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PCC ROKITA SA/SUPPORTING PROCESSES/TECHFNICAL SECURITY MANAGEMENT/		
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Elements of instructions

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Description:

1. INSTRUCTION OBJECTIVE

The objective of the instruction is to provide both relevant reliability of the technical installations and particular devices (minimization of number of breakdowns and critical failures in a determined period of time and minimization of time for eradication of breakdown or critical failure) as well as optimization of costs of maintenance and operation (diminishing of costs of stocks, reduction of time of eradication of breakdowns or failures in relation to application of standard solutions), by determining basic technical requirements in respect of the Control and Measurement Instruments and Automation (AKPiA) branch. Accomplishment of the objective, which is the optimization of the maintenance and operation costs of the installation is performed by ensuring the standards:

- skills and knowledge,
- work.

In order to execute the afore mentioned standards in this document we standardize the devices, technical solutions and manufacturers, which will allow for unification and systematizing of the issues of measurements and automation that in the consequence should lead over a longer perspective to diminishing costs of training of employees in operation of the devices, unify their scope of work over the whole company and also better predictability of the problems related to operation of the possessed installations.

In addition, due to concluding an agreement concerning a grant it is necessary to apply in the procedures selection of the rules resulting from “Guidelines on the principles of awarding public contracts/selection of contractors in transactions not covered by the act PZP under the WD RPO”. The consequence of this is the obligation of allowing

by our company for offering of all solutions that equivalent technically. However, it brings about a risk that the proceedings will be won price wise offer of low quality devices that are impossible to be verified in the documentation phase but only in the later operation.

Moreover, in case of services, the regulations in force allow the possibility of inserting a declaration of compliance by the contractor for the supplied solutions, which reduces substantially a possibility of assessment of the offered devices in respect of the relevant technical tests that are featured by them.

The only possible justification for narrowing the scope of the equivalent solutions in tenders is reference to the standards applied at company （PCC Rokita） resulting from keeping of the compatibility with the solutions that are already existing in the company.

2. SCOPE OF INSTRUCTION

Instruction concerns the PCC Group: PCC Rokita SA, PCC Exol SA., PCC MCAA Sp. z o.o., PCC Prodex Sp. z o.o., LabMatic Sp. z o.o., PCC Apakor Sp. z o.o., PCC Therm Sp z o.o., PCC BD Sp. z o.o. And employees of the third party companies performing assembly works of devices and technical installations within the Control and Measurement Instruments branch upon the orders from the Companies of the PCC Group.

No.	Position (role)	Responsibility and authority	
1.	Technical Director (GT)	Supervision of execution of the instruction	Requests for a change of the instruction
2.	Planning Department Manager (GTP)	Supervision of execution of the instruction, proceeding in compliance with the instruction.	Reporting the needs of amending the instruction.
3.	Technical Specialist/Senior Technical Specialist/Junior Technical Specialist/Technical Specialist Automation Team Leader (GTP)	Proceeding in compliance with the instruction.	Reporting the needs of amending the instruction.
4.	Maintenance Department Manager	Proceeding in compliance with the instruction.	Reporting the needs of amending the instruction.
5.	Project Manager (GI)	Supervision of execution of the instruction,	Reporting the needs of amending the instruction.
6.	Chief Engineer	Supervision of execution of the instruction, proceeding in compliance with the instruction.	Reporting the needs of amending the instruction.

3. PRINCIPLES OF PROCEDURES

3.1. DEFINITIONS AND ACRONYMS

3.1.1. Acronyms

1. **AKP** - Control and Measurement Instruments
2. **AKPiA** - Control and Measurement Instruments and Automation
3. **AMS** - Alarm Management System

4. **APL** - Advanced Process Library
5. **CPU** - Central Processing Unit
6. DG - Director General
7. **DCS** - Distributed Control System
8. **DDE -** Dynamic Data Exchange
9. **DMZ** - Demilitarized zone
10. **EMC** - Electromagnetic Compatibility
11. **ESD** - Emergency Shutdown System
12. **EX -** Explosion proof
13. **GPS** – Global Positioning System
14. **HART** – Highway Addressable Remote Transducer
15. **HMI** – Human-Machine Interface
16. **MPI -** Multi-Point Interface
17. **NTP** - Network Time Protocol
18. **ODBC** - Open Data Base Connectivity
19. **OPC -** OLE for process control
20. **P&ID** - Piping and Instrumentation Diagram
21. **PLC** - Programmable Logic Controller
22. **SCADA** - Supervisory Control And Data Acquisition
23. **SIL** - Safety Integrity Level
24. **SIS -** Safety Instrumented System
25. **SDT** - Standard of Technical Documentation
26. **SUT** - Standard of Technical Devices
27. **UPS** - interruptible power supply - emergency power supply unit
28. **USB** - Universal Serial Bus
29. **VPN** - Virtual Private Network
30. **WAN** - Wide Area Network
31. **ZSZ** - Integrated Management System

3. 1. 2. Definitions

1. **ATEX** - Fr. Atmospheres Explosibles - directive of European Union (legal act), defining principal requirements that must be fulfilled by each product intended for application in the zones featuring explosion risk.
2. **CPU** - Central Processing Unit - a central unit; processor - a sequential digital device, preforming commands on the basis of interpreted data collected from the memory.

3. **Sensor** - a device, physical system, which transfers its reaction to a physical stimulus into a measurable signal of other physical volume in order to provide information about the physical volume.
4. **DCS** - Distributed Control System - a system of control and visualization of an industrial process, which features a common data base for the control and visualization as distinct from the SCADA or PLC systems.
5. **DMZ** - Demilitarized zone - it is a special configuration of a local network objected to improve security by segregation of computers on each side of the firewall.
6. **Measurement accuracy** - the level of correspondence between a measurement result and the real value related to the particular measure pattern.
7. **Emergency Shutdown System (ESD)** - an interlock system ensuring a safe process stoppage for industrial control in case of a failure.
8. **HART** - Highway Addressable Remote Transducer - a communication protocol of industrial networks allowing to change the range and diagnostics of the control and measurement instruments and automation devices. One of the standard communication protocols of the Control and Measurement Instruments in industry.
9. **HAZOP** - Hazard and Operability Study - a method of risk analysis.
10. **HMI** - Human-Machine Interface - A control panel (operator's) - an electric device rendering possible control of other devices that execute certain processes e.g. process or production ones.
11. **Measurement device class** - It is a definition of a value of a possible maximum error during a measurement taken with it. It is determined as a percent error in relation to the full measurement range. The device class can additionally be divided to a laboratory class (devices of class 0.2 and 0.5) and technical classes (devices of classes equal or larger than 1).
12. **Microswitch** — An electric switch triggered by a small movement of its lever.
13. **MPI** - Multi-Point Interface - An industrial network for communication between PLC controllers, programing station, operation panels and other devices of the SIMATIC family made by SIEMENS Company.
14. **NAMUR** - A technical standard accepted by the International Association of Automation Users in the industrial processes. A NAMUR standard determines proximity switches of 2 wire type with switching over parameters from 1.2 mA to 2.1 mA at 8.2 V DC.
15. **NTP** - Network Time Protocol - A communication protocol, which enables precise synchronization of time between ICT devices.
16. **ODBC** - Open Data Base Connectivity - An interface allowing connecting with the data base management systems with application.
17. **OPC** - OLE for process control) - An open standard of communication used in the industrial automation and higher levels of information systems (business and management) in industrial enterprises.
18. **PLC** - Programmable Logic Controller - A programmable logic controller is a microchip device, which performs a control algorithm in cycles, on the basis of which it processes the input states into relevant output states.
19. **PROFIBUS DP** - A communication protocol of industrial networks created for the standard of the PROFIBUS distributed real time deterministic network. One of the standard protocols of communication of the Control and Measurement Instruments and Automation in the industry.

20. **PROFINET** - A modern industrial standard based on the Industrial Ethernet network, for construction of integrated and coherent systems of automation and distributed systems of automation based on the component model.

21. **Straight pipe** - A straight section of pipe with constant cross section and shape.

22. **Transducer** - A device transforming a particular value to another one according to a determined dependence and with a determined preciseness.

23. **Smart transducers** - Transducers ensuring a measurement, signal processing and communication with an external measurement system or control system using a digital signal on the basis of a standard communication protocol.

24. **Communication protocol** - A set of rules and steps executed by a communication device for the needs of transfer and exchange of the data.

25. **SCADA** - Supervisory Control And Data Acquisition - A system of supervision and technological or production process data acquisition, which has the following functions: current process data collection (including measurements), visualization of the collected data, process control on the basis of the collected data and a relevant control algorithm, alarming and measurement data archives.

26. **SDT** - Technical Documentation Standard - developed by the PCC Rokita SA their own standards concerning technical documentation and process identification system.

27. **SIL** - Safety Integrity Level - A level of the safety integrity - It is the level of the requirements, which is fulfilled in order the system ensuring security would work.

28. **SIS** - Safety Instrumented System - A system of protection automatics - A system, which operates automatically in order to keep the installation in the safe state or bring it to this state in case of occurrence of states divergent from the normal conditions.

29. **Controller** - A system busy with supervision of work of an electric device. It can be computer, electric, electronic or electromechanical.

30. **Signal** - A model of any measurable value changing over the time, generated by physical phenomena or systems.

31. **Analog signal** - A signal, which can assume any value from a continuous range and its values can be determined at any moment in time by a given signal mathematical function.

32. **Digital signal** - An electric or optic signal, which carries the digital data by relevant coding (digital modulation).

33. **Measurement signal** - A signal with the parameters set and known to the metrologist, used to stimulate the measured system or checked instrument.

34. **Devices/execution elements (Actuators)** - mechanical devices used in adjustment and control systems, working out an input signal to the adjusted/controlled object on the basis of a control signal.

35. **UPS** - Uninterruptible power supply - Emergency power supply unit - a device /system ensuring uninterrupted power supply for other electronic/electric devices.

36. **USB** - Universal Serial Bus - an universal parallel data bus; a kind of a communication port in computer devices used to connect to the computer of many different devices with automatic detection and identification by the operation system.

37. **VPN** - A communication tunnel used to provide better effectiveness or a larger security level of the transmitted data, through which the traffic goes within a private network between the end customers via the public Internet network in such a way that the nodes of this network are transparent for the packages transmitted in this way.

38. **Watchdog** - A time layout detecting erroneous operation of the system, attempting to repair it and prevent a more serious failure.

39. **Measurement range** - A value range of the measured quantities or other quantities determining the measured value for which the measuring device can be used with an accuracy within the permissible limits, without detriment to the robustness of the device and without violating the safety conditions.

40. **Shut off valve** - A valve responsible for locking a technical installation in case of a failure, by which it plays an important role in the **ESD**/**SIS** security systems. It can be an adjustment and ball type valve or a shutter valve.

41. **Firewall** - It plays a role of connection of a hardware and software protection of an internal LAN network against the access from outside i.e. public networks, the Internet, also it protects against unauthorized data output from the local network outside.

3.2. GENERAL PRINCIPLES

3.2.1. Scope

1. The stipulations of the instruction include general requirements and they are applied during execution of a technical project or selection of a device of the object automation system and control and visualization systems.
2. The instruction presents design and/or performance guidelines in force in the PCC group, which are compatible with the Technical Documentation Standard (SDT) in force at the PCC Rokita SA.
3. In the development there are included the general requirements for designing and selection of the object automation devices and for control systems and visualization as well as the Terms of acceptance of the devices and automation systems. Before commencement of execution of a technical project of selection of a device you should agree all technical requirements, standards concerned and the guidelines included in this development.

Remark: All deviations from the technical guidelines included in this document should be agreed and accepted in writing by the Investor.

3.2.2. Exclusions

The following equipment is excluded from the design of the Control and Measurement Instruments and Automation:

1. The sampling points on devices and pipelines if not equipped in automation.
2. Straight pipes for object devices.
3. All check valves, manual shut off, also with provided with position limit switches and discharge ones except the valves mounted on pulse tubes, valves on outlet of the air manifold.
4. All power supply devices both AC and DC with cables up to distribution power supply cabinets and all intermittent cables and cabinets for power supply of the control systems.

5. **UPS** type power supply devices, banks of batteries.
6. Electric heating lines and their control elements.

3.3. DESCRIPTION OF PROCEDURES

3.3.1. General requirements for designing and acceptance in force at PCC Rokita SA

3.3.1.1. General requirements for designing

1. Automation devices and control systems for new installations should be selected in the way so as to fulfill the requirements of standards and legal regulations included in section **6** and the requirements included in this development.
2. Automation devices should be selected on the basis of the **HAZOP** analysis and with consideration of the **SIL** classification.
3. The accepted solutions should provide safety, trouble free functioning, low maintenance costs. Each device should be located in the way as to enable its free and safe service.
4. You should provide maximal standardization and unification of the automation devices and equipment of the control system cabinets.
5. All materials used in the automation devices must be selected in relation to the process conditions and the environment.
6. The system of SI units should be used for measurement units.
7. The measurement devices installed on the installation qualified as the pressure ones should be selected in compliance with the pressure directive mentioned in section **6**.
8. For the automation devices that use air for their operation you should foresee air collections and provide free, spare outlets on the level of 30%. The air collectors and the valve terminals should be equipped with the main filter regulator with a manometer. Individual filter regulators with a manometer should be used only when it is impossible to use a group one. Each outlet should feature individual marking (with a process number of the device to which it is connected).
9. The installation for measurement air supply should be made of a steel pipe 1.404 in dimensions 8x1 mm, 12x1 mm 16x1 mm, 18x1 mm or 22x1 mm (depending on the air demand volume with consideration of 30% spare air). On short sections near the automatic valve, if the process and atmospheric conditions allow welding spark resistant pneumatic pipelines in PVC coating are preferred. Fitting to the valves and manifolds should use pipe threads G and R.
10. For the Control and Measurement Instruments and Automation devices that use measurement air for their operation, you should use the devices selected in the way so as they could operate correctly at min. supply pressure 4.5 bar in the plant measurement air supply mains.
11. The pressure of the measurement air supplied to the Control and Measurement Instruments and Automation devices should be monitored for the particular installation with consideration of signaling a warning of too low pressure (the pressure less or equal to 5 bas) and alarming with locking in case of too low pressure (the

pressure below and equal 4.5 bar - lack of the measurement air).

12. All devices, which operate in safety loops and locking loops should be equipped with a line damage detection system. Moreover, the automation devices, which take part in the system of safe switching off **Emergency Shutdown System (ESD)**, will be mounted directly into the control systems.
13. All the automation devices, which belong to the safe shut down circuits will be supplied from the power supply system with the guaranteed direct voltage.

    It is recommended to make the guaranteed power supply voltage for all measurement devices and cabinets of the control systems.
14. After the power supply outage the actuators must set themselves automatically in the safe position.
15. All signals from devices of other branches, which will be implemented to the control systems must be included in the design documentation of the branch of Control and Measurement Instruments and Automation.
16. The devices made in explosion proof make will have certificates in Polish or English issued by certificating authorities notified in the area of the EU. The following explosion proof makes are preferable for automation and control system devices:
    - EEx (i) for measurement devices and actuators of the protection system **Emergency Shutdown System (ESD)** integrated with the DCS system via dedicated stations with the Profinet/Profisafe ET200MP Failsafe communication or Profisafe ET200SP HA communication with fail-safe modules (in case of the necessity of assembly of a distributed station in the space with the explosion risk} or in case of extension of the existing Profibus station via the stations ET200M Fail-safe or ET200iSP (in case it is necessary to assemble the distributed in the space with the explosion risk) including the fail-safe type modules..
    - EEx (d) for the actuators of the protection system **Emergency Shutdown System (ESD)** independent of **DCS**.
17. Filling up values should be monitored and logged. Relevant levels in pressure-less and pressure tanks should be signaled in compliance with the guidelines included in the instruction **PBT.I04 Standard of Technical Equipment - SUT M Mechanical Branch**

3.3.1.2. Power supply systems for Instrumentation, Control and Automation

Power supply systems for Instrumentation, Control and Automation systems should be selected in compliance with the regulations in force and below listed requirements:

1. The Instrumentation, Control and Automation instruments must not be damaged, with switched off operation or cause deterioration of operation at:
   a. temporary voltage changes,
   b. momentary switching over between different power supplying systems,
   c. returns of voltage,
   d. switching on and disconnections.
2. The power supply circuits should be designed so as the maximum voltage drop at the supply point did not exceed 5%,

3. The object instruments of the Control and Automation system should be supplied from a superior automation system. The local automation systems should be supplied with the voltage guaranteed by the electric branch.
4. The guaranteed voltage supply system should be used for the needs of the protection and control and automation systems.
5. The guaranteed alternating current voltage system with the value of 230 V AC for the alternating current 230V receivers via a mains inverter, supplied from the system of the guaranteed direct voltage 24V DC or in special cases an **UPS** power supply unit using its own, local bank of batteries or co-working with a separated battery.
6. Application of **UPS** systems should be avoided.
7. The principal system of emergency power supply for the needs of the **DCS** control system protections and control as well as the systems of the Control and Measurement Instruments and Automation is the direct power supply system with the guaranteed voltage 24V DC via the buffer power supply unit (rectifier) co-working with a battery bank connected with its terminals. On the figure - **Figure 1** there is presented an example diagram of the guaranteed supply 24V DC for Control and Measurement Instruments and Automation. Between the buffer power supply unit and the LED bridge there should be a voltage converter 24VDC to 24V DC.
8. The guaranteed power supply systems must provide power supply for the time necessary to stop the particular installation however not less than 60 minutes.
9. The buffer power supply unit should be provided with the following systems:
    a. Contacts for co-working with the **DCS** system.
    b. A connection for digital communication RS485 with software allowing for the full remote operation control of the power supply unit with a PC class computer.
    c. An Ethernet RJ45 connection for digital communication in the Ethernet network with software allowing for the full remote operation control of the power supply unit with a PC class computer.
10. Banks of batteries for co-working with the buffer power supplies should be selected for the nominal voltage of the circuit and the operation conditions in the range from 85% to 110% of the nominal voltage.
11. In case of supplying power to programmable drivers series S7-400 made by SIEMENS, you should apply relevant power supply modules designed with consideration of connecting them the direct current network DC24V supplying on the secondary side power DC 5V/10A and DC 24V/1A. In case of not redundant power supply it will be a module PS 405 10A (6ES7 405-0KA020-0AA0). When it is necessary to increase availability of the control system, and especially when it is necessary to operate the control system from an unreliable power supply mains, it is recommended to design a system with the redundant power supply using two power supply modules type PS 405 10A R (6ES7 405-0KR02-0AA0) provided with buffer batteries.

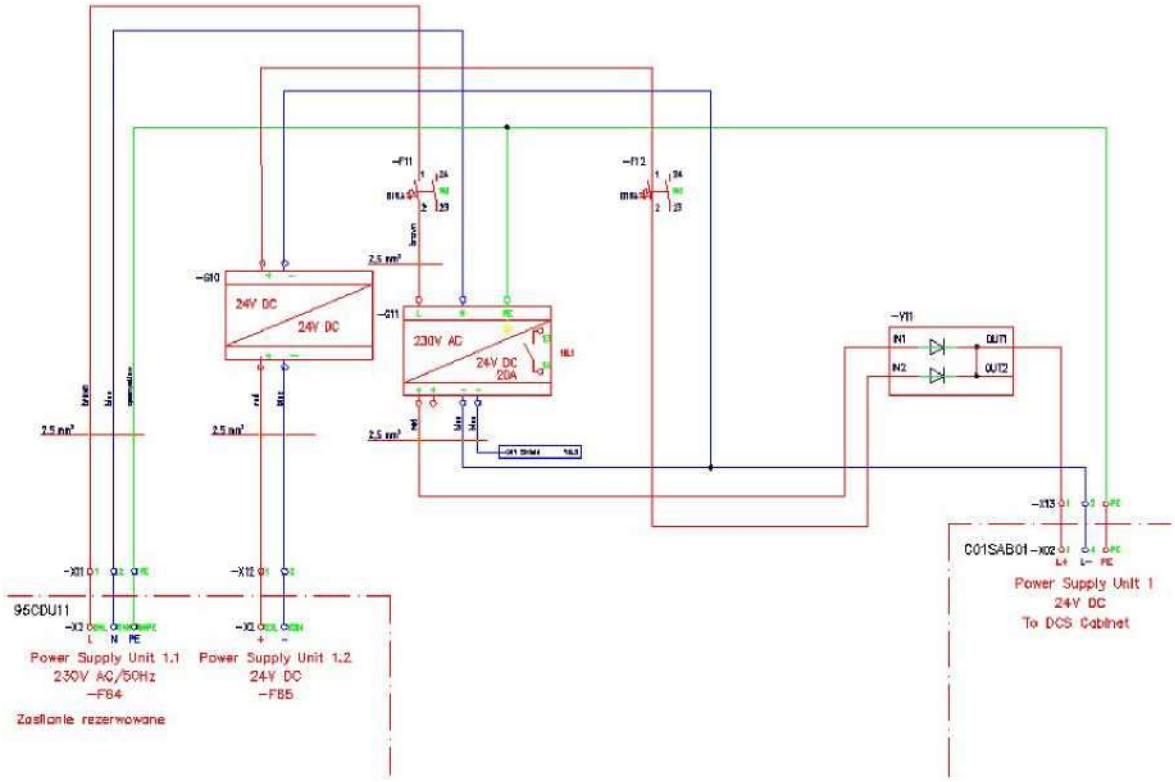


Figure 1 Example of diagram of guaranteed power supply 24V DC for Control and Measurement Instruments and Automation

12. The **UPS** power supplies used in the **DCS** power supply systems and locking systems of the control and measurement automation should fulfill the following requirements:

a. The **UPS** power supplies should feature a minimal overload for the power factor

(power factor, PF = 0.8 <125% (for 10 min.), <150% (for 1 minute),

b. An **UPS** power supply unit should feature the mode with a double conversion (double energy conversion).

c. An **UPS** power supply unit should feature a large current overload of the installed in the system power inverters allowing for correct, selective operation of protections on the receiver bus bar.

d. A power supply unit should feature the time of switching to battery operation = 0s - operation in the ON-LINE mode.

e. The **UPS** power supply unit should feature an over-voltage, over-current and short-circuit protection

f. The **UPS** power supply unit should feature a protection against excessive weakness of the supply battery.

g. The **UPS** power supply unit should feature a bypass circuit with a static connector and a manually switched service bypass.

h. The **UPS** power supply unit should feature a microchip uninterruptible electronic bypass.

i. The **UPS** power supply unit should feature a possibility of co-working with a superior system (**DCS**) in the necessary range e.g. using contacts for co-working with the **DCS** system or for digital communication in the Ethernet network.

j. The **UPS** power supply unit should transfer to the superior system alarm signals:

- battery operation,
- failure of the guaranteed power supply,
- battery low.

k. The **UPS** power supply unit should feature the required rated power resulting from the design in the Control and Measurement Instruments and Automation branch and IT or electric branch in compliance with the foreseen application and consideration of 50% spare.

13. Individual power supply circuits for the object devices of Control and Measurement Instruments and Automation should be used that with their power supply cables should be individually protected (e.g. With a separate fuse for each of the devices supplied with 24V DC).

3.3.1.3. Control and measuring equipment

1. Smart measurement drivers and positioners should be used.
2. Devices and interface software for diagnostics and communication with the object equipment should be used.
3. Overvoltage protection of the devices should be used wherever it is required or for prophylactics for increasing of protection of the devices.
4. The equipment in metal casings should be adapted to connecting to the main earthing mains.
5. All measurement devices installed on the object should be marked and provided with description plates.
6. All measurement devices installed on the object should be provided with rating plates made of stainless steel with engraved information concerning the devices and especially type, series number and EX features (for the devices mounted in the zones with the risk of explosion).

3.3.1.4. Standard signals of measurements and automation

1. Pneumatic signal 20 to 100 kPa.
2. The signal of electronic transducers and output signal for the purpose of control 4...20mA in the two way line 24V DC with the **HART.**
3. Binary signals 24V DC, **NAMUR,** potential-free contact.
4. Binary control signals 24V DC.
5. Serial communication permissible only within one DMZ zone, especially between controllers and distributed stations I/O: PROFINET, **PROFIBUS DP** . You cannot connect via the serial communication two control systems, for which different DMZ zones have been sectioned - in that case the connection are only via the standard analog and bistate signals.

3.3.1.5. Assembly of automation equipment

1. Housings of the automation devices should consider atmospheric and process conditions.
2. The housings should be equipped with a sight hole if a display is installed.
3. The glands routing cables in should be tight and prevent penetration of water and solid particles into the device interior.

4. Places where vibrations and high temperature occur should be avoided.
5. Mounting of the devices under drains and over air vents is ruled out.
6. Clamping rings, holders, supports should be mounted to fixed construction elements omitting barriers and other construction elements, which are used for users safety. It is ruled out to mount the devices directly on concrete walls.
7. All devices to which electric signals are led should be earthed/shielded in the way compliant with the requirements of suppliers.
8. Connection collective boxes should be mounted in easy to access places ab. 1.5 m over the platform level. Each connection box must be described on the outside of the cover. The same marking should be used on the multi-core cable going out of the box
9. Where it is necessary you should use heating of the automation devices and pulse pipes using heating pipes. The heating pipes should be mounted in the way so as to enable easy disassembly and assembly of the automation devices. The heating should be positioned in compliance with recommendations of the device manufacturers.
10. The measurement system elements should be provided with such fixtures and such shut off fittings so that it would be possible to disassemble and replace them during operation of the installation.
11. The cables connecting the actuators with the computer system must be installed separately from the power cables.
12. They should be led by different network routes of the system communication buses. (e.g. optical fiber ring).
13. The cable routes of the digital communication control systems should be protected against cable damages and reacting of external electromagnetic fields.
14. Corrosion protection should be applied (e.g. with galvanic and/or paint coating) on the cable routes with their supporting elements.
15. The access supporting devices (periodical control, maintenance or exchange) should be mounted on not higher than 1.8 m over the service level and in case of positioning above this limit there should be used fixed or movable platforms depending on demand.
16. All the flange/between flange devices should be provided with seals dedicated to the actual process conditions.

3.3.1.6. Cable lines and routing

The lines and cable routes should be selected in compliance with the regulations in force and standards and the below regulations:

1. Elements of cable troughs or ladders should be:
   a. designed with at least twenty percent reserve,
   b. made of hot dip galvanized steel plates (in compliance with standard **PN-EN ISO 1461:2011P Galvanized coatings applied on steel and cast iron products with the hot dip method - Requirements and testing methods**).
   In the spaces with occurrence of an aggressive environment there should be foreseen use of the routes (elements of cable troughs or ladders) made of acid resistant steel or plastic suitable for the conditions.
2. Systemic solutions should be used at making cable routes.
3. The control cables of digital communication and tele technical one should be led along separate cable

routes other than the power supply cables.

4. The cables and wires in troughs or on cable ladders should be covered and protected against reacting of external factors such as: precipitation, direct sunshine, accidental mechanical or heat damage by making of relevant guards.
5. Cabling should be protected against accidental damage.
6. In case of application of conduit tubing relevant Adaptlock ends should be used as a protection of the cable at a device.
7. Electric continuity should be ensured for the cable routes and assembly accessories as well as earthing of the routes every 15 to 20 meters.
8. The control, signaling and measurement installations using the alternate voltage 230V or direct voltage 24V for production installations should be executed with multi core cables:
   a. with the construction - conductors from thin wires of galvanic copper,
   b. with the same cross section of the working conductors and protective cable,
   c. Self-extinguishing acc. to **PN-EN 60332-1-2:2010 Testing of flammability of cables and electric conductors and optical fibers - Part 1-2: Checking of resistance of a single insulated conductor or cable to vertical spreading of fire - Testing method with mixed flame 1 kW**,
   d. good chemical resistance (depending of place of installation),
   e. with numbered or color marked conductors
   f. with halogen free or PVC insulation, in special cases cables with additional guard should be foreseen (steel wire shield),
   g. for applications in industrial conditions, additionally in external installations resistant to the UV radiation and atmospheric conditions.
9. The cross section of the signaling cable cannot be less than 0.5mm^2.
10. The cross section of the supply cable of the Control and Measurement Instruments and Automation cannot be less than 1.5mm^2.
11. The cables installed completely or partially in the space with explosion risk should feature the following minimum cross sections of the conductors:
    a. signaling, control cables - 0.75mm^2,
    b. telecommunication cables - 0.75mm^2.
12. The cables should have increased insulation,
    a. The signaling cables can have multi wire conductors and insulation 0.3/0.5kV,
    b. The power supply cables should have insulation 0.6/1kV.
13. The signaling cables should have reserve pairs of wires amounting at least 15% - not less than 2 reserve wires.
14. Optical fiber cables should have min. 30% of the reserve, not less than four fibers - 2 pairs.
15. It is recommended that maximum amount of wires in one cable should not exceed 48 pcs.
16. Signals with the same voltage levels should be sent via the multi wire cables.
17. The signals for the needs of special measurements will be sent via the shielded cables in compliance with

the requirements of device manufacturers (e.g. shielding in pairs).

18. Signal cables, telecommunication, power supply (pulse cables, digital data transmission cables, etc.) should be installed taking into consideration the requirements of the applied **DCS** system and the requirement s of Norm **PN-EN 50575 - Electromagnetic, control and telecommunication cables and wires for general applications in construction objects with a determined fire resistance class.**
19. The type, number of pairs and routs of structural, telecommunication, visual surveillance cables should be agreed with the PCC IT S.A. company.

    For the cables other than optical fires as telecommunication cables, it is recommended to use cables of cat. 6:

    - U/FTP in coating LSHF (LS0H, FRNC) fire resistance class CPR (Construction Product Regulation – EUROPEAN REGULATION ON CONSTRUCTION PRODUCTS 305/2011) not worse than Eca (in compliance with the guidelines of Standard **PN-EN 50575 - Electromagnetic, control and telecommunication cables and wires - Cables and wires for general applications in construction objects with determined fire resistant class**) with 4 shielded pairs of wires (the shield of the form of aluminum laminated foil around each pair) from soft copper wire with the lead diameter not less than 0.57 mm (not counting the insulation), in insulation from polyethylene of dia. min. 1.4 mm.
    - F/UTP (one common shield for 4 pairs made form varnished aluminum foil) with 4 pairs from copper wire with lead dia. Not less than 0.57 mm (not counting the insulation), in insulation from polyethylene of dia. min. 1.0 mm, mutually stranded and earthing wire from galvanized copper wire covered with an external coating wires from the LSZH material (Low Smoke Zero Halogen) and in fire resistant class CPR: Dca (in compliance with the guidelines of Standard **PN-EN 50575**).
20. In closed rooms the cables should be led under technical floors or in special channels.
21. In open spaces special cable constructions should be made, starting with the main routes to the particular Control and Measurement Instruments and Automation devices (intermediate boxes, sensors and measurement transducers, etc.).
22. Outside the cable should be placed in the earth in protective tubes, in cable channels or on cable constructions. The cables placed in the earth in place where they can break down should be protected additionally with protective element e.g. Steel tubes, concrete bushings etc.
23. Cables of different classes should be placed on different shelves and ladders in the following order from the top: electrical cables HV, electrical cable LV, signaling cables;
24. All cables should be marked in a durable way in the beginning and on the end of the cable as well as on the passages. The kind of markings should be adjusted to the conditions prevailing in the environment according to the guidelines of the Investor.
25. Electrical and Control and Measurement Instruments and Automation installations should be placed after complete finish of the assembly of the process devices, constructions and pipelines, especially after completing works that require welding. In case it is necessary to carry on welding in the vicinity nearby already placed electrical and Control and Measurement Instruments and Automation installations these works should be performed under supervision of the representatives of the electrical supervisors with

application of guards preventing damage of the cables or wires.

26. All wires and all elements of control cabinets such as connectors, bus bars, control instruments, locations of equipment, pushbuttons and signaling devices, relays, contacts, cable bundles or name plates should be described using designators.
27. The way of marking the cables is discussed in the document **PBT.I03 Standard of Technical Equipment - SUT E Electrical Branch**.
28. Relevant colors of sleeves should be used corresponding to different nominal cross sections of the wires, to which they apply. The German system (N) or color marking of the nominal sizes of the endings should be used according to **Figure 2.**
29. After completing all works related to the network assembly, measurements should be performed in compliance with the requirements of Standard **PN-IEC 60364-6-61 Electrical Installations in construction buildings. Acceptance checking - Standard withdrawn.**

Cross section	System	
[mm]	German (N)	
0.14		Gray
0.25		Blue
0.34		Turquoise
0.5		Orange
0.75		White
1		Yellow
1.5		Red
2.5		Blue
4		Gray
6		Black
10		Ivory
16		Green
25		Brown
35		Beige
50		Olive
70		Yellow
95		Red
120		Blue
150		Yellow

Figure 2 Colors of cable sleeves

3.3.1.7. Cabinets and boxes for Instrumentation, Control and Automation

All cabinets and object boxes of different kinds, including the connection ones of the Control and Measurement Instruments and Automation should be selected in compliance with the regulations and standards in force and the below requirements:

1. They should feature the protection level relevant to the particular conditions, not worse than IP65 for the

cabinets width less than 1200 mm and IP55 for the remaining cabinets.

2. They should be made from the material adapted to the environmental conditions and the level of exposure to the contact with chemical substances on the particular installation and protected against corrosion in the relevant way.
3. They should be provided with locks with a replaceable locking cylinder for a patent key adapted for the particular object cabinet/box (e.g. Comfort handle for TS, TS IT, VX, SE, PC, IW - catalog number TS 8611.340 or Comfort handle Comfort AX catalog number AX 2435.100 or Mini-comfort handle catalog number AX 2537.100) taking onto consideration a master key (the kind of the cylinder and key to be agreed with the Investor) or be equipped with a locking system with a handle (e.g. Comfort handle for TS, TS IT, SE, PC, IW - catalog number TS 8611.290 or Comfort handle mini Comfort AX - catalog number AX 2537.30) or possibly equipped with locks with a lock cassette guard (e.g. SZ 2493.000), with a lock (installation to be agreed with the Investor) featuring the possibility of locking with a weather resistant padlock with a cylinder for a patent key with the master key function (the kind of the cylinder and keys to be agreed with the Investor). Key should be supplied with a padlock.

   Guidelines for the lock cylinder and key:

   - The lock cylinder in the Master Key system in compliance with the European standard EN1303:2015 made with the key profiles patented at the Patent Office and making of new original system keys protected with a security card, the possibility of making additional keys and system cylinders many years after supply of the system, durability - class "6" (the top
   - 100 thousand of open/close functions), code protection - at least class "4", resistance to attacks - class "2" (the top), corrosion - class "C" (high resistance in the range -20…+80), fire resistance.
   - The key in the Master Key system, made from brass with high nickel content, superior resistance for damage, granting a long term, trouble free use. The in compliance with the European Standard EN1303:2015 patented at the Patent Office and making of new original system keys protected with a security card, the possibility of making additional keys and system cylinders many years after supply of the system, the keys with corrosion protection. All boxes mounted outside and in places where humidity condensation is possible should be provided with heaters.

4. They should be provided with a ventilation installation in case of large heat generation in them and if necessary, of preserving special operation conditions of the equipment installed inside of them they should be provided with an air conditioning installation.
5. In case of application of ventilation of a cabinet a reserve device should be foreseen.
6. In the cabinets/boxes of the Control and Measurement Instruments and Automation, in case of mounting them outside of rooms and in production halls faint blow of compressed air should be used executed be application of an air reducer in order to create excess pressure in the cabinet to protect it against penetration its interior by the atmosphere from production installations or for

ventilation

of the cabinet with air.

7. The size of cabinets and boxes of the Control and Measurement Instruments and Automation should take into consideration ab. 30% of spare room for possible future extending.
8. The circuits with different voltage levels should be separated/routed and clearly marked according to the standards, it concerns especially the Ex circuits.
9. Assembly of the cabinets should be executed in such a way so as the lowest level of installation of the terminals or instruments was not below 250mm over the floor level.
10. Terminal blocks should be used made using screw or spring connection (clamps), which should not require performance of any service-maintenance works for minimum 10 years, except for the Ex circuits, which are controlled according to separate regulations.
11. The following sequence of instrument displacement in a cabinet should be observed:
    - power supply and distribution elements with protections,
    - control system elements with communication modules,
    - cross terminal blocks and relays.

An example of element displacement in a control cabinet is presented on **Figure 3 Example of diagram of element displacement in control cabinet DCS**

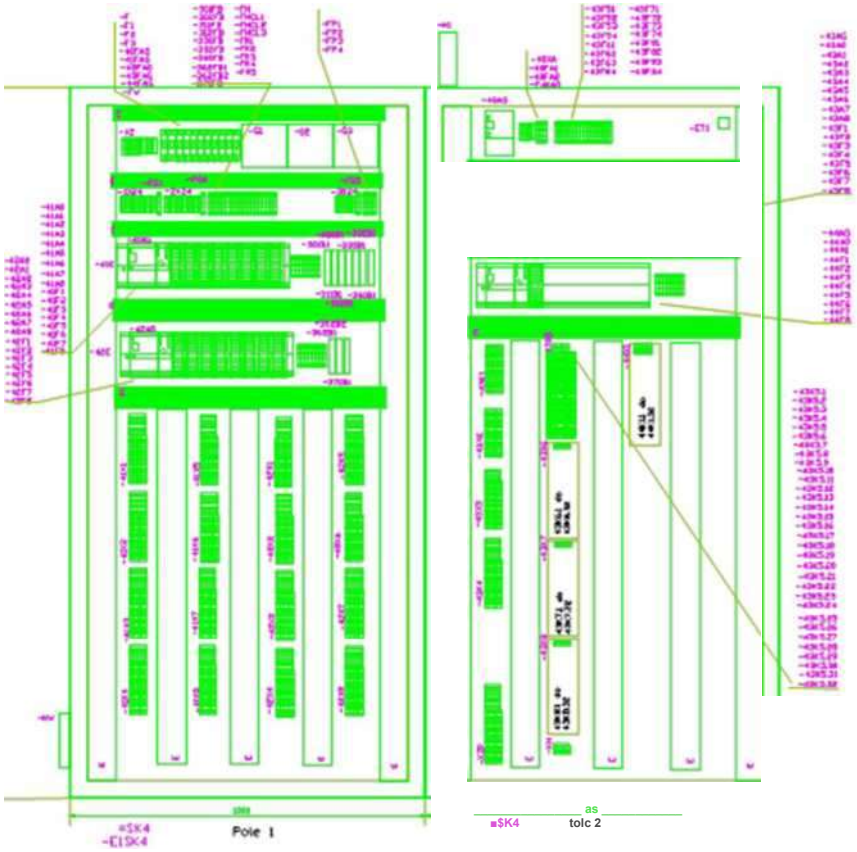


Figure 3 Example of diagram of element displacement in control cabinet DCS

3.3.1.8. Operation panels

1. Operation panels should be powered with the guaranteed power supply.
2. Operation panels should be supplied with:
    a. touch pad,
    b. color screen TFT,
    c. screen 15”,
    d. screen resolution not less than 1280 x 800 pixels
3. The panels should feature the possibility of use in **PROFIBUS DP** networks or the **PROFINET** environment, when it is preferable to connect to the **PROFIBUS DP** network in case of operation with the **DCS** systems and the **MPI** network in case of local operation in the control system **PLC**.
4. Apart from the standard visualization function the operation panels should enable archiving of variables on memory cards or network drives, handling of alarms, recipes, VB scripts, they should enable starting runtime type programs (Soft PLC driver, Internet Explorer).
5. The operation panels should feature the possibility of programming and configuration with SIMATIC WinCC Comfort (TIA Portal) or WinCC flexible Standard.
6. The operation panels should feature the protection level not worse than:
    a. IP 65 at the front,

b. IP 20 at the back.

7. The operation panels should have a relevant protective foil attached on the screen (for SIMATIC HMI TP1500 COMFORT order code for foil set: 6AV2124-6QJ00-0AX1).
8. The operation panels mounted outside buildings and in unheated buildings and construction objects should be protected with an additional opened sight glass window of e.g. NSYCW55 type, with a key lock - the details in section 3.3.1.7, IP55, made by Schneider Electric.
9. Preferred mode of operation panel: SIMATIC HMI TP1500 COMFORT (6AV2124-0QC02-0AX1) and in case of application outside of buildings and in unheated buildings and construction objects and in the zones with the risk of explosion: SIMATIC HMI TP1500 Comfort Outdoor (6AV2124-0QC13-0AX0).
10. It is permissible to apply the operation panels with the diagonal of 7" in small application types like chillers, compressors, scale stands for breaking bulk, loading/unloading stands, etc., where:
    a) The continuous operation of the visualization on the **HMI** panel is not required.
    b) There is no technical possibility to mount a panel with the diagonal of 15”.
    c) The control system comprises not more than 40 signals.

    In such case the preferred panels are TP700 Comfort (6AV2124-0GC01 -0AX0) with protective foil and in case of application outside of buildings and in unheated buildings and construction objects and in the zones with the risk of explosion: SIMATIC HMI TP700 Comfort Outdoor (6AV2124-0GC13-0AX0)
11. The preferred form of logging in the operation panel is use of the readers of RFID cards and ID cards. In particular the readers that should be used are SIMATIC RF1000 ACCESS CONTROL READER RF1060R (6GT2831-6AA50) with an assembly set SIMATIC RF1000 CARD HOLDER FOR RF1060R AND RF1070R (6GT2890-0CA00).

3.3.1.9. PLC Controllers

1. The **PLC** controllers must have the guaranteed power supply.

If it is necessary to use local control and visualization the **PLC** controller series S7-1500 with a relevant operator panel should be used as the **HMI**. In particular the following modules of SIMATIC S7 should be used:

- a power supply unit SIPLUS S7-1500 PM 1507 24V/3A (6AG1332-4BA00-7AA**0**), or SIPLUS S7-1500 PM 1507 24V/8A (6AG1333-4BA00-7AA**0**) depending on the required power demand.
- a module of the standard central **CPU** unit : CPU 1513-1 PN (6ES7513-1AL02-0AB0) + communication module **PROFIBUS DP** CM 1542-5 (6GK7542-5DX00-0XE0)

/ and a module of the **CPU** unit for safety application (fail-safe): CPU 1513F-1 PN (6ES7513- 1FL02-0AB0) + communication module **PROFIBUS DP** CM 1542-5 (6GK7542-5DX00-0XE0) dedicated for exceptionally high demand applications, fail-safe applications and additional communication tasks,

- digital input module standard S7-1500, DI 32X24VDC HF (6ES7 521-1BL00-0AB0) (from the firmware version V2.1 it is possible to use 2 channels in HF modules for simple counting functions (as High Speed Counters - HSC)) or for fail-safe applications ET 200MP, F-DI 16X24VDC (6ES7 526-1BH00-0AB0),
- digital output module standard S7-1500, DQ 32X24VDC/0.5A ST (6ES7 522-1BL01- 0AB0) or for fail-safe application ET 200MP, F-DQ 8X24VDC 2A PPM (6ES7 526-2BF00- 0AB0),
- analog input module S7-1500, AI 8XU/I/RTD/TC ST (6ES7 531-7KF00-0AB0),
- analog output module S7-1500, AQ 8XU/I HS (6ES7 532-5HF00-0AB0),

In case it is necessary to use the technological functions such as traffic control and high speed counters you should use a technological module S7-1500, TM POSINPUT 2 (6ES7 551-1AB00-0AB0) compatible with encoders: incremental encoder with differential signal 5V, pulse encoder with/without direction, front/back pulse encoder, absolute encoder SSI.

In case of additional extending of the PROFIBUS network you should apply a high output communication processor PROFIBUS CP 1542-5 (6GK7542-5FX00-0XE0) or in case when the controller S7-1500 has no integrated with the CPU the PROFIBUS interface you should use a communication module CM 1542-5 (6GK7542-5DX00-0XE0).

In case of connecting a controller S71500 to the ETHERNET network you should us a communication processor Industrial Ethernet COMMUNICATION PROCESSOR CP 1543-1 (6GK7543-1AX00-0XE0).

In case of large distances between the **PROFIBUS** DP network nodes

In case it is necessary to apply the SIWAREX weighing system (enabling i.a. Gravimetric in silos and freight cars and weight measurements in risk zones (in connection with w a Ex SIWAREX IS module)) you should apply for the S7-1500 controllers a technological module of an electronic scale SIWAREX WP522 ST WEIGHING ELECTRONIC (2 CHANNELS) (7MH4980-2AA01) and for the existing S7-300 controllers a module SIWAREX FTA (7MH4900-2AA01). For weighing in a zone with an explosion risk you should use the intrinsically safe barrier EX SIWAREX IS SYSTEM INTERMEDIATE (7MH4710-5BA).

If the existing system is based on the **PROFIBUS**, connections can be exchangeable for the PROFINET for all distributed stations I/O. Alternatively you can use S7- 1500 with PROFIBUS or a gate - connection IE/PB LINK PN IO (6GK1411-5AB10), which transfers signals central from the PROFIBUS to the **PROFINET**.

Apart from a central controller the full migration to S7-1500 comprises the migration of complete operations in / out to new control components. For this purpose a complete portfolio input/output ET 200 is available. For example ET 200SP, ET 200SP HA EX, ET 200MP, ET 200AL etc.

Remark: Even if a partial migration enables a direct connection with OLD in / out (PROFIBUS), the manufacturer recommends implementation of complete migration to the ET 200MP / SP / AL / etc. and connection via the **PROFINET**. This also can be done in the second stage after the basic installation functionality migration. The benefits result e.g. from: improved system diagnostics, faster data bus, the most modern technology and relatively simple migration and simple connection with the existing I/O

stations.

Figure 4

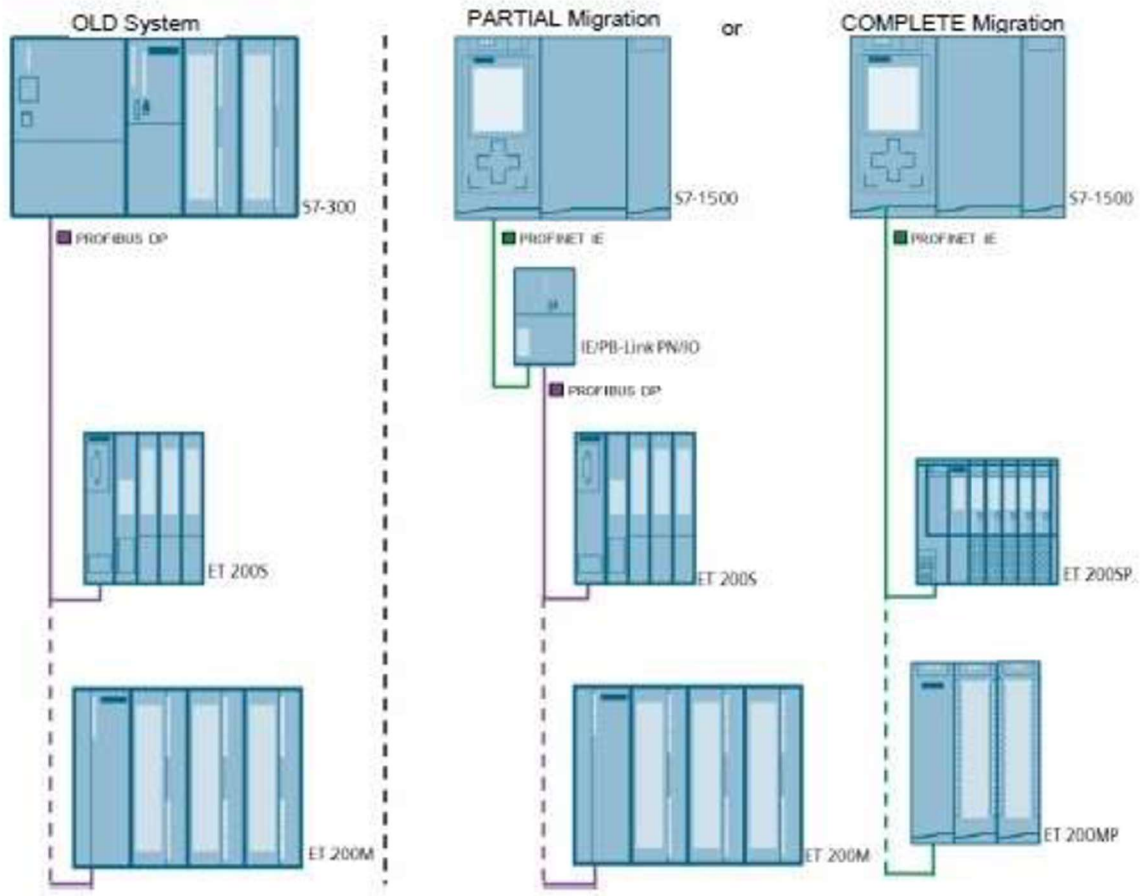


Figure 4 Migration of distributed installation

If it is necessary to extend the existing **PLC** controller series S7-300 you should use the following SIMATIC S7 modules:

- the power supply unit POWER SUPPLY PS307 24 V/5 A (6ES7307-1EA01-0AA0), or PS307 24 V/10 A (6ES7307-1KA02-0AA0) depending on the required power demand.

- the central unit module CPU315-2 DP, 256 KB (6ES7315-2AH14-0AB0),
- the interface module M 365 FOR CONNECTING AN EXPANSION RACK, W/O K-BUS, 2 MODULES + CONNECTING CABLE 1M (6ES7365-0BA01-0AA0),
- the digital input module SM 321, DI 32xDC24V (6ES7321-1BL00-0AA0),
- the digital output module SM 322, DO 32x DC24V/0,5A (6ES7322-1BL00-0AA0),
- the analog input module SM 331, 8AI, 9/12/14BIT (6ES7331-7KF02-0AB0),
- the analog output module SM 332 8 AO, U/I, 11/12 BITS (6ES7332-5HF00-0AB0),

In case it is necessary to use the technological functions such as traffic control or high speed counters you should use the counter input module FM350-2, COUNTER MOD., 8 CHANNELS, 20KHZ (6ES7350-2AH01-0AE0).

In case it is necessary to connect the existing controller with the CPU314 to the PROFIBUS DP network, you should apply COMMUNICATION PROCESSOR CP 342-5 (6GK7342- 5DA03-0XE0).
In case it is necessary to connect the existing controller S7-300 to the ETHERNET network you should apply the communication processor Industrial Ethernet CP343-1 LEAN (6GK7343- 1CX10-0XE0).
In case it is necessary to connect the existing controller S7-300 to the **PROFINET** network you should apply the central unit module - CPU315-2 PN/DP, 384 KB (6ES7315- 2EH14-0AB0).
If it is necessary to apply the weighing system SIWAREX (enabling i.a. gravimetric measurements in silos and freight cars and weighing measurements in risk zones (in connection with the Ex SIWAREX IS module)) it is necessary to use for the existing S7300 controller a technological module of an electronic scale SIWAREX FTA (7MH4900-2AA01). For weighing in a zone with an explosion risk you should use the intrinsically safe barrier EX SIWAREX IS SYSTEM INTERMEDIATE (7MH4710-5BA).
In case of extending of the **PROFIBUS DP** network you should use the Repeater RS485 PROFIBUS/MPI (6ES7972-0AA02-0XA0).
In case it is necessary to lead the **PROFIBUS DP** in an explosion risk zone you should use RS485-IS COUPLER (6ES7972-0AC80-0XA0) before the explosion risk zone to accomplish intrinsic safety.
In case of large distances between the nodes of the **PROFIBUS DP** network you should use as the transmission medium the multi-mode optical fiber with relevant network elements of the PROFIBUS OLM/G12 V4.0 OPTICAL LINK MODULE (6GK1503-3CB00) and in case of very large distances use the single-mode optical fiber with network elements of the PROFIBUS OLM/G11 V4.0 OPTICAL LINK MODULE (6GK1503-2CC00).

2. The systems with the **PLC** controllers should have a reserve both in the number of free channels of the I/O modules, processing power of the **CPU**, memory as well as licenses on the level of at least 25% for each of the listed parameters.
3. You should use only the standard libraries of the particular **PLC** control system.
4. Source codes should be provided, which are necessary for using the software according to its intended use that were used by the application supplier, including the open source software and also the source projects (logics) of adjustment, control, visualization, configuration, reporting, settings with descriptions and commentaries that enable the Ordering Party to review, change and extend them and other operations necessary for correct operation i optimizing of operation of devices or installations, especially for all used PLC controllers and operation panels, excluding the tool software of the systems type PCS7, step7, WinCC flexible, etc., in which the above mentioned projects are created.
5. Copies of the software should be supplied on the media enabling its repeated uploading and modification.
6. For programming you should use any language supported by the PLC controller mentioned in Standard **EN 61131-3, Programmable controllers - Part 3: Programming languages (IEC 61131-3:2013), International Standard, Brussels, May 2013**

3.3.1.10. Programmable relays

1. In cases economically justified instances of flexible automation on a little scale it is permissible to use programmable relays.
2. You should use programmable relays supplied with voltage 24VDC.
3. You should use the programmable relays with relay outputs.
4. For the LOGO type relays you should use the following modules:

   - LOGO! 8.3 12/24RCE, LOGIC MODULE WITH THE ETHERNETEM AND DISPLAY, DATA LOGGING ON MICRO SD CARDS, BUILT IN WEB SERVER + USER PAGES, POWER SUPPLY 12/24V DC/AC, 8 BINARY INPUTS (INCLUDING 4 ANALOG VOLTAGE INPUTS) / 4 RELAY OUTPUTS (3A); MEMORY 400 BLOCKS, WITH POSSIBILITY OF EXTENDING BY ADDITIONAL MODULES 12/24V AC/DC; CONNECTION WITH THE CLOUD ; REQUIRED ENGIINEERING SOFTWARE: LOGO! SOFT COMFORT 8.3 OR LATER (6ED1052-1MD08-0BA1),
   - LOGO! DM16 24R, EXTENSION MODULE, POWER SUPPLY 24V DC/8 DIGITAL INPUTS 24V DC/8 RELAY OUTPUTS, 4TE FOR LOGO! 8 (6ED1055-1NB10-0BA2),
   - LOGO! AM2, EXTENSION MODULE, POWER SUPPLY 12/24V DC, 2 ANALOG INPUTS 0-10V OR 0/4-20MA FOR LOGO! 8 (6ED1055-1MA00-0BA2),
   - LOGO! AM2 AQ EXTENSION MODULE, POWER SUPPLY: 24V DC, 2 ANALOG OUTPUTS 0/4-20MA OR 0-10V FOR LOGO! 8 (6ED1055-1MM00-0BA2),
   - LOGO! TD TEXT DISPLAY, 6 LINES, 3 BACKGROUND COLORS 2 ETHERNET PORTS ACCESSORIES, FOR LOGO! 8,
   - LOGO! POWER 24 V, UNIVERSAL POWER SUPPLY UNIT, STABILIZED, INPUT VOLTAGE: 100-240V AC, OUTPUT VOLTAGE: 24V DC / 4A (6EP3333-6SB00- 0AY0).

5. For the EASY type relays you should use the following type:

   - EASY719-DC-RC - CONTROLLER, POWER SUPPLY UNIT 24 V DC, 12 digital inputs, 4 of which to be used as analog ones, 6 relay Outputs 10A.

6. For programming you should use any language supported by the programmable relay mentioned in standard **EN 61131-3, Programmable controllers - Part 3: Programming languages (IEC 61131-3:2013), International Standard, Brussels, May 2013**

3.3.1.11. Control and visualization systems

1. The preferred control and visualization system is the **DCS** system
2. The systems of control and visualization can be connected with the external Internet network only if it is necessary in relation to providing remote servicing (teleservice) using the encoded connection **VPN** via a Router/Modem with the installed firewall of the network connection in the computer.
3. The access to the **DCS** system should be executed via the **DMZ** zone (demilitarized zone) for

the system components that are used to collect the data with the application of double control using the firewall hardware, taking advantage of a separate logging account via the **VPN** channel inside the PCC IT network, according to the recommendations for construction of the industrial **DCS** network described in the document "RECOMMENDATION Guidelines to industrial network structure *DCS v100"* (the file *Recommendation for the industrial network to DCS.PPDF* located in the PCC Rokita confidential documents base).

4. To ensure connection of the control system and visualization you should provide this system with a power supply control system (switching on/off with a "click" of the power supply by an authorized person) of the Router/Modem using a relay/contact with monitoring and alarm in the course of switching on. Switching on power supply of the Router/Modem should be only for a defined period of time 2.5 h, after which there should appear an alarm in cycles every 30 minutes or switching on power supply for 2 hours, after which a dialog window is to appear with a possibility of extending this time for another 2 hours - it is possible to extend time up to 8 hours maximum. - for the decision of the Technical Manager of the PCC Rokita.

5. At the control room of the production department there should be provided a safety pushbutton XB4 BS9445 (emergency shut down) "Anti-hacker" enabling independently from the **DCS,** for quick disconnection in case of a cyber-attack of the **DC S** network connection with the external **VPN** network (for the needs of the teleservice) and the PCC plant network for communication of the **DCS** with the SAP system (sending of the archive data, reports, etc.) with the return information to the **DCS** system on switching on of this pushbutton.

   Pressing of the safety pushbutton should cause cutting off power supply to the switches and routes of the **DMZ network** (located in the server/virtualization cabinet) which should cause switching off of the network. In addition pressing of the pushbutton should be displayed in the **DCS**.

6. The time of remote work should be strictly logged in the **DCS** system.

7. The control and visualization systems should be provided with an antivirus system and routers filtering the access for the needs of connection with the external network.

8. The control and visualization systems should have safe access to external mass memory storage and external devices via the **USB** data bus (e.g. Access blocking function available from the local group policy manager Option - Allow for service of the **USB** devices with a specified ID). All publicly accessible ports should be permanently blocked for the possibility of external device connection.

9. You should use visualization of the **DCS** by utilization of the pair of redundant servers as hosts of the virtualization system located in separate virtualization rack cabinets (server), each with an installed fan panel. The cabinets in make TS IT (800x2000x1200) with ventilated door. In each of th cabinets there should be foreseen a relevant switch of the industrial class of the third layer with a relevant number of ports 1 Gb/s in order to separate relevant sub-networks with the **DMZ**, zone,

connection-protection instruments and possibly a power supply unit **UPS**, as far as it is not provided by the electric branch.

One of the virtualization cabinets should be additionally equipped with:

— Time synchronizer **GPS** connected to external antenna **GPS** with a cable of relevant length,

— Network drive with 4 discs of relevant capacity,

The terminal computers of virtualized computer stations of the **DCS** system should be installed in the visualization cabinet or in separate cabinets if the distance to operator stands is so large that it is not possible to lead mouse and keyboard cables to them. The terminal computers should be connected to new switches in the virtualization cabinets.

To protect the virtual machines it is recommended to implement 2 parallel and independent mechanisms: replication and backup to an external network drive

Replication of the virtual machines by a dedicated virtual machine i.e. replication server Vmware VSphare Replication. Production machines working on server No.1 should be replicated into the local disc of server No.2 and contrariwise. The task of replication is a possibility of immediate starting up of a machine from the replica in case of damaging of the source machine.

For the tasks of backup of the virtual machines use the software of Nakivo Backup & Replication operating on the network drive in the virtualization cabinet. The objective of the backup is the possibility of restoring to work the virtual machine from the copy in case of e.g. server failure. In order to effectively utilize the disc space or to limit the network traffic the application is to enable execution of incremental backups. The repository of the backups should be located on a network drive in the virtualization cabinet. You should enable in addition copying from the network drive to an external medium e.g. a portable **USB** disc.

In addition the virtualization server should consider the data exchange Linux server in the separated **DMZ** zone with the installed GE Historian server with a relevant number of points for archiving with 2 physical CISCO routers for bracing the **DCS** systems with the SAP and other necessary systems simultaneously ensuring separation from the internal network and enabling the remote access via the **VPN**.

3.3.1.11.1. DCS Control systems

1. The **DCS** systems must feature the guaranteed power supply. It concerns both the I/O modules, power supply units, controllers as well as engineering, application and operation stations with the peripheral hardware.
2. The **DCS** systems should provide safety of execution of the basic measurement-adjustment functions by a relevant level of hardware and software redundancy.
3. The hardware redundancy is executed by application of doubled operation stations, redundant communication bus, redundant controller processors and redundant power supply units.
4. The design should consider i.a. The data concerning the control and visualization system such as:

a. **CPU** processing capacity,
b. information concerning controller memory,
c. software, control and visualization system version,
d. dimension of the current license — you should indicate additionally the number of the used variables,
e. number of PO points - you should indicate additionally the number of used ones,
f. Number of variables for archiving - you should indicate additionally the number of used ones.
g. structure of industrial network and **DCS** control.

5. As a minimum the **DCS** system should ensure:
   a. Measurements, state monitoring, alarm handling.
   b. Continuous and discrete adjustments.
   c. Binary control.
   d. Sequential control.
   e. Assumed mathematical calculations.
   f. Logging of all events, values and states.
   g. Archiving of the logged data with a possibility of replying the data for available for inspection.
   h. Possibility of extending the software and hardware “on-line”.
   i. Possibility of modifications.
   j. Internal diagnostics.
6. The **DCS** systems should feature reserves both in the number of spare channels of the I/O modules, **CPU** processing power, as well as the license on the level of at least 25% for each of the mentioned parameters.
7. The DCS software requirements:
   a. You should use only standard libraries of the particular **DCS** system. Software of the system controllers must be executed on the basis of authorized by the manufacturer system of automation of library function blocks. In the PCS7 in version at least 7.1 there should be installed the **APL** (Advanced Process Library). Whereas in the **DCS** ABB 800xA you should use libraries of “Utility Library” in the version compliant with the supplied version of the **DCS** system. In case it is necessary to apply one’s own function blockade types (own libraries) the Contractor is obliged to agree them earlier with the Ordering Party.
   b. From among the available programming languages, it is allowed for the DCS to use the FBD (Eng. Function Block Diagram, FD (Eng. Function Diagram), SFC (Eng. Sequential Function Chart), ST (Eng. Structured Text, LD (Eng. Ladder Diagram) using dedicated editors e.g. CFC (Eng. Continuous Function Chart), with using of

Technological Blocks, CFC function templates and individual control Modules CMT (Control Module Type) and SFC. In case it is necessary to apply untypical additional functions in the operator system using scripts (in the C language) the Contractor is obliged to agree them earlier with the Ordering Party.

c. The software of the system controllers must be executed in the way so as all configuration parameters of the application modified in the online mode were preserved and automatically restored in case of uploading of the application to the controller in the “Cold”/”Cold restart” mode (in case of the ABB 800xA the variables for these parameters should have assigned the attribute “cold retain”).

8. The **DCS** systems should be supplied with all required licenses, including for the software to be executed and reproduction of the backup copies, antivirus software, development of spreadsheets, operation system, etc..
9. The **DCS** should be supplied with the operation system Windows 10.
10. The operation system Microsoft Windows required for the particular **DCS** system should be supplied only in the version enabling transfer of the license to other computer — in the box version (BOX license).
11. Application software should be supplied in the source version.
12. The source codes should be supplied that are necessary for using of the software in compliance with its intended use, used by the supplier of applications, including the open source software and also the source projects (logic) of adjustments, control, visualization, configuration, reporting, settings with descriptions and comments, enabling the Ordering party their review, changes, extending and other operations necessary for correct operation and optimizing of operation of the devices or installations, especially for all used **PLC** controllers of the AS process stations, OS operation stations, ES engineering stations, IS archiving stations, MS maintenance stations, etc. and operation panels excluding the tool software of the type system PCS7, step7, WinCC flexible, etc., in which the above mentioned project are created.
13. Copies of the software should be supplied on the media enabling its repeated uploading and modification.
14. The **DCS** system should be equipped with the virus protection system and routers filtering the access for the needs of connecting with the internal network.
15. The **DCS** system should feature the architecture enabling communication with it via the communication links based on open standards e.g. **OPC**, **ODBC**, **DDE**, DD, DA.
16. The **DCS** system should communicate with its particular parts via the redundant data transmission buses.
17. The **DCS** system will provide logging mechanism and user identification.
18. The **DCS** system should provide project synchronizing of all OS stations form the ES stations.
19. The **DCS** system should have provided synchronization of time of its all components:

a. in case of lack of access to the wide computer network **WAN** (Eng. Wide Area Network) - directly with application of the hardware real time clock,
b. in case of access to the computer network **WAN** - indirectly via the **Network Time Protocol** (**NTP**) from the specialized server (Eng. Time Server **NTP**).

20. The system should enable printing of reports, trends and synoptics.
21. The system should generate the following reports:
    a) cyclical reports e.g. daily, shift,
    b) operations reports including information on all interventions of the operator,
    c) Event protocols - logging of all failures, switch offs or tp. Indicating the cause, duration time, actions taken.
22. The visualization system should be made in compliance with directive **VDI/VDE 3699 Control Using Display Screens** (a collection of recommendations concerning visualization systems in control room of chemical plants and petrochemical plants) and in compliance with **ANSI/ISA-101.01, Human Machine Interface for Process Automation Systems** and guidelines (report) ISA101 **HMI Usability and Performance**.
23. The control and visualization system should consider visualization of matrices of blocks and alarms. Examples on figures **Figure 5 Picture selection screen with Consideration of blockade matrices and alarms** and **Figure 6 Example of visualization of blockade matrices and alarms in DC S system** as well as **Figure 7 Example of blockades in DCS DeltaV system.**
    These screens should include tables of alarms, in which there are placed all measurements located in the particular synoptics and alarm ranges for the particular measurements. Active warnings upper/lower are signaled with yellow color and active alarms upper/lower are in red color. The second table should be the table of blocks, it includes all actuators such as valves on/off and adjustment valves as well as all causes/alarms/warnings, which cause blocking of the particular elements. On these screens you should not make any actions of the confirmation type, changing of the alarm threshold. Screens should only serve viewing of the settings of the alarm thresholds and viewing of the blockade configuration.
24. The control and visualization system should consider key-switches of the heating system control allowing the user selection of automatic or manual control. In the manual mode the operator should have the possibility of switching on/off of the heating circuit with the on/off buttons regardless the temperature. In the automatic mode, when the temperature of the pipeline drops or increases below the set level the circuit should be automatically switched on or off. These settings should be possible via the electric heating screen (an example of the screen is on the **Figure 8 Screen — electric heating**) where in the table there should be gathered all new heating circuits or via the key-switch of the particular circuit. The screen should be adapted for the recommendations of Directive **VDI/VDE 3699 Control Using**

Display Screens and compliant with **ANSI/ISA-101.01, Human Machine Interface for Process Automation Systems** and guidelines (report) ISA101 **HMI Usability and Performance**.

25. The key-switch of the particular circuit should be open with a pushbutton located on the 

The push button background color should inform the operator if the circuit is in the automatic mode - green color, or if it is in the manual mode - gray color. An additional information is the text color, black color - the circuit switched off, red color - the circuit switched on. The appearance of the key-switch is presented on the **Figure 9 Key-switch of heating circuit**, on the upper bar there is the circuit number and its description. On the left side there are control icons and circuit control push buttons. On the right side there are windows for entering parameters of the circuit. The **Figure 10 Legend of heating circuit key-switch** presents the description of the heating circuit key-switch.
26. The **DCS** system cabinets must be provided with lighting, documentation pocket, thermostat, exhaust fans, module buses, screen and earthing buses, comb cable channels, ladders, base sockets and diagnostics socket.
27. The **DCS** system cabinets should be located in air conditioned rooms. In case there is no such room you should provide relevant operation conditions i.e. The temperature inside of a cabinet and ventilation.
28. The **DCS** system cabinets should be earthed and provided with relevant anti surge and electric shock protection.
29. Each cabinet should be marked with an individual number.

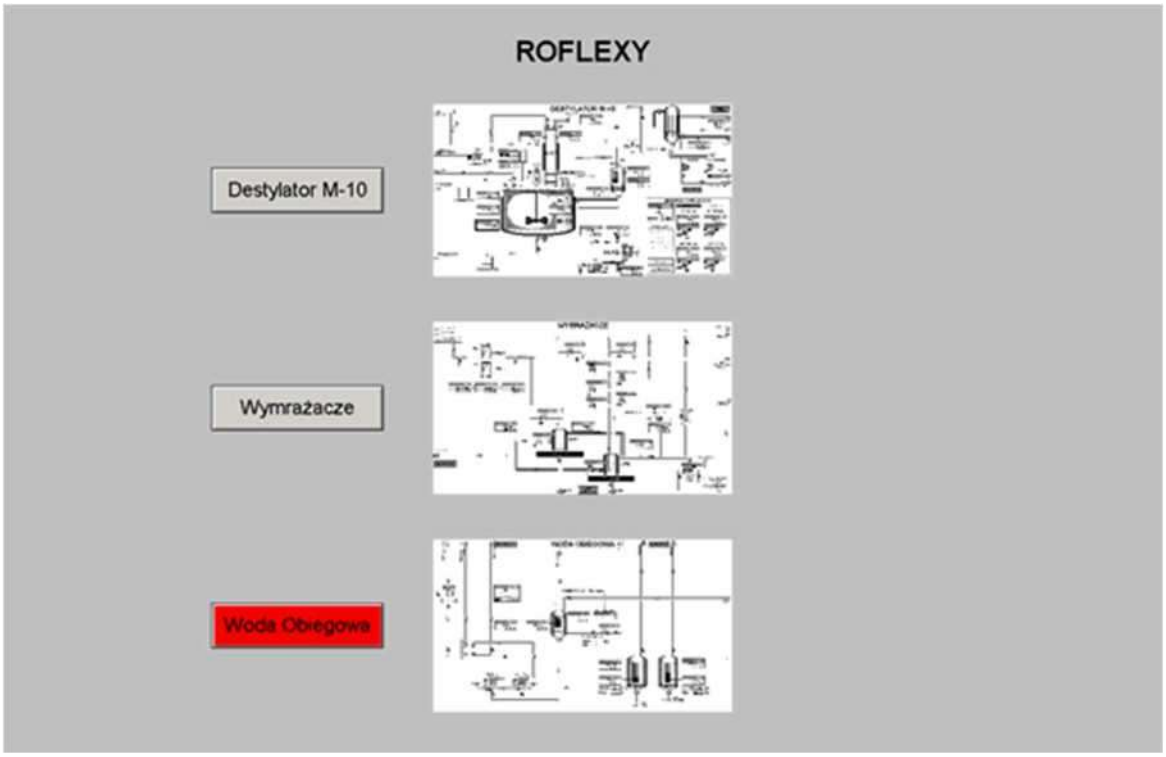


Figure 5 Picture selection screen with consideration of blockade matrices and alarms

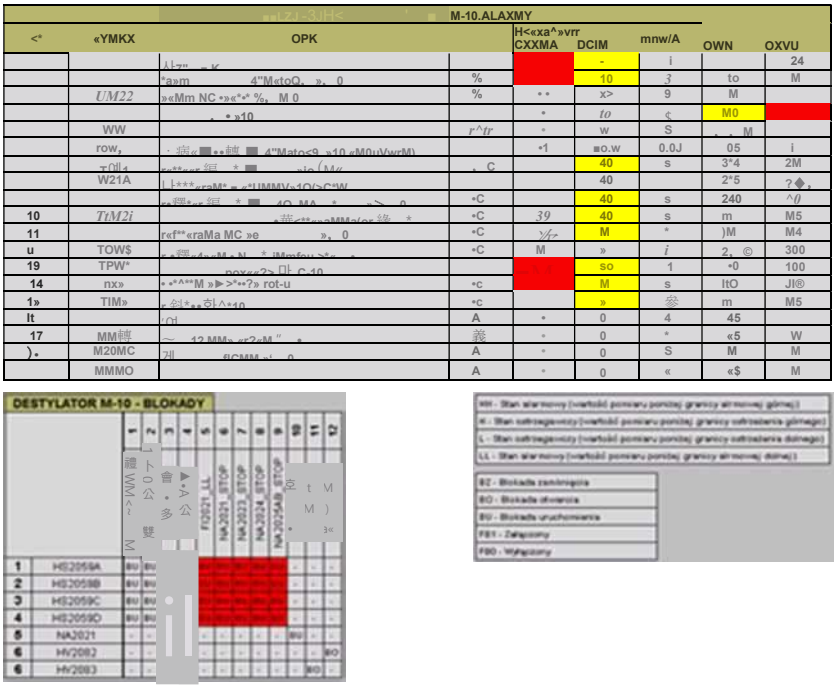


Figure 6 Example of visualization of blockade matrices and alarm in DCS system.

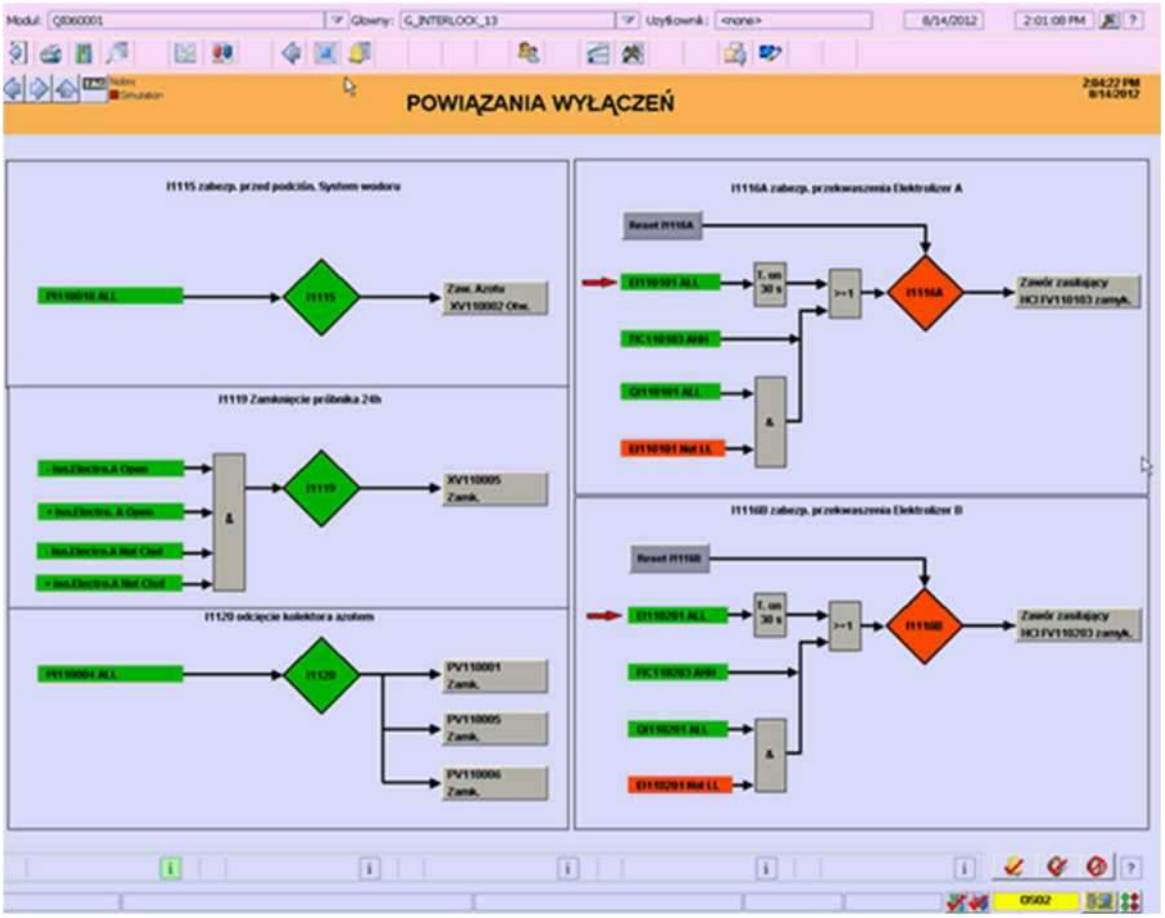
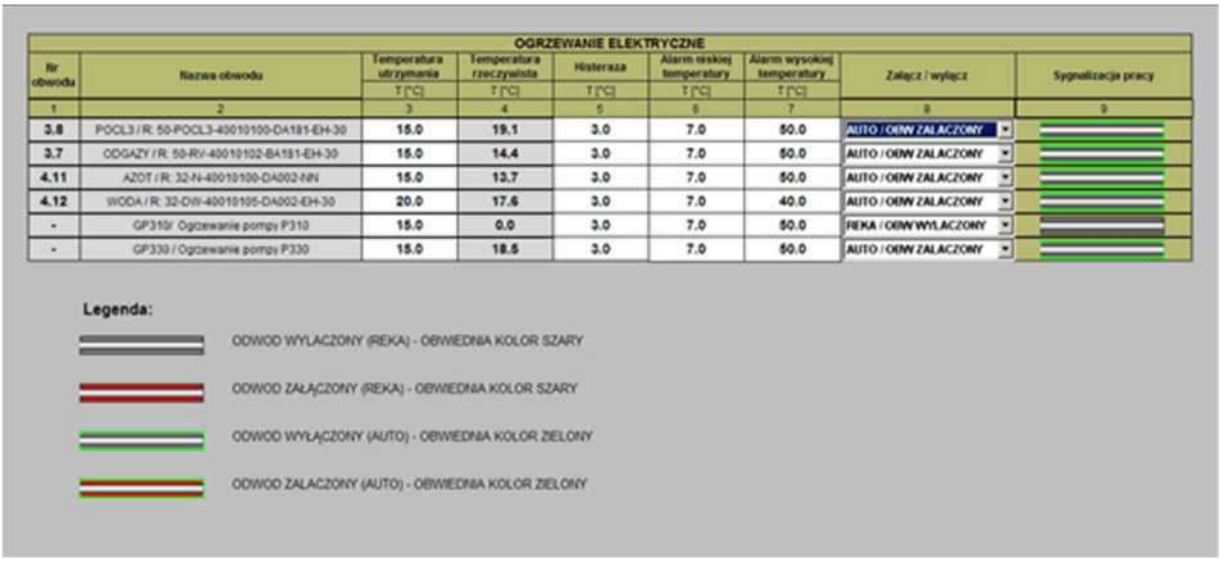


Figure 7 Example of visualization of blockades in DCS DeltaV system



OGRZEWANIE ELEKTRYCZNE

Nr obwodu	Nazwa obwodu	Temperatura utrzymania T [°C]	Temperatura rzeczywista T [°C]	Histereza T [°C]	Alarm niskiej temperatury T [°C]	Alarm wysokiej temperatury T [°C]	Załącz / wyłącz	Sygnalizacja pracy
1	2	3	4	5	6	7	8	9
3.8	POCL3 / R: 50-POCL3-40010100-DA181-EH-30	15.0	19.1	3.0	7.0	50.0	AUTO / ODW ZALACZONY	
3.7	ODGAZY / R: 50-RV-40010102-BA181-EH-30	15.0	14.4	3.0	7.0	50.0	AUTO / ODW ZALACZONY	
4.11	AZOT / R: 32-N-40010100-DA002-NN	15.0	13.7	3.0	7.0	50.0	AUTO / ODW ZALACZONY	
4.12	WODA / R: 32-DW-40010105-DA002-EH-30	20.0	17.6	3.0	7.0	40.0	AUTO / ODW ZALACZONY	
-	GP310/ Ogrzewanie pompy P310	15.0	0.0	3.0	7.0	50.0	REKA / ODW WYLACZONY	
-	GP330 / Ogrzewanie pompy P330	15.0	18.5	3.0	7.0	50.0	AUTO / ODW ZALACZONY	

Legenda:

ODWOD WYLACZONY (REKA) - OBWIEDNIA KOLOR SZARY

ODWOD ZAŁĄCZONY (REKA) - OBWIEDNIA KOLOR SZARY

ODWOD WYŁĄCZONY (AUTO) - OBWIEDNIA KOLOR ZIELONY

ODWOD ZALACZONY (AUTO) - OBWIEDNIA KOLOR ZIELONY

Figure 8 Screen - electric heating

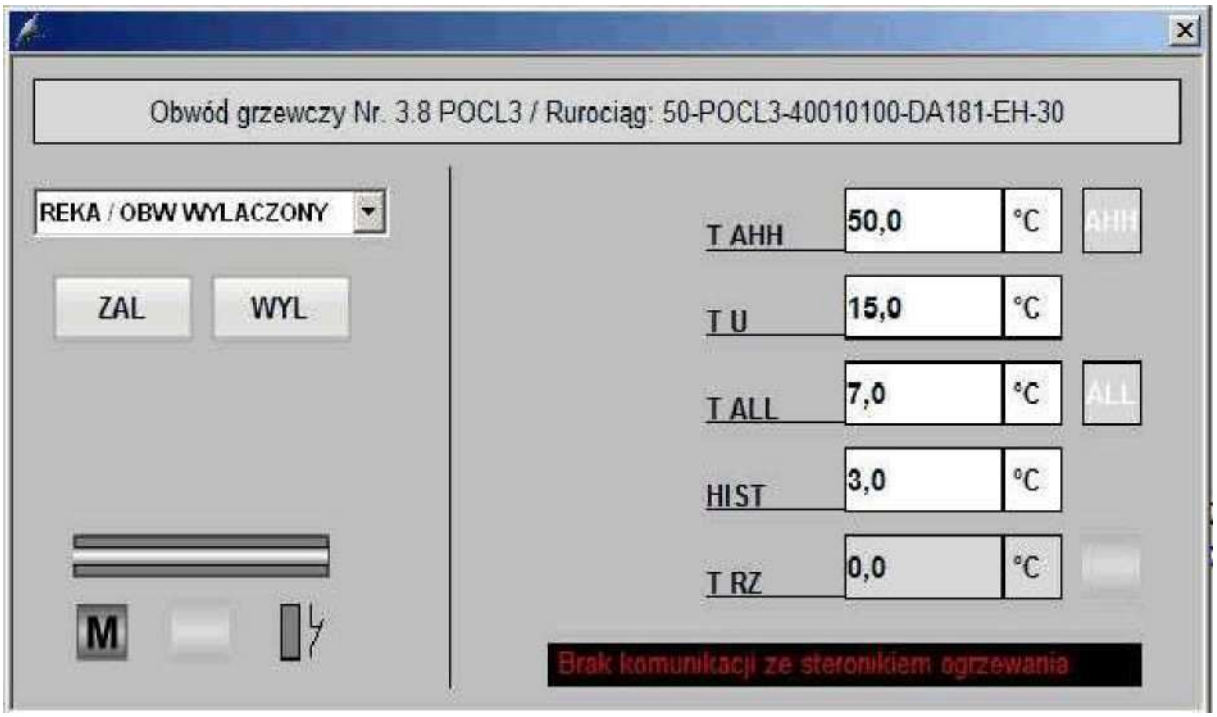
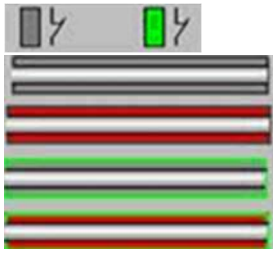


Figure 9 Heating system key-switch



- Contactor switching command - active/not active
- Circuit switched off in manual mode
- Circuit switched on in manual mode
- Circuit switched off in automatic mode
- Circuit switched on in automatic mode

- Heating system state - auto/manual

- Failure, no contactor switching confirmation

- Failure, temperature measurement inoperative

- High temperature signaling

- Low temperature signaling

Figure 10 Legend of heating system key-switch

30. In case of large **DCS** systems it is recommended to place power supply units in separate cabinets.
31. LCD monitors should be used format 16:9 size not less than 24”.
32. After creating of the **DCS** system based on the PCS7 system of SIEMENS company: („PROFINET in SIMATIC PCS 7 Guidelines and Blueprints” for SIMATIC PCS 7 V9.1 – 72887082 (ver 2.4)), you should use the family of redundant (Dual Controller), Fault-tolerant or Safety-related modular systems of automation of the AS410 family SIMATIC PCS 7 CPU410 Redundant bundle” typu 6ES7656-6C...-.... with 2 central control units CPU410-5H F. S7-400/S7-400H/F/FH (6ES7410-5HX08-0AB0) with

relevant expansion card EXPANSION CARD PO with the communication processor CP 443-1. The central unit AS should be connected through CP443-1with a system bus (by the network Industrial Ethernet for the Terminal Bus) in the form of a single or double ring with single stand operator stations (OS Single Stations) and engineer ES. Predefined industrial computers PCS 7 INDUSTRIAL WORKSTATION IPC547E of the IPC family series 547 with 4-monitor card should be used as the OS and ES stations mounted in a dedicated industrial cabinet and attached to them 4 monitor terminals with loudspeakers. Monitors of the terminals should be mounted on special racks mounted to the desk tops.

The AS stations of different DCS systems belonging to the PCS7 family should be connected behind in the Plant Bus network using the Industrial Ethernet network..

On the level of the object main to the central control unit AS via the PROFINET network you should connect distributed ET200SP HA stations with the redundant Profinet communication and the possibility of redundancy of communication modules I/O of stations I/O with the possibility of installation in zone 2 of explosion risk.

For the ET200SP HA station, for the connected non-intrinsically safe devices outside the explosion risk zone the modules that should be used are as follows:

- Usually:

The digital input module DI - SIMATIC ET 200SP HA, DI 32X24VDC HA 6DL1131- 6BL00-0PH1,
The digital output module DO - SIMATIC ET 200SP HA, DQ 32X24VDC/0,5A 6DL1132-6BL00-0PH1,
The analog input module AI - AI 16XI 2-wire HART HA, 6DL1134-6TH00-0PH1, The analog output module AO - AQ 8XI HART HA, 6DL1135-6TF00-0PH1, the input module FC - SIMATIC ET 200SP HA, Fast Multi IO and counter 4xAI, 8xAQ, 4xDI, 6xDI/DQ, 6DL1138-6EA00-0EH1,
The input module RTD - SIMATIC ET 200SP HA, AI 16XTC/8XRTD 2-/3-/4-wire HA. 6DL1134-6JH00-0PH1;

- Safety:

The analog input module AI Safety - SIMATIC ET 200SP HA, F-AI 8xI 2-/4-Wire HART HA, 6DL1136-6AA00-0PH1,
The digital input module DI Safety - SIMATC ET 200SP HA, F-DI 16x24VDC HA, 6DL1136-6BA00-0PH1,
The digital output module DO Safety - SIMATIC ET 200SP HA, F-DQ 10x24VDC/2A HA, 6DL1136-6DA00-0PH1.

If it is necessary to connect intrinsically safe devices in the explosion risk zone for the ET200SP HA station the following modules should be used:

- The digital input module 4 DI NAMUR (6DL1131-6TD00-0HX1),
- The digital output module 2DO (6DL1132-6EB00-0HX1),
- The analog input module 2AI (6DL1134-6TB00-0HX1),
- The analog input module 4AI 4xTC/2xRTD 2-/3-/4-Wire (6DL1134-6JD00-0HX1),

- The analog output module 2AO (6DL1135-6TB00-0HX1).

Whereby in case of extension of the **PROFIBUS DP** network distributed ET200M stations should be connected with the module SIMATIC DP ET 200M, INTERFACE MODULE IM153-2 (6ES7153-2BA10-0XB0) that base on the modules with the SIMATIC S7-300 spectrum in compliance with the below guidelines. The following modules should be used especially for the ET200M:

- The digital input module SM 321, 32 DI DC24V (6ES7321-1BL00-0AA0),
- The digital output module SM 322, 32 DO DC24V/0,5A (6ES7322-1BL00-0AA0),
- The analog input module SM 331, 8AI, 9/12/14BIT (6ES7331-7KF02-0AB0),
- The analog output module SM 332 8 AO, U/I, 11/12 BITS (6ES7332-5HF00-0AB0),
- The counter input module FM350-2, COUNTER MOD., 8 CHANNELS, 20KHZ (6ES7350-2AH01-0AE0).

In case it is necessary to install the SIWAREX weighing system you should use the electronic scale module SIWAREX FTA (7MH4900-2AA01). For weighing in a zone with the explosion risk you should use the intrinsically safe barrier module SIWAREX IS SYSTEM INTERMEDIATE (7MH4710-5BA).

In case of extension of the **PROFIBUS DP** network you should use the Repeater RS485 PROFIBUS/MPI (6ES7972-0AA02-0XA0).

In case it is necessary to lead the **PROFIBUS DP** in an explosion risk zone you should use RS485-IS COUPLER (6ES7972-0AC80-0XA0) before the explosion risk zone to accomplish intrinsic safety.

In case of large distances between the nodes of the **PROFIBUS DP** network you should use multi-mode optical fiber as the transmission medium with relevant element of the network PROFIBUS OLM/G12 V4.0 OPTICAL LINK MODULE (6GK1503-3CB00) and in case of very large distances using the single mode optical fiber with network elements PROFIBUS OLM/G11 V4.0 OPTICAL LINK MODULE (6GK1503-2CC00).

In case it is necessary to assemble distributed station in the space with explosion risk in case of extension of the existing network PROFIBUS DP you should use the ET 200iSP stations with Exi distributors of the type DP/DP COUPLER (6ES7158-0AD01- 0XA0) on the Profibus DP network. The redundant modules IM 152 (6ES7152-1AA00-0AB0) with power supply units 24V (6ES7138-7EA01-0AA0) should be used as the communication modules. For the ET200iSP terminal you should use the following modules:

- the digital input module 8 DI NAMUR (6ES7131-7RF00-0AB0) - channels 0,1 feature the counting function with the frequency of 500Hz for the length of 200m of the cable line, which may be used to connect pulse output of a flow meter.
- the digital output module 4DO "H"-SHUTDOWN (6ES7132-7RD01-0AB0),
- the analog input module 4AI (6ES7134-7TD00-0AB0),
- the analog output module 4AO (6ES7135-7TD00-0AB0),

The company making the control software in the system Simatic PCS7 in version 6.1 should use the standard library PCS7 v 6.1, while in the higher version of PCS7 at least v7.1 (currently preferred v9.0) use the extended library (enclosed free to PCS7 from v 7.1). In case when they must use control blocks of their own authorship the should attach a description of operation, description of inputs/outputs, etc. concerning implemented control block.

For the **DCS** systems licenses should be attached that enable the data collection on the server via the **OPC**.

In case it is necessary to form recipes in the **DCS** system for PCS7 you should use licenses WinCC/User Archives 6AV6371-1C B07-0AX0.

33. In relation to planned moving away from the **DCS** DeltaV systems in the PCC use of the DeltaV system should be agreed with Investor. At creation and extension of the **DCS** system based on the DeltaV system of Emerson you should connect controllers and single stand operator and engineer stations of the control system of the system bus via a dedicated Ethernet network (DeltaV Control Network). As the OS stations predefined computer sets of the type VE-2550 or VE-2552 should be used (preferred version for assembly in rack cabinets) made by DELL with the 4-monitor card mounted in a dedicated industrial cabinet and attached to them 2-monitor terminals. Each station should be provided with perpherial hardware: a mouse, keyboard, loudspeakers. Servers made by DELL company should be used as ES, AS stations.

    M series

    The controller MQ Plus DeltaV VE3008 in the redundant version with the power supply unit VE5009 should be used as the central control unit. The following M series cards should be used as distributed I/O stations:

    - the analog input card 8AI 4-20mA, HART, VE4003S2B4
    - the analog output card 8AO 4-20mA, HART, VE4005S2B3
    - the digital input card 8DI 24VDC, Dry Contact, VE4001S2T2B3
    - the digital output card 8DO 24VDC, High Side, VE4002S1T2B3
    - the card Profibus DP I/O VE4014
    - the fast counter card (module) VE4015

If it is necessary to use distant I/O stations you should use the system series S. Software version DeltaV, in case of using the S series, it must be compatible with the M version and S version.

The following connecting cables should be used for the above mentioned modules:

- FLK 16/EZ-DR/.../KONFEK - the cable length adapted for the cabinet design e.g. FLK 16/EZ-DR/300/KONFEK - 2299330 - for cable length of 3 m

and transition modules mounted on cross strips:

- Digital DI/O - FLKM 16/DV - 2304432
- Digital DO - PLC-V8/FLK14/OUT - 2295554
- Analog AI/O - FLKM 16/AI/DV - 2304429
- Analog AO - FLKM 16/DV - 2304432

and bus connectors for crossing with disconnecting switch UDMTK 5-P/P Phoenix Contact 3101087. Cabling and transition modules should be supplied and mounted by the supplier/contractor of the control/crossing cabinets.

S series

The controller SQ SE3008 in the redundant version should be used as the central unit.

The following cards should be used:

- the analog input card AI 4-20mA, HART, SE4303T01
- the analog output card AO 4-20mA, HART, SE4304T01
- the digital input card DI 24VDC, Dry Contact, SE4301T02
- the digital output card DO 24VDC, High Side, SE4302T01
- the card Profibus DP I/O SE4022
- the card Discrete Input Charm Namur SE4301T01

The obligatory configuration standard DeltaV for the modules and graphic elements is PCSD in version 5.0. If it is necessary to use the elements, which do not appear in the library the documentation of the module and graphic elements co-working with it (key-switches, other interface elements) should be prepared.

34. At creating the **DCS** system based on the system 800xA of the ABB company, the following elements should be applied:

As the central you should use the controller PM866 in the redundant version, which supports up to 1000 inputs/outputs of the controller PM862 on the redundant version, which supports up to 500 inputs/outputs.

Analog input card type: AI815, 8AI, 4-20mA, HART

Analog output card type: AO815, 8AO, 4-20mA, HART

Digital input card type: DI810, 16DI, 24VDC

Digital output card type: DO810, 16DO, 24VDC

- Communication processor PROFIBUS, type: CI854 in case of connections with the existing Profibus DP network
- Communication interface PROFINET, type CI871
- As operator, engineers stations and servers DELL company dedicated computer sets should be used. In the operator station 4-monitor graphic cards should be used. In the engineer stations and servers 2-monitor graphic cards should be used.

Fast counter module, type: DP840 pulse counter, 8ch

For the devices operating in the explosion risk zone it is permissible to use the following components:

Analog input card type: AI895, 8AI, 4-20mA, Intrinsic Safety + HART

Analog output card type: AO895, 8AO, 4-20mA, Intrinsic Safety + HART

Digital input card type: DI890, 8DI, 24VDC, Individually galvanic isolated channels

Digital output card type: DO890, 4DO, 24VDC, Individually galvanic isolated channels

3.3.1.12. Protection systems Emergency Shutdown System (ESD) /SIS

1. The protection systems should provide safety of installation and device operation.
2. The systems **ESD**/**SIS** should be strictly supplied with the guaranteed voltage.
3. For the new installation it is recommended that the **ESD**/**SIS** systems are not integrated with the **DCS**.

   Meanwhile for the existing ones they should be executed by application of the stations dedicated for this purpose. For the PCS7 system this should be dedicated stations with the communication Profinet/Profisafe ET200MP Fail-safe or communication Profisafe ET200SP HA with the fail-safe modules (in case of the necessity of assembly of a distributed station in the space with a risk of explosion) including the modules of the fail-safe type:

   - ET 200MP SM 526 F-DI 16x24V DC (6ES7526-1BH00-0AB0),
   - ET 200MP SM 526 F-DQ 8x24V DC/2A PPM (6ES7526-2BF00-0AB0),
   - ET 200SP HA, F-AI 8xI 2-/4-wire HART (6DL1136-6AA00-0PH1),
   - ET 200SP HA, F-DI 16x24VDC HA (6DL1136-6BA00-0PH1),
   - ET 200SP HA, F-DQ 10x24VDC/2A HA (6DL1136-6DA00-0PH1).

4. or in case of extension of the existing Profibus station with the stations ET200M Fail-safe or ET200iSP (in case of the necessity of assembly of the distributed station in the space with the risk of explosion) including the fail-safe type modules:

   - SM 326, F-DI 24 (6ES7326-1BK02-0AB0),
   - SM 326, F-DO 10 (6ES7326-2BF10-0AB0),
   - SM 336, F-AI 6 (6ES7336-4GE00-0AB0),
   - 8F-DI (6ES7138-7FN00-0AB0),
   - 4F-DO (6ES7138-7FD00-0AB0),
   - 4F-AI (6ES7138-7FA00-0AB0).

In this case the program of the protection system should be created using special blocks provided with a certificate for applications in the protection system.

In relation to the planned abandoning of the **DCS** DeltaV systems a possibility of application of the modules Simplex Logic Solver VS3202 (redundant version) should be agreed with the Investor. The software for the blockade system should be made on dedicated and certified function blocks.

In case of the protection system made by the ABB the following components should be used:

- As the central unit the controller PM863 in the redundant version should be used, which operates up to 100 inputs/outputs.

Analog input card type: AI880A, 8AI, 4-20mA, HART

Digital input card type: DI880, 16DI, 24VDC

- Digital output card type: DO880, 16DO, 24VDC.

5. The system **ESD**/**SIS** should feature separate inputs and outputs in relation to the inputs and outputs of the **DCS** control system.

6. It is recommended that the devices connected to **ESD**/**SIS** that are not integrated with the **DCS** system by application of fail-safe modules and being in the zone with the risk of explosion were in the Eex (d) make. If it is difficult to fulfill this condition, you should apply the devices in the Eex (i) make and delimiters provided with the diagnostics of line continuity in case when the modules do not feature such diagnostics.
7. The visualization of the **ESD**/**SIS** system should be based on the visualization of the **DCS** system.
8. You should foresee 5% reserve for inputs/outputs, of licenses for the **ESD**/**SIS**. modules.

3.3.1.13. Guidelines for designing and execution of HMI

1. Designing and execution of the **HMI** should be executed in compliance with Directive **VDI/VDE 3699 Control Using Display Screens** (a collection of recommendations concerning the systems of visualization in control rooms of chemical and petrochemical plants) and in compliance with **ANSI/ISA- 101.01, Human Machine Interface for Process Automation Systems** and the guidelines (report) ISA101 **HMI Usability and Performance**.

   The example of the screen compliant with Directive **VDI/VDE 3699 Control Using Display Screens** is presented on the below **Figure 11 Example of screen of distillation process compliant with directive**.

   On this screen you can see the applied concept of presentation of information to operators of a large number of information data in a condensed form using so-called hybrid analog-digital indicators of the process values.

   Whereby on the following **Figure 12 Example of hybrid indicator** there is presented an example of a hybrid analog-digital indicator of the process values.

   On **Figure 13 View of distillation column with vertical temperature curve** there is presented the next example of a hybrid indicator implemented on the view of the distillation column.

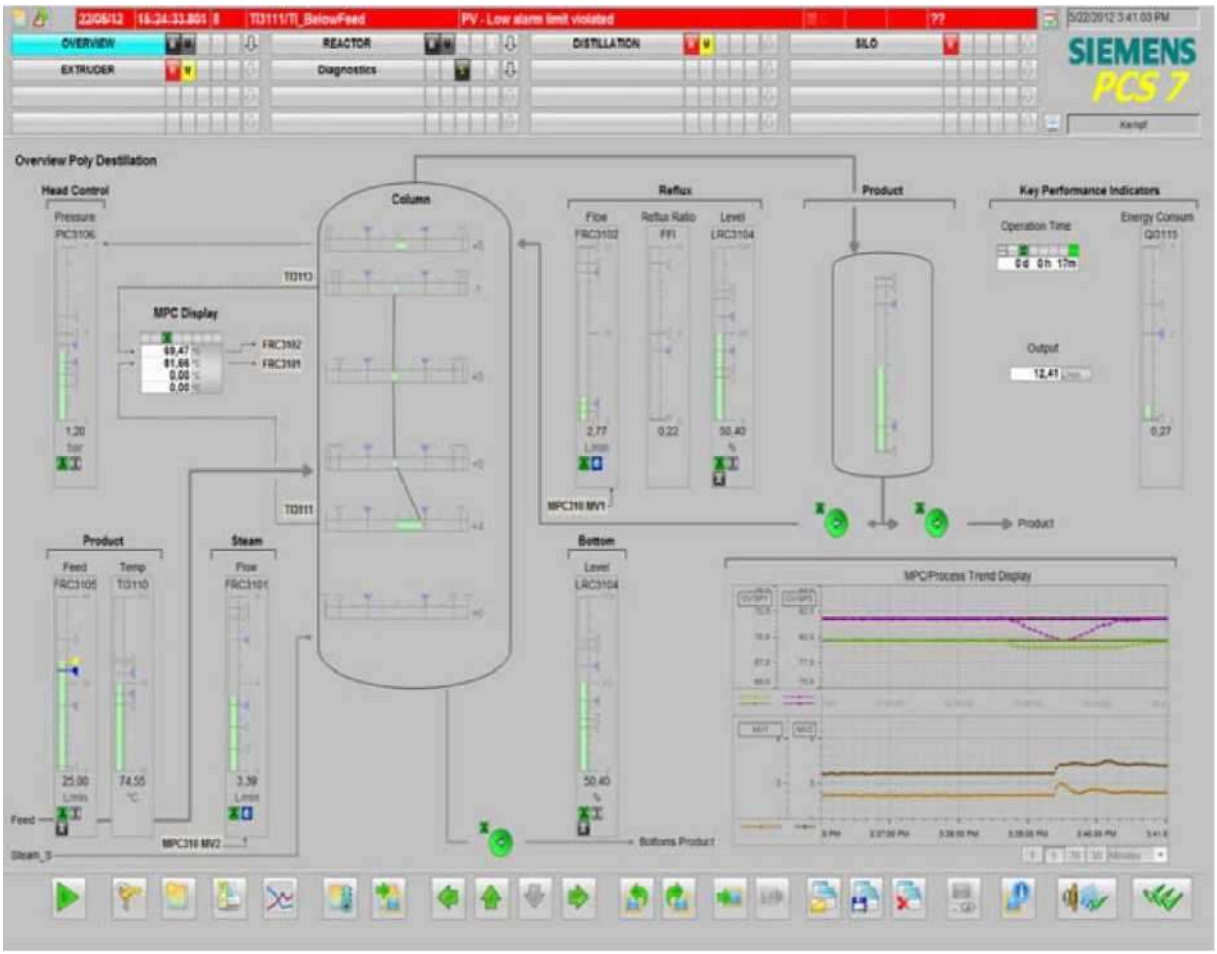


Figure 11 Example of a distillation process screen compliant with the directive

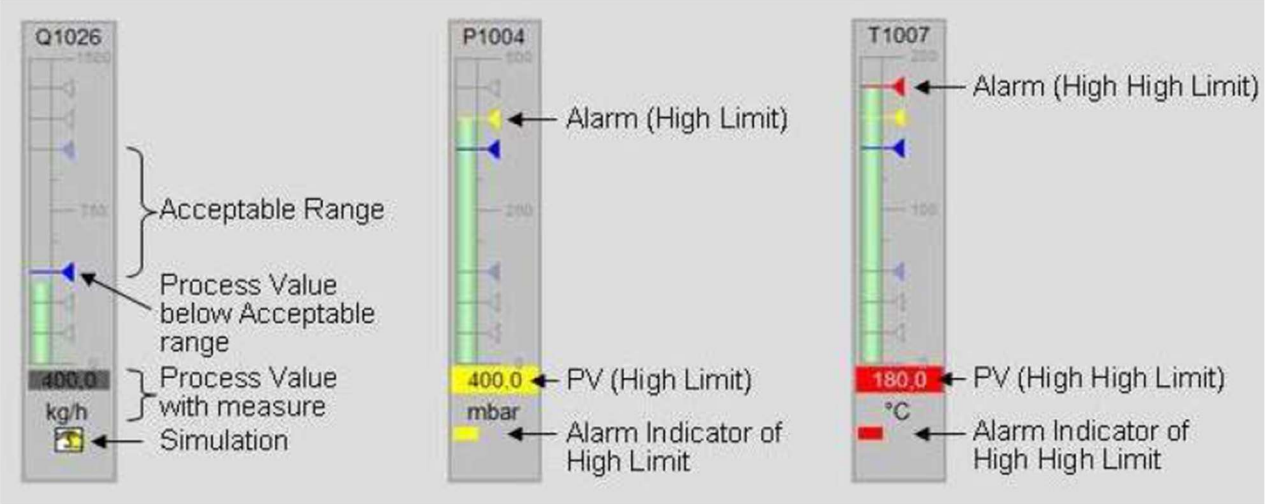


Figure 12 Example of a hybrid process value indicator

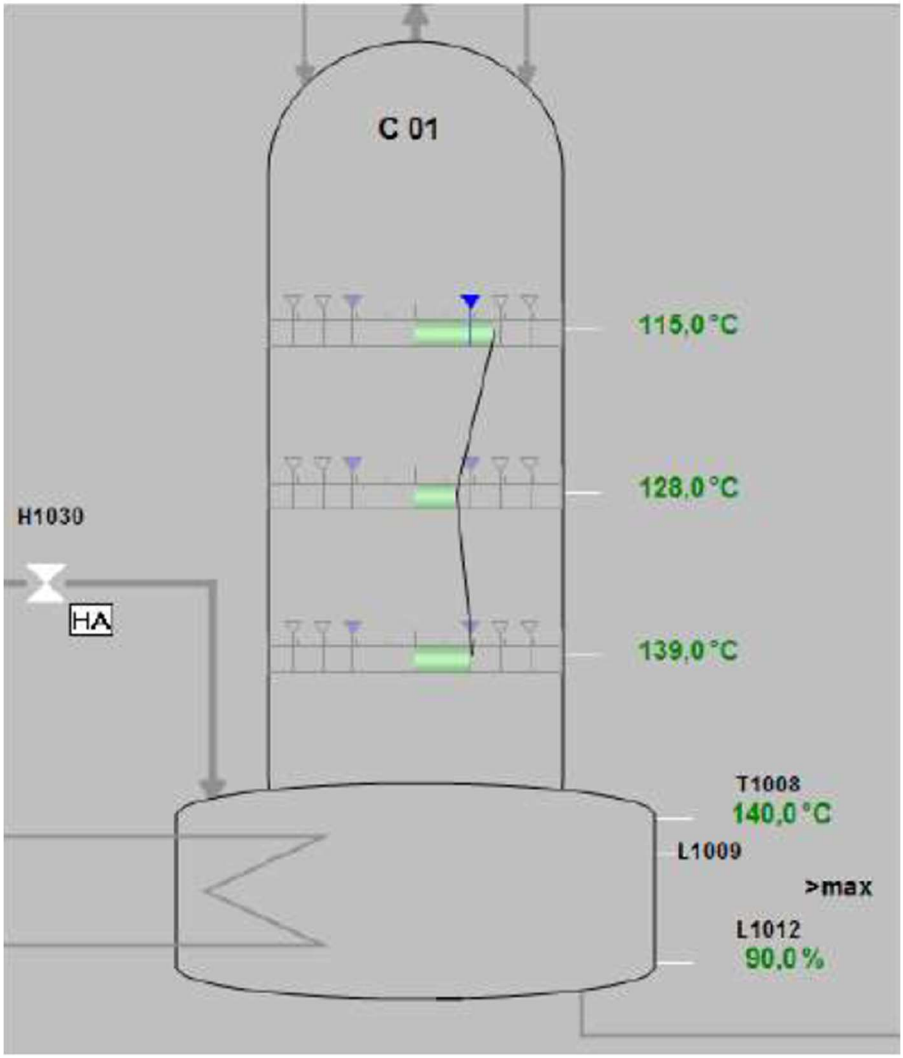


Figure 13 View of a distillation column with vertical temperature curve

2. In order to prevent the appearance of unnecessary alarms (reduction of alarm number) it is necessary to provide in the Design phase within the AMS system, a separate data sheet for each alarm including in particular the following information:
    a. Name of measurement point,
    b. measurement range,
    c. limit values,
    d. hysteresis loop width,
    e. alarm cause,
    f. alarm message text,
    g. recipient of the alarm message (operator, operation maintenance services),
    h. alarm priority,
    i. masking of the alarm by other alarms and events,
    j. influence of the alarm on masking of other messages,
    k. action recommended for the operator (“knowledge base”),
    l. effects in the result of undertaken incorrect actions by the operator,
    m. way of signaling the alarm on synoptics,
    n. influence of the alarm on the automatic adjustment system,
    o. Influence of the alarm on the protection system
3. During making the HMI the AMS system should be implemented or extended on the basis of the information from the alarm data sheet.

3.3.1.14. Acceptance conditions for devices and automation systems

1. The as-built documentation should be supplied comprising:
    a. corrected drawings (plans and installation diagrams),
    b. written agreements concerning deviations to the design with signatures of the Construction Inspector and Designer.
    c. documentations supplied by the manufacturer of instruments and devices.
    d. guarantees, attestations, certificates, declarations of compliance, cards (protocols) of supplying wastes for utilization,
    e. test and post-completion measurement protocols:
        - protocols of the performed tests and starting up of the industrial network,
        - protocols of the performed tests and starting up of the control and visualization system including i.a. Confirmation of performance of functionality checks of all control system blockades and algorithms (including sequences),
        - protocols of the performed tests and starting up of the measurement and control circuits,
        - protocols of the initial control tests of electric devices and protection systems

intended for use in the zones with the risk of explosion in compliance with Procedure **ZSZ** **PBT.PR.01 Operation and maintenance of the network**,

- certificates of calibration/control of the Control and Measurement Instruments and Automation devices,

f. specification lists of the Control and Measurement Instruments and Automation (an Excel file including i.a. the data: process symbol, description, location, type, manufacturer, factory number, range settings (measurement or operation), factory range, characteristic data (e.g. probe length, process connections, accuracy, EX device features, etc. as adequate for the particular device types), cost),

g. list of recommended spare elements for the Control and Measurement Instruments and Automation devices,

h. instruction manuals (service and operation) and user training protocols,

i. updated software of the control and visualization system (e.g. a complete design of controllers and operation panels) with licenses,

j. export of blockades and threshold values,

k. list of regulator settings,

l. graphic files of synoptics,

m. drawing of the industrial network structure and DCS control with indicated network addresses,

n. the data concerning the control and visualization system such as:

- **CPU** computing capabilities with confirmation of checking, that there is a computing capacity reserve as requested in the agreement/order and stipulations of this standard,
- information concerning controller memory with confirmation of checking that there is a memory reserve as requested in the agreement/order and stipulations of this standard,
- software version of the control and visualization system,
- size of the present license - indicate additionally the number of used variables with confirmation of checking that there is a reserve as requested in the agreement/order and stipulations of this standard,
- number of point of Process Object (PO) - indicate additionally the number of configured/ utilized Power Tags in the controller,
- number of variables for archiving - indicate additionally the number of used ones, - information concerning reserve channels of the I/O modules with the confirmation of checking that there is a reserve of the I/O channels as requested in the agreement/order and stipulations of this standard,

2. The source codes of the created software should be supplied.
3. All measurement devices installed at the site should be checked/calibrated at laboratories of the LabMatic Sp. z o.o.or under supervision of the PCC Rokita representative.

4. All measurement devices should be marked according to the regulations in force at the PCC Rokita and especially: The **ZSZ** Procedure **PUR.PR.02 Supervision of equipment for monitoring and measurements** with instruction **PUR.PR.02.I01 Marking**
5. The detailed conditions of the acceptance comprising acceptance tests (FAT), site acceptance tests (SAT) and site integration tests (SIT) of the automation systems should be performed in compliance with Standard **PN-EN 62381:2012 - English version: Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)**.

   The following activities should especially be executed:

   - checking of cabling (cable inlets, terminals, glands)
   - checking of marking, TAGs,
   - checking of assembly of measuring and control devices,
   - checking of condition of bolt connections, clamps,
   - checking of earthing, potential equalization,
   - checking of condition of protection against electric shock, short circuit and overload,
   - checking of condition of cable insulation,
   - checking of routing of cables,
   - checking of maintenance possibilities (operation, e.g. a possibility to replace fans, etc.),
   - checking of plug connections on system cables,
   - checking of reserve possibilities (extension space in cabinets and in Control and Measurement Instruments and Automation cabinets),
   - checking of efficiency of operation of signaling circuits and Control and Measurement Instruments and Automation control,
   - checking of system load (memory, **CPU**, controller cycle duration time, refreshing time of process values, etc.) checking that there is a reserve as requested in the agreement/order and stipulations of this standard of: computing capabilities, memory, reserve I/O channels and system licenses,
   - checking of power outage monitoring (**UPS** monitoring, redundant power supply, etc.),
   - checking of fuse operation signaling (Fuse, breaker monitoring),
   - checking of cooling systems (fans, air conditioning in Control and Measurement Instruments and Automation cabinets),
   - checking of communication in the system, network monitoring,
   - checking of situation of control and measurement circuit damage (Short circuit, wire break, out of range, earth fault),
   - checking of **Watchdog**, if there is one,
   - checking of synoptics (e.g. compliance with P&ID, color scheme, symbols, static texts and test operation, organization: links, tree),
   - checking and test traffic, starting up of the control system, checking of compliance of I/O

inputs with indicators, indications with alarming system, warnings, trend tags and event archiving system, refreshing of graphics and key-switches.

- checking and test traffic of blockade system,
- tank calibration,

3.3.2. Requirements for Instrumentation, Control and Automation Equipment

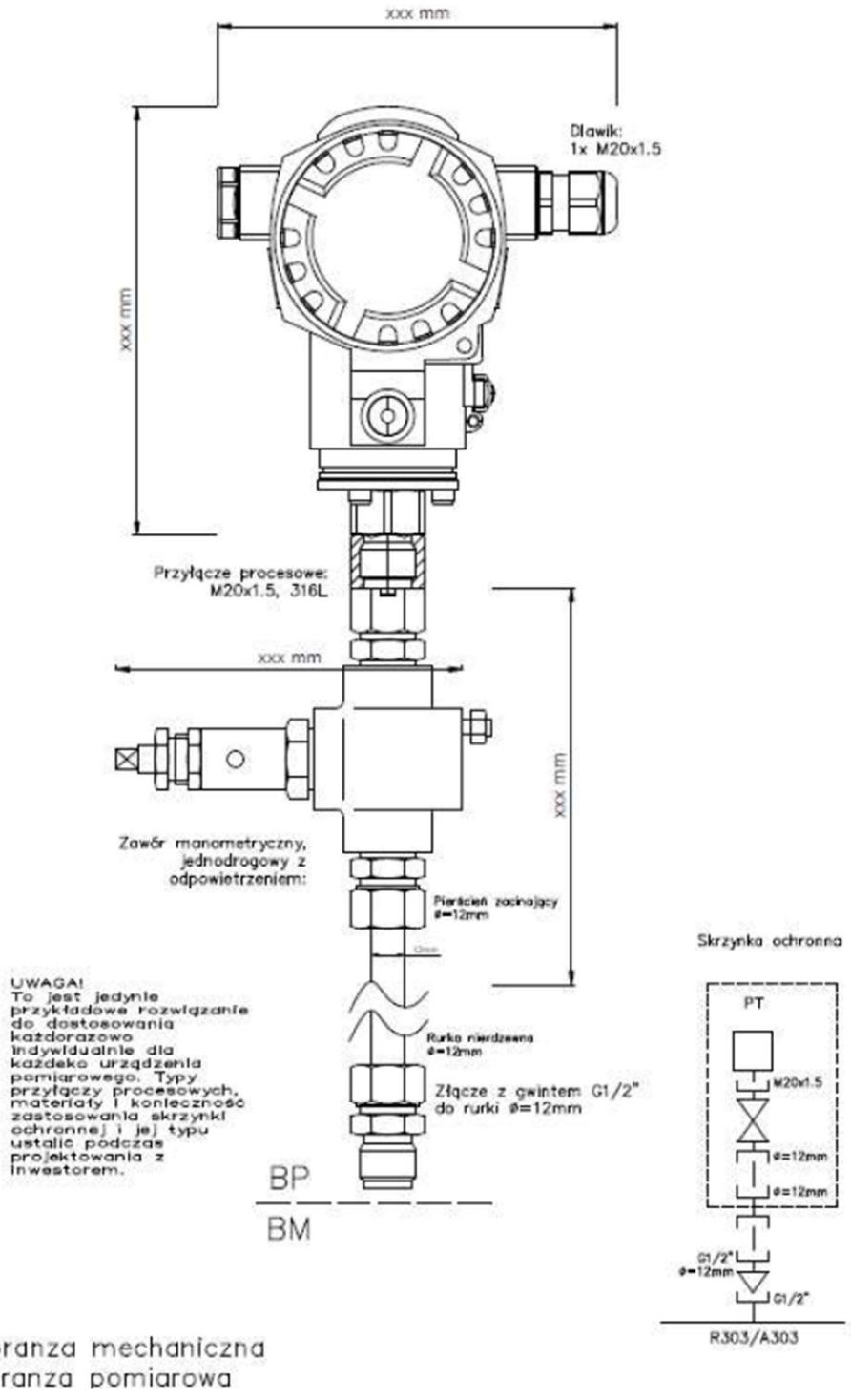
3.3.2.1. Pressure measurements

3.3.2.1.1. Electronic transducers of pressure (PT) and pressure difference (PDT)

1. Electronic pressure and pressure difference transducers should be selected in compliance with the regulations in force and standards and below requirements:
   Smart transducers should be used.
2. The transducer connected only to the **DCS system** / **PLC** controller should be supplied from its input modules.
3. Standard output signal: 4 ... 20 mA, two wire line 24 V DC.
4. The transducers should be provided with the **HART** communication protocol and directly connected to the input cards of the **DCS** system.
5. The total measurement accuracy (measurement device class) should be better than ± 0,1%.
6. Pulse pipes dia. 12 mm should be used. Material version should be selected for the process and environment conditions in compliance with the pipeline mechanical classification determined in the list of pipelines according to form MS06 — LIST OF PIPELINES located in the document **Ordinance of DG PCC Rokita SA Z 2010/46 of 20.12.2010 on Technical Documentation Standards at PCC Rokita SA**. Welded and ERMETO type bolted joints are preferred.
7. Heating and insulation of pulse pipes should be used in case when it is required due to the process or environment conditions.

8. The pressure transducers should be provided with an individual shut off valve (as a standard a manometric valve M20x1.5) or in case of hazardous media individual sets of 2 valves with an additional discharge valve, they should be installed on the pulse lines. Examples on figures **Figure 14 Example of connection of pressure transducer with manometric/shut off valve**, **Figure 15 Example of connection of shut off and discharge valve to pressure transducer**. Remark! These are examples only, **Figure 15 Example of connection of shut off and discharge valve to pressure transducer** concerns application of a transducer with a membrane separator for hazardous, adhesive, abrasive and of high temperature media in case when it is inadvisable due to the process reasons to connect the transducer with the pulse pipe via the manometric valves M20x1.5. Finally the way of connecting should be agreed with the Investor.

9. The pressure difference transducer should be provided with a 3-valve set analogously as in case of the pressure transducers. Including one discharge and per chamber. It is allowed to use the 5-valve sets for measurement of pressure difference.
10. For the media hazardous for people or the environment, vents and drains should be led out with a pipe to safe places.
11. A process threaded connection M20x1.5 is recommended.
12. If it is necessary to use pressure transducers with separation (e.g. Abrasive media, high temperatures, etc.) separators should be used with the connection diameter DN50 in compliance with standard **PN-EN 1092-1-A1:2013-07 - English version Flanges and their connections - Round flanges of tubes, fittings, shapes, connectors and fixtures with marking PN - Part 1: Steel flanges**



BM — mechanical branch
BP — measurement branch

Figure 14 Example of connection of pressure transducer with manometric/shut off valve

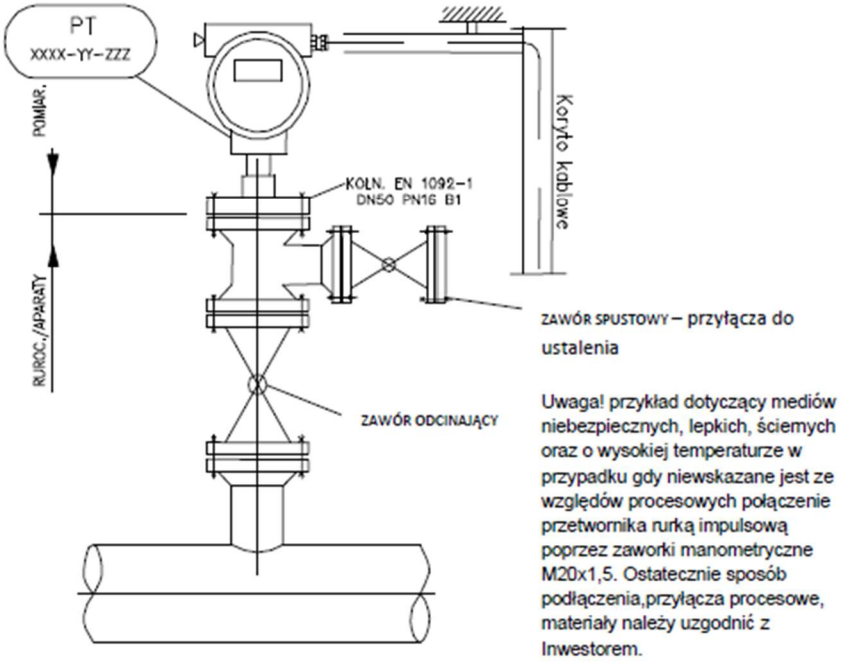


Figure 15 Example of connection of shut off and discharge valve to pressure transducer.

13. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as the input to the **ESD** protection system.
14. It is not recommended to apply pneumatic pressure and pressure difference transducers.

3.3.2.1.2. Manometers (PI)

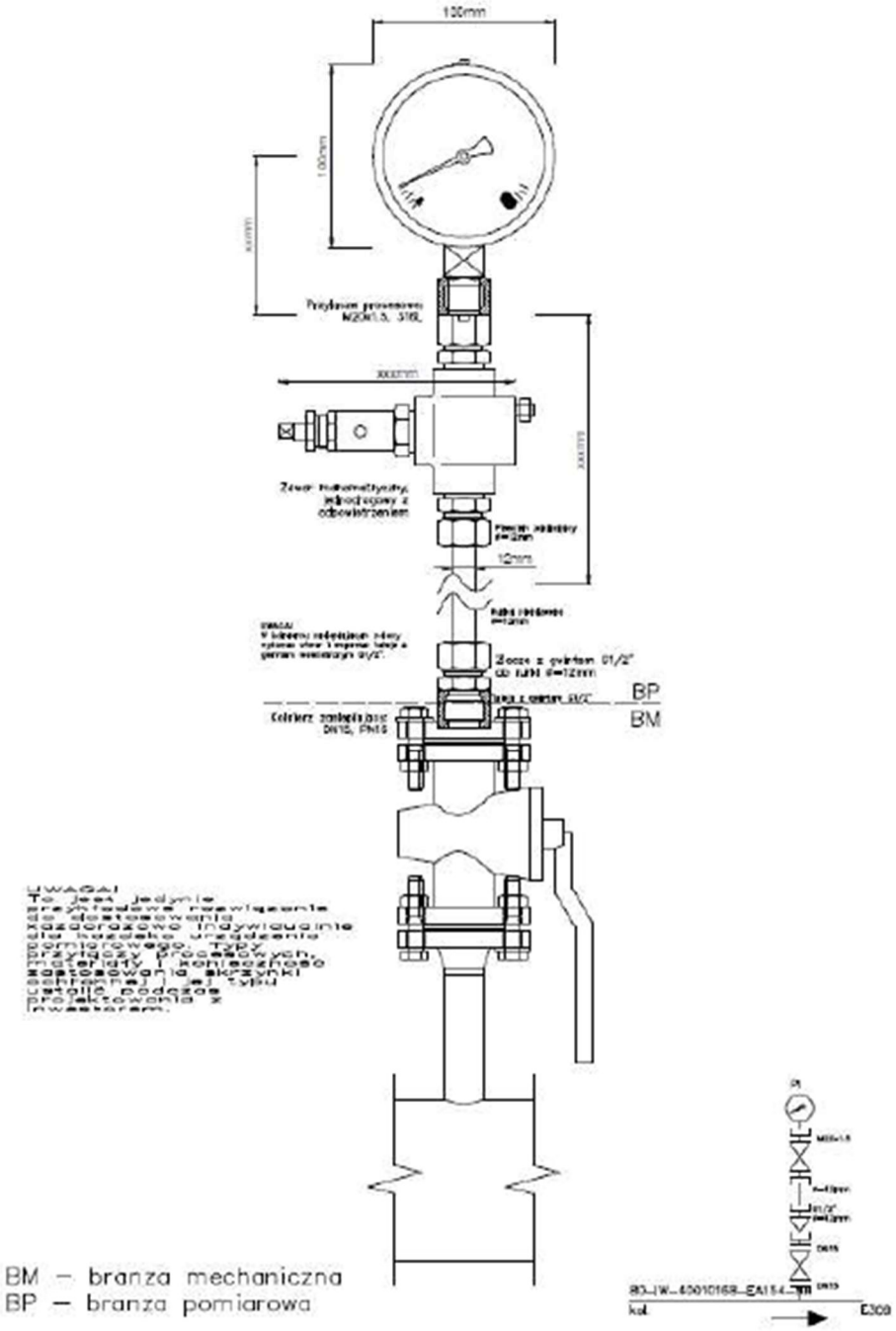
Manometers should be selected in compliance with the standards and regulations in force and the document **PBT.PR.01.I07 Technical supervision**. The manometers should also fulfill the below requirements:

1. The minimum measurement accuracy for the manometers should be 1.6%.
2. The manometers should feature the housings in the make not worse than form varnished carbon steel (recommended from stainless steel ANSI 313) with the recommended diameter 100 or 160 mm with break resistant glass.
3. Recommended threaded connection M20x1.5.
4. The manometers should be provided with an overload membrane.
5. The overload protection should be 130% of the measurement range.
6. Pressure measurement points should be provided with an individual shut off valve as a standard a manometric valve M20x1,5) or in case of the hazardous media with individual sets of 2 valves with an additional discharge valve analogously as for the pressure transducers. Examples on figures

   Figure 16 Example of manometer connection, **Figure 17 Example of connection of shut off and discharge valve to manometers**.

   Remark! These are examples only. **Figure 17 Example of connection shut off and discharge**

valve to manometers refers to the application of the manometer with a membrane separator for the hazardous, adhesive, abrasive and high temperature media in case when it is inadvisable due to the process reasons to connect the transducer with the pulse pipe via the manometric valves M20x1.5. Finally the way of connecting should be agreed with the Investor.



BM — mechanical branch
BP — measurement branch

Figure 16 Example of manometer connection

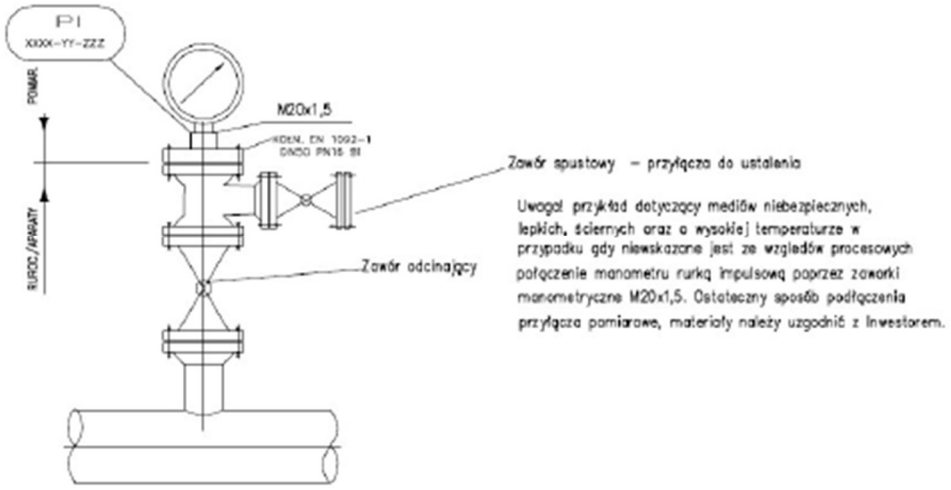


Figure 17 Example of connection of shut off and discharge valve to manometers

7. The maximum permissible device pressure should be marked with a red color line on the manometer dial.
8. For adhesive, abrasive and high temperature media you should use the manometers with flange separators and capillaries with connection diameter DN50 in compliance with standard **PN-EN 1092-1-A1:2013-07 - English version Flanges and their connections - Round flanges of tubes, fittings, shapes, connectors and fixtureswith marking PN - Part 1: Steel flanges**
9. In case of the manometers exposed to shocks and vibrations you should use the manometers filled up with liquid.
10. If pulsation suppressors are required and protections against exceeding of the range, they should be made of steel not worse than the stainless steel ANSI 316 and should feature a possibility to change settings from the outside.

3.3.2.1.3. Pressure indicators (PS)

Pressure indicators should be selected in compliance with the standards and regulations in force and with the below requirements.

1. The indicators should feature contacts of micro switch type or **NAMUR**, 24V DC, 0.5A, their construction should be protected against atmospheric conditions.
2. The changeover switches of pressure used for the **ESD** system should be provided with the system of recognizing of the measuring circuit continuity. In case of assembly in the zones with the risk of explosion they should be in the explosion proof, non-intrinsically safe make.
3. The trigger point should be set in the whole temperature range of indicator operation.
4. Recommended terminal M20x1.5.
5. For adhesive, abrasive and high temperature media you should use the indicators with flange

separators and capillaries with connection diameter DN50 in compliance with standard **PN-EN 1092-1-A1:2013-07 - English version Flanges and their connections - Round flanges of tubes, fittings, shapes, connectors and fixtures with marking PN - Part 1: Steel flanges**

3.3.2.2. Level meters

3.3.2.2.1. Level transducers (LT)

Level transducers should be selected in compliance with the standards and regulations in force and with the below requirements.

1. Smart transducers should be used.
2. In case of hydrostatic transducers for adhesive, abrasive and high temperature media you should use the transducers with flange separators with connection diameter DN50 or DN80 in compliance with standard **PN-EN 1092-1-A1:2013-07 - English version Flanges and their connections - Round flanges of tubes, fittings, shapes, connectors and fixtures with marking PN - Part 1: Steel flanges**
3. Vents and drains should be led out with a pipe to safe places or to a discharge system except for the instruments that are installed on the media not posing hazards - e.g. Low pressure, non-toxic or non-flammable liquids.
4. **DCS** / of the **PLC** controller should be powered from its input modules.
5. Standard output signal: 4 … 20 mA, two wire type line 24V DC.
6. Total accuracy should be better than ± 1 %..
7. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
8. Electric terminal should be used Cable fitting M2x1.5.
9. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and so is explosion proof non intrinsically safe make. In case of application as the input to the **ESD** protection system.

3.3.2.2.2. Level indicators (LS)

The level indicators should be selected in compliance with the standards and regulations in force and with the below requirements.

1. Minimum dimension of the connection ferrules should be DN50. Other dimensions can be used in case of special requirements.
2. The level indicators should have contacts of micro switch type or **NAMUR**, 24V DC, 0.5A, their construction should be protected against atmospheric conditions.
3. The level indicators used for the **ESD** system should be provided with the system of recognizing of the measuring circuit continuity. In case of assembly in the zones with the risk of explosion they should be in the explosion proof, non-intrinsically safe make.

3.3.2.3. Temperature measurements

3.3.2.3.1. Temperature transducers (TT)

The level indicators should be selected in compliance with the standards and regulations in force and with the below requirements.

1. Smart transducers should be used.
2. The transducer connected only to the **DCS system** / **PLC** controller should be supplied from its input modules.
3. Standard output signal: 4 ... 20 mA, two wire type line 24 V DC.
4. Total accuracy should be better than ± 0.5 %..
5. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
6. The temperature transducers should be mounted in thermometric sensor heads or located in a separate flameproof box if it is necessary (e.g. measurements of temperature of electric motor bearings).
7. Resistance sensors (RTD) are preferred for co-working with the transducers.
8. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as the input to the **ESD** protection system.

3.3.2.3.2. Temperature sensors (TE)

The temperature sensors should be selected in compliance with the standards and regulations in force and with the below requirements.

1. The resistance sensors (RTD) are preferred in the connection layout (measurement circuit) with 3 cables and sensor (resistor) class A.
2. If it is necessary to use thermocouples you should use the thermocouples with non-earthed weld.
3. The recommended sensor connection - thread M20x1.5.
4. All temperature sensors should be mounted in thermometric sheaths / guards in order to enable their disassembly without the necessity of turning down operation of the installation.

The temperature sensors should be mounted at the angle of 45° form the level so as the process connection was located higher than the place of inserting the sensor to the machine or pipeline. The example on Figure 18 Example of assembly of temperature sensors.

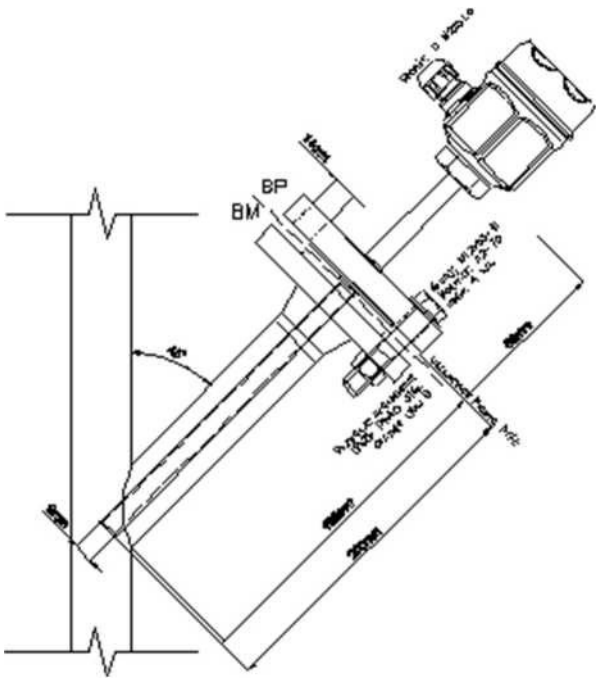


Figure 18 Example of assembly of temperature sensors.

5. The sheath flange selection, a kind of the face and finishing should correspond with the mechanical classification of pipelines or process devices determined in the document **Ordinance of DG PCC Rokita SA Z 2010/46 of 20.12.2010 on Technical Documentation Standards at PCC Rokita SA**.

3.3.2.3.3. Local thermometer (TI)

The local thermometers should be selected in compliance with the standards and regulations in force and the document (PBT.PR.01.I07 Dozór techniczny) The reference source cannot be found The local thermometers should also fulfill the below requirements:

1. The preferred local temperature measurements should be bimetallic or manometric thermometers filled with gas or liquid.
2. Minimal accuracy of measurement for the local temperature measurements should be 1.6%.
3. Measurement disc diameter - min. 100 mm.
4. Measurement unit: °C.
5. On the thermometer graduation or guard there should be the factory made marking with a red line in a durable way of the permissible temperature for which the particular device or process is designed.
6. The recommended thermometer connection - threaded M20x1.5.
7. The thermometers should be mounted in thermometric sheaths / guards in order to enable their disassembly without the necessity of turning down operation of the installation.

The thermometers should be mounted at the angle of 45° form the level so as the process connection was located higher than the place of inserting the sensor to the machine or pipeline. The example on drawing -

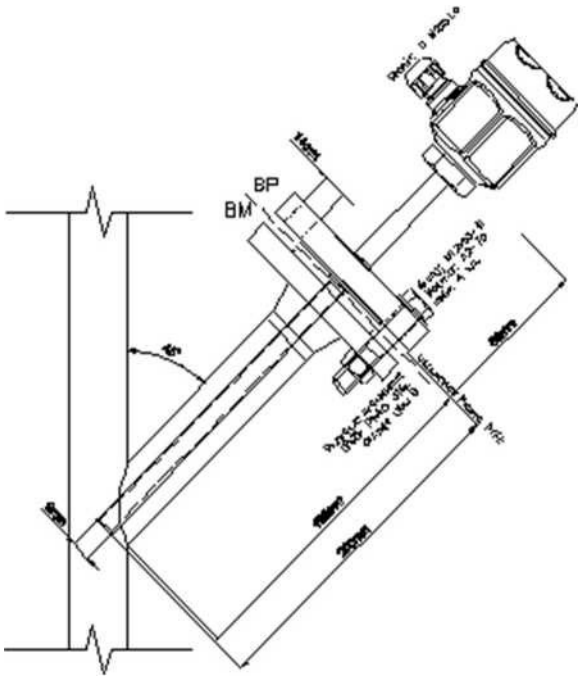


Figure 19 Example of assembly of local thermometers

8. The bimetallic thermometers should be used for measurements of the temperature above 0°C.
9. Use of mercury thermometers is forbidden.

3.3.2.4. Flow measurements

For flow measurements, if it is not defined otherwise, it is recommended to use connections and recommended diameter for the pipelines determined in the document. In justified cases a deviation from this principle is possible, which should be agreed every time with the relevant services of the PCC Rokita SA.

3.3.2.4.1. Venturi flow meters (FT)

The Venturi flow meters should be selected in compliance with the standards and regulations in force and with the below requirements.

1. The Venturi flow meters for the pipeline with the cross section larger than DN50 should be selected in compliance with standard **PN-EN ISO 5167-1:2005 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full Part 1. General principles and requirements**
2. The compact Venturi flow meter should be used for the process pipeline size below DN50. Then the construction in compliance with the supplier's standard is used. The supply should be complete; with the measuring orifice. Flanges should be supplied with ferrule sections before and behind the measuring orifice and with joining elements and gaskets.
3. The compact Venturi flow meter should feature a mesh filter on the inflow side, shut off and by-pass.
4. For the flows with Reynolds number less than 4000, with large impurities or in case of the liquid with large adhesiveness the possibility of use of a swelling device depends on process permissible pressure

drops.

5. If low pressure drop is requested you should use the Venturi tubes. The complete supply should comprise gaskets, bolts, nuts and shut off valves.
6. In case of clean gases and liquids with small density, if pressure drops are not allowed you should use the ANNUBAR swelling pipes in the version that enables their exchange under pressure.
7. Discharge holes should be applied at measurements of steam flow and gases where there appears the risk of condensation.
8. Vent holes should be applied at measurements of liquid flow when there appears gasifying or evaporation.
9. The pulse pipes should be provided with shut off valves.
10. The ferrule sections both on the inflow as well as outflow should be preserved, recommended in compliance with standard **PN-EN ISO 5167-1:2005 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full Part 1. General principles and requirements**
11. Material version should be selected for the process and environment conditions in compliance with the pipeline mechanical classification determined in the form MS06 — LIST OF PIPELINES located in the document **Ordinance of DG PCC Rokita SA Z 2010/46 of 20.12.2010 on Technical Documentation Standards at PCC Rokita SA**.
12. The requirements concerning the pressure transducers are determined in point **3.3.2.1.1**
13. If the required ranging exceeds 5:1 two transducers should be used with the ranges selected so as to provide optimal coverage of the whole measuring range.

3.3.2.4.2. Electromagnetic flow meters (FT)

The Electromagnetic flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Smart transducers should be used.
2. Standard output signal: 4 … 20 mA, two wire type line 24 V DC and pulse output.
3. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
4. Supply voltage: 24V DC.
5. Total accuracy should be better than ± 1 %.
6. Material version should be selected for the process and environment conditions and the measured medium.
7. Cut offs and flow meter by-pass should be made on the pipelines.
8. The ferrule sections recommended by the manufacturer both on the inflow as well as outflow should be preserved,
9. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as

the input to the **ESD** protection system.

10. Protection class against dust and water - not worse than IP65.
11. The flow meters should be provided with integral LCD or LED displays.
12. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.3. Swirl flow meters, Vortex

The swirl flow meters are preferred for measurements of steam flow and for measurements with a wide range. The swirl flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Smart transducers should be used.
2. Standard output signal: 4 … 20 mA, cable type 24V DC and pulse output.
3. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
4. Supply voltage: 24V DC.
5. Total accuracy should be better than ± 1 %.
6. The swirl flow meters should be selected with 30% reserve of the measurement range.
7. Material version should be selected for the process and environment conditions and the measured medium.
8. Cut offs and flow meter by-pass should be made on the pipelines.
9. The recommended ferrule sections both on the inflow as well as outflow should be preserved,
10. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as the input to the **ESD** protection system.
11. Protection class against dust and water - not worse than IP65.
12. The flow meters should be provided with integral LCD or LED displays.
13. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.4. Coriolis mass flow meters (FT)

The Coriolis mass flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Smart transducers should be used.
2. Standard output signal: 4 … 20 mA, and pulse output.
3. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
4. Supply voltage: 24V DC.
5. Total accuracy (instrument class) should be better than ± 0.5 %.
6. Material version should be selected for the process and environment conditions and the measured medium.
7. Cut offs and flow meter by-pass should be made on the pipelines.
8. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the

regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as the input to the **ESD** protection system.

9. Protection class against dust and water - not worse than IP65.
10. The flow meters should be provided with integral LCD or LED displays.
11. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.5. Thermal mass flow meters (FT)

The thermal mass flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Smart transducers should be used.
2. Standard output signal: 4 ... 20 mA, and pulse output.
3. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
4. Supply voltage: 24V DC.
5. Total accuracy should be better than ± 0.5 %.
6. Material version should be selected for the process and environment conditions and the measured medium.
7. Cut offs and flow meter by-pass should be made on the pipelines.
8. The ferrule sections recommended by the manufacturer both on the inflow as well as outflow should be preserved,
9. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as the input to the **ESD** protection system.
10. Protection class against dust and water - not worse than IP65.
11. The flow meters should be provided with integral LCD or LED displays.
12. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.6. Ultrasound flow meters (FT)

The ultra sound flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Smart transducers should be used.
2. Standard output signal: 4. 20 mA and pulse output.
3. The transducers should be provided with the **HART** protocol and connected directly to the **DCS** system input cards.
4. Supply voltage: 24V DC.
5. Total accuracy should be better than ± 2.5 %.
6. Material version should be selected for the process and environment conditions and the measured medium.
7. In case of flange construction on the pipelines cut offs and flow meter by-pass should be made.

8. The ferrule sections recommended by the manufacturer both on the inflow as well as outflow should be preserved,
9. In case it is necessary to apply instruments in the zone with risk of explosion you should follow the regulations in force and standards (see Section 6). The intrinsically safe make is preferred for the purpose of control and monitoring and explosion-proof non-intrinsically safe in case of application as the input to the **ESD** protection system.
10. Protection class against dust and water - not worse than IP65.
11. The flow meters should be provided with integral LCD or LED displays.
12. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.7. Rotameters (FI)

The rotameters should be used chiefly for the local measurements.

The rotameters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Total accuracy should be better than ± 2.5 %.
2. The rotameter should feature a metal housing. The material version should be selected for the process and environment conditions and the measured medium.
3. The rotameter should be provided with a rule shield made from safe glass with sealing.
4. The rotameters should be provided with a cut off on the inflow and outflow.
5. Protection class against dust and water - not worse than IP65.
6. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.8. Turbine flow meters (FI)

The turbine flow meters should be used chiefly for the local measurements. The turbine flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Smart transducers should be used.
2. The standard output signal: optional pulse.
3. Total accuracy should be better than ± 1 %.
4. Material version should be selected for the process and environment conditions and the measured medium.
5. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.9. Oval-circular flow meters (FI)

The oval-circular flow meters should be used chiefly for the local measurements and feeding systems.

The oval-circular flow meters should be selected in compliance with the standards and regulations in force and with the below requirements:

1. Total accuracy should be better than ± 2.5 %.
2. The flow meter should be provided with a pulse output.
3. Material version should be selected for the process and environment conditions and the measured medium.
4. Before the oval-circular flow meters there should be installed filters for impurities.
5. The flow meters should be provided with a cut off on the inflow and outflow.

6. The flow meters should be calibrated by the supplier for the range indicated in the specification.

3.3.2.4.10. Flow indicators (FS)

The flow indicators should be selected in compliance with the standards and regulations in force and with the below requirements:

1. The indicators should feature contacts of micro switch type or **NAMUR**, 24V DC, 0.5A, their construction should be protected against atmospheric conditions.
2. Protection class against dust and water - not worse than IP65.
3. The flow indicators used for the **ESD** system should be provided with the system of recognizing of the measuring circuit continuity. In case of assembly in the zones with the risk of explosion they should be in the explosion proof, non-intrinsically safe make.

3.3.2.5. Analyzers

The analyzers should be selected in compliance with the standards and regulations in force and with the below requirements:

1. They should be provided with a relevant sampling system.
2. The collected sample should be returned to the process or if there is no such possibility should be sent by a pipeline to the discharge network.
3. The response time of the analyzer cannot exceed the demanded reply time resulting from the process requirements.
4. If possible, all analyzers should be provided with a self-diagnostics system. In case of a failure the alarm signal should be sent to the **DCS** system.
5. Sensors of the pH and conductivity analyzers should be designed in the way enabling disassembly for checking, cleaning or calibration during normal operation. It is preferred to install these sensors directly in the process pipelines without samplers.
6. The analyzers located in the local cabinets should have electric heating.
7. A measurement result should be transferred from the analyzers of the **DCS** system with standard analog signals - 4... 20 mA, insulated by galvanizing. The serial transmission signal can be used for monitoring of operation of the analyzer.
8. For detectors of explosive, flammable and toxic substances do not use semiconductor sensors and in the non-production areas do not use optic sensor.

3.3.2.6. Scales

All scales should be compliant with the standards and regulations in force and with the below requirements:

1. The scale systems will be constructed in such way so as to enable the communication with the **DCS** system via an output signal 4 ... 20 mA 24V.
2. The measuring elements must be adapted to the conditions in the particular installation.

3.3.2.7. Shut off valves/on-off (XV)

The shut off/on-off valves with an actuator should be compliant with the standards and regulations in force and with the below requirements:

1. The shut off/on-off ball valves (other valves if it is required) with gaskets excluding asbestos are

preferred for typical applications.

2. In general all the shut off/on-off valves should feature tight close (in case of the adjustment valves they should feature class VI of tightness in compliance with standard **PN-EN 60534-4** or/and for the remaining ones class A in compliance with standard **PN-EN 12266-1**). A deviation from this principle is possible in justified cases and it must be confirmed in the HAZOP analysis. The fire safety certificate is required for the valves only when it is required in the process.
3. Tightness of the body (gland) in automatic valves should be in class A and category at least compliant with C02 (1500 cycles) in compliance with standard **PN-EN ISO15848 (TA LUFT).**
4. The pressure part material of the valve body should be selected according to the pipeline list. The manufacturer should confirm that the materials used by them are proper for the particular application and compliant with the design parameters included in the technical specification.
5. Material version of the internal parts of the valve should be selected individually for each valve depending on the medium and the required parameters.
6. The quarter-turn ball valves should feature pneumatic actuators with the spring return or two sided piston actuators If it is impossible to use pneumatic actuators with the spring return due to the force, velocity of shutting or other process conditions two sided piston actuators should be used.
7. Shutting time of the pneumatic actuator should be compliant with the manufacturer standards, requirements defined by safety standards, process requirements and the HAZOP analysis.
8. The actuators should be provided with solenoid valves as far as the valve terminals are not used.
9. In case of the control of the control valves form the I/O terminals of ET200iSP type (in the EX zones) piezoelectric valve should be used - controlled with a continuous signal (switching on current max. 19 mA), intrinsically safe, Ex ia make.
10. Valve piping should be made from the material resistant to the process and atmospheric conditions. Most frequently pipes diameter 8mm, made from acid resistant steel are used.
11. On short sections, near the valve, if the process and atmospheric conditions allow for it pneumatic hoses are preferred, resistant to welding sparks and in the PVC coating.
12. Position sensors should be used for signaling open/close position in the system.

3.3.2.8. Solenoid valves (XY)

1. The solenoid valve coil should be supplied with voltage 24V DC.
2. Cable glands should have the thread M20x1.5.
3. The solenoid valves should have a noise suppressor.
4. The solenoid valves should made from the material adapted to the conditions appearing in the installation and to the medium.
5. If the solenoid valves operate in the zones with explosion risk they must be in the explosion proof make Eex (d) or Eex (me).
6. In case of the control of the control valves from the I/O terminals of ET200iSP type (in the EX zones) piezoelectric valve should be used - controlled with a continuous signal (switching on current max. 19 mA), intrinsically safe, Ex ia make.

7. You should use relevant plates (throttlers), hydraulic modules or other technical solutions reducing the overdrive velocity of the execution member of the actuator if it is necessary due to the process reason or application of modules slowing down operation of the actuator is it is for some other reasons (e.g. Eradication of the hydraulic impact in the pipeline).

3.3.2.9. Adjustment valves

The adjustment valves should be compliant with the standards and regulations in force and with the below requirements:

1. In general you should use poppet, ball, membrane, flap (throttling) adjustment valves. Seals must be asbestos free.
2. The material of the pressure part of the valve body must be selected according the pipeline list. The manufacturer should confirm that the materials used by them are proper for the particular application and compliant with the design parameters included in the technical specification.
3. The valves should be provided with pneumatic membrane actuators with a spring setting the valve in the safe position in case of power supply loss. The actuators should be provided with smart precision positioners, electro-pneumatic, with manometers, controlled with signal 4-20 mA HART with the loopback signal 4-20mA, supplied from the current loop.
4. The safe position of the adjustment valve should be marked on the P&ID diagram. The valve should set itself in this position both in case of the loss of the control signal as well as the pneumatic supply.
5. The piston actuators should be used if a long stroke of the valve is required, large force or operation velocity are necessary. The piston-rotary actuators can be used for the ball valves and adjustment flaps (throttlers).
6. The adjustment valve actuator should be selected so as it would be able to surmount not less than 125% of the largest foreseen load and also have the stroke reserve.
7. Selection of the valve size should be in compliance with standard **PN-IEC 60534 Part: 1-4 Industrial adjustment valves**. A spread sheet with valve calculations should be attached to the documentation. The Kvs coefficient of the valve should be selected in the way so as the nominal flow was within 70% and 80% of the maximal flow.
8. In general if there are no other requirements, including if the valves are not to work as shut off valves (see Subpoint 2 point 3.3.2.7) then the adjustment valves should feature tightness class IV in compliance with standard **PN-EN 60534-4** .
9. The valve should be fully equipped, including pneumatic pipes. The pneumatic pipe are to be made from copper or acid resistant steel. Cable glands
10. On short section near the valve, if the process and atmospheric conditions allow, pneumatic hoses dia. 8 mm resistant to welding sparks and in the PVC coating are preferred.
11. Each valve should be provided with a nameplate made from stainless steel, fixed permanently. The name plate should include a full list of the valve parameters.
12. Each individual electro-pneumatic positioner should be provided with a filter-regulator with a

manometer.

13. Use of the adjustment valves as the shut off ones is not recommended.

3.3.2.10. Valve terminals

The valve terminals should be compliant with the standards and regulations in force and with the below requirements:

1. In general you should use the multipole valve terminals (multi-pin) with multi-pin connectors to the valve terminals with individual plugs for connecting with the superior control system. Connection of the valve terminals with the superior control system and especially with the DCS system should be effected by the I/O distributed stations via standard I/O signals instead of a digital interface (pole).
2. Modular construction valve terminals should be used enabling easy extension of the terminal with next solenoid valves 2x3/2.
3. The solenoid valve coil should be powered with voltage 24V DC.
4. The valve terminal should be provided with indicators signaling settings of each of the solenoid valves.
5. The valve terminal should allow for manual override of the setting of each of the solenoid valves.
6. The valve terminal should be provided with a noise suppressor(s).
7. The valve terminal and especially the solenoid valves should be made from the material adapted for the installation and atmospheric conditions and for the medium
8. Each valve terminal should be provided with a filter-regulator with a manometer mounted behind the shut off valve on the air supply to the valve terminal.
9. In the cabinet of the valve terminal there should be applied air collectors, to the outlets of which there should be connected reverse lines of the measurement air from the actuator chambers.
10. Compressed air should be blown slightly into the valve terminal cabinet, using an air reducer in order to create overpressure in the cabinet to protect it against penetration of the interior by the installation atmosphere.

3.3.3. Requirements for cyber control systems

The requirements for the cyber control systems are included in the attached document SUT C-2 “Cyber Security Procurement Language for Control Systems”.

3.3.4. Lists of the Control and Measurement Instruments and Automation devices standardized at the PCC Rokita SA

Equipment group	Device kind	Device type	Selected manufacturers to standard manufacturer list
Pressure measurement	Electronic pressure (PT) and pressure difference (PDT) transducer	Smart	Aplisens
Pressure measurement	Electronic pressure (PT) and pressure difference (PDT) transducer	Smart	Emerson
Pressure measurement	Electronic pressure (PT) and pressure difference (PDT) transducer	Smart	Yokogawa
Pressure measurement	Manometer (PI)	Industrial	Badotherm
Pressure measurement	Manometer (PI)	Industrial	Baumer
Pressure measurement	Manometer (PI)	Industrial	WIKA
Pressure measurement	Pressure indicator (PS)	Gas/Liquid	Danfoss
Pressure measurement	Pressure indicator (PS)	Gas/Liquid	Trafag
Pressure measurement	Pressure indicator (PS)	Gas/Liquid	GEORGIN
Level measurement	Level transducer (LT)	Magnetostrictive/float type	Emerson
Level measurement	Level transducer (LT)	Magnetostrictive/	Kubler/WIKA/

			Kuebler
Level measurement	Level transducer (LT)	float type	
		Magnetostrictive/float type	Nivelco
Level measurement	Level transducer (LT)	Radar	Nivelco
Level measurement	Level transducer (LT)	Radar	VEGA
Level measurement	Level transducer (LT)	Radar	
Level measurement	Level transducer (LT)	Ultrasound	Nivelco
Level measurement	Level transducer (LT)	Ultrasound	VEGA
Level measurement	Level transducer (LT)	Ultrasound	
Level measurement	Level transducer (LT)	PDT (Pressure difference)	Aplisens
Level measurement	Level transducer (LT)	PDT (Pressure difference)	Emerson
Level measurement	Level transducer (LT)	PDT (Pressure difference)	Yokogawa
Level measurement	Level indicator (LS)	Conductivity/ Vibration/Float type	Emerson
Level measurement	Level indicator (LS)	Conductivity/ Vibration/Float type	Kubler/WIKA/ Kuebler
Level measurement	Level indicator (LS)	Conductivity/ Vibration/Float type	VEGA
Temperature measurement	Temperature transducer (TT)	Smart	Baumer
Temperature measurement	Temperature transducer (TT)	Smart	WIKA
Temperature measurement	Temperature transducer (TT)	Smart	ABB
Temperature measurement	Temperature transducer (TT)	Smart	
Temperature measurement	Temperature sensor (TE)	RTD/Thermocouple	Limatherm
Temperature measurement	Temperature sensor (TE)	RTD/Thermocouple	Termoprecyzja
Temperature measurement	Temperature sensor (TE)	RTD/Thermocouple	Termoaparatura
	Temperature sensor (TE)	RTD/Thermocouple	ABB
Temperature measurement		RTD/Thermocouple	GEORGIN for temperature indicators TS
Temperature measurement	Local thermometer (TI)	Bimetallic/Gas	Badotherm
Temperature measurement	Local thermometer (TI)	Bimetallic/Gas	Baumer
Temperature measurement	Local thermometer (TI)	Bimetallic/Gas	WIKA
Flow metering	Flow-meter (FT)	Constriction	Emerson
Flow metering	Flow-meter (FT)	Constriction	
Flow metering	Flow-meter (FT)	Electromagnetic	ABB
Flow metering	Flow-meter (FT)	Electromagnetic	KROHNE
Flow metering	Flow-meter (FT)	Electromagnetic	Yokogawa

Flow metering	Flow-meter (FT)	Vortex	Emerson
Flow metering	Flow-meter (FT)	Vortex	KROHNE
Flow metering	Flow-meter (FT)	Vortex	Yokogawa
Flow metering	Flow-meter (FT)	Coriolis mass	Emerson
Flow metering	Flow-meter (FT)	Coriolis mass	KROHNE
Flow metering	Flow-meter (FT)	Coriolis mass	Yokogawa
Flow metering	Flow-meter (FT)	Thermal mass	Emerson
Flow metering	Flow-meter (FT)	Thermal mass	
Flow metering	Flow-meter (FT)	Ultrasound	Emerson
Flow metering	Flow-meter (FT)	Ultrasound	KROHNE
Flow metering	Flow-meter (FT)	Ultrasound	
Flow metering	Rotameter		ABB
Flow metering	Rotameter		KROHNE
Flow metering	Rotameter		ZA „ROTAMETR” Sp. Z o.o.
Flow metering	Rotameter		Yokogawa
Flow metering	Flow-meter (FI)		ABB
Flow metering	Flow-meter (FI)	Turbine	TECFLUID
Flow metering	Flow-meter (FI)	Oval-circle	Bopp&Reuther
Flow metering	Flow-meter (FI)	Oval-circle	
Flow metering	Flow-meter (FI)	Oval-circle	TECFLUID
Flow metering	Flow indicator (FS)		Honsberg
Flow metering	Flow indicator (FS)		Kubler
Flow metering	Flow indicator (FS)		Turck
Measurement of physicochemical	pH-Meter		METTLER TOLEDO
Measurement of physicochemical	pH-Meter		Yokogawa
Measurement of physicochemical	pH-Meter	Zirconium probes AZ	ABB
Mass measurement	Weight	Platform	METTLER TOLEDO
Mass measurement	Weight	Platform	Radwag
Mass measurement	Weight	Platform	
Mass measurement	Weight	Tank	Sartorius
Mass measurement	Weight	Tank	Siemens
Mass measurement	Weight	Tank	
Actuators	Shut on/off valve (XV)		ADLER
Actuators	Shut on/off valve (XV)		Ebro (dampers only)
Actuators	Shut on/off valve (XV)		Richter

Actuator modules	Shut on/off valve (XV)		Kingdom
Actuators	Actuator	Pneumatic	Air Torque
Actuating module	Actuator	Pneumatic	InterApp
Actuating modules	Actuator	Pneumatic	Pentair
Actuator modules	Actuator	Pneumatic	Rotork
Actuating modules	Actuator	Electric	AUMA
Actuating modules	Actuator	Electric	Siemens
Actuating modules	Position indicator		Pepperl+Fuchs
Actuating modules	Position indicator		Rotech
Actuating modules	Position indicator		Soldo controls
Actuating modules	Solenoid valve (XY)		Asco
Actuating modules	Solenoid valve (XY)		Norgren
Actuating modules	Solenoid valve (XY)		Parker
Actuating modules	Solenoid valve (XY)		Rexroth
Actuating modules	Adjustment valve		ARCA
Actuating modules	Adjustment valve		ARI Armaturen
Actuating modules	Adjustment valve		Descote (for chlorine installations)
Actuating modules	Adjustment valve		Polna
Actuating modules	Adjustment valve		Richter
Actuating modules	Adjustment valve		Samson
Actuating modules	Positioner		ABB
Actuating modules	Positioner		Flowserve PMV
Actuating modules	Positioner		Samson
Actuating modules	Positioner		Siemens
Actuating modules	Valve terminals		ASCO Numatics/ Aventics (only during modernizing and

			extension of the existing ones)
Actuating modules	Valve terminals		FESTO
Actuating modules	Valve terminals		Parker
Control system elements	Control system DCS		Emerson (only during extension of the existing one)
Control system elements	Control system DCS		Siemens
Control system elements	Control system DCS		ABB
Control system elements	Controller PLC		Siemens
Control system elements	Controller PLC		
Control system elements	Controller PLC		
Control system elements	Programmable relay		Siemens
Control system elements	Programmable relay		EATON (Moeller)
Control system elements	Programmable relay		
Control system elements	Protection system ESD		Emerson (only during extension of the DeltaV)
Control system elements	Protection system ESD		Siemens
Control system elements	Protection system ESD		ABB
HMI	Operator panel		Siemens
HMI	Operator panel		
HMI	Operator panel		
HMI	ES station, OS	of PCS7 system	Siemens
HMI	ES station, OS	Thin client/ ~~DeltaV system~~	DELL
HMI	ES station, OS		
Electric elements	Electric cable		Bitner

Electric elements	Electric cable		Lappkabel
Electric elements	Electric cable		Helukabel
Electric elements	Electric cable		Technokabel
Electric elements	Electric accessories		Wago
Electric elements	Electric accessories		ETI
Electric elements	Electric accessories		PHOENIX CONTACT
Electric elements	Separation relay		PHOENIX CONTACT
Electric elements	Separation relay		Finder
Electric elements	Separation relay		Relpol
Electric elements	delimiter Ex/Barrier		Phoenix
Electric elements	delimiter Ex/Barrier		MEAN WELL
Electric elements	delimiter Ex/Barrier		SIEMENS
Electric elements	delimiter Ex/Barrier		Turck
Electric elements	delimiter Ex/Barrier		PEPERL FUCHS
Electric elements	Power supply unit Ex		PHOENIX CONTACT
Electric elements	Power supply unit Ex		PEPERL FUCHS
Electric elements	Power supply unit Ex		Aplisens
Electric elements	Power supply unit Ex		Turck
Electric elements	Power supply unit/Buffer power supply unit		PHOENIX CONTACT
Electric elements	Power supply unit/Buffer power supply unit		SIEMENS
Electric elements	Power supply unit/Buffer power supply unit		MEAN WELL
Electric elements	Cable routes		Baks
Electric elements	Cable routes		Ebo System
Electric elements	Cable routes		
Pneumatic elements	Pneumatic hose		Parker Legris
Pneumatic elements	Pneumatic hose		CAMOZZI

Pneumatic elements	Pneumatic hose		ABB
Pneumatic elements	Pneumatic accessories		Parker Legris
Pneumatic elements	Pneumatic accessories		FESTO
Pneumatic elements	Pneumatic accessories		PREMA
Pneumatic elements	Pneumatic accessories		Rexroth
Pneumatic elements	Pneumatic accessories		SMC

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4. LIST OF DOCUMENTED INFORMATION

No. [1cm]	**Kind** [1.5cm]	**Communication range** [5cm]	**Bearer** [3cm]	**Recipient** [3cm]	**Frequency of transfer** [3cm]	**Form of transferred information** [3cm]	**Storing person** [3cm]	**Storing period** [3cm]	**Archiving period** [3cm]
	int./ ext.								

5. LIST OF DOCUMENT FORMS

No. [1cm]	Link [5cm]	Form name [22cm]

6. LIST OF RELATED DOCUMENTS

No.	Link	Document name
1.		PZM OURCHASE OF TECHNICAL MATERIALS SERVICES
2.		PUR.PR.02 Supervision of equipment for monitoring and measurement with instruction
3.		PUR.PR.02.I01 Marking
4.		PBT.PR.01 Operation and maintenance of network
5.		PBT.I03 Standard of technical equipment - SUT E Electric branch
6.		PBT.I04 Standard of technical equipment - SUT M Mechanical branch
7.		PBT.PR.01.I07 Technical supervision
8.		Ordinance of DG PCC Rokita SA Z 2013/25 of 26.06.2013 on implementation of instruction of application and control of efficiency of the means against static electricity at PCC Rokita SA.
9.		Ordinance of DG PCC no. 46/2020 on Technical documentation standard of PCC Rokita SA.
10.		Ordinance of DG PCC Rokita SA Z 2011/18 of 11.05.2011 on minimal requirements Of occupational safety and health, related to possibility of occurrence at work place

		of explosive atmosphere.
11.		Ordinance DG PCC Rokita SA Z 2020/22 of 10.08.2020 on implementation of General Sales Conditions of PCC Group companies
12.		Ordinance of DG PCC Rokita SA Z 2016/29 of 07.12.2016 on General specification of execution and acceptance of designing works, technical and design documentation, principals of organization and supervision of performance at The Group PCC Rokita in Brzeg Dolny
13.	Attachment - SUT C-2 - Procurement Language Systems.pdf	Attachment . SUT C - Cyber Security Procurement Language for Control
14.	Base legal requirements and other	Legal requirements in the scope of OHS and technical safety of processes
15.	Base legal requirements and other	List of legal requirements in the scope of environment protection
16.	NA	Act - of 24 August 1991 on fire protection.
17.	NA	Act – of 10 April 1997 Energy law
18.	NA	Act - of 11 May 2001 Law on measurements
19.	NA	Act - of 21 December 2000 On technical supervision
20.	NA	Act of 30 August 2002 on conformity assessment system
21.	NA	Directive 2014/32/EU (MID) on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments
22.	NA	Machinery Directive 2006/42/EC
23.	NA	ATEX Directive 114 (2014/34/EU) and Directive 1999/92/EC
24.	NA	Directive NAWI 2009/23/EC
25.	NA	Pressure Equipment Directive PED 2014/68/UE

26.	NA	Regulation of Minister of Development of 2 June 2016 on the requirements for measuring instruments.
27.	NA	Regulation of Minister of Economy of 31 January 2008 on the requirements that should be complied with by non-automatic scales and detailed scope of controls performed during the legal metrological control of these measuring instruments.
28.	NA	Regulation of Minister of Economy of 31 March 2008 changing the regulation on the technical conditions of technical supervision that the non-pressure and low pressure tans intended for storage of liquid flammable materials should correspond with.
29.	NA	Regulation of Minister of Economy of 19 April 2007 on the requirements with which should comply oscillating densimeters for density measurement of liquids and detailed scope of testing and controls performed during the legal metrological control of these measuring instruments.
30.	NA	Regulation of Minister of Economy of 23 October 2007 on the requirements, with which should comply water meters and detailed scope of testing and controls performed during the legal metrological control of these measuring instruments.
31.	NA	Regulation of Minister of Economy of 22 January 2008 on the requirements, with which should comply measuring tanks and detailed scope of testing and controls performed during the legal metrological control of these measuring instruments.
32.	NA	Regulation of Minister of Economy of 27 December 2007 on the kinds of measuring instruments subject to the legal metrological control and the scope of this control.
33.	NA	Regulation of Minister of Economy of 7 January 2008 on the legal metrological control of the measuring instruments.
34.	NA	Regulation of Minister of Economy of 2 June 2010 changing the regulation on the legal metrological control

		of the measuring instruments.
35.	NA	Regulation of Minister of Economy of 27 December 2007 on the requirements, with which should comply the measuring installations for continuous and dynamic measurement of volumes of liquids other than water and the detailed scope of the tests and controls performed during the legal metrological control of these measuring instruments.
36.	NA	Regulation of Minister of Economy of 16June 2010 changing the regulation on the requirements, with which should comply the measuring installations for continuous and dynamic measurement of volumes of liquids other than water and the detailed scope of the tests and controls performed during the legal metrological control of these measuring instruments.
37.	NA	Regulation of Minister of Economy of 3 September 2011 changing the regulation changing the regulation on the requirements, with which should comply the measuring installations for continuous and dynamic measurement of volumes of liquids other than water and the detailed scope of the tests and controls performed during the legal metrological control of these measuring instruments.
38.	NA	Regulation of Minister of Energy of 28 August 2019 on occupational safety and health at work with energy equipment
39.	NA	Regulation of Minister of Development of 6 June 2016 on the requirements for protection equipment and systems intended for use in potentially explosive atmosphere
40.	NA	IEC 60332-3-10 Test for Electric Cables Under Fire Condition Part 3-10: Test for Vertical Flame Spread of Vertically-Mounted Bunched Wires or Cables - Apparatus - Fire Edition
41.	NA	IEC 60364 Electrical Installation for Buildings Requirements - For Special Installation or Location
42.	NA	IEC 92-3 Electrical installation in skips, part 3, cables (construction and testing)
43.	NA	PN-76 E 05125 - ELECTROENERGY AND SIGNALING CABLE LINES (standard

		withdrawn)
44.	NA	PN-EN 1092-1-A1:2018-08 - English version Flanges and their joints. Circular flanges for pipes, fittings, connecting elements, accessories with PN designation Part 1: Steel flanges
45.	NA	PN-EN ISO 80079-36:2016-07 - Explosive atmospheres - Part 36: Non-electrical equipment in explosive atmospheres Methodology and requirements
46.	NA	PN-EN 1349:2010 Industrial process control fittings
47.	NA	PN-EN 161-A3:2013-06 - English version Automatic shut off valves for burners and gas equipment
48.	NA	PN-EN 298:2012 Automatic systems of burner control intended for burners and combustion equipment burning gas or liquid fuels
49.	NA	PN-EN ISO 2355-1:2014-07 - English version Burner control and protection equipment - oil - Requirements - detailed PART 1: Automatic and semiautomatic valves
50.	NA	PN-EN 6007-6:2016-02 - English version Atmospheres-explosive Part 6: Protection of equipment using oil immersion “o”
51.	NA	PN-EN 61-41-14:2005 - English version Electrical equipment for application at presence of flammable p-u Part 14: Selection and installation
52.	NA	PN-EN 60079-26:2015-04 - English version Atmospheres-explosive Part 26: Equipment with the equipment protection level (EPL) Ga
53.	NA	PN-EN 60079-0:2018-09 Atmospheres-explosive Part 0:-Equipment - Basic requirements
54.	NA	PN-EN 60079-1:2014-12 - English version Atmospheres-explosive Part 1: Protection of equipment using flameproof guards “d”

55.	NA	PN-EN 60079-10-1:2021-09 - English version Atmospheres-explosive Part 10-1: Classification - Spaces — Gas explosive atmospheres
56.	NA	PN-EN 60079-11:2012 – English version Atmospheres-explosive Part 11: Protection of equipment using intrinsic safety “i”
57.	NA	PN-EN 60079-14:2014-06 - English version Atmospheres-explosive Part 14: Designing, selection and assembly of electrical installations
58.	NA	PN-EN 60079-17:2014-05 - English version Atmospheres-explosive Part 17: Control and maintenance of electrical installations
59.	NA	PN-EN 60079-18:2015-06 - English version Atmospheres-explosive Part 18: Protection of equipment with air-tight sealing
60.	NA	PN-EN 60079-2:2015-02 - English version Explosive atmospheres Part 2: Protection of equipment with gas shields with hypertension “p”
61.	NA	PN-EN 60079-25:2011 Explosive atmospheres - Part 25: Intrinsically safe systems
62.	NA	PN-EN 60079-26:2015-04 - English version Explosive atmospheres. Part 26: Equipment with equipment protection level (EPL) Ga (orig.)
63.	NA	PN-EN 60079-5:2015-08 - English version Atmospheres-explosive Part 5: Protection of equipment with sand shield “q”
64.	NA	PN-EN 60079-7:2016-02 - English version Atmospheres-explosive Part 7: Protection of equipment with reinforced construction “e”
65.	NA	PN-EN 60529:2003 Protection level provided by casing (IP code)
66.	NA	PN-EN 60584-1:2014-04 - English version Thermocouples

		Part 1: Specification and tolerances EMF
67.	NA	PN-EN 60751:2009 Platinum sensors of industrial resistance thermometers and platinum temperature sensors
68.	NA	PN-EN 60534-4:2006 - English version Industrial valves - adjustment Part 4: Control and acceptance tests
69.	NA	PN-EN 60947-5-6:2002 Low voltage distribution and control instruments. Part 5-6: Control instruments and connectors Interfaces d.c. of proximity sensors and connection amplifiers (NAMUR)
70.	NA	PN-EN 61000-4-2:2011 Electromagnetic compatibility (EMC) Part 4-2: Methods of tests and measurements - Testing of resistance to electrostatic discharges
71.	NA	PN-EN 61000-4-3:2007/IS1:2009 Electromagnetic compatibility (EMC) Part 4-3: Methods of tests and measurements Testing of resistance to radiated electromagnetic field with radio frequency * Interpretation of Chapter 5 (orig.)
72.	NA	PN-EN 61000-6-2:2019 Electromagnetic compatibility (EMC) Part 6-2: General standards Resistance in industrial environments
73.	NA	PN-EN 61131-3:2013-10 - English version Programmable controllers Part 3 Programming languages
74.	NA	PN-EN 61285:2015-06 – English version Control of industrial processes - Safety of analyzer rooms
75.	NA	PN-EN 61340-5-1:2009 Static electricity PART 5-1: Protection of electronic instruments against static electricity - General requirements
76.	NA	Series of standards PN-EN 61508 Parts 1 - 7:2010 Functional security of electrical/electronic/programmable electronic systems related to security Part 1-7.

77.	NA	PN-EN 61511 1-3:2009 Functional security Safety instrumented systems for process industry sector. Part 1-3
78.	NA	PN-EN 62381:2012 - English version Automation systems in process industry - Factory acceptance test (FAT), Site acceptance test (SAT) and Site intergeneration test (SIT)
79.	NA	PN-EN 676+A2:2008 - English version Automatic burners with enforced airflow for gas fuels
80.	NA	PN-EN 746-1+A1:2012 Industrial equipment for thermal processes Part 1: General safety requirements concerning industrial equipment for thermal processes
81.	NA	PN-EN 746-2:2010 - English version Industrial equipment for thermal processes - Requirement concerning safety of combustion systems and fuel systems
82.	NA	PN-EN 746-3+A1:2012 Industrial equipment for thermal processes Part 3: Requirements concerning safety of production and use of gas atmospheres
83.	NA	PN-EN ISO 5167-1:2005 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full Part 1. General principles and requirements
84.	NA	PN-EN 60332-1-2:2010 Testing of flammability of electric cables and wires and of optical fibers PART 1-2: **Checking of resistance of a single insulated conductor or cable to vertical spreading of fire - Testing method with mixed flame 1 kW**,
85.	NA	PN-HD 60364-6:2016-07 Low voltage electrical installation -- Part 6: Checking
86.	NA	PN-HD 60364-1:2010 low voltage electric installations. Part 1: Basic requirements, determining of general characteristics, definitions.

87.	NA	PN-IEC 60534 CzQSci 1-4 Industrial adjustment valves
88.	NA	PN-EN ISO 1461:2011P Zinc coating applied on steel and cast iron products with the hot dip method - Requirements and methodology
89.	NA	PN-ISO 5725-1:2002 Precision (correctness and preciseness) of measurement methods and measurement results
90.	NA	PN-EN 1092-1+A1:2013-07 - English version **Flanges and their connections - Round flanges of tubes, fittings, shapes, connectors and fixtures with marking PN** Part 1: Steel flanges
91.	NA	PN-EN 12266-1:2012 - English version Fittings - industrial - Testing of metal fittings Part 1: Pressure tests, testing procedures and acceptance criteria - Obligatory requirements
92.	NA	PN-EN 50575 - Electrical, control and telecommunication - Cables and wires for general applications in construction objects with determined fire resistance class
93.	NA	PN-ISO 724:1995 Metric threads ISO of general purpose. Nominal dimensions
94.	NA	PN-EN ISO 15848-1:2015-10/A1:2017- 06 Industrial fittings - procedures of tests and qualification concerning leakages of harmful substances Part 1: Qualification system and qualification procedures for testing the type of fitting
95.	NA	PN-HD 60364-4-41:2017-09 Low voltage electrical installations -- Part 4-41: Protection for providing safety - Protection against electric shock
96.	NA	PN-HD 60364-5-52:2011 low voltage electrical installations -- Part 5-52: Selection and assembly of electrical equipment - wiring
97.	NA	PN-IEC 60364-5-534:2016-04 Low voltage electrical installations -- Part 5-534: Selection and assembly of electrical equipment -- Insulating disconnection, connecting and control -- Equipment for protection against temporary

		voltage surges.
98.	NA	PN-EN 60445:2018-01 Basic and safety principles at man co-working with a machine, marking and identification -- Identification of terminals of equipment and wire endings and the wires themselves.
99.	NA	PN-HD 308 S2:2007 Wire identification in cables and leads and string cables
100.	NA	PN-EN 60529:2003 Levels of protection provided by casings (IP Code).
101.	NA	N SEP-E-001 Standard SEP. Low voltage of electric power network. Firefighting protection.
102.	NA	N SEP-E-004 Standard SEP. Electrical and signaling cable lines. Design and construction
103.	NA	PN-EN IEC 62275:2020-03 Cable arrangement systems -- Cable bands for electrical installations.
104.	NA	PN-EN 61914:2016-06 Cable holders for low voltage installations.
105.	NA	PN-EN 61537:2007 Installation trough and ladder system for routing the cables
106.	NA	PN-EN 61386-1:2011 System of installation tubes for routing cables. Part 1: General requirements
107.	NA	PN-EN 50085-1:2010/A1:2013-10 Systems of open and closed installation strips for electrical installations -- Part 1: General requirements
108.	NA	PN-E-04700:1998/ Az1:2000 Equipment and electrical systems i power generation objects. Guidelines for performance of post-assembly acceptance tests
109.	NA	PN-EN IEC 61439-1:2021-10 Low voltage distribution boards and switchgears -- PART 1: General stipulations
110.	NA	PN-EN IEC 61293:2020-09 Marking of electrical equipment with nominal data concerning electric power supply. Safety

		requirements.
111.	NA	PN-E-05204:1997 Protection against static electricity Protection of objects, installations and equipment. Requirements.
112.	NA	PN-HD 60364-5-54:2011 Low voltage electrical installation. Part 5-54; Selection and assembly of electric equipment. Earthing, protection wires and cables of connection protection.
113.	NA	PN-EN IEC 60099-5:2018-08. Limiters of voltage surge -- Part 5: Selection and application recommendations.
114.	NA	WUDT-UC WO-A/01 Pressure equipment. Fittings Equipment protecting against excessive pressure growth
115.	NA	WUDT-UC WO-A/02 Pressure equipment general requirements. Accessories Protective automatics
116.	NA	WUDT-UC WO-A/03 Pressure equipment general requirements. Accessories Control and Measurement Instruments
117.	NA	WUDT-UC WO-A/04 Pressure equipment general requirements. Accessories Fixtures
118.	NA	VDI/VDE 3699 Control Using Display Screens.
119.	NA	*CHEMICAL ENGINEERING TRANSACTIONS* VO -. *31, 2013* - A publication of AIDIC The Italian Association of Chemical Engineering "Efficient Plant Operation in Process Industries Using a User-Centric Design" Lutz Glathe*, Sven Kempf
120.	NA	*AUTOMATION - ELECTRICS - DISTURBANCES NO. 9/2012 ALARM MANAGEMENT SYSTEM - CHANCE FOR A MAN AMONG AUTOMATS*
121.	NA	Modern plant control centers and operator control concepts February 10, 2012 SIEMENS HMI+ supports operative process control of industrial production processes by means of user centric process visualization.

122.	NA	ANSI/ISA-101.01, Human Machine Interface for Process Automation Systems
123.	NA	Construction Product Regulation - EUROPEAN REGULATION ON CONSTRUCTION PRODUCTS 305/2011

7. LIST OF AMENDMENTS

No.	Date of amendment	Amendment initiator	Concern of amendment	Point
1.	25.10.2019	Technical Specialist	■ Review and updating of the system documentation on the basis of new editions of standards ISO 9001 and ISO 14001. ■ Adapted to the new numbering in force: instruction number, form number.	Complete document
2.			■ Objective of the instruction was extended	**1.**
3.			■ The instruction was extended for the PCC Rokita SA. Group companies.	**2.**
4.			■ Acronym and definitions of VPN, USB, DMZ, firewall, shut off valve were implemented. ■ Acronym ZSZJiS was changed to ZSZ (adapting of nomenclature to the contemporary Integrated Management System ZSZ). ■ AMS acronym was implemented (Eng. Alarm Management System. ■ A definition of sensor and executing equipment/ elements (actuators) were introduced.	**3.1.1** **3.1.2**
5.			■ Check valves were excluded from the scope of the document. ■ Exclusion stipulation was elaborated (referring to manual valves with limit switches).	**3.2.2**
6.			■ Point 9 was introduced with the content: “For the Control and Measurement Instruments and Automation equipment	**3.3.1.1**

			you should use the equipment selected in the way so as they would be able to operate with min. Supply pressure 4.5 bar in the plant measurement air mains". ■ Point 10 was introduced with the content: "Measurement air supplying the Control and Measurement Instruments and Automation equipment should be monitored for the particular installation considering signaling of low pressure (pressure below and equal 5 bar) and alarming with blocking due to too low pressure (pressure below and equal 4.5 bar - no measurement air)". ■ The provision for the use of filter reducers was changed to "Air manifolds and valve terminals must be equipped with a main filter reducer with a manometer. Individual filter regulators with a manometer should be used only when the group application is not possible." ■ Point 15 was changed to "...The following explosion-proof versions of automatic devices and control systems are preferred: - Eex (i) for measuring devices and actuators of the Emergency Shutdown System (ESD) integrated protection system with the DCS through the dedicated ET200M Fail-safe or ET200iSP stations (in case of the necessity of mounting a distributed station in a hazardous area) containing fail-safe modules. - Eex (d) for the DCS-independent Emergency Shutdown System (ESD) actuators". ■ Provisions were made for monitoring, logging and signaling of appropriate levels in non-pressure and pressure tanks in reference to the mechanical industry guidelines.	
7.			■ Subpoint 6 was introduced " The UPS systems should be avoided". ■ Points 5 and 7 were modified in reference to the change - in section 1. ■ Point 7 was amended with a provision	**3.3.1.2**

			the buffer power supply unit and LED bridge there should be a converter 24V DC to 24V DC". ■ As Subpoint a) a requirement was introduced "UPS power supply units should have a minimum overload for power factor (power factor, PF = 0.8 <125% (for 10 minutes), <150% (for 1 minute)". ■ The drawing was corrected considering the converter 24V DC to 24V DC.	
8.			■ The stipulation concerning the necessity of surge protection was corrected. ■ A new point was introduced. All measuring devices installed on site shall be equipped with stainless steel nameplates with engraved information concerning the device. and, in particular, the type, serial number and EX characteristics (for equipment mounted in explosion risk zones).	**3.3.1.3**
9.			■ Point 26 was introduced with the content: “All cables and all components of control cabinets, such as connection pieces, terminal blocks, control instruments, equipment locations, push buttons, signaling devices, relays, contactors, cable bundles or name plates should characterized using descriptors”. ■ The point concerning the routing of instrumentation cables using the main routes of cable trays in the electrical part was removed. ■ A reference was added to the new standard PN-EN 50575 - Electrical, control and telecommunications cables and wires - Cables and wires for general applications in construction objects with a specified class of fire resistance. ■ The provision "In spaces where there is an aggressive environment, it is necessary to provide for the use of routes (elements of cable troughs or ladders) made of acid-resistant steel or plastic, suitable to the conditions" was corrected. ■ In point 10 the telecommunication cable diameter was corrected to 0.75mm2. ■ In point 18 communication cables were added. ■ In point 19 the type of communication	**3.3.1.6**

			Cables was specified.	
10.			■ Point 7 was completed with the content: (For SIMATIC HMI TP1500 COMFORT order code for foil set: 6AV2124-6QJ00-0AX1). ■ A suggestion was added for the type of a panel to be mounted outside buildings and in unheated buildings and zones with risk of explosion. ■ Change of example type of opened sight window for cabinets with operation panels due to termination of production of the previous one. ■ A substitute of the current operation panel was introduced. ■ The code of the opened sight window for operation panel was corrected. ■ The possibility of using 7" panels was introduced, as well as the use of the RFID card readers for logging into operator panels.	**3.3.1.8**
11.			■ Point 1 was amended with the content: If it is necessary to connect an existing controller to the Profinet network, a CPU module should be used - ― CPU315-2 PN/DP, 384 KB (6ES7315-2EH14- 0AB0)". ■ Point 1 was amended with the content: "In case of large distances between the nodes of the Profibus DP network you should use as the transmission medium the multi-mode optical fiber with relevant network elements PROFIBUS OLM/G12 V4.0 OPTICAL LINK MODULE (6GK1503-3CB00) and in case of very large distances using the single mode optical fiber with network elements PROFIBUS OLM/G11 V4.0 OPTICAL LINK MODULE (6GK1503- 2CC00)". ■ A standard PLC controller series S7-1500 was introduced with relevant dedicated modules of this series ■ The product code was corrected for the CPU of the S7 1500 controller . ■ The proposition of the CPU of the S7 1500 controllers was changed. ■ The S7300 controller was returned to the standard. ■ The provision was elaborated concerning	**3.3.1.9**

			the DI module	
12.			■ The order code of the basic CPU module of the LOGO!8 controller was updated to version 8.2.	**3.3.1.10**
13.			■ The name of the section was changed to Control and Visualization Systems and guidelines for control and visualization systems were introduced. ■ The subsection 3.3.1.11.1 DCS Control systems was introduced. ■ The subsection was added "Access to the DCS system should be executed through the DMZ (demilitarized zone) for system components used for data collection with double control by means of hardware firewalls using a separate login account through a VPN channel inside the PCC IT network, in accordance with the recommendations for building the DCS industrial network described in the document "Recommendation on the structure of the DCS industrial network v100" (file Recommendation for industrial network for DCS. PPDF is located in the database of the confidential documents of the PCC Rokita)."	**3.3.1.11**
14.			■ Point 22 was introduced with the content: "Visualization systems are to be executed in compliance with Directive VDI/VDE 3699 (set of recommendations for visualization systems in control rooms of chemical and petrochemical plants." ■ Point 32 was amended with the content: “In case of large distances between the nodes of the Profibus DP network you should use as the transmission medium the multi-mode optical fiber with relevant network elements PROFIBUS OLM/G12 V4.0 OPTICAL LINK MODULE (6GK1503-3CB00) and in case of very large distances using the single mode optical fiber with network elements PROFIBUS OLM/G11 V4.0 OPTICAL LINK MODULE (6GK1503- 2CC00)". ■ Point 32 was completed with communication modules and input/output modules. ■ Point 32 was completed with the provision “you should attach to the DCS modules the licenses enabling data collection on the server via the OPC”	**3.3.1.11.1**

			■ The provision was added “If you need to create recipes in the DCS system for the PCS7, you should use license WinCC/User Archives 6AV6371-1CB07-0AX0". ■ Point 33 was amended: For the DeltaV system: - The type of the control processors was corrected due to termination of production of the predecessors, - types of cables, transition modules mounted on cross terminal blocks, strip connectors were introduced. ■ It was introduced: - point with the content: Directive 2014/32/EC on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments. - point with the content: VDI/VDE 3699 Process Control Using Display Screens. ■ In Section 5, subsection f) was changed to "Logging of all events, values and states" from "Logging of events, values and states". ■ Change of the provision in point 10 was introduced: “The Microsoft Windows operating system required for a given DCS must be supplied only in a version that allows the license to be transferred to another computer - in a boxed version (BOX license)." ■ Provision was changed in Point 32 concerning AS unit the family AS410 was introduced. ■ The VE4015 high-speed counter card (module) was introduced, and a spelling error in the SE4022 Profibus DP I/O card was corrected and the SE4301T01 Discrete Input Charm Namur card was introduced. ■ In point 24 the provision was introduced: “The screen should be adapted to the recommendation of Directive VDI/VDE 3699 Control Using Display Screens”. ■ In point 24 the information on terminal with loudspeakers was introduced. ■ The tab and references to the APL acronym were corrected. ■ In point 10 the provision was introduced: “The Microsoft Windows operating system required for the particular DCS system	

			must be supplied only in a version that allows the license to be transferred to another computer - in a boxed version (BOX license)." ■ The company ABB was introduced as the supplier of the DCS and ESD systems with the specification of the standard elements of these systems. ■ The list of components of the DCS system made by the ABB company was supplemented with a module for high-speed counters once for modules designed for operation in the zones with risk of explosion. ■ The drawing of the key-switch of the [illegible]	
15.			■ The change was introduced in Point 3 “For the PCS7: input/output modules were added. ■ The provision in Point 3 was changed to “In case of the DeltaV the Simplex Logic Solver VS3202 modules (redundant version) should be used.”. As the Simplex Logic Solver VS3201 is no longer available the SIS is sold only in the redundant version VS3202. ■ The provision in Subpoint 5 was changed “It is recommended that the equipment connected to the ESD/SIS not being integrated with the DCS system by application of the failsafe modules and being in the zones with the risk of explosion was in EeX (d) make. In case when it is difficult to fulfill this condition you should use the devices in Eex(i) and delimiters provided with the diagnostics of line continuity in case when these modules do not feature this diagnostics”. ■ The company ABB was introduced as the supplier of the DCS and ESD systems with the specification of the standard elements of these systems.	**3.3.1.12**
16.			■ Section 3.3.1.13 was introduced Guidelines for HMI designing and execution ■ Stipulations concerning the AMS system and alarm data sheet were introduced. ■ Screen example and hybrid indicator drawings were introduced, compliant with the VDI/VDE 3699.	**3.3.1.13**
17.			■ Point 4 was introduced “All measurement devices should be marked in compliance with the instruction in force PUR.PR.02.I01 Marking	**3.3.1.14**

18.			■ Remarks were added in Point 8 “Remark! This is only an example of the use of a transducer with a membrane separator for adhesive, abrasive and high-temperature media where it is inadvisable, for process reasons, to connect the transducer with a pulse pipe via manometer valves M20x1.5. The definite way of connection should be agreed with the Investor”.	**3.3.2.1.1**
19.			■ Remarks were added in Point 6 “Remark! This is only an example of the use of a transducer with a membrane separator for adhesive, abrasive and high-temperature media where it is inadvisable, for process reasons, to connect the transducer with a pulse pipe via manometer valves M20x1.5. The definite way of connection should be agreed with the Investor”.	**3.3.2.1.2**
20.			■ It was introduced as Point 4 "The transducer connected to the DCS / PLC system only, should be supplied with power from its input modules".	**3.3.2.2.1**
21.			■ Point 7 was introduced with the content: “The resistance sensors (RTD) are preferred for co-working with transducers”	**3.3.2.3.1**
22.			■ Point 1 was introduced with the content: “The resistance sensors (RTD) are preferred. - the requirements for temperature sensors were specified” ■ Point 1 was modified to “The resistance sensors (RTD) are preferred in the layout of 3 -cable connections (measurement circuit) and with the sensor (resistor) class A”. ■ Repeated drawing was deleted.	**3.3.2.3.2**
23.			■ Provisions were modified concerning power supply “Supply voltage: 24V DC” in Subpoints of 4 points - 3.3.2.4.2 Electromagnetic flow meters (FT), - 3.3.2.4.4 Coriolis mass flow meters (FT), - 3.3.2.4.5 Mass flow meters	**3.3.2.4**

			thermal (FT) - 3.3.2.4.6 Ultrasound mass flow meters (FT).	
24.			■ Restrictions were implemented concerning applications of types of detectors of explosive, flammable and toxic substances.	**3.3.2.5**
25.			■ Point 11 was introduced with the content: “On short sections near the valve, if the process and atmospheric conditions allow for it, pneumatic hoses resistant to welding sparks and in the PVC coating are preferred”. ■ Tightness requirements for shut-off / on-off valves were clarified. ■ Point 3 concerning tightness of the valve body (gland) was introduced. ■ A subsection was introduced stating that piezoelectric valves must be used when controlling from the I/O terminals of the ET200iSP type. ■ Description of the diameter of the pipe supplying the valve was corrected.	**3.3.2.7**
26.			■ The provision was added concerning the solutions referring to reduction of the velocity of valve resetting. ■ A subsection was introduced stating that piezoelectric valves must be used when controlling from the I/O terminals of the ET200iSP type.	**3.3.2.8**
27.			■ Point 10 was introduced with the content: On short sections, near the valve, if the process and atmospheric conditions allow for it pneumatic hoses are preferred, resistant to welding sparks and in the PVC coating. ■ The standard concerning adjustment valve tightness was corrected. ■ For flaps a changed name throttler was introduced. ■ In Point 3 the stipulation was added “with the signal of the loopback 4-20 mA, power supply from the current loop”. ■ Information concerning the tightness requirements for adjustment valves was detailed.	**3.3.2.9**
28.			■ Lists of the Control and Measurement Instruments and Automation equipment covered with the standardization at the PCC Rokita SA were completed:	**3.3.3**

			were introduced in the device group - Electrical elements: - delimiter Ex/Barrier Ex, - Power supply unit EX - Power supply unit/Buffer power supply unit b) In the group of the actuators for the device Shut off/on-of valve (XV) - in the Selected Manufacturers column to the standard list of manufacturers, the company Kingdom was introduced instead of Tyco. - in the column Selected manufacturers to the standard list of manufacturers it was specified that the manufacturer Ebro is only for throttlers. c) In the actuator group for the device kind - position setter: - in the column Selected manufacturers to the standard list of manufacturers instead of FOXBOO ECKARD company Samson company was introduced ■ The ABB company was added to the list of the Control and Measurement Instruments and Automation devices covered by standardization At the PCC Rokita SA for the following devices: temperature sensor, temperature transducer, pH meter with Zircon probe ■ In the list of the Control and Measurement Instruments and Automation devices covered by standardization at the PCC Rokita SA for the following devices: delimiter Ex/Barrier proposition of entering the PEPERL FUCHS company. ■ The GEORGIN company was introduced as a standard supplier of pressure and temperature suppliers. ■ For the Position Pneumatic Elements the Position Legris Company was corrected to Parker Legris Company. ■ Introduction of a new division with the reference to the document concerning cyber control systems.	
29.			■ The company ABB was introduced as the supplier of the DCS and ESD systems with the specification of the standard elements of these systems. ■ The PDT (pressure difference) device type was introduced for measurements of the level levels.	**3.3.4**
30.			■ Updating of the list of legal acts and regulations. ■ Updating of the list of standards and technical specifications.	**6**

			■ List of documents was completed: New standards were introduced PN-EN 60534-4:2006, PN-EN 12266-1:2012. ■ The list of documents was completed with a new standard PN-EN 50575 - Cables and electric power, control and telecommunication lines - cables and wires for general applications in construction building in the definite fire resistance class. ■ The provisions of the Coding Practices chapter in SUT Annex C - procurement language for ensuring the cyber security of control systems was expanded. ■ The list of documents was updated in connection with the introduction of the Technical Standards Manual for the electrical and mechanical branches into the IMS. ■ The list of documents was supplemented with references to documents on AMS and HMI in accordance with VDI/VDE 3699. ■ The list of documents was supplemented standard PN-EN ISO 15848-1:2015-10/A1:2017-06 ■ The list of documents was supplemented with CRP Ordinance	
31.	2022-10-28	Patryk Latacz	■ The instruction was extended with the company PCC BD Sp. z o.o.	**2**
32.		Sebastian Zakrzewski	■ Acronyms DDE, GPS, ODBC, OPC, UPS were introduced. ■ The acronym MR was deleted ■ Lists of related documents were updated (procedures, instructions)	**3.1.1**
33.		Sebastian Zakrzewski	■ Spelling was corrected in the ATEX definition ■ The definition was corrected ODBC,	**3.1.2**
34.		Sebastian Zakrzewski	■ Accumulator batteries were added to exclusions	**3.2.2**
		Artur Kopacz	■ Point 9 was introduced concerning the requirements for the pneumatic installation ■ In Point 16 New families of the I/O terminals servicing the fail-safe modules were added.	**3.3.1.1**
		Sebastian Zakrzewski	■ The drawing with considering the converter 24V DC/24V DC was corrected. ■ 2. Point 13 was added concerning individual protection of the Control and Measurement Instruments and	**3.3.1.2**
		Adam Bodurka	■ In point 1 the provisions concerning the requirements of the protection level were changed	**3.3.1.7**

			Cabinet IP. ■ Point 3 was introduced concerning providing of the cabinets with a lock featuring the cylinder with a patent key or a padlock with a master key. ■ Point 7 was introduced concerning application of air blowing into the Control and Measurement Instruments and Automation cabinets.	
		Sebastian Zakrzewski	■ Point 6 was introduced concerning application of the PLC programming languages specified in the standard. ■ 2. In Section 2 a reserve memory was considered in the provision “Systems with PLC controllers should have a reserve in both the number of free channels of I/O modules, CPU processing power, memory and licenses of at least 25%. for each of the listed parameters".	**3.3.1.9**
		Sebastian Zakrzewski	■ Order code of the basic CPU module of the LOGO!8 relay was updated to version 8.3 and the power supply unit order code was completed. ■ Point 6 was introduced concerning application of the PLC programming languages specified in the standard.	**3.3.1.10**
		Sebastian Zakrzewski	■ Item 4 introduced a proposition for an alternative way of connecting the Router/Modem power supply at the discretion of the Technical Director. ■ Point 5 was introduced regarding the use of an "Anti-hacker" security switch, which allows, independently of the DCS, to quickly disconnect the connection of the DCS network with the PCC Rokita network and external networks in the event of a cyber-attack. ■ Point 9 was introduced regarding the necessity of using virtualization for the DCS systems.	**3.3.1.11**
		Adam Bodurka/ Sebastian Zakrzewski	■ The order code for the IM 153-2 replacement module was updated. ■ Section 6 to the required memory reserve for DCS systems was considered.. ■ In Point 7 libraries for the DCS ABB 800xA were considered. ■ In Point 7 programming guidelines were introduced. ■ In Point 9, a newer version of Windows 10 operating system is proposed with PCS7 ver. 9.0. ■ In Subpoints 22 and 24 the requirement of conformity was introduced with **ANSI/ISA-101.01, Human Machine Interface**	**3.3.1.11.1**

			Process Automation Systems and guidelines (by a report) ISA101 **HMI Usability and Performance.** ■ In Point 32 a new substitute of the MODULE IM 153-2 was proposed (6ES7153-2BA10-0XB0 and to be considered entering version 9.0 of PCS7 as preferred. ■ In Point 32 for new systems DCS PCS a possibility of communication via the Profinet was introduced and new types of the I/O terminals were introduced for use. ■ In Point 33 additional information in connection with the planned abandoning of the DCS DeltaV systems, the need to agree on the use of the system was introduced. ■ In Point 34 the interface Profinet for ABB 800xA was added.	
		Sebastian Zakrzewski	■ New families of the I/O terminals supporting fail-safe modules were introduced ■ In connection with the planned abandoning DCS DeltaV systems, the need to agree on the use of the system was introduced. ■ For new installations it is recommended for systems **ESD**/**SIS** not to be integrated	**3.3.1.12**
		Adam Bodurka	■ The requirement of compliance was introduced with **ANSI/ISA-101.01, Human Machine Interface for Process Automation Systems** and the guidelines (report) ISA101 **HMI Usability and Performance.**	**3.3.1.13**
		Adam Bodurka	■ In Point 1, provisions were made for confirmation of reserve checks: computing power, memory, licenses and I/O channels. ■ In point 5 provisions were introduced for verifying that there are adequate reserves of: spare computing power, memory, backup I/O channels and system licenses.	**3.3.1.14**
		Sebastian Zakrzewski	■ Valve terminals were standardized	**3.3.2.10**
		Adam Bodurka/ Sebastian Zakrzewski	■ Lists of the Control and Measurement Instruments and Automation equipment covered by standardization were amended with valve terminals. ■ List provisions were amended and comments added in connection with the planned abandoning in the PCC the use	**3.3.4**
		Adam Bodurka/ Sebastian Zakrzewski/ Wojciech Mazgaj	■ Spelling mistakes in standard names were corrected. ■ The list of standards was amended with new ones, including **ANSI/ISA-101.01, Human Machine Interface for Process Automation Systems** and	**6.**

			the existing ones were updated.	
		Adam Bodurka/ Sebastian Zakrzewski	■ The lists of the related documents were updated (procedures, instructions) ■ In Point 6.1.1 housings locked with a patent key or a padlock with a master key were specified. ■ In Point 6.1.2 protection was changed to protection against the intrusion of pedestrians, vehicles and dangerous objects. ■ The acronym MR was deleted.	**SUT C-2**
	2023-01-20	Sebastian Zakrzewski	■ The PROFINET was introduced as a standard serial communication interface, and a provision was made that two control systems, for which different DMZ zones are designated cannot be connected via serial communication.	**3.3.1.4**
	2023-01-20	Sebastian Zakrzewski	■ In Point 32 the use was removed of the ET200MP for DCS with Profinet connections and the I/O modules for ET200SP HA stations were detailed.	**3.3.1.11.1**
	2023-02-02	Sebastian Zakrzewski	▪ W punkcie 32 doprecyzowano warunki i wytyczne dot. Komunikacji dla DCS PCS7	Błąd! Nie można odnaleźć źródła odwołania.
	2023-06-01	Sebastian Zakrzewski	▪ Wpisanie CPU sterowników S71500 na mocniejsze tj na CPU 1516-3 PN/DP (6ES7516-3AN02-0AB0) dla sterownika standardowego oraz CPU 1516F-3 PN/DP (6ES7516-3FN02-0AB0) dla sterownika Fail-Safe	Błąd! Nie można odnaleźć źródła odwołania.
	2023-06-01	Rafał Walulik	▪ Usunięto dane klucza	Błąd! Nie można odnaleźć źródła odwołania.
	2023-06-02	Paweł Trela	▪ Usunięto z instrukcji spółkę PCC PU	Błąd! Nie można odnaleźć źródła odwołania.
	2023-11-07	Sebastian Zakrzewski	▪ Dodano punkt 35 dot.stosowaniu wirtualizację systemów **Błąd! Nie można odnaleźć źródła odwołania.** zgodnie z wytycznymi w rozdziale **Błąd!**	Błąd! Nie można odnaleźć źródła odwołania.

Additional data - information necessary for the PCT process:

Opinion on Instruction by (consultations):

No.	Company name	Position name
1.	PCC Rokita	Technical Director (GT)
2.	PCC Rokita	Planning Department Manager (GTP)
3.	PCC Rokita	Technical Specialist/Senior Technical Specialist/ Junior Technical Specialist/Technical Specialist Automation Team Leader (GTP)
4.	PCC Rokita	Maintenance Department Manager (GTU)
5.	PCC Rokita	Project Manager (GI)
6.	PCC Rokita	Chief Engineer
7.	LabMatic Sp. Z o.o.	Control System Specialist
8.	LabMatic Sp. Z o.o.	Department Manager (WPE)
9.	*PCC Rokita*	Designer of Instrumentation, Control and Automation (GIP)

Instruction Users (proles and distribution)

No.	Company name	Position name and/or first and last name
1.	*PCC Rokita*	Technical Director (GT)
2.	*PCC Rokita*	Planning Department Manager (GTP)
3.	*PCC Rokita*	Specialist (Technical)/Senior Technical Specialist/Junior Technical Specialist (GTP)
4.	*PCC Rokita*	Technical Specialist Team Leader (GTP)
5.	*PCC Rokita*	Maintenance Manager
6.	*PCC Rokita*	Project Manager (GI)
7.	*PCC Rokita*	Chief Engineer