Collini

TECHNICAL DELIVERY SPECIFICATIONS PLANTS AND INFRASTRUCTURE

Change index:

Issue	Description of the change	Date
05/2014	Created	04.06.2014
05/2020	Complete revision	15.05.2020
08/2022	Supplemented	22.08.2022
02/2025	Minor updates, translated to English	18.02.2025
10/2025	Minor updates	10.10.2025

1. Table of contents

2. Principle

The purpose of the technical delivery specification is standardization and is applied at all Collini locations without exception. The aim is to achieve an identical design of machines and systems in a simple and uniform way. The technical delivery specification forms the basis for every project. Any deviation from the Technical Delivery Specification must be discussed and described in writing, justified and approved by the client (Collini).

The delivery instructions contain general regulations for the procurement, delivery and execution of systems and production equipment. The delivery instructions are intended to simplify negotiations with suppliers.

The delivery specifications do not include every detail but define the aspects that experience has shown to be particularly important.
To ensure that technical progress is not restricted, these specifications are periodically revised. Technically and economically superior solutions that deviate from the technical delivery specifications may also be proposed as alternatives.

In the interests of Collini and the Contractor, clarity should be created regarding the technical designs so that

- the necessary safety precautions for people and equipment are in place
- the designs meet the expectations
- failures are rectified as quickly as possible
- an optimum service life of the systems is achieved

Terms:

- Collini, customer, system operator, client is used synonymously
- Contractor, supplier is used synonymously
- Plant, machine, production facility, infrastructure facility, components, technical facility, sub system, unit ... is used synonymously

3. General

3.1. Regulations/standards

Even if this technical delivery specification does not refer to this in detail, the Contractor shall bear full responsibility for ensuring that, in addition to the requirements specified in this technical delivery specification, all requirements applicable to his performance which result from regulations (e.g. EC directives, ordinances and other applicable laws) as well as from standards and generally recognized rules of technology are complied with.

Insofar as these technical delivery specifications refer to regulations, standards, or technical rules, the Contractor shall independently verify whether they are current and applicable to the performance of its scope.
The Contractor shall also ensure compliance with any additional regulations, standards, or technical rules that may be relevant.

In case of doubt, the Contractor shall contact the Client immediately. In addition, the Contractor shall inform the Client immediately if the Contractor recognizes or can recognize on the basis of its expertise that the service to be provided by the Contractor is not suitable or only suitable to a limited extent for the intended purpose.

As the following standard is not generally known - but is often used in the Collini Group - it is mentioned explicitly:

EN17059:2018; Electroplating and anodizing equipment - Safety requirements:

3.2. Safety

It must be ensured that both personal and operational safety are guaranteed despite faults or errors in the system supply (electricity, water, air, etc.). More detailed information can be found in the chapter 6Safety, environment, fire protection .

3.3. CE mark, declaration of conformity, risk assessment

The manufacturer/supplier is obliged to affix the CE mark to each machine and to issue a declaration of conformity in the national language in accordance with the current directives or, in the case of a machine that is not ready for use, to supply the manufacturer's declaration / declaration of incorporation in accordance with the current directives

The EC conformity assessment must be carried out in accordance with all applicable directives, in particular the Machinery Directive (EU), Low Voltage Directive, Electromagnetic Compatibility (EMC) and Machinery Safety Regulation (MSV) as amended. As part of the EC conformity assessment procedure, the manufacturer must specify which standards and regulations have been taken into account in the planning, design and construction of the machine or system. These must also be listed in the EC Declaration of Conformity.

The EC Declaration of Conformity must be signed by the company and enclosed with the documentation. The CE marking must be clearly visible on the machine, system or production equipment. The manufacturer guarantees that the machine, system or production equipment complies with the state of the art or the relevant requirements for the quality of work equipment in accordance with the applicable provisions, regulations and guidelines of the authorities and trade associations.

The risk must first be minimized by means of an inherently safe design. Technical and supplementary protective measures can then be applied. If there are unavoidable residual risks on the machine,

these must be clearly indicated with appropriate graphic symbols (safety colors and safety signs - registered safety signs).

The risk assessment or risk evaluation must be handed over to the client in full and is therefore part of the scope of delivery without exception. A digital version must be made available to the client. This must be editable in standard Office programs.

3.4. Preliminary acceptance/acceptance

All preliminary and final acceptance tests are carried out with the participation of the client's employees.

Preliminary acceptance

Unless otherwise approved, the pre-acceptance shall be carried out at the supplier's site before approval for shipment by one or more Collini employees. The pre-acceptance shall only take place after the supplier has submitted data or sample parts of the machine or system which show that the machine or system in question meets the requirements of the order.

Final acceptance

Final acceptance takes place at the recipient’s plant under real operating conditions. The required process capability of the system is checked.

3.5. Training

Training of Collini employees for the operation and maintenance of the entire system and all units must be carried out by the contractor before final acceptance. The effectiveness according to the QM requirements must be carried out. A joint annual maintenance 12 months after commissioning must be planned free of charge.

3.6. Duration and start of the warranty

The warranty period begins on the date of final acceptance, certified as free of defects. The warranty period (overall system, individual components) must be disclosed to the client in the offer. The same applies to changes and additional work of a corresponding scope that are subsequently carried out on the system in the order

3.7. Service during the warranty period

During the warranty period, the supplier is obliged to provide appropriate service personnel for on-site service work (repairs, system modifications, etc.) within 48 hours.

3.8. Standardization

As part of the standardization of the Collini Group, the document "Technical Delivery Specifications for Plants and Infrastructure - Material Standards" applies[1] , which declares which components (manufacturer and type) must be used. Components deviating from this must be approved by the

[1] The currently valid version must be requested independently from the client by the contractor.

client, otherwise they must be replaced at the contractor's expense. If a component from the specification is unsuitable for the respective requirements, the contractor is obliged to inform the client of this.

4. General documentation

4.1. Execution

All documents must be prepared in the national language of the place of use. The technical documentation must be supplied in a simple version in paper form and on a data carrier or download (cloud). All documents required for placing on the market (CE marking) must be available for handover ready for operation. The documentation and records specified in this document represent the minimum scope of delivery.

4.2. Filling the documents

The documents must be grouped together in sturdy folders or ring binders made of cardboard with 4 tumblers and provided with a table of contents and index (including external documentation). Documents larger than A3 format must be reinforced with holes.

4.3. Labeling

The labeling of the folder spines must be coordinated with the client or be done according to the client's specifications. The folders must be numbered consecutively, including the total number.

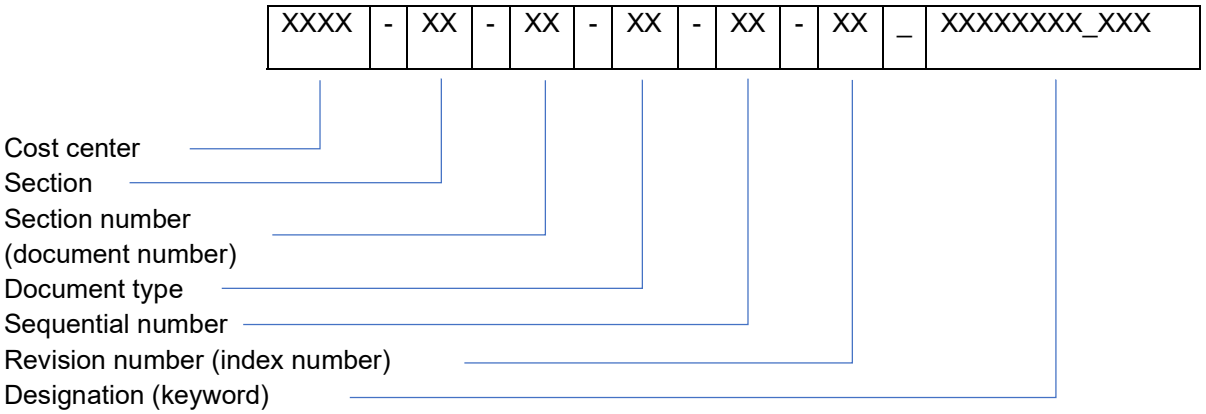
4.4. Contents

Upon delivery of the machine, system or production equipment, Collini shall receive complete documentation in digital form and once in printed form, consisting of at least the following documents:

- Drawing,
- Operating instructions,
- Maintenance instructions, maintenance schedule,
- Circuit diagrams (electrical, hydraulic and/or pneumatic),
- Parts list,
- Spare parts list,
- EC Declaration of Conformity
- Risk assessment

4.5. Document designation

Documents are designated according to a project-specific key, similar to the example below. This document is handed over by the client when the contract is awarded and is valid for the respective project.



4.6. Modifications and conversions

All changes made during the manufacture, installation, assembly, commissioning and trial operation of the machine/machine system at the customer's premises must be incorporated immediately by the contractor into the relevant technical documentation. The final technical documentation must correspond to the condition of the machine/machine system at the time of final acceptance.

Should it become apparent later, which may also be after expiry of the warranty period, that the documents prepared by the Contractor do not correspond to the delivery item, the Contractor undertakes to bear the costs for the resulting rectification or replacement delivery of the technical documents.

Unless otherwise agreed with the client, modifications, extensions or conversions to existing machines/machinery are to be carried out in the relevant technical documents with the original drawing and designation system. In addition, the risk assessments and their results/consequences must be checked and updated if necessary.

4.7. Operating instructions

The requirements of the Machinery Directive and applicable standards must be taken into account in the operating instructions. The operating instructions must also contain all the necessary information on how the machine/system can be brought into a basic position or restarted after a fault. In addition, all operating modes of the machine (automatic, manual, service, set-up, etc.) must be described in detail. Furthermore, it must be described how all the functions available at the operating stations (which can be triggered both via switching elements and via the visualization) work and which mutual interlocks, if any, must be observed. System sequences and process steps must be explained in step-by-step instructions. They must be self-explanatory.

4.8. Maintenance schedule

Operator maintenance schedule

The inspection and maintenance work to be carried out by the operator is listed in the operator maintenance plan. If necessary, the contractor's respective form must be used. All measures required/to be carried out, including those of subcontractors and suppliers, must be summarized centrally in a list. Otherwise, these are not binding on the client.

Maintenance instructions

The documentation must include specific information on the professional inspection, maintenance and servicing of the machine/machine system, diagnostic aids, error lists and detailed error descriptions in the event of faults.

Maintenance service plan

The inspection and maintenance work to be carried out by the specialist personnel is listed in the maintenance service plan. If necessary, the respective form of the client must be used. All measures required/to be carried out, including those of subcontractors and suppliers, must be summarized centrally in a list. Otherwise, these are not binding for the client.

Information on maintenance

The contractor must provide the necessary information on maintenance and operation, which must clearly include the following points:

- describe the start-up and shut-down processes,
- external lubrication points and the type of lubricant required and the inspection intervals,
- Describe maintenance procedures for special assemblies,
- list the recommended spare and wear parts.
- Safety-relevant components incl. reference mark, installation location, manufacturer, type, service life (T1), date of manufacture, serial number, ...

4.9. Machine setting data

All settings must be documented. For this purpose, setting parameters such as pressures, flow rates, parameter lists for electrical systems, etc. must be supplied as they are parameterized for final acceptance.

4.10. External documentation

The technical documents for the assemblies and components provided by a subcontractor, e.g. control components, measurement control, etc., must also be supplied and, if necessary, filed in a separate folder. These documents must contain setting instructions and functional descriptions. The provision of general catalogs is not sufficient.

4.11. Electrical, mechanical and process engineering documentation

Electrical documentation

Electrical circuit diagram, reference labeling (equipment labeling), etc. is covered in the chapter "8Elect"

Mechanical documentation

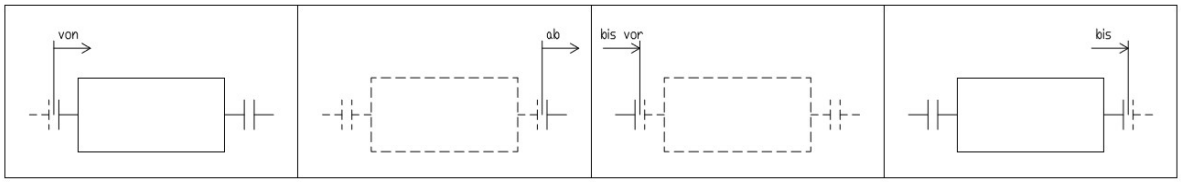
For example, assembly drawings, parts lists, pneumatic and hydraulic circuit diagrams, etc., see chapter "11. Mechanics "

Process engineering documentation

P&I/PID scheme is described in chapter " 12Process engineering "

4.12. Interface description

Interfaces (scope of delivery) must be clearly defined and declared by the contractor and client. The contractor must inform himself about the installation conditions. If, for example, the ambient temperature requires heating or cooling of any units, these must be provided. The client will check completeness after the order has been placed and reserves the right to claim for any omissions that impair operation.



Definition:

B	Beginning	"from"	including the said part
E	End	"from after"	excluding the named part
SD	Scope of delivery	"until before"	excluding the named part
		"until"	including the said part

Example: "Crate handling" section

Loading-unloading

B	in the SD (handover of the crates to the contractor)
E	up to before lid opening station

Compressed air

B	from on-site connection
E	in the SD

E-technology:

B	of consumer terminals
E	in the SD

5. Energy efficiency

The manufacturer undertakes to design the machine, system or production facility in accordance with energy efficiency criteria. The resource consumption of the machine, system or production facility should be reduced to a minimum.

- Corresponding energy-saving effects must be considered
- High energy efficiency must be guaranteed
- Assemblies must comply with the applicable energy efficiency classes
- Electric drives must comply with the highest achievable energy efficiency class as far as economically feasible. However, at least IE4.

Synchronous reluctance motors or permanent magnet motors are required for motors in continuous operation and partial load operation

Energy-efficient measures also affect mechanical systems in particular:

- Electric linear drives instead of pneumatic cylinders
- Hydraulic systems without mechanical overflow
- efficient fans, impellers, ...
- Consider fluid mechanics (bends, T-pieces, ...)
- Reduce running times (intelligent controls, ...)
- Interface for monitoring systems (load, consumption, ...)

6. Safety, environment, fire protection

6.1. General requirements

The machines, systems and production facilities must comply with the requirements and safety, environmental and fire protection regulations (laws, ordinances, standards, etc.) of the installation site as amended.

However, the minimum requirement is that the machine, system or production facility must have at least one emergency stop switch that is easily accessible from the operator side.

Suitable design and, if necessary, appropriate protective equipment (e.g. enclosure, light grid, safety pressure beam, 2-hand operation, etc.) must be used to provide effective protection against the risk of injury to the operator and maintenance personnel, so that no danger in terms of accident prevention arises for the persons concerned when the machine is used as intended.

The machines, systems and production facilities must be designed in such a way that all energy sources (e.g. pneumatic, hydraulic or electrical) are labeled and can be provided with shut-off devices.

6.2. Safety

Every system, machine or production facility supplied must comply with the statutory requirements relating to occupational safety at the installation site as amended. This includes checking for existing requirements with regard to

- Machine safety
- Low voltage
- Electromagnetic compatibility
- Electrical protection
- Laser protection
- Radiation protection
- Employee protection
- Work Equipment Ordinance
- Electromagnetic fields
- Noise protection
- Protection against vibrations, oscillations
- Etc.

6.3. Instruction/training of personnel

The use of machines and equipment must be agreed with the client in advance. Appropriate authorizations and qualifications must be presented by the users. In particular for the use of mobile elevating work platforms.

All work and orders must be carried out in accordance with the currently applicable work and safety regulations and in accordance with the internal safety instructions (up to a maximum of 45 minutes) that have been brought to our attention and signed.

6.4. Workplace design

Machines/mechanical equipment and production facilities must always be designed and constructed according to ergonomic principles. To avoid muscle and bone disorders, the strain on the operator must be kept as low as possible.

Manual workstations for assembly and testing tasks must always be designed as sitting and standing workstations. A seated workstation must at least be equipped with a height-adjustable footrest and a height-adjustable chair. Tables for standing workstations must be height-adjustable and adaptable to the height of the operator.

The operator must be able to easily reach the control panel for the machine, system or production equipment without having to make awkward movements or adopt awkward postures.

6.5. Environment

The Collini Group practices the principles of ISO 14001 and is aware of its responsibility towards the environment. Together with our partners, we want to reduce our environmental impact to an acceptable level or avoid it as far as possible.

Recyclable materials used as transport packaging are to be recycled through targeted separation. All metallic and non-metallic recyclable materials must be properly recycled.

Environmental impacts on the operator such as vibrations, noise, polluted air, heat or cold must be reduced to at least the legally prescribed limits.

The national legal requirements and all European regulations concerning environmental protection must be observed and complied with. Every machine, system or production facility supplied, as well as the materials supplied or contained therein, must comply with the legal requirements without exception.

6.6. Emissions

The manufacturer must inform the client in advance of the expected emissions (e.g. air, water, gases, aerosols, smoke, dust, etc.). It goes without saying that all legal or standardized limit values must be complied with. If necessary, suitable measures must be taken to comply with the specified limit values (e.g. filters, extraction, oil separators, etc.).

The systems, machines and production facilities must be designed to be leak-free so that no process fluids (e.g. oils, coolants, cooling lubricants, etc.) can escape and inadvertently enter the environment. Appropriate collection facilities must be provided in the event of an accident and for maintenance work.

All machines, systems and production facilities that require an extraction system for oils and coolants must have a filter device. The particle density must not exceed 0.2 mg/m3, or the maximum legal density, at the filtration outlet.

6.7. Substances/chemicals used

The manufacturer/supplier is obliged to provide a safety data sheet in digital form and in the national language for each substance supplied with or contained in the machine, plant or production equipment in accordance with the currently applicable chemicals legislation. In addition, it must be clarified in advance with the customer whether the substances supplied or to be used can be imported at Collini. The substances shall be released by means of the "Introduction of chemical substances" process at the relevant location.

The use of materials that do not comply with RoHS, REACH, Conflict Minerals regulations is prohibited.

Also not permitted are:

- Materials containing PCBs (polychlorinated biphenyls) (e.g. capacitors, hydraulic fluids, etc.)
- Switches and devices containing mercury
- Lead-based paints
- Substances or products containing chromium VI
- substances containing asbestos

6.8. Leaving the workplace

After completion of the work, the workplace must be tidied up and handed over to the client in an orderly condition. Waste materials must be sorted and cleaned and disposed of according to material groups. Clean-up work that must be carried out subsequently by the client will be invoiced.

6.9. Fire protection

All buildings and facilities must be designed and planned in accordance with the applicable TRVB guidelines. In principle, the legal principles must be applied to new buildings, but also to conversions or extensions. A fire protection concept must be drawn up in accordance with the planning documents or, if available, revised with the planned changes.

A fire alarm system with full protection must be provided and installed for all buildings and subsystems. Appropriate fire control systems must be set up for buildings and plant sections.

Fire protection equipment and precautions must always be coordinated with the fire protection organization and approved before implementation.

With regard to fire protection and explosion hazards on machines, systems and production facilities, the legal regulations at the installation site apply as a basis. The standards listed below are also binding:

- EN 13478 Safety of machinery - Fire protection,
- EN 1127-1 Explosion protection

In terms of fire protection, the electrical equipment on every machine, system and production facility must comply with the currently applicable regulations at the installation site.

If there is a risk of fire or explosion (e.g. during processes such as welding, soldering, etc.), the machines, systems and production facilities must be equipped with appropriate and suitable fire protection and extinguishing equipment (e.g. CO2 extinguishers). Halon extinguishing devices are prohibited.

To prevent damage and fire hazards to machines, systems or production facilities that are operated electrically, which can be caused by exceeding the maximum permissible load or by improper operation or control errors, appropriate precautions must be taken. (e.g. potential equalization, overvoltage protection, short-circuit protection/limitation, overload protection, isolating transformers, residual current circuit breakers, fire protection switches, ...).

If insulation materials are used, only non-combustible materials in accordance with DIN 4102 A1 may be used.

In addition, the Collini standard "Safety Management Fire Protection"[2] applies regarding fire protection. The validity must be agreed with the client.

6.10. Noise protection

The constant or cyclical noise level emitted by the machine, system or production equipment must not exceed 76 dB (A) under normal operating conditions during production. If this value is exceeded, suitable noise protection measures (e.g. enclosure) must be taken. The noise measurement must be carried out at the machine, system or production facility at a distance of 1 m and also at the operators' locations. The measurement logs must be presented and handed over to Collini on request.

[2] The "Safety Management Fire Protection" standard is the intellectual property of the Collini Group and will be transmitted or issued separately in the relevant case.

7. Spare and wear parts

7.1. Spare and wear parts

The contractor undertakes to provide the client with a spare and wear parts list including delivery times and to include this in the documentation. Critical components must already be noted in the offer with delivery times. The contractor shall provide all information so that the client can also carry out the replacement and wear parts procurement directly himself. For this reason, the spare and wear parts list must also contain at least the following information:

- Part designation
- Part number (according to 8.7Reference labeling
- Manufacturer
- Type
- Part number

For custom-made products:

- Part designation
- Part number (according to 8.7Reference labeling
- Drawing in DWG and PDF
- 3D model in STP

7.2. Spare and wear parts supply

The Contractor must ensure that the procurement of spare parts for the machine/machine system is guaranteed to the Client for at least 10 years. This also applies to its subcontractors and to wear parts.

7.3. Discontinuation of spare and wear parts

The Contractor undertakes to the Client to provide information about the discontinuation of spare parts at an early stage. Furthermore, compatible spare parts must be offered in place of the discontinued spare part and changed in the documentation of the system.

8. Electrical engineering

8.1. Grid types, voltages, protective measures, structure

The protective measures must be implemented in accordance with all local and specific regulations applicable to the system. The 24V DC control voltage must be provided by stabilized and short-circuit-proof power supply units. The power supply units or the overcurrent protection devices must be suitable for the safe and selective disconnection of each individual circuit and galvanically isolate the circuit. Furthermore, the circuits must be able to be switched off individually via the protective devices and a failure of the protective device must be recognizable on the device (preferably LED indicator lights). Compliance with selectivity must be ensured. This applies to all types of protective devices such as short circuit, overcurrent, residual current, etc.

8.2. Energy supply

The power quality of transformer stations fluctuates. Therefore, all electrical components must be designed so that a voltage fluctuation of -15% to +10% has no negative effect on the operation of the machine in question.

8.3. Safety

All safety devices, in particular emergency stops, must be designed in accordance with the local and specific regulations applicable to the system. Furthermore, valid guidelines and safety standards must be observed, in particular standards for the safety of control systems. In general, all monitoring systems must be wire-break-proof.

8.4. Protection class, components

The protection class of the components must be designed in accordance with the local and specific regulations applicable to the system. The components must have at least the following degree of protection:

- Switch cabinets: IP54
- Sub-distributor: IP 54
- Control boxes: IP 55
- Connections: IP65

Protection class outdoors at least IP65 and additional required equipment (weather protection, condensation drains, seals, heating, hygrostat, min/max temperature monitoring, etc.)

Only components from the Collini equipment specification, see document "Technical delivery specifications for systems and infrastructure - material standards"[3] may be used. Deviations require written approval.

8.5. Electrical operating rooms, switch cabinets, terminal and junction boxes

Installation and fastening

If the installation site is equipped with a raised floor, a plinth is optional for the cabinets. If cabinets are installed directly on the subfloor, a plinth with a height of 200 mm must be provided. All cabinets must

[3] The currently valid version must be requested independently from the client by the contractor.

be installed on a solid base, additionally secured and connected to the main equipotential bonding of the system.

Control cabinet

Definition of control cabinet:

A control cabinet is a type-tested housing / room in which electrical and electronic components are installed (terminals, busbars, switches, fuses, contactors, relays, PLC components such as CPU and peripherals, ...).

- Control cabinets, terminal boxes, control boxes etc. outdoors or in specially stressed environments must be made of stainless steel or glass-fiber reinforced, unsaturated polyester, including a rain roof / rain protection and, if necessary, air conditioning.
- Cable entries are only permitted from below. Main switch (it must be possible to release the lock from the outside);
- Cabinet versions with a volume of more than 12 liters must be equipped with lighting incl. door contact (or LED light - saving costs⇔ energy) and country-specific socket outlet as well as Schuko socket outlet.
- Each switch cabinet must be equipped with a temperature monitor (thermostat or sensor). A corresponding error (control system) must be displayed if the temperature is too high or too low
- Locking depending on installation and local regulations: profile half cylinder or double bit
- Plant pockets in sheet metal design and mechanically fastened
- Equipment labeling in cabinets: replaceable, permanent, captive, temperature-resistant and machine-labeled.
- Space reserve of a new enclosure before commissioning:
  30% on mounting plate for e.g. circuit breaker, drive controller, safety devices
  25% in cable ducts
- The main and control circuits must be separated as far as possible in the switch cabinet
- Electrical components that are not touch-proof (IP20) must be covered with Plexiglas

Control and display elements

Terminal box

Definition of terminal box:

A terminal box / junction box is a type-tested housing in which electrical components are installed (terminals).

The sensors (limit switches, inductive sensors, level measurement, ...) or actuators (valves, motors, ...) must be routed to the respective control cabinet without intermediate terminal boxes. Terminal boxes are only used as a maintenance aid for, for example, drag chains, prefabricated machine assemblies, ...

Terminal boxes must be mounted in an easily accessible location. The terminals must be labeled on both sides and the terminal strip must be marked. Reserve wires must be connected to terminals / the terminal block and wired through to the switch cabinet. The reference mark must be clearly visible on the terminal box. If terminal / junction boxes are used as control / switch cabinets, the design guidelines as described under "Switch cabinet" apply.

Exception:

- A power supply unit and a Profibus repeater are considered a terminal box. However, a box with PLC peripherals is considered a "control cabinet"!
- An operating housing (touch panel, emergency stop button, operating buttons, ...) is also considered a terminal box if no cooling is required.

Terminal / junction boxes must always be provided with door hinges and locking (double-bit, etc.). Opening downwards or to the side. Sufficient space must be provided for the terminal and connection area. At least 100 mm free space between terminal and cable entry. Deep boxes and high terminals facilitate connection. Double-deck terminals are not desired

Equipotential bonding, EMC, shielding

The system must be equipped with main equipotential bonding and local equipotential bonding in accordance with all local and specific regulations applicable to the system. Each enclosure must be equipped with a connection point for the main equipotential bonding.

For special enclosures with increased EMC requirements (frequency converters, rectifiers, etc.), side walls, roofs, doors and other attachments must be connected to the body over a large area using earthing straps (braided straps).

If shielded cables are required (e.g. frequency converters, analog signal lines, data lines, etc.), appropriate large-surface connections (type-tested shield clamps) must be provided in the control cabinet. The shielding must be connected to the field side (if necessary, e.g. for motors) with high-quality EMC cable glands over a large area.

Overvoltage protection

The requirements for overvoltage protection must be adapted to the local conditions or the machine and the devices used.

Labeling

All cabinets and boxes must be labeled with location and system identification.

Cable entry

The cable entry must be made using screw fittings, cable entry grommets, plug entry grommets or plug-in bushings. Only one cable per bushing is permitted. Elastic clamping profiles in a system design are permitted in a suitable environment. Open entry points must be sealed in accordance with the degree of protection. Only cable glands are to be used outdoors.

Fixtures

Built-in components are to be functionally combined in power and control cabinets. Built-in components are only permitted on mounting plates or support systems without exception. Only fixtures intended for installation in fronts (operating and display elements, measuring devices, etc.) are permitted on doors.

Colors

Wiring colors must be carried out in accordance with local regulations. As long as the specifications do not contradict the local regulations, the following colors should be used:

Power circuits		black
Neutral conductor		"light blue" (RAL 5015, sky blue)
PEN, PE, earthing, equipotential bonding conductors		green/yellow
Voltage 230VAC	230VAC	red (RAL 3000, fire red)
	0VAC	Color spiral red/white
Control voltage 24VDC	24VDC	"dark blue" (RAL 5003, sapphire blue)
	0VDC	Color coil blue/white
Control voltage 24VAC	24VAC	brown (RAL 8003, clay brown)
	0VAC	Color coil brown/white
External voltage		orange
Control voltage, analog signals, other low voltages (+5V, +12V, +-15V, +-10V, ...) Are to be implemented with shielded control cables; twisted cables are to be used for short distances where a shielded control cable is not practical/possible	+ Plus	violet (RAL 4001, reddish purple)
	- Minus	gray (RAL 7000 feather gray or RAL 7001 silver gray)

Manufacturers to be used according to equipment specifications

Cross sections

Minimum wiring cross-sections must be implemented in accordance with local regulations. The accumulation in the wiring ducts must be taken into account. However, the following specifications must be observed as a minimum:

- Power circuits: min. 2.5 mm²
- Control voltage: min. 1.0 mm²
- Control signals: min. 0.75 mm²

Only flexible conductors are permitted. Analog signal cables must also be shielded in the cabinets up to the module

Air conditioning

Air conditioning of the enclosures is only permitted with devices that ensure separation of the air circuits (inside / outside) (heat exchangers, air conditioning units). Central enclosure ventilation (supply air at the bottom via hall ventilation and outlet filter at the top) is preferable. The air must be filtered, preheated and, if necessary, dried. A heat calculation in accordance with EN 61439 for switch cabinets must be enclosed with the documentation. Each switch cabinet must be equipped with a temperature monitor (thermostat or sensor). In the event of over/under-temperature, a corresponding

fault (control system) must be indicated to . The internal temperature of the switch cabinet must not exceed 40° C (unless there are components that require an even lower temperature).

Terminal strips

Terminal strip arrangement with appropriate space for cable routing, strain relief and shield support. One wire per terminal. When using twin ferrules, two wires per terminal are also permitted.

Operating, control and display elements

Emergency stop controls must be secured against unintentional operation (protective collar, cover). All operating and display elements must be designed uniformly for the entire system. Indicator lamps must be designed as LED indicator lamps to match the control units (same system). If operating elements or operating terminals are located outdoors and may be exposed to direct sunlight, they must be designed (protection, etc.) in such a way that they can be operated without impairment even in direct sunlight. Operating, control and display elements must be labeled in the local language. The lettering must be applied by machine and fastened with mechanical fasteners.

Actuators

All drives should be equipped with PTC thermistor temperature sensors. All three-phase motors must be suitable for operation with frequency converters. Motors that are operated with frequency converters must be equipped with PTC thermistor temperature sensors. All actuators must be recorded for maintenance purposes using a maintenance system (in operating hours or period-dependent records).

Consumer outlets

All consumer outlets must be dimensioned in such a way that the components (overload releases, contactors, etc.) are not damaged in the event of a short circuit. The settings must be documented in the electrical diagram.

Soft start

Only use soft starters that have integrated bypass contacts and in which thermal destruction of the semiconductor elements is prevented by suitable protective devices. The settings must be documented in the electrical diagram.

Frequency inverter

The manufacturer's specifications and installation guidelines must be observed. (Distances, cooling, EMC, ...)

The inverters must be controlled via enable, left-right signal and signal voltage 0 to 10 volts. If other controls are required (bus system), these must be approved separately

To minimize mains feedback, appropriate frequency converters with integrated filters or external filters/chokes must be used.

Appropriate filters / ferrite cores must be used on the outgoing side to avoid interference. It has proven useful to select a filter for servicing (motor replacement) so that unshielded cabling is possible. The filter (ferrite core) and the connection terminals must be installed close to the frequency converter to ensure clear assignment and optimum cooling.

Network technology, bus systems, remote maintenance

Communication networks must be planned and designed to be as fail-safe as possible (protected, separate installation, potential equalization, ...

The following bus systems are permitted:

- Industrial Ethernet (to SCADA/MES control system)
- ProfiNET
- ProfiBus (if still useful or by arrangement)
- Modbus TCP (by arrangement)
- Other bus systems are subject to approval by the control technology department of Collini Dienstleistung!

Only certified components for the bus system used are permitted. The cabling forms interfaces to the IT. The specifications must be observed!

A remote maintenance system is provided by Collini (by arrangement).

8.6. Cabling/installations

Energy and power cables must be laid separately from control and measuring cables. The separation is to be implemented by separate routing or separators in the routes.

Analog signal cables must be shielded. This shielding must be connected over a large area on the field side with EMC cable glands.

Only use specified and approved cables for bus lines.

The reference mark must be affixed to all connected devices and all connection cables.

Signs must be corrosion-resistant and durable. Depending on the environment, made of plastic, aluminum or stainless steel. The lettering must be done by machine (high-quality printing, engraving, laser with contrast lettering, etc.) and must be fastened with mechanical fasteners.

8.7. Reference labeling

The reference marking - also known as equipment marking - is carried out in accordance with the specifications in the document "Technical delivery specification for systems and infrastructure - reference marking"[4] and, if applicable (criterion described in 12.2P&I/PID scheme), must be integrated into the P&ID scheme.

[4] The currently valid version must be requested independently from the client by the contractor.

8.8. Electrical documentation

The electrical documentation must contain at least the following components:

- (Cover sheet, table of contents, explanations of designations, symbols according to IEC/EN60617, structuring and labeling according to IEC/EN81346)
- Circuit diagram, all poles
- Terminal diagram, cable diagram
- Layout plans of the control cabinets (doors and fixtures), terminal, distribution and control boxes (doors and fixtures).
- Heat loss calculation of the enclosures
- Parts / material list (manufacturer, manufacturer type, manufacturer order number, technical data,)
- Parameterization and programming instructions and parameter lists etc.
- EU Declaration of Conformity
- Commissioning protocols/test protocols/acceptance protocols

Documentation formats

- Electrical plans as PDF output and additionally as error-free original EPLAN file
  - 2D data: DWG
  - 3D data: STEP
- Operating and maintenance instructions in PDF.
- Parts, material and spare parts lists in Excel format or attached as an evaluation in EPLAN.
- Photos in graphic format JPG, minimum resolution 3.2MPixel
- The digital documentation must preferably be transmitted as a download (cloud).

9. Control technology and control software

9.1. General information

General conditions

The following applies to software that is/was developed for the fulfillment of requirements (specifications, orders, ...) of the customer and/or is necessary for the operation of the system:

- The software must be fully documented after successful final acceptance (incl. source code) and to the customer
- Subsequent changes, including documentation and source code, must be submitted electronically with versioning
- If special tools (other than the defined standard tools) or software components are used for the development of the software, these must be approved in advance by the Control Technology Department of Collini Services. If these may be used, they must also be supplied. The exact product and supplier designations must also be specified for these products.
- Self-developed locked blocks/libraries are not accepted, access to all data must be guaranteed.
- The software must be reproducible based on the source code with the standard tools or supplied or used aids (tools).
- Software products must be treated in the same way as electrical and mechanical components of the system and must therefore also be included in the parts list.

Development environment

The following development environment for PLC controllers must be used:

Siemens, Step7 TIA Portal

Programming language: KOP, FUP (switchable), by arrangement SCL, AWL

The following development environment for visualization systems must be used:

COPA-DATA, Zenon

Sample projects can be made available

The following development environment for HMI systems must be used:

Siemens, WinCC flexible, TIA

The version to be used must be clarified in advance with the control technology department of Collini Services.

Interfaces (buses)

Interfaces must be monitored (fault message in the event of bus system failure, individual devices, etc.). The status of the interface must be displayed in the visualization. The function of the interface

must be checked using suitable measures (alive bit, checksums) or protocols must be used to ensure the function of the data transmission

9.2. Operating modes

Unless otherwise requested by the client, the following operating modes apply:

Operating modes - Manual

In set-up mode, each actuator can be controlled via a separate command. The home and operating positions of the actuators must be signaled. The actuators must be locked against each other in such a way that no dangerous situation can occur for people or the system. The missing condition for starting an actuator must be displayed as an operating instruction. Actuation of an actuator from the home position to the operating position and vice versa only if all conditions for the movement are met. No IO parts can be manufactured in this operating mode. If parts are manipulated by functions in set-up mode, these parts must be treated as scrap parts. If set-up or setup work is necessary in the protected area, the necessary set-up functions must also be available with open safety doors using appropriate personnel protection devices. Suitable functions/processes must be implemented to make set-up easy for the operator. Set-up must be monitored for completeness and sequence and supported with operator instructions. Set-up / tool change sequences may only be started in set-up mode if the necessary safety conditions are met.

Operating modes - Semi-automatic

In step mode, only one continuous sequence from a selection menu of this station (process unit, function unit) can be executed. The sequence steps of the selected function must be displayed. The module and its sequences must be interlocked in such a way that no dangerous situation can occur for persons or the system.

All sequences must be started explicitly after they have been selected, all safety devices are active and only after the entire cycle has been completed are the corresponding releases issued again by the control system.

Operating modes - Automatic mode

In automatic mode, the entire system/machine is operated in a network. "Automatic start" is only started after it has been activated, all safety devices are active and "automatic mode" is only ended with a "stop". The missing condition for starting automatic mode is displayed as an operating message.

Definition of system states: traffic light functions

Standard for lights or flashing lights:

Continuous red:	Emergency/stop, stop
flashing red:	Fault
Continuous yellow:	Machine protection enabled/open
Flashing yellow:	Operating message warns of an imminent system standstill, (lack of parts, empty system, ...)
Continuous green:	Automatic mode active
Flashing green:	Ready to start automatic mode, automatic sequence stopped

Large warning lights - rotating beacons (without exception only for signaling and warning devices of the waste water treatment plant)

Red rotating beacon	Fault - water stop - no waste water
Yellow rotating beacon	Message and warning device
Blue rotating beacon	Tank farm warning device - Tank level full

9.3. Operating messages and faults

Unless otherwise requested by the client, the following operating messages and faults apply:

Operating messages

- Operating messages are information on incorrect operation of the machine / system.
- Operating messages must be unambiguous.
- Operating messages must also be recorded or documented.
- Operating messages contain information on how to avoid malfunctions.
- Operating messages are information about the machine / system status.
- Operating messages do not lead directly to a system shutdown.
- Operating messages must be timely and informative enough to prevent system downtimes.
- Operating messages inform the operator about the current execution of the desired function and provide information on the use of the respective function

Functionality of operating messages

- Operating messages should be accompanied by a help text containing information on how to avoid subsequent faults.
- The help text can be displayed automatically or by selecting a help function.
- Operating messages can only be acknowledged if the cause has been rectified.
- A clear description with reference to the reporting device / input must be provided

Error messages

- Error messages are the result of evaluations of the system status/process that deviates from the expected or does not allow execution.
- It must be possible to clearly identify error messages (error location, error number)
- Error messages result in a fault response as required (stop, halt, ...).
- Error messages must be recorded, documented and archived.
- It must be possible to classify error messages in groups
- Error messages must not be acknowledged automatically.

Functionality of error messages

- A clear error description with reference to the reporting device, the reporting input and not the suspected cause must be provided.
- Only the error and not its subsequent error may be reported.
- In the event of malfunctions, a help text must be stored containing information on how to rectify the malfunction. The help text can be displayed automatically or by selecting a help function.
- Error messages can only be acknowledged if the cause has been eliminated.
- The start, end and duration must be recorded.

- Bus systems must be monitored for system errors and hardware defects. Bus errors must also be treated as malfunctions and displayed.
- Bus system fault alarm systems must be designed in such a way that all individual components (valve terminals, bus modules, bus couplers, etc.) are evaluated separately and provided with error messages.
- Sensor error messages must clearly describe the respective cause of the error. A distinction must always be made between "not actuated" (possibly defective sensor) and "still actuated" (possibly continuous signal due to defective sensor).

Structure:

1. Module or unit Designation

2. Error number

3. Error description

4. Value / unit

5. Installation location and equipment of the reporting device (E-plan)

9.4. General control system software guidelines

- The software structure is based on the plant structure, which is divided into process units, functional units, assemblies and equipment.
- The program must be structured and clearly laid out. The system structure must be reflected in the software structure.
- The individual functions must be programmed separately in modules.
- The modules must be designed in such a way that they communicate with the other software via clearly defined interfaces. This should make it easy to replace the functions during system/machine modifications.
- Programming must be symbolic.
- The implementation language of the sources is German / English.

9.5. Interface to third-party purchasing systems

Data interface

The data interface must be agreed in advance for "third-party" control systems.

Alarm and message interface

All alarms and messages can also be exchanged via the defined interface

Control and operating interface

Safety-related data transfer must be exchanged via potential-free contacts.

10. IT

Topics relating to IT, such as interfaces to systems, communication with SAP, etc., are dealt with in a separate document "Technical delivery specifications for systems and infrastructure - IT"[5] and are also part of the scope of delivery.

[5] The currently valid version must be requested independently from the client by the contractor.

11. Mechanics

11.1. Steel structures

All steel structures and constructions must be carried out in accordance with the applicable standards, regulations and laws.

Load details must be clearly indicated and recorded in an overview plan for all floors. A civil engineer must provide static proof of the design!

Proof of the execution and quality assurance of steel structures must be provided in accordance with EN 1090 EXC 1 - EXC 2. Steel structures such as staircases and railings must be planned and executed in accordance with the applicable OIB guidelines

11.2. Welded constructions

Weld seams must be continuous. Local Interruptions are prohibited.

11.3. Screw or connection elements

Connecting elements on moving units, such as transfer units, transfer carriages, etc., must be secured (glued in) to prevent them from coming loose on their own. Connecting elements must not cause material mixing (contact corrosion), i.e. the same material must be used for the point to be connected.

11.4. Installations, pipeline construction

Installations and pipelines must be labeled in accordance with country-specific guidelines and subjected to a pressure test; as a minimum, pressure lines are tested at 150% of the operating pressure. The design of all installations and fittings must also be determined according to the following factors:

- Resistance to the process media and the cleaning media
- Temperature spectrum of the media concerned
- Pressure resistance to the specified max. pressures
- Installations and fittings must be checked and labeled in accordance with the Boiler Act before commissioning.
- Certificates and confirmations of the design and tests must be submitted to the client upon commissioning

The use of PVC material in pipeline construction is prohibited and may only be used after explicit approval by the client. Connections must be made in accordance with standards. A mixture of material grades within a section is not permitted. This applies both to welded joints, including welding rod, and to screw connections.

An extended warranty of 10 years applies to the chemical resistance of the components used.

11.5. Process tank construction

Tanks must be pressure tested in accordance with the applicable guidelines. The following factors must also be considered when planning the sumps, containers and tanks.

- Resistance to the process and cleaning media
- Temperature spectrum of the media concerned
- The design of the trays, containers and tanks must be applied in accordance with the applicable standards regarding statics, tightness and duration of use.
- Trays, containers and tanks must be designed and labeled with thermal protection (insulated) for media that have a temperature in the process or temperatures that also occur briefly during use and are above 40°C.
- Containers, trays or tanks that are placed directly on the floor including protective coating must be designed in such a way that a safety inspection of the coating is possible at any time. (e.g. ribbed floor)
- Containers, trays and tanks that are installed in the basement floor must be designed in such a way that they can also be secured against floating if the basement is used as a fire water retention basin. This must therefore be considered in the design and structural analysis.
- Certificates and confirmations of the design and tests must be submitted to the client upon commissioning.

11.6. Compressed air

Air-operated components/parts may be designed with a maximum release pressure of 6 bar (absolute pressure). If the release pressure is higher, the component must be replaced with a component corresponding to this specification at no cost to the customer.

11.7. Ventilation technology

The supply and exhaust air system must be designed in accordance with country-specific specifications and standards, including EN17059. The ventilation concept must also be coordinated with the fire protection concept!

The following criteria must be observed and optimally coordinated with the client:

- Heating requirement
- Cooling requirement
- Humidifying and dehumidifying
- Removing emissions

Maximum permitted speeds:

- Supply air unit: Standard specification, but maximum 2 m/s
- Remaining channels, equipment, etc.: 8 m/s

Deviating flow velocities must be agreed with the client and, in the event of non-compliance, adjusted by the contractor at his own expense.

Mixing of materials is prohibited. Flange, duct, connecting elements, etc. must be made of the same material to avoid contact corrosion.

When designing exhaust air ducts, particular attention must be paid to pressure loss. Bends must always be designed with at least three segments. T-pieces must also be designed accordingly. For ventilation systems, the energy efficiency of the overall system must be calculated and included in the quotation. The energy efficiency of the overall system must be given in mbar (pressure loss) including a detailed breakdown of the larger units (silencers, heat exchangers, etc.).

Fans are designed for the optimum efficiency range based on the pressure loss. Should it become apparent after commissioning that the fans are not being operated in the optimum efficiency range[6] (efficiency deviation of max. 5%), the contractor must rectify this at his own expense.

Only frequency converter - controlled fans may be used. Step control is prohibited!

Meeting rooms, social rooms, offices and other ventilation systems intended for people must be equipped with CO2 sensors and regulated using these.

11.8. Conveyor technology

The client shall provide the possible contact media/temperatures and, if necessary, make suggestions regarding the material. The contractor must check the resistance independently of this and notify the client of any resistance problems. If the client requests a special make/type in the course of standardization, this must be implemented if suitable for the process (resistance/process parameters). The contractor must notify the client of any concerns regarding suitability.

11.9. Pumps and compressors

Pumps must be supplied with an electrical plug connection so that the pump can be replaced without an electrician.

11.10. Corrosion protection, color design, insulation

Requirements

The harmonious color scheme makes the quality of the production facilities and therefore the products visible. The focus is on the areas for employees, which should be tidy, bright and friendly.

Corrosion protection

The contractor must ensure that corrosion protection is provided for at least 15 years (EN ISO 12944-1, protection period "long"; EN ISO 12944-2 corrosivity category "C4"). As the corrosive environment in Collini's processes can be aggressive, attention must also be paid to corrosion protection on the outside of units, e.g. pumps.

Due to the highly corrosive environment at Collini (at least in the electroplating area), V2A steels and materials more susceptible to corrosion are also painted.

Minimum requirement:

Degree of surface preparation:	SA 21/2	(according to EN ISO 8501)	
Corrosion protection:	80 µm	Number of coatings:	1
Top coat:	200 µm	Number of coats:	3

[6] Optimum efficiency range with defined volume flow. If no volume flow rate has been defined, the design parameters from the client apply.

Color palette

According to the color concept.

Deviations must be agreed in writing with the customer prior to execution!

The color palette must be sent to the customer for approval. Incorrect or unapproved paintwork, including a galvanized surface, will be charged to the supplier if it is not corrected during the course of the project.

Consequently, a breakdown of the color palette used by Collini. This serves as a guide, but does not prevent the customer from approving the colors:

Component	Example	Color
Moving parts in production	Transport trolley, cross transporter, rigging and bracing station ...	RAL 1021 Rape yellow
Safety barriers	Protective grids, barriers ...	Gray to black
Movable parts Logistics and routing	Crane and crane runway, lift truck,	RAL 2002 Blood orange
Markings	Floor markings, doors, ramps, gates, truck entrances, (border edge approx. 20 cm strip)	Or yellow-black striped
Constructive parts	Containers / reservoirs / trays (Chrome steel, GFR) Constructive system components Steel buildings Gratings / walkways Ventilation ducts	9007 gray aluminum
Aluminum parts	e.g. cable ladder	Anodized
Switch cabinets Galvanized channels		RAL 7035 light gray
Motors		RAL 2002 Blood orange
Marking, CI effect	Collini blue used in a very reduced way as a marker color, e.g. visitor guidance	NCS S 2065-R90B

Insulation:

The following aspects must be taken into account when selecting insulation: Energy saving, process control, system protection, personal protection.

The surface of the insulation must never exceed 50°C and a maximum of 100 W/m² may be lost via the insulation. Only CE-certified insulation material that is fire-retardant may be used.

Refrigeration pipes must always be insulated.

When using soft insulation such as Armaflex, the insulation in the production area near process baths must be coated with a varnish to facilitate cleaning. The fire behavior of the insulation materials used must not be worse than Armaflex.

11.11. Mechanical documentation

The mechanical documentation must include the following content:

Assembly drawings/parts lists

Assembly drawings (assembly drawings) and, if applicable, exploded drawings must be enclosed with the documentation. Possible assembly and disassembly instructions for the components must be shown in separate drawings. The reference to the parts list must be given.

Assembly drawings with weight details of the individual assemblies, transportation plan, attachment points, load and service life details must be provided.

For all system parts that are in direct contact with existing components, 3D data and drawings of the respective individual parts must also be included in the documentation.

Drawings must be submitted in the following format for design work:

Individual part drawings:

Format: DWG and PDF

Compilation drawings:

Format: DWG and PDF

3D models:

Format: STP

Assembly and disassembly instructions (workpiece-specific accessories, production equipment, machining plans, special tools, etc.)

If certain special tools or other special accessories are required to operate the system, these must be specified in the offer.

If special machining plans or special tools are required for maintenance and servicing tasks, this must also be stated in the quotation.

The scope and procedure must be agreed with the client.

Lubrication data sheets

All information on the lubricants and hydraulic fluids required for operating the machine/machine system must be listed in the lubrication data sheet.

Pneumatic and hydraulic circuit diagrams

Format: DWG and PDF

12. Process engineering

12.1. General interpretation

The field of process engineering is part of Collini's expertise. For this reason, no specific topics are listed here, but it is pointed out that, in particular, systems and sub systems that accompany chemical processes may only be designed in consultation with our internal specialists.

12.2. P&I/PID scheme

A P&I or PID diagram, must be prepared and sent to the client as a PDF and DWG if piping, fittings, equipment, etc. are included in the scope of delivery.

A P&I diagram contains the following information:

- All appliances with machines and drives
- Actuators for valves
- Heating/cooling of any kind
- All pipelines or transport routes and pipeline installations, hoses, compensators and fittings
- All EI&C equipment such as measuring instruments, limit switches, operating elements, etc.
- The autonomous control systems and local control points

Labeling:

The P&I diagram must be labeled in accordance with the document defined at "8.7Reference labeling".