Collini

TECHNICAL DELIVERY SPECIFICATIONS PLANTS AND INFRASTRUCTURE

Change index:

Version	Description of the change	Date
MAY-2014	Created on	04-JUN-2014
MAY-2020	Complete revision	15-MAY-2020

1. Table of Contents

2. General principle

The task of the Technical Delivery Specifications consists in standardisation and is applied without exception at all Collini locations. This is intended to achieve an identical structure of machines and systems in a simple and standardised manner. The Technical Delivery Specification is the basis for every project. Any deviation from the Technical Delivery Specification must be discussed and described in writing, justified and approved by the Customer (Collini).

The delivery specification comprises general rules for the procurement, delivery and implementation of systems and production resources. The purpose of the delivery specifications is to simplify negotiations with suppliers.

The delivery specifications do not cover every detail, but indicate what is of particular importance according to experience. To ensure that technical progress is not limited, the delivery specifications are periodically updated. Solutions that deviate from the Technical Delivery Specification and are technically and economically superior should also be offered as alternatives.

In the interest of Collini and the Contractor, the technical implementations are to be clarified so that

- the necessary safety precautions are put in place for people and systems
- the implementations meet the expectations
- failures are remedied as quickly as possible
- optimal service life of the systems is achieved

Terms:

- Collini, Customer, System Operator, Client are used synonymously
- Contractor, Supplier are used synonymously
- System, plant, machine, production equipment, infrastructure system, components, sub-machine, technical equipment, product, machine, aggregate, … are used synonymously

3. General Information

3.1. Regulations, Standards

Even if this Technical Delivery Specification does not emphasise this in detail, the Contractor shall bear full responsibility for ensuring that, in addition to the requirements specified in this Technical Delivery Specification, all the requirements applicable to its performance, which result from regulations (e.g. EC directives, ordinances and other applicable legislature) as well as from standards and generally accepted codes and good engineering practice, are complied with.

Thus, if and insofar as this Technical Delivery Specification refers to regulations, standards and codes, the Contractor must independently check whether these are current/relevant for its performance, and whether any further regulations, standards and generally accepted codes and good engineering practice must be observed.

In case of doubt, the Contractor must contact the Customer immediately. In addition, the Contractor shall inform the Customer immediately if the Contractor detects or is able to detect on the basis of its expertise that the service to be provided by the Contractor is not or only partially suitable for the intended purpose.

As the following standard is not widely known – but often used in the Collini Group –, it is explicitly mentioned:

EN17059:2018; Plating and anodizing lines – Safety requirements.

3.2. Safety

It must be ensured that despite malfunctions or faults in the supply of the system (electricity, water, air etc.), both personal and operational safety are ensured. More details are explained in Chapter 6 Safety, 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 provide the manufacturer’s declaration or declaration of incorporation in accordance with the current directives.

The EC conformity assessment is to 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 (MSR) as most recently amended. In the course of the EC conformity assessment procedure, the manufacturer must determine which standards and regulations have been taken into account in the planning, design and construction of the machine or system. These are also to be mentioned in the EC declaration of conformity.

The EC Declaration of Conformity must be signed by the company and attached to the documentation. The CE marking must be visibly affixed to the machine, system or production equipment. The manufacturer guarantees that the machine, system or production equipment corresponds to the state of the art or the relevant requirements for the quality of work equipment in accordance with the valid regulations, rules and guidelines of the authorities and trade associations.

Risk minimisation must primarily be achieved by an inherently safe design. Thereafter, technical and complementary protective measures may be applied. If there are inevitable residual risks on the

machine, these must be clearly indicated with easily visible appropriate graphic symbols (safety colours and safety signs – Registered safety signs).

The risk assessment or risk evaluation is to be handed over to the Customer in full and is thus without exception part of the scope of delivery.

3.4. Preliminary acceptance/(Final) Acceptance

All preliminary and final acceptances are to be carried out with the participation of employees of the Customer.

Preliminary acceptance

Unless otherwise approved, the preliminary acceptance is to be carried out at the Supplier's site before approval for shipment by one or more employees of Collini. Preliminary acceptance shall be carried out only after the Supplier of the machine or system has submitted data or sample parts showing that the machine or system in question meets the requirements of the order.

Final acceptance

Final acceptance shall be carried out at the recipient plant under real operating conditions. Here, the required process capability of the system is checked.

3.5. Duration and commencement of warranty

The warranty period begins with the date of the final acceptance certified free of defects. The duration of the warranty period (entire system, individual components) must be disclosed to the Customer already in the quotation. The same applies to any modifications and additional work of a corresponding scope that is subsequently carried out on the system under the contract

3.6. Service during the warranty period

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

3.7. Standardisation

In the course of the standardisation of the Collini Group, the document "Technical Delivery Specifications – Plants and Infrastructure – Material Standards" applies[1], which declares which components (manufacturer and type) are to be used. Any components deviating from this must be approved by the Customer; otherwise they must be replaced at the Contractor's expense. If a component from the specification is unsuitable for the respective requirement, it is the duty of the Contractor to point this out to the Customer.

[1] The currently valid version must be independently requested by the Contractor from the Customer.

4. Documentation – General

4.1. Implementation

All documents must be prepared in the national language of the place of use. The technical documentation is to be provided as one hardcopy plus on data carriers or download (cloud). All documents required for placing the device on the market (CE marking) must be available for the handover ready for operation. The documentation and records mentioned in this document represent the minimum scope of delivery.

4.2. Filing of the documents

The documents must be collected in robust cardboard folders or ring binders with 4 rings and provided with a table of contents and index (including third-party documentation). Any documents with a format larger than DIN A3 must be reinforced with holes.

4.3. Lettering

The lettering of the file spines must be agreed with the Customer or be made according to the Customer's specifications. The folders must be numbered consecutively, including the total number.

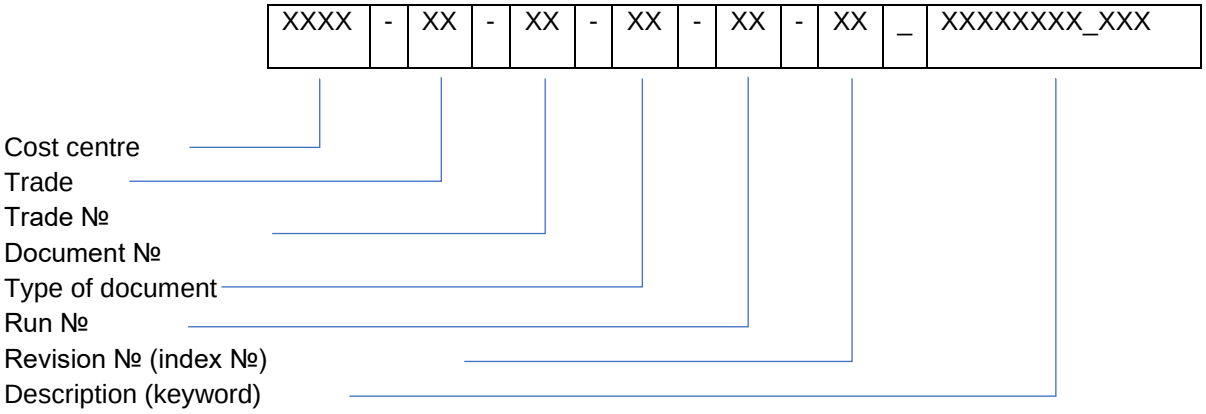
4.4. Contents

With the delivery of the machine, system or production equipment, Collini shall receive a complete documentation in digital form and one printed copy thereof, consisting of at least the following documents:

- Drawing,
- Operating instructions,
- Maintenance Instructions and Maintenance Schedule,
- Circuit diagrams (electric, hydraulic and/or pneumatic),
- Parts list,
- List of spare parts,
- EC Declaration of conformity
- Risk Assessment

4.5. Document identification

Documents are identified by a project-specific key, similar to the example below. This document is handed over by the Customer upon award of the contract and is valid for the respective project.



4.6. Changes and conversions

All changes made during manufacture, installation, assembly, commissioning and trial operation at the premises of the Customer having ordered the machine/system must be incorporated immediately by the Contractor into the relevant technical documents. The definitive technical documentation must match the condition of the machine/machinery at the time of final acceptance.

If at a later time, which may also be after expiry of the warranty period, it should turn out that the documents prepared by the Contractor do match the delivery item, the Contractor shall bear the costs for the resulting rectification or replacement of the technical documents.

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

4.7. Operating instructions

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

4.8. Maintenance schedule

Operator maintenance schedule

The operator maintenance schedule shall list the inspection and maintenance work to be performed by the operator. If necessary, the Contractor's relevant form sheet is to be used. All necessary/implementable measures, including those of subcontractors and suppliers, must be summarised centrally in a list. Otherwise, these are not binding on the Customer.

Upkeep instructions

The documentation must comprise special information on the proper inspection, maintenance and upkeep of the machine/system, diagnostic aids, lists of errors and detailed error descriptions in the event of malfunctions.

Upkeep maintenance plan

The upkeep maintenance plan shall list the inspection and maintenance work to be carried out by qualified personnel. Where appropriate, the relevant form sheet of the Customer is to be used. All necessary/implementable measures, including those of subcontractors and suppliers, must be summarised centrally in a list. Otherwise, these are not binding on the Customer.

Information on upkeep

The Contractor must provide the necessary information for upkeep and operation, which clearly includes the following points:

- describe the start-up and shut-down processes,
- specify external lubrication points and the type of lubricant required and the inspection intervals,
- describe upkeep procedures for specific assemblies,
- list the recommended spare and wear parts.
- Safety-relevant components including reference №, installation location, manufacturer, type, service life (T1), date of manufacture, serial №, …

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 parametrised at the final acceptance.

4.10. Third-Party Documentation

The technical documents of the assemblies and components provided by a subcontractor, e.g. control components, measurement control, etc., is to be included and, if necessary, stored in a separate folder. These documents must contain setting instructions and functional descriptions. Provision of general catalogues is not sufficient.

4.11. Electrical, mechanical and process engineering documentation

Electrical documentation

Electrical circuit diagram, reference marking (labelling of equipment), etc. is addressed in Chapter "8 Electrical engineering"

Mechanical Documentation

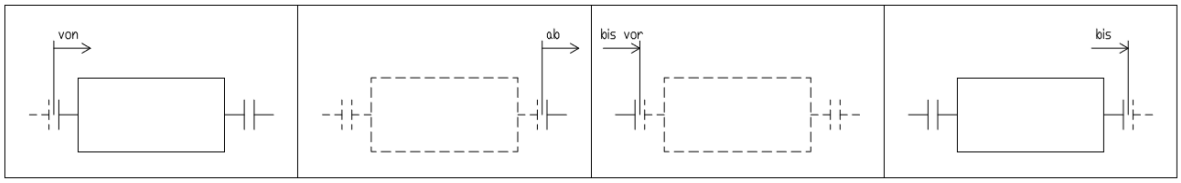
Such as assembly drawings, parts lists, pneumatic and hydraulic circuit diagrams, etc. are described in Chapter „11. Mechanics“

Process engineering documentation

P&ID diagram is described in Chapter “12 Process engineering“

4.12. Interface description

Interfaces (scope of delivery) must be clearly defined and declared by the Contractor and Customer. The Contractor must inform itself about the installation conditions. If, for example, the ambient temperature requires heating or cooling of any aggregates, these must be provided. The Customer will check for completeness after award of the contract, and reserves the right to claims concerning any omissions that may affect operations.



Terminology:

B	Beginning	“from”	including the part mentioned
E	End	“from after”	excluding the part mentioned
SD	Scope of delivery	“up to before”	excluding the part mentioned
		“up to”	including the part mentioned

Example: Trade “Crate handling”

Loading and unloading

B in SD (delivery of the boxes to the Contractor)

E up to before lid opening station

Compressed air

B from on-site connection

E in SD

Electrical engineering:

B of terminals Consumer

E in SD

5. Energy efficiency

The manufacturer undertakes to design the machine, system or production equipment according to energy efficiency criteria. The resource consumption of the machine, system or production equipment should be reduced to a minimum.

- Corresponding energy-saving effects must be considered
- High energy efficiency must be ensured
- Assemblies must conform to the applicable energy efficiency classes
- Electric drives must conform to the economic possibilities for the highest achievable energy efficiency class. 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 in particular also affect mechanical systems:

- Electric linear drives instead of pneumatic cylinders
- hydraulic systems without leakage groove
- efficient fans, pump wheels, …
- Consider fluid mechanics (bends, tees, …)
- Reduction of run times (intelligent control systems, …)
- Interface for monitoring systems (load, consumption, …)

6. Safety, environment, fire protection

6.1. General requirements

The machines, systems and production equipment must comply with the requirements and any safety, environmental and fire protection regulations (laws, ordinances, standards, etc.) of the place of installation as most recently amended.

However, minimum requirements are that the machine, system or production equipment must have at least one emergency stop switch that is easily accessible from the operating side.

Effective protective measures against the risk of injury to the operator and maintenance personnel must be taken by means of suitable design and, if necessary, appropriate protective devices (e.g. enclosure, light curtain, safety pressure beam, 2-hand control, etc.) so that, when used as intended, there is no danger in terms of accident prevention for the persons concerned.

Machines, systems and production equipment must be so designed that all energy sources (e.g. pneumatic, hydraulic or electric) are identified and can be provided with shut-off devices.

6.2. Safety

Each system, machine or piece of production equipment delivered must comply with the legal requirements regarding occupational safety at the place of installation as most recently amended. This includes checking for existing requirements in relation 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 working machines and equipment must be agreed with the Customer in advance. Corresponding authorisations and qualifications must be submitted by the users. Especially for the use of mobile elevating work platforms.

All work and orders are to be carried out in accordance with the currently valid work and safety regulations, as well as in accordance with the internal safety instructions (up to max. 45 min), which have been brought to our attention and signed.

6.4. Workstation design

As a matter of principle, machines/systems and production equipment must be designed and constructed according to ergonomic aspects. To avoid muscle and bone conditions, the strain on the operator must be kept as low as possible.

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

The control panel for the machine, system or production equipment must be easily accessible by the operator without requiring awkward movements or postures.

6.5. Environment

The Collini Group practices the principles of ISO 14001 and is aware of its responsibility towards the environment. In collaboration with our partners, we want to reduce environmental pollution to a tolerable level or avoid it as far as possible.

Recyclable materials in use as transport packaging must be fed into recycling by selective separation. All metallic and non-metallic recyclable materials must be properly recycled.

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

The national legal requirements as well as all European regulations concerning environmental protection must be taken into account and observed. Every machine, system or piece of production equipment supplied, as well as any substances supplied or contained therein, must without exception comply with the legal requirements.

6.6. Emissions

The manufacturer must inform the Customer in advance of the expected emissions (e.g. air, water, gases, aerosols, smoke, dust, etc.). Of course, all legal or standardised limit values must be observed. If necessary, suitable measures must be taken to comply with the specified limit values (e.g. filter, extraction, oil separator, etc.)

The equipment, machines and production systems must be designed free of leaks, so that no process fluids (e.g. oils, cooling liquids, cooling lubricants, etc.) can escape and thus inadvertently enter the environment. Appropriate fall arrest systems must be provided in the event of an accident and for maintenance activities.

All machines, systems and production equipment that require extraction for oil and coolant must be equipped with filter systems. Particle density must not exceed 0.2 mg/m³, or the legal maximum density, respectively, at the outlet of the filtration.

6.7. Substances/chemicals used

The manufacturer/supplier shall provide a safety data sheet in digital form and in the national language for each substance supplied or contained in the machine, system or production equipment, which complies with the currently applicable chemicals legislation. Furthermore, it is to be clarified with the Customer in advance whether the materials supplied or to be used may be introduced at Collini. The release of the substances is carried out by means of the process “Introduction of chemical substances” of the site concerned.

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

Not allowed either:

- Materials containing PCB (polychlorinated biphenyls) (e.g. capacitors, hydraulic fluids, etc.)
- Switches and devices containing mercury
- Lead-containing varnishes
- Substances or products containing chromium(VI)
- Asbestos-containing materials

6.8. Leaving the workstation

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

6.9. Fire prevention

All buildings and facilities must be designed and planned in accordance with the applicable TRVB guidelines. As a matter of principle, the legal principles must be applied to new buildings, but also to conversions or extensions. A fire protection concept must be drawn up according to the specifications of the plan or, if available, revised with the planned changes.

A fire alarm system with full protection must be provided and installed for all buildings and trades. Appropriate fire control systems for buildings and system components must be installed.

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

With regard to fire protection and explosion hazard on machines, systems and production equipment, the legal regulations at the place of installation apply as the basis. The standards listed below are also binding:

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

For the purposes of fire protection, the electrical equipment on every machine, system or production equipment must comply with the currently applicable regulations at the place of installation.

If there are fire and explosion hazards (e.g. during processes such as welding, soldering, etc.), the machines, systems and production equipment must be equipped with appropriate and suitable fire protection and extinguishing devices (e.g. CO_2 extinguishers). Halon extinguishing systems are prohibited.

Appropriate precautions must be taken to avoid damage and fire hazards to and on electrically operated machines, systems or production equipment, which may be caused by exceedance of the maximum permissible load or by improper operation or handling errors. (e.g. potential equalisation, overvoltage protection, short-circuit protection/limitation, overload protection, isolating transformers, fault-current circuit breakers, fire protection switches, …).

Where insulating materials are used, only non-flammable materials according to DIN 4102 A1 may be used.

In addition, the Collini Standard “Safety Management Fire Protection”[2] applies with regard to fire protection. The validity must be agreed with the Customer.

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. encapsulation) must be taken. Noise measurements must be taken at the machine, system or production equipment at a distance of 1 m and also at the operator’s location. The measurement reports must be presented and handed over to Collini upon request.

[2] The standard “Safety Management Fire Protection” is intellectual property owned by the Collini Group, and is transmitted or issued separately in the applicable case of use.

7. Spare and wear parts

7.1. Spare and wear parts

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

- Component designation
- Part № (according to 8.7 Reference marking)
- Manufacturer
- Type
- Item №

For custom-made products:

- Component designation
- Part № (according to 8.7 Reference marking)
- Drawing in DWG and PDF formats
- 3D model in STP format

7.2. Supply of spare and wear parts

The Contractor must ensure provision of spare parts for the machine/system to the Customer for at least 10 years. This also applies to its subcontractors as well as to wear parts.

7.3. Discontinuation of spare and wear parts

The Contractor undertakes to provide the Customer with information about any discontinuation of spare parts in good time. Furthermore, compatible spare parts must be offered instead of the discontinued spare part, and must be changed in the documentation of the system.

8. Electrical engineering

8.1. Power supply configurations, voltages, protective measures, construction

Protective measures must be implemented in accordance with all locally and specifically applicable regulations for the system. The 24V DC control voltage must be implemented with stabilised and short-circuit proof power supplies. The power supply units or the overcurrent protection devices must be suitable for the safe and selective disconnection of each individual circuit and galvanic isolation of the circuit. Furthermore, the circuits must be able to be individually switched off via the protective devices, and any failure of the protective device must be indicated on the device (preferably LED indicator lights). Compliance with selectivity must be ensured. This applies to all types of protective devices in the event of short circuit, overcurrent, residual current, etc.

8.2. Power supply

The power quality of transformer stations fluctuates. Therefore, all electrical components must be designed in such a way 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 implemented in accordance with all locally and specifically applicable regulations for the system. Furthermore, applicable guidelines and safety standards must be observed, in particular standards for the safety of control systems. In general, all monitoring must be carried out in a wire-break-proof manner.

8.4. Degree of protection, components

The degree of protection of the components must be implemented in accordance with all locally and specifically applicable regulations for the system. The components must have at least the following degree of protection:

- Switching cabinets: IP54
- Sub-distribution boards: IP 54
- Control boxes: IP 55
- Connections: IP65

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

Only components from the Collini Equipment Specification, see document “Technical Delivery Specifications for Plants and Infrastructure – Material Standards”[3] are to be used. Deviations require written approval.

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

Installation and attachment

If the installation site is equipped with a double floor, a pedestal is optional for the cabinets. Whenever cabinets are set up directly on the floor, a pedestal with a height of 200 mm must be provided. All

[3] The currently valid version must be independently requested by the Contractor from the Customer.

cabinets must be set up in a stable manner on solid ground, additionally fastened, and connected to the main equipotential bonding of the system.

Switching cabinet

Definition of “Switching cabinet”:

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

- The cabinets must be delivered in the standard colour of RAL 7035 (light grey).
- Switching cabinets, terminal boxes, control boxes etc. outdoors or in particularly polluted environments must be made of stainless steel or glass-fibre-reinforced, unsaturated polyester, including a rain roof / rain protection and, if necessary, air-conditioning.
- Cable entries are allowed exclusively from below. Main switch (lock must be reversible from the outside);
- cabinet versions having a volume of more than 12 litres must be equipped with lighting including door contact (or LED light – saving costs ⇔ energy) and a country-specific socket as well as a shockproof socket.
- Each switching cabinet must be equipped with a temperature monitoring device (thermostat or sensor). In case of over- / under-temperature, a corresponding malfunction must be indicated (control system)
- Lock according to the installation and local regulations: Profile half-cylinder or two-way key bit
- Drawing slot in sheet metal design and mechanically fastened
- Equipment marking in switchboards: interchangeable, durable, non-detachable, temperature-resistant and machine-labelled.
- Reserve space for a new cabinet before commissioning:
  30% on mounting plate for e.g. miniature circuit breakers, drive controllers, safety devices
  25% in cable ducts
- Main and control circuits must be separated as far as possible in the switching cabinet
- Electrical components that are not touch-proof (IP20) must be covered with plexiglass

Operating, adjustment and display elements

Terminal boxes

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 switching cabinet without intermediate terminal box. Terminal boxes serve only as maintenance aids for e.g. drag chains, prefabricated machine assemblies, …

Terminal boxes must be mounted in an easily accessible location. The terminals must be labelled 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 switching cabinet. . The reference mark must be attached to the terminal box in a clearly visible position. If terminal/junction boxes are used as control/switching cabinets, the implementation guidelines as described under “Switch cabinet design” apply.

Exception:

- A power supply unit and a Profibus repeater are regarded as terminal boxes. However, a box with PLC periphery is considered a “switching cabinet”!
- An operating housing (touch panel, emergency stop button, operating buttons, …) is also considered a terminal box if no cooling is required.

Every terminal / junction box must be provided with door hinges and locks (two-way key bit, …). Opening downwards or sideways. Sufficient space must be provided for the terminal and connection area. At least 100 mm clearance between terminal and cable entry. Deep boxes and raised terminals facilitate connection. Two-tier terminals are not desired

Potential equalisation, EMC, shielding

The system must be designed with main and local equipotential bonding in accordance with all locally and specifically applicable regulations for the system. Each cabinet must be equipped with a connection point for the main equipotential bonding.

For special cabinets with increased EMC requirements (frequency converters, rectifiers, …), side panels, roofs, doors and other add-on parts must be connected to the body over a large area using earthing straps (braided bands).

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

Overvoltage protection

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

Labelling

All cabinets and boxes must have a location and system information label.

Cable entry

Cable entry must be provided using screws, cable entry grommets, connector grommets or plug-in bushings. Only one cable per bushing is allowed. In suitable environments, elastic clamping profiles in system construction are permissible. Open entry points must be sealed in accordance with the degree of protection. On the outside, only screwed connections can be used.

Fittings

Fittings must be functionally combined into power and switch cabinets. Fixtures are allowed only on mounting plates or carrier systems, with no exceptions. On doors, only fittings are permitted that are intended for installation in fronts (operating and display elements, measurement devices, etc.).

Colours

Wiring colours must be implemented according to local regulations. As long as the specifications do not contradict local regulations, the following colours must be used:

Power circuits		Black
Neutral wire		“Light blue” (RAL 5015, sky blue)
PEN, PE, grounding, potential equalisation lines		green/yellow
Power supply (230VAC)	230VAC	red (RAL 3000, flame red)
	0VAC	Colour spiral red/white
Control voltage 24VDC	24VDC	”dark blue” (RAL 5003, sapphire blue)
	0VDC	Colour spiral blue/white
Control voltage 24VAC	24VAC	brown (RAL 8003, clay brown)
	0VAC	Colour spiral brown/white
External voltage		orange
Control voltage, analogue signals, other low voltages (+5V, +12V, ±15V, ±10V, …) Shielded control cables must be used; for short distances where a shielded control cable is not advisable/possible, twisted cables must be used	+ Plus	lilac (RAL 4001, red lilac)
	– Minus	grey (RAL 7000 squirrel grey or RAL 7001 silver grey)

Manufacturers to be used according to equipment specifications

Cross-sections

Minimum wiring cross-sections must be implemented according to local regulations. The accumulation in the wiring ducts must be taken into account. However, at least the following requirements must be met:

- Power circuits: at least 2.5 mm²
- Control voltage: at least 1.0 mm²
- Control signals: at least 0.75 mm²

Only flexible lines are allowed. Analogue signal cables must be shielded in the cabinets and all the way to the assembly

Air conditioning

Air conditioning of the cabinets is permitted only with devices that ensure separation of the air circuits (indoor / outdoor) (heat exchangers, air conditioning units). A central switch cabinet ventilation (supply air at the bottom via hall ventilation and outlet filter at the top) is preferable. The air must be filtered, preheated, and dried if necessary. Heat calculation according to EN 61439 for switching cabinets must be annexed to the documentation. Each switching cabinet must be equipped with a temperature monitoring device (thermostat or sensor). In case of over-/under-temperature, a corresponding

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

Terminal blocks

Terminal block arrangement with appropriate space for cable routing, strain relief and shielding. One wire per terminal. With two-core wire-end ferrules; two wires per terminal are also allowed.

Operating, adjustment and display elements

Emergency stop control units must be secured against unintentional actuation (protective collar, hood). All operating and display elements must be designed uniformly for the entire system. Signal lamps must be designed as indicator lights with LED equipment matching the control units (same system). If control panels or operator terminals are outdoors and may be exposed to direct sunlight, they must be designed (protected, etc.) so that they can be operated with no impact, even in direct sunlight. Operating, control and display elements must be labelled in the national language. The sign must be machined and fastened with mechanical fasteners.

Actuator engineering

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

Consumer outputs

All consumer outputs must be dimensioned so that no damage to the components (overload release, breakers, etc.) occurs in the event of a short circuit. The settings must be documented in the electrical plan.

Soft start

Only soft starts may be used which have integrated bridging contacts and in which thermal destruction of the semiconductor elements is prevented by suitable protective devices. The settings must be documented in the electrical plan.

Frequency inverters

The manufacturer’s instructions and their installation guidelines must be observed. (distances, cooling, EMC, …)

The control of the inverters is to be activated via release, left-right signal, as well as via signal voltage 0 to 10 V. If any other controls are required (bus system), these must be approved separately.

In order to minimise mains feedback, appropriate frequency converters with integrated filters or external filters/chokes must be used.

On the outgoing side, appropriate filters / ferrite cores must be used to avoid interference. It has proven to be a good idea to select a filter for service (motor replacement), so that unshielded cabling is possible. The filter (ferrite core) as well as the connection terminals must be installed close to the frequency converter to ensure clear allocation and optimum cooling.

Network technology, bus systems, remote maintenance

Communication networks must be planned and implemented as fail-safe as possible (protected, separate installation, potential equalisation, …)

The following bus systems are permissible:

- Industrial Ethernet (to SCADA/MES control system)
- ProfiNET
- Profibus (if still expedient, or by arrangement)
- Modbus TCP (by arrangement)
- Other bus systems are subject to approval by the control engineering department of Collini Service!

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 will be provided by Collini if necessary (by arrangement)

8.6. Cabling/Installations

Power cables must be laid separately from control and measuring cables. The separation must be implemented with separate routing or dividers in the routes.

Analogue signal cables must be shielded. This shield must be connected on the field side with EMC cable screws over a large area.

Only specified and approved cables may be used for bus cables.

The reference mark must be attached to all connected devices and all connecting cables.

Signage must be corrosion-resistant and durable. Made of plastic, aluminium or stainless steel, depending on the environment. The lettering must be carried out by machine (high-quality printing, engraving, laser with contrast inscription, …) and fixed with mechanical fasteners.

8.7. Reference marking

The reference marking – also called equipment marking – is carried out according to the specifications in the document “Technical Delivery Specification Plants and Infrastructure – Reference Marking”[4] and, if applicable (criterion described in 12.2 P&ID diagram), is to be integrated into the P&ID scheme.

[4] The currently valid version must be independently requested by the Contractor from the Customer.

8.8. Electrical documentation

The electrical documentation must comprise at least the following components:

- (Cover page, table of contents, designation explanations, symbols according to IEC/EN60617, structuring and labelling according to IEC/EN81346)
- Circuit diagram, all-pole
- Terminal diagram, cable diagram
- Layout drawings for the switching cabinets (doors and fittings), terminal distribution, distributor and control boxes (doors and fittings).
- Heat loss calculation of the cabinets
- Parts / material list (manufacturer, manufacturer type, manufacturer order №, technical data,)
- Parametrisation and programming instructions and parameter lists etc.
- EU – Declaration of conformity
- Commissioning records/test records/acceptance records

Documentation formats

- Electrical engineering 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 are attached in Excel format or as evaluation in EPLAN.
- Photos in graphics format JPEG, minimum resolution 3.2M pixels
- Transmission of the digital documentation shall preferably take place as a download (cloud).

9. Control technology and control software

9.1. General

Surrounding conditions

To software that is developed for the fulfilment of requirements (specifications, orders, etc.) of the Customer and/or is necessary for the operation of the system, the following applies:

- The software must be documented after successful final acceptance (including source code) and submitted electronically to the Customer.
- Subsequent changes must include documentation and source code and be submitted electronically with versioning
- If special tools (apart from the defined standard tools) or software components are used for the development of the software, these must be approved in advance by the control engineering department of Collini Services. If these may be used, they must also be supplied. For these products, additionally the exact product and supplier names must be given.
- Self-developed blocked components/libraries will not be accepted; access to all data must be ensured.
- Reproducibility of the software based on the source code with standard tools or tools that are supplied or used must be ensured.
- Software products must be treated in the same manner as electrical and mechanical components of the system are, and must therefore be included into the parts list as well.

Development environment

The following development environment for PLC controls must be used:

Siemens, Step7 TIA Portal

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

The following development environment for visualisation 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 engineering department of Collini Service.

Interfaces (buses)

Interfaces must be monitored (error message in case of failure of the bus system, individual participants, etc.). The status of the interface must be shown in the display. The function of the interface must be checked by suitable measures (alive bit, checksums), or protocols must be used that ensure the function of the data transmission

9.2. Operating modes

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

Operating modes – Manual

In set-up mode, each actuator must be able to be controlled via a separate command. The basic and working position of the actuators must be signalled. The actuators must be locked against each other in such a way that no situations that are dangerous for people or for the system can occur. The missing condition for starting an actuator must be displayed as an operating instruction. Actuation of an actuator from the basic to the working position and vice versa should be possible only if all conditions for the movement are met. No OK parts can be manufactured in this operating mode. When manipulating OK parts through functions in set-up mode, these parts must be treated as NOK parts. If any set-up work is necessary in the protected area, the necessary set-up functions must also be available when the safety guards are open, using appropriate personal protection equipment. Appropriate functions/procedures must be implemented that make set-up easy for the operator. The set-up must be monitored for completeness and sequence and supported with operator instructions. Processes for set-up/tool changes may be started in set-up mode only if the required safety conditions have been met.

Operating modes – Semi-automatic operation

In single-step mode, only a contiguous sequence can be executed from a selection menu at this station (process unit, functional unit). The process steps for the selected function must be displayed. The module and its processes must be locked against each other in such a way that no situations that are dangerous for people or for the system can occur.

All sequences must be started explicitly after their selection, all protective devices are active, and only after the entire cycle has ended, the corresponding releases are granted again by the control system.

Operating modes – Automatic operation

In automatic mode, the entire system/machine must be operated as an assemblage. “Automatic start” is to be started only after it has been actuated; all protective devices must be active, and the “automatic mode” ends only with a “Stop”. The missing condition for starting automatically must be displayed as an operational message.

Definitions of “System statuses”: Traffic light functions

Standard for lights or flashing lights:

Continuous red light:	Emergency stop, stop
Flashing red light:	Malfunction
Continuous yellow light:	Machine protection released/open
Flashing yellow light: (parts shortage, empty system, …)	Operational message warns of an imminent system standstill
Continuous green light:	Automatic operation active

Flashing green light: Ready for automatic operation, automatic sequence stopped

Large warning lights – rotating beacons (without exception, only for the reporting and warning system of the waste water treatment system)

Red rotating beacon Malfunction – water stop – no waste water

Yellow rotating beacon Message and warning device

Blue rotating beacon Warning device of the tank storage – Tank level full

9.3. Operational and error messages

Unless otherwise requested by the Customer, the following operational and error messages apply:

Operational messages

- Operational messages are information about incorrect operation of the machine/system.
- Operational messages must be unambiguous.
- Operational messages must also be recorded or documented.
- Operational messages contain information for avoiding malfunctions.
- Operational messages are information about the machine/system status.
- Operational messages must not lead directly to a system shut-down.
- Operational messages must be timely and informative so that system shut-downs can be avoided.
- Operational messages inform the operator about the current execution of the function requested by the operator and provide an indication of the application of the respective function

Functionality of operational messages

- Operational messages must include help text that contains information for avoiding subsequent errors.
- The help text can be displayed automatically or by selecting a help function.
- Acknowledgement of operational messages is possible when the cause has been eliminated.
- A clear description with the reference to the reporting device/input must be provided

Error messages

- Error messages are the results of evaluations of the system status/process that deviate from expectations or do not allow execution, respectively.
- Error messages must be clearly identifiable (error location, error №)
- Error messages must result in an error response as required (stop, etc.).
- Error messages must be recorded, documented and archived.
- Error messages must be able to be classified in groups
- Error messages must not be able to be acknowledged automatically.

Functionality of error messages

- An unambiguous error description with reference to the reporting device to indicate the reporting input is to be provided, not the suspected cause.
- Only the malfunction may be reported, not the resulting secondary errors.
- In case of malfunctions, a help text must be provided that contains information for resolving the malfunction. The help text can be displayed automatically or by selecting a help function.

- Acknowledgement of malfunctions is possible only when 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 a malfunction and displayed.
- Error signalling systems of bus systems must be designed so that all individual components (valve terminals, bus modules, bus couplers, etc.) are evaluated separately and provided with error messages.
- Error messages from sensors must clearly describe the respective cause of the error. In each case, a distinction must be made between “not actuated” (sensor may be defective) and “still actuated” (possibly continuous signal due to defective sensor).

Design:

1. Module or unit designation

2. Error №

3. Description of error

4. Value / Unit

5. Location and operational equipment of the reporting device (electrical plan)

9.4. General control software policies

- The software structure is based on the system 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 rest of the software via clearly defined interfaces. This will enable simple replacement of the functions in system/machine conversions.
- Programming must be done symbolically.
- The implementation language of the sources must be German/English.

9.5. Interface to external purchasing systems

Data interface

The data interface port must be configured in advance for “third-party” controllers.

Alarm and message interface

All alarms and messages must be exchanged via the defined interface

Control and operating interface

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

10. IT

Issues relating to IT, such as interfaces to systems, communication with SAP, etc., are addressed in a separate document “Technical Delivery Specifications for Plants and Infrastructure – IT”[5] and are also part of the scope of delivery.

[5] The currently valid version must be independently requested by the Contractor from the Customer.

11. Mechanics

11.1. Steel constructions

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

Load details are to be indicated and logged in an overview plan for all floors in an easily understandable manner. A civil engineer must provide structural proof of the design!

Proof of the execution and quality assurance of steel structures must be submitted in accordance with EN 1090 EXC 1 – EXC 2. Steel structures such as stairs and railings must be designed and constructed in accordance with the applicable OIB guidelines

11.2. Welded constructions

Weld seams must be continuous. Local interruptions are prohibited.

11.3. Installations, pipeline construction

Installations and pipelines are to be labelled and subjected to a pressure test in accordance with country-specific guidelines; pressure lines are to be tested at least 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 also the cleaning media
- Temperature spectrum of the media concerned
- Pressure resistance to the specified maximum pressures
- Installations and fittings must be checked and marked before commissioning in accordance with the Boiler Act.
- Certificates and confirmations of the design and tests are to be handed over to the Customer upon commissioning.

The use of PVC material in pipeline construction is prohibited; PVC may be used only after explicit approval by the Customer. Connections must be carried out in accordance with the standards. Mixing of the material grade within a section is not permitted. This applies both to welded joints including welding wire and to screwed joints.

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

11.4. Tank construction

Vessels must be subjected to a pressure test in accordance with applicable guidelines. The following factors must also be taken into account when planning the tubs, containers and tanks.

- Resistance to the process media and also the cleaning media
- Temperature spectrum of the media concerned
- The design of the trays, containers and tanks is to be applied in accordance with the applicable standards with regard to statics, leak tightness and duration of use.

- Tray, containers and tanks for media which have a temperature in the process or temperatures which occur even briefly during use and are above 40 °C must always be designed and marked with thermal protection (insulated).
- Containers, trays or tanks to be placed directly on the floor including the 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)
- If the basement is used as a fire water retention basin, any containers, trays and tanks installed on the floor of the basement must be designed in such a way that they can also be secured against floating. This must therefore be taken into account in the design and structural analysis.
- Certificates and confirmations of the design and tests are to be handed over to the Customer upon commissioning.

11.5. Compressed air

Components operated using compressed air may be designed with max. 7 bar (absolute pressure) release pressure. If the release pressure is higher, the component must be replaced with a component that meets this specification, at no cost to the Customer.

11.6. Ventilation technology

The design of the supply and exhaust air system must comply 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 Customer:

- Heating requirement
- Cooling requirement
- Humidifying and dehumidifying
- Removal of emissions

Maximum permitted speeds:

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

Any deviating flow velocities are to be agreed with the Customer and, in case of non-compliance, adjusted by the Contractor at the latter's expense.

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

In the design of exhaust air ducts, special attention must be paid to the pressure drop. Arches 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 is to be calculated and enclosed with the offer. The energy efficiency of the entire system has to be expressed in mbar (pressure loss) including detailed breakdown of the larger units (silencers, heat exchangers, etc.).

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

Only fault voltage-controlled fans may be used. Step control is prohibited!

Meeting rooms, staff rooms, offices and other ventilated areas which are intended for people must be equipped with CO_2 sensors and regulated according to these.

11.7. Conveying technology

The Customer provides the possible contact media/temperatures and makes suggestions regarding the material if necessary. The Contractor must check the resistance independently of this, and report any resistance problems to the Customer. If the Customer requests a special make/type in the course of standardisation, this must be implemented if it is suitable for the process (resistance/process parameters). The Contractor must notify the Customer of any concerns regarding suitability.

11.8. Corrosion protection, colour design, insulation

Requirements

Harmonious colour design highlights the quality of the production systems and the products. The employee areas are the focus. They should be tidy, well-lit, and appealing.

Corrosion protection

The Contractor must ensure that the corrosion protection is provided for at least 15 years (EN ISO 12944-1, protection duration “long”; EN ISO 12944-2 corrosiveness category “C4”). As the corrosive environment in the processes of Collini can be aggressive, attention must also be paid to the corrosion protection on the outside of aggregates, e.g. pumps.

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

Minimum requirement:

Surface preparation factor:	SA 21/2 (according to EN ISO 8501)		
Corrosion protection:	80 µm	Number of coatings:	1
Topcoat:	200 µm	Number of coatings:	3

[6] Optimum energy efficiency range with defined volume flow. If no volume flow has been defined, the Customer’s design parameters apply.

Colour palette

As specified by the colour concept.

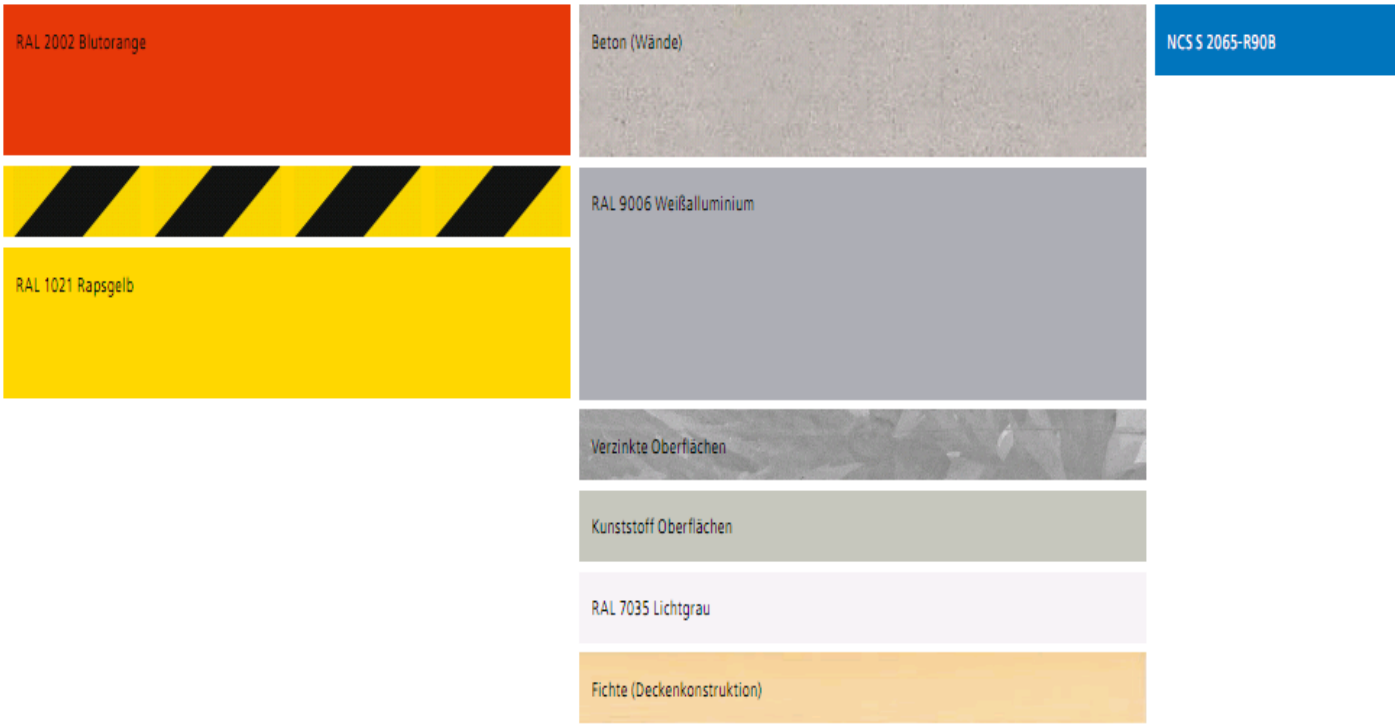
Any deviations must be agreed in writing with the Customer before implementation!

The colour palette must be sent to the employer for approval. Incorrect or non-approved coatings, including galvanised surfaces, will be charged to the Customer unless repaired during the project.

A breakdown of the colour palette used by Collini follows. This serves as an indication, but does not act preventively against a release by the Customer:

Component	Example	Colour
Moving parts of production (signal effect)	Transport trolleys, cross transporters, step-up and step-down substation, railings, protective grids, barriers…	RAL 1021 Rape yellow
Moving parts in logistics and routing	Crane and crane runway[7], lift trucks, floor markings, doors, ramps, gates, truck entrances, (border edge approx. 20 cm strips)	RAL 2002 Blood orange Or: Yellow-black stripes
Constructional parts	Tanks / reservoirs / trays (chrome steel, danger zone scanner) Constructional system parts Steel structures Gratings / bars Ventilation ducts Storage / Shelves …	See following picture
Aluminium parts	e.g. cable ladder	Anodised
Switching cabinets		RAL 7035 Light grey
Motors		RAL 2002 Blood orange
Marking, CI effect	Collini blue is used very sparingly as a marking colour, e.g. visitor guidance	NCS S 2065-R90B

[7] Depending on the size of the crane or crane runway also RAL 1021 Rape yellow. RAL 1021 < 1 tonne < RAL 2002



RAL 2002 Blood orange	**Concrete (walls)**
RAL 1021 Rape yellow	**RAL 9006 White aluminium**
	Galvanised surfaces
	Plastic surfaces
	RAL 7035 Light grey
	Spruce (ceiling construction)

Insulation:

When choosing the insulation, the following aspects must be taken into account: Energy saving, process control, system protection, personal protection.

The surface of the insulation must never exceed 50 °C, and no more than 100 W/m² may be lost through the insulation. Only CE-certified and fire-retardant insulating material is to be used.

Refrigeration lines must always be insulated.

If soft insulation such as ArmaFlex® is used, the insulation in the production area near process baths is to be painted for better cleaning. The fire behaviour of the insulation materials used must not be inferior to that of ArmaFlex®.

11.9. Mechanical Documentation

The mechanical documentation must contain the following content:

Assembly drawings/parts lists

Assembly drawings and, if necessary, exploded drawings must be attached to 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 are to be provided with weight specifications of the individual assemblies, transport plan, attachment points, load and service life specifications.

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

In case of costs incurred for design work, drawings are to be provided in the following format:

Component drawings:

Format: DWG and PDF

Assembly drawings:

Format: DWG and PDF

3D Models:

Format: STP

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

If special tools or other special accessories are required for operation of the system, these must be stated in the offer.

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

The scope and procedure must be agreed with the Customer.

Lubrication data sheets

The lubrication data sheet must comprise all information on lubricants and hydraulic fluids required for the operation of the machine/system.

Pneumatic and hydraulic circuit diagrams

Format: DWG and PDF

12. Process engineering

12.1. General dimensioning

The field of process engineering is part of the know-how of Collini. For this reason, no specific topics are listed here, but it is pointed out that especially systems and trades that accompany chemical processes may be designed only in consultation with our internal specialists.

12.2. P&ID diagram

A P&ID diagram, hereinafter also referred to as an “engineering scheme”, is to be prepared and sent to the employer as a PDF and DWG, provided that pipelines, fittings, equipment, etc. are included into the scope of delivery.

A P&ID diagram comprises the following information:

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

Lettering:

The lettering of the P&ID diagram must be done after presentation of the document defined under “8.7 Reference marking“.