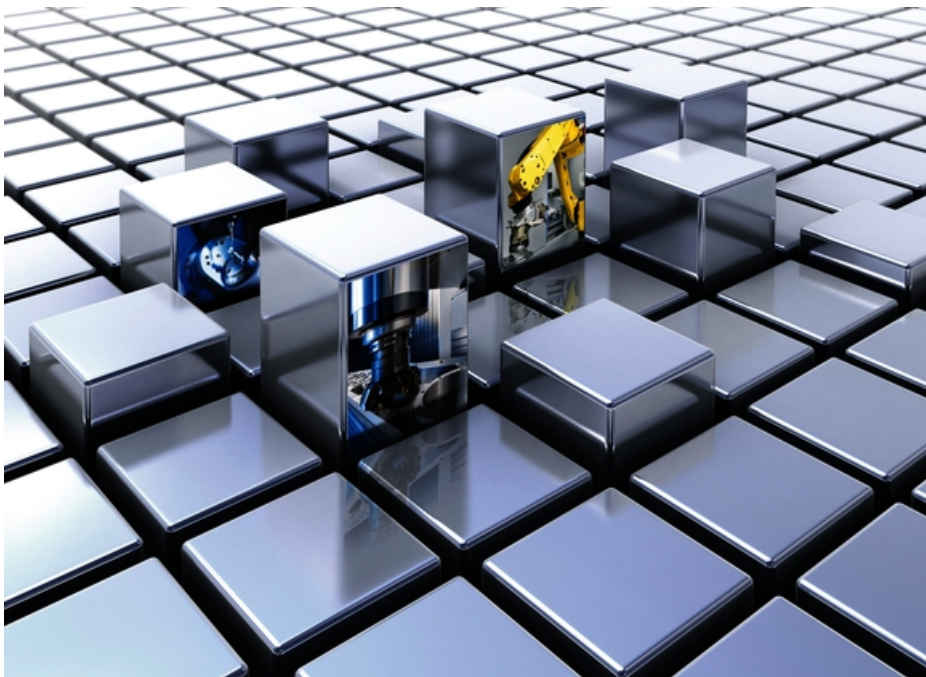


Technical requirements specification CHIRON Werke GmbH & Co.KG



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1 General part

1.1 Foreword

The creator of this document is:

CHIRON Werke GmbH & Co.KG

(referred to as **CHIRON** or **client** in the following).

This document describes the fundamental technical regulations and requirements of the client for the procurement, design and scope of services of the components, devices, automation and mechanical systems (referred to in the following as the **ordered object**) for the contractor.

1.2 Validity and scope

Compliance with the current technical requirements document is binding for the contractor. Deviations require the written approval of the client.

The most up-to-date version of the technical requirements document can be called up on the web page www.chiron.de.

Customer-specific requirements documents have priority.

1.3 Energy efficiency

The ordered object is to be designed so that it consumes less energy and media.

Consumables for regular operation, partial-load operation and wait state are to be specified.

Measures regarding the energy efficiency must be listed:

- Use of corresponding hardware (e.g. pumps, motors with IE3)
- Shut-off strategies in partial-load operation or wait state (short-term standstill)
- Long-term shutdown (e.g. weekend)

1.4 Order processing

If the contractor determines, based on his expertise, that he cannot provide the contractually agreed-upon services or only with limitations, the client must be notified immediately and a solution agreed upon.

General part

Applicable documents

1.5 Data exchange

Small amounts of data up to 10 MB can be transmitted via e-mail to the corresponding responsible person at CHIRON. Larger amounts of data are exchanged via the program "Cryptshare", <https://data.chiron.de>.

1.6 Applicable documents

- Preferred list of CHIRON components
- Purchase conditions of CHIRON Werke GmbH & Co.KG, Tuttlingen
- Confidentiality agreement of CHIRON Werke GmbH & Co.KG, Tuttlingen

2 Labeling and safety

2.1 Normative references

For execution of the order, the requirements valid at the time the order was put into circulation for the first time must be observed according to the product safety law [ProdSG]:

- EU directives and ordinances
- Laws and legal regulations
- Technical and other standards
- Generally recognizes rules of technology, which serve to protect humans, animals, the environment and buildings and systems from damage.

2.2 Declaration of conformity

An EC declaration of conformity according to Annex II, 1 A of the directive 2006/42/EC for machinery must be issued by the contractor for complete machines or machinery; this also applies to the labeling requirement according to other EU directives.

In the case of concatenation of machines, machinery and automation (also old systems), which are linked to one another with regard to function, control and safety, the CE marking must be carried out by the contractor.

Applied standards must be listed.

2.3 Declaration of incorporation

Deliveries of incomplete machines or machinery must be coordinated with the client before the contract is awarded.

For incomplete machines or machinery, the contractor must issue a declaration for the installation of an incomplete machine according to Annex II, 1 B of the directive 2006/42/EC.

If the ordered object is not functional by itself, the described interfaces must meet the basic safety and health requirements of the directive 2006/42/EC.

2.4 Risk assessment

If desired, the client can take a look at the risk assessment for the ordered object; this also applies to risk assessments of subcontractors of the contractor.

2.5 Functional safety

Safety functions

Realized safety functions according to EN ISO 13849-1 and their requirement rates are to be listed.

Labeling and safety

Other applied standards

The achieved performance level (PL) of the safety functions is to be given in an overview.

($PL_{\text{Nominal}} - PL_{\text{Actual}}$)

The detailed determination of the PL is to be presented on request (SISTEMA file).

Safety-related components

All safety-related components must be listed with the characteristic safety values given.

Examples for characteristic values:

- $B10_D$
- $MTTF_D$
- PL
- PFH

The safety equipment must be designed to last 20 years. Safety-related components which do not reach this service life must be agreed upon with the client.

Upon approval, these components must be identified with their expected replacement interval in the documentation.

2.6 Lag time determination

Two-hand switches or contactless protective mechanisms (e.g. light grids) are to be designed according to EN ISO 13855.

For mechanics controlled by the client, a control reaction time of 0.05 s for processing the signals must be taken into account.

2.7 Other applied standards

- EN ISO 12100
Safety of machinery; Basic terms, general principles for design, risk assessment and risk reduction
- EN 60204-1, VDE 0113-1
Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- EN ISO 13849-1
Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
- EN ISO 13849-2
Safety of machinery - Safety related parts of control systems - Part 2: Validation
- Other safety-related standards and regulations according to the risk assessment

3 Acceptance

3.1 Preliminary acceptance

At the contractor site

The client reserves the option for pre-acceptance of the ordered object at the contractor's site in consultation with him.

The deficiencies determined during the pre-acceptance must be fixed before delivering the ordered object. Deviations must be clarified with the client.

At the client site

Pre-acceptance at CHIRON takes place after integrating the ordered object in coordination with the contractor.

If the contractual agreements are not met during the pre-acceptance, the pre-acceptance will be repeated. Any costs involved with this are borne by the contractor.

Function verification

If the function of the ordered object is verified according to the task, it is considered accepted; this must be documented in writing.

The pre-acceptance of the ordered object does not constitute the final acceptance.

3.2 Set-up and commissioning

Set-up, installation, alignment and commissioning of the ordered object are done according to the respective contractual agreements and are to be coordinated with the client.

3.3 Final acceptance

The final acceptance is done in coordination with the end customer. The requirement for this is meeting the contractual agreements from the general, technical and project-specific requirements documents.

Acceptance

Final acceptance

4 Documentation

4.1 Documentation requirements

The documentation must be realized according to the legal requirements.

- EN 82079-1, VDE 0039-1
Preparation of instructions for use – Structuring, content and presentation
Part 1: General principles and detailed requirements
- CHIRON document ID10182
CHIRON implementation regulations for technical documentation
- Directive 2006/42/EC
Documentation regulations of directive 2006/42/EC for complete/incomplete machines
- Further applicable standards and regulations according to the order

4.2 Software

The software is to have a clearly organized, modular structure according to IEC 61131-3.

Software documents

- NC program description
- PLC program description
- Allocation lists
- Parameter lists
- Machine data list
- List of all alarms with the cause, effect and remedy
- Backup data carriers for recommissioning
- Software requiring license (if required)

4.3 Technical design documents

Plans and constructions must be created according to the valid standards.

The client can view the individual construction documents upon request before the beginning of assembly.

If construction plans are presented for approval, this does not release the contractor from the responsibility for a construction which is functional and state of the art. The approval only involves the design principle.

Technical documents

- Circuit diagram with control cabinet layout
- Fluid diagrams

Documentation

Replacement and wear parts

- Construction drawings
- Setup plan
- Device manuals
- Data sheets for the installed components
- Test protocols

4.4 Replacement and wear parts

Replacement and wear parts are identified by the respective piece list item of the assembly and is to be coordinated with the person responsible for this at CHIRON.

Code numbers for the replacement and wear part identification:

- 0 : No replacement part
- 1: Wear part
- 2 : Spare part
- 3: Additional replacement part
- 4: Metric DIN part

Example (Code number 1)

- Sealing elements, e.g. O-rings, quad rings, sliding elements, guide elements
- Collet chucks, spacers, driving tenons, springs, wipers on guide rails, gripper claws, toothed belts, plastic inserts
- Shock absorbers, proximity switches, lamps, batteries
- Filter elements (pneumatics, hydraulics, coolant, cooling system)

Example (Code number 2)

- Grippers, gripper arms, levers, pockets, magazine chains, bolts, circlips
- Oscillating or rotating components or adjacent parts, assuming they are subject to wear
Examples: Torsion stops, articulated levers, sliding bearings, roller bearings, curved pieces, guide and clamping bushes
- Cylinders (pneumatic, hydraulic)
- Valves (pneumatics, hydraulics, coolant), accessory parts, such as couplings, pressure transducers, support elements, screw fittings
- Electrical components, e.g. inductive, optoelectronic or electro-mechanical sensors, identification systems
- Clamping elements, e.g. swivel clamps, clamping chucks
- Components which have contact with the workpiece. Examples: Clamping jaws/claws and the pressure pieces installed here

Example (Code number 3)

- Components which are stocked by major customers, representatives or service support points, e.g. spindles, axis motors, spindle motors, ball screws, concertina guards, control components, electrical drive parts

Example (Code number 4)

- Fastening elements, such as screws, pins, nuts

4.5 Piece lists

All electrical, fluid and mechanical components are to be documented in piece lists.

In the event of wear and replacement parts, the ordering data with manufacturer information is to be provided.

Required documentation

- Piece lists
- Wear and replacement part piece lists

Documentation

Piece lists

5 Electrics

5.1 Electrical equipment

The electrical equipment, such as system sections, assemblies and components, must be state of the art at the time of acceptance.

The electrical equipment must be designed according to the currently valid version of EN 60204-1 (VDE 0113-1).

The design of the electrical installation and wiring is to be realized according to the relevant standards and regulations of electrical engineering.

Before handing over to CHIRON, the tests must be carried out in accordance with EN 60204-1 (VDE 0113-1) "Electrical equipment of machines". The test protocols are to be supplied.

5.2 Components

All components may only be installed in their original condition without modifications. Manufacturer regulations must be complied with.

Component subject to export licensing must be marked and identified separately. The corresponding documents are to be supplied.

Customer-specific requirements for components have priority; if there are no requirements, use components from CHIRON's preferred list.

Deviations

Deviations must be identified separately and be approved in writing by CHIRON.

Oral agreements are not binding. Applying the deviation to other orders is excluded.

For components which have to be used due to exceptional approvals, it must be made sure that these components can still be procured for a time period of 10 years after the final acceptance.

If this cannot be guaranteed, a fully compatible replacement part must be specified for each of these components. Affected components must be listed and submitted for approval.

Components which require testing

Components subject to inspection must be listed in an overview list and provided with the corresponding inspection intervals.

Customer protection

If components are subject to customer protection from the manufacturer, this protection must be lifted for our replacement part procurement.

Electrics

Electrical installation spaces (control cabinet, control panel, small housing)

5.3 Connection data and mains connection

The client must be notified of the connection data (maximum power, rated current, preliminary fuse) before delivery.

The mains connection of the machinery is to be designed analogous to the machining center. The specifications in the order are binding.

Germany:

- Connection voltage: 3x400 V / N / PE
- Frequency: 50 Hz
- Socket: 230 V (VDE-SCHUKO)

Other countries:

- Connection voltage: According to the specification in the order
- Frequency: According to the specification in the order
- Socket: According to the specification in the order

The mains supply cable into the control cabinet is installed by the end customer.

The cable entry point for the supply cable at the control cabinet must be recognizable in the setup plan. Preferably design this to be variable (e.g. at side or at bottom).

5.4 Main switch

Design the main switch in accordance with VDE0113:

- Mechanically actuated
- Lockable

The connection can be made directly on the main switch, or on terminals before the main switch.

When connecting with terminals, also provide additional terminals for the N conductor and protective conductor (PE) in addition to the external conductor terminals.

The terminals are to be labeled as follows:

- L1, L2, L3, N, PE
- Note "Live voltage"

Other connection variants are to be clarified with CHIRON.

5.5 Electrical installation spaces (control cabinet, control panel, small housing)

The color scheme of the electrical installation spaces is to be designed according to the order.

The control cabinet size and layout is to be in agreement with the design of the overall system. The control cabinet design must at least meet IP54.

Small housings made of plastic are not allowed.

Open threaded bores must be sealed with screw plugs.

Sealing screw connections for cable entries are to be designed in oil-resistant design and must not be mounted going upwards.

Transport lugs must be attached to free-standing control cabinets. A suitable document container must be installed inside the control cabinet for storing the plans and data carriers.

Closures on electrical installation spaces must have locks with a double-bit design. Version with 7 mm square is only approved for mechanical installation spaces.

The selection of a galvanized mounting plate or rail system is optional. Attachments to doors and side walls are not permissible. Installed devices must be replaceable without having to dismantle other parts.

When setting up the control cabinet, take the heat development and heat sensitivity of the components into consideration.

Housings that contain electrical equipment must be permanently marked by a warning sign with the high voltage symbol according to the ambient conditions in accordance with DIN EN 60204-1.

Only electrical components may be installed in the control cabinet or control panel.

The NC operating unit can be optionally installed in a separate control panel or the control cabinet housing.

5.6 Electro-technical installation

The design of the installation and line routing must be EMC-compliant.

Electrical interfaces of the individual systems are to be designed with plugs and labeled.

Connection lines to the individual systems must be laid in suitable, oil-resistant hoses, cable trays or sheet-metal ducts to mechanically protect them.

Protect cables in the chip area with steel mesh hoses with a PUR interior or with non-rusting sheet-metal ducts. Lines are to be routed using cable fasteners.

The removal of plugs and the disconnection/connection of individual cables for shipping or setup of the system is not allowed.

Protection against contamination

Plugs are to be installed in such a way that no liquid can penetrate.

To prevent the penetration of foreign objects in plug connectors, blind plugs must be included in delivery.

Round plug connectors may only be tightened with the provided special tools.

All lines and cables should be designed in PUR or be suitable for towing.

Electrics

Protective measures

Connection lines from analog switches, motors and encoder systems must be shielded.

Lines and individual wires must be permanently labelled at both ends with their destination designation.

Outgoing control lines must be routed to terminal strips, installation distributors or plug systems.

Only one line may be connected to terminal connections of terminal blocks.

Terminals and plugs are to be permanently labelled. Make sure there is agreement with the circuit diagram.

Unused wires in multi-wire cables are to be connected to terminals on both sides.

Ferrules for multi-wire connections are to be used. Push-in technology is to be preferred.

5.7 Wire colors

Defined wire colors for single wire connection based on EN 60204-1:

- Green/yellow: Ground wire
- Black: Main circuits, AC and DC current
- Red: Control circuits, AC current
- Light blue: Neutral conductor
- Blue: Control circuits, DC current (24 V DC)
Exception: DC current with load supplies with voltages greater than 24 V -> black.
- White/blue: Control circuits, DC current (0 V DC)
- Orange: Live circuits which are not switched off by the main switch (external voltage).
Mark with orange over the entire length (e.g. with orange protective hose).
Excluded from this is the protective conductor (green/yellow) and the neutral conductor (light blue).
Use single wires directly with orange insulation.

5.8 Voltage on the control circuit

The control voltage is 24 V DC.

5.9 Protective measures

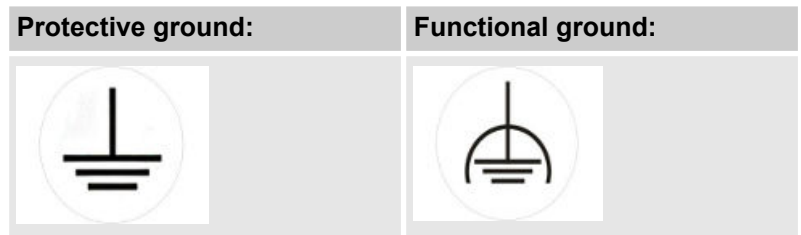
Warning signs for the electrical voltage are to be attached.

The shielding of signal and analog lines must be near the device and may not be used for equipotential bonding.

Protective conductors are to be applied individually and provided with destination labels.

Equipotential bonding is to be consolidated at a central location. Design according to the current EMC directive.

The protective and functional ground are to be distinguished and labelled according to EN60204-1.



DC voltage consumers with a load > 2 A must not be connected to control circuits and are to be protected with suitable fuses.

Transformers must be protected with motor protection switches on the primary side and with circuit breakers on the secondary side.

No safety fuses may be used to protect the current circuits.

No automatic re-start may be initiated after a power failure and voltage return.

The effectiveness of the protective measures is to be documented with a corresponding VDE measurement.

5.10 Safety switches for protective doors, safety fences

Wire the safety switches of protective doors and safety fences to the safety relay / integrated safety technology with 24 V DC on 2 channels.

5.11 Emergency Stop

The Emergency Stop circuit must have a 2-channel design and be wired with 24 V DC to a safety relay or integrated safety technology.

In the event of an actuation of the EMERGENCY STOP, every axis or movement is to be braked as quickly as possible. Drives must not run/coast down, but must be shut down by means of appropriate measures.

Emergency Stop command units must supplement other protective measures and not take their place.

The following items are to be coordinated with CHIRON:

- Emergency Stop concept for mode of operation of the Emergency Stop mechanism
- System parts which are shut down with Emergency Stop
- Number and installation location of the buttons

5.12 Operating equipment labeling

Operating equipment is labeled according to EN 81346-2.

Permanently and legibly label components inside electrical installation spaces at the installation site and on the components themselves.

Permanently and undetachably label electrical components (engraved or lasered) outside the installation spaces (switches, motors, valves, pressure switches, etc.) at the installation site and on the connection cable.

Concealed devices are to be additionally labelled on the coverings.

The component labels must agree with the circuit diagram.

Gluing labels is not permitted in the wet area.

5.13 Name plate

The nameplate must be made of metal and is to be fastened with rivets near the main switch.

Specifications must correspond with those of directives 2006/42/EC and EN 60204-1.

On surrounding fencing, a sign with the manufacturer specifications and CHIRON project ID is to be hung at a suitable place.

5.14 Control cabinet cooling

The system must remain fully functional at an outside temperature of 10°C to 40°C.

If required, a control cabinet cooling system must be installed.

6 Mechanics

6.1 Mechanical equipment

The mechanical equipment, such as system sections, assemblies and components, must be state of the art at the time of acceptance.

The fluidic equipment must be designed according to the currently valid version of EN ISO 4413 and EN ISO 4414.

The design of the fluidic construction and installation is to be realised according to the relevant standards and regulations.

6.2 Components

All mechanical components may only be installed in their original condition without modifications. Manufacturer regulations must be observed

Component subject to export licensing must be marked and identified separately. The corresponding documents are to be supplied.

Customer-specific requirements for components have priority; if there are no requirements, use components from CHIRON's preferred list.

Deviations

Deviations must be identified separately and be approved in writing by CHIRON.

Oral agreements are not binding. Applying the deviation to other orders is excluded.

For components which have to be used due to exceptional approvals, it must be made sure that these components can still be procured for a time period of 10 years after the final acceptance.

If this cannot be guaranteed, a fully compatible replacement part must be specified for each of these components. Affected components must be listed and submitted for approval.

Components which require testing

Components which require testing are to be listed in an overview. Discuss test dates with CHIRON.

Customer protection

If components are subject to customer protection from the manufacturer, this protection must be lifted for our replacement part procurement.

Service life

Design mechanical components such that a service life of at least 5 years is achieved in the case of 3-shift operation.

Exceptions only for components labeled as wear parts.

Precisions

The geometric accuracies of the components are to be designed such that smooth operation of the system is assured.

Mechanics

Servicing, maintenance

6.3 Construction safety

The construction must have a safe design in accordance with DIN EN ISO 12100.

6.4 Noise and noise measurement

The ordered object is to be constructed such that minimal noise development is guaranteed.

The action values and exposure limit values according to DIN45635 apply.

If the permissible limit values are exceeded, it is the responsibility of the contractor to make appropriate improvements.

If noise reduction cannot be achieved, the costs for noise reduction will be borne by the contractor.

Noise measurement, protocol

- Manufacturer
- Model
- Serial number
- Calibration date of the measuring device
- Measurement location, measuring point, measurement method
- Detailed specifications in acc. with DIN45635

Noise measurement, procedure

- Application of the enveloping surface method
- Noise measurement in the loaded and unloaded state
- Measuring point at distance of 1 m and at a height of 1.5 m
- Operate system at nominal load and normal operating conditions (e.g. automated)
Deviations (e.g. missing workpieces) must be documented
- Workplace-based emission values shall be determined and documented
- Noticeable noises, such as screeching, whistling, etc. are to be specified and noted in the log

6.5 Servicing, maintenance

After production approval, a replacement part list must be submitted within 4 weeks.

Documents for preventive servicing

- Servicing cycles in operating hours
- Work instruction and drawings for servicing
- Contact partner for preventive servicing

Maintenance cycle

The maintenance cycle must be complied with to keep the machining center in optimal condition.

At CHIRON, maintenance is planned in 4 cycles:

Tab. 1: CHIRON maintenance intervals

Interval	Examples for typical maintenance work
24 h	<ul style="list-style-type: none"> ■ Cleaning ■ Check coolant level, hydraulic oil level
250 h	<ul style="list-style-type: none"> ■ Machine cleaning ■ Check the operating pressure ■ Check various components for damage
2000 h	<ul style="list-style-type: none"> ■ Replace compressed air micro-filter ■ Clean/replace various filters ■ Lubricate ball screws and guides
6000 h	<ul style="list-style-type: none"> ■ Replace rotary feed-through ■ Replace lubricating element attachments ■ Checking the hoses ■ Emergency Stop function test ■ Carry out visual inspection on safety elements ■ Lamp test

The maintenance cycles of the external system components are to be adapted to the maintenance cycles of the CHIRON machining center.

Deviations must be justified and agreed upon with CHIRON.

6.6 Feed drives

- High positioning accuracy
- Design construction to be service-friendly
- Low noise development
- No jerking at slow speeds
- High static and dynamic rigidity
- Resistant to all disturbances and displacements
- Use of energy-efficient drives

6.7 Linear guides

- Do not grout screw bores in linear guide rails.
- Design the construction such that guide elements can easily be replaced during servicing.
- Select the sealing and lubrication of the guides appropriate for use.
- Equip the guides with additional wiper seals if there is contact with cooling lubricant and chips.
- Use low-maintenance, grease-lubricated guides

Mechanics

Cable drag chains

- Label guides with type specifications.
- Protect guideways from contamination.

Move along the entire guideway length at least 1x per day on feed units in the wet area. Otherwise, there is a danger of solid residues forming on guideway sections that are not constantly used. The residues can no longer be wiped off. This could result in potential damage.

6.8 Ball screws

- Ball screws are to be labelled with type specifications on the nut
- The option for manually adjusting the ball screw is to be provided
- It must be possible to replace the ball screw without having to remove adjacent components

6.9 Drive belts

- Use oil-resistant belts since media contact (oil, cooling lubricant, etc.) cannot be ruled out.
- Drive belts must be able to be retensioned.
- Document the belt pre-tension specifications.

6.10 Rack-and-pinion drives

- Design rack-and-pinion drives so that no foreign objects can remain lying on the toothing.

6.11 Linear direct drives

- Protect permanent magnets of the drive such that they cannot come into contact with media
- Point out the magnetism of the secondary parts with signs
- If there is a hazard due to the no-longer-existing self-locking of the drive, check the hazard situation and document
- Provide sufficiently dimensioned clamping elements

6.12 Cable drag chains

- Use lines and hoses which can be installed in cable carriers
- Route hoses and lines in separate webs
- No crossing of hoses and lines in the cable carrier
- Design hoses and lines so they have strain relief

- Observe the minimum static and dynamic bending radii of the manufacturers
- Make sure the routing and distribution is EMC-compliant

6.13 Lubrication

- Use maintenance-free elements; if not possible, then the lubrication is to be designed as automatic, pressure-monitored central lubrication
 - Individual lubrication points are permissible in the following cases:
 - Lubrication can take place while the machine is running.
 - Lubrication interval is longer than 4 weeks.
- At manual lubrication points, use tapered grease nipples in accordance with DIN71412
- Lubrication points and lubrication systems must be accessible for maintenance tasks and be refillable during running operation
- No individual lubrication points are permissible on systems with central lubrication
- Put up a lubrication plan with all lubrication points of the automation system at a suitable place so that it is visible. The lubrication plan must be designed to be language-neutral

6.14 Workpiece handling

- A manual feed of transport devices or pushing the parts on a belt system must also be possible if the drives fail.
- Design conveyor belts to be easily re-tensionable. Eliminate hazards, such as draw-in points, crushing points, etc.
- The grippers must be able to still securely hold the workpiece if the electrical, pneumatic or hydraulic energy should fail, as well as in an Emergency Stop situation.
- Provide an adjustment option for the workpiece device for handling units.
- Vertical handling units must be equipped with clamps or brakes.
- Portal frames must be adjustable via adjusting plates and adjusting screws.
- Design parts that come into contact with the workpiece such that the workpiece is not damaged. Deviations must be agreed upon with the client.
- The workpiece driver must be quickly and easily replaceable.
- Design a part storage place with a sufficient size and coordinate with CHIRON.
- Design part grippers with sensors for the "part in place" check of the workpieces.
- Include a description of the transport sequence with time specifications with the system.

Mechanics

Protective equipment

- The contractor is responsible for setting up and removing the system at CHIRON as well as at the customer.
- Permanently label the workpiece carriers with easily legible labels.

6.15 Protective equipment

- No functional modules may be mounted or fastened to protective devices
- Frequently used doors are to be fitted with hinges
- In the case of movable disconnecting protective devices, lockable safety switches with guard locking in accordance with CHIRON's preferred list are to be used

7 Devices

7.1 General information

This document describes the fundamental technical requirements of the client for the procurement, design and scope of services for the devices and associated components (referred to in the following as the **ordered object**) for the contractor.

Other applicable documents: "Technical requirements document, general requirements".

7.2 Request for proposal

CHIRON sends all relevant information to the contractor with the request for proposal.

The contractor can create a detailed offer based on this.

The construction costs are to be indicated as a separate item.

The delivery date specification is binding.

Confidentiality

See "Technical requirements document, general requirements", chapter "Other applicable documents".

7.3 Specification documents

The separate specification document is provided by CHIRON for every device order.

It is the working basis over the entire course of the project and is evaluated during the construction, approval and acceptance.

The contractor confirms the fulfilment of the applicable items in the approval documents.

If the specification document is not available at the time of approval, CHIRON will not give its approval. The date of submission is evaluated as "not complied with".

7.4 Milestone plan

For each device order, a milestone plan will be provided by CHIRON.

At latest 4 days after the order was received at the contractor, the order must be confirmed with filled out milestone plan.

The individual milestones are defined in reverse starting from the delivery date of the contractor.

If the order is accepted, the contractor obligates himself to comply with the defined milestones. CHIRON monitors to make sure the deadlines are kept.

7.5 Approval

- Approvals by CHIRON only involve the design principle. They do not release the contractor from his responsibility to design a construction which is functional and state of the art.
- The quality features defined by the CHIRON end customer are the basis for the design. It must already be obvious in the approval documents that these features have been achieved.
- For CHIRON approval, additional suggestions will be noted, if required.
The contractor will implement these suggestions and will send the 3D model and assembly drawing to the person responsible at CHIRON again.

7.6 Part numbers

CHIRON works with SAP.

The material number of the ordered object is assigned by SAP and is given in the order.

Manufacturer part numbers

The part numbers within the ordered components are exclusively managed by the contractor.

The contractor makes sure that his product-relevant documents can be allocated to the assigned part numbers.

7.7 Marking

The order includes the seven-digit CHIRON material number (SAP), among others.

This must be noted on the assembly drawing near the title block.

The ordered object must be permanently marked with the CHIRON material number and the part number of the contractor.

This marking can be the application of a corresponding label or engraving in the direct visual area.

Do not put any markings on the ordered object which allow inferences to be made about the contractor.

7.8 Capacity planning

When the order is accepted, the contractor must take his capacity into account.

Capacity planning is done with the goal of complying with the defined milestones.

Report capacity problems immediately to CHIRON so that a solution can be worked out immediately.

7.9 Contact partner

The responsible person at CHIRON is the contact partner for the contractor.

The contractor will appoint a contact partner for all technical issues.

Requirements:

- Technically competent
- Authorization for independent decisions

7.10 Acceptance

Preliminary acceptance

- For newly developed components, CHIRON will fundamentally carry out pre-acceptance at the contractor.
For recurring components, pre-acceptance is not mandatory. This decision is up to the person responsible at CHIRON and is noted in the order.
- Pre-acceptance includes the checking of all relevant items listed in the specification document.
Before the pre-acceptance can take place, the corresponding items of the specification document must be evaluated and filled out by the contractor.
The corresponding documents of the specification document must be filled out by the contractor and sent back to CHIRON before the pre-acceptance.

Measurement record

Compliance with the relevant and numbered inspection dimensions is indicated in an informational measurement record.

The numbers of the inspection dimensions are indicated in the measurement record.

The measurement record is sent in digital format to the person responsible at CHIRON after the pre-acceptance.

7.11 Technical documentation

7.11.1 Technical documentation, general

- When the component is delivered, the provisional assembly drawings and piece lists will be sent in digital format to the person responsible at CHIRON.
- The final documentation is a fixed integral part of the constructed component and is delivered immediately on request.
Only after the design is complete and satisfies the valid requirements document will any outstanding remaining payments be made by CHIRON.
- The specification document on which the order is based is taken into consideration for the document creation.

- Internal documents of the contractor can fundamentally be an integral part of the final documentation as far as the requirements demanded by CHIRON are met.
- The construction and development of the component is an integral part of the order and is included in the total costs. The complete documentation (e.g. construction drawings, assembly and component drawings, piece lists, etc.) will become the property of CHIRON and will be available to CHIRON without restrictions.
- The formatting of documents and templates (e.g. title blocks) are not prescribed as far as they meet the conditions demanded by CHIRON.
- PDF drawing documents should always be in black/white and in the original format size. Suppress layer colors during conversion.
- If project-specific documentation is required by the CHIRON end customer, the design and scope will be clarified during the start-up meeting. The extra expense that arises from this is offered by the contractor.
- Take any operating equipment regulations of the CHIRON end customer into account. Parts of this requirements document will be supplemented and/or replaced by the operating equipment regulations of the CHIRON end customer. These regulations are indicated in the order if required, or the person responsible at CHIRON will disclose them. The extra expense that arises from this is offered by the contractor.
- All changes and additions must flow into the final documentation. This also applies to items which were only implemented by CHIRON. The contractor will be notified of these changes by the person responsible at CHIRON.

7.11.2 Scope of delivery

7.11.2.1 General integral parts

The following documents are always an integral part of the scope of delivery:

Document / description	Format
Assembly, component and master part drawings	DXF and PDF
3D model of the overall assembly as a solid model	Parasolid or STEP
Piece lists for the assembly drawings <ul style="list-style-type: none"> ■ Identification of the replacement and wear parts ■ Information about the manufacturer and manufacturer part number 	XLSX and PDF
Measurement and test record for the contractual object	PDF

Document / description	Format
Measurement and test record for the master part	PDF
Installation and operating instructions of all installed catalog parts	PDF

7.11.2.2 Documents on request

The following documents are an integral part of the delivery on request:

Document / description	Format
Separate replacement and wear part piece lists with information about the manufacturer and manufacturer part number	XLSX and PDF
Set-up instructions	PDF
Maintenance instructions	PDF
Overviews of replacement parts	PDF

7.11.3 Piece lists

Piece lists must include the following information:

- ITEM no.
Corresponds to the item numbering in the assembly drawing
- Material number
Part number / Id. no. of the contractor
- Drawing number
Deviating drawing number in the case of production parts
- Revision status
Documentation option for chronological form
- Quantity
Quantity specification (piece number and unit)
- Manufacturer
For purchase parts, information about the manufacturer and manufacturer part number
- Replacement and wear part identification
Replacement and wear parts must be explicitly identified in the piece lists of the contractor.
See other applicable document: "Technical requirements document, general requirements".

7.11.4 Language

The contractor always delivers the documents in German and the additionally ordered languages.

Devices

Technical documentation > Structuring

Languages to be delivered can be found in the order or specification document. The translation reaches over the entire documentation.

7.11.5 Scheduling

Deadlines are given in the milestone plan.

Scheduling delay

If deadlines cannot be kept by the contractor and CHIRON is charged by the customer due to incomplete documentation or documentation delivered too late, CHIRON will pass this charge on to the contractor.

7.11.6 Structuring

The overall documentation is structured as follows.

The files and folders are named as described. Replace spaces with "_".

The documentation must always be delivered in this format. Integrate supplementary documents in other languages into this structure.

Key:

- **{Piece_list}**
= Name of the folder
- **CW no.** = CHIRON material no.
- **CT no.** = Number of the contractor

Tab. 2: General structure

Level 1	Level 2
{Assembly_drawing} Designation: CW-no._CT-no. e.g. 1408025_BG5432T	
{Component_drawings} Designation: CT no. e.g. ET4323T	{Components_with_workpiece_contact} Designation: CT no.
	{All_component_drawings} Designation: CT no.
{Piece_list} Designation: CW-no._CT-no._Piece_list e. g. 1408025_BG5432T_Piece_list	

Level 1	Level 2
<p>Assembly model</p> <p>Designation: CW-no._CT-no. E.g.: 1408025_BG5432T</p>	
<p>Other documents</p> <p>CT no. e.g. SD1234 (operating instructions, data sheets, etc.)</p>	
<p>Subassembly folder</p> <p>Folder naming: CT no. e.g.: BG5437H</p>	<p>Assembly drawing</p> <p>Designation: CT no.</p>
	<p>Component drawings</p> <p>Designation: CT no.</p>
	<p>Piece list</p> <p>Designation: CT-no._Piece_list</p>

Component

Every ordered component must be individually archived in a separate folder with the described structure. ↪ *Tab. 2 „General structure“ on page 34*

Devices

Technical documentation > Structuring

8 Machinery and automation



The ordered object is simply referred to as "system" in the following chapters.

8.1 Scope of services

- Selection and implementation of the automation concept, including the interface to the machine
- Independent coordination of the interfaces, cycle times and document exchange with CHIRON
- Development and delivery of the initial stacked pallet equipment (according to the order)
- Creation of the documentation according to CHIRON requirements
- Preliminary acceptance
- Installation, commissioning and acceptance of the system
- Setup and removal at CHIRON, re-setup at the end customer

8.2 Version

The following items must be coordinated with the corresponding CHIRON departments:

- Changes due to the workpiece or its handling
- Hand-held operating unit (depends on control type and configuration of the overall system)
- Signals to the CHIRON loader interface
- Bus system of the loader interface (Profibus/Profinet)
- Selection of servo motors and the control technology

Cable installation

Shielded cables must be used for the following components:

- Motors
- Measuring and encoder systems
- Bus systems
- Analog or other components susceptible to interference

8.3 Interfaces

The communication between the system and the CHIRON machining center goes via Profibus or Profinet according to the currently valid CHIRON documentation for the "Automation interface".

The corresponding bus coupler is integrated in the CHIRON machining center. The same bus system is to be used for other system participants.

Deviating bus systems are only permissible after consultation and with written approval.

The design of the interface, interface assignment or other interfaces between the system and the CHIRON machining center must be defined at the beginning of the project and approved in writing.

The following Harting components are intended for the interface:

- 24-pin attachment housing on the machining center:
Harting series 24B no. 09 30 024 0301 (hardware signals)
- 24-pin upper housing section for the connection line:
Harting series 24B no. 19 30 024 152 (hardware signals)
- 16-pin attachment housing on the machining center:
Harting series 16B no. 09 30 016 0301 (bus signals)
- 16-pin feed-through housing for the connection line:
Harting series 16B no. 09 30 016 0408 (bus signals)

8.4 Protective devices

The safety switches of the protective doors, safety fences and other safety-relevant protective devices are to be wired on 2 channels with 24 V DC for safety technology.

8.5 Emergency Stop

The Emergency Stop circuit must have a 2-channel design and be wired with 24 V DC to a safety relay or integrated safety technology.

If EMERGENCY STOP is actuated, every axis or movement is to be braked as quickly as possible. Drives must not run/coast down, but must be shut down by means of appropriate measures.

Emergency Stop command units must supplement other protective measures and not take their place.

Coordinate the following items with CHIRON:

- Emergency Stop concept for mode of operation of the Emergency Stop mechanism
- System parts which are shut down with Emergency Stop
- Number and installation location of the buttons

8.6 Malfunction and operation

If there is a malfunction on the system or if it is not possible to store a machined part, machining must be ended at the next "end of cycle".

If there are malfunctions on the system or machining center, create the option for diagnostics via correspondence.

A simple home position run of the system and machining center must be possible by means of a key. The necessary retraction strategies and the handling of workpieces currently being worked on must work from any situation.

Automation deactivation

The control of the machining center is superordinate to the control of the system, i.e. the automation cell can be deactivated by means of the key switch. The system must always be in its starting position then. Collisions are avoided this way.

Manual operation

Manual operation of the machining center must be guaranteed (function independent of automation) and coordinated with CHIRON. The valid safety regulations must be complied with.

8.7 Workpiece specifications

The system must be designed for the workpieces listed in the project-specific specification document.

If the workpiece specifications are not complied with or are changed within the course of the project by the customer, there might be impaired function within the system, requiring an adaptation of the system, possibly as far as a completely new construction.

All extra work involved with these named items must be borne in full by the party which caused them in this case.

8.8 Part supply and removal

The part supply and removal is to be realized and delivered according to the project- and system-specific specification document under the aspect of a technically and economically optimal design.

Clarify questions about the mechanical and electrical interfaces, machine change times and the exchange of the necessary documentation in cooperation with CHIRON.

Sequence:

- Unprocessed/premachined parts are supplied damage-free and correctly positioned to the machine interface.
- Machined parts are removed from the machine interface and supplied to the palletizing system or removal device, damage- and drip-free.
- The system is to be designed such that an autarchic run time of the overall system (machining center and system) is guaranteed in the remaining run time required by the customer.

8.9 SPC ejection and NOK handling (option)

Both the SPC ejection as well as the handling of NOK parts are to be considered as options which might be able to be implemented in relation to the project.

NOK parts must be able to be removed damage-free.

8.10 Emissions

Liquid-conducting line systems

Leaking liquid due to a burst line system must be prevented.

One solenoid valve each in the liquid-conducting supply and return lines is to be installed upstream of the system.

These solenoid valves must close when the system is shut off.

Collection tray

Media discharge (oils, cooling lubricants, other substances) from the system must be prevented by suitable design measures.

A collection tray must be installed between the system and machining center.

The collection tray is to be designed such that a negative gradient conducts the accumulating coolant into the collection tray of the system or that of the machining center.

Other collection systems are to be provided below the path of workpieces, workpiece carriers, other coolant-adhering components and any supports or portals; if necessary, use guide plates.

The collection trays, drip pans and guide plates are to be designed in such a way that no cooling lubricant can flow onto the hall floor and personnel.

Removal positions must be easily accessible.

In the case of removable collection trays, pay attention to the maximum weight as well as to handling during removal. The tray should have handles, which are to be correctly fastened with regard to position and ergonomics. No coolant may emerge at the fastening.

If the system is set up in a collection tray, the fastening of the setup points must be taken into account. The design must be such that no coolant can penetrate into the ground.

In general, the corresponding national regulations and laws must be observed, particularly those of the Department of the Environment regarding collection tray requirements.

Drawings of the collection tray must be presented to CHIRON. The transport option, material, size and collection volume must be taken into account in the design.

Customer-specific requirements, such as negative gradients are to be observed.

Aerosol formation

If blow-off operations are performed, e.g. in a separate station or with an open door, be aware of the problem of aerosol formation.

Such cases are to be clarified together with CHIRON about how the accumulating aerosol can be discharged.

If necessary, the end customer is to be informed about the formation of the aerosol. Coordinate the scope of delivery and design of the collection trays, drip pans and guide plates with CHIRON.

8.11 Quality requirements

CHIRON is a certified supplier of high-quality machining centers according to VDA 6.4. The quality of the products is ensured by a modern and effective quality assurance system. The quality expertise of the supplier is therefore taken into account when awarding the contract.

The contractor is regularly inspected after being awarded contracts to make sure that the quality requirements are met. The delivered systems are only accepted once the machine function and process capability are guaranteed.

8.12 Cycle time

The cycle times of the system are to be designed by the contractor such that the cycle time of the machining center is guaranteed. Here, a cycle time reserve of 15 to 20% for any potential later process optimization is to be taken into account. In the event of deviations or unjustifiable expense, this is written down in the machine-specific specifications document.

8.13 System utilization and determination period

If not otherwise agreed upon, the system utilization is planned as follows:

- 250 workdays per year, with 24 working hours per workday
- At the final acceptance, at least 80% should be achieved.
- After 4 months / 2000 operating hours, 93% must be achieved.

8.14 Availability

The technical availability of the machining center is determined based on the VDI guideline 3423. Only individual machines are considered, not concatenated systems.

A technical availability of 95% must be guaranteed by the manufacturer of the system without shift limits.

If the promised values are not achieved, how to further proceed will be determined in a shared meeting.

If the availability is greatly influenced by repeated malfunctions of individual components (latent defects) within the system, the warranty period will be extended by the time required to eliminate the malfunctions.

Machinery and automation

Availability

Required changes to the system as well as more extensive optimization and test phases will be charged to the contractor.

The following requirements must be taken into consideration and met by the user of the system:

- Exact compliance with all regulations from the operating instructions.
- Permissible machine use and preventive maintenance.
- Use of qualified personnel for operation, maintenance and programming.
- Identification of the cause of failure and time through conclusive documentation (e.g. PDA, printer, logbook, trace).

9 Robot systems

9.1 Robot system requirements

Purchased robot systems and automation systems must meet EN ISO 10218-1 "Safety requirements for industrial robots, Part 1: Robots".

Other applicable directives, standards, regulations and rules of technology must be complied with.

9.2 Integration of robot systems

Robot systems must be integrated according to EN ISO 10218-2.

Robot systems

Integration of robot systems

10 Preferred components

10.1 Exhaust fan (air filter)

Designation	Manufacturer	Remark
Exhaust fan	Camfil Handte APC GmbH LTA Lufttechnik GmbH	
Electrostatic air filter	Camfil Handte APC GmbH	
Wet separator	Camfil Handte APC GmbH	

10.2 Connection technology

Designation	Manufacturer	Remark
Sensor/actuator box	Phoenix Contact GmbH Murrelektronik GmbH Weidmüller GmbH & Co. KG	
Sensor/actuator line	Phoenix Contact GmbH Lumberg GmbH & Co. KG Murrelektronik GmbH Weidmüller GmbH & Co. KG Escha Bauelemente GmbH	
M8 / M12 plug connector	Phoenix Contact GmbH Binder GmbH & Co. KG	
Connecting terminal, terminal block	Weidmüller GmbH & Co. KG Phoenix Contact GmbH	
Pluggable connecting terminal, terminal block	Phoenix Contact GmbH Weidmüller GmbH & Co. KG	
Pluggable SUB-D module	Phoenix Contact GmbH	
Connecting terminal with diodes	Phoenix Contact GmbH Wago GmbH & Co. KG	
Connecting terminal with varistor	Phoenix Contact GmbH Wago GmbH & Co. KG	
Heavy plug connector	Harting GmbH & Co. KG	

10.3 Drive technology

The drive technology partly depends on the machine control. The drive components must be agreed upon with the person responsible.

Preferred components

Command and signaling devices

Designation	Manufacturer	Remark
Drive and control technology	Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation)	
Frequency converter	Siemens AG Kostal	

10.4 Protective door, drive

Designation	Manufacturer	Remark
Electric protective door drive (Sidoor)	Siemens AG	
Electric protective door drive, Servax	Landert Motoren AG	

10.5 Command and signaling devices

Designation	Manufacturer	Remark
Mushroom push-button	Siemens AG (22 mm) Rafi (16 mm)	
Push-button	Siemens AG (22 mm) Rafi GmbH & Co. KG (16 mm)	
Illuminated push-button	Siemens AG (22 mm) Rafi GmbH & Co. KG (16 mm)	
Signal lamp	Siemens AG (22 mm) Rafi GmbH & Co. KG (16 mm)	
Key-switch button	Siemens AG (22 mm) Rafi GmbH & Co. KG (16 mm)	
Key switch	Siemens AG (22 mm) Rafi GmbH & Co. KG (16 mm)	
Signal lamp	Werma GmbH & Co. KG	
Foot switch	Bernstein AG	

10.6 Lighting

Designation	Manufacturer	Remark
Work & loading area	Waldmann GmbH & Co. KG	24 V DC LED
Control cabinet lighting	Rittal GmbH & Co. KG	

10.7 Fire protection

Designation	Manufacturer	Remark
Extinguishing system	Kraft & Bauer Minimax GmbH & Co. KG Total Walther GmbH Rerucha GmbH Tyco Camfil Handte APC GmbH	
air shut-off flap	Kraft & Bauer Rerucha GmbH Camfil Handte APC GmbH LTA Lufttechnik GmbH	
Pressure-relief flap	Kraft & Bauer Rerucha GmbH Camfil Handte APC GmbH LTA Lufttechnik GmbH	

10.8 Pressure switch

Designation	Manufacturer	Remark
Pressure switch	IFM Elektronik GmbH Barksdale GmbH Festo AG & Co. KG Norgren GmbH	

10.9 Flow control device

Designation	Manufacturer	Remark
Flow control device	IFM Elektronik GmbH GHM Messtechnik GmbH (Honsberg)	

Preferred components

Manual pulse generator, hand-held operating device

10.10 Telecommunication

Designation	Manufacturer	Remark
Modem	Insys Microelektronics GmbH Phoenix Contact GmbH	
Router	Insys Microelektronics GmbH Phoenix Contact GmbH	

10.11 Filling level and flow monitors

Designation	Manufacturer	Remark
Filling level limit switch	Jola GmbH Microsonic GmbH Endress+Hauser GmbH & Co. KG	
Flow monitor	IFM Elektronik GmbH	

10.12 Housing (control cabinet, control panel and terminal box)

Closures for control cabinet doors and electrical distribution boxes are to be designed with double-bit locks.

Designation	Manufacturer	Remark
Control cabinet	Omega Blechbearbeitung AG Bader GmbH Rittal GmbH & Co. KG	
Control panel housing	Omega Blechbearbeitung AG Bader GmbH Rittal GmbH & Co. KG	
Terminal box	Rose Systemtechnik GmbH Bernstein AG Rittal GmbH & Co. KG	

10.13 Manual pulse generator, hand-held operating device

The manual pulse generator and hand-held operating device might depend on the machine control. Coordinate this with the person responsible

Designation	Manufacturer	Remark
Manual pulse generator	Euchner GmbH & Co. KG Heidenhain GmbH	
Hand-held operating device	Euchner GmbH & Co. KG Siemens AG Fanuc Deutschland GmbH	

10.14 Hydraulic unit

Designation	Manufacturer	Remark
Hydraulic unit	Bosch Rexroth AG Hawe Hydraulik SE	

10.15 Hydraulic accumulator

Designation	Manufacturer	Remark
Hydraulic accumulator	Hydac International GmbH Parker Hannifin GmbH	

10.16 Cable routing / protection

Designation	Manufacturer	Remark
Cable duct, cable channel	Omega Blechbearbeitung AG Pflitsch GmbH Häwa GmbH	
Energy chain	Igus GmbH Tsubaki Kabelschlepp GmbH	
Cable protective hose	Norres GmbH Reiku GmbH	

10.17 Cable wiring duct

Designation	Manufacturer	Remark
Cable wiring duct	Licatec (F2000) Tehalit BA6 duct	Control cabinet

Preferred components

Coolant unit

10.18 Cable screw fitting, cable feed-through

Designation	Manufacturer	Remark
Cable screw joint	Hummel AG Jacob GmbH Pflitsch GmbH	
Cable entry point	Icotec GmbH	

10.19 Marking

Designation	Manufacturer	Remark
Operating equipment labeling	Murrplastik GmbH Rosenbaum Phoenix Contact GmbH	

10.20 Terminal housing

Designation	Manufacturer	Remark
Terminal housing	Rittal GmbH & Co.KG Bernstein AG	

10.21 Control cabinet climate control

Designation	Manufacturer	Remark
Control cabinet cooler	Rittal GmbH & Co. KG	
Heat exchanger	Burn Engineering AG	

10.22 Coolant unit

Designation	Manufacturer	Remark
Coolant unit	Knoll Maschinenbau GmbH Bürener GmbH	

10.23 Cooling unit

Designation	Manufacturer	Remark
Cooling unit	Hyfra GmbH Rittal GmbH & Co. KG Burn Engineering AG Deltatherm Hirmer GmbH Hydac International GmbH	

10.24 Power and auxiliary contactor

Designation	Manufacturer	Remark
Power contactor	Siemens AG	24 V DC
Auxiliary contactor	Siemens AG	24 V DC
Overvoltage limiter	Siemens AG	

10.25 Lines

Designation	Manufacturer	Remark
Profibus lines	Siemens AG Erni GmbH & Co. KG	
Motor lines	Nexans Deutschland GmbH Igus GmbH	
Encoder lines	Nexans Deutschland GmbH Igus GmbH	
Connection lines	SAB Bröckskes GmbH & Co. KG Igus GmbH	
Control cabinet wiring	U.I. Lapp GmbH	

10.26 Line and motor protection

Designation	Manufacturer	Remark
Circuit breakers and accessories	Siemens AG	
Residual current circuit breaker	Siemens AG	
Motor protection switch	Siemens AG	

Preferred components

Engine

10.27 Measuring device (tool / workpiece)

Designation	Manufacturer	Remark
Probe	Blum-Novotest GmbH Renishaw GmbH	
Laser measuring system	Blum-Novotest GmbH	

10.28 Measuring system

Measuring systems might depend on the machine control. Coordinate this with the person responsible

Designation	Manufacturer	Remark
Length measurement system	Heidenhain GmbH	
Angle measuring system	Heidenhain GmbH Renishaw GmbH	

10.29 Motor throttle

Designation	Manufacturer	Remark
Motor throttle	Siemens AG Fanuc Deutschland GmbH Hans O. Habermann J. Schneider Elektrotechnik GmbH	

10.30 Motor interference suppression

Designation	Manufacturer	Remark
Motor interference suppression	Murrelektronik GmbH	

10.31 Engine

Motors might depend on the machine control. Coordinate this with the person responsible

Designation	Manufacturer	Remark
Servo motor	Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation)	
Linear motor	Siemens AG Fanuc Deutschland GmbH	
Spindle motor	Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation) Franz Kessler GmbH CHIRON GmbH & Co. KG	
Other motor	Siemens AG Grundfos GmbH SEW-Eurodrive GmbH & Co. KG Bauer Gear Motor GmbH Knoll GmbH & Co. KG K.H. Brinkmann GmbH & Co. KG AC-Motoren GmbH	

10.32 Line filter

Designation	Manufacturer	Remark
Line filter	EPA Antriebstechnik GmbH Siemens AG	

10.33 Position switch

Designation	Manufacturer	Remark
Multiple position switches	Euchner GmbH & Co. KG Balluff GmbH	

Preferred components

Lubrication

10.34 Terminal blocks

Designation	Manufacturer	Remark
Terminal blocks	Phoenix Contact GmbH Weidmüller	Push-in connection Where possible

10.35 Relay, safety relay, semiconductor switch

Designation	Manufacturer	Remark
Relay module	Phoenix Contact GmbH	
Optocoupler module	Phoenix Contact GmbH	
Safety relays	Pilz GmbH & Co. KG Euchner GmbH & Co. KG K.A. Schmersal GmbH & Co. KG Phoenix Contact GmbH	
Thermistor motor protection relay	Siemens AG	
Undervoltage relay	Dold & Söhne KG	
Monitoring relay	Dold & Söhne KG	
Time relay	Pilz GmbH & Co. KG	
Two-hand start relay	Pilz GmbH & Co. KG K. A. Schmersal Holding GmbH & Co. KG	



Observe switching cycles.

If more than 10^5 per year in 3-shift operation are to be expected:

Use switch elements (auxiliary contactor, optocoupler) or PLC outputs with a corresponding switching capacity.

10.36 Lubrication

Designation	Manufacturer	Remark
Grease lubrication	SKF Lubrication Systems Germany GmbH	
Oil lubrication	SKF Lubrication Systems Germany GmbH	
Minimal lubrication	Lubrix GmbH	

10.37 Interface

Designation	Manufacturer	Remark
Socket (combination)	Murrelektronik GmbH	
Interface (Combination)	Murrelektronik GmbH	USB, RJ45, SUB-D

10.38 Vibration sensor

Designation	Manufacturer	Remark
Vibration sensor with diagnostic electronics	IFM Elektronik GmbH	

10.39 Chip conveyor, chip screw

Designation	Manufacturer	Remark
chip conveyor	Knoll Maschinenbau GmbH Bürener GmbH	
Chip screw	Bauer Gear Motor GmbH	

10.40 Sensor system (proximity switch)

Designation	Manufacturer	Remark
Proximity switch, inductive	Balluff GmbH IFM Elektronik GmbH Pepperl + Fuchs GmbH Baumer GmbH	
Proximity switch, capacitive	Balluff GmbH IFM Elektronik GmbH Pepperl + Fuchs GmbH Baumer GmbH	

Preferred components

Safety technology

Designation	Manufacturer	Remark
Light sensor, optical (Light barrier)	Balluff GmbH IFM Elektronik GmbH Sick AG Wenglor Sensoric GmbH Keyence Deutschland GmbH	
Other sensors	Balluff GmbH Festo AG & Co. KG Norgren GmbH IFM Elektronik GmbH Siemens AG	

10.41 Voltage supply

Designation	Manufacturer	Remark
Transformer	Hans O. Habermann Siemens AG J. Schneider Elektrotechnik GmbH	
Power supply (stabilized)	Puls GmbH Siemens AG	
Buffer module, power supply	Puls GmbH Siemens AG	

10.42 Safety technology

Designation	Manufacturer	Remark
Safety switch	Pilz GmbH & Co. KG Euchner GmbH & Co. KG K.A. Schmersal GmbH & Co. KG	For holding closed with locking mechanism CTP-L1-AP-U-HA-AZ-SA or CET3-AP-CRA-AH-50X-SA
Multifunctional Gate Box MGB	Euchner GmbH & Co. KG	
Safety light barrier	Sick AG Keyence Deutschland GmbH	
Safety switch strip	Barger GmbH	

10.43 Fuses

Designation	Manufacturer	Remark
Fuse elements	Siemens AG	
Safety fuses	Siemens AG Siba GmbH	

10.44 Control technology

Controls might depend on the machine control. Coordinate this with the person responsible

Designation	Manufacturer	Remark
Control technology	Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation)	
Operating and monitoring systems	Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation)	
PLC I/O modules	Phoenix Contact GmbH Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation)	
Fieldline modules	Phoenix Contact GmbH	
Intergated safety PLC	Siemens AG Fanuc Deutschland GmbH Heidenhain GmbH (after consultation) Bosch Rexroth AG (after consultation)	

Preferred components

Disconnect switch (main switch)

Designation	Manufacturer	Remark
Bus system	Profibus (DP) Profinet (after consultation)	Other systems only after consultation
"Workpiece changer" control	Festo AG & Co. KG Peiseler GmbH & Co. KG	



Observe switching cycles.

If more than 10^5 per year in 3-shift operation are to be expected:

Use switch elements (auxiliary contactor, optocoupler) or PLC outputs with a corresponding switching capacity.

Remark: If switching cycles $> 10^5$ per year in 3-shift operation are to be expected for the relays, switch elements (auxiliary contactor, optocoupler or PLC outputs with the corresponding switching capacity) must be used.

10.45 Temperature monitoring

Designation	Manufacturer	Remark
Temperature sensors PT100	B+B Thermotechnik	
Temperature switches	Barksdale	e.g. hydraulics

10.46 Disconnect switch (main switch)

Designation	Manufacturer	Remark
Main switch	Kraus & Naimer Siemens AG	
Control and load switch	Kraus & Naimer Siemens AG	

10.47 Valve (hydraulic, pneumatic, cooling lubricant)

Designation	Manufacturer	Remark
Valve, hydraulic	Bosch Rexroth AG Hawe Hydraulik SE Bucher Hydraulics GmbH Sun Hydraulik GmbH	
Valve, pneumatic	Festo AG & Co. KG Norgren GmbH	
Valve terminal, pneumatic	Festo AG & Co. KG Norgren GmbH	
Valve, cooling lubricant	Müller co-ax AG Gemü Gebr. Müller Apparatebau GmbH & Co. KG	

10.48 Two-hand start

Designation	Manufacturer	Remark
Two-hand start	Pilz GmbH & Co. KG	

10.49 Counter

Designation	Manufacturer	Remark
Operating hours counter	Bauser GmbH & Co. KG Hengstler GmbH	
Piece counter	Bauser GmbH & Co. KG Hengstler GmbH	

Preferred components

Counter

11 Change history

11.1 Changes to requirements document

The technical delivery specifications are revised according to the status of the technical and standard development at irregular intervals.

Version	Date	Author	Remarks / changes
1.0.1	14.07.2017	GAM	Section 5.1 - Test records in acc. with EN 60204-1 (VDE 0113-1)
1.0.1	14.07.2017	GAM	Sections 5.2 and 6.2 – Component subject to export licensing must be marked
1.0.1	14.07.2017	GAM	Corrections of incorrect spelling in various sections, no technical changes
1.0.0	12.06.2017	GAM	Revision and release
0.3.0	14.11.2016	rub	Acceptance into the editing system
0.2.0-2016	21.09.2016	MECA/GAM	S8 and S9 completely revised
0.1.1-2016			Revision, addition, correction
0.1.0-2016	01.04.2016	GAM	Revision, addition, correction
0.1.0-2015	01.10.2015	GAM	First draft and subsequent revision, addition, correction

11.2 Change verification, preferred list

Version	Date	Author	Remarks / changes
1.0.1-2017	14.07.2017	GAM	Corrections of incorrect spelling in various sections, no technical changes
1.0.0-2016	12.06.2017	GAM	Revision and release
0.3.0-2016	28.11.2016	GAM	First draft in editing system and revision