

TECHNICAL DELIVERY SPECIFICATION

II Technical Equipment Instructions

TA07 Safety of Machinery, Environmental Protection and Fire Protection

Status 07/2015



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Modification Service

Status	Chapter / Page	Description of modification including name of the person responsible	Date
07/2015		The designation 'DIN' was deleted from all designations of international standards.	2014-11-15
	1 / 7	Modified: replaced "occupational" with " machine "	
	2 / 7	Added: " If information and warning notices must be attached to the machine/machine system due to the existence of residual risks, EN ISO 7010 shall be applied (Graphical symbols – Safety colors and safety signs – Registered safety signs (ISO 7010:2011)). "	
	2.1.1 / 7	Added: " valid EU Directives "	
	2.1.2 / 7	Added: " Upon request " Added: " For safety control systems or components with safety functions (e. g. safe drives) for which an examined and signed protocol (provisions of the component manufacturer) must be provided as proof of their safety status, the manufacturer shall hand over the protocol. The checksums of the protocol must correspond to the checksums of the machine. "	
	2.1.3 / 8	Modified sequence: Chapter 2.3.1 brought ahead Deleted: " Declaration of incorporation of partly completed machinery " Added: " installation instructions "	
	2.1.4 / 9	Modified: new chapter number due to insertion of chapter "Partly completed machinery" Deleted: "This technical delivery specification also applies to modifications (see I General Information, Chapter 1, Scope of Application)." Modified, final paragraph: changed "Chapter 2.1.3" to " Chapter 2.1.2 "	
	2.3 / 9	Added: " If protection devices (e. g. manual control units) are required for setup, service and maintenance work (e. g. troubleshooting), the Contractor must include them in the scope of delivery (see also TA01, Chapter 11.5 Programming devices). "	
	2.4 / 10	Modified title: replaced "Environmental impacts" with " Environmental protection "	
	3 / 10	Added, paragraph 1: " European ", " (e. g. C standards) "	
	4 / 10	Final two paragraphs added, modified: "Containers and baths holding hazardous substances or mixtures must be permanently (indelibly) labeled with the name of the medium used and a hazard sign. Pipelines carrying hazardous substances or mixtures must be permanently (indelibly) labeled with the name of the medium used and the flow direction. The conveyance of hazardous substances or mixtures in hose lines must be discussed with the Customer. "	
	5.1 / 11	Chapter "Noise" completely revised	
	6.4.1 / 14	Added: " The position of the transducer and the underlying haz-	

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		ard point shall be documented in the measurement report and marked on the machine. Information about the safety distance and overrun time shall be attached to the machine. An inspection tag is installed on the AOS. It may only be installed if the inspection was passed."	
	8 / 16	Modified, final paragraph: replaced "Customer" with " Contractor " and "Contractor" with " Customer "	
	10.1 / 17	Added, second to last paragraph: " With the entry into force of the national AwSV ordinance, which will replace the Federal State VAwS ordinances, the national ordinance shall be applicable. "	
	10.2 / 17	Added, paragraph 3: " (StawaR (steel tub guidelines)) "	
	12 / 18	Modified, paragraph 1: replaced "Federal Recycling and Waste Management Act" with "Federal Recycling Act"	
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1 Scope of Application

The technical instructions described here apply specifically for machine, environmental and fire safety requirements for the machine/machine system. They supplement the instructions listed in Chapter I General Information and all other Technical Equipment Instructions of the Technical Delivery Specification of ZF Friedrichshafen AG and alongside these, are valid for all ZF plants.

2 General Requirements

[If information and warning notices must be attached to the machine/machine system due to the existence of residual risks, EN ISO 7010 shall be applied \(Graphical symbols – Safety colors and safety signs – Registered safety signs \(ISO 7010:2011\)\).](#)

2.1 CE marking

2.1.1 Operable machines

The operable machine/machine system must comply with the fundamental safety and health protection stipulations of the applicable, [valid EU Directives](#) and it must have a CE mark in accordance with Annex II Declarations, 1. Content, A. EC Declaration of Conformity of the Machinery of the Machinery Directive (2006/42/EC). This shall also apply to the labeling requirement in accordance with other EU Directives.

All applied standards must be explicitly named in the EC declaration of conformity and the Declaration of incorporation of partly completed machinery.

In the case that a chain connection of machines and machine systems (also older equipment) constitutes an essential element of the order, then the Contractor who has received the order for the chain connection must participate in a joint CE marking process. The entire scope must be covered by the EC declaration of conformity.

2.1.2 Risk assessment

[Upon request](#), the Contractor (taking into account EN ISO 12100 Safety of machinery - General principles for design - Risk assessment and risk reduction) shall give the risk assessment to the Customer at the latest upon conclusion of the design/engineering phase. It is a part of the machine/machine system's technical documentation.

Design of control system safety shall be in accordance with EN ISO 13849.

[For safety control systems or components with safety functions \(e. g. safe drives\) for which an examined and signed protocol \(provisions of the component manufacturer\) must be provided as proof of their safety status, the manufacturer shall hand over the protocol. The checksums of the protocol must correspond to the checksums of the machine.](#)

The volume and the mode of operation of each safety function must be documented.

All parameters which are relevant and described within the context of EN ISO 13849-1, such as PL, MTTF_d, PFH, CCF, DC, T_{10d}, B_{10d} as well as the block circuit diagrams must also be de-

livered for the respective subassemblies or corresponding safety function used. It must be possible to see clear references between the elements of the block circuit diagram and the real components (e. g. through stating the equipment designation (BMK) in the respective block circuit diagram to a safety function).

Furthermore, the project planning for the safety functions with the IFA software "SISTEMA" as well as the protocols generated by SISTEMA must be delivered. The SISTEMA project status must be "green".

All components which fulfill safety functions must be unambiguously labeled in the equipment designation (BMK) with the suffix "SF". Additionally, a mark in yellow must be placed unambiguously and permanently (on and) next to these components. The equipment designation of the components in the circuit diagrams is to be applied in the SISTEMA project so that the components can be uniquely assigned.

From the Performance Level (PL) "d", the equipment must be designed for control category 3 (redundant design).

The MTTFd must be designed for the following operating times of the machine:

- Cycle time specified in the requirement specification
- Requirements for safety functions from setup frequency, interferences etc.
- 24 hours runtime per day
- 6 days per week
- 50 weeks per year

Replacement of safety components required for the necessary Performance Levels (PL) before the end of their statistical service life of 20 years is prohibited. Deviations must be released by the Customer.

2.1.3 Partly completed machinery (subsystems)

As a basic principle, the Contractor must deliver complete, standalone and safe machines with a CE mark and the declaration of conformity. If only incomplete machines (Declaration of incorporation of partly completed machinery in accordance with 2006/42/EC, Annex II Declarations, 1. Content, B.) can be delivered, this aspect must be discussed and agreed with the Customer prior to the awarding of the contract.

Machines/Machine systems that are not standalone as defined in the Machinery Directive (2006/42/EC) must comply with the basic safety and health requirements of the Machinery Directive (2006/42/EC) up to the interfaces described in the Contractor's technical documents (e. g. circuit diagrams, drawings, operating instructions, installation instructions). This is to be confirmed in the Declaration of incorporation of partly completed machinery. The incomplete machine is to be delivered with operating instructions (according to 2006/42/EC, Chapter 1.7.4 ff).

2.1.4 Modifications

The Customer must verify whether the modification is an essential change according to the interpretation paper of the BMA and the Federal States on the subject of Material change to

machines, publication by the BMA on September 7, 2000 - IIIc 3-39607-3. If the Contractor is aware of technical solutions which will not lead to a material change, then this should be discussed with the Customer. In the event of a material change, a new machine is created which needs to have a Conformity Assessment Procedure (CE marking) carried out on it by the Contractor. Rectifying defects which exist on the present machine which were possibly not known at the time of awarding the contract can not be charged to the Contractor. The Customer must be aware of the safety-related condition of the machine/machine system before planning a modification.

The Chapter [2.1.2](#) Risk assessment is unreservedly applicable for the scope of the modification, in the event of a material change, for the entire machine.

2.2 Obligations regarding monitoring, inspecting, disclosure and permission

The machine/machine system must be ready for operation when delivered. This includes in particular all necessary pre-operation inspections and authorizations acc. to the statutory provisions effective on the site.

The Contractor must inform the Customer in writing about the obligations regarding monitoring, inspecting, disclosure and equipment/parts subject to permission. If a regular inspection is required for the machine/machine system and/or its components, assemblies, devices, etc. (e. g. for centrifuges, pressure reservoirs, catch pans, cooling devices with contents of more than 3 kg, etc.), then it must also be listed in the technical documentation and separately in the operating instructions and maintenance instructions.

Any necessary inspection books and a separate list containing all equipment requiring inspection/monitoring (Annex 2 of this Technical Delivery Specification) must also be delivered with indication of the respective inspection intervals and included in the technical documentation of the machine/machine system.

2.3 Setup, service, maintenance work and troubleshooting

All standard activities linked to the operating conditions of the machine/machine system, such as setup, service and maintenance work, as well as troubleshooting, must be effected by the operating and maintenance personnel safely without manipulating protective equipment and, if possible, directly from the ground. Otherwise, the machine/machine system must have a safe ascent and a safe working platform installed (in accordance with EN ISO 14122 Sheets 1-4). If it is not technically possible to implement safe ascents and/or safe working platforms, then safe access and suitable anchor points (according to EN ISO 12100) need to be implemented. [If protection devices \(e. g. manual control units\) are required for setup, service and maintenance work \(e. g. troubleshooting\), the Contractor must include them in the scope of delivery \(see also TA01, Chapter 11.5 Programming devices\).](#)

2.4 Environmental protection

The unavoidable environmental impact caused by a machine/machine system must be kept to a minimum. Their type and scope must be named explicitly (e. g. waste, substantial emissions, noise). Any measures taken to prevent these from occurring must be documented.

All materials used in the machine/machine system must be recirculated in the material cycle or disposable in an environmentally friendly manner. Deviations must be discussed separately with the Customer.

When using fluids (cooling lubricant, hydraulic fluid, etc.), the seal integrity of all systems is especially important, in other words, the machine/machine system must not leak at any point in time.

3 Normative References

If there are any deviations from the applicable harmonized [European](#) safety standards ([e. g. C standards](#)), then documented proof must be presented that the same level of safety has been attained by different means.

As a basic principle, the requirements listed in document I General Information regarding normative references apply.

4 Hazardous Materials and Working Materials

With the comprehensive project-related quotation, the Customer is to receive all pertinent, safety-relevant information (Material Safety Data Sheet (MSDS)) and/or current EC material safety data sheets (REACH Ordinance 1907/2006) relating to hazardous materials and working materials which will be used. The documentation must be furnished for release purposes.

Each EC safety data sheet must be edited by the Contractor with regard to information about the

- intended use and
- frequency of use

and supplemented respectively.

Primarily, process materials must be used which have already been released by the Customer at the installation site. Information on VOC shares must be contained in the technical documentation. Adherence to the substitution provisions in accordance with the Hazardous Substances Ordinance is taken for granted. The ChemVerbotsV (German Chemicals Prohibition Ordinance) is also applicable.

Only components, assemblies and devices may be used with the machine/machine system that are free of CFCs, CHCs, asbestos and artificial mineral fibers with a carcinogenicity index $CI < 40$.

Only phosphate-free cables and wires may be used in the machine/machine system. Exceptions must be discussed with the Customer.

Containers and baths [holding hazardous substances or mixtures](#) must be permanently (indelibly) labeled with the name of the medium used and a hazard sign.

Pipelines [carrying hazardous substances or mixtures](#) must be permanently (indelibly) labeled with the name of the medium used and the flow direction. [The conveyance of hazardous substances or mixtures in hose lines must be discussed with the Customer.](#)

5 Physical Effects

5.1 Noise – Objectives of the Noise Emission Legislation

[\(Also refer to Annex 5 Measurement Report: Annex_5_Noise_Measurement_Report-2015.xlsx\)](#)

1. [The objective is to ensure and maintain low-noise and low-vibration workstations. To this end, ZF Friedrichshafen AG shall observe the national legal limit values for noise at the workplace of the respective locations. The basis for this is EC Directive 2003/10/EC that was transposed into German national law through the LärmVibrationsArbschV ordinance \(Noise and Vibrations Occupational Safety and Health Ordinance\).](#)
2. [The avoidance of noise emissions and the observance of national legal emission/immission requirements at the respective ZF locations. \(Germany: TA Lärm - Technical Instruction on Noise Protection\)](#)

5.1.1 Systems/Machines

[DIN EN ISO 4871 \(Acoustics - Declaration and verification of noise emission values of machinery and equipment \(ISO 4871:1996\); German version EN ISO 4871:2009\) serves as basis for the assessment.](#)

5.1.2 Machines and systems in closed workshops

[Workplace-related emission sound pressure level](#)

[Irrespective of the operating state of the machine/machine system, a workplace-related emission sound pressure level \$L_{pAeqT}\$ of max. 76 dB\(A\) shall be complied with at the workplace of the machine/machine system operator.](#)

[\(Determined according to DIN 45645-2, EN ISO 9612 and/or EN ISO 11 200 ff.\)](#)

Machine-related emission sound pressure level

Irrespective of the operating state of the machine/system, an emission sound pressure level L_{pAeqT} of max. 78 dB(A) shall be complied with within a distance of 1 m from the machine/system surface.

(Determined according to DIN 45635 ff and/or EN ISO 3740 ff)

Tone incorporation

Irrespective of the operating state, the emission of pronounced individual tones that are subjectively perceived as a nuisance is to be avoided. Emission sound pressure levels at the measurement locations which contain tonal components shall be documented separately in the inspection/acceptance protocol. (Determination/Assessment of tonal components is done purely subjectively.)

(Tonal component adjustment can be determined as per DIN 45645-2 or DIN 45681.)

Noise peaks

Irrespective of the operating state of the machine/system, single, short and irregularly occurring noise peaks must not exceed a level of $L_{pC,peak} = 135$ dB(C).

5.1.3 Machines and systems outside of buildings and closed workshops

This matter shall be coordinated with the Customer for individual projects. The requirements set out in Chapter 5.1.1 ff shall be observed.

All machines/systems that are to be installed outside of buildings as well as all supply/exhaust air and exhaust gas inlets/outlets and/or all lines or conveyor systems running outside of buildings and conveying solid, liquid or gaseous media must be designed with state-of-the-art mufflers and/or sound insulation. All system components must be mounted to buildings and other supporting structures including state-of-the-art vibration isolation.

The insertion loss, muffler and/or sound insulation for the machine/system that is to be procured must be designed such that the immission guide value night/day (as per the valid Technical Instruction on Noise Protection) applicable for neighboring buildings is not exceeded. Compliance with the immission guide value is assessed by ZF Friedrichshafen AG on the basis of the noise data provided by the supplier.

The sound pressure level (L_{pAeqT}) and/or the sound power level (LWA) shall be indicated as third octave spectrum. Documentation shall be provided for an operating point under full load as well as for a noise-critical operating point under partial load that is defined by the Customer. The impulsiveness of noise emissions shall be indicated.

5.2 Building vibrations

Machines and systems which may emit considerable building vibrations must be suitably decoupled in terms of vibration engineering. The Customer must be informed in good time of any measures it may be necessary to take regarding the building and these must be discussed with the Customer.

In order to prevent any impact on the neighborhood, the reference values provided by DIN 4150 must be met.

5.3 Use of energy / heat

Residual heat quantities dissipated via emissions must be quantified and used within the process as far as possible. Here, the Contractor will work out a concept for the use of heat and/or is obliged to actively cooperate in the establishment of such a document.

Measures and actions geared towards saving energy, in accordance with the state of technology, must be seized.

5.4 Electromagnetic fields

The Contractor is obliged to furnish information on the electromagnetic fields (EMF) of his machines/machine systems. If this information is not safety-relevant, then evidence has to be provided e. g. in the risk assessment. Otherwise, measurement values and exposition areas must be provided.

6 Machine Component Standards

6.1 Lasers

The Contractor must provide unambiguous information about the existing laser equipment.

Openly radiating lasers can be used only up to laser class 2M. If they are radiated in the direction of workers, then they may only be switched on when needed.

6.2 Robots

General information

Robots are to be equipped with a secure control unit min. in PL d.

EN ISO 10218 (Industrial robots), Parts 1 and 2 must be taken into consideration.

Size and properties of the protective fence

If a secure control unit is not available:

The protective fence must be higher than the mechanical scope of the robot. If this can not be realized, then the manufacturer must prove that the protective fence is (calculated to be) strong enough.

If the robot has corresponding axis limit switches or respectively axis stops, then the strength verification is not necessary.

The protective fence must be at least 2,200 mm high. The gap to the floor may be max. 200 mm. If there is any danger of parts being ejected by the robot, e. g. during overhead movements, this must be considered in the geometry (dimensions) and stability of the protective fence.

Access points to the robot cell

Preferably, a robot cell should only have one access point.

If several access points are required, control engineering is to be used to ensure that the robot drives are safely switched off if these additional access points are opened.

Test or teach operation may only be possible if the additional access points are closed.

On the outside of the access point, a holder for the manual programming device must be provided.

Test2 operation (moving the robot at process speed when the protective doors are opened)

For handling robots, Test2 operation (at process speed) should always be deactivated.

In the case of welding, gluing or similar application, the manual movement speed in Test2 operation should be limited to the necessary process speed.

Robot operating modes

Basically, the operating modes "Automatic" and "Setup" or "Teach operation" should be provided for in the robot control. If other operating modes e. g. "Manual loading of systems within the robot cell" are required, then these additional operating modes should be considered in the robot control unit.

6.3 Linear systems

Interlinking machines using gantry loaders which travel between protected areas.

Automatic mode

In automatic mode, it must be ensured that workpieces cannot be dropped or ejected. The gantry loaders are to be secured in PL d (control category 3) at minimum. Special attention should be paid to combined movements (e. g. turning and moving). If it cannot be ensured that the workpiece has been securely gripped, then additional measures need to be taken, e. g. on the guards.

Workplaces, passage ways or travel paths underneath the traverse path of the gantry loaders must be secured with guards of sufficient strength.

Safety distances as per EN ISO 13857 must be adhered to.

Setup/Service/Maintenance, including troubleshooting

Machine working areas which are traversed by the gantry loader and which have to be entered while the gantry loader is operating must be secured using mobile guards of sufficient strength.

For maintenance work, the manufacturer is to define a safe parking position.

Lowering the z-axis, e. g. if there is a power cut, must be prevented using control engineering and mechanical measures.

Safe access for maintenance and repair work must be ensured by the supplier (maintenance passage way, walkway, in accordance with Machinery Directive 2006/42/EC, Annex I, Chapter 1.6.2, EN ISO 12100, Chapter 6.3.5.6 and the EN ISO 14122 series of standards).

6.4 Protective equipment

6.4.1 AOS (active optoelectronic protective devices)

An overrun traverse measurement to calculate the safety distance is to be carried out on active optoelectronic protective devices (also known as non-contact protective devices, e. g. light

curtains, light grids) before carrying out the test run at the suppliers'. The Customer is to be sent the measurement report, according to the standards in Part I General Information, Chapter 6.2 of this Delivery Specification before the test run. [The position of the transducer and the underlying hazard point shall be documented in the measurement report and marked on the machine. Information about the safety distance and overrun time shall be attached to the machine. An inspection tag is installed on the AOS. It may only be installed if the inspection was passed.](#)

6.4.2 Two-hand control devices

The standards set out in Chapter 6.4.1 AOS are applicable analogously.

6.4.3 Protective fences

Protective fences must be attached to the floor. Attaching them to machine parts must be avoided.

Conduits (cable ducts), empty tubes, pipelines for energy supply etc. may not be attached to removable protective devices (e. g. segments of a protective fence) if access for maintenance or service work is only possible through these.

6.4.4 Screening grids

6.4.4.1 Strength

The strength of the screening grid used in the machine/machine system must comply with the latest version of these European standards

- EN ISO 23125 for lathes
- EN 12417 for machine centers.

The retention ability of the applicable screening grid must be ensured for every possible stress/load.

For all other machines/machine systems, the design must comply with the recommendation of the "screening grids" VDW working group in the absence of any relevant international standards.

6.4.4.2 Resistance

In the interior of the machine/machine system, screening grids (laminated glass made of mineral glass and polycarbonates) must be resistant over a minimum term of 5 years against coolants, vapors emitted by coolants, chips and other lifetime-reducing impacts. The replacement date must be stated visibly on the screening grids.

7 Fire and Explosion Hazard

A risk assessment of fire and explosion hazards from gases, vapors, mist (aerosols) and flammable dust shall be performed for machines/machine systems by the Contractor. In coordination with the Customer, the Contractor shall create an action plan to prevent or minimize damage associated with these risks. In the case of machines/machine systems with explosion areas, an explosion zone plan (classification of hazardous areas) must be supplied.

If explosive dust/air mixtures or vapor/air mixtures are evacuated or if such mixtures may be produced during the evacuation process, then the directives for explosion protection must always be taken into consideration.

If there is any risk of an explosion, additional (one or more) pressure relief flaps (EX flaps) are required at the machine covering. The pressure relief flaps are to be aligned in such a way that a pressure surge which escapes through them does not present any kind of hazard to people. Machine paneling must be designed to be shot-proof and flame-proof. The conditions later on at the point of installation of the machine/machine system (in particular fire protection) must be taken into consideration for the positioning of the pressure relief flaps. To minimize the spread of fires, housing seals are to be designed as labyrinth seals (door labyrinths). Moreover, it must be ensured that in the case of a deflagration/explosion, flames cannot get into the filter system via the evacuation equipment.

The filter systems (pipelines, filter material) must be made of non-flammable material. Baffles and flame barriers are preferable to fire shutters, in particular if there is central evacuation or should be used in addition. Machine-related inertizing extinguishers (e. g. CO₂ extinguishing systems) are to be incorporated into the evacuation system in agreement with the Customer (additional extinguishing nozzles). Installations to monitor the air flow volume must be provided.

8 Ergonomics

When designing the machine/machine system, all aspects of ergonomics must be taken into consideration.

For individual issues, the following, experience-based reference values have proven to be feasible:

- Loading and unloading height: 950 mm – 1,100 mm
- Screen (upper edge, top legible line): min. height 1,400 mm, max. height 1,650 mm
- Depth of legroom: min. 210 mm
- Insertion depth / gripping space: max. 450 mm
- Working spaces within machines/machine systems must be lit up appropriately for the respective task, but at least 300 lux.

If there are any deviations from these values, the [Contractor](#) must contact the [Customer](#).

9 Immission Control

The release of pollutants to the atmosphere is only permissible if it can be proven that recirculating the air is technically/economically not feasible.

The required evacuation and filter systems must already be separately included in the quotation. The requirements stated in the other sections of this delivery specification (e. g. TA02 Mechanics) and location-specific requirements must be considered. The decision on the type and design of an evacuation system shall be made coordinated with the Customer.

Agreements shall be reached with the Customer on how the limits regarding air pollutant control as defined by law shall be observed. The basis for these agreements are TA Luft (Air), TA Lärm (Noise), 26th BImSchV (Federal Immission Control Ordinance), the official zoning map for the installation site, the distance from the next closest residential building and, if available, the latest building development plan.

The machine/machine system working space must be designed so that air-polluting and environmentally hazardous materials do not escape.

10 Handling Materials Hazardous to Water

10.1 General requirements

If substances hazardous to water are used in the machine/machine system including all associated auxiliary equipment, then suitable protective equipment (e. g. catch pans) must be included in delivery. These must be designed in accordance with §§ 62 and 63 WHG (Federal Water Act) and Federal State VAwS (Ordinance on installations for handling of substances hazardous to water). According to Federal State VAwS, only specialists may be commissioned for their installation, setup, servicing, repair or cleaning. [With the entry into force of the national AwSV ordinance, which will replace the Federal State VAwS ordinances, the national ordinance shall be applicable.](#)

Proof of specialist licensing must be presented automatically to the Customer.

Special requirements for machines/machine systems in water protection zones must be taken into account after getting feedback from the Customer.

10.2 Retaining equipment

Collecting trays and drip plates below conveyor belts must tilt at least 3%.

The escaping substances must be recycled back into the machine/machine system. Deviations must be discussed with the Customer.

The volume and design of the pans or collection areas must comply with the Ordinance on Facilities For Handling Substances Hazardous to Water (national VAwS) valid for the countries in which the installation site is located ([StawaR \(steel tub guidelines\)](#)).

As a basic principle, floor drains are not allowed.

Retaining equipment must be durably sealed and media-resistant. The corresponding evidence (e. g. inspection certificates, static calculations, construction descriptions, licenses) must be provided to the Customer without being asked for.

When coating is used for the pans, the Contractor must comply with the building inspection permit (e. g. labeling the coating, engineering type license).

As a basic principle, the requirements of national VAwS, TRwS 779, DWA-A 786 and steel tub guidelines apply to the pans required by water law.

11 Cooling and Heating Systems

If cooling systems are required for the operation of machines/machine systems, then these must be designed to produce low losses and little wastewater. Materials to be used as auxiliary and additional chemicals must comply with Annex 31 of the Waste Water Ordinance.

The chemicals to be used require a special approval to be obtained by the Customer.

The following information must be provided by the Customer: additional chemicals to be used (generation of algae, corrosion protection etc.), wastewater volumes for regeneration, and the regeneration cycle.

Special requirements (e. g. installing a safety heat exchanger) must be coordinated with the Customer for cooling and heating the machines/machine systems, especially those systems using substances hazardous to water.

12 Waste

In general, the avoidance/minimization/use regulation of the Federal Recycling Act shall be observed (e. g. by extending service life of cooling lubricants in machines/machine systems or using maintenance-free filters).

Waste of any kind resulting from building measures, installation, mounting, or dismantling the machine/machine system must be expertly and legally disposed of in coordination with the Customer or the party commissioned with disposing of the waste (local Corporate Environmental Protection Officer). Transport containers are to be taken back by the Contractor after delivery.

13 Disposal of Machines/Machine Systems

In the technical documentation, the Contractor must describe how machines/machine systems are to be disposed of/disassembled after the end of their useful life and which special features are to be taken into consideration (Design of recycling-compliant technical products, VDI (Association of German Engineers) Guideline 2243).

Components, assemblies and devices must be recycled or disposed of in an environmentally friendly manner. Deviations must be approved by the Customer.

14 Energy

The machine/machine system must be designed to be energy efficient and run energy efficiently. In the quotation, the Contractor shall list any additional units that can save additional energy separately.

15 List of Abbreviations

- AD Working group on pressure vessels
- ATEX **AT**mosphère **Explosive**
- BGI Professional association information
- BGR Professional association's rules
- BGV Professional association regulation
- BImSchG Federal Immission Control Act
- BImSchV Federal Immission Control Ordinance
- BMAS Federal Ministry of Labor and Social Affairs
- CE Communauté Européene or Conformité Européene
- ChemOzonSchichtV Ordinance on materials which damage the ozone layer
- ChemVerbotsV The Regulation on Prohibited Chemicals prohibits or limits the distribution of hazardous substances, preparations and products in accordance with the Law on Chemicals

- DGUV German statutory accident insurance
- DIN German Institute for Standardization
- DWA-A Worksheet of the German Association for Water Management
- EC European Community
- [EU](#) [European Union](#)
- EN European Standard
- GUV Standards of the statutory accident insurance
- ISO International Standards Organization
- ProdSG Product Safety Act
- RL Guidelines
- TA Technical Instruction
- TRBS Technical regulations for operational safety
- TRGS Technical regulations for hazardous substances
- TRwS Technical regulations for water-hazardous substances
- VAwS Ordinance on Facilities For Handling Substances Hazardous to Water

- VDA German Association of the Automotive Industry
- VDA LVE Supply specifications for electric equipment of machines, machine systems and equipment

- VDE Association for Electrical, Electronic & Information Technologies
- VDI Association of German Engineers
- WHG Federal Water Act

16 Appendix: Other Applicable Documents

For orientation purposes, the Appendix states some of the important, legal, international and national provisions/directives without claiming completeness.

16.1 Globally valid standards

- EN ISO 4414 Pneumatic fluid power - General rules and safety requirements for systems and their components
- EN ISO 10218-1 Industrial robots - Safety requirements - Part 1: Robots
- EN ISO 10218-2 Industrial robots - Safety requirements - Part 2: Robot systems and integration
- EN ISO 12100 Safety of machinery - General principles for design - Risk assessment and risk reduction
- EN ISO 13857 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
- EN ISO 14122-1 Safety of machinery - Permanent means of access to machinery - Part 1: Choice of fixed means of access between two levels
- EN ISO 14122-2 Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways
- EN ISO 14122-3 Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guardrails
- EN ISO 14122-4 Safety of machinery - Permanent means of access to machinery - Part 4: Fixed ladders

16.2 European legal requirements

- Re 2.1 CE markings: Directives and standards

Directives

- Directive 2001/95/EC of the European Community on product safety in general
- Directive 2006/42/EC of the European Community on machines (Machinery Directive)
- EC Directive on Electric Operating Equipment (EC Low Voltage Directive 2006/95/EC)
- Directive 2004/108/EC of the European Community on electromagnetic tolerance
- Directive 97/23/EC of the European Community on pressure equipment
- Directive 2009/105/EC of the European Community on simple pressure containers
- Directive 94/9/EC of the European Community on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX Directive)

Standards

- EN 60204-1 Electrical equipment of machines

Design of screening grid strength, e. g. according to

- EN ISO 23125 Machine tools – Safety – Lathes (ISO 23125:2010)
- EN 12417 Safety of machine tools, machining centers
- EN 60825-1 Safety of laser products - Part 1: Classification of equipment, requirements and user guidelines

16.3 German legal requirements

In Germany, EC Directives are implemented by enacting the respective directives for ProdSG (Product Safety Act), EMC-G etc.

The Contractor is responsible for the proper functioning of the machine/machine system and for maintaining the regulations that are valid when the contract is signed such as e.g.:

- Product Safety Act (ProdSG)
- Interpretation paper on the subject of Entirety of Machines, - Publication by the Federal Ministry of Labor and Social Affairs dated 2011-05-05 – IIIb5-39607-3 -
- Water Management Act (WHG)
- German State Water Law and the national VAWS (Ordinance on installations for handling of substances hazardous to water)
- TRwS 779 (Technical regulations on water-hazardous substances) for systems used to handle water-hazardous liquid and solid substances
- DWA-A 786 Worksheet to TRwS 779
- Steel tubs guideline (StawaR)
- Waste Water Ordinance incl. Annexes
- Waste water statutes applicable to the installation site
- ChemOzonSchichtV (German Chemical And Ozone Layer Regulation)
- ChemVerbotsV (German Chemicals Prohibition Ordinance)
- Ordinance governing electromagnetic fields (26th BImSchV (Federal Immission Control Ordinance))
- Other laws applicable to the installation site
- State of the art, including:
 - EN standards
 - VDE provisions
 - DIN standards
 - VDI guidelines
 - VDI Guideline 2243, Recycling-oriented product development, Designing of recycling-compliant technical products, Basics and design rules
 - VDA guidelines
 - DGUV regulations/DGUV rules
 - BImSchG (Federal Immission Control Act)
 - 26th BImSchV (Federal Immission Control Ordinance)
 - TA Lärm (Technical Instruction on Noise Protection)
 - TA Luft (Technical Instructions on Air Quality Control)
 - AD 2000 regulations
 - Technical regulations (TRBS, TRGS, TRwS, ...)
- For technical execution
 - DIN 33411-5, Physical strength of man - Part 5: Maximal isometric action forces, Values
 - EN 13478, Safety of machinery, Fire prevention
 - VDA-LVE
 - DIN 45681, Acoustics - Determination of tonal components of noise and determination of a tone adjustment for the assessment of noise immissions

- DIN 4150, Vibrations in buildings

Including the standards, target specifications and recommendations contained therein. Currently valid German standards shall apply until they are replaced by harmonized European or international standards.

Special attention shall be given to:

- Drafting the inquiry and offer
 - VDI 2856, Standardized specification for inquiries and offers on machine tools

Professional associations' rules

- BGV/GUV A3, Inspection of mobile electrical operating materials
- BGV/GUV B11, Electromagnetic fields
- BGI/GUV-I 5048, Ergonomic machine design

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