

TECHNICAL DELIVERY SPECIFICATION

II Technical Equipment Instructions

TA08 Technical Documentation

Status 07/2015



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Modification Service

Status	Chapter / Page	Description of modification including name of the person responsible	Date
07/2015	2.1 / 5 4.1.4 / 9 4.1.5 / 9	Requirement of delivery of two copies of the documentation in the form of paper changed to one copy 'Function plans' section moved to later chapter, chapter number added (4.1.8), Electrical Engineering moved further down Added: (Annex 3) New text: The critical spare and wear parts shall be identified by the Contractor with the ZF ABC risk analysis for spare parts and wear parts (Annex 5) per type of machine. The analysis shall be conducted according to the ZF standard template and be made available to ZF after design approval/release, or at the latest before delivery approval.	2014-11-12
	4.2.2 / 11 4.8 / 14	Deleted: "(such as e.g. HNC by Festo, Rexroth...)" Modified paragraph 1: replaced "Occupational Safety" with " Safety of Machinery " Added: " EC/EU declaration of conformity/risk assessment The EC/ EU declaration of conformity and the risk assessment (upon request , taking into account EN ISO 12100, EN ISO 13849) shall be included in delivery." All modifications: Helmut Bach, ZBST dept.	
01/2013	1-17	Chapter adjusted for changed directory structure. Changes blue and underlined, ZBOE, Helmut Bach	2012-11-20
01/2011	1-16 4	Update, ZGM-B dept., Rita Gildemeier New folder structure	2011-01-01
06/2009	1-16 4	Update, ZGM-B dept., Rita Gildemeier New folder structure	2009-06-01
01/2008	1-16	Update, ZGM-B dept., Rita Gildemeier	2008-02-06
01/2005	1-14	Original	2005-01-01

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1 Scope of Application

The technical instructions described here apply specifically to the machine/machine system's technical documentation. They supplement the instructions listed in document 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

2.1 Scope and time of delivery

[One copy](#) of the technical documentation shall be delivered in the form of paper and on a data carrier. The scope and time of delivery of the technical documentation are defined in Annex 1 (Scope of Documentation) and must always be coordinated with the Customer.

For ready-for-operation delivery, all documentation required for commissioning/marketing (CE marking) must be available.

The scope and time of delivery of preliminary documentation are likewise defined in the Scope of Documentation (Annex 1).

2.2 Language

All documents shall be written in the language used in the location (in compliance with the European product directives). A separate agreement must be made with regard to choice of language for international sites (sites outside the EEA).

2.3 Structure

The technical documentation must be structured. Here, the folder structure predefined by ZF Friedrichshafen AG is binding.

Folder structure:

- 📁 **Mxxxx**
 - 📁 **00-General**
 - 📁 01-Operating Instructions
 - 📁 02-Maintenance Plan
 - 📁 03-Setup Instructions
 - 📁 04-Setup Documentation
 - 📁 05-Spare Parts and Wear Parts
 - 📁 06-Machine Setting Data
 - 📁 07-Third Party Documentation
 - 📁 **01-Electrical Engineering**
 - 📁 01-Circuit Diagrams
 - 📁 02-PLC
 - 📁 03-NC
 - 📁 04-Safety Control
 - 📁 05-Manuals - System Description
 - 📁 06-Interface Description
 - 📁 **02-Mechanics**
 - 📁 **03-Hydraulics**
 - 📁 **04-Pneumatics**
 - 📁 **05-Lubricating Technology**
 - 📁 **06-Cooling Lubricating Technology**
 - 📁 **07-Safety of Machinery, Environmental Protection and Fire Protection**
 - 📁 **08-Protocols**
 - 📁 **09-ZF-Internal Documentation**

2.4 Format of documents

As a basic principle, the format of the respective documents in technical documentation must be coordinated with the Customer.

Subject to the Customer's input, all documents – except drawings – shall be created preferably in DIN A4 (acc. to DIN EN ISO 216).

Drawings in the technical documentation must be produced at least in DIN A3 (acc. to DIN EN ISO 216) or original size. All drawings must be legible.

2.5 Document filing

The documents must be grouped in stable files or ring binders made of cardboard with 4 rings and include a table of contents and register (including third party documentation).

Documents appearing in a format larger than DIN A3 must have reinforced holes.

To the extent described in Annex 1 of the technical documentation, documents must be delivered in sheet protectors/plastic pockets.

2.6 Marking

The Customer must be consulted about how the file binders shall be labeled, or the binders shall be labeled according to the Customer's specification respectively (amongst others using ZF machine number, ZF operating materials numbering system).

The files must be numbered in sequence incl. the total number.

2.7 Revisions and modifications

All changes made to the machine/machine system during manufacture, installation, assembly, startup and trial operation at the Customer's site must be immediately added to the relevant technical documents by the Contractor.

The final technical documentation must match the state of the machine/machine system at the time of final acceptance.

If at a later time, which may even follow the warranty period, it is discovered that the documents provided by the Contractor do not match the delivered object, the Contractor must pay for any reworking or replacement of the technical documents.

Provided nothing else has been agreed to with the Customer, any changes, expansions or modifications to existing machines/machine systems shall be made in the relevant technical documents with the original drawing and designation system.

2.8 Filling out the labeling fields

Filling out the labeling fields in the documents (e. g. ZF numbers in drawings) is part of the scope of delivery. Labeling specifications must be discussed with the Customer.

3 Normative References

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

4 Contents of Technical Documentation

4.1 General

4.1.1 Operating Instructions

The requirements from the Machinery Directive and applied standards shall be considered in the operating instructions.

The operating instructions must also include all necessary information on how the machine/machine system can be re-set to home position or be re-started after a malfunction.

Furthermore, all operating station functions (initiated both via switch elements as well as via visual display) must be described along with any important information with regard to reciprocal interlockings.

4.1.2 Maintenance Plan

In the maintenance plan register, among other things, the operator's maintenance plan, the maintenance instructions and the service and maintenance plan are to be filed.

Operator's maintenance plan

The operator's maintenance plan contains the inspection and maintenance work to be performed by the operator. If applicable, the respective form from the Contractor shall be used.

All necessary/planned steps including steps by subcontractors and suppliers must be compiled in a central list. Otherwise, the Customer is not required to observe them.

Maintenance instructions

Special information on expert inspection, maintenance and repair of the machine/machine system. Diagnostic aids, error lists and detailed error descriptions in the case of malfunctions.

Also a list of necessary project planning software (e. g. for visual displays, axis assemblies, frequency converter) and communication software (e. g. for CPs, COM software).

Also include any necessary adjustment and alignment aids for machine components.

Service and maintenance plan

The service and maintenance plan contains the inspection and maintenance to be performed by the maintenance technician. If applicable, the respective form from the Customer shall be used.

All necessary/planned steps including steps by subcontractors and suppliers must be compiled in a central list. Otherwise, the Customer is not required to observe them.

4.1.3 Setup Instructions

Description of an optimal setup process.

4.1.4 Setup Documentation

Operating sheet (job card) for spatial and installation planning

The operating sheet for spatial and installation planning ([Annex 3](#)) must be filled out based on the Customer's template. Any changes must be updated immediately.

Transport, installation and assembly instructions

The technical documentation shall contain information on proper transport, installation and assembly.

Foundation drawings

The basic requirements for the foundation are to be included in the foundation drawings (stiffness, recesses, precision, loads in general and at specific points, calculation results dynamic).

The Customer will define the main axes X, Y for the dimensions based on the respective plant system. All dimensions must be based on these axes and heights.

Installation plan/layout

Installation plan and layout of the machine/machine system based on the Customer's template. A complete as well as an abridged version is to be delivered in each case.

If statics are required and commissioned by the Contractor, they must be included in delivery.

The following points are to be observed:

- Drawing to scale
- Format: DWG (or DXF)
- Maintenance interfaces drawn in
- Contents reduced to a few external contours
- User interface (side) must be visible
- Machine axes drawn in
- Statics: data on static and dynamic loads and location of impact.

4.1.5 Spare Parts and Wear Parts

[The critical spare and wear parts shall be identified by the Contractor with the ZF ABC risk analysis for spare parts and wear parts lists \(Annex 5\) per type of machine. The analysis shall be conducted according to the ZF standard template and be made available to ZF after design approval/release, or at the latest before delivery approval.](#)

4.1.6 Machine Setting Data

This includes setting parameters like pressures, flow volumes, parameter lists for electric systems and workpiece-specific data.

4.1.7 Third Party Documentation

The technical documents of assemblies and components provided by subcontractors such as control components, chip conveyors, measurement control, servo valve, etc., shall be included in delivery and if necessary filed separately. These documents must include setting information and function descriptions.

Providing general catalogs is not sufficient.

4.1.8 Function plans

The functions are to be described as defined in DIN EN 60848. The on and off conditions and control and locking conditions must be clearly stated.

The function plan must essentially contain: the function process/sequence, mechanical ratings, drive ratings, auxiliary device ratings and a brief description of control bodies inasmuch as they are hydraulically, pneumatically or electrically operated.

Parts that are not included in the Contractor's scope of delivery must be identified in the function plan.

The function plan must be extensive enough that the electric control can be implemented based on this description.

A function description shall be added to the function plan at the request of the Customer.

4.2 Electrical Engineering

4.2.1 Circuit Diagrams / Parts List [BoM]

The circuit diagram as well as the parts list and its description must comply with DIN EN 61 082.

Create in E-Plan, version P8 or later, if not available as agreed.

The structure should at least contain the following:

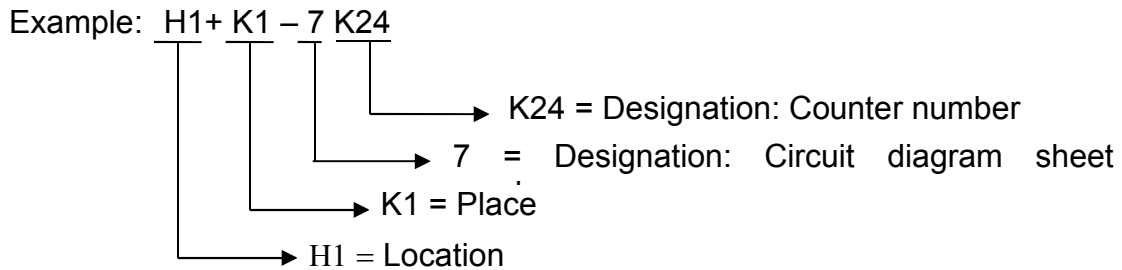
- Cover sheet
- Supplements/Comments (with order data, wire colors, fuse protection, performance data, software and software versions used)
- Table of Contents
- Change Index
- Switch cabinet design drawings
- Mounting plates, panels and terminal boxes; assignment diagram of components outside of switch cabinet; circuit diagrams; routing diagrams signal exchange; installation plan, connection diagrams and terminal diagrams
- Parts list with manufacturer data.

The following information must be included in the circuit diagrams: voltages, frequency, rated currents of fuses, ratings and settings (e. g. motors, etc.)

Bus structures and the hardware setup of the visual display system shall be depicted in the circuit diagram.

The delivered hardware and firmware version and the hardware setting (DIL switch) shall be noted in the circuit diagram for all intelligent assemblies (also PC).

Component or location identification must be based on location or sheet.



(ZF sample templates can be provided upon request)

The PLC inputs/outputs shall be illustrated as a linked, continuous block.

The designation between sensor/actuator level and PLC/control must be intuitively consistent/uniform.

4.2.2 PLC Documentation

The PLC programs must be saved as S7 project and delivered on data carriers.

Hard drive contents of PC-based systems (e. g. robot control units) must be delivered as a hard drive image on a data carrier.

The program printout in PDF format must contain the following:

- Assignment list
- Step chain structure with and without actions
- Organization component (OB1, OB100)
- Function components (FC, FB without standard FB)
- Reference list
- Bus structure (participant overview)
- Third-party elements

4.2.3 NC Documentation

The NC documentation includes:

- A security CD. The format must be coordinated with the Customer.
- Volume production startup files of NC and PLC
- PLC program as S7 project
- NC programs and all data relevant to the operation of the machine/machine systems.

4.2.4 Safety Control

For the safety control program, all passwords must be provided.

The validation documentation must also be supplied.

4.2.5 Manuals and System Descriptions

A basic software license shall be included in delivery for all operating systems, visual display systems and software of all programmable systems.

The scope of delivery includes manuals and system descriptions, installation disks, bootable media, drivers used (GSD files), the description of structure/file storage.

4.2.6 Interface Description

The interface descriptions shall be coordinated among the Contractors and submitted for approval. They must be incorporated in the documentation of both contractors. The designation and pin configuration must be uniform.

4.3 Mechanics

Assembly drawing/Parts lists [BoM]

The assembly drawings and, if applicable, exploded drawings must clearly show how the components can be dismantled and assembled. The reference to the parts list must be indicated.

Subassembly drawing/Parts lists [BoM]

Drawings of assemblies with weight data shall be made for the individual assemblies, transport plan, connection points, load data and service life data.

Workpiece-specific accessories, production resources and tools, machining plan

The Contractor must coordinate the scope and procedures with the Customer.

4.4 Hydraulics

Circuit diagrams/Parts lists [BoM]

Circuit diagrams and parts lists shall be created as defined by DIN ISO 1219-2. (E-Plan)

All electrical devices must be listed that have a functional relation to the hydraulic assemblies. For larger or more complicated production equipment, the diagrams shall be structured based on function groups.

The valves mounted on plates or in links shall be depicted on the circuit diagrams according to location/position. The pos. no., electrical designation and triggered functions are also to be included.

Upon agreement with the Customer, pipes and connections shall be depicted in the installation diagram for extensive, large-scale systems.

4.5 Pneumatics

Circuit diagrams/Parts lists [BoM]

Circuit diagrams and switching symbols shall be displayed as defined by DIN ISO 1219 (E-Plan).

All electrical devices must be listed that have a functional relation to the pneumatic assemblies. For larger or more complicated production equipment, the diagrams shall be structured based on function groups.

The valves mounted on plates or in links shall be depicted on the circuit diagrams according to location/position. The pos. no., electrical designation and triggered functions are also to be included.

The diagrams must include information about compressed air consumption, connection cross-sectional area, etc.

4.6 Lubricating Technology

Lubrication circuit diagram/Parts lists [BoM]/Lubrication instructions/Plan with lubricating points

The lubrication diagram should include the following information (E-Plan):

- Lubricating point with name in the machine/system
- Lubricant (medium)
- Lubricating cycle and metered amount (volume)
- Setting for pressure switch/valve
- Capacity and re-fill amount (volume) of lubricant reservoir
- Allowable oil temperature for circulating lubrication
- Performance data of the pump drive.

For linked machines/machine systems, a lubricant manual for the entire system shall be delivered in addition to lubricant instructions for the individual machines.

Machine lubricant card

Coordinated with Customer.

4.7 Cooling Lubricating Technology

Circuit diagrams/Parts lists [BoM]

Circuit diagrams and parts lists shall be created as defined by DIN ISO 1219-2.

All electrical devices must be listed that have a functional relation to the cooling lubricating technology assemblies. For larger or more complicated production equipment, the diagrams shall be structured based on function groups.

Upon agreement with the Customer, pipes and connections shall be depicted in the installation diagram for extensive, large-scale systems.

4.8 Safety of Machinery, Environmental Protection and Fire Protection

EC/EU declaration of conformity/risk assessment

The EC/EU declaration of conformity and the risk assessment ([upon request](#), taking into account EN ISO 12100, EN ISO 13849) shall be included in delivery. Refer here also to the requirements of TA07 [Safety of Machinery](#), Environmental Protection and Fire Protection.

Documents subject to the pressure device directive, AD 2000 standards or industrial safety regulations must be submitted before startup (at the latest).

4.9 Protocols

Certificates and licenses

These include certificates and licenses such as certificates of origin and software licenses.

Electric test reports

These include the electric test report based on DIN EN 60204-1, the test report for insulation resistance, the loop resistance test report for the equipment grounding conductor and the Profibus measurement report.

Geometric measurement report

The geometric measurement report of the spindle unit shall be delivered. These documents shall be stored in the 08 Protocols folder.

Test reports/Certificates/Overview list

When installing pressure tanks, non-contact protective devices, presses and other equipment requiring inspection, the Contractor must fill out an overview list (Annex 2 Overview List).

Components featuring specific test periods must be mentioned explicitly and an agreement must be reached respectively.

Necessary test certificates, e. g. TÜV documents, seal integrity tests, sound measurement report, shall be included in delivery.

Subcontractor documentation, welding certificates and all other documentation which is used to prove compliance with the Federal Water Act, must be grouped together in the Protocols register.

5 Instructions for Technical Documentation on Data Carriers

The machine number shall be entered in the upper-most level; the Customer will assign such numbers.

The files shall be stored in the lowest level of the file structure. The file name must start with the designation in plain language.

For drawings, the file name is *designation, drawing number*.

For parts lists, the file name is *designation, drawing number, parts list*.

Non-integrated images are to be delivered in jpg format.

Other Applicable Documents

Standard	Designation
DIN EN ISO 216	Writing paper and certain classes of printed matter - Trimmed sizes - A and B series, and indication of machine direction
DIN EN 60848	GRAFCET - Specification language for sequential function charts
DIN EN 61082	Preparation of documents used in electrotechnology
DIN EN 60204	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
DIN ISO 1219-1	Fluid power systems and components - Graphic symbols and circuit diagrams - Part 1: Graphic symbols for conventional use and data-processing applications
DIN ISO 1219-2	Fluid power systems and components - Graphic symbols and circuit diagrams - Part 2: Circuit diagrams
DIN EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN ISO 13849-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design

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