

TECHNICAL DELIVERY SPECIFICATION

II Technical Equipment Instructions

TA05 Lubricating Technology

Status 07/2015



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Modification Service

Status	Chapter / Page	Description of modification including name of the person responsible	Date
07/2015	1 / 6	Added: " Friedrichshafen AG " All modifications: Helmut Bach, ZBST dept.	2014-11-15
01/2013	1-13	Changes are underlined and printed in blue, ZBOE4, Helmut Bach	2012-10-30
01/2011	1-12	Update, VTE-4 dept., Helmut Bach	2011-01-01
06/2009	1-12	Update, VTE-4 dept., Helmut Bach	2009-06-30
01/2008	1-12	Update, VTE-4 dept., Helmut Bach	2008-02-06
01/2005	1-10	Original	2005-01-01

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1 Scope of Application

The technical instructions described here apply specifically to lubricating technology of the machine/machine system. They supplement the instructions listed in document I General Information of the Technical Delivery Specification of ZF [Friedrichshafen AG](#) and alongside these, are valid for all ZF plants.

2 General Requirements

2.1 Approved list

Only components, assemblies, devices, lubricants and process materials stated on the release list may be used.

2.2 Accessibility

All components and assemblies must be accessible for maintenance and repair work and may not be concealed by pipes or hoses or any other components/assemblies.

No screw connections are permitted in hard-to-reach areas of the pipework.

2.3 Catch pans

See TA07 Safety of Machinery, Environmental Protection and Fire Protection.

2.4 Central lubrication

The central lubrication used must be self-ventilating and automatic with an integrated reservoir level monitor.

The design of the central lubrication must ensure that there is adequate reserve pressure and volume within a work cycle.

2.5 Oil mist lubrication system

If an oil mist lubrication system is used in the machine/machine system, then the oil mist lubrication system must ensure that the oil mist is collected in an enclosed area.

2.6 Lubricant guidelines

The number of lubricants used in the machine/machine system must be as low as possible.

The use of lubricants must be economical and comply with applicable environmental requirements, guidelines, laws, etc.

The machine/machine system's technical documentation must state the lubricant consumption for eight hours under normal operating conditions.

The lubricant reserve quantity must be sufficient to cover at least 100 operating hours before the next filling.

2.7 Lubricating nipple

Lubricating nipples are to be avoided.

If lubricating nipples must be used, this shall be coordinated with the Customer.

Lubricating nipples must be freely accessible, e. g. without disassembling covers. If pipelines are used, they must be able to withstand the applied pressure (hand-lever press min. 500 bar). Button head lubricating nipples as defined in DIN 3404 are not permitted.

All lubricating nipples which are only required for initial lubrication need to be disassembled.

2.8 Other instructions

All components and assemblies of the machine/machine system which are subject to mechanical wear must be designed with lifetime lubrication.

Installing lubrication systems that involve oil loss must be avoided where possible. Using them must be agreed with the Customer.

If recirculating lubrication is used, then the lubricant involved must be separated from the other coolants and lubricants used in the machine/machine system.

Spent lubricants may not dirty or contaminate the lubrication system or the area around the machine/machine system.

3 Normative References

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

DIN/ISO 5170 in conjunction with DIN 8659 (Parts 1 and 2) and DIN 51502 will serve as the basis for these Technical Equipment Instructions for the machine/machine system's lubricating technology installed.

An informative overview on the country-specific laws, guidelines and standards can be found in the Appendix (Chapter 11) of this document.

4 Lubricant Containers

4.1 Design

Lubricant containers must be sealed from contaminants.

Free-standing lubricant reservoirs with a volume over 60 l must comply with DIN 24339 (container model AN, cover model C).

4.2 Fluid-level indicator

An accessible and replaceable view glass is to be used to indicate the lubricant level. It must be externally visible when it is being filled, during the work cycle and when the machine/machine system is down. Dip sticks are not permitted.

4.3 Level control

There must be a level control unit in the lubricant container with two switch points for the minimum fluid level:

1st	switch point	→	Oil level min	→	Preliminary warning (refill with oil)
2nd	switch point	→	Oil level < min	→	Shut-down (after cycle end).

4.4 Temperature monitoring

If the lubricant temperature has a significant impact on the function of the machine/machine system's lubricated components and assemblies, then the lubricant temperature must be monitored and displayed. The minimum/maximum temperature limits must also be indicated.

Temperature monitoring must be designed with a switch point:

Switch point	→	Oil too hot	→	Shut-down (after cycle end).
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4.5 Ventilation filter

The lubricant containers must have a ventilation filter for venting. The ventilation filter's filter element must be replaceable; it must be finer than the smallest filter in the system.

Under very dirty or dusty conditions, the ventilation filter must have a visual contaminant indicator.

4.6 Filler nozzles

The filler nozzles must have a nominal diameter of at least 40 mm.

When lubricating oil is used, the filler nozzle must have a filler inlet filter with a mesh width of 0.8 mm.

5 Pipelines and Hose Lines

5.1 Design

Pipelines and hose lines must be protected. They must be installed in such a way that they do not impede or disrupt the function of moving components and assemblies.

Minimum dimensions for the inside diameter of pipelines and hose lines:

- Main lines: 6 mm
- Lubricating point lines: 4 mm.

Pipes made of stainless steel in compliance with DIN ISO 1127, material number 1.4571 n1, must be used in areas of the machine/machine system at risk of corrosion (chemicals, water spray, condensation, etc.).

Compression couplings as defined in DIN 2353 must be used.

5.2 Anchorage

Pipelines and hose lines must be secured to the machine/machine system with pipe clamps in accordance with DIN 72571 and DIN 72573.

6 Distributor

6.1 General requirements

The distributor must be located as close as possible to the lubricating point.

The distributor outlets may only be provided in each case for the lubricant supply of one lubricating point.

The distributor outlets must have recognizable numbering system. The numbers (incl. identification of the lubricating point) must appear in a distributor diagram attached to machine/machine system.

6.2 Progressive distributors

Lubricant must be fed in on the basis of dosed lubricant quantities by means of a progressive distributor or an individual doser with monitoring after the last lubrication point.

Large presses must come equipped with a progressive distributor, an upstream quantity regulator and a mesh screen.

6.3 Metering/Dosing units

Lubricant systems with metering units must be self-ventilated.

6.4 Dual-line distributors

Dual-line distribution systems may only be used after prior consent from the Customer.

7 Filters

7.1 General requirements

The machine tool filtering must be designed so that the filter elements last at least six months under the machine's operating conditions while at the same time warranting that the required purity of the medium is maintained.

The filter manufacturer and/or subcontractor must always be included in the design of the filters. This service is currently offered free of charge by the companies "Pall" and "Hydac" for example.

Intake filters are not permitted.

A pressure filter with electrical and visual contamination indicator must be used if band filter systems and hydrostatic filter systems are used.

7.2 Purity

The lubricant must be kept pure at least in accordance with the required purity grade 19/17/14 (classification acc. to ISO 4406) over the entire lifetime of the machine/machine system.

7.3 Accessibility

Filters must be accessible and the filter inserts replaceable without disassembling other components/assemblies.

7.4 Monitoring filter soiling

The filters must have an electronic soiling indicator with a readout/signal on the control panel. If the maximum permissible level of soiling for the filter is exceeded, the machine/machine system must be shut down in accordance with the agreed criteria.

The filter soiling level must be monitored at two switch points:

1. Switch point → Filter contamination 75% → Preliminary warning: "Change filter!"
2. Switch point → Filter contamination 100% → Shut-down (after cycle end).

7.5 Shut-off valve

A shut-off valve (i. e. stop cock) must be installed for band filter systems with an oil return quantity ≥ 60 l so that the oil may remain in the lubrication system lines during maintenance and repair work.

8 Control of Lubricant Supply

All friction points in the machine/machine system must be lubricated before the machine/machine system starts up.

For periodical lubrication, the first lubrication cycle is to take place at the same time as the machine/machine system is switched on.

The lubricant supply control must work either as a function of travel or time.

If the machine/machine system is repeatedly switched on and off, measures must be taken to ensure that it is not overlubricated by periodic lubrication systems.

When the work cycle stops, so must the lubrication cycle.

9 Monitoring the Lubricant System

9.1 General requirements

All messages from the monitoring devices must be displayed in a central location in the operator panel.

The criteria for shutting down the machine/machine system must be determined for each particular case.

9.2 Pressure-dependent monitoring

A pressure switch must be integrated at the end of the main line for lubrication systems with metering units.

A pressure switch with the switch points "minimum pressure" and "maximum pressure" must be used between the pump and the first distributor for lubrication systems with progressive distributors.

9.3 Monitoring the lubricant flow rate

The lubricant flow rate must be monitored for especially vulnerable friction points in the machine/machine system.

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The Contractor must automatically inform the Customer's maintenance departments about especially vulnerable friction points in the machine/machine system. This information shall be included in a separate section of the machine/machine system's technical documentation.

9.4 Monitoring system soiling

For lubrication systems with reservoirs that hold over 50 l, a Minimes measuring connection as defined by DIN must be attached to an optimal flow location in the pressure line so that a lubricant sample may be taken.

10 Marking

10.1 General requirements

All devices within a system including the hose lines must be distinctively and permanently marked.

Identification signs must always be

- engraved, etched or lasered in aluminum or two-layer plastic
- legible
- permanently attached at a clearly visible location
- located next to components, assemblies and devices
- when the devices are concealed, located next to the installation

space.

The identification signs may not be located on replaceable components, assemblies and devices.

Marking components which have safety functions: see TA07 Safety of Machinery, Environmental Protection and Fire Protection, Chapter 2.1.2 Risk assessment.

10.2 Additional information

The following information is important for marking the lubricating technology installed in the machine/machine system:

- All devices must be identified according to the lubrication circuit diagram with identification plates.
- The lubrication instructions must be based on DIN 8659. They must be engraved or etched using a diagram made of aluminum and permanently attached in a clearly visible location (e. g. next to the control panel or the switch cabinet) on the machine/machine system.

11 Appendix: Other Applicable Documents

11.1 International requirements

Re 3 Normative References

DIN ISO 5170 Machine tools; lubrication systems

Re 7.2 Purity

ISO 4406 Hydraulic fluid power - Fluids - Method for coding the level of contamination by solid particles

11.2 German requirements

Re 2.7 Other instructions

DIN 3404 Lubricating nipples; button head

Re 3 Normative References

DIN 51502 Designation of lubricants and marking of lubricant containers, equipment and lubricating points

Re 4.1 Lubricant Containers, Design

DIN 24339 Fluid power; hydraulic reservoirs made of steel; dimensions, requirements, test methods; nominal capacity 63 to 1250

Re 5.1 Pipelines and Hose Lines, Design

DIN EN ISO 1127 Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length

DIN 2353 Non-soldering compression fittings with cutting ring - Complete fittings and survey

Re 5.2 Anchorage

DIN 72571 Pipe clamps - One-sided fastening

DIN 72573 Pipe clamps - Two-sided fastening

Re 9.4 Monitoring system soiling

Minimess connection acc. to DIN

Re 10.2 Additional information

DIN 8659 Machine tools; lubrication of machine tools, lubrication instructions

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