DAIMLER

Powertrain Requirement Specifications Part IV Production Equipment – Tools

Version 2021

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Author	Passenger car planning approval	Truck planning approval
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Table of Contents

1 General Information

1.1 Preface

All new procurement projects at Daimler AG are characterized by very demanding cost-reduction targets and by extremely high requirements with regard to the productivity of the production equipment.

In addition to the manufacturing-related optimization of the workpieces, there is an ongoing detailed revision of the technical standards of the production equipment.

The results are recorded in the following specifications:

Powertrain Requirement Specifications Part I	**General Information**
Powertrain Requirement Specifications Part II	**Mechanical Components**
Powertrain Requirement Specifications Part III	**Electrical Components, Control Technology and Production-Oriented IT Systems**
Powertrain Requirement Specifications Part IV	**Production Equipment**
Powertrain Requirement Specifications Part V	**Documentation**
Powertrain Requirement Specifications Part VI	**IT Security**
Powertrain Requirement Specifications	**Workpiece-Specific Scope (created individually by the planner)**

The individual specifications may deviate from the optimum solution, but are considered as an economical measure within the overall system.
As a basic rule, any suggestions from our suppliers to improve the availability of production equipment or provide potential savings will be given careful consideration. Should you have any such suggestions, please do not hesitate to submit these to Daimler AG. The contact is the representative.

1.2 Validity and Obligations

These requirement specifications define the production equipment specifications "Production Equipment - Tools" for all production sites and centers in the divisions

- Mercedes-Benz Cars Powertrain (abbreviated as "MO") of Mercedes-Benz AG and
- Daimler Trucks Powertrain (abbreviated as "Trucks") of Daimler Truck AG

and jointly referred to as "Daimler" in the following.

Fixtures for Trucks are taken into consideration in the separate part "Fixtures for Daimler Trucks".

Compliance with the requirement specifications is binding and shall be confirmed in the bids.
The requirement specifications valid at the time of the contract award are binding.

The requirements of MBN 9666 shall be met. The specifications in these requirement specifications supplement the requirements of MBN 9666.

If the vendor feels that deviations are required with regard to the individual points, this shall be indicated in the bid and approved in writing by Daimler.

The contractor shall ensure that all parties involved in the contract adhere to the latest Daimler regulations.
This tender document may not be disclosed to third parties without the prior consent of Daimler!

All service products and auxiliary service products used require internal approval for use. The supplier shall therefore supply a list of the substance contents.

No particularly ecologically detrimental or harmful substances (CFC, asbestos, etc.) shall be used.
If it is possible to replace a hazardous substance required for the operation of the system with a harmless or less dangerous substance, this should be done. If this is not possible, the working procedure is to be designed in such a manner to prevent the exposure of dangerous gases, fumes or suspended matter.
The working procedure is to be designed in such a manner to prevent employees' skin from coming into contact with dangerous solid or liquid substances or preparations.
If the emission of dangerous gases cannot be prevented, it shall be possible for them to be detected completely at their point of emission or creation.

1.3 Record of Revisions

Version:	**Last revised**:	**Chapter:**	**Changed by:**
2020		• Appendix 13 MTM Filling Matrix Standardization F8 Setting Data	Participants in work package (WP) 1.4 in the "Powertrain Standardization" project
2021		• 4 modified to "Machine and Tool Holder Structure in the MTM Production Equipment Plan (F0 11) and Definition of Tool Numbers". • 4.1 New "Machine and Tool Holder Structure in MTM". • 4.2 New "Definition of Tool Numbers" • Appendix 5 modified • Appendix 12 changed paragraph b) to "List of Costs for Tool Ordering Scope"	Participants in work package (WP) 1.4 in the "Powertrain Standardization" project

1.3.1 Changes from Version 2020 to Version 2021

Any changes in the Function Descriptions and significance from the previous version are indicated as follows:
Newly added text is underlined (and also displayed in blue in the file).
Deleted text is ~~crossed out~~
In both cases, the lines / paragraphs concerned are marked at the left margin by a vertical line.
Changes made for editorial reasons are not marked.

1.4 Contacts

For general comprehension questions about requirement specifications content, please e-mail the following:
LH4-Betriebsmittel@daimler.com
Please contact - in accordance with the further processing/data processing-compliant procedure –
the representative specified on the client's side in the case of order-specific questions.

1.5 Identifications for Sites and/or Scopes of Validity

Unless otherwise indicated, the chapters/sections are valid for all locations and/or scopes of validity.
Examples:
The chapter on power packs for supply and disposal systems has a limited scope:
...

Power pack for supply and disposal systems	5

...
The text passage applies to one location only:
...

In deviation from Appendix 22, a current measurement facility to be agreed upon separately shall be implemented for systems larger than 100 kVA. current measuring setup is to be agreed upon separately, in deviation from Appendix 22.	Y

...

The blank or missing identification field on the right indicates text that applies from here on to all locations and all scopes of validity:

...

2.1.1.1 Machine Connections

...

1.5.1 Locations

If validity is limited, the locations for which the chapter / section is **valid** are indicated as follows:

MBC code	Meaning
A	Plant 010 (throughout)
B	Not assigned
C	Not assigned
D	Not assigned
E	Plant 040, Berlin (MO/PT)
F	Plant 068, Hamburg (MO/PT)
G	Not assigned
W	Not assigned
Truck code	**Meaning**
X	Plant 030, 034 Gaggenau, converter, parts, sheet metal production center/transmission production center (Trucks)
Y	Plant 069 Kassel, axle production center (Trucks)
Z	Plant 020, Mannheim, engine production center, foundry production center (Trucks)

1.5.2 Scope of Validity

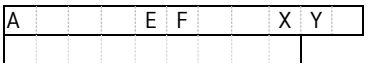
If the scope of validity is limited, the corresponding chapters / sections are identified as follows:

Code	Meaning
1	Mechanical production incl. machine linkages
2	Assembly incl. machine linkages
3	Test stands
4	Handling technology, sorting magazines, stock, shipping
5	Supply and disposal systems
6	Standard production equipment with workpiece-bound equipment and additional automation Clock-pulse controlled, automatically controlled installation, with impact on K factor Using large and medium standard control panels and control panel interface for connection to MDE/BDE control technology
7	Standard production equipment with workpiece-bound equipment and additional automation Clock-pulse controlled, automatically controlled installation, with impact on K factor
8	Standard production equipment
9	Washing machines

The range of validity of the requested machines has to be taken from the RFQ or requested from Daimler.

Identifications 1 to 5 meet the requirements for all special machines according to MBN 9666.

2 Order Processing



A planner shall be defined for the project by Daimler.

- Overall responsibility for the machining process (machine – device – tools) is assumed by the supplier. Deviating responsibilities shall be agreed separately.
- The approval of drawings, material lists or drafts by a representative of Daimler does not under any circumstances relieve the machine supplier from the responsibility to provide the agreed services. This also applies if the tools are procured and provided by Daimler.
- The manufacture of tools and the related equipment shall not start prior to the provision of the tool plans/drawings and approval by Daimler. The scheduled tool service lives shall be specified for the selected cutting data.
- Tool service life counting (e.g. number of holes, milling path, workpiece count) shall be agreed on between the above-mentioned representatives.
- The tools are to be labeled permanently with Daimler item numbers prior to their delivery.
- The tools are handed over/returned to Daimler as an assembly that is set and ready for operation.
- For tools with chip coding, the chip is to be described with the data documented in the MTM system.
- The tool documentation and production equipment plans in the MTM system are relevant for an operational system and acceptance stage and shall be undertaken in accordance with Section 3.1. They shall be checked by the client in terms of completeness and quality.
- The entire tool documentation and chip coding is to be updated after the final acceptance.
- The F8 no. is to be included in the NC programs without classification part.

2.1 List of Costs for Tool Ordering Scope

The initial tool equipment shall to be offered together with the scope of the machine, subdivided into individual items according to Appendix 12, and coordinated with the representative.

2.2 Tool Costs

2.2.1 When Submitting the Bid:

The expected tool costs per component are shall be specified. 100% reversible cutting tip (WSP) use and no cutter tool wear shall be assumed. The tool costs require particular attention during assessment of the detailed list (see also Appendix 12).

2.2.2 After the Contract Award:

On presentation of the production equipment plan for approval the data shall be documented in accordance with Appendix 13 (MTM Filling Matrix). The following specifications are to be additionally made:

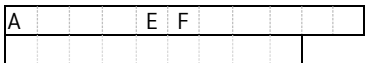
- Tool with reversible cutting tip
  - Number of reversible cutting tips
  - Reversible cutting tip designation
  - Number of cutting edge faces per reversible cutting tip
  - Number of cutting circles
  - Costs per WSP (with special WSP: respective order quantity 50/100/500)

- Solid carbide tool
  - Number of refacing operations (target value: at least 5 with MMS or dry machining, at least 8 with oil/emulsion)

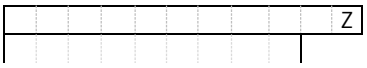
The chip removal costs and the agreed number of pieces are to be verified at the operational system + acceptance stage (K factor or OEE). The tool costs shall be no more than 20% above the specified chip removal costs due to the number of pieces which may not yet be completely exhausted. The minimum amounts shall not be fallen short of by more than 20%. If not attained, the process step for operational system + acceptance shall be repeated.

2.3 Chip Coding

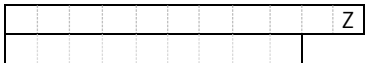
- A chip coding with Balluff code carrier BIS M-122-02/A (F7 9010 1038449) is to be offered to identify tools by means of an RFID data storage medium. Data format for BIS M–122-02/1 as per Appendix 9b



- A chip coding with Balluff code carrier BIS C-122-04/L (F7 9010 0515088) is to be offered to identify tools by means of an RFID data storage medium.



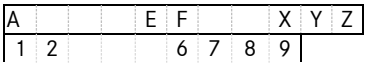
- Chip coding with Balluff code carrier BIS C-122-11/L (F7 9010 0547512) is to be provided if it is necessary to store information from more than three blades on the code carrier for operation of the machine.



- For the unique assignment of the tool to the machine, at least
  - the tool item no. (F8 no.) and
  tool plan no. (F011 no.) data stored on the chip shall be evaluated.
  Chip data format for BIS C-122-11/L as per Appendix 9a

3 Production Equipment Master Data in MTM

- Production equipment master data shall be recorded in the MTM system according to the MTM Filling Matrix (Appendix 13).



- Priority should always be given to the numbered production equipment items approved for use at the Daimler plant concerned. The corresponding search takes place in the MTM system.
- For managing the production equipment master data the MBN 81022 series of standards is mandatory. Item number assignment for production equipment shall be requested by the production equipment manufacturer, i.e. by specifying its article/order number and storing the geometry incl. the complete repair documentation for internal repair in the MTM system by means of a collective order (DWP process) by the planner or tool planner/standardizer.

3.1 Tool Provision by Daimler

If tool provision by Daimler is agreed on, close scheduling coordination is required and deadline interdependencies shall be considered. These are:

- From the "Schedule for Production Equipment," see LH Part 1 (Form 01), the deadlines for "Delivery of approval plans and tool plans" and "Tool provision of DAI" are mandatory for the on-time recording of the procurement-relevant production equipment master data.

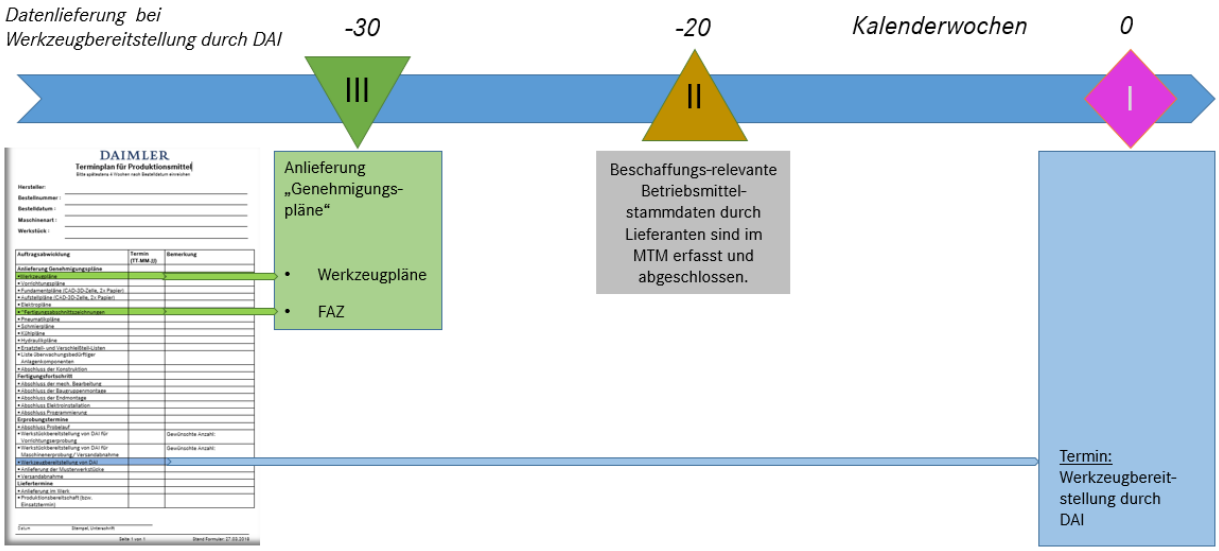


Bild 1: Tool provision time axis

- Tool provision by DAI by the specified time: (see Figure 1 I)
  The delivery of approval plans, tool plans and manufacturing section drawings shall occur **at least 30 weeks** prior to the deadline for "tool provision by DAI"
  (see Figure 1: Tool provision time axis III).
- The recording of procurement-relevant production equipment master data shall be prioritized, coordinated and completed **at the latest 20 weeks** prior to the deadline for "tool provision by DAI"
  (see Figure 1: Tool provision time axis II).
  In the MTM Filling Matrix, Appendix 13, the procurement-relevant production equipment master data are separately marked.
- Shorter deadlines shall be coordinated with the representative without exceptions.

3.2 Production Equipment Assembly Geometry (F8)

									Y	
1				6	7	8	9			

- For every assembly (ZB) of production equipment, a DXF geometry of the assembly as per ISO 13399-70 shall be saved to produce a tool file sheet in the F8 data record. This geometry depicts the assembly with all individual parts identified by item numbers as in the parts list. The format and resolution of the geometry shall be appropriately incorporated into the drawings section of the tool file sheet. The overall format (incl. drawing frame) of the tool file sheet is DIN A3 landscape (see Appendix 14).
- In the tool file sheet, attention need only be given to the first level of the tiered parts list. The characteristics of drive form/size (ANG), output form/size (ABG) and cooling lubricant feed type (KSA) found in the F8 data record shall be entered into the MTM.

4 Machine and Tool Holder Structure in the MTM Production Equipment Plan (F0 11) and Definition of Tool Numbers

A			E			X	Z
1			6	7	8		

- The structure of a production installation with the corresponding tool holder numbers (formerly spindle numbers) is mapped and documented on the MTM system in the F0 11 production equipment plan. The tool holder number has a regulative function in the installation structure and is determined within a defined production installation (refer to 4.1).

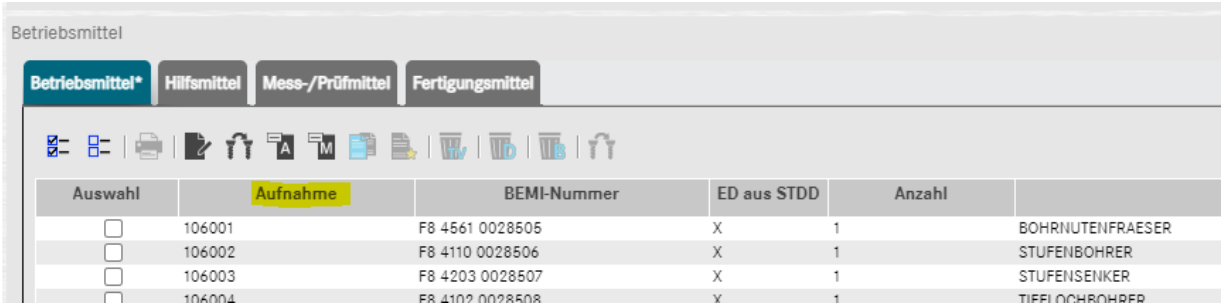
- In contrast to the tool holder number, the tool number is independent of the production installation and is used for the unique identification of a tool assembly (ZB) (refer to 4.2).

- The tool number is used, among other things, in the NC machining program and for tool management processes.

4.1 Machine and Tool Holder Structure in MTM

- The definition of the structure of a production installation in the F0 11 production equipment plan and the system for tool holder number assignment is described in Appendix 5.
- The tool holder numbers are assigned in the context of the initial production equipment plan approval and shall be coordinated with the client.
- On the MTM system, the tool holder number in the F0 11 production equipment plan is documented in abbreviated form as the tool holder (refer to extract from MTM).
- The labeling of drilling heads and spindles in the machining center is to be carried out by the supplier of the production machinery as needed.

Extract from the MTM system:

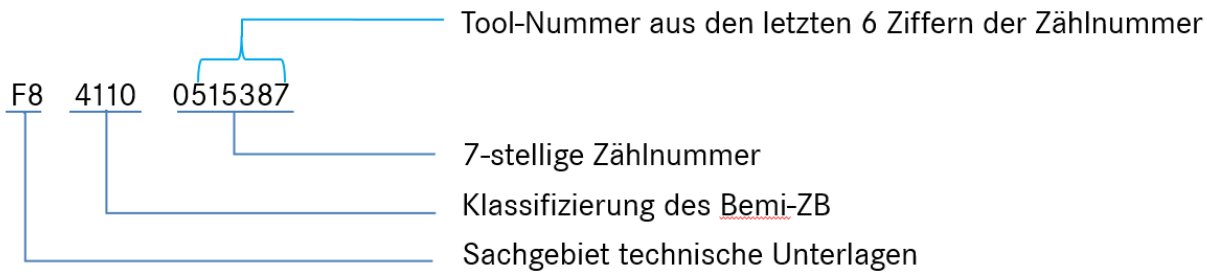


4.2 Definition of Tool Numbers

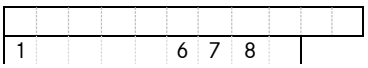
Production equipment assemblies (ZB) of cutting tools are always assigned a 13-digit part number and are assigned to and managed by the F8 functional area.
A ZB contains the associated component parts, listed and itemized in a parts list, as well as their adjustment dimensions.
From the F8 part number, a tool number is assigned to derive a **biunique identification** of the ZB. This is required in the productive environment for the machine tool call within the cutting operation (NC program) as well as for upstream and downstream processes.

The tool number is always associated with an existing F8 part number. From the 7-digit progressive change number, the last 6 digits are defined as the tool number.

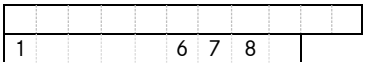
Example from a ZB stepped drill bit from the tool number 515387 produces this result:



5 Use of Standardized Spindles

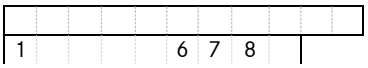


5.1 Spindle Types in Special Machines

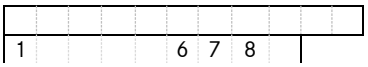


Standardized stub spindles according to DIN 69002 (all parts), form A, shall be used.
For fine machining, type B may also be approved after consultation with our experts. To guarantee that nominal sizes can be interchanged, despite having different shapes, the hole in the housing shall be chosen so that all three types can be installed.
For thread tapping, deep hole drilling, milling with cutters greater than 100 mm in diameter as well as for spindles with special tools, for instance facing heads or sliding tools, etc., as an exception, the spindles used up to now, for instance to DIN 69001 (all parts), may be used.
No other exceptions are permitted or they shall be technically substantiated for specific machining applications.

5.2 Spindle Selection

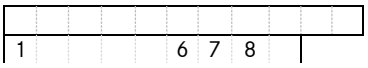


5.3 Special Machines (e.g. Transfer Lines / Turntable Machines)



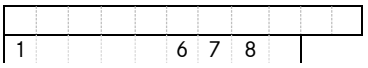
Stub drilling spindles as per DIN 69002 (all parts) or spindles as per DIN 69063-1 or ISO 12164-2 shall be planned for special machines. Stainless steel (X 45 CrMoV 15 or X 46 Cr 13) shall be used as the spindle material.
The mounting system (spindle contour of the clamping cartridge) shall be planned in accordance with Section 5.3.

5.4 Standard Machines (e.g. Machining Center / Machining Unit)

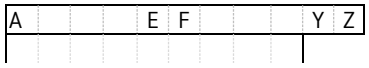


Spindles as per DIN 69063-1 or ISO 12164-2 Form A for HSK-A 63 or HSK-A100 shall be planned for standard machines with automatic tool change.

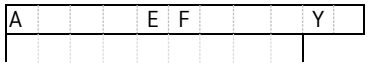
5.5 Tool Holding Systems (interfaces)



Definition:
The connection from the machine spindle to the exchangeable tool assembly.
The approved mounting systems are to be found in the context of the standard for stub drilling spindles. The following two variants or suppliers are currently permitted for the manual clamping system HSK form C:

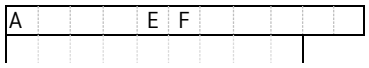


- Gühring system (thread spindle contour) acc. to modular system GM 300
- Mapal system (bayonet spindle contour) acc. to MN5000-40 (all parts) (details available at DocMaster)

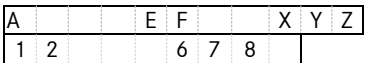


Both systems can hold production equipment with HSK holders and are used identically).

All other tool holders shall be executed as per DIN 2079, DIN 55058, MBN 58, or with collets (e.g. Emuge/Bilz system) (see MBN 58).

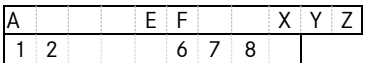


5.6 Configuring the Spindle Power



When configuring the spindle power for power-intensive machining work, it shall be ensured that the spindle power (with a 30% blunting of the cutting edges factored in) at no time rises to over 80% of the specified rated power output.
The specified rated output is based on the operating time relevant for the machining application (but not less than 60% operating time).
The formulas and material characteristics used for calculation shall be agreed with the representative responsible.

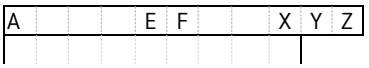
6 Planning Specifications for Production Equipment Design



(see Appendix 15).

7 List of Standard Production Equipment Suppliers for Supplier Approval

Only production equipment from suppliers approved on the List of Standard Production Equipment Suppliers may be used. The List of Standard Production Equipment Suppliers is administered and updated centrally by Purchasing (IPS).
The current List of Standard Production Equipment Suppliers is annexed to the project requirement specifications.
Other suppliers require the express approval of purchasing (IPS) and the Daimler representative.



8 Abbreviations

DIN	German Standards Institute: Deutsches Institut für Normung
HSK	Tapered hollow shank
ISO	International Organization for Standardization
KSA	Cooling lubricant type (Kühlschmierstoffart)
MBN	Mercedes-Benz standard
PCD	Polycrystalline diamond
CBN	Cubic boron nitride
MQL	Minimal quantity lubrication
HSC	High Speed Cutting
SC	Solid carbide
SOP	Start of Production

9 Index of Terms

10 Appendices

11 Normative References

Note: Internal and external standards shall be appended or distributed to third parties.

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

All standards listed here are available on the Daimler AG intranet in "SIS DocMaster" under
https://docmaster.es.corpintra.net.
External access to "DocMaster" can be requested on the internet at
https://supplier-portal.daimler.com/portal/de.
Authorization to access certain groups of documents will be defined, when the request is made.

11.1 MBN (Company Standards)

(always download the version valid on the order date via DocMaster)

MBN	58	Parallel Shanks with Adjusting Screw and Clamping Surface Inclined by 2°, Mounitng Bores
MBN	9666	Construction of and Specifications for Production and Operational Equipment, Machines, Systems, Facilities, and Devices
MBN	81022-2	Machinery and Equipment Documentation - Part 2; Machinery and Equipment Geometries and Plans as well as Machine Overview Geometry, Design, Delivery and the Transmission and Use of Data
MBN	81022-4	Machinery and Equipment Documentation - Part 4; Machinery and Equipment Assemblies (F8); Definition, Numbering Structure, Classification

11.2 DIN Standards

DIN	2079		7:24 tapers for spindle noses for machine tools
DIN	55058		Spindle noses for adjustable adapters; connecting dimensions
DIN	69001	All parts	Machine tools; multi-spindle heads
DIN	69002	-1	Machine tools - Stub spindles - Part 1: General, description, basic principles
DIN	69002	-2	Machine tools - Stub spindles - Part 2: Dimensions and lists of parts, designation
DIN	69002	-3	Machine tools - Stub spindles - Part 3: Components

11.3 ISO Standards

ISO	12164	-1	Hollow taper interface with flange contact surface - Part 1: Shanks - Dimensions
ISO	12164	-2	Hollow taper interface with flange contact surface - Part 2: Receivers - Dimensions
ISO	13399	-70	Graphical data layout — layer settings for tool layout [Technical Specification]

Appendix 5 to Requirement Specifications, Part IV

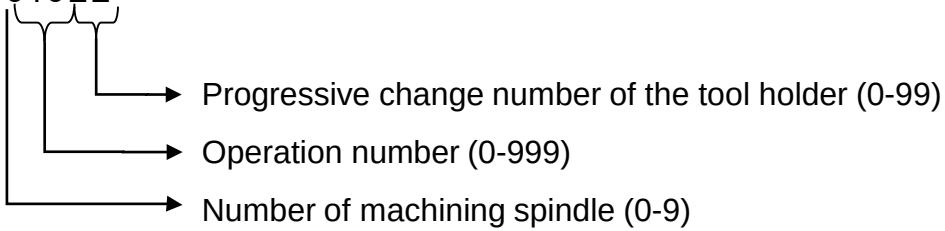
Specifications on Double-Spindle Machines, Simple Machining Centers and Transfer Lines – also with Drilling Heads in the Production Equipment Plan F0 11

Mercedes-Benz
Das Beste oder nichts.

Specifications on a Production Equipment Plan for Double-Spindle Machining Center

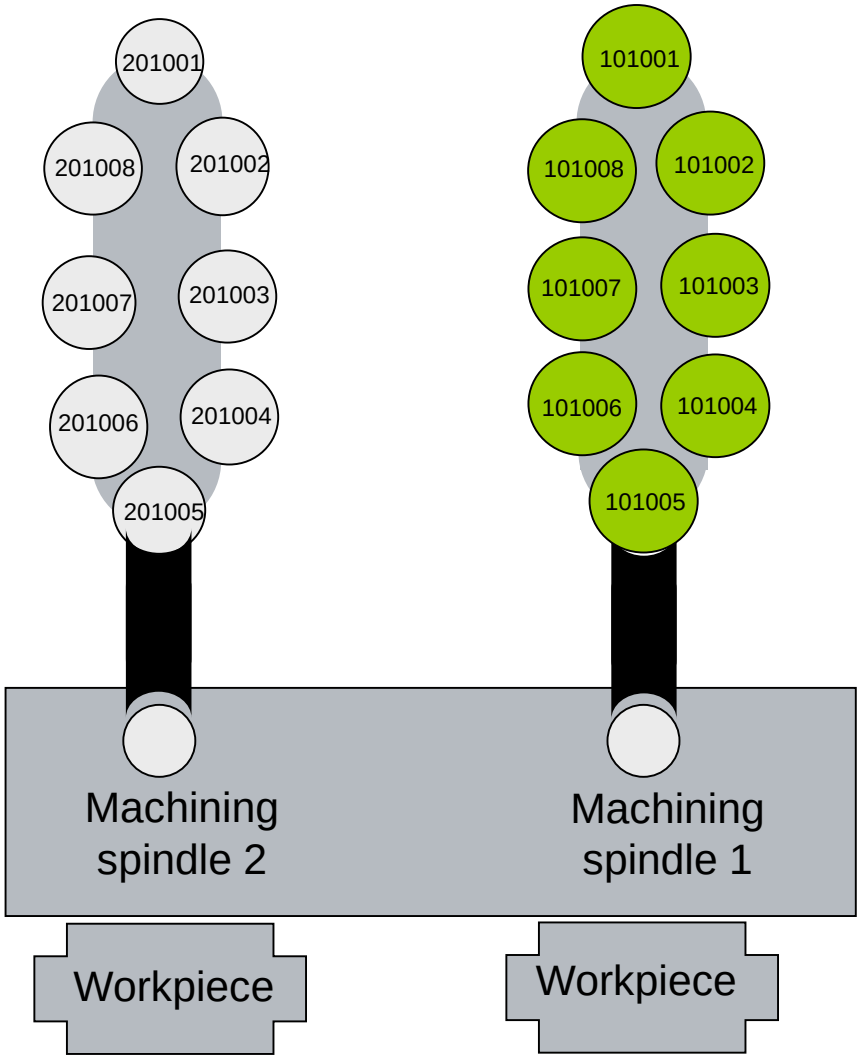
Specification of the planning structure for a double-spindle machining center (both spindles carry out the same operation, workpiece is only machined by one spindle):

- Tool holder number is always a 6-digit number structured as follows:
  1st digit = number of the machining spindle,
  2nd to 4th digits = operation numbers and the
  5th to 6th digits = progressive change number of the tool holder
  E.g.: 101022



- The tooling for a machining spindle is to be combined in one unit. No distinction is made as to whether the machine has one or two tool magazines.

Double-Spindle Machining Center
Machine with Two Magazines



Plan structure:

Machine

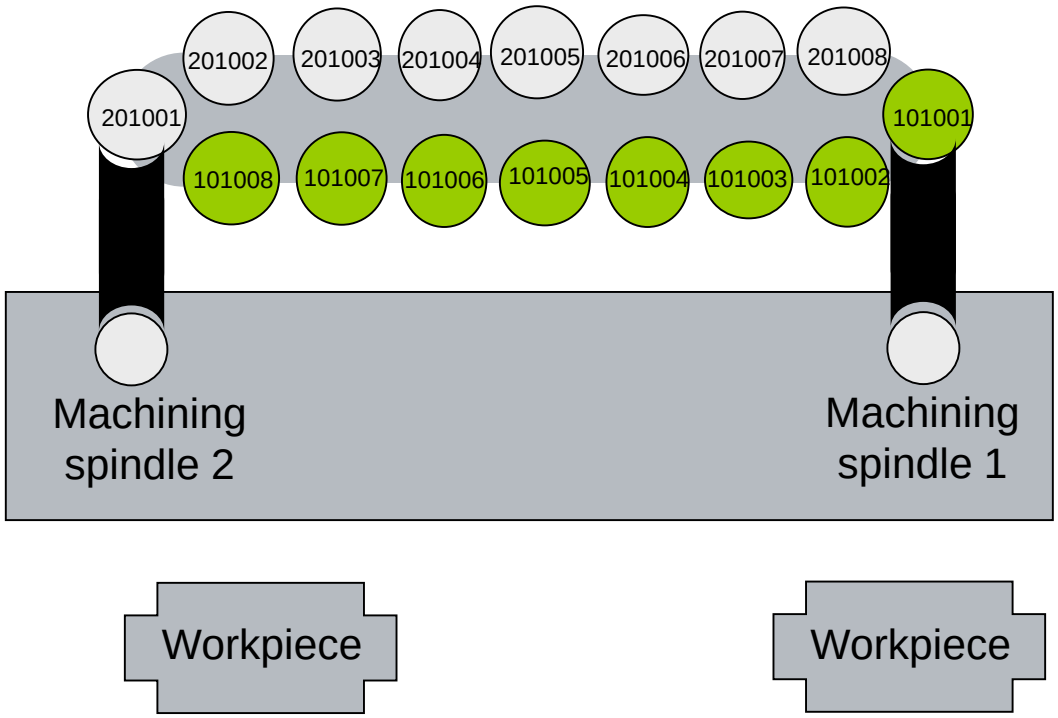
- BS1 (unit)
  - 101001
  - 101002
  - 101003
  - .....
- BS2 (unit)
  - 201001
  - 201002
  - 201003
  - ... ...

Definition:

The assignments of both magazine positions per tool holder are identical.

Workpieces are identical.

Double-Spindle Machining Center
Machine with a Shared Magazine



Plan structure:

Machine

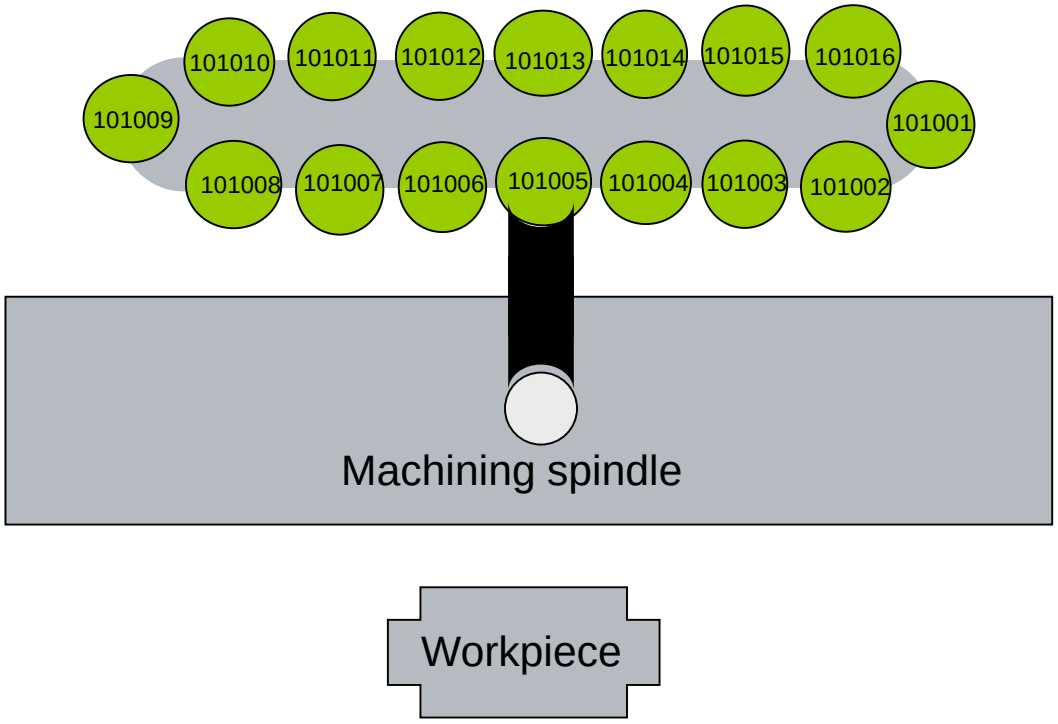
- BS1 (unit)
  - 101001
  - 101002
  - 101003
  - .....
- BS2 (unit)
  - 201001
  - 201002
  - 201003
  - ... ...

Definition:

Assignments of assigned magazine positions for each machining spindle are identical.

Workpieces are identical.

Machine with One Machining Spindle



Plan structure:

Machine

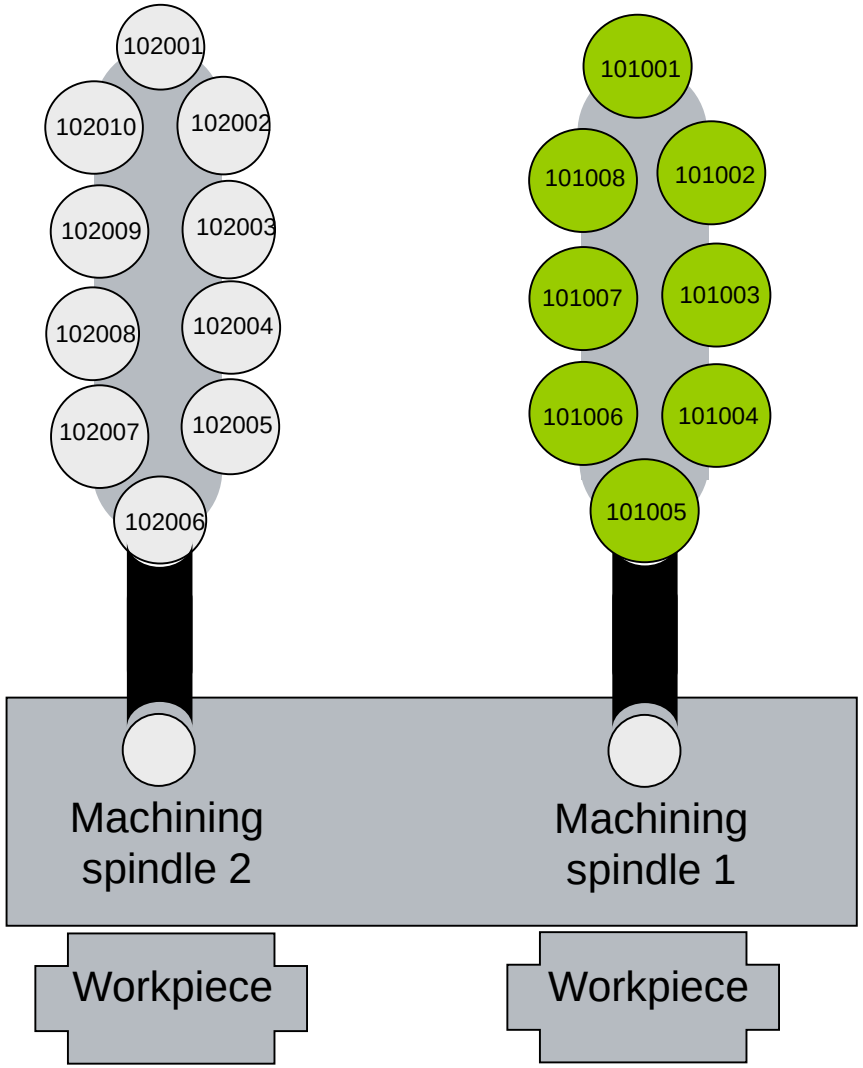
__BS1 (unit)

- 101001
- 101002
- 101003
- .....

Definition:

Same structure as for double spindles.

Machine with Two Magazines and Two Machining Spindles



Plan structure:

Machine

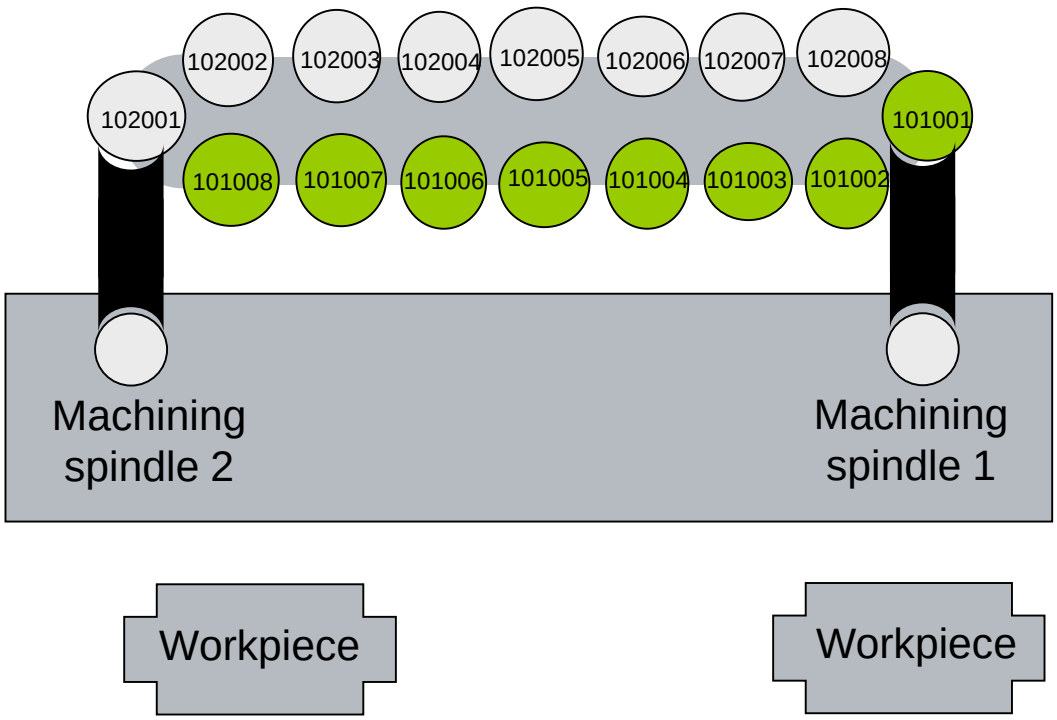
- BS1 (OP10)
  - 101001
  - 101002
  - 101003
  - .....
- BS2 (OP20)
  - 102001
  - 102002
  - 102003
  - ... ...

Definition:

The assignments of both magazine positions per tool holder are independent.

Workpieces are machined by both spindles.

Machine with a Shared Magazine



Plan structure:

Machine

- BS1 (OP10)
  - 101001
  - 101002
  - 101003
  - .....
- BS2 (OP20)
  - 102001
  - 102002
  - 102003
  - ... ...

Definition:

Assignments of assigned magazine positions for each machining spindle are independent.

Workpieces are machined by both spindles.

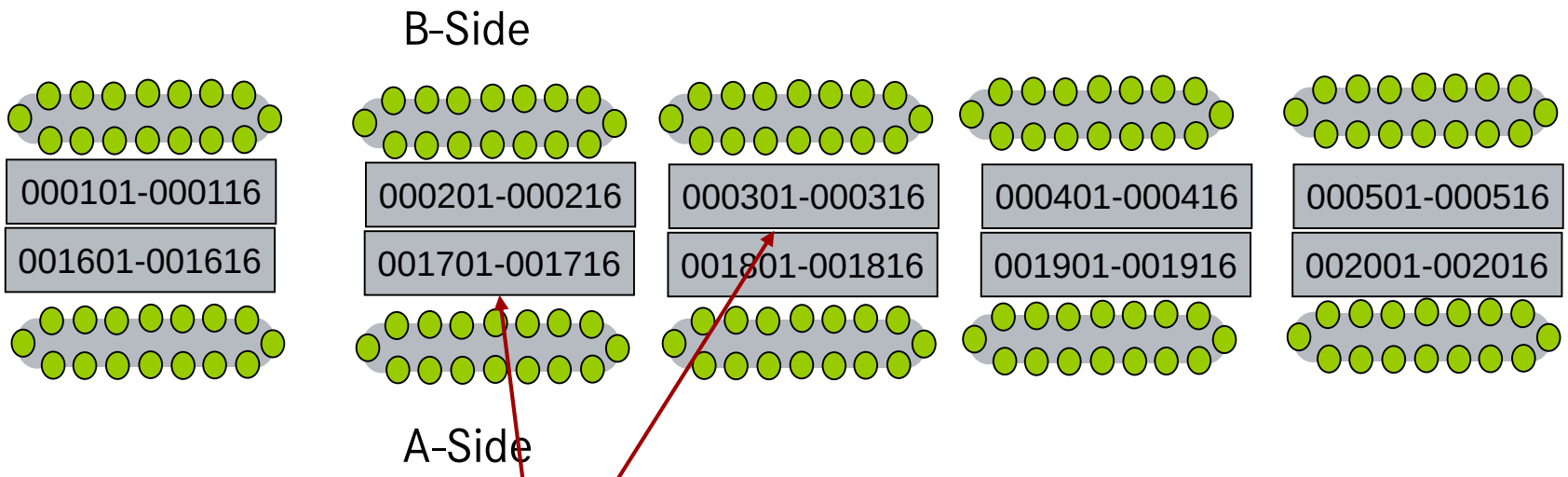
Transfer Lines with Drilling Heads

Specification of planning structure for transfer lines

- Here the first position is not used for the machining spindle
- Machines are numbered consecutively for the entire production process.
- 30 drilling head numbers are reserved for each machine:
  - 15 for the left-hand machine side (B-side) and
  - 15 for the right-hand machine side (A-side).
  - Numbering begins on left with drilling head number 1 (31, 61, etc.) and
  - numbering begins on right with drilling head number 16 (46, 76, etc.).

Transfer Lines with Drilling Heads (Example 1)

Machine 1 has 10 drilling heads (5 on each side)

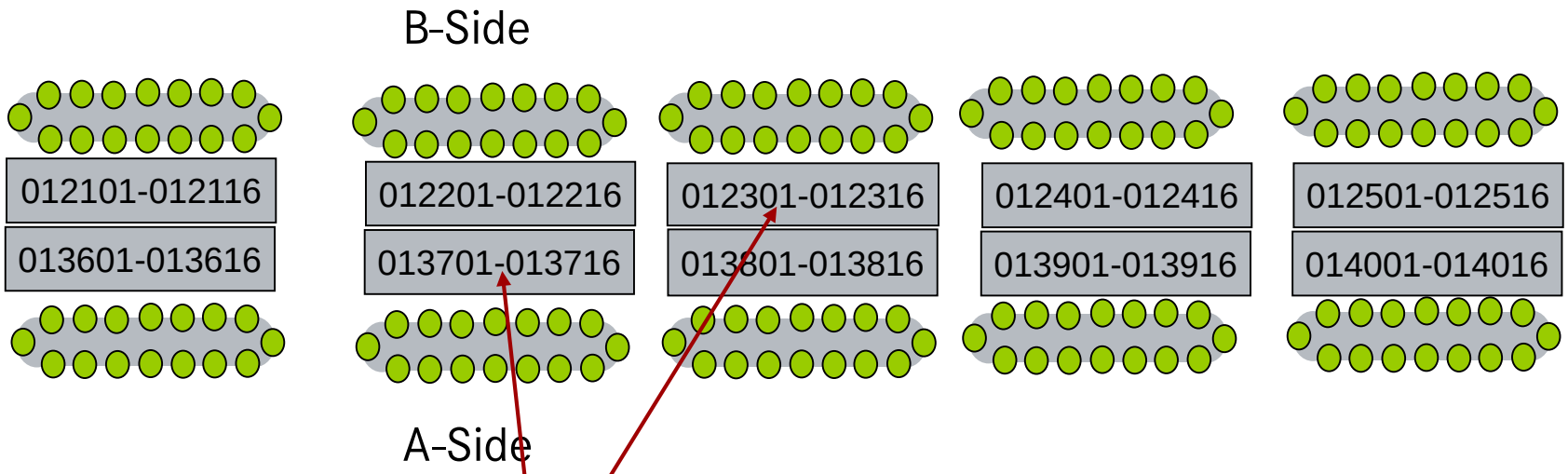


The 5th tool holder on the 3rd drilling head (left-hand side) is assigned tool holder number 000305

The 14th tool holder on the 7th drilling head (2nd drilling head on right-hand side) is assigned tool holder number 001714

Transfer Lines with Drilling Heads (Example 2)

Machine 5 has 10 drilling heads (5 on each side)



The 5th tool holder on the 3rd drilling head (left-hand side) is assigned tool holder number 012305

The 14th tool holder on the 7th drilling head (2nd drilling head on right-hand side) is assigned tool holder number 013714

Data Transfer from Shrinking/Adjustment Device to Code Carrier

Status of the specification: 14.04.2016

ID	Item no.	Field name: Balluff	Data type	Start	Length	Value from MTM	Comment
1	Item1	ID	ASCII	0	32	ID	Tool designator: F8 number without classification part
2	Item2	DUPLO	NUM (BCD)	32	3		Duplo number value range: 1-9999. From MTM the value "1" is always transmitted
3	Item3	GR	NUM (BCD)	35	2	GR	1111 (for larger tools 2222 or 3333, depending on magazine list)
4	Item4	STD	ASCII	37	32	STD	Default value: "NORMAL"
5	Item5	WTYP	NUM (BCD)	69	2	WTYP	See Appendix (1) or as per magazine list
6	Item6	INITSTAT	NUM (BCD)	71	2	INSTAT	Tool status From MTM the value "66" is always transmitted for new tool
7	Item7	Z	NUM (BCD)	73	1		n - cutting; Item7 forms the repeat counter for block BItem1 to BItem14
8	Item8	WUEB	NUM (BCD)	74	1	WUEB	Type of tool monitoring (1=according to tool life; 2=according to quantity)
9	Item9	WSUCH	NUM (BCD)	75	1	WSUCH	Type of tool search
10	Item10	TOOLCHECK	NUM (BCD)	76	4	TOOLCHECK	Toolcheck reference length
11	Item11	KUEHLDRUCK	NUM (BCD)	80	4	KUEHLDRUCK	Pressure in bar
12	Item12	WEST	ASCII	84	4	Initial tool use quantity	Value range: 0-9 0=no initial part check 1=initial part check without disadvantage 2=initial part check with 1 (2-1) follow-up parts 9=initial part check with 8 (9-1) follow-up parts Please note: New parameter: must be written to code carrier! Adaptation of configuration file of the adjustment devices. for (e.g.) value "5" Byte 84: 0 Byte 85: 0 Byte 86: 0 Byte 87: 5
13	Item13	SPINDELREG	NUM (BCD)	88	4	SPINDELREG	Use with (e.g.) measuring probe
14	Item14	BOHRKABST	NUM (BCD)	92	4	BOHRKABST	with drilling head support
15	Item15	SPINMAX	NUM (BCD)	96	4	SPINMAX	rpm
16	Item16	LANGWZW	NUM (BCD)	100	1	LANGWZW	0 = fast, 1 = slow
17	Item17	SPINDM	NUM (BCD)	101	4	SPINDM	Reference value for spindle torque monitoring
18	Item18	LANGW	NUM (BCD)	105	4	LANGW	Special tool regarding contour radius (0= normal, 1= greater than 340 mm)
19	Item19	AUSST	NUM	109	4	AUSST	Actuating tool 0=without 1=with Please note: Previously not used, details to be clarified:
20	Item20	WKONZ	NUM (BCD)	113	5	WKONZ	Tool contour: dimension along Z axis (max. length)
21	Item21	WKONX	NUM (BCD)	118	5	WKONX	Tool contour: dimension along X axis (max. radius)
22	Item22	WKONY	NUM (BCD)	123	5	WKONY	Tool contour: dimension along Y axis (max. height)
23	Item23	Istmass	NUM (BCD)	128	5	*(HAUPTNR)*	
24	Item24	Res4	ASCII	133	19		Unstructured reserve sector, may be assigned as required in the future.
25	Item25	TOOLPLAN	ASCII	152	32	TOOLPLAN	F011Plan-Nr
26	Item26	PART	ASCII	184	32	PART	A-part no.
27	Item27	SPINDEL	ASCII	216	3	SPINDEL	Value range: 1-9999 Please note: Previously not used, details to be clarified: for (e.g.) OP150-2 spindle 12: Byte 216: 0 Byte 217: 1
28	Item28	MACHINE	ASCII	219	32	MACHINE	DC machine no.
29	Item29	MQL	ASCII	251	1	MQL	0=no MMS tool 1=MMS tool
30	BItem1	SCHNEIDE1	NUM (BCD)	252	2		Blade number (01)
31	BItem2	ISTMASS1	NUM (BCD)	254	5		Length1
32	BItem3	WKOR2	NUM (BCD)	259	5		Length2
33	BItem4	WKOR3	NUM (BCD)	264	5		Radius1
34	BItem5	WKOR4	NUM (BCD)	269	5		Length3
35	BItem6	STANDREST1	NUM (BCD)	274	4	STANDREST1	Remainder: tool life in minutes
36	BItem7	STANDVORG1	NUM (BCD)	278	4	STANDVORG1	Pre-warning limit: tool life
37	BItem8	STANDSOLL1	NUM (BCD)	282	4	STANDSOLL1	Specified: tool life
38	BItem9	STANDRESTSTKZ1	NUM (BCD)	286	4	STANDRESTSTKZ1	Remainder: quantity
39	BItem10	STANDVORGSTKZ1	NUM (BCD)	290	4	STANDVORGSTKZ1	Pre-warning limit: quantity
40	BItem11	STANDSOLLSTKZ1	NUM (BCD)	294	4	STANDSOLLSTKZ1	Specified: quantity
41	BItem12	Res15	NUM (BCD)	298	4		Reserve
42	BItem13	Res16	NUM (BCD)	302	4		Reserve
43	BItem14	Res17	ASCII	306	20		Reserve
44	BItem1	SCHNEIDE2	NUM (BCD)	326	2		Blade number (02)
45	BItem2	ISTMASS2	NUM (BCD)	328	5		Length1
46	BItem3	WKOR2	NUM (BCD)	333	5		Length2
47	BItem4	WKOR3	NUM (BCD)	338	5		Radius1
48	BItem5	WKOR4	NUM (BCD)	343	5		Length3
49	BItem6	STANDREST2	NUM (BCD)	348	4	STANDREST2	Remainder: tool life in minutes
50	BItem7	STANDVORG2	NUM (BCD)	352	4	STANDVORG2	Pre-warning limit: tool life
51	BItem8	STANDSOLL2	NUM (BCD)	356	4	STANDSOLL2	Specified: tool life
52	BItem9	STANDRESTSTKZ2	NUM (BCD)	360	4	STANDRESTSTKZ2	Remainder: quantity
53	BItem10	STANDVORGSTKZ2	NUM (BCD)	364	4	STANDVORGSTKZ2	Pre-warning limit: quantity
54	BItem11	STANDSOLLSTKZ2	NUM (BCD)	368	4	STANDSOLLSTKZ2	Specified: quantity
55	BItem12	Res25	NUM (BCD)	372	4		Reserve
56	BItem13	Res26	NUM (BCD)	376	4		Reserve
57	BItem14	Res27	ASCII	380	20		Reserve
58	BItem1	SCHNEIDE3	NUM (BCD)	400	2		Blade number (03)

59	BItem2	ISTMASS3	NUM (BCD)	402	5		Length1
60	BItem3	WKOR2	NUM (BCD)	407	5		Length2
61	BItem4	WKOR3	NUM (BCD)	412	5		Radius1
62	BItem5	WKOR4	NUM (BCD)	417	5		Length3
63	BItem6	STANDREST3	NUM (BCD)	422	4	STANDREST3	Remainder: tool life in minutes
64	BItem7	STANDVORG3	NUM (BCD)	426	4	STANDVORG3	Pre-warning limit: tool life
65	BItem8	STANDSOLL3	NUM (BCD)	430	4	STANDSOLL3	Specified: tool life
66	BItem9	STANDRESTSTKZ3	NUM (BCD)	434	4	STANDRESTSTKZ3	Remainder: quantity
67	BItem10	STANDVORGSTKZ3	NUM (BCD)	438	4	STANDVORGSTKZ3	Pre-warning limit: quantity
68	BItem11	STANDSOLLSTKZ3	NUM (BCD)	442	4	STANDSOLLSTKZ3	Specified: quantity
69	BItem12	Res35	NUM (BCD)	446	4		Reserve
70	BItem13	Res36	NUM (BCD)	450	4		Reserve
71	BItem14	Res37	ASCII	454	20		Reserve
72		Res38	ASCII	474	6		
73		NAME	ASCII	480	20		
74		Res39	ASCII	500	4		
75		Res40	ASCII	504	7		

Tool classifications at Daimler AG*
plus the corresponding
tool types as per SIN 840D

Tools for drilling

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
4100	200	Twist drill	
4101	205	Solid drill	
4102	203	Gun drill	
4103		Pinhole drill	
4104		Flat drill	
4105		Spot drill	
4106		Center drill	
4110	201	Stepped drill	
4111	206	Stepped solid drill	

Tools for drilling / counterboring

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
4200	210	Drill	
4201	211	Drill, end cutting	
4202	212	Drill with journal	
4203	213	Stepped drill (counterbore)	
4210	231	Spot facer	
4211	232	Spot facer with journal	
4212	233	Reverse facing tool	also combination counterbore
4213		Countersink	
4214	234	Countersinks	
4215		Facing tool	

Tools for reaming

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
4300	250	Reamers, multi-edged	
4301	251	Reamers, single-edged	
4302		Taper reamers, multi-edged	
4303		Taper reamers, single-edged	
4304		Expanding reamers, multi-edged	
4305		Expanding reamers, single-edged	
4310		Stepped reamers	
~~4311~~		~~Deep-hole reamers~~	
~~4312~~		~~Taper bridge reamers~~	
4313		Outside reamers	

Tools for tapping

Tool classifications at Daimler AG*
plus the corresponding
tool types as per SIN 840D

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
4400	240 / 241 / 242	Screw taps	Rule / fine / Withworth
4401		Stepped taps	
4402		Thread rollers	
4410		Dies	
4411		Cutting jaws	

Tools for milling

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
4500		Cylindrical milling cutters	
4501		End face mills	
4510	140	Face milling heads	
4511	141	Corner milling heads	
4520	125	Slot cutters	
4521	150	Side and face milling cutters	
4522	130	Angular mills	
4523	132	Angular face milling cutters	
4524		Slitting cutters	
4525		Prism cutters	
4530	165	Profile cutters	
4531		Radius cutters	
4532	110 or 111	Ball cutters	
4540		Male thread milling cutters (outside)	
4541	145	Male thread milling cutters (inside)	
4542		Deburring wheels	
4543		Deburring cutters	
4550		Hobs for running gears	
4551		Hobs for drive-type splines	
4552		Tooth gap cutters	
4553		Tooth edge cutters	
4560	120 / 121	End Milling Cutters	with/without "corner rounding"
4561		Elongated hole cutters	
4562		Groove milling cutters	
4563		T-groove cutters	
4564		Die-sinking cutters	
4565		Gravers	
4570		Gang hobs	
4571		Ring cutters	
4572		Circular cutters	

Combined tools

*Valid for Plant 020,
other plants as per agreement

Tool classifications at Daimler AG*
plus the corresponding
tool types as per SIN 840D

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
4800	146	Female thread milling cutters	
4801	215	Bore milling tool	

Tools for cleaning

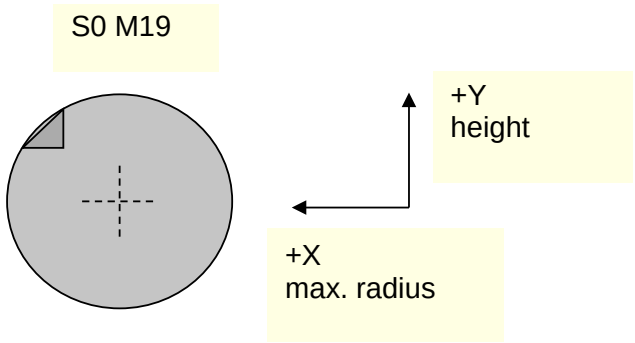
Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment
5700	750	Cylinder brushes	
5701	751	Shank brushes	
5702	752	Pot brushes	
5703	753	Plate brush	
5704	754	Roller brush	
5705	755	Ring brushes	

Measuring probe / plug gage

Classification (MTM)	Tool type (Sinumerik 840D)	Designation	Comment

Appendix 2: Measurement of the Max. Tool Contour

The applicable position of the tool for measuring the tool contour along the X and Y axes is determined as follows:
Spindle alignment (S0 M19), viewing direction onto spindle, use of HSK-A100 as per DIN 69893



Overview of CHIP Description for Shrink-Fitted Drills (F8 41xx), Shrink-Fitted Reamers (F8 4300), Shrink-Fitted Milling Cutters (F8 45xx)

		MTM data *(characteristics for pre-set devices)*					**Balluff chip data** *(items)*					**Grob machine data** *(Dialog variables)*		
	Input in project HDEP ZKG	**Identifier**	**Value**	**Unit**	**Description**		**Item**	**Length in Bytes**	**Format**	**Content**	**Comment**	**Dialog variable GROB**	**G module**	**Machining center shelf magazine**
		(Example of stepped drill F8 4110 0007816; F011 016 326246 OP40 HDEP ZK)												
Machine data	X	C_BOHRKABST	0		Drilling head support	1=yes; 0=no	Item14	4	BCD	with drilling head support		A5	important; set tool with drilling head support to 1	important; set tool with drilling head support to 1
	X	C_GR	1111		Tool size for magazine	Dm less than 150 =1111; greater than 150 =2222	Item3	2	BCD	Tool size	1111	T4	important; meaning: see Siemens Manual, important in corrections > magazine station; see mech. planning of magazine assignment	is not analyzed (but must be pre-assigned 1111); instead, variables U1 and U2 are present
	X	C_KUEHLDRUCK	8	bar	Coolant pressure	Specifications: see tool plan	Item11	4	BCD	High coolant pressure	Pressure in bar	A2	important	important
	X	C_LANGW	0		Special tool	1=yes; 0=no	Item18	4	BCD	Special tool regarding contour radius (0= normal, 1= greater than 340 mm)		A9	Enter 0	0 normal; 1 diameter greater than 340 mm
	X	C_LANGWZW	0		Tool change slow	1=yes; 0=no	Item16	1	BCD	Slow tool change	0 = fast, 1 = slow	A7	important; must be specified if tool heavy or top-heavy	important; must be specified if tool heavy or top-heavy
	X	C_MMS	0		MQL	1=yes; 0=no	Item29	1	ASCII	MMS tool	0=no MMS tool 1=MMS tool	-	Unimportant	Unimportant
		C_MS_CHP			Measurements for chip									
		C_MS_REH			Measurement sequence									
	X	C_SPINDELREG	0		Spindle control	1=yes; 0=no	Item13	4	BCD	without spindle control	Use with (e.g.) measuring probe	A4	if tool locked, the spindle control must be switched off / e.g.: tool chisel, stamp tool)	if tool locked, the spindle control must be switched off / e.g.: tool chisel, stamp tool)
	X	C_SPINDELM	0		Torque monitoring system	1=yes; 0=no	Item17	4	BCD	Reference value for spindle torque monitoring		A8	0 monitoring off; 1 monitoring is activated	0 monitoring off; 1 monitoring is activated
	X	C_SPINDMAX	3.850	rpm	max. spindle speed	0-10000 (2 x value as in tool plan)	Item15	4	BCD	max. spindle speed	rpm	A6	important	important
		C_STANDSOLL		Min	Specified tool life		BItem8	4	BCD	Specified: tool life		C33	Depending on monitoring	Depending on monitoring
	X	C_STANDSOLLSTKZ	1.333	units	Specified quantity	Specified by tool planner	BItem11	4	BCD	Specified: quantity		C34	Depending on monitoring	Depending on monitoring
		C_STANDVORG		Min	Pre-warning limit tool life		BItem7	4	BCD	Pre-warning limit: tool life		C39	Depending on monitoring	Depending on monitoring
	X	C_STANDVORGSTKZ	5	units	Pre-warning limit: quantity	Specified by tool planner	BItem10	4	BCD	Pre-warning limit: quantity		C32	Depending on monitoring	Depending on monitoring
	X	C_TOOLCHECK	1		Toolcheck	1=yes; 0=no	Item10	4	BCD	Toolcheck reference length		A1	0 no toolcheck monitoring, tool is measured first time Toolcheck is used	0 no toolcheck monitoring, tool is measured first time Toolcheck is used
	X	C_WKONTX	100	mm	Tool contour along X axis	See Appendix 2	Item21	5	BCD	Tool contour: dimension along X axis (max. radius)	See Appendix (2)	U2	Unimportant	very important
	X	C_WKONTY		mm	Tool contour along Y axis	See Appendix 2	Item22	5	BCD	Tool contour: dimension along Y axis (height)	See Appendix (2) The specification of the tool height is optional.	-	Unimportant	Unimportant
	X	C_WKONTZ	144,6	mm	Tool contour along Z axis	See Appendix 2	Item20	5	BCD	Tool contour: dimension along Z axis (max. length)		U1	Unimportant	very important
	X	C_WSTAT	66		Tool status	66	Item6	2	BCD	Tool status	New tool: 66	T9	important; 66 > tool approved and coded for fixed station	important; 66 > tool approved and coded for fixed station
	X	C_WSUCH	0		Type of tool search	0	Item9	1	BCD	Type of tool search		T11	Specify 0	Specify 0
	X	C_WTYPE	201		Tool type as per Sin840D	See Appendix 1	Item5	2	BCD	Tool type	See Appendix (1)	C1	important; meaning: see Siemens Manual, computation of the tool correction	important; meaning: see Siemens Manual, computation of the tool correction
	X	C_WUEB	2		Tool monitoring	0-3	Item8	1	BCD	Type of tool monitoring	1=tool life, 2=quantity	T10	0,1,2 or 3 according to desired monitoring type	0,1,2 or 3 according to desired monitoring type
Giss 4000 data	X	GR_ABST	70		Shrink depth + fixed value	See Appendix 3								
	X	GR_AS	6-12		Stop plate	See Appendix 3								
	X	GR_FREQ	10		Frequency	See Appendix 3								
		GR_HILFSM	0		Aids									
	X	GR_KUEHLADAP	10-12		Cooling adapter	See Appendix 3								
	X	GR_KZEIT	80		Cooling time	See Appendix 3								
	X	GR_MOD	65		Modulation	See Appendix 3								
	X	GR_OPT	0		Subsequent optical alignment check	1=yes; 0=no								
	X	GR_PINL	113	mm	Pin length	See Appendix 4								
		GR_PISW	4	mm	PIN size for MMS									
	X	GR_TEMP	0,03	mm	Temperature correction	See Appendix 3								
	X	GR_ZEIT	7		Time (max. shrink time)	See Appendix 3								

These data serve the automatic process of tool setting/measurement on the shrinking device.
Data are not transferred to the chip and are not processed by the machine.

Overview CHIP Description for Drill+Counterbore (F8 42xx), Reamers with Hydraulic Expansion (F8 43xx), Thread Taps (F8 44xx), Milling Cutter (F8 45xx), Combination Tool (F8 48xx), Cleaning T

		MTM data *(characteristics for pre-set devices)*					**Balluff chip data** *(items)*					**Grob machine data** *(Dialog variables)*		
	Input in project HDEP ZKG	**Identifier**	**Value**	**Unit**	**Description**		**Item**	**Length in Bytes**	**Format**	**Content**	**Comment**	**Dialog variable GROB**	**G module**	**Machining center shelf magazine**
		(Example of stepped drill F8 4510 0007553; F011 016 326100 OP20 HDEP ZK)												
Machine data	x	C_BOHRKABST	0		Drilling head support	1=yes; 0=no	Item14	4	BCD	with drilling head support		A5	important; set tool with drilling head support to 1	important; set tool with drilling head support to 1
	x	C_GR	1111		Tool size for magazine	Dm less than 150 =1111; greater than 150 =2222	Item3	2	BCD	Tool size	1111	T4	important; meaning: see Siemens Manual, important in corrections > magazine station; see mech. planning of magazine assignment	is not analyzed (but must be pre-assigned 1111); instead, variables U1 and U2 are present
	x	C_KUEHLDRUCK	0	bar	Coolant pressure	Specifications: see tool plan	Item11	4	BCD	High coolant pressure	Pressure in bar	A2	important	important
	x	C_LANGW	0		Special tool	1=yes; 0=no	Item18	4	BCD	Special tool regarding contour radius (0= normal, 1= greater than 340 mm)		A9	Enter 0	0 normal; 1 diameter greater than 340 mm
	x	C_LANGWZW	0		Tool change slow	1=yes; 0=no	Item16	1	BCD	Slow tool change	0 = fast, 1 = slow	A7	important; must be specified if tool heavy or top-heavy	important; must be specified if tool heavy or top-heavy
	x	C_MMS	0		MQL	1=yes; 0=no	Item29	1	ASCII	MMS tool	0=no MMS tool 1=MMS tool	-	Unimportant	Unimportant
		C_MS_CHP			Measurements for chip									
		C_MS_REH			Measurement sequence									
	x	C_SPINDELREG	0		Spindle control	1=yes; 0=no	Item13	4	BCD	without spindle control	Use with (e.g.) measuring probe	A4	if tool locked, the spindle control must be switched off / e.g.: tool chisel, stamp tool)	if tool locked, the spindle control must be switched off / e.g.: tool chisel, stamp tool)
	x	C_SPINDELM	0		Torque monitoring system	1=yes; 0=no	Item17	4	BCD	Reference value for spindle torque monitoring		A8	0 monitoring off; 1 monitoring is activated	0 monitoring off; 1 monitoring is activated
	x	C_SPINDMAX	500	rpm	max. spindle speed	0-10000 (2 x value as in tool plan)	Item15	4	BCD	max. spindle speed	rpm	A6	important	important
		C_STANDSOLL		Min	Specified tool life		BItem8	4	BCD	Specified: tool life		C33	Depending on monitoring	Depending on monitoring
	x	C_STANDSOLLSTKZ	900	units	Specified quantity	Specified by tool planner	BItem11	4	BCD	Specified: quantity		C34	Depending on monitoring	Depending on monitoring
		C_STANDVORG		Min	Pre-warning limit tool life		BItem7	4	BCD	Pre-warning limit: tool life		C39	Depending on monitoring	Depending on monitoring
	x	C_STANDVORGSTKZ	5	units	Pre-warning limit: quantity	Specified by tool planner	BItem10	4	BCD	Pre-warning limit: quantity		C32	Depending on monitoring	Depending on monitoring
	x	C_TOOLCHECK	0		Toolcheck	1=yes; 0=no	Item10	4	BCD	Toolcheck reference length		A1	0 no toolcheck monitoring, tool is measured first time Toolcheck is used	0 no toolcheck monitoring, tool is measured first time Toolcheck is used
	x	C_WKONTX	150	mm	Tool contour along X axis	See Appendix 2	Item21	5	BCD	Tool contour: dimension along X axis (max. radius)	See Appendix (2)	U2	Unimportant	very important
	x	C_WKONTY		mm	Tool contour along Y axis	See Appendix 2	Item22	5	BCD	Tool contour: dimension along Y axis (height)	See Appendix (2) The specification of the tool height is optional.	-	Unimportant	Unimportant
	x	C_WKONTZ	133	mm	Tool contour along Z axis	See Appendix 2	Item20	5	BCD	Tool contour: dimension along Z axis (max. length)		U1	Unimportant	very important
	x	C_WSTAT	66		Tool status	66	Item6	2	BCD	Tool status	New tool: 66	T9	important; 66 > tool approved and coded for fixed station	important; 66 > tool approved and coded for fixed station
	x	C_WSUCH	0		Type of tool search	0	Item9	1	BCD	Type of tool search		T11	Specify 0	Specify 0
	x	C_WTYPE	140		Tool type as per Sin840D	See Appendix 1	Item5	2	BCD	Tool type	See Appendix (1)	C1	important; meaning: see Siemens Manual, computation of the tool correction	important; meaning: see Siemens Manual, computation of the tool correction
	x	C_WUEB	2		Tool monitoring	0-3	Item8	1	BCD	Type of tool monitoring	1=tool life, 2=quantity	T10	0,1,2 or 3 according to desired monitoring type	0,1,2 or 3 according to desired monitoring type
Giss 4000 data	x	GR_ABST												
	x	GR_AS												
	x	GR_FREQ												
		GR_HILFSM												
	x	GR_KUEHLADAP												
	x	GR_KZEIT												
	x	GR_MOD												
	x	GR_OPT												
	x	GR_PINL												
		GR_PISW												
	x	GR_TEMP												
	x	GR_ZEIT												

In the case of tools not shrunk and measured on the Gühing Giss 4000, data need not be entered here.

These data serve the automatic process of tool setting/measurement on the shrinking device.
Data are not transferred to the chip and are not processed by the machine.

ool (F8 57xx)

Appendix 9b – Data Format for RFID Data Storage Medium BIS M-122-02/A

Data Transfer from Shrinking/Adjustment Device to Code Carrier

Status of the specification: 20.02.2020

Change

20.02.2020: ID 111 - Bitem 111 was residual tool life\number / Bitem 112 and 113 text adapted to Bitem111
19.03.2019: Bitem 106,114,117 addition for measuring sensor data / Bitem117-119 addition for angular head data
03.08.2018: ITEM2 data type changed to ASCII and length changed / ITEM14,35,45 and 49 data type and length changed to 19 bytes, comment

ID	Item no.	Field name: Balluff	Data type	Start	Length	Value from MTM	Comment
1	Item1	ID	ASCII	0	32	ID	Tool designator: F8 number with/without classification part (example: F8 4110 01234567)
2	Item2	NT	ASCII	32	16	NT	Tool no. series (see ID1) e.g. 104017
3	Item3	NTA	ASCII	48	16	NTA	Tool no. start-up/Sirnau e.g. F8-# last 6 characters (see ID1)
4	Item4	TESTT	NUM (BCD)	64	1	TESTT	Series production tool or test tool (e.g. 0=test tool , 1=series production tool)
5	Item5	GR	NUM (BCD)	65	2	GR	1111 (for larger tools 2222 or 3333, depending on magazine list)
6	Item6	STD	ASCII	67	32	STD	Default value: "NORMAL"
7	Item7	SF	NUM (BCD)	99	1	SF	Shrink shrink-fit chuck (0=no; 1=yes)
8	Item8	Z	NUM (BCD)	100	1		n - cutting; Item8 forms the repeat counter for block BItem1 to BItem24
9	Item9	MACHINE	ASCII	101	20	MACHINE	DC machine no. (corresponds to equipment no. - when unloading tool from the machine) Ignore when reading, fill when unloading
10	Item10	DMCFI	ASCII	121	36	DMCFI	DMC code component 1st machining (MBN 10495 specification)
11	Item11	DMCLA	ASCII	157	36	DMCLA	DMC code component last machining (MBN 10495 specification)
12	Item12	INITSTAT	NUM (BCD)	193	2	INSTAT	Tool status From MTM the value "66" is always transmitted for new tool
13	Item13	WGR	NUM (BCD)	195	2	WGR	Reason for change (from WVS)
14	Item14	WGRTS	ASCII	197	19	WGRTS	Machine WKZ off time stamp (hh:mm:ss YYYYMMDD)
15	Item15	WUEB	NUM (BCD)	216	1	WUEB	Type of tool monitoring (1=according to tool life; 2=according to quantity; generally corresponds to cuts with WVS)
16	Item16	SPINMAX	NUM (BCD)	217	4	SPINMAX	rpm
17	Item17	LANGWZW	NUM (BCD)	221	1	LANGWZW	0 = fast, 1 = slow
18	Item18	GWI	NUM (BCD)	222	1	GWI	ZB total weight in kg (for WZW)
19	Item19	WKONZ	NUM (BCD)	223	5	WKONZ	Tool contour: dimension along Z axis (max. length)
20	Item20	WKONX	NUM (BCD)	228	5	WKONX	Tool contour: dimension along X axis (max. radius)
21	Item21	WKONY	NUM (BCD)	233	5	WKONY	Tool contour: dimension along Y axis (max. height)
22	Item22		NUM (BCD)	238	3	*SOKE*	Special identifier Bit 0 = increased weight torque Bit 1 = tool with torque support Bit 2 = bridge tool 5 = traverse feed Bit 13 = pick-up tool
23	Item23	TOOLCHECK	NUM (BCD)	241	4	TOOLCHECK	Toolcheck reference length
24	Item24	KUEHLDRUCK	NUM (BCD)	245	4	KUEHLDRUCK	Pressure in bar

ID	Item no.	Field name: Balluff	Data type	Start	Length	Value from MTM	Comment
25	Item25	WEST	ASCII	249	4	Initial tool use quantity	Value range: 0-9 0=no initial part check 1=initial part check without disadvantage 2=initial part check with 1 (2-1) follow-up parts 9=initial part check with 8 (9-1) follow-up parts Please note: New parameter: must be written to code carrier! Adaptation of configuration file of the adjustment devices. for (e.g.) value "5" Byte 227: 0 Byte 228: 0 Byte 229: 0 Byte 2230: 5
26	Item26	SPINDELREG	NUM (BCD)	253	4	SPINDELREG	Use with (e.g.) measuring probe
27	Item27	LANGW	NUM (BCD)	257	4	LANGW	Special tool regarding contour radius (0= normal, 1= greater than 340 mm)
28	Item28	RES10	NUM (BCD)	261	5		Reserve
29	Item29	TOOLPLAN	ASCII	266	32	TOOLPLAN	F011Plan-Nr
30	Item30	SPINDEL	ASCII	298	3	SPINDEL	Value range: 1-9999 Please note: Previously not used, details to be clarified: for (e.g.) OP150-2 spindle 12: Byte 276: 0 Byte 277: 1 Byte 278: 2
31	Item31	MQL	ASCII	301	1	MQL	0=no MMS tool 1=MMS tool
32	Item32	RES20	ASCII	302	30		Reserve sector for OEM
33	Item33	WVGID	ASCII	332	32		Adjustment device field ID no.
34	Item34	WVGBEZ	ASCII	364	32		Adjustment device design.
35	Item35	WVGTS	ASCII	396	19		Adjustment device time stamp
36	Item36	WVGU	ASCII	415	16		Adjustment device user no.
37	Item37	WVGEQ	ASCII	431	32		Adjustment device WVG identifier EQ no.
38	Item38	WVGADP	NUM (BCD)	463	3		Adjustment device adapter number
39	Item39	SERNRH	ASCII	466	50	SERNRH	Serialization no. of the holder
40	Item40	SERNR1	ASCII	516	50	SERNR1	Serialization no.1 single part
41	Item41	SERNR2	ASCII	566	50	SERNR2	Serialization no.2 single part
42	Item42	SERNR3	ASCII	616	50	SERNR3	Serialization no.3 single part
43	Item43	REVSOLL	NUM (BCD)	666	6	REVSOLL	Specified: number of tool applications up to auditing
44	Item44	REVREST	NUM (BCD)	672	6	REVREST	Remainder: number of tool applications up to auditing
45	Item45	REVDAT	ASCII	678	19	REVDAT	Last auditing date
46	Item46	INSTNA	ASCII	697	32	INSTNA	Repair: name (company)
47	Item47	INSTNR	ASCII	729	32	INSTNR	Repair: order number
48	Item48	INSTCO	NUM (BCD)	761	2	INSTCO	Repair: counter number of repairs (accumulated)
49	Item49	INSTDAT	ASCII	763	19	INSTDAT	Repair: date
50	Item50	ALLOPSI	NUM (BCD)	782	5	ALLOPSI	Total number of pieces per die for all individual steps
51	Item51	ALLOP	NUM (BCD)	787	2	ALLOP	Accumulated number of implementations
52	Item52	RES30	ASCII	789	40		Reserve sector for OEM

Tool data, total **828**

ID	Item no.	Field name: Balluff	Data type	Start	Length	Value from MTM	Comment

Offset X = 829 + (Schneide -1) * 115

829 = Startwert Schneide Nummer 1
Schneide = Angabe 'wie vielte Schneide auf dem Code Chip'
115 = Anzahl Schneidendaten

101	BItem101	SCHNEIDE1	NUM (BCD)	X+0	2		Blade number (n number) see Item8
102	BItem102	WTYP1	NUM (BCD)	X+2	2	WTYP1	Tool type (cut type)
103	BItem103	ISTMASS1	NUM (BCD)	X+4	5		Length 1 -Z
104	BItem104	WKOR2	NUM (BCD)	X+9	5		Length2
105	BItem105	WKOR4	NUM (BCD)	X+14	5		Length3
106	BItem106	WKOR3	NUM (BCD)	X+19	5		Radius 1 (cutting edge corner radius when turning) Radius of the measuring sensor ball (measuring sensor according to Siemens TOOL (WZG) type 710,712,713, except star measuring sensor 714) Outside radius R of the star (star measuring sensor TOOL MODEL 714)
107	BItem107	VLAENG1	NUM (BCD)	X+24	3		Wear length 1
108	BItem108	VLAENG2	NUM (BCD)	X+27	3		Wear length 2
109	BItem109	VLAENG3	NUM (BCD)	X+30	3		Wear length 3
110	BItem110	VRAD	NUM (BCD)	X+33	3		Wear radius (cutting edge corner radius when turning)
111	BItem111	STANDREST1	NUM (BCD)	X+36	4	STANDREST1	Actual: quantity / tool life (in minutes) [MB Powertrain: Standard is number of tool applications]
112	BItem112	STANDVORG1	NUM (BCD)	X+40	4	STANDVORG1	Prewarning limit: quantity / tool life (in minutes) [MB Powertrain: Standard is number of tool applications]
113	BItem113	STANDSOLL1	NUM (BCD)	X+44	4	STANDSOLL1	Specified: quantity / tool life (in minutes) [MB Powertrain: Standard is number of tool applications]
114	BItem114	MULTI1	NUM (BCD)	X+48	4		Teeth number (in milling) Pitch (with thread tap) Point angle/cut-free angle (with remainder) Length L of the extension arm (L measuring sensor, Siemens tool model 713) Radius of a measuring sensor ball (star measuring sensor, Siemens tool model 714)
115	BItem115	SCHNEIDLAGE1	NUM (BCD)	X+52	2		Blade 1 cutting position according to quadrants
116	BItem116	ORIENTW	NUM (BCD)	X+54	1		Angular head (orientation)
117	BItem117	WÍNKEL11	NUM (BCD)	X+55	5		Angle 1 (e.g. when turning=holder angle) Correction angle (measuring sensor Siemens tool model 710,712,713,714) Adapter length 1 (angular head)
118	BItem118	WÍNKEL12	NUM (BCD)	X+60	5		Angle 2 (e.g. when turning=blade turning angle) Adapter length 2 (angular head)
119	BItem119	PLLAENG1	NUM (BCD)	X+65	5		Plate length (for turning tools) Adapter length 3 (angular head)
120	BItem120	PLBREIT1	NUM (BCD)	X+70	4		Plate width (with turning tools)
121	BItem121	BZGRICHT1	NUM (BCD)	X+74	1		Reference direction (with turning tools)
122	BItem122	PLAN1	NUM (BCD)	X+75	5		Axial runout
123	BItem123	RUND1	NUM (BCD)	X+80	5		Concentricity
124	BItem124	RES1	NUM (BCD)	X+85	5		Reserve1
125	BItem125	RES2	NUM (BCD)	X+90	5		Reserve2
126	BItem126	RES3	NUM (BCD)	X+95	20		Reserve3

Length per blade **115**

Tool data, total (8 blades) **1748**

Start of blade 1	ID101	829
End of blade 1		943
Start of blade 2	ID201	944
End of blade 2		1058
Start of blade 3	ID301	1059
End of blade 3		1173
Start of blade 4	ID401	1174
End of blade 4		1288
Start of blade 5	ID501	1289
End of blade 5		1403
Start of blade 6	ID601	1404

ID	Item no.	Field name: Balluff	Data type	Start	Length	Value from MTM	Comment
	End of blade	6		1518			
	Start of blade	7	ID701	1519			
	End of blade	7		1633			
	Start of blade	8	ID801	1634			
	End of blade	8		1748			

List of Costs for Tool Ordering Scope

a) Costs for tool engineering (such as planning of the machining sequence/performance data, coordination on machining device, tool life calculation, etc.)

b) Costs for 3 sets of chucking tools and/or tool holders ready for use
additional, shown separately
Costs for 3/5 set of wear tools
Note: 1 set of tools corresponds to the number of tools in a machine configuration x the number of (parallel) machines.

Adjusting gages and setting masters (1 set)

Wearing tool costs per component (information on tool life per application)

c) Costs for documentation

Tool plan/NC file cards	Costs/page (station for special machines/ tool – assembly for machining center)
	Total costs
Tool drawing	Costs/page
	Total costs
Conversion plan	Total costs
Production sectional drawing	Costs/page
	Total costs
MTM	Costs per assembly
	Total costs

d) Tooling costs for the production of preproduction parts

MTM Filling Matrix

Key MTM entry: X = mandatory data *) = Check at operational system + acceptance		For internal use: R = Responsible for implementation O = Obligation to collaborate (1st competence partner) C = Competence (other competence partners)		FILLING BY:			*) Check operational system + acceptance		
				SUPPLIER		DAI			
No.	MTM data field	Unit	Description / Comment	Tool	Machine		RFID data	Mandatory field *) LH	Procurement-relevant data see LH Chap. 3.1
1	*Tool data*							X	
1.0	Create tool data			X	X	-	-	X	X
1.1	Component part			X	-	-	-	X	X
1.2	Designation			X	-	-	-	X	X
1.3	Designation			X	-	-	-	X	X
1.4	Object characteristics			X	-	-	-	X	X
1.5	Part list			X	-	-	-	X	X
2	*Tool assembly (F8-ZB)*							X	
2.0	Create tool assembly (F8)			-	X	-	X	X	X
2.1	Object characteristics			-	X	-	-	X	X
2.2	Designation			-	X	-	-	X	X
2.3	Designation			-	X	-	-	X	X
2.4	Parts list			-	X	-	-	X	X
2.5	Enter adjustment data (F8)			-	X	-	-	X	
2.6	Settings (D,L,R...)	[mm]		-	X	-	X	X	
2.7	Tolerance values			-	X	-	-	X	
3	*Production equipment plan (F011)*							X	
3.0	Create production equipment plan (F011)			-	-	X	-	X	
3.1	Create planning basic data			-	-	X	-	X	
3.2	Create layout		Component no. (A ...) and F011	-	-	X	-	X	
3.3	Assign part numbers		Equipment no..	-	-	X	-	X	
3.4	Supplier approval		Layout, machine and plan	-	-	X	-	X	
3.5	Number tool holders (DAI tool no. series)		Assignment of machine tool holder numbers	-	-	X	X	X	
4	*Assign tool to holder*							X	
4.0	Assign tool to holder			-	X	-	-	X	
4.1	Enter sister tools		Fill field in the MTM	-	X	-	-	X	
4.2	Define tool holder in magazine		Machine - tool interface (separator coding) (tool for tool number)	-	X	-	-	X	

MTM Filling Matrix

Key MTM entry: X = mandatory data *) = Check at operational system + acceptance		For internal use: R = Responsible for implementation O = Obligation to collaborate (1st competence partner) C = Competence (other competence partners)		FILLING BY:			*) Check operational system + acceptance		
				SUPPLIER		DAI			
No.	MTM data field	Unit	Description / Comment	Tool	Machine		RFID data	Mandatory field *) LH	Procurement-relevant data see LH Chap. 3.1
5	*Adjustment data F011 (F8) see 2.5 - 2.7 (F8-ZB)*							X	
6	*Enter technology data F011*							X	
6.0	Enter technology data F011			-	X	-	-	X	
6.1	Line frequency	[min]	Enter all machining individual cycles, no fast motions	-	X	-	-	X	
6.2	Characteristic designator (MKZ)		Previously machining point plan (BST)	-	X	-	-	X	
6.3	Diameter to be machined	[mm]		-	X	-	-	X	
6.4	Vc	[m/min]	Cutting speed	-	X	-	-	X	
6.5	n	[rpm]	turns	-	X	-	-	X	
6.6	f	[mm/rot]	Feed	-	X	-	-	X	
6.7	Vf	[mm/min]	Feed rate	-	X	-	-	X	
6.8	Travel	[mm]	Machining distance traversed in workpiece	-	X	-	-	X	
6.9	Machine time th	[s]	Time for working distance	-	X	-	-	X	
6.10	Cooling lubricant pressure	[bar]		-	X	-	X	X	
7	*Peripheral data F011*							X	
7.0	Enter peripheral data F011			-	X	-	-	X	
7.1	Cutting direction		left or right	-	X	-	-	X	
7.2	Balancing		See selection	-	X	-	-	X	
7.3	Balancing speed	[rpm]	Rotational speed for which the tool is being balanced	-	X	-	-	X	
7.4	Residual imbalance	[gmm/kg]		-	X	-	-	X	
7.5	Tool weight	[kg]		-	X	-	X	X	
7.6	Adapter number		Adapter for WVG	-	-	X	X	-	
7.7	Production equipment type		Note selection	-	-	X	-	-	
7.8	Measurement process		Parameters for particular WVGs	-	-	X	-	-	
7.9	Tool presetting comment		Device specific	-	-	X	-	-	
7.10	Tool presetting parameter		Devices or measuring program specific	-	-	X	-	-	
7.11	Enter alternatives			-	-	X	-	-	
7.12	Turning tool	[yes/no]	Yes/no	-	-	X	-	-	

MTM Filling Matrix

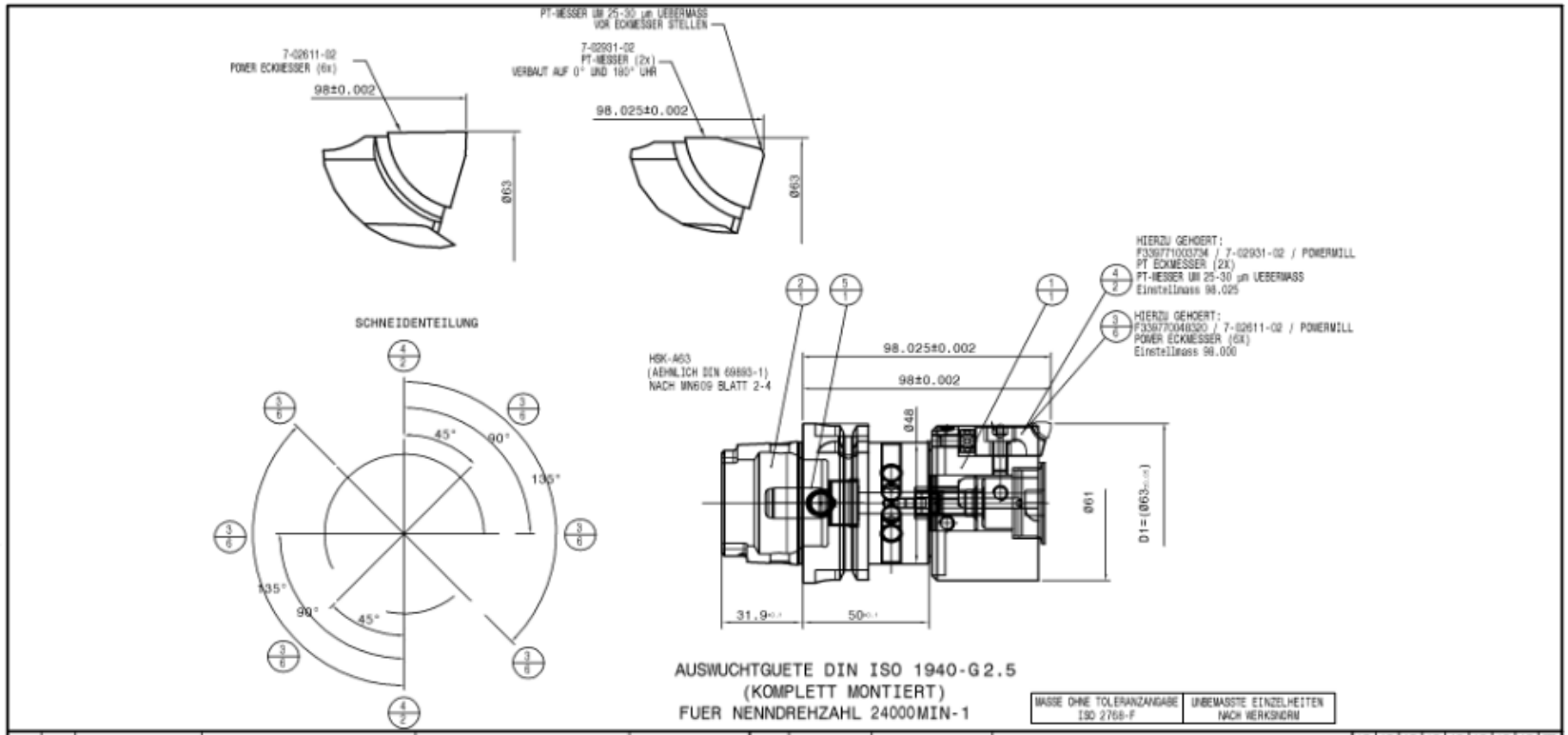
Key MTM entry: X = mandatory data *) = Check at operational system + acceptance		For internal use: R = Responsible for implementation O = Obligation to collaborate (1st competence partner) C = Competence (other competence partners)		FILLING BY:			*) Check operational system + acceptance		
				SUPPLIER		DAI			
No.	MTM data field	Unit	Description / Comment	Tool	Machine		RFID data	Mandatory field *) LH	Procurement-relevant data see LH Chap. 3.1
8	*MTM WVS*							X	
8.1.0	MTM WVS			-	X	-	-	X	
8.1.1	WVS Operate Part III Appendix 35 (Prisma connection)		Mandatory when ordering	-	X	-	-	X	
8.1.2	WVS machine parameters		Default values: if necessary, see MTM-WVS documentation or Appendix on "Matrix_Param_and_Special Functions"	-	X	-	-	X	
8.1.3	WVS machine	[yes/no]	Machine is thereby declared as WVS machine	-	X	-	-	X	
8.1.4	Machine control system type		840D only, WVS is currently available only for Siemens control systems	-	X	-	-	X	
8.2	*WVS workpiece configuration*							X	
8.2.0	WVS workpiece configuration			-	X	-	-	X	
8.2.1	Workpiece name in WVS		Workpiece designation that should be visible on the control panel	-	X	-	-	X	
8.2.2	Units per cycle in the WVS		Number of workpieces finished per cycle	-	X	-	-	X	
8.2.3	WVS cycle times		Time for one machine cycle	-	X	-	-	X	
8.2.4	PLC TYPE DB59 in the WVS		as per MTM/WVS documentation; this is the number under which the workpiece is known in the PLC.	-	X	-	-	X	
8.2.5	Workpiece type DB59 in the WVS		as per MTM/WVS documentation; this is the workpiece type counter number in the PLC that is also relevant for Prisma.	-	X	-	-	X	
8.3	*WVS tool configuration*							X	
8.3.0	WVS tool configuration			-	-	-	-	X	
8.3.1	Number of steps		E.g. number of bores drilled on a workpiece by a drill.	-	X	-	-	X	
8.3.2	Tooling		Default value = 0; relevant only if sister tools are used. This configures in which tool sector of the NC the tool is located.	-	X	-	-	X	
8.3.3	Tool row index		Default value = 0; relevant only if sister tools are used. This configures which tool row index the tool has in the NC.	-	X	-	-	X	
8.3.4	Target number of tool applications		Specification for the number of steps that a tool can attain before it must be changed.	-	X	-	-	X	
8.3.5	Sister tool no.		Default value = " "; if sister tools are used, the number of the sister tool is configured here.	-	X	-	-	X	

MTM Filling Matrix

Key MTM entry: X = mandatory data *) = Check at operational system + acceptance		For internal use: R = Responsible for implementation O = Obligation to collaborate (1st competence partner) C = Competence (other competence partners)		FILLING BY:			*) Check operational system + acceptance		
				SUPPLIER		DAI			
No.	MTM data field	Unit	Description / Comment	Tool	Machine		RFID data	Mandatory field *) LH	Procurement-relevant data see LH Chap. 3.1
8.3.6	Warning limit		Default value = 90% Specification for a warning limit at which the yellow signal lamp on the machine flashes and the control panel displays a message "WVS prewarning limit reached". A color change (yellow) occurs in the change preview on the control panel.	-	-	-	-	-	
8.3.7	Threshold value		Default value = 60% Specification for a further warning limit at which the change preview on the control panel displays a color change (blue). Display only, no machine reaction.	-	-	-	-	-	
8.3.8	Increase in number of tool applications		Default value = 10% Incremental value by which the specified number of applications of a tool is temporarily increased percentage-wise if the button for "specified number of tool applications" on the control panel is actuated. This function serves the incremental approach to an optimal specified number of tool applications in new processes.	-	-	-	-	-	
8.3.9	PLC ID		Possibility of assigning a tool an identification number that if required can be written to a particular storage location in the PLC following a tool change, in order to derive a machine reaction.	-	-	-	-		
8.3.10	Serial No. (serialization no.)		For serialized tools in MTM. Describes in terms of MTM the number of specimens of a tool reserved for a machine.	-	-	-	X	-	
8.3.11	Prisma ID		Automatic filling. The Prisma ID contains the unique portion of tool information in the telegram to Prisma in a tool change. It is automatically generated by MTM from the spindle number, series no. and F-number (assembly).	-	-	-			
8.3.12	Select reasons for change		Default values with coverage of approx. 98%. RFID receives only the reason for change transmitted. Adaptation per tool possible.	-	-	-	X	-	
9	*F011 - Preset devices (WZ)*								
9.0	F011 - Preset devices (WZ)			-	X	-	-	-	
9.1	Check adjustment dimension			-	-	-	-	-	
9.2	Add presetting relevant data (adapter+commentary+measurement sequence...)			-	-	-	-	-	
9.3	Forward adjustment dimension to presetting device			-	-	-	-	-	
9.4	F8 with adjustment dimension!? Currently at F011 check online interface NC programming			-	X	-	-	-	
9.5	DXF drawing 100% check F011 + F8			-	-	-	-	-	
9.6	DXF drawing 100% check DWP process			-	-	-	-	-	
9.7	DWP process 3D data			-	-	-	-	-	
9.8	DWP process 3D data (F8)			-	-	-	-	-	

MTM Filling Matrix

Key MTM entry: X = mandatory data *) = Check at operational system + acceptance		For internal use: R = Responsible for implementation O = Obligation to collaborate (1st competence partner) C = Competence (other competence partners)		FILLING BY:			*) Check operational system + acceptance		
				SUPPLIER		DAI			
No.	MTM data field	Unit	Description / Comment	Tool	Machine		RFID data	Mandatory field *) LH	Procurement-relevant data see LH Chap. 3.1
10	*RFID data (WZ) - supplementary Appendix 9a/9b*							X	
10.0	RFID data (tool) - supplementary			-	-	-	-	X	
10.1	Tool no. Start-up		e.g. F8-# last 6 characters	-	X	-	X	X	
10.2	Standard value		Tool size "normal" default	-	X	-	X	X	
10.3	Tool size		1111,2222,3333 - space required in magazine	-	X	-	X	X	
10.4	Tool status		Generally "66" for new tool	-	X	-	X	X	
10.5	Number of cutting stages = n		corresponds to employed measurement levels (only 840D control-relevant cutting)	-	X	-	X	X	
10.6	Tool type per cutter			-	X	-	X	X	
10.7	Max. rotational speed of the tool	[rpm]	of the tool	-	X	-	X	X	
10.8	Tool change		0 = fast, 1 = slow	-	X	-	X	X	
10.9	Adjustment dimension along Z-axis (number n-fold)	mm	corresponding to the cutting stage	-	X	-	X	X	
10.10	Adjustment dimension along X-axis (number n-fold)	mm	corresponding to the cutting stage	-	X	-	X	X	
10.11	Cutting radius (number n-fold)	mm	corresponding to the cutting stage	-	X	-	X	X	
10.12	Cutting position		Lathes require cutting position according to quadrants	-	X	-	X	X	
10.13	Tool contour: dimension along Z-axis	mm	(max. length)	-	X	-	X	X	
10.14	Tool contour: dimension along X-axis	mm	(max. radius)	-	X	-	X	X	
10.15	Tool contour: dimension along Y-axis	mm	(max. height)	-	X	-	X	X	
10.16	Shrink-fit chuck yes/no	[yes/no]		-	X	-	X	X	



Pos	St.	Sachnummer	Benennung	Kurzbezeichnung	Hersteller
1*	1	F7 4652 0549765	ECKFRAESERKOERPER	63 X 48 X 22 -Z8-PKD	WAPAL WMS G..
2*	1	F7 0063 1028882	AUFSTECKFRAESERDORN	HSK-A 63 X 22 X 50	DR. KRESS KG..
3	6	F3 3977 0048320	SCHNEIDKOERPER	7-02611 - 02-PKD	WAPAL WMS G..
4	2	F3 3977 1003734	SCHNEIDKOERPER	30696518-PKD	WAPAL WMS G..
5*	1	F7 9006 0091461	KUEHLMITTELROHR	MN5218-08	WAPAL WMS G..

Nr.	Datum	Name	Art der Aenderung
0	26.04.16	BIR	

Eq.-Nummer	Aufnahme Nr.	Kost.
9101000186633	119036	1531
9101000186636	119036	1531
9101000186630	119036	1531
9101000186635	119036	1531
9101000186632	119036	1531
9101000197776	119036	1531
9101000186634	119036	1531
9101000186631	119036	1531

Bearb.: Ignatakis	Antrieb S1: FDA-A22	
Datum: 09.02.16	Kühlmittel:	
Benennung: ECKFRAESKOPF	Werk: 010	Blatt: Blatt 1 von 2
Bezeichnung: 63 X 98-Z8-PKD		U.-Ken.: WKB
Zeichnungs-Nr. (MB-Sachnummer) F8 4511 0035183	Mercedes-Benz	

DIN A3

Production Equipment Technology Manual

Table of Contents

Record of Revisions

Version:	**Last revised**:	**Chapter:**	**Changed by:**
11.0		• Technology Manual for Production Equipment as Appendix 15 in Powertrain Requirement Specifications	Participants in work package (AP) 1.4 in the "Powertrain Standardization" project
12.0	29.04.14	• 1.4.1 +1.6 + 1.7 + 1.11.1.1 + 2.1 + 5.2.1 + 5.2.2	Participants in work package (AP) 1.4 in the "Powertrain Standardization" project
13.0	10/2015	• 1.8.2. + 1.8.3.+ 5.	Participants in work package (AP) 1.4 in the "Powertrain Standardization" project
14.0	03/2018	• Editorial revision and updating of references to standards • 1.4.1 Omission of a holding system	Participants in work package (AP) 1.4 in the "Powertrain Standardization" project
15.0	03/2019	• All standard numbers updated • 1.3.2 Editorial revision • 1.4.1 Editorial revision • 1.9.3 Editorial revision Requirements on gearing scraping in hob peeling changed • 3.2.1 Test Pushbutton and • 3.2.1.1 Test Pins deleted	Participants in work package (AP) 1.4 in the "Powertrain Standardization" project

Version:	**Last revised**:	**Chapter:**	**Changed by:**
		• 3.2.1 Inspection by Mechanical Contact with Tool deleted • 4.1 Drill Bushes and 4.2 Drill Bush Holders deleted • 5 Balance Requirement as per ISO16084 Fine supplemented. • Appendix 5 in 15-5 and the name "Machine and Spindle Documentation (spindle numbering)" changed to "Specifications on Double Spindle Machines, Machining Center and Transfer Lines - also with drilling heads in the production equipment plan"	

1. Technology Manual for Production Equipment Design

A			E	F			X	Y
1	2			6	7	8		

1.1 Drilling/Deep Hole Drilling

Coated carbide drills shall be provided for as per MBN 30-1 or MBN 60. Drill types should be selected considering cost effectiveness and process reliability, as follows:

Speed	**<= 8000 rpm**	**> 8000 rpm**
Machining of aluminum	MBN 30-1 with adapter in combination with shanks without clamping surfaces or MBN 60	MBN 30-1 with adapter in combination with shanks without clamping surfaces
Machining of steel	MBN 30-1 with adapter	
Machining of cast iron	MBN 30-1 with adapter	

During drilling or deep hole drilling on machining centers, spiral fluted, internally cooled drills with

shanks as per MBN 30 -1shall be used (see Chapter 1.5).

The tools are always to be designed with inner cooling at bore hole depths of > 2 x D.

For single-fluted deep drilling, spindle tool holder systems acc. to MBN 93 (in special cases MBN 58) shall be used.

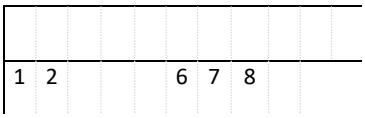
When re-drilling cross holes, the length of the solid carbide head is to be designed accordingly. Brushes are to be used to deburr gun-bored holes.

For shrink-fitted solid carbide tools or solid carbide tools clamped in the hydraulic expansion chuck, the following applies

- Shank shape DIN 6535 HA
- Shank tolerance h6.

The readjustment area is to be dimensioned sufficiently (min. 10 mm) to ensure regrinding is repeated a corresponding number of times. A maintenance drawing shall be made available to Daimler.

1.2 Reaming



1.2.1 Reaming (Straight Bores)

Multi-blade carbide reamers with parallel shaft according to DIN 6535 HA are to be used.

Rail-guided tools with inserts and HSK holder are to be used for bores with high roundness requirements and positional accuracy.
They are to be designed with two blades (microcut) if possible.

The cutter shall be adjustable both radially and axially. Cermet, PCD or carbide is to be used as rail material.

For verification of the efficiency, single-piece reamers with soldered

PCD blades are possible as an alternative for aluminum machining. These shall be used with a spindle. It shall be possible to regrind them several times.

Multi-blade bore rods (without guide strips) with adjustable plate seats or short clamping brackets are to be used for bores D > 20 mm with a tolerance of H9 (e.g. cover bores).

1.2.2 Reaming (Tapered Bores)

1 2 6 7 8

For tapered holes in steel, multi-cutter HSS reamers shall be used. Rail-guided tools with inserts and HSK holder can be used if the economic and technical requirements are met. The cutter shall be adjustable both radially and axially.

1.2.3 Reaming of Long Bores

1 2 6 7 8

To produce deep drilled holes (l/d ⍰ 4) with demanding requirements regarding concentricity, straightness, surface roughness and for production in one machining step, the following applies:

E F

- Reamers are inserted in EMUGE sleeve spindles with locking sets and guided closely in front of the workpiece by pilot bushings that move along.
  (e.g. with shift valves and valve housings of automatic transmissions and with the valve guides of cylinder heads).
- The reamers used are primarily gib-guided single-lip tools.

1.3 Milling

1 2 6 7 8 9

The usage of angular milling heads shall be approved by the responsible representative.

1.3.1 Face/Corner Milling

1 2 6 7 8 9

Milling should be performed without cooling lubricant (dry). The representative's approval is necessary if the usage of cooling lubricant is technically required.

Key indicators such as drive power, torque and cutting, feed and axial forces shall be specified for new or worn blades for rough cutting processes.

Shell-type milling arbors with screwed sliding blocks are required without exception; catalog tools have priority in use.

The milling body is to be of compact design. The overall height shall be designed as per DIN8030-1.

In machining center production with HSK-A100, the maximum milling cutter diameter is 315 mm (with milling cutter Ø > 100.00 mm with enlarged contact surfaces, "HSK-AS" as per ISO12164-1; HSK-B100 as per DIN 69893-2:2010-06).

For milling cutter diameters ≥ 160.00 mm, the milling bodies can be produced from aluminum in special cases – following prior approval by Daimler. They shall be equipped with a ground concentricity and axial run-out control ring and two M12 forcing threads at the face end.

For milling cutters Ø > 250.00 mm, the use of appropriate replacement aids is to be coordinated with Daimler.

Transport holes (M12) shall be drilled at the sides according to the higher-priority work and accident prevention safety guidelines.

If milling cutter bodies are of aluminum, precautions shall be taken to prevent erosion from the flow of chips.

For shrink-fitted solid carbide tools or solid carbide tools clamped in the hydraulic expansion chuck, the following applies:

- Shank shape DIN 6535 HA
- Shank tolerance h6

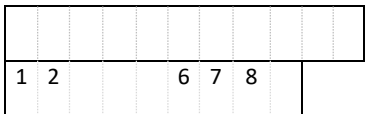
Commercially available shell-type milling cutters of up to 50.00 mm in diameter are mounted on corresponding tool holders with an HSK shank.

A			E	F					

Milling cutters in the diameter range of 63 to 100 mm are to be designed as single-piece tools with a HSK tool holder. If possible, shell-type milling arbors from the catalog may be used in accordance with the standard.

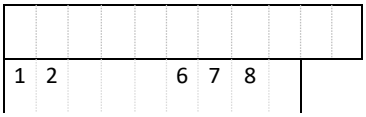
Milling cutters of diameter > 100 mm shall be designed accordingly for spindle holders as per DIN 2079 or with HSK shank for spindle holder as per ISO 12164-2.

1.3.2 Side and Face Milling Cutters and Sets



- Side and face milling cutters shall be designed with a tool holding system as per DIN 2079 .
- Shell-type milling arbors with HSK shank as per ISO12164-1 shall comply with DIN 69882-2 and DIN 69882-3. The corresponding milling cutter tightening screw "FAS74" shall comply with Appendix 15-7.
- Milling arbor for shell-type milling cutters or side and face milling cutters with HSK shank as per ISO12164-1 shall be offered with a hydraulic clamping system as per Appendix 15-7.

1.3.3 Milling Cutters with PCD/CBN Cutting Tips



- These milling cutters shall be designed with 1D or 2D setting.
- 3D setting or combinations are only permissible following consultations with Daimler.
- Repeated regrinding shall be possible when using PCD/CBN cutting tips.
- See also Chapter 1.6

1.4 Threads

1 2 6 7 8

1.4.1 Thread Forming/Tapping

Forming taps shall preferably be used, rather than thread taps.

Reasoning:

- Technically not feasible (e.g. material, wall thickness at workpiece, torque)
- or not permitted for design reasons.

Thread taps comply with MBN 2.

Core hole drills for thread forming are designed as per MBN 81060 Part 2.

For the design of the thread-cutting tools in accordance with the above standards it is an essential precondition that threads comply with MBN 32004-1:1994-08and MBN 10222:2013-06.

In the case of threads for which reworking is impermissible, a check shall be made of an appropriate means of process monitoring.

1.4.1.1 Synchronizing Compensation of Rotational Speed and Feed

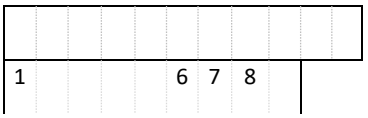
SYNCHRO chucks according to the supplier approval (with minor axial compensation against synchronization errors between thread pitch and spindle) shall be used as a production-reliable mounting system for direct thread forming at high tool rotational speeds.

A E F

1.4.1.2 In Special Cases

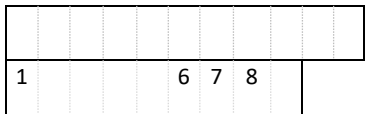
For quick change inserts with a safety coupling, it is important to state in the order whether they are to be used for forming or tapping. The torques are accordingly set and the inserts marked e.g. with "F".

1.4.2 Male and Female Thread Milling



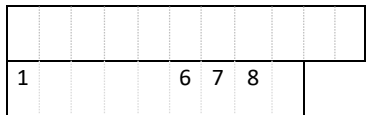
- Male and female thread milling on machining centers is permissible if evidence is provided of economic efficiency and with the agreement of the Development department.
- For thread milling, shrink-fit chucks as per DIN 69882-8 or MBN10387-1 shall be provided for
- Boring part at the female thread milling cutter shall be possible.

1.4.3 Male Thread Production by Cold Rolling



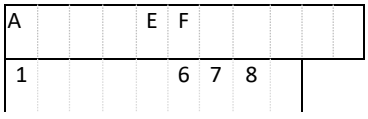
See Chapter 1.11.

1.5 Counterbores, Countersinks, Boring Tools, Combination Boring Tools, Drill-Chamfer Tools, etc. (without Replaceable Cutting Tips)



- Commercially available tools shall be planned.
- For bores in cavities (raw cast contour), solutions shall be selected that prevent any ring formation
- Drill-chamfer tools shall be avoided in favor of stepped drills. Drill-chamfer tools are to be provided only for large spot-faces.
- For shrink-fitted solid carbide tools or solid carbide tools clamped in the hydraulic expansion chuck, the following applies:
- Shank shape DIN 6535 HA
- Shank tolerance h6

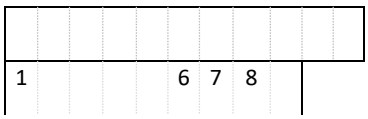
1.5.1 Counterbores



- Stepped counterbores shall be designed as multi-bevel tools.
- The minimum length shall be stated.

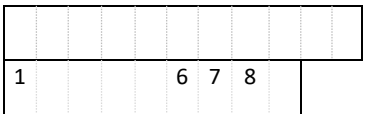
- Multiple regrinding of counterbores shall be possible.

1.5.2 Countersinks



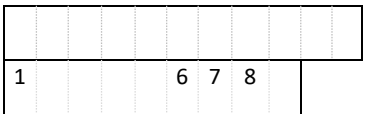
- The width of the circular grinding chamfer should allow the tool to be reground at least three times. Otherwise the tool shall be designed as a shaping tool with a relief ground profile.
- The minimum length shall be stated.

1.5.3 Boring Tools with Detachable Blades



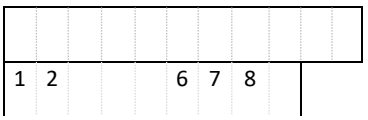
See Chapter 1.6.

1.5.4 Combination Boring Tools



Combination boring tools shall be provided for holes with large spot-faces, see also Chapter 1.6.

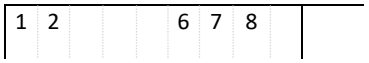
1.6 Cutting Tips for Tools with Detachable Blades (Turning, Boring, Milling)



- ISO cutting tips already approved by Daimler shall be preferably used. The corresponding search shall take place in the MTM system

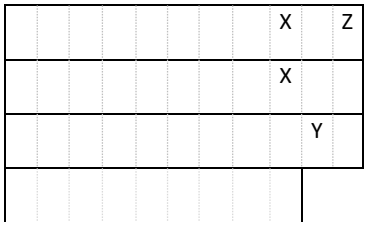
  (see Powertrain Requirement Specifications, Part IV, Chapter 3).
- The tangential alignment of the reversible cutting tip is to be applied if large allowance deviations of up to 4 mm are expected due to cast tolerances.
- When using CBN/PCD cutting material, multiple refacing should be possible if feasible.
  To be able to reuse reground blades, a short clamp holder or a cartridge in the basic body or direct adjustability of the blades is required.

1.7 Turning



- The interface to the machine shall always be designed as per DIN ISO 10889-1 (formerly VDI 3425, DIN 69880).

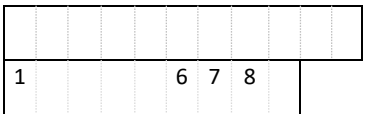
  The following alternatives are possible by agreement with the representative:



- KM40 and KM50 interface
- PSC 32-PSC 100 as per ISO 26623-1 (previously Capto interface)
-
- A detailed determination with the representative with regard to the interfaces to be used is therefore required for MMS use.

  See also Chapter 2

1.8 Grinding



1.8.1 Grinding with Corundum as Grinding Material

- Hub flanges shall be used for attaching and driving grinding wheels without slip under normal operating conditions. Approved flanges for grinding wheels are listed in Appendix 15-8.
- Support flanges shall be designed as per ISO 666 or DIN ISO 666
- For grinding tools made of bonded material, ISO 13942 applies.
- Grinding disks as per DIN ISO 603 (all parts) shall be pre-profiled, with an outer diameter of 500 mm and a 304.8 mm hole.
- Grinding wheels, packing rings and intermediate packing rings for use in the grinding wheel set are defined in MBN 81099.
- Polypenco intermediate layers are required without exception.
-
- Grinding wheels as per DIN ISO 13942 for D < 300 mm shall be tolerated contrary to tolerance specifications TD there as follows:

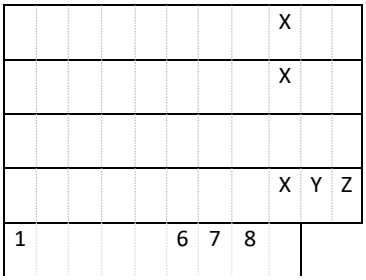
  D TD

3 ≤ D ≤ 8: 0.1 mm

8 < D ≤ 20: 0.1 mm

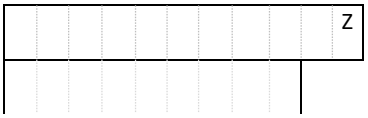
20 < D ≤ 50: 0.2 mm

50 < D: 0.3 mm

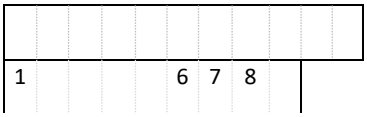


1.8.2 CBN Grinding

- Slanted joints are to be applied to grinding wheel segments.
- Re-coatable steel basic bodies with ceramic bonded CBN are to be preferably used. The effective coating thickness – with ceramic-bonded CBN – shall be at least 5 mm.
- The complete grinding wheel specification is to be stated.
- Galvanically bonded diamond dressing wheels are to be preferably used.
- Appropriate load hoists are to be applied to the transport packaging.
- The usable coating thickness – for ceramic-bonded CBN – shall be at least 8.5 mm. Here the machine shall be designed technically and according to CE conformance so that 7.5 mm of the coating can be used. Deviations are only permitted after consulting with the responsible representative.



1.8.3 Dressing



- Grinding machines are to be equipped with a structure-borne sound sensor system.
- Rotating dressing tools are to be preferably used.
- Needle dressers should be used for stationary dressers.
- Appropriate coolant lubrication is to be provided for the dressing process. The performance of the dressing unit is to be designed for an appropriate dressing speed ratio.
- The number of lifts and the dressing amount shall be coordinated together with the responsible representative.

1.9 Gear Machining

1.9.1 Hobbing

- Hob cutters shall conform with MBN 82001 and MBN 10302. Modules larger than 2.5 are allowed. The number of hob teeth shall be determined in accordance with guide tables MBN 82001 and MBN 10302.

  Note:

  The tools will be reground and refaced or reprofiled several times.

- The coating shall be specified with Daimler according to the latest technology (e.g. wet / dry machining, workpiece material).
- The supplier shall always attach an inspection report.

1.9.2 Gear Shaping

- The geometry and quality of the slitting wheels / gear shaping tools are to be designed according to the following DIN standards:

  DIN1825, DIN1826, DIN 5480-1, DIN 5480-2, DIN ISO 1328-1,–ISO 606, -ISO1275, , DIN 3972, DIN 3978:1987-10.

- The other overall dimensions of the scraping wheels are the responsibility of the machine supplier in cooperation with the tool supplier, based on the collision examinations and the clamping situation.

- Repeated (at least 20 times) regrinding of the slitting wheels / gear shaping tools is to be provided for the design. HSS or carbide substrate shall be selected as agreed with the tool supplier and the manufacturing process, and optimally arranged technically and economically according to the latest information.
- See also Appendix 15-11

1.9.3 Gearing Scraping

1 6 7 8

- The geometry and quality of the scraping wheels are to be designed according to the following DIN standards:

  DIN 5480-1, 5480-2, 3962-1, , DIN ISO 1328-1–ISO 606, -ISO1275, , DIN 3972, DIN 3978:1987-10.

- The other overall dimensions of the scraping wheels are the responsibility of the machine supplier in cooperation with the tool supplier, based on the collision examinations and the clamping situation.
- Repeated (at least 20 times) regrinding of scraping wheels is to be provided for the design. HSS or carbide substrate shall be selected as agreed with the tool supplier and the manufacturing process, and optimally arranged technically and economically according to the latest information.
- The supplier shall always attach a regrinding curve.

1.9.4 Hob Peeling

1 6 7 8

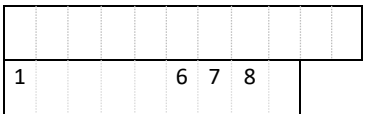
- The geometry and quality of the shaper cutters are to be designed according to the following DIN standards:

  DIN1825, DIN1826, DIN5480-1, DIN5480-2, 8196 –ISO 606, -ISO1275, 8197, 3972,

  DIN 3978:1987-10.

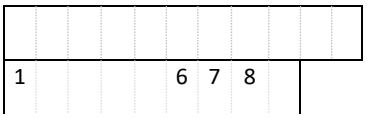
- The other dimensions of the shaper cutters are the responsibility of the machine supplier in cooperation with the tool supplier, given the collision considerations and clamping situation.
- Repeated (at least 10-15 times) regrinding of the slitting wheels / gear shaping tools is to be provided for the design. MBN10137 shall be used as the basis for cutting materials and coatings; HSS or carbide substrate shall be selected as agreed with the tool supplier and the manufacturing process, and optimally arranged technically and economically according to the latest information.

1.9.5 Sharpening and Relief Cutting of Gear Teeth



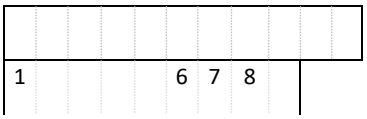
- Tools are used only according to the drawing. The tool geometry is determined by the drawing of the component in soft condition.

1.9.6 Roller Deburring



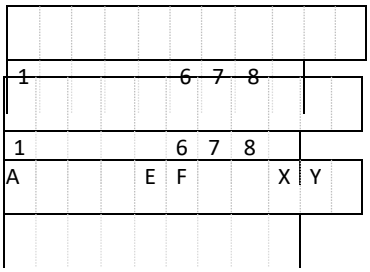
- Tools are used only according to the drawing. The tool geometry is determined by the drawing of the component in soft condition. The tool geometry is usually machine-specific.

1.9.7 Tooth Forming by Grinding



- Dressable roller grinding is to be preferably applied.
- For tooth forming by grinding, the H/D ratio is 160/275 mm according to ISO 666, Table 2.
- Supplemental to MBN 81099:
  - For tooth forming by grinding aluminum intermediate layers are used.
- Measurement reports on the surface quality of the tools are to be appended.

1.10 Broaching



1.10.1 Drawing Shank End Pieces as per DIN

Preferred series for non-oriented profiles for internal profiling broaches:

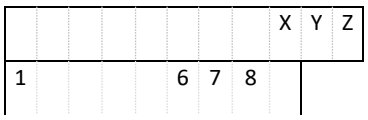
- Drawing shank, round form K as per DIN 1417-1
- End piece, round form M as per DIN 1417-2

In special cases, the preferred series for oriented profiles for internal profiling reamers shall apply:

- Drawing shaft, flattened form J as per DIN 1417-1

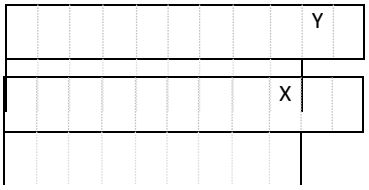
- End piece, flattened form L as per DIN 1417-2

1.10.2 Cutting Material



The cutting material shall be specified as per HSSQ.

- Vanadis 30 SuperClean from Uddeholm
- S 590 from Böhler
- ASP 2030 Erasteel
- S652 from Zapp/Erasteel
- CPM T15 from Zapp
  ASP30



1.10.2.1 When Using Chlorine-Free Broaching Oil:

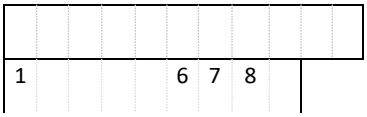
- All dimensions stated in the drawing include the coating
- Before using it for the first time, following application of the coating, the rake angle shall be ground over (peel grind)

1.10.2.2 For Dry Reaming:

- All dimensions stated in the drawing include the coating.
- Each time the tool is serviced – regrinding of rake angle – it shall be recoated.

The coatings are to be designed according to economic aspects and in accordance with state of the art. New and reground broaching tools shall be free of burrs after 10 broaching operations at the blades.

1.10.3 Design



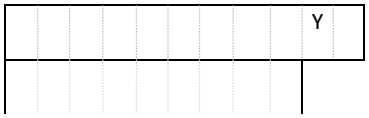
Broaches shall be designed in accordance with the following features:

- At least 4 reserve teeth shall be provided

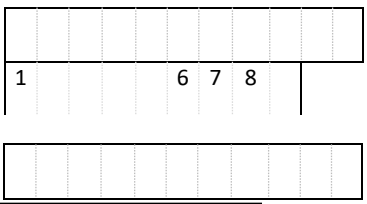
- The profile pitch may not exceed 0.05 mm.
- The pulling stem before starting to ream has a reserve length of at least 20 mm (toothing inlet start up to 1st broaching tooth)
- Centering bore holes at both ends: the bearing section shall match the tool size
- Workpiece measurement report A broached trial workpiece with dimension inspection record is required, with 100% inspection of all functional dimensions
- Labeling with drawing number, toothing (SAE or DIN), cut length, fit
  Labeling point (preferably at pulling stem) cut length, fit group, supplier, batch size, commission number, date, coating company
- State on delivery Without additional conservation
- Surface specifications Rz 2.5 at flanks of teeth
- Dimensions without tolerance specification according to ISO 2768-1-m
- Hardness of cutting part HRC 64-66
- Steady location Specification of the steady location
- Undercut gap Specification of the undercut gap

Note:

- An inspection record shall be included with each tool.
- Details regarding rake angle, lead angle and profile upward & downward gradients shall be coordinated with the representative.
- Alternative coding with chip for service life acquisition, reworking level, residual tooth thickness, component and geometric properties and MB item number are to be coordinated with the representative.



1.11 Rolling (production of locating teeth, threads)



1.11.1 External Teething

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1.11.1.1 Cold Forming

1 6 7 8

In the working range:	Tip circle diameter	10 to 60 mm
	Module	0.5 to 2.0 mm
	Number of teeth	≥ 14
	pressure angle	30° to 45°

The cold-rolling method according to the Roto-Flo or round-rolling principle shall be used for solid workpieces.

- For hollow workpieces for which the Roto-Flo method cannot be used due to the forming forces, axial flow pressing with female dies or the plunge-cut method with 2 rollers shall be used.
- For tip diameters up to 210 mm and up to a module of 4.0 mm, providing the workpiece connection geometries allow, the Grob process can be used for solid and hollow workpieces.
- The geometry and quality of the thump rollers is to be designed according to DIN 5480 -2and DIN 1328-1. The other overall dimensions of the thump rollers are the responsibility of the machine supplier in cooperation with the tool supplier, based on the collision examinations and the clamping situation.
- As a basic principle: Whenever no tool drawing is available which was created by Daimler, it shall be created by the tool supplier. As part of the initial delivery, the supplier shall prove that their tools are fit for use (in general by operational trials).

1.11.1.2 Metal-Cutting Machining

1 6 7 8

For special cases and for small batches, as an option metal-cutting production processes may be used.

1.11.2 Internal Teething

1 6 7 8

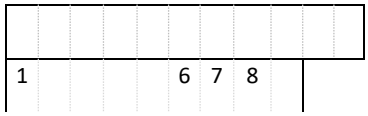
In the working range:	Tip diameter	up to 300 mm
	Number of teeth	≥ 6

internal toothing should be implemented by reaming. For special cases and for small batches, other machining processes may optionally be used.

- The following basically applies:

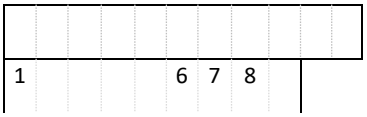
  If there is no tool drawing available which was produced by Daimler, it shall be produced by the tool supplier. As part of the initial delivery, the supplier shall prove that their tools are fit for use (in general by operational trials).

1.11.3 Threads



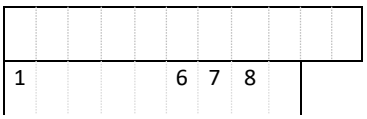
- External threads on torque-transmitting parts shall be produced by cold rolling. We recommend Roto-Flo cold rolling for combined spline machining or e.g. the non-cutting Pee-Wee thread and section machining for individual machining.
- As a basic principle: Whenever no tool drawing is available which was created by Daimler, it shall be created by the tool supplier. As part of the initial delivery the supplier shall provide proof of the employability of the tools (through operational tests,).

1.12 Centering



Two-sided center drills as per DIN 333 shall be used for forms R, A and B or MBN 97 for model series form made of HSS-E or solid carbide.

1.13 Honing



- Diamond hone strips are to be used for pre-honing, intermediate honing and plateau honing.
- Ceramic honing strips should be used for finish honing.
- The honing stones are to be clamped on the honing stone carrier. Other attachment types (soldered, bonded etc.) shall be coordinated with the responsible representative.
- Measurement and guide strips should be soldered onto a basic body.
- These basic bodies are to be attached by means of screw connections in the basic body of the honing tool.
- Other attachment types are to be coordinated with the responsible representative.

- The MB standard MBN 37800 applies to the honing of cylinder barrels.

1.14 Brushes

1 6 7 8

- If single-piece brushes are used, their economic efficiency compared to the brushes shall be verified (e.g. additional costs for single-piece brushes lower than the expected wear to clamping pliers).
- The procedure is to be performed in the reverse order when using multi-piece brushes.
- The usage of diamond-coated brushes is subject to the machine manufacturer's approval.
- The speed specifications of the brush manufacturer should be observed. The tool is to be labeled with the maximum permissible speed.

2. Cooling Lubricant for Metal-Cutting Machining

The use of cooling lubricant is specified in the Requirement Specifications for the "workpiece-specific scope".

1 6 7 8 9

2.1 Minimal Quantity Lubrication (MMS)

- Tool selection as per DIN 69090 is prohibited without exception for the MMS machining technology.

The machining with MMS functions in a process-reliable manner starting at an air pressure of ≥ 8 bar. To ensure the process reliability even with a pressure drop down to 4.5 bar, the MMS process shall be supplied via a pressure converter. The special features of the feed technology for MMS are specified in the Powertrain Part II "Mechanical System" Requirement Specifications.

2.1.1 Tool Mounts for MMS

The interface between spindle and tool mounting sections shall be in accordance with MBN 10386 -1 (MMS – Machine-Mounting Interface).

The tool holder area shall be designed in accordance with MBN 10387-1 and MBN 10387-2

(MMS Holder).

2.1.2 MMS Tool Shank End

The tool shank end shall be designed in accordance with MBN 10388-1 (parting point of shank end).

2.1.3 Tool Design Suitable for MQL

The tool design shall be state of the art and be particularly suitable for MMS machining.

The MMS function test in the machine spindle is carried out as per MBN 10386-2.

2.2 Tools with Internal Coolant-Lubricant Supply

1 6 7 8

2.2.1 Cooling Lubricant (KSS) in Manufacturing

The exact specification of the coolant lubricant (KSS) can be found in the requirement specifications "Workpiece-specific scope". The minimum quantity of coolant-lubricant for the reliable functioning of the tool shall be specified by the tool supplier.

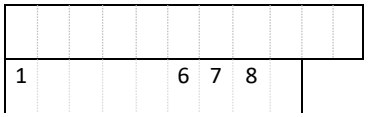
2.2.2 Handling of Cooling Lubricant during Series Production

- For internal coolant supply, it is important to state the consumption in l/min per spindle or per boring head in the production equipment plan. Generally the average consumption shall be 3 - 15 l/min measured at the tool outlet.
- It shall be possible to regulate the coolant-lubricant pressure to suit the machining operation.
- There shall be adequate pressure and volume capacity at the tool.
- The machine supplier is responsible for the process.
- If oil is used, due to the risk of minor explosions, the cooling lubricant pressures shall be kept at a low level (max. 30 bar for internally cooled tools; 50 bar for drilling deep holes).

A E F

- When deep-hole drilling, provide for the recommended coolant lubricant pressures/quantities!
- For internally cooled tools, a graded filter is specified in the Powertrain Requirement Specifications Part I Mechanical System. If this grade of filter is not sufficient for individual machining processes, then this shall be coordinated with the representative.

3. Monitoring for Tool Breakage / Tool Wear



3.1 Checklist for Risk Analysis

3.1.1 Tool Breakage Monitoring:

- When doing this machining job, how high is the probability that the tool will break (depends on anticipated tool loading)?

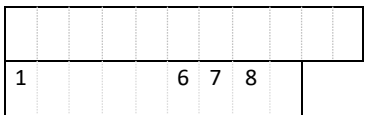
When and where will breakage of a tool be recognized if no monitoring system is employed (inspection station, end of line inspection, assembly)?

- In addition to tool breakage, is damage to the machine to be expected?
- Will there be any consequential damage caused by subsequent tools (e.g. thread taps following core hole drills)?
- Does a broken off tool cause further rejects?
- Is it possible to make repairs if faults are not immediately detected?
- Is there a chance of preventing tool breakage if the machine reacts in good time?

3.1.2 Tool Wear Monitoring:

- Does a severely worn, but not broken, tool give rise to similar problems?
- Should normal wear with the consequence of loss of dimension be detected in-process or is post-process inspection of micro- and macro-geometries necessary?

3.2 Post-Process Inspection



Purpose of application: favorable for subsequent workpiece

Cost/benefit: avoidance of rejects, downtimes, tool costs

•

3.3 In-Process Inspection (Electronic) - In-Process Tool Monitoring

3.3.1 Approval of suppliers

1					6	7	8			

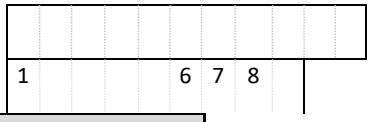
See Powertrain Requirement Specifications, Part III, Electrical Components, Chapter 3.2.2.

3.4 Monitoring of Production Process (Tool Monitoring)

1					6	7	8			

- Integrated production process monitoringshall only be provided if it is not possible to use less expensive tool breakage monitoring devices such as inspection probes or measuring pins.
- The application of a strictly software solution as integrated production process monitoring (excluding utilization of the PCU capacity) is not permitted.
- The function shall be able to be shut down for operating the mechanical treatment machine without monitoring in case of a fault.
- The definition of the user levels and access rights for the integration in the control concept shall be coordinated by the supplier with the operator.
- The system shall detect and display the condition (breakage and optional wear) of the monitored tool correctly in > 50% of the messages (rough adjustment) at the time of the final inspection.

3.4.1 System Recommendations for in-Process Monitoring



	Collision detection	Breakage detection	Wear detection	Dressing detection
Machining Process	Possible for all processes within monitoring period			
Milling		Active power	Active power	
Drilling		Active power	Active power	
Turning		Force sensing Active power		
Deep-hole drilling		Active power	Active power for large diameters	
Threads		Torque sensing, active power (single-spindle)		
Multi-spindle machining		Up to 3 spindles: active power, More than 3: torque per spindle		

Continued: System recommendations

	Collision detection	Breakage detection	Wear detection	Dressing detection
Combination tools		Depending on complexity: active power or torque or several axes digitally		
Grinding			Force sensing for failure of electrolytically coated CBN grinding wheels	Structure-borne noise for nick detection and dressing

Note on monitoring the active power:

Monitoring of the active power according to the active power of the main/machining spindle and at least one feed axis

3.5 Laser Inspection (optical inspection)

1 6 7 8

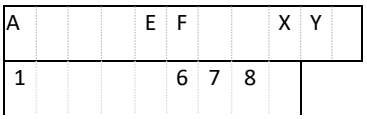
Laser inspection is to be used as an alternative to the process described under 3.2. Laser tests are usually a good idea in machining centers, where a mechanical/electrical inspection is not attractive or cannot be integrated. It must be taken into account that the tool change time is increased in each case by the testing time + result processing in the controller, i.e. the laser test shall therefore only be carried out for selected tools (e.g. risk of breakage, subsequent operation).

4. Guides for Deep Hole Drills

1 6 7 8

If necessary for deep hole drilling, the following sections apply:

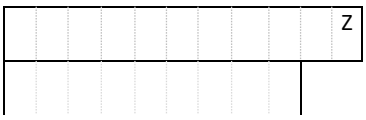
5. Chucks



- For tools with cylindrical shank diameters, expanding chucks as per DIN 69882-7 or shrink-fit chucks as per DIN 69882-8 or MBN 10387-1 shall be used in combination with smooth, cylindrical shanks (max. shank tolerance h6).

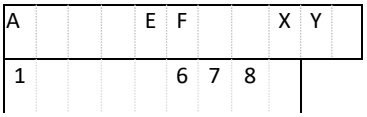
Note:

Expansion and shrink-fit chucks with Daimler part numbers are listed in the classification F7 0067 (automatic tool change) and F7 6370/F7 6371 (manual tool change).



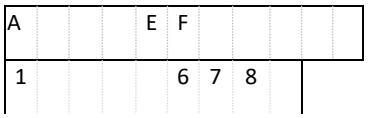
- Shrink-fit chucks as per DIN 69882-8 or MBN 10387-1 shall be used.

5.1 Use Criteria for Expansion Chucks



For a tool change interval < 3 production shifts, expansion chucks as per DIN 69882-7 or MBN 10387-1 shall be used with preference. Expansion chucks with radial length adjustment shall only be planned for technically justified operating points and given approval by Daimler.

5.2 Use Criteria for Shrink-Fit Chucks



- For a tool change interval ≥ 3 production shifts, expansion chucks as per DIN 69882-8 or MBN 10387-1 shall be used with preference.
- The "-S for balancing screw" version should be acquired.
- The shrink-fit chuck can then be balanced as required by means of various various balancing screws.

- Balancing is to be performed by means of balancing drilling.

6. Balancing Requirements , Balancing as per ISO16084 - Fine Balancing

1 6 7 8

- Tool systems shall be designed for the respective rotational operating speed and machining task so that the balancing requirements as per ISO16084 are met. Differing or additional balancing requirements shall be coordinated separately for the specific project and tool with the representative.
- As a result, fine balancing is not required following a tool change and/or blade replacement.
- During repair and/or replacement of basic tool bodies or intermediate elements, a test as per ISO16084 is required. This may result in the need for repeat fine balancing.
- For machining tools (milling systems, etc.) for cutting speeds vc ≥ 1,000 m/min, DIN EN ISO 15641 shall be complied with.

7. Abbreviations

Abbreviation	Meaning
ALU	Aluminum or aluminum alloys
BAZ	Machining centers
CBN	Cubic boron nitride
CPU	Central processing unit
D	Diameter
DBL	Daimler-Benz supply specifications
DIN	German Standards Institute: Deutsches Institut für Normung
etc.	etc.
HM	Carbide
HSC	High Speed Cutting
HSK	Tapered hollow shank
HSS	High-speed steel
i.A.	Commissioned
ISO	International Organization for Standardization
KSS	Coolant-lubricant
MBN	Mercedes-Benz standard
MQL	Minimal quantity lubrication
PCD	Polycrystalline diamond
PSC	Polygonal taper interface with flange contact surface
TD	Diameter tolerance
SAE	Positive splined shaft connection

SOP	Start of production
SR	Pinion-type cutter
SC	Solid carbide
WR	Shaper cutter
WSP	Reversible cutting tip

8. Index of Terms

9. Appendices

		Number of pages
Appendix 15-5	Specifications on Double-Spindle Machines, Machining Center and Transfer Lines	10
Appendix 15-7	Clamping Systems for Milling Arbors and Shell End Milling Arbors	1
Appendix 15-8:	Selection of Grinding Wheel Flanges	1
Appendix 15-11:	Gear Shaping	2

10. References to Standards

Note: Internal and external standards shall be appended or distributed to third parties.

The documents cited in the following are required for the application of this document. Only the issue referred to applies in the case of dated references. In the case of undated references, the last issue of the document (including all changes) to which reference is made applies.

All standards listed here are available on the Daimler AG intranet in "DocMaster" under

http://intra.corpintra.net/docmaster.

External access to "DocMaster" can be requested on the internet at

https://daimler.portal.covisint.com/web/portal/home

Authorization to access certain groups of documents will be defined, when the request is made.

10.1 MBN (Company Standards)

(always download the version valid on the order date via DocMaster)

MBN	2	High-Speed Steel Thread Taps; Technical Delivery Conditions
MBN	30-1	Drills made of solid carbide; dimensions, designations, design
MBN	30-2	Drills and step drills made of carbide; geometry, cutting material, application
MBN	58	Straight shanks with clamping face inclined at 2° and setting screw, location holes
MBN	60	Drill with solid carbide cutting part and reinforced straight shank according to MBN 58
MBN	93	Clamping shanks and holders for deep-hole drilling tools
MBN	10222	Threaded connections; blind tapped hole versions
MBN	10302	Hob cutters with shank (design, dimensions, cutting material and supply)
MBN	10386-1	Minimalmengenschmierung Maschinenspindel mit Kegel-Hohlschaft, 1-Kanal-System-Übergabe durch Spannpatrone bzw. Direktanbindung MMS – Schnittstelle Maschine-Aufnahme (DocMaster contains no English translation)
MBN	10386-2	Minimalmengenschmierung - Funktionsprüfung -Prüfvorgaben und Sprühtest für die 1-Kanal und Mehrkanaltechnik (DocMaster contains no English translation)
MBN	10387-1	Minimum Quantity Lubrication Tool Holders with Cylindrical Bore — Shrink Chucks —
MBN	10387-2	Minimum Quantity Lubrication – Thread Tapping Chucks –
MBN	10388-1	Minimum Quantity Lubrication Tools with Parallel Shank for the 1-Channel and Multi-Channel System

MBN	32004	Screwed connections; depth of thread engagement
MBN	81022-2	Equipment geometries and plans as well as an overview of the machine geometries, version, delivery, data transmission
MBN	81099	Grinding wheel sets, packing rings and intermediate layers
MBN	82001	Hob cutters, single and multiple start; tolerances
MNB	9666	Construction of and Specifications for Production and Operational Equipment, Machines, Systems, Facilities and Devices

10.2 DIN Standards

DIN	1417	Broaching tolls; rounds and endpieces
DIN	1835-2	Parallel shanks for milling cutters - Part 2: Connecting dimensions for holder chucks, accessories
DIN	2079	7:24 tapers for spindle noses for machine tools
DIN	3972	Reference profiles of gear-cutting tools for involute tooth systems according to DIN 867
DIN	6535	Hardened parallel shanks for machining tools - dimensions
DIN	8030-1	Face milling cutters for indexable inserts; dimensions
DIN	69880	Tool holders with parallel shank; parallel shanks and location holes
DIN	69882-7	Tool holders with hollow taper shank; expansion clamping chuck
DIN	69882-8	Tool holders with hollow taper shanks; shrink chuck
DIN	69888	Requirements for balancing of rotating tool systems
DIN	69893-1	Hollow taper shanks with flange contact surface; types A and C
DIN ISO	603	Bonded abrasive products; dimensions
DIN EN ISO	15641	Milling cutters for high speed machining - Safety requirements (ISO 15641:2001); German version EN ISO 15641:2001
DIN ISO	1940	Balance quality requirements of rotors in a constant (rigid) state; determination of permissible residual unbalance

DIN ISO	2768	General tolerances
DIN ISO	13942	Bonded abrasive products; limit deviations and run-out tolerances

10.3 ISO Standards

ISO	666	Mounting of grinding wheels by means of hub flanges
ISO	12164-1	Hollow taper interface with flange contact surface - Part 1: Shanks - Dimensions
ISO	16084	Balancing of rotating tools and tool systems
ISO	26623-1	Polygonal taper interface with flange contact surface - Part 1: Dimensions and designation of shanks

11. References

11.1 MBN (Company Standards)

11.2 DIN Standards

DIN	55058	Spindle noses for adjustable adapters
DIN	69001	Machine tools; multi-spindle heads
DIN	69002	Machine tools; stub spindles

DIN	69063-1	Machine tools - Tool receiver for hollow taper shanks - Part 1: For Type A and Type C according to DIN 69893, connecting dimensions
DIN ISO	21940-11	Mechanical vibration - Rotor balancing - Part 11: Procedures and tolerances for rotors with rigid behaviour (ISO 21940-11:2016)

11.3 ISO Standards

11.4 Further Literature

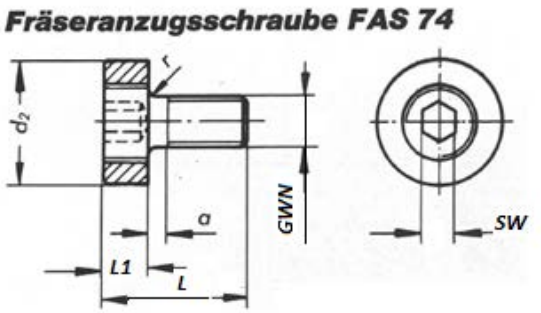
Clamping System for Milling Arbor and Shell-Type Milling Arbor in Special Machines

Clamping arbors for side milling cutter sets (with external thread) shall be equipped with a hydraulic clamping nut system.

Table 1: Hydraulic tensioning nut ~~table~~

Item number	Dimensions	Clamping force in kN	Designation
B8 7227 0023019	M24 x 1.5	40	D 92 – 090
B8 7227 0009193	M24 x 1.5 L	40	D 91 – 090
B8 7227 0022704	M27 x 1.5	40	D 92 – 090
B8 7227 0023020	M30 x 1.5	30/60	D 92 – 100
B8 7227 0009191	M30 x 1.5 L	30/60	D 91 – 100
B8 7227 0008632	M30 x 1.5	40/80	D 92 – 300
B8 7227 0024094	M32 x 2	40/80	D 92 – 300
B8 7227 0024093	M32 x 2 L	40/80	D 91 – 300
B8 7227 0024161	M36 x 1.5	40/80	D 92 – 300
B8 7227 0000158	M36 x 2 L	40/80	D 91 – 300
B8 7227 0000321	M36 x 2	40/80	D 92 – 300
B8 7227 0008633	M36 x 2	60/120	D 92 – 500
B8 7227 0008961	M42 x 1.5	60/120	D 92 – 500
B8 7227 0024087	M52 x 1.5	80/150	D 92 – 600

The milling cutter tightening screws for shell-type arbors (with internal thread) are to be equipped with a clamping element in differential technology (FAS 74).



Cutter tightening screw FAS74

Figure 1: Cutter tightening screws for shell-type arbor as per DIN69882-2 and DIN69882-3

Table 2: Cutter tightening screw FAS74 dimensions and tightening torque

Order number	Item no.	**d1**	a	$d_{2\,h12}$	L1	L	r	SW	for journal diameter	**Torque in Nm**
~~7400~~	~~-~~	~~**M 6**~~	~~2.2~~	~~17~~	~~6~~	~~18~~	~~1.2~~	~~4~~	~~13~~	~~**20**~~
7401	F7 4031 1044074	**M 8**	3	20	7	23	1.6	5	16	**28**
7402	F7 4031 1044075	**M 10**	3.6	28	8	26	2	6	22	**60**
7403	F7 4031 1044076	**M 12**	4.5	35	9	31	2.5	8	27	**80**
7404	F7 4031 1028844	**M 16**	5.5	42	10	36	3	10	32	**130**
7405	F7 4031 1044077	**M 20**	6	52	11	41	3	12	40	**200**
7406	F7 4031 1044078	**M 24**	7.5	63	13	49	4	14	50	**360**

~~**Torque table for milling cutter tightening screws**~~

~~**D1**~~	~~**Torque in Nm**~~
~~M6~~	~~20~~
~~M8~~	~~28~~
~~M10~~	~~60~~
~~M12~~	~~80~~
~~M16~~	~~130~~
~~M20~~	~~200~~
~~M24~~	~~360~~

Approved flange for grinding wheels with drill diameter of 304.8 mm

Drawing no.	Spindle diameter D4	Max. clamping length L2	External diameter D2	Drilling diameter D1	Spindle taper
F7 5100 0043135	80	51	382	304.8	01:10
F7 5100 0204272	80	63	382	304.8	01:10
F7 5101 0043136	80	81	382	304.8	01:10
F7 5102 0045353	80	101	382	304.8	01:10
F7 5103 0206860	80	113	382	304.8	01:10
F7 5104 0205995	80	135	382	304.8	01:10
F7 5105 0501148	80	136 *)	382	304.8	01:10
F7 5106 0044219	80	278	382	304.8	01:10
F7 5107 0204120	100	75	385	304.8	01:10
F7 5108 0203845	100	83	385	304.8	01:10
F7 5109 0042191	100	91	385	304.8	01:10
F7 5110 0203274	100	101	385	304.8	01:10
F7 5111 0203721	100	114	385	304.8	01:10
F7 5112 0204936	100	145	385	304.8	01:10

F7 5113	0203166	100	162	385	304.8	01:10
F7 5114	0205720	120	167	411	304.8	01:10
F7 5115	0205291	120	173	411	304.8	01:10
F7 5116	0205295	120	185	411	304.8	01:10
*) variable clamping length						

Gear Shaping

Design of Pinion-Type Cutting for New Procurement

- **Types of pinion-type cutters:**
  Disk, bell, hollow-bell, shank pinion-type cutter, pinion-type cutter set as per or similar to DIN 1825, DIN 1826, DIN 1828, DIN 1829-1, DIN 1829-2

- **Quality grades:**
  AA, A and B according to DIN 1829-2

- **Substrates:**
  HSS or carbide substrate shall be selected as agreed with the tool supplier and the manufacturing process.

- **Coatings:**
  Coating types and cut edge treatment shall be selected as agreed with the tool supplier and the manufacturing process.

- **Tool and production data:**
  (recommended standard values of tool supplier)

  For the following tool substrates, dependent on toothing geometry and module:

HSS pinion-type cutter	**PM pinion-type cutter** **Wet**	**PM pinion-type cutter** **Dry**	**HM pinion-type cutter** **Dry**

- **Cutting speed:**
  Max: 160 m/min — Min: 3 m/min

- **Rolling feed:**
  Max: 15 mm/DH — Min: 0.1 mm/DH (= double stroke)

- **Head cutting thickness:**
  Only one specification related to application case possible

- **Head radius of pinion-type cutter tooth:**
  Only one specification related to application case possible

- **Specifications:**

  If not separately specified by TPT-1 and -2, the following must be observed:

  - Pinion-type cutter substrate PM
  - TIN as per DBL 8301
  - Scraping addition 0.05 mm/edge
  - Honing addition 0.05 mm/edge
  - Grinding addition 0.10 mm/edge
  - Coroning addition 0.04 – 0.06 mm/edge
  - Scraping pinion-type cutter with protuberance
  - Honing pinion-type cutter with protuberance
  - Coroning pinion-type cutter with protuberance
  - Grinding pinion-type cutter without protuberance
  - Finish pinion-type cutter without protuberance
  - In case of new machine procurement the machine supplier together with the tool supplier shall prepare and append a feasible time study for the (new) tool.
  - The usable tooth length/profile consistency on the tool shall be specified on the tool drawing and should be noted on the tool route sheet in Production.
  - The Daimler ID No. is applied by the tool supplier.
  - Test records shall be archived at the tool supplier's plant and be retrieved as required.

The following tool data are commercially relevant:

- **Grind-off amounts:**

  An average of 0.3 mm/refacing (HSS/PM)

- **Pinion-type cutter tool life:**

  Cannot be determined in the tool planning and procurement process owing to the many different individual factors in the series production process

- **No. of teeth of pinion-type cutter:**

  This shall be chosen so that collision-free toothing is possible.

- **Edge lead angle:**

In range of 2-3°

- **Test shoulder:**
  Slitting wheels shall generally come with test shoulders

- **Back groove for locating/driving:**
  shall be specified in coordination with the tool supplier

Tool profile design:

- **Root circle tolerance:**
  Coroning, honing, scraping, finish joining
  - Lower tolerance limit or according to machining-wheel drawing specification

- **Grinding:**
  Medium tolerance or according to machining-wheel drawing tolerance

- **Tooth width tolerance:**
  According to machining-wheel drawing tolerance

- **Tip chamfer:**
  According to machining-wheel drawing tolerance

- **Pinion-type cutter holder:**
  Hydraulic expansion arbors with an HSK tool carrier

  are to be used.

Recoating:

The tool life of the new pinion-type cutter should be reached with re-coated HSS/PM pinion-type cutters.

The cutting parameters will not be changed for coated tools for production-related reasons.

The advantage lies in the higher output/pinion-type use and reduced wear band width.

If the parameters listed are used as the basis for the tool design, process-consistent production implementation is possible.

Packaging:

New pinion-type cutters are delivered in suitable crates by the tool supplier.

Technical documentation:

For each pinion-type cutter type a standard drawing template is available; the tool supplier shall provide a tool drawing archivable in the ZGDOK for each pinion-type cutter position with the initial order or change/optimization.