

DIAX03 Drive With Main Spindle Function SERCOS interface

Drive Configuration: SHS 03VRS

Title	DIAX03 Drive With Main Spindle Function, SERCOS interface
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Purpose of Documentation	<p>This documentation serves to identify the designation for a configured drive of the DIAX03 drive family, based on:</p> <ul style="list-style-type: none"> • Determining the motor type • Choosing the motor - motor feedback combination • Choosing the desired function of the drive control device <p>In addition, an overview is provided of the available basic functions and possible additional functions.</p>

Record of Revisions	<table border="1"> <thead> <tr> <th>Description</th> <th>Release Date</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>DOK-DIAX03-SHS-03VRS**-IF01-EN-P</td> <td>03.2000</td> <td>First edition</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Description	Release Date	Notes	DOK-DIAX03-SHS-03VRS**-IF01-EN-P	03.2000	First edition						
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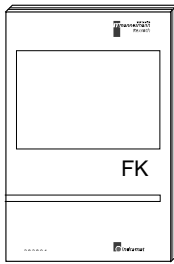
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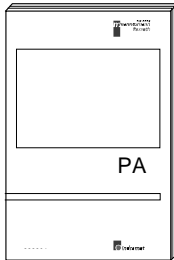
Summary of Documentation - Box



Functional Description:

Description of all implemented Function based on SERCOS-Parameters

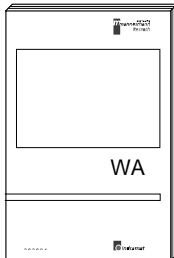
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Parameter Description:

A description of all parameters used in the firmware

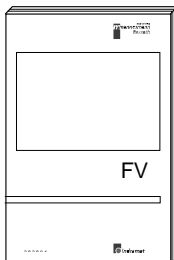
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Troubleshooting Guide:

- Explanation of the diagnostic states
- How to proceed when eliminating faults

Order designation:
DOK-DIAX03-SHS-03VRS**-WA01-EN-P

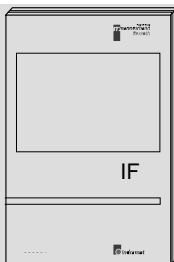


Firmware Version Notes:

Description of new and changed functions in terms of the derivatives:

- FWA-DIAX03-SHS02VRS-MS

Order designation:
DOK-DIAX03-SHS-03VRS**-FV01-EN-P



Drive Configuration:

- Determining the motor type
- Choosing the motor – motor feedback combination
- Choosing the desired function of the drive control device

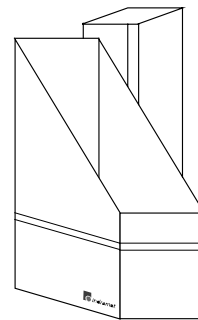
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CD: DRIVEHELP

Collection of Windows help systems which contain documents on firmware derivatives

Order designation:
DOK-GENEERL-DRIVEHELP**-GExx-MS-D0600



Order designation
DOK-DIAX03-SHS-03VRS**-5201-EN-P

Notes

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Notes

1 Determining Drive Configuration

1.1 Explanation of Terms

Digital drive controllers of the type DIAX03 from Rexroth Indramat can be adapted to meet numerous application requirements by using various plug-in modules.

For this reason, drive controllers are equipped with ports for plug-in modules.

Basic devices Drive controllers without additional plug-in modules are defined as basic devices. The basic device DDS 3.1 has two slots for plug-in modules (U1, U2). All other basic devices are equipped with 4 slots for plug-in modules (U1, U2, U3, U4). All devices are equipped with one specific slot (U5), which is used for a parameter/software module.

Plug-in modules The following plug-in modules are available:

- Command interface card.
- Modules for evaluating position measurement systems.
- Input/output modules to evaluate SPS signals or to export signals to the SPS.
- Software modules
- Modules for evaluating analog inputs

Command interface card module The DSS plug-in module is used as a command interface card module. This module must always occupy slot U1 in the drive controller.

Configured drive controller A basic device with fitted with additional plug-in modules is called a configured drive controller.

Hardware configuration Every hardware configuration is designated by a letter/number sequence, e.g., BE04-01-FW. Digital drive controllers are delivered as configured drive controllers which may be equipped with various components, according to the selected configuration.

The following illustration represents the components of a typical hardware configuration.

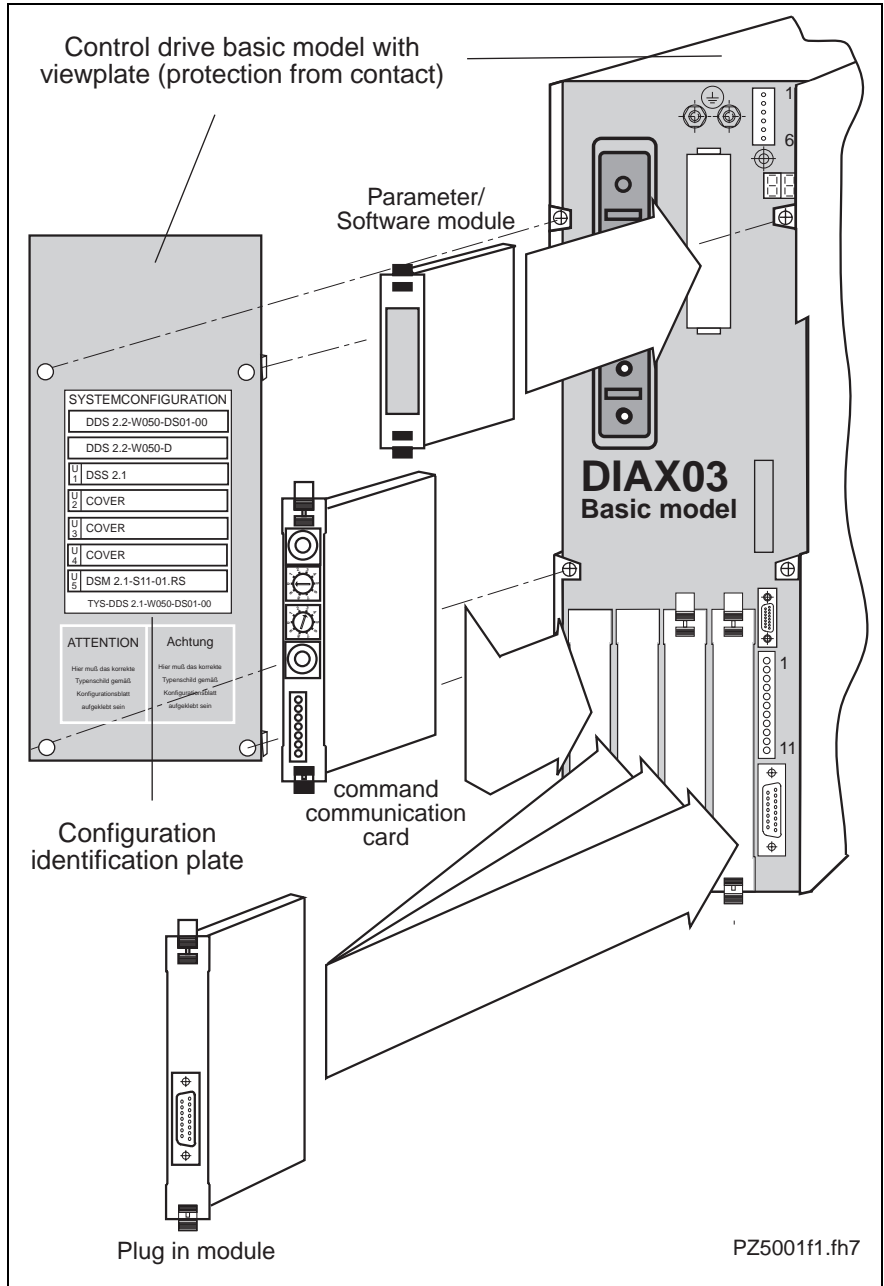


Fig. 1-1: Components of a hardware configuration

1.2 Procedure

To determine the drive configuration or to specify the hardware configuration labeling of a DIAX03 drive controller for the corresponding machine, we recommend the following procedure:

1. Determine the motor/controller combination:

- Determine rpm/torque requirements for your purpose.
- Select a motor/controller combination from the list.

2. Determine the hardware configuration labeling:

Select a motor - motor feedback combination.

- Select the desired features.
- Determine the configuration labeling based on the plug-in modules required for the desired features.

The following two illustrations offer an idea on how to determine the configuration labeling.

Illustration: Determining the motor/controller combination

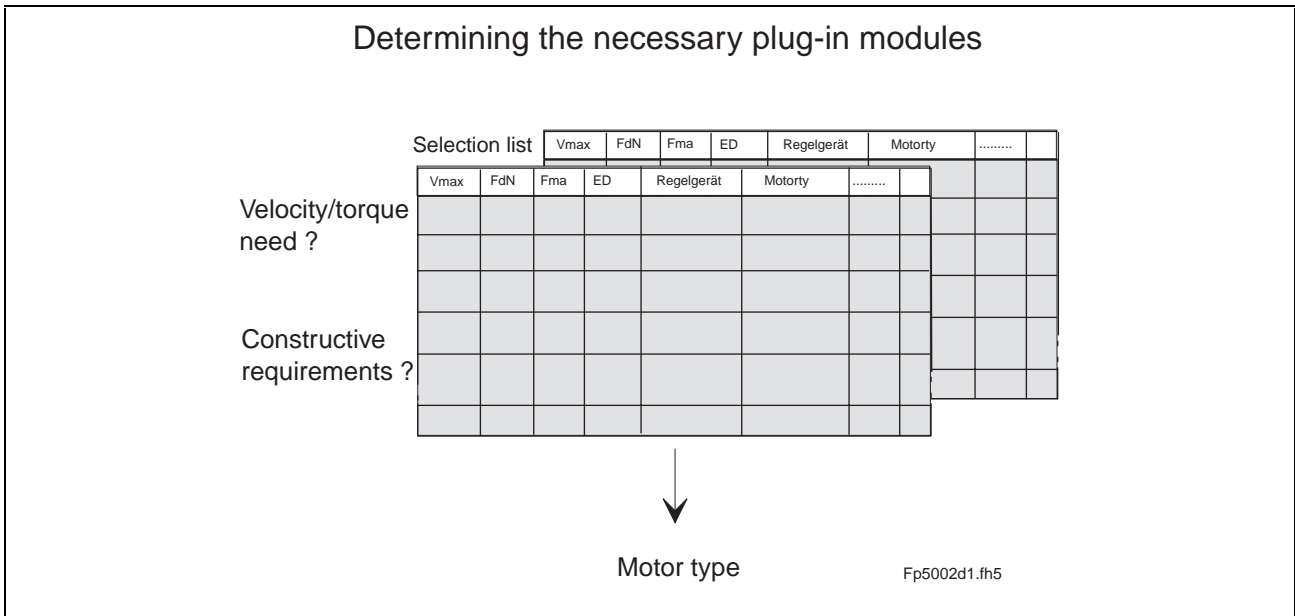


Fig. 1-2: Illustration for working with selection lists

Illustration: Determining the hardware configuration labelling

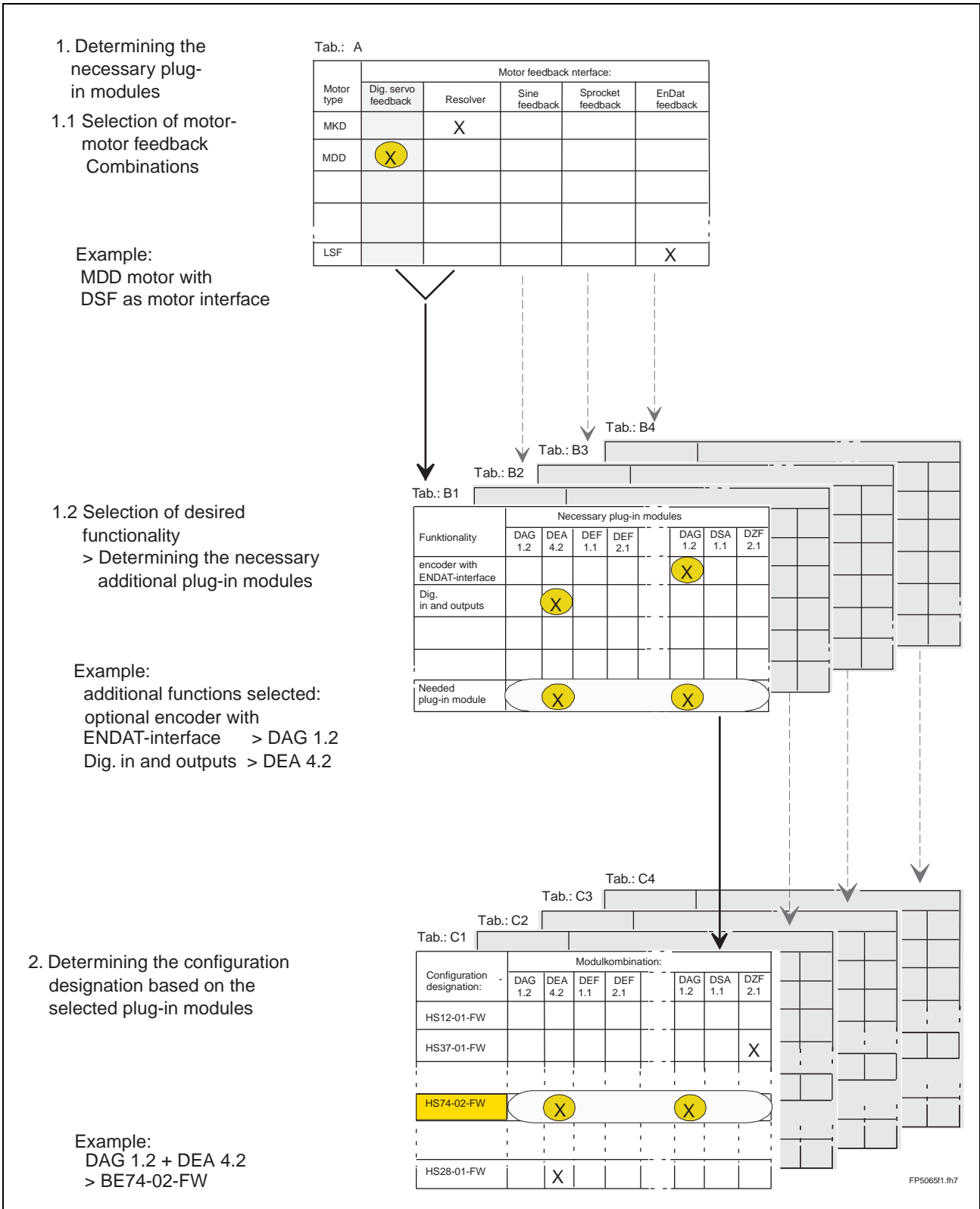


Fig. 1-3: Illustration for determining configuration labelling

Notes

2 Determining the motor/controller combination

2.1 Selection lists

Selection lists can be used to select the required motor controller combination.

You should consider the necessary requirements for torque and velocity just as carefully as the physical requirements.

The **Motor type** which you choose for use from the selection list is the most decisive factor in determining hardware configuration labeling.

Notes

3 Choosing the motor - motor feedback combination

3.1 Possible motor - motor feedback combinations

The following table contains types of motors which correspond to the permissible motor encoder interfaces.

Here you must select the motor encoder interface according to the motor type in use.

Tab A: Motor encoder interface								
Motor feed-back type	Digital servo feedback (1)	Resolver with FDM (2)	Sine-encoder (3)	Indramat gear wheel encoder	EnDat-encoder (4)	Resolver without FDM (5)	Resolver without FDM + sine-encoder (6)	Gear wheel encoder with 1Vpp-signals (7)
P-0-0074*	1	1	2	3	8	10	11	9
MKD		X						
MDD	X							
2AD	X			X				
ADF	X			X				
1MB	X		X	X	X			X
MBW	X		X		X			
LAR			X		X			
LAF			X		X			
LSF					X			
MBS	X				X	X	X	

Fig. 3-1: Permissible motor type - motor/feedback combinations

- (1) : singleturn or multiturn DSF
- (2) : resolver or multiturn resolver (RSF) with feedback data memory (FDM)
- (3) : incremental scale with sine signals or incremental sine rotary encoder with μ A or 1Vpp signals
- (4) : absolute linear scale, singleturn or multiturn rotary encoder with EnDat-Interface
- (5) : resolver without feedback data memory
- (6) : resolver without feedback data memory combined with incremental rotary encoder
- (7) : gear wheel encoder with 1Vpp signals, evaluation via module DZF3.1

* P-0-0074, Motor encoder interface

3.2 Connection examples

DSF/RSF or resolver without feedback data memory

The encoder is connected to the standard interface. Therefore, no other plug-in card is required.

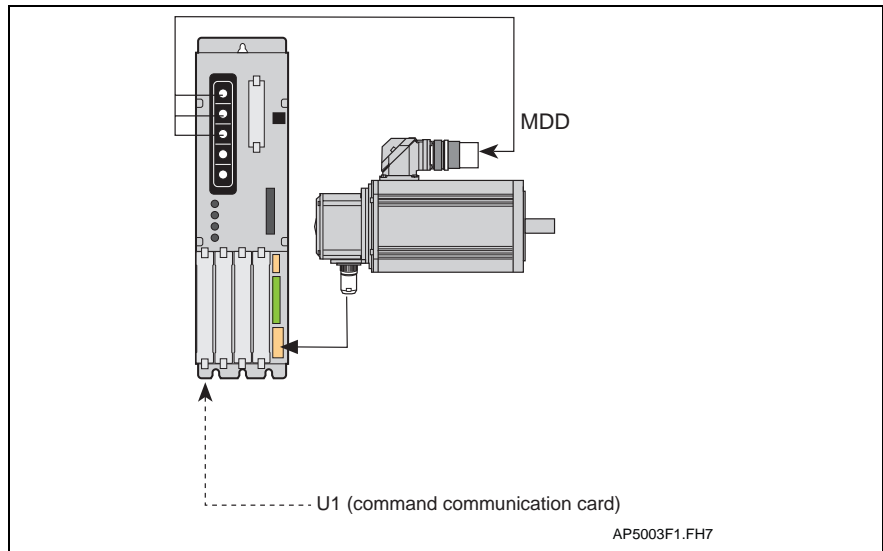


Fig. 3-2: MDD motor with DSF motor encoder to standard interface

Sine encoder

The DLF01.1M plug-in module is required to connect the motor encoder.

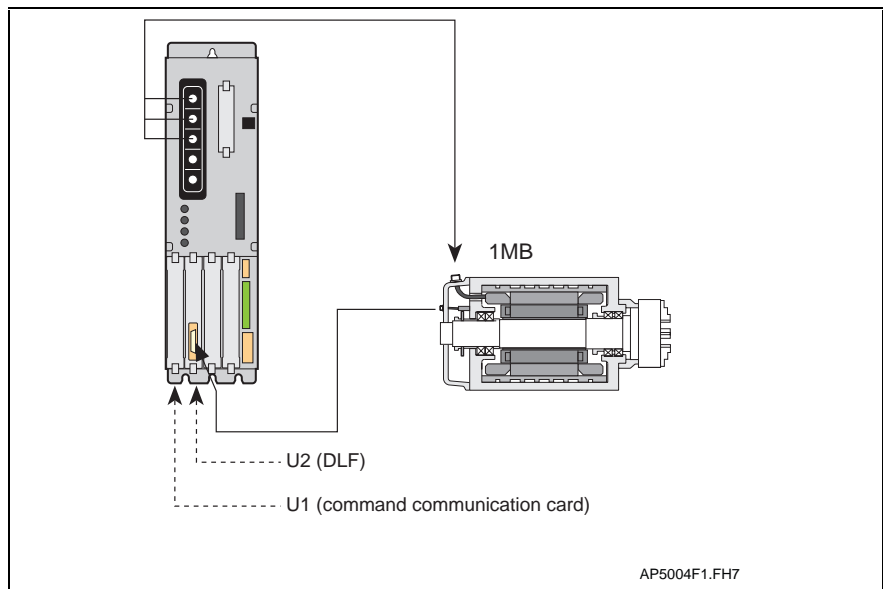


Fig. 3-3: 1MB motor with incremental sine encoder from Heidenhain, connected to a DLF01.1M module

Indramat gear wheel encoder

The DZF02.1M module is required to connect the motor encoder.

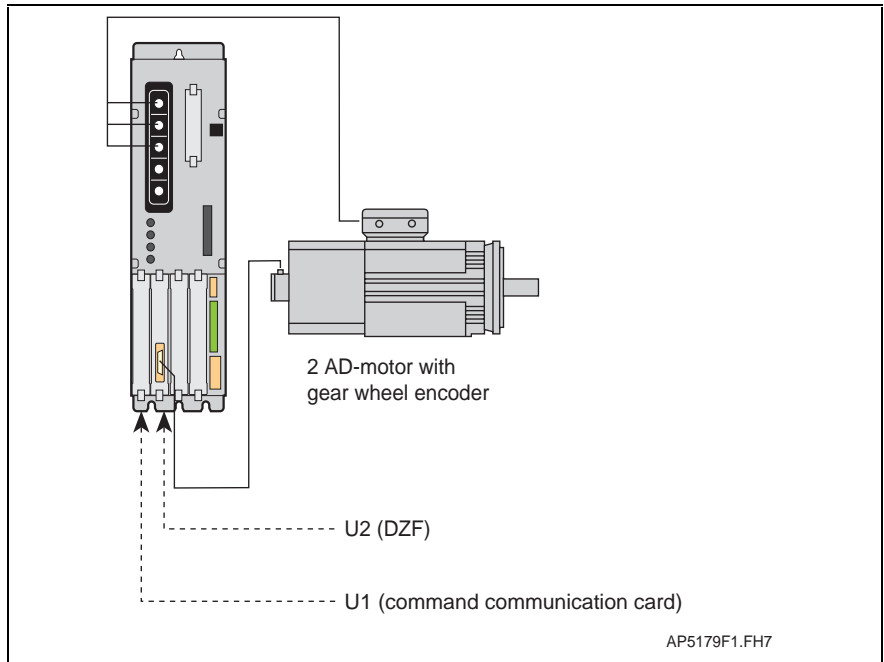


Fig. 3-4: 2AD motor with gear wheel encoder, connected to a DZF02.1M module

EnDat encoder

A DAG01.2M module is required to connect the motor encoder.

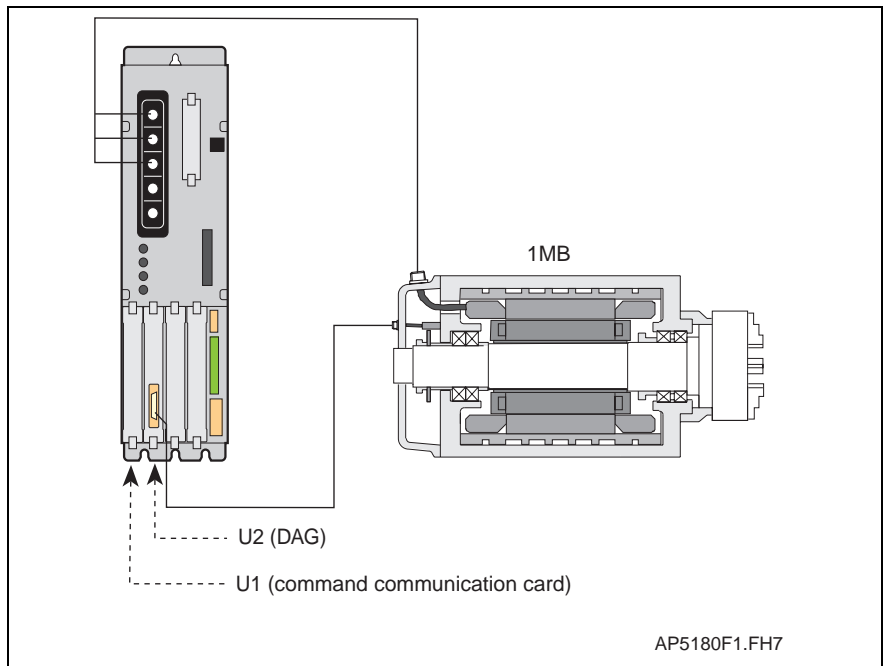


Fig. 3-5: 1MB motor with EnDat encoder, connected to a DAG01.2M module

Resolver without feedback data memory + sine encoder

The DLF01.1M and DSS plug-in modules are needed to connect the motor encoder.

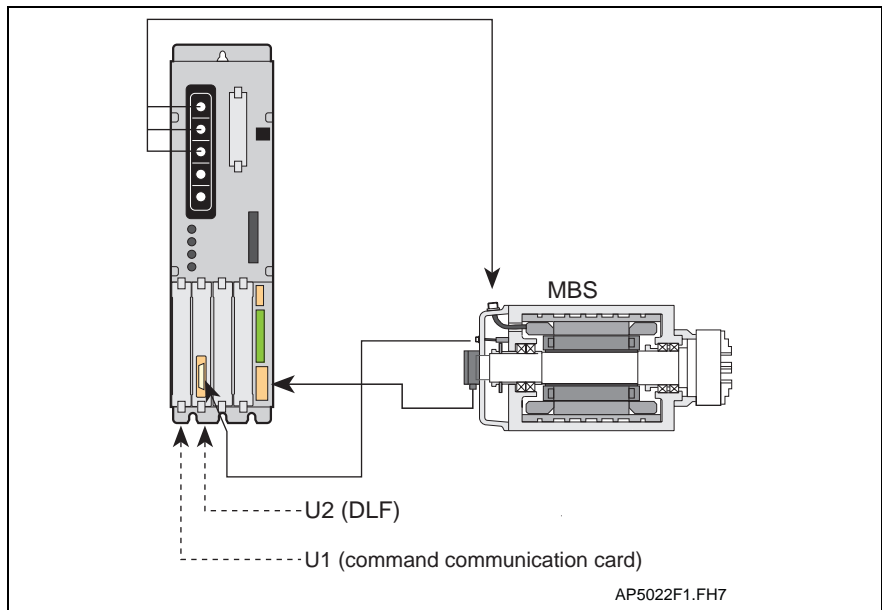


Fig. 3-6: MBS motor with sine encoder on a DLF01.1M plug-in module

Gear wheel encoder with 1Vpp signals

The DZF03.1M plug-in module is needed to connect the motor encoder.

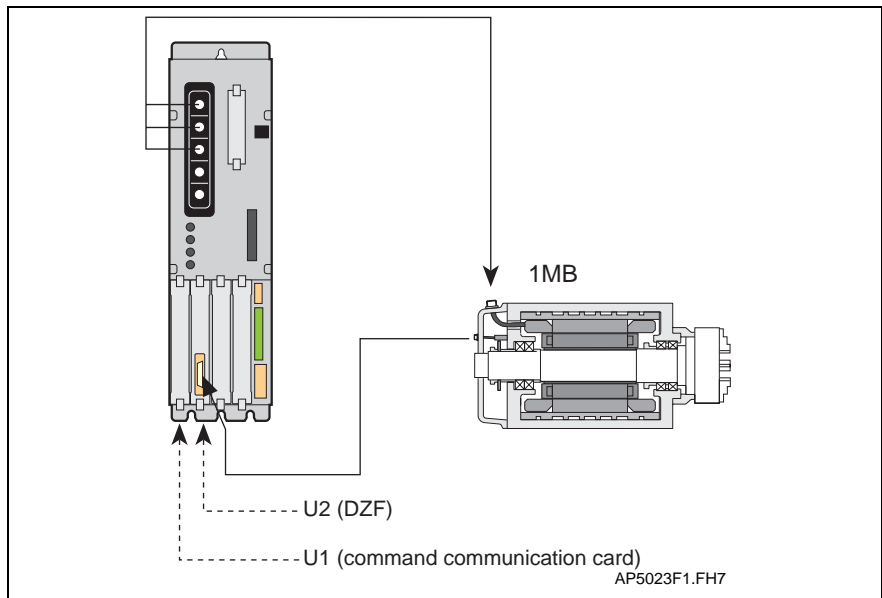


Fig. 3-7: 1MB motor with gear wheel encoder with 1Vpp signals on a DZF03.1M plug-in module

4 Selecting Features - Determining Configuration Labeling

4.1 Basic Features

The following **basic features** are available:

- Diagnostic possibilities
- Basic parameter block that can be activated for a defined setting of the drive parameters to default values.
- configurable signal status word
- Supports five (5) languages for parameter names and units and diagnoses (S-0-0095):
 - German
 - English
 - French
 - Spanish
 - Italian
- Programmable, drive-internal position resolution
- Evaluation of option (load-side) encoder for position and/or velocity control
- Evaluates absolute measuring system with setting of absolute dimension
- Modulo function
- Parametrizable torque limit
- Current limit
- Velocity limit
- Travel range limitations
- Starting lockout
- E-Stop-Function
- Drive-side error reactions:
 - best possible standstill "velocity command to zero"
 - best possible standstill "Torque free"
 - best possible standstill "velocity command to zero with ramp and filter"
 - power shutdown with fault
 - NC reaction with fault
- Control loop settings:
 - base load function
 - acceleration precontrol
 - velocity mix factor
 - velocity precontrol
- Velocity control loop monitor
- Position control loop monitor
- Drive halt
- Command "Drive-Controlled Homing"
- Command "Set Absolute Measuring"

- Analog output
- Digital I/Os
- Oscilloscope function
- Command "Detect marker position"
- Command park axes
- Command open break

4.2 Additional Firmware Features: Drive With Main Spindle Functions

- Parameter block switching
- Gear switching
- Star/Delta transitions
- Drive controlled spindle positioning
- Spindle positioning with spindle homing switch
- Drive controlled oscillating

4.3 Selection of additional features

Additional plug-in modules are required Additional to the basic features DIAX03 offers a range of further features. When you select these additional features which are presented in the following chapters and tables, you should consider that additional plug-in modules will be required.

Max number of modules Depending on the basic device type being used, there may be differences in the number of plug-in modules used.

DDS 3.2 max. 2 additional plug-in modules

DDS 2.2 max. 4 additional plug-in modules

DKR max. 4 additional plug-in modules

Note: One slot is already used for the DSS communication module in every basic device type.

Selection requirements The following requirements must be taken into consideration when selecting an additional feature:

- Each module can only be used for one function.
- A maximum of one external measurement system may be selected.

In contrast to basic features, use of additional features depends on the type of motor or motor encoder interface being used.

For this reason, distinctions are made based on the motor encoder interface in the following chapters.

Motor encoder interface: DSF / RSF or resolver without feedback data memory

If a motor type with a digital servo feedback or a resolver is used, you can then select the *Additional features for motor with DSF/RSF or resolver without feedback data memory* from the following table.

Depending on your selection, the result will be a number or a combination of required modules.

Using this module combination, you can define the corresponding configuration labeling in the table Configuration selection for *motor with DSF/RSF or resolver without feedback data memory* which is then used to order the correct components.

If the module combination is not listed in this table, check your selected components again (motor type, motor encoder interface, features); some changes may be required.

Selection of features for the motor with DSF/RSF or resolver without feedback data memory

Features	Table B1: Plug-in modules:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFE 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
16 universal dig. outputs 15 universal dig. inputs		X							
32 universal dig. Inputs 24 universal dig. outputs			X						
Ext. measurement system with sine wave signals (1Vpp or 1uA)							X		
Ext. measurement system with square wave signals (TTL)				X	X				
Ext. measurement system with DSF encoder						X			
Ext. measurement system with SSI Interface	X								
Ext. measurement system with EnDat Interface (Heidenhain)	X								
Ext. measurement system with gear wheel encoder (Indramat)								X	
Ext. measurement system with gear wheel encoder (1Vpp signals)									X
No additional features									
Plug-in modules determined:									

Fig. 4-1: Additional features for motor with DSF/RSF or resolver without feedback data memory

Configuration Selection for Motor with DSF/RSF or resolver without feedback data memory

Name of configuration	Table C1: Module combination								
	DEA 04.2M	DEA 08.1M	DAG 01.2M	DEF 01.1M	DEF 02.1M	DFE 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
BE12-01									
BE23-01	X								
BT20-01		X							
BE45-01			X						
BE74-02	X		X						
BT51-01		X	X						
BE76-01				X					
BE78-00	X			X					
BT52-01		X		X					
BE09-01						X			
BE30-01	X					X			
BT53-01		X				X			
BE32-01							X		
BE33-01	X						X		
BT54-01		X					X		
BE37-01								X	
BE38-01	X							X	
BT55-01		X						X	
BE79-01									X
BE80-01	X								X
BT56-01		X							X

Fig. 4-2: Configuration Selection for Motor with DSF/RSF or resolver without feedback data memory

Motor encoder interface: sine encoder

If a motor type was specified, and an incremental scale with sine signals or an incremental sine encoder is used for the motor encoder interface, then the desired additional feature can be selected from the table *Additional features for motor with sine encoder as a motor encoder*.

Depending on your selection, the result will be a number or a combination of required modules.

With this module combinations you can determine the configuration labeling from the table *Configuration selection for motor with sine encoder as a motor encoder* to order the correct components.

If the module combination is not listed in this table, check your selected components again (motor type, motor *encoder* interface, features); some changes may be required.

Selection of features for motor with sine encoder

Features:	Table B2: Plug-in modules:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
16 universal dig. outputs 15 universal dig. inputs		X					X		
32 universal dig. Inputs 24 universal dig. outputs			X				X		
Ext. measurement system with square wave signals (TTL)					X		X		
Ext. Measurement system with DSF encoder (1)						X	X		
Ext. Measurement system with SSI Interface	X						X		
Ext. Measurement system with EnDat Interface (Heidenhain)	X						X		
No additional features							X		
Plug-in modules determined:							X		

Fig. 4-3: Additional features for motor with sine encoder as the motor encoder

(1) If the standard interface X4 is not used, there is then no need for the DFF module. The DSF feedback can be connected at the standard interface X4.

Configuration selection for motor with sine encoder

Name of configuration:	Table C2: Module combination:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
BE32-01							X		
BT04-01					X		X		
BT54-01			X				X		
BE33-01		X					X		
BT01-01	X						X		
BT57-01			X		X		X		
BT05-01		X			X		X		
BT58-01	X		X				X		
BT02-01	X	X					X		

Fig. 4-4: Configuration selection for motor with sine encoder as the motor encoder

Motor encoder interface: Indramat gear wheel encoder

If a motor type was specified for an application where a gear wheel encoder is used for a motor encoder interface, then you can select the desired additional features from the table *Additional features for motor with Indramat gear wheel encoder*.

Depending on your selection, the result will be a number or a combination of required modules.

With this module combination from the table *Configuration selection for motors with Indramat gear wheel encoder* you can determine the configuration label and order the correct components.

If the module combination is not listed in this table, check your selected components again (motor type, motor encoder interface, features); some changes may be required.

Selection of features for motor with Indramat gear wheel encoder

Features:	Table B3: Plug-in modules:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
16 universal dig. outputs 15 universal dig. inputs		X						X	
32 universal dig. Inputs 24 universal dig. outputs			X					X	
Ext. Measurement system with square wave signals (TTL)					X			X	
Ext. measurement system with DSF encoder (1)						X		X	
Ext. measurement system with SSI Interface	X							X	
ext. measurement system with EnDat Interface (Heidenhain)	X							X	
No additional features								X	
Plug-in modules determined:								X	

Fig. 4-5: Additional features for motor with Indramat gear wheel encoder

(1) If the standard interface X4 is not used, there is then no need for the DFF module. The DSF feedback can be connected at the standard interface X4.

Configuration selection for motor with Indramat gear wheel encoder

Name of configuration:	Table C3: Module combination:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
BE37-01								X	
BT59-01					X			X	
BT60-01			X					X	
BE38-01		X						X	
BE04-02	X							X	
BT61-01			X		X			X	
BT62-01		X			X			X	
BT63-01	X		X					X	
BE03-02	X	X						X	

Fig. 4-6: Configuration Selection for Motor with Indramat gear wheel encoder

Motor encoder interface: EnDat encoder

If a motor type was specified for an application where an encoder with EnDat interface is used for the motor encoder interface, then you can select the desired additional features from the table *Additional features for motors with EnDat motor encoder Interface*.

Depending on your selection, the result will be a number or a combination of required modules.

With this module combinations you can define the appropriate configuration label for ordering the correct components in the table *Configuration selection for Motor with EnDat motor encoder interface*.

If the module combination is not listed in this table, check your selected components again (motor type, motor *encoder* interface, features); some changes may be required.

Selection of features for motor with EnDat encoder

Features	Table B4: Plug-in modules:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
16 universal dig. outputs 15 universal dig. inputs	X	X							
32 universal dig. Inputs 24 universal dig. outputs	X		X						
Ext. measurement system with sine wave signals (1Vpp or 1uA)	X						X		
Ext. Measurement system with square wave signals (TTL)	X			X					
Ext. measurement system with DSF encoder (1)	X					X			
Ext. measurement system with SSI Interface	X							X	
ext. measurement system with EnDat Interface (Heidenhain)	X								X
No additional features	X								
Plug-in modules determined:	X								

Fig. 4-7: Additional features for motors with EnDat motor encoder interface

(1) If the standard interface X4 is not used, there is then no need for the DFF module. The DSF feedback can be connected at the standard interface X4.

Configuration selection for motors with EnDat encoder

Name of configuration	Table C4: Module combination:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
BE45-01	X								
BE93-01	X								X
BE04-02	X							X	
BT01-01	X						X		
BT24-01	X			X					
BT51-01	X		X						
BT74-02	X	X							
BT64-01	X		X						X
BT12-01	X	X							X
BT63-01	X		X					X	
BE03-02	X	X						X	
BT58-01	X		X				X		
BT02-01	X	X					X		
BT65-01	X	X		X					

Fig. 4-8: Configuration selection for motor with EnDat motor encoder interface

Motor encoder interface: Resolver without feedback data memory + sine encoder

If a motor type was specified for an application where an resolver without feedback data memory is used for the motor encoder interface, then you can select the desired additional features from the table *Additional features for motors with resolver without FDS + sine encoder interface*.

Depending on your selection, the result will be a number or a combination of required modules.

With this module combinations you can define the appropriate configuration label for ordering the correct components in the table *Configuration selection for Motor with resolver without FDS + sine encoder interface*.

If the module combination is not listed in this table, check your selected components again (motor type, motor encoder interface, features); some changes may be required.

Selection of features for motor with resolver without FDS + sine encoder

	Table B5: Plug-in modules::								
Features:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
16 universal dig. outputs 15 universal dig. inputs		X					X		
32 universal dig. Inputs 24 universal dig. outputs			X				X		
Ext. Measurement system with square wave signals (TTL)					X		X		
Ext. measurement system with DSF encoder (1)						X	X		
Ext. measurement system with SSI Interface	X						X		
ext. measurement system with EnDat Interface (Heidenhain)	X						X		
No additional features							X		
Plug-in modules determined:							X		

Fig. 4-9: Additional features for motor with resolver without FDS + sine encoder

Configuration selection for motors with resolver without FDS + sine encoder

Name of configuration	Table C5: Module combination:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
BE32-01							X		
BE08-01						X	X		
BT04-01					X		X		
BT54-01			X				X		
BE33-01		X					X		
BT01-01	X						X		
BT66-01			X			X	X		
BE28-01		X				X	X		
BT57-01			X		X		X		
BT05-01		X			X		X		
BT58-01	X		X				X		
BT02-01	X	X					X		

Fig. 4-10: Configuration Selection for Motor with resolver without FDS + sine encoder

Motor encoder interface: gear wheel encoder with 1Vpp signals

If a motor type was specified for an application where a gear wheel encoder with 1Vpp signals is used for the motor encoder interface, then you can select the desired additional features from the table *Additional features for motors with gear wheel encoder interface with 1Vpp signals*.

Depending on your selection, the result will be a number or a combination of required modules.

With this module combinations you can define the appropriate configuration label for ordering the correct components in the table *Configuration selection for Motor with gear wheel encoder interface with 1Vpp signals*.

If the module combination is not listed in this table, check your selected components again (motor type, motor *encoder* interface, features); some changes may be required.

Selection of features for motor with gear wheel *encoder* with 1Vpp signals

Features:	Table B6: Plug-in modules:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
16 universal dig. outputs 15 universal dig. inputs		X							X
32 universal dig. Inputs 24 universal dig. outputs			X						X
Ext. Measurement system with square wave signals (TTL)					X				X
Ext. measurement system with DSF encoder (1)						X			X
Ext. measurement system with SSI Interface	X								X
ext. measurement system with EnDat Interface (Heidenhain)	X								X
No additional features									X
Plug-in modules determined:									X

Fig. 4-11: Additional features for motor with gear wheel encoder with 1Vpp signals

(1) If the standard interface X4 is not used, there is then no need for the DFF module. The DSF feedback can be connected at the standard interface X4.

Configuration selection for motors with gear wheel encoder with 1Vpp signals

Name of configuration	Table C6: Module combination:								
	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DZF 02.1M	DZF 03.1M
BE79-01									X
BT67-01					X				X
BT56-01			X						X
BE80-01		X							X
BE93-01	X								X
BT68-01			X		X				X
BT69-01		X			X				X
BT64-01	X		X						X
BT12-01	X	X							X

Fig. 4-12: Configuration Selection for Motor with gear wheel encoder with 1Vpp signals

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