

DIAX04

Drive With Servo Function

Firmware Versionnote: SSE 01VRS

DOK-DIAX04-SSE-01VRS**-FVN1-EN-P

Titel	DIAX04 Drive with servo function
Type of Documentation	Version notes FWA-DIAX04-SSE-01VRS-MS
Documentation type	DOK-DIAX04-SSE-01VRS**-FVN1-EN-P
Internal Filing otation	<ul style="list-style-type: none"> • Mapped 61-01V-EN / Register 10 • 209-0077-4315-01 • Based on: 01V07
What is the purpose of this documentation	<p>The following documentation is a complement to the function description in DOC-DIAX04-SSE-01VRS**-FKB1-EN-P</p> <p>It describes the differences between DIAX04-SSE-01VRS and DIAX02-SSE-02VRS.</p>

Editing sequence

Document-identification of previous and present editions	Date	Note
DOK-DIAX04-SSE-01VRS**-FVN1-EN-P	05.97	DIAX02 -> DIAX04

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Publisher	<p>INDRAMAT GmbH • Bgm.-Dr.-Nebel-Str. 2 • D-97816 Lohr a. Main Dept. END (KT/JR)</p>
Validity	<p>All rights are reserved with respect to the content of this documentation and the availability of the product.</p>

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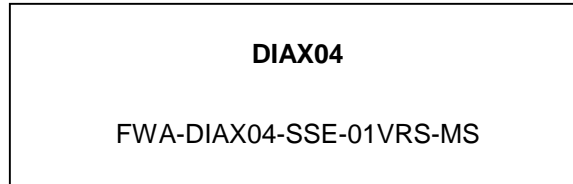
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Customer Service Locations

1 General Information

1.1 Product Family

The product release description refers to the product family:



The version notes describe the differences to the previous product family DIAX02.

The following drive controls can be operated with this software:

- HDS 02.1
- HDS 03.1
- HDS 04.1
- HDD 02.1

Note: There is no difference in functions between the product families DIAX03 and DIAX04 with the same firmware versions.

1.2 Documentation

The documentation for product **FWA-DIAX04-SSE-01VRS** is available as follows:

Paper form

Windows help system

The following table contains a summary of available items.

POS	Type	Document style	Register in Mapped 61-01V	Part number	Symbol number
1	DOK-DIAX04-SSE-01VRS**-61M1-EN-P	Mappe 61-01V-EN Paper	--	275987	209-0077-4311-01
2	DOK-DIAX04-SSE-01VRS**-FKB1-EN-P	Functional Description Paper	3	275988	209-0077-4312-01
3	DOK-DIAX04-SSE-01VRS**-INF1-EN-P	Drive Configuration	6	275989	209-0077-4313-01
4	DOK-DIAX04-SSE-01VRS**-WAR1-EN-P	Trouble Shooting Guide Paper	8	275990	209-0077-4314-01
6	DOK-DIAX04-SSE-01VRS**-FVN1-EN-P	Firmware Versionsnote	10	275992	209-0077-4315-01
7	DOK-DIAX04-SSE-01VRS**-61M1-EN-H1,44	Help System for Windows3.1 Disk	12	275991	209-0077-4311-01

Figure: 1-1: Documentation for FWA-DIAX04-SSE-01VRS

1.3 Notes on Replacing the Firmware

Prior to replacing the firmware, the following points must be noted:

- Read the entire documentation
- Store the current set of parameters

Note: The parameters that are to be secured are stored in parameter S-0-0192.

- Switch drive controller off and replace software module
- Load the parameters back in
- Check the functions

2 Version notes FWA-DIAX04-SSE-01VRS-MS

2.1 Release Notes

Firmware version **FWA-DIAX04-SSE-01V07** represents the first official edition of version 01. It was released on **10 June 1997**.

The released software can be used to operate the following drive controllers:

- HDS 02.1
- HDS 03.1
- HDS 04.1
- HDD 02.1

2.2 Checksums

Program flash: 1F51 h

Data flash: B1F8 h

Sum: D149 h

2.3 New functions

Motors supported

In addition to MHD, MKD and MKE motors, 2AD/1MB/ADF, LAF/LAR and LSF motors are also supported.

The parameter block was expanded in terms of those parameters needed to parametrize inductance motors, e.g., such parameters as govern the slip factor, magnetization current, and so on.

Feedbacks supported

The standard feedback, i.e., DSF and resolver, can be used as a motor encoder for MHD, MKD and MKE motors. D or R units are not needed.

As far as the other motor types are concerned, incremental encoders with sinusoidal signals, gear/wheel encoders and encoders with ENDAT interface are also evaluated as motor encoders.

As external encoders it is possible to use all types of encoders that can also be used as motor encoders. Incremental encoders with square-wave signals and encoders with SSI interface can also be used. In other words, external absolute encoders are also supported.

With the DIAX02 only incremental encoders with sinusoidal and square-wave signals can be used as external encoders.

Automatic load of base values

MHD, MKD and MKE motors conduct a comparison between the motor type read in the feedback (S-0-0141) and the connected motor type stored in the new parameter P-0-4036. If the strings are not the same, then error „F208 Motor type has changed“ is generated. UL appears in the 7 segment display. Clearing the error generates an automatic assumption of the default control parameters stored in the feedback and to a copying of S-0-0141 into P-0-4036.

Speed control with external encoder

The speed control loop of the DIAX02 is always closed with the actual speed value of the motor encoder. The DIAX04 offers, with parameter P-0-0121, speed mix factor encoder 1 & 2 the option of allowing the actual speed value of the external encoder to take effect as well.

Speed control with ramp and filter

In speed control mode, the DIAX04 offers the option of approaching the set speed command value in ramp fashion. Additionally, the speed command values are transmitted via a low-pass filter after generating the ramp. To parametrize ramp and filter, the new parameter P-0-1201, ramp 1 pitch and P-0-1222, command value smoothing time constant were introduced.

Additive speed command value

The additive velocity command value (S-0-0037) is active in every mode in which the speed control is active. Thus, e.g., the lag error in the position control mode can be affected.

Best possible standstill

In the DIAX04, it is now possible to adjust the best possible standstill (parameter P-0-0119, best possible standstill). In the DIAX02, only speed command to zero is executed, i.e., decel at maximum torque.

Best possible standstill is conducted upon removal of the drive enable signal and with interface errors.

Diagnoses

The 7-segment display is more fully used. When displaying error numbers, the error class (F2..F8) is also displayed. The same applies to the warnings (E2..E8). Active commands are displayed with a C, followed by a command number. The cause of negative command acknowledgements is displayed by the pertinent command error number.

Warnings

The following warnings have been additionally implemented for the DIAX04:

- warning amplifier temperature monitor defective.
- warning motor temperature monitor defective.
- positioning speed > maximum value.
- target position outside of travel range.
- feedrate override (S-0-0108) = 0.
- continuous current limit active.
- speed command limit value active.
- continuous current limit pre-warning.
- speed command value S-0-0036 größer als Grenzwert Bipolar.
- slave not scanned or address 0.
- position limit value positively exceeded.
- position limit value negatively exceeded.
- travel range limit switch positively actuated.
- travel range limit switch negatively actuated.

A detected overvoltage is also classified, in contrast to the DIAX02, as a warning.

To be able to chronologically detect very short warning diagnoses, a warning remains standing for 2 seconds after the end of the warning state has been reached.

Using Key S1 to clear an error

The S1 key on the controller can be used to clear a pending C1D error.

Masks for status class errors

Parameter S-0-0097, mask C2D error and S-0-0098, mask C3D make it possible to affect the results of bit changes in C2D and C3D to the pertinent change bit in the drive status.

Probe function

The probe function implemented as per the SERCOS specification in the DIAX02, was expanded for use in the DIAX04 in terms of two functions

- Using parameters P-0-0200, signal select probe 1 and P-0-0201, signal select probe 2 it is possible to set the latching of a target value.
- Parameter P-0-0202, difference probe value 1 and P-0-0203, difference probe value 2 each supply the difference between the measured value of the positive and the negative edge.

Correcting axis error

New in the DIAX04 is the option of correcting the actual position value sent by the NC.

Additionally the option has been created of compensating changes in length caused by changes in temperature.

Linking I/O card with parameters

With the new parameter P-0-0124, ident number allocation -> DEA output permits the cyclical output of the data of an allocated parameter to the output of an I/O card (DEA 4, 5 or 6).

The cyclical copying of a DEA input value to the data of a parameter can be activated with P-0-0125, allocate DEA input -> ident number.

Measuring motor temperature

Motor temperature is measured and stored in parameter S-0-0383, motor temperature. The value is only used, in synchronous motors, to detect overtemperature. In inductance motors, it is additionally needed to parametrize slip increases (P-0-0530).

Optional changing of feedback and amplifier data

After entering a password, feedback and amplifier data can be changed via the required data channel.

This function is exclusively for customer service use.

2.4 Changed functions

Operating modes

The mode "position control with guide filter", defined in the DIAX02 as manufacturer-specific, has been changed to the pertinent SERCOS-specified mode „Drive internal interpolation“.

SERCOS interfaces

The use of the SERCOS-Asic in the DSS2 enables the following improvements in communications in DIAX04 unit:

- reduced to a minimum cycle time of 500 usec
- baud rate can be switched from 2 to 4 MBaud
- S-0-0185, length of configurable data block in AT expanded from 16 to 24 bytes
- S-0-0186, length of configurable data block in the MDF expanded from 16 to 32 bytes
- telegram reception times are checked
- more rapid required data channel transmission

Variable Min/Max values

The minimum and maximum values of several parameters are dependent on the type of weighting and the parametrized mechanics. In the DIAX04, the min/max values in prepare transition commands for phase 4 are calculated and the data to maintain limits are checked. In the DIAX02, the min/max values are set to input limits and not adjusted. This results in overruns when processing data.

Limits

Speed limits

In speed control mode, S-0-0091, bipolar speed limit limits the effective speed command value. The same applies to drive-internal interpolation mode. If in torque control mode, the bipolar speed limit value is exceeded, then error F879 speed limit value is generated.

Torque limits

In addition to S-0-0092, torque/force limit value - bipolar, P-0-0109, peak torque/force limit limits maximum output current.

Parameter P-0-0006, overload factor to determine the continuous current limit has been dropped in the DIAX04. The effective continuous current is listed in the table with unit data. The value is also thereby effected by the switching frequency (P-0-4011) and magnetization current (P-0-4004).

Travel range limits

The new parameter P-0-0090, travel range limit switch parameter makes it possible to treat any exceeding of the travel range (position limit value exceeded or travel range limit switch actuated) as a warning. The drive then brings itself to a standstill and returns to the travel range if the command values lead it there.

The diagnosis with travel range exceeded contains the information as to which position limit value was exceeded or which travel range limit switch actuated (positive or negative).

Dynamic current limit

The dynamic current limit has been changed for the DIAX04. Using a temperature model, chip overtemperature of the power transistors is calculated. Once the permitted overtemperature is reached, peak current is reduced. The parametrization of the overload warning (P-0-0127) specifies a threshold as of which a pre-warning is generated. If current limit becomes active, then this is also displayed as a warning.

Speed control

The smoothing time constant (P-0-0004) of the low-pass filter in the DIAX04 does not affect the proportion gain of the speed controller but rather the speed controller output (current command value) after the limit.

The actual speed value filter time constant is new (S-0-0392). It supports the parametrization of a low-pass filter for the actual speed value.

Current controller

In DIAX02 only an analog current controller with P-gain (P-controller) is used. In DIAX04 units, a digital current controller with additional PI-gain (PI controller) is used.

The use of the digital current controller necessitates the digital compilation of the actual current value. This means that the torque/force actual value can be read from parameter (S-0-0084) which is equal to the actual current value.

Referencing

When referencing a linear scale to two not absolute linear scales, both actual position values are switched into.

In DIAX02 units, only that actual position value is switched which was used during referencing.

Modulo function

In rotary axes turning infinitely in one direction, and if modulo processing of position data is set, then the marginal conditions for an error-free processing of position data are generally no longer restrictive in contrast to the DIAX02.

The new parameter S-0-0393, command value mode in modulo format also permits the option of selecting the direction in which a new command value is to be approached (positive or negative direction or shortest possible path).

Position command value generation with MDT failure

The DIAX02 parameter P-0-0095, position command value interpolation with MDT failure, has been dropped. Given a simple failure of the master data telegram, the failed position command value is automatically extrapolated.

Error reaction

Parameter P-0-0007, error reaction has been replaced with parameter P-0-0117, activate NC reaction with error, P-0-0118, powering down with error and P-0-0119, best possible standstill. This makes a more finely defined setting of the drive reactions in the event of error and upon removal of drive enable possible.

Drive enable signal

DIAX04 units require, upon setting the drive enable signal, a positive edge (0 -> 1) of the release bits in the master control word. In the DIAX02, the bits are statically evaluated.

Error message on supply bus

If a controller diagnosis an error, then, given the relevant error reaction, the X1.2 signal on the supply bus is set to 0 to switch the power to the supply unit off. This signal is further detected by other units connected to the supply bus.

DIAX02 controllers can only react in terms of switching the motor off in the case of undervoltage. In contrast, DIAX04 units respond as they do with drive enable removal, namely with a best possible standstill. No error message is generated.

Probe function

A probe edge can be detected in the DIAX04 in precisely 1 µsec. The appropriate probe position is intermediately linearly interpolated using the previous and the following actual position values. The precision of the detected position has been considerably improved at higher speeds in contrast to the DIAX02.

Correcting axis errors

Conversion compensation for actual position value 2 is no longer possible.

Axis error correction using the correction value table has basically remained the same. Only the ident numbers for start position, correction value table and support point distance have changed. Activating with parameter P-0-0055, spindle ramp error status has been dropped. Correction is active if the support point distance is not equal to 0 and the actual position value to be corrected is in reference.

Expanded oscilloscope function

The oscilloscope function of the DIAX04 has been expanded for development and diagnostic purposes. Internal triggering due to software events is possible and any amount of data content can be stored in the list of measured values.

Invalid parameters

In operating mode of the DIAX02, (communications phase 4) no parameter was labelled invalid in the data status. In DIAX04, it is possible to make some parameters in operating mode invalid because they have not yet been write accessed.

Evaluating an external encoder

In DIAX04 units, it is not obvious with inductance motors at which encoder interface the motor encoder and at which an external encoder is connected. As result, in parameter P-0-0075, external encoder interface, it must be specified which encoder interface is for the external encoder and in parameter P-0-0074, motor encoder interface, which is for the motor encoder. In MHD, MKD and MKE motors, the standard interface is automatically set as motor encoder interface. An external encoder is only then evaluated if the relevant interface card is set in parameter P-0-0075.

DIAX02 units automatically support an inserted DLF or DEF card to evaluate an external encoder.

2.5 Eliminated functions

Command - park axis

The command to park axis is not in firmware FWA-DIAX04-SSE-01VRS.

Evaluating encoders with distance-coded reference markers

Evaluating encoders with distance-coded reference markers is not in firmware FWA-DIAX04-SSE-01VRS.

Command detect marker position

Command detect marker position is not in firmware FWA-DIAX04-SSE-01VRS.

Deactivating absolute encoder evaluation

With firmware FWA-DIAX04-SSE-01VRS it is not possible to execute the command drive-guided referencing with an absolute encoder.

List of ident numbers

The lists in the DIAX02 for control-dependent application parameters, machine-dependent application parameters, drive parameters and parameters for control settings are not in DIAX04.

2.6 Parameter block

New parameters in DIAX04

- S-0-0037, velocity command value
- S-0-0097, mask class 2 diagnostic
- S-0-0098, mask class 3 diagnostic
- S-0-0107, current regulator 1 integral action time
- S-0-0116, resolution of rotational feedback 1
- S-0-0193, positioning jerk
- S-0-0201, motor warning temperature
- S-0-0204, motor shutdown temperature
- S-0-0259, positioning velocity
- S-0-0260, positioning acceleration
- S-0-0267, password
- S-0-0277, position feedback 1 type parameter
- S-0-0347, speed control deviation
- S-0-0382, DC bus power
- S-0-0383, motor temperature
- S-0-0390, diagnostic message number
- S-0-0392, velocity feedback filter time constant
- S-0-0393, command value mode in modulo format
- P-0-0018, number of pole pairs / pole pair distance
- P-0-0044, scaling factor for power analog outputs
- P-0-0074, interface feedback 1
- P-0-0075, interface feedback 2
- P-0-0090, travel limit parameter
- P-0-0109 torque / force peak limitation
- P-0-0117, NC reaction with error
- P-0-0118, power off with error
- P-0-0119, best possible deceleration
- P-0-0121, velocity mix factor feedback 1 & 2
- P-0-0123, absolute encoder buffer
- P-0-0124, assign IDN -> DEA output
- P-0-0125, assign DEA -> IDN
- P-0-0126, longest braking time
- P-0-0127, overload warning
- P-0-0141, thermal drive load
- P-0-0145, expanded trigger edge
- P-0-0146, expanded trigger address
- P-0-0147, expanded signal K1 address
- P-0-0148, expanded signal K2 address
- P-0-0149, list of valid samples for oscilloscope function
- P-0-0150, number of valid samples for oscilloscope function

- P-0-0153, optimal distance home switch reference mark
- P-0-0200, signal select probe 1
- P-0-0201, signal select probe 2
- P-0-0202, difference probe value 1
- P-0-0203, difference probe value 2
- P-0-0400, position correction, external correction value
- P-0-0401, position correction, active corr. value
- P-0-0402, position correction, reference temperature
- P-0-0403, position correction, reference position temp. correct.
- P-0-0404, position correction, actual temperature pos.dep.
- P-0-0405, position correction, actual temperature pos. indep.
- P-0-0406, position correction, temp. pos.dep.
- P-0-0407, position correction, temp. factor pos. indep. [0.1/K]
- P-0-0508, commutation offset
- P-0-0509, slot angle
- P-0-0510, moment of inertia of rotor
- P-0-0511, brake current
- P-0-0513, feedback type
- P-0-0514, absolute encoder offset
- P-0-0518, amplifier nominal current 2
- P-0-0519, amplifier peak current 2
- P-0-0525, type of motor brake
- P-0-0526, brake control delay
- P-0-0530 slip increase
- P-0-0531, stall current limit
- P-0-0532, premagnetization scaling factor
- P-0-0533, flux loop proportional gain
- P-0-0534, flux loop integral action time
- P-0-0535, motor voltage at no load
- P-0-0536, maximum motor voltage
- P-0-0537, S1 kink speed
- P-0-0538, motor function parameter 1
- P-0-1201, ramp 1 pitch
- P-0-1222, command value smoothing time constant
- P-0-4000, current zero trim phase U
- P-0-4001, current zero trim phase V
- P-0-4002, current amplify trim phase U
- P-0-4003, current amplify trim phase V
- P-0-4004, magnetization current
- P-0-4011, switching frequency
- P-0-4012, slip factor
- P-0-4014, motor type
- P-0-4015, DC bus voltage
- P-0-4028, impulse wire feedback offset

- P-0-4029, impulse wire feedback - PIC counter value
- P-0-4035, trim current
- P-0-4036, connected motor type
- P-0-4045, active permanent current
- P-0-4046, active peak current

Changes in ident numbers for DIAX04

ident number DIAX02	ident number DIAX04	Name
P-0-0049	S-0-0258	target position
P-0-0005	S-0-0265	language change
P-0-0020	S-0-0298	reference cam shifted by ..
P-0-0050	S-0-0348	P-gain acceleration pre-control
P-0-0106	S-0-0349	jerk limit value - bipolar
P-0-0120	S-0-0391	monitoring window, ext. encoder
P-0-0057	P-0-0408	position correction, start position
P-0-0058	P-0-0409	position correction, correction profile
P-0-0056	P-0-0410	position correction, support point distance

Fig. 2-2: List of altered ident numbers

2.7 Parameters removed from DIAX04

- S-0-0118, resolution of linear feedback
- S-0-0139, park axis procedure command
- S-0-0165, distance coded reference marks A
- S-0-0166, distance coded reference marks B
- S-0-0173, marker position A
- S-0-0178, absolute distance 2
- P-0-0006, overload factor
- P-0-0007, error reaction
- P-0-0014, deter. command mark position
- P-0-0045, id.no. list control-dependent application parameters
- P-0-0046, id no. list machine-dependent application parameters
- P-0-0047, id no. list drive parameters
- P-0-0048, id no. of control setting parameter
- P-0-0055, spindl ramp error status
- P-0-0095 interpolation of position command value with MDT failure
- P-0-0107 slave version
- P-0-0114 negation of travel range limit inputs
- P-0-0138, deactivate absolute encoder evaluation

Notes

Customer Service Locations

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