



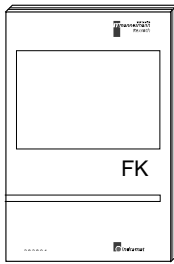
ECODRIVE03 Drive For General Automation With Fieldbus-Interface

Firmware Version Notes: FGP-03VRS

SYSTEM200

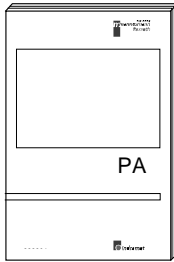
- Title** ECODRIVE03: Drive for General Automation with Fieldbus-Interfaces
- Type of documentation** Firmware Version Notes
- Documentation code** DOK-ECODR3-FGP-03VRS**-FV01-EN-P
- Internal file reference**
- Box Set 73-03-EN
 - Document number 120-1000-B320-01/EN
- What is the purpose of this document?** This documentation is a supplement to the function description DOK-ECODR3-FGP-03VRS**-FK01-EN-P: ECODRIVE03 Drive for General Automation with Fieldbus-Interfaces (DKC03.3, DKC04.3, DKC05.3, DKC06.3).
It describes the differences between ECODRIVE03-Version FWA-ECODR3-FGP-03VRS and the previous ECODRIVE03-Version FWA-ECODR3-FGP-02VRS.
- Course of modifications**
- | Document identification of previous and present output | Release Date | Comments |
|--|--------------|---------------|
| DOK-ECODR3-FGP-03VRS**-FV01-EN-P | 03/00 | first release |
| | | |
| | | |
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- Published by** Rexroth Indramat GmbH
Bgm.-Dr.-Nebel-Str. 2 • D-97816 Lohr a. Main
Telephone 09352/40-0 • Tx 689421 • Fax 09352/40-4885
<http://www.rexroth.com/indramat>
Dept. ECD (TH/SA/VS)
- Note** This document has been printed on chlorine-free bleached paper.

Documentation Overview – Box Set



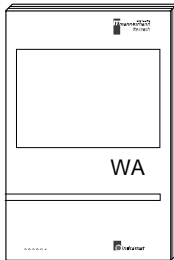
Functional Description:
 Description of all implemented functions

 Order designation:
 DOK-ECODR3-FGP-03VRS**-FK02-EN-P



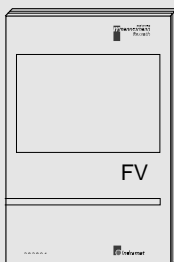
Parameter Description:
 A description of all parameters used in the firmware

 Order designation:
 DOK-ECODR3-FGP-03VRS**-PA01-EN-P



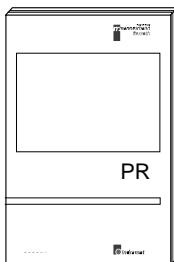
Troubleshooting Guide:
 -Explanation of the diagnostic states
 -How to proceed when eliminating faults

 Order designation:
 DOK-ECODR3-FGP-03VRS**-WA01-EN-P



Firmware Version Notes:
 Description of new and changed functions in terms of the derivative:
 -FWA-ECODR3-FGP03VRS-MS

 Order designation:
 DOK-ECODR3-FGP-03VRS**-FV01-EN-P



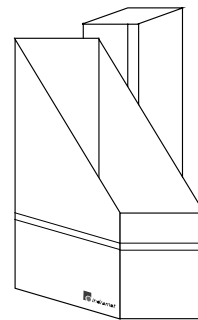
Project Planning Manual:
 -Planning control cabinet construction
 -Planning the electric layout in the control cabinet

 Order designation:
 DOK-ECODR3-DKC** .3****-PR**-EN-P



CD: DRIVEHELP
 Collection of Windows help systems which contains documents on firmware derivatives

 Order designation:
 DOK-GENERL-DRIVEHELP**-GE**-MS-D0600



Order designation
 DOK-ECODR3-FGP-03VRS**-7302-EN-P

Notes

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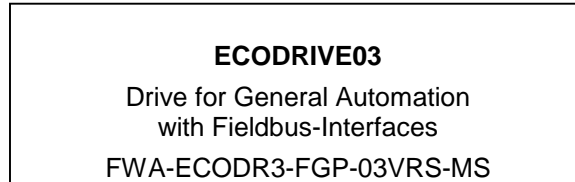
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1 General Information

1.1 Product Family

The product release description refers to the product family:



The following drive controls can be operated with this software:

DKC03.3-040-7-FW	DKC03.3-100-7-FW	DKC03.3-200-7-FW
DKC04.3-040-7-FW	DKC04.3-100-7-FW	DKC04.3-200-7-FW
DKC05.3-040-7-FW	DKC05.3-100-7-FW	DKC05.3-200-7-FW
DKC06.3-040-7-FW	DKC06.3-100-7-FW	DKC06.3-200-7-FW

This document describes the differences between ECODRIVE03 version FWA-ECODR3-FGP-03VRS and the previous ECODRIVE03 version FWA-ECODR3-FGP-02VRS .

Notes

2 Replacing the Firmware

2.1 Notes on Replacing the Firmware

When replacing, please note the following:

1. The drive controller must be on.
2. The current parameters must be secured.
3. The drive controller is in Phase 2.
4. The baud rate is set to 9600 (in **P-0-4021**, **baud rate RS-232/485** is set to '0')

Note: Do not switch the 24 DC volts off while replacing the firmware.

2.2 How to replace the Firmware

The following text relates to the replacement of firmware with Dolfi V1.05 (SWA-DOL*PC-INB-01V05-MS-C1.44-COPY, material number 279804).

1. Callup Dolfi
2. Input the following under **Options**:
Register card **Com Port**
 - Under **COM Port** select interface to PC.
 - Under **Baud rate connect** set '9600'.
 - Under **Baud rate download** set baud rate for download (recommended setting: 'Auto')

Register card **Address**

- Enter the address set at switches S2 and S3 on the drive controller.

Register card **Language**

- Select language.

3. Press **Connect** button.
4. Press **Transmit** button.
→ The standard Windows dialog for opening a file is opened.
5. Select *.ibf file for update and open file.
→ The headers of the programmed modules are read out.
(The headers can be read by selecting the register card **Header**.)
6. Press **Send** button.
→ If „Module - All“ has been selected, then the complete ibf file can be sequentially programmed without call back (normally one ECODRIVE03-FWA contains three firmware modules). If „Module - Single“ has been selected, then press **Send** each time a firmware module has been programmed.
7. With successful update, press **Disconnect**.
→ Drive firmware is started.
8. Exit Dolfi.
→ If the number of backed up parameters has changed, then "PL" appears on the display. (If errors are pending, then clear these first.) If the S1 key is now pressed, then all backed up parameters are reset to their default values. "C8 load default parameters" appears for this duration on the display.

If the command "C8 load default parameter" has been started, the motor replaced, then upon progression from phase 3 to 4 "UL" appears on the display. S1 must now be pressed or the command to clear the error started. The controller default values are now loaded out of the motor feedback into the controller.
9. Load the desired parameter file.

3 Modifications to ECODRIVE03-FGP-02VRS

3.1 New Functions

DeviceNet

The firmware supports the command communications interface DeviceNet (consisting of and applicable to drive controller family DKC6.3 / ECODRIVE03).

General features:

- Protocol : DeviceNet specification, Release 2.0
- Baud rates: 125, 250 and 500 kbps
- Maximum length of cyclic channels equals 16 bytes
- Parameter transmission via Explicit Messages
- The use of a pre-defined master / slave connection set
- Interfaces are electrically isolated
- Pluggable 5-pin open style connector

Firmware-specific features:

- A mapping of all drive parameters on fieldbus objects (includes all classes and entities).

Velocity Synchronization with a Virtual or Real Master Axis

The drive is in velocity control and synchronously follows the master axis position. The master axis encoder is evaluated via encoder 2. It supplies **P-0-0052, Position feedback value 3**, the actual position value of the master axis encoder. This value is copied from the drive into parameter **P-0-0053, Master drive position**.

Pertinent parameters:

- S-0-0236, Master drive 1 revolutions
- S-0-0237, Slave drive 1 revolutions
- P-0-0053, Master drive position
- P-0-0083, Gear ratio fine adjust
- P-0-0108, Master drive polarity
- P-0-0156, Master drive gear input revolutions
- P-0-0157, Master drive gear output revolutions

Angle Synchronization with a Virtual or Real Master Axis

The drive is in position control and follows the master axis position in a position synchronous manner. The master axis encoder is evaluated via encoder 2. It supplies **P-0-0052, Position feedback value 3**, the actual position value of the master axis encoder. This value is copied from the drive into parameter **P-0-0053, Master drive position**.

Pertinent parameters:

- S-0-0048, Position command value additional
- S-0-0236, Master drive 1 revolutions
- S-0-0237, Slave drive 1 revolutions
- P-0-0053, Master drive position
- P-0-0108, Master drive polarity
- P-0-0156, Master drive gear input revolutions
- P-0-0157, Master drive gear output revolutions
- P-0-0159, Slave drive feed travel

Electronic cam shaft with a virtual or real master axis

Using operating mode "Electronic cam shaft" it is possible to emulate the function of a mechanical cam shaft. In this mode, the drive controller is in position control. The profile accessing angle is generated out of the master axis position. The profile value is evaluated along with the distance. The results are then passed onto the position controller and the drive thus follows the cam shaft profile. The master axis position is specified by **Position feedback value 3 (P-0-0052)**.

Pertinent parameters:

- S-0-0048, Position command value additional
- P-0-0053, Master drive position
- P-0-0061, Angle offset begin of profile
- P-0-0072, Cam shaft profile 1
- P-0-0085, Dynamic angle offset
- P-0-0088, Cam shaft control
- P-0-0089, Cam shaft status
- P-0-0092, Cam shaft profile 2
- P-0-0093, Cam shaft distance
- P-0-0094, Cam shaft switch angle
- P-0-0108, Master drive polarity
- P-0-0144, Cam shaft distance switch angle
- P-0-0156, Master drive gear input revolutions
- P-0-0157, Master drive gear output revolutions
- P-0-0158, Angle offset change rate

Master Axis Encoder

Encoder 2 can be parametrized as if it were a master axis encoder. Only encoders with a binary pitch may be used. Incremental encoders are also possible in addition to single or multi-turn encoders. This encompasses automatic detection of the zero impulse followed by a transition from P-0-0052 to the offset in P-0-0087. The **Position feedback value 3** is smoothed via the PT1 filter, the time constant is set with parameter **P-0-0186, Actual Position value 3, smoothing time**.

Selecting a Linear or Cubic Position Command Value Interpolator in Position Control

The firmware is now equipped with a cubic position command value interpolator, in addition to the linear one. The interpolators can be switched with the use of parameter **P-0-0187, Position command processing mode**.

In the case of linear position command value interpolation, the position command values specified by the control are specified to the position controller one NC cycle later. Both the velocity and the acceleration pre-control can change within the step of the NC cycle time.

In the case of a cubic interpolator, the transmitted position command values are not specified to the position controller until two NC cycles later. With cubic interpolation, both the velocity and the acceleration pre-control can change within every position control cycle.

Airing the Motor Holding Brake

Parameter **P-0-0542, B100 Command release motor holding brake** was introduced to offer the user the option of airing the motor brake. The motor holding brake is released at the start of this command.

Monitoring the Motor Holding Brake

The user can check whether the motor holding brake is working or not in two different ways:

- There is an automatic check each time the drive enable is applied and removed. Upon application, it is checked whether the brake has released or not; with removal, it is checked whether it is generating the required nominal torque or not.
- There is a manual check at the start of each new command **P-0-0541, B200 Brake check command**. In this case, it is checked at a low torque whether the brake has been released or not. If it has, then the brake is closed and then it is checked whether it generates its required nominal torque or not. If it does not generate the required torque, then the attempt is made to generate it by grinding the brake.

Monitoring Maximum Decel Time

The drive controller monitors maximum decel time because repeatedly exceeding maximum decel time could mean the destruction of the motor holding brake. Each time the maximum decel time is exceeded, error message **F224 Maximum decel time exceeded** is generated.

Digital Output

A parameter can be allocated to parameter **P-0-0124, Assignment IDN - > Digital output**. Bit 0 of this allocated parameter is output at digital output X3/8 and bit 1 of this allocated parameter is output at digital output X3/10.

Synchronous Motor with Incremental Measuring System

Note: Combining “a synchronous motor with an incremental measuring system” is only allowed after the Drive Development Department has been consulted and they have explicitly permitted this combination !

This firmware is capable of operating linear and rotary synchronous motors with an incremental encoder system. The commutation offset for this motor – encoder combination is determined automatically each time the drive runs up into operating mode and the drive enable is applied.

The following encoder systems may be used:

- Incremental sinusoidal encoder, 1Vss level
- Incremental square-wave encoder, 5V-TTL signal
- Gearwheel encoder with 1Vss level

A Synchronous Motor in a Fieldweakening Range

Synchronous motors suited for a fieldweakening range can be operated with this firmware in that range. This function must, however, be activated in parameter **P-0-0538, Motor function parameter 1**.

A Filter for the Actual Velocity Value

It is possible to activate a low-pass filter for parameter **S-0-0040, Velocity feedback value** via parameter **P-0-0538, Motor function parameter 1**. This filter has a filter time constant of 8ms.

Note: This filter only makes sense if the value in S-0-0040 is used for display purposes.

Allowing for the Cooling Mode when Scaling the Torque/Force Data

The different cooling modes of the motor mean that the standstill and nominal currents of the motor vary. All torque/force data of the drive represent a per cent factor and reference the standstill and nominal currents of the motor. To obtain the correct torque/force data for the various cooling modes of MDD, MKD and MHD motors, it is necessary to allow for the cooling mode during scaling. A factor is defined via parameter **P-0-0640, Cooling type** which specifies the rise of the standstill or nominal currents.

Type of cooling	Parameter value	Factor
not cooled	0	100 %
cooled	1	150 %
water cooled	2	190 %

Fig. 3-1: Adjusting the torque/force values with cooled MDD, MKD and MHD motors

Note: With all motors other than MDD, MKD and MDD motors, the value in parameter P-0-0640 must always be set to zero.

3.2 Expanded/Changed Functions

Profibus DP

All drive parameters on fieldbus objects are now being mapped.

A start-up without a PC via profibus has become possible since the "SetParam" service is now being supported during bus initialization.

CANopen

All drive parameters on fieldbus objects are now being mapped.

Interbus-S

All drive parameters on fieldbus objects are now being mapped.

The option of reconfiguring the bus has also made a start-up without the use of a PC via Interbus possible.

Drive-Internal Interpolation (relative or absolute)

The operating modes "Drive-internal interpolation" and „Relative drive-internal interpolation“ are combined in the operating mode „Drive-internal interpolation“. Both absolute and relative positions are transmitted in parameter **S-0-0282, Positioning preset**. It is specified in parameter **S-0-0393, Command value mode** whether the position target is to be relatively or absolutely processed. The position entry is only processed if parameter **S-0-0346, Setup flag for relative/non-cyclic command values** is toggled. It is also possible to set in parameter **S-0-0393, Command value mode** whether a new position entry should be immediately traveled to or not until after the old position entry has been reached. It is not acknowledged that the relative/acyclic command values have been assumed (S-0-0419) until the position entry has been traveled to.

Separate acceleration (**S-0-0260, Positioning acceleration**) and deceleration ramps (**S-0-0359, Positioning deceleration**) are available. In the case of **S-0-0359, Positioning Deceleration** = 0, the acceleration ramp is effective.

Note: If parameter **S-0-0282, Positioning preset** is not used and the absolute target position specified directly via **S-0-0258, Target position**, then the function becomes compatible with the present "Drive-internal interpolation".

Velocity Control

Separate acceleration (**P-0-1201, Ramp 1 pitch** and **P-0-1201, Ramp 2 pitch**) and deceleration ramps (**P-0-1211, Deceleration ramp 1** and **P-0-1213, Deceleration ramp 2**) are available. If parameter **P-0-1211, Deceleration ramp 1** is equal to zero, then **P-0-1201, Ramp 1 pitch** is used for deceleration. If parameter **P-0-1213, Deceleration ramp 2** is equal to zero, then **P-0-1203, Ramp 2 pitch** is used for deceleration.

Velocity Command Value to Zero with Ramp and Filter

As with velocity control, error reaction „Velocity command value to zero with ramp and filter“ uses the new parameters for deceleration. These work in the same way as does velocity control.

Drive Halt

Drive halt uses that deceleration that was active in the previous operating mode. If the last active operating mode was „Position control with cyclic position command value“, then **S-0-0138, Bipolar acceleration limit value** becomes active.

Positioning Mode

Separate acceleration and deceleration ramps (**P-0-4008, Process block acceleration** or **P-0-4063, Process block deceleration**) are available. In the case of **P-0-4063, Process block deceleration = 0**, the acceleration ramp becomes effective.

Absolute Encoder Evaluation and Monitoring for Two Absolute Measuring Systems

The use of a second absolute encoder back-up now makes it possible to operate two absolute measuring systems without any restrictions. A plausibility check of the absolute encoder data is now also possible. This means that an exchange/replacement of encoders deletes the home of the encoder.

Homing with a Permanently Defined Traversing Path with Distance-Coded Encoders

Homing gantry axes with distance-coded linear measuring systems is now possible. It was necessary to realize this function because the traversing path that a distance-coded encoder needs to firmly establish home is specified by the distance between the homing marks.

Setting bit 8 in parameter **S-0-0147, Homing parameter** now activates function "Homing with fixed traversing path". The drive passes over at least two homing marks and then stops regardless of whether it has recognized the homing marks or not.

Monitoring the distance to be covered for distance-coded encoders and rotary incremental encoders

A monitoring function which covers the distance to be covered for distance-coded encoders and rotary incremental encoders is now in use.

Travel Range Monitoring

Travel range monitoring with two measuring systems:

If the measuring system selected via bit 3 in parameter **S-0-0147, Homing parameter** has not been homed but the other measuring system has been homed, then the homed one is automatically used for monitoring.

Determining the Commutation Offset in Synchronous Motors with Absolute Measuring Systems

The commutation offset is still determined by starting command **P-0-0524, D300 Commutation adjustment command**. The only difference is that it now suffices if the drive is "Ab". Torque control no longer needs to be activated.

Absolute Encoder Emulation – Weighting Dependent

Absolute encoder emulation of signals "Actual position value encoder 1", "Actual position value encoder 2" and "Position command value" is scaling dependent, i.e., dependent on **S-0-0076, Position data scaling type**.

Expanded Probe Function

The probe function has been expanded by the following options:

- Velocity command value to zero with probe signal.
A positive flank of signal "Probe 1" executes a velocity command value to zero of the drive. After the drive has decelerated with maximum torque, it remains in this state until the probe enable for probe 1 has been deleted. The drive then follows the command values from the control.
- Probe with window.
There is an option for probe 1 with which it can be set that only those master axis positions or actual position values are latched that lie within a fixed range (select signals 3, 4 and 6). The range is defined in parameters **P-0-0204, Start position for active probe** and **P-0-0205, End position for active probe**.
- Continuous measurements (S-0-0169, bits 4 or 5).
If a probe flank has been detected, then the next measuring of this flank is automatically enabled in the drive.

Note: Parameter **S-0-0169, Probe control parameter** has been expanded for this functional change.

Current Command Value Limitation

If the current command value limit is active, then warning **E260 Command Current limit active** is generated. If the warning remains active for at least 1.5 seconds, then the drive shuts down and generates error message **F260 Command current limit shutoff**.

Command "Park Axis"

It is now also possible to start the "Park axis" command in phase 4.

The command can also be configured in parameter **S-0-0145, Signal control word** as it is in **S-0-0399, IDN list of configurable data in the signal control word**.

Profile Types

Profile types "Target position setting" and "Velocity control 2" are no longer being supported as the function achieved with the use of these types is completely covered by the profile type "Velocity control" or the operating mode "Drive-internal interpolation."

Fieldbus Control Word

Bits 3 and 4 are additionally evaluated in the fieldbus control word. These bits directly effect the command value mode for drive-internal interpolation. Bit 3 of the control word specifies whether the target position is to be processed in an absolute or relative way. In the case of bit 4 =1 the target position is immediately assumed, but if bit 4 =0 then it is not assumed until after the old target position has been run to.

Fieldbus Status Word

Bit 10 in the fieldbus control word corresponds to parameter **S-0-0419, Acknowledge for relative/non-cyclic command values.**

Analog Output

There are now more signals available for an expanded analog output.

Signal number P-0-0421 / P-0-0424	Output signal	Reference unit: Evaluation factor 1.0000
0x00000001	Sine signal motor encoder	0.5V/10V
0x00000002	Cosine signal motor encoder	0.5V/10V
0x00000003	Sine signal optional encoder	0.5V/10V
0x00000004	Cosine signal option encoder	0.5V/10V
0x00000005	Position command value difference in the position controller	rotary=>1000 rpm/10V linear=>100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	DC bus power absolute amount	1kW/10V
0x00000008	Active current (Iq)	S-0-0110/10V
0x00000009	Reactive current (Id)	S-0-0110/10V
0x0000000a	Thermal load	100 % / 10V
0x0000000b	Motor temperature	150°C/10V
0x0000000c	Magnetization current	S-0-0110/10V
0x0000000d	Velocity command value in the velocity controller	rot. =>1000 rpm/10V lin. => 100m/min/10V
FREI		
FREI		
0x00000014	Synchronous position command value	rot. => 360°/10V lin. => 1mm/10V
0x00000015	Synchronous velocity	rot. => 1000 rpm/10V lin. => 100m/min/10V
0x00000016	Master axis position fine interpolation	2^20/10V
0x00000017	Master axis velocity in the NC cycle	rot. => 1000 rpm/10V

Fig. 3-2: Signal selection list with a pre-defined selection of signals

3.3 New Parameters

- S-0-0359, Positioning deceleration
- S-0-0419, Acknowledge for relative/non-cyclic command values
- S-7-0177, Absolute distance 1
- S-7-0178, Absolute distance 2
- P-0-0124, Assignment IDN -> Digital output
- P-0-0177, Absolute encoder buffer 1
- P-0-0178, Absolute encoder buffer 2
- P-0-0187, Position command processing mode
- P-0-0540, Torque of brake
- P-0-0541, B200 Brake check command
- P-0-0542, B100 Command Release motor holding brake
- P-0-0560, Commutation adjustment current
- P-0-0562, Commutation adjustment periodic time
- P-0-0640, Cooling type
- P-0-1211, Deceleration ramp 1
- P-0-1213, Deceleration ramp 2
- P-0-4063, Process block deceleration
- P-7-0540, Torque of brake

New parameters for synchronous operating modes:

- S-0-0236, Master drive 1 revs.
- S-0-0237, Slave drive 1 revs.
- P-0-0053, Master drive position
- P-0-0061, Angle offset begin of profile
- P-0-0072, Cam shaft profile 1
- P-0-0083, Gear ratio fine adjust
- P-0-0085, Dynamic angle offset
- P-0-0088, Cam shaft control
- P-0-0089, Cam shaft status
- P-0-0092, Cam shaft profile 2
- P-0-0093, Cam shaft distance
- P-0-0094, Cam shaft switch angle
- P-0-0108, Master drive polarity
- P-0-0144, Cam shaft distance switch angle
- P-0-0156, Master drive gear input revolutions
- P-0-0157, Master drive gear output revolutions
- P-0-0158, Angle offset change rate
- P-0-0159, Slave drive feed travel
- P-0-0186, Actual Position value 3, smoothing time

3.4 Expanded/Altered Parameters

With the following parameters, additional functions were assigned to bits:

- P-0-0165, Selection for autom. control loop adjust
- P-0-0538, Motor function parameter 1
- S-0-0135, Drive status word
- S-0-0147, Homing parameter
- S-0-0169, Probe control parameter
- S-0-0393, Command value mode

The selection list was expanded for parameter **S-0-0399, IDN list of configurable data in the signal control word.**

The display of parameter **S-0-0040, Velocity feedback value** is now smoothed, if necessary.

4 Kundenbetreuungsstellen - Sales & Service Facilities

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