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ECODRIVE03

Drive For General Automation With Profibus Interface

Firmware Version Notes: FGP-01VRS

DOK-ECODR3-FGP-01VRS**-FVN1-EN-P

280278

Indramat

Titel
ECODRIVE03 Drive For General Automation
With Profibus Interface

Type of Documentation
Firmware-Versionnote FWA-ECODR3-FGP-01VRS-MS

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DOK-ECODR3-FGP-01VRS**-FVN1-EN-P

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- Mappe 73-01V-EN / Register 10
- Based on: FGP 01V
- 209-0088-4335-01

What is the purpose of this documentation
This documentation is a supplement to the function description DOK-ECODR3-FGP-01VRS**-FKB1-EN-P: Drive For General Automation With Profibus Interface.

It describes the differences between ECODRIVE3-Version FWA-ECODR3-FGP-01VRS and FWA-ECODR-PDP-03VRS.

Editing sequence

Document identification of previous and present editions	Release Date	Note
DOK-ECODR3-FGP-01VRS**-FVN1-EN-P	04.98	first release

Liability
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Contents

1 General Information

1.1 Product Family

The product release description refers to the product family:

ECODRIVE03
DKC03.3
FWA-ECODR3-FGP-01VRS-MS

The following drive controls can be operated with this software:

- DKC03.3

This document describes the differences between ECODRIVE03 version FWA-ECODR3-FGP-01VRS and the previous ECODRIVE version FWA-ECODR-PDP-03VRS.

1.2 Documentation

The documentation for product **FWA-ECODR3-FGP-01VRS** is availible as follows:

- Paper form
- Windows help system

The following table contains a summary of available items.

POS	Type	Document style	Register in Mappe	Part number	Symbol number
1	DOK-ECODR3-FGP-01VRS**-73M1-EN-P	Mappe 73-01V-EN	--	279102	209-0088-4331-01
2	DOK-ECODR3-FGP-01VRS**-FKB1-EN-P	Functional Description Paper	3	279103	209-0088-4332-01
3	DOK-ECODR3-DKC**.3****-PRJ1-EN-P	Project Planning	7	279714	209-0088-4301-01
4	DOK-ECODR3-FGP-01VRS**-WAR1-EN-P	Trouble Shooting GuidePaper	10	279104	209-0088-4334-01
5	DOK-ECODR3-FGP-01VRS**-FVN1-EN-P	Firmware Versionsnote	11	280278	209-0088-4335-01
6	DOK-ECODR3-FGP-01VRS**-73M1-EN-H1,44	Help System for Windows3.1 Disk	12	279105	209-0088-4331-01

Fig. 1-1: Documentation for FWA-ECODR3-FGP-01VRS

1.3 Notes on Replacing the Firmware

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

1. The drive controller is on.

2. Secure the current parameters.

3. Switch the controller into phase 2.

4. Replace firmware with Dolfi,
SWA-DOL*PC-INB-01VRS-MS-C1.44-COPY, parst number 279804.

Note: 24V control voltage may not be switched off during the firmware exchange procedure.

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a) Switch drive into phase 2.

b) Start Dolfi.

c) Input the following under specified settings:

- **Interface:**
  - select interface (COM 1 - 4)
  - set baudrate for Connect to 9.6 kB (always)
  - set baudrate for download (9.6 to 115 kB)

- **Addresses**
  - Set **Sender** to value < 128
    - do not select the address set on programming module via switches S2 and S3
    - Sender and receiver addresses must be different.
  - Set **receiver** to value < 128
    - do not select the address set on programming module via switches S2 and S3
    - Sender and receiver addresses must be different.
  - Enter the address set via switches S2 and S3 into field **unit address.**

- **Language**
  - Select language (German/English)

d) press connect button

→ Header of the programmed module is read out.

- Look at header by selecting the header button.

- then change into window messages by selecting the message button

e) Press transmit button

→ *.ibf-file for update must be selected

f) Start firmware update with ok (must be pressed after every programmed firmware module, generally, one FWA contains three firmware modules).

g) Press separate button after successful update
→ drive firmware is started

h) end Dolfi

5. If the number of parameters to be backed up has changed, then "PL" appears in the display. (If errors are pending, then these must be cleared first). If the S1 key is now pressed, then all backed up parameters are set to their default values. During this time "C8 load default parameters" appears on the display.

6. If command "C8 load default parameters" was started or the motor type changed, then "UL" appears prior to transition check from phase 3 to 4. The S1 key must now be pressed, or the command clear error started. The control default settings are then loaded out of the motor feedback into the drive controller.

7. Load the desired parameter file.

2 Version Notes FWA-ECODRV3-FGP-01VRS-MS

2.1 Release notes

Firmware version **FWA-ECODR3-FGP-01V02** represents the first official edition of version 01. It was released on

18.05.1998

The following drive controllers can be operated with the released software:

- DKC03.3-040-7-FW
- DKC03.3-100-7-FW

Note: To commission the drive firmware version **FWA-ECODRV03-FGP-01VRS-MS** then DriveTop version **SWA-DTOP***-INB-05VRS-MS-C1,44-COPY** is needed.

2.2 New functions

Error Memory and Operating Hour Counter

Operating hour counters and error memory were used in the past to store class 1 diagnostics errors and the number of operating hours of the machine in the form of parameters:

- **P-0-0190, Operating hours control section**
- **P-0-0191, Operating hours power section**
- **P-0-0192, Error recorder, diagnosis number**
- **P-0-0193, Error recorder, operating hours control section**

These are stored in the amplifier EEPROM. The user can not write access them.

New Component to Communicate with the Parameter Interface

Additional ID number lists

For communication between drive firmware and parameter interface, new ID number lists have been introduced:

- **S-0-0018, IDN-list of operation data for CP2**
- **S-0-0019, IDN-list of operation data for CP3**
- **S-0-0025, IDN-list of all procedure commands**
- **S-0-0292, List of all operating modes**

Identifying the Writability of a Parameter in Attribute

In bits 28..30 the information as to in which communications phase a parameter is write accessible is stored.

Bit no. in attribute	Definition
28	0 - writable in comm. phase 2 1 - not writable in comm. phase 2
29	0 - writable in comm. phase 3 1 - not writable in comm. phase 3
30	0 - writable in comm. phase 4 1 - not writable in comm. phase 4

Fig. 2-1:

List of diagnosis numbers

To display the previously generated diagnoses for errors, warning, command errors, commands and operating states of the drive, parameter **S-0-0375, List of diagnostic numbers** is used.

Permanently configured status messages

In parameter **S-0-0013, Class 3 diagnostics** and **S-0-0182, Manufacturer class 3 diagnostics** the following general and operating-mode specific status messages have been newly implemented.

In **S-0-0013, Class 3 diagnostics** :

- actual velocity = command velocity
- | actual velocity | < velocity threshold
- | Md | > Mdgrenz
- target position reached

In **S-0-0182, Manufacturer class 3 diagnostics** :

- IZP (Zielposition erreicht & IN_POSITION & IN_STANDSTILL)
- IN_TARGETPOSITION
- drive halt acknowledge
- End position reached

Language switch to French, Spanish and Italian

The followng languages for parameter names and units as well as diagnoses in parameter **S-0-0095, Diagnostic message** are in the drive.

S-0-0265, Language selectionl	Language selected
0	German
1	English
2	French
3	Spanish
4	Italien

Fig. 2-2:Language selection in *S-0-0265, Language selectionl*

Motor Types

In addition to the synchronous motors MKD, the following synchronous and asynchronous motors can also be operated.

MHD	**LAF/LAR**
MKE	**LSF**
2AD/1MB/ADF	**MBS**
synchronous kit motor	

MHD, MKD and MKE motors are automatically detected and the needed motor parametrs set. All other motor types must be set by inputting the relevant parameters.

Motor holding brake control

Parameters

- **P-0-0525, Type of motor brake**
- **P-0-0526, Brake control delay** are used to control the holding brake.

These parameters are automatically set in MHD, MKD and MKE motors. The brake current is not monitored.

Load-side motor encoder in rotary asynchronous motors

If motor type "2" or"6" is set (rotary asynchronous motor), then the motor encoder can be mounted load side and operated there as well. The load side motor encoder is parametrized with parameters from encoder 2 (optional encoder):

- **S-0-0115, Position feedback 2 type**
- **S-0-0117, Feedback 2 Resolution**
- **P-0-0075, Feedback type 2**

P-0-0074, Feedback type 1 must be parametrized with "0". Parameter **P-0-0121, Velocity mix factor Feedback 1 & 2** must be set to 100%.

Operating Modes

Four operating modes, i.e., the main and three auxiliary operating modes, can be simultaneously selected on the drive. Which of these four modes is to be active can be selected in the master control word. Both setting and selection can generally be viewed in the Profibus protocol or the higher-ranking control.

The following operating modes can be set in the drive:

- torque control
- velocity control
- *position control with cyclical position command default* (do not use with non-synchronized Profibus communication)
- (absolute) drive-internal interpolation
- relative drive-internal interpolation
- positioning block mode
- jogging

Note: The parametrization of **P-0-4084, Operation mode selection code** determines that operating mode that is activated with active Profibus communications. Only a reduced number of operating modes can be selected.

Measuring Systems

Up to two measuring systems can be simultaneously evaluated and used. One measuring system is used as motor encoder. The other is evaluated as an optional encoder. The operating mode selected determines the measuring system used to close the position control loop. In parameter **P-0-0121, Velocity mix factor Feedback 1 & 2** the actual velocity value can be mixed in velocity control.

The following table describes which measuring system is evaluated at which interface.

Measyuring system	Interface	Value P-0-0074/75
digital servo feedback or resolver	1	1
Incremental encoder with sine signals from Heidenhain with 1V signals	2	2
Incremental encoder with square-wave signals from Heidenhain	2	5
Encoder with EnDat-interface	2	8
Gearwheel encoder with 1Vss signals	2	9
resolver without feedback memory	1	10
Resolver without feedback memory + Incremental encoder with sine signals	1 + 2	11
Hall encoder + square-wave encoder	1 + 2	12
ECI encoderr	1	13

Fig. 2-3: Measuring systems > connections

Absolute Encoder

Both motor encoder and optional encoders can be absolute encoders. Whether the measuring system is evaluated as an absolute encoder or not, depends on

- the travel range set in **S-0-0278, Maximum travel range** (with absolute format of position data) or
- the modulo value set in **S-0-0103, Modulo value** (with modulo format of position data).

This means it is now possible:

- to handle singleturn encoders as absolute encoders and
- to switch absolute encoder evaluation for multiturn encoders off

Programmable drive-internal position resolution

The resolution of the drive-internal position data is no longer dependent on the motor encoder type, but can be set via parameter **S-0-0278, Maximum travel range**. The maximum resolution is 2^{15} per encoder period, minimum 2^2. The computed resoluton for encoders 1 and 2 is displayed in parameters **S-0-0256, Multiplication 1** und **S-0-0257, Multiplication 2**.

Note: The drive-internal position resolution mentioned here does not here the format and unit in which the position data are displayed. This is still set in parameter **S-0-0076, Position data scaling type**.

The drive-side resolution in form of the number of increments per motor revolution of a rotary motor encoder, for example, is computed in terms of **S-0-0116, Feedback 1 Resolution** * **S-0-0256, Multiplication 1**.

The function supports

- the increase of drive-internal resolution of position data with small travel paths and high resolution requirements as well as
- to decrease the resolution in favor of the possible travel range.

Note: The per "Load default value" activated resolution generally meets demands in terms of possible travel range with sufficiently large position resolution.

Current Limits

The dynamic current limit no longer implements the overload factor **P-0-0006, Overload factor**, but rather the temperature model of the amplifier powerstage and the motor. In parameter **P-0-4046, Active peak current** maximum available current, including limits, is displayed by the dynamic current limit. In **P-0-4045, Active permanent current** the available continuous current is displayed. This value depends on the set switching frequency.

Monitoring Amplifier Overload

Monitoring thermal controller load with a temperature model of the endstage

The thermal load of the controller endstage is performed with a temperature model. The thermal load is displayed in parameter **P-0-0141, Thermal drive load**. It is no longer necessary to make a setting in a parameter. If the drive limits the effective peak current because of the amplifier overload, then warning **E257 Continuous current limit active** is generated and bit 0 (overload warning) is set in **S-0-0012, Class 2 diagnostics**.

Monitoring Motor Overload

Monitoring thermal motor load with temperature model of motor

For 400msec the fourfold motor standstill current is allowed. The 2.2 fold is continuously allowed. If the motor overload limit is active, then warning **E225 Motor overload** is generated and bit 0 (overload warning) is set in **S-0-0012, Class 2 diagnostics**.

Drive-Side Error Reaction

The reaction of the drive to detected errors has been expanded as follows:

- Via parameter **P-0-0119, Best possible deceleration** the reaction of the drive to non-fatal and interface errors can be set. In addition to the reactions "Velocity command to zero" and "Torque to zero", "Velocity to zero with ramp and filter" and "Jerk limit" are also used.
- "NC reaction with error". If a non-fatal error occurs, then the drive error reaction can be delayed by 30 seconds. Seting in parameter **P-0-0117, NC reaction on error**.
- In parameter **P-0-0118, Power off on error** settings can be made for a) the time that power should be switched on, b) shutdown of power with fault, c) execution of a package reaction and d) reaction of the drive to DC bus undervoltage.

Automatic Control Loop Settings

With the automatic control loop settings, the velocity and position control loops are completely automatically parametrized.

This uses a new command "**D900 Command automatic loop tuning**" in the drive.

In conjunction with Drivetop the command "D9 Automatic control loop settings" can be started in the Drivetop dialog "Parameter / Automatic control loop settings".

The user can effect, via the socalled attenuating fator, the resulting control loop dynamics. This mans that no further control technically knowledge is needed to make control loop settings.

Additionally, at the end of the control loop setting, the determined load moment of inertia and the maximum parametrizable accel are displayed and stored in a parameter.

Note: To optimize the control loop, it is necessary to move an axis!

Velocity Mix Factor

With the help of the velocity mix factor, the actual velocity value used for velocity control can be put together based on motor and external measuring systems. This can be advantageous with coupling units between motor and load that are characterized by backlash or torsion.

To set the mixing relationship, use parameter **P-0-0121, Velocity mix factor Feedback 1 & 2**

Analog Inputs

With the function *Analog inputs* it is possible:

- enter some parameters of the drive with variable scaling via analog/digital converters. (Parameter **P-0-0212, Analog inputs, IDN list of assignable parameters**, **P-0-0213, Analog input 1, assignment, P-0-0214, Analog input 1, scaling per 10V full scale, P-0-0215, Analog input 2, assignment** and **P-0-0216, Analog input 2, scaling per 10V full scale,** new).
- The analog input signals have an offset (parameter **P-0-0217, Analog input 1, offset** and **P-0-0218, Analog input 2, offset** new)

Analog input 1 is processed every 500 usec, 2 only every 8 msec.

Oscilloscope Function

With the oscilloscope function, specific signals of the drive such as

- **S-0-0051, Position feedback 1 value or S-0-0053, Position feedback 2 value,**
- **S-0-0040, Velocity feedback value**
- **S-0-0080, Torque/Force command**
- **S-0-0347, Speed deviation**
- **S-0-0189, Following error**

can be stored in 2*512-deep measurand lists. Triggering results either from external or thresholds that can be parametrized in the drive for position, velocity or torque data. By using the triggering stipulations, reading the measurand list and graphically illustrating the measurands stored therein by means of a parametrization interface, an oscilloscope function can be implemented. Superimposing the measuring results of axes interpolating with each other, it is possible to illustrate contour accuracy.

Probe Function

There are two probe inputs on the drive. This function stores signals from:

- actual position values or
- relative drive-internal time

at the time the switching edge of this probe occurs. They are stored in the relevant parameters. By preselecting, it is fixed whether the positive or negative edge of the probe is evaluated. Each time the edge occurs, the difference between the measurand for the positive and that of the negative edge is stored in the parameter for the measurand difference.

Detect Marker Position Command

With command **P-0-0014, D500 Command determine marker position** the correct detecting and the position of the reference marker of an incremental measuring system can be detected. The position of the marker is displayed in parameter **S-0-0173, Marker position A**. The command is also used to operate gantry axes with external measuring systems as well as to examine the error-free detection of reference markers.

Park Axis Command

Command **S-0-0139, D700 Command Parking axis** was used. Write access to this command is only possible in communications phase 2. If this command is activated, then all the monitoring activities of the command **S-0-0128, C200 Communication phase 4 transition check** are not conducted. Message **"PA"** appears on the 7-segment display. A phase regression deactivates this command (as is the case with all other commands).

Dynamic Programmable Limit Switch (PLS)

With the function dynamic Programmablr limit switch, up to 8 position-dependent cams can be realized. The actual position value 1 can be used as reference signal (motor encoder) or that of 2 (optional encoder). There is one on and one off threshold for each cam. If an off threshold is smaller than the on threshold, then the cam is inverted. There is also for each cam a separately programmable prehold time with which the reference signal can be corrected in terms of the velocty.

Encoder Emulation

With function encoder emulation it is possible to emulate

- actual position value 1
- and actual position value 2 or
- the command position value in the form of
- SSI signals or
- TTL signals (incremental encoder).

2.3 Expanded/Changed Functions

Password

The password function has been modified so that

- by inputting a customer password, not all parameters of the drive become write protected but instead only those parameters that are in parameter **S-0-0192, IDN-list of backup operation data.** These are precisely those parameters stored in the programming module.

Command Communication via Profibus

Communications via Profibus has been modified:

- Profibus DP is absolute required, Profibus FMS optional, possible for parametrization of the drive. Also, a parameter channel can be opened via the protocol DP.
- A **freely-configurable process data channel** of up to 16 words in both data directions via FMS objects 6000 and 6001.
- Similar to drive profile **DRIVECOM Profil 22** for drive functions position target setting.
- Automatic baudrate detection
- For setting operating mode via **P-0-4084, Operation mode selection code,** the following are possible:

Select code in P-0-4084	Function
0xFF80	I/O moe, compatible to Ecodrive01
0x0001	position target setting similar to **DRIVECOM Profil 22**

Fig. 2-4: Select operating mode in FGP-01VRS

Positioning Block Mode

The following modifications have been made in positioning block mode:

- the switch-signal dependent following block expansion commutation always brings about a commutation to the next (cam 1) or penultimate (cam 2) positioning block, in terms of the positioning block selected in parameter **P-0-4026, Process block selection**. The commutation relates absolutely to the positioning block selected in P-0-4026. In firmware version ECODRV-PDP-03VRS this switching signal commutation always related to the current positioning block. Any bouncing of the cam meant that further commutations could occur.
- Activating mode „*Slow travel*“ is set in bit 1 of parameter **P-0-4060, Process block control word** and no longer in **P-0-4027, Function parameter**.
- Relative positioning is performed with or without residual path storage. Any break in a relative positioning block with residual path storage will not lose the reference dimension of the sequence.

Jogging

If communications uses a Profibus and not a 16 bit I/O mode, than jogging can only be activated if the drive halt signal is on „1“ (not active). The parameters for accel and jerk limits during operation are

- **S-0-0260, Positioning Acceleration** and
- **S-0-0193, Positioning Jerk**.

Note: It is no longer possible to activate „*Travel slow*“ in jog mode. ebsart! The velocity set in **P-0-4030, Jog velocity** always applies.

Travel range limit

Whether the travel range limit switch input is active or not can be checked in parameter **P-0-0222, Status Inputs travel range limits**.

E-Stop Function

The E-Stop function was changed so that

- in bit 1 and 2 of **P-0-0008, Activation E-Stop function** the reaction of the drive upon actuation of the E-stop input can be selected and
- the status of the E-stop input (active / not active) is displayed in parameter **P-0-0223, Status Input E-Stop function**.

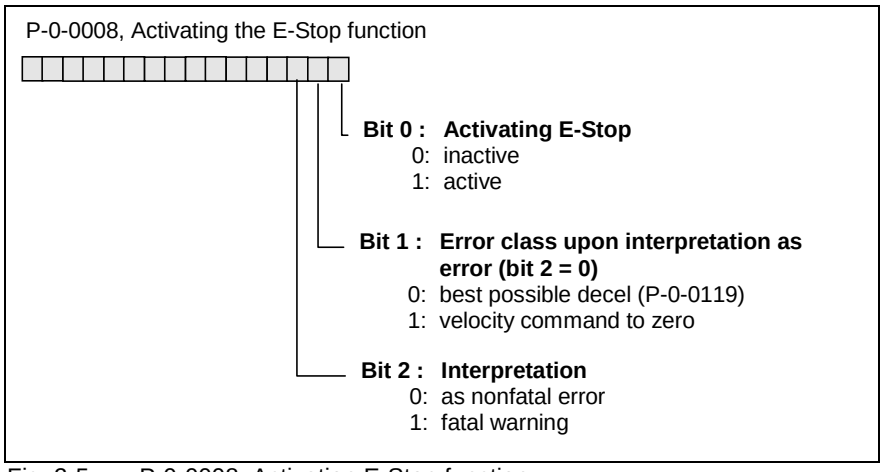

Fig. 2-5: P-0-0008, Activation E-Stop function

Controller Structure

The velocity controller has been modified so that

- the deep pass filter of the actual velocity value is dropped in parameter **S-0-0392, Velocity feedback filter**,
- the variables (torque command) generated by the velocity controller can be filtered over a bandstop filter with programmable frequencies and bandwidth (Parameter **P-0-0180, Rejection frequency velocity loop** and **P-0-0181, Rejection bandwidth velocity loop** new) and
- the deep pass can be set via **P-0-0004, Velocity loop smoothing time constant** to not effect the variables but rather the control deviations of the velocity controller.

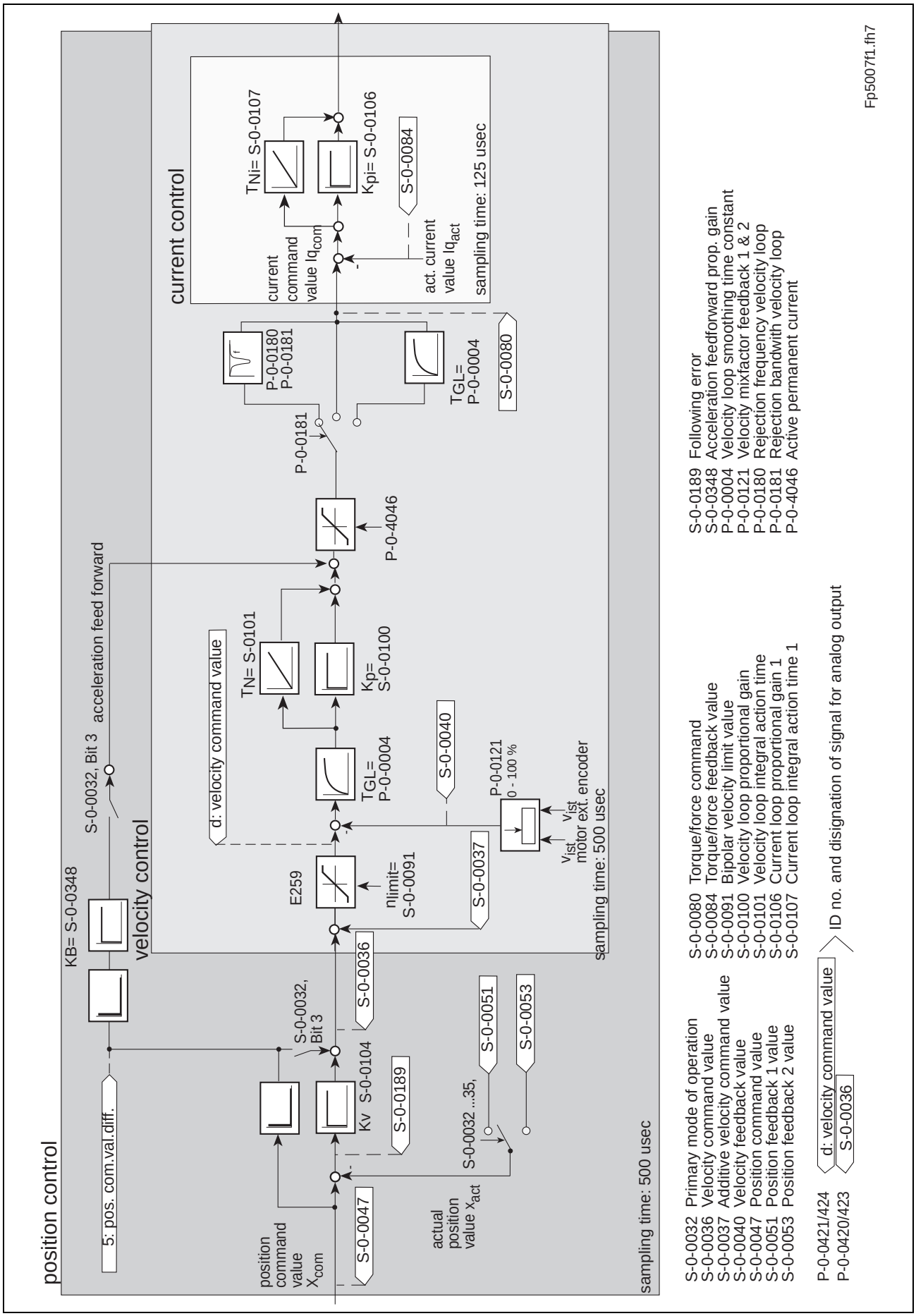

Fig. 2-6: Control structure *FWA-ECODR3-FGP-01VRS*

Velocity Control Loop Monitoring

The velocity control loop monitor can be switched off with bit 8 of parameter **P-0-0538, Motor function parameter 1**.

Drive Halt

The drive brings itself to a stop taking accel and jerk limit values into account:

Previous operating state	Parameters usedr
no position control mode	P-0-1201, ramp-1, P-0-1203, ramp-2, P-0-1202, transition velocity
position control with drive-internal interpolation (pos. block mode, rive-internal interpol. relative drive-internal interpolation)	previous accel and jerk limit remains active
position control without drive-internal interpolation	S-0-0138, bipolar accel S-0-0349, bipolar jerk limit

Fig. 2-7: Accel and jerk with drive halt

Drive-Controlled Referencing

The function *Drive-controlled referencing* has been expanded:

- Encoder 1 (motor encoder) and 2 (optional encoder) can be referenced.
- encoder with distance-coded reference marker is possible
- via bit 7 in parameter **S-0-0147, Referenzfahr-Parameter** it can be selected whether the drive will go to the reference point or stands still after switching into the actual value coordinate system.

Analog Output

The analog output function has been altered and expanded with:

- Specific drive parameters can be output with variable scaling via digital/analog converter. (Parameter **P-0-0426, Analog outputs, IDN list of assignable parameters**, **P-0-0420, Analog output 1 signal selection, P-0-0422, Analog output 1, scaling per 10V full scale** and **P-0-0425, Analog output 2, evaluation,** new).
- Bits and bytes that can be output via the expanded signal selected are. (parameter **P-0-0421 Analog output 1, expanded signal selection** and **P-0-0424 Analog output 2, expanded signal selection** new).

Signal no. P-0-0421/424	Output signal	Reference unit: eval. factor 1.0
0x00000001	sine signal motor encoder	0.5V/10V
0x00000002	cosine signal motor encoder	0.5V/10V
0x00000003	sine signal ext. Encoder	0.5V/10V
0x00000004	cosine signal ext. Encoder	0.5V/10V
0x00000005	command pos. difference on position controller	rot. =>1000rpm/10V lin. =>100m/min/10V
0x00000006	DC bus power	1kW/10V
0x00000007	DC bus power absolute amount	1kW/10V
0x00000008	rms current (Iq)	S-0-0110/10V
0x00000009	Blind current (Id)	S-0-0110/10V
0x0000000a	Thermal load	--
0x0000000b	Motor temperature	150°C/10V
0x0000000c	Magnetization current	S-0-0110/10V
0x0000000d	veloc. command value on speed controller	rot. =>1000rpm/10V lin. => 100m/min/10V
0x0000000e	Bleeder load	100 % / 10V

Fig. 2-8: Signal select list with predefined signal selection

- These outputs are scaling-indepentent and always relate to the motor shaft. The scaling o the signals is possible in terms of the evaluation parameters P-0-0422&P-0-0425. They are, with the expanded signal selection with predefined signals, fixed as a factor with four decimal places and have a permanent reference unit to the selected signal (see table).

Serial Communication

The serial communications with drive via the serial interface can implement either (connector X2):

- an ASCII protocol (see Ecodrive-1) or
- via SIS protocol (**S**erial **I**ndronat-**S**chnittstelle)

The protocol is automatically identified.

Customer Service Locations - Sales & Service Facilities

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