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ECODRIVE03

Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

Firmware Version Notes: SMT-01VRS

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

280280

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Titel

ECODRIVE03 Drive for Machine Tool Applications With SERCOS-, Analog- and Parallelinterface

Type of Documentation

Firmware-Versionnote FWA-ECODR3-SMT-01VRS-MS

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

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- Based on: SMT 01V
- 209-0088-4315-01

What is the purpose of this documentation

This documentation is a supplement to the function description DOK-ECODR3-SMT-01VRS**-FKB1-EN-P: EDODRIVE03 Drive for Machine Tool Applications with SERCOS, Analog and Parallel interface (DKC11.3, DKC01.3, DKC02.3).

It describes the differences between ECODRIVE3-Version FWA-ECODR3-SMT-01VRS and the previous ECODRIVE-Versions FWA-ECODRV-ASE-04VRS and FWA-ECODRV-SSE-03VRS.

Editing sequence

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

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1 General Information

1.1 Product Family

The product release description refers to the product family:

ECODRIVE03
DKC11.3 / DKC01.3 / DKC02.3
FWA-ECODR3-SMT-01VRS-MS

The following drive controls can be operated with this software:

DKC11.3-040-7-FW	DKC11.3-100-7-FW
DKC01.3-040-7-FW	DKC01.3-100-7-FW
DKC02.3-040-7-FW	DKC02.3-100-7-FW

This document describes the differences between ECODRIVE03 version FWA-ECODR3-SMT-01VRS and the previous ECODRIVE version FWA-ECODRV-SSE-03VRS or FWA-ECODRV-ASE-04VRS.

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1.2 Documentation

The documentation for product **FWA-ECODR3-SMT-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-SMT-01VRS**-71M2-EN-P	Mappe 71-01V-EN	--	**279086**	209-0088-4311-01
2	DOK-ECODR3-SMT-01VRS**-FKB1-EN-P	Functional Description Paper	3	279087	209-0088-4312-01
3	DOK-ECODR3-DKC01.1/11.1*-PRJ1-EN-P	Project Planning	7	280107	209-0088-4301-01
4	DOK-ECODR3-SMT-01VRS**-WAR1-EN-P	Trouble Shooting GuidePaper	10	279088	209-0088-4314-00
5	DOK-ECODR3-SMT-01VRS**-FVN1-EN-P	Firmware Versionsnote	11	280280	209-0088-4315-01
6	DOK-ECODR3-SMT-01VRS**-71M1-EN-H1,44	Help System for Windows3.1 Disk	12	279089	209-0088-4311-01

Fig. 1-1: Documentation for FWA-ECODR3-SMT-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.

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Notes

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2 Version Notes FWA-ECODR3-SMT-01VRS-MS

2.1 Release notes

Firmware version **FWA-ECODR3-SMT-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:

- DKC11.3-040-7-FW, DKC11.3-100-7-FW
- DKC01.3-040-7-FW, DKC01.3-100-7-FW
- DKC02.3-040-7-FW, DKC02.3-100-7-FW

Note: To commission the drive firmware version **FWA-ECODRV03-SMT-01VRS-MS** then DriveTop version **SWA-DTOP***-INB-05VRS-MS-C1,44-COPY** or higher than **SWA-S*TOP*-INB-04T14-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**

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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 | > Mdx
- | Md | > Mdgrenz
- | P | >Px
- 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

Message „IN-MOTION“ has been replaced with |nist| < **S-0-0124, Standstill window** and thus inverted.

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*

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Multiplex channel

With the multiplex channel the limit cyclical data channel can be upgraded. With index switching, it is also possible to cyclically access list elements.

It is possible, with the multiplex channel to:

- despite limited maximum number of transmittable bytes in the master data telegram and drive telegram, to cyclilcally exchange more parameter contents.
- With the use of both indices S-0-0362 and S-0-0366 to access individual list elements.
- By incrementing the index S-0-0368 in each cycle, the multiplexed data can be trnsmitted with a cycle time of *Tscyc * number of multiplexed data.*
- Index switching can also be generated in operating mode terms and thus only transmitted for the parameters needed for the activated operating mode.

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%.

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Operating Modes

Four operating modes (main and three auxiliary modes) can be simultaneously selected. Which of the four is active, depends on the master control word selected. The setting and the selection is performed by the higher ranking control.

The following modes can be set in the drive:

- torque control
- velocity control
- position control with cyclical position command
- (absolute) drive-internal interpolation
- relative drive-internal interpolation
- positioning block mode
- jogging
- position control with step motor interface

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).

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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**.

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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!

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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**

Freely-Configurable Signal Status Word

A freely configurable signal status word has been used. It can be defined via parameters:

- **S-0-0026, Configuration list signal status word**
- **S-0-0328, Assign list signal status word**

as to which bit of which parameter is configured in parameter

- **S-0-0144, Signal status word**

Up to 16 bits can be configured. Generating the collective message S-0-0144 only takes place once in each interface cycle.

The digital outputs of DKC01.3 correspond to bits 0..9 of the signal status word.

Freely-Configurable Signal Control Word

A freely configurable signal status word has been implemented. It can be defined via parameters:

- **S-0-0027, Configuration list signal control word** and
- **S-0-0329, Assign list signal control word**

as to which bit of which parameter is configured in parameter

- **S-0-0145, Signal control word**

Up to 16 bits can be configured. The collective message is evaluated once in every interface cycle.

The digital outputs of DKC01.3 correspond to bits 0..9 of the signal control word.

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.

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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).

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Dynamic Programmable Limit Switch (PLS)

With the function dynamic programmable 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).

Command Spindle Positioning

A command from the control makes the drive position the spindle in terms of the spindle zero position. The command position can be set via a parameter. It can be set as either an absolute or a relative position.

Command spindle positioning means that the spindle can be positioned with position control within, e.g., speed control mode, without having to switch from mode speed to position control. The command speed set the control is ignored for the duration of the command.

Spindle positioning is used with milling and drilling spindles

- when preparing to change tools, the spindle remains in a defined position to make this exchange possible.

Spindle positioning is used in lathe main spindles to position the spindle

- when changing the workpiece, if necessary,
- or to bring scaling drilling into place for workpieces,
- to index the workpiece for further machining.

Spindle positioning is used in rotary machines

- to move the rotary table to bring the workpiece into a defined position at one of the stations.

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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 SERCOS Interface

Communication via SERCOS interface has been modified as follows:

- if SERCOS communication is not active, there are no edges at the LWL inputs, then the drive goes into phase 4. The drive behaves like an analog unit (drive enable and drive halt via hardware inputs are possible).
- SERCOS compliance class C
- Multiplex channel for reading and writing data not needed in every cycle or dependent on the active mode. Individual elements of the list parameters can also be read/write. (Also see new function "Multiplex channel")

Position Block Mode

The following modifications have been made here:

- Mode"**Run slow**" is activated in bit 1 of parameter **P-0-4060, Process block control word** and no longer in **P-0-4027, Function parameter**.

Jogging

The parameters effectiving accel and jerk limit values are parameters

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

Note: Activating *"Run slow*" no longer works in jogging mode. Only velocity in **P-0-4030, Jog velocity** is effective.

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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**.

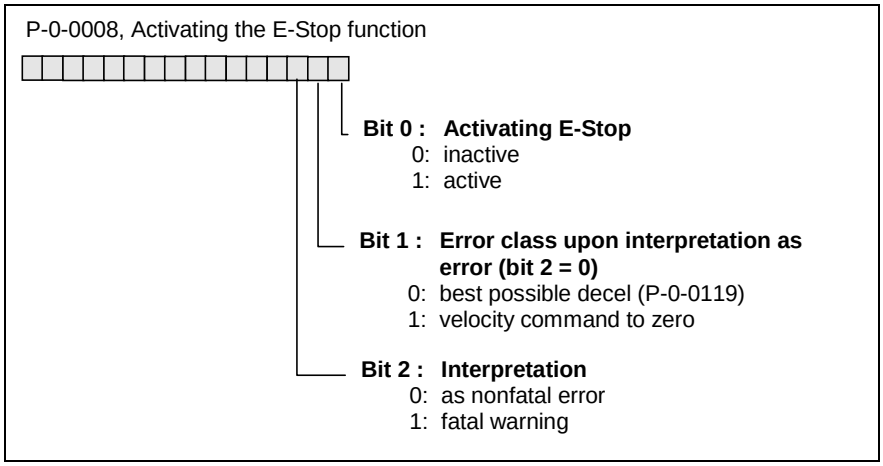


Fig. 2-4: P-0-0008, Activation E-Stop function

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.

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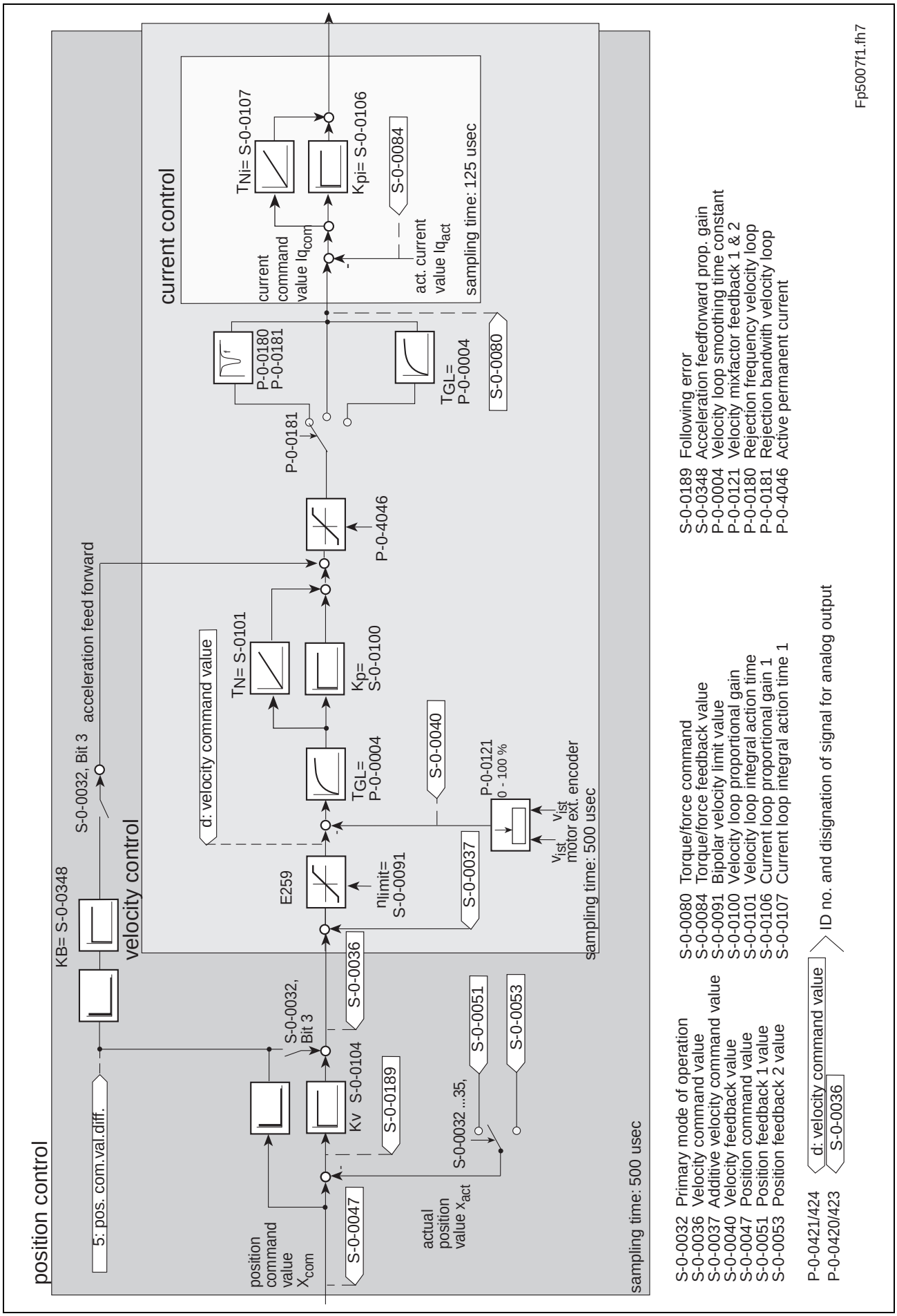


Fig. 2-5: Control structure *FWA-ECODR3-SMT-01VRS*

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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. 2-6: 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 function *Analog output* was modified. It is now possible

- to output some drive parameters with variable scaling via the 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, P-0-0423, Analog output 2, signal selection** and **P-0-0425, Analog output 2, scaling per 10V full scale,** new).
- Any bits and bytes can be output via the expandes signal select. (Parameter **P-0-0421, Analog output 1, expanded signal selection** and **P-0-0424, Analog output 2, expanded signal selection** new).
- Signals can be output via a list of permanently set signals.

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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. 2-7: 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.

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