



ECODRIVE DKC01.1/DKC11.1 Drive Controllers

Trouble Shooting Guide: ASE 04VRS

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What is the purpose of this document? This document is design to assists maintenance personnel in identifying errors with the machinery
It should:

- help in understanding error messages
- help in finding the causes of errors
- describe the procedure for trouble shooting
- simplify the process of establishing contact with the INDRAMAT Customer service department

help you use this documentation This documentation is meant as a switch board panel supplement for the machine manufacturer.

Procedure for change

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Contents

1 Diagnostic Message Description	1-1
1.1 Overview of the Diagnostic Message Descriptions	1-1
Diagnostic Message Types	1-1
Construction of a diagnostic message	1-1
2 Error Diagnostic Messages	2-1
UL Motor Type not Reported	2-1
PL Load Parameter Default Value	2-1
F207 Switching to an Uninitialized Operating Mode	2-2
F218 Heatsink Overtemperature Shutdown	2-2
F219 Motor Overtemperature Shutdown	2-2
F220 Bleeder Overtemperature Shutdown	2-3
F226 Undervoltage Error	2-3
F228 Excessive Deviation	2-4
F229 Motor Encoder Error: Quadrant Error	2-4
F248 Low Battery Voltage	2-5
F262 External Short at Status Outputs	2-5
F276 Absolute Encoder Error	2-6
F629 Positive Travel Limit Value is Exceeded	2-6
F630 Negative Travel Limit Value is Exceeded	2-7
F643 Positive Travel Limit Switch Detected	2-7
F644 Negative Travel Limit Switch Detected	2-8
F822 Motor Encoder Failure: Signal too Small	2-8
F860 Overcurrent: Short in Powerstage	2-9
F870 +24 V Error	2-9
F873 Power Supply Driver Stage Fault	2-10
F878 Velocity Loop Error	2-10
F879 Velocity Limit Value Exceeded (S-0-0092)	2-11
F895 4 kHz Signal Error	2-11
3 Warning Diagnostic Messages	3-1
E209 Parameter storage activ	3-1
E248 Interpolation acceleration equals 0	3-1
E249 Positioning vel. (S-0-0259) greater S-0-0091	3-1
E250 Heatsink Overtemperature Warning	3-2
E251 Motor Overtemperature Warning	3-2
E252 Bleeder Overtemperature Warning	3-3
E253 Target Position Out of Range	3-3
E254 Not Homed	3-4

E255 Feedrate-Override(S-0-0108) = 0	3-4
E256 Torque Limit = 0	3-4
E257 Continuous Current Limiting Active.....	3-5
E258 Selected Process Block is not Programmed.....	3-5
E259 Command Velocity Limit Active.....	3-5
E260 Current limitation active!	3-6
E264 Target Position Out of Range	3-6
E825 Overvoltage Error.....	3-6
E829 Positive Position Limit Value Exceeded	3-7
E830 Negative Position Limit Value Exceeded	3-7
E831 Jog Position Limit Value Exceeded.....	3-8
E843 Positive Travel Zone Limit Switch Activated	3-8
E844 Negative Travel Zone Limit Switch Activated.....	3-8

4 Command Diagnostic Messages 4-1

C100 Communication Phase 3 Transition Check	4-1
C101 Invalid Communication Parameters (S-0-0021)	4-1
C102 Limit Error Communication Parameter (S-0-0021)	4-1
C200 Communication Phase 4 Transition Check	4-2
C201 Invalid Parameter Block (-> S-0-0022)	4-2
C202 Limit Error Parameter (-> S-0-0022).....	4-2
C203 Parameter Calculation Error (-> S-0-0022).....	4-2
C207 Load Error LCA.....	4-2
C208 Invalid SSI Parameter (-> S-0-0022)	4-3
C211 Invalid Feedback Data (-> S-0-0022).....	4-3
C212 Invalid Amplifier Data (-> S-0-0022)	4-3
C213 Position Data Scaling Error.....	4-4
C214 Velocity Data Scaling Error	4-4
C215 Acceleration Data Scaling Error.....	4-5
C216 Torque/Force Data Scaling Error.....	4-5
C217 Motor Feedback Data Reading Error.....	4-6
C220 Motor Feedback Initializing Error	4-6
C227 Modulo Range Error.....	4-6
C300 Command: Set Emulation - Absolute Value	4-7
C300 Set Absolute Measuring.....	4-7
C301 Setting Absolute Measuring not Allowed, Drive Enabled.....	4-7
C302 Absolute Measuring System not Installed.....	4-7
C400 Command: Switch To Parameter Mode	4-8
C401 Drive Active, Switch Not Allowed	4-8
C500 Reset Class 1 Diagnostic.....	4-8
C600 Drive Controlled Homing Procedure Command	4-8
C601 Homing Not Possible If Drive Is Not Enable	4-8
C602 Distance Homing Switch Reference Mark Erroneous	4-9
C603 Homing Not Permitted in this Operating Mode	4-9
C604 Homing of Absolute Encoder Not Possible.....	4-9
C605, Homing velocity too great	4-9
C700 Basic Load	4-10

C800 Load Basic Parameters	4-10
D900 D9 Command Automatic Loop Control	4-10
D901 Sart Only With RF	4-11
D902 Motor Feedback Not Valid	4-11
D903 Inertia Detection Failed	4-11
D904 Gain Adjustment Failed	4-12
D905 Wrong Position Range.....	4-12
D906 Position Range Exceeded.....	4-13

5 State diagnostic message **5-1**

A002 Communication Phase 2.....	5-1
A003 Communication Phase 3.....	5-1
A010 Drive Halt	5-1
A012 Control and Power Sections Ready for Operation	5-1
A013 Ready for Power ON	5-1
A100 Drive in Torque Mode.....	5-1
A101 Drive in Velocity Mode.....	5-2
A111 Velocity Synchronisation, Real Lead Drive	5-2
A118 Phase Synchr., Lagless, Encoder 1, Real Lead Drive	5-2
A203 Position Mode	5-2
A204 Position Mode / Lagless Positioning	5-2
A206 Position Mode / POSITION Encoder 1.....	5-2
A207 Position Mode/POSITION Lagless Positioning Encoder 1	5-3
AF Control Drive Enable.....	5-3
JF Jogging in the Positive Direction	5-3
JB Jogging in the Negative Direction.....	5-3

6 Exchanging Drive Components **4-1**

6.1 Procedure for Exchanging Devices.....	4-3
Exchange the DKC:.....	4-3
Motor exchange:.....	4-4
Cable exchange:.....	4-5

Notes

1 Diagnostic Message Description

1.1 Overview of the Diagnostic Message Descriptions

Diagnostic Message Types

Each operational state of the drive controller will be characterized with a diagnostic message.

Therein, it will be differentiated between:

- Error diagnostic message
- Warning diagnostic message
- Command diagnostic message
- State diagnostic message
- Process states

Construction of a diagnostic message

A diagnostic message consists of:

- Diagnostic number and a
- Diagnostic text

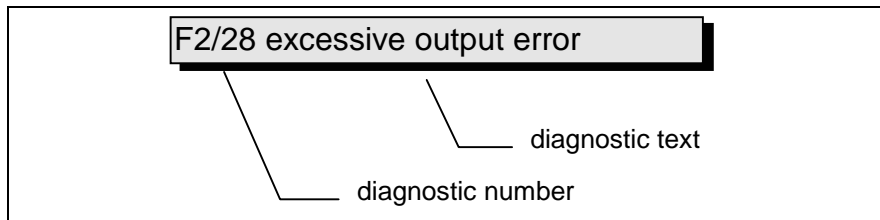


Fig. 1-1: Construction of a diagnostic message from a diagnostic number and a diagnostic text.

In the example shown, the "F2" and "28" alternate on the H1 display.

The parameter **S-0-0390, diagnostic message number**; appears in hexadecimal form.

Also, the drive controller stores the diagnostic number and diagnostic text as the string "F2/28, excessive output error" in the parameter **S-0-0095, diagnostic message**.

H1-Display

The H1 condition display on the front side of the DKC gives information about:

- Operating condition of the drive controller
- Drive controller or cable malfunctions
- Motor malfunctions
- Malfunctions caused by invalid parameter input
- Application errors

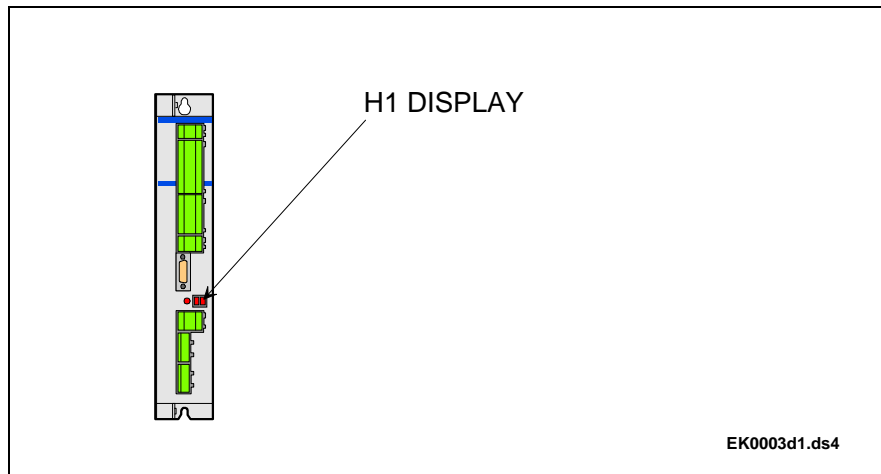


Fig. 1-2: H1-Display

The symbolized diagnostic number appears on this two positional-seven segment display. The form of the display is seen on the diagram "Priority dependent diagnostic message diagram."

In addition to the display, it is possible to use the communication interface to quickly monitor the actual process state.

The operating mode is not evident from the H1-Display. If the drive is enabled and no command was activated, the symbol "AF" appears on the display.

Priority of the diagnostic message output

If more than one diagnostic message is generated at the same point within the string, the diagnostic with the highest priority will be displayed first.

The following graphic shows the order of priority.

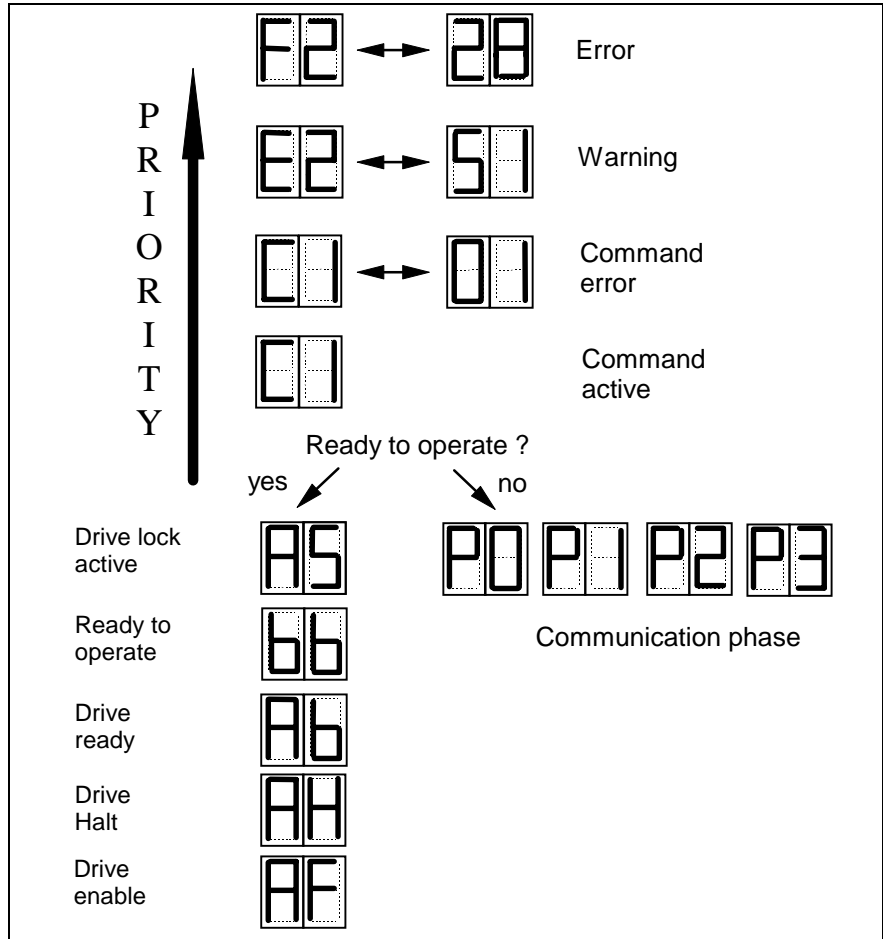


Fig. 1-3: Priority dependent diagnostic message diagram

Clear Coded Text-Diagnostic Message

The clear coded text-diagnostic message contains the diagnostic number followed by the diagnostic text; for example, "excessive output error" (Fig 1-1). It can be read from parameter **"S-0-0095, diagnostic message"** and serves the direct display of the process state on a operator surface.

The clear coded text-diagnostic message will be changed over from the language selection to the current language.

Notes

2 Error Diagnostic Messages

UL Motor Type not Reported

Description:

The settings for current regulation, velocity command, and position loop are stored in the feedback of the motor. After powering up, the drive compares the motor type stored in the parameters with the connected motor type. If the two do not match, then the drive remains in this state.

By pressing the S1 key, the drive overwrites its stored parameters with the control loop parameters from the motor feedback.

Cause:

Motor was exchanged.

Parameter file was loaded, but parameter "**P-0-4036, motor type connected**" contained a different motor type.

Remedy:

Command "C700 Basic Load" or press the S1 button.

PL Load Parameter Default Value

Description:

After the firmware is replaced (EPROMs), if the parameters have been changed in regards to the old product, the drive displays "**PL**". By pressing the S1 button on the drive or by starting the command "load basic parameters", all the parameters will be erased and restored with the default values.

Cause:

Product was replaced. The number of parameters in comparison to the new products has changed.

Remedy:

Press S1 button on the drive controller and all the parameters will be erased and restored with default values

**WARNING**

⇒ This overwrites all parameters and positioning blocks.

F207 Switching to an Uninitialized Operating Mode

Description:

A valid operating mode has not been defined.

This error cannot occur in the DKC01 because the input of the operating mode will be tested at input.

Remedy:

Input correct operating mode

F218 Heatsink Overtemperature Shutdown

Description:

The temperature of the DKC heatsink will be monitored. If the temperature of the heatsink is too high, the drive will power down in order to protect against damage.

Cause:

1. Ambient temperature is too high. The specified operational data is valid up to an ambient temperature of 45°C.
2. The DKC's heatsink is dirty.
3. Air flow is prevented by other assembly parts or a control cabinet panel assembly.
4. Heatsink blower may be defective

Remedy:

For 1. Reduce the ambient temperature; for example, through cooling of the control cabinet

For 2. Remove any obstruction or dirt from the heatsink.

For 3. Install the device vertically and clear a large enough area for proper heatsink ventilation.

For 4. Exchange drive.

F219 Motor Overtemperature Shutdown

Description:

Motor temperature has risen to an unacceptable level. As soon as temperature threshold (155°C) is exceeded, the drive will immediately be brought to a standstill as set in the error reaction (P-0-0119, best possible standstill).

It applies:

temperature warning threshold < temperature error threshold

Cause:

1. The motor was overloaded. The effective torque demanded from the motor was above its allowable continuous torque level for too long.
2. Break in line, ground short or short circuit in the motor temperature monitor line
3. Instability in the velocity loop.

Remedy:

- For 1. Check the installation of the motor. If the system has been in operation for a long time, check to see if the operating conditions have changed. (in regards to pollution, friction, moved components, etc.)
- For 2. Check wires and cables to the motor temperature monitor for wire breaks, earth short and short circuits.
- For 3. Check velocity loop parameters.

F220 Bleeder Overtemperature Shutdown

Description:

The regenerated energy from the mechanism of the machine via the motor has exceeded the power capability of the bleeder resistor. By exceeding the maximum resistance energy, the drive will shutdown according to the set error reaction. Thereby protecting the bleeder from temperature damage.

Cause:

The reflected energy from the machine's mechanism over the motor is too large.

Remedy:

- With too much power ---> reduce the acceleration value
- With too much energy ---> reduce the velocity
- Check the drive installation.
- May require installation of an additional bleeder module.

F226 Undervoltage Error

Description:

The level of the DC bus voltage will be monitored by the drive controller. If the DC bus voltage falls below a minimal threshold, the drive independently shuts down according to the set error reaction.

Cause:

1. The power source has been interrupted without first switching off the drive enable (RF).
2. Disturbance in the power supply

Remedy:

- For 1 Check the logic regarding the activation of the drive within the connected control.
- For 2 Check the power supply.

The error can be cleared by removing the control enable signal.

F228 Excessive Deviation

Description:

The drive could not process the given command value and reacted according to the set error reaction.

Cause:

1. The acceleration ability of the drive was exceeded.
2. The motor shaft was blocked.
3. Parameterization error in the drive parameters.
4. **"S-0-0159, Monitoring Window"** was parameterized incorrectly

Remedy:

- For 1. Check the **Bipolar Torque Limit, S-0-0092** parameter and set it equal to the maximum allowable value for the application.
- For 2. Check the mechanical system and eliminate any jamming of the motor shaft
- For 3. Check the drive parameters (control loop settings)
- For 4. **Parameterize "S-0-0159, Monitoring Window"**

F229 Motor Encoder Error: Quadrant Error

Description:

An encoder signal error was found during the encoder evaluation.

Cause:

1. Defective encoder cable
2. Insulation disturbance on the encoder or the encoder cable
3. Defective drive controller

Remedy:

- For 1. Check the encoder cable and change if necessary.
- For 2. Use only insulated motor cable and power cables
Separate encoder cable from power cables
- For 3. Exchange drive controller

F248 Low Battery Voltage

Cause:

The connected motor has an absolute encoder. The absolute position information is stored in the motor feedback. This memory has a battery powered backup for the electronic circuit. The battery is designed for an operating life of 10 years. If the battery voltage drops below 2.8 V, this message appears. The absolute encoder function is preserved for about 2 weeks.

Instructions for Exchanging Batteries

Have the following tools and accessories ready:

- Torx screwdriver, size 10
- Needle nose pliers, torque wrench
- New packaged battery (Part No.: 257101)

If the control voltage of the installed battery is turned off, the absolute position is lost.

The absolute position must be re-established through the process of the command **Set Absolute Measurement**.

F262 External Short at Status Outputs

Description:

Status outputs are monitored for short circuits and thermal overload.

- If output current exceeds 350mA for about 1 μ s, then this is acknowledged as a short circuit and the pertinent channel is shut off. The output remains off until the error is cleared.
- With thermal overload, the error is set and the output(s) shut off. After the driver has cooled off, the outputs are switched back on and so on. The error, however, remains until it is cleared. Thermal overload can occur if several outputs are overloaded in excess of 80 mA.

Note: Light bulbs, for example, cannot be controlled as their inrush current causes a short-circuit.

Cause:

1. Short circuited outputs (X2/6, X2/7, X2/8, X2/9, X2/10, X2/20, X2/21, X2/22)
2. One or more outputs are overloaded.

Remedy:

- For 1. Eliminate short circuit or limit switching current (< 350 mA)
For 2. Drop current, depending on output, to < 80 mA.

F276 Absolute Encoder Error

Description:

When turning off the drive controller with an absolute encoder (multiturn), the actual feedback position will be stored. When powered up, the absolute position given by the encoder is compared to the stored position. If the deviation is larger than the parameterized "**P-0-0097, AbsoluteEncoderMonitoring Window**", the error "**F276, Absolute Encoder Error**" will appear and be given to the control system.

Cause:

1. Turning on for the first time (invalid stored position).
2. The motor was moved further than allowed by the parameter in the absolute encoder monitoring window, P-0-0097, while it was turned off.
3. Incorrect position initialization

Remedy:

For 1. Press S1 to reset the error and set the absolute position.

For 2. The motor was moved while turned off and sits outside of its permissible position. Check to see if the displayed position is correct in relation to the machine zero point. Reset subsequent errors.

For 3. **An accident may occur by accidental shaft movement.**

Check absolute position information. A feedback defect is present if the absolute position information is false. The motor should be exchanged and sent to the INDRAMAT Customer Service .

F629 Positive Travel Limit Value is Exceeded

The drive has been provided with a command value that leads to an axis position outside the positive travel range. The axis has been stopped and the error reaction "set velocity command value to zero" issued. Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

S-0-0049, Positive position limit value is exceeded.

Remedial action:

1. Check **S-0-0049, Positive position limit value**
2. Check the controller software limits
3. Activate the axis after the error reaction

Procedure:

- Clear the error
- Activate power if it has been de-activated
- Move the axis to the permissible working range

Note: Only command values that lead back into the permissible working range will be accepted. Any other command value will stop the drive again.

F630 Negative Travel Limit Value is Exceeded

The drive has been provided with a command value that leads to an axis position outside the negative travel range. The axis has been stopped and the error reaction "set velocity command value to zero" issued. Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

S-0-0050, Negative position limit value is exceeded.

Remedial action:

1. Check **S-0-0050, Negative position limit value**
2. Check the controller software limits
3. Activate the axis after the error reaction

Procedure:

- Clear the error
- Activate power if it has been de-activated
- Move the axis to the permissible working range

Note: Only command values that lead back into the permissible working range will be accepted. Any other command value will stop the drive again.

F643 Positive Travel Limit Switch Detected

The positive travel limit switch has been actuated. The axis has been stopped with the error reaction "set velocity command value to zero". Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

The positive travel limit switch has been actuated.

Remedial action:

1. Reset the error
2. Activate the power supply
3. Move the axis into the permissible working range

Note: The drive will not accept any command values that lead further away from the permissible range. Specifying such a command will again generate this error.

F644 Negative Travel Limit Switch Detected

The negative travel limit switch has been actuated. The axis has been stopped with the error reaction "set velocity command value to zero". Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is considered as an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

The negative travel limit switch has been actuated.

Remedial action:

1. Reset the error
2. Activate the power supply
3. Move the axis into the permissible working range

Note: The drive will not accept any command values that lead further away from the permissible range. Specifying such a command will again result in this error.

F822 Motor Encoder Failure: Signal too Small

Description:

The motor encoder signals are monitored. If the signal amplitudes as measured via AK1 and AK2 are outside of the allowable region between $U_{ss} = 12.0V$ and $U_{ss} = 18.0 V$, then the error message appears. The drive becomes torque-free and an optional brake is immediately activated.

Cause:

1. Defective feedback cable.
2. Defective feedback.

Remedy:

For 1. Check the feedback cable.

Lay the power cables separate from the feedback cable.

The cable shield must be connected to the drive controller.

(See also project reference of the drive control).

For 2. Exchange motor.

Note: This error can only be cleared in parametrization mode (phase 2). As a result of this error, the encoder emulation is switched off.

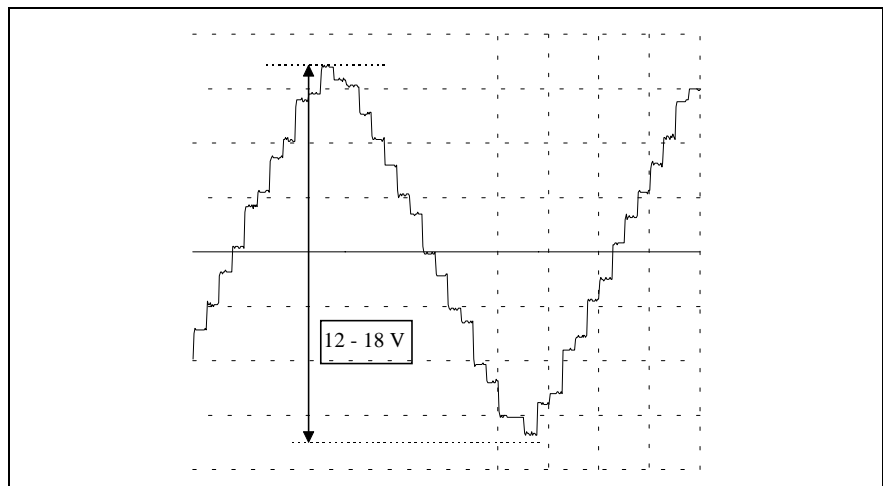


Figure 2-1: Methodically measured signal amplitude over AK: X31/1-2

F860 Overcurrent: Short in Powerstage

Description:

The current in the power transistor bridge has exceeded twice the peak current of the drive. As a result, the drive will be immediately turned off. The drive has switched to a torque-free condition. An optional brake is immediately activated.

Cause:

1. Short circuit in the motor cable.
2. Defective power section of the drive controller.
3. The current regulator was incorrectly parameterized.

Remedy:

For 1. Check the motor cable for a short.

For 2. Exchange drive controller.

For 3. The current regulator parameters should not deviate from the default values of the feedback.

F870 +24 V Error

Description:

The DKC requires a 24V control voltage. If the maximum allowable tolerance of $\pm 20\%$ is exceeded, then the drive is immediately switched to torque free operation. An optional brake is activated.

Cause:

Disturbance or overload of the 24 V supply voltage. Measure control voltages.

Remedy:

Check wiring and/or replace power supply module.

Note: This error can only be cleared in parametrization mode (phase 2). As a result of this error, the encoder emulation is switched off.

F873 Power Supply Driver Stage Fault

Description:

The voltage supply of the driver stage is monitored and if the voltage is too low then the drive is turned off.

Cause:

Voltage supply of the driver stage is too low

Remedy:

Exchange drive controller

F878 Velocity Loop Error

Description:

The velocity loop monitor will appear when the following conditions occur simultaneously:

- The current command value is at the peak current limit
- The difference between the actual velocity and the command velocity is larger than 10% of the maximum motor velocity.
- actual speed > 1.25% of maximum speed
- command and actual acceleration have different qualifying signs

Cause:

1. Motor cable is connected incorrectly.
2. Defective controller section of the drive.
3. Defective feedback.
4. Velocity loop parameterized incorrectly.
5. Incorrect commutation offset

Remedy:

For 1. Check motor cable connection.

For 2. Exchange drive controller.

For 3. Exchange motor.

For 4. Check velocity controller to see if it is within operational parameters.

For 5. Exchange motor.

F879 Velocity Limit Value Exceeded (S-0-0092)

Description:

The actual velocity is monitored in torque regulation mode. This error is generated if the programmed velocity in the "**S-0-0091, bipolar velocity limit value**" parameter is exceeded by 1.25 times or a maximum of 100 Rpm.

Cause:

The load torque was smaller or larger than the torque command value for too long a time. This leads to an increase in the actual velocity up to the maximum possible motor velocity.

Remedy:

Check the primary control loop.

F895 4 kHz Signal Error

Description:

The 4kHz signal is synchronized with the software processing for creation of the resolver signal. This error message is created when synchronization occurs improperly.

Cause:

1. The synchronization of the resolver controller voltage is invalid in regards to the software.
2. The error can be produced through an electrical discharge.

Remedy:

- For 1. Exchange drive controller and return for testing.
- For 2. Power down and then on. If this is not successful; exchange drive controller.

Notes

3 Warning Diagnostic Messages

E209 Parameter storage activ

Description:

A storage procedure is running in the drive as long as this warning is displayed. This means that the drive may not yet be switched off.

Note: Wait until warning E209 fades before switching power off. If power is switched off while the warning stands, then the parameters could be lost or some parameters could become invalid.

E248 Interpolation acceleration equals 0

Description:

Note that the currently effective acceleration in the position command value is equal to zero.

This is possible, for example, if the selected positioning block has a parametrized acceleration of $a=0$.

Remedy:

Enter a sensible accel value >0 .

E249 Positioning vel. (S-0-0259) greater S-0-0091

Cause:

For modes "drive-internal interpolation" and the "block-controlled mode", a speed must be entered in parameter **S-0-0259, Positioning speed** must be entered with which the target position can be reached.

If this exceeds permissible maximum value **S-0-0091, bipolar speed limit value**, then message E249 is generated.

Remedy:

S-0-0259, Positioning speed or **S-0-4007, process block speed** must be reduced.

E250 Heatsink Overtemperature Warning

Description:

The temperature of the heatsink in the drive controller has reached the maximum allowable temperature. Within a time frame of 30 seconds, the drive follows the command value input. Consequently, there exists the possibility to shut down the motor with the control so that it remains true to the process. (For example close the operation, leave the collision area, etc.) After 30 seconds, the parameter "**Best Possible Deceleration, P-0-0119**" set reaction appears during operation.

Cause:

1. Deficiency of the drive's internal blower.
2. Deficiency of the control cabinet's climate control.
3. Incorrect control cabinet dimensioning regarding the head ventilation.

Remedy:

- For 1. If the blower fails exchange the drive controller.
- For 2. Install climization feature to the cabinet.
- For 3. Check the dimensions of the control cabinet.

E251 Motor Overtemperature Warning

Description:

As soon as the temperature warning threshold (145°C) is exceeded, warnig E251 is generated and the drive complies with the command value.

This state can last infinitely without a powering down occurring. Not until the temperature error threshold is exceeded will an immediate powering down take place.

See also **F219 Motor Overtemperature Shutdown**

Cause:

The motor became overloaded. The effective torque required of the motor was above the allowable standstill continuous torque for too long.

Remedy:

Check the installation of the motor. For systems which have been in use for a long time, check to see if the drive conditions have changed (in regards to pollution, friction, components which have been moved, etc).

E252 Bleeder Overtemperature Warning

Cause:

The dampening resistance in the DKC is balanced through the energy that is reflected from the motor (about 90%). The bleeder overtemperature warning shows that an overload of the bleeder is expected with continued increasing feedback energy.

Remedy:

Reduce acceleration value or velocity. Check the drive installation.

E253 Target Position Out of Range

Description:

If a position is entered which would exceed the target position, it will not be accepted. With "command controlled operation", the drive will not move.

Cause:

1. Position limit value monitor was activated
2. In the "Drive Internal Interpolation" operating mode, the **S-0-0258, Target Position** will be checked to determine if it's in the possible travel range of the drive.
3. In the "Command Controlled Operation" operating mode, the target position of the selected process block will be checked to see if it lies within the travel range.

The possible travel range is defined through the two parameters **S-0-0049 Position Limit Positive** and **S-0-0050, Position Limit Negative**.

Remedy:

- For 1. Deactivate the position limit monitor
- For 2. Check the entered **S-0-0258, target position** and correct if necessary.
- For 3. Check the target position of the process block. Add the relative path of travel to the actual position.
Additionally, check the position limit value.

E254 Not Homed

Description:

If "Absolute Positioning Commands" are selected while in "Command Controlled Operation" the control drive must be homed. If this is not the case, an absolute position cannot be reached. The drive rejects this positioning command and stops. The warning E254 will be given.

Cause:

Absolute positioning command was selected without the drive being referenced.

Remedy:

1. Reference the drive
2. Select "Relative Positioning Command"

E255 Feedrate-Override(S-0-0108) = 0

Description:

The transversing velocity can be changed while jogging, homing and while in positioning operation with the "**S-0-0108, Feedrate Override**" parameter. Since the drive controller cannot follow command values which do not move, the warning will be given if the value of this parameter is 0.

Cause:

1. Feedrate override is set at zero.
2. The "Feedrate Override Via Analog Output" field is activated and the voltage there is 0V.
3. Positioning speed = 0

Remedy:

- For 1. Set the **S-0-0108** parameter to the correct value for the application.
- For 2. Deactivate the field or establish a voltage larger than 0V.
- For 3. Positioning speed greater than 0 must be selected.

E256 Torque Limit = 0

Cause:

1. For protection against mechanical overload, the maximum torque can be limited by the "**S-0-0092, Bipolar Torque Limit**" parameter. If the actual value of this parameter is equal to 0, the motor does not develop torque and does not follow the command value which has been entered.
2. Torque reduction is set through an analog channel and the established current amounts to 10 V.

Remedy:

- For 1. Set the torque limit to a value larger than 0.
- For 2. Establish the analog voltage so that it is smaller than 10 V.

E257 Continuous Current Limiting Active

Description:

The drive controller sets the peak current available for 400ms. Thereafter, the continuous current limit becomes active and dynamically limits the peak current to the continuous current.

Cause:

More continuous torque was required than was available.

Remedy:

1. Check the drive installation.
2. Check the installation of the motor. For systems which have been in use for a long time, check to see if the drive conditions have changed (in regards to pollution, friction, components which have been moved, etc).

E258 Selected Process Block is not Programmed

Cause:

A positioning block was selected for which there is no set target position or positioning velocity, etc.

Remedy:

Select another positioning block or enter the required data.

E259 Command Velocity Limit Active

Description:

The velocity command value is limited to the value set in the **S-0-0091, Bipolar Velocity Limit** parameter when in the position and velocity control operating modes. This warning is given if the value in the **S-0-0036, Velocity Command Value** parameter reaches this limit.

Cause:

S-0-0091, Bipolar Velocity Limit parameter was set too low.

Remedy:

In normal operation, set the **S-0-0091, Bipolar Velocity Limit** parameter to a value 10% higher than the NC operation velocity.

E260 Current limitation active!

Description:

The warning shows that the speed controller is entering its limit. This means that the acceleration capacity of the drive has been exceeded. In position control mode this means that there is an ever-increasing deviation between command and actual values (lag error).

Remedy:

- In position control, reduce parametrized accel value or speed value so that the drive can follow the position command value.
- Increase torque limit value, if necessary.

E264 Target Position Out of Range

Cause:

When using the operating mode "command controlled operation, the target position of the selected additive process block will be verified to see if it lies within the represented range.

Remedy:

1. Check the target position and correct if necessary.
2. Select the position data display channel in modulo format.

E825 Overvoltage Error

Cause:

1. The mechanical system energy reflected via the motor was so large for a moment that it could not be completely converted to heat by the bleeder. As a result, the DC Bus voltage rose above the maximum allowable value. The motor is then switched to torque free operation. If the DC Bus voltage falls below the maximum allowable value, the controller will be turned on again.
2. DC Bus voltage is too high

Remedy:

- For 1. Reduce the acceleration value and check the drive controller layout if necessary.
Install an auxiliary bleeder, if necessary.
- For 2. Check the supply voltage, if necessary.



⇒ Danger of high-voltage shock!

WARNING

E829 Positive Position Limit Value Exceeded

The drive has received a command value that has led to an axis position outside the positive travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

S-0-0049, Positive position limit value exceeded.

Remedial action:

Specify command values that lead back to the valid range.

E830 Negative Position Limit Value Exceeded

The drive has received a command value that has led to an axis position outside the negative travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

S-0-0050, Negative position limit value exceeded.

Remedial action:

Specify command values that lead back to the valid range.

E831 Jog Position Limit Value Exceeded

Description:

If the position limit value monitor is activated and the drive is "IN REFERENCE", then it will be positioned during movement in the jogging operation on the position limit value. If the drive is positioned on the position limit value or on the other side of the position limit value, then the drive stays still and signals „position limit value reached during jogging."

Remedy:

1. Move the motor back within the allowable travel area with the jog function.
2. Turn off the position limit value monitor.

E843 Positive Travel Zone Limit Switch Activated

The drive has received a command value that has led to an axis position outside the positive travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

The positive travel zone limit switch has been actuated.

Remedial action:

Specify command values that lead back to the valid range.

E844 Negative Travel Zone Limit Switch Activated

The drive has received a command value that has led to an axis position outside the negative travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

The negative travel zone limit switch has been actuated.

Remedial action:

Specify command values that lead back to the valid range.

4 Command Diagnostic Messages

The commands serve the control of complex features in the drive.

For example, the features "drive controlled homing procedure" or "communication phase 3 transition check" are defined as commands.

Commands can start, interrupt or erase a primary control.

A parameter belongs to each command whereby the command can be controlled by the parameter.

During the command operation, the diagnostic message "Cx" appears in the H1 display where the x stands for the number of the command.

The drive can distinguish between 3 types of commands.

Command Types

- **Drive Control Commands**

- Lead to an eventual automatic drive movement
- Can be started only through an inputted control enable
- Deactivates the active operating mode during its operation

- **Monitor Commands**

Activation or deactivation of monitors or features

- **Management Commands**

- Lead management tasks that are not interruptable

C100 Communication Phase 3 Transition Check

Description:

The command "**S-0-0127, C1 Communication Phase 3 Transition Check**" is activated. The drive switches from parameter mode into operating mode.

C101 Invalid Communication Parameters (S-0-0021)

Cause:

Invalid parameters were found during the switch from parameter mode to operating mode.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C102 Limit Error Communication Parameter (S-0-0021)

Cause:

Parameters which exceed their limits were found during the switch from the parameter mode to operating mode.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C200 Communication Phase 4 Transition Check

Description:

The command C2 performs the last steps of the switch from parameter mode to operational mode. Thereby, numerous parameter checks will be conducted.

C201 Invalid Parameter Block (-> S-0-0022)

Cause:

Parameters which are necessary for the operation of the drive in operating mode are invalid.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C202 Limit Error Parameter (-> S-0-0022)

Cause:

Parameters which are necessary for the operation of the drive in operating mode are outside of its minimum or maximum input values.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C203 Parameter Calculation Error (-> S-0-0022)

Cause:

Parameters which are required for operation of the drive in the operation mode, found errors in the conversion that do not permit an orderly operation.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C207 Load Error LCA

Cause:

Defective drive.

Remedy:

Power down and then on again. If this is not successful, exchange drive.

C208 Invalid SSI Parameter (-> S-0-0022)

Description:

When the motors are first distributed, the parameter for absolute control emulation is purposely invalid to ensure that the "Set Absolute Measurement Emulator Command" will be executed after a motor is exchanged.

Cause:

The SSI emulation was selected. The parameters required for emulation are invalid.

Remedy:

Connect the control drive to a PC and activate DriveTop.

"Actual Position Output" menu with controller emulation type "Absolute Controller Emulation (SSI)":

- Describe "Homing Position/Offset"
- Select "Absolute Control Directional Counter"

C211 Invalid Feedback Data (-> S-0-0022)

Description:

Invalid data was found while processing the parameters stored in the motor feedback.

Causes:

1. Motor feedback cable not connected or it is defective
2. Defective motor feedback
3. Drive controller defective

Remedy:

For 1. Check motor feedback cable, connect at both ends

For 2. Exchange the motor

For 3. Exchange drive controller

C212 Invalid Amplifier Data (-> S-0-0022)

Description:

During the installation of the drive, data from the drive controller will be processed for drive identification. If invalid data is detected, this error message will be displayed.

Cause:

Defective hardware in the drive controller

Remedy:

Exchange drive controller.

C213 Position Data Scaling Error

Cause:

The display format of the position data can be set with the help of the scaling parameter. The internal drive format of the position data is dependent on the applied feedback and the controller resolution. The factor for the conversion of the position data from the internal drive format into the display format or the reverse conversion is outside of the workable area because either:

- Rotary motor and linear positional scaling are not representable or
- the average factor for conversion of the position data from the display format into the internal format (or reverse process) is not representable.

Remedy:

Connect the drive with a PC and start DriveTop. In the dialog box „Scaling/Mechanical system" select a scaling setting.

Should another scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0076, Position Data Scaling Type**
- **S-0-0077, Linear Position Data Scaling Factor**
- **S-0-0078, Linear Position Data Scaling Exponent**
- **S-0-0121, Input Revolutions of Load Gear**
- **S-0-0122, Output Revolutions of Load Gear**
- **S-0-0123, Feed Constant**

C214 Velocity Data Scaling Error

Cause:

The display format of the velocity data can be set with the help of the scaling parameter. The internal drive format of the velocity data is dependent on the applied feedback and the controller resolution. The factor for the conversion of the velocity data from the internal drive format into the display format (or the reverse process) is outside of the workable area.

Remedy:

Connect the drive with a PC and start DriveTop. In the dialog box „Scaling/Mechanical system" select a scaling setting.

Should another scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0044, Velocity Data Scaling Type**
- **S-0-0045, Velocity Data Scaling Factor**
- **S-0-0046, Velocity Data Scaling Exponent**
- **S-0-0121, Input Revolutions of Load Gear**
- **S-0-0122, Output Revolutions of Load Gear**
- **S-0-0123, Feed Constant**

C215 Acceleration Data Scaling Error

Cause:

The display format of the acceleration data can be set with the help of the scaling parameter. The internal drive format of the acceleration data is dependent on the applied feedback and the controller resolution. The factor for the conversion of the acceleration data from the internal drive format into the display format (or the reverse process) is outside of the workable area.

Remedy:

Connect the drive with a PC and start DriveTop. In the dialog box „Scaling/Mechanical system" select a scaling setting.

Should another scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0160, Acceleration Data Scaling Type**
- **S-0-0161, Acceleration Data Scaling Factor**
- **S-0-0162, Acceleration Data Scaling Exponent**
- **S-0-0121, Input Revolutions of Load Gear**
- **S-0-0122, Output Revolutions of Load Gear**
- **S-0-0123, Feed Constant**

C216 Torque/Force Data Scaling Error

Cause:

The display format of the torque data can be set with the help of the scaling parameter. The factor for the conversion of the torque data from the internal drive format into the display format (or the reverse process) is outside of the workable area.

Remedy:

Connect the drive with a PC and start DriveTop. Select a scaling setting in the "Scaling/Mechanical system" dialog box.

Should a scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0086, Torque/Force Data Scaling Type**
- **S-0-0093, Torque/Force Data Scaling Factor**
- **S-0-0094, Torque/Force Data Scaling Exponent**

C217 Motor Feedback Data Reading Error

Cause:

All MKD and MDD motors contain feedback data memory. From this, the settings for the controller will be read. By processing these values, an error is detected.

Remedy:

Check the feedback cable
Exchange the motor

C220 Motor Feedback Initializing Error

Description:

A number of tests are performed when the motor feedback is initialized. An error was detected while doing this. This error can be:

1. Disturbance in the communication with the controller
2. Invalid offset between the high and low dissipating path
3. Error in the micro-controller of the measuring system

Cause:

1. Defective motor feedback cable
2. Defective motor feedback
3. Defective measurement system interface

Remedy:

For 1. Check the motor feedback cable
For 2. Exchange the motor
For 3. Exchange the measuring system interface (module)

C227 Modulo Range Error

Cause:

The given modulo value is larger than half of the represented positioning area of the drive. (Half of the represented positioning area for the DKC is 2048 rotations.)

Remedy:

Select a smaller modulo value.

C300 Command: Set Emulation - Absolute Value

Description:

The actual position of the motor can be given by means of an SSI emulation. The zero point of a given position can be fixed with the "C3 Command set emulation-absolute value" command.

C300 Set Absolute Measuring

Description:

The command "**P-0-0012, Set Absolute Measurement**" was activated via the control system.

C301 Setting Absolute Measuring not Allowed, Drive Enabled

Cause:

The command "C300 Command Setting of Absolute Measurement Emulator" was started with the given drive enable.

Remedy:

End the command and deactivate the control enable.

C302 Absolute Measuring System not Installed

Description:

The command "**P-0-0012, command set absolute measurement**" would be started without an existing absolute measurement system.

The command can not be processed because there is no existing absolute measurement system.

Cause:

1. The command was falsely activated.
2. The connected motor does not contain an absolute encoder. (Option)

Remedy:

For 1. Stop the command process.

For 2. Equip the motor or external measurement system with an absolute encoder function.

C400 Command: Switch To Parameter Mode

Description:

The command for transition is in parameter mode. While editing the parameters that can be edited only in parameter mode, this command must be processed.

C401 Drive Active, Switch Not Allowed

Cause:

The command C400 "switch from operational to parameter mode" would be started without the control enable being activated.

Remedy:

End the command and turn off the drive enable, then the command can be started from the beginning.

C500 Reset Class 1 Diagnostic

Description:

The command for erasing errors, "**S-0-0099, Reset Class 1 Diagnostics**" was activated via the connected control system. All internal drive errors are erased. However, the errors must have been previously corrected.

C600 Drive Controlled Homing Procedure Command

Description:

The command "**S-0-0148, Drive Controlled Homing Procedure**" was activated via the connected control system. The control drive automatically performs the internal drive homing procedure. Give the drive a start command to do this. Prior to this the drive must be enabled and in motion.

C601 Homing Not Possible If Drive Is Not Enable

Cause:

The command would be started without drive enable being turned on.

Remedy:

1. Enable Drive
2. Restart the command.

C602 Distance Homing Switch Reference Mark Erroneous

Cause:

During the drive controlled homing procedure, an ambiguous position for the home reference of the feedback and the switch flank of the home switch was determined.

Remedy:

The cam of the home switch must be shifted in such a manner such that an accurate homing procedure is possible.

- Read the contents of parameter **S-0-0298, reference cam shifting**
- Mechanically shift the homing cam by the amount in the parameter.
- Re-perform the drive controlled homing procedure.

C603 Homing Not Permitted in this Operating Mode

Cause:

During operation of the drive in torque control or velocity control, the homing command can not be processed.

Remedy:

Clear the homing command.

Set another operating mode.

C604 Homing of Absolute Encoder Not Possible

Cause:

If the homing command is called up by the absolute value encoder without previously processing the command **P-0-0012, setting the absolute measurement**, the reference command will be discontinued with this error.

If the encoder was able to be homed through the "**set absolute measurement**", a position on the home value will be erased with the homing command.

Remedy:

Home the absolute encoder with the command "**Set Absolute Measurement**"

C605, Homing velocity too great

Cause:

Unequivocal allocation of a reference marker to a zero switch is not possible at a high velocity since the zero switch is only evaluated every 2 ms.

Remedial action:

Reduce the value of **S-0-0041, Homing velocity**.

C700 Basic Load

Description:

When using MDD and MKD motors, the technical control adaptation of the mechanical system on the digital drive relates to the activation of the stored velocity control parameter in the motor feedback. The drive controller signals with the message C7 that the command C7 basic load was activated with the command "**S-0-0262, command basic load.**"

C800 Load Basic Parameters

Description:

By pressing the S1 button on the controller with display PL or by starting the **P-0-4094, Command Parameter Default Set**, all parameters will be erased and set with the default value.

The process blocks are lost also.

D900 D9 Command Automatic Loop Control

Description:

The start of this command means that an automatic control loop setting is executed in the drive if the drive is in the loop at command start, i.e., the drive enable signal is applied.



WARNING

-
- ⇒ The start of this command can trigger a movement if drive enable and drive start are at the drive.
 - ⇒ The drive conducts autonomous movements within the range defined by both limits.
 - ⇒ The E-stop sequence function and the travel range limit switch must be guaranteed and checked.

See also Function description:
"**Safety Instructions**"

- ⇒ During command D9, the drive autonomously conducts motions, i.e., without external command value.
-

Note: Under some circumstances, errors can also occur while the command is being executed. These are then signalled with pertinent messages.

D901 start only with RF
D902 motor feedback not valid
D903 inertia detection failed
D904 gain adjustment failed
D905 wrong position range
D906 position range exceeded

D901 Sart Only With RF

Description:

To ensure that the drive is in the loop when starting the command **P-0-0162, D9 automatic control loop setting**, such is queried at command start.

Cause:

Drive enable not set at command start (NO-RF)

Remedy:

Set drive enable and restart command.

D902 Motor Feedback Not Valid

Description:

At the start of the automatic control loop setting (**P-0-0162**), the motor parameters

- torque constant
- rated current of unit are read out of the feedback.

Cause:

One of the above feedback data has a value smaller than or equal to zero (≤ 0). This means that the controller parameter is incorrectly calculated.

Remedy:

If known, write the correct values back into the parameter or contact Indramat Customer Service to obtain the feedback data valid for your motor.

In the worst case, it may be necessary to replace the motor.

D903 Inertia Detection Failed

Description:

At the start of the automatic control loop setting, the load moment of inertia is determined with an "oscillation attempt".

This means that the speed change and the motor current must exceed a minimum value during acceleration or deceleration to guarantee a sensible and sufficiently precise calculation of the moment of inertia.

Cause:

- drive acceleration too low
- number of measured value too small for automatic control loop setting
- motor speed too low
- load moment of inertia too big

Remedy:

- increase bipolar torque/force value **S-0-0092**
- increase pos. accel S-0-0260
- increase pos. speed S-0-0259
- increase feedrate override S-0-0108

D904 Gain Adjustment Failed

Description:

In exceptional cases, difficulties in the automatic control loop setting may arise. This means that an automatic setting is not possible. Standard or default values must therefore be loaded into the drive.

Cause:

- oscillating mechanical systems (resonance)
- high level of interference in the encoder signal

Remedy:

Satisfactory results can sometimes be achieved by starting the command **P-0-0162, D9 automatic control loop setting** with a large **P-0-0163, damping factor for automatic control loop setting**, i.e., low dynamics.

This value can be reduced until the control loop behaves as needed.

If even then control loop settings remain unsuccessful, then the setting must be manual.

Note: A manual setting should only be necessary in exceptional cases!

D905 Wrong Position Range

Description:

Before starting an automatic control loop setting, both travel range limits, i.e., upper and lower, must be defined.

When starting command **P-0-0162, D9 automatic control loop setting** the number values are automatically checked for validity. It is checked if the traversing path is large enough and if sensible values have been entered.

Possible fault causes:

- **P-0-0167, upper traversing range** smaller than **P-0-0166, lower traversing range**
- Maximum traversing path (= upper - lower limits) is less than 6 motor rotations and thus too small to start the automatic control loop setting.

Remedy:

- clear command error by ending the command
- a) input new limits whereby: upper > lower limits
- b) redefine limits to define a larger traversing range
- restart command with sensible traversing range

D906 Position Range Exceeded

Description:

During automatic control loop setting, there is a constant monitoring of the valid traversing range **P-0-0166** and **P-0-0167**.

Cause:

If only one of these limits is exceeded, then command error **D906** is generated and the drive brought to standstill speed controlled.

Possible causes:

- actual position outside of defined traversing range
- limits redefined after command start

Remedy:

- clear command error and end command
- redefine limits so that the actual position is within defined traversing range
- retart command using sensible traversing range

Notes

5 State diagnostic message

A002 Communication Phase 2

Parameter Mode

A003 Communication Phase 3

Parameter Mode

A010 Drive Halt

Description:

With the set control, the function drive halt would be activated. The drive-stop-function serves to stop the motor with a defined acceleration and defined jerk.

The acceleration or the jerk limit of the inputted position block functions during "linked block operation."

The acceleration limit and bipolar jerk value function during jogging operation and stepper motor interface.

The drive will be brought to stand still by the velocity command zero switch during torque regulation and velocity regulation.

A012 Control and Power Sections Ready for Operation

Description:

The drive is supplied with control voltage and the power is switched on. The drive is ready for power delivery.

A013 Ready for Power ON

Description:

The drive is supplied with a control voltage; there are no errors in the control drive. The drive is ready to be turned on.

A100 Drive in Torque Mode

Description:

The drive is functioning in torque mode. The drive follows the given torque command value received over the analog channels E1 and E2.

A101 Drive in Velocity Mode

Description:

The drive is functioning in velocity mode. The drive follows the given velocity command value received over the analog channels E1 and E2.

A111 Velocity Synchronisation, Real Lead Drive

Description:

The drive is in speed control. The speed command value is derived from the master axis position. The master axis position is generated from the incremental encoder signals of the master axis encoder inputs.

A118 Phase Synchr., Lagless, Encoder 1, Real Lead Drive

Description:

The drive is in lag-free position control. The position command value is calculated based on the master axis position which is derived from the incremental encoder signals.

A203 Position Mode

Description:

The drive is functioning in position control with Stepper interface. The device follows the position command which will be developed out of the stepper motor signals.

A204 Position Mode / Lagless Positioning

Description:

The drive is functioning in position regulation without lag/Stepper Drive interface. The device follows the position command which will be developed out of the stepper motor signals.

A206 Position Mode / POSITION Encoder 1

Description:

The drive is functioning in position regulation/Positioning drive. The drive is positioned on the selected target position with the given acceleration, velocity and jerk.

A207 Position Mode/POSITION Lagless Positioning Encoder 1

Description:

The drive is functioning in position regulation without lag/Positioning Interface. The drive is positioned on the selected target position with the given acceleration, velocity and jerk.

AF Control Drive Enable

The drive enable signal has been applied. The drive will follow the velocity command (normal operation)

JF Jogging in the Positive Direction

The drive moves with a jogging velocity (P-0-4030) in the positive direction. The motor is turning clockwise, when viewing the motor shaft.

JB Jogging in the Negative Direction

The drive moves with a jogging velocity (P-0-4030) in the negative direction. The motor is turning counter clockwise, when viewing the motor shaft.

Notes

6 Exchanging Drive Components

Lengthy error searches in individual devices and the repair devices in the machine should be avoided because of the loss of production that would result.

As a result the diagnostic message displays from ECODRIVE makes it possible to search for the error effectively.

Defective drive components can be exchanged without any difficulty which guarantees the quickest possible resolution of the defect and return to operation without the lengthy assembly and adjustment work.

When you return a defective device to Indramat please include a completed copy of the defect report found at the conclusion of this chapter. When you do this, you will get the repaired drive component back as soon as possible and/or you can receive further assistance from INDRAMAT.

Note: The replacement component must have exactly the same typecode description as the component that was removed! To insure that this is the case, let INDRAMAT know the typecode description for the replacement component.

Position of the identification plates:

The identification plate for the DKC drive controller is found on the front side of the casing. It contains all data related to this drive.

The identification plate for MKD motors is on the right side of the motor (when looking at the motor shaft with the motor connection box on top).

Assembled cables are supplied with a label (cable mark) that carries the cable number and the length of the assembled cable.

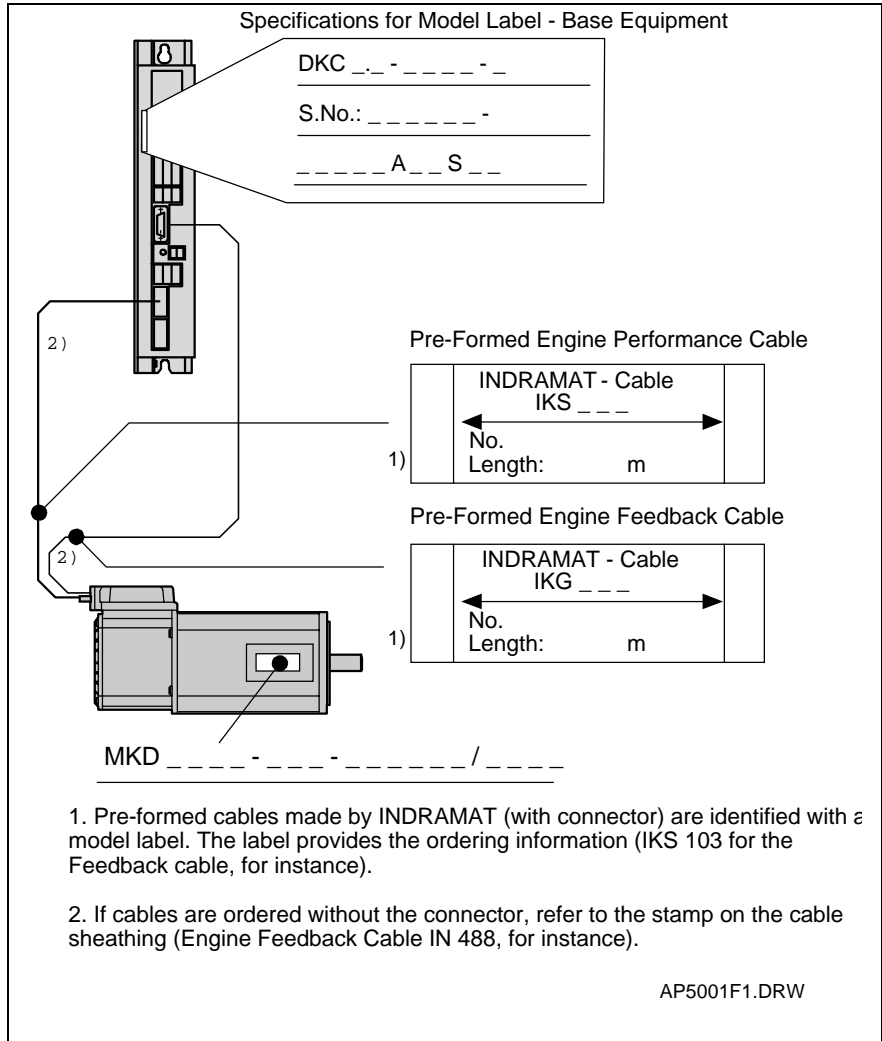


Figure 4-1: Type Description of the Drive Components

6.1 Procedure for Exchanging Devices



Danger of an accident with life-threatening voltage levels!

⇒ 1. Before working with electrical equipment, turn off the main switch and take steps to insure that it will not be switched on again.

The drives must be at a stand still because motor rotations cause voltage to be generated back through the motor power cables.

2. Do not separate live connections

Exchange the DKC:

- Turn off the main switch
- protect against the drive being turned back on prematurely



⇒ Before making contact with the connecting lines and clamps, wait for the capacitor to discharge for at least 1 minute! Only then should you begin work with the connecting cables!

- Separate the connecting lines from the DKC
- Remove the screws from the upper and lower portions of the casing. Remove the DKC from the drive package.
- Insert the new DKC and tighten the screws.
- Attach the new DKC according to the machine control plans.
- Load the parameter file from Drive Top which was saved during the installation into the DKC.
- Power up the machine.

Motor exchange:

- Turn off the main switch
- protect against the drive being turned back on prematurely

Note: When the motor is exchanged, open connectors from power connections should be covered with protection caps to protect against the spread of coolant, lubricating fluid or dirt (adm. protection level V2).

- when exchanging mechanisms from the AC servo motor, please observe the directions from the machine manufacturer



⇒ Danger of accident due to undesired axis movements. For servo axes with indirect path measuring systems through the motor, the absolute position will be lost when the motor is exchanged! This is why it is necessary to reconstruct the absolute position to the machine coordinate system after the exchange.

- Reconstruct the absolute position for servo axes. Acquire the position feedback value indirectly through the motor's own measurement system.
- Reconstruct the absolute position for the position feedback value output when the feature "Indirect absolute position feedback value output" is used.

Cable exchange:

- Turn off the main switch
- protect against the drive being turned back on prematurely



⇒ Danger of accident with life-threatening voltage levels. Connect or disconnect the power connector connections for the cables only if power has been turned off for the machine!

Note: When the cables are exchanged, open connectors from power connections should be closed with protection covers to protect against the spread of coolant, lubricating fluid or dirt (adm. protection level V2).

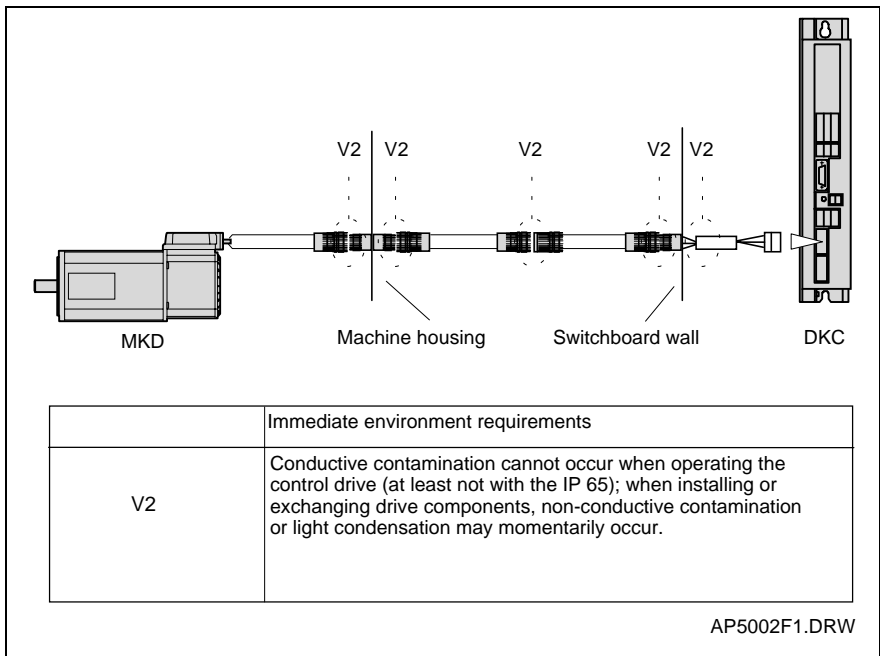


Figure 4-2: Contamination level according to DIN VDE 0160

- when exchanging cables, observe the directions given by the machine manufacturer.



⇒ Only connect the power connectors if they are dry and clean.

Note: If no assembled cables from INDRAMAT are used. Check to see if the new cables comply with the connection plan from the machine manufacturer!



Error Report

for DKC and MKD digital AC servodrives

This error report helps clarify errors and their causes. It is imperative to also find hidden, sporadic, or application induced problem and eliminate them.
 - Always send error reports with repairs.
 - In other cases send error reports to the appropriate INDRAMAT location or to the INDRAMAT Quality Assurance address printed in the address field.
 INDRAMAT would like to thank you for by providing you with a quick and thorough turnaround.

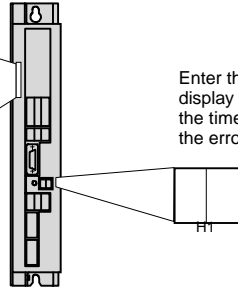
Error report	Company:	Location:	Date:
	Department:	Name:	Telephone:

Details of the faulty drive

Model specifics
 Basic device

DKC - - - - -
 S.No.: - - - - -

Power supply:
 single-phase
 three-phase

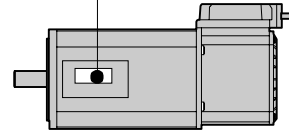


Enter the display at the time of the error

Motor specifics:

Motor type: _____

Serial number: _____



Operating mode used: _____

Firmware details: FWA-ECODRV- - -

Details of the machine on which the error occurred:

Machine manufacturer: _____ Type: _____ Hours of operation: _____

Machine number: _____ Installation date: _____

Machine control system manufacturer and type: _____

Designation of the machine shaft in which the error occurred: _____

How was the error detected:

Supplementary information:

Error condition:	Causes:	Accompanying phenomenon:
<input type="checkbox"/> is continually present <input type="checkbox"/> during installation <input type="checkbox"/> occurs sporadically <input type="checkbox"/> occurs after approx. <input type="checkbox"/> hours <input type="checkbox"/> occurs during vibration <input type="checkbox"/> <input type="checkbox"/> additional information: _____ _____ _____	<input type="checkbox"/> unknown <input type="checkbox"/> connection error <input type="checkbox"/> external cause <input type="checkbox"/> mechanical damage <input type="checkbox"/> loose power connection <input type="checkbox"/> condensation in device <input type="checkbox"/>	<input type="checkbox"/> mechanical system problems <input type="checkbox"/> power supply failure (24 V _{ext.}) <input type="checkbox"/> control system failure <input type="checkbox"/> motor failure <input type="checkbox"/> cable break <input type="checkbox"/> defective ventilator <input type="checkbox"/> <input type="checkbox"/> is the switch box air-conditioned? Y / N <input type="checkbox"/> Have there been similar errors in the same shaft before? How often: _____ Did the errors always occur on specific days or at specific times? _____ _____

INDRAMAT GmbH
 Bgm.-Dr.Nebel-Straße 2
 Abt. QSP
 D-97816 Lohr am Main

PI001d1.drw

Figure 4-3: Defect report

Customer Service Locations

Germany

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<p><u>Sales area South</u></p> <p>INDRAMAT GmbH D-80339 München Ridlerstraße 75 Telefon: 089/540138-30 Telefax: 089/540138-10</p>	<p><u>Sales area South-West</u></p> <p>INDRAMAT GmbH D-71229 Leonberg Böblinger Straße 25 Telefon: 07152/972-6 Telefax: 07152/972-727</p>		<p><u>INDRAMAT Service-Hotline</u></p> <p>INDRAMAT GmbH Telefon: D-0172/660 040 6 -oder- Telefon: D-0171/333 882 6</p>

Customer service locations in Germany

Europe

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<p><u>Switzerland</u></p> <p>Rexroth AG Geschäftsbereich INDRAMAT Gewerbstraße 3 CH-8500 Frauenfeld Telefon: +41 52/720 21 00 Telefax: +41 52/720 21 11</p>	<p><u>Russia</u></p> <p>Tschudnenko E.B. Arsenia 22 153000 Ivanovo Rußland Telefon: +7 93/22 39 633</p>		

European Customer service locations without Germany

Outside Europe

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<p>Korea</p> <p>Rexroth-Seki Co Ltd. 1500-12 Da-Dae-Dong Saha-Gu, Pusan, 604-050</p> <p>Telefon: +82 51/264 90 01 Telefax: +82 51/264 90 10</p>	<p>Korea</p> <p>Seo Chang Corporation Ltd. Room 903, Jeail Building 44-35 Yoido-Dong Youngdeungpo-Ku Seoul, Korea</p> <p>Telefon: +82 2/780-82 07 -9 Telefax: +82 2/784-54 08</p>	<p>Mexico</p> <p>Motorización y Diseño de Controles, S.A. de C.V. Av. Dr. Gustavo Baz No. 288 Col. Parque Industrial la loma Apartado Postal No. 318 54060 Tlalnepantla Estado de Mexico</p> <p>Telefon: +52 /397 86 44 Telefax: +52/398 98 88</p>	
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Customer service locations outside Europe

Notes

Notes

