



OPTIFEED-CS Customized Single-Axis Solution for Rollfeed Application

Application Manual

Title	OPTIFEED-CS Customized Single-Axis Solution for Rollfeed Application
Type of Documentation	Application Manual
Document Typecode	DOK-ECODR3-CR*-01VRS**-AW02-EN-P
Internal File Reference	Doku-Server (home:\Ein\BAG\29244102) Document Number, 120-1000-B342-02/EN
Purpose of Documentation	This documentation describes ...

Record of Revisions

Description	Release Date	Notes
DOK-ECODR3-CR*-01VRS**-AW02-EN	02.02	

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Published by	Rexroth Indramat GmbH Bgm.-Dr.-Nebel-Str. 2 • D-97816 Lohr a. Main Telephone +49 (0)93 52/40-0 • Tx 68 94 21 • Fax +49 (0)93 52/40-48 85 http://www.boschrexroth.de/ Dept. BRC/BMG2 (FK/WD)
Note	This document has been printed on chlorine-free bleached paper.

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1 System Overview

1.1 Important Information

The OPTIFEED product is available in several configurations:

- **OPTIFEED-CS, the complete single-axis solution for standard applications with no need for specialized programming**
- OPTIFEED-FS, the user-configurable, programmable single-axis solution for complex or customized machine functionality
- OPTIFEED-FM, the user-configurable multi-axis solution for complex or customized machine functionality.

This documentation is specific to the OPTIFEED-CS used with the FWA-ECODR-CRP-01VRS firmware and serves as a compact reference for start-up, operation and diagnostics for the complete single-axis feed-to-length solution.

1.2 Description of the Feed-To-Length System

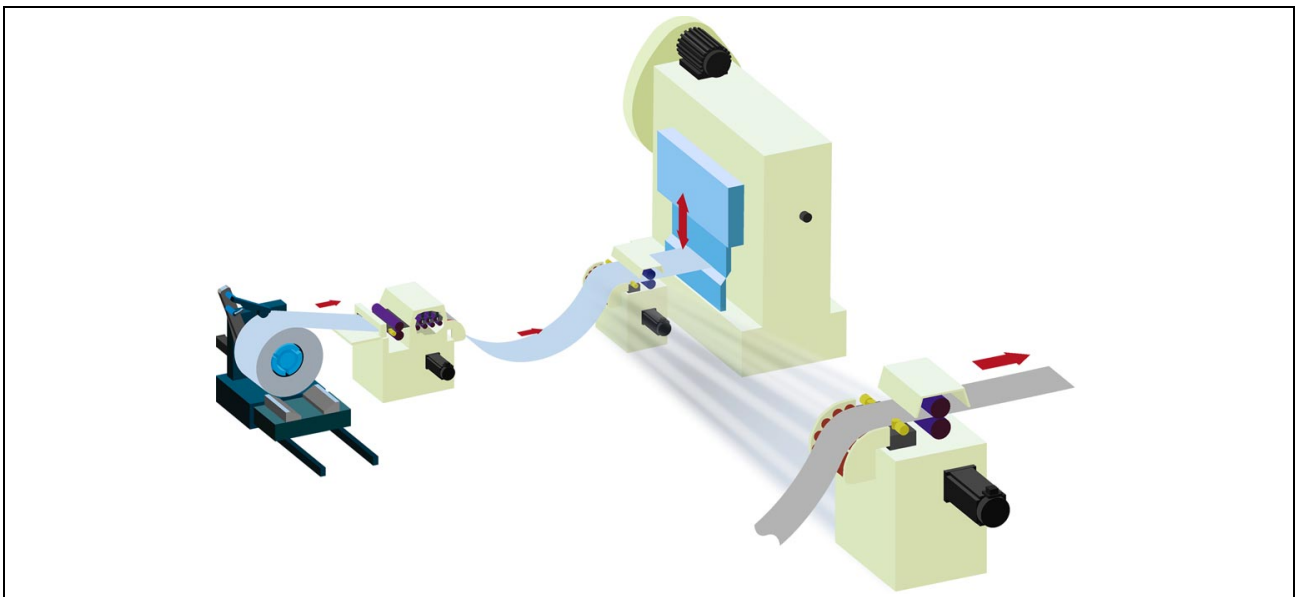


Fig. 1-1: Feed-To-Length System

The Rexroth Indramat "Optifeed-CS" Feed-To-Length solution is a single-axis positioning system that can be customized for a variety of needs by using specific hardware and software components. Optifeed-CS has been optimized for material positioning applications with controlled feeding of metals, foils or similar materials that are processed using a shear, a press, a plastic covering machine, a thermoformer or related machine types. Adding features such as a PLS or tool control can enable more complex machine applications.

The Optifeed-CS firmware FWA-ECODR-CRP-01VRS runs on a Rexroth Indramat servo controller of the ECODRIVE03 (DKC21.3) series, which is equipped with NC and logic functionality by a second processor. No additional programming is required by the machine builder or the end customer. Setting parameters and wiring pre-defined inputs and outputs for position-specific data are quickly accomplished, and lay the groundwork for extensive diagnostic options.

By setting a few parameters, a machine builder can combine the Optifeed-CS system with a third-party positioning system. The system configuration is further simplified by using standard parameters and user data. Machine-specific settings can be password-protected.

On the Rexroth Indramat BTV04 Display, a machine user sees only information and input fields that are relevant for the specific system. At the press of a button, the operating mode (Manual, Parameter, Setup, Automatic) can be changed or a particular product can be loaded through the project management function. Meaningful status information is therefore available in every screen. Instead of the BTV04 Display, a PC or a PLC can be used for control and input of the production data.

The system has been developed with high integrity and security. An extensive diagnostic system displays the status of inputs/outputs as well as messages specific to each operating mode. The clear language of the diagnostic messages provides all-around support to the machine operator. This helps to quickly return to the production process after an error occurs.

1.3 Standard Configuration

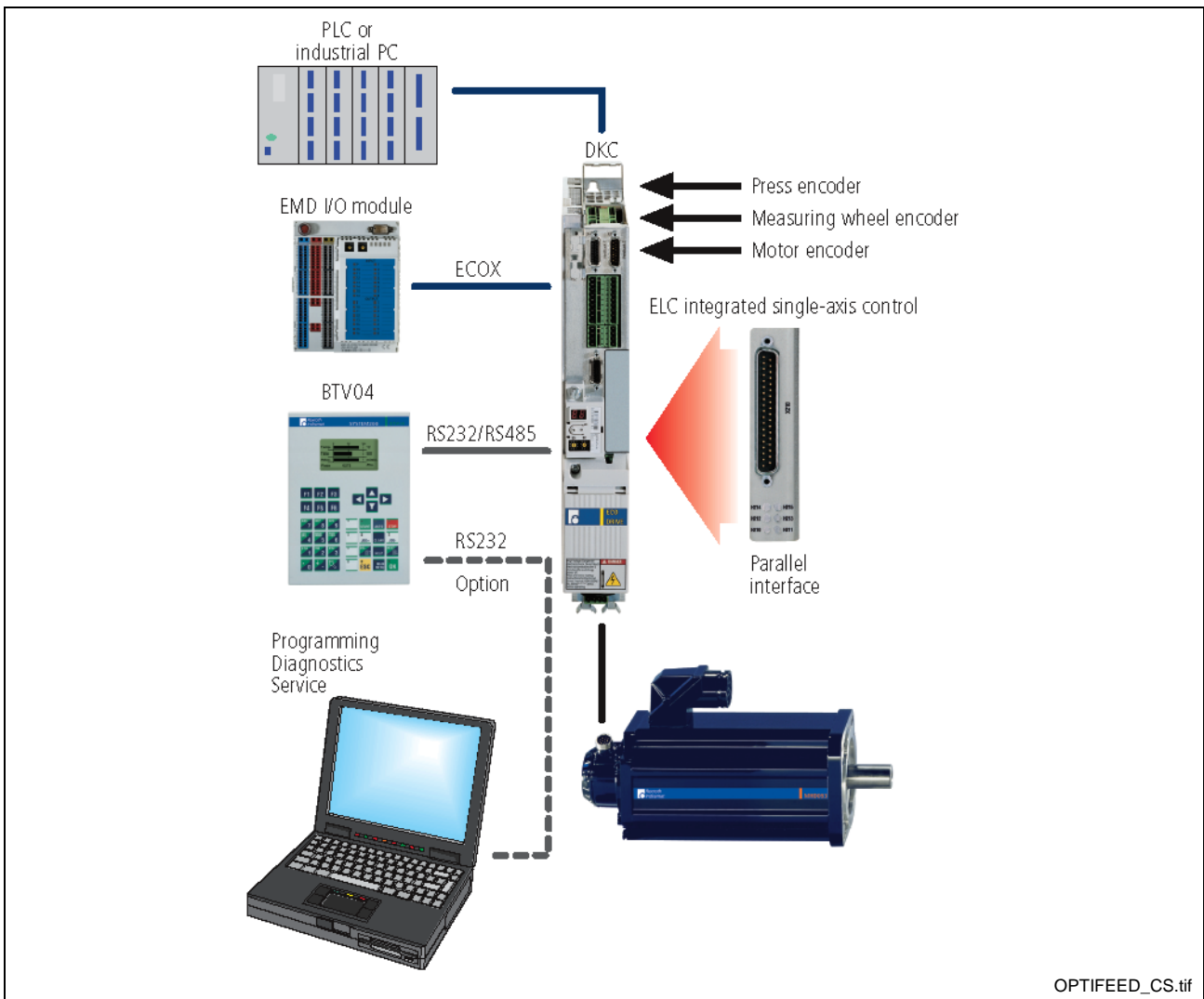


Fig. 1-2: Optifeed System

The Optifeed-CS system consists of the following hardware and software modules:

1. **DKC 21.3 ECODRIVE03 with integrated single-axis control.** This controller consists of:
 - Ecodrive03 Base Unit
 - Firmware Module FWA-ECODR3-CR*-01VRS
 - ELC Parallel Interface (DIO Board)

The description for ordering is DKC21.3-xxx.

The firmware listed above must be ordered separately from the controller. However, when the product is shipped, the firmware is already loaded.

2. BTV04 Display

- BTV04 Hardware

Description for Ordering:

BTV04.2-GN-FW Material No.: 282182

- The Optifeed CRE User Interface. The user interface, which is available as firmware, must be ordered separately from the BTV04 hardware. When the product is shipped, the interface is pre-installed on the BTV04 unit.

Description for Ordering:

FWA-BTV04*-CRE-01VRS-MS Material No.: 292439

3. Cables

- IKB0005 (optional) – connection between the PC (9-pin) and the DKC03 or BTV04 (15-pin). This cable may not be required, because a PC is not absolutely necessary for starting up the system.
- IKB0017 – connection between the BTV04 and DKC03, for RS485 serial communication.
- IKB0029 (optional) – connects the EMD expansion module to the DKC21.3 base unit.
- IKS4037 – connection between connector X210 (DIO Board) external I/O sources (see also chapter ... "Drawings"). For the physical inputs/outputs, the connections can be from/to the BTV04, from/to additional switches, or from/to the machine builder's controllers.

4. MotionManager Software (optional)

The MotionManager NT software can be run on common Windows operating systems (Win95, Win NT) and, with the DKC21.3, provides simple ways to set parameters and diagnose the system. However, all data can also be input and all displays also shown on the BTV04.

Description for Ordering:

SWA-MOMANT-INB-03VRS-MS (Material No.: 291761)

5. EMD Module to Expand Functionality (optional)

Connecting the EMD module expands the existing system by 8 outputs for PLC control as well as 8 outputs and 8 inputs for tool control with tool acknowledgement. Both the baseplate and the plug-in module are required.

Description for Ordering:

Baseplate: EMD-B16.1-DC024N (Material No.: 00291681)

Plug-In Module: EMD-D16.1-DC024N (Material No.: 00292245)

Fuse: 6.3A FUSE (Material No.: 00292157)

6. Documentation

A box containing all important documentation is available. Besides project planning information, this box contains a comprehensive description of the Optifeed-CS system including the BTV04 operator console.

Description for Ordering: DOK-ECODR3-CR*-01VRS**-2201-EN-P

7. More Extensive Documentation

- ECODRIVE NC Controller with Parallel Interface (Functional Description: DOK-ECODR3-FLP-03VRS-EN-P). This documentation is useful for the machine builder, more than for the machine operator. The Optifeed-CRP firmware runs on the DKC21.3 (Ecodrive03). This documentation comprehensively describes the DKC controller. This documentation contains a complete description of the serial interface, all parameters and diagnostics.
- System200, BTV04.2. Hardware Description (DOK-SUPPL*-BTV04.2***) and Runtime Description (DOK-SUPPL*-SCM*BEDIEN*). Runtime describes a type of BTV04 operating system where COM ports are set, passwords are issued or the file system is managed. In the Hardware Description, review Chapter 6 "Initial Startup"; complete instructions for initial startup can be found in this manual.
- EMD Digital Input/Output Expansion Module (DOK-DRIVE*-ECOX*****-PR01-EN-P).
- Technical Data and Connection of the EMD Module.

2 Important Directions for Use

2.1 Appropriate Use

Introduction

Rexroth Indramat products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

Note: Rexroth Indramat, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Rexroth Indramat products, make sure that all the prerequisites for an appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

Areas of Use and Application

Drive controllers made by Rexroth Indramat are designed to control electrical motors and monitor their operation.

Control and monitoring of the motors may require additional sensors and actors.

Note: The drive controllers may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either mounted or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

Every drive controller has to be programmed before starting it up, making it possible for the motor to execute the specific functions of an application.

The drive controllers of the ECODRIVE03 family are designed for use in single or multiple-axis drive and control applications.

To ensure an application-specific use, the drive controllers are available with differing drive power and different interfaces.

Typical applications of drive controllers belonging to the ECODRIVE03 family are:

- handling and mounting systems,
- packaging and foodstuff machines,
- printing and paper processing machines and
- machine tools.

The drive controllers may only be operated under the assembly, installation and ambient conditions as described here (temperature, system of protection, humidity, EMC requirements, etc.) and in the position specified.

2.2 Inappropriate Use

Using the drive controllers outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as "inappropriate use".

Drive controllers may not be used if

- they are subject to operating conditions that do not meet the above specified ambient conditions. This includes, for example, operation under water, in the case of extreme temperature fluctuations or extremely high maximum temperatures or if
- Rexroth Indramat has not specifically released them for that intended purpose. Please note the specifications outlined in the general safety instructions!

3 Safety Instructions for Electric Drives and Controls

3.1 Introduction

Read these instructions before the initial startup of the equipment in order to eliminate the risk of bodily harm or material damage. Follow these safety instructions at all times.

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Rexroth Indramat representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented or transferred or passed on to others, then these safety instructions must be delivered with the equipment.



Improper use of this equipment, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions.

Warning symbol with signal word	Degree of hazard seriousness according to ANSI
	Death or severe bodily harm will occur.
	Death or severe bodily harm may occur.
	Bodily harm or material damage may occur.

Fig. 3-1: Hazard classification (according to ANSI Z535)

3.3 Hazards by Improper Use



DANGER

**High voltage and high discharge current!
Danger to life or severe bodily harm by electric shock!**



DANGER

Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!



WARNING

High electrical voltage due to wrong connections! Danger to life or bodily harm by electric shock!



WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!



CAUTION

Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!



CAUTION

Risk of injury due to improper handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock or incorrect handling of pressurized systems!



CAUTION

Risk of injury due to incorrect handling of batteries!

3.4 General Information

- Rexroth Indramat GmbH is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Only persons who are trained and qualified for the use and operation of the equipment may work on this equipment or within its proximity.
 - The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in these instructions.
 - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and equipment on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Project Planning Manual.

For example, the following areas of use are not permitted: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications sensitive to high frequency, mining, food processing, control of protection equipment (also in a machine).
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturer must

 - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
 - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Startup of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.

- Operation is only permitted if the national EMC regulations for the application are met.
The instructions for installation in accordance with EMC requirements can be found in the documentation "EMC in Drive and Control Systems".
The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

3.5 Protection Against Contact with Electrical Parts

Note: This section refers to equipment and drive components with voltages above 50 Volts.

Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.



DANGER

High electrical voltage! Danger to life, severe bodily harm by electric shock!

- ⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.
 - ⇒ Follow general construction and safety regulations when working on high voltage installations.
 - ⇒ Before switching on power the ground wire must be permanently connected to all electrical units according to the connection diagram.
 - ⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.
 - ⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.
 - ⇒ The following should be observed with electrical drive and filter components:
 - ⇒ Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
 - ⇒ Never touch the electrical connection points of a component while power is turned on.
 - ⇒ Install the covers and guards provided with the equipment properly before switching the equipment on. Prevent contact with live parts at any time.
 - ⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.
 - ⇒ Electrical components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example, in a control cabinet.
-

To be observed with electrical drive and filter components:



DANGER

**High electrical voltage on the housing!
High leakage current! Danger to life, danger of
injury by electric shock!**

- ⇒ Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.
- ⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.
- ⇒ Use a copper conductor with at least 10 mm² cross section over its entire course for this safety conductor connection!
- ⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

3.6 Protection Against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Rexroth Indramat products are protective low voltages designed in accordance with international standards on electrical safety.



WARNING

**High electrical voltage due to wrong
connections! Danger to life, bodily harm by
electric shock!**

- ⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.
- ⇒ Only electrical circuits may be connected which are safely isolated against high voltage circuits. Safe isolation is achieved, for example, with an isolating transformer, an opto-electronic coupler or when battery-operated.

3.7 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

**DANGER****Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!**

- ⇒ Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation. Unintended machine motion is possible if monitoring devices are disabled, bypassed or not activated.
 - ⇒ Pay attention to unintended machine motion or other malfunction in any mode of operation.

 - ⇒ Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:
 - use safety fences
 - use safety guards
 - use protective coverings
 - install light curtains or light barriers
 - ⇒ Fences and coverings must be strong enough to resist maximum possible momentum, especially if there is a possibility of loose parts flying off.
 - ⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.
 - ⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.
 - ⇒ Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.
 - ⇒ Secure vertical axes against falling or dropping after switching off the motor power by, for example:
 - mechanically securing the vertical axes
 - adding an external braking/ arrester/ clamping mechanism
 - ensuring sufficient equilibration of the vertical axes
- The standard equipment motor brake or an external brake controlled directly by the drive controller are not sufficient to guarantee personal safety!

- ⇒ Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
 - maintenance and repair work
 - cleaning of equipment
 - long periods of discontinued equipment use
 - ⇒ Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.
-

3.8 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.



WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

- ⇒ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter the following areas:
 - Areas in which electrical equipment and parts are mounted, being operated or started up.
 - Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.
 - ⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.
 - ⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.
-

3.9 Protection Against Contact with Hot Parts



CAUTION

Housing surfaces could be extremely hot! Danger of injury! Danger of burns!

- ⇒ Do not touch housing surfaces near sources of heat! Danger of burns!
- ⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.
- ⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

3.10 Protection During Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.



CAUTION

Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!

- ⇒ Observe general installation and safety instructions with regard to handling and mounting.
- ⇒ Use appropriate mounting and transport equipment.
- ⇒ Take precautions to avoid pinching and crushing.
- ⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.
- ⇒ Use lifting devices and tools correctly and safely.
- ⇒ For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.
- ⇒ Never stand under suspended loads.
- ⇒ Clean up liquids from the floor immediately to prevent slipping.

3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.



Risk of injury by incorrect handling!

- ⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).
- ⇒ Never charge non-chargeable batteries (danger of leakage and explosion).
- ⇒ Never throw batteries into a fire.
- ⇒ Do not dismantle batteries.
- ⇒ Do not damage electrical components installed in the equipment.

Note: Be aware of environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (danger of explosion). Dispose batteries separately from other waste. Observe the legal requirements in the country of installation.

3.12 Protection Against Pressurized Systems

Certain motors and drive controllers, corresponding to the information in the respective Project Planning Manual, must be provided with pressurized media, such as compressed air, hydraulic oil, cooling fluid and cooling lubricant supplied by external systems. Incorrect handling of the supply and connections of pressurized systems can lead to injuries or accidents. In these cases, improper handling of external supply systems, supply lines or connections can cause injuries or material damage.



Danger of injury by incorrect handling of pressurized systems !

- ⇒ Do not attempt to disassemble, to open or to cut a pressurized system (danger of explosion).
- ⇒ Observe the operation instructions of the respective manufacturer.
- ⇒ Before disassembling pressurized systems, release pressure and drain off the fluid or gas.
- ⇒ Use suitable protective clothing (for example safety glasses, safety shoes and safety gloves)
- ⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The media used in the operation of the pressurized system equipment may not be environmentally compatible. Media that are damaging the environment must be disposed separately from normal waste. Observe the legal requirements in the country of installation.

Notes

4 Functional Description

4.1 Usage

The FWA-ECODR*-CRP-01VRS firmware was specifically developed for feed-to-length machines. Products consisting of up to 10 part lengths can be manufactured. Each of the 10 part lengths can be assigned its own velocity and up to 8 tool settings (with the optional EMD Module only), before and after the feed progression. Each tool control operation can be cleared via inputs. Each part length can be repeated up to 999 times. Up to 8 outputs, which can be switched based on the position of an absolute press encoder (PLS), can be assigned to each product (see also Fig 2-2, Product Definition). The press (shear) can be synchronized via 4 different application types in Automatic Mode. Signal transfers are made via the serial interface with 24 V signals at defined inputs and outputs. Positioning can be done via the motor encoder or the measuring wheel encoder. All feed progressions can be calculated with a multiplication factor. If a product consists of only one length, it can be corrected in steps using a programmed micro-adjust. The synchronization of feed and press or shear is accomplished via the input signal "Feed Angle" or via an external press encoder. A feed progression is possible only if the feed angle is enabled.

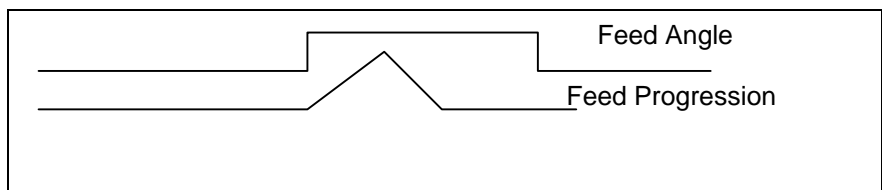


Fig. 4-1: Feed Angle

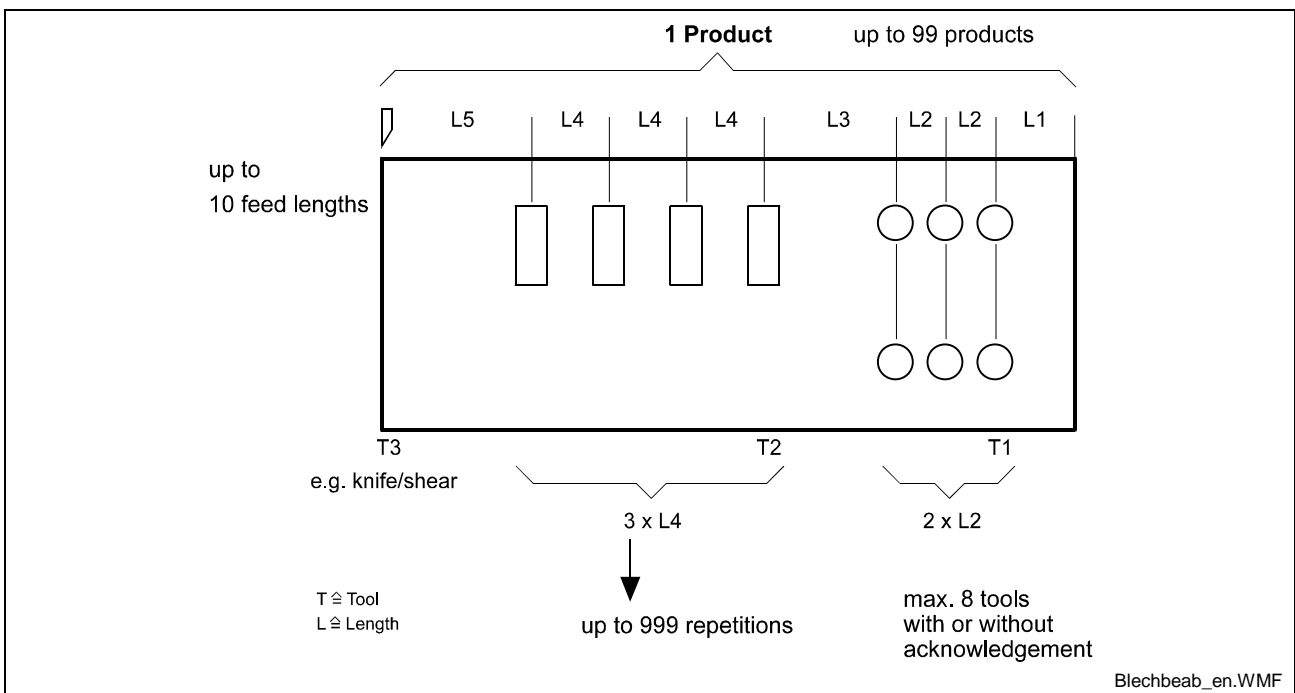


Fig. 4-2: Product Definition

4.2 Operating Modes

Four operating modes are supported:

Parameter Mode

In Parameter Mode, all system-specific data like feed constant, maximum velocity, encoder information, PLS outputs, etc. are input. The power section is turned off in this operating mode.

Manual Mode

In Manual Mode, progressions can be made via the jog inputs (X210 / Pins 5 and 6) using the pre-defined velocity in Parameter A107. The velocity override in Parameter AA04, which may be invoked, is evaluated. From Parameter A116, the user can select whether the progression occurs only when the feed angle is enabled or continuously processed. In this operating mode, no tools or press are controlled by the Optifeed program.

Parameters and Inputs/Outputs for this Operating Mode

Parameter Number	Definition	Input	Connector / Pin	Acknowledge Output	Connector / Pin
A107	Jog Velocity			Q0.00.0	X210/17
A116	Feed Angle Monitoring				
AA04	Velocity Override				

Fig. 4-3: I/O Manual Mode

Set-Up Mode

Set-Up Mode allows you to make a progression of an entire product at a separate velocity via the jog keys. This velocity is input as a percent of the maximum possible system velocity. The velocity override from Parameter AA04, which may be invoked, is used. The operating modes "Press before feed" and "Feed before press" (pre-selected from the BTV or the PLC via the M8.00.4 markers) are evaluated. Each length can be calculated with a multiplication factor, which is the same for all lengths. When the end position or start position is reached, the jog keys no longer function. The number of different part lengths and the repetitions of individual part lengths are evaluated. In Set-Up Mode, the tools and press (shear) are not controlled by the Optifeed-Program. Part counters are also inactive. However, the press stroke and the feed angle are monitored. Set-Up Mode can only be exited when a complete cycle (feed before press or press before feed) is completed. If this mode is to be exited earlier, this is possible only via an external Reset at the DKC input (X3/Pin 7). In such cases, it is impossible to continue the program and process any remaining product length.

Note: For this functionality, the following values must be recorded in Parameter AA10.
AA10 = M4.00.2 / I0.00.4 / M4.04.0

Parameters and Inputs/Outputs for this Operating Mode

Parameter Number:	Definition	Activated via Input	Connector / Pin	Acknowledge Output / Marker Flag:	Connector / Pin
A106	Maximum Velocity	I0.00.7	X210/8	Q0.01.1	X210/26
A116	Feed Angle Monitoring				
AA04	Velocity Override				
AA10	Set-Up Mode			M4.00.2	

Fig. 4-4: I/O Setup Mode

Automatic Mode

In Automatic Mode, the products are processed using the input data for length, velocity, acceleration, etc. Any multiplication factor that may have been set for the feed lengths and an active velocity override (Parameter AA04) are evaluated. Before and after each feed, up to 8 outputs for tool control can be used (only possible with optional EMD Module). The switching operations of these outputs are counted, so that information about tool wear is available. Two production counters are taken into consideration in Automatic Mode. In the first counter, the quantity for a part length of the entire production can be input, and in the second counter, the entire production is input.

If the value of one of the counters is reached, or if either the "Cycle Stop" or "Product Stop" signal is present, the press is stopped, all outputs for tool control are turned off (not the PLS outputs) and Automatic Mode is interrupted. If no part count is desired, the counters are to be set to "0." Continue in Automatic Mode by issuing a Start signal.

You can exit Automatic Mode only when the entire product has been processed or if "Immediate Stop" is active. To exit Automatic Mode earlier, an external Reset at the DKC input (X3/Pin 7) can be performed. If an external absolute encoder that signals the press position is connected, four inputs can be compared to four press positions (PLS outputs) for monitoring. The comparison can be based on "0," "1," rising edge or falling edge.

Parameters and Inputs/Outputs for this Operating Mode

Parameter Number:	Definition	Inputs Used	Connector / Pin	Outputs Used	Connector / Pin
A106	Maximum Velocity	I0.00.1	X210/2	Q0.00.1	X210/18
A116	Feed Angle Monitoring				
AA04	Velocity Override				
AA12	Press, Signal Offset			Q0.00.4	X210/21
AA13	Press Intermittent Signal	I0.01.0	X210/9	Q0.01.0	X210/25

Fig. 4-5: I/O Automatic Mode

Application Types in Automatic Mode

In Automatic Mode, the application types "Press before feed" and "Feed before press" are distinguished, as are "Press intermittent" and "Press continuous." "Press continuous" can be turned on at any time via an input signal, while "Press before feed" or "Feed before press" must be selected in a machine parameter via a marker. This marker is written from the BTV or a PLC. Also via the parameters, one can select whether the press is turned off when the falling edge or the rising edge of the feed angle is reached, and whether a shared output or two separate outputs are used for the two press control modes "Press intermittent" and "Press continuous." This function is activated via Parameters AA12 and AA13.

Press Before Feed in Intermittent Mode

In this application type, the cycle begins with setting a maximum of 8 outputs. A tool acknowledgement (input query) can then be executed. After the acknowledgement is complete, the output for press control (X210/21 or X210/25, depending on parameter settings) is turned on. After the press stroke is complete, the 8 outputs for tool control are accessed. Again, an acknowledgement query can be executed. When all the desired tool acknowledgements are present, the feed progression and part count are executed. Subsequently, if neither of the part counter quantities has been reached and no "Stop" command is present, the cycle re-starts.

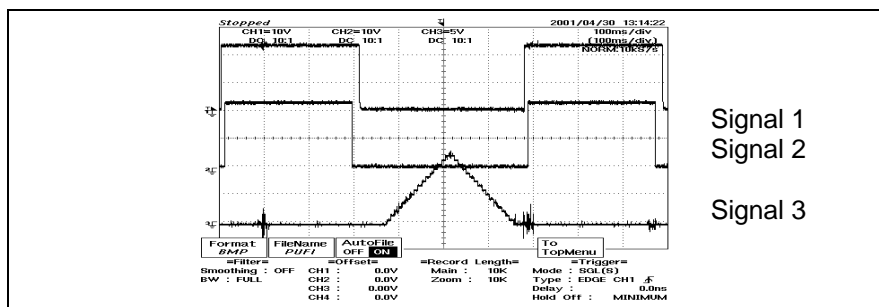


Fig. 4-6: Press Before Feed, in Intermittent Mode

- Signal1 Tool Control
- Signal2 Press Control
- Signal3 Feed Progression

Press Before Feed in Continuous Operation

In this application type, the exact same order is used as for "Press before feed." The only difference is that the press is not turned off after a press stroke occurs. In this case, the press is only turned off when a counter has been reached or a "Stop" signal is issued.

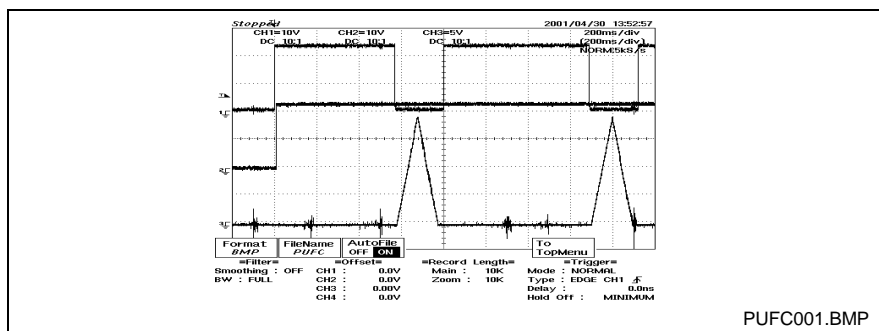


Fig. 4-7: Press Before Feed in Continuous Operation

- Signal1 Tool Control
- Signal2 Press Control
- Signal3 Feed Progression

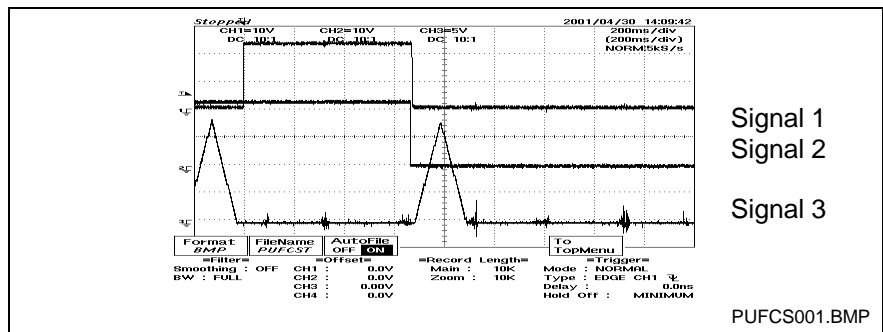


Fig. 4-8: Press Before Feed / Continuous Operation / Cycle Stop Present

- Signal1 Tool Control
- Signal2 Press Control
- Signal3 Feed Progression

Feed Before Press in Intermittent Mode

In this application type, 8 outputs for tool control are addressed with the corresponding input acknowledgement. The feed is then executed. After the feed is completed, these outputs are accessed again with the relevant acknowledgement. After the acknowledgement and after the press stroke is executed, the output for press control is turned on and then off again.

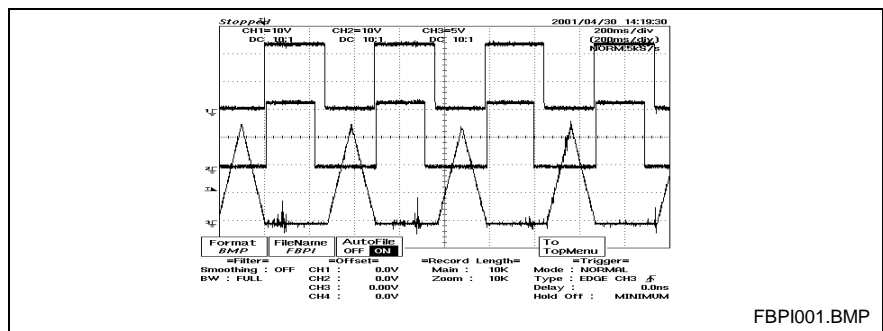


Fig. 4-9: Feed Before Press in Intermittent Mode

- Signal1 Tool Control
- Signal2 Press Control
- Signal3 Feed Progression

Feed Before Press in Continuous Mode

The processing time in this operating mode corresponds to that of the "Feed before press" operating mode with the press in intermittent operation.

The difference is that the output for press control is not cleared after the press stroke is executed. This output is only cleared if a counter is reached or if a stop signal is present.

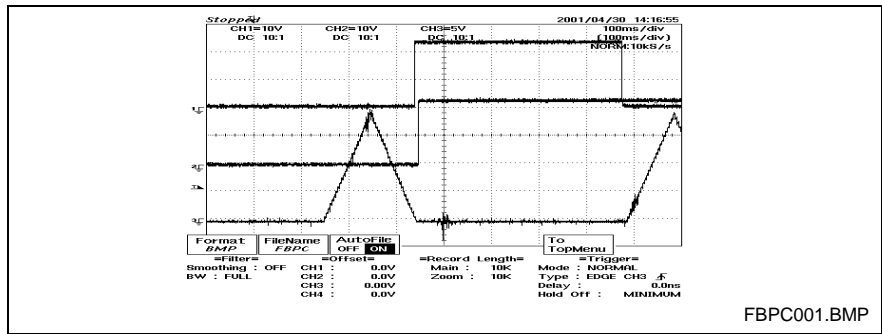


Fig. 4-10: Feed Before Press / Press Continuous

- Signal1 Tool Control
- Signal2 Press Control
- Signal3 Feed Progression

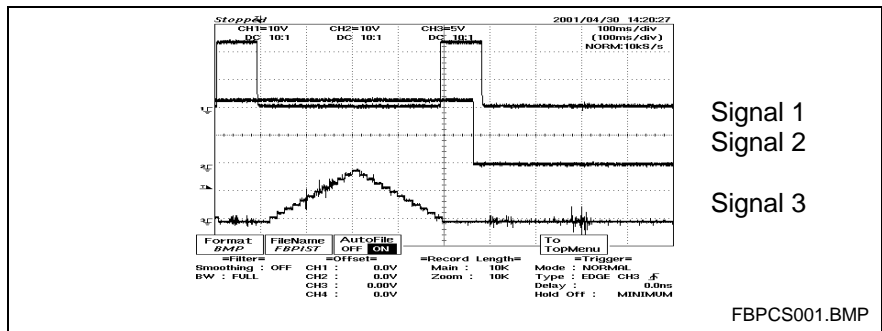


Fig. 4-11: Feed Before Press / Press Continuous/ Cycle Stop Active

- Signal1 Tool Control
- Signal2 Press Control
- Signal3 Feed Progression

4.3 Automatic Feed Adjustment

To avoid unnecessarily high acceleration and deceleration ramps, a feed angle adaptation (adjustment) can be performed in Automatic Mode. When the press has reached the desired velocity, this function can be activated via an input or via marker M8.01.4. In this case, depending on the feed angle load, acceleration and deceleration can be increased or decreased in programmable percentual steps. The steps for the change should be set at 1 and 10%. For the minimum acceleration and deceleration values, a value of 15% of Parameter A108 is automatically assigned. The optimal load range is also user-programmable. If the load of the feed angle is more than 90 percent, this is signalled via output X210/22. The following graphics show the feed profile with and without automatic feed adjustment, with the same feed angle and feed length, and a selected load of 80-90 percent of the feed angle.

Note: If the increments selected for the change in acceleration/deceleration are too large, it is possible that the feed may not be completed within the feed angle. The error message "Feed angle loss" results.

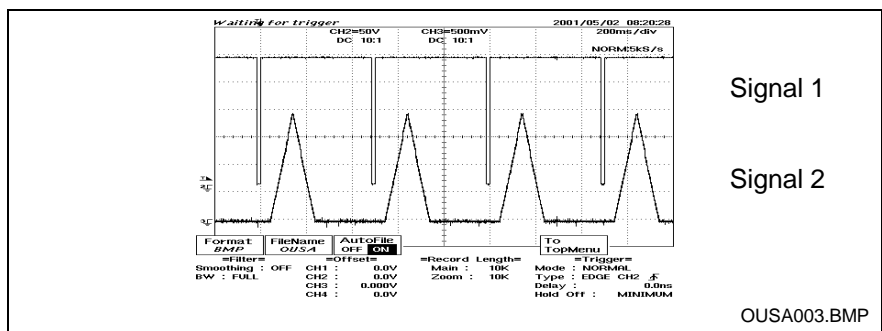


Fig. 4-12: Without Automatic Feed Adjustment

- Signal 1 Feed Angle
- Signal 2 Feed Progression

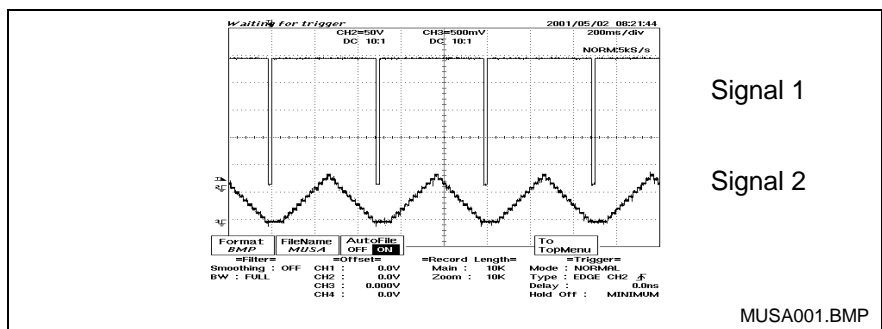


Fig. 4-13: With Automatic Feed Adjustment

- Signal 1 Feed Angle
- Signal 2 Feed Progression

4.4 Measuring Wheel Mode

To equalize possible slip between the feed rolls and the material, the length measurement can be assigned to an external measuring wheel encoder instead of to the motor encoder. Via input X210/12, this function can be activated, as long as it is programmed in Parameter A100. The external encoder data must also be correctly input into Parameters C004 to C007. In Parameter A117, monitoring the encoder difference can be activated. If the difference exceeds the programmed value, an error message is issued. Incremental encoders with 5 V square waves can be used as measuring wheel encoders. In Manual Mode (Jog forward, Jog reverse), a motor encoder is generally used. The current difference (slip) in percent can be found in Variables V 107 or read directly from the BTV04 Diagnostics Menu (Positions).

Parameters and Inputs/Outputs for this Function

Parameter Number	Definition	Activated via Input	Connector / Pin	Acknowledge Output	Connector / Pin
A100	Function of Encoder 2:				
A117	Encoder Difference Monitoring				
AA07	Measuring Wheel Mode	I0.01.3	X210/12		
C004	Encoder 2 Interface				
C005	Position Encoder Type 2				
C006	Encoder 2 Resolution				
C007	Encoder 2 Feed Rate Constant				

Fig. 4-14: Measuring Wheel

4.5 PLS

If an external absolute encoder is attached to the press, the feed angle can be derived from it. A maximum of 11 PLS positions that are output over 8 PLS outputs can be programmed. Multiple PLS positions can be assigned to each output. The outputs can be controlled within the entire PLS range, or set only as a timer. For each output, hysteresis spacing in the forward and reverse directions can be assigned. To balance switching times for controlled peripherals, a lead time for turning on/off each PLS output can be set. These outputs are then controlled for correct positioning, depending on the press velocity. Physical outputs are available via the optional EMD Module, in group Q3.01. If the PLS positions are to be used only as internal markers, for example, this can occur via the outputs in group Q1.00. The PLS function must be enabled in Parameter N100 and the PLS outputs, PLS positions and desired functions must be correctly input in Parameters N101-N131. The encoder type and the encoder reference position are recorded in Parameters C017 – C019.

Parameters for this function:

Parameter Number	Definition
C017	Encoder Type, Press Encoder
C018	Home Encoder
C019	Reference Distance
N100	Enable and Feed Constant
N101 - N131	PLS Parameters

Fig. 4-15: PLS

4.6 Tool Wear

The number of switching operations are counted for the 8 outputs for tool control in output group Q3.00 on the optional EMD Module. The counter values can be read from variables V631-V645. In variables V630-V644, the number of desired switching operations can be input. If the programmed quantity of switching operations is reached, the corresponding marker in group M8.02 is set. This function must also be enabled in Parameter AA11. The counter values can be called up on the BTV or a higher-ranking control, and any markers that are set can be cleared via the BTV or via a serial command.

Output	Preset Count	Actual Quantity	Marker Flag
Q3.00.0	V630	V631	M8.02.0
Q3.00.1	V632	V633	M8.02.1
Q3.00.2	V634	V635	M8.02.2
Q3.00.3	V636	V637	M8.02.3
Q3.00.4	V638	V639	M8.02.4
Q3.00.5	V640	V641	M8.02.5
Q3.00.6	V642	V643	M8.02.6
Q3.00.7	V644	V645	M8.02.7

Fig. 4-16: Tool Wear

Parameters for this Function:

Parameter Number	Definition
AA11	Tool Wear

Fig. 4-17: Parameter Tool Wear

4.7 Precautionary Prompts

For monitoring purposes, four input signals can be compared to four press positions (PLS outputs). If this function is activated via the relevant parameters, the bit signals within the test range are checked for a signal change. Any invalid signal changes are signaled. This message is set and maintained until the Clear function is used, the system is switched to Parameter Mode, or the power is turned off. In Parameter AA14, an output can be programmed that signals an invalid signal change. If no output is programmed, any invalid signal changes cause the automatic program to be interrupted and an error to be issued. The selected input signals can be tested for the following status: "0," "1," rising edge or falling edge.

All 4 bit signals are enabled at once via input or marker and only one error message is assigned (Parameter AA14). However, the functions can be enabled individually and the test mode can be designated via Parameters AA15-AA18.

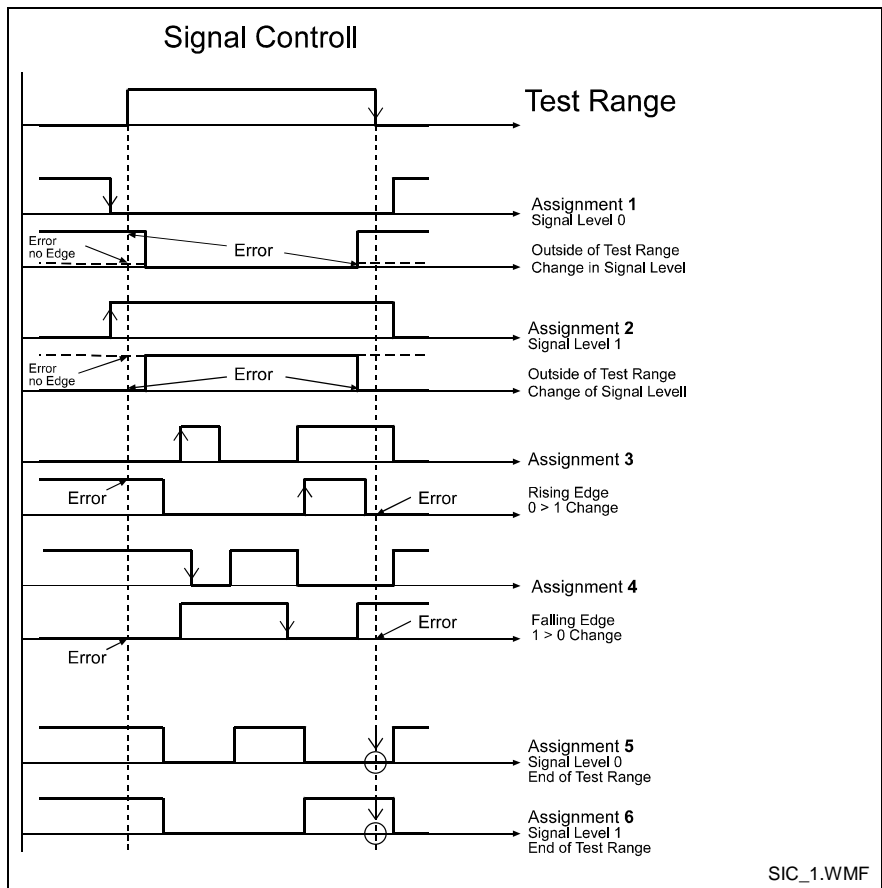


Fig. 4-18: SIC Inputs

Parameters and Inputs/Outputs for this Function

Parameter Number	Definition	Activated via Input	Connector / Pin	Output Acknowledgement Fault	Connector / Pin
AA14	Enable Signal Control	I3.01.0	EMD Input 9	Q3.01.0	EMD Output 9
AA15	Signal Control Bit 1	I4.00.7	X3/2		
AA16	Signal Control Bit 2	I4.01.0	X3/3		
AA17	Signal Control Bit 3	I4.00.3	X3/4		
AA18	Signal Control Bit 4	I4.00.4	X3/5		

Fig. 4-19: SIC-Parameter

4.8 Open Feed Rolls

To open the feed rolls, an output (X210/24) is set. This output controls an external device (hydraulic or similar) that opens the feed rolls. The signal for opening the feed rolls is communicated to the control from externally via an input (X210/15) or via the press encoder position. The signal is preselected via Parameter AA05.

As long as the signal is present to open the feed rolls, all measuring wheel movement is ignored and the output to open the feed rolls is turned on. A feed is delayed until the signal "Feed rolls closed" is present or a time programmed in Parameter AA05 has expired.

There are different possibilities for opening the feed rolls.

1. Open Feed Rolls in Manual Mode

If the input for opening the feed rolls is active (determined in Parameter AA06), the output for opening the feed rolls is set. As long as the input is active, the output also remains set.

2. Open Feed Rolls in Automatic Mode

In Automatic Mode, opening the feed rolls is activated via a PLS output or via the input (X210/15). The selection is made in the "Open Feed Rolls" parameter. The "Open Feed Rolls" function can be disabled via an input or marker in Automatic Mode. This must be enabled in Parameter AA06.

Parameters and Inputs/Outputs for this Function

Parameter Number	Definition	Inputs Used	Connector / Pin	Output	Connector / Pin
AA05	Open Feed Roll 1	I0.01.6	X210/15	Q0.00.7	X210/24
AA06	Open Feed Roll 2	I0.01.7	X210/16		
		I0.01.1	X210/10		

Fig. 4-20: Rollfeed Lifting

4.9 Average Velocity

The average material velocity can be issued via an analog output, as an approximate value for controlling the coil drive (winder). For this function, which is activated in the parameter, the material velocity, the press stroke count and the processing time are evaluated. The scaling of the analog output signal (Voltage/Velocity) can be programmed via parameters or on the BTV (Machine Menu → Various Functions). No output of the average velocity occurs in Manual Mode. If an analog output is preselected in Parameter B003, this output is active.

4.10 Press Monitoring

If no press stroke (signal change of the feed angle or PLS output, as programmed in Parameter A116) occurs within a programmed time frame after a control signal was sent to the press, an error message is issued. In Parameter AA19, an output can be programmed to be set after the time is expired.

Relevant parameters for this function:

Parameter Number	Definition
AA19	Press Time Monitoring

Fig. 4-21: Press Monitoring

4.11 Velocity Override

All currently programmed velocities can be calculated using an analog override. If this function is activated in Parameter AA04, when an analog input voltage of +10 V exists at Input E1 (X3/12 and X3/13) the programmed velocities are used for progression. If this analog input voltage is reduced, the travel velocity is reduced by the same proportion.

The travel velocity V_o is produced by multiplying the programmed travel velocity V_p by the override factor F ($F = 0 - 1$ corresponds to $0V - 10V$):

$$V_o = V_p \times F$$

- L: V_o = active travel velocity
 V_p = programmed travel velocity
 : F = override factor

Fig. 4-22: Velocity Calculation with Analog Override

If a voltage = 0V is applied, the E-0100 diagnostic error message is generated.

4.12 User specified diagnostic messages

Using the MotionManager NT tool for initial startup, it is possible to output diagnostic and program processing messages like " WAIT FOR FEED ANGLE" in any language. The "Dialog Editor" required to produce these messages can be found in the "Extras" menu. The information must be input in a simple table format. After downloading to the control (DKC21.3) and activating in Parameter B000 (x x xx 1), the "customized" processing messages are displayed on the BTV04.

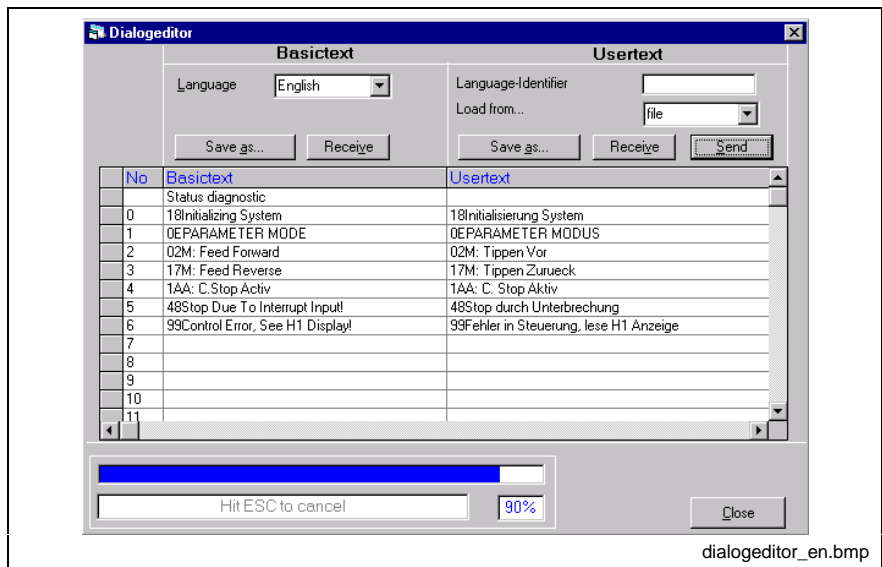


Abb. 4-23:Dialogeditor

The custom text is input in the "Usertext" column. The processing text in the "Basictext" column is structured as follows:

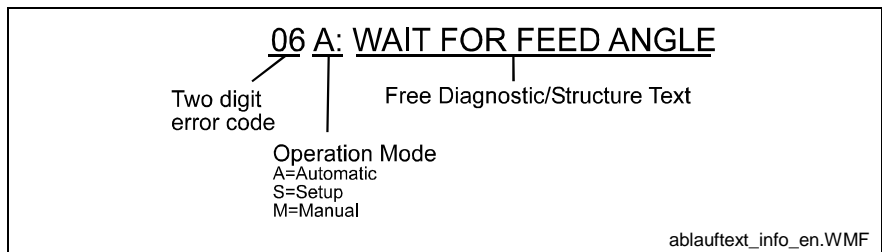


Abb. 4-24:Diagnostic/Structure Text

Please note that if the two-digit error code is not used, two spaces are required at the beginning of the input text. If these spaces are not present, two characters of the text are cut off.

Keys:

Save as

Saves the input text on the PC in text format (*.txt).

Receive

To select text from the control or a saved text file.

Send

The input text is transmitted to the control.

5 Inputs/Outputs

5.1 Inputs on the DKC 21.3 Controller Unit

The "Optifeed" feed-to-length solution uses not only the inputs especially designated for this system, but also a number of standard inputs on the DKC. Specific definitions are assigned to these inputs and they cannot be reprogrammed. For additional information, please refer to the Project Planning Guide "DOK-ECODR3-DKC3**.3****-PR03-EN-P

NOTE: All inputs marked with an asterisk (*) maintain their functionality only when certain parameters are pre-set. Different functionality can be assigned to these inputs if the user reprograms the parameters.

Standard Inputs on the DKC Connector X1

X1/1 Power Supply +24V

Using this input, a voltage between +20V and +28V must be applied across from X1/2, for power supply to the drive controller.

X1/2 Power Supply 0V

Here, 0V is applied for the power supply.

X1/4 Drive Enable

This input activates the drive via a 0-1 (rising) signal edge. If the signal drops out, the drive is brought to a standstill using the method selected in Parameter A119. The Ready for Operation (Betriebsbereit - Bb) contact remains closed.

Standard Inputs on the DKC Connector X3

X3/6 E-Stop

At this input, +24V must be present during operation. If this input drops off, the Ready for Operation (Betriebsbereit - Bb) contact and the drive are stopped using the method selected in Parameter A119.

X3/7 Clear Errors and Mode Changes

If a positive edge exists at this input, all existing errors are cleared or a mode change is forced.

Special Inputs for Optifeed on the DKC Connector X1

X1/3 Feed Angle (I4.00.1) *

If no press encoder is connected, the feed angle can be communicated to the control via this input. Using the feed angle, the feed material is synchronized with the press. A feed operation is only possible when an input is set. If the input is to be defined as a feed angle, this information must be recorded in Parameter A116 as I4.00.1 xx.xx.x.

If a press encoder is present, this signal can also be generated by any PLS. (PLS 1-4 are used for the SIC precautionary prompt). In this case, the PLS output is recorded in Parameter A116.

Special Inputs for Optifeed on the DKC Connector X3

X3/1 Rolls Closed (I4.00.6) *

Via this input, a query can be issued to determine whether the rolls are closed. When the function is activated in Parameter AA05, the feed is delayed until the input value is "1."

X3/2 Safety Input SIC1 (I4.00.7) *

This input can be assigned to a press position (PLC output) in Parameter AA15. The input is tested within the test range for the programmed status.

X3/3 Safety Input SIC2 (I4.01.0) *

This input can be assigned to a press position (PLC output) in Parameter AA16. The input is tested within the test range for the programmed status.

X3/4 Safety Input SIC3 (I4.00.3) *

This input can be assigned to a press position (PLC output) in Parameter AA17. The input is tested within the test range for the programmed status.

X3/5 Safety Input SIC4 (I4.00.4) *

This input can be assigned to a press position (PLC output) in Parameter AA18. The input is tested within the test range for the programmed status.

5.2 Inputs on the Parallel Interface (DIO) X210

The inputs in the group I0.00 and I0.01 via the parallel interface DIO (X210) are controlled with 24V signals. An input voltage of 16V to 30V is the high level. An input voltage of -0.5V to 3V is the low level.

Definition of the Inputs on the DIO

X210/1 Parameter Mode

Via this input, the control is switched into "Parameter Mode." Parameter Mode is normally used only at initial startup for the input of machine data. In this operating mode, the power section is off.

X210/2 Automatic Mode

This input activates Automatic Mode. In Automatic Mode, the programmed products are processed with the data that has been input.

X210/3 Start

When the system is in Automatic Mode, a transition to high on the "Start" input starts the automatic cycle. After the part count has been reached, or after a "Stop," the automatic program must be re-started via this input. Only the rising edge is monitored. A pulse of at least 2 ms duration is sufficient as a start signal.

X210/4 $\overline{\text{Stop}}$

To allow motion, the signal "Stop NOT" must always be present in all operating modes. If this signal drops off, the automatic program and any progressions in process are interrupted. After the "Stop NOT" signal is returned to high and then a new "Start" pulse is issued, the program continues where it left off. Without the "Stop NOT" signal, neither Jog Mode nor Manual Mode is possible. If the input is not to be used, it must be permanently wired for 24V.

X210/5 Jog Forward

If no signal is present at the inputs for Parameter Mode, Automatic Mode or Set-Up Mode, Manual Mode is active. In this operating mode, the drive can be moved forward at a defined speed. The drive continues to move as long as the signal is present.

X210/6 Jog Reverse

In Manual Mode, the drive can be moved in reverse via this input.

X210/7 $\overline{\text{Cycle Stop}}$

If the signal at this input drops off, the automatic program stops at the end of the current cycle. Via the "Start" input, the automatic program can be continued. The cycle is considered ended when the feed and the press stroke have been executed. If the input is not to be used, it must be permanently wired for 24V.

X210/8 Set-Up Mode

With this input, the operating mode "Set-Up Mode" is activated. In this operating mode, the current feed length can be traversed using the jog keys.

X210/9 Press Continuous

This input switches the output for control of the press or the shear. For continuous press operation, this output is turned off only when a stop, fault or interrupt is present, or when the part count has been reached.

X210/10 Open Feed Rolls in Manual Mode (I0.01.1) *

Via this input, the feed rolls are opened in Manual Mode. If this input is on, the output that opens the feed rolls is turned on. This function is enabled in Parameters AA05 and AA06.

X210/11 Interrupt (I0.01.2) *

This input is for interrupting a positioning move. If the signal at this input drops off, a running positioning move is interrupted and the remaining distance is saved. The output for press control is also cleared. When the signal is present again, the automatic program continues, without a "Start" signal, at the same point where the signal dropped off. Any remaining distance to be traversed is begun, and the press output is re-set. The material length is not lost because this signal has dropped off. For example, this input can be used to "inform" the control that there is no more material in the bin. If the "Interrupt" input is to be used, it must be recorded in Parameter A116 as XX.XX.X I0.01.2.

X210/12 Measuring Wheel (I0.01.3) *

With this input, when the system is in Automatic or Set-Up Mode, the user can switch to an external encoder for detection of the length. The input "Measuring Wheel Mode" must also be recorded in Parameter AA07 as I0.01.3. In addition, Measuring Wheel Mode must also be enabled in Parameter A100.

X210/13 Product Stop

Via this input, the system can be stopped when the product is fully processed. If this input drops off, the system is stopped only after all part lengths for a product have been processed. If the product is made up of only one part length, this input has the same effect as a cycle stop. If this function is not to be used, this input must be permanently wired for 24V.

X210/14 Feed Optimization

When the press has reached the desired velocity, an automatic feed adjustment can be performed via this input. The available feed angle is output and the acceleration/deceleration is adjusted in programmable steps, so that the feed angle is used to its maximum load. The desired load of the feed angle is also programmable.

X210/15 Open Feed Rolls (I0.01.6) *

Via this input, Open Feed Rolls is activated in Automatic Mode. If this input is on, the output that opens the feed rolls is turned on and the measuring wheel progressions are ignored. This function is enabled in Parameters AA05 and AA06.

If opening the feed rolls is controlled via the internal PLS, the input is not present and the PLS output is set in Parameter AA05.

X210/16 Enable Open Feed Rolls (I0.01.7) *

Via this input, the function "Open Feed Rolls" can be separately enabled in Automatic Mode, as long as it is activated in Parameter AA06.

5.3 Inputs on the EMD Module

When the DKC21.3 is used with the CRE firmware, it is possible to expand the number of inputs and outputs using an EMD module. An input voltage of 11V to 30V is the high level for these inputs. An input voltage of 0V to 5V is the low level for these inputs.

Definition of the Inputs on the EMD

The **8 inputs in group I3.00 (I3.00.0-I3.00.7)** on the EMD Module can be used to **query for an acknowledgement** from **tools** that are set up, before and after every feed (press stroke). These inputs can be verified for signal level zero using "0" and for signal level one using "1." If "2" is entered at that input, no verification is done.

Input No. 9 (I3.01.0) Enable SIC Monitoring Function *

This input in group I3.01 activates the monitoring of a signal (PLS/input) programmed in Parameters AA14 – AA18, when the next rising edge is encountered within the test range.

Note: All inputs marked with an asterisk (*) maintain their functionality only when certain parameters are pre-set. Different functionality can be assigned to these inputs if the user reprograms the parameters.

5.4 Outputs on the DKC 21.3 Controller Unit

The "Optifeed" feed-to-length solution uses not only the outputs especially designated for this system, but also a number of standard outputs on the DKC. For additional information please refer to the Project Planning Guide "DOK-ECODR-DKC3**-PR-EN-P.

System Outputs on the DKC Connector X3

X3/8 Ready

When the unit is ready to receive the drive enable signal, this output is set. The output is turned off when the following occur:

- Errors
- DC bus voltage less than 80.75 x line voltage (Us)
- control voltage is not present

$$U_s = 1.414 \times U_{Nom}$$

X3/10 Warning

Many types of monitoring are performed depending on the operating mode and parameter settings. If a state is detected which still permits proper operation but leads to generation of an error message as the program continues, the warning output is set to 1. ("Diagnostics" chapter, "Status Diagnostics" section)

X3/11 UD Message

When a minimum voltage is reached in the DC bus, the U_D output is set to 1.

See also Project Planning Guide: X3, Digital Inputs/Outputs

5.5 Outputs on the DIO Parallel Interface

The outputs in groups Q0.00 and Q0.01 supply 24V signals and support a maximum of 80 mA.

NOTE: All inputs marked with an asterisk (*) maintain their functionality only when certain parameters are pre-set. Different functionality can be assigned to these inputs if the user reprograms the parameters.

Definition of the Outputs on the DIO

X210/17 Manual

The "Manual" output signals that Manual Operating Mode is active. Jogging is only possible using the inputs "Jog forward" and "Jog reverse".

X210/18 Automatic

The "Automatic" output signals that Automatic Operating Mode is active. The automatic program can be started.

X210/19 $\overline{\text{Fault}}$

This output is active when no fault is present. When a fault occurs, the output is cleared.

X210/20 Run

The "Run" output signals when Automatic Mode is preselected, and that the automatic program was started. This output is also active during Set-Up Mode.

X210/21 Permit Press *

This output helps to accurately control the press or shear in Automatic Mode. Depending on the operating mode selected (Press Continuous or Press Intermittent), the output remains constantly set or it is cleared after each press stroke. After the part counter has been attained, after a stop is activated or when a fault occurs, this output is cleared.

X210/22 $\overline{\text{Feed Angle 90\%}}$

This output signals that the feed angle capacity is already at 90%. If the stroke count of the press is increased further or the feed length is programmed with a larger value, this could lead to the feed no longer being able to be completed within the available feed angle. In this case, the error message "Feed angle monitoring" is output.

X210/23 Parameter *

This output signals that Parameter Operating Mode is active. Parameter Mode is only signaled via this output when this function has been activated in Parameter AA08 with XX.XX.X Q0.00.6. If the output is not activated in this parameter, it can be available as an output for the PLS, for example

X210/24 Open Rolls (Q0.00.7) *

Via this input, the function "Open Feed Rolls" can be activated, as long as it is programmed in Parameter AA06 "Open Feed Rolls." If not, this output can be used for other functions.

X210/25 Press Intermittent (Q0.01.0) *

If two separate outputs are desired for the operating modes "Press Intermittent" and "Press Continuous," this input is used to control the press in Intermittent Mode. Enabling [this function] occurs in Parameters AA12 and AA13. If one output is sufficient for press control, the output can be activated in the parameters for various messages or functions (e.g. PLSs).

X210/26 Set-Up Mode

This output signals when Set-Up Mode is active. The feed length can now be traversed using the jog keys.

X210/27 Press Immediate Stop

This output is used to immediately stop the press. It is normally on and is only cleared when a fault occurs.

X210/28 Feed Complete in Set-Up Mode

This output is on if the programmed feed length has been reached in Set-Up Mode using the jog keys.

5.6 Outputs on the EMD Module

The outputs in groups Q3.00 and Q3.01 are assigned via the optional EMD Module. These outputs supply 24V signals and support 0.5 A.

NOTE: All inputs marked with an asterisk (*) maintain their functionality only when certain parameters are pre-set. Different functionality can be assigned to these inputs if the user reprograms the parameters.

Definition of the Outputs on the EMD Module

Tool Control

The 8 outputs in group Q3.00 (Outputs 1-8) can be used for tool control. These outputs are accessed in parallel before and after each feed (press stroke). With the value "0," the corresponding output is turned off, and it is turned on with the value "1." The value "2" represents no status change of the outputs.

Output 9 Q3.01.0 Safety Input Check (SIC) Error *

If the monitoring function (input query for press position) has been activated in the corresponding parameters AA14-AA18, this output signals an error. One of the four inputs did not match the programmed status within the test range. After an error acknowledgement, a switch to Parameter Mode or a Re-Start, this output is cleared again.

Outputs 10-16 (Q3.01.1-Q3.01.7) *

The 7 outputs in group Q3.01 (Outputs 10-16) are intended for the PLS. If an absolute press encoder is connected, the press position can be issued using these outputs. These user-definable outputs can then be used to activate different functions.

Note: All outputs marked with an asterisk (*) maintain their functionality only when certain parameters are pre-set. Different functionality can be assigned to these outputs if the user reprograms the parameters.

5.7 BTV Outputs

At the touch of a button, the BTV04 operator and display console sets various outputs that can be used to control the DKC21.3 drive controller when it is used with FWA-ECODR-CRE firmware. The supply voltage to the BTV04 and the BTV outputs is +24 V (20 V-30 V) . The BTV outputs support a maximum of 200 mA.

Significance of the BTV Outputs

X5/1 Parameter

If Parameter Mode is pre-selected on the BTV (by pressing the Parameter key), the corresponding output will be turned on. The LED on the "Parameter" key lights up when the control has accepted the selected operating mode. If the key is pressed again, or if the "Auto" key is pressed, the output is cleared.

X5/2 Automatic

When Automatic Mode is selected ("Auto" key pressed) on the BTV04, the corresponding output is set. The LED on the "Auto" key lights up when the control has accepted the selected operating mode. If Automatic Mode has not yet initiated or ended, the output can be cleared by pressing this button again.

X5/3 Start

By pressing the "Start" key in Automatic Mode, this output is set while the key is being pressed.

X5/4 Stop

The Stop output can be set by pressing the "Stop" key. The LED on the "Stop" key lights up if the "Immediate Stop" signal is not present at the drive controller. Pressing the "Stop" key in Manual, Set-Up or Automatic Mode allows the output to be cleared. This output is also cleared in Automatic Mode if one of the three stop inputs is not used on the BTV04.

X5/5 Jog Forward

In Manual or Set-Up Mode, this output is set while the "Jog+" key is being pressed. If "external jog active" is signalled via BTV input X4/4, this output is also left out when the "Jog" key is pressed.

X5/6 Jog Reverse

In Manual or Set-Up Mode, this output is set while the "Jog-" key is being pressed. If "external jog active" is signalled via BTV input X4/4, this output is also left out when the "Jog" key is pressed.

X5/7 Cycle Stop

The "Cycle Stop" output is always set, and is only turned off as long as the "Cycle Stop" key is being pressed.

X5/8 Set-Up Mode

This output is activated using the "Set up" key on the BTV. It remains set until the operating mode is deselected.

X5/9 Free

Not in use

X5/10 Free output

By pressing "Fx-Key" output is set to 24V. Release the key set output to 0V.

X5/11 Part Count Reached

If one of the two part counters (Product or Batch) has been reached, the output is set and the message "Part count reached" is issued. After the message is cleared on the BTV, the output is also cleared.

5.8 BTV Inputs

A number of inputs are available on the BTV, for querying external machine status.

Significance of the Inputs:

X4/1 External Jog

This input signals that the jog commands from an external operator console are currently being issued. Jog outputs X5/5 and X5/6 on the BTV are blocked, so that feed progressions cannot be issued from different sources.

X4/2 – X4/5 Stop Inputs

Different operating modes are queried via these inputs. If one of these inputs drops off in Automatic Mode, the BTV output X5/4 (Stop) is immediately set to zero. If this output is connected to the drive controller (X210/4), the automatic program is interrupted. If these inputs are not to be used, they must be permanently wired to +24V. Definitions for these stop inputs can be stored in plain text.

5.9 Overview

Hardware Inputs

Function	Inputs	Comment
Feed Angle	X1/3 I4.00.1	programmed in Parameter A116 as an input or PLS output
Drive Enable RF (Reglerfreigabe)	X1/4 I4.00.0	pre-programmed
Rolls Closed	X3/1 I4.00.6	programmed in Parameter AA05
Safety Input SIC 1	X3/2 I4.00.7	programmed in Parameter AA15
Safety Input SIC 2	X3/3 I4.01.0	programmed in Parameter AA16
Safety Input SIC 3	X3/4 I4.00.3	programmed in Parameter AA17
Safety Input SIC 4	X3/5 I4.00.4	programmed in Parameter AA18
E-Stop	X3/6 I4.01.1	pre-programmed
Clear Errors	X3/7 I4.00.2	pre-programmed
Parameters	X210/01 I0.00.0	pre-programmed
Manual/Automatic	X210/02 I0.00.1	pre-programmed
Start	X210/03 I0.00.2	pre-programmed
Stop	X210/04 I0.00.3	pre-programmed
Jog forward	X210/05 I0.00.4	pre-programmed
Jog reverse	X210/06 I0.00.5	pre-programmed
Cycle Stop	X210/07 I0.00.6	application
Manual Mode	X210/08 I0.00.7	application
Press, Continuous Operation	X210/09 I0.00.0	application must also be recorded in Parameter AA13
Open Feed Roll in Manual Mode	X210/10 I0.01.1	programmed in Parameter AA06
Interruption	X210/11 I0.01.2	programmed in Parameter A116
Measuring Wheel	X210/12 I0.01.3	programmed in Parameter AA07
Product Stop	X210/13 I0.01.4	application
Feed optimization	X210/14 I0.01.5	application
Open Feed Roll	X210/15 I0.01.6	programmed in Parameter AA05
Enable Feed Rolls Open	X210/16 I0.01.7	programmed in Parameter AA06
Tool acknowledge 1	EMD 1 I3.00.0	application
Tool acknowledge 2	EMD 2 I3.00.1	application
Tool acknowledge 3	EMD 3 I3.00.2	application
Tool acknowledge 4	EMD 4 I3.00.3	application
Tool acknowledge 5	EMD 5 I3.00.4	application
Tool acknowledge 6	EMD 6 I3.00.5	application
Tool acknowledge 7	EMD 7 I3.00.6	application
Tool acknowledge 8	EMD 8 I3.00.7	application

Block SIC	EMD 9 I3.01.0	programmed in Parameter AA14
	EMD 10 I3.01.1	free
	EMD 11 I3.01.2	free
	EMD 12 I3.01.3	free
	EMD 13 I3.01.4	free
	EMD 14 I3.01.5	free
	EMD 15 I3.01.6	free
	EMD 16 I3.01.7	free

Fig. 5-1: Hardware Inputs

Hardware Outputs

Function	Inputs	Comment
Ready	X3/8	pre-programmed
Warning	X3/10	pre-programmed
DU Message	X3/11	pre-programmed
Manual	X210/17 Q0.00.0	pre-programmed
Automatic	X210/18 Q0.00.1	pre-programmed
Fault	X210/19 Q0.00.2	pre-programmed
Run	X210/20 Q0.00.3	pre-programmed
Permit press	X210/21 Q0.00.4	programmed in Parameter AA12
Feed angle 90%	X210/22 Q0.00.5	application
Parameters	X210/23 Q0.00.6	programmed in Parameter AA08
Open Feed Roll	X210/24 Q0.00.7	programmed in Parameter AA05
Press Intermittent	X210/25 Q0.01.0	programmed in Parameter AA13
Manual Mode	X210/26 Q0.01.1	application
Press Immediate Stop	X210/27 Q0.01.2	application
Feed Complete in Set-Up Mode	X210/28 Q0.01.3	application
Tool 1	EMD 1 Q3.00.0	application
Tool 1	EMD 2 Q3.00.1	application
Tool 1	EMD 3 Q3.00.2	application
Tool 1	EMD 4 Q3.00.3	application
Tool 1	EMD 5 Q3.00.4	application
Tool 1	EMD 6 Q3.00.5	application
Tool 1	EMD 7 Q3.00.6	application
Tool 1	EMD 8 Q3.00.7	application
SIC Fault	EMD 9 Q3.01.0	programmed in Parameter AA14
	EMD 10 Q3.01.1	free
	EMD 11 Q3.01.2	free
	EMD 12 Q3.01.3	free
	EMD 13 Q3.01.4	free
	EMD 14 Q3.01.5	free
	EMD 15 Q3.01.6	free
	EMD 16 Q3.01.7	free

Fig. 5-2: Hardware Outputs

6 System Control (BTV04)

6.1 Overview of the System Architecture



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Fig. 6-1: BTV04 for System Control

The system can be used with the BTV04 as an input and operator console. Alternatively, a PLC or PC can be used as the input and operator console. In either case, the 24V inputs and outputs must be wired. System control using the BTV04 is described in this chapter.

Language

The BTV04 user interface supports different languages. Parameter B000 is used to change the language selection. The BTV04 displays the language selected in this parameter.

Password Protection

The BTV04 has 3-level password management. This makes it possible to password-protect certain BTV04 screens. No passwords are active when the product is shipped from the factory.

The user management is as follows:

- User Password (Level 3 - lowest priority)
- Service Password (Level 2)
- Master Password (Level 1 - highest priority)

The protected screens are marked in the architecture (see Fig. 6-2: BTV04 – Overview 1 and Fig. 6-3: BTV04 – Overview 2).

Explanation of Password Settings

To activate passwords, switch to the BTV Parameter menu by pressing SHIFT+F1. Then, press the following keys: "F2 – System Parameters" and "F1 – Password Setup." If the Level 2 password is not activated, the Level 3 password is automatically invalid.

6.2 Overview of the System Architecture

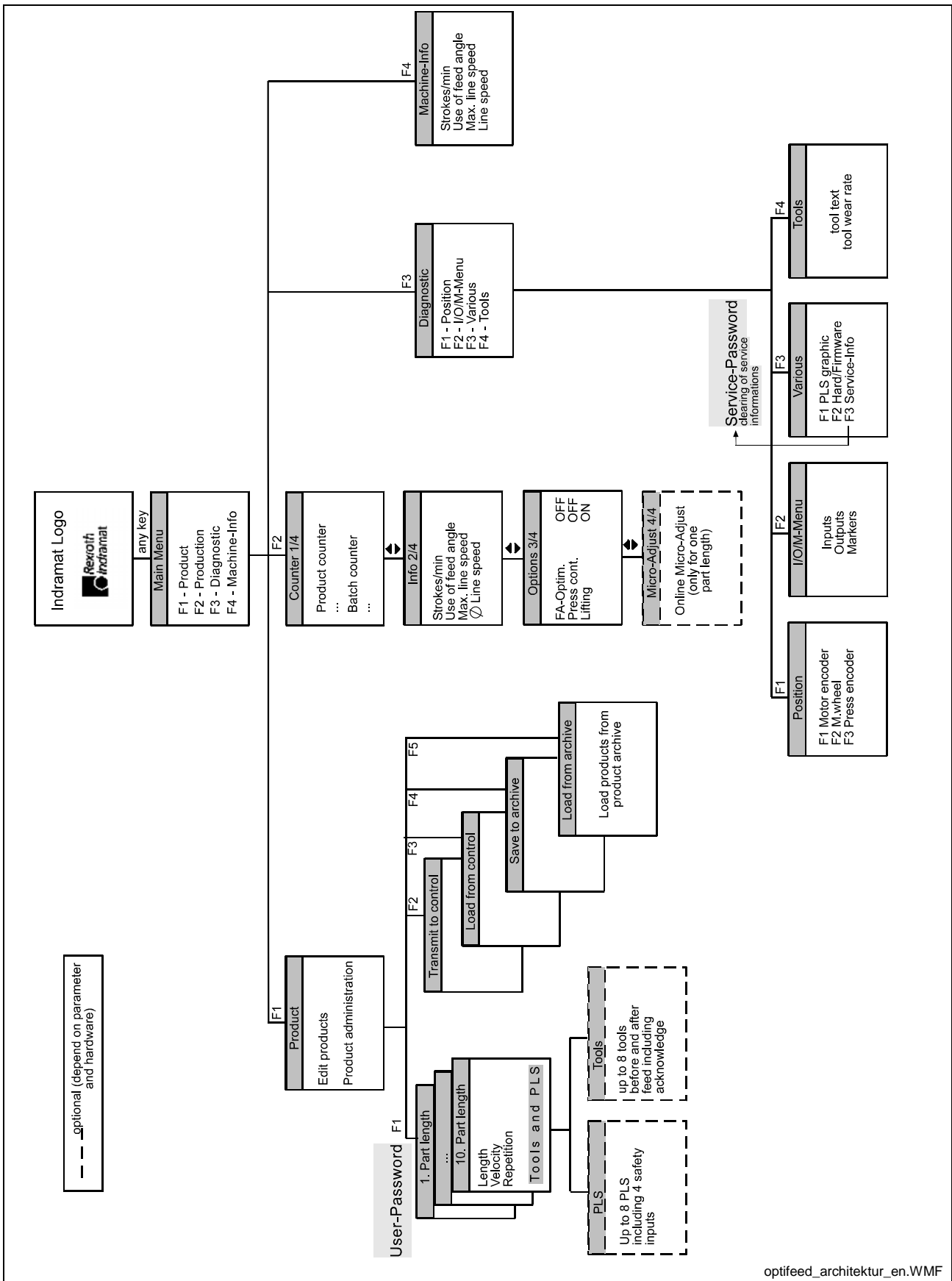


Fig. 6-2: BTV04 – Overview 1

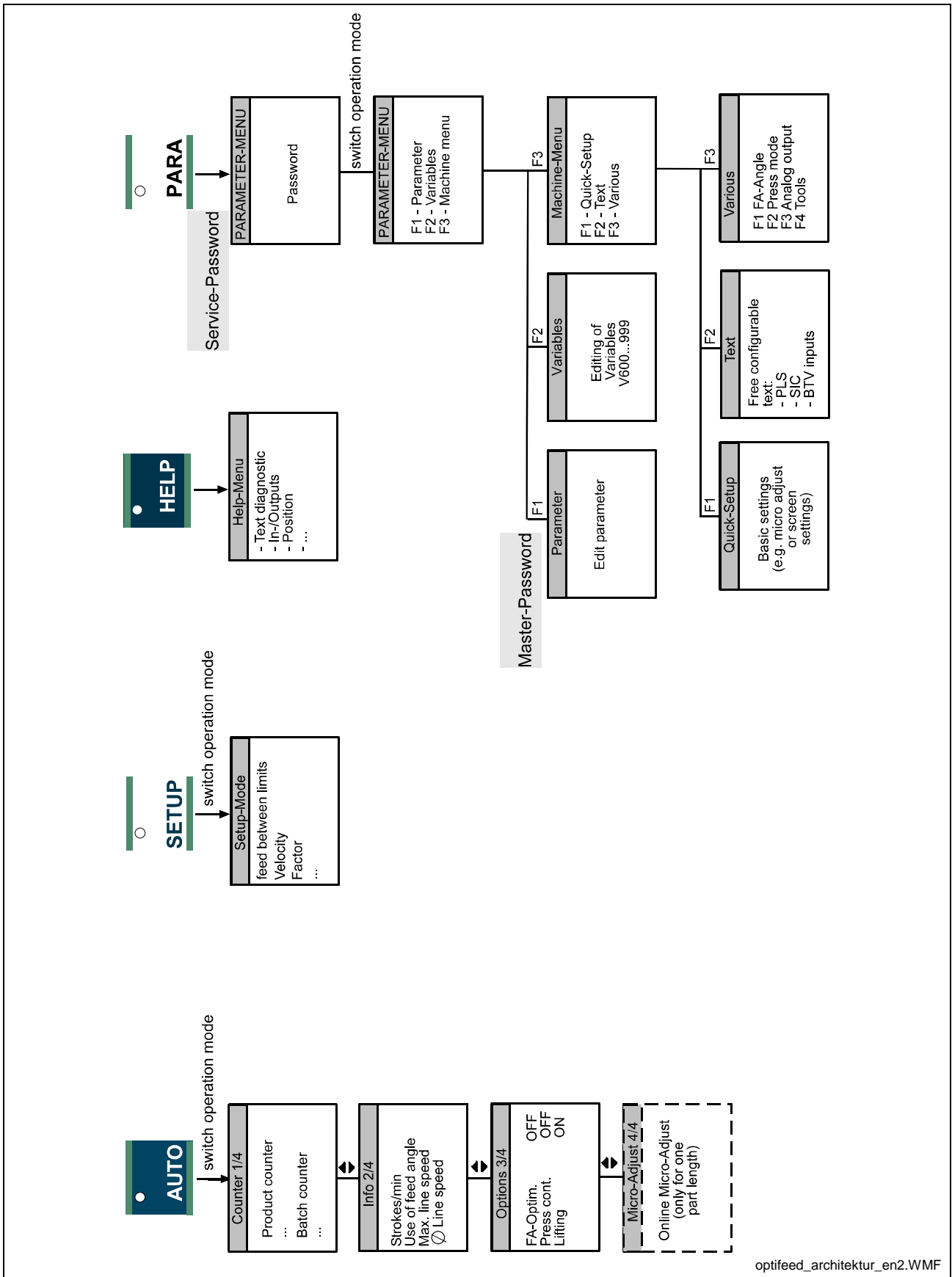


Fig. 6-3: BTV04 – Overview 2

6.3 BTV04 Display/Keys/LEDs

The display has a resolution of 128x64 pixels and can display 7 text lines of 21 characters each.

The display informs the user of the current system status and displays plain-text diagnostic messages.

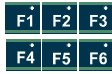







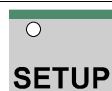
The keypad contains all required keys for data input (parameters, feed length, product counter, etc.) and for system control (mode change, start, stop, etc.).









The LEDs on various keys signal to the machine operator the current status or the selected operating mode of the Optifeed-CS system.

BTV04 Keypad Description

This section describes the general functionality of the BTV04 keypad. Any deviations from these general descriptions are noted. As previously mentioned, the system can be controlled using the BTV. For this to be possible, the BTV04 inputs and outputs must be correctly wired (see connection diagrams). In the following description of the keypad, wiring according to the connection diagram is assumed.

Note: Some keys have dual functionality, which can be seen by their two-color (green/blue) labels. Pressing and holding SHIFT activates the key functions labeled in green.

Keys	
Symbol	Definition
	<p>F1 to F5 are function keys which are used to select menus or functions.</p> <p>The F6 key is exclusively designed to activate/deactivate Relay Mode. Relay Mode increases transmission capacity when PC software (e.g. MotionManagerNT) is in use.</p>
	<p>The arrow keys enable navigation inside a screen or activation of input fields. When inputting parameters, they also perform additional functions for scrolling through parameter groups.</p>
	<p>The page keys allow paging through screen contents. This function significantly simplifies working in nested menus.</p> <p>During parameter input, pressing the page keys increments the parameter value by 1 up or down.</p>
	<p>The alphanumeric keypad allows data input and loading/saving products in the BTV04 Product Administration. Except for in the Product Administration screen, user input of alphabetical characters is not required. In the BTV Machine Menu, individual text strings can be stored, which increases the use of alphabetical characters. To compose the character "B," for example, the character key must be pressed twice while holding the SHIFT key; to compose the character "C," the character key must be pressed 3 times, etc.</p>
	<p>PARAMETER – The Parameter Menu is called up and the controller switches to Parameter Mode. Pressing the key again closes Parameter Mode and the display returns to the Main Menu. The controller is in a state of "Ready for Operation."</p>
	<p>START – When the system is in "Automatic" Mode, pressing this key starts the program.</p>
	<p>AUTO – The display switches to the first of four production menus and the controller switches to Automatic Mode. In the displayed screens, product and part counters can be set, system-specific functions can be activated and system information can be requested. Pressing the key again cancels Automatic Mode and the system switches to Manual Mode. Switching to or from AUTOMATIC Mode is only possible when a product has been correctly completed, or it must be specifically cleared.</p>
	<p>STOP – Causes an immediate stop of the system. The system is stopped as quickly as possible, without regard to the feed. The system can only be restarted when the error source has been eliminated.</p>
	<p>SETUP – The display switches to the Setup Menu screen and the controller switches to Setup Mode. In Setup Mode, a progression is only possible within the set part length. The axis is moved using the JOG keys. Pressing the SETUP key again closes Setup Mode and returns to the Main Menu. Switching from SETUP or AUTOMATIC Mode to another operating mode is only possible when a product has been correctly completed (see RDY screen on BTV display), or it must be specifically cleared.</p>

 <p>JOG+ JOG-</p>	<p>JOG-/JOG+ - In Manual Mode, a progression occurs in a positive (toward the press) or negative (away from the press) direction. Movement occurs by pressing the keys and is stopped by releasing the keys. In Setup Mode, a progression occurs only in increments of the set piece length; this length can be no shorter or longer.</p>
 <p>CLEAR</p>	<p>CLEAR – Using the CLEAR key, error messages are cleared. To clear an error, it must first have been eliminated, otherwise the error screen will continue to be displayed. In the first Production Menu, clearing the product and piece counter is done using the CLEAR key. In the "Position Lag" menu, the position can be reset using the CLEAR key. In the Tool Menu, the wear counters are reset. To avoid waste, when switching from Auto to Setup Mode or vice versa, the system waits in the current mode for the product to be completed. To force a mode change, the CLEAR key can be used. In this case, output X5/10 must be connected to DKC input X3/7.</p>
 <p>C-STOP</p>	<p>C-STOP – Stopping the system occurs after the end of a cycle.</p>
 <p>DEL</p>	<p>Hold the DEL – SHIFT key and press the DEL key: A marked input is completely cleared.</p>
 <p>HELP</p>	<p>HELP – Calls up the Help screen. Besides the error message and the expanded clear-text diagnostic, information about the BTV and drive status is shown. If the HELP key is pressed again within the Help Menu, user-defined diagnostic text strings are assigned to the BTV and the safety inputs. In case of an error, the machine user is therefore able to quickly limit the error and eliminate it.</p>
 <p>ESC</p>	<p>ESC – Jump to previous menu. Cancel functions or data input.</p>
 <p>MAIN MENU</p>	<p>MAIN MENU – Leave the current screen and return to the Main Menu.</p>
 <p>OK</p>	<p>OK – Data input is accepted and saved only via the OK key. Switching to another screen does not automatically save data. Note: As long as a data input has not been saved, it is shown in italics.</p>

Key Combinations with SHIFT	
Symbol	Definition
SHIFT+F1	Calls the BTV Parameter Menu.
SHIFT+F1	Calls the Machine Menu without setting the operating mode to Parameter Mode.
SHFIT+ESC	Causes a re-boot of the BTV04. This key combination is equivalent to turning the BTV04's 24V power supply off and then on again.

Fig. 6-4: Key Labels

Note: The keys marked with an asterisk * cause a response from the DKC21.3 only if the corresponding BTV output is connected to the designated input on the DKC.

BTV04 Menus

After turning on the OPTIFEED-CS system, the BTV04 display shows a "Start Logo" which is replaced by the Main Menu after pressing any key (except ESC) or automatically after 5 seconds.



Abb_5_01_en.WMF

Fig. 6-5: Start Logo

Turning on the System for the First Time

When the BTV is connected to the DKC21.3 digital controller for the first time, a Format List of all parameters and NC data is transmitted on a one-time basis. This process also occurs when the language is changed (FLP Parameter B000). The procedure can last several minutes.

For additional branching, two main possibilities are available:

- Pressing the displayed function keys (F1 – F3), and thus branching into the displayed menus.
- Pressing the PARA, SETUP or AUTO keys, to open the specific screens for these operating modes.

Status Line

The first line of the BTV04 display is the status line. It can be in two different formats:

1. A plain text message about the current status, like "PARAMETER MODE" or "Initialization."
2. X: STATUS MESSAGE, where X is to be interpreted as an indicator of the current operating mode and STATUS MESSAGE contains information about the system.

Explanation:

A: AUTOMATIC MODE

S: SETUP MODE (MANUAL)

M: MANUAL MODE (MANUAL)

Example:

A: NO CYCLE START – The system is in Automatic Mode and is waiting for cycle to start.

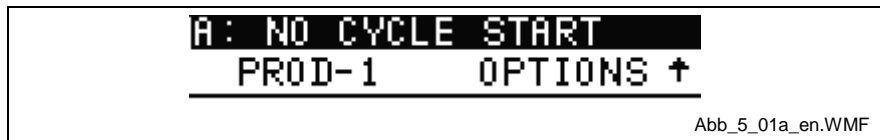


Fig. 6-6: Diagnostic Message

LED Display

Besides, the status line, the LEDs on some of the BTV04 keys help to see the currently active operating mode and the status of the inputs/outputs. The BTV LEDs show the selected operating mode.

Main Menu



Fig. 6-7: Main Menu

Press one of the displayed function keys or select a new screen using the operating mode keys (AUTO, SETUP or PARA).

6.4 Product Screen (F1 from Main Menu)

Illustration of the saving organization or data storage.

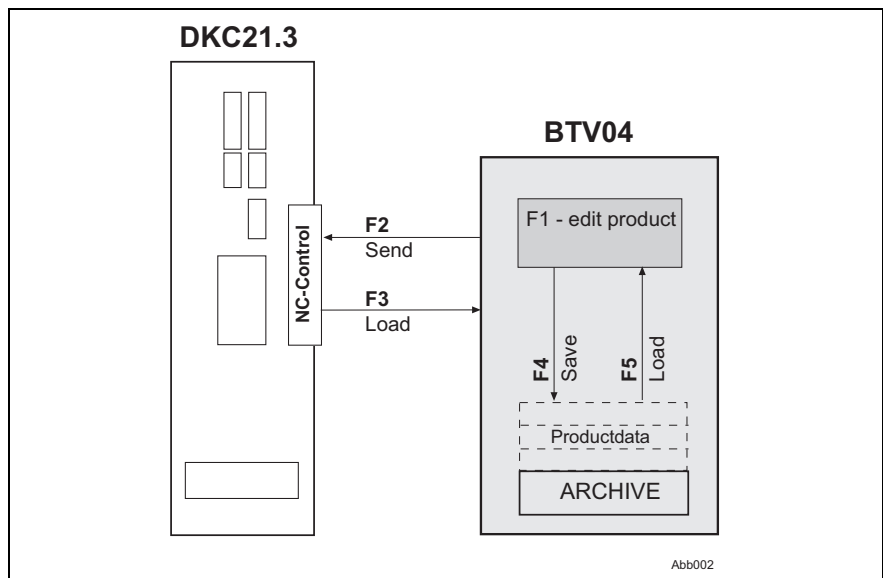


Abb. 6-8: Save Organization

The BTV04 internally saves the product that was last transmitted to the control; this ensures immediate access to the last transmitted product data after restarting the machine.

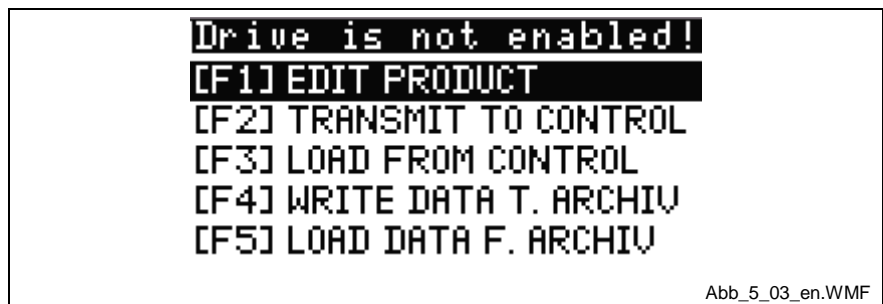


Fig. 6-9: Product Screen

Via the various product menus, you can store up to 99 products in the BTV memory (archive) and call them back up as required. However, data can also be read directly from or written directly to the control. In addition,

it is possible to prepare another product without stopping the running production process. During the production process, it is not possible to transmit data to the control.

Edit Product (F1 from the Product Screen)



Fig. 6-10: Edit Product:

This menu is for setting up new products. The BTV04 display unit "remembers" the product transmitted to the control and prepares all relevant product data for further editing, even after restarting the system.

The Product Input screen is designed as a scroll menu, so pressing the arrow keys shifts the contents of the screen up or down. Depending on the number of Part Lengths (1-10), the size of the scroll menu is increased or decreased. The active line is displayed with inverted highlighting (dark background).

- | | |
|---------------------------|---|
| PRODUCT | Here, a name is assigned to the product. This name can be made up of 10 alphanumeric characters. The name is saved as a product name in the BTV memory. |
| T_LENGTH | The input designates the number of part lengths of a product. The smallest value is "1," the largest value "10." Any inputs outside of this range are limited automatically. |
| Length1...Length10 | The display of Length 1 and Length 2 to Length 10 show information about the currently programmed part length, which cannot be edited. To change data for the part lengths, press OK when the desired part length is active (inverted highlighting). Another menu for defining the part length appears. For further details, see "Part Lengths (Submenu of Product Input)." |

Note: Only the number of part lengths listed in T_LENGTH are shown.

- | | |
|---------------|---|
| ACCEL. | The acceleration entered here affects the whole product, including all part lengths. The value is input in percent and references the maximum allowable acceleration that is entered in Parameter A108 "Acceleration." |
| DECEL. | The deceleration entered here affects the whole product, including all part lengths. The value is input in percent and references the maximum allowable deceleration that is entered in Parameter A108 "Acceleration." |
| FACTOR | The length factor is a corrective value for directly changing the length of all programmed part lengths. Therefore, the possibility exists to adjust the lengths without changing the feed rate constant (Parameter A101), which would lead to a change in operating mode (Parameter Mode). |

Note: Transmitting product data is not allowed during the production process. This is possible only when the control is in Manual Mode. The BTV04 status display signals MANUAL mode with the shortcut "M." "M:“ for Manual Mode (Manual)

PLS / PLS Not Active If the text "PLS not active" appears, the PLS display screens have not been activated in the BTV Machine Menu.

Input dialogs for the PLS are selected by pressing OK when the text line is active (inverted highlighting). For details about the PLS, see "PLS (Submenu of Product Input)." Besides the 8 possible PLSs, the safety inputs are also designated here.

PLS and SIC Inputs (Submenu of Product Input)



Only available when the PLS is activated in the BTV !

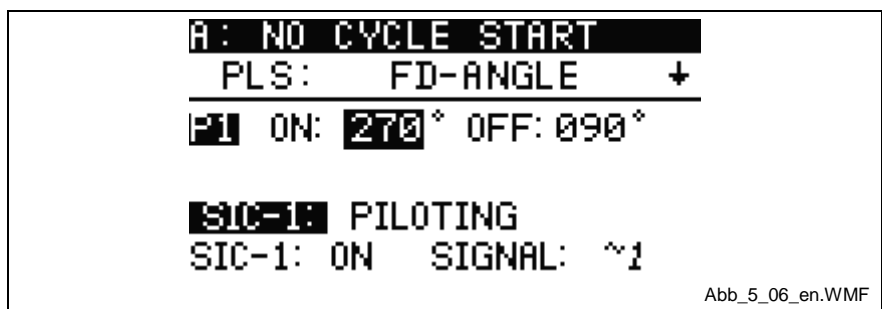


Fig. 6-11: PLS

For each PLS, a separate menu is available. The page keys scroll between the eight PLS menus. The first four PLS menus contain additional input fields for descriptions of safety inputs (SIC function), provided this function is activated in the machine menu.

Use the right arrow key to jump to the first input field of the PLS menu.

Pressing the down arrow jumps to the input fields for the SIC inputs, provided the SIC function is activated.

PLS

The PLS offers the possibility of various settings, which are usually machine-dependent (compensation of a reset relay at the PLS output, or similar), and not product-dependent. For this reason, the user is required to input when to switch on and off in 0-360 degrees. These two inputs are permanently saved to the product.

Additional PLS settings are to be made via the control's Parameter Group N1. Parameter settings for the control are not saved with the product (therefore in the BTV).

A programmable text can be assigned to each PLS, which is displayed with the PLS. The text can be entered by activating/deactivating the PLS menu in the BTV04 Machine Menu (Machine Menu → F2 Text) This text is saved in the BTV and must be input again if the BTV is replaced.

ON / OFF Points at which to switch on and off the corresponding PLS, in 0-360 degrees.

SIC Inputs

SIC stands for Security Input Control. Four inputs are present, which are controlled according to the PLS position.

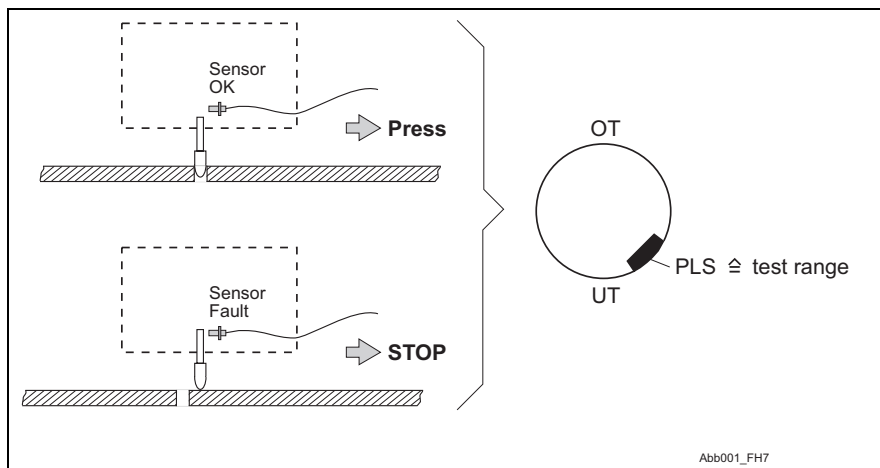


Fig. 6-12: SIC Graphic

The assignment of SIC inputs to PLSs is as follows:

- SIC 1 to PLS 1
- SIC 2 to PLS 2
- SIC 3 to PLS 3
- SIC 4 to PLS 4

As described in the PLS section, a programmable text string can be assigned to the SIC inputs in the BTV04 Machine Menu.

SIC monitoring is active in all operating modes. However, the four SIC inputs can be completely disabled via an input on the EMD module (Input 9). Separately enabling individual SIC inputs is also possible, and is described in the following section (see also Controller Parameters AA14 – AA18).

SIC ON/OFF If an SIC input is not needed, it can be turned off. To turn off, the SIC input must be set to OFF. Then, no monitoring of this input occurs.

SIC SIGNAL For compatibility with various signal sources, an individual test signal is assigned to each SIC input:

The definition of the signal selection is as follows:

0 = Test for Signal Level 0 – when not enabled, tests for a change in the leading edge, whereby the input must be "0" within the entire test range.

1 = Test for Signal Level 1 – when not enabled, tests for a change in the leading edge, whereby the input must be "1" within the entire test range.

0>1 = Test for a rising edge within the test range.

1>0 = Test for a falling edge within the test range.

~0 = Test for Signal Level 0 when exiting the test range.

~1 = Test for Signal Level 1 when exiting the test range.

Part Lengths (Submenu of Product Input)



Tool selection only available when the tools are activated in the BTV. A requirement for tool control is the EMD I/O expansion module !

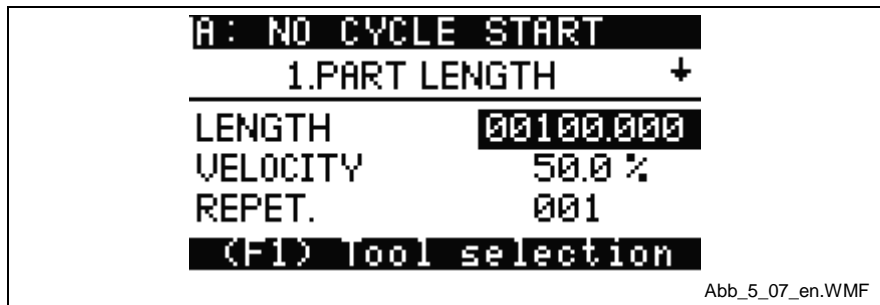


Fig. 6-13: Part Lengths

Here, the relevant data for part lengths are detected. In addition to length, velocity and repetitions, the outputs for tool control and their acknowledgements can also be programmed (must be activated in the BTV Machine Menu – see section "Machine Menu," Submenu Quick-Setup).

The page keys are used to scroll forward and backward within the programmed part lengths.

- | | |
|--------------------|---|
| LENGTH | The maximum allowable length is 99999.999 IU (input units) and is dependent on the parameter values set in the DKC21.3. |
| VELOCITY | A different velocity can be assigned to each part length. The input is in percent and is referenced to Parameter A106, "Maximum Velocity." |
| Repetitions | Each part length can be repeated up to 999 times. Both in Manual Mode (Setup Mode) and Automatic Mode, the next part length is processed only after the programmed repetitions have been processed. |

The last line of this menu can display 3 different messages:

1. F1=PRODUCT
All part lengths are programmed; pressing F1 returns to the Product Input menu.
2. (F1) NEXT LENGTH
The product consists of multiple part lengths and not all part lengths have yet been programmed. Pressing F1 displays the next part length.
3. (F1) Tool Selection
In the Machine Menu of the BTV04, it was determined that a tool control operation should occur. Up to 8 outputs (before and after the feed) and up to 8 acknowledgement inputs (before and after the feed) can now be set and requested per part length. Pressing F1 displays the Tool Programming menu (see section entitled "Tool Control (Submenu Part Lengths)").

Tool Control (Submenu Part Lengths)



Tool selection only available when the tools are activated in the BTV. A requirement for tool control is the EMD I/O expansion module !

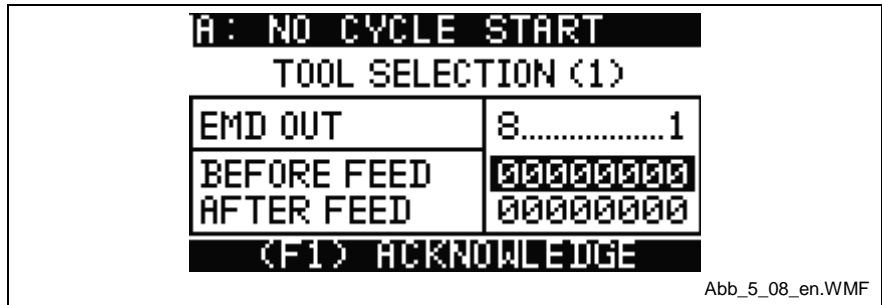


Fig. 6-14: Tool Control

The second display line indicates by the digit inside the parentheses which part lengths are involved (e.g. "TOOL ACKN (2)," the second part length. Pressing F1 pages to the next Tool Menu; pressing ESC brings up the previous screen. If all tools are programmed for the part lengths, pressing F1 causes a jump back to the Product Input Menu.

Setting Tools

BEFORE FEED In this menu, you set the tools that should be powered before initiating a feed. Communication with up to 8 outputs can occur.

AFTER FEED In this menu, you set the tools that should be powered after initiating a feed. Communication with up to 8 outputs can occur.

Syntax:

The syntax of the input is to be understood as follows:

- 0 = Output is set to zero
- 1 = Output is set to 1
- 2 = The output remains unchanged.

Acknowledgement of Tools

ACKN BEFORE In this menu, it is determined how the acknowledgement of the set tools should occur before the feed. Up to 8 acknowledgement inputs can be designated.

ACKN AFTER In this menu, it is determined how the acknowledgement of the set tools should occur after the feed. Up to 8 acknowledgement inputs can be designated.

Syntax:

The syntax of the input is to be understood as follows:

- 0 = Wait for zero signal
- 1 = Wait for 1 signal
- 2 = Acknowledgement is disabled

Transmit to Control (F2 from Product Input screen)



Fig. 6-15: Transmit to Control

Pressing F2 transmits the product data that are currently present in the BTV.

If the controller is in SETUP or Automatic Mode, no data can be transmitted. This is signalled by the appearance of a Notes screen. In this case, you can switch the operating mode, for example to Manual Mode.



Fig. 6-16: Note System Running

Load from Control (F3 from Product Input Screen)

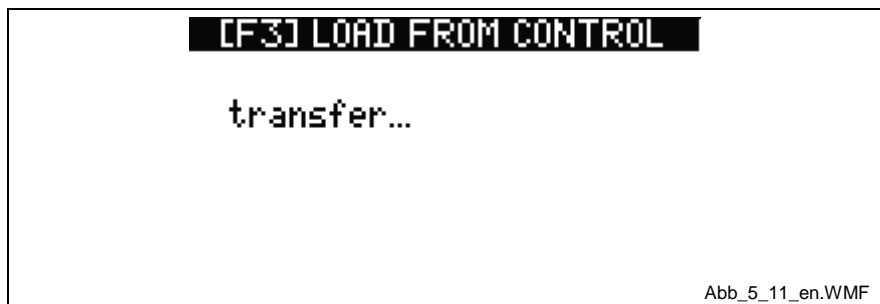


Fig. 6-17: Load from the Control

Pressing F3 reads out the product data from the control's working memory, and these are available for editing (see also "Edit Product") in the BTV.

Data can be read out in any operating mode at any time.

Note: By reading the product data from the control, all data except the product name are transmitted to the BTV.

Write Data to BTV (F4 from Product Input Screen)

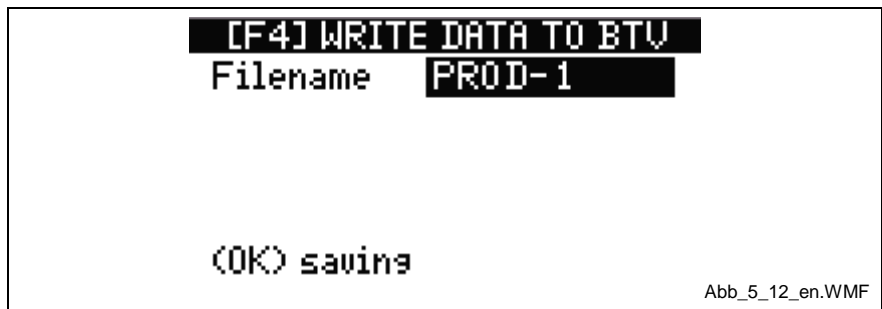


Fig. 6-18: Write to Flash

In this menu, saving occurs in the file system of the BTV. Here, the user can again edit the product name. Pressing OK initiates the save procedure. If a file with the same product name exists, the user is informed via the following screen:

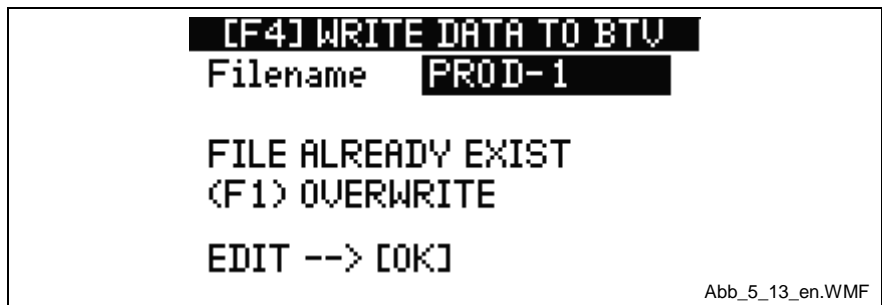


Fig. 6-19: Note about saving

There are a total of 2 available inputs.

- Pressing F1 overwrites the existing file in the BTV file system with the current inputs.
- The user changes the product name and reinitiates the save process by pressing OK.

Load Data from BTV (F5 from Product Input Screen)

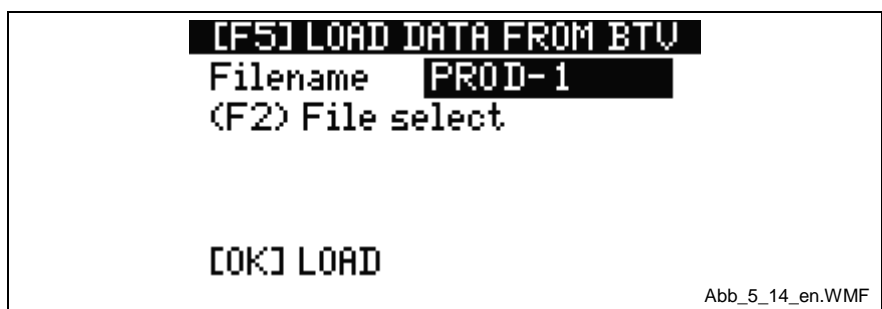


Fig. 6-20: Load Data from BTV

Data can be loaded from the BTV file system in two ways:

1. The product name is input directly into the input field "Filename" using the alphanumeric keypad. Pressing OK starts loading the product. In case of an error (the product name is not found in the file system), the message "File not found" is output to the BTV display.
2. Pressing F2 opens a list of all loaded products. Using the arrow keys, one can select the desired product and confirm by pressing OK.

Via the product list, previously loaded products can also be deleted. To do this, the product to be deleted must be selected using the arrow keys; then DEL (Shift+DEL) must be pressed.

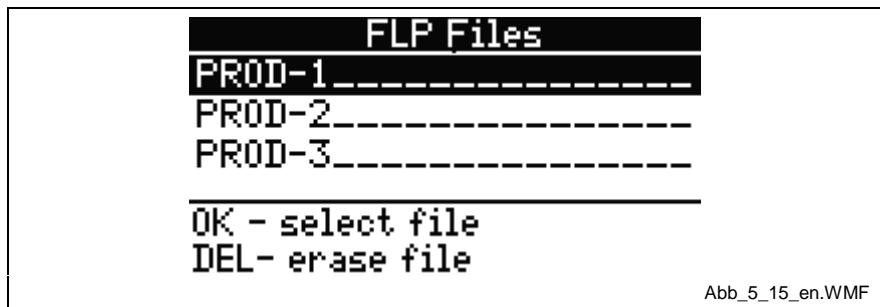


Fig. 6-21: Flash List

6.5 Production Screen (F2 from Main Menu)

In the following menus, which can be paged with the arrow keys (Page up, Page down), the user has all the relevant data to control and view the production process.

Pressing AUTO also leads to the Production screens.

Production/COUNTER

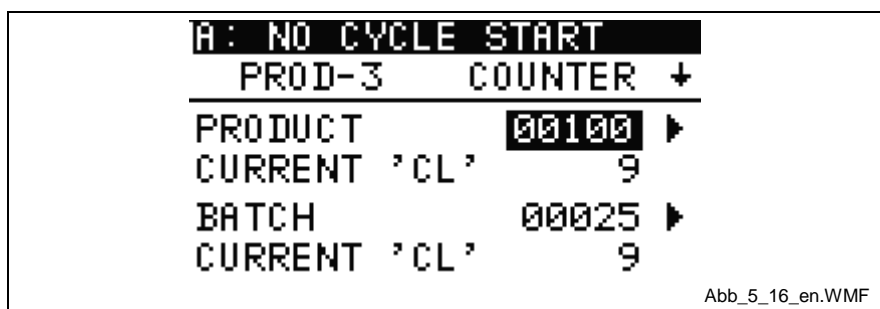


Fig. 6-22: Production Counter

PRODUCT The product counter designates the total production quantity for a product. After reaching the value of this counter, the system and the press are stopped and the current counter values for the product and batch counter are set to zero. A message is issued on the BTV and BTV Output X5/11 is set to 24V.

Pressing OK sets the BTV04 output back to 0V and the display returns to Screen 1 of the Production Menu.

To restart the system a new start signal is required.



Fig. 6-23: Product Counter Message

BATCH The batch counter designates the quantity for part production of a product and is intended for filling boxes, palettes, or similar containers. After reaching the value of this counter, the system and the press are stopped and the current counter value for the batch counter is set to zero. A message is issued on the BTV and BTV Output X5/11 is set to 24V. Pressing OK sets the BTV04 output back to 0V and the display returns to Screen 1 of the Production Menu.

To restart the system a new start signal is required.



Fig. 6-24: Batch Counter Message

CONTINUOUS OPERATION, e.g. deactivating counter monitoring occurs when "0000" is input into the product and batch counter.

Resetting the Product and Batch Counter

In the Production screen, "Production/Counter" the CLEAR key has a special meaning. Pressing CLEAR opens an additional menu:

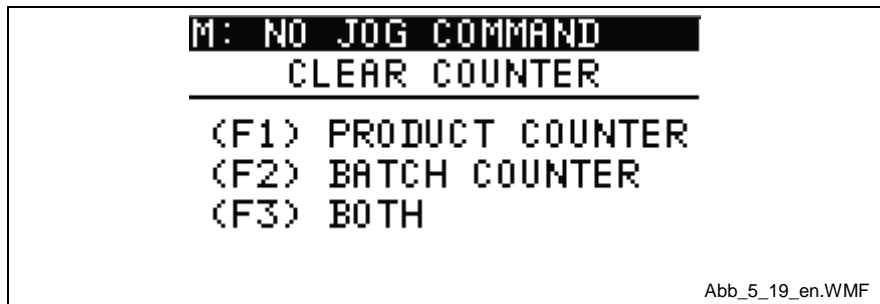


Fig. 6-25: Clear Counter

In the displayed selection menu, three functions are available:

1. (F1) PRODUCT COUNTER: Only the current product counter is set to zero.
2. (F2) BATCH COUNTER: Only the current batch counter is set to zero.
3. (F3) BOTH: The product and batch counters are set to zero.

After resetting the counters, the BTV04 returns to the "Production/Counters" screen.

Production/INFO (Page Down from COUNTER)

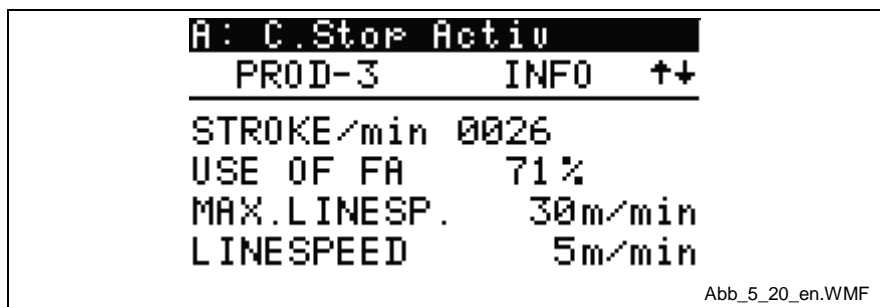


Fig. 6-26: Production Information

This is a screen with information only; no changes or inputs can be made.

- STROKES/min** Shows the current quantity of strokes for the system in **Strokes per Minute**.
- USE OF FA** Shows the use of the feed angle in percent, which is calculated via the control. A value less than 90% signals to the machine user that the maximum feed velocity has not yet been reached and the press velocity can be increased. If a value of 100% is exceeded, this leads to a feed angle loss that immediately stops the system. The error is displayed in the BTV04 status line. If the feed angle range is not fully occupied, automatic feed optimization is possible (see Production/Options).
- NOTE:** In case that use of feed angle is > 99%, but no error message is generated, please check the parameters A111 „Switching Threshold“ and A113 „In-Position Window“ !
- MAX. LINESP.** Shows the **maximum Linespeed** velocity in m/min or i/min. The maximum system velocity is dependent on Parameter A106 "Maximum Velocity" of the DKC21.3 drive controller.

LINESPEED Shows the actual **Linespeed** velocity in m/min or i/min. Here, the current velocity of the system is used for the calculation.

Note: The units m/min and inch/min can be selected in the BTV04 Machine Menu.

Production/OPTIONS (Page Down from INFO)

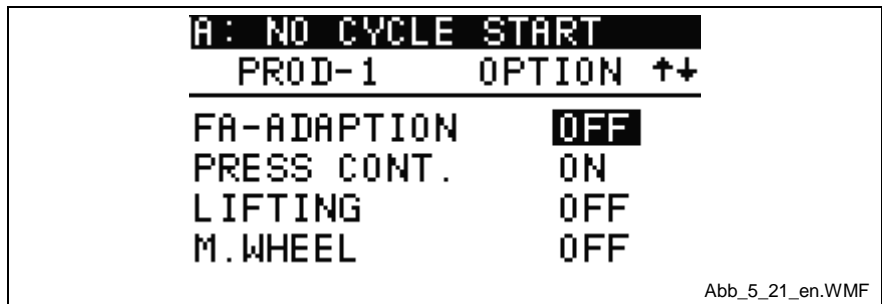


Fig. 6-27: Production Options

During operation, the functions listed below can be activated/deactivated. Use the left/right arrow keys to activate/deactivate and confirm the setting by pressing OK. It is possible to use these options even without the BTV. In this case, the functions are executed via hardware inputs (see chapter entitled Inputs/Outputs).

Note: The signals via hardware inputs take priority, e.g. for access via the interface (BTV) and via hardware inputs at the same time, the hardware inputs take priority.

FA ADAPTATION To avoid unnecessarily high acceleration and deceleration ramps, a feed angle adaptation (adjustment) can be performed in Automatic Mode. When the press has reached the desired velocity, the function can be activated. In this case, depending on the feed angle load, acceleration and deceleration can be increased or decreased in programmable percentual steps (see also Chapter 4-7, Automatic Feed Adjustment).

PRESS CONT. If the operating mode Press Continuous is selected, the press is not turned off after a press stroke has occurred. In this case, the press is only turned off when a counter has been reached, an error occurs or a stop signal is issued.

„Online“ switching between single step and continuous mode via BTV04 is only possible, if this option is released in machine menu (press-mode) of the BTV04. Otherwise, this display line shows the input status of hardware input “Press continuous” (Parameter AA13).

LIFTING Function "Feed rolls open" As long as the signal is present to open the feed rolls, all measuring wheel movement is ignored and the output to open the feed rolls is turned on. A feed is delayed until the signal "Feed rolls closed" is present or a time programmed in Parameter AA05 has expired.

This option can only be used via the BTV04 if the marker M8.00.1 has been entered as the function enable bit in Parameter AA06. Otherwise, this option is grayed-out.

M.WHEEL Function „Measuring Wheel“. To equalize possible slip between the feed rolls and the material, the length measurement can be assigned to an external measuring wheel encoder instead of to the motor encoder.

This option can only be used via the BTV04 if the marker M8.00.0 has been entered in Parameter AA07. Otherwise, this option is grayed-out.

Production/Micro-Adjust (Page Down from OPTIONS)



This menu is only available when the programmed product consists of only one part length.

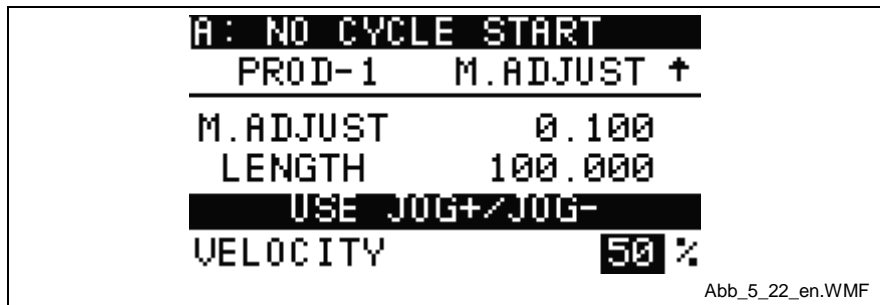


Fig. 6-28: Micro-Adjust

M.ADJUST Only for information of the effective correction value (Micro-Adjust). This value can only be edited in the BTV Machine Menu. Using the left and right arrow keys, the displayed micro-adjust value is added to or subtracted from the current length (see LENGTH display). This process can occur directly on-line and is effective immediately in the next cycle.

LENGTH Displays the actual product length. Pressing the right or left arrow key corrects the value according to the set micro-adjust increment. The length is only displayed and cannot be directly edited.

VELOCITY Offers the possibility to edit the velocity of the first feed length directly (online). Input is made in percent and is effective at next cycle.

6.6 Diagnostic Screen (F3 from Main Menu)



You only receive diagnostics about tools when the option Tools in the BTV Machine Menu is activated.



Fig. 6-29: Diagnostic Screen

In addition to the status line and the help menus, the user can find all important information under Diagnostic. The status of the inputs and outputs can also be requested here, as can the tool wear.

Positions (F1 from Diagnostic Screen)

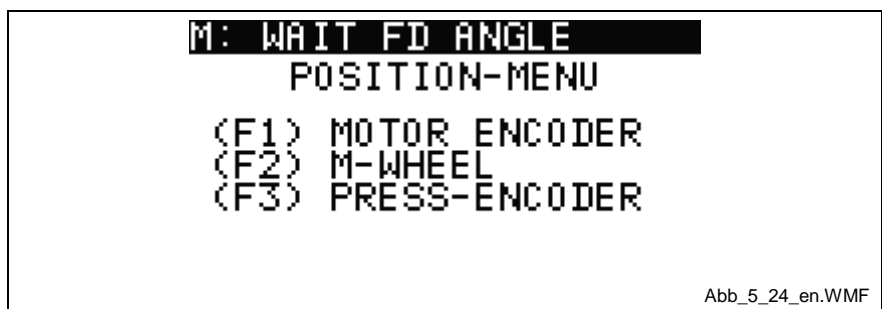


Fig. 6-30: Position Lag

Motor Encoder (F1 from Position)

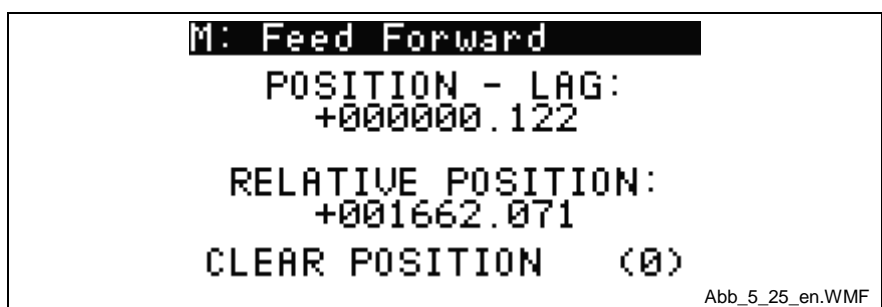


Fig. 6-31: Motor Encoder

In addition to the current position, the position lag is also displayed. By pressing zero, the current position is set to zero.

Measuring Wheel (F2 from Position)

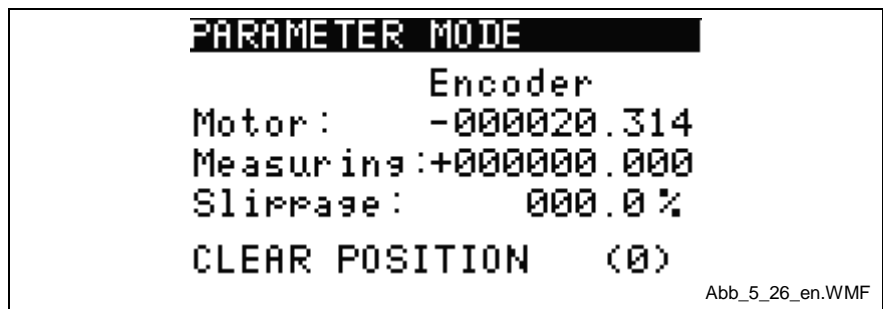


Fig. 6-32: Measuring Wheel

Positions of the measuring wheel and the motor encoder are signaled. The resulting slip is shown. By pressing zero, the current position is set to zero.

Press Encoder (F3 from Position)



Fig. 6-33: Press Encoder

Display of the Press Encoder Position

I/O/M Menu (F2 from Diagnostic Screen)

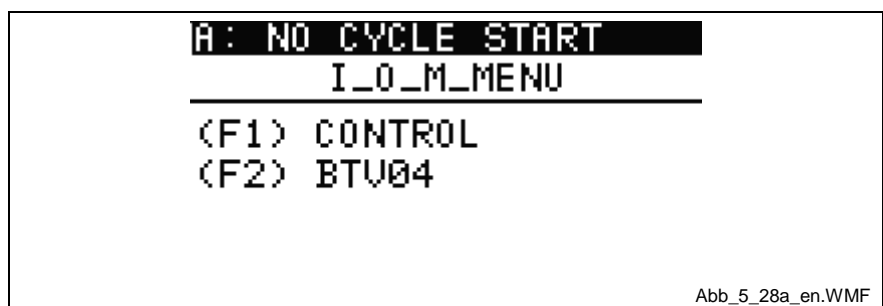


Fig. 6-34: I/O/M Main Menu

Select the desired information via function keys F1 or F2.

Control (F1 from I/O/F Menu)

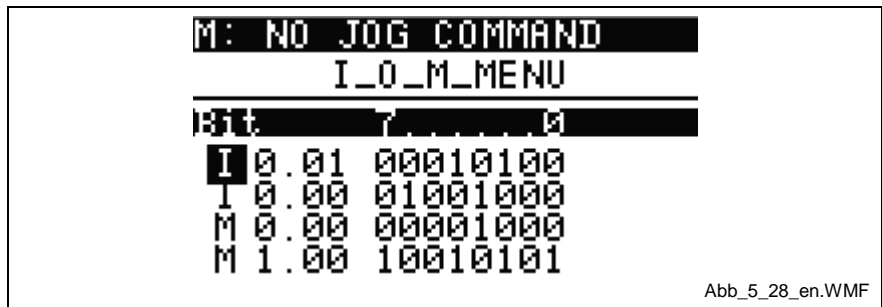


Fig. 6-35: Help Menu

It may be helpful to display information about markers, inputs and outputs simultaneously. For this purpose, this menu offers a user-configurable I/O/M menu. The lowest valued Bit 0 is shown at the right edge of the screen.

Each of the 4 lines can be filled as desired. To do this, the user sets the cursor to the first position at the left edge of the screen and selects from the following signals using the up and down arrow keys.

- Q = Output
- I = Input
- M = Marker Flags

Pressing the right arrow key leads places the cursor in the second configuration field, which determines the group to be displayed.

Examples:

I 0.00 Displays the assignment of input bits 0 to 7, which corresponds to Pin 1 to Pin 8 on the X210 connector.

M 3.00 Displays the first group of the retained NC markers.

The inputs become active immediately after pressing OK.

They are numbered from right to left.

BTV04 (F2 from I/O/M Main Menu)

OUTPUTS

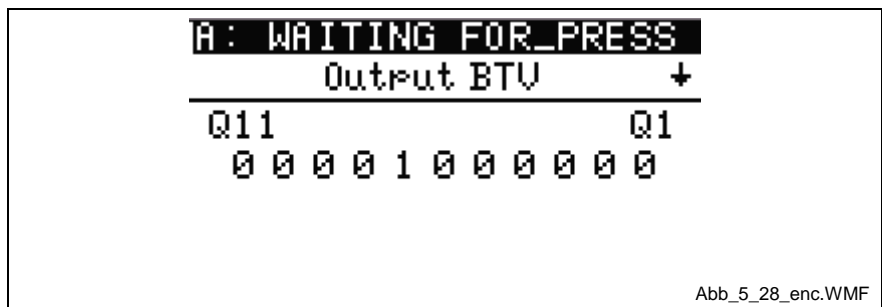


Fig. 6-36: BTV04 Outputs

The 11 BTV outputs are shown here. The definition of the individual bits is shown in the following table.

Output	Definition	Output	Definition
Q1	Parameter Mode	Q7	Cycle Stop (inverted)
Q2	Automatic Mode	Q8	Manual Mode (Setup)
Q3	Start Signal	Q9	Free
Q4	Stop Signal (inverted)	Q10	Fx-Key pressed = 24V Fx-Key released = 0 V
Q5	Jog Forward	Q11	Part Count Reached
Q6	Jog Reverse		

Fig. 6-37: BTV Outputs

INPUTS

The BTV inputs can displayed by pressing the Page Up key.

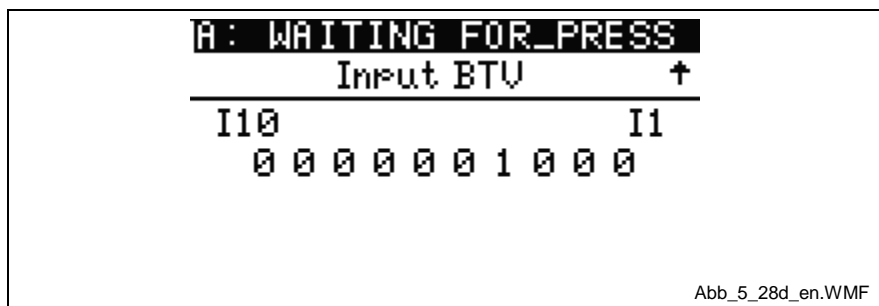


Fig. 6-38: BTV Inputs

The 10 BTV inputs are shown here. The definition of the individual bits is shown in the following table.

Input	Definition	Input	Definition
I1	External Jog	I6	Free
I2	External Immediate Stop	I7	Free
I3	External Immediate Stop	I8	Free
I4	External Immediate Stop	I9	Free
I5	External Immediate Stop	I1	Free

Fig. 6-39: BTV Inputs

Various (F3 from Diagnostic Screen)



Fig. 6-40: Various

PLS Graphic

The PLS Graphic shows the programmed PLSs in a bar chart form. It provides an orientation aid and enables a quick check of the set PLS areas.

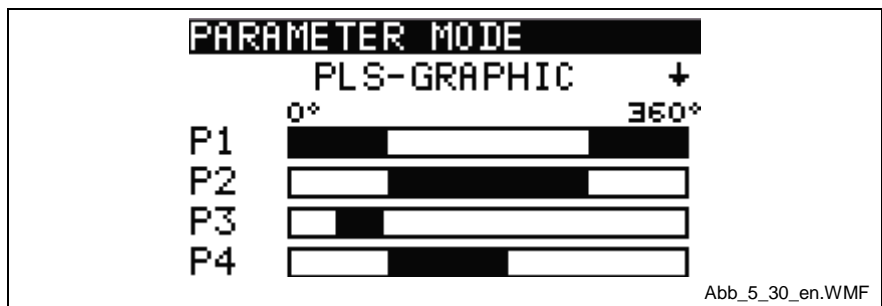


Fig. 6-41: PLS Graphic

Note: Offset values that have been set are always used in the calculation.

Firmware/Hardware

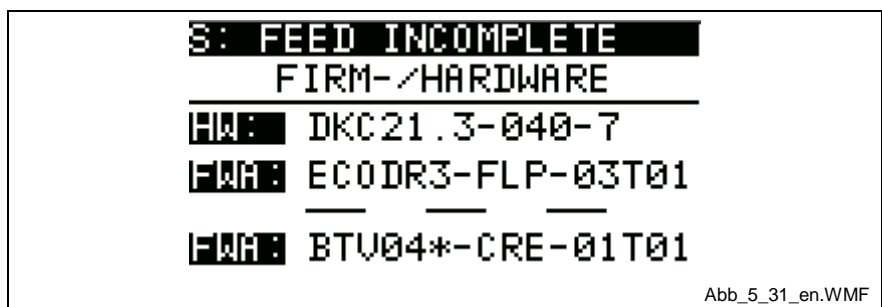


Fig. 6-42: Firmware/Hardware

This screen displays information about the firmware and the digital servo controller, and the BTV04 firmware version is displayed.

Service Info

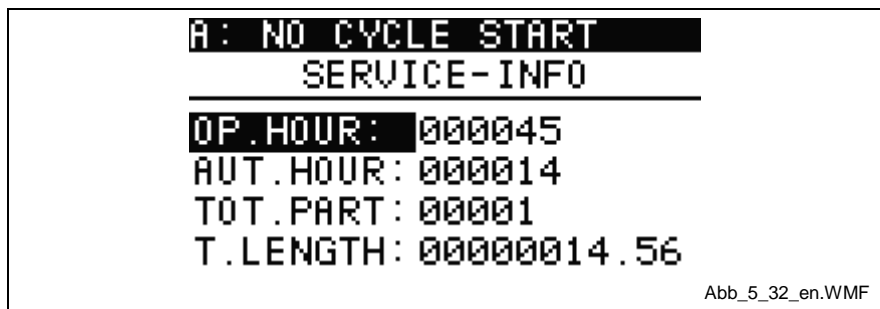


Fig. 6-43: Service Info

- OP.HOUR:** Total hours of operation (independent of Operating Modes).
- AUT.HOUR:** Total hours of operation which have been completed in Automatic Mode.
- TOT.PART:** Number of parts produced. The counter is not incremented up; this means that the counter is reset to zero when the programmed piece count is reached.
- T.LENGTH:** In AUTOMATIC Operating Mode, all moves are summed. The summed length value is displayed here. After exiting AUTOMATIC Mode, the length is set to zero.
- CLEAR (password-protected):** Select the information to be deleted using the arrow keys (with dark background, see AUT.HOUR in the Figure) and then press CLEAR. For unauthorized personnel, the clear functionality can be locked out by passwords in the BTV.

Tools (F4 from Diagnostic Screen)

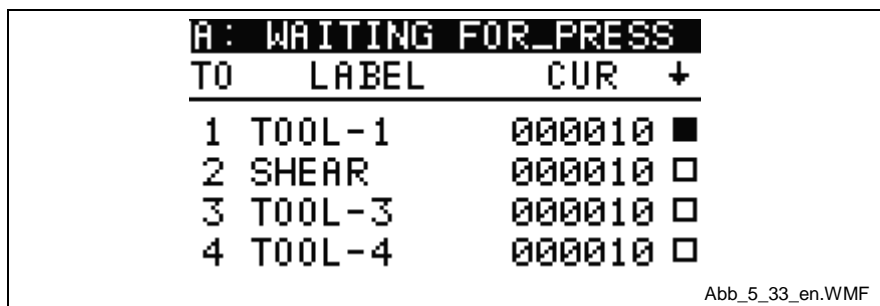


Fig. 6-44: Tools

The Tools option is only displayed when the Machine Menu screens are activated.

In the BTV04 Machine Menu, a tool counter and a plain text string can be stored. In this screen, the user gets information about the current status of the tool counter; by pressing the **Help Key**, the maximum programmed switch cycles of the tool are displayed along for each tool. This way, the user can monitor tool wear. A filled-in box at the right screen edge signals that the maximum number of switching cycles has been exceeded. In this case, replacing the tool is recommended.

Pressing the Page Down key shows tools 5 to 8.

Note: After replacing tools, the actual tool counter must be zeroed in the BTV04 Machine Menu.
The machine is not stopped when the tool wear counter is reached.

6.7 Setup Mode (SETUP Key)

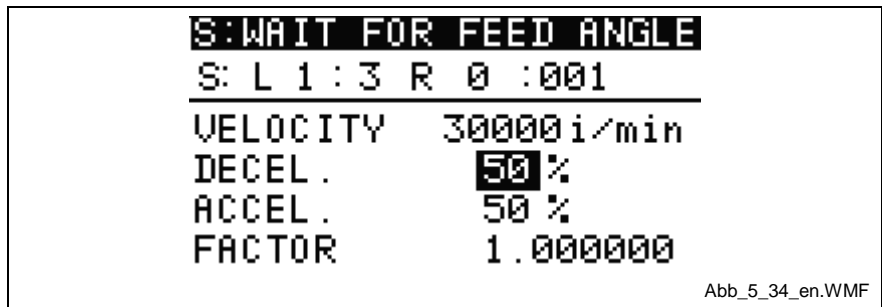


Fig. 6-45: Setup Mode

After pressing the SETUP key, the display switches to the Setup Menu screen and the control switches to Manual Mode (Setup Mode). In Setup Mode, a progression is only possible within the set part length. The axis is moved using the JOG keys. Pressing the SETUP key again closes Setup Mode and returns to the Main Menu. To avoid waste, switching from Automatic to SETUP Mode is only possible when a product has been correctly completed; "RDY" is then displayed.

The abbreviations "L" and "R" have the following definitions.

- **L stands for Length** and displays how many part lengths make up the entire product, or which part length is currently being processed.
- **R stands for Repetitions** and displays how many repetitions are programmed for the currently displayed part length, or how many repetitions have already been processed.

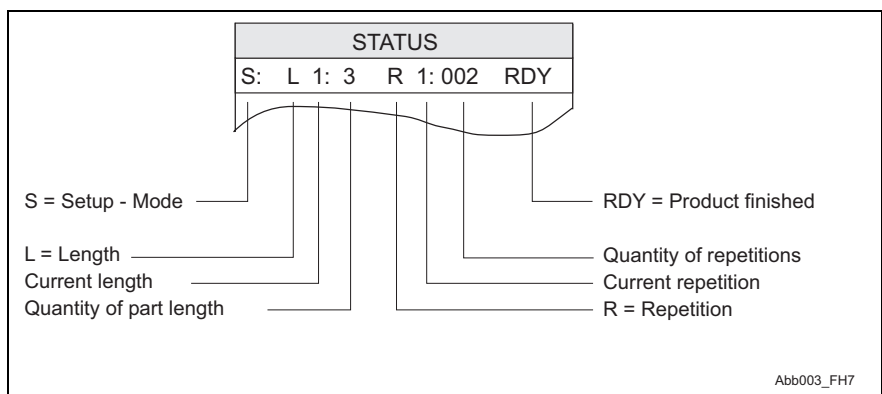


Fig. 6-46: Setup Mode 2

Example:

L 2 : 3 W 1 : 002 means that the product consists of 3 part lengths, and the second length is currently being processed.

For the second part length, a total of 2 repetitions are programmed, and the first repetition is currently being processed.

- VELOCITY** Designation of the velocity in percent. The input is referenced to Parameter A106, "Maximum Velocity."
- DECEL.** The deceleration that is input here is in percent, and is referenced to Parameter A108, "Bipolar Acceleration."
- ACCEL.** The acceleration in percent is also referenced to Parameter A108, "Bipolar Acceleration."
- FACTOR** The factor makes it possible to edit or correct all feed lengths on-line, without having to edit at the parameter level.

Note: Activating edited data on the BTV04 display requires approximately 2-3 seconds.

6.8 Parameter Menu (PARA-Key)

The Parameter Menu enables access to all available parameters. These are all machine and function parameters that are stored in the DKC21.3 drive controller, as well as the production-specific data like tool control, PLS, etc., that are activated in the BTV.

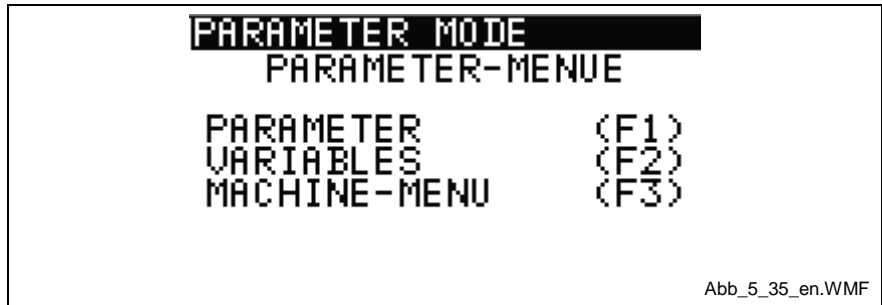


Fig. 6-47: Parameter Menu

Note: Password protection is only active for this menu if a password was designated in the BTV04 parameter settings (key combination SHIFT + F1).

Parameter Mode (F1 from Parameter Menu)

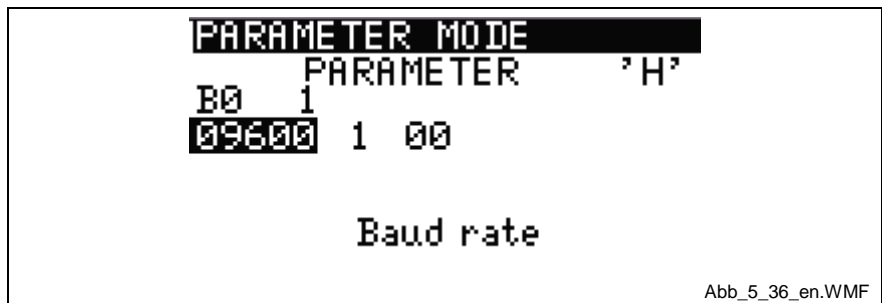


Fig. 6-48: Parameters

In this menu, the most machine-specific properties are set. By pressing HELP (see screen "H"), additional functions are displayed, e.g. loading base parameters.

The parameters are organized in 8 groups. The arrangement is as follows:

- A1: System Parameters
- AA: Function Parameters
- B0: General Parameters
- C0: Encoder Parameters
- CR: Controller Parameters
- CM: Motor Parameters
- N1: PLS Parameters

To select the desired parameter group, the cursor must be placed at the left margin of the 3rd line. Pressing the Up and Down Arrow keys scrolls through the parameter groups. After selecting the parameter group, press the Right Arrow key to display the desired parameter of this group. In the 4th line, the parameter can be edited. At the bottom of the screen, the plain text messages of the currently selected parameter is displayed.

Note: The 7-segment firmware module display on the control must show "PA," because changes to parameters are only permitted in Parameter Mode.

Variables (F2 from Parameter Menu)

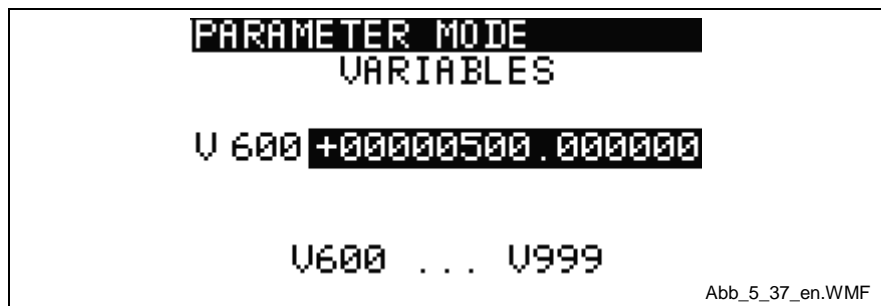


Fig. 6-49: Variables

Many important data are processed in the form of variables by the NC program. In general, changing the variables is not necessary in this menu, because all data is described on the BTV04 display or directly in the NC Program. This menu serves primarily for error diagnosis in the event of faults and is intended for "specialists." Variables V000-V599 are system variables and can only be edited under certain conditions.

Machine Menu (F3 from Parameter Menu)

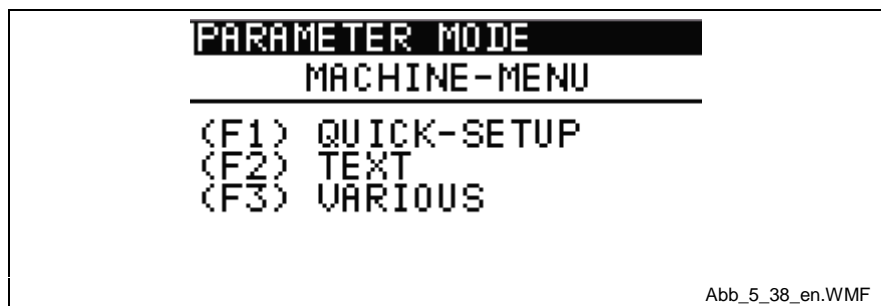


Fig. 6-50: Machine Menu

In the Machine Menu, important basic settings are determined. In the following menus, functions are pre-set, text strings are established for various diagnostic messages, and specific machine data is determined.

Quick Setup (F1 from Machine Menu)

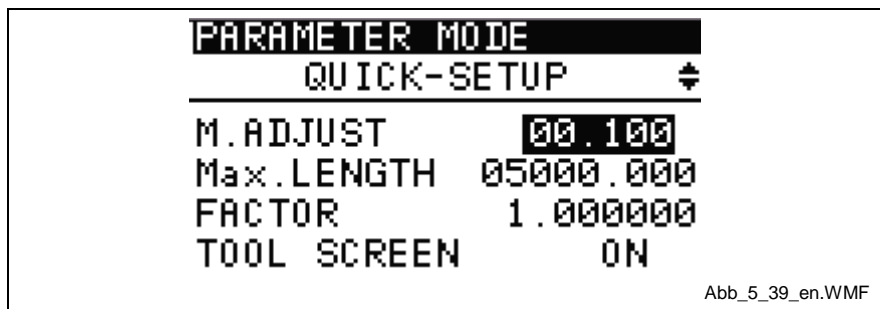


Fig. 6-51: Quick Setup

In the Quick Setup, not only machine data are determined, but complete screens are also activated or deactivated; therefore, this menu should always be consulted for an initial startup.

M.ADJUST	The Micro-Adjust set here is used in the production menu "Micro-Adjust" as a basis for individual length corrections.
Max.LENGTH	To avoid erroneous inputs for product lengths, a maximum allowable length can be pre-set. Inputs that are beyond the maximum Length value are limited to the value set here.
FACTOR	The Factor references all programmed lengths and therefore enables corrections for an entire product (including all part lengths).
TOOL SCREEN	Enables activation/deactivation of the Tool screens. If no tools are used, deactivating (OFF) the tool functions simplifies the BTV04 display.
PLS SCREEN	Enables activation/deactivation of the PLS screens. If no PLSs are programmed or the PLSs are only set up once for the machine, deactivating (OFF) the PLS functions simplifies the BTV04 display.
SIC SCREEN	Enables activation/deactivation of the SIC screens. Within the PLS input screen, if the SIC screen is deactivated, the expanded SIC function is not shown.
UNIT1	The Right or Left Arrow keys allow changing the Unit from "m/min" to "inch/min." Because the control operates in IU (input units), changing the units does not prompt a recalculation of the units, but the selected text is displayed.
UNIT2	The Right or Left Arrow keys allow changing the Unit from "mm" to "inch." Because the control operates in IU (input units), changing the units does not prompt a recalculation of the units, but the selected text is displayed.
PRESIG.PARTS	If a value between 1 and 99 is entered here, it leads to activation of Presignal Monitoring. It is therefore possible to set a marker for X-Parts (X represents the input value) before reaching the product or partial part quantity. The following markers can be queried by external sources (PLC or PC): <div style="margin-left: 40px;">M4.04.6 = x parts before reaching the product quantity</div> <div style="margin-left: 40px;">M4.04.7 = x parts before reaching the part quantity</div>
(F1) DEFAULT VALUES	By pressing function key F1 , the default values are loaded. Thus, the product data in the control are overwritten and specific settings like Micro-Adjust are set to permissible values. Control parameters are not re-initialized using this function. <u>CAUTION: Existing product data are overwritten.</u>

Text Strings (F2 from Machine Menu)

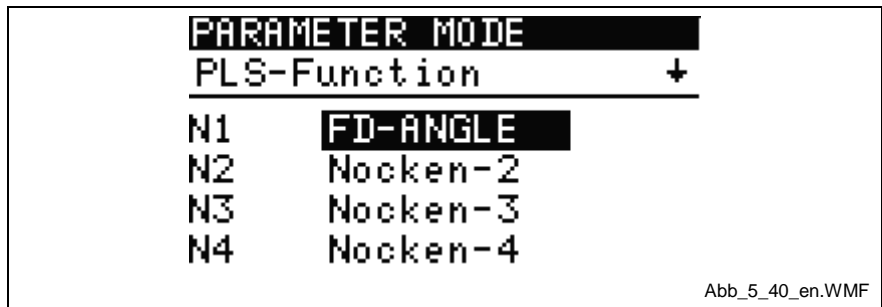


Fig. 6-52: Text Strings

To satisfy a variety of needs, a user-programmable alphanumeric text string can be assigned to each PLS, SIC input and BTV input.

The character limitations are as follows:

- **PLS:** 10 characters
- **SIC INPUTS:** 14 characters
- **BTV Inputs:** 14 characters

Switching between the various text inputs is done via the Page Up and Page Down keys. All inputs must be confirmed by pressing OK.

The text strings stored here are displayed on the screen in an appropriate location (e.g. diagnostics).

Various in the Machine Menu (F3 from Machine Menu)



Display "(F4) TOOLS" is only shown when tools are activated.

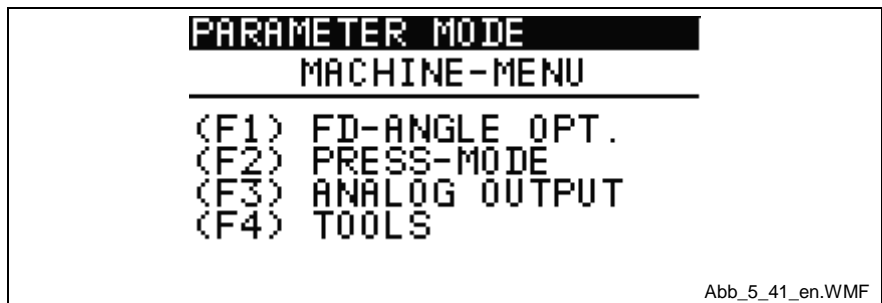


Fig. 6-53: Various in the Machine Menu

Feed Angle Optimization (F1 from Various)

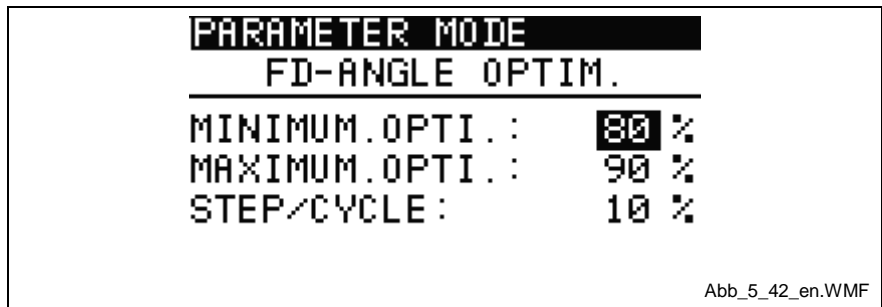


Fig. 6-54: Feed Angle Optimization

To protect the mechanics and to save energy, the function "Automatic Feed Optimization" can be turned on. However, a requirement is that the feed angle not be fully loaded. To set the optimal feed angle range for the system, three input fields are available. For the minimum acceleration and deceleration values, a value of 15% of Parameter A108 is automatically assigned. The optimal load range is also user-programmable. If the load of the feed angle is more than 90 percent, this is signalled via output X210/22 on the DIO card.

- MINIMUM OPTI.:** Describes the lower limit value of the feed angle range load.
- MAXIMUM OPTI.:** Describes the upper limit value of the feed angle range load.
- STEP/CYCLE:** Shows the steps per cycle. Optimization in steps within a cycle generally leads to a feed angle loss, which results in an error message. Therefore, it is important to "feel your way" to the optimal feed angle. The maximum steps/cycle value is dependent on the machine, but should be between 1-10%.

Press Mode (F2 from Various)

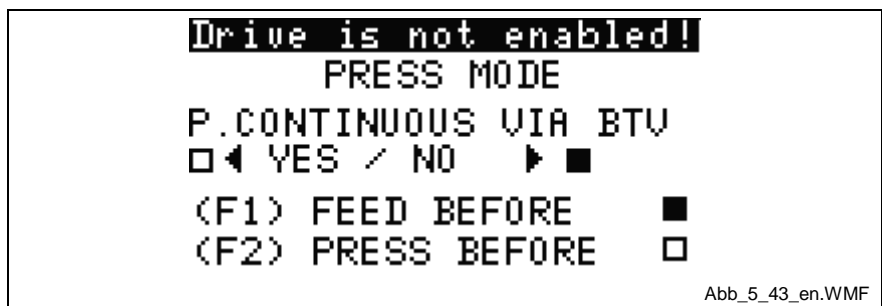


Fig. 6-55: Press Mode

The basic setting Single Step or Continuous can be set via hardware input (e.g. I0.01.0) or serial via BTV04 (see Production Screen). Both can be done out of this screen. To enable serial switching via BTV04 press the "Left Cursor Key", to disable press the "Right Cursor Key".

The option "Feed Before" or "Press Before," however, is only possible in this menu. Explanations for the different press operating modes can be found in Chapter 4 – Functional Description).

Analog Output (F3 from Various)

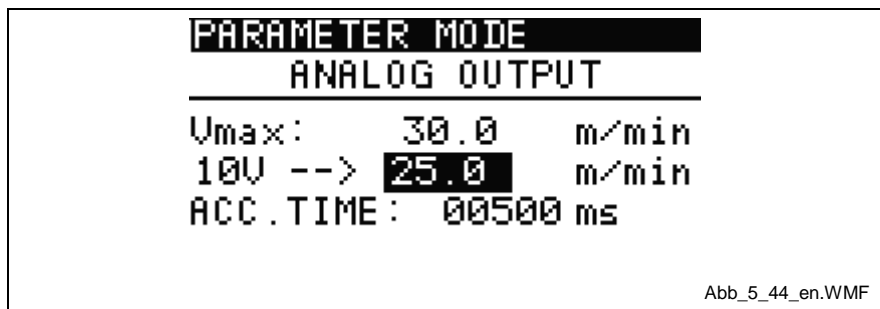


Fig. 6-56: Analog Output

- Set Analog Output:** Here, the analog output voltage (e.g. for the unwinder) is set. The output is proportional to the average velocity. In the example shown here, the maximum output voltage of 10V is prepared at the analog output at a velocity of 100 m/min; at 50 m/min., 5V would be output, etc..
- Startup Time:** The time (ramp) is set to its default using the startup time, and it should be the time that passes until the 10V output voltage is reached. This way, choppiness in the unwinder's movements is avoided, and the mechanics are therefore protected.

Tools (F4 from Machine Menu)



Access is only available when the tools are activated.

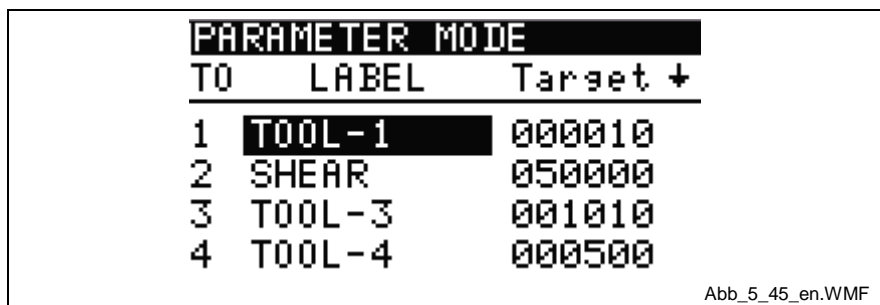


Fig. 6-57: Machine Menu / Tools

If the tool display in the BTV04 quick setup is deactivated, this menu is not shown.

For each tool, the maximum number of switching cycles can be pre-set. The maximum number of switching cycles is then compared to the actual number of tool control operations performed. Via the Tool screens, under DIAGNOSTIC (F3 from the Main Menu), the counter status of the tool control operations can be viewed (see also Diagnostics – Tools).

- Additional Information** Pressing the HELP key compares the maximum switching cycles (max. Schalt) to currently executed switching cycles (IST).

Pressing the Page keys switches between tools 1-4 or 5-8.

- User-Programmable Text and Switching Cycles** With the arrow keys, the desired tool is selected and a user-programmable text is assigned to the tool in the space "LABEL." In the space "TARGET," the maximum possible switching cycles for this tool are assigned.

- Clearing the Tool Counter** To set the current actual value of a tool to zero after a tool change, select the tool with the arrow keys and press CLEAR. The actual value of the tool is set to zero.

6.9 Help Menu (HELP Key)

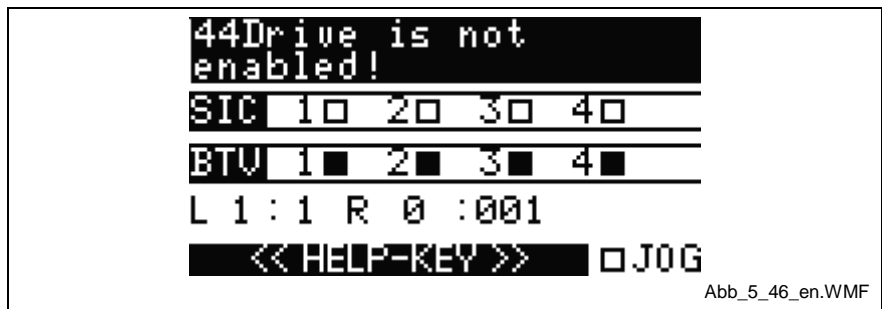


Fig. 6-58: Help Menu

In the Help screen, clear text diagnostics are available on two lines, including the diagnostic code (see above drawing "06A)." In addition, control inputs (SIC inputs and BTV04 inputs) that could lead to a hindrance in operation are shown. If the Help key is pressed and held in the Help Menu, the user-programmed text for the inputs is shown.

The abbreviations "L" and "R" have the following definitions.

- **L stands for Length** and displays how many part lengths make up the entire product, or which part length is currently being processed.
- **R stands for Repetitions** and displays how many repetitions are programmed for the currently displayed part length, or how many repetitions have already been processed.

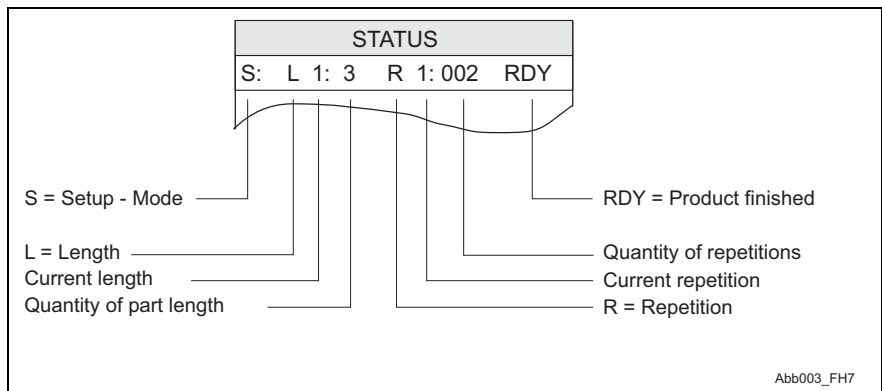


Fig. 6-59: Info Note

Example:

L 2 : 3 W 1 : 002 means that the product consists of 3 part lengths, and the second length is currently being processed.

For the second part length, a total of 2 repetitions are programmed, and the first repetition is currently being processed.

Note: The input and text can be assigned from the Machine Menu.
The collective stop is only valid when the input/output wiring of the DIO card is connected via the BTV04 (see also Chapter 5.8, BTV Inputs).

Additional Help Menu (SHIFT+HELP from the Help Menu)



For service staff only.

```

M: NO JOG COMMAND
POSITION: +000000.003
Q 0.00 00000101
V 100 +00000000.003000
TASK1 0000 NOP
TASK2 0000 NOP
TASK3 0830 AKN

```

Abb_5_47_en.WMF

Fig. 6-60: Additional Help Menu

If the first Instance Help Menu does not lead to resolving the problems, there is a possibility to use additional diagnostic tools. To do this, press the key combination SHIFT+HELP. The second instance help menu is structured as follows:

Line	Definition
1 st Line	Status Message
2 nd Line	Position of motor encoder
3 rd Line	Optionally, Input/Output /Marker Flag
4 th Line	Freely available variables
5 th Line	Program Task 1 – Gives information about the processing of the NC Task 1.
6 th Line	Program Task 2 – Gives information about the processing of the NC Task 2.
7 th Line	Program Task 3 – Gives information about the processing of the NC Task 3.

Fig. 6-61: Second Instance Help Menu

7 Initial Startup

7.1 Checklist

For an initial system startup that is seamless, the appropriate hardware and firmware are required. A list of the components is shown in Chapter 1 – Standard Configuration.

Following is a list of all components and tools required for the initial startup of a system.

Basic Components		
DKC21.3 Hardware		<input type="checkbox"/>
FWA-ECODR3-CR*-01VRS Firmware		<input type="checkbox"/>
DOK-ECODR3-CR*-01VRS Documentation – Application Description		<input type="checkbox"/>
3mm screwdriver to change address settings on the DKC21.3 firmware module.		<input type="checkbox"/>
Based on the selected system controller:		
Option 1	BTV04	<input type="checkbox"/>
	FWA-BTV04*-CRE-01VRS Firmware	<input type="checkbox"/>
	IKB0017 cable, for RS485 serial communication between the BTV04 and DKC21.3.	<input type="checkbox"/>
Option 2	IBM-compatible PC	<input type="checkbox"/>
	IKB0005 cable, for serial communication between the PC and DKC21.3.	<input type="checkbox"/>
	MotionManager-NT software, for diagnostic purposes, and to set parameters (also required for data security on the PC)	<input type="checkbox"/>
Optional		
EMD Module – required for up to 8 physical outputs for tools or PLSs		<input type="checkbox"/>
DOK-ECODR3-DKC**.3****-PR02 Documentation – Project Planning for DKC21.3 Controller Unit		<input type="checkbox"/>

Fig. 7-1: Checklist for Initial Startup

Explanation:

When using the BTV04 with FWA-BTV04*-CRE-01VRS firmware, a PC is not required. All controller parameters can also be accessed via the BTV04.

For data security and documentation, a PC is required, even when the BTV04 is used. The Windows-based MotionManager NT software provides a higher degree of user-friendliness and is indispensable if diagnostic text is to be programmed in the user’s own language.

7.2 General Hardware Wiring

DKC21.3 Base Unit

For general wiring information, please refer to the Project Planning Guide "DOK-ECODR3-DKC3**.3****-PR02-EN-P.

Additional Options and Expansion Modules

For drawings of optional components and detailed wiring for the Optifeed-CS system, please refer to Chapter 12 of this manual – Terminal Connection Diagrams.

The EMD expansion module is described in more detail in Chapter 10 – EMD Module.

BTV04

If the BTV04 is used for system control via inputs/outputs, the wiring must be done according to the wiring diagram "BTV04" in Chapter 12 – Terminal Connection Diagrams.

If the four BTV04 stop inputs (Input 2 to Input 5) are not used, these must be wired for 24V.

7.3 Load Default Parameters

When the drive is shipped from the factory, pre-set default values are written to the parameters. The Load Default Parameters function can be invoked using the S1 key and the address setting 98 or 99. The sequence below must be followed:

1. Switch to Parameter Mode.
2. Set address to "00" and then press "S1." Display shows "Ad."
3. Set address to "98" or "99" and then press "S1."
4. Set address dial to the desired unit address. (05)

The default parameter set is structured so that:

- all optional functions are deactivated
- limit values for position are deactivated
- limit values for torque/force are set to high values
- limit values for velocity and acceleration are set to low values
- Address 98 ASCII Protocol 9600 Baud No Parity
Address 99 SIS Protocol 9600 Baud No Parity

Note: If machine parameters have already been set prior to invoking this function, they will be overwritten.

Note: The basic parameter load does not guarantee that the drive will be matched to the machine, and only in certain instances will it be matched to the connected motors and measuring systems. The relevant settings must be made when first starting up the axis!

7.4 Initial Startup Guidelines

During initial startup, the drive must be disconnected from the mechanical system.

- Check to see that devices and cables are of the correct type.
- Connect the power supply, the control voltage and the drive with its encoder according to the information provided in the documentation: Project Planning Manual DOK-ECODR3-DKC**.*-PRxx-EN-P.
- Wire inputs and outputs X3 and DKC21.3 X210
- Wire the EMD Module (optional).
- Wire the interface to the operator panel (PC or BTV).
- Required only for a PC! Match the interface parameters using the S1 key, for direct (peer-to-peer) interface connection between a PC and the DKC.
- Match parameters to the equipment (with the BTV04 or with a PC and MotionManager NT startup software). For a detailed description of parameters, refer to Chapter 7 "Parameters."
- Turn on the power
- Use 'Jog' to move the axis in manual mode
- Check the equipment safety devices (e.g. Emergency STOP)

If the drive functions as expected, the power can be turned off and the motor can be connected to the machine. After that, the following tasks must be performed if required by the application:

- Set the absolute distance or home the drive
- Test the dynamic motion reaction and match up the control parameters (CRxx) if necessary.

Note: To set the DKC21.3 parameters, Parameter Mode ("PA" on the 7-segment display H1) must be selected. Parameter Mode is selected by applying 24V= at Pin 1 of the DIO connector X210.

7.5 General Information

Basic Settings – Communication

Drive Controller (Basic Settings)

DKC21.3 – Com	
Baud Rate	9600
Protocol	SIS
Parity	No Parity
Write Confirmation	On

Fig. 7-2: DKC21.3 Interface, Basic Settings

Because of the different protocols used for the display unit (SIS Protocol) and the MomaNT PC software (ASCII Protocol), it is sometimes possible to force interface settings without having to make changes to the controller's interface parameters.

The S1 key and the address switch located below it on the firmware module can be used to force different interface settings for limited periods of time. These settings are not retained, and they are reset to the values set in the parameters (B001 / B002) after clearing an error, after a mode change or after restarting the controller.

Addresses	Protocol	Baud Rate	Parity	Notes
00	-	-	-	Initialization via address switch is activated for approx. 20 seconds.
90	ASCII	9600	No Parity	Settings for MotionManager NT

Fig. 7-3: S1 Programming Module

Changing the Interface Settings via the S1 Programming Module:

- Set dial on firmware module to "00" (S2 = 0, S3 = 0) and press S1.
- Set dial on firmware module to "90" (S2 = 0, S3 = 9) and press S1.
- Set dial on firmware module to "05" (drive address) (S2=5, S3=0). DO NOT press the S1 key.

BTV04 (Basic Settings)

COM1 (RS485) for DKCxx.3	
Baud Rate	9600
Protocol	SIS Master
Parity	OFF = No Parity
COM2 (RS232) for PC	
Baud Rate	9600
Protocol	ASCII + SIS
Parity	OFF = No Parity

Fig. 7-4: BTV04 Interface

PC->BTV04->DKC Push-Through Operation

It is possible to push the serial communication from the PC and DKC through to the BTV04 via the second interface connection. For this type of operation, hard-wiring of the interface between the BTV04 and the DKC can remain intact. In such a case, no changes are required to the interface settings, as long as the communication between the BTV04 and the DKC is already functioning.

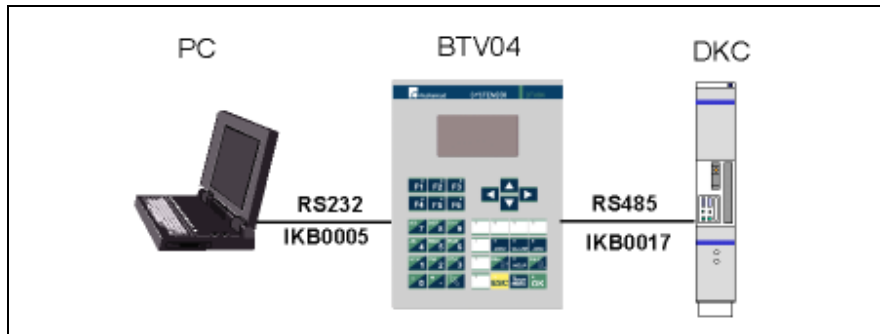


Fig. 7-5: Push-Through Operation

In this setup, the data shown on the BTV as well as the data requested by the PC are processed. If the BTV displays are not needed, the data throughput speed to the PC can be increased by activating Relay Mode on the BTV04. Press F6 on the BTV04 to activate/deactivate Relay Mode.

Note: Push-Through Operation is also called Relay Mode.
The fastest data transmission to the PC is only achieved by a direct PC-DKC connection. To make this possible, the DKC interface must be moved.

Data Storage

Central data storage of all data required for operation takes place in the "ESM" firmware module.



Fig. 7-6: ESM Firmware Module

The following operating data are stored there:

- FWA-ECODR3-CRP-01VRS Firmware
- Parameters (configuration settings)

Buffering takes place for each write access in Parameter Mode followed by a mode change.

After restarting the system, a readout of the last valid stored data takes place.

Data Security and Documentation

To secure machine data and to document the system, a PC with the MotionManager NT software is required.

For a serial connection of the PC to the DKC controller, an IKB0005 cable must be used.

Replacement of a Unit

Because data is stored on the ESM firmware module, replacing component units is quite simple.

1. Disconnect defective DKC controller.
2. Remove ESM firmware module from defective unit.
3. Connect new DKC controller and plug in firmware module from defective unit.
4. Turn unit on.

After turning on the controller, an initialization process follows, which may take several seconds.

Lastly, input/transfer the product data from the product archive via the PC or BTV, and production can continue.

Warning

Warnings do not lead to an automatic shutdown

A number of monitoring functions are performed, depending on the operating modes and parameter settings. If a state is detected which allows proper operation for the time being, but eventually generates an error and leads to a shutdown of the drive, a warning will be generated if this state continues.

Warning Classes

Warning Class:	Diagnostic Message:	Drive Reaction:
Without drive reaction	E2xx E- 01xx	--

Fig. 7-7: Warning Classes

Warnings can not be externally cleared.

Faults

A number of monitoring functions are performed depending on the operating modes and parameter settings. An error message is generated if a condition is discovered which no longer allows proper operation.

Error Classes

The error class is apparent from the diagnostic error message.

Errors can be divided into four error classes. The error class determines the drive error reaction.

Error Class:	Diagnostic Message:	Drive Reaction:
Fatal	F8xx	Switch to Torque-Free State
Travel Limit	F6xx F- 03xx	Velocity Command Value Set to Zero
Interface	F4xx	per setting for "Best possible deceleration," Parameter A119
Non-Fatal	F2xx F- 02xx	per setting for "Best possible deceleration," Parameter A119

Fig. 7-8: Error Classes

Drive Error Reaction

If an error condition is detected in the drive, execution of the drive's error reaction starts automatically as long as the drive is ready. The H1 display flashes Fx / xx. The drive's reaction to interface and non-fatal errors can be set in **Parameter A119, Best possible deceleration**. The drive switches to torque-free operation at the end of each error reaction.

Clear Errors

Errors must be cleared externally

Errors are not cleared automatically; they must be cleared externally via:

Input X3/7

or

by pressing the "S1" key

or

by pressing the BTV04 CLEAR key

If the error condition is still present, the error will be immediately detected again.

The **positive edge of a controller enable signal** is required to restart the drive.

Clear errors with controller enable set

If a drive error is discovered while operating with the controller enable set, the drive executes an error reaction and removes the controller enable signal. This means that axis movement is no longer possible. The drive is deactivated.

To re-enable the drive:

- the error must be cleared

After clearing the error, another start signal is required.

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8.1 Basic Information

In this chapter, the DKC21.3 parameters are described. They are used to define and adjust the system components and to activate hard-coded operations. Except for the CRxx Parameters and PLS Parameters N111 - N131, the parameters can only be modified in Parameter Mode via the serial interface. To configure the system parameters, the MomaNT startup software and the BTV04 operator console are available. Once the system is no longer in Parameter Mode, the parameters are monitored and a diagnostic message is issued if incorrect parameters are found.

To provide a better overview, the parameters are divided into 7 groups:

Parameter Groups	Group Identifier	Parameter Number
System Parameters	A1	00 to 19
Function Parameters	AA	00 to 08
General Parameters	B0	00 to 13
Encoder Parameters	C0	00 to 16
Controller Parameters	CR	00 to 10
Motor Parameters	CM	00 to 09
PLS Switch Press Encoder	N1	00 to 31

Fig. 8-1: Parameter Groups

Controller Parameters CR

These parameters can be changed via the serial interface, both in Manual and Automatic Mode.

Motor Parameters CM

In motors with feedback memory, these parameters are set when the program is initially loaded.

PLS Parameters N1

N1 Parameters are needed only when an external absolute encoder is connected for the PLS.

PLS Parameters N1 11 to N1 31 can also be written when the system is not in Parameter Mode. In this case, however, they must be initialized using a command.

Unit of Measurement / Input Unit

The user specifies most parameter data in terms of input units (IU). A unit is defined by the user, and can be inches, millimeters and meter. Once the user has chosen the unit of measurement, then all position and feed rate data must be in accordance to that unit, where it is logically required.

For example, the input unit could be specified as inches. The maximum feed rate in parameter A101 might be programmed as 12 inches/second. The acceleration parameter would then be in units of inches per second squared.

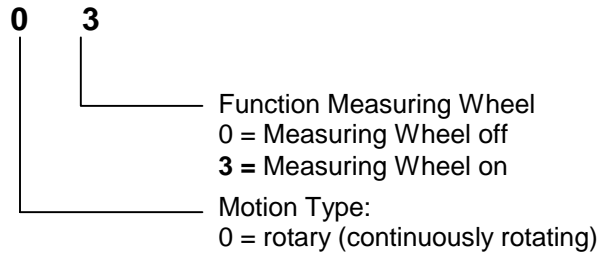
NOTE: BTV04 with CRE-Firmware display inch, meter, inch/min and meter/min only. Selectable in "Machine Menu".

Pre-Set Parameters

To the extent possible, all parameters that are important for this feed-to-length program have been pre-set. The parameter input settings that are relevant for the current system setup are bolded. Parameter input values that are not relevant for the feed-to-length program are italicized.

8.2 System Parameters

A100 Application Type



Motion Type:

For rotary motion, the drive unit normally turns continuously in one direction. The feed rolls transport the product to its relative position and it is then processed. Feed-to-length mechanisms are typically used.

Function Measuring Wheel:

Off: *There is no second encoder*

Measuring Wheel: At times, an external encoder takes over position detection. It is possible to switch back and forth between the motor encoder and the measuring wheel encoder at any time. All movement is relative (not absolute).

For encoder settings see parameter C004 – C007.

A101 Feed Rate Constant

0100.0000

Feed Rate Constant in IU

Note: This is where the IU scaling is defined.

IU = Input Unit

This parameter describes the transition from rotary to linear motion. It is defined as the linear displacement of the load during one revolution of the gear output shaft.

Input min.: 0.1000 IU

Input max.: 5000.0000 IU

One rotation of the gear output shaft corresponds to the linear distance in IU.

A102 Gearing

0001 0001

Output Revolutions of the Load Gear

Input Revolutions of the Load Gear

A mechanical gear is often employed between the motor and the load.

The **gear ratio** is defined as:

$$i = \frac{\text{Input Revolutions of the Load Gear}}{\text{Output Revolutions of the Load Gear}}$$

Fig. 8-2: Gear Ratio

Example:

Five turns of the motor shaft equal two turns of the output shaft.

⇒ Input Revolutions: 5
Output Revolutions: 2

Input min.: 1

Input max.: 9999

A103 Reserved

A104 Reserved

A105 Reserved

A106 Maximum Velocity

001000.000

Maximum velocity of the axis in IU/s

The maximum velocity defines the maximum permissible velocity and applies symmetrically in both directions.

The maximum value that can be entered is limited by **Parameter CM03** "Maximum Motor Speed" and by the amplifier output.

For Rotary Motors :

$$A106_{\max} = \frac{\text{Max. possible Velocity} \times FC (A101)}{60 \times i}$$

For Linear Motors :

$$A106_{\max} = CM03$$

L: FC = Feed Constant in IU
i = Gear Ratio

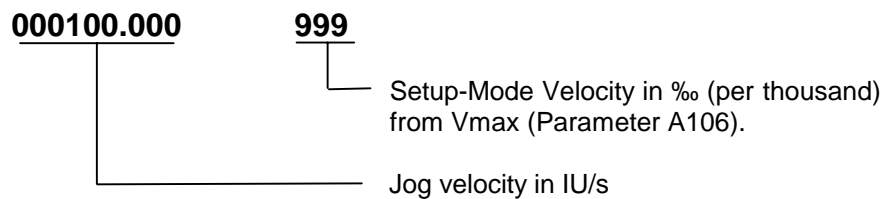
Fig. 8-3: Calculation of Maximum Velocity

The velocity given in per thousand in the feed commands is referenced to this value.

Input min.: 0.010

Input max.: depending on the drive and the amplifier output
200000.000

A107 Jog- and Setup Mode Velocity



With the velocity entered here, the drive motion is
'Jog forward' or 'Jog reverse.'

Additionally: A107 =< A106 (Jog velocity is equal to or less than the maximum velocity)

Input min.: 0.001

Input max.: depending on the drive and the amplifier output
200000.000

In Setup Mode the amplifier can have a different jog velocity, the ‰ indication refers to the maximum velocity in **Parameter A106**.

Input min.: 0 ‰ (per thousand)

Input max.: 999 ‰ (per thousand, = 99.9%)

A108 Bipolar Acceleration



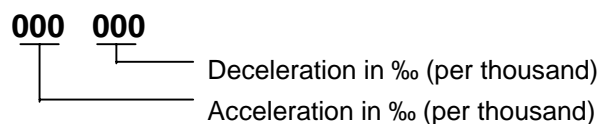
The maximum possible bipolar acceleration defines the maximum permissible acceleration symmetrically in both directions (acceleration and deceleration) and is programmed in this parameter.

Limiting acceleration or deceleration is possible in Parameter A109.

Input min.: 1

Input max.: 200000

A109 Acceleration / Deceleration



In both of these values, the ‰ indication refers to the maximum acceleration in **Parameter A108**. If 000 is entered, the program retrieves the acceleration value from **Parameter A108**.

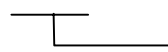
Acceleration and deceleration can be set to different values using this parameter. These values are always valid following a restart, after error messages, and after exiting Parameter Mode.

Input min.: 0 ‰ (per thousand)

Input max.: 999 ‰ (per thousand, = 99.9%)

A110 Bipolar Jerk Limiting Time Constant

0.000



Time Constant for acceleration [s]

Min. = 0 (no jerk)

Max. = 1.024 s

Only values of 2^n can be entered.

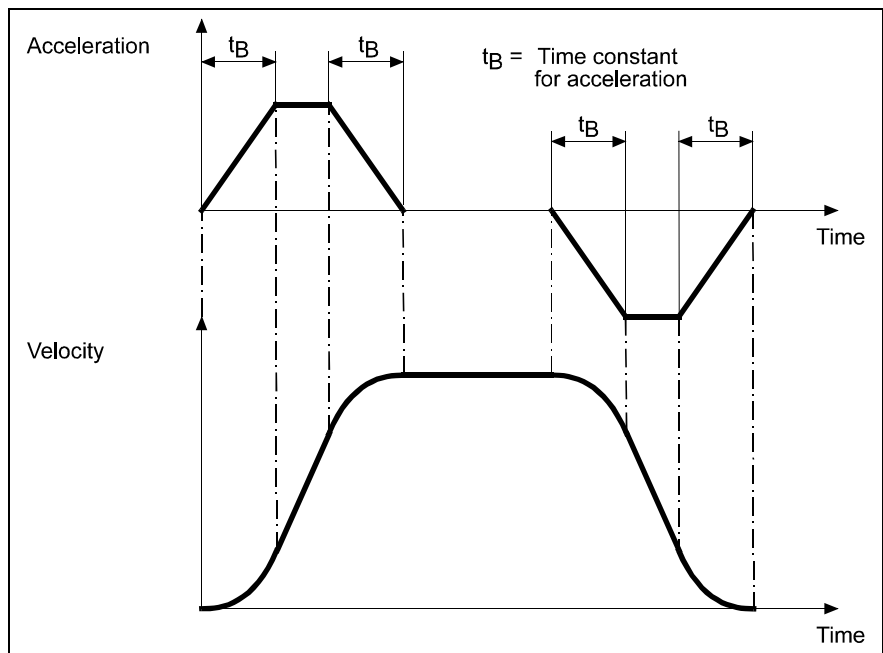
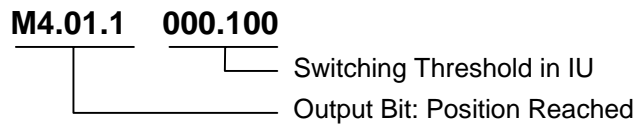


Fig. 8-4: Jerk

A111 Switching Threshold



Output: This parameter is set when the remaining distance to travel from the last feed command is within the monitoring window (switching threshold) range. If the motor does not remain within this \pm switching threshold range, or if a new feed command is detected, the output is turned off. If 00.00.0 is entered, the function is not enabled. **In the feed-to-length program, this marker is evaluated as "Position Reached".**

The parameter must contain the value M4.01.1.

Switching Threshold: This value is used to establish a monitoring window.

The last progression is considered completed when the remaining distance is less than the switching threshold.

Depending on the friction and external forces acting on the feed rolls, and depending on the control loop parameter settings, a small untraveled distance remains at the end of each progression. This distance does not accumulate for more than one progression. If this remaining distance (position lag) is greater than the switching threshold that has been set, the feed angle monitoring function (Parameter A116) reacts, or program processing is stopped. The typical values for the switching threshold for feed-to-length progressions are 0.05 to 0.5 IU (IU = mm).

Switching Threshold Input Min.: in IU 0.001

Switching Threshold Input Max.: in IU 999.999

A112 Reserved

A113 In-Position Window

M2.02.2 0000.100

"In Position" - Window in IU

Output : Axis in Last Programmed Position
00.00.0 = function not active

M2, M3, M4

DKC21.3: Q0.00.4-Q0.01.3

DKC 3.3 : Q2.02.0-Q2.05.7

EMD: Q3,00.0-Q3,03.7

The last target position specified via a feed command or homing is stored and then continually compared with the actual position value. If the actual position value is within this window, the output is set.

| Programmed Position – Actual Position | < Positioning Window ?
Output = 1

| Programmed Position – Actual Position | > Positioning Window ?
Output = 0

This function is active in Manual and Automatic Mode.

Position Input Min.: 0.001

Position Input Max.: 9999.999

A114 Presignaling

00.00.0 0.0 0000

Distance from the Programmed Position
in IU, Min: 1 Max: 9999

Time in s (pulse)

0.0 = Output as continuous signal

Presignaling output

00.00.0 = Presignaling function not
enabled

M2, M3, M4

DKC21.3: Q0.00.4-Q0.01.3

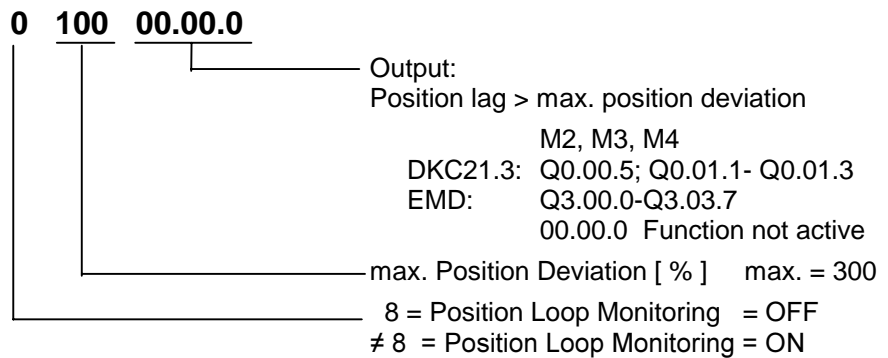
EMD: Q3.00.0-Q3,03.7

The presignaling function programmed in this parameter applies for every progression.

As soon as the remaining travel distance becomes less than the programmed presignaling distance, the output is enabled. The output remains enabled continuously or for the programmed time period. When a new positioning move is issued, the output is deactivated.

This parameter is not used in the described application.

A115 Monitoring



The position loop is continuously monitored. This is done by calculating a sample actual position value and comparing it with the actual position value.

The maximum deviation tolerated between the measured and calculated actual positions is set using **Parameter A115, Monitoring**. At maximum velocity, the position lag is assumed to be at 100%.

If the position deviation exceeds this monitoring window, the error message **F228, Excessive deviation** is issued.

$$\text{max.Deviation}[IU] = \frac{A106}{CR07} \times \frac{60}{1000} \times \frac{\text{max.Position Deviation}}{100}$$

A106 Maximum Velocity
CR07 Kv Factor

Fig. 8-5: Monitoring Window

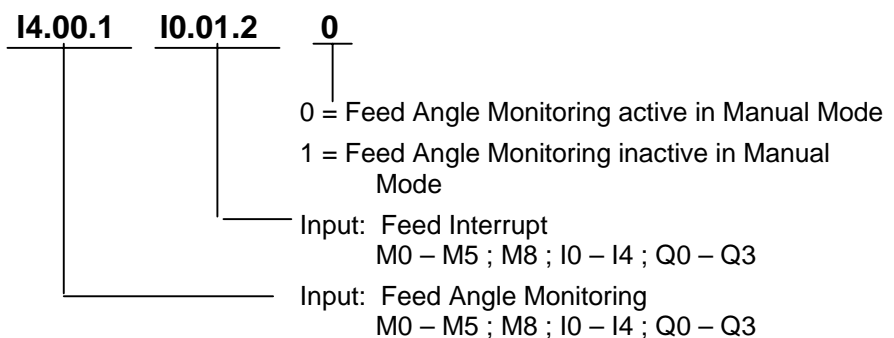


Property damage due to wrong parameter settings!

Turning off Position Loop Monitoring is only intended for initial start-up or for verifying the motion sequence.

⇒ In any case, activate Position Loop Monitoring with its value = 0.

A116 Feed Angle Monitoring



Feed Angle Monitoring:

If Input X1/3 for the DKC is used to determine the feed angle, that input must be entered here. If the feed angle of the PLS is derived, the corresponding output must be entered here (e.g. Q1.00.7).

If the signal drops out during feed, feed is aborted and the following **error message** is generated. **F-0210** (Feed Angle Monitoring)

Interrupt:

Enter whether or not a positioning function in progress can be interrupted. Entering 00.00.0 means there is no interrupt.

If the signal at the specified input is lost, any initiated positioning functions are not executed, or those already in progress are stopped.

If the other operating conditions have been retained, execution or continuation of the positioning function takes place as soon as the signal is present.

If the signal drops off, the press is immediately turned off, even if the operating mode "Press, Continuous Operation" is pre-selected.

Manual Mode

Deactivate Feed Angle Monitoring in Manual Mode

This value can also be edited outside of Parameter Mode, via the serial port.

A117 Encoder Difference Monitoring

Slip between motor and measuring wheel encoders

000

000 = no monitoring
Monitoring window in ‰ (per thousand) referencing
C007
(only for Measuring Wheel Mode)

If Measuring Wheel Mode is active, the motion of the motor and the measuring wheel is monitored. As soon as the difference between the two encoders during one measuring wheel revolution is greater than the monitoring window entered, the drive is shut down and the error message E-0213 "Measuring Wheel Difference" is issued.

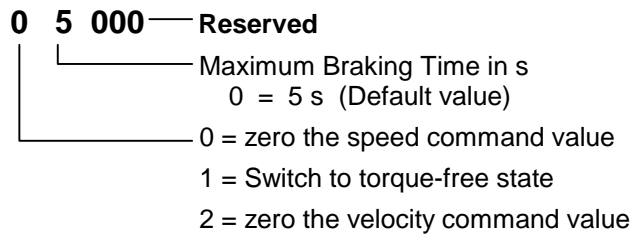
**CAUTION****Property damage due to wrong parameter settings!**

When the measuring wheel is activated, turning off Measuring Wheel Difference is only intended for initial start-up or for verifying the motion sequence.

⇒ In any case, activate Measuring Wheel Difference Monitoring with a value > 0.

A118 Reserved

A119 Best Possible Deceleration



This parameter specifies how the drive will be decelerated in the event of

- a non-fatal error
- an interface error
- a phase regression
- clearing the drive enable signal

A119:	Reaction:
0	<p>Velocity Command Value Set to Zero</p> <p>The motor decelerates, allowing for the torque limit. The Max. Braking Time is 5 s. The holding brake is activated 100 ms prior to expiration of the braking time. If the velocity has previously fallen below 10 Rpm (rotary motors) or below 10 mm/min (linear motors), the motor holding brake will be engaged immediately. The motor is torque free 100 ms after the mechanical brake is engaged.</p>
1	<p>Switch to Torque-Free State</p>
2	<p>Velocity Command Value to Zero with command ramp and filter</p> <p>The ramp value, i.e., the maximum acceleration, is set via Parameter A108, the jerk filter via Parameter A110.</p>

Fig. 8-6: Deceleration Mode for the Drive

The drive enable signal can be applied only after the drive has finished its error reaction.

8.3 Function Parameters

AA00 Reserved

AA01 Reserved

AA02 Reserved

AA03 Reserved

AA04 Override

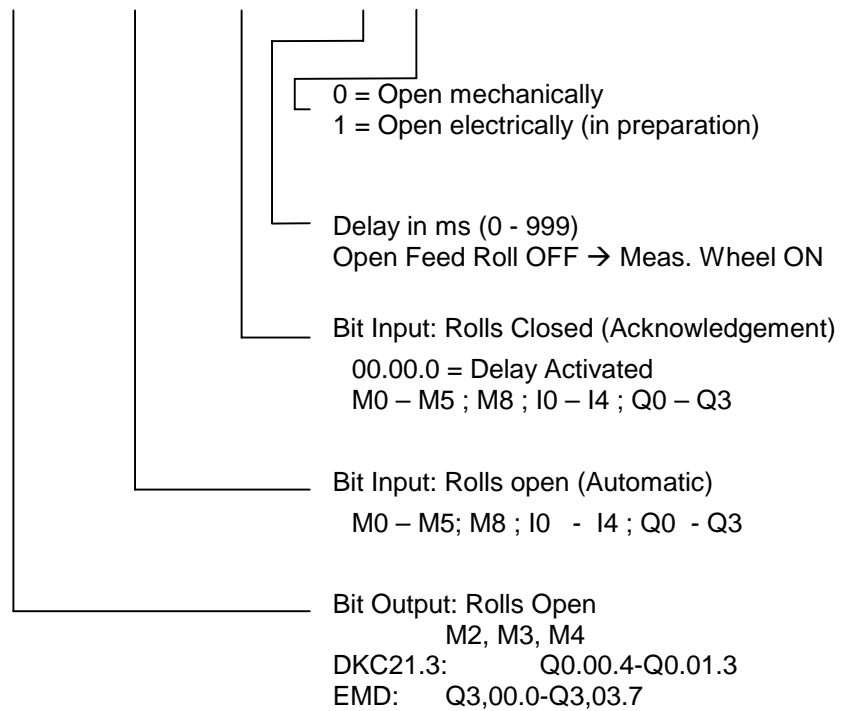
3

3 = Analog Input 0-10V E1 (Connector X3/12 X3/13)

See additional information in Chapter 7.4, "Override," in the general documentation DOK-ECODR3-FLP-01VRS and in Chapter 12, "Functional Description," of this manual.

AA05 Open Feed Roll I

Q0.00.7 I0.01.6 I4.00.6 000 0



Open Feed Roll in Automatic Mode

If pilot pins are used for precise positioning, the feed rolls must be open while engaging the pilot pins. This can be accomplished by opening the feed rolls (mechanically), or by preventing a connection from making contact (electrically). For the latter, positioning is disabled and the power to the motor is cut. (In preparation)

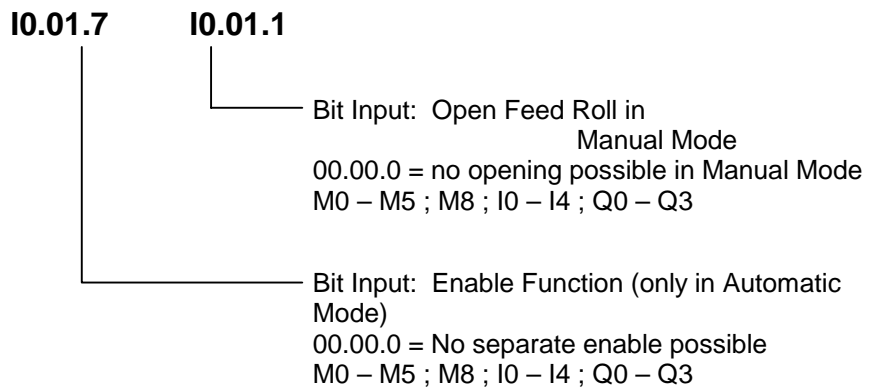
The pilot pins must hold the material in place before, and position it after opening the rolls. The material must also be held in place at all times while closing the rolls.

If a measuring wheel is used for positioning in conjunction with this function, a motor encoder is used after the initial signal is received. The position of the motor encoder is not re-set. All motor motion is registered and if the feed rolls are not far enough apart, a following error can occur when the motor is turned by an external source. Switching back to Measuring Wheel Encoder occurs after the acknowledgement signal "Rolls closed" or after the programmed delay has expired. If a positioning command is called while the rolls are open, the positioning move occurs after the acknowledgement signal.

If an E-Stop, Fault, Immediate Stop, switch to Parameter Mode, or switch to Manual Mode occurs, the programmed output is immediately cleared.

AA06 Open Feed Roll II

This function is only valid in conjunction with Parameter AA05.



Open Feed Roll in Manual Mode

If the input for opening the feed rolls is high, the output for opening the feed rolls is set (independently of the enable bit). Jogging is always possible.

Enable Function

This function can also be enabled via the NC Program, Logic Task or an external input (e.g. X210/16). Removing the enable signal while the function is active has no effect on the output.

In Manual Mode, this function is always enabled.

To activate this function in Manual or Automatic Mode, the same input can be used.

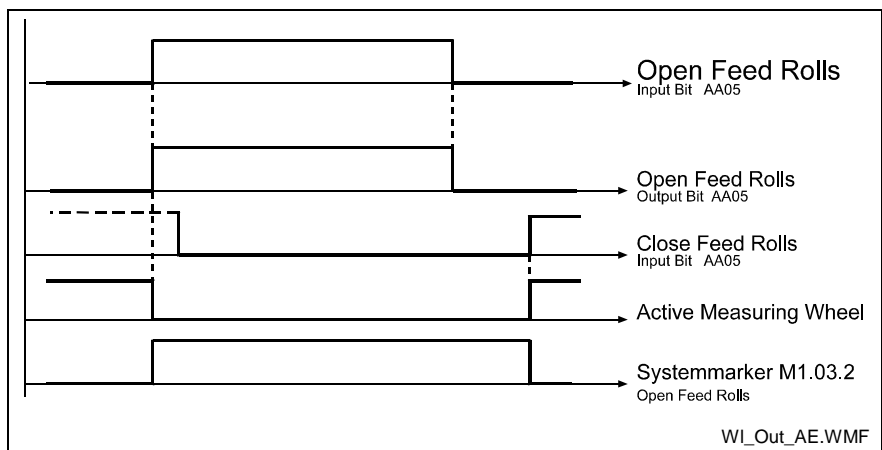


Fig. 8-7: Open Feed Roll with Acknowledgement Signal

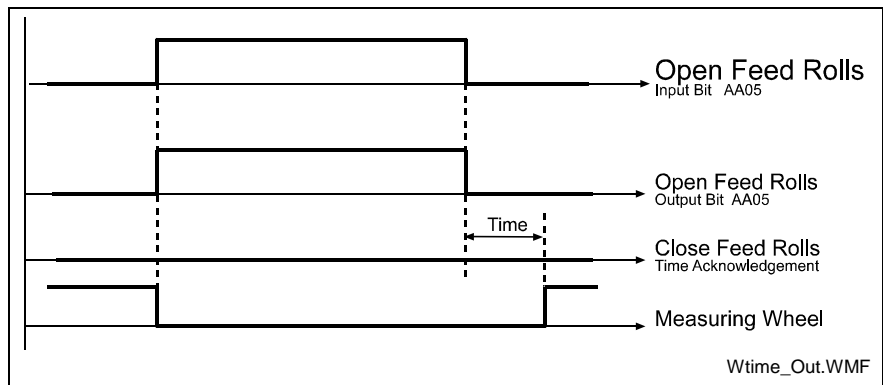


Fig. 8-8: Open Feed Roll with Time Acknowledgement

AA07 Measuring Wheel Mode

Only active in Automatic and Set-Up Modes

10.00.3

“Activate measuring wheel” input

Input status = 0 : Control using motor encoder

Input status = 1 : Control using measuring wheel encoder

00.00.0 = no input programmed.

The measuring wheel is always active in Automatic Mode if programmed in **Parameter A100**.

M0 – M5 ; M8 ; I0 – I2 ; Q0 – Q3

This parameter applies only if Measuring Wheel Mode has been preselected in **Parameter A100**. The measuring wheel is always active in Automatic Mode or can be disabled using the programmed input.

See also Parameter A117 Encoder Difference Monitoring.

AA08 Various Functions

00.00.0 Q0.00.6

Output: Parameter enabled

Output: Programmed velocity reached
M0 – M5 ; M8 , I0 - I2 ; Q0 - Q3

00.00.0 = no output programmed

Target Velocity Reached

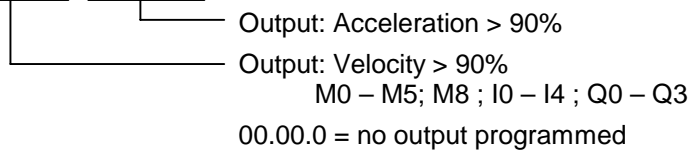
As long as the roll moves the material at the preselected speed, the output is set to 1.

Parameter enabled

This output indicates whether Parameter Mode is active. If 00.00.0 is entered here, no output is selected.

AA09 Feed-To-Length Monitoring

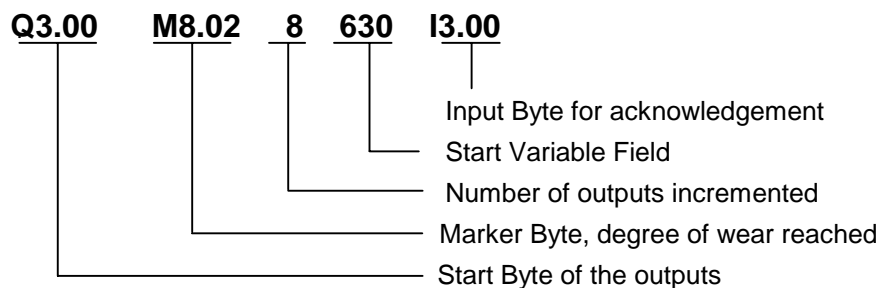
00.00.0 00.00.0



The outputs and flags programmed in this parameter are set when the velocity or the acceleration reach 90% of their maximum possible values.

AA10 Reserved

AA11 Tool Wear



The switching operations of the output byte registered here are counted. For each output bit, the corresponding bit of the marker group with the same number is assigned. In the variable field, the number of counters is defined along with the number of outputs. After reaching the command piece count, the corresponding marker bit is set.

V630 → Output Bit 0 (Command value for number of times activated)

V631 → Output Bit 0 (Actual value for number of times activated)

V644 → Output Bit 7 (Command value for number of times activated)

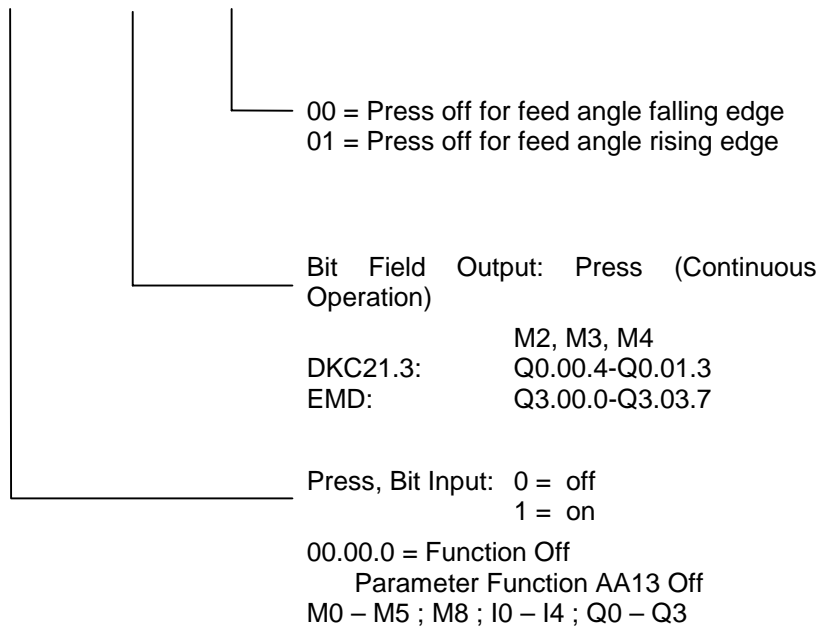
V645 → Output Bit 7 (Actual value for number of times activated)

After reaching the command piece count, the corresponding marker bit is set and the counter continues to count. The markers and the variables with the actual piece count must be cleared by the user.

AA12 Press: Signal Offset

This parameter allows the definition of the output used to control the press and when this output is cleared.

M4.01.7 Q0.00.4 00



Default M4.01.7 Q0.00.4 00

The press marker M4.01.7 must be turned off in the program when the feed angle edge is falling. Via this parameter, it is possible to offset the shutoff signal of the feed angle rising edge. The signal to turn on the press is always immediate.

This parameter must also be programmed when the function in Parameter AA13 is used.

If an E-Stop, Fault, Immediate Stop, switch to Parameter Mode, or switch to Manual Mode occurs, the programmed press output is immediately cleared.

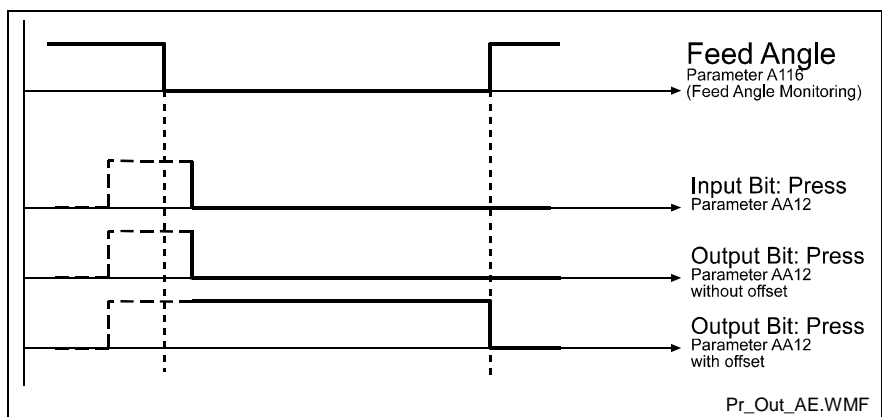
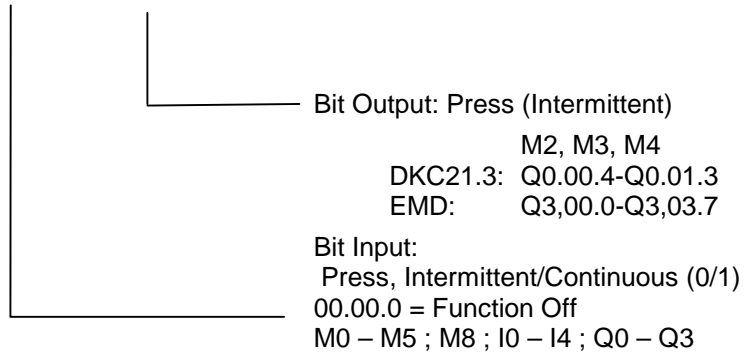


Fig. 8-9: Signal Sequence for the Press

AA13 Press: Signal, Intermittent

This function is only valid as an option when Parameter AA12 is programmed. Here, a second output can be set when the press is run intermittently. If this parameter is not activated, the output from Parameter AA12 is used for the press in continuous operation or in intermittent operation.

10.01.0 Q0.01.0

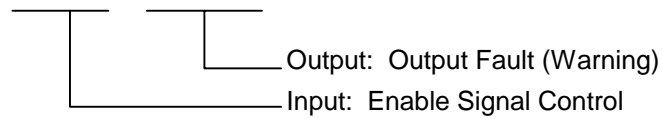


Input Press On/Off	Input Intermittent/Continuous	Output Press (Intermittent Operation AA13)	Output Press (Continuous Operation AA12)	Output Press AA12 Without Parameter AA13
0	0	0	0	0
1	0	1	0	1
0	1	0	0	0
1	1	0	1	1

Fig. 8-10: Output Press Intermittent / Continuous

AA14 SIC Enable Signal Control

I3.01.0 Q3.01.0



When this input is high, each signal that is programmed to be monitored is activated at the next rising edge of the test range. For Assignments 1 and 2, all the rising edges set to be tested that are outside the test range are not tested for the first cycle after enabling!

The output 'Fault' acts as a collective message for all 4 signals being monitored. . However, four numbers/texts are output in the error text.

If the output bit 'Fault' is programmed, when a fault occurs the output bit is set and the diagnostic "A-0010 Control Sign.Bit" is issued.

If the output bit is not programmed, an error message is issued.

F-0226 Control Sign.Bit 1

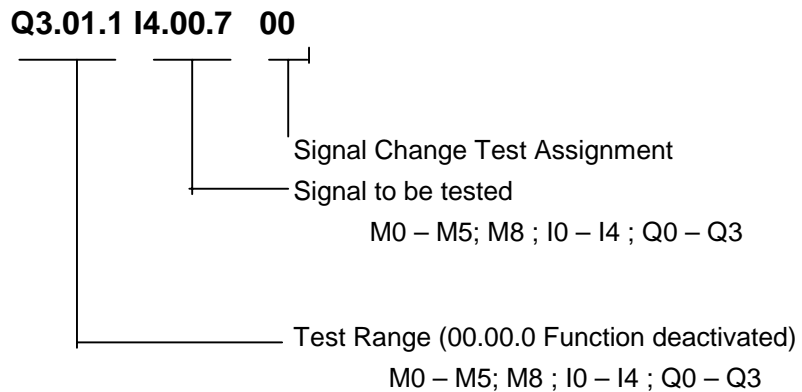
F-0227 Control Sign.Bit 2

F-0228 Control Sign.Bit 3

F-0229 Control Sign.Bit 4

The output bit can be cleared by pressing 'Clear.' It is also cleared when power is lost or Parameter Mode is turned on.

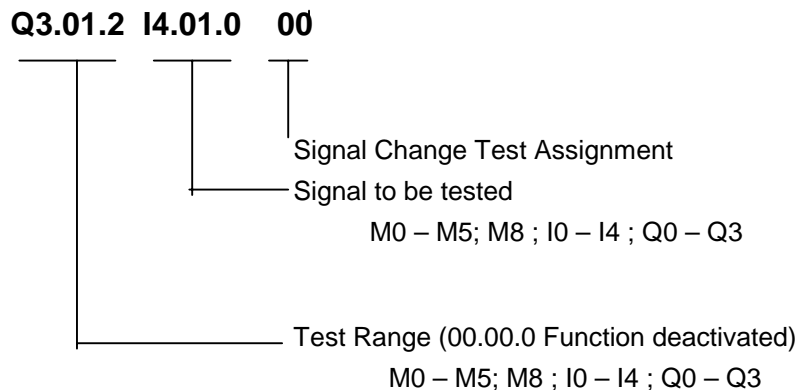
AA15 Signal Control 1



Signal Change:

- 00 = Function inactive
- 01 = Test for signal level 0
when not enabled, tests for a change in the leading edge
The input must be at '0' during the entire test range
- 02 = Test for signal level 1
when not enabled, tests for a change in the leading edge
The input must be at '1' during the entire test range
- 03 = Test for rising edge within the test range
- 04 = Test for falling edge within the test range
- 05 = Test for signal level 0 when leaving the test range
- 06 = Test for signal level 1 when leaving the test range

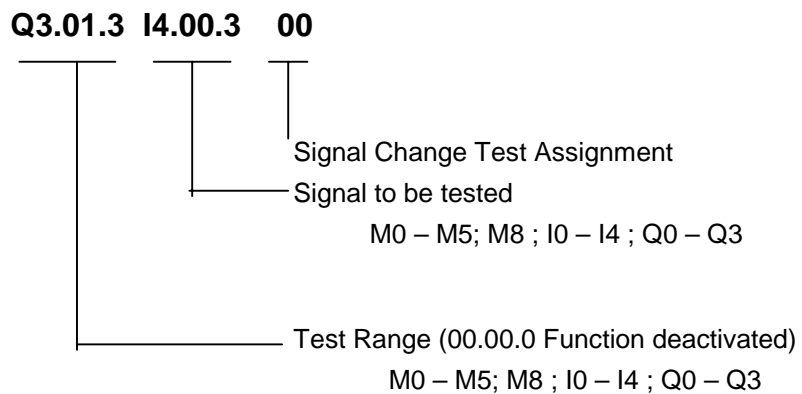
AA16 Signal Control 2



Signal Change:

- 00 = Function inactive
- 01 = Test for signal level 0
when not enabled, tests for a change in the leading edge
The input must be at '0' during the entire test range
- 02 = Test for signal level 1
when not enabled, tests for a change in the leading edge
The input must be at '1' during the entire test range
- 03 = Test for rising edge within the test range
- 04 = Test for falling edge within the test range
- 05 = Test for signal level 0 when leaving the test range
- 06 = Test for signal level 1 when leaving the test range

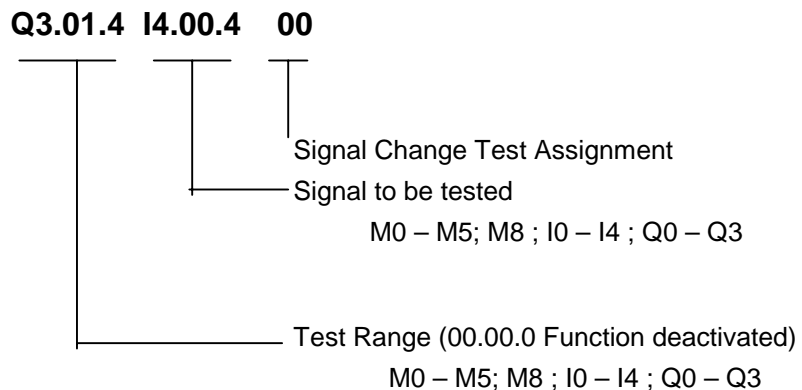
AA17 Signal Control 3



Signal Change:

- 00 = Function inactive
- 01 = Test for signal level 0
when not enabled, tests for a change in the leading edge
The input must be at '0' during the entire test range
- 02 = Test for signal level 1
when not enabled, tests for a change in the leading edge
The input must be at '1' during the entire test range
- 03 = Test for rising edge within the test range
- 04 = Test for falling edge within the test range
- 05 = Test for signal level 0 when leaving the test range
- 06 = Test for signal level 1 when leaving the test range

AA18 Signal Control 4

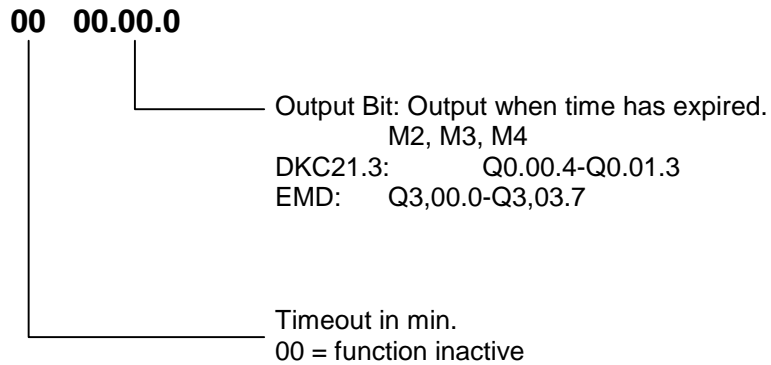


Signal Change:

- 00 = Function inactive
- 01 = Test for signal level 0
when not enabled, tests for a change in the leading edge
The input must be at '0' during the entire test range
- 02 = Test for signal level 1
when not enabled, tests for a change in the leading edge
The input must be at '1' during the entire test range
- 03 = Test for rising edge within the test range
- 04 = Test for falling edge within the test range
- 05 = Test for signal level 0 when leaving the test range
- 06 = Test for signal level 1 when leaving the test range

Note: If the BTV04 is used for programming and setting parameters, the test ranges (PLS outputs) are automatically detected from PLS Parameters N1-N4 and transferred to the test range values for Parameters AA15 – AA18.

AA19 Press: Time Monitoring



The press motion is tested using the falling edge of the feed angle (A116 Feed Angle Monitoring). In Automatic Mode, when the NC Program has been initialized, the system monitors for a change in the leading edge from 1 to 0. If this edge does not transition during the timeout preselected in the parameter, the following diagnostic is issued: **A-0012 Press Timeout** and the output bit programmed in Parameter AA19 is set.

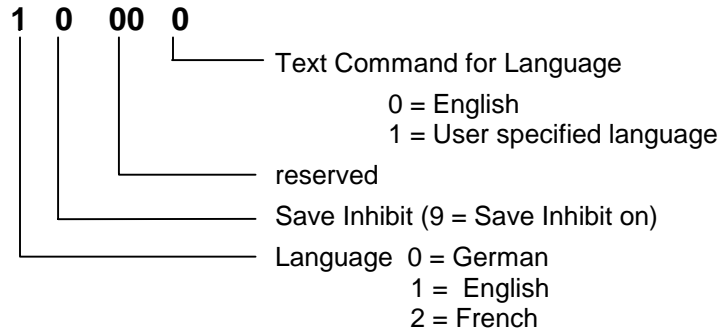
Via the function "Clear Error," the diagnostic and the output bit are cleared. Thereafter, time monitoring restarts.

The following conditions clear the diagnostic and the output bit:

Fault, Manual Mode, NC Stop

8.4 General Parameters

B000 Display



Save Inhibit:

With an input of 9, saving the NC Program and the Logic Task is inhibited.

Language:

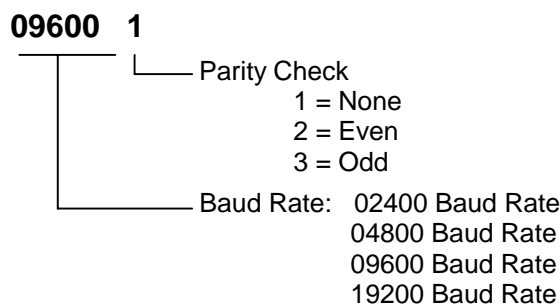
All texts are output in the selected language. The language selection becomes active immediately after the change is made in the parameter.

Language Text Command

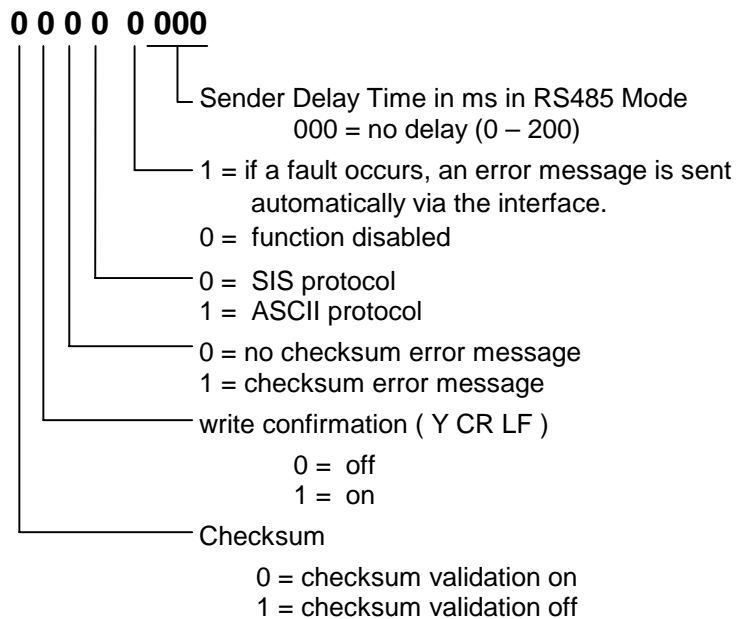
Basic language setting for user specified messages is English. User specified diagnostic messages (e.g. „FEED ANGLE IS MISSING“) can be created with the software MotionManager NT. A list of all existing messages is implemented in the software. One user specified message is possible (1 = User specified messages).

Details see chapter 4.12 – User specified diagnostic messages.

B001 Serial Interface Parameter 2



For further details, see the chapter entitled 'Serial Interface.'

B002 Serial Interface Parameter 2**Explanation of the term 'Response Delay' (0 – 200 ms)**

In RS485 Mode, once the serial interface receives the last character of an 'LF' request (Line feed: ASCII Code 10), it immediately switches to Send Mode. With various RS 485 PC driver cards, this leads to problems if the cards are unable switch to Receive Mode fast enough.

The interface can delay the switch from Receive to Send Mode by a defined amount of time (response delay).

The PC driver should be able to switch reliably from Send to Receive Mode within this time limit.

B003 Reserved**B004 Reserved****B005 Reserved**

B006 Analog Output 2, Signal Select

S 0 0000

└── Signal Number
S 0 0000 = unassigned

The B006 parameter can be used to assign a signal number to the analog AK2 output channel of the drive controller.
The content of these signals can be viewed using an oscilloscope.

Input	Definition	B008 Input Value	Value at 10V
S 0 0036	Command Velocity	Contents of Parameter A106 x 6	Contents of Parameter A106 [IU/s]
S 0 0040	Actual Velocity	Contents of Parameter A106 x 6	Contents of Parameter A106 [IU/s]
S 0 0047	Command Position	IU with 4 Decimal Places	Value from B005 [IU]
S 0 0051	Actual Position, Encoder 1	IU with 4 Decimal Places	Value from B005 [IU]
S 0 0053	Actual Position, Encoder 2	IU with 4 Decimal Places	Value from B005 [IU]
S 0 0080	Command Torque/Force	0.500 = 500%	Current at Standstill, Parameter CM02
S 0 0084	Actual Torque/Force	0.500 = 500%	Current at Standstill, Parameter CM02
S 0 0189	Lag Distance	IU with 4 Decimal Places	Value from B005 [IU]
S 0 0347	Velocity Control Deviation	Contents of Parameter A106 x 6	Contents of Parameter A106 [IU/s]
S 0 0383	Motor Temperature	0000.1000	100° C
P 0 0098	Max. Model Deviation	IU with 4 Decimal Places	Value from B005 [IU]
P 0 0141	Thermal Controller Load	0000.0100	100%

Fig. 8-11: Signal Selection

B007 Analog Output 2, Expanded Signal Select

12345678



Expanded signal selection is possible for representing signals as an analog voltage, a function which is not included in the B006 list. This function is activated if no parameter is assigned to the analog output via **B006, Analog Output 2, Signal Select**.

The following expanded signal selection options are defined:

- Expanded signal selection with permanently defined signals
- Byte output
- Bit output

1) Expanded Signal Selection with Permanently Defined Signals

Internal signals are assigned numbers. These signals have fixed reference units so that they can be scaled via **B007, Analog Output 2, Scaling per 10V Full Scale**. A scaling factor of 1.0 equals the fixed reference unit.

The following permanently defined signals are possible:

Signal Number B007	Output Signal	Reference Unit: Scaling Factor = 1.0
0x00000001	Motor Encoder Sine Signal	0.5V/10V
0x00000002	Motor Encoder Cosine Signal	0.5V/10V
0x00000003	Optional Sine Signal Encoder	0.5V/10V
0x00000004	Optional Cosine Signal Encoder	0.5V/10V
0x00000005	Position Loop Command Value Difference	rotary => 1000 Rpm/10V linear => 100 m/min/10V
0x00000006	DC Bus Power	1kW/10V
0x00000007	Absolute DC Bus Power amount	1kW/10V
0x00000008	Effective Current (Iq)	Peak Current Amplifier/10V
0x00000009	Relative Current (Id)	Peak Current Amplifier/10V
0x0000000a	Thermal Load	100%/10V No Scaling Possible
0x0000000b	Motor Temperature	150°C/10V
0x0000000c	Magnetizing Current	Peak Current Amplifier/10V
0x0000000d	Velocity Loop Command Value	rotary => 1000 Rpm/10V linear => 100 m/min/10V

Fig. 8-12: Signal Selection List with Predefined Signal Selection

The outputs are not scaling dependent and are always referenced to the motor shaft for the position and velocity data.

2) Byte Output

With this option, it is possible to directly output data memory storage location as an analog voltage. However, this is only useful if the data storage structure is known. Since this structure differs from version to version, this function can only be used by developers. The function is activated by setting Bit 28 in **Parameter B007, Analog Output 2, Expanded Signal Select**. The address of the storage location is defined in the 24 least significant bits of the expanded signal selection.

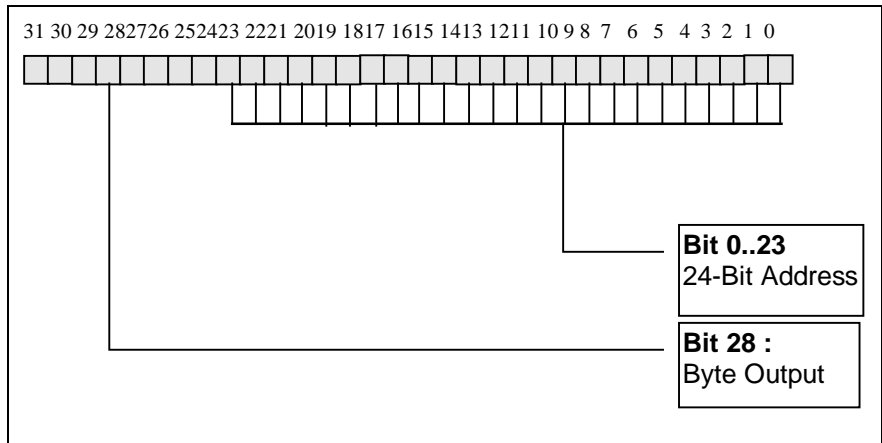


Fig. 8-13: Definition of **B007, Analog Output 2, Expanded Signal Select** with Byte Output

3) Bit Output

With this option, individual bits of the data memory can be represented as an analog voltage. If the bit in question is set, 10 volts are output at the analog output. In response to a reset bit, -10 volts are output. The function is activated by setting Bit 29 and inputting the desired memory address in **Parameter B007, Analog Output 2, Expanded Signal Select**.

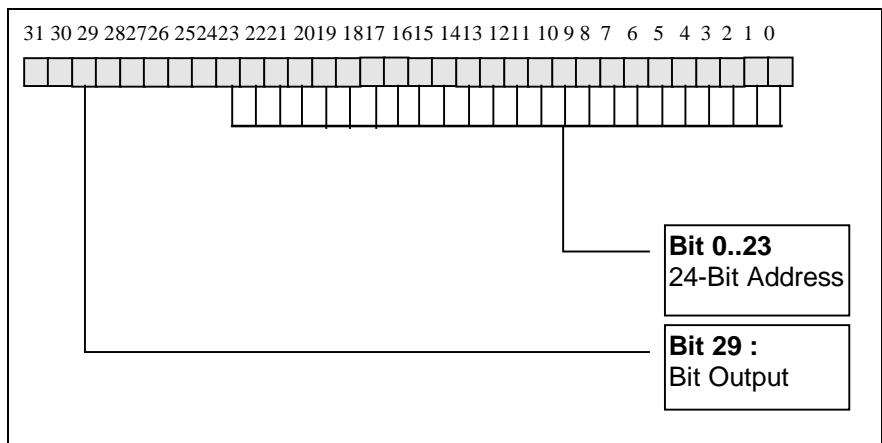
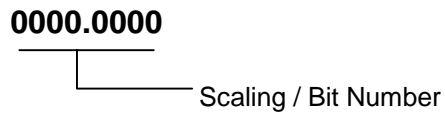


Fig. 8-14: Definition of **B007, Analog Output 2, Expanded Signal Select** with Bit Output

B008 Analog Output 2, Scaling per 10V Full Scale



The resolution of the selected signal can be varied using **Parameter B008, Analog Output 2 Scaling per 10V Full Scale**. If a signal number is assigned via **B006, Analog Output 1, Signal Selection**, scaling always uses the same **unit** as the parameter with the assigned ID number.

When pre-defined signals are output, scaling is defined as a factor having 4 decimal places. It has a permanent reference with a fixed unit. The scaling defines the least significant bit for bit and byte output. The input is an integer value without decimal places.

B009 Reserved

B010 Reserved

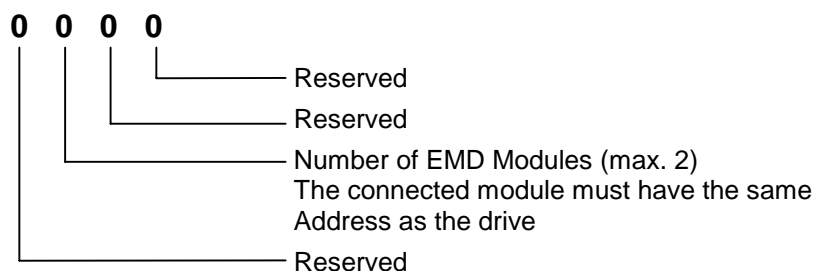
:

B011 Reserved

B012 Reserved

B013 Reserved

B014 EMD Configuration



See the chapter entitled "EMD Module"

8.5 Encoder Parameters

C000 Working Polarity

0
 0 = motor turns in clockwise direction
 1 = motor turns in counterclockwise direction

'Right-hand motor rotation = motor turns in clockwise direction'
 (viewed facing the motor shaft end)

C001 Interface, Feedback 1 (Motor)

01
 Measuring System

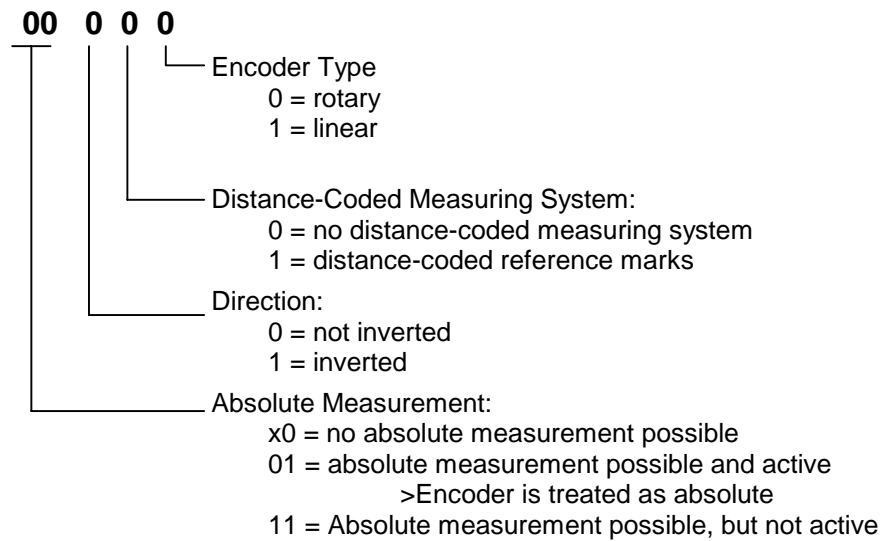
In motors with feedback memory, these parameters are written automatically.

This parameter determines the encoder interface to which the motor encoder is connected. The number of the corresponding interface module should be entered in this parameter.

C000	Interface	Measuring System
1	X4	Digital servo feedback or resolver
2	X8	Incremental encoder with sine signals by Heidenhain; 1V signals
5	X8	Incremental encoder with square wave signals, by Heidenhain
8	X8	Encoder with EnDat interface
9	X8	Gearwheel encoder with 1Vp-p signals
10	X4	Resolver encoder without feedback memory
11	X4+X8	Resolver without feedback memory plus incremental encoder with sine signals
12	X4+X8	Hall encoder with square-wave encoder
13	X4	ECl encoder
14	X4+X8	Hall encoder with sine encoder

Table 8-15 Measuring System Ports

C002 Position Feedback 1 Type



This parameter is used to stipulate the most important properties of the motor encoder (position encoder 1).

Remark:

In absolute measuring systems with memory, absolute readout is automatically set.

For MHD, MKD and MKE motors, the encoder type, distance-coded measuring system, and direction of movement are set by the drive and are write-protected.

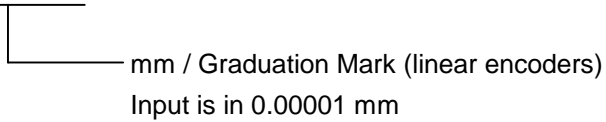
Note: Only the bits listed here are supported by the software.

C003 Feedback 1 Resolution (Motor)

00005000



00005000



In motors with feedback memory, these parameters are written automatically.

Depending on parameter **CM00, Motor type** (rotary or linear motors), **C003, Resolution, position encoder 1** stipulates the motor encoder resolution.

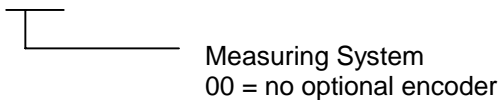
For rotary motors, this value reflects the number of pulses (number of graduation marks) or cycles per motor revolution, and with linear motors, the number of graduation marks per mm. For motors with a resolver feedback, the number of pole pairs is stored here.

C004 Interface Feedback 2

Applicable for

- **measuring wheel encoder**

05

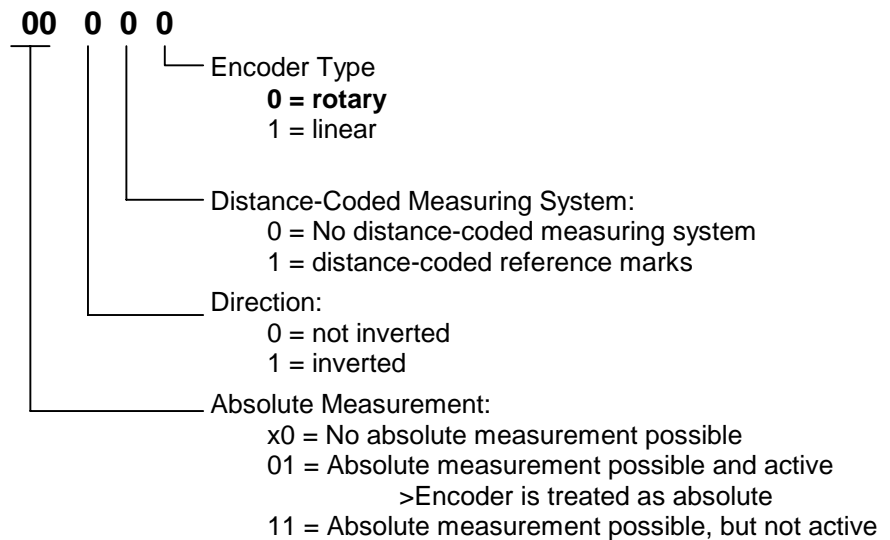


This parameter determines the encoder interface to which the measuring wheel encoder is connected. The number of the corresponding interface module should be entered in this parameter.

C004:	Interface	Measuring System
1	X4	Digital Servo feedback or resolver
2	X8	Incremental encoder with sine signals by Heidenhain; 1V signals
5	X8	Incremental encoder with square wave signals, by Heidenhain
8	X8	Encoder with EnDat interface
9	X8	Gearwheel encoder with 1Vp-p signals

Fig. 8-16: Measuring System Connections

C005 Position Feedback 2 Type

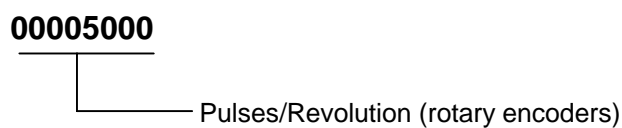


This parameter is used to set the most important properties of the interface encoder (position encoder 2).

Remark:

In absolute measuring systems with memory, absolute readout is automatically set to x1.

C006 Feedback 2 Resolution



See C003.

C007 Feed Rate Constant 2

0500.0000

Measuring Wheel Feed Rate Constant in IU

This parameter is read out only with rotary encoders.

This parameter describes the conversion from rotary to linear motion. It is defined as the linear displacement of the load during one revolution of the measuring wheel encoder shaft.

Input min.: 0.1000 IU

Input max.: 5000.0000 IU

C008 Reserved

C009 Reserved

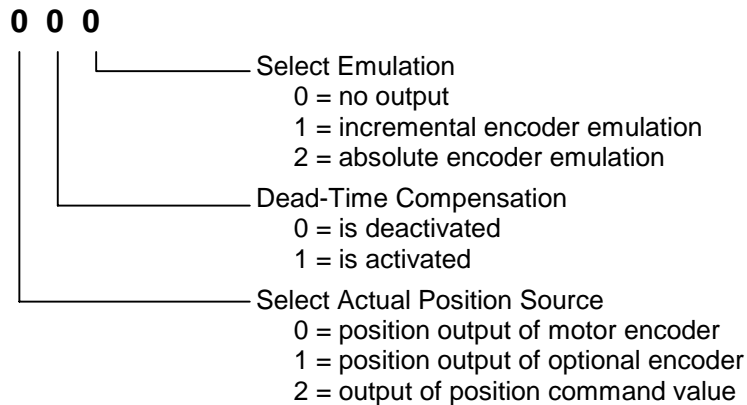
C010 Reserved

C011 Reserved

C012 Reserved

C013 Reserved

C014 Encoder Emulation Configuration



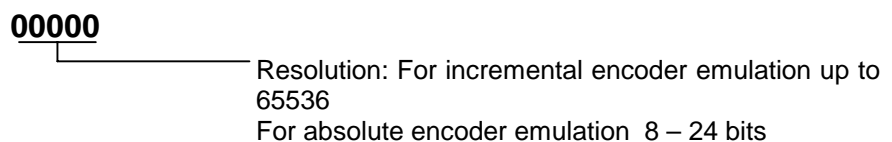
Select between incremental/absolute encoder emulation.

Select the source of the signal to emulate.

See also functional description for: "Encoder Emulation."

Note: If an external press encoder is used, the encoder emulation can no longer be activated, because this connector interface is in use to detect the press encoder.

C015 Encoder Emulation Resolution

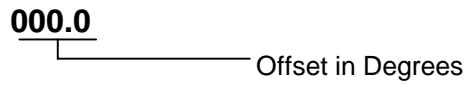


If incremental encoder emulation is selected as the actual position output, the number of graduation marks used by the emulated incremental encoder must be entered here.

See also functional description for: "Encoder Emulation."

Input min.: 1 or 8
Input max.: 65536 or 24

C016 Marker Pulse Offset

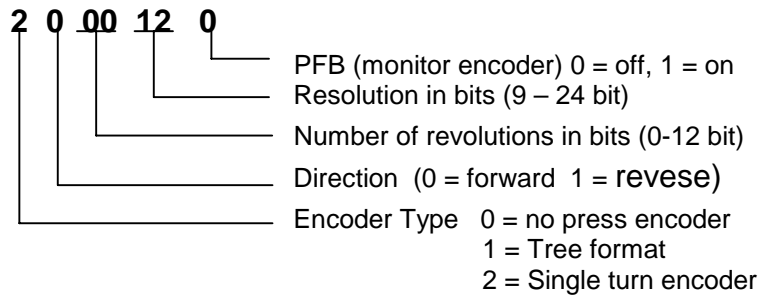


For the emulated incremental encoder, this parameter can shift the position of the marker pulse (zero pulse) within one (electrical or mechanical) revolution.

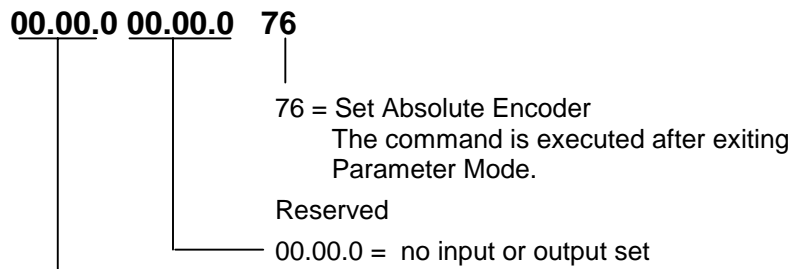
See also functional description for: "Encoder Emulation."

Input min.: 0
 Input max.: 359.9
 Input Value 0 0 0

C017 External SSI Encoder (Press Encoder)

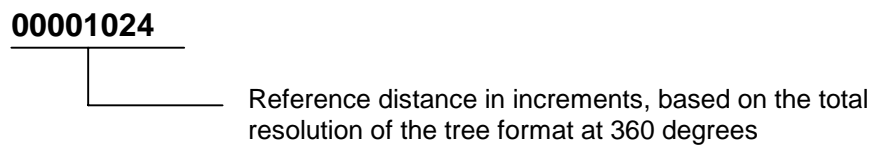


C018 SSI Encoder Homing



Set Absolute Position: If 76 is entered in this parameter, the absolute value is set to the value stored in **Reference distance, Parameter C019**, upon exiting Parameter Mode. After that, the 76 is cleared. If a parameter error occurs, the 76 is cleared automatically, and the function must be reprogrammed.

C019, Encoder Reference Distance



Example: To attain an offset of 180 degrees when a directly connected encoder is used, the value 4096 must be set in this parameter.

8.6 Control Parameters

CR00 Current Loop Proportional Gain 1

655.35
_____ V/A

The current loop proportional gain is fixed for every motor-drive combination. It depends on the type of motor and should not be changed. It is loaded from the motor feedback memory when the initial connection is made (UL is displayed) or when the "Basic load" command is issued.

Note: The values set at the factory should not be changed!

See also functional description for: "Setting the current loop"

Input min.: 0 V/A

Input max.: 655.35 V/A

CR00 Current Loop Integral Action Time 1

6553.5
_____ [ms]

The current loop integral action time is fixed for every motor-drive combination. It depends on the type of the motor. The factory setting may not be changed. The basic setup for all loops is loaded after the initial connection is made (UL is displayed) or with the command "Basic load." For motors without feedback memory, the value can be found in the motor data sheet.

See also functional description for: "Setting the current loop"

Input min.: 0 ms

Input max.: 6553.5 ms

CR02 Velocity Loop Proportional Gain

6553.5

_____ A s/rad (A min/m)

This parameter contains the value for the velocity loop proportional gain of the velocity loop.

The proportional gain **unit** depends on the motor type of the connected motor.

Unit:

Motor Type:	Unit:
Rotary motor:	A•s/rad
Linear motor:	A•min/m

Fig. 8-17: Units for the Velocity Loop Proportional Gain Depending on Motor Type

It is possible to load a default value for this parameter using the "Basic load" command if the current motor has a feedback memory. (**CM00**, **Motor type:** 1 or 5).

See also functional description for: "Setting the velocity loop."

Input min.: 0 A s/rad (A min/m)

Input max.: 6553.5 A s/rad (A min/m)

CR03 Velocity Loop Integral Action Time

6553.5

_____ [ms]

The velocity loop forms a current command value from the difference between the velocity command value and the velocity feedback value (= speed regulation deviation).

This current command value consists of a proportional component and an integral component. The Velocity Loop Integral Action Time corresponds to the time in which the integral component of the current command value is increasing on the value of the proportional component.

Definition of the Integral Action Time:

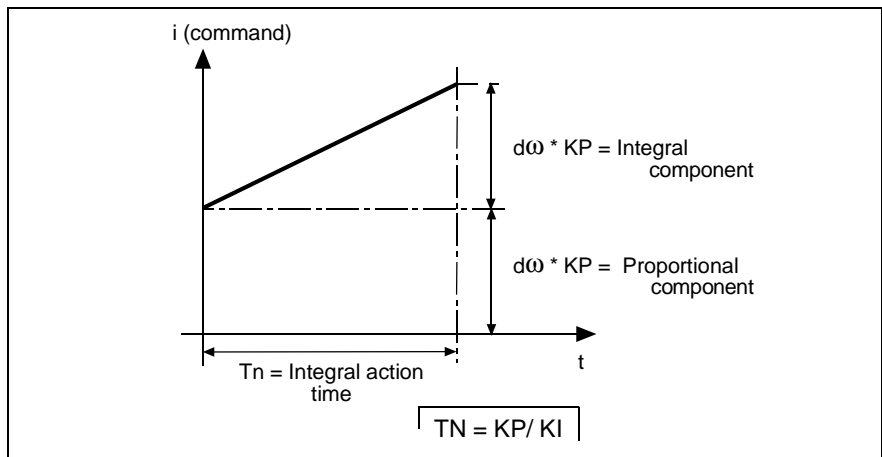


Fig. 8-18: Integral Action Time

The integral action time is defined as that value on the time axis at which the integral component is equal to the proportional component. This represents the time that a pure I-controller would need until the controller output variable y is equal to the output variable of a P-controller at time $t=0$.

Entering a value of 0 deactivates the integral component (see also functional description for: "Setting the Velocity Loop").

Input min.: 0 ms
 Input max.: 6553.5 ms

CR04 Velocity Loop Smoothing Time Constant

00500

_____ [μs]
00000 = Function disabled

The time constant that can be activated in this parameter affects the output of the velocity loop. It can be used to suppress quantization effects and limit the bandwidth of the velocity loop. The limit frequency is derived from smoothing time constant T resulting from the relationship:

$$f_g = \frac{1}{2 \cdot \pi \cdot T}$$

Inputting the minimum input value or '0' turns the filter off.

See also functional description for: "Setting the velocity loop"

Input min.: 0 μs
Input max.: 65500 μs

CR05 Notch Filter Frequency of Velocity Loop

900

_____ Frequency [Hz]

To suppress the mechanical resonance frequency, a band-pass filter can be activated at the output of the velocity loop.

Output of the velocity controller to activate a band-pass filter. It can be set using the following parameters:

CR05, Notch Filter Frequency and

CR06, Velocity Loop Bandwidth Rejection Filter

Velocity loop parameter set.

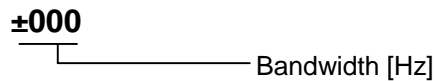
In **CR05, Notch Filter Frequency of Velocity Loop**,

the most attenuated frequency is set.

See also functional description for: "Filtering oscillations from mechanical resonance."

Input min.: 50 Hz
Input max.: 950 Hz

CR06 Velocity Loop Bandwidth Notch Filter



To suppress the mechanical resonance frequency, a band-pass filter can be activated at the output of the velocity loop. The parameters for this function are **CR05, Notch Filter Frequency of Velocity Loop** and **CR06, Velocity Loop Bandwidth Notch Filter**.

CR06, Velocity Loop Bandwidth Notch Filter sets the frequency range on either side of the notch frequency in which the attenuation is less than -3dB.

Example:

CR06 = 500 Hz,

CR06 = 200 Hz;

then: attenuation < -3dB in range of 400 - 600 Hz.

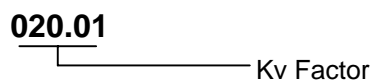
Parameter Value	Action of CR06
-1	VZ1 filter with CR04 time constant
0	filter is off
>0	bandwidth for notch filter

Fig. 8-19: CR06, Velocity Loop Bandwidth Rejection Filter

See also functional description for: "Filtering oscillations from mechanical resonance."

Input min.: -1 Hz
 Input max.: 950 Hz

CR07 Kv Factor



This parameter contains the value for the proportional gain of the position loop. The Kv factor must be matched to the given mechanical conditions.

Input min.: 00.01
 Input max.: 30.00

CR08 Acceleration Feedforward Gain

6553.5

_____ [mA/rad/s²]

The acceleration feedforward helps to reduce the following error during the acceleration in lagless mode. To do this, the current acceleration command value is multiplied by the "acceleration feedforward gain" and added to the current command value of the velocity loop.

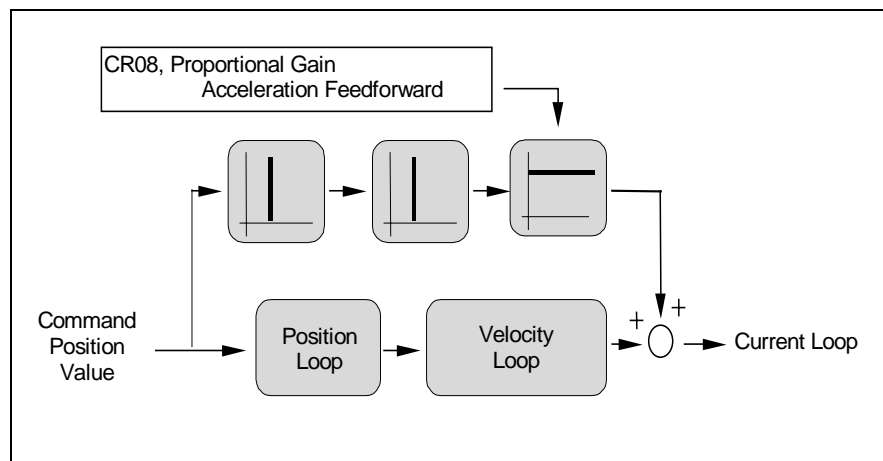


Fig. 8-20: Acceleration Feedforward

Activation:

Writing a value greater than 0 to this parameter activates the acceleration feedforward.

Note: The loop also functions without feedforward! (The standard value equals 0.) Acceleration feedforward is only possible in lagless mode.

Comparison between the different types of feedforward

The **velocity feedforward** is activated by selecting an operating mode with no **position lag** (following error). This creates (from the standpoint of the position loop) a **feedforward of the 1st order** (proportional to velocity). This means that at constant speed, the position deviation is 0. Nevertheless, a lag results, during acceleration (and deceleration).

The **acceleration feedforward** is activated by entering a value greater than 0 for this parameter. It creates (from the standpoint of the position loop), a **feedforward of the 2nd order** (proportional to acceleration). The position deviation is 0, as long as the correct gain is set and the acceleration is constant.

Recommended Input Value:

$$CR08 = \frac{\text{Moment of Inertia (kgm}^2\text{)} * 1000}{\text{Torque Constant (Nm/A)}}$$

The moment of inertia is the total sum of the rotor and the reflected load inertia.

The factor 1000 is needed because of the unit mA.

Fig. 8-21: Acceleration feedforward proportional gain

See also functional description for: "Setting the Acceleration Feedforward."

Input min.: 0 mA/rad/s²
Input max.: 6553.5 mA/rad/s²

CR09 Switching Frequency

4
_____ [kHz]

This parameter is used to set the switching frequency of the pulse width modulation controller to **4 kHz or 8 kHz**.

This parameter cannot be changed online.

Input min.: 4 kHz
Input max.: 8 kHz

CR10 Actual position smoothing time constant in measuring wheel mode

010.00
_____ Smoothing Time Constant in ms

•

When measuring wheel mode is active, the position control loop is closed using the sum of

- actual position 1 (motor encoder) and the
- filtered difference between actual position 2 and actual position 1

This parameter determines the time constant of the filter used.

The differences in actual position are attenuated in order to minimize any negative effects caused by poor coupling between encoder 2 and the motor shaft (e.g., due to the measuring wheel becoming disengaged from the material).

Actual position 2 by itself stipulates the end position.

See also functional description for: Measuring wheel operating mode.

If the input value = 0, only the measuring wheel is operable.

Input min.: 000.00
Input max.: 327.67

8.7 Motor Parameters

CM00 Motor Type

1 _____ Motor Type

The motor type can be selected with this parameter. The following motor types are supported:

- 1: **MHD**
- 2: 2AD / 1MB with NTC temperature sensor
- 3: **LSF**
- 4: LAR / LAF
- 5: **MKD / MKE**
- 6: 2AD /1MB with PTC temperature sensor
- 7: Synchronous kit motor

Input min.: 1

Input max.: 7

CM01 Bipolar Torque/Force Limit Value

100 _____ [%]

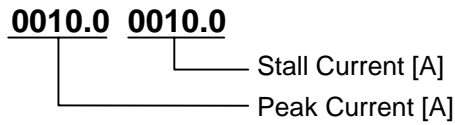
This parameter specifies the maximum permissible torque and applies symmetrically in both directions. It ensures that the maximum permissible peak torque for the given application is not exceeded, regardless of how high the torque/force is set in the MOM command.

The evaluation is based on the percentage of the motor current at standstill:

Input min.: 1 %

Input max.: 500 %

CM02 Motor Peak Current / Stall Current



The “Motor Peak Current” specifies the maximum current which may flow through the motor for a short period without damaging it.

If the motor's peak current is less than the amplifier's peak current, the maximum output current will be automatically limited to the motor's peak current.

This value is stored in the motor feedback memory of MHD, MKD and MKE motors and is loaded from there when the drive controller is turned on for the first time. For other motor types, the value must be taken from the data sheet.

Input min.: 0.1 A

Input max.: 500.0 A

The “Continuous Motor Stall Current” is the current at which the motor continuously generates standstill torque according to the motor data sheet. This value is stored in the motor feedback memory for MHD, MKD and MKE motors and is loaded from there when the drive controller is turned on for the first time. For other motor types, the value must be taken from the data sheet.

All torque/force data are based on this motor stall current being equal to 100% .

Input min.: 0.1 A

Input max.: 500.0 A

CM03 Maximum Motor Speed

10500.000

_____ in RPM for rotary motors
m/min for linear motors

The maximum velocity of the motor must not be exceeded. It also limits the **A106, Maximum Velocity** parameter.

This value is stored in the motor feedback memory of MHD, MKD and MKE motors and is loaded from there when the drive controller is turned on for the first time. For other motor types, the value must be taken from the data sheet.

In torque regulation, the drive will be switched to a torque-free state and the error message **F879 Velocity limit exceeded** will be issued if the maximum motor speed is exceeded by more than 12.5%.

Input min.: 0
Input max.: 99999.999

CM04 Number of Pole Pairs/Pole Pair Distance

0003

_____ Number of pole pairs

For **rotary motors**, the number of **pole pairs** per motor revolution is specified here. For **linear motors**, the **length of a pole pair** must be indicated here. In motors with motor feedback memory, e.g., MKD motors, this value is stored in memory and need not be specified (see also functional description for: "Motor Feedback Memory").

CM05 Torque/Force Constant

000.20

_____ [Nm/A]

The torque/force constant indicates how much torque or force the motor delivers at a certain effective current. For synchronous motors, this value depends entirely on the design of the motor.

In asynchronous motors, this value is valid as long as the motor is not operated in the field-weakening range.

For MHD, MKD and MKE motors, this value is stored in the feedback memory and cannot be changed.

Input min.: 0.01 Nm/A
Input max: 655.35 Nm/A

CM06 Moment of Inertia of the Rotor

0.00003
[Kgm²]

This parameter indicates the moment of inertia of the rotor without load. For motors with feedback memory (e.g. MKD), it is saved in the feedback memory.

Input min.: 0.00001
Input max.: 1.00000

CM07 Holding Brake Type

0 0

- 0 = self-holding brake
0V at the brake, brake applied
- 1 = self-releasing brake
24V at the brake, brake applied
- 0 = Servo brake
brake is applied after reaching the max. braking time.
- 1 = Main spindle brake
Brake is applied only at < 10 RPM

If a holding brake is used, this parameter specifies whether it is a **self-holding or self-releasing** brake. If an **MHD** or **MKD** motor is used, the holding brake, if there is one, is a self-holding one. Bit 0 is automatically set to 0. When other motor types are used, this bit must be input at initial startup.

CM08 Holding Brake Current

010.000
└──────────┘ [A]

This parameter indicates how much current is drawn by the holding brake in the in-circuit motor.

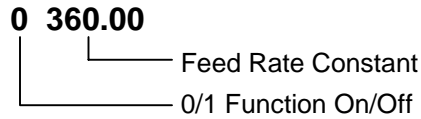
Input min.: 0
Input max.: 500.000

CM09 Motor Temperature

145 155
└──────────┘ Motor shutdown temperature
└──────────┘ Motor warning temperature

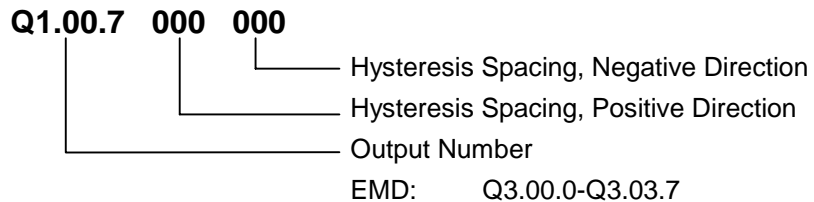
8.8 PLS Parameter

N100 Activate PLS



The PLS must be activated, and a feed constant that references one encoder revolution must be programmed.

N101 Output Channel 1



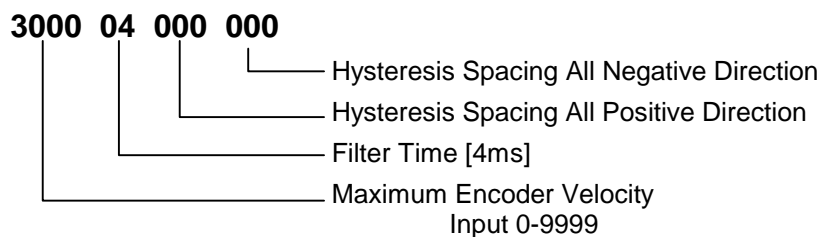
The output number determines at which output the PLS position is issued. If the PLS position is only to be used internally as a marker (e.g. for feed angle), outputs that are not physically present in the hardware, like outputs in group Q1.00 can be used. Multiple PLS positions can be assigned to each output.

For all outputs, hysteresis spacing can be assigned separately for both encoder directions.

Example: The programmed PLS position can be between 60 and 120 degrees, and the hysteresis spacing for the forward direction is input as 20 degrees. The output is turned on between 80 and 140 degrees, when the encoder moves in the positive direction. If hysteresis spacing of 20 degrees is programmed for the negative direction and the encoder turns in that direction, the output is set between 100 and 40 degrees.

Note: Parameters N1 2 to N1 8 have the same function for output channels 2 through 8.

N109 SSI Encoder Monitoring



Encoder Velocity:

The encoder is monitored for a maximum possible velocity. If it is exceeded, the error message "F-0323 PLS velocity exceeded" is issued.

Filter Time:

To prevent bounce in the output for an encoder speed that is not constant, a filtering time in milliseconds can be set for all inputs. The input value is multiplied by 4 internally.

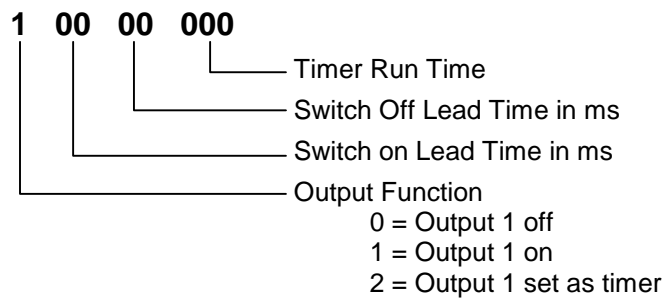
Hysteresis Spacing:

Hysteresis spacing for both directions of movement, which is valid for all PLS outputs, can also be programmed here.

Note: These parameters can only be written in Parameter Mode.

N110 Reserved

N111 Output Channel 1 Function, Output



Output Function:

The output function determines whether or not the output is used, and how it is used.

Lead Time:

To balance switching hystereses for connected peripherals, a lead time for turning on/off the output can be set. Depending on the encoder speed, the corresponding output is turned on/off earlier.

Run Time:

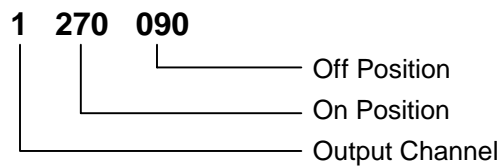
If the output is programmed as a timer, it is set when the PLS position is reached and cleared again after the programmed time has expired.

Note: Parameters N1 12 to N1 18 have the same function for output channels 2 through 8.

N119 Reserved

N120 Reserved

N121 PLS Position



Output Channel

The output channel determines which output (Parameter N101 – N109) is assigned to the PLS position.

On Position

The point at which the output is turned on is defined by the on position. If a hysteresis or lead time has been input in the corresponding parameters, the on position is automatically calculated and adjusted.

Off Position

The point at which the output is turned off is defined by the off position. If a hysteresis or lead time has been input in the corresponding parameters, the off position is automatically calculated and adjusted.

Note: Parameters N1 22 to N1 31 have the same function for output channels 2 through 11.

8.9 List of CRP Parameters

Firmware : _____ Com. No. : _____
 Date : _____ Client/End Cl.: _____
 Prep. by : _____ Serial No. : _____

Designation	Parameters	Data
Application Type	A100	0 _
Feed Rate Constant	A101	
Gearing	A102	
Not Required	A103*	+000000.000
Not Required	A104*	+000000.000
Not Required	A105*	000000.000 0
Maximum Velocity	A106	
Jog Velocity	A107	
Bipolar Acceleration	A108	
Acceleration / Deceleration	A109	
Bipolar Jerk Limiting, Time Constant	A110	
Switching Threshold, Position Reached	A111*	M4.01.1 _._._._
Reserved	A112	
Not Required	A113	00.00.0 0000.000
Presignaling	A114	
Monitoring	A115	
Feed Angle Monitoring	A116	
Slave axis, measuring wheel mode	A117	
Not Required	A118*	0000.000
Best Possible Deceleration	A119	

Tasks 2 & 3	AA00*	0000 0830 0
Not Required	AA01*	00.00.0 0 0000
Not Required	AA02*	00.00.0 0 0 0000
Reserved	AA03	
Override	AA04	
Open Feed Roll 1	AA05	
Open Feed Roll II	AA06	00.00.0
Measuring Wheel Mode	AA07	
Various Functions	AA08	
Feed-To-Length Monitoring	AA09	
Manual Mode	AA01*	M4.00.2 I0.00.4 M4.04.0
Tool Wear	AA11*	Q3.00 M8.02 8 630
Press, Signal Offset	AA12*	M4.01.7 __.__. _
Press (Intermittent)	AA13	I0.01.0 __.__. _
Enable Signal Control SIC	AA14	
Signal Control 1	AA15	
Signal Control 2	AA16	
Signal Control 3	AA17	
Signal Control 4	AA18	
Timeout for Press	AA19	

Display	B000	
Interface Parameters	B001	
Interface Parameters	B002	
Analog Output 1 Signal Selection	B003	
Analog Output 1, Expanded Signal Selection	B004	
Analog Output 1, Scaling per 10V Full Scale	B005	
Analog Output 2 Signal Selection	B006	
Analog Output 2, Expanded Signal Selection	B007	
Analog Output 2, Scaling per 10V Full Scale	B008	
Not Required	B009*	0 000
Not Required	B010*	4
Not Required	B011*	00000
Not Required	B012*	0000000.0
Not Required	B013*	0 0 0
ECOX Configuration	B014	

Working Polarity	C000	
Interface Encoder 1	C001	
Position Encoder Type 1	C002	
Resolution, Position Encoder 1 (Motor)	C003	
Interface Encoder 2	C004	
Position Encoder Type 2	C005	
Resolution 2	C006	
Feed Constant 2	C007	
Reserved	C008	
Not Required	C009*	0 0 0 00 00
Not Required	C010*	00.00.0 00.00.0 00
Not Required	C011*	+000000.000
Not Required	C012*	+000.000
Not Required	C013*	0000 0000
Encoder Emulation (only without Press Encoder)	C014*	0 0 0
Not Required	C015*	00000
Not Required	C016*	000.0
SSI Absolute Encoder for PLS	C017	
Home SSI Encoder for PLS	C018	
Reference Distance, SSI Encoder for PLS	C019	

Current Loop Proportional Gain 1	CR00	
Current Loop Integral Action Time 1	CR01	
Velocity Loop Proportional Gain	CR02	
Velocity Loop Integral Action Time	CR03	
Velocity Loop Smoothing Time Constant	CR04	
Notch Filter Frequency of Velocity Loop	CR05	
Velocity Loop Bandwidth Notch Filter	CR06	
Kv Factor	CR07	
Acceleration Feedforward Gain	CR08	
Switching Frequency	CR09	
Actual Position Filter, Time Constant for Measuring Wheel Mode	CR10	

Motor Type	CM00	
Bipolar Torque/Force Limit Value	CM01	
Motor Peak Current / Stall Current	CM02	
Maximum Motor Speed	CM03	
Number of Pole Pairs/Pole Pair Distance	CM04	
Torque/Force Constant	CM05	
Moment of Inertia of the Rotor	CM06	
Holding Brake Type	CM07	
Holding Brake Current	CM08	
Motor Temperature	CM09	

PLS	N1 XX	_ 360.00
PLS	N1 00	
Output Channel 1	N1 01	
Output Channel 2	N1 02	
Output Channel 3	N1 03	
Output Channel 4	N1 04	
Output Channel 5	N1 05	
Output Channel 6	N1 06	
Output Channel 7	N1 07	
Output Channel 8	N1 08	
SSI Encoder Monitoring	N1 09	
Reserved	N1 10	
Output Channel 1	N1 11	
Output Channel 2	N1 12	
Output Channel 3	N1 13	
Output Channel 4	N1 14	
Output Channel 5	N1 15	
Output Channel 6	N1 16	
Output Channel 7	N1 17	
Output Channel 8	N1 18	
Reserved	N1 19	
Reserved	N1 20	
PLS 1, Output Channel Position	N1 21	
PLS 2, Output Channel Position	N1 22	
PLS 3, Output Channel Position	N1 23	
PLS 4, Output Channel Position	N1 24	
PLS 5, Output Channel Position	N1 25	
PLS 6, Output Channel Position	N1 26	
PLS 7, Output Channel Position	N1 27	
PLS 8, Output Channel Position	N1 28	
PLS 9, Output Channel Position	N1 29	
PLS 10, Output Channel Position	N1 30	
PLS 11, Output Channel Position	N1 31	

Fig. 8-22: Parameter Lists

Note: In order to ensure the described functionality, the parameter list values must be entered for all parameter numbers marked with an asterisk (*).

9 Diagnostic Message Descriptions

9.1 Overview of the Diagnostic Message Descriptions

Diagnostic Message Types

Each operating state of the drive controller is identified with a diagnostic message.

Distinctions are made between:

- **Diagnostic Error Messages**
- **Diagnostic Warning Messages**
- **Command Diagnostic Messages**
- **Diagnostic Status Messages**
- **Operation Status**

Composition of a Diagnostic Message

A diagnostic message consists of:

- a **diagnostic message number** and a
- **Diagnostic Message Text**

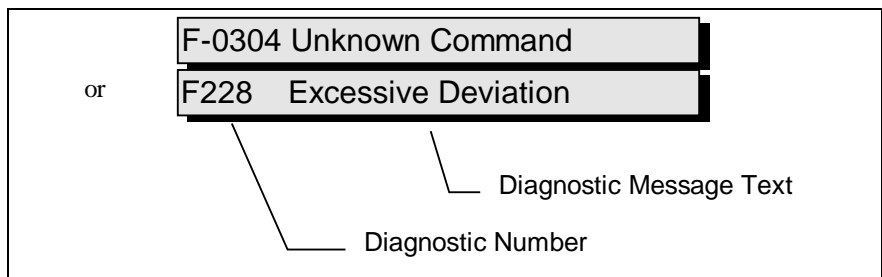


Fig. 9-1: Composition of Diagnostic Message with Diagnostic Message Number and Text

For the example shown in the above graphic, "F2" and "28" alternate in the H1 display.

Using status 53, the control can read the **diagnostic message number** and the diagnostic message text as **F228, Excessive deviation**.

H1 Display

The H1 display visually displays the diagnostic message on the drive controllers.

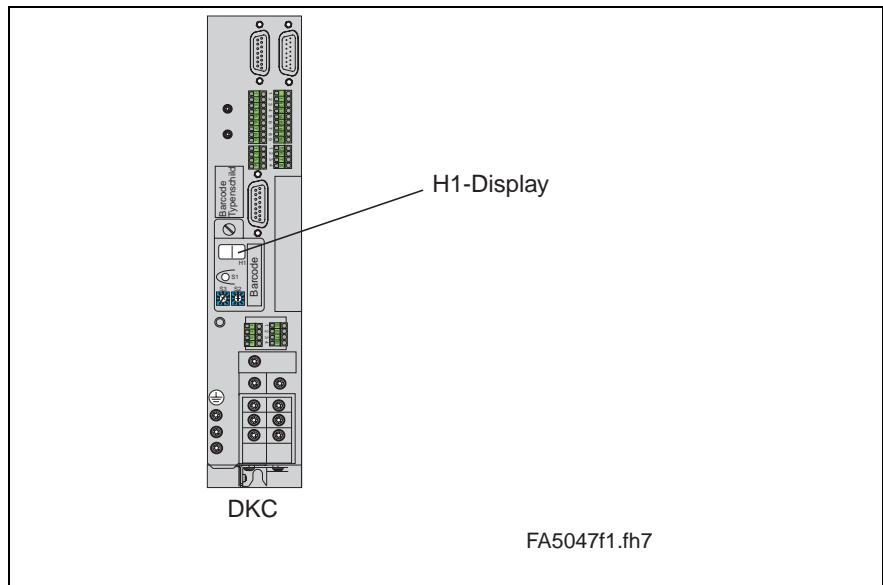


Fig. 9-2: H1 Display

The diagnostic message number appears in the two-digit seven-segment display. See the "Diagnostic Message Priority Diagram" for the display format.

This display quickly shows the current operating state without the use of a communications interface.

The operating mode is apparent from the H1-Display. If the drive complies with the operating mode and no error is present, "AU" appears on the display. = Automatic

"HA" = Manual Mode

"PA" = Parameters

Diagnostic Message Output Priority

If more than one diagnostic message is active, then the message with the highest priority will be displayed. If more than one diagnostic message is active, then the message with the highest priority will be displayed.

The following graphic classifies the operating states in order of importance.

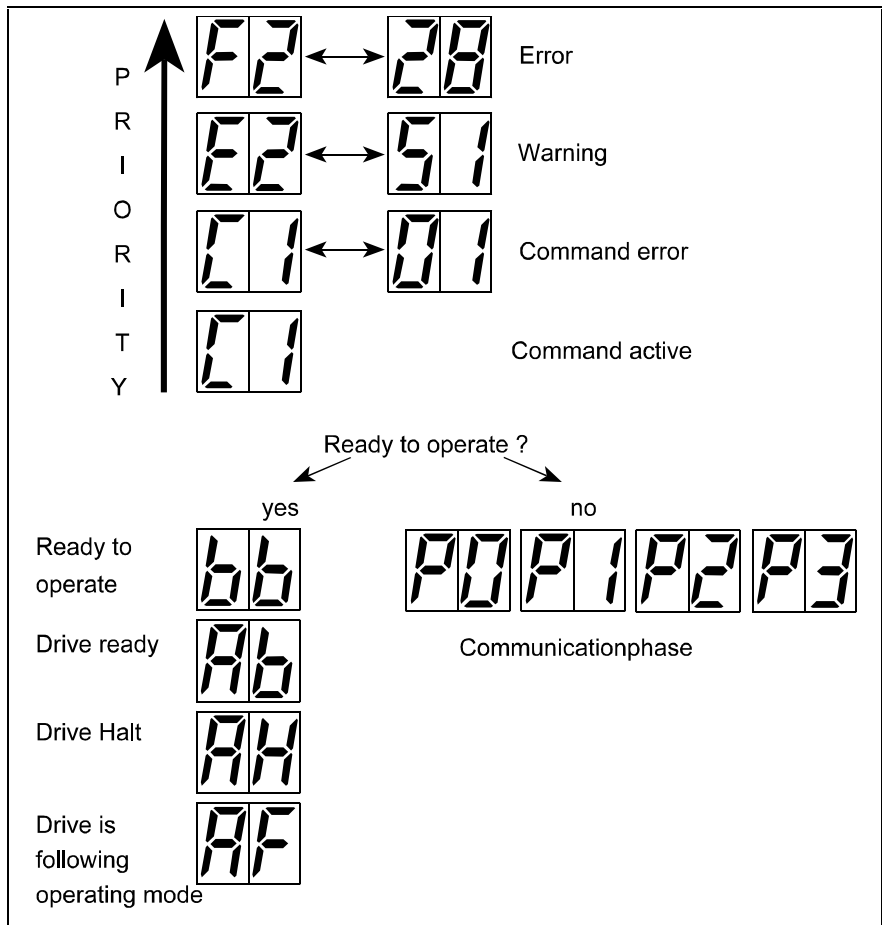


Fig. 9-3: Diagnostic Message Priority Diagram

Plain Text Diagnostic Message

The plain-text diagnostic message contains the diagnostic message number followed by the diagnostic message text, as shown in the example, "Excessive deviation" (Fig. 11-1). It can be read out via Status 53, **Diagnostic**, and is used for direct display of the drive status on a user interface.

The language of the plain-text diagnostic message can be changed, depending on the language selection (Parameter B000).

9.2 Display of PL, UL, and Pd

PL

If an incompatible firmware version is installed, the drive controller detects the problem the next time the control voltage is turned on. "PL" is then shown on the seven-segment display.

By pressing "S1" on the programming module, the following parameters are set to their default values:

CR00	CR05	C001	CM00 - CM11
CR01	CR06	C002	
CR02	CR08		
CR03	CR09		
CR04	CR10		
CR07			

UL

If a motor with different power data is connected to the drive controller, the drive controller detects the problem the next time the control voltage is turned on. "UL" is then shown on the seven-segment display.

By pressing "S1" on the programming module, the following parameters are set to their default values:

CR00	C001	CM00 - CM11
CR01	C002	
CR02	C003	
CR03		
CR04		
CR07		

Pd

If any parameters are lost, the drive controller detects the problem the next time the control voltage is turned on. "Pd" is then shown on the seven-segment display.

By pressing "S1" on the programming module, all parameters are set to their default values.

Note: Previous parameter settings are lost after installing new firmware and subsequently executing the "Load Default Parameters" function. If the loss of previous parameter settings is to be avoided when new firmware is installed, back up and re-load the parameters before firmware installation.

9.3 Diagnostic Error Messages

F208 UL The motor type has changed

This message is displayed when the unit is powered up for the first time with a new motor.

The regulator settings for the current, velocity and position loops are stored in the feedback memory on the motor. After powering up, the controller compares the motor type stored in the parameter with the connected motor type. If the two do not match, the basic control loop setting must also be adjusted.

With the Basic Load command, the default control loop settings are loaded from the feedback memory into the drive controller. The previous control loop settings are overwritten. The Basic Load command is started by pressing the S1 key on the controller.

Causes:

- The motor has been replaced.
- A parameter file was loaded in which the motor type is different from the motor type present.

Remedy:

Press the S1 key.

F208 - Attributes

SS Display:	UL
Message No.:	F208 (hex)
Error No.:	208
Class:	Non-Fatal

F209 PL Load parameter default values

After replacing the firmware version, the drive displays “PL” if the parameters have been changed compared to the old firmware. Pressing the S1 key on the controller clears all of the parameters and sets them to the default values.

Cause:

The firmware has been replaced; the number of parameters in the new firmware has changed compared to the old version.

Remedy:

Press the S1 key on the controller. All parameters will be cleared and preset with the parameters assigned at the factory.

**CAUTION**

Following acknowledgement of the S1 key, a save query is also issued. The parameters can then be saved via the serial interface, or the function for presetting the parameters can be suppressed.

F209 - Attributes

SS Display: PL
Message No.: F209 (hex)
Error No.: 209
Class: Non-Fatal

F218 Amplifier overtemp. shutdown

The temperature of the amplifier's heatsink is monitored. If the heatsink is too hot, the drive will power down in order to protect against damage.

Cause:

1. Ambient temperature is too high. The specified performance data apply up to an ambient temperature of 45°C.
2. The amplifier's heatsink is dirty.
3. Air flow is prevented by other assembly parts or the control cabinet assembly.
4. Blower is defective

Remedy:

For 1. Reduce the ambient temperature, e.g. through cooling of the control cabinet.

For 2. Clean heatsink.

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

For 4. Replace drive.

F218 - Attributes

SS Display: F2/18
Message No.: F218 (hex)
Error No.: 218
Class: Non-Fatal

F219 Motor overtemp. shutdown

The motor temperature has risen to an unacceptable level.

As soon as the **temperature error threshold** of 155°C is exceeded, the drive will immediately be brought to a standstill in accordance with the type of error response selected (A119, Best possible deceleration).

The following applies:

temperature warning threshold < temperature error threshold

See also **E251 Motor overtemperature prewarning**.

Cause:

1. The motor is **overloaded**. The effective torque demanded by the motor has been above its allowable continuous torque level for too long.
2. **Wire break**, ground fault or short circuit in the motor temperature monitoring line
3. **Instability** in the velocity loop

Remedy:

For 1. Check the motor rating. If the system has been in operation for a long time, check to see if the operating conditions have changed. (with regard to contamination, friction, moved components, etc.)

For 2. Check the motor temperature monitoring line for wire breaks, ground faults and short circuits.

For 3. Check velocity loop parameter settings.

See also functional description for: "Temperature Monitoring."

F219 - Attributes

SS Display:	F2/19
Message No.:	F219 (hex)
Error No.:	219
Class:	Non-Fatal

F220 Bleeder overload shutdown

The regenerative energy coming from the machine mechanism via the motor has overloaded the braking resistor (bleeder). When the maximum braking energy is exceeded, the drive shuts down after braking. The bleeder is thus protected against destruction due to overheating.

Cause:

The regenerative energy coming from the machine mechanism via the motor is too great.

Remedy:

If demand is too great → reduce the acceleration values.

If too much power is supplied → reduce the velocity.

Check the drive rating.

Install additional bleeder module if necessary.

F220 - Attributes

SS Display:	F2/20
Message No.:	F220 (hex)
Error No.:	220
Class:	Non-Fatal

F221 Motor temp. surveillance defective**Cause:**

Wire break or improper connection in motor temperature monitoring line.

Remedy:

Check motor temperature monitoring line (signals MT(emp)+ and MT(emp)-) for breaks/interruptions and short circuits.

See also functional description for: "Temperature Monitoring."

F221 - Attributes

SS Display:	F2/21
Message No.:	F221 (hex)
Error No.:	221
Class:	Non-Fatal

F226 Undervoltage in power section

The level of the DC bus voltage is 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 response.

Cause:

1. Power is turned off without first deactivating the drive using the drive enable (RF) signal.
2. Disturbance in the power supply

Remedy:

For 1. Check the drive activation logic in the connected controller.

For 2. Check the power supply.

The error disappears in the DKC03 when the drive enable signal is cleared.

F226 - Attributes

SS Display:	F2/26
Message No.:	F226 (hex)
Error No.:	226
Class:	Non-Fatal

F228 Excessive deviation

When the position loop is closed, the drive monitors whether it is able to follow the specified command value. This is done by calculating a model position value in the drive and comparing that value with the actual feedback value. If the difference between the theoretical and actual position values continually exceeds the value in **Parameter A115, Monitoring**, the drive obviously cannot comply with the given command value. This error is then generated.

Cause:

1. The drive's **acceleration capacity** has been exceeded.
2. The axis is **locked**.
3. Incorrect parameter values set in the drive parameters.
4. **Parameter A115, Monitoring** set incorrectly.

Remedy:

For 1. Check program to see whether a value that is too low has been entered in a MOM_command.

For 2. Check the mechanical system and eliminate jamming of the axis.

For 3. Check the drive parameters (control loop settings).

For 4. Set **Parameter A115, Monitoring**.

See also functional description for: "Position Control Loop Monitoring."

F228 - Attributes

SS Display:	F2/28
Message No.:	F228 (hex)
Error No.:	228
Class:	Non-Fatal

F229 Encoder 1 failure: Quadrant error

On the basis of faulty signals detected during the encoder evaluation, a hardware error has been discovered in the interface being used for encoder 1.

Cause:

1. Defective encoder cable
2. Electromagnetic interference on the encoder cable
3. Defective encoder interface
4. Defective drive controller

Remedy:

For 1. Replace the encoder cable.

For 2. Keep the encoder cable well away from power cables. Use shielded motor and encoder cables.

For 3. Replace the encoder interface.

For 4. Replace the drive controller.

F229 - Attributes

SS Display:	F2/29
Message No.:	F229 (hex)
Error No.:	229
Class:	Non-Fatal

F230 Max. signal frequency of encoder 1 exceeded

The signal frequency of encoder 1 (motor encoder) is checked to see whether the max. permissible frequency of the encoder interface has been exceeded.

If the frequency is higher than allowed, error **F230, Max. signal frequency of encoder 1 exceeded** is generated. The "homed" output in **Parameter C010** is turned off.

F230 - Attributes

SS Display:	F2/30
Message No.:	F230 (hex)
Error No.:	230
Class:	Non-Fatal

F234 Emergency-Stop

Cause:

The emergency stop function was initiated by switching off the +24V present at the emergency stop input. The drive controller was brought to a standstill according to the set error response.

Remedy:

1. Correct the problem that caused the +24V signal present at the emergency stop input to be switched off.
2. Execute the "Reset class 1 diagnostics" command, e.g., via the control or the S1 key on the drive controller.

F234 - Attributes

SS Display:	F2/34
Message No.:	F234 (hex)
Error No.:	234
Class:	Non-Fatal

F236 Excessive position feedback difference

Cause:

After the system is restarted, actual position values 1 and 2 are set to the same value, and the cyclic evaluation of both encoders is started. In cyclic mode, the difference in the actual position values of both encoders is compared using **Parameter A117, Monitor encoder difference**. If the amount of the difference is greater than the parameter value, the diagnostic error message **F236 Excessive position feedback difference** is generated, the error response set in the parameter is executed and the reference bits (**Parameter C010**) of both encoders are cleared.

The monitoring function is inactive if a value of 0 is entered in **Parameter A117, Monitor encoder difference**.

Possible Causes:

1. Wrong parameter for encoder 2
(**Parameter C005, Position Feedback 2 Type, Parameter C006, Feedback 2 Resolution**)
2. Incorrect parameter setting of mechanical system between motor shaft and encoder 2: (**Parameter A102 Gearing, Parameter A101, Feed Rate Constant**)
3. Mechanical system between motor shaft and encoder 2 is not rigid (e.g., gear play).
4. Defective encoder cable
5. Maximum input frequency of the encoder interface exceeded
6. Encoder 2 is not mounted to the driven axis.
7. Reference point of an absolute encoder is incorrect

Remedy:

For 1. Check **Parameter C005, Position Feedback 2 Type** and **Parameter C006, Feedback 2 Resolution**.

For 2. Check **Parameter A102, Gearing**.

For 3. Increase **A117, Encoder Difference Monitoring**.

For 4. Replace encoder cable.

For 5. Reduce the velocity.

For 6. Set **Parameter A117, Encoder Difference Monitoring** to 0 (turn monitoring off).

For 7. Execute **Parameter C010, Set Absolute Encoder**.

F236 - Attributes

SS Display:	F2/36
Message No.:	F236 (hex)
Error No.:	236
Class:	Non-Fatal

F237 Excessive position command difference**Cause:**

The position command values created by the position loop must be monitored. If two position command values received in succession request the drive to produce a velocity that is greater than or equal to the value in **Parameter A106, Maximum Velocity**, the position command value monitoring function is activated.

F237 - Attributes

SS Display:	F2/37
Message No.:	F237 (hex)
Error No.:	237
Class:	Non-Fatal

F242 Encoder 2 failure: Signal amplitude wrong

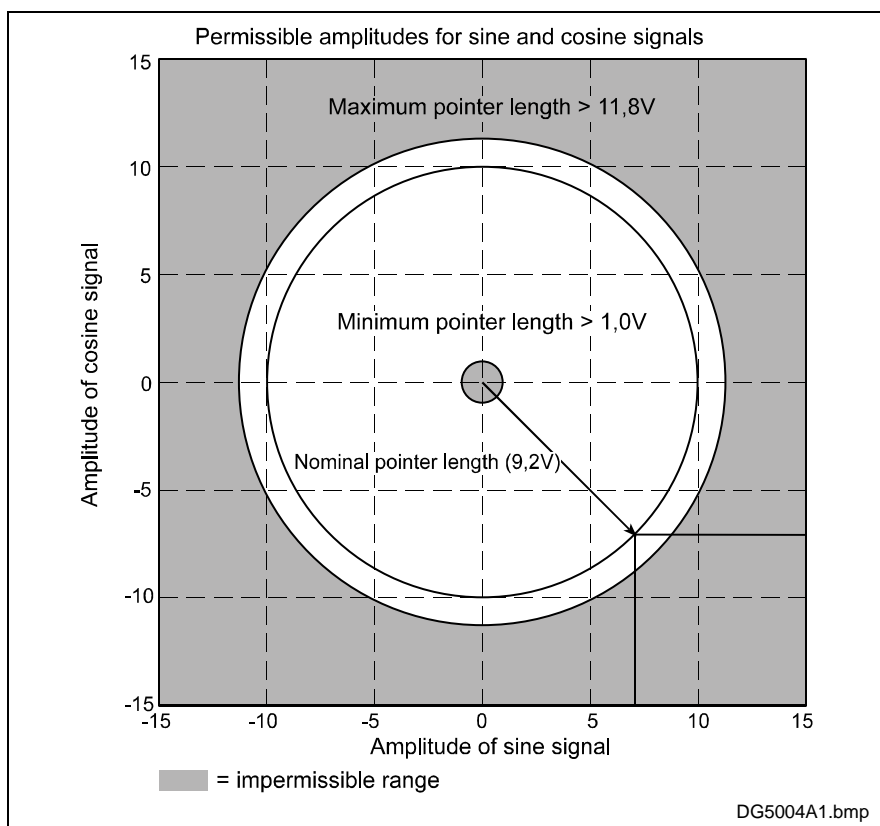
Cause:

The analog signals of an optional measurement system are used for high resolution analysis of that measurement system. These signals are monitored according to two criteria:

1. The pointer length, determined from the sine and cosine signals, must be greater than 1 V.
2. The maximum pointer length resulting from the sine and cosine signals must not exceed 11.8 V.

$$\text{Pointer Length} = \sqrt{\sin^2 + \cos^2}$$

Fig. 9-4: Pointer Length



L: Legende

Fig. 9-5: Correct Signal Amplitude

Example:

$U_{\cos} = -6.5V$

$U_{\sin} = 6.5V$

$$\text{Pointer Length} = \sqrt{(6.5V)^2 + 6.5V^2} \quad 9.2V$$

Remedy:

1. Check the measurement system cable.
2. Check the measurement system.

F242 - Attributes

SS Display: F2/42

Message No.: F242 (hex)
Error No.: 242
Class: Non-Fatal

F245 Encoder 2 failure: Quadrant error

The evaluation of the additional optional encoder (encoder 2) is active. In the evaluation of the sinusoidal input signals of the optional encoder, a plausibility check is performed between these signals and the counter fed by these signals. In so doing, an error has been encountered.

Cause:

1. Defective encoder cable
2. Electromagnetic interference on the encoder cable
3. Defective encoder interface

Remedy:

For 1. Replace the encoder cable

For 2. Keep the encoder cable well away from power cables.

For 3. Replace unit (ECODRIVE)

F245 - Attributes

SS Display: F2/45
Message No.: F245 (hex)
Error No.: 245
Class: Non-Fatal

F246 Max. signal frequency of encoder 2 exceeded

The signal frequency of encoder 2 (optional encoder) is checked to see whether the allowed max. frequency of the encoder interface has been exceeded.

If the frequency is higher than allowed, error **F246, Max. signal frequency of encoder 2 exceeded** is generated. The "homed" output in **Parameter C010** is turned off.

F246 - Attributes

SS Display:	F2/46
Message No.:	F246 (hex)
Error No.:	246
Class:	Non-Fatal

F248 Low Battery Voltage

Cause:

For model MKD and MKE motors, the absolute position information is stored in the motor encoder electronics with battery backup. The battery is rated for a 10-year service life. If the battery voltage goes below 2.8 V, this message is displayed. Encoder functioning is ensured for approximately another 2 weeks.



CAUTION

Malfunction in the control of motors and moving elements

Equipment damage can occur.
Replace battery immediately.

Instructions for Replacing Batteries

Have the following tools and accessories ready:

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



CAUTION

Malfunction in the control of motors and moving elements

Equipment damage can occur.
Turn off the power supply. Make sure the equipment is not switched back on. Replace the battery while the control voltage is turned on.

If the control voltage is turned off while the battery is out, the absolute **reference** point will be lost. Then, the reference point must be reestablished using the "**Set absolute encoder**" command.

Removing the Battery

- Unscrew Torx screws (1) using size 10 screwdriver.
- Pull out the resolver feedback (RSF) lid by hand.
- Remove battery connector (2)
- Undo battery clamp (3) and remove battery
- Place the battery pack in the housing and screw on the clamp.
Attention! Do not kink or crimp the battery cable.
- Attach battery connector (2)

Close the resolver feedback lid, screw in the 4 Torx screws (1) and tighten to 1.8 Nm with the torque wrench.

F248 - Attributes

SS Display:	F2/48
Message No.:	F248 (hex)
Error No.:	248
Class:	Non-Fatal

F253 Incr. encoder emulator: Frequency too high

Cause:

The incremental encoder emulator can process a maximum of 1023 graduation marks per 250- μ s sampling period; this value was exceeded.

Remedy:

1. Decrease the **number of lines** to be used by the incremental encoder emulator (Parameter C015).

or

2. Reduce the travel **velocity**.

See also functional description for: "Encoder emulation."

F253 - Attributes

SS Display:	F2/53
Message No.:	F253 (hex)
Error No.:	253
Class:	Non-Fatal

F267 Erroneous internal hardware synchronization

Cause:

The drive control is synchronized to the bus interface (DIO, SERCOS, Profibus, Interbus, ...). Synchronization is monitored to check for proper functioning. If the average value of the deviation exceeds 5 μ s, this error message is generated.

Remedy:

Replace the drive controller.

F267 - Attributes

SS Display:	F2/67
Message No.:	F267 (hex)
Error No.:	267
Class:	Non-Fatal

F276 Absolute encoder out of allowed window

When turning off the drive controller with an absolute encoder motor (multiturn), the actual feedback position will be stored. When powered up, the absolute position determined by the encoder evaluation is compared with this stored position. If the deviation is greater than the value set in parameter **A118, Absolute Encoder Monitoring Window**, error **F276** is generated and the control is notified.

Cause:

1. Controller is turned on for the first time (stored position is invalid)
2. While the controller was turned off, the axis was moved further than allowed by **Parameter A118, Absolute encoder monitoring window**.
3. Incorrect position initialization

Remedy:

For 1. Clear error (establish absolute reference point).

For 2. The axis was moved with the motor turned off and is outside of its permissible position. Check to see if the displayed position is correct in relation to the machine zero point. Then clear the error.

For 3. **Unintentional movement of the axis may cause accidents.** Check absolute reference point. If the absolute reference point is incorrect, the encoder is defective. The motor should be replaced and sent to Rexroth Indramat Customer Service.

F276 - Attributes

SS Display:	F2/76
Message No.:	F276 (hex)
Error No.:	276
Class:	Non-Fatal

F277 Current measurement trim wrong

This error can occur only when the drive controller is tested at the INDRAMAT factory.

Measurement of the current within the drive controller is precisely calibrated in the INDRAMAT test bay using a compensation current. During this calibration, the correction values are found to be outside the intended tolerances.

Cause:

1. Defective hardware in the drive controller.
2. The correct compensation current for this measurement is not flowing.

Remedy:

1. Repair the control card.
2. Check the compensation current.

F277 - Attributes

SS Display:	F2/77
Message No.:	F277 (hex)
Error No.:	277
Class:	No. 1

F281 Mains fault

Cause:

The power supply voltage was not present during operation for at least 3 power periods. As a result, the drive controller was brought to a standstill according to the set error response (**Parameter A119**).

Remedy:

Check the power connections to ensure that they are as specified in the project planning specifications.

F281 - Attributes

SS Display:	F2/81
Message No.:	F281 (hex)
Error No.:	281
Class:	Non-Fatal

F217 Blower not connected

For the 100A and 200A drive controllers, the blower must always be connected.

Cause:

- Blower is not connected or is incorrectly connected

Remedy:

- Connect or replace blower

F288 Error when updating SDR Module firmware

Description:

An error occurred during the firmware update for the SDR Module. After checking the remedy in the drive controller, clear the error and switch from Phase 2 to Phase 3 again and check if the error recurs.

Cause:

- Error while clearing the flash memory
- Error during flash memory programming
- Error during flash memory checksum
- Address switch on the SDR Module is set incorrectly
- Communication timeout
- The supply voltage for the SDR-Modules was turned off

Remedy:

- Check EcoX-Bus
- Check the address switch on the SDR Module (for the new address to be accepted, the supply voltage must be turned on and then off at the SDR Module).
- Check the supply voltage for the SDR Modules.
- Replace the SDR Module.

F291 Timeout in the SDR Module

The SDR Modules send the inputs to the base unit in a cyclic telegram. If this telegram is not sent for 2 cycles, Error F291 is generated. The telegram cycle time is dependent on the number of slaves on the EcoX-Bus.

The following is valid:

$$\text{Cycle Time} = (\text{Number of Slaves} + 1) \text{ ms.}$$

Cause:

- Address switch on the SDR Module is set incorrectly.
- Faults on the EcoX-Bus.
- EcoX-Bus is incorrectly wired.
- The supply voltage for the SDR-Modules was turned off

Remedy:

- Check the address switch on the SDR Module (for the new address to be accepted, the supply voltage must be turned on and then off at the SDR Module).
- Check EcoX-Bus
- Check the supply voltage for the SDR Modules.

F292 Overtemperature in the SDR Module

The temperature of the SDR Module has risen to an unacceptable level. As soon as the temperature error threshold is exceeded, the outputs are immediately turned off and the error is generated in the base unit.

Cause:

- The SDR Module ventilation is inadequate.
- The specifications for the SDR Module are not adhered to; therefore, an overload occurs.

Remedy:

- Ensure adherence to the specifications.

F294 Timeout in the EcoX Slave

The EcoX Slave sends a cyclic telegram to the EcoX Master. If this telegram is not sent for 2 cycles, and the controller is enabled, Error F294 is generated in the Master. The telegram cycle time is dependent on the number of slaves on the EcoX-Bus. The following is valid:

$$\text{Cycle Time} = (\text{Number of Slaves} + 1) \text{ ms.}$$

When the error is cleared, the EcoX Bus is re-scanned. If the EcoX Slave is still not present, Warning E296 is entered.

Cause:

- EcoX Bus is incorrectly wired.
- The EcoX Bus parameters are not set in the EcoX Slave/Master.
- Faults on the Bus.
- The supply voltage for the EcoX Slaves was turned off

Remedy:

- Check EcoX Bus
- Check parameter settings.
- Check the supply voltage for the SDR Modules.

F296 Incorrect number of EcoX Slaves

The number of EcoX Slaves must be entered in Parameter B014, EMD Configuration for the EcoX Master. While scanning the slaves, if the Master determines that the number found does not correspond with the the number set in the parameters, Error E296 is entered. If this warning is present while an attempt is made to set drive enable, Error F296 is generated.

Cause:

- EcoX Bus is incorrectly wired.
- The EcoX Bus parameters are not set in the EcoX Slave/Master.
- Faults on the Bus.
- The supply voltage for the EcoX Slaves was turned off

Remedy:

- Check EcoX Bus
- Check parameter settings.
- Check the supply voltage for the SDR Modules.

F297 Error in the EcoX Slave

If an error is shown in an EcoX Slave, this information is transmitted to the EcoX Master via the EcoX interface. The EcoX Master then enters Error F297.

Cause:

- An error occurred in the EcoX Slave.

Remedy:

- Eliminate and clear any errors in the EcoX Slave.

F386 No ready signal from supply module

Cause:

Input BbN "Power supply ready!" on the drive controller is at 24V, i.e., the connected power supply is not issuing a ready signal.

F386 - Attributes

SS Display:	F3/86
Message No.:	F386 (hex)
Error No.:	386
Class:	Non-Fatal

F407 Error during initialization of master communication

An error has occurred during initialization and check testing of the command communications card (DIO1.1).

Cause:

- No command communications card is inserted
- Wrong command communications card is inserted
- Wrong firmware is loaded

Remedy:

- Insert correct command communications card
- Replace firmware

F407 - Attributes

SS Display:	F4/07
Message No.:	F407 (hex)
Error No.:	407
Class:	Interface

F408 Fatal error of the interface card

Communication with the DIO1.1 parallel interface card of the DKC21.3 has been disrupted.

Cause:

- DIO card not properly seated
- Impermissible memory access occurs.

Remedy:

- Check card seating
- Switch unit off and on. If error still pending, replace hardware.

F408 - Attributes

SS Display:	F4/08
Message No.:	F408 (hex)
Error No.:	408
Class:	Interface

F411 Double SST Failure

Description:

The EcoX Master sends the synchronization and target value (SST) telegram cyclically. If this telegram is not sent for 2 cycles, and the drive enable is set, Error F411 is generated in the EcoX Slave. The cycle time for the telegram is 500us.

Cause:

- The EcoX Master was switched according to Phase 2.
- EcoX Bus is incorrectly wired.
- The EcoX Bus parameters are not set in the EcoX Master.
- Faults on the EcoX Bus.
- The supply voltage for the EcoX Slave was turned off

Remedy:

- Switch EcoX Master to Phase 3 or Phase 4.
- Check EcoX Bus
- Check parameter settings.
- Check the supply voltage for the EcoX Master.

F434 Emergency-Stop

Actuating the emergency stop switch has caused the drive to execute the emergency stop function set via **Parameter A119, Best possible deceleration**.

Cause:

The emergency stop switch was detected.

Remedy:

Eliminate the malfunction that has caused the emergency switch to be activated, and clear the error.

See also functional description for: "Emergency stop function."

F434 - Attributes

SS Display: F4/34
Message No.: F434 (hex)
Error No.: 434
Class: Interface

F629 Positive travel limit exceeded

A command was executed which resulted in an axis position outside the negative travel range. The axis has been brought to a standstill with the error response "Set velocity command value to zero."

Cause:

Parameter A104, Positive travel limit exceeded.

Remedy:

1. Verify **Parameter A104, Positive travel limit**.
2. Check program.

Procedure:

- Clear error
- If the power supply was turned off, turn it back on.
- Move the axis into the permissible working range.

Note: Only those command values which lead back into the allowed working range will be accepted. With other command values, the drive will stop again. **Parameter A111, Switching threshold** is used to implement a hysteresis function.

F629 - Attributes

SS Display: F6/29
Message No.: F629 (hex)
Error No.: 629
Class: No. 1

F630 Negative travel limit exceeded

A command was executed which resulted in an axis position outside the negative travel range. The axis has been brought to a standstill with the error response "Set velocity command value to zero."

Cause:

Parameter A103, Negative travel limit exceeded.

Remedy:

1. Verify **Parameter A103, Negative travel limit**.
2. Check program.

Procedure:

- Clear error
- If the power supply was turned off, turn it back on.
- Move the axis into the permissible working range.

Note: Only those command values which lead back into the allowed working range will be accepted. With other command values, the drive will stop again. **Parameter A111, Switching threshold** is used to implement a hysteresis function.

F630 - Attributes

SS Display: F6/30
Message No.: F630 (hex)
Error No.: 630
Class: Travel Limit

F634 Emergency-Stop

Actuating the emergency stop (E-Stop) switch has caused the drive to stop by setting the velocity setpoint value to zero.

Cause:

The emergency stop switch was detected.

Remedy:

Eliminate the malfunction that has caused the emergency switch to be activated, and clear the error.

F634 - Attributes

SS Display: F6/34
Message No.: F634 (hex)
Error No.: 634
Class: Travel Limit

F643 Positive travel limit switch detected

The positive travel limit switch has been activated. The axis has been brought to a standstill with the error response "Set velocity command value to zero."

Cause:

The positive travel limit switch has been detected.

Remedy:

1. Reset the error.
2. Turn the power supply back on.
3. Move the axis into the permissible travel range.

Note: Command values which would move the axis outside the permissible range are not accepted, and this error message is generated again.

F643 - Attributes

SS Display: F6/43
Message No.: F643 (hex)
Error No.: 643
Class: No. 1

F644 Negative travel limit switch detected

The negative travel limit switch has been activated. The axis has been brought to a standstill with the error response "Set velocity command value to zero."

Cause:

The negative travel limit switch has been activated.

Remedy:

1. Reset the error.
2. Turn the power supply back on.
3. Move the axis into the permissible travel range.

Note: Command values which would move the axis outside the permissible range are not accepted, and this error message is generated again.

F644 - Attributes

SS Display: F6/44
Message No.: F644 (hex)
Error No.: 644
Class: Travel Limit

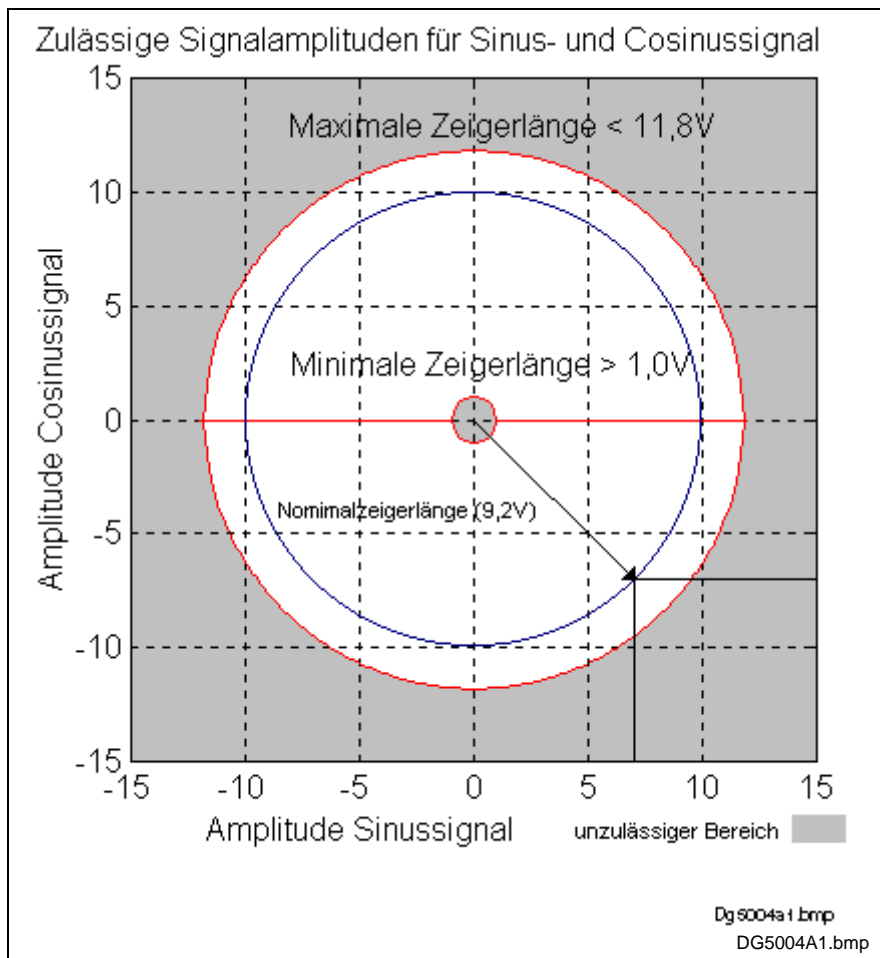
F822 Encoder 1 failure: Signal amplitude wrong

The analog signals of an optional measurement system are used for high-resolution analysis of that measurement system. These signals are monitored according to two criteria:

1. The pointer length, determined from the sine and cosine signals, must be greater than 1 V.
2. The maximum pointer length resulting from the sine and cosine signals must not exceed 11.8 V.

$$\text{Pointer Length} = \sqrt{\sin^2 + \cos^2}$$

Fig. 9-6: : Pointer Length



L: Legende

Fig. 9-7: Correct Signal Amplitude [Texte, Fig. 8-8]

Zulässige Signalamplituden für Sinus- und Cosinussignal = Permitted Signal Amplitudes for Sine and Cosine Signal

Maximale Zeigerlänge = Maximum Pointer Length

Minimale Zeigerlänge = Minimum Pointer Length

Nominalzeigerlänge = Nominal Pointer Length

Amplitude Cosinussignal = Cosine Signal Amplitude

Amplitude Sinussignal = Sine Signal Amplitude

unzulässiger Bereich = illegal area

Example:

Ucos = -6.5V

Usin = 6.5V

$$\text{Zeigerlänge} = \sqrt{(-6,5V)^2 + (6,5V)^2} = 9,2V$$

Note: The error cannot be cleared in the (manual/automatic) operating mode. Switch to parameter mode before clearing the error.

Causes:

1. Defective encoder **cable**
2. **Disruption** of feedback signal transmission
3. Defective **encoder**

Remedy:

1. Check the measurement system cable.
2. Keep the cable well away from motor power cables . Shielding must be placed on the drive controller.
3. Check the measurement system and replace if necessary.

F822 - Attributes

SS Display: F8/22
Message No.: F822 (hex)
Error No.: 822
Class: Fatal

F860 Overcurrent: short in power stage

The current in the power transistor bridge is more than twice as high as the equipment's peak current. The drive is immediately switched to a torque-free state. An optional holding brake, if present, engages immediately.

Cause:

1. Short circuit in motor cable
2. Defective power section of the drive controller
3. The current-loop parameters were set incorrectly.

Remedy:

For 1. Check motor cable for short circuit.

For 2. Replace the drive controller.

For 3. The current-loop parameters must not deviate from the initial values received from the encoder.

F860 - Attributes

SS Display: F8/60
Message No.: F860 (hex)
Error No.: 860
Class: Fatal

F870 +24Volt DC error

The drive controller requires a 24-V control voltage. The drive is immediately switched to a torque-free state when the maximum

permissible tolerance of +-20% is exceeded. An optional holding brake, if present, engages immediately.

Cause:

1. Defective **cable** for the control voltages.
2. 24-V power supply **overload**.
3. Defective power **supply unit**.
4. **Short-circuit** in the emergency stop circuit.

Remedy:

For 1. Check cables for control voltages and/or connections and replace if necessary.

For 2. Check the 24-V supply voltage at the power supply unit.

For 3. Check the power supply unit.

For 4. Check the emergency stop circuit for a short-circuit.

Note: The error can be reset only in Parameter Mode. As a result of this error, the encoder emulation is switched off.

F870 - Attributes

SS Display: F8/70
Message No.: F870 (hex)
Error No.: 870
Class: Fatal

F873 Power supply driver stages fault

The power supply for the driver stages is monitored. If the voltage is too low, the drive is turned off.

Cause:

The voltage supplied to the driver stages is too low.

Remedy:

Replace drive controller.

F873 - Attributes

SS Display: F8/73
Message No.: F873 (hex)
Error No.: 873
Class: Fatal

F878 Velocity loop error

The velocity loop monitoring function is activated when the following conditions occur simultaneously:

- The current command value is at the peak current limit.
- The difference between the actual velocity and the target velocity is more than 10% of the maximum motor velocity.
- Actual velocity > 1.25% of the maximum velocity
- Target and actual acceleration values have different operational (+/-) signs.

Cause:

1. Motor cable is connected incorrectly.
2. Power circuit of the drive controller defective.
3. Defective encoder.
4. Velocity loop parameters set incorrectly.
5. Incorrect commutation offset.

Remedy:

For 1. Check motor cable connection.

For 2. Replace the drive controller.

For 3. Replace the motor.

For 4. Check the velocity loop to see whether it is within operational parameters.

For 5. Replace the motor.

F878 - Attributes

SS Display:	F8/78
Message No.:	F878 (hex)
Error No.:	878
Class:	Fatal

F895 4-kHz signal wrong

The 4-kHz signal for generating the resolver signals is synchronized with the processing of the software. This error message is generated if there is a lack of synchronization.

Cause:

1. The error can be caused by an electrostatic discharge.
2. Synchronization between the resolver excitation voltage and the software is not correct.

Remedy:

For 1. Turn everything off and then on again. If this does not solve the problem: Replace the drive controller and send the old one in for inspection

For 2. Replace the drive controller and send the old one in for inspection.

F895 - Attributes

SS Display: F8/95
Message No.: F895 (hex)
Error No.: 895
Class: Fatal

9.4 Diagnostic Warning Messages

E221 Warning, Motor temp. surveillance defective

The temperature monitoring system checks to see if the measured motor temperature is within reasonable bounds. If it finds that the temperature is lower than -10°C , then it is assumed that the measuring unit is defective. The warning message **E221 Warning, Motor temp. surveillance defective** will appear for 30 seconds. Afterwards the drive is brought to a standstill according to the selected error response and message **F221 Error, motor temp. surveillance defective** will be generated.

Cause:

1. Motor temperature sensor not connected.
2. Broken cable.
3. Defective sensor.
4. Broken cable in drive controller.

Remedy:

For 1. Connect the sensor to the drive controller and to the motor (see project planning specifications for the motor).

For 2. Replace the lead between the drive controller and the motor.

For 3. Replace the motor.

For 4. Replace the drive controller.

E221 - Attributes

SS Display: E2/21
Message No.: E221 (hex)
Class: Non-Fatal

E225 Motor overload

The maximum possible motor current is reduced in order to prevent damage to the motor.

If the current flowing in the motor is more than 2.2 times the **Motor current at standstill, Parameter CM02**, the maximum possible motor current (**Motor peak current, Parameter CM02**) is reduced. The reduction begins after 400 ms at 4 times the motor current at standstill. At 5 times the current, it begins earlier; at 3 times the current, later.

If the limitation causes the motor peak current to be reduced, the **E225 Motor overload** warning is issued.

E225 - Attributes

SS Display: E2/25
Message No.: E225 (hex)
Class: Non-Fatal

E250 Drive overtemp. prewarning

The temperature of the heatsink in the drive controller has reached the maximum permissible temperature. The drive controller complies with the command value input for a period of 30 seconds. This makes it possible to bring the axis to a standstill via the control system without disruption of the process (e.g., close the operation, leave the collision area, etc.).

After 30 seconds, the response set in parameter **Parameter A119, Best possible deceleration** will be performed by the drive controller.

Cause:

1. Failure of the drive's internal blower.
2. Failure of the control cabinet's climate control.
3. Incorrect control cabinet sizing in regards to heat dissipation.

Remedy:

For 1. If the blower fails, replace the drive controller.

For 2. Restore climate control feature in the cabinet.

For 3. Check the sizing of the control cabinet.

E250 - Attributes

SS Display:	E2/50
Message No.:	E250 (hex)
Class:	Non-Fatal

E251 Motor overtemp. prewarning

As soon as the temperature **warning threshold** (145°C) is exceeded, the E251 warning is output, and the drive continues to follow the setpoint specification.

This state can last for a long time without the drive powering down. Only when the temperature **error threshold** is exceeded, will the drive immediately power down.

See also **F219 Motor overtemp. shutdown**.

Cause:

The motor is overloaded. The effective torque required by the motor has been above its allowable continuous torque level at standstill for too long.

Remedy:

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

E251 - Attributes

SS Display:	E2/51
Message No.:	E251 (hex)
Class:	Non-Fatal

E252 Bleeder overload prewarning

Cause:

The braking resistor (bleeder) in the drive controller is charged with regenerative energy from the motor by about 90%. The bleeder overload prewarning indicates that an overload of the bleeder is expected if the regenerative energy continues to increase.

Remedy:

Reduce the acceleration values or velocity and check the drive rating if necessary.

E252 - Attributes

SS Display: E2/52
Message No.: E252 (hex)
Class: Non-Fatal

E256 Torque limit = 0

Cause:

1. For protection against mechanical overloading, the MOM command can be used to limit the maximum torque. If the current value is equal to 0, the motor does not develop torque and does not comply with the stipulated command values.
2. Torque reduction is set via an analog channel, and the applied voltage amounts to 10 V.

Remedy:

For 1. Set the torque limit to a value greater than 0.

For 2. Apply an analog voltage of less than 10 V.

E256 - Attributes

SS Display: E2/56
Message No.: E256 (hex)
Class: Non-Fatal

E257 Continuous current limit active

The drive controller supplies peak current for 400 ms. Afterward, the continuous current limit becomes active and dynamically limits the peak current until it reaches the value of the continuous current.

Cause:

More continuous torque was required than was available.

Remedy:

1. Check the drive rating.
2. For systems which have been in use for a long time, check to see whether the drive conditions have changed with regard to
 - contamination
 - friction
 - moved mass

E257 - Attributes

SS Display: E2/57
Message No.: E257 (hex)
Class: Non-Fatal

E259 Command velocity limit active

The velocity command value is limited to the value present in **Parameter A106, Maximum velocity**.

Cause:

Parameter A106, Maximum velocity set too low.

Remedy:

Check parameter and program.

E259 - Attributes

SS Display: E2/59
Message No.: E259 (hex)
Class: Non-Fatal

E261 Continuous current limit prewarning

Digital drives are monitored via a continually operating temperature model. Continuous current limiting is activated shortly after the thermal load capacity reaches 100%.

At 90%, the continuous-current-limiting prewarning is issued prior to this torque reduction.

Cause:

The drive controller was overloaded.

Remedy:

1. Check the amplifier rating.
2. Reduce acceleration.
3. With systems which have been in use for long periods of time, check to see if drive controller conditions have changed in regards to:
 - friction
 - moved mass
 - feed during processing.

E261 - Attributes

SS Display:	E2/61
Message No.:	E261 (hex)
Class:	Non-Fatal

E263 Velocity command value > limit A106

Cause:

The **maximum velocity** stipulated was greater than the permissible value.

Remedy:

The value is limited to that given in **Parameter A106, Maximum velocity**.

E263 - Attributes

SS Display:	E2/63
Message No.:	E263 (hex)
Class:	Non-Fatal

E267 Erroneous internal hardware synchronization

The drive control in the EcoX Slave is synchronized to the EcoX Bus using a phase control loop. In order for the EcoX Slave to synchronize to the Master, the Master must be in Phase 3 or 4. The proper functioning of synchronization is monitored from Phase 4 in the EcoX Slave. If the average value of the deviation exceeds 5 μ s, this warning is generated. If drive enable is set, Error F267 is generated.

Cause:

- The EcoX Bus parameters are not set in the EcoX Master.
- EcoX Master in Phase 2.
- Faults on the Bus.
- The supply voltage for the EcoX Slave was turned off

Remedy:

- Check parameter settings.
- Switch EcoX Master to Phase 3 or Phase 4.
- Check EcoX Bus
- Check the supply voltage for the EcoX Master.

E288 Firmware update for the SDR Module active

If the Ecodrive firmware was replaced, and the firmware for the SDR Module has changed, an automatic firmware update occurs during the command to transition from Phase 2 to Phase 3. During this time, Warning E288 is displayed on the base unit.

Cause:

The firmware in the SDR module does not correspond to the firmware in the drive controller.

Remedy:

The warning is automatically cleared after the firmware update takes place.

E289 Wait for scan via EcoX Master

During the command to transition from Phase 3 to Phase 4, the EcoX Slave is tested to determine whether or not it was scanned by the EcoX Master. The warning is automatically reset after the scan takes place.

Cause:

- The EcoX Bus parameters are not set in the EcoX Slave/Master.
- The EcoX Master is in Phase 2
- Faults on the Bus.
- EcoX Bus is incorrectly wired.
- The supply voltage for the EcoX Slaves was turned off

Remedy:

- Check EcoX Bus
- Check parameter settings.
- Check the supply voltage for the SDR Modules.
- Switch EcoX Master to Phase 3 or Phase 4.

E291 Timeout in the SDR Module

Description:

The SDR Modules send the inputs to the base unit in a cyclic telegram. If this telegram is not sent for 2 cycles, Warning E291 is generated.

The following is valid:

Cycle Time = 2 ms.

If drive enable is set, Error F291 is generated in place of the warning.

Cause:

- Address switch on the SDR Module is set incorrectly.
- Faults on the EcoX Bus.
- EcoX Bus is incorrectly wired.
- The supply voltage for the SDR-Modules was turned off

Remedy:

- Check the address switch on the SDR Module (for the new address to be accepted, the supply voltage must be turned on and then off at the SDR Module).
- Check EcoX Bus
- Check the supply voltage for the SDR Modules.

E296 Incorrect number of EcoX Slaves

The number of EcoX Slaves must be entered in **Parameter B014, EMD Configuration** for the EcoX Master. While scanning the slaves, if the Master determines that the number found does not correspond with the the number set in the parameters, Error E296 is entered. The EcoX-Master then scans cyclically through the EcoX Slaves, until the number is correct.

Cause:

- EcoX Bus is incorrectly wired.
- The EcoX Bus parameters are not set in the EcoX Slave/Master.
- Faults on the EcoX Bus.
- The supply voltage for the EcoX Slaves was turned off

Remedy:

- Check EcoX Bus
- Check parameter settings.
- Check the supply voltage for the SDR Modules.

E300 Processor watchdog timer

The processor in the drive controller is equipped with a **watchdog timer**. The processor must regularly signal it internally.

What has occurred?

The watchdog timer has timed out without receiving a signal from the processor. Reliable running of the firmware program is no longer assured.

Cause:

An **overload** or a serious error in the **firmware** has caused the processor to no longer service interrupts.

Remedy:

Please contact Rexroth-INDRAMAT Customer Service. Explain precisely under what circumstances the error occurred. The firmware should be replaced.

E300 - Attributes

SS Display:	E3
Message No.:	E300 (hex)
Class:	Fatal

E411 Zweifacher SST-Ausfall

Description:

The EcoX Master sends the synchronization and target value (SST) telegram cyclically. If this telegram is not sent for 2 cycles, Warning E291 is generated. The cycle time for the telegram is 500us. If drive enable is set, Error F411 is generated in place of the warning.

Cause:

- The EcoX Master was switched according to Phase 2.
- EcoX Bus is incorrectly wired.
- The EcoX Bus parameters are not set in the EcoX Master.
- Faults on the EcoX Bus.
- The supply voltage for the EcoX Slave was turned off

Remedy:

- Switch EcoX Master to Phase 3 or Phase 4.
- Check EcoX Bus
- Check parameter settings.
- Check the supply voltage for the EcoX Master.

E825 Overvoltage in power stage

The **DC bus voltage** is too high.

Cause:

1. During **braking** (decelerating): The regenerative energy received from the machine mechanism via the motor was briefly so high that the bleeder resistor was unable to convert enough of it to heat. The regenerative current could not be bled off and therefore charged the DC bus, causing the voltage on the bus to get too high.
2. The **supply voltage** (AC voltage input) is too high.

Result:

If an overvoltage is present, the motor is switched to a **torque-free** state. Once the DC bus voltage again drops below the maximum allowable value, the controller will again be switched on.

Remedy:

For 1. Reduce the **acceleration** values. Check the drive rating if necessary.

Install an additional bleeder if necessary.

For 2. Check the **supply voltage** (AC voltage/3phase).



WARNING

Danger! High voltage!
Protect against accidental contact.

E825 - Attributes

SS Display: E8/25
Message No.: E825 (hex)
Class: Fatal

E826 Undervoltage in power section

Undervoltage is handled as a "fatal warning" and the motor is switched off. If the drive enable signal is present and the DC bus voltage status signal is lost, the drive displays this warning.

Cause:

Power supply unit is switched off or power grid failure occurs when the drive enable signal is set.

Remedy:

Switch off the drive enable signal before switching off the power supply unit.

E826 - Attributes

SS Display: E8/26
Message No.: E826 (hex)
Class: Fatal

9.5 Command Diagnostic Messages

C100 Communication phase 3 transition check

The **C100 Communication phase 3 transition check** command has been activated.

C100 - Attributes

SS Display: C1
Message No.: C100 (hex)

C200 Communication phase 4 transition check

Definition

The **C200 Communication phase 4 transition check** command has been activated.

C200 - Attributes

SS Display: C2
Message No.: C200 (hex)

C201 Parametersatz unvollständig

Cause:

Parameters needed to operate the drive in communications phase 4 (operating mode) are invalid.

Remedy:

- Check parameters and make corrections.
- Turn unit off and on
- Check for correct firmware.

C201 - Attributes

SS Display: C2/01
Message No.: C201 (hex)
Class: Command error

C202 Parameter limit error

Cause:

Parameters needed to operate the drive in communications phase 4 mode (manual/automatic) exceed the minimum or maximum input values, or the entered value cannot be processed.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C202 - Attributes

SS Display: C2/02
Message No.: C202 (hex)
Class: Command error

C203 Parameter calculation error

Cause:

Parameters needed for phase 4 (operating mode) cannot be processed as they are.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C203 - Attributes

SS Display: C2/03
Message No.: C203 (hex)
Class: Command error

C204 Motor type P-0-4014 incorrect

An MHD, MKD or MKE motor is installed, however the corresponding abbreviation ("MHD," "MKD" or "MKE") was not found in the motor feedback memory.

Cause:

1. Incorrect parameter set for type of motor.
2. The motor feedback memory cannot be read.

Remedy:

- For 1. Enter the correct motor type in **Parameter CM00, Motor type**.
- For 2. Check encoder feedback connection. If encoder is defective, replace motor.

C204 - Attributes

SS Display: C2/04
Message No.: C204 (hex)
Class: Command error

C207 Load error LCA

Cause:

Defective unit.

Remedy:

1. Turn off and then on again. If this does not solve the problem:
2. Replace the unit.

C207 - Attributes

SS Display: C2/07
Message No.: C207 (hex)
Class: Command error

C210 Feedback 2 required

Cause:

Values were entered in **Parameter A100, Type of application** which make an optional encoder necessary. However, a 0 (for not available) is entered in **Parameter C004, Interface, encoder 2**.

Remedy:

- Correct **Parameter A100, Type of application**
- Correct **Parameter C004, Interface, encoder 2**

C210 - Attributes

SS Display: C2/10
Message No.: C210 (hex)
Class: Command error

C211 Invalid feedback data

Invalid data have been encountered when the parameters stored in the motor feedback memory were read, or an error has occurred when the data were read.

Causes:

1. Motor feedback cable not connected or defective
2. Motor encoder defective.
3. Drive controller defective

Remedy:

- For 1. Check motor feedback cable; connect both ends
For 2. Replace the motor.
For 3. Replace amplifier

C211 - Attributes

SS Display: C2/11
Message No.: C211 (hex)
Class: Command error

C212 Invalid amplifier data

During drive initialization, the operating software accesses data from an EEPROM in the drive controller. This error message is generated if the attempt to read the data has failed.

Cause:

Defective hardware in the drive controller.

Remedy:

Replace the drive controller.

C212 - Attributes

SS Display: C2/12
Message No.: C212 (hex)
Class: Command error

C213 Position data scaling error

Cause:

The drive-internal format of the position data is dependent on the motor encoder and the encoder resolution. The factor for converting the position data from the drive-internal format to the display format and vice versa is outside of the possible range, because one of the following is true:

- linear motor and rotary position scaling with respect to the motor, or
- rotary motor and linear position scaling with respect to the motor, or
- linear motor and modulo scaling is set, OR
- the detected factor for converting the position data from display format to internal format or vice versa is not displayable.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C213 - Attributes

SS Display: C2/13
Message No.: C213 (hex)
Class: Command error

C214 Velocity data scaling error

Cause:

The drive-internal format of the velocity data is dependent on the motor encoder and the encoder resolution. The factor for converting the velocity data from the drive-internal format to the display format and vice versa is outside of the possible range.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C214 - Attributes

SS Display: C2/14
Message No.: C214 (hex)
Class: Command error

C215 Acceleration data scaling error

Cause:

The drive-internal format of the acceleration data is dependent on the motor encoder and the encoder resolution. The factor for converting the acceleration data from the drive-internal format to the display format and vice versa is outside of the possible range.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C215 - Attributes

SS Display: C2/15
Message No.: C215 (hex)
Class: Command error

C216 Torque/force data scaling error

Cause:

The factor for converting the torque/force data from the drive-internal format to the display format and vice versa is outside of the possible range.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C216 - Attributes

SS Display: C2/16
Message No.: C216 (hex)
Class: Command error

C217 Feedback 1 data reading error

All MKD and MHD motors have a feedback memory. From this memory, the settings for the encoder are read.

Cause:

An error has occurred while the values from the feedback memory were being read.

Remedy:

Check feedback cable.
Replace the motor.

C217 - Attributes

SS Display: C2/17
Message No.: C217 (hex)
Class: Command error

C218 Feedback 2 data reading error

If the measurement system to be initialized has an intrinsic memory, this memory is read when the manual/automatic operating mode is switched on. The **C218 Feedback 2 data reading error** error message is generated if an additional optional encoder (encoder 2) is present and being evaluated (**Parameter C004, Interface, encoder 2** is not set to 0), and if an error is discovered while reading the data.

Measurement systems with intrinsic data memory are :

- DSF/HSF/LSF and resolvers, as well as
- Measurement systems with the EnDat interface (from Heidenhain)

Cause:

1. Defective measurement system cable.
2. Defective measurement system.

Remedy:

- For 1. Check the measurement system cable.
For 2. Replace measurement system.

C218 - Attributes

SS Display:	C2/18
Message No.:	C218 (hex)
Class:	Command error

C220 Feedback 1 initializing error

A number of tests are performed when the motor encoder is initialized. An error was detected during this process. This error may be:

- an error reading the angle rectification data
- an error copying the angle rectification data
- interruption of communications with the encoder
- an assembly error regarding the position of an initialization track
- an error reading the analog signals of an initialization track
- an error in the pointer length for the analog signals of an initialization track
- an invalid offset between the high- and low-resolution tracks
- Error in the measurement system micro-controller

Cause:

1. Defective motor feedback **cable**.
2. Motor encoder defective.
3. Defective measurement system **interface**

Remedy:

- For 1. Check the motor feedback cable.
For 2. Replace the motor.
For 3. Replace the measurement system interface if it is a module, or the complete drive controller.

C220 - Attributes

Message No.:	C220 (hex)
Class:	Command error

C221 Feedback 2 initializing error

Several checks are performed during the initialization of an optional encoder. An error was detected during this process. This error may be:

- an error reading the angle rectification data
- an error copying the angle rectification data
- interruption of communications with the encoder
- an assembly error regarding the position of an initialization track
- an error reading the analog signals of an initialization track
- an error in the pointer length for the analog signals of an initialization track
- an invalid offset between the high- and low-resolution tracks
- Error in the measurement system micro-controller
- with DAG 1.2: error, external 24V set for SSI interface

Cause:

1. opt. Defective encoder cable
2. Defective encoder
3. Defective measurement system **interface**

Remedy:

For 1. opt. Check encoder cable.

For 2. Replace encoder.

For 3. Replace the measurement system interface (module).

C221 - Attributes

SS Display: C2/21
Message No.: C221 (hex)
Class: Command error

C223 Input value for max. range too high

Cause:

An internal position resolution was set which no longer ensures correct commutation of the motor.

Remedy:

- Check parameters and make corrections.
- Check for correct firmware.
- Turn off and then on again. If this does not solve the problem:
- Replace the unit.

C223 - Attributes

SS Display: C2/23
Message No.: C223 (hex)
Class: Command error

C227 Modulo range error

Cause:

The modulo value entered is larger than half of the position display range of the drive.

Remedy:

Select a smaller modulo value, Parameter A105.

C227 - Attributes

SS Display: C2/27
Message No.: C227 (hex)
Class: Command error

C228 Wrong controller type

In preparing for the communications phase 4 transition check, first check whether the heat-sink temperature model data stored in the resident memory of the amplifier are valid. If an error is detected, the drive responds with the error message **C228 Wrong controller type**.

Cause:

Amplifier EEPROM defective.

Remedy:

Replace/repair controller.

C228 - Attributes

SS Display: C2/28
Message No.: C228 (hex)
Class: Command error

C234 Encoder combination not possible

Cause:

The encoder interface that has been selected in **Parameter C004, Optional encoder interface** cannot be supported by the drive; since it has already been allocated to the motor encoder.

Remedy:

Select another **optional** encoder.

C234 - Attributes

SS Display: C2/34
Message No.: C234 (hex)
Class: Command error

C235 Load-side motor encoder with inductance motor only

Cause:

The functionality of the optional encoder can be defined in **Parameter A100, Type of application**. If 'load-side motor encoder' has been selected as the function of the optional encoder, that function will be supported only for asynchronous motors.

Remedy:

Set **Parameter CM00, Motor type** in accordance with the type of motor used.

Check **Parameter A100, Type of application**.

C235 - Attributes

SS Display: C2/35
Message No.: C235 (hex)
Class: Command error

C236 Feedback 1 required

Cause:

If a load-side motor encoder was set in **Parameter A100, Type of application**, no motor encoder is required (**Parameter C001 = 0**). However, values have been entered in the **Homing parameter** which do require a motor encoder.

Remedy:

Change **Homing parameter** to reflect use of the optional encoder.

Activate the motor encoder by entering a value other than 0 in **Parameter C001, Interface, Encoder 1**.

C236 - Attributes

SS Display: C2/36
Message No.: C236 (hex)
Class: Command error

C300 Command set absolute measuring

The **Set absolute encoder** function was activated via **Parameter C010, Homing**.

C300 - Attributes

SS Display: C3
Message No.: C300 (hex)

C301 Setting absolute encoder not possible when RF set

Cause:

The “C3 Command, set absolute encoder emulator“ was initiated in response to the current drive enable signal.

Remedy:

Terminate the command and deactivate the drive enable signal.

C301 - Attributes

SS Display: C3/01
Message No.: C301 (hex)
Class: Command error

C302 Absolute measuring system not installed

The command in **Parameter C010, Homing “Set absolute encoder”** was initiated with no absolute measurement system installed.

The command can be executed only if an absolute measurement system is installed.

Cause:

1. The command should not have been activated.
2. The connected motor or the optional measurement system is not implemented as an absolute encoder.

Remedy:

For 1. Stop execution of the command.

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

C302 - Attributes

SS Display: C3/02
Message No.: C302 (hex)
Class: Command error

C400 Switching to Parameter Mode

Parameters can be written only in Parameter Mode, so switch to Parameter Mode prior to editing parameters.

C400 - Attributes

SS Display: C4
Message No.: C400 (hex)

C500 Reset class 1 diagnostic, error reset

The input for clearing the errors was activated. All drive internal errors are cleared. However, the cause of the errors must first have been eliminated.

C500 - Attributes

SS Display: C5
Message No.: C500 (hex)

C600 Drive-controlled homing procedure command

The **homing command** is activated via a command or an input.

See also functional description for: "Homing"

C600 - Attributes

SS Display: C6
Message No.: C600 (hex)

C601 Homing only possible with drive enable

Cause:

The drive enable signal was not active when the **drive-controlled homing command** was initiated. This is not permitted.

Remedy:

1. Switch on the drive enable signal.
2. Initiate the command again.

See also functional description for: "Homing"

C601 - Attributes

SS Display: C6/01
Message No.: C601 (hex)
Class: Command error

C602 Distance home switch – reference mark erroneous

Cause:

Evaluation of the home switch signal has been activated. The distance between the positive edge of the home-switch signal and the reference mark to be interpreted is outside the valid range.

Remedy:

Change the value in **Parameter C012, Home switch offset**.

See also functional description for: "Configuration of the home switch"

C602 - Attributes

SS Display:	C6/02
Message No.:	C602 (hex)
Class:	Command error

C604 Homing of absolute encoder not possible

Cause:

With the absolute encoder, this error cancels the homing command if it was invoked without having first executed the command in **Parameter C010, Set absolute encoder**.

If the encoder was homed using the "**Set absolute encoder**" command, the homing command can be used to initiate a return to the reference point.

Remedy:

Home the absolute encoder using the "**Set absolute encoder**" command.

See also functional description for: "Possible error messages with drive-controlled homing."

C604 - Attributes

SS Display:	C6/04
Message No.:	C604 (hex)
Class:	Command error

C605 Homing velocity too high

Cause:

If the velocity is too high, it is not possible to achieve precise coordination between a reference mark and the zero switch because the zero switch is only evaluated every 2 ms.

Remedy:

Reduce **Parameter C009, Homing velocity**.

See also functional description for: "Homing"

C605 - Attributes

SS Display:	C6/05
Message No.:	C605 (hex)
Class:	Command error

C700 Basic load

With motors of the MHD, MKD and MKE series, activating the controller parameters stored in the motor feedback memory sets the default parameters in the controller for the connected motor. The C7 message signals the drive controller that the C700 "Basic load" command has been activated.

Cause:

The **C700 Basic load** command has been activated.

C700 - Attributes

SS Display: C7
Message No.: C700 (hex)

C701 Basic load not possible with drive enable

Cause:

Basic load cannot be executed if the drive enable function is set.

Remedy:

1. Turn off drive enable.
2. Reinitiate command.

See also functional description for: "Causes of error in executing the 'Basic load' function"

C701 - Attributes

SS Display: C7/01
Message No.: C701 (hex)
Class: Command error

C702 Default parameters not available

With motors of the MHD, MKD and MKE series, the control loops are adapted to the connected digital drive by activating the speed controller parameters stored in the motor feedback memory. Via message C702, the drive controller signals that "**Basic load**" has been activated; however, **no data memory** is present in the connected motor.

Remedy:

Order the parameter sheet for the motor from REXROTH INDRAMAT Customer Service, and enter the parameters.

C702 - Attributes

SS Display: C7/02
Message No.: C702 (hex)
Class: Command error

C703 Default parameters invalid**Cause:**

The default parameters are read from the motor feedback memory. At least one of these parameters is invalid.

Remedy:

Check the connection to the motor feedback memory. Replace the motor if necessary.

C703 - Attributes

SS Display: C7/03
Message No.: C703 (hex)
Class: Command error

C704 Parameters not copyable**Cause:**

The existing default parameters are not compatible with this software version.

Remedy:

Please contact Indramat. Explain which software version, which device and which motor type you have.

C704 - Attributes

SS Display: C7/04
Message No.: C704 (hex)
Class: Command error

C705 Locked with password

Set default parameters.

C705 - Attributes

SS Display: C7/05
Message No.: C705 (hex)
Class: Command error

C800 Default parameter load

Initiating the command:

This command can be initiated in 2 ways:

1. By pressing the **S1 key** when "**PL**" is displayed on the drive controller (appears after a change in firmware version).
2. By initiating the **C8 Load basic parameters command** via the serial interface

Result:

All the **parameters** are cleared and preset with their respective default (initial) values. Positioning blocks and control loop settings are also **overwritten**.

See also functional description for: "Basic parameter load."

C800 - Attributes

SS Display: C8
Message No.: C800 (hex)

C801 Parameter default value erroneous

Cause:

During execution of the **C800 Command, Load basic parameters**, a default value stored in the drive was recognized as incorrect.

C801 - Attributes

SS Display: C8/01
Message No.: C801 (hex)
Class: Command error

C802 Locked with password

Remedy:

Load basic parameters.

See also Section 4: "System Startup"

C802 - Attributes

SS Display: C8/02
Message No.: C802 (hex)
Class: Command error

D300 Command adjust commutation

A correctly adjusted commutation offset is mandatory for the operation of synchronous motors. The "D3" message indicates that the command for determining the commutation offset has been activated.

Cause:

The adjust commutation command has been activated.

D300 - Attributes

SS Display: d3
Message No.: D300 (hex)

D301 Drive not ready for commutation command

Cause in linear motors:

No drive enable signal can be present when the command is initiated, however, it must be present in communications phase 4 mode ("bb" or "Ab" is displayed).

Cause in rotary synchronous motors:

The drive must be in torque mode when the "D3" command is initiated. If these conditions are not met, this error message is generated.

Remedy for linear motors:

Depending on the motor type, turn off the drive enable signal and initiate the command again.

Remedy for rotary synchronous motors:

Activate torque mode and initiate the command again.

D301 - Attributes

SS Display: d3/01
Message No.: D301 (hex)
Class: Command error

D302 Torque/force too small for movement

The command **D3 Commutation Setting** was initialized. For this to occur, the **motor must be moving**. However, it is not moving.

Cause:

1. The torque is too small to overcome the mechanical resistance (friction or weight load).
2. The motor is mechanically **locked**.

Remedy:

1. **Using the MOM command**, raise the value of **Bipolar torque/force limit value** until the motor can overcome the mechanical resistance and turn. Also check CM01, Peak Torque/Force Limit
2. Release pinched cables/wires. If necessary, also check the brake.

D302 - Attributes

SS Display: d3/02
Message No.: D302 (hex)
Class: Command error

D500 Kommando Markerposition erfassen

An unknown command was invoked.

Cause:

Firmware malfunction.

D500 - Attributes

SS Display: d5

Message No.: D500 (hex)

D501 No incremental measurement system

Cause:

The command was initialized for a measuring system that does not have any real reference marks. Examples are measuring systems like DSF, EnDat, SSI or resolver measurement systems.

Remedy:

Check if the correct encoder is set in **Parameter C009, Reference-move configure**.

Implement an encoder system with real reference marks.

D501 - Attributes

SS Display: d5/01

Message No.: D501 (hex)

Class: Command error

9.6 Diagnostic Status Messages

A002 Communication phase 2

Parameter Mode.

A002 - Attributes

SS Display: P2
Message No.: A002 (hex)

A003 Communication phase 3

Preparation for communications phase 4 (manual/automatic)

A003 - Attributes

SS Display: P3
Message No.: A003 (hex)

A010 Drive HALT.

The input Drive HALT is for stopping an axis using a defined **acceleration** and a defined **jerk**.

A010 - Attributes

SS Display: AH
Message No.: A010 (hex)

A012 Control and power sections ready for operation.

The drive is supplied with control voltage, and the power is on. The drive is ready to have the power turned on.

A012 - Attributes

SS Display: Ab
Message No.: A012 (hex)

A013 Ready for power on

The drive is supplied with control voltage, and there are no errors on the drive. The drive is ready to have the power turned on.

See also functional description for: "Parameter Mode - Operating Mode."

A013 - Attributes

SS Display: bb
Message No.: A013 (hex)

A102 Position mode with encoder 1

The drive is in **position control mode**. Within the drive, the position control loop is closed via a position encoder. The control system only sets the position command value sequence; the drive complies with the command value with a systematic **lag** (following error).

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

See also functional description for: "Position control."

A102 - Attributes

SS Display: AF
Message No.: A102 (hex)

A103 Position mode with encoder 2

The drive is in **position control mode**. Within the drive, the position control loop is closed via a position encoder. The control system only sets the position command value sequence; the drive complies with the command value with a systematic **lag** (following error).

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

A103 - Attributes

SS Display: **Diag. Mess. Name:** AF
Message No.: A103 (hex)

A104 Position mode without position lag (following error), encoder 1

The drive is in **position control mode**. Within the drive, the position control loop is closed via a position encoder. The control system only sets the position command value sequence; the drive complies with the command value without a systematic **lag** (following error).

Encoder 1 indicates that the position encoder is installed on the motor shaft (indirect measurement of the axis position).

A104 - Attributes

SS Display: AF
Message No.: A104 (hex)

A105 Position mode without lag, encoder 2

The drive is in **position control mode**. Within the drive, the position control loop is closed via a position encoder. The control system only sets the position command value sequence; the drive complies with the command value without a systematic **lag** (following error).

Encoder 2 indicates that the position encoder is installed on the machine axis (direct axis position measurement).

A105 - Attributes

SS Display: AF
Message No.: A105 (hex)

A800 Unknown operating mode

No diagnostic messages exist for the active operating mode.

A800 - Attributes

SS Display: AF
Message No.: A800 (hex)

9.7 Diagnostic Messages for Basic Initialization and Fatal System Errors

Diagnostic Message Display: -0

The writable **data storage** area of the drive controller is tested for functionality.

Diagnostic Message Display: -1

- The hardware of the amplifier is being initialized. Diagnostic Message Display: -2

Cause:

The control voltage of the encoder power supply is not present.

Remedy:

Replace the hardware.

Diagnostic Message Display: -3

Initialization of the parameters retrieved from NovRam and calculation of the relevant data depending on the parameter content.

Diagnostic Message Display: -4

Initializing and testing of command communications.

Diagnostic Message Display: -5

Initializing the system control.

Diagnostic Message Display: -6

Starting the system controls.

Diagnostic Message Display: Watchdog E1

Cause:

Processor fault caused by voltage surge, programming error or hardware fault. More information available via a terminal connected to the RS232 port.

Remedy:

Turn amplifier on and off. If error persists, replace hardware. In any case, inform Customer Service.

Diagnostic Message Display: Watchdog E2

Cause:

Test of the RAM on the programming module has shown an error.

RAM defective or programming module not properly seated.

Remedy:

Turn off, check connector and turn on again.

If the error message appears again, replace the firmware module.

Diagnostic Message Display: Watchdog E3

Cause:

The 1st watchdog timer of the amplifier has been triggered in response to a hardware fault or a high-voltage discharge.

Remedy:

Turn amplifier off and then on again. If E3 recurs, replace amplifier. In any case, inform Customer Service.

Diagnostic Message Display: Watchdog E4

Cause:

The 2nd watchdog timer of the amplifier has been triggered in response to a hardware fault or a high-voltage discharge.

Remedy:

Turn amplifier off and then on again. If E4 recurs, replace amplifier. In any case, inform Customer Service.

Diagnostic Message Display: Watchdog E5

Cause:

Testing of the dual-port RAM for command communications has shown an error.

The command communications hardware may not be properly seated.

Remedy:

Check the connector; if OK, replace the amplifier.

9.8 Operation Status

The possible operating states are listed alphabetically below. These states are displayed on the H1 display of the unit.

bb

"Ready for operation"

See also: **A013 Ready for power on**

Ab

"Drive is ready"

See also diagnostic message: **A012 Control and power sections ready for operation**

AF

"Drive enable"

Depending on the operating state used, you will find a more exact description of the "AF" display under the respective diagnostic status message (A101 - A800).

AH

"Drive Halt"

See also: **A010 Drive HALT**

AU

"Automatic"

See also: **Automatic**
Diagnostic number : 0004

HA

"Manual"

See also: **Manual**
Diagnostic number : 0003

PA

"Parameters"

See also: **Parameter**
Diagnostic number : 0002

Jb

"Jog reverse"

See also: **A218 Jog negative**
Diagnostic number : 0006

JF

"Jog forward"

See also: **A208 Jog positive**
Diagnostic number : 0005

P2**"Phase 2"**

The control is in parameter mode and is checking the parameter data. The power cannot be switched on. See also status message A002.

P3**"Phase 3"**

The control is transitioning from Phase 2 to Phase 4 (manual or automatic mode). See also status message A003.

P4**"Phase 4"**

The control is in manual or automatic mode. Normally, this display appears only very briefly.

PL**"Basic Parameter Load"**

See also: **F209 PL Load parameter default values**

UL**"Basic Load"**

See also: **F208 UL The motor type has changed**

F-0200 Parameter and automatic input simultaneously

If the 'Parameters' input is activated in Automatic Mode, the following error message is issued: The 'Automatic' input is not monitored in Parameter Mode.

F-0201 Wrong phase transition**F-0203 Target position < negative position limit****F-0204 Target position > positive position limit****F-0205 Stack overflow with JSR command**

F- 0206 Stack overflow with RTS command

F- 0207 Invalid destination task number

F- 0208 Per mille value in ACC command > 999

F- 0209 Invalid value in FAK command

F- 0210 Feed monitoring

F- 0211 Torque > 500%

F- 0212 Program run without power

F- 0213 Max. difference between motor and measuring wheel encoder too large

F- 0214 Wrong BCD information

F- 0215 Wrong slave factor input

F- 0216 Per mille value in command > 999

F- 0217 HOM command not allowed

F- 0218 RTM command not allowed**F- 0219 Variable in NC command > permissible input value****F- 0220 Constant in NC command > permissible input value****F- 0221 Error in PLC program (Logic Task program error)**

Do not close the Logic Task or a valid program in the Logic Task with the "END" command.

A Logic Task command uses an output or marker that already exists in a Parameter, and therefore has been assigned to a function.

F-0222 Sa1 Command not possible

Output of an analog value via the AK1 Analog Channel is not possible.

F-0223 Wrong variable index

Indexed variables are programmed, but no index is input in V508.

F-0226 Control signal bit 1 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA15 did not correspond to the PLS position. Check input signal and PLSs.

F-0227 Control signal bit 2 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA16 did not correspond to the PLS position. Check input signal and PLSs.

F-0228 Control signal bit 3 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA17 did not correspond to the PLS position. Check input signal and PLSs.

F-0229 Control signal bit 4 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA18 did not correspond to the PLS position. Check input signal and PLSs.

F- 0300 Invalid I/O number in command instruction

F- 0301 Wrong I/O status in command

F- 0302 Command instruction number too large

F- 0304 Unknown command

F- 0305 Drive not homed to absolute value

F- 0306 Feed distance overrun

F- 0307 Data loss parameter

F- 0308 Drive message not sent

F- 0309 Master data message not processed

F- 0310 Input error in parameter

F- 0311 Stack correction value > 9

F- 0312 Acknowledgement of an initialization error and not in parameter mode

F- 0313 Interval too great, BCB/BCD command

F- 0314 Instruction offset too large for BIC command

F- 0315 BCB command: Wrong selection

F- 0316 Field bus real-time communication interrupted

F- 0317 Field bus cyclic communication interrupted

F- 0318 Wrong axis number in NC command

F- 0319 NC cycle time exceeded

F- 0320 System error (firmware error)

F- 0321 Wrong axis number in NC command

F-0322 SSI-Geberfehler (Nockenschaltwerk)

The PLS has been enabled in Parameter N1 00, but no attached encoder, or the encoder type was incorrectly input in Parameter C017.

Remedy: Check parameters, Check encoder, Check wiring

F-0323 Velocity of PLS encoder too high

The velocity of the absolute encoder for the PLS is greater than input in Parameter N109.

Remedy: Check parameter and program.

F-0324, APZ command in NC Program not allowed

Check Parameter AA11

F-0325 No curve data**E- 0100 Velocity = 0****E- 0102 Both jog inputs read simultaneously****E- 0103 Hardware outputs overloaded****E- 0104 System control using BTV interrupted****E- 0105 Real-time communication with BTV interrupted****E- 0106 Jog reverse not possible**

Negative position limit value exceeded

E- 0107 Jog forward not possible

Positive position limit value exceeded

E-0108 IDS01 timeout

Interface interrupt to IDS decade switch unit

E-0109 Load default values

A- 0007 Stop is active

No voltage at the 'Immediate Stop' input X210/4 or the automatic program was stopped using a Stop command (JST).

Cause: Part Count Reached

Immediate stop is present X210/4

Cycle stop is present X210/7

Product stop is present X210/13

Automatic preselection lost X210/2

A- 0008 Manual vector program is active

The Manual Vector program in Parameter AA01 is currently being processed.

A- 0009 Function interrupt is active

24V not present at input programmed in Parameter A116.

A-0010 Control signal bit wrong

The function was activated in Parameters AA14 – AA18, to compare PLS positions with the state of an input. One or more inputs that are programmed in Parameters AA15 – AA18 does not reflect the programmed state in the corresponding PLS position. Check input state with PLS positions.

A-0011 Feed rolls open

In Parameters AA05 and AA06, the function 'Open feed rolls' was activated and the output for opening the feed rolls is currently active, based on the PLS position or the input state.

A-0012 Press Timeout

In Parameter AA19, press monitoring is active. No signal change for the feed area (Par A116) occurred during the set time (Par AA19).

A-0026 Control signal bit 1 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA15 did not correspond to the PLS position. Check input signal and PLSs.

A-0027 Control signal bit 2 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA16 did not correspond to the PLS position. Check input signal and PLSs.

A-028 Control signal bit 3 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA17 did not correspond to the PLS position. Check input signal and PLSs.

A-0029 Control signal bit 4 wrong

The function was activated in Parameters AA14-AA18, to compare PLS positions with a particular state of an input signal. The state of the input signal from Parameter AA18 did not correspond to the PLS position. Check input signal and PLSs.

10 EMD Module

10.1 Important Notes

Appropriate Use

Introduction

Rexroth Indramat products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

Note: Rexroth Indramat, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Rexroth Indramat products, make sure that all the prerequisites for appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

Areas of Use and Application

The equipment described in this documentation is intended for use while connected to a digital drive controller with a corresponding interface. Using this equipment, additional digital inputs/outputs are added to a drive controller.

To use this equipment, additional sensors and actors need to be connected.

Note: The input/output modules may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either mounted or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

The input/output modules may only be operated under the specified conditions of mounting and installation, in the specified area of use and according to the specified environmental requirements (temperature, type of protection, humidity, EMV, etc.).

Inappropriate Use

Using the input/output modules outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as "inappropriate use."

Input/Output modules may not be used if:

- ... they are subject to operating conditions that do not meet the above specified ambient conditions. This includes, for example, operation under water, in the case of extreme temperature fluctuations or extremely high maximum temperatures.
- Rexroth Indramat has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Guidelines!

10.2 Digital Input/Output Module

System Setup

Functionality and Communication

Using the digital input/output module described in this documentation, the number of digital inputs and outputs can be increased for drive controllers in the ECODRIVE03 family. Input/Output modules and drive controllers must be connected using the EcoX Bus. Via this bus, signals and the firmware required for the modules are transmitted.

Physical Characteristics

The input/output module consists of two parts:

- the base module
- the electronic module (shown in detail in the following drawing). A description plate that allows the user to add information is attached to the electronic module.

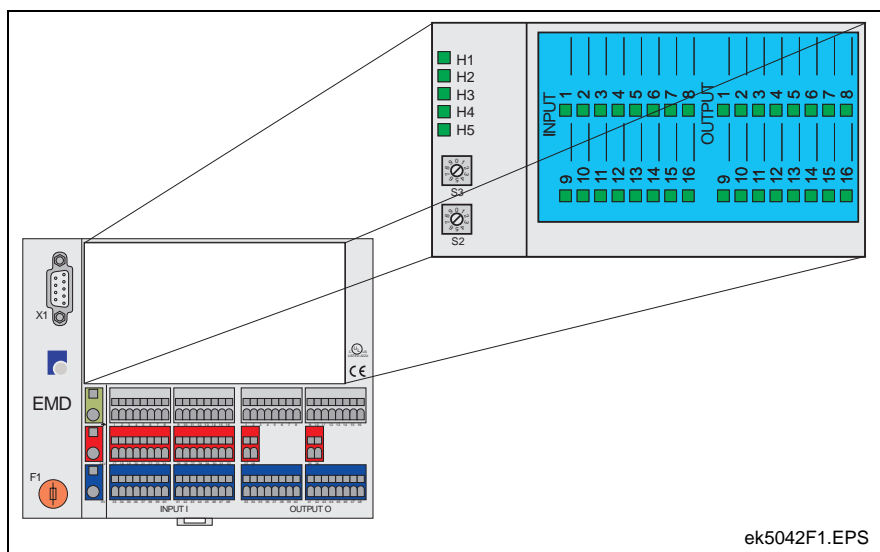


Fig. 10-1: Digital Input/Output Module

The **base module** is designed for mounting on a top-hat rail. The power supply, EcoX Bus, sensors and actors must be connected to this rail. The electronic module connector must be inserted into the base module.

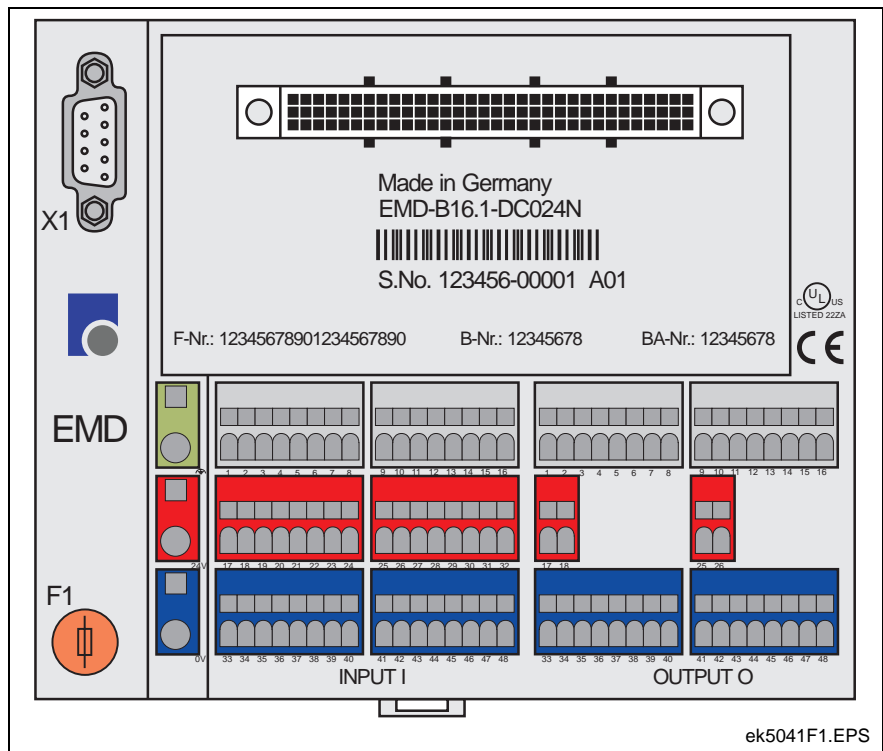


Fig. 10-2: Base Module

The **electronic module** contains the processing unit, the fieldbus connection and the input and output connections.

Diagnostic and status LEDs, as well as address switches are also on this module.

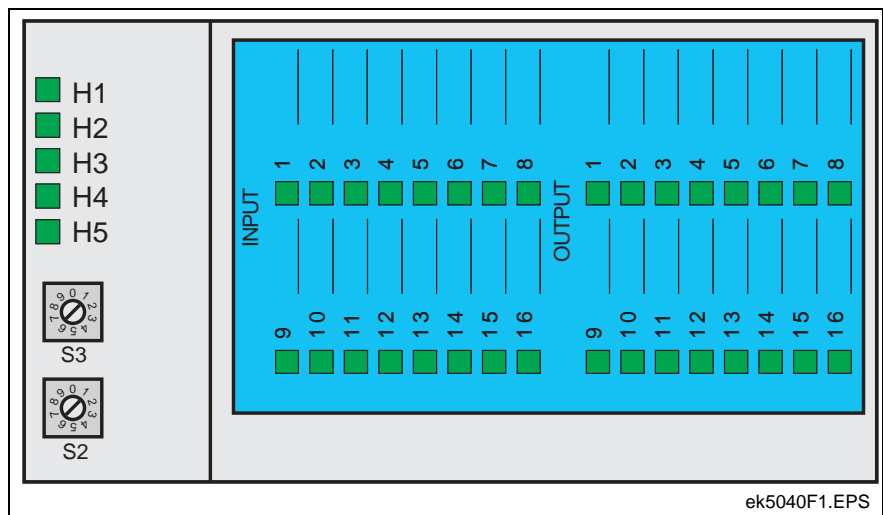


Fig. 10-3: Electronic Module (With Description Plate)

Electrical Connection

For operation, an input/output module must be supplied with power. The requirements are outlined in Chapter 3.4 and 3.6.

In addition, note the following:



Electrical components will be damaged by electrostatic discharge!

⇒ When handling electrical components, ensure that you and any equipment are appropriately grounded.

CAGE CLAMP® Connections

General Information

All connector clamps for supply lines as well as sensor and actor connections are made with CAGE CLAMP connections.

The CAGE CLAMP® connections are appropriate for fine or single-conductor wiring. Generally, only **one** conductor can be connected to each clamp.

The CAGE CLAMP® connection is structured so that, with proper handling, a fine conductor can be fed through without splicing and can be securely clamped. Under normal operating conditions, this direct clamping, e.g. direct contact between the conductor and the clamp's busbar, achieves optimal contact quality.

Note: If structural characteristics or ambient conditions require splicing protection in the form of ferrules, the smaller conductor diameter should be selected.

Clamp Handling A 2.5 mm x 0.5 mm screwdriver is required for connecting a conductor. Fig. 10-4 shows where the screwdriver is to be placed and Fig. 10-5 shows how to attach a conductor with CAGE CLAMP® connectors.

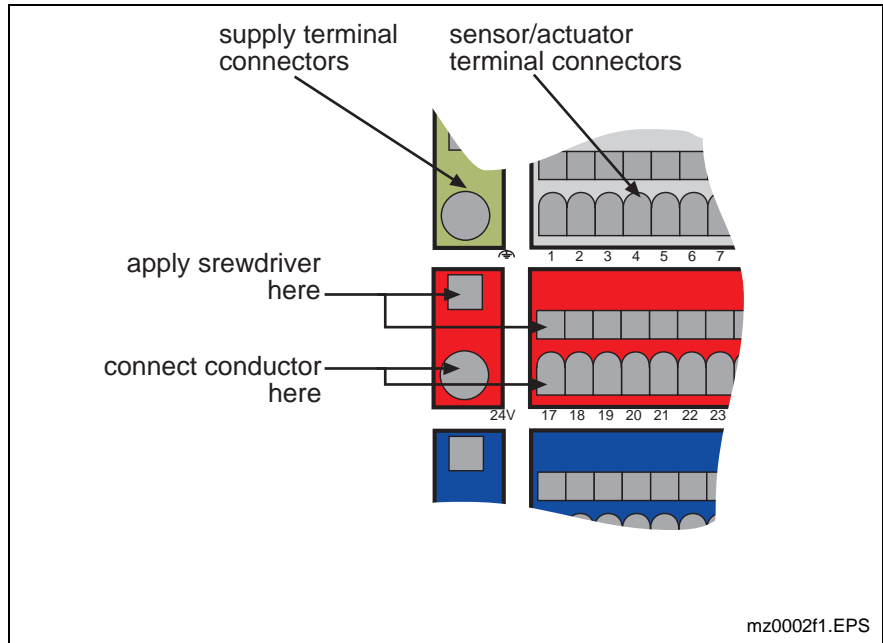


Fig. 10-4: CAGE CLAMP® Connections

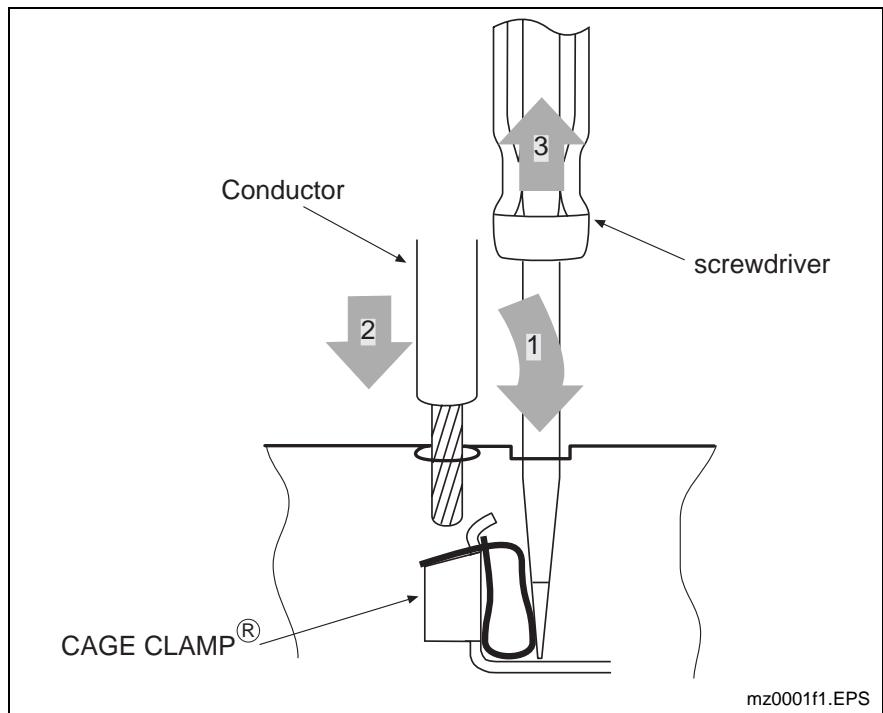


Fig. 10-5: CAGE CLAMP® Handling / Attaching a Conductor

Position of Connections

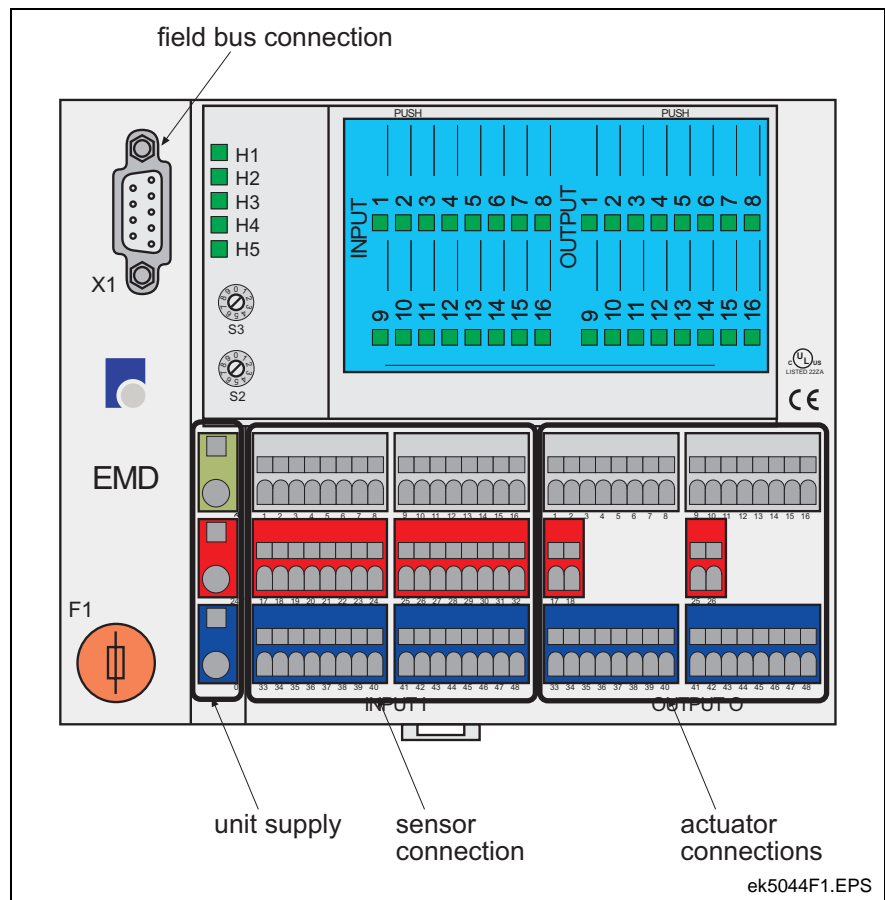


Fig. 10-6: Position of Connections

Power Supply, Protection and Grounding

Power Supply

The input/output module must be supplied with 24 Volts DC power using the clamps labeled as "equipment power supply" in Fig. 10-6.

Green clamp: Grounding

Red clamp: 24 Volts

Blue clamp: 0 Volts

With the appropriate layout, the external power supply can be used as the power source that is also used to supply the drive controller.

The actors (digital outputs) can be supplied in two ways:

- via the equipment power supply
- externally

Power for the sensors is supplied via the equipment power supply.

Protection

The electronic module is protected from short circuiting by the F1 plug-in fuse on the base module.

Actors When power is supplied via the input/output module, the electrical protection of the actors is ensured by the F1 plug-in fuse on the module. When power is supplied externally, protection must be provided according to the appropriate technical data.

Sensors Power supply to the sensors is protected against short-circuiting by the F1 plug-in fuse on the module.

Grounding

The base module is set up to be grounded via the top-hat rail: At the rear of the base module, two contacts are present that establish the electrical connection to the top-hat rail when the base module is correctly mounted.

The contacts at the rear of the base module are, in turn, connected to the grounding clamp (front of unit).

Note: Ensure that the top-hat rail is grounded!

Input Signals

Position of the Connector Clamps

The sensor connection clamps are labeled as "sensor connections" in Fig. 10-6. For each of the 16 sensors that can be connected, three clamps are available. The connectors for a sensor are arranged vertically. (Example: Clamps 3, 19 and 35 form the group for connecting one sensor.)

Connecting the Sensors

Dual-conductor sensors (e.g. switches) must be connected to the gray and red clamps.

Sensors with a connection to the power supply receive the 24 V power supply by connection to the red and blue clamps. The output signal of the sensor must be connected to the gray clamp.

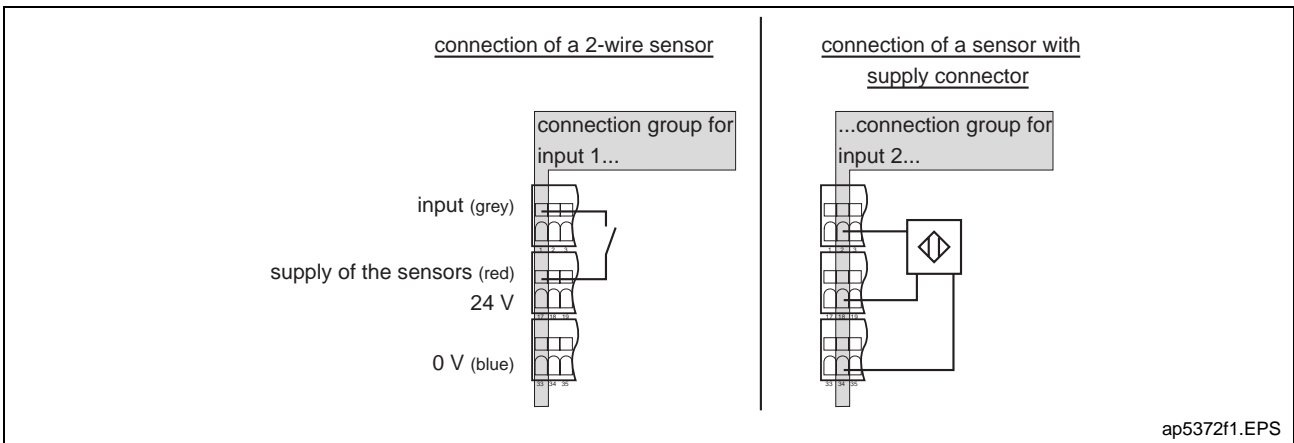


Fig. 10-7: Connecting the Sensors

Power Supply of the Outputs

For power supply to the outputs, four red clamps are available in the area labeled "actor connections" in Fig. 10-6. Each set of 2 clamps is assigned for the power supply to 8 outputs. The left clamp in each pair connects the 24 V input voltage, and the right clamp is connected to the outputs.

The outputs can be supplied either via the equipment power supply of the input/output module or via an external power source.

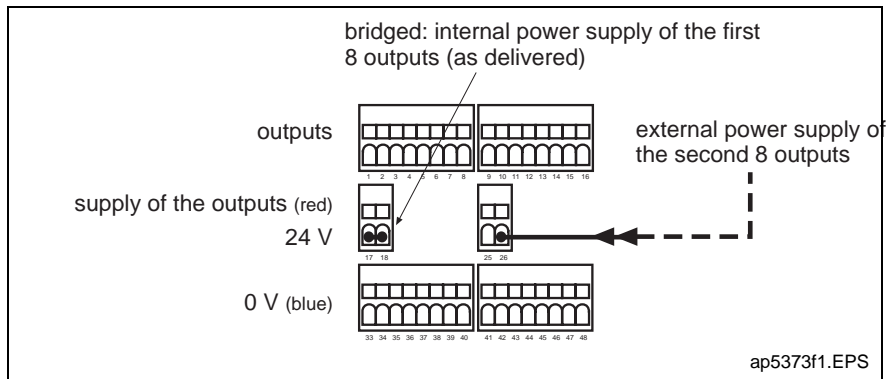


Fig. 10-8: Clamp Positions for Power Supply to the Outputs, and Power Supply Options

Using the Internal Power Supply

If the outputs are to be supplied via the equipment power supply to the input/output module, the left clamp (24 V) must be bridged with the right clamp (connection to the outputs).

Note: At the factory, the bridges between the two clamps for both output groups (1 group = 8 outputs) are placed.

Connecting an External Power Supply

The connection of an external power supply must be wired via the correct supply clamp. Make sure that the output voltage can also flow in reverse to the power supply. To ensure that this is possible, an external connection between the 0 V potential of the input/output module (blue clamp) and the 0 V potential of the external power supply must be established.

Note: The entire load voltage flows across the connection between the 0 V potential of the input/output module and the 0 V potential of the external power supply. Because a connector clamp is approved for a maximum of 6 A load in the field, the 0 V potentials of the power supply units must be combined and wired to the 0 V unit power supply clamp.

Output Signals

The actor connection clamps are labeled as "actor connections" in Fig. 10-6. For each of the 16 actors that can be connected, two clamps are available. The connectors for an actor are arranged vertically. (Example: Clamps 14 and 46 form the group for connecting one actor.)

The positive connection of a load must be connected to the gray connection clamp and the negative connection must be connected to the blue connection clamp.

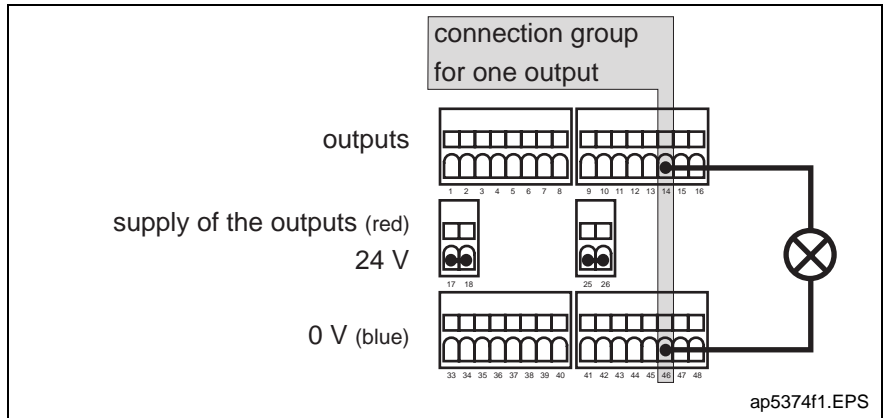


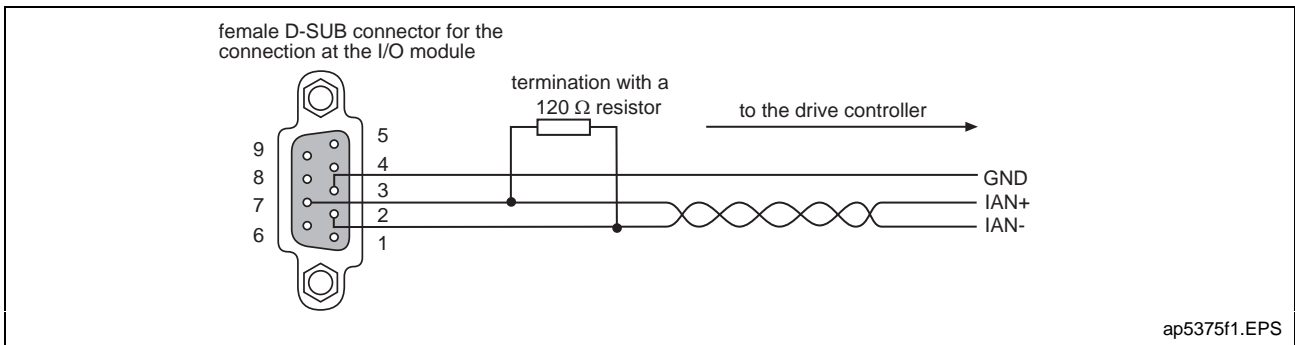
Fig. 10-9: Connection of the Actors

Fieldbus Conductor

The input/output module must be connected to the drive controller. This connection can be made via a 9-pole D-SUB connector with a maximum housing width of 16 mm and a twisted conductor. For the first and the last input/output modules along an EcoX bus, a bus termination must be attached to the end of the conductor.

The fieldbus input/output modules are galvanically isolated from each other.

The following figure shows the assignment and the block diagram for the bus conductor.



Connector Assignment

- 2: IAN-
- 3: GND
- 6: GND
- 7: IAN+
- 9: SUB_ADR

Fig. 10-10: Assignment and Block Diagram for the Bus Conductor

Note: Switching between input/output module 1 (inputs/outputs 0 to 15) and module 2 (inputs/outputs 16 to 31) is done via a bridge in the EcoX connector on the input/output module.

^

10.3 Initial Startup

Setting the Module Address

For an input/output module and a drive controller to be able to communicate, identical (unit) addresses must be set for both units.

The input/output module address is set using address switches S2 and S3. The address switches can be found on the electronic module of the input/output module. The S2 switch sets the one's place and the S3 switch sets the ten's place of the module address.

For more information about how and where to set the address on the corresponding drive controller, see the appropriate Project Planning manual.

Assigning the Input/Output Numbers

Two input/output modules with 16 inputs/outputs each can be connected to one drive controller.

Switching between the input/output modules [Module 1 (inputs/outputs 0 to 15) and Module 2 (inputs/outputs 16 to 31)] is done via a bridge in the EcoX connector on the input/output module.

How to do it:

To define a module as Module 2, thereby defining the inputs/outputs on this module as Input 16, 17, 18,..., 31 or Output 16, 17, 18,..., 31, a bridge must be placed across Pin 9 (SUB-ADR) and Pin 6 (GND) of the EcoX connector.

No bridge may be placed on the EcoX connector for Module 2!

Setting the Drive Controller Parameters

For the drive controllers to which an input/output module is connected, the parameters must be set up to ensure functional communication. See the term "EcoX" in the appropriate Functional Description for the firmware.

Note: The input/output module is not supported by all types of firmware!

After each startup of the supply voltages to the input/output module and the drive controller, a firmware test and an update are executed. This process is automatically executed, e.g. you must periodically check the status display to determine whether the firmware test resulted in any errors.

Note: The firmware test is also executed automatically when the drive controller switches from Phase 2 to Phase 3.

10.4 Installation

Dimensions and Installation Measurements

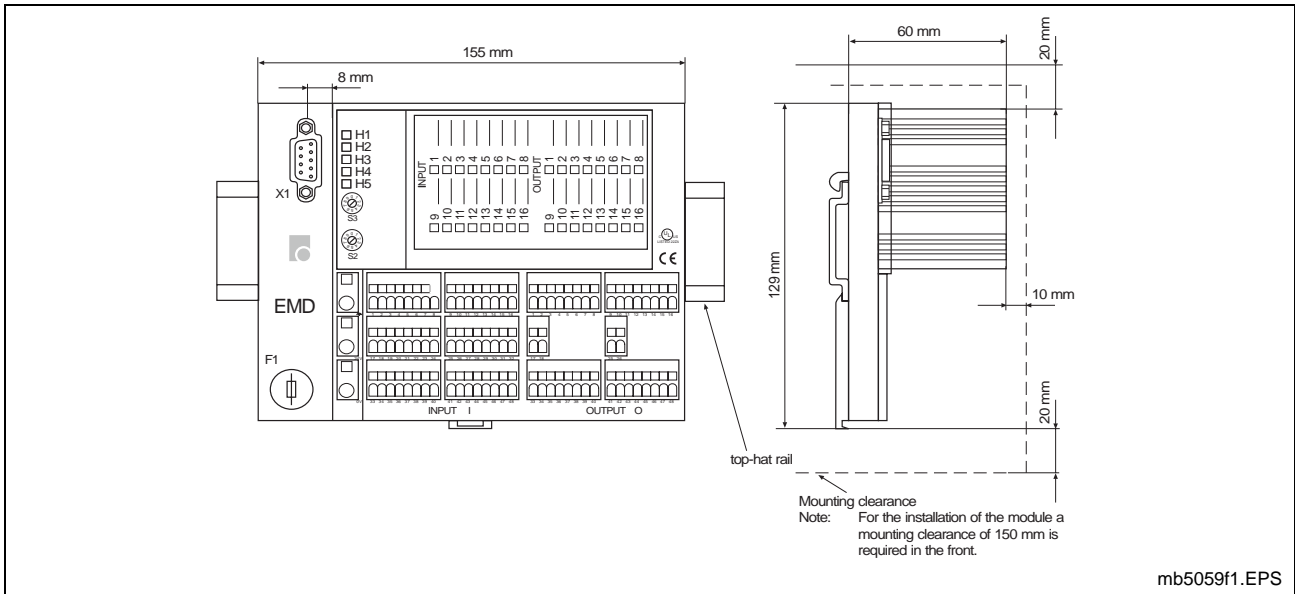


Fig. 10-11: Unit Dimensions and Required Installation space

Note: To ensure adequate ventilation of the input/output module and to avoid overheating, please adhere to the required installation space listed in Fig. 10-11.

Please also note that the required installation space of 150 mm is required at the front. Additionally, the D-SUB connector for the bus connection may protrude beyond the unit!

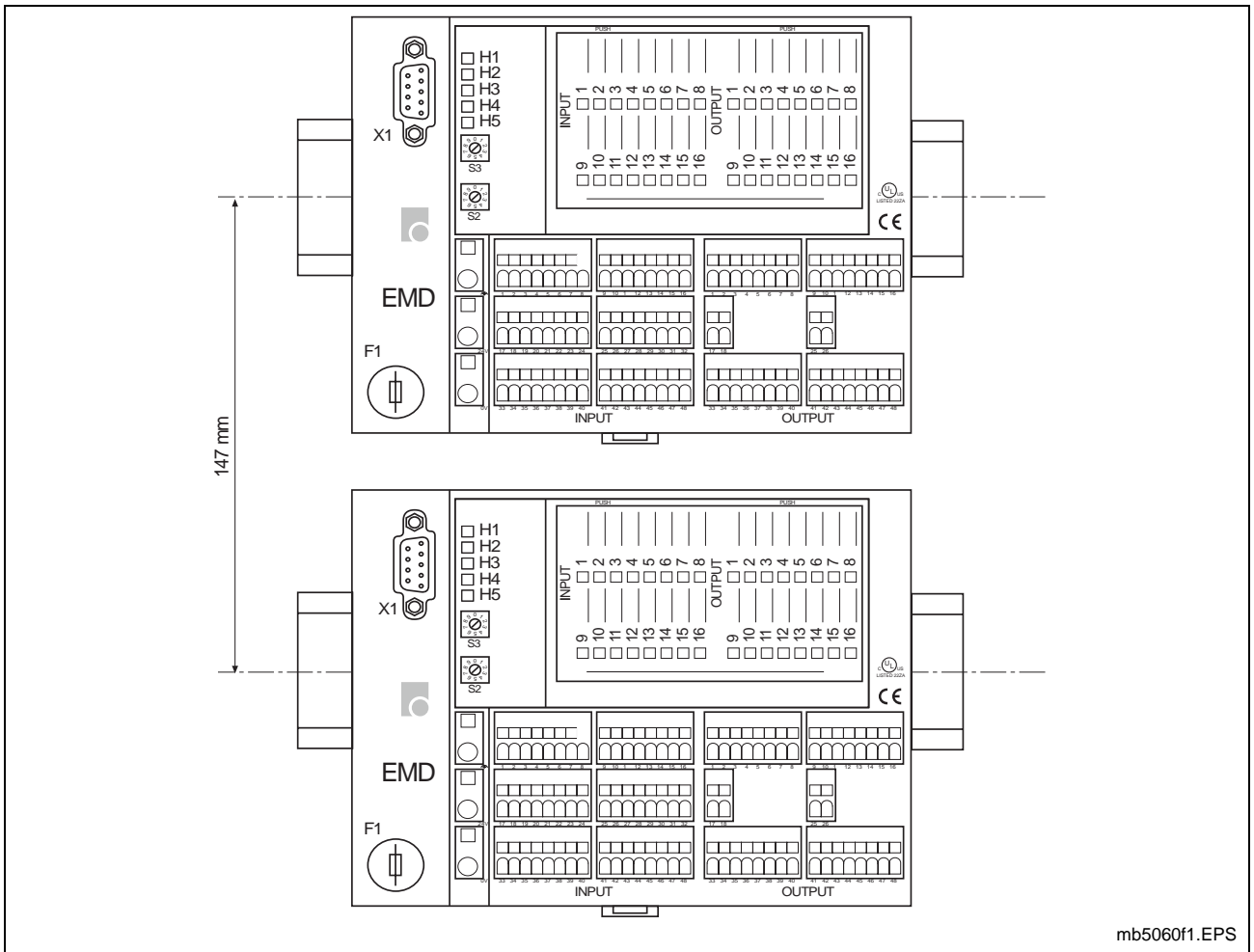


Fig. 10-12: Distance Between Two Stacked Input/Output Modules

mb5060f1.EPS

Installation/Removal

Required Installation Space and Measurements

The required installation space and the unit dimensions can be found in Chapter 10.4 Installation.

Mounting Materials

The input/output module is designed for mounting on a top-hat or mounting rail. The following drawing contains the dimensions of the top-hat rail.

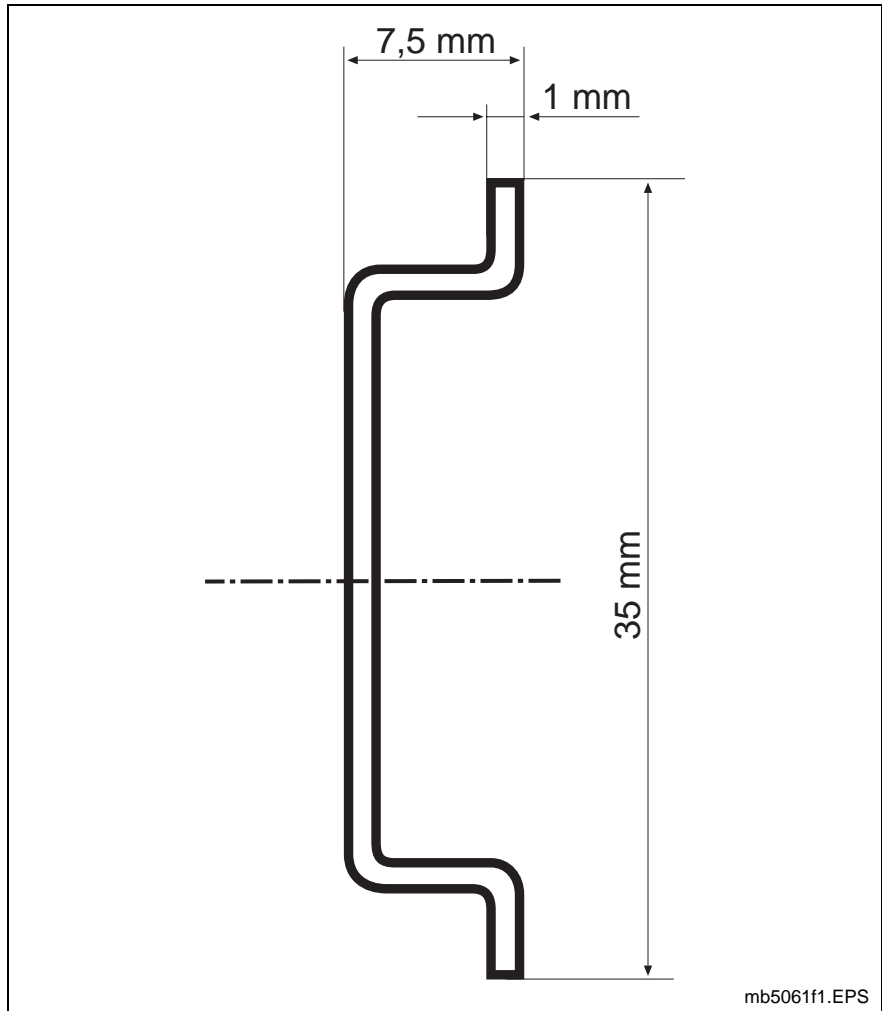


Fig. 10-13: Dimensions of the Top-Hat Rail

The base module and the electronic module together make up the input/output module.

Installing the Basic Module

No tools are required to install the base module. It must be hooked into the top-hat rail and latched into place, as shown in the following drawing.

For initial startup instructions for the input/output module, please see Chapter 8.

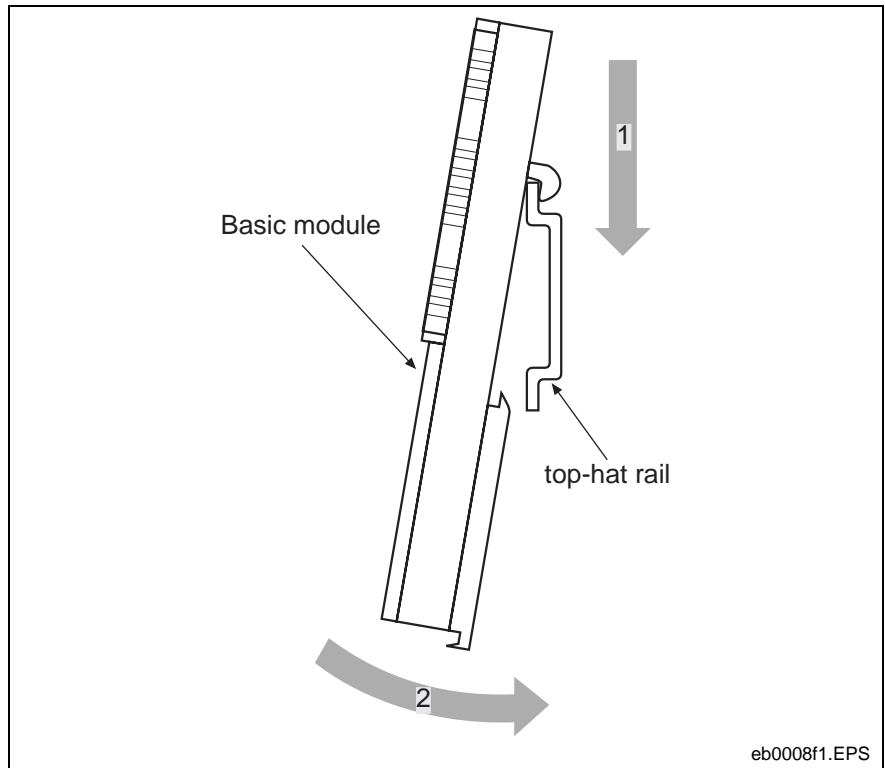


Fig. 10-14: Installing the Basic Module

Removing the Base Module

Removing the base module requires a 6 mm x 1 mm screwdriver.

Remove the base module by placing the tip of the screwdriver on the release clip of the base module. Proceed as shown in the following drawing.

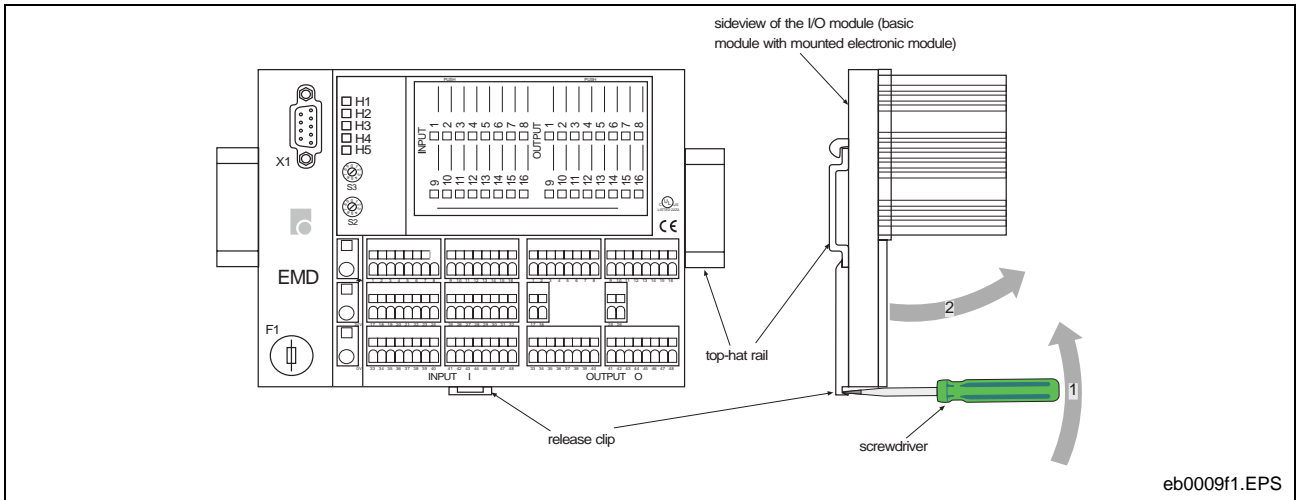


Fig. 10-15: Removing the Base Module

Installation and Removal of the Electronic Module



CAUTION

Damage by live parts!

⇒ Turn off the power to the base module before installing or removing the electronic module, so the electronic module is not damaged.

No tools are required to install or remove the electronic module. It must be inserted in the required slot on the base module and pressed in place, until an audible click is heard for each of the four latches.

For initial startup instructions for the input/output module, please see Chapter 8.

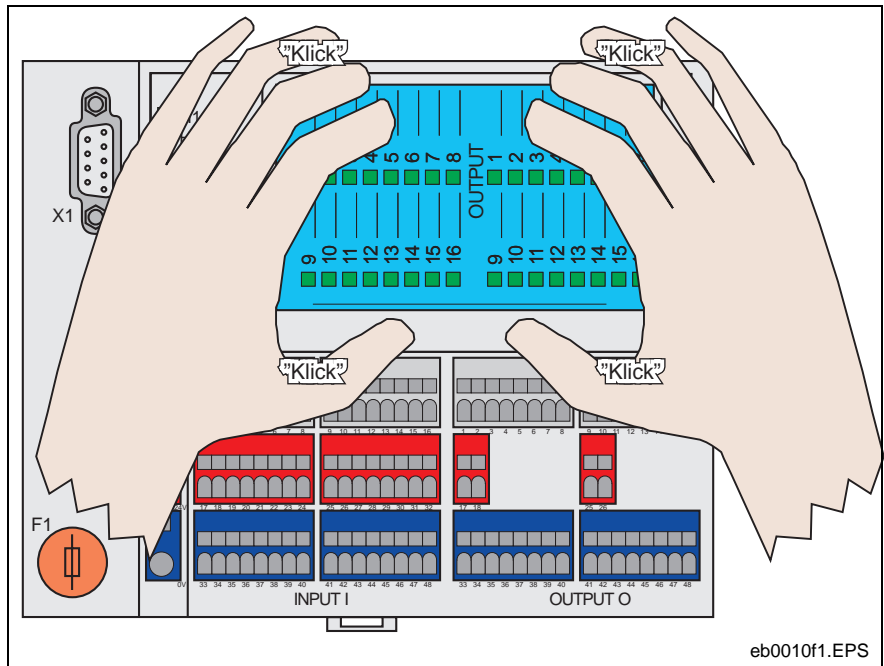


Fig. 10-16: Installing the Electronic Module

To remove the electronic module, press all four latches simultaneously, hold them down and pull the electronic module away from the base module.

Installation and Removal of the Description Plate

The description plate is plastic. It can be removed for replacement or to place on a flat surface for labeling. (Für die Beschriftung empfehlen wir einen wasserfesten Filzstift.)

To install or remove the description plate, no tools are required. To remove it, use fingers to slightly bend it free of the latch points. Installation is accomplished in the opposite order.

10.5 Faults and Messages

Display

Position of the Displays

Display of general status messages and input/output status messages is integrated on the electronic module. The following figure shows the electronic module and the position of all its displays.

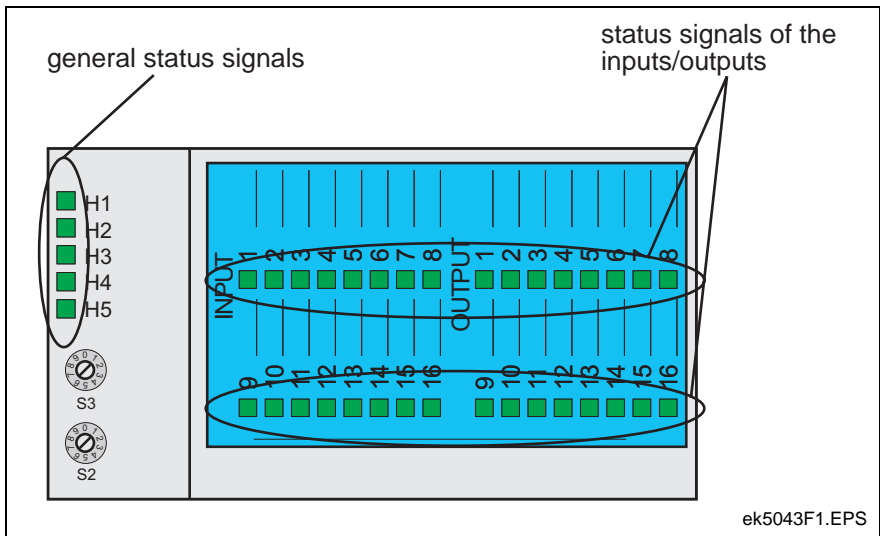


Fig. 10-17: Position of the Electronic Module Displays

General Status Displays

LED	Color	Status	Definition	Error-Clearing
H1	green	on	input/output module is synchronous to master drive, synchronous data exchange with the assigned drive	
H1	orange	on	input/output module is synchronous to master drive, no data exchange with the assigned drive	
H1	-	off	input/output module is asynchronous to master drive, asynchronous data exchange with the assigned drive	
H1	red	on	no communication with a drive	check if... <ul style="list-style-type: none"> ...the bus cable is correctly connected. ...the address switches on the input/output module are correctly set. ... the assigned drive controller is turned on. ...the parameters for the input/output module assigned to the drive controller are set correctly.

LED	Color	Status	Definition	Error-Clearing
H2			"reserved"	
H3	-	off	input/output module is configured as Module 1 (I/O 0...15)	
H3	green	on	input/output module is configured as Module 2 (I/O 16...32)	
H3	red	blinking	watchdog, error executing firmware	Turn power supply off and on. If the error occurs again, contact Customer Service.
H4	-	off	firmware test in process	
H4	green	on	firmware tested and o.k.	
H4	red	on	firmware tested and contains errors, or firmware update in process	Wait for firmware update to be executed. If the error is still occurring, switch from Phase 2 to Phase 3 again.
H5	green	blinking	normal operation	
H5	red	on	overtemperature	Check load on input/output module. Check ambient temperature, ventilation and installation.

Fig. 10-18: Definitions of General Status Displays and Error-Clearing

Status Displays for the Inputs:

The status displays for the inputs are ready for operation as soon as supply voltage is applied to the input/output module.

The following table shows the relationship between input voltage, input value and LED status.

Input Voltage	Input Value	LED Status
DC -3 V - 5 V	"0"	OFF
DC 5 V - 11 V	not defined	not defined
DC 11 V - 30 V	"1"	ON

Fig. 10-19: Switching Threshold of the Inputs

Status Displays for the Outputs

If an output is set to "1," the LED assigned to that output is on.

If an output is set to "1" and the LED is not on, check the following:

- Is the power supply to the outputs connected?
- Is there a short-circuit at the output?
- Is the output turned off in the input/output module because of overtemperature?

10.6 Replacement of a Unit



CAUTION

Damage by live parts!

⇒ Turn off the power to the input/output module before installing or removing it, so it is not damaged.

Following is a short list of items that must be considered when a unit is replaced.

First, please note that the replacement of a unit in a drive control system – consisting of a drive controller and an input/output module – always also affects the unit that is not replaced. Among other topics, this chapter addresses these reciprocal effects.

Replacement of the Electronic Module

The electronic module is plugged into the base module. The removal/installation is described on page 5-6. The wiring of the input/output module is not affected by replacing the electronic module.

For (re-)startup instructions for the electronic module, please see Chapter 8.

Replacement of the Base Module

Removal/Installation of the base module is described on page 5-4ff. The replacement unit must be rewired.

For (re-)startup of the base module, the same description is valid as for the electronic module.

Replacement of the Drive Controller

A physical connection to the drive controller exists via the EcoX interface. It is also necessary to set the parameters for the drive controller, so it can communicate with the input/output module. Setting the parameters is not necessary if the programming module is transferred to the replacement unit.

Note: For more information about the drive controller, see the term "EcoX" in the firmware functional description.

10.7 Technical Data

EcoX System Data

max. number of drive controllers	4
max. number of input/output modules per drive controller	2
bus conductor	Rexroth Indramat cable assembly, Material Number: <i>not released at press time</i>
maximum conductor length	2 m
bus connection	9-pole D-SUB connector
transmission rate	1 MBaud

Fig. 10-20: EcoX Bus Data

Input/Output Module Data

Designation	Symbol	Unit	Value / Description
Supply			
Supply Voltage	U_{DC}	V [DC]	24 ($\pm 20\%$)
Current Consumption (Module without Load at $U_{DC}=24\text{ V}$)	I	A	0.1 ($\pm 20\%$)
Rated Current at 24 V / 0 V	I_B	A	8
Total Power Loss	P_V	W	< 4,5
Protection for sensor power supply	F1		TR5 250 V / 6.3 A T
Inputs			
Number			16
Connections			dual- or triple-conductor, depending on whether the sensor requires power supply
Signal Voltage (low or 0)	U_{E0}	V [DC]	0 - 5
Signal Voltage (high or 1)	U_{E1}	V [DC]	11 - 30
Time Constant (no bus)		ms	< 0.5
Electronic Isolation – Circuit Side			no

Outputs			
Number			16
Connections			triple-conductor
External Power Supply			
total			with power supply clamps 24 V, 0 V and ground clamp
by group			with power supply clamps for each group of 8 outputs
Rated Voltage	U_B	V [DC]	24
Rated Current	I_B	A	
maximum per output			0.5
maximum per group			4.0
maximum per module (16 DO)			8.0
Leakage Current		mA	< 0.2
Maximum Switching Frequency			
with Ohm load			<i>not released at press time</i>
with inductive load			<i>not released at press time</i>
Short-Circuit Diagnostic			no short-circuit diagnostic possible
Short-Circuit Protection			electronic, automatic re-start
Electronic Isolation – Circuit Side			no
Conditions for Use			
Ambient Temperature Allowed		°C	0° - +55°
Storage and Transport Temperature		°C	-25° - +70°
max.		m over NN	2000
Max. Allowable Relative Humidity		%	10 - 45, no condensation
Air Pressure during Operation		hPa	86 - 106
Protection Type			IP 20 according to EN 60529 /IEC 529
Special Requirements for Operation			The unit can be used in locations where dust, caustic steam, caustic gases or ionized radiation can be present, only if additional measures are undertaken!

Fig. 10-21: Input/Output Module Data

10.8 Factory Settings and Identifying the Components

Factory Settings

not released at press time

Identifying the Components

The base module and the electronic module are clearly marked with a typecode.

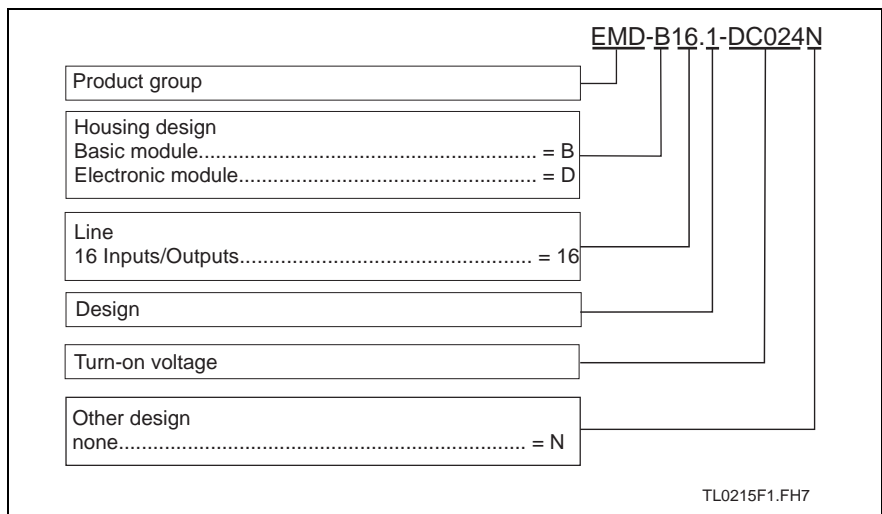


Fig. 10-22: Typecode for the Electronic or Base Module

11 Interface

11.1 Inputs / Outputs / Marker Flags

Designation

The designation of the inputs, outputs and marker flags.

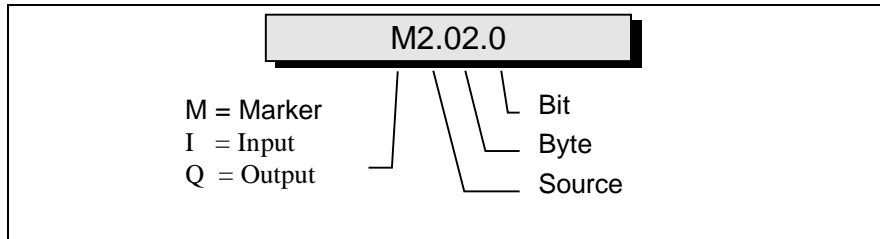


Fig. 11-1: Structure of the Inputs / Outputs / Marker Flags

e.g.

I0.00.6

- I Input
- I0 Input, Connector X210
- I0.00 Input, Connector X210, Group 0 (Byte)
- I0.00.6 Input, Connector X210, Group 0, Bit 0

First user-programmable input

Inputs

The inputs are designated with 'I.' They can be programmed and processed in the parameters, commands, and in the Logic Task. They are read at the beginning of each cycle (every 2 ms) or at the start of the Logic Task.

Source	Bytes	Functions
0	00...01	DSUB Connector X210 DKC21.3
1	00...04	BTV04 (can be enabled via Parameter B009 / B010)
2	00...05	Fieldbus : Profibus DKC3.3 or DeviceNet DKC6.3
3	00...03	EMD Enhancement
4	00...01	Hardware Inputs X1, X3

Fig. 11-2: Source Numbers of the Inputs

Outputs

The outputs are designated with 'Q.' They can be programmed and processed in the parameters, commands, and in the Logic Task. They are processed at the beginning of each cycle (every 2 ms) or at the start of the Logic Task. If an output is designated in the Logic Task, this output can no longer be processed in one of the NC Tasks or via the functions enabled in the parameters.

Source	Bytes	Functions
0	00...05	DSUB Connector X210 DKC21.3
1	00...03	BTV04 (can be enabled via Parameter B009 / B010)
2	00...19	Fieldbus : Profibus DKC3.3 or DeviceNet DKC6.3
3	00...07	EMD Enhancement
4		

Fig. 11-3: Source Numbers of the Outputs

Marker Flag

The marker flags are designated with 'M.' They can be programmed and processed in the parameters, commands, and in the Logic Task. They are processed at the beginning of each cycle (every 2 ms) or at the start of the Logic Task. To avoid confusion, the NC Task and the Logic Task have different marker flags. Transfer marker flags handle the exchange of information between the NC Task and the Logic Task.

Source	Bytes	Function
0	00...05	System Marker Flags (Inputs)
1	00...03	System Marker Flags (Outputs)
2	00...19	NC Marker Flags
3	00...07	Saved NC Marker Flags
4	00...09	NC ? Transfer Marker Flags Logic Task
4	10...13	NC ? Transfer Marker Flags Logic Task cleared after processing of the Logic Task
5	00...09	Logic Task ? Transfer Marker Flags NC
6	00...18	Saved Logic Task Marker Flags
6	19	System Byte (Parameter B010 = 4) Saved
6	20...36	Logic Task Marker Flags
6	37...39	Logic Task Marker Flags for Command TXT 3 and Serial Interface Status 25
8	00...19	Command Marker Flags via Serial Interface

Fig. 11-4: Source Numbers for the Marker Flags

Source

Origin or category

Bytes

8 inputs, outputs or marker flags are grouped together (to form bytes).

BIT

The bit designates an input, output or marker flag. Numbering is from 0 to 7.

System Inputs

Parameters **DKC21.3** **X210/1 (I0.00.6)**
DKC3.3 **Control Word (I2.00.0)**
 In this mode, users can program the parameters .
 When calling up this mode, power is shut down.

Manual/Automatic **DKC21.3** **X210/2 (I0.00.1)**
DKC3.3 **Control Word (I2.00.1)**

Manual Mode is possible if neither of the other two operating modes is active and all other preconditions have been met.

The following inputs are acceptable: RF

Stop
 Jog

Other functions can be assigned to inputs via programming:

Homing
 Manual vector

Automatic Mode is possible when a signal is present at this input, no error is present, and the RF signal is present.

The following inputs are acceptable: Stop

Start

Other functions can be assigned to inputs via programming:

Homing
 Interrupt vector

Start **DKC21.3** **X210/3 (I0.00.2)**
DKC3.3 **Control Word (I2.00.2)**

When the leading edge of this input is detected, the start instructions for tasks 1 and 2 initiate these two tasks. If both tasks have already been started, the input is ignored.

Stop **DKC21.3** **X210/4 (I0.00.3)**
DKC3.3 **Control Word (I2.00.3)**

If the signal at the STOP input is lost , execution of both tasks 1 and 2 stops immediately. If the drive is in motion, it immediately decelerates to a standstill via the programmed acceleration command. The remaining distance to travel is stored.

If the system remains in automatic mode, the remaining distance to travel is executed following a new START input, and the program continues to execute the task from the stopping point.

Jog forward **DKC21.3** **X210/5 (I0.00.4)**
DKC3.3 **Control Word (I2.00.4)**

If a signal is present at the "Jog forward" input, in Manual Mode the drive moves forward at the velocity entered in Parameter A107.

Position limit monitoring is active only if the axis has been homed.

Note: There is no movement if a STOP, interrupt or feed monitoring signal is active.

Jog reverse **DKC21.3** **X210/6 (I0.00.5)**
DKC3.3 **Control Word (I0.00.5)**

If a signal is present at the "Jog reverse" input, in Manual Mode the drive moves in reverse at the velocity entered in Parameter A107.

Position limit monitoring is active only if the axis has been homed.

Note: There is no movement if a STOP, interrupt or feed monitoring signal is active.

Connector X1

RF (Drive Enable) **X1/4** **(I4.00.0)**

The RF (Drive Enable) input RF activates the drive via a 0-1 (rising) signal edge. If the signal drops out, the "Best possible deceleration mode" (**Parameter A119**) is activated. The BB contact remains closed.

AH (Drive Stop) **X1/3** **(I4.00.1)**

A signal must always be present

Ref **X3/1** **(I4.00.6)**

Home position switch

The rising edge of the home position switch signal is always read.

Connector X3

Limit + **X3/2** **(I4.00.7)**

Travel limit switch + .

This limit switch must always be a normally-closed contact.

Limit - **X3/3** **(I4.01.0)**

Travel limit switch - .

This limit switch must always be a normally-closed contact.

Probe 1 **X3/4** **(I4.00.3)**

Measurement of positions using the SRM command

Probe 2 **X3/5** **(I4.00.4)**

No function

E-Stop	X3/6	(I4.01.1)
	In the operating state, +24V must be present at this input. If this signal is not present, contact Bb opens. The axis is stopped via the "Best possible deceleration mode" (Parameter A119).	
Clear Errors	X3 / 7 or	(I4.00.2)
	DKC3.3	Control Word (I2.00.6)
	When the rising edge of the pulse is present at the "Clear errors" input, all existing errors are cleared. Pressing the S1 button (on the firmware module) clears the currently displayed error and shows the next one.	
S1 Button		(I4.01.2)

System Outputs

Manual	DKC21.3	X210/17	(Q0,000,0)
	DKC3.3	Status Word	(Q2.000,0)
	If manual mode is preselected and there are no faults, this output is set.		
Automatic	DKC21.3	X210/18	(Q0,000,1)
	DKC3.3	Status Word	(Q2.000,1)
	If automatic mode is preselected and there are no faults, this output is set.		
Fault	DKC21.3	X210/19	(Q0,000,2)
	DKC3.3	Status Word	(Q2.000,2)
	In the event of a fault, the output is immediately deactivated. The fault can be cleared using the "Clear errors" input, X3 / 7.		
Run	DKC21.3	X210/20	(Q0,00.3)
	DKC3.3	Status Word	(Q2.00.3)
	If automatic mode is selected and the tasks have been started, this output is set.		
Ready	DKC21.3	X3/8	
	DKC3.3	Status Word	(Q2.000,4)
	When the unit is ready to receive the drive enable signal, the "Ready" output is set.		
	The output is turned off:		
	<ul style="list-style-type: none"> • if an error is present • if DC bus voltage is < (0.75 X line voltage) • if control voltage is not present 		
Warning	DKC21.3	X3/10	
	DKC3.3	Status Word	(Q2.00.5)

Many types of monitoring are performed depending on the operating mode and parameter settings. If a state is detected which still permits proper operation but leads to generation of an error message as the program continues, the warning output is set to 1.

U_D Message X3/11

When a minimum voltage is reached in the DC bus, the U_D_output is set high.

See also Project Planning Guide: X3, Digital Inputs/Outputs

DKC21.3 Programmable Inputs/Outputs

Inputs

Inputs I0.06.0 through I0.01.7 Connector X210 / Pin No.: 07 to 16

There are, therefore, 10 available inputs.

The inputs are user-definable.

Moreover, these programmable inputs can be used for various functions which have been activated in the parameters.

Outputs

Outputs Q0.00.6 to Q0.01.7 Connector X210 / Pin No.: 21 to 28

There are 8 available outputs.

All outputs are user-programmable within all NC Tasks and in the Logic Task.

Note: If an output is used by the Logic Task, an error message is generated as soon as the same output is also used by an NC Task.
F-0300 Invalid I/O number in command instruction

Moreover, these user-programmable outputs can be used for different functions.

EMD Programmable Inputs/Outputs

Two input/output modules with 16 inputs/outputs each can be connected.

Inputs

Module 1 Inputs I3.00.0 to I3.01.7

Modul 1 Inputs I3.02.0 to I3.03.7

There are, therefore, up to 32 available inputs.

The inputs are user-definable.

Moreover, these programmable inputs can be used for various functions which have been activated in the parameters.

Outputs

Module 1 Outputs Q3.00.0 to Q3.01.7

Module 1 Outputs Q3.02.0 to Q3.03.7

There are, therefore, up to 32 available outputs.

All outputs are user-programmable within all NC Tasks and in the Logic Task.

Note: If an output is used by the Logic Task, an error message is generated as soon as the same output is also used by an NC Task.
F-0300 Invalid I/O number in command instruction

DKC3.3 Programmable Inputs/Outputs

Profibus Inputs

32 inputs, I2.02.0 through I2.05.7, are available.

Profibus Outputs

32 outputs, Q2,02.0 through Q2,050,7, are available.

See also Section 11,2 Profibus

BTV04 Programmable Inputs/Outputs

These I/Os are only available if a BTV04 is being used as an operator console. The parameters must be designated as:

- B002 0 1 0 0 0 000
- B009 1 xxx (xxx = 200 – 500)

The I/Os are transferred serially to the BTV04. The transfer time can take up to 500ms.

BTV04 X4 Inputs

11 inputs, I1.03.0 through I1.04.1 are available.

BTV04 X5 Outputs

12 outputs, Q1.03.0 through Q1.04.2, are available.

Some keys can be queried from the user programs.

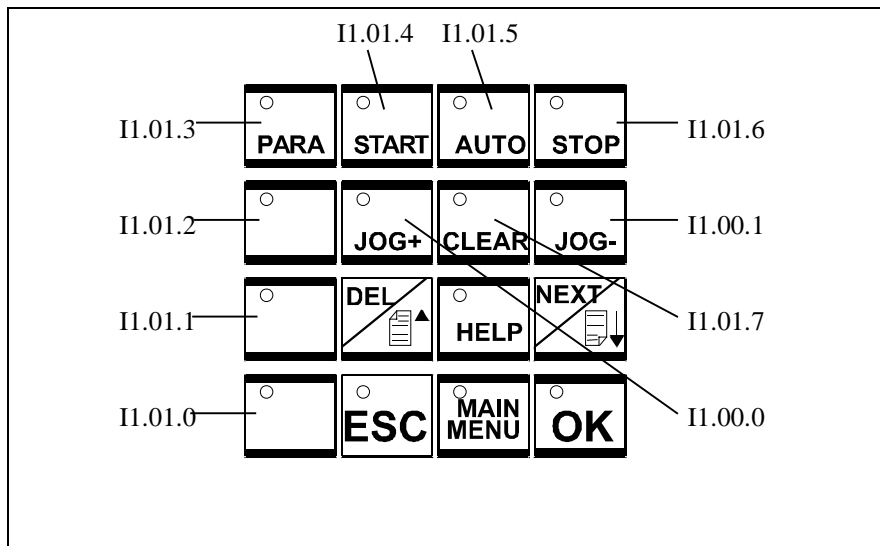


Fig. 11-5: BTV04 Key Inputs

Accessing System Inputs and Outputs from the BTV04

If Parameter B010 is set to 1 the operating modes and jog buttons are valid.

Caution: The system outputs on the DKC21.3 no longer execute the functions!

The system inputs and outputs of the DKC21.3 on connector X210 are no longer queried or set. They can be used freely from the user programs.

If a fault output or the operating modes are to be assigned to a hardware output, this can be programmed in the Logic Task.

The following keys are now active:

PARA
 START
 AUTO
 STOP
 JOG+
 JOG-

Marker Flags

The marker flags can be distinguished as follows:

Source	Bytes	Function
0	00...05	System Marker Flags (Inputs)
1	00...03	System Marker Flags (Outputs)
2	00...19	NC Marker Flags
3	00...07	Saved NC Marker Flags
4	00...09	NC ? Transfer Marker Flags Logic Task
4	10...13	NC ? Transfer Marker Flags Logic Task cleared after processing of the Logic Task
5	00...09	Logic Task ? Transfer Marker Flags NC
6	00...18	Saved Logic Task Marker Flags
6	19	System Byte (Parameter B010 = 4) saved
6	20...36	Logic Task Marker Flags
6	37...39	Logic Task Marker Flags for Command TXT 3 and Serial Interface Status 25
8	00...19	Command Marker Flags via Serial Interface

Fig. 11-6: Marker Flag Categories

System Marker Flags (Inputs)

Here, the requirements are mirrored.

These marker flags can only be read by the programs.

M0.00

Bit Field	Function	Source
0	Parameters	Inputs or Fieldbus
1	Manual/Automatic	Inputs or Fieldbus
2	Start	Inputs or Fieldbus
3	Stop	Inputs or Fieldbus
4	Jog forward	Inputs or Fieldbus
5	Jog reverse	Inputs or Fieldbus
6	Clear Errors	Inputs or Fieldbus
7	Reserved	

Fig. 11-7: Marker Flag System Inputs

M0.01

All bits in this byte are reserved.

M0.02

These marker flags are only valid if the function is enabled in the designated parameter.

Status of the Function Inputs

Bit File Id	Function	Source
0	Interruption	Parameter A116
1	Feed Angle Monitoring	Parameter A116
2	Manual Vector	Parameter AA01
3	Interrupt Vector	Parameter AA02
4	Reserved (Free)	Parameter AA03
5	Reserved (Free)	Parameter AA05
6	Reserved (Free)	Parameter AA06
7	Measuring Wheel Control enabled	Parameter AA07

Fig. 11-8: Marker Flags - Programmable System Inputs

M0.03

All bits in this byte are reserved.

M0.04

All bits in this byte are reserved.

M0.05

All bits in this byte are reserved.

System Marker Flags (Outputs)

M1.00

Bit Field Id	Function	Source
0	Manual Mode	Status
1	Automatic	Status
2	Fault	Status
3	Run	Status
4	Ready	Status
5	Warning	Status
6	Parameters	Status
7	In Position	Status

Fig. 11-9: Marker Flags - System Outputs

M1.01

Status of Generating Position Command Values

Bit Field Id	Function
0	Position Command Value: Command Position reached and Command Velocity = 0
1	Position Command Value: Acceleration Phase
2	Position Command Value: Deceleration Phase
3	Position Command Value: Constant Velocity
4	Position Command Value: Negative Velocity
5	Inhibited Movement: Stop, Interrupt, Feed Angle Monitoring, Movement to Positive Stop
6	Axis in Home Position of the last Positioning Command (dependent on Parameter A113 "Positioning Window").
7	Reserved

Fig. 11-10: Marker Flags Generating Command Values

M1.02

All bits in this byte are reserved.

M1.03

Bit Field Id	Function	Source
0	EMD Module 1 enabled	Status
1	EMD Modules 1 and 2 enabled	Status
2	Open feed roll enabled	Status
3	Reserved (Free)	
4	Reserved (Free)	
5	Reserved (Free)	
6	Reserved (Free)	
7	Reserved (Free)	

Fig. 11-11: Marker Flags - System Outputs

NC Marker Flags

M2.00 - M2.19

These marker flags can be read and written via NC commands. These marker flags are cleared when exiting Automatic Mode, losing power or when a fault occurs.

Saved NC Marker Flags

M3.00 - M3.07

These marker flags can be read and written via NC commands. They are not cleared, even when power is lost.

**NC ? Transfer Marker
Flags Logic Task**

M4.00.-.M4.09

These marker flags are only for signal transfers between the NC Tasks and the Logic Task. They can be read and written by the NC Tasks. The Logic Task can only read these marker flags. These marker flags are cleared when power is lost.

M4.10 - M4.13

These marker flags are written from the NC tasks, but are cleared immediately after the Logic Task is processed.

**Logic Task ?
Transfer Marker
Flags NC**

M5.00.-.M5.09

These marker flags are only for signal transfers between the Logic Task and the NC Tasks. They can be read and written by the Logic Task. The NC Tasks can only read these marker flags. These marker flags are cleared when entering Parameter Mode, when a fault occurs in the Logic Task, or when power is lost.

Saved Logic Task Marker Flags

M6.00 - M6.18

These marker flags can be read and written by the Logic Task. They are not cleared, even when power is lost.

M6.19

System Marker Flags

see Parameter B010

Logic Task Marker Flags

M6.20 - M6.36

These marker flags can be read and written by the Logic Task. These marker flags are cleared when entering Parameter Mode, when a fault occurs in the Logic Task, or when power is lost.

M6.37 - M6.39

see TXT command

Communication Marker Flags

M8.00 - M8.19

These marker flags can be written using a command from the serial interface.

Note: Because these marker flags are saved, the last written status remains active. A safety-related function like "jogging" is only allowed when the master interface monitors the transmission cyclically and can ensure that the function or system will be shut down by an external source in case of an interface fault.

11.2 Serial Interface

Overview

The drive controller is equipped with a serial interface. This interface is used to program the drive. The following can be exchanged via this interface:

- **Parameters**
- **Programs**
- **Logic Task**
- **Status Information**
- **Commands**

These data are numbers-oriented and a single transfer occurs.

Interface Mode The interface can operate optionally in either

- **RS232 Mode** or
- **RS485 Mode**

Interface Protocol Three different protocols are supported:

- Indramat **SIS Protocol**
user data transmitted in INTEL format
- **ASCII Protocol**

The precise structure is outlined in the following section.

- **IDS protocol (RS232)**

Transmission from the Indramat decade switch.

Setting the Drive Address Setting the drive address using the S2 button and the S3 button is only required when communicating via the RS485 bus (e.g. BTV04).
The addresses can be set from 1 to 36, and for Profibus from 2 to 36.

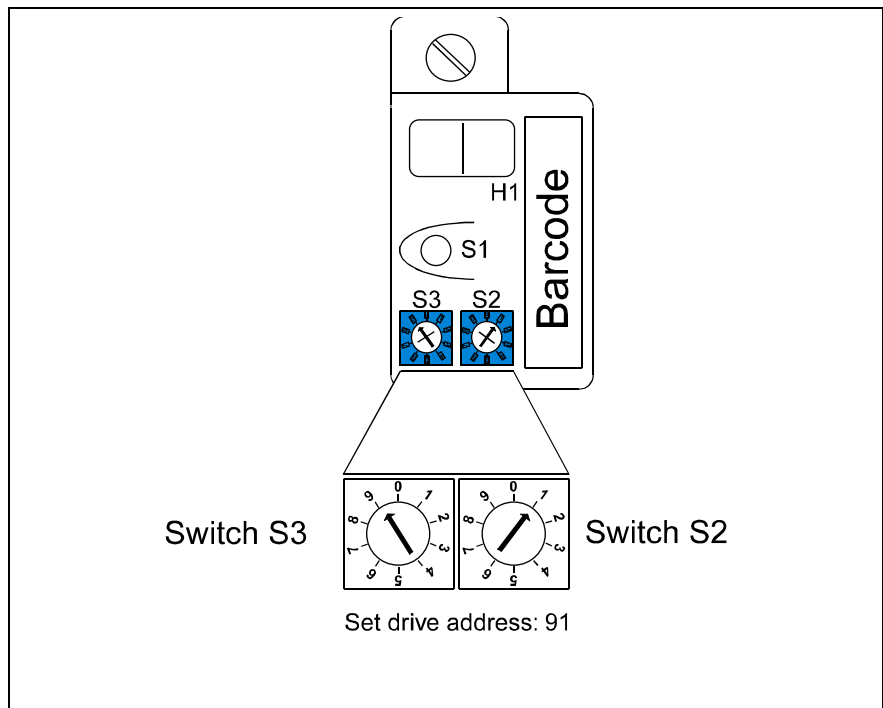


Fig. 11-12: Setting the Address via the Address Switch on the Programming Module

RS232 Mode In this mode, it is not necessary to set the drive address, since only one user is connected (peer-to-peer connection).

Communications via RS232 Interface

Features:

The RS232 interface is intended for use when connecting a PC with the **MotionManager** startup program.

- Transmission rates of:

2400	baud	ASCII
4800	baud	ASCII
9600	baud	ASCII / SIS
19200	baud	ASCII / SIS
- Maximum transmission path: 15m
- 8-bit **ASCII** protocol or 8-bit **SIS** protocol
- Parity bit: none, even, odd
- one stop bit

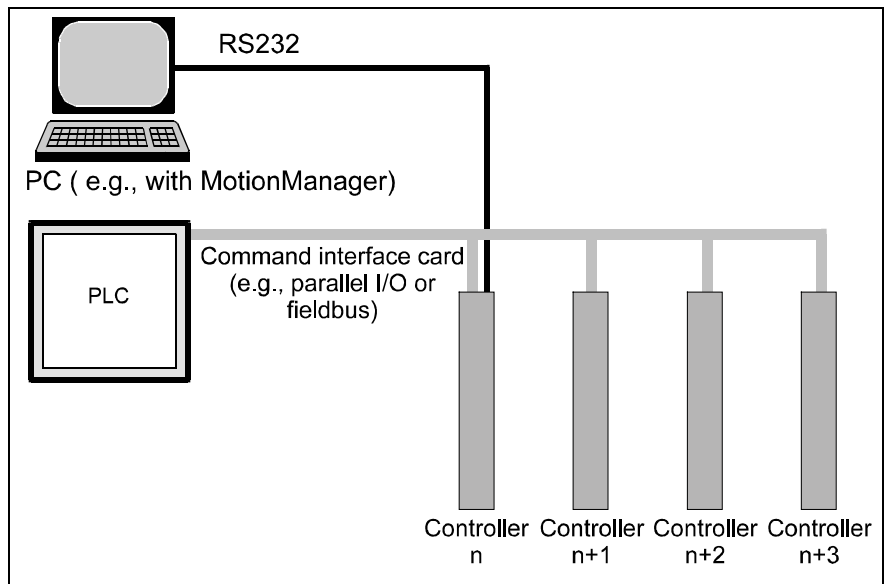


Fig. 11-13: Communications via RS232 Interface

Communications via RS485 Interface

Features

Communication via the RS485 interface makes it possible to implement a **serial bus** with the following data:

- Up to **8 drives** can be connected to one bus master.
- Transmission rates of:

2400	baud	ASCII
4800	baud	ASCII
9600	baud	ASCII / SIS
19200	baud	ASCII / SIS
-
- Maximum transmission path: **500m**
- **Half duplex** mode over a **2-wire** line
- 8-bit **ASCII** protocol or 8-bit **SIS** protocol
- Parity bit: none, even, odd
- one stop bit

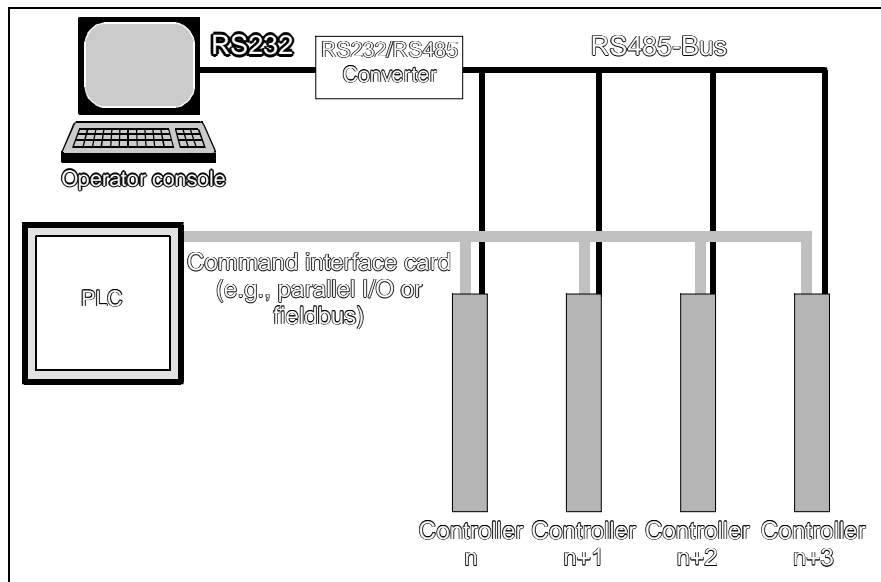


Fig. 11-14: Data Exchange of Drive Groups from an Operator Console

Transmission Protocols

When the 24V supply voltage is switched on, the data set in Parameters B001, B002, B009 and B010 are used as the communications parameters. If these settings do not correspond to the data in the programming unit, the S1 button on the programming module can be used to set the default transmission parameters. See also: "Initial Startup" Chapter, S1 Button.

ASCII Protocol

First Control Character in the Data String:

The first control character indicates the beginning of a data transmission:

- 1) **?** hexadecimal 3F / character for data query

If the control receives a '?', requested information (program instruction, parameter, status message) is output.

- 2) **#** hexadecimal 23 / character for transmission of instruction
NC, Parameters, Logic Task, Variables

If the control receives a '#', the following characters are read into the corresponding instruction number of the program memory.

- 3) **!** Hexadecimal 21

If the control receives a '!', the following characters are picked up as the control command.

- 4) **:** Hexadecimal 3A

Colon for polling query.

Second Control Character in the Data String:

S This character identifies the station number. The 's' is to be replaced by an appropriate character, depending on the operating mode. The `s` is replaced by an appropriate character depending on the operating mode.

- 1) In RS232C operating mode, the 's' is replaced by a blank space. However, the responses always contain the station number.
- 2) In RS485 mode, the `s` is replaced by the respective station number (1 - 9; A - W). If this number does not correspond to the number set in the programming module, there is no response to the received data. If this number does not correspond to the number set in the programming module, there is no response to the received data.
If `s` is a blank space, this information is relevant for all users on the bus.

Third Control Character: The third character identifies the information type:

- 1) **N** hexadecimal 4E / character for instruction number

The information following the `N` is interpreted as a program instruction.

- 2) **K** hexadecimal 4B / character for parameter

The information following the `K` is interpreted as a parameter.

- 3) **X** hexadecimal 58 / character for status

- 4) **P** hexadecimal 50 / character for Logic Task

The information following the `P` is interpreted as a Logic Task instruction.

- 5) **V** hexadecimal 56 / character for variable

The information following the `V` is interpreted as a variable.

- 6) **C** hexadecimal 43 / character for commands

The information following the `C` is interpreted as a command.

Other Control Characters:

- 1) **\$** hexadecimal 24 / character for checksum

- 2) **hh** hexadecimal value / checksum

These two characters represent the result of the checksum for a piece of information. The checksum is sent along with each type of information. When data is received, the checksum can be disregarded (see Parameter B002).

- 3) **CR** hexadecimal 0D / character for carriage return (Carriage Return)

LF hexadecimal 0A / character for linefeed (Feed)

The characters `CR` and `LF`, together, form the end of each transmission. (transmission of instruction)

Information Characters: All information characters are coded in hexadecimal format in accordance with the ASCII code table. The following characters are used to exchange information:

1) **0** through **9** hexadecimal 30 through 39

A through **Z** hexadecimal 41 through 5A

The numerals `0` through `9` and the letters `A` through `Z` are available for command and data input.

2) **—** hexadecimal 20 / space (space bar)

To produce the desired format, the space is used at various points within the data string.

3) **+** hexadecimal 2B / operational sign for data

- hexadecimal 2D / operational sign for data

4) **.** hexadecimal 2E

, hexadecimal 2C

When numerical values are received, both a period and a comma are accepted. Both are recognized as the decimal point. When numeric values are sent, a decimal point is always used.

Generating the Checksum

- Examples:** 1. #_N0000_POI_1_ _ _ _ 123456.789_123_ \$
 2. #5N0123_NOP_ _ \$

Character	Hex	Σ Hex	Character	Hex	Σ Hex
#	23	23	#	23	23
_	20	43	5	35	58
N	4E	91	N	4E	A6
0	30	C1	0	30	D6
0	30	F1	1	31	107
0	30	121	2	32	139
0	30	151	3	33	16C
_	20	171	_	20	18C
P	50	1C1	N	4E	1DA
o	4F	210	O	4F	229
l	49	259	P	50	279
_	20	279	_	20	299
1	31	2AA	_	20	2B9
_	20	2CA			
_	20	2EA			
_	20	30A			
_	20	32A			
+	2B	355			
1	31	386			
2	32	3B8			
3	33	3EB			
4	34	41F			
5	35	454			
6	36	48A			
.	2E	4B8			
7	37	4EF			
8	38	527			
9	39	560			
_	20	580			
1	31	5B1			
2	32	5E3			
3	33	616			
_	20	636			

Fig. 11-15: Generating the Checksum

- The sum of all 'ASCII' characters is calculated, from the first control character to the last character before the '\$'.
- Then, the 'High Byte' is added to the 'Low Byte.' A transmission occurring during this time is ignored.
- The Two's Complement of the 'Low Byte' of this sum results in the checksum

Example 1: #_N0000_1_ _ _ _ 123456.789_123_ \$**C4**

Sum: 636 → 06 + 36 = 3C. The Two's Complement of 3C is **C4**.

Example 2: #5N0123_NOP_ _ \$**45**

Sum: 2B9 → 02 + B9 = BB. The Two's Complement of BB is **45**.

RS Program Instructions

Transmit Program Instructions: A new instruction is read in as shown in the example below.
 The character sequence `# s N` always comes first.
 An entry must always be concluded with `CR LF`.

Format:

```
#sNbbbb_ccc_dddddddddddddddd_$hh CR LF
```

Meaning of the characters used:

- s = Blank space for RS232C or station number for RS485
- b = Instruction number
- c = Command code
- h = Checksum
- d = Instruction Information (data field with up to 32 characters)

Examples of data transmissions to the FLP:

```
#5N0100_POI_1____+123456.786_123__$hh CR LF
#5N0101_AEA_Q0.00.3_1____$hh CR LF
#5N0102_BPA_0123_M2.02_____22112212__$hh CR LF
```

The data formats are stipulated for each command and must be complied with!

Command	Data	Data
ACC	ACC_1____234_567_	ACC_1____V600_V601_
AEA	AEA_Q1.01.1_1____	AEA_Q1.01.0_V600_
AKN	AKN_M1.02.3_1____	AKN_M2.02.3_V600_
AKP	AKP_M2.02_01201201_	AKP_M2.02_01201201_
APE	APE_Q0.01_01201201_	APE_Q0.01_01201201_
APZ	APZ_01201201_	APZ_01201201_
BAC	BAC_1234_-5678_98765_	BAC_V600_-5678_V601_
BCE	BCE_0234_I0.12.3____1____	BCE_V601_I1.01.3____V600_
BIC	BIC_0234_56_____M0.12.3_0_1_	BIC_V601_V600_____M0.12.3_0_1_
BIO	BIO_0234_M2.03_Q0.56_01201201_	BIO_V600_M2.03_Q0.01_01201201_
BPA	BPA_0234_M2.02_____01201201_	BPA_V600_M2.02_____01201201_
CIO	CIO_M2.02.3_Q0.01.1_45__	CIO_M2.02.3_Q0.01.1_V600_
CLC	CLC_0234_	CLC_V600_
CON	CON_1____1____+234__	CON_1____V600_+V601_
COU	COU_+12345_Q0.01.1_654321_	COU_+12345_Q0.01.1_V600__
CPJ	CPJ_V600>=+12345.678_1234.56_1234_	CPJ_V604_>=+V600_____V601_____V603_

CPL	CPL_1_ _ _ _	CPL_1_ _ _ _
CPS	CPS_V602<=+12345.678 1234.56_Q0.01.1_	CPS_V602_<+V600_ _ _ _ _V601_ _ _ _Q0.01.1_
CID	CID_V600<= 1_ _ _ _ _ +12345.678_	CID_V600<= 1_ _ _ _ _ +V601_
CST	CST_1_2_	CST_1_2_
CVT	CVT_V600_M2.02_3_1_	CVT_V600_M2.02_3_1_
FAK	FAK_1_ _ _ _1.654321_	FAK_1_ _ _ _V600_ _ _ _ _
FOL	FOL_1_ _ _ _1_ _ _ _ _ +12.654321_	FOL_1_ _ _ _1_ _ _ _ _ +V600_ _ _ _ _
FUN	FUN_0_0_0_0000_	FUN_0_0_0_0000_
HOM	HOM_1_ _ _ _	HOM_1_ _ _ _
JMP	JMP_0234_	JMP_0234_
JSR	JSR_0234_	JSR_0234_
JST	JST_0234_	JST_0234_
JTK	JTK_0234_3_	JTK_V600_3_
MAT	MAT_V600_=_V656_ _ _ _ +123456.987654_	MAT_V123_=_V456_ _ _ _ +V600_ _ _ _ _
MOM	MOM_1_ _ _ _123_ _456_ _M0.12.3_789_ _	MOM_1_ _ _ _V600_V601_ _M2.02.3_V602_
NOP	NOP_	NOP_
PBK 1	PBK_1_ _ _ _	PBK_1_ _ _ _
PFA	PFA_1_ _ _ _ +123456.789_123_ _	PFA_1_ _ _ _ +V600_ _ _ _ _V601_
PFI	PFI_1_ _ _ _ +123456.789_123_ _	PFI_1_ _ _ _ +V600_ _ _ _ _V601_
POA	POA_1_ _ _ _ +123456.789_123_ _	POA_1_ _ _ _ +V600_ _ _ _ _V601_
POI	POI_1_ _ _ _ -123456.789_123_ _	POI_1_ _ _ _ - V600_ _ _ _ _V601_
PSA	PSA_1_ _ _ _ +123456.789_123_ _	PSA_1_ _ _ _ + V600_ _ _ _ _V601_
PSI	PSI_1_ _ _ _ +123456.789_123_ _	PSI_1_ _ _ _ + V600_ _ _ _ _V601_
REP	REP 0234 1_ _ _ _ _123456.789_	REP 0234 1_ _ _ _ _V600_ _ _ _ _
RSV	RSV_1_ _ _ _0234_12345_	RSV_1_ _ _ _V600_12345_
RTM	RTM_1_ _ _ _1_ _ _ _	RTM_1_ _ _ _V600_
RTS	RTS_	RTS_
SA1		
SAC	SAC_1_ _ _ _1_ _ _ _ _ _+123456.789_	SAC_1_ _ _ _V600_ _ _ _ _ +V601_ _ _ _ _ _
SET	SET_V600_=_ _ _ _ _ +12345678.123456_	SET V601_=_ _ _ _ _ +V600_ _ _ _ _ _ _ _ _ _
SRM	SRM_1_ _ _ _ +123456.123_+123_ _I0.00.6_	SRM_1_ _ _ _ +V600_ _ _ _ _ +V601_ _I0.00.6_
SRP		
TXT		
VCC	VCC_1_ _ _ _ +123456.789_123_ _0_1_ _ _	VCC_1_ _ _ _ +V600_ _ _ _ _V601_0_V602_
VEO	VEO_1_ _ _ _1_1_123_1_	VEO_1_ _ _ _1_1_V600_1_
WAI	WAI_12.34_ _ _ _ _ \$	WAI_V600_ _

Fig. 11-16: Transmission Formats of the Commands

Read Out Program Instructions: Example of querying an instruction:

Format:

```
?sNbbbb_$hh CR LF
```

The character sequence `?sN` always comes first. An entry must always be concluded with `CR LF`.

In response to this query, the contents stored in the queried program instruction `bbbb` are sent.

```
#sNbbbb_ccc_ddddddddddddddddddd_$hh CR LF
```

Meaning of the characters used:

- s = Blank space for RS232C or station number for RS485
- b = Instruction number
- c = Command code
- d = instruction information (number dependent on command)

Parameters

Read Out Parameters: Parameters can be read out in any operating mode.

Format:

```
?sK_xxyy_$hh CR LF
```

In response to this query, the contents stored in the queried parameter `xyy` is sent.

```
Ksxyy_dddddddd_$hh CR LF
```

Meaning of the characters used:

- x = Parameter Number
- y = Block Identifier
- d = Instruction information (number dependent on parameter)

Writing a parameter

```
!sKxyy_dddddddd_$hh CR LF
```

Meaning of the characters used:

- x = Parameter Number
- y = Block Identifier
- d = Instruction information (number dependent on parameter)

Parameter Blocks	Block Identifier	Parameter Number
System Parameters	A1	00 to 19
Function Parameters	AA	00 to 19
General Parameters	B0	00 to 14
Encoder Parameters	C0	00 to 19
Controller Parameters	CR	00 to 10
Motor Parameters	CM	00 to 11
PLS Switch Press Encoder	N1	00 to 31

Fig. 11-17: Parameter Groups

Parameter	Data
A100	A100_1_1_
A101	A101_1234.5678_
A102	A102_1000_2000_
A103	A103_+123456.789_
A104	A104_+123456.789_
A105	A105_123456.789_0_
A106	A106_123456.789_
A107	A107_123456.789_
A108	A108_123456_
A109	A109_123_456_
A110	A110_1.024_
A111	A111_M2.02.2_123.456_
A112	Reserved (Free)
A113	A113_M2.02.0_1234.567_
A114	A114_M2.02.2_1.5_0050_
A115	A115_1_100_M2.02.0_
A116	A116_M2.02.0_M2.02.1_
A117	A117_123_
A118	A118_1234.567_
A119	A119_0_0_

AA00	AA00_0100_0200_1_
AA01	AA01_M2.02.0_1_0_0100_
AA02	AA02_M2.02.2_1_0_0100_
AA03	Reserved (Free)
AA04	AA04_1_
AA05	Reserved (Free)
AA06	Reserved (Free)
AA07	AA07_M2.02.0_
AA08	AA08_M2.02.0_M2.02.1_
AA09	AA09_00.00.0_00.00.0_
AA10	AA10_00.00.0_
AA11	AA11_Q3.00_M8.02_8_630_
AA12	AA12_M2.02.2_M2.02.3_00_
AA13	AA13_M2.02.2_M2.02.3_
AA14	AA14_M2.02.2_M2.02.3_
AA15	AA15_M2.02.2_M2.02.3_00
AA16	AA16_M2.02.2_M2.02.3_00
AA17	AA17_M2.02.2_M2.02.3_00
AA18	AA18_M2.02.2_M2.02.3_00
AA19	AA19_99_M2.02.2

B000	B000_1_0_
B001	B001_09600_1_
B002	B002_0_0_0_0_0_000_
B003	B003_S_0_0001_
B004	B004_12345678_
B005	B005_0001.0000_
B006	B006_S_0_0001_
B007	B007_12345678_

B008	B008_0001.0000_
B009	B009_0_123_
B010	B010_0_
B011	B011_12345_
B012	B012_123456.7_
B013	B013_0_1_0_
B014	B014_0_0_0_0_

C000	C000_1_
C001	C001_01_
C002	C002_01_0_0_0_
C003	C003_00005000_
C004	C004_01_
C005	C005_01_0_0_0_
C006	C006_00005000_
C007	C007_1234.5678_
C008	Reserved (Free)
C009	C009_1_0_0_12_34_
C010	C010_10.00.6_Q0.00.6_03_
C011	C011_+123456.789_
C012	C012_+123.456_
C013	C013_1234_4567_
C014	C014_0_0_0_
C015	C015_02500_
C016	C016_000.0_
C017	C017_1_0_00_12_0_
C018	C018_00.00.0_00.00.0_76
C019	C019_00001024_

CR00	CR00_655.35_
CR01	CR01_6553.5_
CR02	CR02_6553.5_
CR03	CR03_6553.5_
CR04	CR04_00500_
CR05	CR05_900_
CR06	CR06_+000_
CR07	CR07_056.78_
CR08	CR08_6553.5_
CR09	CR09_4_
CR10	CR10_056.78_

CM00	CM00_1_
CM01	CM01_040_
CM02	CM02_0100.0_0070.0_
CM03	CM03_10500.000_
CM04	CM04_003_
CM05	CM05_000.20_
CM06	CM06_0.00003_
CM07	CM07_0_0_
CM08	CM08_010.000_
CM09	CM09_123_123_
CM01	CM10_000.00_
CM11	CM11_+0000.0000_

Examples:

Query	Response
?5K_B006_\$hh CR LF	K5B006_S_0_0001_\$05 CR LF
?5K_A101_\$hh CR LF	K5A101_1234.5678_\$B8 CR LF

Examples: Write

!5K_A103_+123456.789_\$11 CR LF
!5K_CR00_655.35_\$F1 CR LF

If no checksum validation function has been programmed prior to entering Parameter Mode, this function remains disabled, even though Parameter B002 has been overwritten, until Parameter Mode is exited.

Variables

Read Out Variables

Variables can be read out in any operating mode.

Format:

?sVxxx_\$hh CR LF

In response to this query, the contents stored in the queried variable `xxx` are sent.

Vsxxx_+12345678.123456_\$hh CR LF

Meaning of the characters used:

- x = Variable Number
- h = Checksum

Write Variables

#sVxxx_+ddddddd.ddddddd_\$hh CR LF

Meaning of the characters used:

- x = Variable Number
- h = Checksum
- d = Variable information

Logic Task

Read Out Logic Task

Logic Task instructions can be read out in any operating mode.

Format:

?sP_xxxx_\$hh CR LF

In response to this query, the contents stored in the queried Logic Task instruction `xxxx` is sent.

Psxxxx_dddddddd_\$hh CR LF

Meaning of the characters used:
 x = Parameter Number
 d = Instruction Information

Write Logic Task

#sPxyy_ddddddd_\$hh CR LF

Meaning of the characters used:
 x = Parameter Number
 y = Block Identifier
 d = Instruction information (number dependent on parameter)

Command	Data
LD	LD__M2.02.0_
LDN	LDN__M2.02.0_
ST	ST__M2.02.0_
STN	STN__M2.02.0_
SET	SET__M2.02.0_
SETC	SETC__M2.02.0_
SETCN	SETCN_M2.02.0_
RES	RES__M2.02.0_
RESC	RESC__M2.02.0_
RESCN	RESCN_M2.02.0_
AND	AND__M2.02.0_
ANDN	ANDN__M2.02.0_
AND(AND(_M2.02.0_
ANDN(ANDN(_M2.02.0_
OR	OR__M2.02.0_
ORN	ORN__M2.02.0_
OR(OR(_M2.02.0_
ORN(ORN(_M2.02.0_
XOR	XOR__M2.02.0_
XORN	XORN__M2.02.0_
XOR(XOR(_M2.02.0_
XORN(XORN(_M2.02.0_
))_
NOP	NOP_
END	END_

Examples:

Query	Response
?_P_0006_\$hh CR LF	P_0006_ORN(__M2.02.0_\$hh CR LF
?_P_0101_\$hh CR LF	P_0101_AND__M2.02.1_\$hh CR LF

Examples: Transmission

#_P_0103_SET__M2.02.3_\$hh CR LF
 #_P_0600_RESCN_M2.02.5_\$hh CR LF

If no checksum validation function has been programmed prior to entering Parameter Mode, this function remains disabled, even though Parameter B002 has been overwritten, until Parameter Mode is exited.

Readout of Status Information

The following status messages can be queried via the serial data interface:

Status `00`	=	Actual position of axis 1 in IUs
Status `01`	=	Transmission error, interface
Status `04`	=	Counter
Status `05`	=	Firmware version
Status `08` numbers	=	Current instructions and return instruction of tasks 1 through 3
Status `09` and position	=	Measuring Wheel Mode: Actual position of Axis 1 of motor encoder
Status `10`	=	Position lag (following error) of Axis 1 in IU
Status `19`	=	Hardware and firmware version
Status `25`	=	Two-digit diagnostic code with text output
Status `48`	=	Actual velocity of axis 1 in RPM
Status `53`	=	Fault message
Status 60	=	Output of first erroneous instruction number (Parameter, Task, Logic Task)
Status 61	=	Output of a byte M/I/Q
Status 62	=	Controller Type or Motor Type
Status 63	=	Text output (TXT command)
Status `64`	=	Two-digit diagnostic code

Status 00

Actual position of Axis 1 in IU

The status query:

```
?sX__00_ CR LF
```

produces the message:

```
Xs00_e v m m m m m . m m m __ + 000000.000$ h h CR LF
```

Meaning of the characters used:

- e = ` ` stands for relative position (not homed)
- `A` stands for absolute position (axis homed)
- v = Operational sign of the actual position
- m = Actual position of Axis 1 in IU

Status 01

Transmission errors

The control sends this status information automatically if an error occurs in the transmission. Status 01 can *not* be queried.

In the event of a transmission error, the control delivers the following message:

```
Xs01_ff_tttttttttttttttttt_$hh CR LF
```

Meaning of the characters used:

- f = Fault (error) number
- t = Fault (error) text (always 20 characters)

Below is a list of the fault (error) numbers and their meanings:

Faults No.	Fault Text	Description
01	RS Instruction # Wrong	Incorrect characters in the instruction number. The transmitted instruction number is not a decimal number.
02	RS Format Error	The format of the transmitted data is incorrect
03	RS Instruction Data Error	The transmitted instruction data are incorrect.
04	RS Checksum Error	The transmitted checksum is incorrect.
05	Invalid Mode	Attempt was made to transmit parameter data. The control was not in 'Parameter' operating mode at the time.
06	Wrong RS Param #	The transmitted parameter number is not a decimal number.
07	Param. # too large	The transmitted parameter number is too large.
08	Wrong RS Status #	The number given in a status request is not a decimal number.
09	Status # illegal	An attempt was made to query status information that was not present.
11	Invalid Param. Block	Incorrect parameter instruction identifier.
12	Instruction # too large	The transmitted instruction number is greater than 2999.
13	Invalid Prg Command	An illegal command was transmitted to the DKC.
16	Value too large	One of the values is too large See description for max. values
17	Value too small	One of the values is too small See description for min. values
18	Not accepted!	
19	Group no. illegal	
20	RS system error #1	
21	RS system error #2	
22	MF para. Read only	Motor feedback parameter
23	Var. No. incorrect	The variable number is not enabled.

Status 04

Counter

The status query:

`?sX__04_nnnn_CR LF`

produces the message:

`Xs04_nnnn_iiii_zzzzzz_____ $hh CR LF`

Meaning of the characters used:

n = Block number
 i = Actual Quantity
 z = Preset Count

If the requested instruction contains no counter, blank spaces ` ` are output for `i` and `z`.

Status 05

Firmware version

The status query:

`?sX__05_CR LF`

produces the message:

`Xs05__vvvvvvvvvvvvvvvvv_ $hh CR LF`

Meaning of the characters used:

v = firmware version (also appears on the display of the BTV)

e.g. e.g.

Status 08

Current instruction number and return instruction number to the main program of the 3 tasks

The status query:

`?sX__08_CR LF`

produces the message:

`Xs08_aaaa_bbbb_cccc_dddd_eeee_fff_ $hh CR LF`

Meaning of the characters used:

a = Task 1 - Current instruction number
 b = Task 1 - Instruction number of the main program
 c = Task 2 - Current instruction number
 d = Task 2 - Instruction number of the main program
 e = Task 3 - Current instruction number
 f = Task 3 - Instruction number of the main program

In the case of tasks that have not been enabled, an appropriate number of blank spaces is output.

If a task is not located in a subroutine, only the current instruction number is output.

Status 09

Measuring Wheel Mode: Actual position of Axis 1 and position of motor encoder

The status query:

```
?sX__09_CR LF
```

produces the message:

```
Xs09__evmmmmm.mmm_vnnnnnn.nnn$hh CR LF
```

Meaning of the characters used:

- e = `_' stands for relative position (not homed)
- `A' stands for absolute position (axis homed)
- v = Operational sign of the actual position
- m = Actual position of Axis 1 in IU. The sums of all Measuring wheel encoder movements are added
- n = Actual position of the motor encoder in IU (incremental encoder 1)

Status 10

Axis 1 Position Lag (Following Error)

The status query:

```
?sX__10_CR LF
```

produces the message:

```
Xs10_vmmmmm.mmm__+000000.000$hh CR LF
```

Meaning of the characters used:

- v = Operational sign for position lag (following error)
- m = Position lag (following error) of Axis 1 in IU

Status 19

Hardware and firmware version

The status query:

```
?sX__19_CR LF
```

produces the following message, e.g.,:

```
Xs19DKC21.3_ _ _ _ _ _ _ _ _ _ _ _ _ ECODR3-FLP-xxVxx$hh CR LF
```

Firmware version
max. 16 charactersHardware version
max. 16 characters**Status 25**

Two-digit diagnostic code with text output.

see also TXT Command and Markers M2.37 – M3.39

The status query:

```
?sX__25_<cr><lf>
```

produces the message:

```
Xs25_cc-----40 characters information-----$hh<cr><lf>
```

cc = current diagnostic code

Examples:

```
Xs25_8BAxis 1 Motor Has Overheated $hh<cr><lf>
```

```
Xs25_02M: Feed Forward $hh<cr><lf>
```

Overview of Error Messages:Status Messages:

```
"18Initialisierung System "
```

```
"0EPARAMETER MODUS "
```

```
"02M: Tippen Vor "
```

```
"17M: Tippen Zurueck "
```

```
"1AA: C. Stop Aktiv "
```

```
"48 Stop durch Unterbrechung "
```

```
"99Fehler in Steuerung, lese H1 Anzeige "
```

Minor Error:

```
"13 Tippen vor+zur "
```

Soft Fault:

```
"6A Ungueltiger Modus Gewaehlt "
```

```
"66 Vorschubwinkel Fehler "
```

Hard Fault:

```
"77Para. Ungueltig P-modus waehlen "
```

Drive Error:

```

"00Betriebsbereit                "
"44Achse 1 Antrieb nicht bereit  "
"7DMotor Uebertemperatur Warnung "
"7EVerstaerker Uebertemperatur  "
"82Achse 1 Mitkopplung!          "
"88NOT-AUS NOT_AUS              "
"8BAchse 1 Motor Uebertemperatur"
"8CAchse 1 blockiert!           "
"93Antrieb Watch-Dog Fehler      "
"96Fehler im Antrieb, lese H1 Anzeige"
"3FM: Stop aktiv                 "

```

Status 48

Actual velocity of Axis 1

The status query:

```
?sX__48_CR LF
```

produces the message:

```
Xs48_g_vmmmm.mm_0_0000.00_$hh CR LF
```

Meaning of the characters used:

```

v   =   Operational sign
m   =   Velocity of Axis 1 in Rpm
g   =   0 Axis deactivated
      1 Axis activated

```

Status 53

Fault message

The status query:

```
?sX__53_CR LF
```

produces the message:

```
Xs53_xxxxxx_tttttttttttttttt $hh CR LF
```

t = Fault message in plain text (max 40 characters)

x = error code / diagnostic number

If the TXT command was called with Mode 1 (TXT 1 tttttttttttt), the text from this text command is output with Status 53.

t = 16 characters of the TXT command.

For fault texts and codes, see Chapter 12, Diagnostics.

Status 60

Output of erroneous

- Parameter Number
- NC instruction number
- Logic Task instruction number

The status query:

```
?sX__60_a_CR LF
```

produces the message:

```
Xs60_a_nnnn_$hh CR LF
```

a = Source 0 = Parameter
 1 = NC
 2 = Logic Task

nnnn = instruction number or parameter number

If no error is present, blank spaces are transmitted

Status 61

Output of a byte M/I/Q

The status query:

```
?sX__61_mt.nn_CR LF
```

produces the message:

```
Xs61_mt.nn_bbbbbbbb_$hh CR LF
```

Bit 7 0

m = Source type I / Q / M
 t = Source number
 n = Byte number
 b = Bits

Status 62

Output of the controller type or the type of connected motor.

The status query:

```
?sX_ _62_a_CR LF
```

produces the message:

```
Xs62_an...n_$hh CR LF
```

a = selection 0 = Controller type

2 = Motor type

n...n = character string with variable length and max. 40 characters.

Example:

```
?5X 62 0      →      X562 0DKC21.3-040-7 $DC
?5X 62 2      →      X562 2MKD025B-144-KG0-KN$84
```

Status 63

Output of the TXT field input in a TXT command .

The status query:

```
? s X _ _ 63 _ v b _ CR LF
      v = 1-4 : from line
      b = 1-4 : to line
```

produces the message:

```
X s 63 _ tttttttt . . . tttttttt _ $ h h CR LF
```

t = 16, 32, 48 or 64 characters of the TXT command with mode greater than 0

see also TXT command

Status 64

Two-digit diagnostic code

Current two-digit diagnostic code.

The status query:

```
? s X _ _ 64 _ <cr> <lf>
```

produces the message:

```
X s 64 _ c c $ h h <cr> <lf>
```

cc = current diagnostic code (see Status 25)

Examples:

```
X s 64 _ 8 B $ h h <cr> <lf>
X s 64 _ 0 2 $ h h <cr> <lf>
```

For diagnostic code see Status 25, TXT command, M2.37 to M2.39

Interface Commands

For all commands, it is necessary for the checksum to be transmitted independently from Parameter B002!

Clear Fault

```
!s CLEAR_ $hh CR LF
```

or

```
!s CCLEAR_ $hh CR LF
```

Clears a fault message

Clear Position Counter

The position counter can be cleared via the interface.

```
!s CRPOS0_ $hh CR LF
```

With this transmission, the relative position counter is set to 0. This counter also represents the position that is transmitted with status 00 when the type of motion = 0 (Parameter A100). If another type of motion is activated, the command is followed by error message 18 "Not accepted."

This is possible only when the type of motion = 0 (Parameter A100). If the control is not in Manual or Automatic Mode, the interface responds with error message 05 "Incorrect operating mode."

Set Default Values

Default parameters can be set via the interface.

```
!s CSETPA_ $hh CR LF
```

Note: All parameters are overwritten

Write to Marker Flag Group M8

Change a bit in marker flag group M8:

```
!s CSETM_ M8 . nn . b _ x _ $hh <cr> <lf>
```

Change a byte in marker flag group M8:

```
!s CSETMB_ M8 . nn _ xxxxxxxx _ $hh <cr> <lf>
```

```

|           |
|_Bit7     |_Bit0

```

With

- s : Station Number
- nn : Byte number 00 to 19
- b: Bit number of the selected byte.
- x: 0 = Clear the bit
- 1 = Set the bit
- 2 = Leave bit unchanged
- 3 = Invert the bit

Note: There is no time monitoring of the data transmission!
The marker flags are saved.

Write NOP to NC Instructions The NOP command is written to all NC program instructions:

Format:

```
! s C N O P N C $ h h <cr> <lf>
```

s = Station Number

The NOP command is written to the NC program instructions:

Format:

```
! s C N O P N C v v v v b b b b $ h h <cr> <lf>
```

vvv = beginning with NC instruction number (0000...0999)

bbbb = up to and including NC instruction number (0000...0999)

Note: These commands are only accepted in Parameter Mode.

A Yes response follows, and the command is successfully completed.

Write NOP to Logic Task Instructions

The NOP command is written to all logic task program instructions:

Format:

```
! s C N O P L T $ h h <cr> <lf>
```

Note: 'END' is written to instruction 0000 !

Complete logic task programming area with NOP:

Format:

```
! s C N O L T C v v v v b b b b $ h h <cr> <lf>
```

vvv = starting with logic task instruction number
(0000...0999)

bbbb = up to and including logic task instruction number
(0000...0999)

Note: If instruction 0000 is the first instruction, 'END' is written to it !

Note: These commands are only accepted in Parameter Mode.

A Yes response follows, and the command is successfully completed.

Clear NC Variables V600 to V999 and the indicated variables are cleared.

Format:

```
! s C C L V A R $ h h <cr> <lf>
```

Clear a variable range

Format:

```
! s C C L V A R v v v v b b b b $ h h <cr> <lf>
```

vvvv = starting with variable number (0600...0999)

bbbb = up to and including variable number (0600...0999)

Note: These commands are only accepted in Parameter Mode.

A Yes response follows, and the command is successfully completed.

Clear Saved Marker Flags Marker flags M3, M6 and M8 are cleared.

Format:

```
! s C C L M _ _ $ h h <cr> <lf>
```

A particular group of saved NC marker flags is cleared.

Format:

```
! s C C L M _ _ m n $ h h <cr> <lf>
```

m = "M" for marker flag

n = Group number

The saved NC marker flags are groups M3 and M6.

Note: These commands are only accepted in Parameter Mode.

A Yes response follows, and the command is successfully completed.

Write to Marker Flag Group M8 Change a bit in marker flag group M8:

Format:

```
! s C S E T M _ M 8 . n n . b _ x _ $ h h <cr> <lf>
```

Change a **byte** in marker flag group M8:

Format:

```
! s C S E T M B _ M 8 . n n _ x x x x x x x x _ $ h h <cr> <lf>
```

/ Bit7
 / Bit0

With s: Station Number

nn : Byte number 00 to 19

b: Bit number of the selected byte.

x: 0 = clear bit

1 = set bit

2 = bit unchanged

3 = invert bit

Re-Initialize PLS The PLS is initialized using the current PLS parameter data.

Format:

```
! s C I N I T N $ h h <cr> <lf>
```

Note: The command is accepted only in Manual or Automatic Mode.

An answer of Yes occurs immediately after acceptance of the command.

Polling Query A query, in the shortest possible format, which cyclically polls all of the controls connected to the RS485 bus.

The query:

```
:s CR LF
```

produces the DLC message:

```
:snnnn CR LF
```

Meaning of the characters used:

nnnn = Fault code (hexadecimal)
 Fault list

SIS Protocol

In preparation

11.3 Variables and Marker Flags

Below, all variables and marker flags that currently have fixed values and functionality in the Optifeed-CS system are described.

11.4 Variables

In order to process a product, the product data must be written to program variables of the DKC21.3 with CRE firmware. With the Indramat Optifeed with CRE, this is performed using the BTV04 operator and display console. If the BTV is not being used and the functionality of the DKC21.3 with CRE firmware is desired, all information about the product can be issued from a PLC or other operator console.

In order to read or write to a variable, the following ASCII format must be used:

Reading a Variable ? VXXX \$hh CR LF

Writing to a Variable # VXXX +XXXXXXXXX.XXXXXX \$hh CR LF

Note: Additional information about serial communications can be found in the general documentation "DOK-ECODR3-FLP."

Summary of the Variables Used

Variable	Definition	Set by	Format
V 007	Analog input	Firmware	+/-1 at 10 Volts
V 011	Actual velocity of the measuring wheel	Firmware	IU/sec
V 013	Strokes per minute	Firmware	
V 014	Feed angle load	Firmware	%
V 019	Operation time counter	Firmware	Hours
V 100	Absolute position value of motor encoder	Firmware	
V 101	Position Command Value	Firmware	
V 103	Lag Distance	Firmware	
V 104	Actual velocity	Firmware	IU/sec
V 105	Material that has been processed	Firmware	Meters
V 106	Average Velocity	Firmware	IU/sec
V 107	Slip between motor and measuring wheel encoder	Firmware	%
V 500	Base variable 1 for part length	NC Program in V700	
V 501	Base variable 2 for velocity of part length	NC Program in V701	
V 502	Base variable 2 for target quantity of part length	NC Program in V702	
V 503	Base variable 3 for actual quantity of part length	NC Program in V703	
V 504	Base variable 4 for tool control before feed	NC Program in V704	
V 505	Base variable 5 for tool control after feed	NC Program in V705	
V 508	Maximum quantity of the indicated variables	NC Program in 10	
V509	Variable Index	Calculated by the NC	

		program	
V 600	Jog velocity in % of the value in Parameter A106	BTV or external	00000XX0.000000
V 602	Feed length scaling factor	BTV or external	0000000X.XXXXXX
V 603	Acceleration in % of the value in Parameter A108	BTV or external	00000XX0.000000
V 604	Deceleration in % of the value in Parameter A108	BTV or external	00000XX0.000000
V 605	x parts finished before attaining the target quantity	BTV or external	000XXXXX.000000
V 606	Partial quantity target value	BTV or external	000XXXXX.000000
V 607	Partial quantity actual value	Read through BTV or externally	000XXXXX.000000
V 608	Total quantity target value	BTV or external	000XXXXX.000000
V 609	Total quantity actual value	Read through BTV or externally	000XXXXX.000000
V 610	Micro-adjustment value when only one feed length is present	BTV or external	000000XX.XXX000
V 611	Maximum feed length	BTV or external	000XXXXX.XXX000
V 612	Number of partial lengths of a product (max. 10)	BTV or external	000000XX.000000
V 613	free		
V 614	Total number of individual lengths of a product	Calculated by the NC program	
V 615	Already processed individual lengths of a product	Read only	
V 616	Evaluation factor for average velocity	BTV or external	00000000.XXXX00
V 617	Analog output startup time for average velocity	BTV or external	000XXXXX.000000
V 618	Minimum feed angle load in %	BTV or external	000000XX.000000
V 619	Maximum feed angle load in %	BTV or external	000000XX.000000
V 620	Acceleration change increment in %, when automatic optimization is used Optimization in %	BTV or external	000000XX.000000
V 630	Maximum number of switching operations for Tool 1 (Q3.00.0), target quantity	BTV or external	00XXXXXX.000000
V 631	Number of previous switching operations for Tool 1 (Q3.00.0), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 632	Maximum number of switching operations for Tool 2 (Q3.00.1), target quantity	BTV or external	00XXXXXX.000000
V 633	Number of previous switching operations for Tool 2 (Q3.00.1), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 634	Maximum number of switching operations for Tool 3 (Q3.00.2), target quantity	BTV or external	00XXXXXX.000000
V 635	Number of previous switching operations for Tool 3 (Q3.00.2), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 636	Maximum number of switching operations for Tool 4 (Q3.00.3), target quantity	BTV or external	00XXXXXX.000000
V 637	Number of previous switching operations for Tool 4 (Q3.00.3), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 638	Maximum number of switching operations for Tool 5 (Q3.00.4), target quantity	BTV or external	00XXXXXX.000000
V 639	Number of previous switching operations for Tool 5 (Q3.00.4), actual quantity	Read through BTV or externally	00XXXXXX.000000

V 640	Maximum number of switching operations for Tool 6 (Q3.00.5), target quantity	BTV or external	00XXXXXX.000000
V 641	Number of previous switching operations for Tool 6 (Q3.00.5), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 642	Maximum number of switching operations for Tool 7 (Q3.00.6), target quantity	BTV or external	00XXXXXX.000000
V 643	Number of previous switching operations for Tool 7 (Q3.00.6), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 644	Maximum number of switching operations for Tool 8 (Q3.00.7), target quantity	BTV or external	00XXXXXX.000000
V 645	Number of previous switching operations for Tool 8 (Q3.00.7), actual quantity	Read through BTV or externally	00XXXXXX.000000
V 672	Manual Mode feed length times value in V602	Calculated by the NC program	
V 673	free	Executed by the NC program	
V 674	Acceleration in % (internal)	Executed by the NC program	
V 675	Deceleration in % (internal)	Executed by the NC program	
V 700	Part length 1	BTV or external	000XXXXX.XXX000
V 710	Part length 2	BTV or external	000XXXXX.XXX000
V 720	Part length 3	BTV or external	000XXXXX.XXX000
V 730	Part length 4	BTV or external	000XXXXX.XXX000
V 740	Part length 5	BTV or external	000XXXXX.XXX000
V 750	Part length 6	BTV or external	000XXXXX.XXX000
V 760	Part length 7	BTV or external	000XXXXX.XXX000
V 770	Part length 8	BTV or external	000XXXXX.XXX000
V 780	Part length 9	BTV or external	000XXXXX.XXX000
V 790	Part length 10	BTV or external	000XXXXX.XXX000
V 701	Velocity for part length 1 in %	BTV or external	00000XX0.000000
V 711	Velocity for part length 2 in %	BTV or external	00000XX0.000000
V 721	Velocity for part length 3 in %	BTV or external	00000XX0.000000
V 731	Velocity for part length 4 in %	BTV or external	00000XX0.000000
V 741	Velocity for part length 5 in %	BTV or external	00000XX0.000000
V 751	Velocity for part length 6 in %	BTV or external	00000XX0.000000
V 761	Velocity for part length 7 in %	BTV or external	00000XX0.000000
V 771	Velocity for part length 8 in %	BTV or external	00000XX0.000000
V 781	Velocity for part length 9 in %	BTV or external	00000XX0.000000
V 791	Velocity for part length 10 in %	BTV or external	00000XX0.000000
V 702	Target quantity, part feed 1	BTV or external	00000XXX.000000

V 712	Target quantity, part feed 2	BTV or external	00000XXX.000000
V 722	Target quantity, part feed 3	BTV or external	00000XXX.000000
V 732	Target quantity, part feed 4	BTV or external	00000XXX.000000
V 742	Target quantity, part feed 5	BTV or external	00000XXX.000000
V 752	Target quantity, part feed 6	BTV or external	00000XXX.000000
V 762	Target quantity, part feed 7	BTV or external	00000XXX.000000
V 772	Target quantity, part feed 8	BTV or external	00000XXX.000000
V 782	Target quantity, part feed 9	BTV or external	00000XXX.000000
V 792	Target quantity, part feed 10	BTV or external	00000XXX.000000
V 703	Actual quantity, part feed 1	Read through BTV or externally	00000XXX.000000
V 713	Actual quantity, part feed 2	Read through BTV or externally	00000XXX.000000
V 723	Actual quantity, part feed 3	Read through BTV or externally	00000XXX.000000
V 733	Actual quantity, part feed 4	Read through BTV or externally	00000XXX.000000
V 743	Actual quantity, part feed 5	Read through BTV or externally	00000XXX.000000
V 753	Actual quantity, part feed 6	Read through BTV or externally	00000XXX.000000
V 763	Actual quantity, part feed 7	Read through BTV or externally	00000XXX.000000
V 773	Actual quantity, part feed 8	Read through BTV or externally	00000XXX.000000
V 783	Actual quantity, part feed 9	Read through BTV or externally	00000XXX.000000
V 793	Actual quantity, part feed 10	Read through BTV or externally	00000XXX.000000
V 704	Instruction number of tool program before feed of part length 1	NC Program in 600	
V 714	Instruction number of tool program before feed of part length 2	NC Program in 610	
V 724	Instruction number of tool program before feed of part length 3	NC Program in 620	
V 734	Instruction number of tool program before feed of part length 4	NC Program in 630	
V 744	Instruction number of tool program before feed of part length 5	NC Program in 640	
V 754	Instruction number of tool program before feed of part length 6	NC Program in 650	
V 764	Instruction number of tool program before feed of part length 7	NC Program in 660	
V 774	Instruction number of tool program before feed of part length 8	NC Program in 670	
V 784	Instruction number of tool program before feed of part length 9	NC Program in 680	
V 794	Instruction number of tool program before feed of part length 10	NC Program in 690	

V 705	Instruction number of tool program after feed of part length 1	NC Program in 605	
V 715	Instruction number of tool program after feed of part length 2	NC Program in 615	
V 725	Instruction number of tool program after feed of part length 3	NC Program in 625	
V 735	Instruction number of tool program after feed of part length 4	NC Program in 635	
V 745	Instruction number of tool program after feed of part length 5	NC Program in 645	
V 755	Instruction number of tool program after feed of part length 6	NC Program in 655	
V 765	Instruction number of tool program after feed of part length 7	NC Program in 665	
V 775	Instruction number of tool program after feed of part length 8	NC Program in 675	
V 785	Instruction number of tool program after feed of part length 9	NC Program in 685	
V 795	Instruction number of tool program after feed of part length 10	NC Program in 695	

Fig. 11-18: List of All Variables

Variables are only for selecting information and may not be written to from an external source.

Variables are set or calculated internally, and may not be written to from an external source.

11.5 Marker Flag

Using marker flags, various information is exchanged between the BTV and drive controller(s) or operating modes are preselected. So that the drive functionality of the Indramat Optifeed system can also be accessed without the BTV from an external operating console (PLC), all marker flags and their definitions are listed in the following table.

Marker Flag	Definition	Set by	Cleared by
M4.00.0	The programmed feed length in Manual Mode was attained	NC Program	NC Program
M4.00.1	Feed length and press stroke executed in Manual Mode	NC Program	NC Program
M4.00.2	Set-Up Mode active	NC Program	NC Program
M4.00.3	Press stroke executed in Manual Mode	NC Program	NC Program
M4.00.4		NC Program	NC Program
M4.00.5	Cycle stop present	NC Program	NC Program
M4.00.6	Cycle completed in Automatic Mode	NC Program	NC Program
M4.00.7	Total production quantity attained	NC Program	NC Program
M4.01.0	Partial production quantity attained	NC Program	NC Program
M4.01.1	Drive in position, Parameter A111	Firmware	Firmware
M4.01.2			
M4.01.3			
M4.01.4	Manual Mode enabled, feed using jog inputs	NC Program	NC Program
M4.01.5			
M4.01.6	Automatic Mode enabled	NC Program	NC Program
M4.01.7	Permit press	NC Program	NC Program
M4.04.0	Home position ("0" position) in Manual Mode	NC Program	NC Program
M4.04.1	End position in Manual Mode	NC Program	NC Program
M4.04.2	Product completed or not yet being processed (valid in Setup Mode)	NC Program	NC Program
M4.04.3	Stop after completed part present	NC Program	NC Program
M4.04.4	A complete part is finished	NC Program	NC Program
M4.04.5	Stop after completed part enabled	NC Program	NC Program
M4.04.6	x parts until total production attained	NC Program	NC Program
M4.04.7	x parts until partial production attained	NC Program	NC Program
M5.01.0	Feed optimization preselected	Logic Task	Logic Task
M8.00.0			
M8.00.1	Enable open feed roll in Automatic Mode (Par. AA106)	BTV or PLC	BTV or PLC
M8.00.2	Enable precautionary prompt (Par. AA14)	BTV or PLC	BTV or PLC
M8.00.3			

M8.00.4	Feed before press = 0 / Press before feed = 1	BTV or PLC	BTV or PLC
M8.00.5			
M8.00.6	Signal to clear partial quantity piece counter	BTV or PLC	NC Program
M8.00.7	Signal to clear total quantity piece counter	BTV or PLC	NC Program
M8.01.0	Signal to add 1 piece to piece counter	BTV or PLC	NC Program
M8.01.1	Signal to subtract 1 piece from piece counter	BTV or PLC	NC Program
M8.01.2	Total production quantity attained	NC Program	BTV or PLC
M8.01.3	Partial production quantity attained	NC Program	BTV or PLC
M8.01.4	Feed optimization	BTV or PLC	BTV or PLC
M8.01.5	High Speed Program	BTV or PLC	BTV or PLC
M8.02.0	Marker flag for tool wear and tear 1 (Parameter AA11)	Firmware	Firmware
M8.02.1	Marker flag for tool wear and tear 2 (Parameter AA11)	Firmware	Firmware
M8.02.2	Marker flag for tool wear and tear 3 (Parameter AA11)	Firmware	Firmware
M8.02.3	Marker flag for tool wear and tear 4 (Parameter AA11)	Firmware	Firmware
M8.02.4	Marker flag for tool wear and tear 5 (Parameter AA11)	Firmware	Firmware
M8.02.5	Marker flag for tool wear and tear 6 (Parameter AA11)	Firmware	Firmware
M8.02.6	Marker flag for tool wear and tear 7 (Parameter AA11)	Firmware	Firmware
M8.02.7	Marker flag for tool wear and tear 8 (Parameter AA11)	Firmware	Firmware

Fig. 11-19: List of All Marker Flags

12 Connection Drawings

12.1 Overview of Components

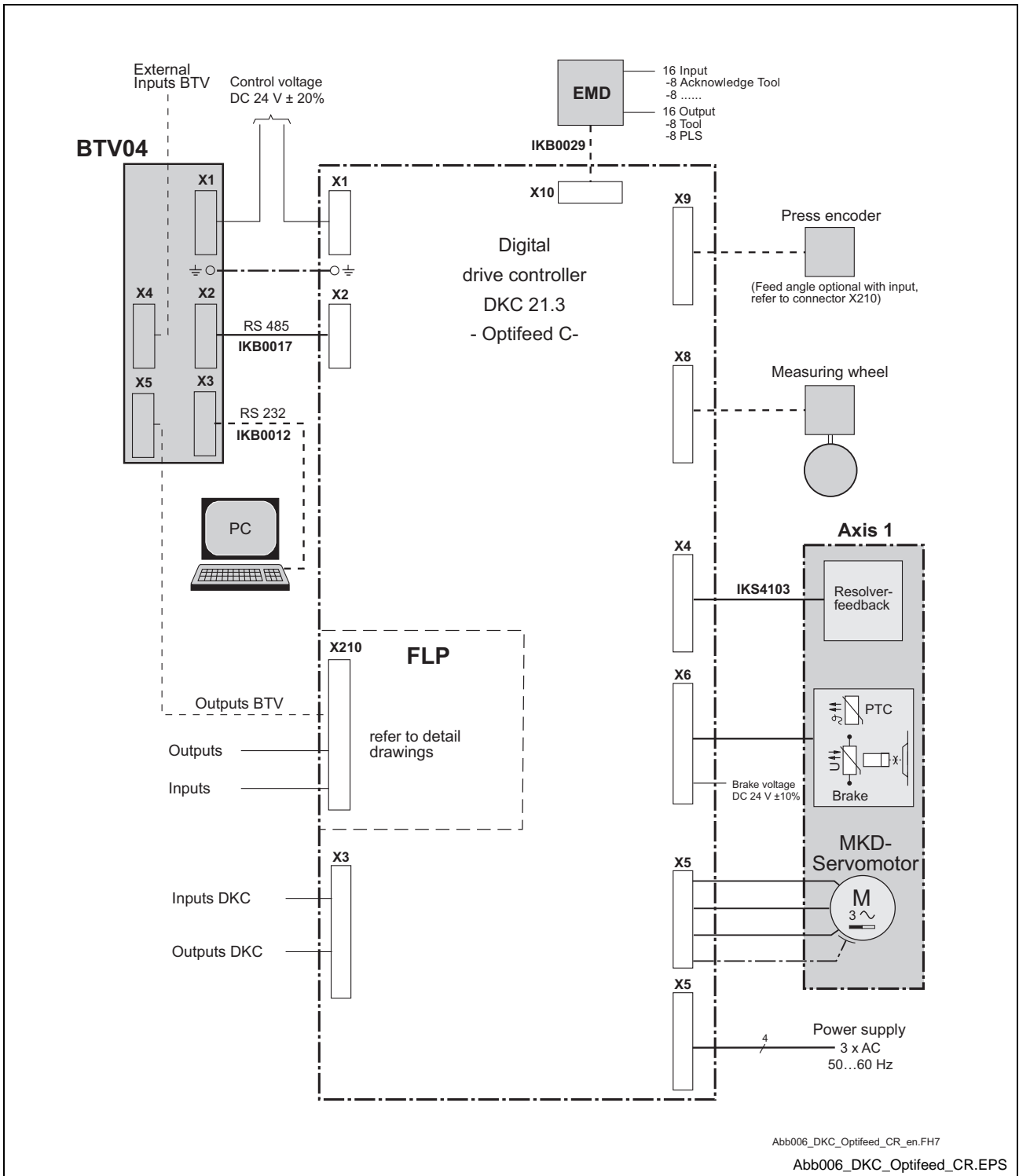


Fig. 12-1: Overview

12.2 DKC21.3 Drive Controller

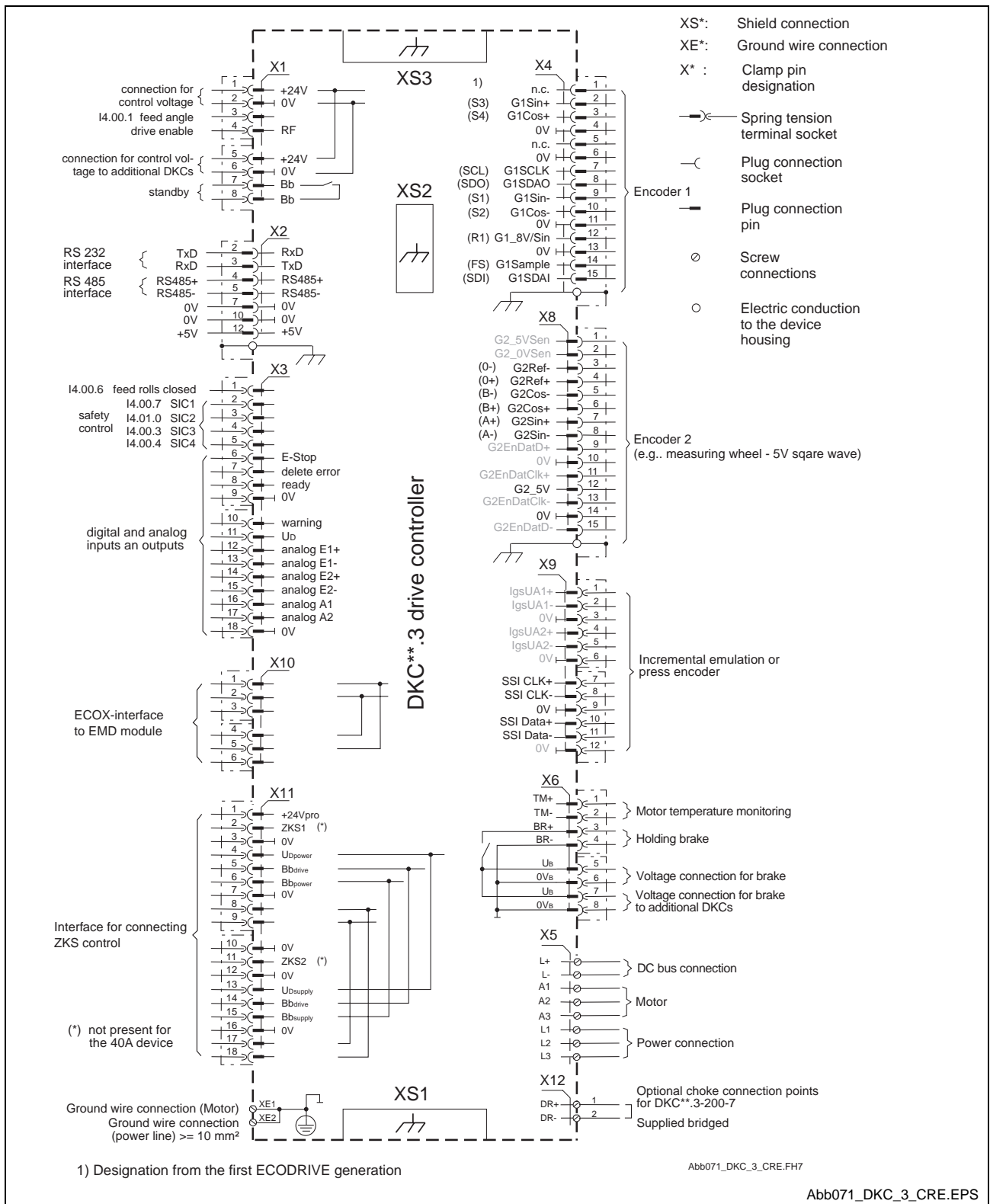


Fig. 12-2: DKC21.3 Drive Controller

12.3 Power and Motor Connection

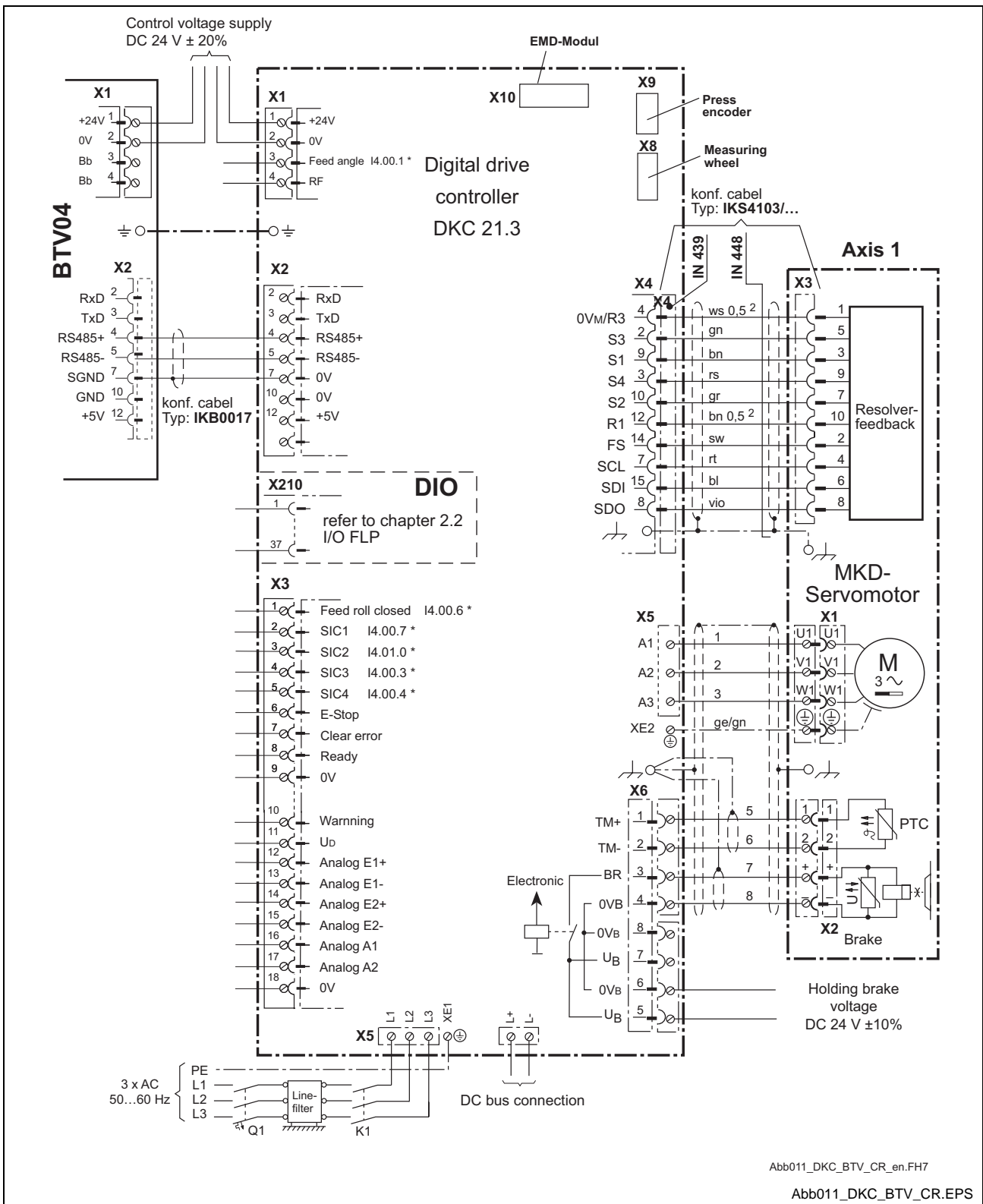


Fig. 12-3: Power and Motor Connection

12.4 DIO Input/Output Board

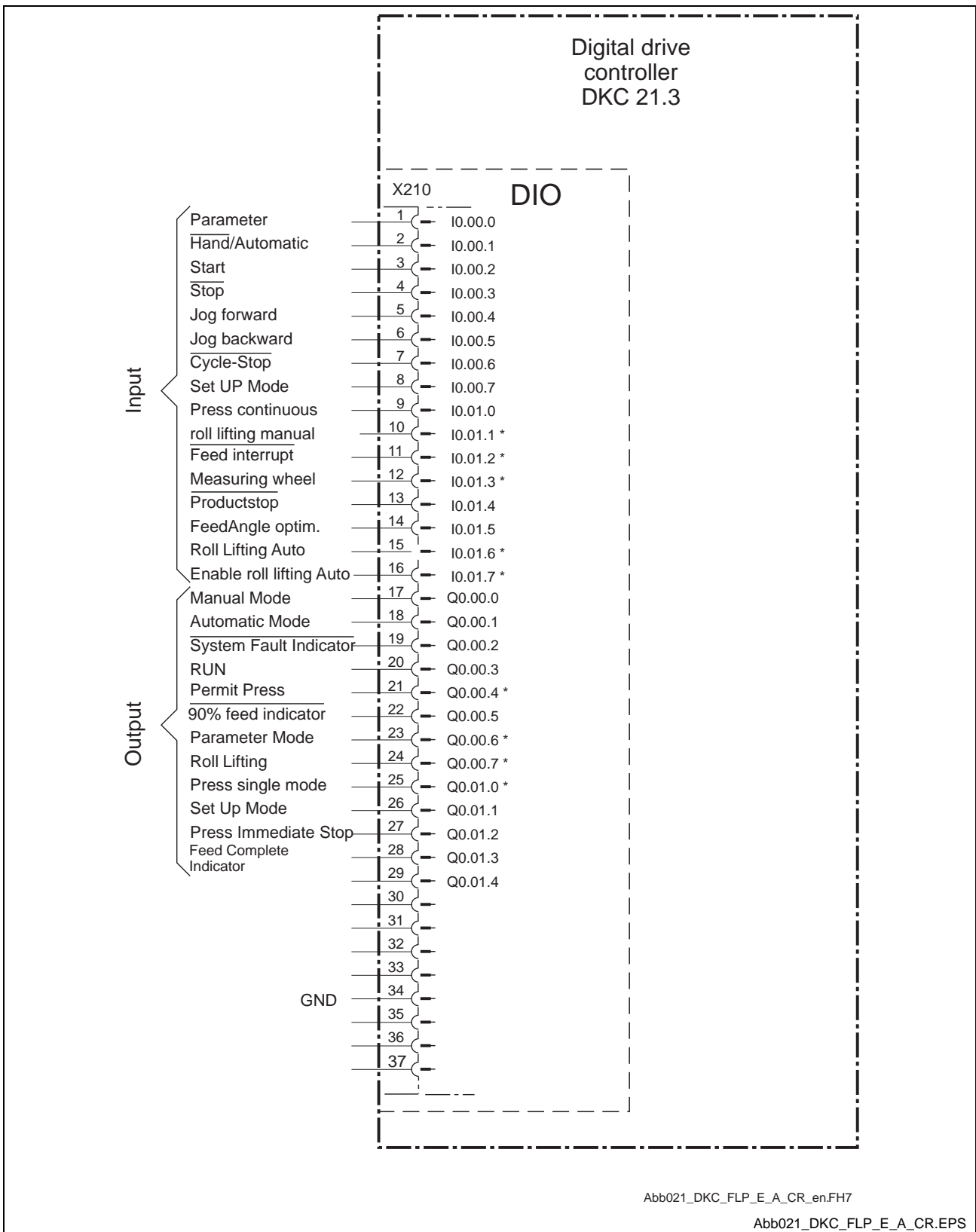


Abb. 12-4: DIO Input/Output Board

12.5 Press Encoder

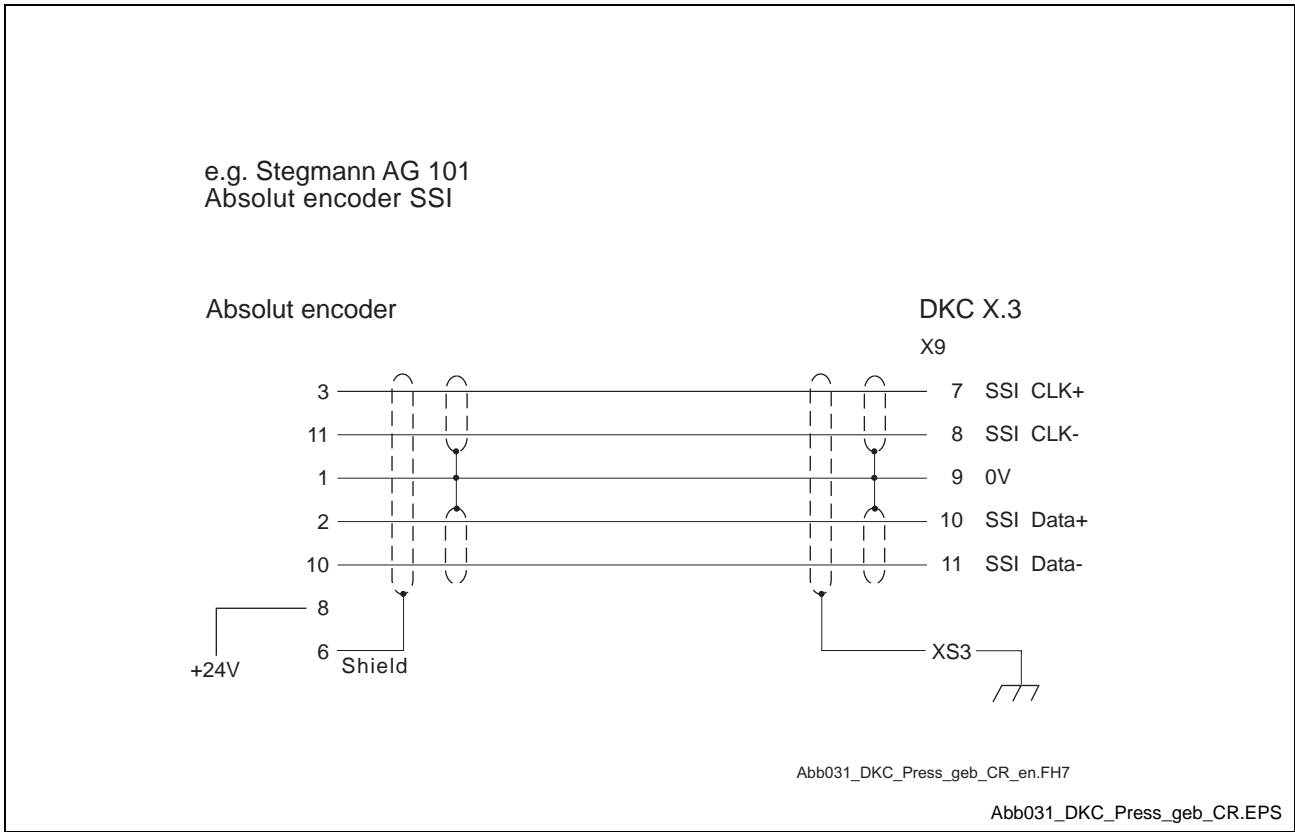


Abb. 12-5: Press Encoder

12.6 EMD – Extension for Tools and Additional PLS

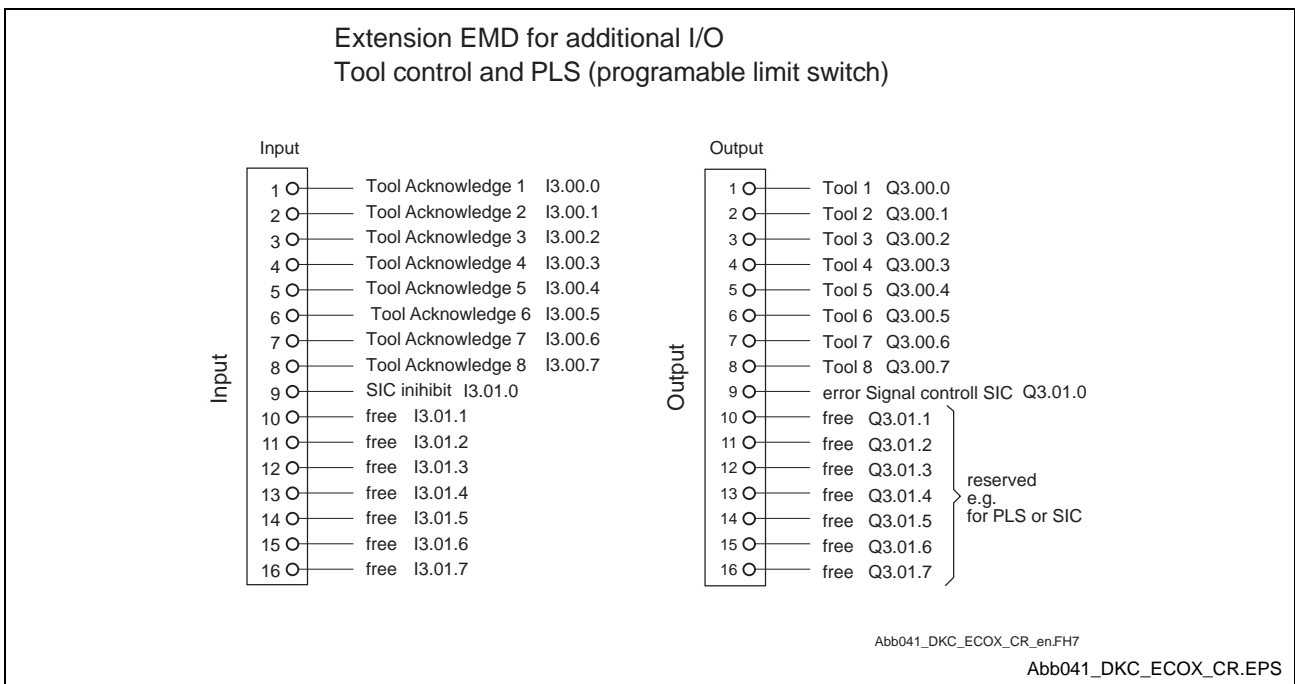


Abb. 12-6: EMD – Extension for Tools and Additional PLS

12.7 Encoder (Measuring Wheel and Press)

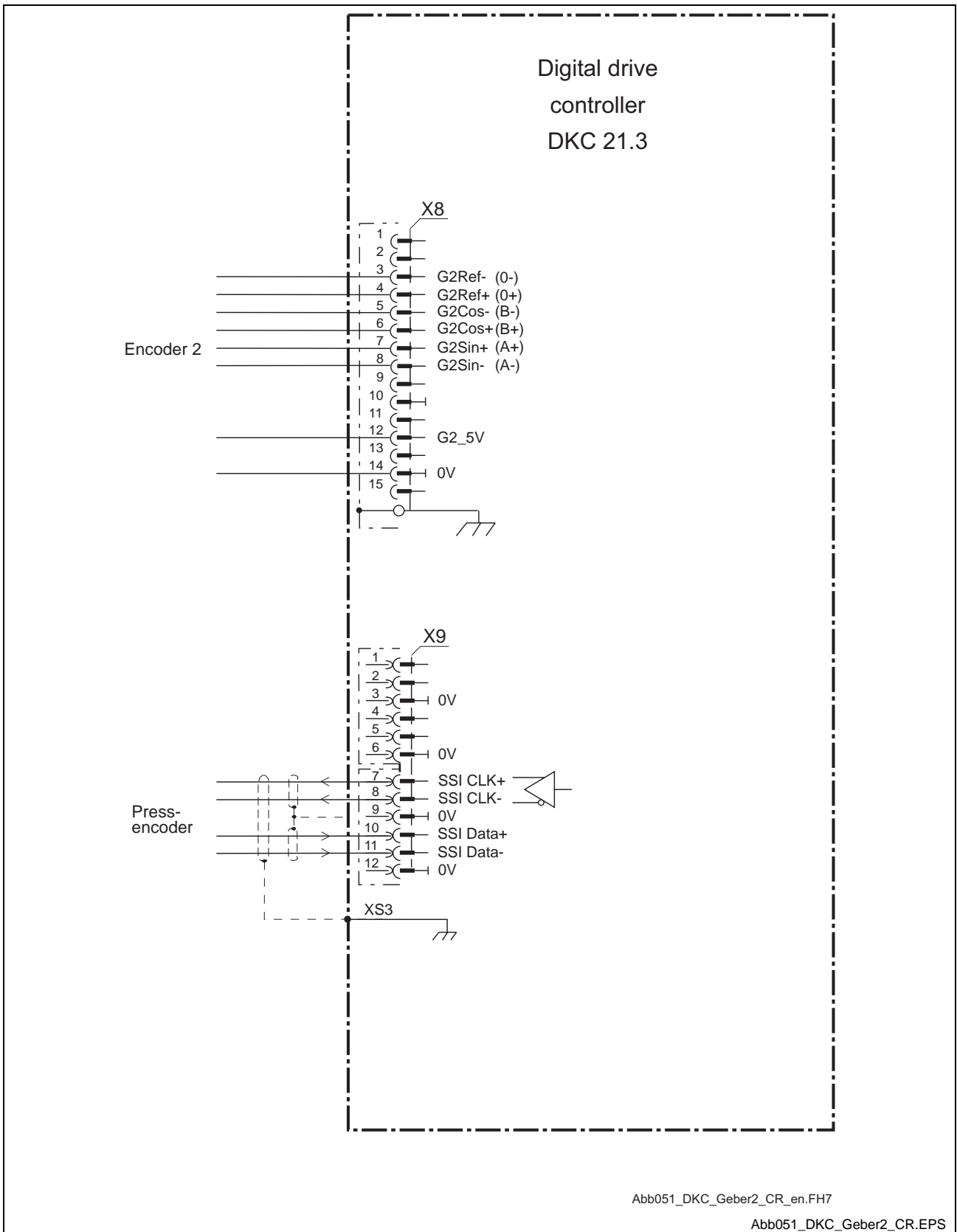


Abb. 12-7: Encoder (Measuring Wheel and Press)

12.8 BTV04

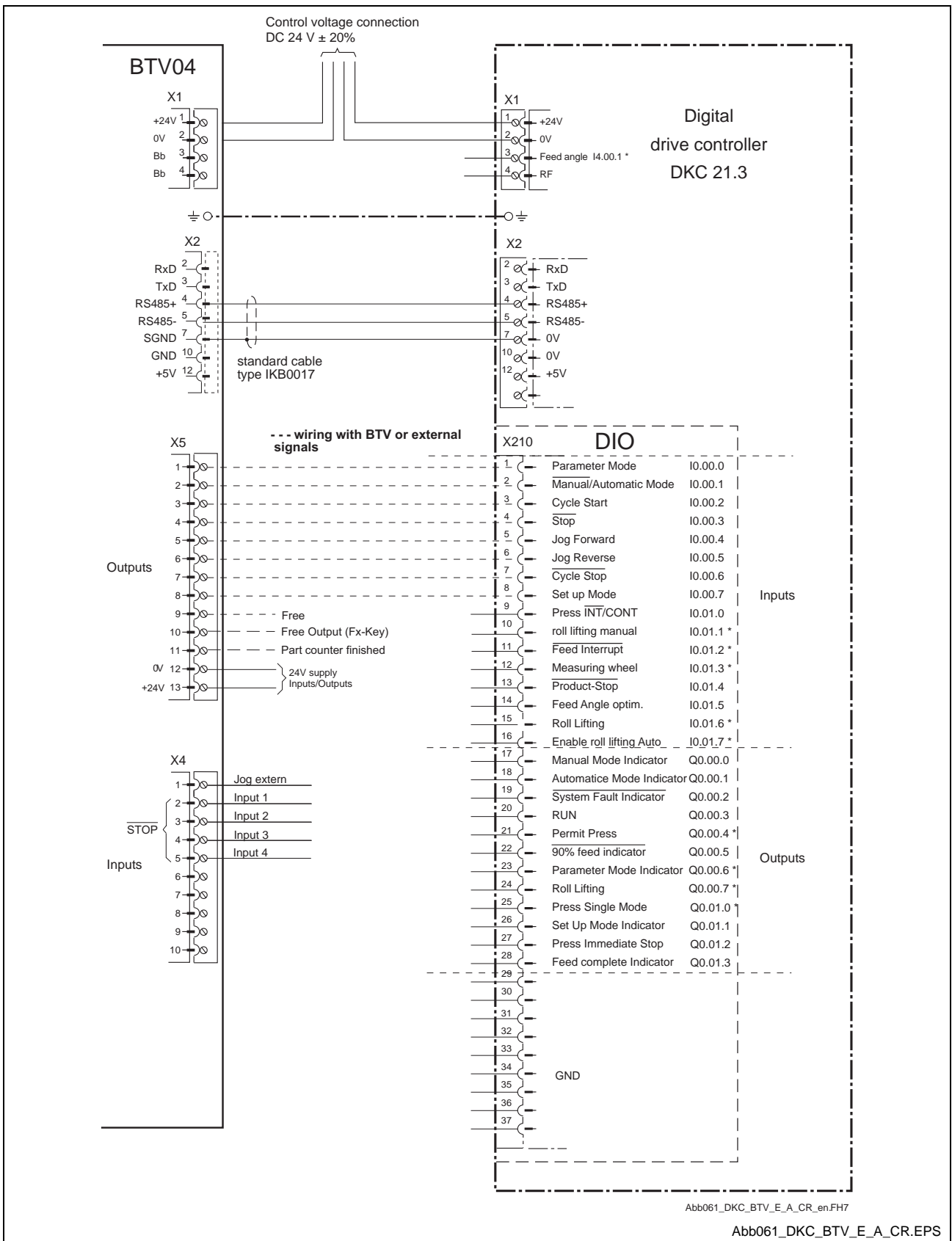


Abb. 12-8: BTV04

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14 Service & Support

14.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite. Sie erreichen uns

- telefonisch: **+49 (0) 9352 40 50 60**
über Service Call Entry Center Mo-Fr 07:00-18:00
- per Fax: **+49 (0) 9352 40 49 41**
- per e-Mail: **service@indramat.de**

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries. Contact us

- by phone: **+49 (0) 9352 40 50 60**
via Service Call Entry Center Mo-Fr 7:00 am - 6:00 pm
- by fax: **+49 (0) 9352 40 49 41**
- by e-mail: **service@indramat.de**

14.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

+49 (0) 171 333 88 26
+49 (0) 172 660 04 06

oder

After helpdesk hours, contact our service department directly at

+49 (0) 171 333 88 26
+49 (0) 172 660 04 06

or

14.3 Internet

Ergänzende Hinweise zu Service, Reparatur und Training sowie die **aktuellen** Adressen unserer Service- und Vertriebsbüros finden Sie unter **www.indramat.de** – einige Angaben in dieser Dokumentation können inzwischen überholt sein.

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit Ihrem lokalen Ansprechpartner auf.

- Verkaufsniederlassungen
 Niederlassungen mit Kundendienst

Additional notes about service, repairs and training as well as the **actual** addresses of our sales- and service facilities are available on the Internet at **www.indramat.de** – some information in this documentation may meanwhile be obsolete.

Please contact the sales & service offices in your area first.

- sales agencies
 offices providing service

14.4 Vor der Kontaktaufnahme... - Before contacting us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

1. detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. Tel./Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

For quick and efficient help, please have the following information ready:

1. Detailed description of the failure and circumstances.
2. Information on the type plate of the affected products, especially type codes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

14.5 Kundenbetreuungsstellen - Sales & Service Facilities

Deutschland – Germany

vom Ausland:

(0) nach Landeskennziffer weglassen!

from abroad:

don't dial (0) after country code!

Vertriebsgebiet Mitte Germany Centre Rexroth Indramat GmbH Bgm.-Dr.-Nebel-Str. 2 97816 Lohr am Main Kompetenz-Zentrum Europa Tel.: +49 (0)9352 40-0 Fax: +49 (0)9352 40-4885	SERVICE CALL ENTRY CENTER MO – FR von 07:00 - 18:00 Uhr from 7 am – 6 pm Tel. +49 (0) 9352 40 50 60 service@indramat.de	SERVICE HOTLINE MO – FR von 17:00 - 07:00 Uhr from 5 pm - 7 am + SA / SO Tel.: +49 (0)172 660 04 06 oder / or Tel.: +49 (0)171 333 88 26	SERVICE ERSATZTEILE / SPARES verlängerte Ansprechzeit - extended office time - ♦ nur an Werktagen - only on working days - ♦ von 07:00 - 18:00 Uhr - from 7 am - 6 pm - Tel. +49 (0) 9352 40 42 22
Vertriebsgebiet Süd Germany South Rexroth Indramat GmbH Landshuter Allee 8-10 80637 München Tel.: +49 (0)89 127 14-0 Fax: +49 (0)89 127 14-490	Gebiet Südwest Germany South-West Bosch Rexroth AG Vertrieb Deutschland – VD-BI Geschäftsbereich Rexroth Indramat Regionalzentrum Südwest Ringstrasse 70 / Postfach 1144 70736 Fellbach / 70701 Fellbach Tel.: +49 (0)711 57 61-100 Fax: +49 (0)711 57 61-125	Vertriebsgebiet Ost Germany East Bosch Rexroth AG Beckerstraße 31 09120 Chemnitz Tel.: +49 (0)371 35 55-0 Fax: +49 (0)371 35 55-333	Vertriebsgebiet Ost Germany East Bosch Rexroth AG Regionalzentrum Ost Walter-Köhn-Str. 4d 04356 Leipzig Tel.: +49 (0)341 25 61-0 Fax: +49 (0)341 25 61-111
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