

# Operating Manual

## PacDrive Controller C400 / C400 A8

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	<b>Manufacturer's declaration</b> According to the EC machine guidelines 98/37/EC	ELN 117-02/02.04 page 1/1
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The product we delivered:

PacDrive C400 Controller

is intended for installation in a machine.

Commissioning is forbidden until it is established that the machine in which this product is to be installed complies with the provisions of the EC guideline. The manufacturer guarantees that the delivered product was manufactured in accordance with the applied harmonized standards/specifications.

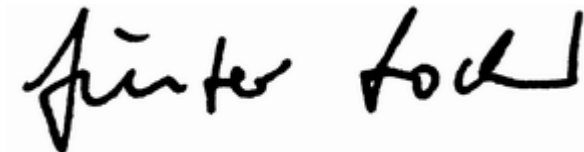
**The following standards were applied:**

- **EN 60204-1: 2006** Safety of machinery: Electrical equipment of machines - General requirements
- **EN 61800-3: 2004** EMC Product standardization for "electric drives with variable revolution speed"
- **EN 50178: 1997** - Electronic equipment for use in high-current electrical systems

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# Table of contents

<b>1</b>	<b>About this manual</b>	<b>7</b>
1.1	Introduction .....	7
1.2	Symbols, designator and display format of safety notes .....	8
<b>2</b>	<b>Notes for working safely with the product</b>	<b>9</b>
2.1	Proper use .....	9
2.2	Selection and qualification of personnel .....	10
2.3	Rest dangers .....	11
<b>3</b>	<b>System overview</b>	<b>15</b>
<b>4</b>	<b>Indicators, control elements, diagnosis</b>	<b>18</b>
4.1	Indicators on the PacDrive C400 controller .....	18
4.2	CompactFlash™ card slot .....	20
4.3	Battery compartment .....	21
4.4	Switching the controller on/off / Resetting the controller .....	21
4.5	Diagnosis .....	23
4.5.1	Minimal boot of the controller .....	23
4.5.2	Connection to PacDrive Controller .....	23
4.5.3	Example of a diagnostic message .....	24
<b>5</b>	<b>Transport, storage, unpacking</b>	<b>25</b>
5.1	Transport .....	25
5.2	Storage .....	25
5.3	Unpacking .....	25
5.4	Type plate .....	25
5.5	Type code .....	28
<b>6</b>	<b>Installation and maintenance</b>	<b>29</b>
6.1	Initial start-up .....	29
6.2	Configuration, homing and programming .....	32
6.3	Electromagnetic compatibility, EMC .....	33

6.4	Maintenance, repair, cleaning .....	36
6.4.1	Repair .....	36
6.4.2	Cleaning .....	36
6.5	Spare part inventory .....	36
6.6	Device replacement .....	37
<b>7</b>	<b>Technical data</b>	<b>39</b>
7.1	Ambient conditions .....	39
7.2	Standards and regulations .....	40
7.3	Mechanical and electrical data .....	40
7.4	Electrical connections .....	44
7.5	Dimensions .....	54
<b>8</b>	<b>Diagnosis</b>	<b>55</b>
8.1	Scenarios to be met at the machine .....	55
8.2	The Notion of 'Diagnosis Classes' .....	57
8.3	Reactions of "drives" .....	59
8.3.1	Time diagram for reaction "A" .....	59
8.3.2	Time diagram for reaction "B" .....	60
8.3.3	Shutting off .....	63
8.3.4	Stopping .....	64
8.3.5	De-energizing the axes .....	64
8.4	Device display elements (LEDs) .....	66
8.4.1	LED red "bus err" (SERCOS real-time bus error) .....	66
8.5	Acknowledging diagnosis messages .....	67
8.6	Diagnostic messages .....	68
8.6.1	0xx "Messages" diagnostic messages .....	68
8.6.2	1xx "Drives" diagnostic messages .....	83
8.6.3	Diagnostic messages 2xx "Object managing" .....	108
8.6.4	3xx "General" diagnosis messages .....	113
8.6.5	4xx "IEC-Task" diagnosis messages .....	125
8.6.6	5xx "SERCOS / realtime" diagnosis messages .....	127
8.6.7	6xx "master encoder" diagnosis messages .....	135
8.6.8	7xx "field buses and expansion module" diagnosis messages .....	137
8.6.9	8xx "System" diagnosis messages .....	156
8.6.10	9xx "Software" diagnosis messages .....	160
<b>9</b>	<b>Retroactive installation of UPS</b>	<b>162</b>
<b>10</b>	<b>Appendix</b>	<b>165</b>
10.1	Contact addresses .....	165
10.2	Product training courses .....	165

10.3	Safety tests .....	166
10.4	Changes .....	166
10.5	Fault report form .....	167

# 1 About this manual

## 1.1 Introduction

Read and observe this manual before you work on the PacDrive Controller for the first time. Take particular note of the safety instructions (see 2.3 Rest dangers). As described in section 2.2, only those persons who meet the "Selection and qualification of employees" are allowed to work on the PacDrive Controller.



A copy of this manual must always be available for personnel who are entrusted to work on the PacDrive Controller.




This manual is intended to help you use the PacDrive Controller and its intended applications safely and properly.

By observing this manual, you will help to


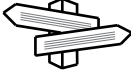

- avoid risks,
- reduce repair costs and down times the PacDrive Controller,
- increase the life spanthe PacDrive Controller
- and increase reliability the PacDrive Controller.

## 1.2 Symbols, designator and display format of safety notes

This manual divides the safety instructions into four different categories. Hazards and their potential consequences are categorized by using a combination of symbols and signal words:

Symbol / Signal word	Meaning
 <b>▲ DANGER</b>	Indicates an immediate hazardous situation that can lead to death or serious injury if the safety regulations are not observed.
 <b>▲ WARNING</b>	Indicates a potentially hazardous situation that can lead to serious injury or death if the safety regulations are not observed.
 <b>▲ CAUTION</b>	Indicates a potentially hazardous situation that can lead to injury or equipment damage if the safety regulations are not observed.
<b>CAUTION</b>	Indicates a potentially dangerous situation that may result in damage to the device if the safety regulations are not observed.

The following symbols and designators are used in this document:

Symbol/Character	Meaning
	<b>Information Symbol:</b> After this symbol, you will find important instructions and useful tips on using the components.
	<b>Marker:</b> After this symbol, you will find references for further information.
▪	<b>Prerequisite symbol:</b> This symbol indicates a prerequisite you have to fulfill before you start to implement an instruction.
▶	<b>Activity symbol:</b> After this symbol, you will find an instruction. Follow the instructions in sequence from top to bottom.
✓	<b>Result symbol:</b> The text after this symbol contains the result of an action.
•	First level <b>bullet point</b>
–	Second level <b>bullet point</b>
	<b>Orientation aid:</b> Information serving as an orientation aid regarding the section's contents follows this symbol.
<b>bold</b>	If the descriptive text contains <b>keywords</b> , such as parameters, they are highlighted in bold.
<code>lBufSelect:AXIS_BUF_SELECTION; (* Buffer Auswahl *)</code>	<b>Program code</b> is written in a different font.



## 2 Notes for working safely with the product



The following section contains information regarding safe work with the PacDrive Controller. Anyone using or working on the PacDrive Controller must read and observe this information. The PacDrive Controller is state of the art and conform to recognized technical safety regulations. Nevertheless, the use the PacDrive Controller can present a hazard to life and limb or cause property damage.

### 2.1 Proper use

The PacDrive Controller is intended for installation in a machine or switching cabinet.

*What do you need to observe?* Proper use includes that you observe the following points and the resulting rules:

- The regulative, warning and instruction signs on the connected components and in the switching cabinet
- The warning instructions to the PacDrive Controller on the connected components and in the switch cabinet
- The inspection and maintenance instructions
- The operating instructions of the other components
- All other documentation

*Flawless condition* Operate the PacDrive Controller only when they are in a flawless technical condition. Observe the regulations, act with safety and hazards in mind. If circumstances occur that impact safety or cause changes in the operating performance the PacDrive Controller, switch the PacDrive Controller off immediately and contact the responsible service staff.

*Use original-equipment only* Use only the options and mounting parts specified in the documentation and no third-party devices or components that are not expressly approved ELAU recommends. Do not change the PacDrive Controller inappropriately.

*Provide for protective measures* Before installing, provide for appropriate protective devices in compliance with the local and national standards. Do not commission components without accordant protective devices. After installation, commissioning or repair, test the protective devices used.

*Forbidden environments* The components must not be used in the following environments:

- In dangerous (explosive) atmospheres
- In mobile, movable or floating systems
- In life support systems
- In domestic appliances
- underground

**Installation and operating conditions** You may only use them in accordance with the installation and operating conditions described in the documentation. The operating conditions at the installation location must be checked and maintained in accordance with the required technical data (performance data and ambient conditions). CN  
Commissioning is prohibited until it is guaranteed that the usable machine or system in which of the PacDrive Controllers is installed meets all requirements of EC Directive 98/37/EC (machinery directive).

In addition, the following standards, directives and regulations are to be observed:

- DIN EN 954 Part 1 Safety of machinery - Safety-related parts of control systems
- DIN EN 60204 Safety of machinery: Electrical equipment of machines
- DIN EN 292 Part 1 and Part 2 Safety of machinery: Basic Concepts, General Principles for Design
- DIN EN 50178 Electronic equipment for use in high-current electrical systems
- DIN EN 61800-3 Status: 2005-07 speed changeable electrical drives - Part 3: EMC-requirements including special test procedures
  
- The generally applicable local and national safety and accident prevention regulations.
- The rules and regulations on accident prevention and environmental protection that apply in the country where the product is used.
- The applicable laws and ordinances

## 2.2 Selection and qualification of personnel

**Target audience for this manual** This manual is geared exclusively toward technically qualified personnel, who have detailed knowledge in the field of automation technology. The description is mainly for construction and application engineers from the engineering and electro-technics division as well as service and commissioning engineers.

**Professional or trained personnel** Work on the PacDrive Controller may only be carried out by qualified professionals or by trained staff under the instruction and supervision of a qualified person in accordance with electrical regulations. Qualified persons are those persons who, as a result of their training, knowledge, and experience and knowledge of the pertinent regulations, can

- evaluate the transferred work,
- recognize the meaning of the safety instructions and implement them consistently,
- recognize possible hazards and
- take appropriate safety measures.

## 2.3 Rest dangers



Health risks arising from the PacDrive Controller have been reduced by means of safety technology and design engineering. However a residual risk remains, since the PacDrive Controller operates with electrical voltage and electrical currents.



If activities involve residual risks, a safety note is made at the appropriate points. The note details the potential hazard and its effects and describes preventative measures to avoid it. The following section contains warnings about residual risks which can be assigned no concrete action. The structure of warning instructions is identical to the safety instructions.

### Assembly and handling

## WARNING

### CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING

- Observe the general construction and safety regulations for handling and mounting.
- Use suitable mounting and transport equipment correctly and use special tools if necessary.
- Prevent clamping and crushing by taking appropriate precautions.
- Cover edges and angles to protect against cutting damage.
- Wear suitable protective clothing (e.g. safety goggles, safety boots, protective gloves) if necessary.

**Failure to follow these instructions can result in death or serious injury.**

### Touching electrical parts

## DANGER

### ELECTRICAL SHOCK, EXPLOSION OR ELECTRIC ARC

- Observe the general construction and safety regulations for working on high-current electrical systems.
- Operate electrical components only with connected protective conductor
- After installation, check the fixed connection of the protective conductor to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the device is switched on. First shut down drives because potentially fatal voltage can occur on the motor lines in generator operation.
- Provide protection against indirect contact (DIN EN 50178 : 1997, Section 5.3.2).
- Disconnect/connect the plug connectors on the cables or plug terminals on the device only when the system is deactivated (de-energized).

**Failure to follow these instructions will result in death or serious injury.**

## Dangerous Movements

There can be different causes of dangerous movements:

- Missing or faulty homing of the robot mechanics
- Wiring or cabling errors
- Errors in the application program
- Module error in the components
- Error in the measured value and signal transmitter
- Operation error
- Malfunction of protective equipment



Provide for personal safety by primary equipment monitoring or measures. Do not only rely on the internal monitoring of the drive components. Adapt the monitoring or other measures to the specific conditions of the installation in accordance with a risk and error analysis by the system manufacturer. For this purpose, consider the valid safety regulations for the equipment.

## DANGER

### MISSING PROTECTIVE DEVICE OR WRONG PROTECTION

- Prevent entry to a danger zone, for example with protective fencing, mesh guards, protective coverings, or light barriers.
- Dimension the protective devices properly and do not remove them.
- Do not carry out any changes that can invalidate the protection device.
- Before accessing the drives or entering the danger zone, safely bring the drives to a stop.
- Protect existing work stations and operating terminals against unauthorized operation.
- Position EMERGENCY OFF switches so that they are easily accessible and can be quickly reached.
- Check the functionality of EMERGENCY OFF equipment before start-up and during maintenance periods.
- Prevent unintentional start-ups by disconnecting the power connection of the drive using the EMERGENCY OFF circuit or using a safe start-up lock out.
- Check the system and installation before the initial start-up for possible malfunctions in all general purposes.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines.
- If necessary, perform a special EMC check of the system.

**Failure to follow these instructions will result in death or serious injury.**

## PELV circuits

The signal voltage and control voltage of the PacDrive™ devices are <33 Volts and to be designed as PELV circuits. In this range, the specification as PELV system according to IEC 60364-4-41 contains a protective measure against direct and indirect contact with dangerous voltage through a **safe separation** of the primary and secondary side implemented in the system/machine. ELAU strongly recommends performing a safe separation on the system/machine (**PELV Protective-Extra-Low-Voltage**).

# DANGER

## ELECTRIC SHOCK BECAUSE OF A MISSING SAFE SEPARATION

- Only connect devices, electrical components or lines to the signal voltage connectors of these components that feature a sufficient, safe separation from the connected circuits in accordance with the standards (EN 50178 / 1997 edition - Electronic equipment for use in power installations).
- Achieve a safe separation in the entire process of the electric circuit.
- FELV circuits must always be separated from PELV circuits using a safe separation in accordance with EN 50178:1997 (Section 5.2.14.2).
- To protect from direct contact, always cover connections and contacts which guide FELV voltages.
- Avoid using FELV current circuits for safety reasons.
- Design the cover or device connection so that it can only be removed by using a tool.
- The protection measures have to be adhered on all connected devices.

**Failure to follow these instructions will result in death or serious injury.**

Examples for connections and contacts of a PacDrive controller to be covered:

- Sub-D connector
- serial interface
- CAN-Bus interface

### 3 System overview

The described component is a part of the PacDrive System. The PacDrive System is the complete control system that consists of several single components, depending on its application.

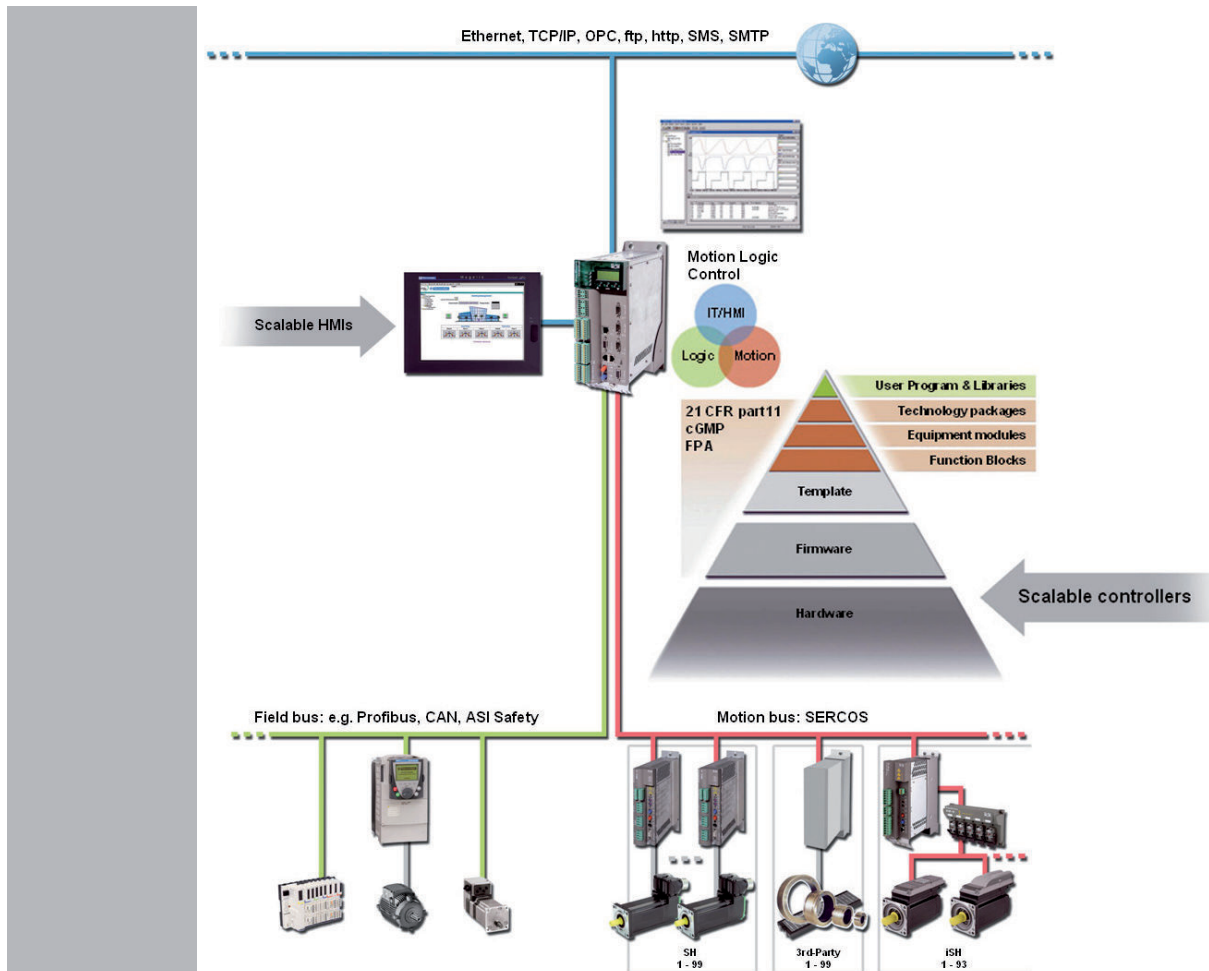


Figure 3-1: PacDrive System overview

#### PacDrive Controller Family



The PacDrive Controller, microprocessor-based control hardware with the VxWorks real-time operating system, centrally implements the PLC and motion functions. A PacDrive Controller synchronizes, coordinates, and creates the motion functions for maximum

- 8 drives for the PacDrive Controller C200
- 2 drives for the PacDrive Controller C200 A2
- 16 drives for the PacDrive Controller C400
- 8 drives for the PacDrive Controller C400 A8
- 99 drives for the PacDrive Controller C600

of a food and packaging machine.

Many different HMIs are used for the HMI tasks. Whether it is low-cost clear text or IPC, it is no problem for the flexible PacDrive Controller.

The PacDrive P600 Controller is additionally equipped with a full-fledged PC. Due to its PC-based architecture, it can perform HMI tasks with no problem in addition to the usual motion functions.

### PacDrive Power Supply PS-5



The PacDrive PS-5 Power Supply unit features modern technology and a compact and closed construction for switching cabinet installation. Each PacDrive iSH has a PacDrive PS-5 that can be quickly installed with a single connection line. Which means that the PS-5 fits seamlessly into the extremely flexible, modular drive concept.

The highlights

- Integrated mains filter and bleeder
- Intermediate circuit power for up to 25 iSH (depending on the application)
- Integrated SERCOS interface
- Fully diagnosable due to integrated controller
- Simple mounting

### PacDrive Distribution Box DB-5



PacDrive DB-5 is the link between PS-5 and iSH. Optionally, 1 to 4 iSH Motors can be connected depending on the number of drives. When operating more than 4 drives simply expand the system using one or more DB-5s.

The highlights

- 1-4 connections for iSH motors or easily expandable with more DB-5s
- Easy to expand

### PacDrive Intelligent Servo Module iSH



The innovative iSH combines the motor, power amplifier, and the digital servo controller for an axis in a space-saving housing. Due to the compact build type with an integrated controller, it is eminently suitable for a decentralized setup.

It is available with single or multi-turn encoders and configures itself in the iSH with the aid of the electronic type plate.

The highlights

- Compact type of construction
- 3.5 times peak torque
- Integrated SERCOS interface
- High-resolution single or multi-turn encoder
- Protection class IP65
- Simple wiring
- Superior reliability



### PacDrive Servo Amplifier MC-4



The digital Servo Amplifier MC-4 features compact, closed, wall-mountable construction as well as state of the art technology. For the innovative MC-4, the power supply unit, the final stage and the software servo regulator for an axis are housed in a space-saving housing. Because it communicates with the PacDrive Controller exclusively via fiber optic cable, it is also suitable for peripheral layout. It does not require a user program, processes single or multi-turn encoders, and configures itself using the electronic type plate in the SH-Motor.

#### Highlights of the PacDrive MC-4

- Global voltage range
- Integrated power supply unit
- Max. 34.5/69 kVA output
- Automatic motor detection
- Minimal design
- Inverter Enable safety input
- 250 % overload
- Integrated SERCOS interface

### PacDrive SH Servo motor



The AC servo motors of the SH series meet the highest demands on dynamics and precision. Five flange sizes with different grades of torque offer the right drive solution for virtually any application. New winding technology with single tooth winding enables compact sizes and reduces production costs compared to traditional motors.

#### **Highly dynamic AC Servo Motors**

Compared to other AC servo motors, the SH motor has a low internal moment of inertia and a high overload capability, which allow the motor to satisfy any requirement with regard to precision, dynamics and efficiency.

The SH motors are compatible with SM Motors and available in five different flange sizes:

- SH-055
- SH-070
- SH-100
- SH-140
- SH-205

#### Brief summary of technical data:

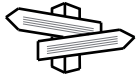
- Developed for the highest dynamics and precision
- Single tooth winding
- Compact size
- High power density
- Low internal moment of inertia
- High overload capability
- High resistance to winding damages
- Low detent torque

# 4 Indicators, control elements, diagnosis

The PacDrive™ System supports the user with its comprehensive diagnostic system.

The diagnostic messages can be read out with the Automation Toolkit **EPAS-4** or in the **PD-Diagnostic**. The PacDrive™ System contains a powerful message logger in which additional diagnostic information is recorded.

Diagnostic messages are usually displayed on a control panel on the machine. If an "error" occurs, read the diagnostic message on this unit and then contact the machine manufacturer.



Detailed information on diagnosis is available in the Online-Help of the Automation Toolkit **EPAS-4** or in the **PD-Diagnostic**.

## 4.1 Indicators on the PacDrive C400 controller

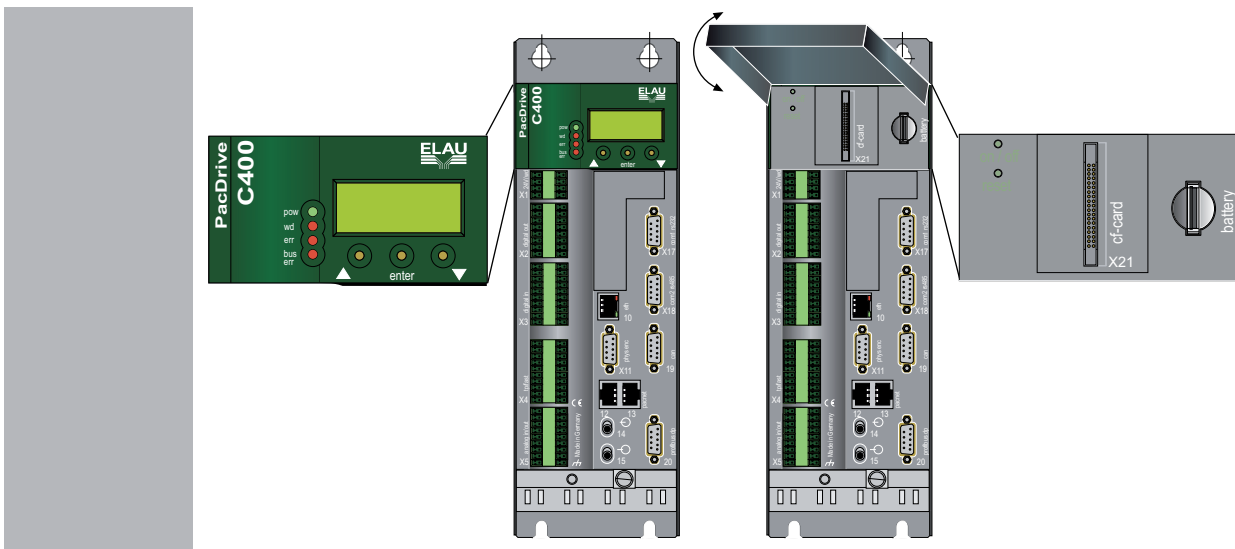
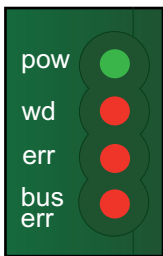
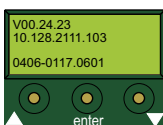


Figure 4-1: Control unit of PacDrive C400 Controller



If the cover of the Controller is closed, you will see four vertically arranged indicators, which signify various operating states or errors.

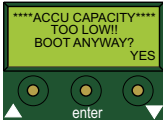
- pow (control voltage indicator)
- wd (watchdog indicator)
- err (error display)
- bus err (SERCOS real-time bus error indicator)



In addition to the LED displays, further information about the operating status of the controller is given on the 4-line LCD display.

Line 1	currently used firmware version
Line 2	current IP number of the PacDrive Controller
Line 3	-
Line 4	FPGA-Version/Bootloader-Version/Software-Version (PIC)

The horizontally arranged buttons on the controller currently have no function.



Display during the boot with empty battery pack (UPS).

Press the right button below the display to continue the boot and to start charging the battery pack.

### **pow (control voltage display)**

The "pow" LED indicates the state of the control voltage.

OFF	The control voltage (24 V DC) is not available or is too low.
ON	Normal operation; control voltage in normal range
Flashes	UPS active

### **wd (watchdog indicator)**

Watchdog is a hardware module to monitor the controller.

OFF	Normal operation
ON	Fatal error; reset required, reboot system

A "fatal error" is a serious hardware problem or an unexpected software problem.

When a "fatal error" occurs

- the CPU is stopped,
- the optional module is reset,
- the outputs are reset and
- the wd (watchdog) relay outputs are opened.

### **err (error display)**

The error LED (err) indicates errors. The following table lists the possible display conditions and their accompanying error descriptions.

OFF	Normal operation
Flashes slowly (1.7 Hz)	Error of class 1, 2, 3, 4 or 5 active
Flashes quickly (10 Hz)	Controller boot completed, last boot failed. See diagnostic message 209 "last boot failed". Controller performed a minimal boot.
Flashes fast and slowly alternately	Firmware download via SERCOS is active
ON	A serious error occurred during the current boot.

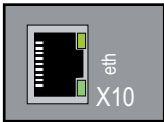
The err-LED is switched on following "Power on". Once the operating system, user configuration, user parameters and the IEC program have been loaded and the IEC program has been started successfully the err LED will switch off again. The boot procedure is now complete.

**bus err (SERCOS real-time bus error indicator)**

OFF	Normal operation
ON	Bus error (problem with fiber-optic cable connection, e.g. transmitting power is too low or too high, cable break, etc.)



The innovative iSH combines motor, final stages and the digital servo regulator for one axis in a space-saving housing. The sending power (fiber optic cable intensity) is set on the controller in the PLC configuration.



**Ethernet LEDs (data throughput indicator and network activity)**

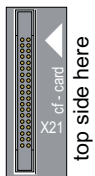
There are two LEDs affixed to the Ethernet connection of the controller.

LED yellow: ON	Controller connected
LED yellow: flashing/flickering	Current network traffic
LED yellow: OFF	Controller not connected
LED green: ON	100 MB connection
LED green: OFF	10 MB connection

Once you have opened the operating cover you have access to the controller control elements:

- CompactFlash™ card slot
- Battery compartment
- **[on / off]** button
- **[reset]** button

**4.2 CompactFlash™ card slot**

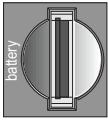


The CompactFlash™ card slot is the receptacle for the permanent data storage (CF™ card) of the controller.

**How to replace the Compact Flash™ in case of servicing:**

- ▶ Switch off controller.
- ▶ Hold the CF™ card with your thumb and forefinger and pull it out of the slot.
- ▶ To insert, carefully place the CF™ card on the guide rail and push it into the device.
- ▶ Push lightly until the card clicks in.

## 4.3 Battery compartment



The controller battery buffers controller data (Bios, NVRAM, time, etc.).

**Maintenance interval** The battery should be replaced every 6 years. After this period of time the battery must be replaced. If the device (with battery inserted) is not used for an extended period of time, you should check/replace the battery.

**Measurement** This is how you measure the battery:

- ▶ Replace battery and continue with the manual measurement

or

- ▶ observe the diagnostic message "**037 Battery down**" in the IEC program and display it on an HMI (panel), if necessary.
- ▶ Replace battery three days after the first diagnostic message at the latest.

**This is how you replace the battery:**

- You can change the battery while the controller is on or off. There is no loss of data when it is performed with the controller on. When the controller is switched off, the time period allotted for data buffering without a battery is approx. 5 minutes.

### **WARNING**

**THERE IS A RISK OF EXPLOSION/FIRE IF THE WRONG BATTERY IS USED.**

- Only use the type of battery with the following data: 3V Lithium Renata Type 2450N.

**Failure to follow these instructions can result in death or serious injury.**

- ▶ Use insulated pliers to lightly pull the old battery out of its slot.

### **CAUTION**

**DANGER OF EXPLOSION WHEN REMOVING/REPLACING BATTERY!**

- Use a pair of suitable, insulated pliers.
- When replacing the battery use tools which contain no current conducting material on the contact points.
- In general, be careful not to short circuit the battery poles.
- Do not recharge, dismantle or place battery in fire.

**A non-observance of these instructions can cause bodily injury or damage the equipment.**

- ▶ Carefully place the new battery on the guide and lightly push it into the device.

## 4.4 Switching the controller on/off / Resetting the controller



**[on / off] button**

- ▶ Press this button when the controller is switched off, completely wired and connected to the power supply system and shall be switched on.

- ▶ Pressing this button when the system is running will switch off the controller. If necessary, put the system in a secure position before switching it off.



**[reset] button**

- ▶ Press this button to reset and boot the controller.



Connected MC-4 servo amplifiers have their own **[reset]** button.

## 4.5 Diagnosis

### 4.5.1 Minimal boot of the controller



If a serious boot error occurs as a result of an application error, the user can perform a minimal boot. During a minimal boot the application data (PLC configuration and IEC program) are not loaded.

#### Perform a minimal boot as follows:

- ▶ Boot the controller by pressing the **[reset]** button.
  - ✓ The controller starts and the err - error indicator lights up.
- ▶ Press the **[reset]** button again while the preset IP address is displayed.
  - ✓ After the boot, the controller will flash quickly (10 Hz), signaling a minimal boot.

The controller automatically performs a minimal boot if:

- a voltage interruption of the control voltage occurs when starting the controller while the "err" indicator is illuminated.
- a reset of the controller is triggered.
- a serious error occurs (memory call up cannot be performed).

### 4.5.2 Connection to PacDrive Controller

The connection from the (service) PC (EPAS-4) to the Controller can be made in two different ways:

1. Serial connecting cable
2. Ethernet connection 10/100 Base-T

If the Windows computer being used in the service case or for commissioning has a functioning TCP/IP installation, the PacDrive Controller net management tool can be used to establish a connection. Further information on working with the PacDrive Controller Net Manage commissioning tool can be found on the PacDrive EPAS-4 CD.

If it is not possible to connect the EPAS-4 to the Controller, one/several of the following causes may be the problem:

*TCP / IP  
connection*

- ▶ Check IP\_Address in EPAS-4 under **ONLINE > Communicationparameter**.
  - Is the channel (umbrella term for the connection parameters) set correctly?
  - Is the TCP/IP address set correctly?
  - Is the port set to "5000"?
  - Is Motorola byte order set to "No"?
- ▶ Check TCP/IP settings in the PLC configuration of the project.
  - Is the parameter IP\_SubNetMask correctly filled out?
  - Is the parameter IP\_Address correctly entered and does it correspond to the setting under **ONLINE > Communication parameters** in EPAS-4?
  - Is the parameter IP\_Gateway address correctly entered?
- ▶ Establish serial connection to the controller.
  - Enter settings for a serial connection under **ONLINE > Communication parameters** (Port = "5000"(depending on the computer); Baud rate = "38400"; Parity = "No"; Stop bits = "1"; Motorola byte order = "No").
  - Establish serial connection.
- ▶ Check settings in the PLC configuration of the controller.
  - Has the IP\_SubNetMask been correctly entered?
  - Is the parameter IP\_Address correct and does it correspond to the setting under **ONLINE > Communication parameters** in EPAS-4?
  - Has the address IP\_Gateway been entered correctly?

*Serial  
connection  
via COM1*

- ▶ Adjust parameter upon detection of error.
  - Take over parameter with **ONLINE > Parameter**.
  - Activate parameter with **ONLINE > reset controller**.
- ▶ Check serial cable if jumpers are available. The connector plug assignment can be found in the EPAS-4 online help and in the "EPAS-4 Operating Instructions"
- ▶ Check the setting for the serial interface of the PC under **ONLINE > communication parameters** (Port = "5000" (depending on the computer); Baud rate = "38400"; Parity = "No"; Stop bits = "1"; Motorola byte order = "No").
- ▶ Check if a modem is configured in the PLC configuration under **PacDriveM > General > Com1User Modem / 1**. In this case, a modem is expected at the serial interface COM1 of the controller. - Perform a minimal boot on the controller so that the serial interface COM1 is converted to the direct serial connection to EPAS-4.

*File  
transfer service*

**This is how to check whether the controller flash disk is full:**

- ▶ Log-in with EPAS-4 without file transfer.
- ▶ Check available memory with the help of the parameter Diskfree in the **PLC configuration > PacDrive C600 > Memory & Disks**.
- ▶ Delete files on the flash disk using an FTP client.
- ▶ If necessary, replace the flash disk in the controller with a flash disk of a larger storage capacity.

### 4.5.3 Example of a diagnostic message

#### 2121 Bleeder Temperature Too High

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 2

Diagnostic code 121

Reaction (see 8.3 Reactions of "drives"): B

The bleeder is overloaded.

- The drive has incorrect dimensions.
- ▶ Check drive sizing.
- Hardware error detected: The braking resistor or addressing is defective.
- ▶ Contact ELAU customer service.



The meaning of the diagnostic code is more thoroughly explained in the online help section of the Automation Toolkit EPAS-4 or the **PD-Diagnostic**.



A complete list of the diagnostic messages can be found in the chapter entitled Diagnostic messages (see 8 Diagnosis).



## 5 Transport, storage, unpacking

### 5.1 Transport

- ▶ Avoid heavy shocks and/or vibrations during transport.
- ▶ Check the units for visible transport damage and inform the shipping company immediately if necessary.



For further information on transportation. (see 7.1 Ambient conditions)

### 5.2 Storage

- ▶ Store PacDrive Controller in a clean, dry room.



For further information on storage. (see 7.1 Ambient conditions)

### 5.3 Unpacking

- ▶ Remove packaging.
- ▶ Dispose of the packaging material in accordance with the relevant local regulations.
- ▶ Check that delivery is complete.
- ▶ Check the delivered goods for transport damage.

### 5.4 Type plate

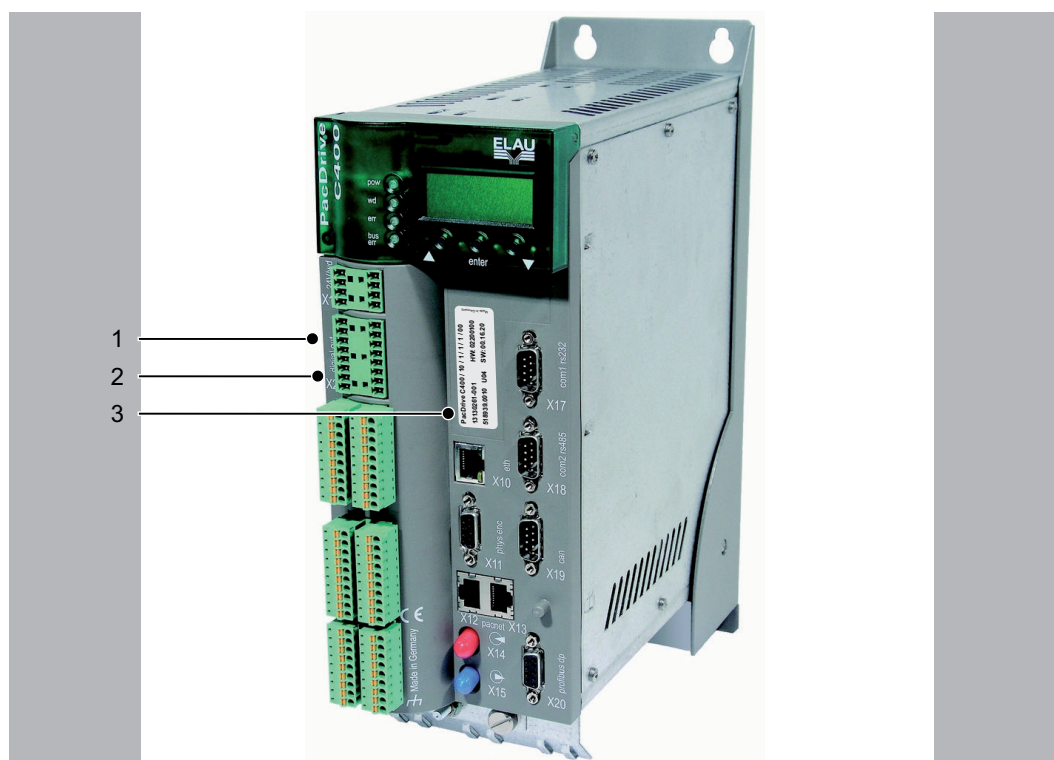


Figure 5-1: PacDrive Controller C400 with type plate

1	Technical type plate
2	Type plate USP
3	Logistic type plate



*Figure 5-2: Logistic type plate of the PacDrive C400 Controller*

PacDrive C200/C400/C600...	Item name
1313026X	Item no.
888067.0010 3X08	Serial number
HW	Hardware version
SW	Software version

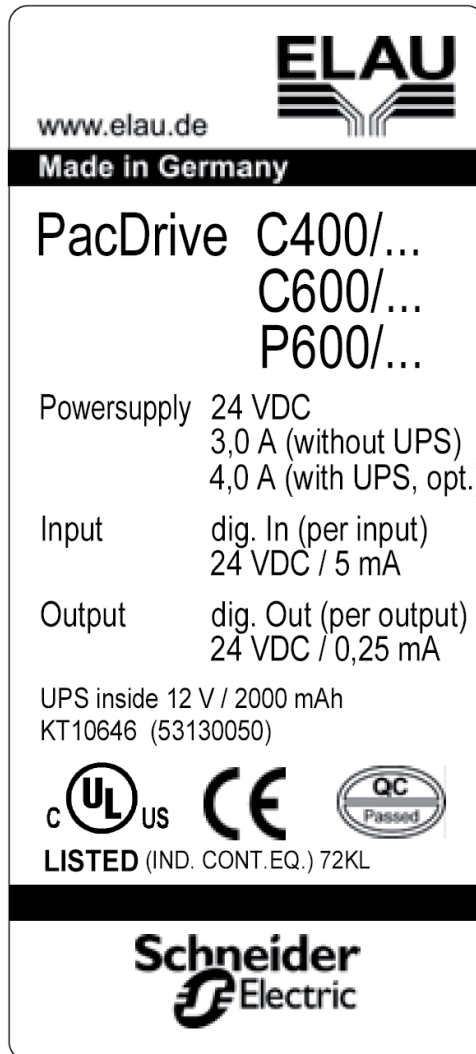


Figure 5-3: Technical type plate of the PacDrive C400/C600 Controller

PacDrive C400, C600, P600	Device type, see type key
Power supply	Rated voltage and rated current
Input	Digital inputs / input voltage und input current (per input)
Output	Digital outputs / output voltage und rated current (per input)
USV inside	USV inside (12V/2000mAh)
cUL	cUL mark
CE	CE mark

## 5.5 Type code

**Product ID code**

**C400 / 10 / 1 / 1 / 1 / 00**

**HW-Variant**

**Processor**

1 = Intel Pentium M 600 MHz

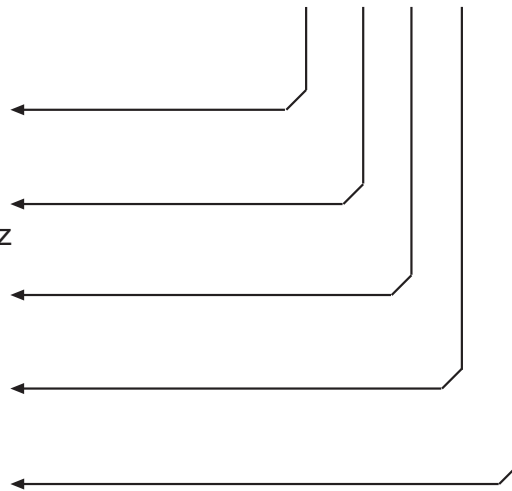
**RAM**

1 = 256 MB

**Flash memory**

1 = 32 MB

**Optional functions**



## 6 Installation and maintenance



When carrying out the following steps, make sure to exercise with the necessary accuracy and make arrangements to avoid,

- injuries and material damage,
- incorrect installation and programming of components,
- the incorrect operation of components
- and the use of non-authorized cables or modified components

zu vermeiden.

For warranty reasons, we recommend that you employ ELAU personnel for the initial start-up. The ELAU personnel

- will check the equipment,
- determine the optimal configuration
- and instruct the operating staff.

### 6.1 Initial start-up

#### **⚠ DANGER**

##### **ELECTRICAL SHOCK, EXPLOSION OR ELECTRIC ARC**

- Observe the general construction and safety regulations for working on high-current electrical systems.
- Operate electrical components only with connected protective conductor
- After installation, check the fixed connection of the protective conductor to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the device is switched on. First shut down drives because potentially fatal voltage can occur on the motor lines in generator operation.
- Provide protection against indirect contact (DIN EN 50178 : 1997, Section 5.3.2).
- Disconnect/connect the plug connectors on the cables or plug terminals on the device only when the system is deactivated (de-energized).

**Failure to follow these instructions will result in death or serious injury.**

#### **CAUTION**

##### **ELECTROSTATIC DISCHARGE**

- Do not touch any of the connections or components.
- Discharge any existing static charge by touching a grounded metallic surface such as a grounded housing.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.

**Failure to follow these instructions can result in equipment damage.**

**This is how you prepare the initial start-up:**

- Testing*
- ▶ Remove packaging.
  - ▶ Dispose of the packaging material in accordance with the relevant local regulations.
  - ▶ Check that delivery is complete.

- ▶ Check device for sound condition.

## **WARNING**

### **DAMAGED OR MODIFIED DRIVE SYSTEMS**

- Damaged drive systems must be neither mounted nor commissioned.
- Do not modify the drive systems.
- Return defective devices to ELAU GmbH.

**Failure to follow these instructions can result in death or serious injury.**

- ▶ Check data against type plates.
- ▶ Observe requirements for the installation location.
- ▶ Observe requirements for the protection class and the EMC rules.
- ▶ Then install PacDrive controller.

### **How to wire the PacDrive Controller:**

- ▶ Connect devices, beginning with the ground conductor.
- ▶ Check if the terminals are securely fastened and the necessary cable cross sections are correct.
- ▶ Check that shielding is completely correct.
- ▶ Eliminate the possibility of short circuits and interruptions.
- ▶ Check the continuity of the protective conductor system.

### **This is how you connect the control voltage:**

- ▶ Check the power supply voltage and control voltage.
- ▶ Connect external 24 V DC control voltage.
  - ✓ The devices initialize and the LEDs should display the following:

Controller during initialization: pow: ON, err: ON, buserr: any state, wd: ON

Controller after initialization: pow: ON, err: FLASHES or OFF, buserr: OFF, wd: OFF

### **How to finish the initial start-up:**

- ▶ Check safety functions such as the EMERGENCY OFF switch.

### **This is how you connect the mains voltage:**

- ▶ Activate EMERGENCY STOP switch.
- ▶ Connect mains voltage.
- ▶ Check status displays for proper function.
- ▶ Release EMERGENCY OFF switch and activate ON switch.

### **This is how you move the axis:**

- ▶ When moving the axis for the first time, use a reliable, tested application program which covers the following motions / functions:
  - the correct direction of rotation of the axis,
  - the correct setting of the limit switches and
  - the braking distance in both directions.

### **This is how you transmit the configuration and the program:**

- ▶ Transfer the project with EPAS-4 Automation Toolkit onto the PacDrive Controller.

## WARNING

### DANGEROUS MOVEMENTS

- Ensure that no one is in the danger zone.
- Remove all tools, loose parts and other working aids not belonging to the axis/machine/system from the area of movement.
- Engaged the engine only after the function test has been successfully performed.

**Failure to follow these instructions can result in death or serious injury.**

### **This is how you perform the function test:**

- ▶ Check devices and wiring again.
- ▶ If you haven't already done it, connect the mains voltage.
- ▶ Carry out function test using a checklist for axis/machine/system functions.
- ▶ Resume system operation according to the operating manual (from the machine manufacturer and servo amplifier).

## 6.2 Configuration, homing and programming



The PacDrive™ System is adapted to your task using the EPAS-4 Automation Toolkit. The system will be configured and programmed according to IEC 61131-3 in EPAS-4.

### CAUTION

#### FAULTY PROGRAM CHANGES

- Program changes may only be carried out by trained personnel with detailed knowledge of the system.
- Changes may only be carried out by your machine supplier or by ELAU employees.
- ELAU is not liable for damages caused by unauthorized program changes.

**Failure to follow these instructions can result in equipment damage.**



## 6.3 Electromagnetic compatibility, EMC

### WARNING

#### ERROR OF SIGNALS AND DEVICES

- Defective signals may cause unexpected device reactions.
- Check the correct execution of the EMC measures.

**Non-compliance with these precautions may cause death, serious injuries or material damage.**

*Switch cabinet layout* The prerequisite for compliance with the specified limit values is an EMC compatible layout. Comply with the following specifications:

Measures on the EMC	Target
Use galvanized or chromium-plated sub plates, bond metallic parts across large surface areas, remove paint layer on supporting surface.	Good conductivity by surface area contact
Ground switch cabinet, door and sub-plates by means of grounding strips or grounding cables with a cross-section of 10 mm <sup>2</sup> (AWG 6).	Reduce emission.
Supplement switch devices such as contactors, relays or magnetic valves with interference suppression combinations or spark blow-out elements (e.g. diodes, varistors, RC elements).	Reduce mutual interference coupling.
Fit power and control components separately.	Reduce mutual interference coupling.

*Shielded cables*

Measures on the EMC	Target
Place cable shields on the surface, use cable clamps and grounding strips.	Reduce emission.
At the switch cabinet outfeed, connect the shield of all shielded cables via cable clamps to the sub plate across large surface areas.	Reduce emission.
Ground shields of digital signal cables on both sides across large surface areas or via conducting connector housings.	Reduce interference action on signal cables, reduce emissions.
Ground shield of analog signal cables directly on the device (signal input), insulate the shield at the other cable end or ground the same via a capacitor, e.g. 10 nF.	Reduce grounding loops by low frequency interferences.
Use only shielded motor supply cables with a copper braid and at least 85% cover, ground shield on both sides across a large surface area.	Specifically discharge interference currents, reduce emissions.

*Cable routing*

Measures on the EMC	Target
Do not route field bus cables and signal cables together with cabling for direct and alternating voltages above 60 V in the same cable duct (field bus cables can be routed together with signal cables and analog cables in the same duct). Recommendation: Routing in separated cable ducts with a distance of at least 20 cm.	Reduce mutual interference coupling.
Keep the cables as short as possible. Do not install any unnecessary cable loops, short cable routing from a central grounding point in the switch cabinet to the external grounding connection.	Reduce capacitive and inductive interference couplings.
Insert a potential equalization conductor for installations with <ul style="list-style-type: none"> <li>• large surface installation</li> <li>• different voltage infeeds</li> <li>• networking across buildings</li> </ul>	Reduce current on cable shield, reduce emissions.

Measures on the EMC	Target
Use fine wire potential equalization conductor.	Discharging of high frequency interference currents.
If motor and machine are not connected in a conducting fashion, e.g. due to an insulated flange or a connection not across a full surface, the motor must be grounded via a grounding cable > 10 mm <sup>2</sup> (AWG 6) or a grounding strip.	Reduce emissions, increase interference resistance.
Use twisted pair for 24 V <sub>dc</sub> signals.	Reduce interference action on signal cables, reduce emissions.

**Power supply**

Measures on the EMC	Target
Operate product on mains with a grounded neutral.	Enable the effect of the integrated mains filter.
Protection circuit if there is a risk of overvoltage.	Reduce risk of damage due to overvoltages.

**Motor and encoder cables**

From an EMC point of view, motor supply cables and encoder cables are particularly critical. Only use pre-configured cables, or cables with the prescribed properties, and comply with the following EMC measures.

Measures on the EMC	Target
Do not fit any switching elements in motor supply cables or encoder cables.	Reduce interference coupling.
Route motor supply cables with a distance of at least 20 cm to the signal cables, or insert shield plates between motor supply cable and signal cables.	Reduce mutual interference coupling.
For long cabling, use potential equalization cables.	Reduce current on cable shield.
Route motor supply cables and encoder cables without any separation point. <sup>1)</sup>	Reduce interference radiation.
<sup>1)</sup> If a cable must be cut through for installation purposes, the cables must be connected at the point of separation by means of shield connections and metal housing.	

**Additional measures for improving the EMC**

The prerequisite for compliance with the specified limit values is an EMC compatible layout. Depending on the respective application, the following measures may lead to the achievement of better results:

Measures on the EMC	Target
Upstream connection of power chokes	Reduction of the harmonic network oscillations, extension of the service life of the product.
Upstream connection of external integrated mains filters	Improvement of the EMC limit values.
Special EMC-suitable layout, e.g. within an enclosed switch cabinet complete with 15 dB attenuation of the interferences emitted	Improvement of the EMC limit values.

To control and regulate the motors, the mains voltage is stored by rectification in the DC bus of the servo amplifier. This stored power is supplied to the motor by precise on and off switching using six semi-conductor switches. The steep increase/decrease in voltage places considerable demands on the dielectric strength of the motor winding.

An important additional aspect to observe is the **electromagnetic compatibility (EMC)** with other system components. The high rate of change of the clocked voltage generates harmonics of great intensity up into the high frequency range.

## CAUTION

### SYSTEM FAILURE DUE TO ELECTROMAGNETIC FIELDS

- During installation, select the grounding option with the lowest resistance for high frequency operation (e.g. unpainted sub plate in switching cabinet).
- Provide the largest possible contact surface area (skin effect).
- If necessary, remove existing layers (paint) to establish electrical contact.
- Lay the grounding in a star configuration from the Central Grounding Point to the corresponding connections.
- Avoid looping the grounding to prevent unnecessary influences.
- Use shielded cable only.
- Ensure large shielding transitions.
- Do not connect shields via the PIN contacts of connectors.
- Observe the circuit suggestions.
- Shorten motor cable to minimum length.
- Avoid laying cable loops in the switching cabinet.
- In conjunction with electronic controllers, do not switch inductive loads without suitable interference suppression.
- Provide suitable interference suppression. To this end, use recovery diodes for direct current operation and protector type-based, industry-standard quenching circuits during alternating current activity.
- Arrange the interference suppression immediately at the point of inductivity, as otherwise even more interference may be generated by the shock of the switching current on the interference suppression lines.
- Avoid sources of interference instead of eliminating the effects of existing interference.
- Do not arrange contacts with unsuppressed inductive loads in the same room as the PacDrive Controller. The same applies for connection lines that do not lead suppressed, switched inductances and lines that run parallel to them.
- Isolate the controller from such interference sources using a Faraday cage (separately partitioned switching cabinet).
- Depending on the combination of servo amplifier/motor and the cable length, use mains or motor filters and observe the PacDrive planning information hardware.

**Failure to follow these instructions can result in equipment damage.**

## 6.4 Maintenance, repair, cleaning

### 6.4.1 Repair

**Proceed as follows in case of repair:**

- ▶ Fill in the fault report form (see 10.5 Fault report form) in the attachment (can also be sent per Fax).
- ▶ If possible, replace faulty components (see 6.6 Device replacement).
- ▶ Send faulty components back to ELAU.

### 6.4.2 Cleaning

**How to remove dust and foreign objects from the PacDrive Drive:**

- ▶ De-energize PacDrive Controller
- ▶ Remove PacDrive Controller.



It is not possible to test in advance all materials of the Schneider Electric product range as used at present and in the future for compatibility with the cleaning agents available on the market.

## CAUTION

### DAMAGE CAUSED BY CLEANING AGENTS

- Before using a cleaning agent, carry out a compatibility test in relation to the cleaning agent and the component affected.
- Do not use alkaline detergent as the polycarbonate can lose its stability if you come into contact with it.
- Do not use any chloride-containing cleaning agents as these corrode the stainless steel and in particular the welds, and thus reduce the strength of the mechanics.

**Failure to follow these instructions can result in equipment damage.**



For more information on the material properties of your component (see 7.3 Mechanical and electrical data).

- ▶ Then blow out PacDrive Controller with dry pressurized air (max. 1 bar).

## 6.5 Spare part inventory



Keep a stock of the most important components to make sure the equipment is functioning and ready for operation at all times.



You may only exchange units with the same hardware configuration and the same software version.

- ▶ Indicate the following information on the spare part order:

Item name:	e.g. PacDrive C400 / 10 / 1 / 1 / 1 / 00
Item no.:	e.g. 13130261
Hardware code:	e.g. HW: 02200100
Software version:	e.g. SW: 00.16.20



This information can be found on the type plate (see 5.4 Type plate).

## 6.6 Device replacement

### **⚠ DANGER**

#### **ELECTRICAL SHOCK, EXPLOSION OR ELECTRIC ARC**

- Observe the general construction and safety regulations for working on high-current electrical systems.
- Operate electrical components only with connected protective conductor
- After installation, check the fixed connection of the protective conductor to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the device is switched on. First shut down drives because potentially fatal voltage can occur on the motor lines in generator operation.
- Provide protection against indirect contact (DIN EN 50178 : 1997, Section 5.3.2).
- Disconnect/connect the plug connectors on the cables or plug terminals on the device only when the system is deactivated (de-energized).

**Failure to follow these instructions will result in death or serious injury.**

**How to replace the PacDrive Controller:**

### **CAUTION**

#### **IMPROPER REPLACEMENT**

- Do not open the the PacDrive Controller for commissioning or replacement.

**Failure to follow these instructions can result in equipment damage.**

### **CAUTION**

#### **FAULTY REPLACEMENT OR OPENING OF CONTROLLER**

- Do not open the the PacDrive Controller for commissioning or replacement.
- In addition to the following instructions, you must observe the machine manufacturer's specifications when replacing the the PacDrive Controller.
- Replace defective devices as a whole.

**Failure to follow these instructions can result in equipment damage.**

### **CAUTION**

#### **ELECTROSTATIC DISCHARGE**

- Do not touch any of the connections or components.
- Discharge any existing static charge by touching a grounded metallic surface such as a grounded housing.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.

**Failure to follow these instructions can result in equipment damage.**



In addition to the following instructions, you must observe the machine manufacturer's specifications when replacing devices.

**How to de-energize the system:**

- ▶ For voltages higher than 30 V AC or 42.2 V DC, set the main switch to the "OFF position".
- ▶ Secure main switch against restart in order to disconnect the PacDrive Controller from mains or the power supply.
- ▶ Wait at least 5 minutes after switching off before you work on the PacDrive Controller.
- ▶ Discharge DC bus.
- ▶ Before working on the equipment, check the DC bus with a measuring instrument to make sure that it is de-energized (< 50V).
- ▶ Disconnect cables of the controller.
- ▶ Remove the screws from the top and bottom of the housing.
- ▶ Remove PacDrive Controller and replace as a complete unit.
- ▶ Install New controller and tighten screws.
- ▶ Connect Controller according to the machine's circuit diagram.


**DANGER**
**WRONG CONFIGURATION OF NEW CABLES**

- If you are not using prefabricated ELAU cables, make sure that the configuration of the new cables complies with the connection diagram of the machine manufacturer.

**Failure to follow these instructions will result in death or serious injury.**

- ▶ Following replacement of the PacDrive Controller proceed as for the initial start-up.

**Proceed as follows for start-up:**

- ▶ Import the user project again using a PC on which the automation toolkit EPAS-4 is installed.

or

- ▶ Remove the already used CompactFlash card of the controller that has to be repaired and insert it into the new controller.
- ▶ Ensure that the card is functional.
- ▶ Store the PacDrive controller in a suitable transport packaging.
- ▶ Put the system back in operation.

# 7 Technical data

## 7.1 Ambient conditions

Procedure	Parameters	Value	Basis
Operation	<b>Class 3K3</b>		IEC/EN 60721-3-3
	Ambient temperature	+5°C...+45°C	
	Condensation	Prohibited	
	Icing	Prohibited	
	another water	Prohibited	
	Relative humidity	5% ... 85%	
	<b>Class 3M3</b>		
	Shock	70 m/s <sup>2</sup>	
Vibration	5 m/s <sup>2</sup>		
Transport	<b>Class 2K3</b>		IEC/EN 60721-3-2
	Ambient temperature	-25°C...+70°C	
	Condensation	Prohibited	
	Icing	Prohibited	
	another water	Prohibited	
	Relative humidity	5% ... 95%	
	<b>Class 2M2</b>		
	Shock	100 m/s <sup>2</sup>	
Vibration	15 m/s <sup>2</sup>		
Long-term storage in transport packaging	<b>Class 1K4</b>		IEC/EN 60721-3-1
	Ambient temperature	-25°C...+55°C	
	Condensation	Prohibited	
	Icing	Prohibited	
	another water	Prohibited	
	Relative humidity	5% ... 95%	

Table 7-1: Ambient conditions of Class C20 for switch cabinet devices (without UPS)

Procedure	Parameters	Value	Basis
Operation	<b>Class 3K3</b>		IEC/EN 60721-3-3
	Ambient temperature	+5°C...+40°C	
	Condensation	Prohibited	
	Icing	Prohibited	
	another water	Prohibited	
	Relative humidity	5% ... 85%	
	<b>Class 3M3</b>		
	Shock	70 m/s <sup>2</sup>	
Vibration	5 m/s <sup>2</sup>		

Procedure	Parameters	Value	Basis
Transport	<b>Class 2K3</b>		IEC/EN 60721-3-2
	Ambient temperature	-25°C...+50°C	
	Condensation	Prohibited	
	Icing	Prohibited	
	another water	Prohibited	
	Relative humidity	5% ... 95%	
	<b>Class 2M2</b>		
	Shock	100 m/s <sup>2</sup>	
Vibration	15 m/s <sup>2</sup>		
Long-term storage in transport packaging	<b>Class 1K3</b>		IEC/EN 60721-3-1
	Ambient temperature	-5°C...+45°C	
	Condensation	Prohibited	
	Icing	Prohibited	
	another water	Prohibited	
	Relative humidity	5% ... 95%	

Table 7-2: Ambient conditions of Class C20 for switch cabinet devices (with UPS)

## 7.2 Standards and regulations

<b>Certifications</b>	CE, cULus
-----------------------	-----------

Table 7-3: Standards and regulations C400 Controller

## 7.3 Mechanical and electrical data

Category	Parameters	Value
<b>Product configuration</b>	Type key C400 up to 16 SERCOS slaves (SERCOS slaves = MC-4, SCL, iSH)	PacDrive C400 / 10 / 1 / 1 / 1 / 00
	Type key C400 up to 8 SERCOS slaves	PacDrive C400 / A8 / 1 / 1 / 1 / 00
	Order number- C400 up to 16 SERCOS slaves	13 13 02 61
	Order numbers C400 up to 8 SERCOS slaves	13 13 02 61-001
<b>Processor</b>	CPU	C400 up to 16 SERCOS slaves: Intel Pentium M 600 MHz C400 up to 8 SERCOS slaves: Celeron M 600 MHz
	RAM	256 MB
	L2 Cache	C400 up to 16 SERCOS slaves: 1 MB C400 up to 8 SERCOS slaves: 512 kB
	NVRAM	128 kB
	CompactFlash™ card	≥128 MB
	Real time clock (RTC)	Yes (battery maintenance interval: 5 years)
	Watchdog	Yes (max. 60 V < 2 A)
	Diagnosis	Alphanumeric diagnostic display, Status LEDs
<b>Operating system</b>	Real-time operating system	VxWorks



Category	Parameters	Value
Programming languages	Programming languages IEC 61131-3	Instruction list (IL)
		Ladder diagram (LD)
		Function block diagram (FBD)
		Sequential function chart (SFC)
		Structured text (ST)
		Continuous function chart (CFC)
Interfaces	Serial interfaces	COM1: RS232 (X17)
		COM2: RS485 (X18)
	Network connection	Ethernet (10/100 Base-T) (X10)
	Field bus connections	PROFIBUS DP Master/Slave (12 MBaud) (X20) or CAN (2.0A) or CANopen (X19)
		DeviceNet Slave (cable adapter required)
		EtherNet/IP Slave (projected) (optional hardware module required)
	Real-time bus interface	SERCOS interface (16 MBaud) (X14, X15)
	PacNet interface	2 PacNet interfaces (X12, X13)
	Master encoder interfaces	1 SinCos master encoder or
		1 incremental master encoder (X11)
	HMI Interfaces	RS485 (Modbus or PROFIBUS DP)
		HMI software tools: OPC server (for Windows NT/2000/XP or Windows CE)
	Diagnostic interface for remote maintenance	Modem
	Communications protocols	Http
Ftp		
SMTP (E-Mail)		
Integrated trace recorder (software oscilloscope)	8 channels, resolution 1 ms	
Integrated data logger for diagnostic messages	27 kB	
Output	C400	16 servo axes with all SERCOS cycle times
	C400 / A8	8 servo axes with all SERCOS cycle times Max. of 255 parallel motion profiles possible
SPS output	Time for 1000 Bit instructions	7 $\mu$ s
	Number of PLC processes	Unlimited
	Type of PLC processes	Continuous,
		periodic or Event-controlled
	Cycle time fast task	250 $\mu$ s
Nominal I/O response time	500 $\mu$ s (read in data, process, set output)	
Cam sequential circuit	Number of cams	Max. 256
	Sequential circuit	Dynamic
	Outputs	Memory or
		Digital outputs
	Inputs	External master encoder
		Virtual master encoder
Axis position		
Processing time	250 $\mu$ s	

Category	Parameters	Value
Digital inputs (X3)	Number	20 (IEC61131-2)
	Range U <sub>IN</sub> 0 Voltage	DC 0 ... 6 V
	Range U <sub>IN</sub> 1 Voltage	DC 20 ... 33 V
	Input data	I <sub>IN</sub> = 5 mA by U <sub>IN</sub> = 24 V
	Polarized	Yes
	Input filter	1 or 5 ms can be parameterized
Analog inputs (X5)	Number	2
	Range U <sub>IN</sub>	-10 ... 10 V
		Resolution 12 Bit (5 mV)
		Resistor 100 kOhm
	Range I <sub>IN</sub>	-20 ... 20 mA
		Resolution 12 Bit, (5 µA)
Resistor 500 Ohm		
Interrupt inputs (X4)	Number:	4 (IEC61131-2)
	Range U <sub>IN</sub> 0 Voltage	DC 0 ... 6 V
	Range U <sub>IN</sub> 1 Voltage	DC 20 ... 33 V
	Input data	I <sub>IN</sub> = 5 mA by U <sub>IN</sub> = 24 V
	Polarized	Yes
	Input filter	0.1 or 1 ms can be parameterized
Touchprobe inputs (X4)	Number	16 (IEC61131-2)
	Range U <sub>IN</sub> 0 Voltage	DC 0 ... 6 V
	Range U <sub>IN</sub> 1 Voltage	DC 20 ... 33 V
	Input data	I <sub>IN</sub> = 5 mA by U <sub>IN</sub> = 24 V
	Polarized	Yes
	Input filter TP0 to TP15	100 µs resolution
	TP0 to TP15	10 µs at a cycle time of 1, 2, 4 ms
Digital outputs (X2)	Number	16 (IEC61131-2)
	Output voltage	(+UL-3 V) < U <sub>OUT</sub> < +UL
	Rated current	I <sub>e</sub> = 250 mA per output
	Inrush current	I <sub>emax</sub> < 2 A for 1 s
	Leakage current with 0 signal	< 0.4 mA
	Transmission time	100 µs
	short circuit proof	Yes
Digital outputs (X5)	Number	2
	Range U <sub>OUT</sub>	-10 ... 10 V
	Resolution	12 Bit (5 mV)
	Load	> 5 kOhm (max. Offset < +/- 75mV)
Additional digital and analog I/Os	Via field bus	Max. 3,584 bytes digital/analog inputs and Max. 3,584 bytes digital/analog outputs Max. number of stations: 126 (PROFIBUS)
	Via PacNet	Max. 128 inputs and 128 outputs
	Via PacNet	Max. 128 Touchprobe inputs

Category	Parameters	Value
<b>Power supply</b>	Power supply unit	DC 24 V (-15% / +25%)
		max. 3,0 A without UPS
		max. 4,5 A without UPS
	Power consumption	Max. 85 W
	Uninterruptible Power Supply (UPS)	Internal, optional (maintenance interval 3 years)
<b>Dimensions</b>	Dimensions packaging	DxWxH (mm): 300x130x400
<b>Weight</b>	Weight (with packaging)	3.5 kg (4.1 kg)
<b>Protection class</b>	Housing	IP 20
<b>Isolation class</b>	Degree of pollution	2

Table 7-4: Technical data PacDrive C400 Controller

## 7.4 Electrical connections

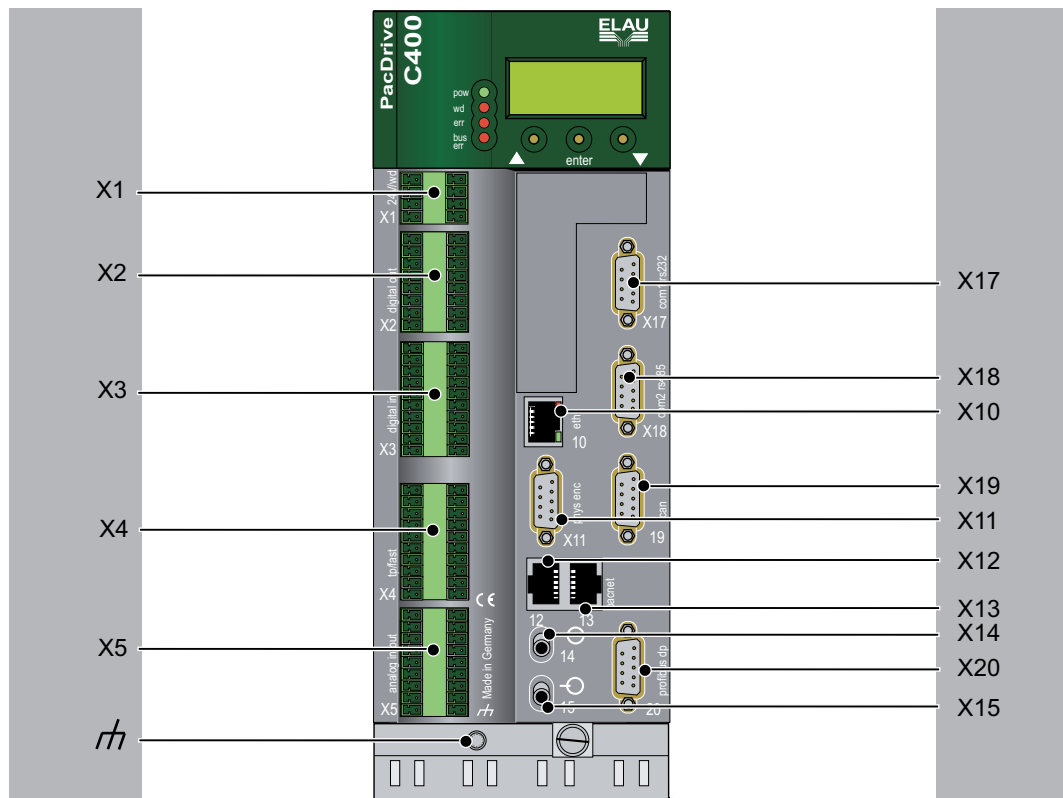


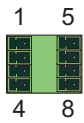
Figure 7-1: Connection overview PacDrive C400 Controller

Connection	Meaning	max. terminal cross-section [mm <sup>2</sup> ] [AWG]	max. tightening torque [Nm]
X1	Control voltage/ Watchdog	1.50 mm <sup>2</sup>	-
X2	Digital outputs	1.50 mm <sup>2</sup>	-
X3	Digital inputs	1.50 mm <sup>2</sup>	-
X4	Touchprobe and fast digital inputs	1.50 mm <sup>2</sup>	28 - 16
X5	Analog inputs/out- puts	1.50 mm <sup>2</sup>	-
X10	Ethernet connection	-	-
X11	Master encoder (Sin- Cos)	0.25 mm <sup>2</sup>	0.4
X11	Master encoder (in- cremental)	0.25 mm <sup>2</sup>	0.4
X12/X13	PacNet	-	-
X14	Motion bus SER- COS input	-	0.8
X15	Motion bus SER- COS output	-	0.8
X17	Com 1 (RS232)	0.25 mm <sup>2</sup>	0.4
X18	Com 2 (RS485)	0.25 mm <sup>2</sup>	0.4
X19	CAN	0.25 mm <sup>2</sup>	0.4

Connection	Meaning	max. terminal cross-section [mm <sup>2</sup> ]/ [AWG]		max. tightening torque [Nm]
X20	PROFIBUS db	0.25 mm <sup>2</sup>	-	0.4
<i>rh</i>	Shielded connector	-	-	1

Table 7-5: Connection overview PacDrive PacDrive C400 Controller

### X1 - control voltage and watchdog



Pin	Designation	Meaning	Range
1	DC +24 V	Supply voltage	- 15 % / +25 %
2	DC 0 V	Supply voltage	
3	+UL	For digital outputs	DC +24 V -15 % / +25 %
4	L0	For digital inputs/outputs	
5	DC +24 V	Supply voltage (bridged with pin 1, max. ampacity 4A)	-15 % / +25 %
6	DC 0 V	Supply voltage (bridged with pin 2, max. ampacity 4A)	
7	WD	Watchdog relay	
8	WD	Watchdog relay	

Table 7-6: Connection X1

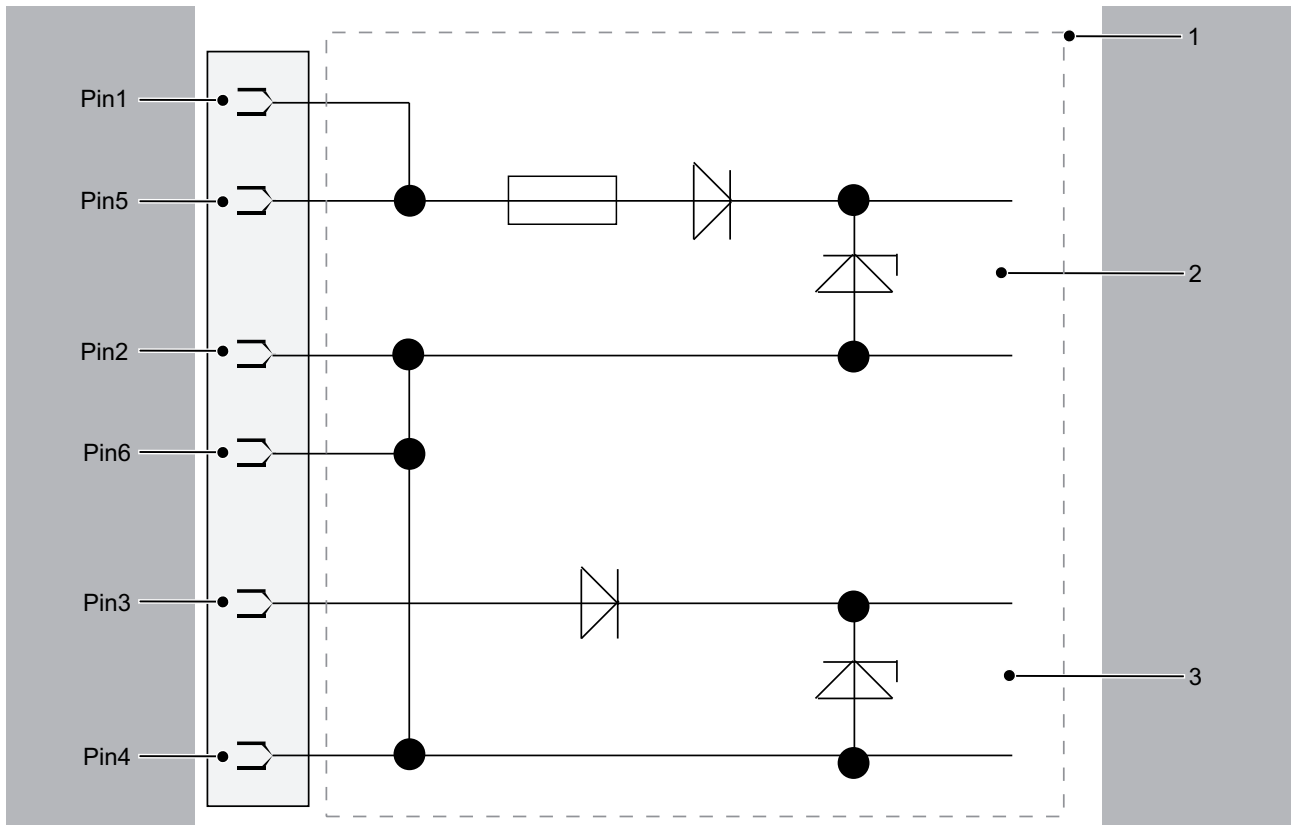
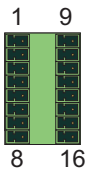


Figure 7-2: Input connection

1	Internal wiring diagram - input connection of power supply (simplified)
2	Internal supply voltage
3	Supply voltage for digital outputs/inputs

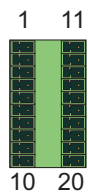
## X2 - Digital outputs



Pin	Designation	Meaning	Range
1	O.00	Digital output 1	DC 20 ... 30 V
2	O.01	Digital output 2	DC 20 ... 30 V
3	O.02	Digital output 3	DC 20 ... 30 V
4	O.03	Digital output 4	DC 20 ... 30 V
5	O.04	Digital output 5	DC 20 ... 30 V
6	O.05	Digital output 6	DC 20 ... 30 V
7	O.06	Digital output 7	DC 20 ... 30 V
8	O.07	Digital output 8	DC 20 ... 30 V
9	O.08	Digital output 9	DC 20 ... 30 V
10	O.09	Digital output 10	DC 20 ... 30 V
11	O.10	Digital output 11	DC 20 ... 30 V
12	O.11	Digital output 12	DC 20 ... 30 V
13	O.12	Digital output 13	DC 20 ... 30 V
14	O.13	Digital output 14	DC 20 ... 30 V
15	O.14	Digital output 15	DC 20 ... 30 V
16	O.15	Digital output 16	DC 20 ... 30 V

Table 7-7: Connection X2

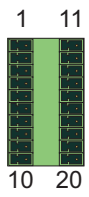
## X3 - Digital inputs



Pin	Designation	Meaning	Range
1	I.00	Digital input 0	DC 20 ... 30 V
2	I.01	Digital input 1	DC 20 ... 30 V
3	I.02	Digital input 2	DC 20 ... 30 V
4	I.03	Digital input 3	DC 20 ... 30 V
5	I.04	Digital input 4	DC 20 ... 30 V
6	I.05	Digital input 5	DC 20 ... 30 V
7	I.06	Digital input 6	DC 20 ... 30 V
8	I.07	Digital input 7	DC 20 ... 30 V
9	I.08	Digital input 8	DC 20 ... 30 V
10	I.09	Digital input 9	DC 20 ... 30 V
11	I.10	Digital input 10	DC 20 ... 30 V
12	I.11	Digital input 11	DC 20 ... 30 V
13	I.12	Digital input 12	DC 20 ... 30 V
14	I.13	Digital input 13	DC 20 ... 30 V
15	I.14	Digital input 14	DC 20 ... 30 V
16	I.15	Digital input 15	DC 20 ... 30 V
17	I.16	Digital input 16	DC 20 ... 30 V
18	I.17	Digital input 17	DC 20 ... 30 V
19	I.18	Digital input 18	DC 20 ... 30 V
20	I.19	Digital input 19	DC 20 ... 30 V

Table 7-8: Connection X3

## X4 - Touchprobe and fast digital inputs

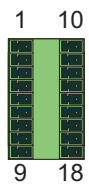


Pin	Designation	Meaning	Range
1	T.00	Touchprobe input 0	DC 20 ... 30 V
2	T.01	Touchprobe input 1	DC 20 ... 30 V
3	T.02	Touchprobe input 2	DC 20 ... 30 V
4	T.03	Touchprobe input 3	DC 20 ... 30 V
5	T.04	Touchprobe input 4	DC 20 ... 30 V
6	T.05	Touchprobe input 5	DC 20 ... 30 V
7	T.06	Touchprobe input 6	DC 20 ... 30 V
8	T.07	Touchprobe input 7	DC 20 ... 30 V
9	T.08	Touchprobe input 8	DC 20 ... 30 V
10	T.09	Touchprobe input 9	DC 20 ... 30 V
11	T.10	Touchprobe input 10	DC 20 ... 30 V
12	T.11	Touchprobe input 11	DC 20 ... 30 V
13	T.12	Touchprobe input 12	DC 20 ... 30 V
14	T.13	Touchprobe input 13	DC 20 ... 30 V
15	T.14	Touchprobe input 14	DC 20 ... 30 V
16	T.15	Touchprobe input 15	DC 20 ... 30 V
17	F.00	Fast input 1	DC 20 ... 30 V
18	F.01	Fast input 2	DC 20 ... 30 V
19	F.02	Fast input 3	DC 20 ... 30 V
20	F.03	Fast input 4	DC 20 ... 30 V

Table 7-9: Connection X4



X5 - analog inputs /outputs



Pin	Designation	Meaning	Range
1	AI.0 +	Analog input 0+	-10 ... +10 V <sup>(*)</sup> 0 ... 20 mA <sup>(**)</sup>
2	J.0 +	Br. current input 0 +	
3	AI.0 -	Analog input 0-	
4	A.GND 0	Analog ground 0	
5	12 V Out 0	Output voltage 0	12 V
6	PE	Shield	
7	AO.0	Analog output 0	-10 ... +10 V
8	A.GND AO.0	Analog ground 0	
9	PE	Shield	
10	AI.1 +	Analog input 1+	-10 ... +10 V <sup>(*)</sup> 0 ... 20 mA <sup>(**)</sup>
11	J.1 +	Br. current input 1 +	
12	AI.1 -	Analog input 1-	
13	A.GND 1	Analog ground	
14	12 V Out 1	Output voltage 1	12 V
15	PE	Shield	
16	AO.1	Analog output 1	-10 ... +10 V
17	A.GND AO.1	Analog ground	
18	PE	Shield	

(\*) Voltage metering and (\*\*)current measurement on AI.0+ / AI.0- (Pin 1 / Pin 3) and AI.1+ / AI.1- (Pin 10 / Pin 12)

(\*\*\*)Current measurement via bridging to J.0+ (Pin 2) or J.1+ (Pin 11).

Table 7-10: Connection X5

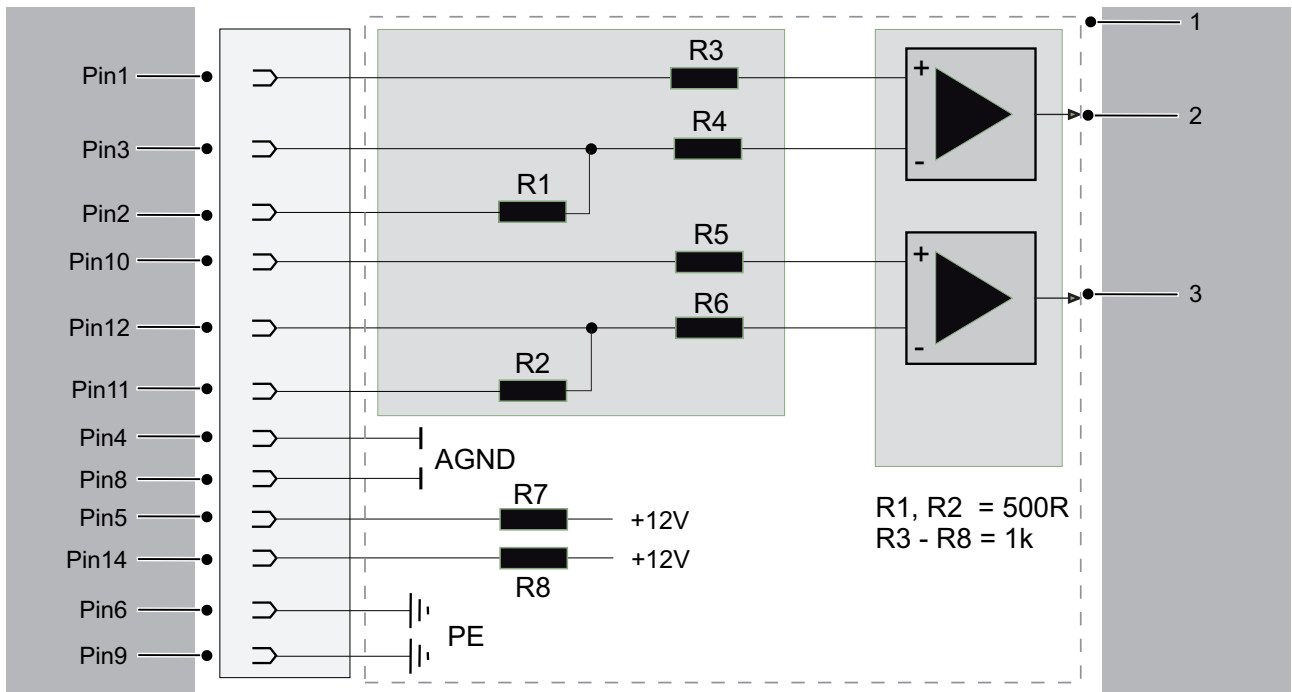
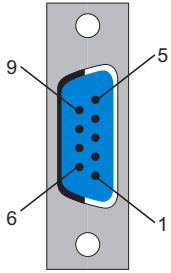


Figure 7-3: Input connection

1	Internal wiring diagram - input connections for analog inputs (simplified)
2	Analog Input 1
3	Analog Input 2

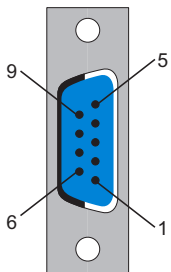
## X X11 - Master encoder (SinCos)



Pin	Designation	Meaning	Range
1	REFSIN	Reference Signal Sinus	
2	SIN	Sinus trace	
3	REFCOS	Reference Signal Cosinus	
4	COS	Cosinus trace	
5	+9 V	Supply voltage	
6	RS485-	Parameter channel -	
7	RS485+	Parameter channel +	
8	SC_SEL	Master encoder plugged in (bridge to GND)	
9	GND	Supply voltage	

Table 7-11: Connection XX11 - Master encoder (SinCos)

## X X11 - Master encoder (incremental)



Pin	Designation	Meaning	Range
1	_UA	Track A	
2	UA	Track A	
3	_UB	Track B	
4	UB	Track B	
5	+5 V	Supply voltage	
6	_UO	Track O	
7	UO	Track O	
8	-	-	
9	GND	Ground	

Table 7-12: Connection XX11 - Master encoder (incremental)

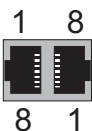
## ⚠ CAUTION

### INTERRUPTION OF THE CONTROL CIRCUIT

- Only unplug or plug the master encoder when it is in a off-circuit state.
- Disconnect controller from the 24 V supply voltage.

**Failure to follow these instructions can result in equipment damage.**

## X12/13 - PacNet



Pin	Designation	Meaning	Range
1	TxD+	OutputTransmitData+	
2	TxD-	OutputTransmitData-	
3	RxD+	InputReceiveData+	
4	TxC-	OutputTransmitClock-	
5	TXC+	OutputTransmitClock+	
6	RxD-	InputReceiveData-	

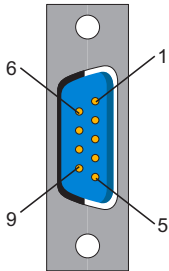
Pin	Designation	Meaning	Range
7	RxC+	InputReceiveClock+	
8	RxC-	InputReceiveClock-	

Table 7-13: Connection X12, X13



Use only approved PacNet cables at the PacNet connection to avoid malfunction.

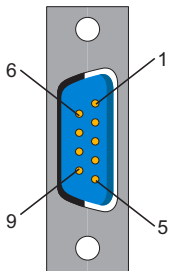
### X X17 - Com 1 (RS 232)



Pin	Designation	Meaning	Range
1	DCD	Data Carrier Detect	
2	RxD	Receive Data	
3	TxD	Transmit Data	
4	DTR	Data Terminal Ready	
5	GND	Signal Ground	
6	DSR	Data Set Ready Clear To Send	
7	RTS	Request To Send	
8	CTS	Clear To Send	
9	RI	Ring Indicator	

Table 7-14: Connection XX17

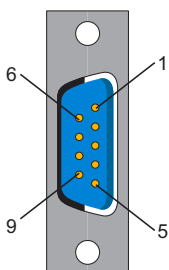
### X X18 - Com 2 (RS485)



Pin	Designation	Meaning	Range
1	+5 VM	Supply voltage	
2	TxD-	RS485 Transmit -	
3	TxD+	RS485 Transmit+	
4	RxD+	RS485 Receive +	
5	RxD-	RS485 Receive -	
6	GNDR	GND receive RS485	
7	-	Reserved	
8	GNDM	Supply voltage	
9	GNDR	GND receive RS485	

Table 7-15: Connection Xpow: ON, err: FLASHES or OFF, buserr: OFF, wd: OFF

### X X19 - CAN



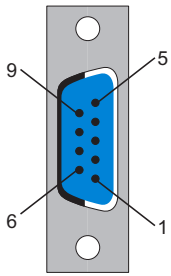
Pin	Designation	Meaning	Range
1	-	Reserved	
2	CAN_L	Bus line (low)	
3	GND	Ground	
4	-	Reserved	
5	-	Reserved	
6	-	Reserved	
7	CAN_H	Bus line (high)	
8	-	Reserved	
9	-	Reserved	

Table 7-16: Connection XX19



An adapter is available for the connection to the DeviceNet.

## X X20 - profibus db



Pin	Designation	Meaning	Range
1	PE	Shield	
2	-	Reserved	
3	RxD / TxD -P	Data -P	
4	CNTR-P	Control signal P	
5	DGND	Signal ground	
6	VP	Supply voltage	
7	-	Reserved	
8	RxD / TxD -N	Data -N	
9		Reserved	

Table 7-17: Connection XX20

### Connector

A PROFIBUS connector must be used to connect to the 9 pole PROFIBUS outlet because the bus terminal resistors are in this connector. The possible PROFIBUS connectors with different cable outlets are illustrated below.

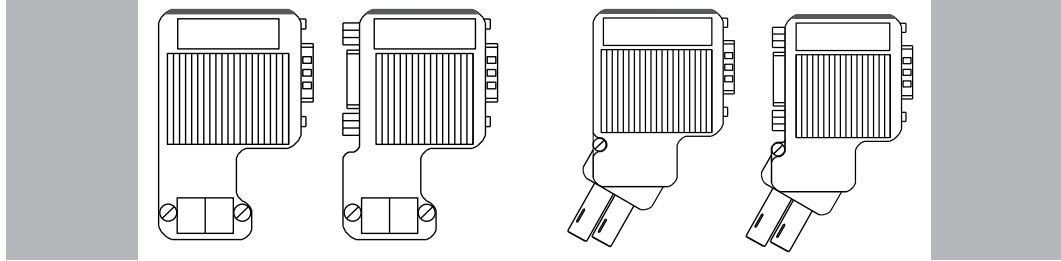


Figure 7-4: PROFIBUS connector

### Bus terminal resistors

For the first and last bus nodes, the terminal resistors must be switched on. Otherwise data transmission will not function properly.

The shielding must be applied generously and on both sides.

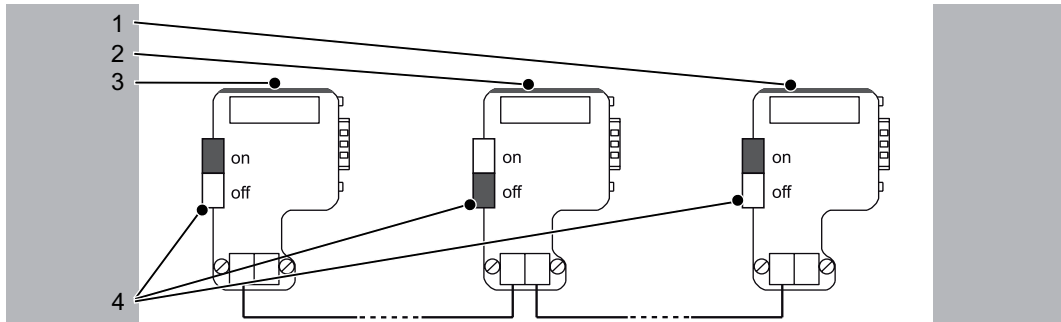


Figure 7-5: Position of the bus terminal resistors

1	Last bus slave
2	Nth bus slave
3	First bus slave
4	Bus terminator



## 8 Diagnosis

The PacDrive™ system supports the user with its comprehensive diagnostic system.



If the Automation System cannot follow the instructions we gave him, it should not suffer in silence but

- react in a defined way as far –and as fast -as possible to prevent people from injury and the machine from damage.
- give a significant message about what happened to indicate the ‘Error’ to the operator and to support him in locating and removing the error!

### 8.1 Scenarios to be met at the machine



- A** There may be jam due to obstacles while placing bottles, ...
- B** There may be friction due to fouling, worn out bearings, damaged mechanics, ...

#### A: There may be jam due to obstacles while placing bottles, ...

So, if the **gripper of the robot meets an obstacle while placing the bottles into the carton**, the servo will deviate from its schedule. This deviation can be found by examining Following Error.

If **Following Error exceeds the given limit dramatically**, there should be a reaction –for example, stopping the movement of the gripper immediately if still possible to minimize damage of bottles, cartons or mechanics. After a timeout, PositionControl will be switched off.

If **Following Error exceeds Following Limit ‘slightly’**, there should be a message but there is no need for a reaction of the ‘reporting’ drive. The message is worth the trouble, for

- programmers will use it as a criterion to **launch userspecific reactions of the machine** within the userprogram,
- maintenance staff can gather these messages from the message logger and use them e.g. for **‘preventive maintenance’!**

**B:** There may be friction due to fouling, worn out bearings, damaged mechanics, ...

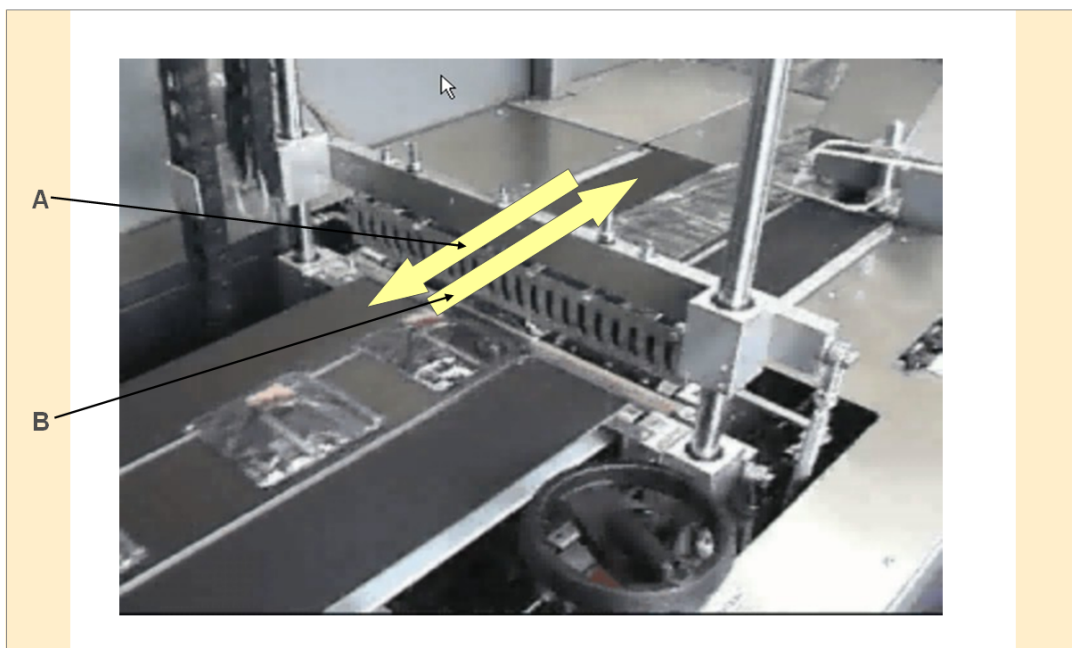
Friction requires 'more than the usual amount of torque' for a given movement or for cyclic sequences of them. Remedying this error is a bit more complex. For most of all cases, friction within an installation is not that obvious, that it immediately disturbs the schedule like the above obstacles did.

Friction 'kills' the ServoDrive in the long run. Thus the MotorController takes root mean-square of torque – determined via root mean current- to **detect this kind of 'continuous overload'**. ... and this is what we have come to know as '**I<sub>2t</sub>**' in the previous lesson!

The above 'warning-philosophy' applies again:

If the **drive is still functional and 'I<sub>2t</sub>' exceeds a certain threshold**, there will be only a warning, either to be used as criteria for stopping the machine in a defined way on behalf of the userprogram, or as a message to be logged in the sense of preventive maintenance.

If '**I<sub>2t</sub>' reaches its upper limit**, the current movement will be stopped immediately and PositionControl will be switched off after the timeout mentioned above!



- C** Moving synchronously to seal & cut
- D** Moving back towards next product

**C, D: Sealing movements may require more than admitted effective current due to 'exaggerated' cycle rate!**

The motion-profiles for the up-down-movement and the back and forth movement of the sealing-bar require acceleration- and deceleration-phases due to changing directions.

**Increasing cycle rate will require more and steeper(!) accel- and decel-phases per cycle** and that will result in rising the effective values of torque and current!

This continuous overload **will be detected and invoke a reaction in order** to prevent overheating the Motor or the MotorController above their acceptable temperature ranges!



## 8.2 The Notion of 'Diagnosis Classes'

'Classification' - in the sense of our Diagnosis Concept - is a mapping of lots of possible errors to appropriate 'Reactions'. **Thus 'Diagnosis Classes' are a set of carefully defined 'Reactions' that are provided to handle exceptional situations.**

Let us consider some examples to shed more light on the above approach:

1. We have to 'classify' **an encoder that we are not able to read** as severe so that it produces a reaction that includes switching off position control of all related drives:
  - If the encoder can not be read, the position of the respective drive is getting out of control and there is danger of colliding with other drives.

To minimize damage, we have to

- 'de-energize' the drive with the severe failure
  - ramp-down to standstill and de-energize additional drives that would be affected.
2. If **reading field-bus-signals fails**, that would be less grave than no communication with the encoder mentioned above:
    - PositionControl does not depend on 'field-bus', So it remains active in this case.
    - Danger of injury or damage comes from the fact, that we could miss –say- a stop signal for some of the drives under consideration due to 'No more field bus communication': For safety-reasons, ELAU's R&D engineers decided to stop the drives with a defined deceleration ramp in such cases
  3. We will 'classify' a **short-circuited Digital output** as to react on it by simply a message (- leaving further reaction to the user-program if necessary!):
    - PacController is still working properly, MotorControllers and Motors do not report any discrepancies and all conditions for Position Control are still given.
    - **In this case from the point of view of Automation System** there is no need to stop some movement or to switch off drives due to something 'getting out of control'.
    - ... the message about what happens is desirable for operators or service-staff to quickly find the source of the trouble!

Diagnostic class	Designation	Priority
1	Fatal error	high
2	Error resulting in complete shutdown	
3	Error resulting in single shutdown	
4	Error resulting in complete stop	
5	Error resulting in single stop (if error is triggered by an axis)	
6	Warning	
7	Message	low
8	Logger entry	None
9	Deactivated	None

Table 8-1: Designation of the diagnostic classes and their priority

The system assigns each diagnostic message a specific diagnostic class when enabled. The assignment can be overwritten with the user program (function DiagConfigSet() ).

The following restrictions apply when overwriting an assignment:

- Certain internal diagnosis codes ("Drives" with Reaction A, B and C) may only be assigned classes 1, 2 and 3 .
- Reaction (A ... E), related to diagnostic messages of type "Group 1xx - Drives" cannot be changed.
- Diagnostic class 8 is used by the system and may not be changed.

Certain system reactions are permanently assigned to each diagnosis class:

Class	1	2	3	4	5	6	7	8	9
Entry in message logger	X	X	X	X	X	X	X	X	-
best standstill of all drives	X	X	-	-	-	-	-	-	-
best standstill of the triggering drive	-	-	X	-	-	-	-	-	-
Error stop of all drives	-	-	-	X	-	-	-	-	-
Error stop of the triggering drive	-	-	-	-	X	-	-	-	-
Inform IEC program ( DiagMsgRead() function )	X	X	X	X	X	X	X	-	-
Activate ERROR LED	X	X	X	X	X	-	-	-	-
Configurable	X	X	X	X	X	X	X	X	X
Update diagnosis parameters of PacDrive controller	X	X	X	X	X	X	-	-	-
Update diagnosis parameters of drive	X	X	X	X	X	X	X	-	-

Table 8-2: Diagnosis classes and system reactions

### best standstill

If Enable (ControllerEnable and HW\_Enable) is removed, then DrivePeakC is the best way to stop the drive. If used for this purpose, **DrivePeakC** can be controlled with LimCurrent.

### Error stop

If ControllerStop becomes active, the drive is stopped with StopDec.

## 8.3 Reactions of "drives"

Errors in the "drives" diagnosis group have an additional reaction.

Reaction	Meaning	Diagnosis example
A	Motor immediately loses all torque; brakes engage immediately	119 "Short or ground circuit in output stage" (see 8.6.2.20 119 Short circuit or ground fault in output stage)
B	Best automatic stop: Motor brakes with maximum deceleration, brake engages at $n < n_{min}$ (10 revolutions/min) or after StopTimeLim (default: 400 ms); drive loses all torque after StopTimeLim + BrakeCouplingTime (default: 500 ms)	112 "Communication error real-time bus" (see 8.6.2.13 112 Communication error real-time bus)
C	If an overload occurs (Overload position), the reference position is set equal to the overload position and the axis moves to that position. The brake does not engage.	124 Overload (see 8.6.2.25 124 Power-Off due to overload)
D	Warning message to PacDrive controller; program can be used for controlled, synchronous standstill; if no reaction occurs, then a state class 1 error may result	125 "I <sup>2</sup> t motor warning" (see 8.6.2.26 125 "I <sup>2</sup> t motor warning)
E	Message	133 "Speed-dependent power reduction" (see 8.6.2.34 133 Speed-dependent power reduction)

See also: Servo amplifier time diagram

### 8.3.1 Time diagram for reaction "A"

In case of an error with reaction "A" (1), the Axis is immediately switched to a torque-free state, the brake reacts and the ready contact is opened. When the brake coupling time (parameter BrakeCouplingTime) has expired (2) and the axis comes to a stop (actual speed  $< n_{min}$ ) (3), the state of the device (parameter DeviceState or **MC4State**) is switched to the state 0x02. From this state, the axis can return to the control state after acknowledgement of the diagnostic message.

With the CoastOption (see IEC library "System" > Function **CoastOptionSet**) for the brake, the brake will not engage until the device is standing still (4: actual speed  $< n_{min}$ ). After expiry of the brake coupling time (parameter **BrakeCouplingTime**) the **DeviceState** is switched to 0x02. The same reaction is achieved if the CoastOption for enabling is activated (**bEnableCoast** = TRUE) when enable is lifted or if the CoastOption for reaction "B" (**bErrorCoast** = TRUE) is activated in case of an error with reaction "B".

The axis behavior depends on whether the motor is equipped with a holding brake or not.

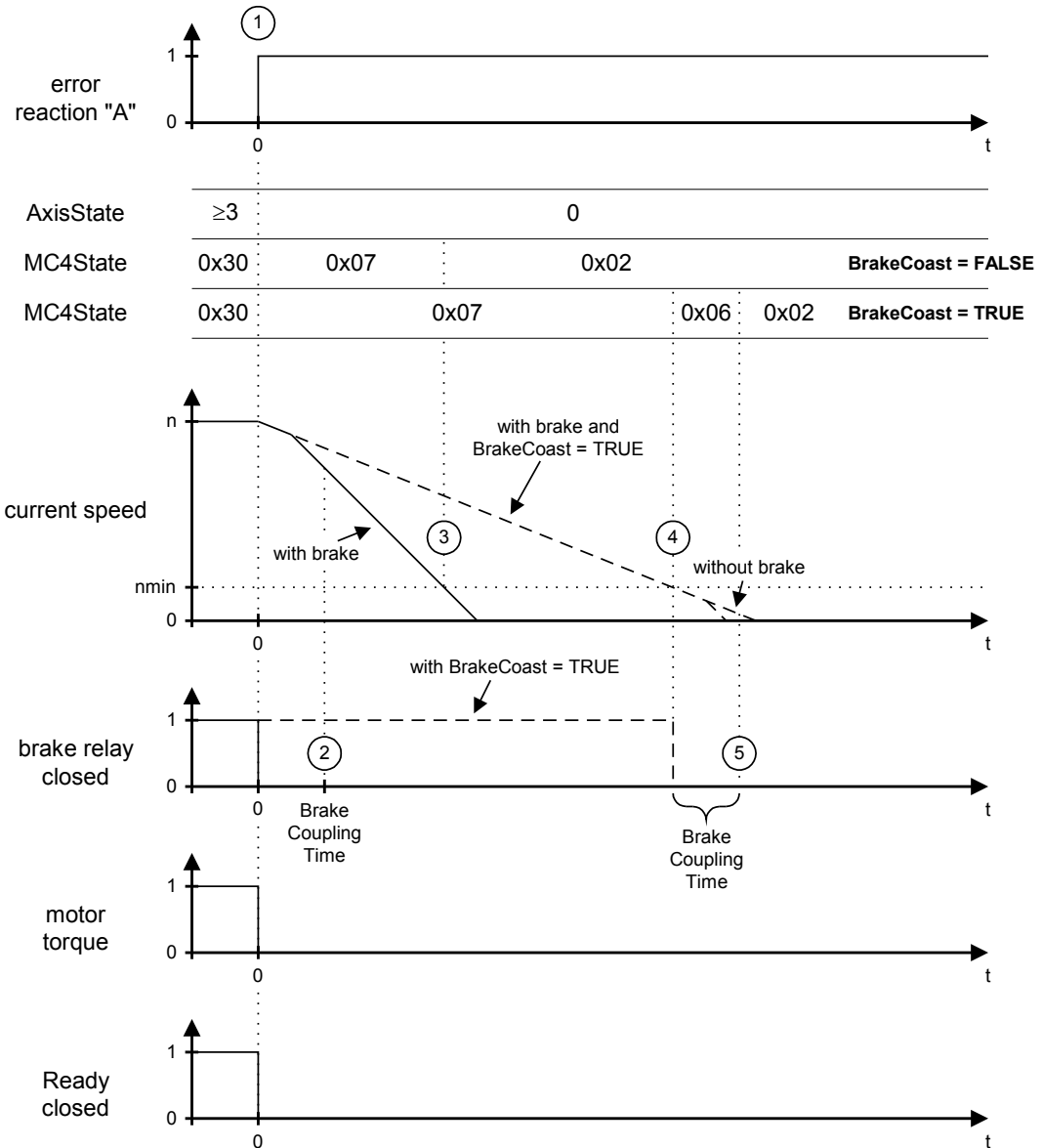


Figure 8-1: Time diagram for reaction "A"

### 8.3.2 Time diagram for reaction "B"

In case of a diagnostic message with reaction "B", to sequences can occur.

#### Ramping down within the maximum ramp-down time

In case of an error with reaction "B" (1), the axis ramps down at maximum current and the ready contact is opened. The axis comes to a standstill before expiry of the maximum ramp-down time (parameter `StopTimeLim`) (4). As soon as the actual speed becomes lower than the speed threshold (actual speed  $< n_{min}$ ) (2), the brake relay is released. After expiry of the brake coupling time (parameter `BrakeCouplingTime`) (3), the motor is switched to a torque-free state.

In this way, error free ramping down is performed if the CoastOption (see IEC library "System" > Function `CoastOptionSet`) for reaction "B" is not active (`bErrorCoast = FALSE`).

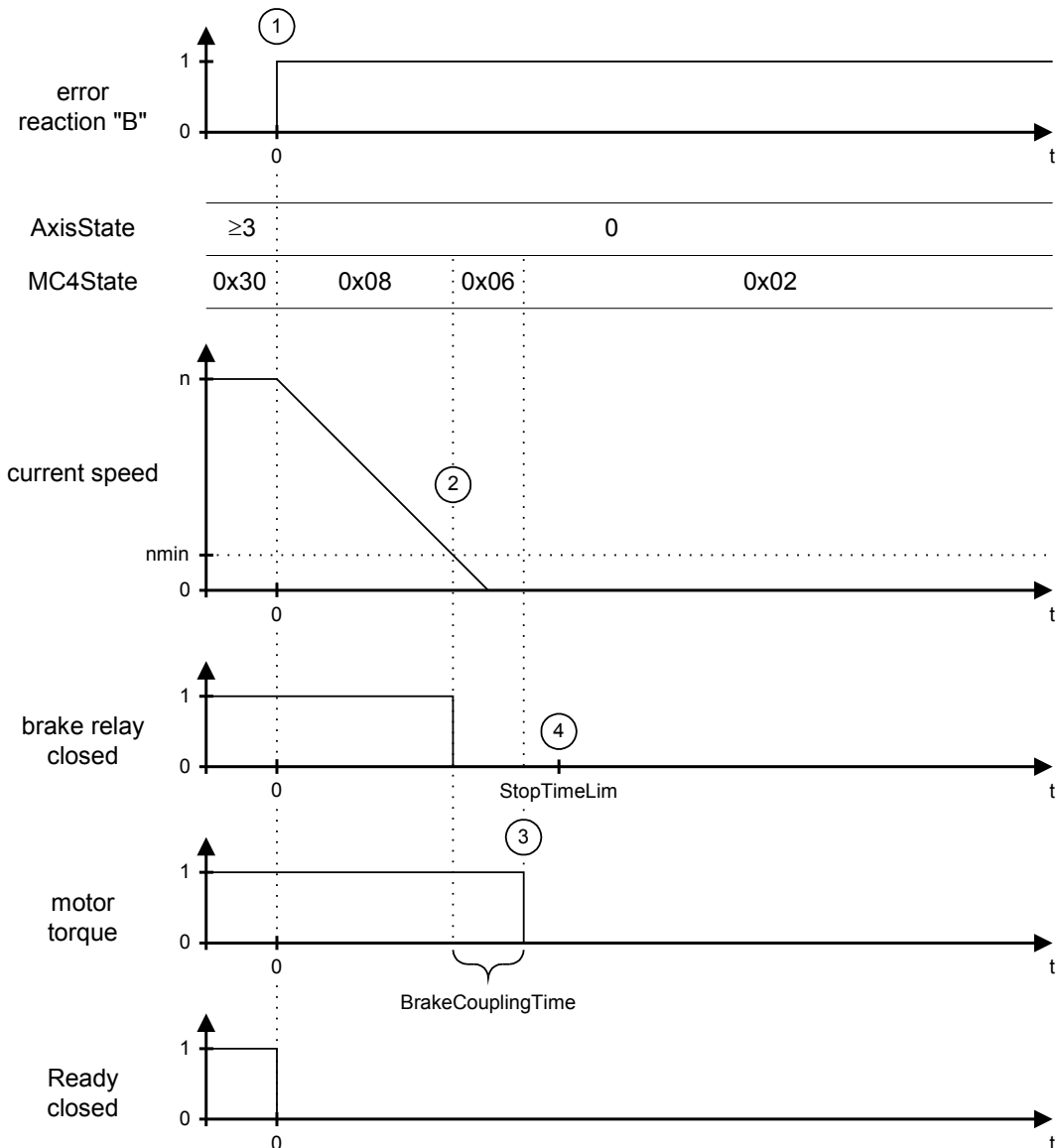


Figure 8-2: Time diagram for reaction B (Ramping down within the max. ramp-down time)

### Maximum ramp-down time exceeded

In case of an error with reaction "B" (1), the Axis ramps down at maximum current and the ready contact is opened. The axis does not come to a standstill before expiry of the maximum ramp-down time (parameter `StopTimeLim`) (2) (actual speed <  $n_{min}$ ).

Therefore, the brake relay is opened and error message 140 "Ramp-down time exceeded" (see 8.6.2.41 140 Ramp-down braking time exceeded) is triggered. As an error with the same reaction is already active, however, this error message does not have an effect on the axis. After expiry of the brake coupling time (parameter `BrakeCouplingTime`) (3), the motor is switched to a torque-free state.

In this way, during the maximum ramp-down time plus brake coupling time, ramping down is performed in a controlled and subsequently stopping is performed in an uncontrolled way (drive coasts to standstill). This only applies if `CoastOption` (see IEC library "System" > Function `CoastOptionSet`) for reaction "B" is not active (`bError-Coast = FALSE`). Uncontrolled stopping does not result in an error message.

The drive behavior during uncontrolled stopping depends on whether the motor is equipped with a holding brake or not.

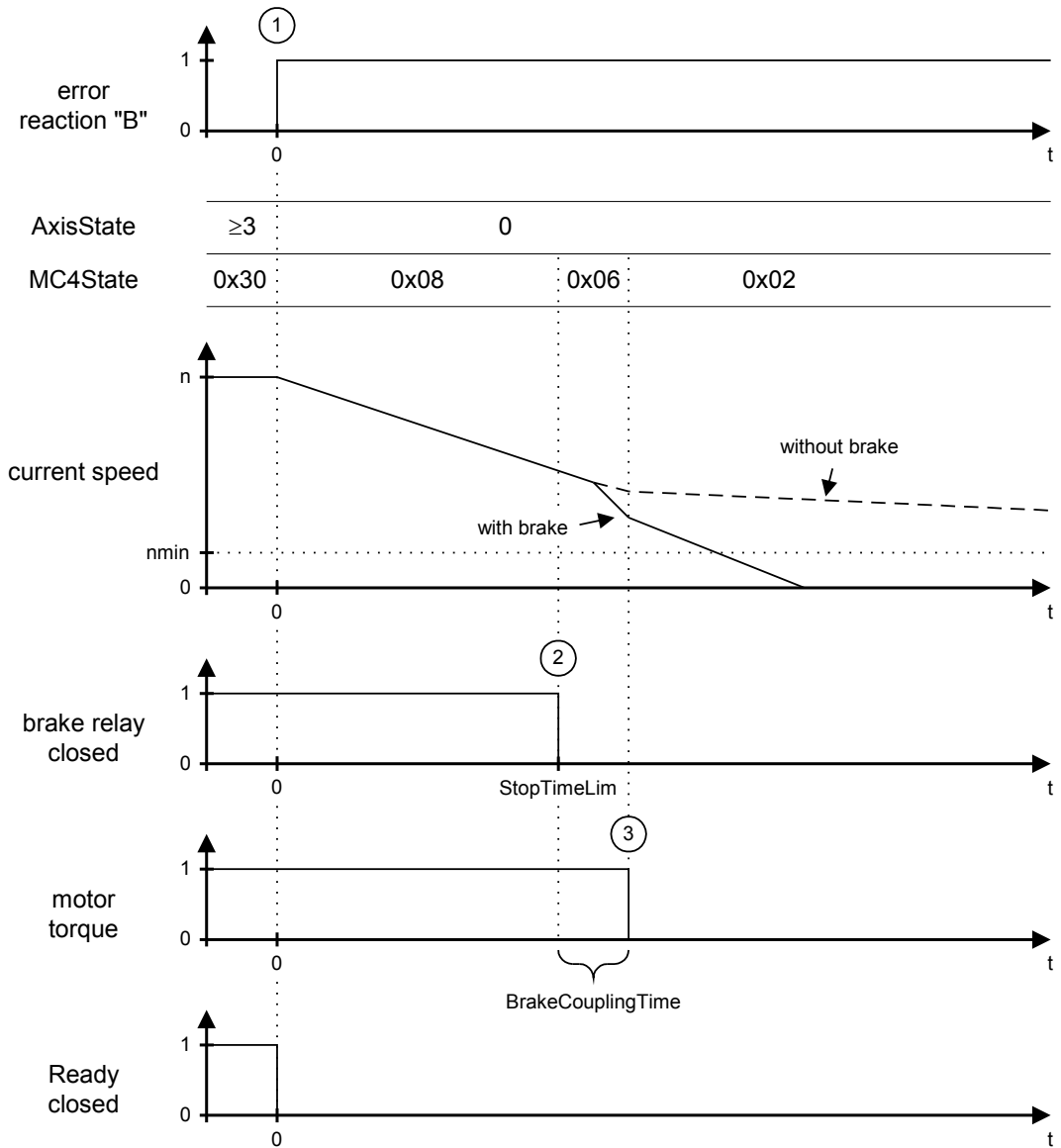


Figure 8-3: Time diagram for reaction "B" (maximum ramp-down time exceeded)

### 8.3.3 Shutting off

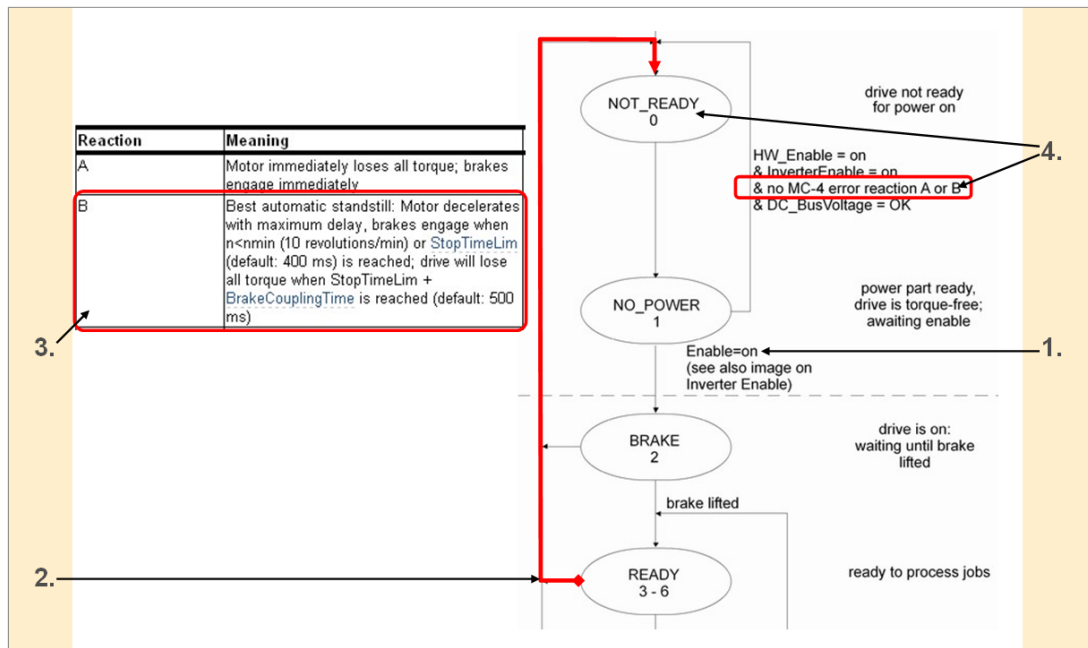


Figure 8-4: The system switches off the drive due to reaction A or reaction B (see parameter *AxisState*)

1. Condition 'Enable' goes FALSE due to detection of an error with certain 'severity'.
2. AxisState moves from '3' to '6' then finally to '0' due to the lost condition
3. According to 'severity', the drive is disengaged following the above rules.  
**Note: The system will drop the Ready-Contact if MC-4 errors with reaction A and B occur! ... thus de-energizing all drives 'fed' from the respective MainsContactor!**
4. AxisState is stuck at '0' due to 'error reaction ...'

... and once the system should be stuck in State "0", inspection of the respective group of conditions within the 'State Folder' of PLC-Configuration will tell us how to proceed!

### 8.3.4 Stopping

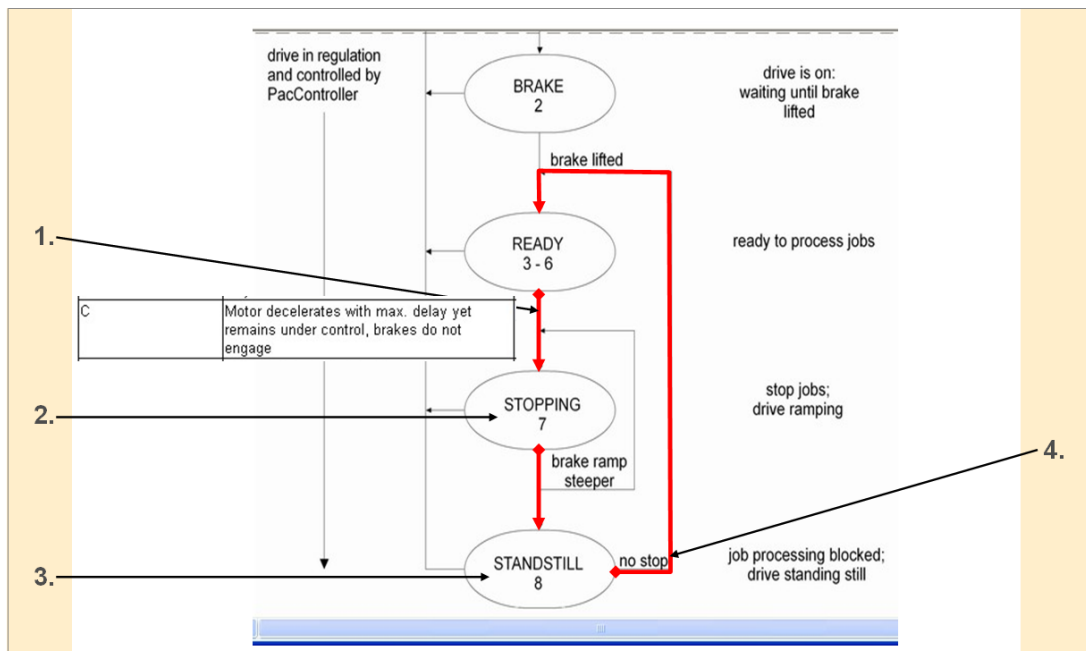


Figure 8-5: The system stops the drive due to errors with reaction C (see parameter **Axis-State**)

1. 'Controller Stop' required due to 'Reaction' „C“.
2. Drive in 'deceleration-phase'
3. Drive stopped and still in PositionControl; System 'refuses' moving instructions.
4. Error removed and DiagMsg acknowledged: Back to accepting & processing moving instructions.

### 8.3.5 De-energizing the axes

Under certain circumstances Health & Safety Regulations imperatively require 'de-energizing' the machine to prevent injury to people.

## CAUTION

Thus the Automation System provides an interface to the according Safety Wiring and System Behaviour covers de-energizing depending on the current DiagnosisClass!



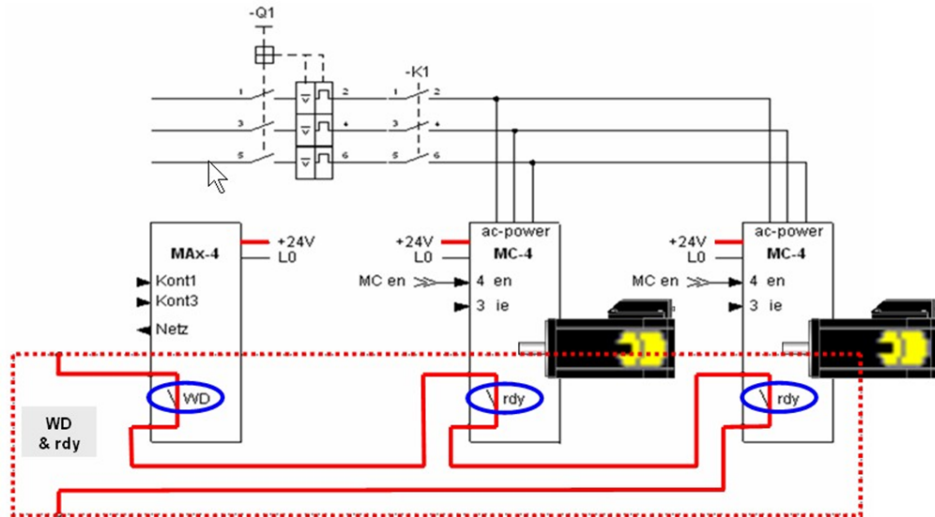


Figure 8-6: Safety Wiring: WD and rdy

**CAUTION**

'rdy' and 'WD' contacts in the above sketch will drop, if there is either a DiagMsg launching ErrorReaction A or B or if one of the components fails.

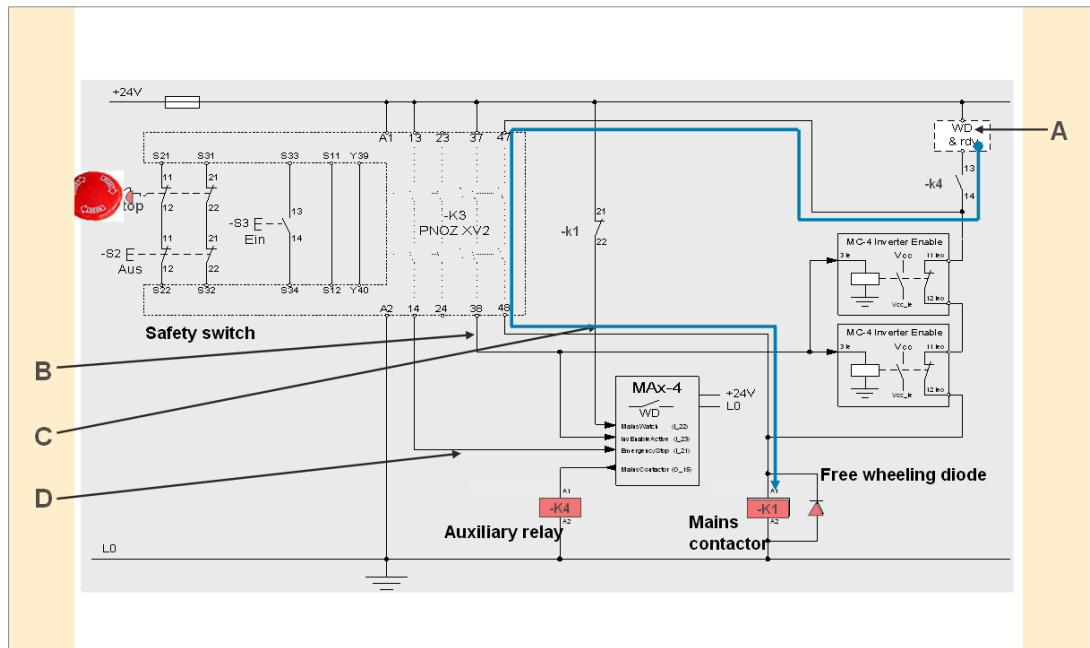


Figure 8-7: Safety Wiring

- A** Interface between *Safety Wiring* and *ErrorReactions*
- B** I\_InvEnableActive : I\_23
- C** I\_MainsWatch : I\_22
- D** I\_EmergencyStop : I\_21

If one of the contacts of the 'WD & rdy'-block drops, **either the MainsContactor or the "MC-4 InverterEnable"-relais will drop**. Both of them will de-energize the drives!

“MC-4 Inverter Enable” The “MC-4 Inverter Enable” locks the PowerStage of the respective MotorController –**thus de-energizing the motors immediately!**- while leaving MainsContactor engaged!

## 8.4 Device display elements (LEDs)

The LEDs signify various operating states or errors.

A more detailed description of the LEDs can be found in the device-specific operating instructions (or under "PacDrive devices" in the Online Help).

The following LEDs are available:

- **pow** (control voltage indicator)  
Devices: MAx-4, C200, C400, C600, P600 controllers / MC-4 servo amplifier, SCL integrated servo drive, iSH intelligent servo module, PS-4 power supply, PS-5 power supply
- **wd** (watchdog indicator)  
Devices: Controllers MAx-4, C200, C400, C600, P600
- **err** (error display)  
Devices: MAx-4, C200, C400, C600, P600 controllers / MC-4 servo amplifier, SCL integrated servo drive, iSH intelligent servo module, PS-4 power supply, PS-5 power supply
- **bus err** (SERCOS real-time bus error display)  
Devices: MAx-4, C200, C400, C600, P600 controllers / MC-4 servo amplifiers, PS-4 power supply, PS-5 power supply
- **slink** (SERCOS link display)  
Devices: PS-5 power supply:
- **serr** (SERCOS bus error display)  
Devices: PS-5 power supply:
- DC bus residual voltage display  
Devices: PS-5 power supply, Distribution Box DB-5
- **slink / pow** (status display)  
Devices: Distribution Box DB-5
- **slink / serr** (status display)  
Devices: Distribution Box DB-5

### 8.4.1 LED red "bus err" (SERCOS real-time bus error)

The "bus err" – LED (SERCOS) on PacDrive components allows fast and easy detection when a fiber-optic cable is interrupted or the intensity setting for a transmitter in the SERCOS loop is incorrect. The LED turns off when error-free telegrams are received. After booting, the master starts to send telegrams continuously. At this point, all "bus err" LEDs of the SERCOS slave (PacDrive Controller, Servo amplifier, and others) must be OFF.

## CAUTION

The status of the "bus err" LED is undefined during the boot procedure. The "err" – LED indicates when the boot procedure is complete. The "err" – LED switches on when the BIOS starts. Once the operating system, user configuration, user parameters and the IEC program have been loaded and the IEC program has been started successfully the err LED will switch off again. The boot procedure is now complete.

### Operating principle

- When the fiber-optic ring is closed and the light output at the receiver is optimal, the LED is off.
- If the light output at the receiver is too high or too low (high damping), the LED will glow dimly.
- The further away the light output moves from the optimal reception point (i.e. too much or too little light output), the brighter the LED glows.
- The LED will glow at its brightest if the fiber-optic ring is interrupted.

Flickering or continuous light indicates a problem with the SERCOS input of the device.

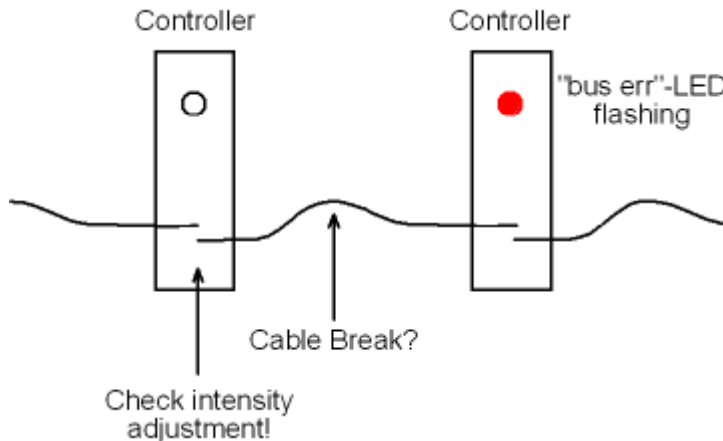


Figure 8-8: "bus err" – SERCOS slave LED (e.g. MC-4 servo amplifier) flashes

Other problems in the ring can be detected via the "err" LED of the SERCOS master (e.g. C400 controller).

## 8.5 Acknowledging diagnosis messages

There are two ways to acknowledge diagnosis messages:

- EPAS-4 > Online > Reset diagnostic message
- Function DiagQuit()

### ⚠ CAUTION

#### POSITION LOSS DUE TO SERIOUS SERCOS BUS ERROR!

- Acknowledge the diagnosis message only after the re-initialization or referencing of the system is secured by the IEC program.
- The capability to acknowledge the diagnostic message can be switched off with the function DiagNoQuitSet().
- If necessary, use the SysReset() or the PrgResetAndStart().

**Property damage possible!**

**Due to the erroneous acknowledgement of diagnostic message 506 "Serious SERCOS error (MASTER)", without restarting the controller, loss of position of the axes and physical encoder (SinCos, incremental encoder) from V00.15.00 is possible.**

Please note that acknowledging a diagnostic message does not eliminate the cause of the error. Acknowledgement serves to confirm that I have "seen" the message. By acknowledging, the diagnostic message in the PacDrive system will be deleted. If the

cause for the diagnostic message continues to exist, this diagnostic message will be recognized in the PacDrive system again.

Nr.	Zeitmarke	Typ	Objekt	Instanz	Diag. Code	Ext. Diagnose	Meldungstext
17	Mi 08. Dez 2004 08:00:51.923	0x0002	MC_4	Servo1	1118		Fehler auf ser. Schnittstelle zum Geber
16	Mi 08. Dez 2004 08:00:51.923	0x0002	MC_4	Servo1	1105		Feedbackfehler (Spurüberwachung)
15	Mi 08. Dez 2004 08:00:51.897	0x0002	LZ5	LZ5	8001	Error Quit	Diagnosequittung
14	Mi 08. Dez 2004 08:00:37.032	0x0002	MC_4	Servo1	1118		Fehler auf ser. Schnittstelle zum Geber
13	Mi 08. Dez 2004 08:00:37.032	0x0002	MC_4	Servo1	1105		Feedbackfehler (Spurüberwachung)

Figure 8-9: Message logger example for diagnostic messages produced again following acknowledgement

With the following errors it is also necessary to reset the triggering device for reasons of safety or due to the far reaching consequences of the error. This occurs with the reset button on the device or by switching the device's control voltage off and on again.

- 105 "Feedback error (track monitoring)"
- 107 "over-current"
- 113 "Bleeder defective"
- 114 "Reading error EEPROM"
- 115 "Gate-power failure"
- 117 "Reading error encoder EEPROM"
- 118 "Error on ser. interface to encoder"
- 119 "Short or ground circuit in output stage"
- 138 "Prohibited motor"
- 144 "DC bus short circuit"
- 145 "DC bus ground circuit"
- 148 "Internal voltage error 15V"
- 160 "Under voltage power stage driver"
- 202 "Faulty configuration file"
- 203 "Faulty parameter file"
- 207 "Hardware module does not exist"
- 209 "Last boot failed"
- 300 "Division error" up to 312 "Parameter relocation failed"
- 700 "CAN Layer2 driver error"
- 701 "CAN Layer2 init error"
- 721 "Module not ready"
- 723 "No Profibus config data"
- 730 "Bad master parameter data"
- 731 "Automatic bus deactivation"
- 737 "Double IEC address assigned"
- 738 "Config. IO data > permitted IO range"
- 739 "Double profibus address assigned"
- 752 "No CanOpen EDS file exists"
- 753 "Initialization CanOpen module failed"
- 826 "Error during PIC FW update"
- 900 "Software error (suspend task)"
- 901 "Software error (invalid opcode)"
- 902 "Software error (page fault)"
- 904 "Software error (class 1)"

## 8.6 Diagnostic messages

### 8.6.1 0xx "Messages" diagnostic messages

**001 Diagnosis acknowledgement**

A diagnostic message was acknowledged.

The "001 diagnosis acknowledgement" message is always entered in the message logger even if the diagnosis class (see 8.2 The Notion of 'Diagnosis Classes') of the message was set to 9 using the DiagConfigSet() function.

**002 PacController boot started**

The PacDrive controller was restarted.

In V00.15.00 or higher, the firmware version is shown in the ext. diagnosis in the message logger (e.g. FW V00.15.00).

**003 PacController boot finished**

The startup procedure for the PacDrive controller is complete.

In V00.15.00 or higher, the kernel version is shown in the ext. diagnosis in the message logger (e.g. V00.02.05 MAx4).

**004 IEC program started**

The IEC program in the PacDrive controller was restarted.

**005 automatic program start active**

The autom. program start of the IEC program is active in the PacDrive controller.

**006 IEC program stopped**

The IEC program in the PacDrive controller was stopped.

**007 login**

A login to the PacDrive controller was performed. The application that performed the login (e.g. EPAS-4) is shown in the extended diagnosis.

**008 logout**

A logout from the PacDrive controller was performed. The application that performed the logout (e.g. EPAS-4) is displayed in the extended diagnosis.

**009 IEC program reset**

A program reset was triggered with EPAS-4.

**010 write file**

File transfer via communication server. The file name is displayed in DiagExtCode.

**011 connect to WEBS**

Connecting to webserver.

**012 disconnect from WEBS**

Disconnecting from webserver.

**013 connect to TCP/IP server**

Connecting to communication server of PacDrive controller.

**014 disconnect from TCP/IP server**

Disconnecting from communication server of PacDrive controller.

**015 filesystem <ide0:> repaired**

Error in filesystem detected and corrected.

<b>CAUTION</b>
The filesystem is consistent again. This may also mean that files have been deleted.

**016 system reset**

warm start

**017 CanOpen emergency message reset**

A CANopen node has sent a CANopen emergency message reset to the bus.

Meaning of ext. diagnosis:

The system displays the node address, the error code and the error register.

Structure: Nxxx Cxxxx Rxx

**N node address** decimal CANopen node address

**C error code** hexadecimal CANopen error code

**R error register** hexadecimal CANopen error register.

**018 CanOpen node guarding error resolved**

A CANopen node has sent a CANopen emergency message reset to the bus.

Function DiagQuit()

Meaning of ext. diagnosis:

The system displays the node address, the error code and the error register.

Structure: Nxxx Cxxxx Rxx

**N node address** decimal CANopen node address

**C error code** hexadecimal CANopen error code

**R error register** hexadecimal CANopen error register.

#### **019 CanOpen node-specific error info**

A CANopen node has sent an emergency message to the bus. This diagnosis message is always sent with the 754 "CanOpen emergency message" (see 8.6.8.30 754 CanOpen emergency message) diagnosis message. It contains manufacturer-specific error data. This data consists of 5 byte values.

Meaning of ext. diagnosis:

Structure: b1 b2 b3 b4 b5

**b1-b5** hexadecimal data

#### **020 IEC cycle check changed**

The CycleCheckSet() function was used to enable/disable the cycle check. TRUE or FALSE is displayed in DiagExtCode.

#### **021 IEC cycle check values are changed**

The CycleCheckSet() function was used to change the times for monitoring single and excessive cycles time overruns. The file name is displayed in DiagExtCode.

#### **022 Calling SetTaskPriority()**

The SetTaskPriority() function has been called up.

#### **023 system shutdown**

SysShutdown is used via:

- IEC function: SysShutdown()
- UPS shutdown

#### **DiagExtMsg: Windows**

If Windows XP is shut down while the real-time system is running, then the message in the P600 PacDrive controller may have other causes:

- Supply voltage is 0V => UPS shuts P600 down
- The startup procedure for the PacDrive controller is complete.

Up to version V00.16.xx diagnosis message 8016 "System reset" was set.

#### **024 modem connected**

Successful connection through a modem.

#### **025 modem disconnected**

Disconnection via a modem.

**026 user exception**

The function SysUserCallStack() caused an entry in the message logger. The value the function delivers is available in "Ext. Diagnosis" in the message logger. The message logger call hierarchy function can be used to "backtrace" the function block call or nesting.

**027 open write file**

**028 close write file**

**029 UPS ok**

UPS monitoring reported "UPS ok" (State = 1).

**030 UPS active, no power**

UPS monitoring reports that no power is available (State = 3).

**031 UPS power ok**

UPS monitoring reports that power is available.

**032 Begin saving retainarea**

At shutdown, via UPS monitoring, saving retain area was started.

**033 Retainarea saved**

At shutdown, via UPS monitoring, saving retain area was terminated.

**034 IEC-tasks terminated**

At shutdown, via UPS monitoring, the IEC tasks were terminated.

**035 UPS active - system shutdown started**

At shutdown, via UPS monitoring, the O\_OffValue output was set to switch off the UPS.

**036 Rebooting started**

At shutdown, via UPS monitoring, the power supply of the PacDrive controller was found to be OK. A reboot of the PacDrive controller was initiated.

**037 Battery low**

The battery power is below the minimum permitted value.

- The battery voltage is too low.



- ▶ Change the battery for the PacNet optional module PN-4.

### 038 Power fail

- A power failure has occurred at the NvRam and the real-time clock (RTC). The NvRam has been deleted and the system time is incorrect.
- The system was shut off for too long and the battery power is too low (see 8.6.1.37 037 Battery low).
- ▶ Retain range and reinitialize clock.
- ▶ Change the battery for the PacNet optional module PN-4.

### 039 file removed

Filter type 13 "extended system messages"

The system has deleted a file. Deletion is triggered when, for example, there is a symbol file that does not match the program file.

The file name is shown in **Ext. Diagnosis**.

### 040 file copied

The system copied a file. The "Boot.sbd" symbol file is copied to "Download.sbd" when, for example, Online-Change is executed without downloading a program and the system is reset (boot procedure).

### 041 file renamed

The system renamed a file.

### 042 SERCOS phase changed

A SERCOS phase change has occurred. The message logger Ext. diagnosis, the new phase is displayed (e.g. Phase=4).

DiagExtCode	Meaning
Phase=0	Phase change after Phase 0
Phase=1	Phase change after Phase 1
Phase=1/4MBd	Tells you the baud rate in V00.24.00 and higher
Phase=1/xxx	Internal error xxx during phase change after phase 1
Phase=2	Phase change after Phase 2
Phase=2/L=25%	Tells you the SERCOS cycle load in percent in V00.22.00 and higher
Phase=2/xxx	Internal error xxx during phase change after phase 2
Phase=3	Phase change after Phase 3
Phase=3/2ms	Tells you the SERCOS cycle time in V00.24.00 and higher
Phase=3/xxx	Internal error xxx during phase change after phase 3
Phase=4	Phase change after Phase 4
Phase=4/xxx	Internal error xxx during phase change after phase 4
Phase=5	Phase change after Phase 5
Phase=5/xxx	Internal error xxx during phase change after phase 5

*Table 8-3: Possible values for DiagExtCode for diagnostic message 042 "SERCOS phase change"*

**"Phase=<Phase number>/<internal error number>":**

- An error occurred when the phase changed.
- ▶ Check the message logger for other SERCOS diagnostic messages.
- ▶ Note the description of these diagnostic messages.

**"Phase=1/-<internal error number>":**

- SCL-055 motors are connected to the PacDrive controller. The connection of the SCL-055 motors in the PacDrive PD-8 box is not correct.
- ▶ Check the connection of the SCL-055 motors in the PacDrive PD-8 box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position.
- ▶ Observe also the information outlined in the "SCL" and "PS-4 and PD-8" operating manuals.

**043 Detect SERCOS configuration**

The SERCOS configuration is being detected. During the detection a scan is processed.

Ext. diagnosis	Meaning
Start	Configuration scanning started.
Position	The physical address of the instance in the SERCOS loop and the device type is shown (e.g. instance "SLAVE1" Pos=03,Type=MC4). If the device type cannot be determined, then "Type=yyy" is eliminated. In controller version 00.23.00 or lower, the device type is not displayed.
End	Configuration scanning stopped.
No slaves	No SERCOS slaves found.
Duplicate	There are several devices with the same address in the SERCOS loop. The additional "xxx" indicates the loop position in which the last device with a duplicate address was found.

*Table 8-4: Meaning of ext. diagnosis:*

**044 SERCOS firmware download**

A firmware download is being executed from the PacDrive controller to a SERCOS bus slave.

The message logger Ext. diagnosis shows the following values:

- DL start -> Firmware download started
- DI x OK -> Successful firmware download to slave x (x is the RealTimeBusAdr)

**045 error by writing in file**

An error has occurred while writing in a file.

- Insufficient memory space.
- ▶ Check to see that memory capacity is sufficient (parameter RamDiskFree, Disk-free).
- ▶ Increase the RamDiskSize.  
(the default size has been increased from 128 kBytes to 1 MByte in V00.16.10 and higher).
- An attempt was made to write a trace file to the RAM disk ("ram0").

- ▶ Increase the RamDiskSize.  
(the default size has been increased from 128 kBytes to 1 MByte in V00.16.10 and higher).

#### 046 FPGA firmware download

This diagnosis message is triggered after the FPGA (C400, C600 and P600) is programmed or an error occurs.

The various causes for this message are displayed through different external diagnosis codes. Below is a summary of all external diagnosis codes along with their causes and means of correction:

**DiagExtCode: C6\_xpXX.esv (z.B. C6\_0301.esv) oder C6\_xpXX.xsv (z.B. C6\_0301.xsv)**

- The FPGA firmware was programmed successfully. The DiagExtCode now indicates the name of the programmed FPGA file.
- ▶ -

**DiagExtCode: PinOut <> "p" (e.g. PinOut <> 3)**

- No C6\_xpXX.xsv file with a matching pinout was found on the flash disk (C400 or C600) or hard disk. (P600). xpXX corresponds to the FPGA firmware version. The FPGA programming was not executed. The PinOut number "p" contained in the file name indicates the required hardware version. i.e. a certain hardware version is required for an FPGA version.
- ▶ Contact ELAU customer service to obtain the correct FPGA version for your hardware.

#### 047 PIC firmware download

The firmware of the PIC controller (on the PacDrive controller C400, C600 or P600) is being replaced. The extended diagnosis code shows the name of the firmware file (e.g. "c6p\_0510.bin").

If an error occurs during the firmware exchange, the 826 "PCI update error" (see 8.6.9.27 826 Error During PIC FW Update) diagnosis message will be triggered.

#### 048 BT-4 firmware download

The firmware of the **BT-4/DIO1** or **BT-4/ENC1** bus terminal is being exchanged.

In the following HW versions or higher, an automatic FW update of the connected **BT-4/DIO1** bus terminal is possible with controllers C600, C600, C-4 and P1:

- P600/C600/C400 with FPGA version x311 or higher
- C200 with FPGA version x209 or higher

Other requirements:

- Firmware file for **BT-4/DIO1**: "BD1\_xxxx.ESV"
- Firmware file for **BT-4/ENC1** : "BE1\_xxxx.ESV"

To execute the update, the firmware file for the **BT-4/DIO1** or **BT-4/ENC1** bus terminal must be copied to the root directory of the controller. The update will be automatically executed at the next startup.

*Duration of the update* Controllers C400, C600 and P600: about 1 minute / bus terminal  
Controller C200: approx. 3.5 minutes / bus terminal

## CAUTION

After the update, all BT-4/DIO1 or BT-4/ENC1 bus terminals must be switched off and on. A standard reset on the controller is sufficient.  
The update will only be executed if a bus terminal has a differing firmware version.

### 050 No reaction from Windows

Windows did not react within the WinWatchDog time. The control task can react to certain events in a fast task.

### 051 Controller type

The PacDrive controller was restarted (rebooted). Shortly before the start procedure ends, the controller type will be saved as a diagnosis message in the message logger.

#### Example:

Max4/FPGA/=130f/CPU=581/AX=8/RAM=32/NRAM=32/DiskS=16

## CAUTION

The controller type may not be displayed in full, as the message text does not have enough characters.

### 052 Extended SERCOS diagnosis (MASTER)



The "extended SERCOS diagnosis (MASTER)" is no longer needed. Use **PacDrive Diagnostics** (SERCOS topology) and the RDISTCounter, RERRCounter, FIBBR-Counter, MSTLateCounter and MSTEarlyCounter parameters of the SERCOS slave devices for debugging.

As it is very difficult to get an exact SERCOS diagnosis and localize communication errors, especially when complex errors occur in pure SCL systems, the first stage for extended diagnosis functions was implemented in V00.16.30.

#### Operating principle

If a communication error occurs, the controller will, at specified times, record the error counter in the SERCOR memory and the pending error events (error interrupts) in the SERCOS registers.

At first, these times refer to the occurrence of the first fault as a simple cycle error. Secondly, they refer to the occurrence of a multiple cycle error, which results when simple cycle errors occur directly after each other. Finally, a recording is made directly before the controller returns to phase 0.

These recordings are displayed in the message logger. To prevent these messages from being displayed when a machine is shut down intentionally, they will be displayed with a delay of 10 seconds and then triggered at a lower priority level. If during this time the pending errors are acknowledged, the message will also be displayed without delay.

#### Voraussetzungen

The following requirements must be observed when using the extended SERCOS diagnosis:

- PacDrive controller – firmware version V00.16.30 or higher
- EPAS-4 as of V 16.22 or higher (PacControl CD V16 SP3)

## Operation

**Activation** To activate the extended SERCOS diagnosis, the Bit0 of the TestSwitch1 must be set to 1 in the PLC configuration.



The Testswitch1 may only be set in version V00.16.30 / V00.16.40 or higher. In versions above V00.16.40, expect the Testswitch to have a new purpose with different functions! The support of "Extended SERCOS diagnosis" in a newer firmware version is no longer required.

Nr.	Name	Wert	Einheit	Bereich
1	AutoRun	nein / FALSE		
2	Language	deutsch / 0		deutsch /
3	IP_SubNetMask	255.0.0.0		
4	IP_Address	10.205.100.107		
5	IP_Gateway	0.0.0.0		
6	EthernetAdr	00e03351-0102		
7	TestSwitch	16#0		16#0 - 16
8	TestSwitch1	16#1		16#0 - 16
9	MsgFilter	16#FFFF		16#0 - 16
10	ControllerReset	wahr / TRUE		
11	Com1User	Auto / 2		Epas-4 / 0
12	Com1UserState	Auto -> Search / 3		Init / 0 - /
13	RetainInit	bei Download / 1		nach Dow
14	ICReset	nach Download oder Prg. Reset / 2		kein Rese

Figure 8-10: Set TestSwitch1 parameter to 1 (V00.16.30 / V00.16.40)

The display filter settings in the message logger must continue to include the 5th entry ("additional SERCOS diagnosis"):

Nr.	Zeitmarke	Typ	Objekt	Instanz	Diagg. Code	Ext. Diagnose	Meldungstz
325	Mi 11. Aug 2004 14:01:12.066	0x1000	SERC	RTB	8042	Phase=1	SERCOS Pr...
324	Mi 11. Aug 2004 14:01:10.510	0x1000	SERC	RTB	8042	Phase=0	SERCOS Pr...
323	Mi 11. Aug 2004 14:01:01.673	0x1000	SERC	RTB	8042	Phase=4	SERCOS Pr...
322	Mi 11. Aug 2004 14:01:00.904				8042	Phase=3	SERCOS Pr...
321	Mi 11. Aug 2004 14:00:57.032				8042	Phase=2	SERCOS Pr...
320	Mi 11. Aug 2004 14:00:40.948				8042	Phase=1	SERCOS Pr...
319	Mi 11. Aug 2004 14:00:47.392				8042	Phase=0	SERCOS Pr...
318	Mi 11. Aug 2004 14:00:38.581				8042	Phase=4	SERCOS Pr...
317	Mi 11. Aug 2004 14:00:37.830				8042	Phase=3	SERCOS Pr...
316	Mi 11. Aug 2004 14:00:33.968				8042	Phase=2	SERCOS Pr...
315	Mi 11. Aug 2004 14:00:25.884				8042	Phase=1	SERCOS Pr...
314	Mi 11. Aug 2004 14:00:24.328				8042	Phase=0	SERCOS Pr...
313	Mi 11. Aug 2004 14:00:15.492				8042	Phase=4	SERCOS Pr...
312	Mi 11. Aug 2004 14:00:14.740				8042	Phase=3	SERCOS Pr...
311	Mi 11. Aug 2004 14:00:10.677				8042	Phase=2	SERCOS Pr...
310	Mi 11. Aug 2004 14:00:02.793				8042	Phase=1	SERCOS Pr...
309	Mi 11. Aug 2004 14:00:01.237	0x1000	SERC	RTB	8042	Phase=0	SERCOS Pr...
308	Mi 11. Aug 2004 13:59:52.408	0x1000	SERC	RTB	8042	Phase=4	SERCOS Pr...

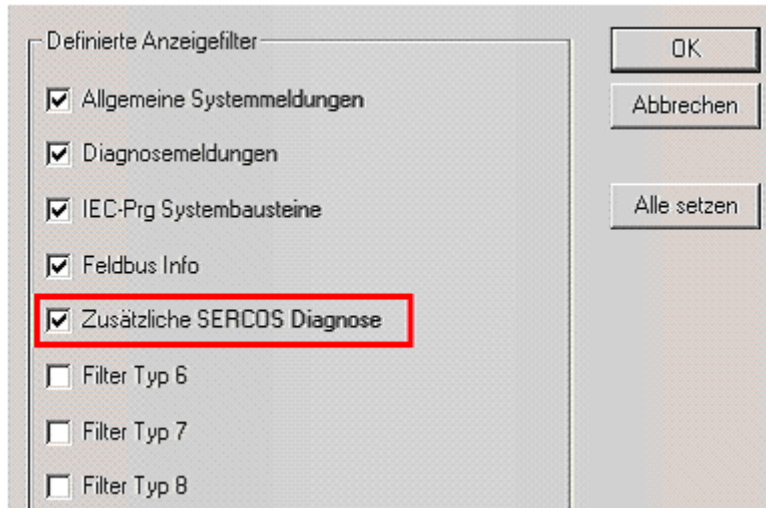


Figure 8-11: Set the filter in the message logger for "additional SERCOS diagnosis".

However, the filter settings should correspond to the basic settings in EPAS-4 V16 SP3 or higher.

**Evaluation** After a SERCOS cycle error occurs, entries can be found in the message logger in a way similar to the figure below:

Nr.	Zeitmarke	Typ	Objekt	Instanz	Diag. Code	Ext. Diagnose	Meldungstext
19	2:01.380	0x0010	SERC	RTB	8052	r=18	Erweiterte SERCOS Diagnose
18	2:01.376	0x0010	SERC	RTB	8052	R=17	Erweiterte SERCOS Diagnose
17	2:01.376	0x0010	MC_4	Axis_3	8052	nerr=0	Erweiterte SERCOS Diagnose
16	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=18	Erweiterte SERCOS Diagnose
15	2:01.376	0x0010	MC_4	Axis_1	8052	nerr=0	Erweiterte SERCOS Diagnose
14	2:01.376	0x0010	SERC	RTB	8052	0:111352ms	Erweiterte SERCOS Diagnose
13	2:01.376	0x0010	SERC	RTB	8052	r=2	Erweiterte SERCOS Diagnose
12	2:01.376	0x0010	SERC	RTB	8052	R=1	Erweiterte SERCOS Diagnose
11	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=2	Erweiterte SERCOS Diagnose
10	2:01.376	0x0010	SERC	RTB	8052	M:111288ms	Erweiterte SERCOS Diagnose
9	2:01.376	0x0010	SERC	RTB	8052	r=1	Erweiterte SERCOS Diagnose
8	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=1	Erweiterte SERCOS Diagnose
7	2:01.376	0x0010	SERC	RTB	8052	S:111284ms	Erweiterte SERCOS Diagnose
6	1:51.372	0x1000	SERC	RTB	8042	Phase=0	SERCOS Phasenwechsel
5	1:51.288	0x0002	SERC	RTB	1506	Rr	mehrfacher SERCOS Zyklusfehler
4	1:43.356	0x1000	SERC	RTB	8042	Phase=4	SERCOS Phasenwechsel
3	1:42.912	0x1000	SERC	RTB	8042	Phase=3	SERCOS Phasenwechsel
2	1:39.140	0x1000	SERC	RTB	8042	Phase=2	SERCOS Phasenwechsel
1	1:36.564	0x1000	SERC	RTB	8042	Phase=1	SERCOS Phasenwechsel

Figure 8-12: SERCOS interface / example of a message logger when an error occurs

The usual error message for a multiple cycle error appears at the beginning of line number 6.

After line number 6, the first block of the extended SERCOS diagnosis appears (line numbers 8-10).

An info mark ("S:111284ms") appears at the beginning of this diagnosis block (here line number 7) and allows the block to be assigned a specific error message. In this case, a distinction is made between the three diagnosis situations:

- S – single SERCOS cycle error (SingleCycleError)
- M – multiple SERCOS cycle error (MultiCycleError)
- 0 – switch to phase 0



The time mark (in ms) of when the error occurred is shown in connection with this error type.

All axes whose receive error counter (nerr) has changed since the last diagnosis acknowledgement or phase startup (line number 8) are then listed. The error counter is assigned to the axis via the "Object" and "Instance" columns.



The value displayed in connection with "nerr=x" is only reset during phase startup. If more than one single SERCOS cycle error occurs during operation, the error counter will increase each time accordingly.

The remaining information refers to the error status (line no. 9). Each error status is reset during each phase startup and each error acknowledgement. This information always consists of a letter and a number ("r=1"). Each error status is reset during each phase startup and each error acknowledgement.

The meaning of the letter is the same as the letter in the ext. diagnosis messages for SERCOS cycle errors:

- R – double miss of drive telegrams (RMISS)
- R – double miss of the synchronous telegram (MSTMISS)
- F – fiberoptic break (FIBBR)
- 1 – late reception of the synchronous telegram (MSTLATE)
- e – early reception of the synchronous telegram (MSTEARLY)
- d – receive distortion
- r – single miss of a drive telegram (RERR)

Hence, the first diagnosis block would be interpreted as follows:

"Simple SERCOS cycle error at 111284 ms. A single telegram miss at the axis\_2 drive was determined".

A second block follows the first block. In this case, the display of the multiple cycle error is involved, since the telegram from the axis\_2 drive was missed a second time.

Nr.	Zeitmarke	Typ	Objekt	Instanz	Diag. Code	Ext. Diagnose	Meldungstext
19	2:01.380	0x0010	SERC	RTB	8052	r=18	Erweiterte SERCOS Diagnose
18	2:01.376	0x0010	SERC	RTB	8052	R=17	Erweiterte SERCOS Diagnose
17	2:01.376	0x0010	MC_4	Axis_3	8052	nerr=0	Erweiterte SERCOS Diagnose
16	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=18	Erweiterte SERCOS Diagnose
15	2:01.376	0x0010	MC_4	Axis_1	8052	nerr=0	Erweiterte SERCOS Diagnose
14	2:01.376	0x0010	SERC	RTB	8052	0:111352ms	Erweiterte SERCOS Diagnose
13	2:01.376	0x0010	SERC	RTB	8052	r=2	Erweiterte SERCOS Diagnose
12	2:01.376	0x0010	SERC	RTB	8052	R=1	Erweiterte SERCOS Diagnose
11	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=2	Erweiterte SERCOS Diagnose
10	2:01.376	0x0010	SERC	RTB	8052	M:111288ms	Erweiterte SERCOS Diagnose
9	2:01.376	0x0010	SERC	RTB	8052	r=1	Erweiterte SERCOS Diagnose
8	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=1	Erweiterte SERCOS Diagnose
7	2:01.376	0x0010	SERC	RTB	8052	S:111284ms	Erweiterte SERCOS Diagnose
6	1:51.372	0x1000	SERC	RTB	8042	Phase=0	SERCOS Phasenwechsel
5	1:51.288	0x0002	SERC	RTB	1506	Rr	mehrfacher SERCOS Zyklusfehler
4	1:43.356	0x1000	SERC	RTB	8042	Phase=4	SERCOS Phasenwechsel
3	1:42.912	0x1000	SERC	RTB	8042	Phase=3	SERCOS Phasenwechsel
2	1:39.140	0x1000	SERC	RTB	8042	Phase=2	SERCOS Phasenwechsel
1	1:36.564	0x1000	SERC	RTB	8042	Phase=1	SERCOS Phasenwechsel

Figure 8-13: SERCOS interface / example of a message logger when an error occurs (multiple cycle error)

The multiple cycle error occurred directly in the next cycle (cycle time 4 ms) after the single cycle error and affected the axis\_2 drive again. The error counter for this drive

("nerr=2") increased to 2 as did the error counter for simple cycle errors ("r=2"). The error counter for the multiple cycle error ("R=2") also increases for the first time.

The only difference between the last diagnosis block and the first two is that the error counters of all the connected drives are displayed when switching to phase 0, even for those that did not have an error ("axis\_1" and "axis\_3").

The time span between the multiple cycle error and the last switch to phase 0 can vary greatly and depends on a number of different factors. However, the values of 10-20 cycles are typical.

Nr.	Zeitmarke	Typ	Objekt	Instanz	Diag. Code	Ext. Diagnose	Meldungstext
19	2:01.380	0x0010	SERC	RTB	8052	r=18	Erweiterte SERCOS Diagnose
18	2:01.376	0x0010	SERC	RTB	8052	R=17	Erweiterte SERCOS Diagnose
17	2:01.376	0x0010	MC_4	Axis_3	8052	nerr=0	Erweiterte SERCOS Diagnose
16	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=18	Erweiterte SERCOS Diagnose
15	2:01.376	0x0010	MC_4	Axis_1	8052	nerr=0	Erweiterte SERCOS Diagnose
14	2:01.376	0x0010	SERC	RTB	8052	0:111352ms	Erweiterte SERCOS Diagnose
13	2:01.376	0x0010	SERC	RTB	8052	r=2	Erweiterte SERCOS Diagnose
12	2:01.376	0x0010	SERC	RTB	8052	R=1	Erweiterte SERCOS Diagnose
11	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=2	Erweiterte SERCOS Diagnose
10	2:01.376	0x0010	SERC	RTB	8052	M:111288ms	Erweiterte SERCOS Diagnose
9	2:01.376	0x0010	SERC	RTB	8052	r=1	Erweiterte SERCOS Diagnose
8	2:01.376	0x0010	MC_4	Axis_2	8052	nerr=1	Erweiterte SERCOS Diagnose
7	2:01.376	0x0010	SERC	RTB	8052	S:111284ms	Erweiterte SERCOS Diagnose
6	1:51.372	0x1000	SERC	RTB	8042	Phase=0	SERCOS Phasenwechsel
5	1:51.288	0x0002	SERC	RTB	1506	Rr	mehrfacher SERCOS Zyklusfehler
4	1:43.356	0x1000	SERC	RTB	8042	Phase=4	SERCOS Phasenwechsel
3	1:42.912	0x1000	SERC	RTB	8042	Phase=3	SERCOS Phasenwechsel
2	1:39.140	0x1000	SERC	RTB	8042	Phase=2	SERCOS Phasenwechsel
1	1:36.564	0x1000	SERC	RTB	8042	Phase=1	SERCOS Phasenwechsel

Figure 8-14: SERCOS interface / example of a message logger when an error occurs (switch to phase 0)

### 053 UPS active, overtemperature

Diagnostic class (Default): 8

Diagnosis message removed in V00.22.00 or higher (see 339 "UPS active - system temperature too high" (see 8.6.4.40 339 UPS active - system temperature too high))

The system has detected a temperature that is too high and will change the state to "System Shutdown/4" after 70 seconds.

See also:

- UPS.State parameter

### 054 Temperature Warning

Diagnostic class (standard): 6

The temperature in the device (C400, C600 and P600) is outside the specified range. If the temperature continues to decrease the controller may shut itself off.

#### DiagExtCode: Temp<5°C

The temperature in the device is less than 5°C.

The following message text appears on the display:

1st line: temperature warning

3rd line: Temp < 5°C

This message can be acknowledged.

The warning is given for PIC version (software version) 0512 and higher.



- The temperature of the surroundings decreases significantly. The switching cabinet door may be open.
- ▶ Check ambient temperature.
- The device will be switched on and the ambient temperature is too low.
- ▶ Check ambient temperature.

### 055 Hardware Monitoring Debug Message

Diagnostic class (standard): 8

MsgFilter: Bit 14 "Filter Type 15"

See also:

- Diagnosis message 056 "Shutdown due to supply voltage outage"
- Diagnosis message 827 "Power-Off due to hardware monitoring"

DiagMsg:

-> specific error message for debugging purposes

Structure: <last error entry> : <error group> : <cause of error>

**Error groups:**

- VoltageError
- TempError
- EnvError

**Cause of error**

**(VoltageError):**

- V3.3 < Vmin
- V5 < Vmin
- V+12 < Vmin
- V-12 < Vmin
- Vin < Vshutd
- VAccu < Vshutd
- Vin\_jit < Vshutd
- capacitance
- LTC error
- Vin > Vmax
- VAccu > Vmax
- V3.3 > Vmax
- V5 > Vmax
- V+12 > Vmax
- V-12 > Vmax
- VcpuCore < Vmin
- VcpuIO < Vmin
- VM2.5 < Vmin
- VM3.3 < Vmin
- VM5 < Vmin
- VM+12 < Vmin
- VM-12 < Vmin
- VcpuCore > Vmax
- VcpuIO > Vmax
- VM2.5 > Vmax
- VM3.3 > Vmax
- VM5 > Vmax
- VM+12 > Vmax
- VM-12 > Vmax

**Cause of error**

**(TempError):**

- Vin < Vmin
- VAccu < Vmin

- TAccu < Tmin
- TLM75 < Tmin
- TCPU < Tmin
- TM1 < Tmin
- TM2 < Tmin
- TAccu > Tshutd
- TLM75 > Tshutd
- TCPU > Tshutd
- TM1 > Tshutd
- TM2 > Tshutd
- TAccu > Tmax
- TLM75 > Tmax
- TCPU > Tmax
- TM1 > Tmax
- TM2 > Tmax
- I2C bus failed
- LM75 failed

*Cause of error* - fan1stop-shutd  
*(EnvError):* - fan1stop-off  
 - fan2stop-shutd  
 - fan2stop-off  
 - fan3stop-shutd  
 - fan3stop-off

*Example of message text:* -1 : TempError : TLM75 > Tshutd

-> The error was in the last error entry created. It is a temperature error in which the LM75 sensor detected a temperature that is too high. The shutdown limit was exceeded, and so the system shut down after the timer ran out.

### 056 Shutdown due to supply voltage outage

Diagnostic class (standard): 8

MsgFilter: Bit 1 "Diagnosis Messages"

The hardware provides an internal error logger that logs all the causes for error-dependent controller deactivations. The next time the controller is started up the error logger is analyzed and the cause of the error can be output in the message logger. If the reason for the shutdown was a supply voltage outage, message 056 "Shutdown due to supply voltage outage" is output.

In addition, a more specific message is displayed (055 "Debug message cause by hardware monitor") that can be enabled by the MsgFilter Parameter through the EPAS-4 message logger. This message is intended to be a debug message and outputs the exact cause of the deactivation.

### 057 Online-change

Filter type 13 "extended system messages"

An online change was performed.

### 058 Controller synchronization

V00.22.00 and higher

## General status information on controller synchronization (Encoder Network)

Ext. diagnosis	Meaning
Conf slave	The synchronization slave is configured by the synchronization master.
Start Sync	The synchronization process started.
Sync OK	The <b>synchronization slaves</b> are not synchronized with the <b>synchronization master</b> .
Data Ready	Sync. Encoder inputs are configured by the sync. encoder outputs and ready for data exchange.
Data Enable	<b>Sync. encoder outputs</b> distribute encoder data to the <b>sync. encoder inputs</b> .

**059 UPS active - IEC-control task running****060 control task active on changing state**

Filter type 13 "extended system messages"

The control task can react to certain events in a fast task. The UPS uses this tool to delay the shutdown of the **PacDrive Controllers**, so that certain actions defined in an application can be executed before the system is switched off.

For this purpose, an event starting the configured **monitoring task** is triggered for the following changes in the UPS state machine:

- UPS.State = 3 – UPS active – no power
- UPS.State = 4 – UPS active – system shutdown started
- UPS.State = 6 – UPS active – system temperature too high

The **060 control task active on changing state** diagnostic message is displayed if a **control task** that has been started by UPS is still active on the following UPS state changes:

- UPS.State=3 -> UPS.State=4
- UPS.State=3 -> UPS.State=6
- UPS.State=6 -> UPS.State=4

**061 retain variables****8.6.2 1xx "Drives" diagnostic messages****100 I2T Motor**

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The motor is overloaded or the power supplied to the motor is too high. The integrator ( I2t parameter) has increased to 100%. The motor I2t monitoring is performed with the help of an integrator that is derived from the following equations.

$$\ddot{u} = I_{\text{current}} / I_{\text{NM}}$$

$$\Delta t_{at} = 45s / (\ddot{u}^2 \cdot 1)$$

$$\Delta t_{at} = 45s / (\ddot{u}^2 \cdot 1)$$

$I_{current}$  = current power

$I_{NM}$  = motor rated power (in V00.11.00 or higher, the IOM /  $I_{NM}$  characteristic curve is incorporated).

$t_{at}$  = build up time

$t_{from}$  = dissipation time

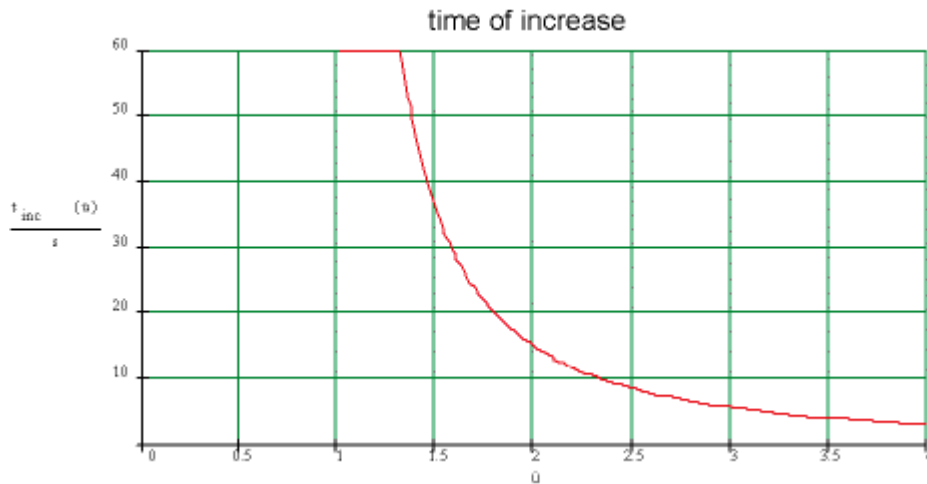


Figure 8-15: I2T motor / build up time diagnosis message

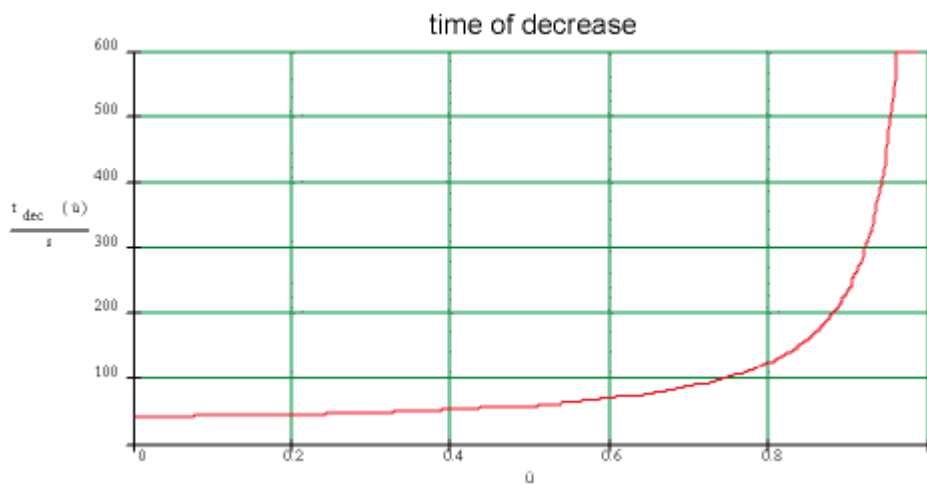


Figure 8-16: I2T motor / dissipation time diagnosis message

- The holding brake is not released (cable break, power outside the 24 V +/- 10% range).
  - ▶ Check the brake and the wiring.
- The lubrication system is defective.
  - ▶ Check lubrication.
- Blunt tool.
  - ▶ Check/replace the tool.
- The motor is vibrating.
  - ▶ Check the controller parameters.
- The shutdown limit was exceeded, and so the system shut down after the timer ran out.

- ▶ Check drive sizing and weight distribution.
- ▶ Drive/accelerate the system at a slower speed.
  - The motor is de-magnetized.
- ▶ Replace the motor.

### 101 Amplifier – power off due to overtemperature

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The cooling element of the PacDrive servo amplifier is too hot.

- Insufficient ventilation or ambient temperature too high.
  - ▶ Check device fans and ventilation slots (if available).
  - ▶ Check ventilation in switching cabinet.
  - ▶ If installed, make sure the air conditioning unit is functioning properly.
- The final stage or the power rectifier is overloaded.
  - ▶ Check combination motor / actuator.
  - ▶ Check calculation of motor and actuator.
- Hardware error: The temperature sensor is defective.
  - ▶ Replace the device.

### 102 Motor - PowerOff due to overtemperature

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The internal motor temperature (temperature switch in the motor) is at least 2 seconds too high (approx. 130°C).

- Wiring error: The temperature switch in the motor winding is not connected properly.
  - ▶ Check the wiring.
- Wiring error: The shielding of the motor cable is not attached properly.
  - ▶ Check the shielded terminal on the bottom of the MC-4 servo amplifier and the terminal boxes of the SM motor.
- Holding brake not vented
  - ▶ Release the brake.
- The motor is overloaded.
  - ▶ Ext. diagnosis
  - ▶ Check drive sizing.
  - ▶ Use a larger motor for this application.
- Commutation error, i.e. the encoder is not aligned / leveled.
  - ▶ Align / level the encoder.
- Hardware error: The temperature switch in the motor winding is defective.
  - ▶ Replace the motor.

### 103 PowerOff due to cooling error

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The internal temperature of the device is too high.

In the **PS-5** the fan is switched on at temperatures over 55°C and switched off again below 40°C .

- Insufficient ventilation or ambient temperature too high.
- ▶ Check device fans and ventilation slots (if available).
- ▶ Check ventilation in switching cabinet.
- Hardware error: The temperature sensor is defective.
- ▶ Replace the device.

#### 104 PowerOff due to control voltage error

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The control voltage is incorrect.

- The control voltage is too low / a brief voltage failure of the 24 V DC has occurred.
- ▶ Check the 24 V control voltage.

#### 105 Feedback error (track monitoring)

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

A hardware encoder error has occurred. The device that triggered this error must be reset.

- Wiring error: Encoder cable at the encoder or the servo amplifier / PacDrive controller has been removed or is defective.
- ▶ Check the encoder cable and replace if necessary.
- ▶ Check the ground connection (shield).
- The encoder voltage is unavailable or incorrect.
- ▶ Check the encoder voltage.
- Hardware error: Encoder is defective.
- ▶ Replace the encoder.

#### 106 Communication error DC controller

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): A

An internal system error has occurred.

- EMC faults.
- ▶ Reset the PacDrive system (PacDrive controller and servo amplifier).
- Hardware error: Servo amplifier defective.
- ▶ Replace the servo amplifier.

#### 107 Excess current

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The current through the final stage of the servo amplifier or in the DC bus of the power supply is too high. In contrast to the diagnosis messages 120 "Overload PowerOff of output stage" (see 8.6.2.21 120 Overload PowerOff of output stage) and 146 "DC bus overload" (see 8.6.2.21 120 Overload PowerOff of output stage), the device is switched off immediately after the maximum current is exceeded.

In the **PS-5** diagnostic message 146 "DC bus overload" is also reported as diagnostic message 107 "excess current".

- Wiring error: The shielding of the motor cable is not attached properly.
- ▶ Check the wiring.
- Servo amplifier: The current controller parameters are incorrect.
- ▶ Check the power control parameters Curr\_P\_Gain, Curr\_I\_Gain and CurrFilter and set them to default, if necessary.
- Hardware error servo amplifier: The motor has a short circuit.
- ▶ Replace the motor.
- Power supplies **PS-4/PS-5**: Too many loads (ServoDrive **SCL**, Intelligent Servo Module **iSH**) are connected.
- ▶ Use an additional power supply and distribute the sinks' power supply.
- ▶ It may be that the existing device constellation will be sufficient by adapting the application (e.g. less acceleration).

### 108 Excess voltage

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): A

The DC bus voltage is too high (for 400 V AC devices greater than 860 V DC; for 230 V AC devices greater than 430 V DC).

- Wiring error: Bleeder is not connected.
- ▶ Connect bleeder.
- Ventilation is inadequate or the ambient temperature is too high.
- ▶ Brake at a slower rate.
- ▶ Check the dimensioning of the bleeder.
- ▶ Apply additional bleeder (bleeder module **BM-4**) with 400 V AC units.
- The mains voltage is too high.
- ▶ Check the mains supply.
- Hardware error: Servo amplifier defective.
- ▶ Replace the servo amplifier.

### 109 Undervoltage

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The DC bus voltage is too low.

device	Thresholds
MC-4	<ul style="list-style-type: none"> <li>• 480 V DC, for 400 V AC devices (less than V00.20.00: 450 V DC)</li> <li>• 240 V DC, for 230 V AC devices (less than V00.20.00: 225 V DC)</li> </ul>
SCL	<ul style="list-style-type: none"> <li>• 225 V DC</li> </ul>
PS-4	<ul style="list-style-type: none"> <li>• 260 V DC</li> </ul>
iSH	<ul style="list-style-type: none"> <li>• 400 V DC</li> </ul>
PS-5	<ul style="list-style-type: none"> <li>• 400 V DC</li> </ul>

- The mains voltage is too low.
- ▶ Check the mains voltage (see technical data).

- If DC buses are connected in parallel, an error has occurred in a servo amplifier.
- ▶ Locate servo amplifier with error and eliminate error.

### 110 Phase error (power supply)

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

Failure of one or two phases of the mains connection of the servo amplifier. 131 "Phase failure of power supply warning" (see 8.6.2.32 131 Phase failure of power supply Warning) must have been pending 10 s in advance.

- Wiring error: Not all phases are connected properly / the mains contactor is not wired properly.
- ▶ Check the wiring.
- External fuse has blown.
- ▶ Check fuses.

### 111 Excessive following error

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

A very large following error has occurred - more than 8 times the value of the FollowingLimit.

- This error normally only occurs in conjunction with the CAM movement functions (e.g. MultiCam() ).
- ▶ Check curve data.
- The axis should be operated at regulated speeds.
- ▶ Set parameter Pos\_P\_Gain to "0".

### 112 Communication error real-time bus

Diagnostic class (Default): 2

Reaction (see 8.3 Reactions of "drives"): B

The device (SERCOS slave) did not receive a valid telegram via the real-time bus (SERCOS).

## CAUTION

### CONNECTION TO CONTROLLER INTERRUPTED

- The diagnostic message 112 "Communication error real time bus" (see 8.6.2.13 112 Communication error real-time bus) is not reported in the system because the SERCOS slave cannot report the diagnosis code via the SERCOS bus to the Controller in case of an error.
- In this case, diagnosis code 506 "Fatal SERCOS error (MASTER)" (see 8.6.6.7 506 Fatal SERCOS error (MASTER)) is reported.

**Failure to follow these instructions can result in equipment damage.**

- The intensity of the fiber optic signal from the preceding device is too low or too high.
- ▶ Set Intensity according to specifications.
- Hardware error: Fiber-optic conductor is defective or the signal is too weak as a result of deterioration.



- ▶ Increasing the intensity may solve the problem.
- ▶ Replace the fiber-optic conductor
- Hardware error: Device is defective
- ▶ Replace the device.

### 113 Bleeder defective

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

A defect in the bleeder was detected by the device.

- Wiring: The bleeder or the feed line has a short-circuit.
- ▶ Check the bleeder and feed lines.
- The bleeder has a wrong size (too low ohm value).
- ▶ Check the bleeder sizing (also refer to the project planning guide and technical data).
- Hardware error: Bleeder defective.
- ▶ Measure the bleeder
- ▶ Replace bleeder if necessary.
- Hardware error: Device with internal bleeder is defective.
- ▶ Replace the device.

### 114 Error reading EEPROM

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The electronic device type plate cannot be read from the EEPROM.

The type plate contains e.g. the device type, serial number, alignment values, etc.

- Hardware error: The EEPROM is defective.
- ▶ Contact ELAU customer service.
- ▶ Replace the servo amplifier.

### 115 Gate - power failure

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

There is no supply voltage at the output stage of the servo amplifier.

- Hardware error: Servo amplifier defective.
- ▶ Replace the servo amplifier.

### 116 Commutation error

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): A

Unable to determine the commutation.

- Motor turns when starting (boot procedure) the MC-4 servo amplifier.
- ▶ Make sure that the motor is still when starting (boot procedure) the servo amplifier.
- Wiring error: encoder cable is not plugged in or defective.
- ▶ Check the wiring.

### 117 Reading error encoder EEPROM

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The electronic motor type plate cannot be read from the EEPROM encoder.

- Wiring error: Encoder cable is not correct.
- ▶ Check the wiring.
- Hardware error: Encoder is defective.
- ▶ Change out the motor or the encoder.

### 118 "Error on ser. interface to encoder

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The data transfer to the encoder is disrupted.

- Wiring error: Encoder cable is defective.
- ▶ Check the encoder cable and replace if necessary.
- ▶ Check the ground connection (shield)
- ▶ Check the jumpers in the encoder cable connector.
- The encoder voltage is unavailable or incorrect.
- ▶ Check the encoder voltage.
- Hardware error: Encoder is defective.
- ▶ Change out the motor or the encoder.

### 119 Short circuit or ground fault in output stage

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The motor and motor lines are checked for short circuits (phase short circuit).

- Wiring error: Short circuit in motor cable.
- ▶ Replace the motor cable.
- The electronic device type plate cannot be read from the EEPROM.
- ▶ Replace the motor.
- Hardware error: final stage in servo amplifier defective.
- ▶ Replace the servo amplifier.

### 120 Overload PowerOff of output stage

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The final stage is overloaded. In contrast to the 107 "Excess current" (see 8.6.2.8 107 Excess current) diagnosis message, the power is switched off as soon as the max. current value is exceeded. The thermal overload of the device is observed for a specific period of time.

- The final stage is overloaded.
- ▶ Check combination motor / actuator.
- ▶ Check calculation of motor and actuator.
- ▶ Ext. diagnosis
- The motor brake is not open.
- ▶ Check the wiring of the motor brake (voltage reversal, cable break ...).

- Hardware error: Servo amplifier defective.
- ▶ Replace the servo amplifier.

### 121 Bleeder Temperature Too High

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 2  
Reaction (see 8.3 Reactions of "drives"): B

The bleeder is overloaded.

- The drive has incorrect dimensions.
- ▶ Check drive sizing.
- Hardware error: The braking resistor or addressing is defective.
- ▶ Contact ELAU customer service.

### 122 Max. motor speed reached

Diagnostic class (standard): 2  
Reaction (see 8.3 Reactions of "drives"): B

The current speed is greater than the rated speed of the motor.

- Error occurs when using motor SH-055 with a rated speed greater than 6000 rpm.
- ▶ Use firmware version no earlier than V00.22.00 in the servo amplifier MC-4.
- Error occurs with CAM movement function (e.g. MultiCam() ) due to incorrect curves or profile data.
- ▶ Check curve data and program.
- Jumps occurred in the master encoder.
- ▶ Check the master encoder.
- The error occurs during a CAM movement function due to an incorrect position manipulation (e.g. Setpos1() function).
- ▶ Check the program.
- Hardware error: Commutation error, i.e. the motor encoder (SinCos) is not calibrated or leveled.
- ▶ Contact ELAU customer service.

### 123 Error inverter enable

Diagnostic class (standard): 2  
Reaction (see 8.3 Reactions of "drives"): A

The Inverter Enable input changed to LOW while the drive was "under control" (DeviceState = 16#05, =16#06, =16#08, >= 16#20).

## CAUTION

**If the drive is brought to a standstill using HW\_Enable or ControllerEnable, control remains active until the drive stops and then the brake engages (BrakeCouplingTime).**

- Wiring error.
- ▶ Check wiring of "Inverter Enable" input.
- Circuit error: The "Inverter Enable" input was set to LOW.
- ▶ Check the control of the "Inverter Enable" input.

- **Ext. diagnosis = Wrong Mode: xx**  
The mode set in the parameter InverterEnableMode does not correspond to the real devices.
- ▶ Check the parameter **InverterEnableMode** and adjust it, if necessary.
- ▶ Check **iSH** hardware configuration and connect or disconnect **iSH-DIS1** if necessary.

### 124 PowerOff due to overload

Diagnostic class (standard): 5

Reaction: C

Overload PowerOff determined that torque was exceeded ( Overload function).

You can switch the diagnosis message off using the OverloadErrorOff() function and switch it back on (default) using the OverloadErrorOn() function.

- An overload will occur if the overload function is active.
- ▶

### 125 "I<sup>2</sup>t motor warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The motor is overloading. The integrator (I2tparameter) has already increased to 80%. A 100 "I2T Motor" (see 8.6.2.1 100 I2T Motor) error may result.

### 126 Amplifier – overtemperature warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The cooling element of the MC-4/SCL/PS-4 is too hot. A 101 "Amplifier – power off due to overtemperature" (see 8.6.2.2 101 Amplifier – power off due to overtemperature) error may result.

### 127 Overtemperature motor warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The internal motor temperature (temperature switch in the motor) is too high (approx. 130°C). If the internal motor temperature switch detects a too high temperature for at least 2 seconds, error 102 "Motor - Excess temperature switch off" (see 8.6.2.3 102 Motor - PowerOff due to overtemperature) will occur.

### 128 Cooling error warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The internal temperature of the device is too high. With SCL, the internal power supply may also be overloaded. A 103 "PowerOff due to cooling error" (see 8.6.2.4 103 PowerOff due to cooling error) error may result.

**129 Overload PowerOff of output stage warning**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The final stage is overloaded. A 120 "Overload PowerOff of output stage" (see 8.6.2.21 120 Overload PowerOff of output stage) error may result.

**130 Bleeder temperature rising**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The bleeder is overloading. A 121 "Bleeder temperature too high" (see 8.6.2.22 121 Bleeder Temperature Too High) error may result.

**131 Phase failure of power supply Warning**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

Failure of one or two phases of the mains connection of the servo amplifier. If the warning persists for 10 s or longer, a 110 "Phase failure (power supply)" (see 8.6.2.11 110 Phase error (power supply))error will occur.

**132 Following error**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

A position following error in the position controller of the servo amplifier has occurred that is greater than the "FollowingLimit" parameter.

- The following error monitoring is too strict.
- ▶ Increase the FollowingLimit object parameter.
- The acceleration is too high.
- ▶ Reduce acceleration.
- The following error is a result of the 100 "I2T Motor" diagnosis message.
- ▶ See diagnosis message 100 "I2T Motor" (see 8.6.2.1 100 I2T Motor)
- The mechanical system is sluggish or blocked.
- ▶ Check the travel range.
- Incorrect parameter settings.
- ▶ Check the controller parameters and the J\_Load .
- The current feedforward is switched off.
- ▶ Set the CurrFeedForw parameter to "on / TRUE".
- Wiring error: The wires in the motor or encoder cable are interchanged.
- ▶ Check the cable connection /cable.
- Wiring error: An incorrect encoder connector or motor connector is plugged-in (possibly from the neighboring actuator).
- ▶ Check the encoder connector and the motor connector.
- ▶ Check the encoder cable and motor cable.
- Wiring error: holding brake not vented
- ▶ Check the holding brake.

- No mains voltage.
- ▶ Check the mains voltage at the servo amplifier.
- An encoder with an incorrect number of pulses was used.
- ▶ Check the encoder.
- Hardware error: The coupling to the position controller is loose.
- ▶ Check the encoder coupling.
- Hardware error: Encoder signal jumps.
- ▶ Check the travel range.
- The axis should be operated at regulated speeds.
- ▶ Set the Pos\_P\_Gain parameter to 0.

**133 Speed-dependent power reduction**

Diagnostic class (standard): 7

Reaction (see 8.3 Reactions of "drives"): E

Starting at a motor speed of < 75 rpm (112.5 rpm for SR058, 150 rpm for SM070) the maximum motor current is restricted to 70 % of the top current of the servo amplifier (e.g. MC-4). This is a security measure to protect the final stage of the servo amplifier when reaching the stop position.

In V00.11.00 or higher, this message is only generated when the target current is actually limited to 70% of the peak current.

In previous versions the message is generated when the limit is active, even if the target current is below 70% of the peak current.

- The axis is moved to a block.
- ▶ Check traversing range of the axis.

**134 External 24V power supply too low**

Diagnostic class (standard): 6 (lower than V00.24.01: 7)

Reaction (see 8.3 Reactions of "drives"): E

The control voltage (24 V DC) is too low.

- Control voltage too low.
- ▶ Check the control voltage (see technical data of the device).

**135 Undervoltage warning**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

An attempt is being made to start the drive, but the DC bus voltage is too low.

device	Thresholds
<b>MC-4</b>	<ul style="list-style-type: none"> <li>• 480 V DC, for 400 V AC devices (less than V00.20.00: 450 V DC)</li> <li>• 240 V DC, for 230 V AC devices (less than V00.20.00: 225 V DC)</li> </ul>
<b>SCL</b>	<ul style="list-style-type: none"> <li>• 240 V DC (less than V00.20.00: 225 V DC)</li> </ul>
<b>PS-4</b>	<ul style="list-style-type: none"> <li>• 260 V DC</li> </ul>

device	Thresholds
iSH	<ul style="list-style-type: none"> <li>• 420 V DC, if the drive is "in control" ( DeviceState &gt;= 16#20)</li> <li>• 440 V DC, if the drive is not "in control" ( DeviceState &lt; 16#20)</li> </ul>
PS-5	<ul style="list-style-type: none"> <li>• 420 V DC, if the drive is "in control" ( DeviceState &gt;= 16#20)</li> <li>• 450 V DC, if the drive is not "in control" ( DeviceState &lt; 16#20)</li> </ul>

For V00.20.00 and higher, the diagnosis message is also generated when the drive is "under control" ( DeviceState >=16#20) (except for **PS-4**). If the DC bus voltage continues to drop while the drive is "under control", diagnosis message 109 "Under voltage" (see 8.6.2.10 109 Undervoltage) is triggered.

- Hardware Enable and Software Enable are there but the mains voltage is too low.
- ▶ Check the mains voltage (see the technical data on the device); the mains contactor may not be connected.
- If DC buses are connected in parallel, an error has occurred in a servo amplifier.
- ▶ Locate servo amplifier with error.
- ▶ Eliminate error.

### 136 Inverter enable warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

An attempt is being made to start the drive, but Inverter Enable is still LOW.

- Hardware Enable and Software Enable are available, but "Inverter Enable" is still LOW.
- ▶ The output stage is overloaded.

### 137 Motorless

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): A

When switching the MC-4 servo amplifier from motorless to normal mode, a message reporting a motor error that has occurred will appear.

Motor errors that result in the diagnosis message:

- 102 Motor - PowerOff due to overtemperature (see 8.6.2.3 102 Motor - PowerOff due to overtemperature)
- 105 Feedback error (track monitoring) (see 8.6.2.6 105 Feedback error (track monitoring))
- 111 Excessive following error (see 8.6.2.12 111 Excessive following error)
- 116 Commutation error (see 8.6.2.17 116 Commutation error)
- 117 Reading error encoder EEPROM (see 8.6.2.18 117 Reading error encoder EEPROM)
- 118 "Error on ser. interface to encoder (see 8.6.2.19 118 "Error on ser. interface to encoder)
- 122 Max. motor speed reached (see 8.6.2.23 122 Max. motor speed reached)

The above error messages are disabled in the motorless mode (Motorless Parameter = yes) and result in the 137 "Motorless" error message when reverting to normal mode (Motorless parameter = no).

Note here that the 105, 117 and 118 diagnosis messages can also result in the 137 "Motorless" diagnosis message if the messages occur in normal mode and afterwards the mode is switched to motorless and then back to normal.



- A motor error has occurred.
- ▶ Perform a hardware reset on MC-4 or switch back to motorless mode.
- The MC-4 was not switched off when coupling a motor to a servo amplifier that was set to motorless. The current feedforward is switched off.
- ▶ Perform a hardware reset on MC-4 or switch back to motorless mode.

### 138 Impermissible motor

Diagnostic class (standard): 1  
 Reaction (see 8.3 Reactions of "drives"): A

An impermissible motor is connected to the servo amplifier.

- An SM 070 60 010 is connected to the MC-4 / 22 A.
- ▶ Use a "larger" motor (e.g. SM 070 60 020) or a "smaller" servo amplifier (e.g. MC-4 / 10 A).
- An SM 070 60 010, SM 070 60 020 or SM 100 50 030 is connected to the MC-4 / 50 A.
- ▶ Use a "larger" motor (e.g. SM 100 40 050) or a "smaller" servo amplifier (e.g. MC-4 / 10 A).

### 139 Error in DC-precharge

Diagnostic class (standard): 2  
 Reaction (see 8.3 Reactions of "drives"): A ( **MC-4/PS-4** V00.16.30 or higher)  
 Reaction (see 8.3 Reactions of "drives"): B (**MC-4/PS-4** versions < V00.16.30)

The error message will be triggered if the mains voltage is present and the DC bus voltage is not reached after the main phases are activated.

The phase check (**MC-4**: PhaseCheck, **PS-4**: PhaseCheckMode) does not affect this error monitoring.

device	Thresholds	Monitoring times
<b>MC-4</b>	<ul style="list-style-type: none"> <li>• 450 V DC, for 400 V AC devices</li> <li>• 225 V DC, for 230 V AC devices</li> </ul>	<ul style="list-style-type: none"> <li>• 1000 ms</li> </ul>
<b>PS-4</b>	<ul style="list-style-type: none"> <li>• 225 V DC</li> </ul>	<ul style="list-style-type: none"> <li>• 350 ms (V00.22.00 or lower: 1000 ms)</li> </ul>

This monitoring feature protects the internal precharging circuit.

- The following order causes the diagnosis message:
  1. The parameter DC\_LowCheck is "off".
  2. The mains voltage decreases and the drive remains under control. (If **DC\_LowCheck** is "on", then diagnostic message 109 "under voltage" (see 8.6.2.10 109 Undervoltage) is displayed. This leads to a Reaction (see 8.3 Reactions of "drives") B and the drive does not remain in control mode.)
  3. The mains voltage increases again (drive still under control!) while a load pushes on the axis, for example (energy consumption at the shaft!). In doing so, enough energy is used that the DC circuit cannot be charged.
- ▶ Prevent the mains voltage from dropping while the drive is under control.
- ▶ Switch off controller or final stage of servo amplifier when switching off the mains contactor (parameter ControllerEnable or input enable at the servo amplifier).
- Short circuit or ground fault in DC bus wiring.
- ▶ Check the wiring.



### 140 Ramp-down braking time exceeded

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The maximum ramp down time was exceeded during control down ramping of motor.

When switching off

- ControllerEnable or
- HW\_Enable or
- when an error occurs with **Reaction B** (best possible stoppage) or user driven stoppage

the ramp down time is determined by the parameter StopTimeLim. If the drive has not stopped at the end of the down ramp time, the brake engages and the error message **Ramp down time exceeded** is emitted. Once the BrakeCouplingTime is up, the drive is connected torque free.

For error with Reaction C (Overload function) the ramp down time is firmly set at 800ms. If the drive is not still once the ramp down time has expired the error message **Ramp down time exceeded** with **Reaction B** is triggered. In so doing, the ramp down time (**StopTimeLim**) is restarted until the brake engages. Once the **BrakeCoupling-Time** is up, the drive is connected torque free.

- The load on the drive is too great to adhere to the set ramp down time.
- ▶ Check parameter **StopTimeLim**.  
If the diagnostic message occurs in conjunction with the **Overload Functions**, keep in mind that in this case the ramp down time is firmly set to 800ms and is thus triggered independently from **StopTimeLim**. In this case, a more powerful motor / servo amplifier combination is required.
- Encoder in the motor defective (or commutation not OK).
- ▶ Replace the motor.

### 141 EncoderPosition Reading Error

Diagnostic class (standard): 5

Reaction (see 8.3 Reactions of "drives"): D

An impermissible motor is connected to the servo amplifier.

The diagnostic message will be replaced as of MotorController Firmware 00.20.00 by the diagnostic message 170 "Reading error DrvEncPosition" (see 8.6.2.71 170 DrvEncPosition reading error).

- The function DrvEncSetPosition() was called up but could not be properly processed.
- ▶ Call up function DrvEncSetPosition() again.
- Encoder in the motor is defective.
- ▶ Replace the motor.

### 142 Board - PowerOff due to overtemperature

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The temperature of the power board inside the housing is too high.

- Insufficient ventilation or ambient temperature too high.
- ▶ Check ventilation in switching cabinet.

- ▶ If installed, make sure the air conditioning unit is functioning properly.
- Hardware error: The temperature sensor is defective.
- ▶ Replace the device.

### 143 Encoder temperature warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The temperature inside the encoder is too high.

- Insufficient ventilation or ambient temperature too high.
- ▶ Check device fans and ventilation slots (if available).
- ▶ Check ventilation in switching cabinet.
- ▶ If installed, make sure the air conditioning unit is functioning properly.
- Hardware error: The temperature sensor is defective.
- ▶ Replace the device.

### 144 DC bus short circuit

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

A short circuit has occurred in the DC bus of the power supplies **PS-4/PS-5**.

It is also possible that a ground fault has occurred in the **PS-5**.

- Wiring error:  
The connection cables from the power supply to the servo drives through the distribution boxes are not connected properly or have a short circuit.
- ▶ Check the cables and replace if necessary.

### 145 DC bus ground fault

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

A ground fault has occurred on the power supply **PS-4**

- Wiring error:  
The connection cables from the power supply to the servo drives through the distribution boxes are not connected properly or have a ground fault.
- ▶ Check the cables and replace if necessary.

### 146 DC bus overload

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

The DC-circuit is overloaded. In this case, unlike diagnostic message 107 "over-current" (see 8.6.2.8 107 Excess current), switch off does not occur as soon as the current threshold has been exceeded. The thermal overload of the device is observed for a specific period of time.

- Too many loads (e.g. ServoDrive SCL) are connected to the DC circuit.
- ▶ It may be that the existing device constellation will be sufficient by adapting the application (e.g. less acceleration).
- ▶ Use another mains device PS-4 and distribute supply of loads.

**147 24V power supply overload**

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

The 24V provided at the output of the power supplies **PS-4/PS-5** to serve the Servo-Drives **SCL/iSH** is overloaded.

If the diagnostic message occurs in the **PS-5** (load >100%) and the burden continues to rise to >130%, the 24V for the inferior **iSH** and **DB-5** will be switched off. This means that the **iSH** can no longer be reached via SERCOS. The **PS-5** can still be reached in the SERCOS ring, as the **PS-5** closes the ring in this case.

- Wiring error: A short circuit has occurred.
- ▶ Check the wiring of the 24 V supply from the power supply to the servo drives through the distribution boxes.
- Too many loads (ServoDrive **SCL**, Intelligent Servo Module **iSH**) are connected.
- ▶ Use an additional power supply and distribute the sinks' power supply.

**148 Internal voltage error 15V**

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The device-internal 15 V voltage is too low.

- The device is defective.
- ▶ Replace the device.

**149 Internal voltage error 12V**

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

The device-internal 12 V voltage is too low.

- The device is defective.
- ▶ Replace the device.

**150 Phase L1 failure**

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

The L1 phase of the mains connection to the device has failed or is too low.

The diagnostic message can be deactivated with the parameter PhaseCheckMode.

- Wiring error.
- ▶ Check the connection of the phase.
- ▶ Check the wiring of the mains contactor.
- External fuse has blown.
- ▶ Check fuses.
- Too many loads (e.g. ServoDrive **SCL**) are connected to the DC circuit.
- ▶ Replace the mains contactor.

**151 Phase L2 failure**

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

The L2 phase of the mains connection to the device has failed or is too low.

The diagnostic message can be deactivated with the parameter PhaseCheckMode.

- Wiring error.
- ▶ Check the connection of the phase.
- ▶ Check the wiring of the mains contactor.
- External fuse has blown.
- ▶ Check fuses.
- Too many loads (e.g. ServoDrive SCL) are connected to the DC circuit.
- ▶ Replace the mains contactor.

### 152 Phase L3 failure

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

The L3 phase of the mains connection to the device has failed or is too low.

The diagnostic message can be deactivated with the parameter PhaseCheckMode.

- Wiring error.
- ▶ Check the connection of the phase.
- ▶ Check the wiring of the mains contactor.
- External fuse has blown.
- ▶ Check fuses.
- Too many loads (e.g. ServoDrive SCL) are connected to the DC circuit.
- ▶ Replace the mains contactor.

### 153 DC bus discharge failure

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): B

DC bus was not discharged properly.

- Too much braking energy is being fed from the connected SCL back into DC bus.
- ▶ Decelerate the drives before discharging (at a reduced rate of speed if necessary) and then start the discharge procedure.
- Incorrect shutdown sequence; phase voltage has been present for too long (see also 159 "DC bus no discharged warning" (see 8.6.2.60 159 DC bus no discharged warning)).
- ▶ Allow the mains contractor to release before activating the discharge.
- The bleeder (responsible for the discharge) reaches its maximum load when the discharge begins.
- ▶ Decelerate the drives before discharging (at a reduced rate of speed if necessary) and then start the discharge procedure.

### 154 Phase L1 warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The L1 phase of the mains connection to the device has failed. If the drive is in controlled operation and the phase has failed for 10 s, error 150 "Phase failure L1" (see 8.6.2.51 150 Phase L1 failure) will occur.

### 155 Phase L2 warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The L2 phase of the mains connection to the device has failed. If the drive is in controlled operation and the phase has failed for 10 s, error 151 "Phase failure L2" (see 8.6.2.52 151 Phase L2 failure) will occur.

### 156 Phase L3 warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The L3 phase of the mains connection to the device has failed. If the drive is in controlled operation and the phase has failed for 10 s, error 152 "Phase failure L3" (see 8.6.2.53 152 Phase L3 failure) will occur.

### 157 DC bus overload warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The load of the DC bus is at 80%. This is displayed by the parameter DC\_BusOverload. If the load increases to 100%, error message 146 "DC bus overload" (see 8.6.2.47 146 DC bus overload) will occur.

### 158 24V power supply overload warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The load of the 24 V power supply for the devices **SCL**, **iSH**, **PS-4** and **PS-5** is at 80%. If the load increases to 100%, error message 147 "24 V power supply overload" (see 8.6.2.48 147 24V power supply overload) is triggered.

### 159 DC bus no discharged warning

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

An attempt was made to discharge the DC bus, but the mains voltage is still present. If the DC bus voltage does not decrease to 25 V within 200 ms of this warning appearing, the system issues the error message 153 "DC bus discharge failure" (see 8.6.2.54 153 DC bus discharge failure) is triggered.

- Wiring error: The mains contactor is not controlled correctly.
- ▶ Check the wiring.

### 160 Undervoltage power stage driver

Diagnostic class (standard): 1

Reaction (see 8.3 Reactions of "drives"): A

The supply voltage of the power stage driver is too low.

- Hardware error: Device is defective
- ▶ Replace the device.

**161 Overtemperature board warning**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The temperature of the power board inside the housing is too high. If the temperature continues to rise, it comes to the diagnostic message 142 "Board-PowerOff due to overtemperature". (see 8.6.2.43 142 Board - PowerOff due to overtemperature)

**162 Wiring error O\_0**

Diagnostic class (standard): 5

Reaction (see 8.3 Reactions of "drives"): B

There is a wiring error at Pin 1 of the sensor/actor connector of the SCL.

- Too much braking energy is being fed from the connected SCL back into DC bus.
- ▶ Decelerate the drives before discharging (at a reduced rate of speed if necessary) and then start the discharge procedure.
- Hardware error: The output function block is defective.
- ▶ Replace the device.

**163 SERCOS: C1D error**

Diagnostic class (standard): 1

Reaction: manufacturer-specific

A SERCOS error in diagnosis class 1 (C1D) has occurred. The extended diagnosis contains a data word that provides information on the exact cause.

**⚠ WARNING****THE MEANING OF THE DATA WORD HAS CHANGED!**

- Refer to the operating instructions of the SERCOS device.

**Incorrect interpretation of the error message.**

The individual bits of this data word have the following meanings:

Bit	Meaning
Bit 0	overload shut-down
Bit 1	amplifier overtemperature shut-down
Bit 2	motor overtemperature shut-down
Bit 3	cooling error shut-down
Bit 4	control voltage error
Bit 5	feedback error
Bit 6	error in the "commutation" system
Bit 7	overcurrent error
Bit 8	overvoltage error
Bit 9	undervoltage error
Bit 10	power supply phase error
Bit 11	excessive position deviation
Bit 12	communication error
Bit 13	overtravel limit is exceeded (shut-down)

Bit	Meaning
Bit 14	reserved
Bit 15	manufacturer-specific error (see #1164)

Table 8-5: SERCOS C1D error (assignment according to SERCOS specifications)

### 164 SERCOS: C1D manufacturer-specific error

Diagnostic class (standard): 1

Reaction: manufacturer-specific


A manufacturer-specific SERCOS error in diagnosis class 1 (C1D) has occurred. The extended diagnosis contains a data word that provides information on the exact cause. For information on what each bit means, refer to the manual of the SERCOS device manufacturer.

### 165 SERCOS: C2D warning

Diagnostic class (standard): 6

Reaction: manufacturer-specific

A SERCOS warning in diagnosis class 2 (C2D) has occurred. The extended diagnosis contains a data word that provides information on the exact cause.

 <b>WARNING</b>
<b>THE MEANING OF THE DATA WORD HAS CHANGED!</b>
<ul style="list-style-type: none"> <li>Refer to the operating instructions of the SERCOS device.</li> </ul>
<b>Incorrect interpretation of the error message.</b>

The individual bits of this data word have the following meanings:

Bit	Meaning
Bit 0	overload warning
Bit 1	amplifier overtemperature warning
Bit 2	motor overtemperature warning
Bit 3	cooling error warning
Bit 4	reserved
Bit 5	feedback error
Bit 6	reserved
Bit 7	reserved
Bit 8	reserved
Bit 9	undervoltage error
Bit 10	reserved
Bit 11	excessive velocity deviation
Bit 12	reserved
Bit 13	Target position outside of travel range
Bit 14	reserved
Bit 15	Manufacturer-specific error (see #6166)

Table 8-6: SERCOS C2D warning (assignment according to SERCOS specifications)

**166 SERCOS: C2D manufacturer-specific warning**

Diagnostic class (standard): 6  
Reaction: manufacturer-specific

A manufacturer-specific SERCOS warning in diagnosis class 2 (C2D) has occurred. The extended diagnosis contains a data word that provides information on the exact cause. For information on what each bit means, refer to the manual of the SERCOS device manufacturer.

**167 SERCOS: C3D operation status**

Diagnostic class (standard): 9

A SERCOS C3D operation status of diagnostic class 3 (C3D) has changed. The extended diagnosis contains a data word that provides information on the exact cause.

⚠ WARNING
THE MEANING OF THE DATA WORD HAS CHANGED!
<ul style="list-style-type: none"> <li>• Refer to the operating instructions of the SERCOS device.</li> </ul> <p><b>Incorrect interpretation of the error message.</b></p>

The individual bits of this data word have the following meanings:

Bit	Meaning
Bit 0	overload warning
Bit 1	$n(\text{feedback}) = 0$
Bit 2	$ n(\text{feedback})  <  n(x) $
Bit 3	$ T  \geq  T(x) $
Bit 4	$ T  \geq  T(\text{limit}) $
Bit 5	$ n(\text{command})  >  n \text{ limit} $
Bit 6	in position
Bit 7	$ P  \geq  P(x) $
Bit 8	Position feedback = Active target position
Bit 9	$ n(\text{feedback})  \leq \text{minimum spindle speed}$
Bit 10	$ n(\text{feedback})  \geq \text{maximum spindle speed}$
Bit 11	excessive velocity deviation
Bit 12	Target position attained
Bit 13	Interpolator halted
Bit 14	reserved
Bit 15	Manufacturer-specific operation status (see #9168)

*Table 8-7: SERCOS C3D operation status (assignment according to SERCOS specifications)*

**168 SERCOS: C3D manufacturer-specific status**

Diagnostic class (standard): 9  
Reaction: manufacturer-specific

A manufacturer-specific SERCOS operation status of diagnosis class 3 (C3D) has changed. The extended diagnosis contains a data word that provides information on the exact cause. For information on what each bit means, refer to the manual of the SERCOS device manufacturer.



**169 Single SERCOS error (SLAVE)**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

A temporary signal fault on the SERCOS bus has been detected. The MDT data may now be incorrect due to this fault. In this case, the data of the last cycle is reused.

Temporary faults can have the following causes:

- Signal distortion
- Loss of more than 10 signal edges (fibreoptic break)
- Failure of the master synchronous telegram (MST)
- Failure of the master data telegram (MDT)
  - Signal over the SERCOS fiberoptic conductor is incorrect.
  - ▶ Check the intensity setting in the PacDrive controller and on the servo amplifier.
  - ▶ Service transfer error
  - EMC problems.
  - ▶ Check the wiring.
  - SCL-055 motors are connected to the PacDrive controller. The connection of the SCL-055 motors in the PacDrive PD-8 box is not correct.
  - ▶ Check the connection of the SCL-055 motors in the PacDrive PD-8 box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position.  
In addition, follow the notes in the "SCL" and "PS-4 and PD-8" operating instructions.

**170 DrvEncPosition reading error**

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The error message is triggered when an error occurs as the position is being read from or written to the electronic type plate of the motor. The writing of the position occurs with the DrvEncSetPosition() function.

This diagnosis message replaces the diagnosis message 141 "Reading error encoderposition" (see 8.6.2.42 141 EncoderPosition Reading Error) in MotorController firmware version 00.20.00 or higher.

- The DrvEncSetPosition() function was called and could not be processed properly.
- ▶ Call the DrvEncSetPosition() function again.
- Encoder in the motor is defective.
- ▶ Replace the motor.

**171 Encoder communication warning**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

Incorrect interpretation of the error message.

- Wiring error: Encoder cable is not correct.
- ▶ Check the wiring.
- Hardware error: Encoder is defective.
- ▶ Change out the motor or the encoder.

**172 Extended diagnosis message**

Diagnostic class (standard): 8

Reaction (see 8.3 Reactions of "drives"): E

For now, this diagnosis message is only intended for internal ELAU use. To view the diagnosis message in the **message logger**, **Set filter...** must be used to set **Filter Type 15**.

**173 Feedback warning (track monitoring)**

Diagnostic class (standard): 8

Reaction (see 8.3 Reactions of "drives"): E

For now, this diagnosis message is only intended for internal ELAU use. To view the diagnosis message in the **message logger**, **Set filter...** must be used to set **Filter Type 15**.

**174 Excess current warning**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): E

Filter type 2 "Diagnosis messages"

As from hardware code xx3xxx, an **"Excess current warning"** will be triggered in the power unit **PS-4** if there is a DC bus current of more than 50 A for at least 1 ms. The error message 107 "Excess current" will be generated if the DC bus current reaches 55A .

- Too many loads (e.g. ServoDrive **SCL**) are connected to the DC circuit.
- ▶ Use an additional power supply **PS-4** and distribute the sinks' power supply.
- ▶ It may be that the existing device constellation will be sufficient by adapting the application (e.g. less acceleration).

**175 Bleeder overload**

Diagnostic class (standard): 9

Reaction (see 8.3 Reactions of "drives"): E

Filter type 2 "Diagnosis messages"

A bleeder load of 86 % (**MC-4** and **PS-4**) or 90 % (**PS-5**) can trigger the message **"Bleeder overload"**.

By default, this message is assigned to **diagnostic class 9** and therefore is not visible. If you want to react to the diagnostic message, you can reconfigure the **diagnostic class** (e.g. to **diagnostic class 7** or **8**).

At 100 % **Bleeder-I2t** the bleeder will be deactivated without further notification (as before). Not until the DC bus driver increases to more than 860V , the error message (as previously) 108 "Excess voltage" is generated.

- Ventilation is inadequate or the ambient temperature is too high.
- ▶ Brake at a slower rate.
- ▶ Check the dimensioning of the bleeder.
- ▶ Apply additional bleeder (bleeder module **BM-4**) with 400 V AC units.

**176**

reserved

**177 Power board - PowerOff due to excess temp**

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): B

The temperature of the power board inside the housing is too high.

- Insufficient ventilation or ambient temperature too high.
- ▶ Check ventilation in switching cabinet.
- ▶ If installed, make sure the air conditioning unit is functioning properly.
- Hardware error: The temperature sensor is defective.
- ▶ Replace the device.

**178 Device error**

Diagnostic class (standard): 2

Reaction (see 8.3 Reactions of "drives"): A

An internal error has occurred.

- Device error
- ▶ Contact your ELAU responsible.
- Device is defective
- ▶ Replace the device.

**179 Warning bleeder overload**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The Bleeder-I2t has reached a value of 80 % at **PS-5** .

At 100 % **bleeder** the bleeder will be deactivated without further notification. Not until the DC bus driver increases to more than 850 V, the error message (as previously) 108 "Excess voltage" is generated.

- Ventilation is inadequate or the ambient temperature is too high.
- ▶ Brake at a slower rate.
- ▶ Check the dimensioning of the bleeder.
- ▶ Use additional bleeder.

**180 Warning Board - PowerOff due to excess temp.**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

The temperature of the power board inside the housing is too high. If the temperature continues to rise, it results in the diagnostic message 177 "Board-PowerOff due to overtemperature". (see 8.6.2.78 177 Power board - PowerOff due to excess temp)

**181 Warning defective fan**

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): D

A fan error has occurred.

- The fan is blocked.

## ⚠ CAUTION

### ROTATING FAN.

- Open main switch.
- Prevent main switch from being switched back on.

**May cause bodily harm.**

- ▶ The existing arrangement of devices may be made adequate by adjusting one of the applications (e.g. decreasing acceleration).
- ▶ Clean dirt out of the fan.
  - The fan is defective.
- ▶ Replace the device.

### 182 External 24 V power supply too high

Diagnostic class (standard): 6

Reaction (see 8.3 Reactions of "drives"): E

The control voltage (DC 24 V) is too high.

- Control voltage is too high.
- ▶ Check the control voltage (see technical data of the device).

## 8.6.3 Diagnostic messages 2xx "Object managing"

### 200 Faulty logical address of parameter

Diagnostic class (standard): 4

The temperature of the power board inside the housing is too high. In the ext. diagnosis in the message logger, the logical address is displayed.

- Ventilation is inadequate or the ambient temperature is too high.
- ▶ Check the program.  
Please contact our application support department.
- Subsequent errors from diagnosis message 209 "last boot failed".
- ▶ See diagnostic message 209 "last boot failed".
- The configuration file on the controller is incorrect.
- ▶ Transfer the configuration file to the controller again.

### 201 Faulty parameter type code

Diagnostic class (standard): 4

The type code of a parameter is incorrect.

- Software error
- ▶ Contact your ELAU responsible.

### 202 Faulty configuration file

Diagnostic class (standard): 4

The configuration file is no longer readable.

In controller firmware version 00.16.30 or higher, the name of the temporary configuration file is displayed in the ext. diagnosis in the message logger.

- There is no configuration file in the PacDrive controller or the configuration file is corrupt.
- ▶ Transfer the configuration file with EPAS-4 again.

### 203 Faulty parameter file

Diagnostic class (standard): 4

The parameter file is not readable.

In controller firmware version 00.16.30 or higher, the name of the temporary parameter file is displayed in the ext. diagnosis in the message logger.

- The temperature of the power board inside the housing is too high.
- ▶ Transfer the parameter file with EPAS-4 again.

### 204 IEC program cannot be loaded

Diagnostic class (standard): 4

Unable to load the IEC program.

Additional information on how to limit errors is stored in the DiagExtCode or the ext. diagnosis in the message logger.

Ext. diagnosis	Meaning
prog xhhhhhhh	IEC program code is too big
bad version	The IEC program is not compatible with the PacDrive controller firmware (V00.10.00 or higher)
data xhhhhhhh	IEC data area is too large -> adjust number of data segments
ret xhhhhhhh	The retain area is too large
DOWNLOAD	Unable to load and prepare the IEC program.
.. miscellaneous	Other data errors

#### Cause of "data xhhhhhhh":

A project was developed for an older version of the PacDrive controller firmware. In this project, the number of data segments is greater than two (e.g. three). If you now transfer the program to the controller, EPAS-4 will display the following message after the transfer is complete: "IEC program cannot be loaded!"

- ▶ If this happens, reduce the number of data segments to two and transfer the project to the controller again after the conversion process is complete.

#### Cause of "DOWNLOAD":

A subsequent error is involved in this case.

- ▶ Refer to the previous error message (e.g. 312 "Parameter relocation failed" (see 8.6.4.13 312 Parameter relocation failed)).
  - There is no IEC program in the PacDrive controller or the IEC program is incompatible.
  - ▶ Transfer the IEC program again using EPAS-4.
  - The fan is blocked.
  - ▶ See DiagExtCode.
  - ▶ Adjust project.
  - The setting in EPAS-4 > Project > Options > Compilation options in the item "Number of Data Segments" is less than 2 (DiagExtCode = ret xhhhhhhh).
  - ▶ Increase the number of data segments.

## 205 Impermissible parameter value

Diagnostic class (standard): 4

A parameter has an impermissible value. The DiagExtCode parameter in the PLC configuration or message logger can be used to determine the logical address of the parameter that contains an impermissible value. This allows assignment to the PLC configuration.

- **Ext. diagnosis: BaudRate=<illegal value>M**  
In V00.15.00 or higher, the PacDrive controller supports the BaudRate SERCOS parameter.  
2, 4, 8 and 16 MBaud values are supported in general.  
Only specific values are supported depending on the type of PacDrive controller (Max-4, CXX, PXX). Each value is dynamically checked when written. Incorrect values are not transferred. Diagnosis message 205 "Impermissible parameter value" is triggered.
- ▶ Enter a valid BaudRate value.
- I=0Bxx0004; i.e., a value is entered that is either too small or too large for acceleration.
- ▶ In the ext. diagnosis in the message logger, logical address is displayed.
- I=03xx0025; i.e. the J\_Load in the PLC configuration is too large.
- ▶ Check the program.
- I=01010004; i.e. the IP\_Gateway in the PLC configuration does not match the IP\_SubNetMask.
- ▶ Only use standard IP address names.

## 206 Faulty ObjType of LogAdr

Diagnostic class (standard): 4

No object with the type code exists. The DiagExtCode parameter in the PLC configuration or message logger can be used to determine the logical address of the parameter that contains an impermissible value. This allows assignment to the PLC configuration.

- Subsequent errors from diagnosis message 209 "last boot failed (see 8.6.3.10 209 Last boot failed)".
- ▶ See diagnostic message 209 "last boot failed".
- Software error
- ▶ Contact your ELAU responsible.

## 207 Hardware module does not exist

Diagnostic class (standard): 4

The parameter file is not readable. The DiagExtCode parameter in the PLC configuration or message logger can be used to determine the type of the hardware module.

- A non-existent analog input or physical encoder was entered into the PLC configuration.
- ▶ Check the PLC configuration.
- There is no parameter file in the PacDrive controller or the parameter file is defective.
- ▶ Replace the PacDrive controller or optional module.

**208 Too many real axes in config**

Diagnostic class (standard): 4

The number of axes in the PLC configuration is too large.

**CAUTION**

In V00.15.00 or higher, the diagnosis message is replaced by the 518 "Too many real SERCOS Slaves" (see 8.6.6.18 518 Too many real SERCOS Slaves) diagnosis message.

- The number of axes for the CycleTime is too high.
- ▶ Check the CycleTime.
- There is no IEC program in the PacDrive controller or the IEC program is incompatible.
- ▶ Check the PacDrive controller type by referring to the type plate.

**209 Last boot failed**

Diagnostic class (standard): 4

A drop in the control voltage of the PacDrive controller, a reset of the PacDrive controller or a fatal error occurred in the last boot procedure. Use DiagExtCode to localize the problem.

While booting, the PacDrive controller logs the individual phases in the NvRam. If this results in a fatal error (err LED continually ON), then the next boot will use the default configuration and diagnosis message 209 will be triggered.

**! CAUTION**

**IF THE PACDRIVE CONTROLLER IS STARTED IN MINIMAL BOOT MODE, THE CONFIGURATION AND THE PLC CONFIGURATION PARAMETERS WILL BE SET TO THEIR DEFAULT VALUES.**

TCP / IP – address is set to its default value

A configured modem is not available.

Subsequent errors will result when loading the IEC program (e.g. diagnosis messages 200 and 206).

**CAUTION**

The third startup will occur in normal boot mode.

If this does not happen, the default configuration will be used for the next startup, and the process will be repeated ... !

DiagExtCode	Meaning
1	Boot procedure begins before kernel initialization
2	Kernel initialization complete; FTP server priority adjusted; Time Slicing switched on; System clock; No. Tick per second determined
3	Init logger and NvRam complete; interrupts blocked
31	Before ScanDisk
4	Diag created, messages sent, before ObjectContr new
10	Begin Constructor ObjVerObjektContr; Tasklock active
11	Config and Par file read



DiagExtCode	Meaning
12	Config file evaluated, generate before objects
13	generate after objects
14	set after CycleTime
15	after init of Moni.Max, LogGeb, VirtGeb, PhyGeb, construction of RTP before filling in indication table
16	set after parameter
17	after Sercos startup
18	after runtime system start
19	after RTP start, before IEC program load
20	after IEC program load
5	after ObjectContr new
6	after axis release, before WatchDogEin
RAM < 32MB	insufficient RAM in the PacDrive controller

Procedure:

- Read out and evaluate EPAS-4 connection with TCP/IP default address or serial message logger (important DiagExtCode!)
- The DiagExtCode can be used to read which phase of the boot procedure was executed correctly the last time.

## CAUTION

**If the PacDrive controller is booted using the minimal configuration settings (LED blinks quickly), then the program, parameter and configuration will always be available for download in the download box when you log in with the EPAS-4 (V00.07.00 or higher). This does not indicate different versions of the files on the PacDrive controller! Since the PacDrive controller was booted in the default configuration, the 206 Faulty type code of LogAdr (see 8.6.3.7 206 Faulty ObjType of LogAdr) diagnostic message will be triggered when downloading the IEC program since the program will use parameters that are not available.**

- The SysReset() function was called, although the boot procedure of the PacDrive controller is not yet complete.
- ▶ Use the GetPacDriveBootState() function to make sure that the PacDrive controller has stopped the boot procedure before you use the SysReset() function.
- DiagExtCode = 19: Program error; i.e. the IEC program file is incorrect.
- ▶ Overwrite the IEC program on the PacDrive controller by transferring the IEC project (dummy) with the default configuration.
- ▶ Check your program and send an error-free project to the PacDrive controller.
- DiagExtCode is not 19.
- ▶ Contact your ELAU responsible.
- The PacDrive controller was booted twice in quick succession. This may have been caused by pressing the reset button twice or a drop in the control voltage.
- ▶ Check the control voltage (also refer to the technical data).
- Insufficient RAM in the PacDrive controller for the project (DiagExtCode=out of memory).  
Meaning:  
A memory requirement could not be executed. Memory requirements are execut-



ed when booting, resetting the IEC task, calling a system functional block, setting/reading parameters, establishing/terminating an FTP connection, transferring data (remote device), communicating with EPAS-4, establishing/terminating a Telnet connection and communicating with Telnet.

- ▶ Reduce configuration.
- ▶ RamDiskSize must be decreased.
- ▶ Reduce number of tasks.
- ▶ Apply a PacDrive controller that has more RAM.
- A PacDrive controller with version 00.15.00 or higher is being used. The user data area was increased from 2 MB to 3.7 MB in this version. If the PacDrive controller has less than 32 MB of RAM, the PacDrive will start up in minimal boot mode.
- ▶ Use a PacDrive controller that has least 32 MB of RAM or firmware version V00.15.00 or lower.

### 210 Last boot failed

Diagnostic class (standard): 4

This diagnosis message is used to differentiate from the 209 "Last boot failed" (see 8.6.3.10 209 Last boot failed) message for minimal boot (boot not complete). In such a case the last boot failed.

#### Ext. diagnosis: RAM < 32MB

- If this diagnosis message appears, the minimal boot is also in error. However, this is caused by having insufficient RAM in the MAx-4 PacDrive controller (RAM<32 MB).
- ▶ Replace MAx-4 PacDrive controller with a device that has newer hardware.  
or  
Use an older firmware version in the MAx-4 PacDrive controller (V00.15.03 or lower).

### 211 Invalid configuration

Diagnostic class (standard): 4

A configuration error has occurred.

#### Cause, Firmware V00.20.00:

The Connector parameter is set for the "Bottom / 1" connector, but there is no expansion module present in the PacDrive controller (C600 or P600).

- ▶ Check the Connector parameter in the PLC configuration.
- ▶ Check whether an expansion module is present in the PacDrive controller.

#### Cause, Firmware V00.16.41:

This diagnosis message will be triggered if there are two field buses configured in PacDrive controller C600 or P600 that cannot be connected at the same time.

CAN Layer2 and DeviceNet Slave are configured;  
or CANopen Master and DeviceNet Slave are configured;  
or PROFIBUS DP master and PROFIBUS DP slave are configured.

- ▶ Check the PLC configuration.

## 8.6.4 3xx "General" diagnosis messages

### 300 Division error

Diagnostic class (standard): 4

A division by “0” should be executed in the IEC program.

## CAUTION

The division by “0” is defined for REAL and LREAL and hence does not generate the 300 “Division error” diagnosis message.

- The divisor was zero in an IEC division function.
- ▶ Include division by “0” in the IEC program.
- ▶ Check the number range.

### 301 Coprocessor segment overflow

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### 302 Stack error

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### 303 General protection error

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### 304 Coprocessor error

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### 305 Memory limit exceeded

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### 306 Arithmetic overflow

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.

- ▶ Please contact your ELAU representative.

### **307 Double execution error**

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### **308 Invalid task state segment**

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### **309 No memory segment**

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### **310 Faulty memory segment adjustment**

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### **311 Coprocessor division error**

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### **312 Parameter relocation failed**

Diagnostic class (standard): 4

A system error has occurred.

- An internal system error has occurred.
- ▶ Please contact your ELAU representative.

### **313 Excessive cycle time overrun**

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 4

The excessive cycle time error is monitored by the system. The IEC task is stopped immediately, if a fatal error occurs because of a cycle time overrun. Stopping the task is controlled by the system, not by the task itself so it is done without taking care of the current or following operations. Therefore, it can not be ruled out, that the task is per-

forming e.g. a read/write operation on the file system and so blocks another system resource exclusively. This resource is not released, when the task is stopped. If other tasks try to access this resource following errors may occur.

The fatal cycle error of an IEC task is reported when the 10x cycle time (see task configuration) is exceeded.

The task then receives an error status. You can quit the error message by resetting the IEC program but the error itself can be solved only by resetting the controller (Online > Reset PacDrive controller). The cycle time monitoring of the IEC task refers to the load parameter that is displayed in the IEC task expansion object in the PLC Configuration.

- The processing time of a parameter or system functional block that is being called is taking "too long".
  - ▶ Perform a reset of the the controller, as soon as possible.
  - ▶ Check program (e.g. access to SERCOS Parameter or WaitTime() function).
- The time interval in the task configuration is too short.
  - ▶ Increase the time interval in the task configuration.
  - ▶ if possible, use critical activities in new/another task.

### 314 Program file defective

(only in versions below 00.07.00)

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 4

A system error has occurred.

- An internal system error has occurred.
  - ▶ Transfer the program again.

### 315 Library function not implemented

Diagnostic class (standard): 4

The program used an interface library that is not supported or not fully supported by the current PacDrive controller. (For the name of the function, see DiagExtCode)

- Firmware in the PacDrive controller is obsolete.
  - ▶ Update firmware in the PacDrive controller.
  - ▶ Using older library versions may also work.

### 316 Faulty NvRam CRC

Diagnostic class (standard): 6

The NvRam lost the data. This means that the data in the message logger and the IEC variable values have been deleted. In this case the message logger is automatically deleted by the system.

- **"Object" in the message logger: "Cx00"**

The battery in the PacDrive controller is empty and the PacDrive controller was turned off (control voltage!).

  - ▶ Replace battery in the PacDrive controller.
  - ▶ Retain range and reinitialize clock.
- **"Object" in the message logger: "MAX4"**

The PacDrive controller has not been switched on for over 7 days (control voltage!).

  - ▶ Reboot the PacDrive controller. The error should now be resolved.

- **"Object" in the message logger: "PN4"**  
The internal or external battery on the PN-4 optional module is empty and the PacDrive controller has not been switched on in over 7 days (control voltage!).
- ▶ Reboot the PacDrive controller. The error should now be resolved.
- **"Object" in the message logger: "Cx00"**  
A system error has occurred.  
The NvRam on the PacDrive controller is defective.
- ▶ Replace PacDrive controller.
- **"Object" in the message logger: "MAX4"**  
A system error has occurred.  
The NvRam on the PacDrive controller is defective.
- ▶ Replace PacDrive controller.
- **"Object" in the message logger: "PN4"**  
A system error has occurred.  
The NvRam on the PN-4 optional module is defective.
- ▶ Replace the PN-4 optional module.
- An internal system error has occurred.
- ▶ Replace PacDrive controller.

### 317 Cycle time overrun

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 6

A cycle time error has been found. This error is triggered when the cycle time exceeds one system clock tick (default value for a system clock tick is 250 µs or 1 ms with the C200). DiagExtCode shows the "current cycle time" / "cycle time from the task configuration" in ms.

### 318 Calculated profile deleted

Diagnostic class (standard): 5

An attempt was made to calculate a profile (e.g. CamMasterStart() ) that was just deleted with the ProfilDelete(). The DiagExtCode displays the profile in hexadecimal form (e.g. Prof=1001000).

- An internal system error has occurred.
- ▶ Check the program.
- Program error: asynchronously running high-priority FastTasks were used.
- ▶ Synchronize **FastTask** to real-time process.

### 319 TPEdge not valid at 4ms

Diagnostic class (standard): 2

The touchprobe measurement is not valid at the specified CycleTime of 4 ms.

- A cycle time of 4 ms is specified in the PLC configuration and the PacDrive controller hardware does not support the touchprobe measurement correctly for this cycle time.
- ▶ Set the cycle time to 1 or 2, if possible.
- ▶ Update the PacDrive controller hardware.  
Contact your ELAU responsible.

### 320 Bad array access (check)

Diagnostic class (standard): 5

An array access error in the IEC user program was found by the Check.lib. The message logger call hierarchy function can be used to "backtrace" the function block call or nesting.

- While accessing an array, the area limits of that array were breached in the IEC user program.
- ▶ Reboot the PacDrive controller.

### 321 Division by zero (check)

Diagnostic class (standard): 5

A division by zero was found in the IEC user program by the Check.lib. The message logger call hierarchy function can be used to "backtrace" the function block call or nesting.

- A division by zero should be executed in the IEC program.
- ▶ Include division by "0" in the IEC program.
- ▶ Check the number range.

### 322 Exception by IEC task

Diagnostic class (standard): 5

(For the name of the function, see DiagExtCode) The message logger call hierarchy function can be used to "backtrace" the function block call or nesting.

### 323 String too long

Diagnostic class (standard): 5

The maximum string length (255) was found in the IEC user program by the Check.lib. The message logger call hierarchy function can be used to "backtrace" the function block call or nesting.

- The maximum string length in the IEC user program was exceeded.
- ▶ Reboot the PacDrive controller.

### 324 UPS internal failure

Diagnostic class (standard): 5

There is an internal error in the UPS.

- The battery of the UPS is empty.
  - ▶ Charge the battery.
- The power supply of the UPS is working, but the "ON/OFF" input of the UPS is set to OFF.
  - ▶ If the voltage supply is correct, then the "ON/OFF" input must be ON in order to use the UPS.
- An USV Object is specified in the PLC configuration, but no UPS is connected.
  - ▶ Check the IEC program.
- An internal UPS error has occurred.
  - ▶ Check the program.

**Ext. diagnosis: "PIC fail" or "State = 5"**

- Program error: Asynchronous running high priority FastTasks were used.
- ▶ Contact your ELAU responsible.

**325 File corrupt**

Diagnostic class (standard): 5

A problem (file non existent or CRC error) occurred while reading the retain file. The retain file will be read by the flash disk while the PacDrive controller boots if the Enable parameter of the UPS object is set to "External / 1".

- An USV Object is specified in the PLC configuration, but no UPS is connected.
- ▶ Check the IEC program.
- The UPS is not functioning properly.
- ▶ Check the UPS.

**326 Unsupported function**

Diagnostic class (standard): 5

A division by zero was found in the IEC user program by the Check.lib. Further information of the object type and the instance is displayed in the message logger. The DiagExtCode also provides information on the error cause.

- A division by zero should executed in the IEC program.
- ▶ Check the hardware version in reference to the type plate and the Mx4Type parameter.

**327 Invalid PositionSource**

Diagnostic class (standard): 6

The CamTrack in the PositionSource parameter contains an invalid value.

- The symbolic name of a logical encoder or an axis (MC-4 or SCL) was not specified in the PositionSource parameter.
- ▶ Check the value in the PositionSource parameter.

**328 Invalid Destination**

Diagnostic class (standard): 6

The CamTrack in the Destination parameter contains an invalid value.

- The message logger call hierarchy function can be used to "backtrace" the function block call or nesting.
- ▶ If an IEC task detects a fatal error (e.g. access error using pointer), it triggers a diagnosis message.

**329 Invalid BitNumber**

Diagnostic class (standard): 6

The CamTrack in the Bitno parameter contains an invalid value.

- The maximum string length in the IEC user program was exceeded.
- ▶ Check the IEC program.

**330 Bad master parameter data**

Diagnostic class (standard): 5



There is an internal error in the UPS.

Charge the battery. XXX indicates the generator type while YYY indicates the Master-JobId of the job that caused the problem.

**The power supply of the UPS is working, but the "ON/OFF" input of the UPS is set to OFF.**

0 -> CAM

1 -> POS

- Internal calculation error.
- ▶ Contact your ELAU responsible.

### 331 Licensing

Diagnostic class (standard): 5

This diagnostic message will be triggered by the license server of the PacDrive controller (e.g. C600) if a function block is used without a sufficient number of points. The 331 "Licensing" error (can be acknowledged) will be triggered first so as to notify the user that the remaining run time of the system is only six hours. More information on the object type and the instance is displayed in the message logger. When this time period has elapsed, a high priority error (see 8.6.4.33 332 Licensing) that cannot be acknowledged is triggered. After a few minutes (about 5 min.), the SERCOS bus is shut down, making any further use of the affected controller impossible.

- The PacDrive controller hardware does not support this function.
- ▶ Check the number of required license points by means of parameter for licensing in the PLC configuration.

### 332 Licensing

Diagnostic class (standard): 5

This diagnostic message will be triggered by the license server of the PacDrive controller (e.g. C600) if a function block is used without a sufficient number of points. The 331 "Licensing" error (can be acknowledged) will be triggered first so as to notify the user that the remaining run time of the system is only six hours. More information on the object type and the instance is displayed in the message logger. The DiagExtCode also provides information on the error cause. After a few minutes (about 5 min.), the SERCOS bus is shut down, making any further use of the affected controller impossible.

- The PacDrive controller hardware does not support this function.
- ▶ Check the number of required license points by means of parameter for licensing in the PLC configuration.

### 333 Fatal error receiving encoder data

V00.22.00 and higher

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 5

In the encoder network, a fatal error occurred while distributing the encoder positions.

**Ext. diagnosis: "Dupl. Obj."**

- Multiple initialization of object (SYN\_DIN, SYN\_DOUT).
- ▶ -

**Ext. diagnosis: "Int.Err=-xxx"**

- Internal error code.
- ▶ -



**Ext. diagnosis: "SyncLost"**

- Synchronization was lost while the object (SYN\_DIN, SYN\_DOUT) was active.
- ▶ -

**Ext. diagnosis: "No Data: xxx"**

- The number of data sets (xxx) that was not received sequentially exceeds the limit specified in DataCycleErrorLimit.
- ▶ -

**Ext. diagnosis: "Send error"**

- Due to an internal mistake for 5 cycles no telegrams were dispatched.
- ▶ -

**334 Error receiving encoder data (warning)**

V00.22.00 and higher

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 6

An error occurred in the encoder network while distributing the encoder positions.

**Ext. diagnosis: "No Data: xxx"**

- The Destination parameter was specified either without the symbolic name of an output group or with "none". If the number (xxx) of data sets that was not received sequentially exceeds the limit specified in DataCycleErrorLimit the 333 "Fatal error receiving encoder data" (see 8.6.4.34 333 Fatal error receiving encoder data) diagnosis message will be triggered.
- ▶ -

**335 Fatal synchronization error**

V00.22.00 and higher

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 5

Filter type 2 "Diagnosis messages"

A server error in the encoder network occurred while synchronizing the controller system clocks.

**Ext. diagnosis: "Sync Init" (Object SYN\_M or SYN\_S)**

- The initialization of synchronization master or synchronization slave failed. The IP address (SlaveIPAddress) of the sync. module is assigned twice.
- ▶ Check parameter **SlaveIPAddress** of the **sync. modules** in the **synchronization master** PLC configuration.

**Ext. diagnosis: "SercosPhase xxx"**

- The SERCOS ring is not in phase 4.
- ▶ SERCOS bus in phase 4 "booted".

**Ext. diagnosis: "Dupl. MasterID"**

- The set MasterID is already being used by another **synchronization master** in the same network.
- ▶ Change the **MasterID**.

**Ext. diagnosis: "Sync Init" (Object SYN\_M or SYN\_S)**

- The **synchronization master** protocol version no longer matches the **synchronization slave** protocol version.
- ▶ Check the SlaveIPAddress parameter of the sync. module in the synchronization master PLC configuration.

- ▶ Contact your ELAU responsible.

#### Ext. Diagnosis: "Ping Master"

- The **synchronization master** failed to respond to a ping.
- ▶ Check the Ethernet connection to the **synchronization master**.

#### Ext. Diagnosis "Dupl. Slave IP" (object SYN\_MOD)

- The IP address (SlaveIPAddress) of the sync. module is assigned twice.
- ▶ Check parameter **SlaveIPAddress** of the **sync. modules** in the **synchronization master** PLC configuration.

#### Ext. Diagnosis: "SlaveCycleTime"

- The SlaveCycleTime is not a multiple of the SERCOS cycle time.
- ▶ parameter **SlaveCycleTime** or adjust the **SERCOS cycle time**.

#### Ext. diagnosis: "Wrong config" (object SYN\_MOD)

- The activated **synchronization slave** is not configured properly or is not responding.
- ▶ Check the configuration of the **synchronization slave** (e.g. same CycleTime).
- ▶ Check TCP/IP connection between **synchronization master** and **synchronization slave**.

#### Ext. diagnosis: "Wrong config" (object SYN\_S)

- The SERCOS cycle times differ between **synchronization master** and **synchronization slave** or the **synchronization slave**-configuration cannot be transmitted.
- ▶ Adjust the CycleTime parameter of the **synchronization master** and/or **synchronization slaves**.

#### Ext. diagnosis: "Wrong State"

- The activated **synchronization slave** is in an error state.
- ▶ Acknowledge the error in the **synchronization slave**.

#### Ext. diagnosis: "No DataOut"

- No sync. encoder output has been configured or activated. Encoder output has been configured or activated.
- ▶ Check the PLC configuration.
- ▶ Check the TCP/IP connection **synchronization master** to **synchronization slave**. Activate **encoder output** (parameter Enable).

#### Ext. diagnosis: "No Module"

- No **sync. encoder output** has been configured or activated. **module** and no **sync. encoder output** are configured or active.
- ▶ Check the PLC configuration.
- ▶ Check the TCP/IP connection **synchronization master** to **synchronization slave**. **moduel** or **sync**. Activate **encoder output** (**sync. module** parameter Enable or **sync. encoder input** parameter Enable).

#### Ext. diagnosis: "Sync Err"

- The **synchronization slaves** are unable to synchronize with the **synchronization master**.  
The Ethernet (see parameter SyncQuality) and/or the CPU load (see parameter AvailableLoad) is too high.
- ▶ Check the Ethernet connection.
- ▶ Optimize the IEC project to reduce the CPU load.

**Ext. diagnosis: "No Sync: xxx"**

- The number of sequential synchronization telegrams (xxx) which were not received exceeded the number specified in **SlaveCycleErrorLimit**. The Ethernet (see parameter **SyncQuality**) and/or the CPU load (see parameter **AvailableLoad**) is too high.
- ▶ Check the Ethernet connection.
- ▶ Optimize the IEC project to reduce the CPU load.
- ▶ Increase **SlaveCycleErrorLimit** .

**Ext. diagnosis: "DataReady Err"**

- The number of sequential synchronization telegrams (xxx) which were not received exceeded the number specified in **SlaveCycleErrorLimit**. **Encoder outputs** cannot configure **sync. encoder inputs** or a data error occurred in the course of normal operation.
- ▶ Check parameter **DiagCode** of **sync. modules** to obtain more detailed information about the source of the error.

**Ext. diagnosis: "DataReady Err"**

- Either the **sync. encoder outputs** are unable to configure the **sync. encoder inputs** or a data error has occurred while the system is running. **Encoder outputs** and **sync. encoder inputs** are ready for data exchange.
- ▶ Check parameter **DiagCode** of **sync. modules** to obtain more detailed information about the source of the error.

**Ext. diagnosis: "Wrong IP Add"**

- The **SlaveIPAddress** parameter is not set.
- ▶ Contact your ELAU responsible.

**Ext. diagnosis: "Wrong IP Add"**

- The **SlaveIPAddress** parameter is not set.
- ▶ Contact your ELAU responsible.

**Ext. diagnosis: "Sync Err Wnd"**

The synchronization has been interrupted due to excessive telegram delays.

- Ethernet data communication excessive.
- ▶

**Ext. diagnosis: "Sync Err LCyc"**

The synchronization has been interrupted due to excessive telegram failures.

- 
- ▶

**Ext. diagnosis: "Sync Err CtrlM"**

The synchronization master has received an error message from a slave reporting a severe communication error.

- 
- ▶

**Ext. diagnosis: "Sync Err CtrlS"**

The synchronization slave has received an error message from the master reporting a severe communication error.

- 
- ▶

**Ext. diagnosis: "Sync Err CtrlN"**

The synchronization module has received an error message from the corresponding synchronization slave reporting a severe communication error and was unable to read more detailed diagnosis information.

- 
- ▶

**Ext. diagnosis: "Sync TimeoutM"**

The synchronization master has determined a timeout for establishing synchronization (> 5min).

- 
- ▶

**Ext. diagnosis: "Sync TimeoutS"**

The synchronization slave has determined a timeout for establishing synchronization (> 5min).

- 
- ▶

**336 Synchronization error (warning)**

V00.22.00 and higher

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 6

A fatal error has occurred in the encoder network, while synchronizing the controller system clocks.

**Ext. diagnosis: "No Sync: xxx"**

- More than half of the synchronization telegrams (xxx) specified in `SlaveCycleErrorLimit` have not been received sequentially. If more than the number of synchronization telegrams specified in `SlaveCycleErrorLimit` are not received in a row, diagnostic message 335 "Fatal synchronization error" (see 8.6.4.36 335 Fatal synchronization error) is triggered.
- ▶ -

**337 Insufficient system memory to create DynIECData**

V00.22.00 and higher

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 4

Filter type 1 "general system messages"

The dynamic memory area, which was specified with the `DynIECDataSize` parameter, could not be reserved due to insufficient memory (RAM). During IEC program start, a check will be performed to determine if there is at least 4 MB of available memory after the dynamic memory area is reserved (also see the `Memoryfreeparameter`).

- The dynamic memory area to be reserved is too high.
- ▶ Reduce the value of the parameter `DynIECDataSize`.

**338 UPS accu error**

Diagnostic class (standard): 5

The battery is not sufficiently charged.

**Ext. diagnosis: "State = 2"**

- The PacDrive controller has been switched off for too long.

- ▶ Switch on the PacDrive controller.
  - ✓ The battery will be charged automatically when the PacDrive controller is on.
- The UPS has been operating in the battery mode (State = 3) for an extended period.
- ▶ Check the supply voltage.
- ▶ Switch on the PacDrive controller if it is off.
  - ✓ The battery will be charged automatically when the PacDrive controller is on.
- The battery capacity is insufficient due to aging.
- ▶ Contact your ELAU responsible.

### 339 UPS active - system temperature too high

Diagnostic class (standard): 5

The temperature in the PacDrive controller is too high.

**Ext. diagnosis: "State = 6"**

- Ambient temperature too high.
- ▶ For further details, please refer to the technical data on the PacDrive controller (see operating instructions).

### 340 Outside of limits (check)

reserved

### 341 Invalid PositionType

Diagnostic class (standard): 6

The CamTrack in the parameter PositionType contains an illegal value.

- No valid position type (parameter **PositionType**) of the position source PositionSource (see 8.6.4.28 327 Invalid PositionSource)) has been entered.
- ▶ Check the parameters **PositionType** and **PositionSource**.

## 8.6.5 4xx "IEC-Task" diagnosis messages

### 400 IEC diagnosis message class 2

Diagnostic class (standard): 2

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

### 401 IEC diagnosis message class 3

Diagnostic class (standard): 3

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

**402 IEC diagnosis message class 4**

Diagnostic class (standard): 4

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

**403 IEC diagnosis message class 5**

Diagnostic class (standard): 5

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

**404 IEC diagnosis message class 6**

Diagnostic class (standard): 6

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

**405 IEC diagnosis message class 7**

Diagnostic class (standard): 7

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

**406 IEC diagnosis message class 1**

Diagnostic class (standard): 1

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.
- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

**407 IEC diagnosis message class 8**

Diagnostic class (standard): 8

A diagnostic message from the IEC program has been triggered with the DiagMsgWrite() function.

- The error was triggered by the IEC program.

- ▶ See description of your IEC program. It is possible to display an additional error text with the DiagMsgWrite() function.

## 8.6.6 5xx “SERCOS / realtime” diagnosis messages

### 500 SERCOS slave with duplicate address

Diagnostic class (standard): 1

While booting the SERCOS bus' in phase 3, the addresses of the detected SERCOS slaves are checked. The system detects any multiple address assignments. This function, however, must be supported by the SERCOS slaves. ELAU slaves (MC-4, SCL and PS-4) support this function in V00.15.00 or higher.

- A SERCOS slave address has been assigned to the SERCOS slaves twice.
- ▶ Check the rotary switch settings on the SERCOS slaves.

#### Meaning in versions below V00.15.00:

A SERCOS slave address has been assigned more than once in the PLC configuration. The DiagExtCode parameter displays the address that has been assigned multiple times. If the address is displayed once, it has been assigned twice; if it is displayed twice, it has been assigned three times, and so forth.

- A SERCOS slave address has been assigned more than once in the PLC configuration.
- ▶ DiagMsgWrite function.
- ▶ Check and adjust the RealTimeBusAdr parameter in the PLC configuration.

### 501 SERCOS slave not found

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 1

The device, that was expected at the position (x), was not found. (PDIII)

- Error when assigning the identification features.
- ▶ Check the settings of the identification features (for example: ConfiguredTopologyAddress)

A SERCOS slave specified in the PLC configuration is not detected in the SERCOS bus.

- SERCOS slave not present in the SERCOS bus.
- ▶ Integrate the SERCOS slave in the SERCOS-Bus or remove the SERCOS slave from the PLC configuration or parameterize it as a virtual device.
- SCL-055 motors are connected to the PacDrive controller. The connection of the SCL-055 motors in the PacDrive PD-8 box is not correct.
- ▶ Check the connection of the SCL-055 motors in the PacDrive PD-8 box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position. In addition, follow the notes in the "SCL" and "PS-4 and PD-8" operating instructions.

### 502 Ring not closed

Diagnostic class (standard): 1

The SERCOS ring is not closed. The result was a longer interruption (>100 ms) of the ring.



You can detect whether the interruption is still present using Light diode "bus err" (see 8.4 Device display elements (LEDs)) and the RingStatus (see 8.4 Device display elements (LEDs)) parameter.

When the interruption has been eliminated and the SERCOS bus is at least in phase 2, the source of the error can be narrowed down with the help of the **SERCOS Firmware Assistenten** in the data view **System diagnosis > SERCOS-configuration** and **SERCOS Topology**.

- Signal over the SERCOS fiberoptic conductor is incorrect.
- ▶ Check the intensity setting in the PacDrive controller and on the servo amplifier.
- ▶ Check wiring (see parameter RingStatus).
- A device in the SERCOS ring is switched off or was reset.
- ▶ Check the power supply (24 V) of the device.
- ▶ Switch on the device.
- **SCL-055** motors are connected to the PacDrive controller. The **SCL-055** motors are not connected properly in the PacDrive **PD-8** box.
- ▶ Check the connection of the **SCL-055** motors in the PacDrive **PD-8** box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position. Please refer to the notes provided in the "**SCL**" and "**PS-4**" and **PD-8** operating instructions.

### 503 Error in parameter channel

Diagnostic class (standard): 4

A transfer error has occurred in the SERCOS bus during operation. Additional information will be stored in DiagExtCode .

DiagExtCode	Meaning
ST-Err:xxx	Service transfer error
ST Timeout	Timeout during service transfer
ST Any	Other service transfer error
ST-99	Error while processing reset ZK1
ST -99 ChangeBit	Error while processing reset ZK1; change bit was not set or protocol error
no SYNC	Communication synchronization with slave disrupted.

- **DiagExtCode = no SYNC**  
There are SERCOS slaves (MC-4) with a firmware version below V00.15.00 in the loop that are not responding as real devices. The result is a serious error during phase start up of the SERCOS bus, interrupting the phase start up.
- ▶ If there are SERCOS slaves (MC-4) with a firmware version below V00.15.00 that have not responded as real devices, the SERCOS address on the device must be set to zero.
- EMC problem
- ▶ Connect the SERCOS slave to the SERCOS bus
- Hardware problem with a SERCOS slave (e.g. servo amplifier MC-4) or a SERCOS master (e.g. PacDrive controller Max-4).
- ▶ Contact your ELAU responsible.

### 504 Read cycle overflow

Diagnostic class (standard): 4



The transfer of the actual position of the axes (servo amplifiers) to the PacDrive controller occurred too late. The actual values of the next SERCOS cycle have already been read. The actual velocity for the IEC program may not be correct.

- SERCOS bus is overloaded.
- ▶ Increase CycleTime parameter in the PLC Configuration.
- A device in the SERCOS ring is switched off or was reset.
- ▶ Switch on SERCOS slave.

### 505 Single SERCOS error (MASTER)

Diagnostic class (default): 6

A check sum error on the SERCOS bus has been detected. Additional information will be stored in DiagExtCode .

- Signal over the SERCOS fiberoptic conductor is incorrect.
- ▶ Check the intensity setting in the PacDrive controller and on the servo amplifier.
- ▶ Service transfer error
- EMC problems.
- ▶ Check the wiring.
- SCL-055 motors are connected to the PacDrive controller. The connection of the SCL-055 motors in the PacDrive PD-8 box is not correct.
- ▶ Check the connection of the SCL-055 motors in the PacDrive PD-8 box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position.  
In addition, follow the notes in the "SCL" and "PS-4 and PD-8" operating instructions.

### 506 Fatal SERCOS error (MASTER)

Diagnostic class (Default): 1

SERCOS communication interrupted, because no link exists anymore on both ports. (PDIII)

- Wiring error (cable separated).
- ▶ Check wiring.
- SERCOS slave failed after the controller.
- ▶ Check device and reset if necessary.

SERCOS communication interrupted, because more than the allowed numbers of DT's have failed sequentially. (PDIII)

- Wiring error (cable separated).
- ▶ Check wiring.
- A SERCOS slave has failed.
- ▶ Check device and reset if necessary.

In two consecutive cycles, an error was detected on the SERCOS bus while receiving data. The SERCOS bus was shut down. For firmware versions earlier than V00.15,00 it is necessary to reset the PacDrive controller to start the SERCOS bus.

## ! CAUTION

### POSITION LOSS DUE TO SERIOUS SERCOS BUS ERROR!

- Due to the erroneous acknowledgement of diagnostic message 506 "Serious SERCOS error (MASTER)", without restarting the controller, loss of position of the axes and physical encoder (SinCos, incremental encoder) from V00.15.00 is possible.
- Acknowledge the diagnosis message only after the re-initialization or referencing of the system is secured by the IEC program.
- The capability to acknowledge the diagnostic message can be switched off with the function `DiagNoQuitSet()`.
- If necessary, use the `SysReset()` or the `PrgResetAndStart()`.

**A non-observance of these instructions can cause bodily injury or damage the equipment.**

## CAUTION

### CONNECTION TO CONTROLLER INTERRUPTED

- The diagnostic message 112 "Communication error real time bus" (see 8.6.2.13 112 Communication error real-time bus) is not reported in the system because the SERCOS slave cannot report the diagnosis code via the SERCOS bus to the Controller in case of an error.
- In this case, diagnosis code 506 "Fatal SERCOS error (MASTER)" (see 8.6.6.7 506 Fatal SERCOS error (MASTER)) is reported.

**Failure to follow these instructions can result in equipment damage.**

- `DiagExtCode = RFr` or `RFlr` (see 8.6.1.51 052 Extended SERCOS diagnosis (MASTER))  
Control voltage dropped (24 V DC). Diagnostic message 134 "External 24V power supply too low" (see 8.6.2.35 134 External 24V power supply too low) may still be entered in the message logger (if it was still possible to transfer it via the SERCOS bus).
  - ▶ Check the control voltage (see technical data of the device).
- `DiagExtCode = Rr` (see 8.6.1.51 052 Extended SERCOS diagnosis (MASTER)) during the phase start up  
There are SERCOS-Slaves (**MC-4, SCL, PS-4**) in the ring with a firmware version lower than V00.20.00 and the parameter `FastBootUp` is set to `TRUE`. The result is a serious error during phase start up of the SERCOS bus, interrupting the phase start up.
  - ▶ If there are SERCOS slaves (**MC-4, SCL, PS-4**) with a firmware version lower than V00.20.00 in the ring, the parameter `FastBootUp` must be set to `FALSE`.
- `DiagExtCode = RFr` (see 8.6.1.51 052 Extended SERCOS diagnosis (MASTER)) during phase start up  
There are SERCOS slaves (**MC-4**) with a firmware version earlier than V00.15.00 in the ring that are not addressed as real devices. The result is a serious error during phase start up of the SERCOS bus, interrupting the phase start up.
  - ▶ For SERCOS slaves (**MC-4**) with a firmware version earlier than V00.15.00 that are not being addressed as real devices, the SERCOS address must be set to 0.
- SCL-055 motors are connected to the PacDrive controller. The connection of the SCL-055 motors in the PacDrive PD-8 box is not correct.

- ▶ Check the connection of the SCL-055 motors in the PacDrive PD-8 box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position. Please refer to the notes provided in the "SCL" and "PS-4 and PD-8" operating instructions.

### 507 Write cycle overflow

Diagnostic class (default): 4

The transfer of the target position to the SERCOS bus occurred too late. Check the fiberoptic conductor. This results in a velocity jump in the drives (see parameter RTPWriteRes)

- SERCOS bus is overloaded.
- ▶ Increase CycleTime parameter in the PLC Configuration.
- The real-time process is overloaded.
- ▶ Simply placing jumpers on the desired terminals will not resolve the problem.
- A device in the SERCOS ring is switched off or was reset.
- ▶ Switch on SERCOS slave.

### 508 SERCOS run-up-error

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (Default): 1

At least one SERCOS slave does not react on time after the phase change to phase 3. (PDIII)

- Software error in FW 1.29.14.0
- ▶ Start SERCOS start-up again.
- General software error in one of the SERCOS slaves.
- ▶ Reset the SERCOS slave and start SERCOS start-up again.

No telegrams were received in phase 0, the ring is not closed. (PDIII)

- Wiring error (cable separated).
- ▶ Check wiring.
- SERCOS slave failed after the controller.
- ▶ Check device and reset if necessary.

A system error has occurred.

- Virtual SERCOS slaves are specified in the PLC configuration although the slaves are physically connected on the SERCOS bus.
- ▶ Check the RealTimeBusAdr parameter of the SERCOS slaves in the PLC configuration.
- There are more SERCOS slaves in the loop than specified in the PLC configuration.
- ▶ Check the number of SERCOS slaves in the PLC configuration.
- ▶ Check and RealTimeBusAdr parameter in the PLC configuration.
- ▶ Remove the SERCO slave from the loop or set the address on the device to zero.
- SCL-055 motors are connected to the PacDrive controller. The connection of the SCL-055 motors in the PacDrive PD-8 box is not correct.
- ▶ Check the connection of the SCL-055 motors in the PacDrive PD-8 box. Simply placing jumpers on the desired terminals will not resolve the problem. No nodes to be plugged into the following SERCOS plug-in position. Please refer to the notes provided in the "SCL" and "PS-4 and PD-8" operating instructions.

- **Ext. Diagnose: "no telegram"**  
On a bad connection it can happen that a ring interruption was not detected yet. However, the transfer quality on the BUS may be so bad that no telegrams can be transmitted. A Start up from phase 0 is then cancelled without a diagnosis message. The message logger then shows that the change from phase 0 to phase 1 was cancelled with internal error code -483.
  - ▶ Check the intensity settings for the SERCOS interface.
  - ▶ Check the SERCOS bus wiring.
  - ▶ Check the setting of the MaxPhysicalSlaves parameter.
- **Ext. Diagnose: "SemDPM-Timeout"**  
A synchronization error occurred during the phase start-up.
  - ▶ Contact your ELAU responsible.
- **Ext. Diagnose: "AutoRunTimeout"**  
The phase start-up of the SERCOS bus took too long. The diagnostic message is triggered when booting the control system. In addition, the following conditions must apply: Parameter AutoRun = TRUE and PhaseSet = 4. The IEC program is started automatically when the diagnostic message has been triggered.
  - ▶ Contact your ELAU responsible.

### 509 Unsupported FW-version

Diagnostic class (default): 4

The firmware version of the SERCOS slave is incorrect.

- The firmware version of the SERCOS slaves (MC-4, SCL, PS-4, ...) is higher than the firmware version of the PacDrive controller in the first 4 positions.
  - ▶ Increase the CycleTime parameter in the PLC configuration.
- **Ext. diagnosis = Vxx.yy.zz BLD**  
The SERCOS slave is in bootloader mode. The version of the Bootloader is shown in the message logger under **Ext. Diagnosis**. The SERCOS slave can also be found using the information on the **object** and **instance** provided in the message logger.
  - ▶ Reduce the number of objects with real-time tasks (e.g. virtual axes, virtual encoders, logical encoders, sum encoders, ...).
  - ▶ Reset the SERCOS slaves.
  - ▶ Acknowledge the diagnosis message.
- ✓ The SERCOS bus is running in phase 4.

### 510 EZB IRQ lost

Diagnostic class (default): 4

The interruption of the SERCOS buy has not been received in at least twice the cycle time. This diagnosis message normally occurs at the same time as other diagnosis messages ( 504 Read cycle overflow (see 8.6.6.5 504 Read cycle overflow) ... 507 Write cycle overflow (see 8.6.6.8 507 Write cycle overflow)).

- The problem occurs when the system shuts down. The 24 V control voltage of the SERCOS slave is removed faster than the 24 V control voltage of the PacDrive controller.
  - ▶ Check the wiring or connection diagram.
- However, the transfer quality on the BUS may be so bad that no telegrams can be transmitted.
  - ▶ Check the intensity setting for the SERCOS interface.

- Ext. diagnosis: "SemDPM-Timeout"
- ▶ Check the SERCOS slave.

### 511 CPU time overflow

Diagnostic class (default): 2

The real-time process is overloaded ( CycleLoad >95 %). The DiagExtCode parameter displays the measured load as 'Load = xxx%' with xxx indicating the load in %.

## CAUTION

**After detecting the error, the actual and target values for the encoders, generators and axes will no longer be processed in the real-time process. As a result, the "target and actual values" parameter of the axes will show invalid values.**

- The version of the bootloader is displayed in the message logger under Ext. diagnosis.
- ▶ Increase the CycleTime parameter of the SERCOS interface in the PLC configuration.

### 512 SERCOS wrong device type

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (Default): 1

The device type of the SERCOS slave found on position (x) does not match the expected type (type). (PDIII)

- Error when assigning the identification features.
- ▶ Check the settings of the identification features (for example: ConfiguredTopologyAddress).

When starting up the SERCOS bus in Phase 2, the type of the detected SERCOS slave will be checked (MC-4, SCL, PS-4, ...) with the slave that is entered in the PLC configuration. The interrupt of the SERCOS bus has not been received in at least twice the cycle time . The SERCOS address and the detected type will be entered in the extended diagnosis.



The problem occurs when the system shuts down.

If this is the case, at least two SERCOS slaves have the same address.

- The SERCOS slave address (RealTimeBusAdr) on the SERCOS slave (MC-4, SCL, PS-4) was not set correctly.
- ▶ Replace the fiberoptic conductor.
- ▶ Check if the address setting on the SERCOS slave matches the address setting in the PLC configuration (RealTimeBusAdr).
- A SERCOS slave has failed.
- ▶ Check the SERCOS slave.

### 513 Download result

Diagnostic class (default): 4

Filter type 2 "Diagnosis messages"

An error has occurred during the program-controlled firmware download.

If no match is found, the SERCOS bus phase startup will be cancelled.

**DI <SERCOS address> Err <internal error code>**

- **Ext. diagnosis = DI <SERCOS address> Err -479**  
A wrong device type was entered in the configuration file (e.g. one **PS-4** firmware for another **MC-4**). If this is the case, at least two SERCOS slaves have the same address.
  - ▶ Adjust the configuration file.
- **Ext. diagnosis = DI <SERCOS address> Err -495**  
The "Download Mode" in the configuration file is specified as "upgrade" (or "downgrade") and the current firmware version is higher (or lower) than the firmware version that is to be programmed.
  - ▶ Check the address setting on the SERCOS slave that is displayed in the diagnosis message.
  - ▶ Check if the address setting on the SERCOS slave matches the address setting in the PLC configuration (RealTimeBusAdr).

### 514 Error download configuration file

Diagnostic class (default): 4

### 516 SERCOS wrong device position

Diagnostic class (default): 1

When the SERCOS bus boots at the end of Phase 3, the assignment of the SCLs to the PS-4 systems is checked. All SCLs that have been assigned a specific PS-4 power supply in the PLC configuration must be physically connected with that PS-4. If an assignment error occurs, the 516 "SERCOS wrong device position" diagnosis message will be displayed.

The message appears for the affected SCL. The DiagExtCode displays the name of the PS-4 that actually should be assigned to the SCL.

- This diagnosis message is generated for each SERCOS slave.
  - ▶ Adjust the configuration file.
- The addresses of the PS-4 power supply have been incorrectly set via the rotary switch on the device.
  - ▶ Check the address settings on the PS-4.
- The RealTimeBusAdr parameter in the PLC configuration contains incorrectly specified PS-4 and/or SCL addresses.
  - ▶ Check the RealTimeBusAdr parameter in the PLC configuration.

### 517 Multiple used RealTimeBusAdr

Diagnostic class (standard): 1

A SERCOS address (RealTimeBusAdr) has been assigned more than once in the PLC configuration. A check is performed while preparing the SERCOS phase 1. The boot procedure of the SERCOS bus will be cancelled. The DiagExtCode parameter and the ext. diagnosis in the message logger display the address that have been assigned more than once.

- A SERCOS address has been assigned more than once in the RealTimeBusAdre parameter in the PLC configuration.
  - ▶ Check the RealTimeBusAdr parameter in the PLC configuration.

### 518 Too many real SERCOS Slaves

Diagnostic class (see 8.2 The Notion of 'Diagnosis Classes') (standard): 4



Too many SERCOS slaves have been connected (x), not able to connect them all with the logical objects (y). (PDIII)

- The WorkingMode is not configured correctly.
- ▶ Check if for every real connected slave an appropriate object is existent in the PLC configuration where the WorkingMode is set to real or optional.
- The identification features are not configured correctly.
- ▶ Check if for every real connected slave, by the appropriate objects in the PLC configuration, the correct identification features are entered (for example, correct TopologyAddress)

The number of real SERCOS slaves is too high.

**Ext. diagnosis: HW <maximum number of SERCOS slaves on the controller>/<Number of configured SERCOS slaves>**

- Limiting through the Controller type:  
Before exiting the SERCOS Phase 0, the number of configured real SERCOS slaves in the PLC configuration is being checked. The number must be smaller or equal to the licensed number for the PacDrive controller. If this value is exceeded, the startup will be cancelled. The extended diagnosis shows the licensed and the configured number together with the "HW" prefix.  
As of controller firmware version 00.23.00, power supplies (PS-4, PS-5) are no longer counted as SERCOS slaves.
- ▶ Check the PacDrive controller type by referring to the type plate.

**Ext. diagnosis: BUS t=<time overrun>µs**

- The communication parameters of the SERCOS slave are queried in the SERCOS phase 2. Together with the settings of the SERCOS master, the time slots for the cyclical telegram traffic will be determined and set. The BaudRate and CycleTime parameters determine the available BUS bandwidth. If the bandwidth is insufficient, the startup will be cancelled with the 518 "Too many real SERCOS Slaves" diagnosis message. The extended diagnosis shows the time by which the cycle time has been exceeded as a negative value.
- The number of SERCOS slaves (MC-4, PS-4, SCL) for the cycle time is too high.
- ▶ Check the CycleTime.
- ▶ Check the BaudRate.

**The addresses of the integrated SCL servo drive have been incorrectly set via the rotary switch on the device.**

- Limiting through the hardware configuration (licensing):  
Before exiting the SERCOS phase 0, the number of configured real SERCOS-SercDrv slaves in the PLC configuration is being checked. The number must be smaller or equal to the licensed number for the PacDrive controller. If this value is exceeded, the startup will be cancelled. The extended diagnosis shows the licensed and the configured number together with the "SercDrv" prefix.
- ▶ Check the PacDrive controller type.
- ▶ Contact your ELAU responsible.

## 8.6.7 6xx "master encoder" diagnosis messages

### 600 Serial interface problem

Diagnostic class (standard): 4

The number of real SERCOS slaves is too high.

## ⚠ CAUTION

### INITPOSITION AND ENCODERPOSITION ARE POSSIBLY INCORRECT.

- Ext. diagnosis: HW <maximum number of SERCOS slaves on controller>/<number of configured SERCOS slaves>

**Damage may result from a non-referenced machine.**

- Wiring error: The encoder cable is not plugged in correctly or is defective.
  - ▶ Check the encoder cable and replace if necessary.
  - ▶ Contact your ELAU representative.
- Data is exchanged using the encoder's serial interface during the functions PhyEndGetPosition(),PhyEncResetEncoder() and PhyEndSetPosition(). The actual data exchange is performed by the system task (TASK\_TYPE\_PHY\_ENC\_JOB\_Server). If the function is active, this task must query the serial interface on a regular basis (usually<2ms). Insufficiently allocated processing time may result in data loss (diagnosis message 600). The TASK\_TYPE\_PHY\_ENC\_JOB\_Server system task runs at IEC priority 5 (same as system priority 225). If the above functions in the IEC tasks are called with a priority of 1 to 4, this problem may result when the processing requirements are too high.
  - ▶ Check the cycle time.
  - ▶ Contact your ELAU representative.

#### Example:

The PhyEncGetPosition() function is triggered from an IEC task with IEC priority of 4. The IEC task normally requires 2.5ms for processing. Increase the priority of the system task from 225 (or IEC priority 5) to 224 (IEC priority 4) for example.  
 SetTaskPriority(ITaskType:=TASK\_TYP\_PHY\_ENC\_JOB\_Server, IPriority:=224);

- Hardware error: The SinCos encoder is defective.
  - ▶ Replace the encoder.
  - ▶ Contact your ELAU representative.
- Hardware error: The SinCos encoder is defective.
  - ▶ Replace the controller.

#### 601 Encoder track error

Diagnostic class (standard): 4

Unable to receive analog data from the SinCos master encoder.

## ⚠ CAUTION

### HARDWARE ENCODER ERROR!

- Acknowledge the diagnosis message only after the re-initialization or referencing of the system is secured by the IEC program.
- If necessary, use the SysReset() or the PrdResetAndStart().

**Reset the PacDrive controller.**

- Wiring error: The encoder cable is not plugged in correctly or is defective.
  - ▶ Check the encoder cable and replace if necessary.
- Hardware error: The SinCos encoder is defective.
  - ▶ Replace the encoder.



- Hardware error: The SinCos encoder is defective.
- ▶ Replace the controller.

## 8.6.8 7xx "field buses and expansion module" diagnosis messages

### 700 CAN layer2 driver error

Diagnostic class (standard): 4

Unable to start the driver for the CANopen module.

- TM Safety Instructions Position Loss
- ▶ Hardware encoder error!
- Wiring error: The encoder cable is not plugged in correctly or is defective.
- ▶ Check the I/O address.
- ▶ Check the interrupt setting
- Hardware error: The SinCos encoder is defective.
- ▶ Replace the CAN module.
- Hardware error: Controller is defective.
- ▶ Replace the controller.

### 701 CAN layer2 init error

Diagnostic class (standard): 4

Initialization has failed.

- No CAN module in the PacDrive controller.
- ▶ -
- Incorrect I/O address or interrupt setting.
- ▶ Replace the module.

### 702 CAN layer2 single error detected

Diagnostic class (standard): 4

A send or receive error has occurred.

Meaning of ext. diagnosis:

The system displays the pending register information at the time the error occurred.

Structure: eXXsXXrXXtXX (XX indicates a hexadecimal number)

e error register (error code capture register)

Bit 7	Bit 6
0	0: Bit error
0	1: Format error
1	0: Stuff error
1	1: Other error

Bit 5
0: Send error
1: Receive error

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	1	1	Start of frame
0	0	0	1	0	ID.28 to ID.21

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	1	1	0	ID.20 to ID.18
0	0	1	0	0	Bit SRTR
0	0	1	0	1	Bit IDE
0	0	1	1	1	ID.17 to ID.13
0	1	1	1	1	ID.12 to ID.5
0	1	1	1	0	ID.4 to ID.0
0	1	1	0	0	Bit RTR
0	1	1	0	1	Reserved bit 1
0	1	0	0	1	Reserved bit 0
0	1	0	1	1	Data length code
0	1	0	1	0	Data field
0	1	0	0	0	CRC sequence
1	1	0	0	0	CRC delimiter
1	1	0	0	1	Acknowledge slot
1	1	0	1	1	Acknowledge delimiter
1	1	0	1	0	End of frame
1	0	0	1	0	Intermission
1	0	0	0	1	Active error flag
1	0	1	1	0	Passive error flag
1	0	0	1	1	Tolerate dominant bits
1	0	1	1	1	Error delimiter
1	1	1	0	0	Overload flag

Table 8-8: Bit 4 to Bit 0 indicate the position of the error.

s Status Register (see Status parameter)

r Receive Error Counter (see Status parameter)

t Send Error Counter (see Status parameter)

- Bit Error + Data Length Code.  
Two nodes are using the same identifier or COB-ID.
- ▶ Check the identifier or COB-ID.
- Bit Error + Identifier  
Intermittent connection error to receiver.
- ▶ -
- Stuff Error + Identifier  
Dominant signal level due to external interference.
- ▶ -
- Format error + Acknowledge delimiter  
Critical bus time setting (Baudrate) or bus length.
- ▶ -

**Ext. diagnosis = count=xx/yy**

xx: Contains the value of the ErrorCount at the time the error occurred.

yy: Contains the value of the ErrorOffCount parameter at the time the error occurred.

The GlobalError parameter is set to Bit 4.

- Bus error.
- ▶ -

**703 CAN layer2 errors reach warning limit**

Diagnostic class (standard): 4

The number of send or receive errors specified in the warning limit register has been exceeded.

**Meaning of ext.**

**diagnosis:** The system displays the pending register information at the time the error occurred.  
 Structure: sXXrXXtXX  
 s Status register (see Status)  
 r Receive Error Counter (see Status parameter)  
 t Send Error Counter (see Status parameter)

**704 CAN layer2 switched passive**

Diagnostic class (standard): 4

128 send or receive errors have occurred. In passive mode, no CAN messages are acknowledged and no error messages are sent to the bus.

**Meaning of ext.**

The system displays the pending register information at the time the error occurred.  
**diagnosis:** Structure: sXXrXXtXX  
 s Status register (see Status)  
 r Receive Error Counter (see Status parameter)  
 t Send Error Counter (see Status parameter)

**705 CAN system error**

Diagnostic class (standard): 4

An internal error in the CAN module has occurred. The type of error is specified in more detail in the ext. diagnosis.

- **Ext. diagnosis = msg lost=XXX:**  
 The PLC firmware was unable to retrieve the command or status messages from the CAN module fast enough, which led to a buffer overrun and the loss of XXX messages.  
 ▶ Contact your ELAU responsible.
- **Ext. diagnosis = fmsg lost=XXX:**  
 The control firmware was unable to retrieve the layer2 messages from the CAN module fast enough.  
 ▶ Contact your ELAU responsible.
- **Ext. diagnosis = module overload:**  
 CPU on CAN module was unable to read the data from the CAN bus fast enough and messages have been lost as a result.  
 ▶ Contact your ELAU responsible.
- **Ext. diagnosis = module int lost:**  
 CPU on CAN module was unable to read the CAN messages (intended for CAL/CANopen) from the bus fast enough. No messages for CAL/CANopen have been defined for layer 2. Error is not permitted to occur with the CAN layer 2 module.  
 ▶ Contact your ELAU responsible.
- **Ext. diagnosis = mod queue out:**  
 CPU on CAN module was unable to read the CAN messages send for CAL/CAN-open fast enough. No messages for CAL/CANopen have been defined for layer 2. Error is not permitted to occur with the CAN layer 2 module.  
 ▶ Contact your ELAU responsible.

- **Ext. diagnosis = mod error:**  
Event error of the CAN module not specified in more detail. Default branch event error evaluation. Should not occur.
- ▶ Contact your ELAU responsible.

### 706 CAN layer2 errors below warning limit

Diagnostic class (standard): 8

The number of send or receive errors specified in the warning limit register has been exceeded. Sending or receiving functioning again.

### 707 CAN layer2 switched active

Diagnostic class (standard): 8

The number of send or receive errors (128) has been exceeded. The CAN module is running again in active mode. Sending or receiving functioning again.

**Meaning of ext.** The system displays the pending register information at the time the error occurred.  
**diagnosis:** Structure: sXXrXXtXX  
s Status register (see Status)  
r Receive Error Counter (see Status parameter)  
t Send Error Counter (see Status parameter)

### 720 No module found

Diagnostic class (standard): 4

Unable to find module identifier or field bus firmware update not possible.  
A **iSH-DIO8** was configured on the **iSH** and activated (Enable = TRUE), but not detected during the SERCOS phase boot.

- The firmware file on the flash disk (or the hard disk of P600) could not be found or is incorrect.
- ▶ Check if a valid firmware file is present.
- Optional module not found.
- ▶ Install module or send in the controller/drive for retrofitting.
- An optional module was entered in the PLC configuration that is not available.
- ▶ Check the PLC configuration.
- A **phys. master encoder** (SinCos-Geber) is entered in the PLC configuration on the **BT-4/ENC1**, but no **phys. master encoder** is detected on the connector **BT-4/ENC1**.
- ▶ Plug the incremental encoder cable in at the **BT-4/ENC1** connection.
- ▶ Check the encoder cable.
- The I/O address is incorrectly set.
- ▶ Check the I/O address.
- Hardware error: Module defective.
- ▶ Replace the module.
- Hardware error: Controller is defective.
- ▶ Replace the controller.

### 721 Module not ready

Diagnostic class (standard): 4

The module does not respond after initialization by the controller.

- Module defective.
- ▶ Replace module in controller.
- **Ext. diagnosis = no answer:**  
Watchdog monitoring for the (Profibus) module has triggered. The module does not respond within the preset monitoring time (see default configuration).
- ▶ Replace module in controller.
- **Ext. diagnosis = FPGA defect:**  
Unable to program FPGA. The module is not ready.
- ▶ Replace module in controller.
- **Ext. diagnosis = FPGA PinOut:**  
The FPGA firmware file does not match the FPGA pinout. This may result in damage to the module.
- ▶ Via FTP, copy the correct FPGA firmware to the flash disk of the controller and restart the controller.
- **Ext. diagnosis = FPGA prg fail:**  
Unable to program the FPGA. The firmware is not compatible with the module.
- ▶ Via FTP, copy the correct FPGA firmware to the flash disk of the controller and restart the controller.
- **Ext. diagnosis = no FPGAfl open:**  
Unable to open the FPGA firmware file. The flash disk may be defective.
- ▶ Replace the flash disk.
- **Ext. diagnosis = def FPGA-head:**  
The header in the firmware file is not correct.
- ▶ Via FTP, copy the correct FPGA firmware to the flash disk of the controller and restart the controller.
- **Ext. diagnosis = wr FPGA size:**  
The size of the FPGA file is incorrect.
- ▶ Via FTP, copy the correct FPGA firmware to the flash disk of the controller and restart the controller.
- **Ext. diagnosis = no FPGAfile:**  
An FPGA firmware file was not found on the flash disk.
- ▶ Via FTP, copy the correct FPGA firmware to the flash disk of the controller and restart the controller.
- **Ext. diagnosis = RTC is damaged:**  
Unable to set the time of the RealTimeClock in the PN-4 option module. The diagnosis message cannot be acknowledged.
- ▶ This is due to a problem in a very early hardware version of the PN-4. To correct the error, the PN-4 module must be replaced. The problem has been corrected in hardware code 030033 and higher.  
**Workaround:**  
The DiagNoQuitReset() IEC function can be used to make the diagnosis message acknowledgeable.  
**Example**  
DiagNoQuitReset(721);

### 722 No cyclic telegram

Diagnostic class (standard): 4

The exchange of cyclical data was interrupted.

## CAUTION

**No error is displayed when the connection between the PROFIBUS-DP Slave und PROFIBUS-DP master is interrupted if the response monitoring in the slave was shut off by the master. This means that diagnosis code 722 is not triggered.**

- The master interrupts the sending of cyclical data.
- ▶ Check the master.
- Cable fault.
- ▶ Check the wiring.
- The slave address has been assigned twice in the network.
- ▶ Check the configuration.

### 723 No profibus configuration data

Diagnostic class (standard): 4

This diagnosis message only occurs in the boot phase of the PacDrive controller or with bus enable. No configuration file was found on the flash disk of the PacDrive controller.

A DiagExtCode may be generated.

- **Database:** Unable to delete the SyCon configuration database on the Profibus card software.
  - **bad load:** No configuration file was found on the flash disk of the controller.
  - **bad sldata:** The slave data of the configuration file is incorrect. Should occur together with the 730 "Bad master parameter data" (see 8.6.8.16 730 Bad master parameter data) diagnosis message. If not, the incorrect configuration will result in the Profibus card resetting.
  - **bad madata:** The master bus data of the configuration file is incorrect. Should occur together with the 730 "Bad master parameter data" diagnosis message. If not, the incorrect configuration will result in the Profibus card resetting.
- Communication problems.
  - ▶ Retransmit the PLC configuration.
  - The slave address has been assigned twice in the network.
  - ▶ Check the configuration.
  - Hardware error: Flash disk defective.
  - ▶ Replace the flash disk.
  - Hardware error: Controller is defective.
  - ▶ Replace the controller.

### 724 no I/O area detected

Diagnostic class (standard): 4

The field bus server(s) did not detect an IEC I/O area. The I/O area is prepared while loading the IEC program.

- Subsequent error to diagnosis message 204 "IEC program cannot be loaded".
- ▶ See 204 "IEC program cannot be loaded" (see 8.6.3.5 204 IEC program cannot be loaded)diagnostic message.
- Libraries in the project were modified or replaced. This can occur in controller versions below V00.16.20.
- ▶ Reset the controller (EPAS-4: Online > Reset PacDrive Controller).

- A project was transferred with EPAS-4 using a different setting from the MaxNumOfPOUs in the "EPAS-4.ini" file.
- ▶ Adjust the setting for MaxNumOfPOUs to match your EPAS-4 installations. Reset the controller (EPAS-4: Online > Reset PacDrive Controller).
- Defective project.
- ▶ Reconvert the project by choosing "Project > Fix All" in the EPAS-4 and then "Project > Convert All". Then transfer the project again to the controller and reset the controller (EPAS-4: Online > Resetting the PacDrive Controller).

### **725 Firmware of the module was replaced**

Diagnostic class (standard): 7

This message shows that the firmware of a fieldbus module was replaced. In controller firmware version 00.16.40 or higher, the version of the new fieldbus firmware is displayed in the ext. diagnosis in the message logger.

### **726 Firmware of the module is incorrect**

Diagnostic class (standard): 4

This message shows that the firmware of a fieldbus module is incorrect.

- Firmware download for a fieldbus module via the controller failed.
- ▶ Repeat the firmware download.

### **730 Bad master parameter data**

Diagnostic class (standard): 4

The slave and/or master data of the configuration file are incorrect. The error code specified after "Err=" corresponds to the error code of the ErrorCode parameter.

- Communication problems when transferring the PLC configuration from EPAS-4 to controller.
- ▶ Transfer the PLC configuration again.
- Hardware error: Controller or flash disk defective.
- ▶ Replace the controller.

### **731 Automatic bus deactivation**

Diagnostic class (standard): 4

The Auto Clear Bit in the master is set and at least one slave is not exchanging cyclical I/O data. The error code specified after "Err=" corresponds to the error code of the ErrorCode parameter.

- Slave has been disabled.
- ▶ Reactivate slave.
- At least one slave is not configured correctly.
- ▶ Check the configuration.
- Wiring error: Cable fault in bus.
- ▶ Check cable.
- Wiring error: Incorrect bus topology.
- ▶ Check terminals, transmission lines, ...

**732 Slave not responding**

Diagnostic class (standard): 4

Slave with bus address preceded by "SI=" is not exchanging cyclical I/O data. The error code specified after "Err=" corresponds to the error code of the ErrorCode parameter.

If the Activation parameter is set to "false", then this diagnostic message will not be triggered in V00.20.00 or higher.

- Slave has been disabled.
- ▶ Reactivate slave.
- At least one slave is not configured correctly.
- ▶ Check the configuration.
- Wiring error: Cable fault in PROFIBUS-DP.
- ▶ Check cable.
- Wiring error: Incorrect bus topology.
- ▶ Check terminals, transmission lines, ...

**733 Fatal bus error**

Diagnostic class (standard): 4

Further bus communication is not possible due to a severe bus error.

 <b>CAUTION</b>
--

<p><b>NO DATA EXCHANGE WITH BUS TERMINAL BT-4 ENC1!</b></p> <ul style="list-style-type: none"> <li>• Acknowledge the diagnosis message only after the re-initialization or referencing of the system is secured by the IEC program.</li> <li>• If necessary, use the SysReset() or the PrdResetAndStart().</li> </ul> <p><b>Position loss of the master encoder connected to bus terminal BT-4/ENC1.</b></p>
--



- Wiring error: Incorrect bus topology.
- ▶ Check terminals, transmission lines, ...
- EMC faults.
- ▶ Check the wiring and EMC protection.
- **Ext. diagnosis = asynchronous:**  
A synchronization error has occurred. The touchprobes on the **BT-4/DIO1** are not working..
- ▶ Check the jumper cable that connects the controller to the optional module **PN-4** (in the controller).
- **Ext. diagnosis = clock miss:**  
A communication error has occurred in PacNet. This may be due to a variety of causes:
  - PacNet loop not closed
  - PacNet terminating plug is missing
  - A module connected to PacNet failed (no power)
- ▶ Check the PacNet loop and all the modules in the loop.

**734 Bus short circuit detected**

Diagnostic class (standard): 4

The number of bus short circuits specified by "count=" was detected.



- Slave fault.
- ▶ Check the slave device.
- EMC problem.
- ▶ Check the wiring.
- Wiring error: Cable is defective.
- ▶ Check the wiring.

### 735 Reject bus telegrams

Diagnostic class (standard): 4

The number of telegrams specified in "count=" was rejected.

One or more telegrams could not be transmitted to the bus. This occurs, for example, when there are no further slaves in the bus, which is confirmed by the telegram.

- Wiring error: Cable is defective.
- ▶ Check the wiring.

### 736 No I/O data exchange with slave

Diagnostic class (standard): 4

Slave with bus address preceded by "SI=" is not exchanging cyclical I/O data.

- Slave is not configured correctly.
- ▶ Check the configuration based on the documentation for the slave.

### 737 Double IEC address assigned

Diagnostic class (standard): 4

The IEC start address for the input or output area was assigned more than once.

DiagExtCode:

- **I S1xxx=S1yyy:** The slaves with the Profibus addresses xxx and yyy have been specified with the same start address for the IEC input data.
- **O S1xxx=S1yyy:** The slaves with the Profibus addresses xxx and yyy have been specified with the same start address for the IEC output data.
- Slaves are not configured correctly.
- ▶ Check the configuration.
- ▶ Adjust the addresses manually or select "Addresses automatic" in the properties dialog box of the Profibus master object in the PLC configuration.

### 738 Conf. I/O data > permissible IO are a

Diagnostic class (standard): 4

The maximum IO data size has been exceeded.

DiagExtCode:

- **I D=xxx>yyy:** The maximum input data size of yyy bytes was exceeded by the configured data size of xxx bytes.
- **O D=xxx>yyy:** The maximum output data size of yyy bytes was exceeded by the configured data size of xxx bytes.
- Slaves are not configured correctly.
- ▶ Reduce the IO data of the slave.

### 739 Double profibus address assigned

Diagnostic class (standard): 4

The Profibus Adr=xxx has been assigned twice in a master configuration.

- Slave is not configured correctly.
- ▶ Check the configuration.
- ▶ Adjust the addresses manually or select "Addresses automatic" in the properties dialog box of the Profibus master object in the PLC configuration.

### 750 CanOpen node does not exist

Diagnostic class (standard): 4

The bus will be examined for existing nodes using the default Sdo Index 0x1000. This diagnosis message will be triggered if nodes are detected that do not exist in the configuration. This diagnosis message will be triggered if the configuration contains nodes that have not been detected.

#### **Ext. diagnosis:**

Displays the node addresses of the nodes that have been configured but not detected on the bus.

Structure: NodeId=xxx

xxx decimal node address

- Node not switched on or ready when the check is performed; node does not permit Sdo access to the index 0x1000; node addresses are not set correctly.
- ▶ Check the configuration.
- Electrical connection incorrect or defective.
- ▶ Check the wiring.

### 751 CanOpen node not configured

Diagnostic class (standard): 7

The bus will be examined for existing nodes using the default Sdo Index 0x1000. This diagnosis message will be triggered if nodes are detected that do not exist in the configuration. This diagnosis message will be triggered if nodes are detected that do not exist in the configuration.

#### **Ext. diagnosis:**

Displays the node addresses of the detected node that has not been configured.

Structure: NodeId=xxx

xxx decimal node address

- CanOpen node not configured.
- ▶ Configure or switch off node.

### 752 No CanOpen EDS file exists

Diagnostic class (standard): 4

Unable to load the COPMAX4.EDS CANopen description file on the flash disk of the controller.

- Description file has not been transferred to the controller or has been deleted.
- ▶ Transfer the description file to the controller via FTP.

### 753 Initialisation CanOpen module failed

Diagnostic class (standard): 4

An error has occurred during the initialization phase of the CANopen module.

**Meaning of ext. diagnosis:**

- **can\_open:** Init driver of the can\_open call failed.
  - **CmsConfig:** Init driver of the CmsConfig call failed.
  - **SetHostEndian:** Init driver of the SetHostEndien call failed.
  - **InquiryStatus:** Init driver of the InquiryStatus call failed.
  - **SSyncToHost:** Init driver of the SsyncToHost call failed.
  - **Baudrate:** Init driver of the Baudrate call failed.
  - **Termination:** Init driver of the Termination call failed.
  - **LsBusOnReq:** init driver of the LsBusOnReq call failed.
  - **CalMaster:** Init driver of the CalMaster call failed.
  - **IdVersReq:** Init driver of the IdVersReq call failed.
  - **LsSwitchBerrReq:** Init driver of the LsSwitchBerrReq call failed.
- Software error.
  - ▶ Contact your ELAU responsible.

**754 CanOpen emergency message**

Diagnostic class (standard): 4

A CANopen node has sent an emergency message to the bus.

**Meaning of ext. diagnosis:**

The system displays the node address, the error code and the error register.

Structure: Nxxx Cxxxx Rxx

N node address decimal CANopen node address

C error code hexadecimal CANopen error code

Error code (hex)	Meaning
00xx	Error reset or no error
10xx	Generic error
20xx	Current
21xx	Current, device input side
22xx	Current, inside the device
23xx	Current, device output side
30xx	Voltage
31xx	Mains voltage
32xx	Voltage inside the device
33xx	Output voltage
40xx	Temperature
41xx	Ambient temperature
42xx	Device temperature
50xx	Device hardware
60xx	Device software
61xx	Internal software
62xx	User software
63xx	Data set
70xx	Additional modules
80xx	Monitoring
81xx	Communication
90xx	External error

Error code (hex)	Meaning
F0xx	Additional function
FFxx	Device specific

Table 8-9: Error Code (hex) and meaning

Bit	M/O	Meaning
0	M	Generic error
0	O	Current
0	O	Voltage
0	O	Temperature
0	O	Communication error (overrun, error state)
0	O	Device profile specific
0	O	reserved
0	O	Manufacturer-specific

Table 8-10: R error register hexadecimal CANopen error register

Bit: Bit number in error register

M/O: Mandatory/Optional

- See description of the triggering node
- ▶ -
- CopMaTriggerEmcy was called by another controller.
- ▶ -

### 755 CanOpen node guarding error

Diagnostic class (standard): 4

The CANopen master can monitor the individual CANopen slave nodes. While monitoring, the status of the nodes is queried in configurable intervals (Guard Time). If a response is not received within a specified time (Guard Time \* Life Time Factor), this diagnosis message will be triggered. The CANopen slave also checks the time between monitoring queries (Guard Time \* Life Time Factor) after the first monitoring query is received. No ext. diagnosis is displayed in this case.

#### Meaning of the ext. diagnosis of the CANopen master:

Structure: Nxxx timeout

N decimal CANopen node address

The displayed node has not responded to a monitoring query within the specified time (Guard Time \* Life Time Factor).

Structure: Nxxx toggle bit

N decimal CANopen node address

The displayed node has responded to a query with an incorrect monitoring response. The "toggle bit" has not been sent properly. The correction of this error will not be displayed.

Structure: Nxxx e=xx r=xx

N decimal CANopen node address

e= expected status of hexadecimal CANopen status

r= received status of hexadecimal CANopen node address

Status: DISCONNECTED, INITIALISING0

CONNECTED3

PREPARED4

OPERATIONAL5  
PRE\_OPERATIONAL7f

The displayed node has responded to a query with an incorrect monitoring response. An unexpected status was received.

- CANopen node has not processed the reset or a configuration has not been sent.
- ▶
- Electrical bus connection faulty or incorrect.
- ▶ Check the wiring.

#### 756 CanOpen DPM access timeout

Diagnostic class (standard): 4

Unable to read one or more input application objects.

##### Meaning of ext. diagnosis:

Displays the size of the non-readable application object.

- Software error; module overload.
- ▶ Contact your ELAU responsible.

#### 757 CanOpen config error

Diagnostic class (standard): 4

An error has occurred while configuring the individual CANopen slaves.

##### Meaning of the ext. diagnosis (Controller Mx-4):

Structure: xxxxSyyzzvvNcc

Upper case characters appear directly.

Lower case characters have the following meanings:

Character	Meaning
xxxx	Cop Index in hex display
yy	Cop SubIndex in hex display
zz	Meaning of Cop Index is displayed as follows: MT: Map entry for send PDO MR: Map entry for receive PDO T: send PDO R: receive PDO '': Index has nothing to do with PDO.
vv	Number of the respective PDOs in hex display
cc	Node number in hex display

- CANopen node not reachable via Sdo access (e.g. node still in startup phase); node not available; mapping of application object not permitted (application object not available or mappable); write access to the index is not permitted for this node.
- ▶
- Electrical bus connection faulty or interrupted.
- ▶ Check the electrical connection.
- **Ext. diagnosis: <None>**  
Parameterization error.
- ▶ See GlobalError parameter (Bit 0 is set).  
Contact your ELAU responsible.

- **Ext. diagnosis: Database**  
Message is generated when a hardware error occurs.
- ▶ Contact your ELAU responsible.

**Ext. diagnosis: Sl=xx Err=yy**

xx: Contains the CANopen bus address of the slave that has configuration data with errors.

yy: Contains the value of the Status parameter at the time the error occurred.

**758 Application object size not supported**

Diagnostic class (standard): 4

The CANopen master provides the specified application objects. If the application objects are configured in the CANopen node configuration with an application object size that is not available, this diagnosis message will be triggered.

**Meaning of ext. diagnosis:**

Structure: Nxxx Cxxxx Rxx

CID Pdo Cobld hexadecimal Coplf (Identifier) of the Pdos in which the application object has been mapped.

S size of the application object of the hexadecimal application object size

N hexadecimal CANopen node address

- Configuration error.
- ▶ Check the configuration.

**759 Application obj. max count limit reached**

Diagnostic class (standard): 4

The CANopen master provides the application objects described in the operating manual. If more application objects are configured in the CANopen master configuration than are actually available, this diagnosis message will be triggered.

**Meaning of ext. diagnosis:**

Structure: Nxxx Cxxxx Rxx

CID Pdo Cobld hexadecimal Coplf (Identifier) of the Pdos in which the application object has been mapped.

S size of the application object of the hexadecimal application object size

N hexadecimal CANopen node address

- Configuration error.
- ▶ Check the configuration.

**770 Option-modules area exceeded**

Diagnostic class (standard): 4

An overlapping of the IO area of the optional module was detected. The DiagExt-Code displays the number code of the type key of the overlapping module.

**Example:**

DiagExtCode = '3/01 2/02'; i.e. the IO address of the PROFIBUS-DP master module (2/02) is within the IO address area of the DeviceNet slave module (3/01).

- The IO area of the optional module has not been set properly in the controller.
- ▶ Check the IO area settings based on the operating instructions for the option modules.

**771 Double IRQ config of the option-modules**

Diagnostic class (standard): 4

A double interrupt use by the optional module was detected. The DiagExtCode displays the interrupt that was used twice.

- The interrupt of the optional module has not been set properly in the controller.
- ▶ Check the interrupt settings based on the operating instructions for the option modules.

**780 Frequency > 1MHZ**

Diagnostic class (standard): 5

The incremental speed to be output was too high.

<b>! CAUTION</b>
------------------

<b>INCREMENTAL SPEED TOO HIGH.</b>
------------------------------------

- |   |
|---|
| <ul style="list-style-type: none"> <li>• Carry out the referencing of the amplified incremental encoder inputs or systems again.</li> <li>• Note the causes and troubleshooting measures listed below.</li> </ul> |
|---|

<b>Position loss at the incremental encoder output.</b>
---

<b>Position loss at the incremental encoder output.</b>
---

- The speed of the encoder to be simulated is too high.
- ▶ Reduce the speed of the encoder.
- The resolution and/or FeedConstant parameters have not been entered correctly.
- ▶ Check the parameters.
- The connector of the incremental encoder was connected or removed while the device was switched on (control voltage on).

<b>! CAUTION</b>
------------------

<b>DEVICE SWITCHED ON.</b>
----------------------------

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Switch off the power supply before connecting or removing the connector.</li> </ul> |
|--|

<b>Changes to the wiring can damage the device.</b>
---

- ▶ Switch off the device.
- ▶ Connect or remove the connector.
- ▶ Switch on the device.

**781 No connection to encoder**

Diagnostic class (standard): 5

The jumper in the encoder cable connector to the controller was not detected.

This monitoring function is active in the MAx-4 optional INC-4 optional module when connecting an incremental encoder. The monitoring function for the SinCos encoder is active on the Cx00 and P600 controller.

- Wiring error: Encoder cable to the controller removed.
- ▶ Plug in the encoder cable.
- Wiring error: Encoder cable is defective.

- ▶ Check the encoder cable and replace if necessary.

### 782 Track error

Diagnostic class (standard): 5

A hardware encoder error occurred at the incremental encoder input (**BT-4/ENC1** or incremental encoder module **INC-4**).

## ! CAUTION

### HARDWARE ENCODER ERROR!

- Acknowledge the diagnosis message only after the re-initialization or referencing of the system is secured by the IEC program.
- If necessary, use the SysReset() or the PrdResetAndStart().

**Reset the PacDrive controller.**

- Wiring error: Encoder cable at the encoder or the encoder input has been removed or is defective.
  - ▶ Check the encoder cable and replace if necessary.
  - ▶ Check the ground connection (shield).
- The encoder / encoder supply or encoder simulation is not ready.
  - ▶ Switch off the default monitoring with the parameter CheckOff.
  - ▶ If the encoder or encoder simulation is ready, then activate the monitoring in the IEC program.
- Encoder defective.
  - ▶ Replace the encoder.

### 785 Hardware defect

Diagnostic class (standard): 4

A hardware defect exists.

- **Ext. diagnosis = PIIX Error**
  - ▶ Replace the controller.
- **Ext. diagnosis = EEPROM damag**
  - ▶ Replace the PN-4 optional module.
- **Ext. diagnosis = EEPROM S xxxx**
  - ▶ Replace the PN-4 optional module.
- **Ext. diagnosis = RTC is damaged**

Unable to set the time of the RealTimeClock in the PN-4 option module. This is due to a problem in a very early hardware version of the PN-4. This problem has been removed in hardware code 030033 or higher.

  - ▶ Replace the PN-4 module.
- **Ext. diagnosis = Ref PowerFail**  
**Instance= OutputGroup**

The status of the digital outputs remains unchanged until the supply voltage (connector X1) has fallen to 0 volts. The diagnosis message can be entered in the message log when the controller is switched off, as the voltage drop of the supply voltage causes a Spi error before the CPU detects a power failure.

**Instance= InputGroup**

The digital inputs cannot be evaluated. The diagnosis message can be entered



in the message log when the controller is switched off, as the voltage drop of the supply voltage causes a Spi error before the CPU detects a power failure.

- ▶ Check the supply voltage.
- **Ext. diagnosis = Ref PowerFail**  
Evaluation of the digital inputs in accordance with the en61131-2 type 1 standard is no longer guaranteed. The diagnosis message can be entered in the message log when the controller is switched off, as the voltage drop of the supply voltage causes a Ref PowerFail error before the CPU detects a power failure.
- ▶ Check the supply voltage.

### 786 Asynchronous to SERCOS bus

Diagnostic class (standard): 4

### 787 Configuration error

Diagnostic class (standard): 4

A configuration error has occurred.

- **Ext. diagnosis = Mtype=xx wrong (xx = detected module)**  
A non-configured module was detected on PacNet. The module cannot be used.
- ▶ Check the configuration of the module in the PLC configuration.
- **Ext. diagnosis = Mtype=0 wrong**  
No module was found on PacNet.
- ▶ Switch on the control voltage on the module.
- **Ext. diagnosis = M=xx n.res**  
The module with bus address xx repeatedly gives no response. This may be caused by a power failure or a defective module. The module cannot be used.
- ▶ Check the module address on the module.
- ▶ Check the module address in the PLC configuration.
- ▶ Check the power supply of the module.
- ▶ Replace the module if necessary.
- **Ext. diagnosis = Powerfail 0-7**  
The power supply for outputs 0 through 7 of the **BT-4/DIO1** or **iSH-DIO8** is not available or too low (<14 V). These outputs cannot be used.  
The **iSH-DIO8** triggers the diagnostic message only if PowerSupply = "Extern / TRUE".
- ▶ Check the power supply of the outputs.

## CAUTION

The **DiagPF0\_7Enable** parameter allows you to switch off the message.

- **Ext. diagnosis = Powerfail 8-15**  
The power supply for outputs 0 through 7 of the **BT-4/DIO1** is not available or too low (<14 V). These outputs cannot be used.
- ▶ Check the power supply of the outputs.

## CAUTION

The **DiagPF8\_15Enable** parameter allows you to switch off the message.

- **Ext. diagnosis = no FPGAfile**  
No "c2\_xpxx.bin" file was found on the flash disk of the C200. xpxx stands for the FPGA firmware version. The C200 controller cannot be used. The pinout of the C200 controller must match the pinout of the FPGA firmware. The pinout of the FPGA firmware is the number represented by p in the xpxx of the FPGA firmware version. The pinout of the controller can be read in the ControllerType1 parameter and is indicated by the p in FPGA=pyxxxx.
- ▶ Install a valid "c2\_xpxx.bin" FPGA firmware file with a matching pinout on the flash disk of the C200.

## CAUTION

While installing a firmware version on the C200 controller, the Firmware Assistant automatically copies the "c2\_xpxx.bin" to the flash disk of the C200.

- **Ext. diagnosis = FPGA Pinout**  
No "c2\_xpxx.bin" file with a matching pinout was found on the flash disk of the C200. xpxx stands for the FPGA firmware version. The C200 controller cannot be used. The pinout of the C200 controller must match the pinout of the FPGA firmware. The pinout of the FPGA firmware is the number represented by p in the xpxx of the FPGA firmware version. The pinout of the controller can be read in the ControllerType1 parameter and is indicated by the p in FPGA=pyxxxx.
- ▶ Install a valid "c2\_xpxx.bin" FPGA firmware file with a matching pinout on the flash disk of the C200.

## CAUTION

While installing a firmware version on the C200 controller, the Firmware Assistant automatically copies the "c2\_xpxx.bin" to the flash disk of the C200.

- **Ext. diagnosis = FPGA not supp.**  
The current firmware on the controller (C400, C600 or P600) does not match the controller hardware.
- ▶ Install a matching firmware version on the controller with the **Firmware Assistant-en**.  
**Example:**  
Firmware versions below 00.16.40 (e.g. 00.16.32) do not support HW versions with the FPGA pinout "3" (e.g. FPGA version = 0316).  
The controller hardware used does not yet support **BT-4/ENC1** bus terminals.
- **Ext. diagnosis = FPGA Version**  
An FPGA version was found on the controller (C200, C400, C600 or P600) that is specified as a beta test version.  
The pinout of the FPGA firmware is the number represented by p in the zpxx of the FPGA firmware version. The pinout of the controller can be read in the ControllerType1 parameter and is indicated by the p (for C200, under FPGA=pyzpxx). The highest bit indicated by z is a beta test version.
- ▶ Install a released FPGA firmware file on the controller (C200, C400 and C600 -> flash disk; P600 -> hard disk).
- **Ext. diagnosis = BusAddr > Max**  
The PROFIBUS address is larger than the maximum permitted bus address.
- ▶ Check the PROFIBUS configuration.

- **Ext. Diagnosis = too many IM**  
With iSH-DIO8, the sum of the measuring inputs and the Impulse Counters is more than two.
- ▶ Check the configuration (parameter IO0\_Mode ... IO7\_Mode).

### 788 Wiring error

Diagnostic class (standard): 5

There is a wiring error.

- **Ext. diagnosis = Overload**  
The affected output is short circuited or overloaded.  
iSH-DIO8 triggers the diagnostic message only if PowerSupply = "Intern / FALSE".
- ▶ Check the wiring of the output.
- **Ext. diagnosis = Openload**  
The output is not connected or only slightly loaded.
- ▶ Check the wiring of the output.
- ▶ It may be useful to disable the diagnosis message.
- **Ext. diagnosis = PowerFail**  
The external power supply of the digital outputs was not connected. The supply of the digital outputs is checked when at least one bit is set to 1 in the DiagMask parameter of the output group object.
- ▶ Check the power supply of the digital outputs.
- ▶ Check the DiagMask parameter.
- **Ext. Diagnosis = PowerFail (BT-4/ENC1)**  
The power supply of the encoder is too low.  
Parameter EncPowerSupply = "Intern / FALSE":  
Short circuit of the power supply (pins 5 and 9) of the connected encoder or defective bus terminal **BT-4/ENC1**  
Parameter **EncPowerSupply** = "Extern / TRUE":  
There is no or not enough power at the X5 plug connector or there is a short circuit of the power supply (pins 5 and 9) of the connected encoder.
- ▶ Check the power supply of the encoder.
- ▶ Check the encoder cable.
- **Ext. Diagnosis = PowerFail (BT-4/ENC1)**  
A SinCos encoder (physical encoder) was entered in the PLC configuration, but no SinCos encoder is recognized at connector X2 or X3 of **BT-4/ENC1**.
- ▶ Plug the SinCos encoder cable into the **BT-4/ENC1** X2 or X3 connections.
- ▶ Check the encoder cable.
- **Ext. diagnosis = type not supp.**  
The connected encoder type is not supported by the system.
- ▶ Connect an encoder supported by the system.
- **Ext. diagnosis = out <-> out**  
Power is supplied externally to the connectors X2, X3, or X4 (pin 5 and 9) of the bus terminal **BT-4/ENC1**. The connector for the incremental encoder output may have been plugged into an encoder input.
- ▶ Check the assignment of the encoder connectors.

### 789 Single bus error

Diagnostic class (standard): 6

A single bus error has occurred.

- **Ext. diagnosis = M=xx n.res**  
The module with bus address xx is suddenly not responding.  
The transfer is disrupted.
- ▶ Check the wiring of the module.
- PacNet Warning. An RX clock is missing.
- ▶ Check the wiring of the module.

### 790 Module error

Diagnostic class (standard): 5

There is a module error.

- **Ext. Diagnosis = Com. Ext. Diagnosis = Com. IOModule**  
A communication error occurred between iSH-DIO8 and iSH.
- ▶ Contact your ELAU responsible.
- **Ext. Diagnosis = DIVCLK**  
An error occurred while synchronizing with the SERCOS cycle.
- ▶ Contact your ELAU responsible.
- **Ext. Diagnosis = drive disabled**  
The iSH<sub>n</sub>, on which the iSH-DIO8 was configured is disabled (RealTimeBusAdr = 200 ... 299) and the iSH-DIO8 is enabled (Enable = TRUE).
- ▶ Check the PLC configuration.
- **Ext. Diagnosis = int. error**  
Internal error.
- ▶ Contact your ELAU responsible.

## 8.6.9 8xx "System" diagnosis messages

### 800 Insufficient memory

Diagnostic class (standard): 2

The 800 diagnosis message is triggered as soon as the free main memory exceeds 512000 bytes. The DiagExtCode parameter in the PLC Configuration or message logger can be used to localize the problem.

- Insufficient RAM for the project (DiagExtCode=free<512000).
- ▶ Reduce the PLC Configuration, decrease RamDiskSize reduce the number of tasks, use a controller with more memory.

### General Information on ScanDisk

A function for checking the file system on the IDE disk has been integrated in the firmware. This ScanDisk function is automatically called when the system boots. Errors are automatically detected, logged and corrected. The consistency of the file system is repaired. Defective, incomplete file are removed. A detailed protocol is saved in the message logger. After ScanDisk repairs, a message ( 015 "File system <ide0:> re-stored" (see 8.6.1.15 015 filesystem <ide0:> repaired)) is triggered.

ScanDisk generates the following diagnosis messages:

DiagCode	DiagMsg	DiagExtCode
800	Insufficient memory	
801	Error reading FAT	
802	Error writing FAT	FAT <nr>
803	Inconsistency of FAT's	
804	Corrupt cluster detected	<dirname>

DiagCode	DiagMsg	DiagExtCode
805	Corrupt filename detected	<filename>
806	Corrupt file size detected	<filename>
807	Multiple used cluster/block detected	<dirname>
808	Corrupt directory name detected	<dirname>
809	Circular linked clusters/blocks detected	<dirname>
810	Error reading directory entry	<dirname>
811	Error writing directory entry	<dirname>
812	Lost cluster/block found	<number cluster>
813	Device <ide0:> not found	<devicename>
814	Initialization of <ide0:> failed	<devicename>
815	Error using function with <ide0:>	<devicename>
816	Bootrom.sys	
817	No devicename	
818	File not found	
819	File open error	
820	File read error	
821	File not continuous	
822	Cluster read error	
823	Contents of file different	
824	No file name	
825	Invalid directory size	

### 801 Error reading FAT

Diagnostic class (standard): 2

### 802 Error writing FAT

Diagnostic class (standard): 2

### 803 Inconsistency of FAT's

Diagnostic class (standard): 2

### 804 Corrupt cluster detected

Diagnostic class (standard): 2

### 805 Corrupt file name detected

Diagnostic class (standard): 2

### 806 Corrupt file size detected

Diagnostic class (standard): 2

**807 Multiple used cluster/block detected**

Diagnostic class (standard): 2

**808 Corrupt directory name detected**

Diagnostic class (standard): 2

**809 Circular linked clusters/blocks detected**

Diagnostic class (standard): 2

**810 Error reading directory entry**

Diagnostic class (standard): 2

**811 Error writing directory entry**

Diagnostic class (standard): 2

**812 Lost cluster/block found**

Diagnostic class (standard): 2

**813 Device <ide0:> not found**

Diagnostic class (standard): 2

**814 Initialization of <ide0:> failed**

Diagnostic class (standard): 2

**815 error using function with <ide0:>**

Diagnostic class (standard): 2

**816 Bootrom.sys**

Diagnostic class (standard): 2

**817 No devicename**

Diagnostic class (standard): 2

**818 File not found**

Diagnostic class (standard): 2

**819 File open error**

Diagnostic class (standard): 2

**820 File read error**

Diagnostic class (standard): 2

**821 File not continuous**

Diagnostic class (standard): 2

**822 Cluster read error**

Diagnostic class (standard): 2

**823 Contents of file different**

Diagnostic class (standard): 2

**824 No filename**

Diagnostic class (standard): 2

**825 Invalid directory size**

Diagnostic class (standard): 2

**826 Error During PIC FW Update**

Diagnostic class (standard): 1

An error occurred during a firmware exchange for the PIC controller (on C400, C600, or P600). The firmware (such as file "c6p\_0511.bin") is on the flash disk (C400 and C600) or on the hard disk (P600). When the firmware has been exchanged, the controller will be reset (Reset).

PacDrive controller P600 has no automatic reset. A note appears on the display. After the real-time system successfully starts up, the firmware file is deleted automatically.

- **Ext. diagnosis = bootl.active**  
This message appears after an unsuccessful PIC firmware update.
  - ▶ The PacDrive controller attempts to exchange the firmware again.
  - ▶ If you do not succeed, please contact your ELAU responsible.
- **Ext. diagnosis = File not found**  
This message appears with message "bootl. active." This means it appears when an update is forced in the PIC bootloader but the necessary file is not on the flash disk (C400 and C600) or on the hard disk (P600).
  - ▶ Transfer the firmware file to the flash disk (C400 and C600) or to the hard disk (P600).
  - ▶ If this attempt also fails, contact your ELAU customer service representative.
- **Ext. diagnosis = File not OK**  
This message appears when the PIC update file is incorrect.
  - ▶ Transfer the correct firmware file to the flash disk (C400 and C600) or to the hard disk (P600).

- ▶ If you do not succeed, please contact your ELAU responsible.
- **Ext. diagnosis = Header not OK**  
This message appears when the ELAU header in the file is not correct.
- ▶ Transfer the correct firmware file to the flash disk (C400 and C600) or to the hard disk (P600).
- ▶ If you do not succeed, please contact your ELAU responsible.
- **Ex. Diagnosis = HWIndex <> <Index>** (e.g. HWIndex <> 5)  
Ex. The message appears if PIC update files are found that have an incorrect hardware code. The index outputs the required HW index.
- ▶ Use the PIC update file that matches the device (hardware).

### 827 Power-Off due to hardware monitoring

Diagnostic class (standard): 3

MsgFilter: Bit 1 "Diagnosis Messages"

The hardware provides an internal error logger that logs all the causes for error-dependent controller deactivations. The next time the controller is started up the error logger is analyzed and the cause of the error can be output in the message logger. In addition, a more specific message is output (055 "Hardware Monitoring Debug Message" (see 8.6.1.54 055 Hardware Monitoring Debug Message)) that can be enabled by the MsgFilter parameter through the EPAS-4 message logger. This message is intended to be a debug message and outputs the exact cause of the deactivation.

- The DiagExtCode defines the error further (high or low voltage, high or low temperature, fan error, temperature sensor error):
  - Voltage<Min
  - Voltage>Max
  - Temp<Min
  - Temp>Max
  - Fan error
  - LM75 error
- ▶ Contact your ELAU responsible.

### 828 Library active

Diagnostic class (standard): 8

## 8.6.10 9xx "Software" diagnosis messages

### 900 Software error (suspend Task)

Diagnostic class (standard): 4

This error should not occur during operation of the PacDrive system.

- -
- ▶ Contact your ELAU responsible.

### 901 Software error (invalid opcode)

Diagnostic class (standard): 4

This error should not occur during operation of the PacDrive system.

- -
- ▶ Contact your ELAU responsible.



**902 Software error (page fault)**

Diagnostic class (standard): 4

This error should not occur during operation of the PacDrive system.

- An firmware version older than < V00.10.00 was played onto a PacDrive controller and the project on the flash disk of the PacDrive controller was created for firmware >= 00.10.00.  
The error occurred while booting and is recorded under the MAX4 object in the message logger.
- ▶ Retransmit project from EPAS-4.
- It is entered under object IECPRG in the message logger. A serious error has been detected in the IEC task named under instance in the message logger. Possible errors include e.g. not observing the array limits, faulty handling of pointers or the address operator (ADR).
- ▶ Record faulty program spot and correct user program.

**903 Software error (class 2)**

Diagnostic class (standard): 2

This error should not occur during operation of the PacDrive system.

- -
- ▶ Get in touch with your ELAU contact person.

**904 Software error (class 1)**

Diagnostic class (standard): 1

This error should not occur during operation of the PacDrive system.

- -
- ▶ Contact your ELAU responsible.

## 9 Retroactive installation of UPS



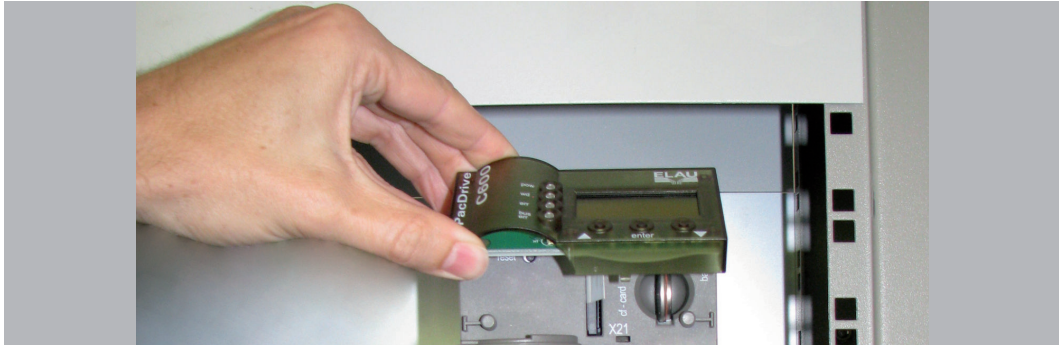
The controllers can be fitted with an internal battery pack for an uninterruptible power supply. The battery pack is continually charged via the power supply of the controller during operation.

The function of the battery pack is to maintain the power supply to the controller in the event of a power failure long enough to shut down the controller properly and not lose any data. The preset time of a shutdown can be up to 5 minutes.

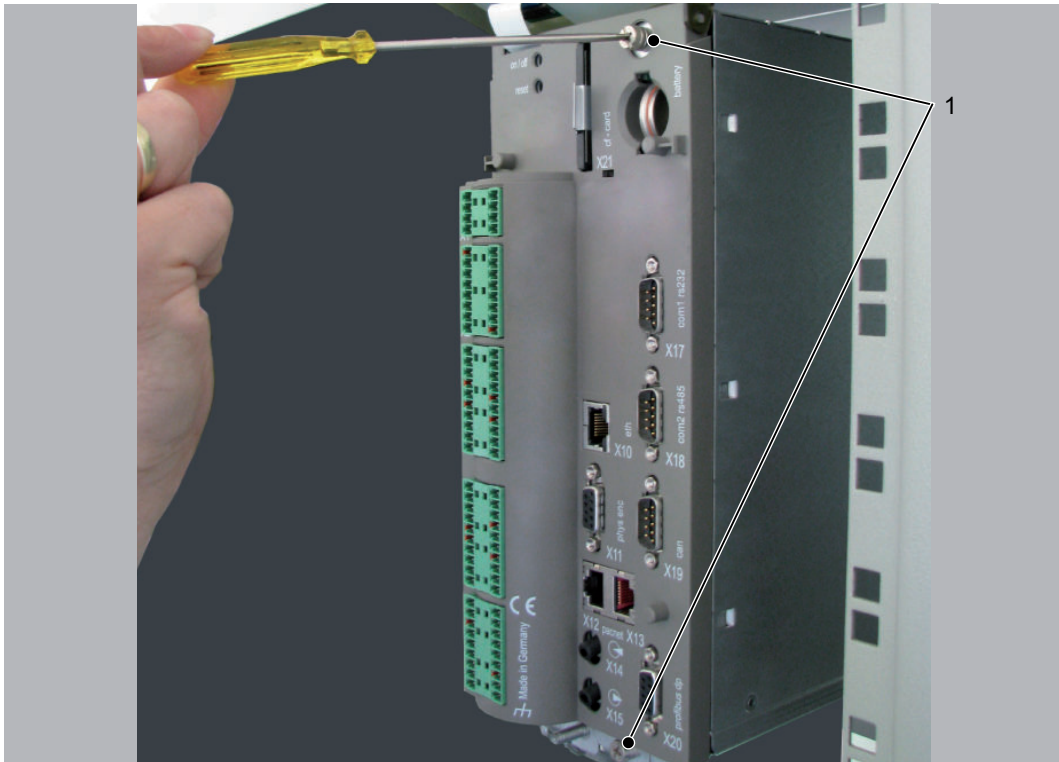
If necessary, the battery pack can also be installed or replaced after the fact for the UPS, see Retroactive installation of UPS.

**Preparation** This is how you open the controller:

- ▶ Open main switch.
- ▶ Prevent main switch from being switched back on.
- ▶ Open the the operating cover of the PacDrive controller upwards.



- ▶ Undo the two fastening screws on the front of the controller (1).



- ▶ Then remove the electronic module from housing.

## CAUTION

### IMPROPER HANDLING OF ELECTRONIC COMPONENTS

- Always observe the ESD regulations when opening the PacDrive controller to avoid damage caused by static charging.

**Failure to follow these instructions can result in equipment damage.**

**How to connect the battery:**

- ▶ Adjust the battery pack and attach using 2 cable ties (1).

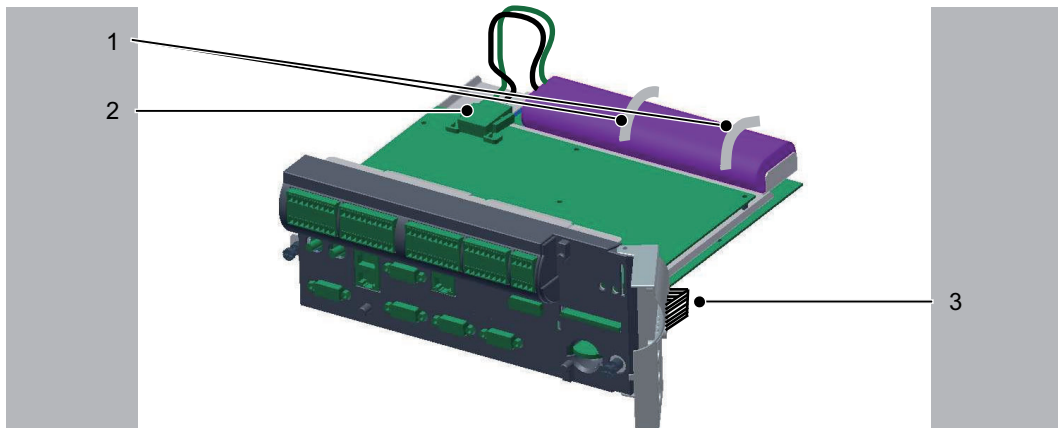
<h1>CAUTION</h1>
<p><b>BATTERY PACK NOT PROPERLY SECURED</b></p> <ul style="list-style-type: none"> <li>• Use only the supplied cable ties to secure the battery pack (Item no. 53130050).</li> <li>• Check that the battery pack is properly secured.</li> </ul> <p><b>Failure to follow these instructions can result in damage to the devices.</b></p>

- ▶ Connect battery cable (2).



The maintenance interval for replacing the battery is 3 years. Once this period has gone by the battery pack must be replaced.

<h1>CAUTION</h1>
<p><b>WRONG INSTALLATION OF THE ELECTRONIC MODULE</b></p> <ul style="list-style-type: none"> <li>• Do not catch or tear the display supply cable (3) when installing the electronic module.</li> </ul> <p><b>Failure to follow these instructions can result in damage to the devices.</b></p>



1	Cable ties
2	Battery cable
3	Display supply cable

*Table 9-1: UPS installation of PacDrive Controller*

**This is how you close the controller:**

- ▶ Carefully push the electronic module of the controller back into the housing.
- ▶ Tighten the two fastening screws on the front of the controller.
- ▶ Close operating cover.
- ▶ See chapter on how to charge battery.

## 10 Appendix

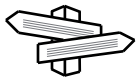
### 10.1 Contact addresses

#### ELAU GmbH Deutschland

Dillberg 12 - 16  
D-97828 Marktheidenfeld, Germany  
Tel.: +49 (0) 9391 / 606 - 0  
Fax: 09391/606-300  
e-mail: [info@elau.de](mailto:info@elau.de)  
Internet: [www.elau.de](http://www.elau.de)

#### ELAU GmbH Customer Service

P.O. Box 1255  
D-97821 Marktheidenfeld, Germany  
Phone: +49 (0) 9391 / 606 - 142  
Fax: +49 (0) 9391 / 606 - 340  
e-mail: [info@elau.de](mailto:info@elau.de)  
Internet: [www.elau.de](http://www.elau.de)



See the ELAU Homepage ([www.elau.de](http://www.elau.de)) for additional contact addresses.

### 10.2 Product training courses

We also offer a number of training courses about our products.

Our seminar leaders with several years of experience will help you take advantage of the extensive possibilities offered by the PacDrive system.



See the ELAU Homepage ([www.elau.de](http://www.elau.de)) for further information and our current seminar schedule.

## 10.3 Safety tests

The following safety checks for the PacDrive Controller are performed in the production in accordance to EN 50178 / EN 60204-1:

### Check for end-to-end connection of grounding conductor

with 30 A

### Insulating resistance check

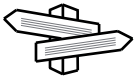
with  $U = 500 \text{ V DC}$

### Withstand voltage check

with  $U = 2500 \text{ V DC}$

for a time period of 1 min.

## 10.4 Changes



The latest product documentation, application notes and the change service are always available on the ELAU Homepage.

### 06/2004

- New edition of the operating manual

### 02/2007

- Various error eliminations and additions
- Layout of document revised
- Diagnostic messages expanded
- PROFIBUS connector added
- Chapter on uninterruptible power supply added
- Chapter on hardware/software compatibility list added

### 11/2008

- Update of the chapter "Technical Data"
- Update document structure

### 01/2009

- Update of chapter "Installation and maintenance"

### 04/2009

- Update of the chapter "Technical Data"

## 10.5 Fault report form

This fault report is required without fail to enable efficient processing.

Send the fault report to your ELAU GmbH-representative or to:

ELAU GmbH  
 Customer Service Department  
 Dillberg 12-16  
 97828 Marktheidenfeld  
**Fax: +49 (0) 93 91 / 606 - 340**

Return address:

<b>Company:</b>	<b>City:</b>	<b>Date:</b>
Department:	Name:	Phone:

### Specifications regarding product in question

Item name: .....

Item no.: .....

Serial number: .....

Software version: .....

Hardware code: .....

Parameter included: Yes  No

IEC - Program included: Yes  No

### Information about machine on which the error occurred:

Machine manufacturer: .....

Type: .....

Operating hours: .....

Machine no.: .....

Date of commissioning: .....

Manufacturer / Type of machine control:

.....

### How did the error present:

.....

.....

.....

**Additional information:**

**Condition of error:**

- is always available
- during commissioning
- occurs sporadically
- occurs after approx. hours
- occurs by concussion
- depends on the temperature
- foreign objects in the device

**Causes:**

- unknown
- wiring error
- mechan. damage
- moisture in device
- defect encoder

**Accompanying side effects:**

- problems in the mechanism
- power failure (24V)
- controller failure
- motor failure
- broken cable
- insufficient ventilation

Is there an air conditioner in the switch cabinet? Y / N

Have there been similar errors in the same axis previously?

How often: .....

Did the errors always occur on certain days or at certain times of day?

.....

Further information:

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.....  
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.....  
.....  
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# Index

## 0

001 69  
002 69  
003 69  
004 69  
005 69  
006 69  
007 69  
008 69  
009 69  
010 69  
011 70  
012 70  
013 70  
014 70  
015 70  
016 70  
017 70  
018 70  
019 71  
020 71  
021 71  
022 71  
023 71  
024 71  
025 71  
026 72  
027 72  
028 72  
029 72  
030 72  
031 72  
032 72  
033 72  
034 72  
035 72  
036 72  
037 72  
038 73  
039 73  
040 73  
041 73  
042 73  
043 74  
044 74  
045 74  
046 75  
047 75  
048 75  
050 76  
051 76  
052 76

053 80  
054 80  
055 81  
056 82  
057 82  
058 82  
059 83  
060 83  
061 83

## 1

100 83  
101 85  
102 85  
103 85  
104 86  
105 86  
106 86  
107 86  
108 87  
109 87  
110 88  
1105 86  
1107 86  
111 88  
1113 89  
1114 89  
1115 89  
1117 90  
1118 90  
1119 90  
112 88  
113 89  
1138 96  
114 89  
1144 98  
1145 98  
1146 98  
1147 99  
1148 99  
1149 99  
115 89  
1150 99  
1151 99  
1152 100  
1153 100  
116 89  
1160 101  
1163 102  
1164 103  
117 90  
118 90  
119 90  
120 90  
121 91

122 91	170 105
123 91	171 105
124 92	172 106
125 92	173 106
126 92	174 106
127 92	175 106
128 92	176 106
129 93	177 107
130 93	179 107
131 93	180 107
132 93	181 107
133 94	182 108
134 94	1826 159
135 94	1904 161
136 95	
137 95	
138 96	<b>2</b>
139 96	200 108
140 97	201 108
1406 126	202 108
141 97	203 109
142 97	204 109
143 98	205 110
144 98	206 110
145 98	207 110
146 98	208 111
147 99	209 111
148 99	210 113
149 99	2100 83
150 99	2101 85
1500 127	2102 85
1501 127	2103 85
1502 127	2104 86
1506 129	2106 86
1508 131	2108 87
151 99	2109 87
1512 133	211 113
1516 134	2110 88
1517 134	2111 88
152 100	2112 88
153 100	2116 89
154 100	2120 90
155 101	2121 91
156 101	2122 91
157 101	2123 91
158 101	2137 95
159 101	2139 96
160 101	2140 97
161 102	2142 97
162 102	2170 105
163 102	2177 107
164 103	2319 117
165 103	2400 125
166 104	2511 133
167 104	2800 156
168 104	2801 157
169 105	

2802 157  
2803 157  
2804 157  
2805 157  
2806 157  
2807 158  
2808 158  
2809 158  
2810 158  
2811 158  
2812 158  
2813 158  
2814 158  
2815 158  
2816 158  
2817 158  
2818 158  
2819 159  
2820 159  
2821 159  
2822 159  
2823 159  
2824 159  
2825 159  
2903 161

### 3

300 113  
301 114  
302 114  
303 114  
304 114  
305 114  
306 114  
307 115  
308 115  
309 115  
310 115  
311 115  
312 115  
313 115  
314 116  
315 116  
316 116  
317 117  
318 117  
319 117  
320 118  
321 118  
322 118  
323 118  
324 118  
325 119  
326 119  
327 119

328 119  
329 119  
330 119  
331 120  
332 120  
333 120  
334 121  
335 121  
336 124  
337 124  
338 124  
339 125  
340 125  
3401 125  
341 125  
3827 160

### 4

400 125  
401 125  
402 126  
403 126  
404 126  
405 126  
406 126  
407 126  
4200 108  
4201 108  
4202 108  
4203 109  
4204 109  
4205 110  
4206 110  
4207 110  
4208 111  
4209 111  
4210 113  
4211 113  
4300 113  
4301 114  
4302 114  
4303 114  
4304 114  
4305 114  
4306 114  
4307 115  
4308 115  
4309 115  
4310 115  
4311 115  
4312 115  
4313 115  
4314 116  
4315 116  
4337 124

4402	126	503	128
4503	128	504	128
4504	128	505	129
4507	131	506	129
4509	132	507	131
4510	132	508	131
4513	133	509	132
4514	134	510	132
4518	134	511	133
4600	135	512	133
4601	136	5124	92
4700	137	513	133
4701	137	514	134
4702	137	5141	97
4703	139	516	134
4704	139	5162	102
4705	139	517	134
4720	140	518	134
4721	140	5318	117
4722	141	5320	118
4723	142	5321	118
4724	142	5322	118
4726	143	5323	118
4730	143	5324	118
4731	143	5325	119
4732	144	5326	119
4733	144	5330	119
4734	144	5331	120
4735	145	5332	120
4736	145	5333	120
4737	145	5335	121
4738	145	5338	124
4739	146	5339	125
4750	146	5403	126
4752	146	5780	151
4753	146	5781	151
4754	147	5782	152
4755	148	5788	155
4756	149	5790	156
4757	149		
4758	150		
4759	150	<b>6</b>	
4770	150	600	135
4771	151	601	136
4785	152	6037	72
4786	153	6038	73
4787	153	6050	76
4900	160	6054	80
4901	160	6125	92
4902	161	6126	92
		6127	92
		6128	92
		6129	93
<b>5</b>		6130	93
500	127	6131	93
501	127	6132	93
502	127		

6134 94  
6135 94  
6136 95  
6143 98  
6154 100  
6155 101  
6156 101  
6157 101  
6158 101  
6159 101  
6161 102  
6165 103  
6166 104  
6169 105  
6171 105  
6174 106  
6179 107  
6180 107  
6181 107  
6182 108  
6316 116  
6317 117  
6327 119  
6328 119  
6329 119  
6334 121  
6336 124  
6341 125  
6404 126  
6505 129  
6789 155

## 7

700 137  
701 137  
702 137  
703 139  
704 139  
705 139  
706 140  
707 140  
7133 94  
720 140  
721 140  
722 141  
723 142  
724 142  
725 143  
726 143  
730 143  
731 143  
732 144  
733 144  
734 144  
735 145

736 145  
737 145  
738 145  
739 146  
7405 126  
750 146  
751 146  
752 146  
753 146  
754 147  
755 148  
756 149  
757 149  
758 150  
759 150  
770 150  
771 151  
7725 143  
7751 146  
780 151  
781 151  
782 152  
785 152  
786 153  
787 153  
788 155  
789 155  
790 156

## 8

800 156  
8001 69  
8002 69  
8003 69  
8004 69  
8005 69  
8006 69  
8007 69  
8008 69  
8009 69  
801 157  
8010 69  
8011 70  
8012 70  
8013 70  
8014 70  
8015 70  
8016 70  
8017 70  
8018 70  
8019 71  
802 157  
8020 71  
8021 71  
8022 71

8023 71  
8024 71  
8025 71  
8026 72  
8027 72  
8028 72  
8029 72  
803 157  
8030 72  
8031 72  
8032 72  
8033 72  
8034 72  
8035 72  
8036 72  
8039 73  
804 157  
8040 73  
8041 73  
8042 73  
8043 74  
8044 74  
8045 74  
8046 75  
8047 75  
8048 75  
805 157  
8051 76  
8052 76  
8053 80  
8055 81  
8056 82  
8057 82  
8058 82  
8059 83  
806 157  
8060 83  
8061 83  
807 158  
808 158  
809 158  
810 158  
811 158  
812 158  
813 158  
814 158  
815 158  
816 158  
817 158  
8172 106  
8173 106  
818 158  
819 159  
820 159  
821 159  
822 159  
823 159

824 159  
825 159  
826 159  
827 160  
828 160  
8407 126  
8706 140  
8707 140  
8828 160

## 9

900 160  
901 160  
902 161  
903 161  
904 161  
9167 104  
9168 104  
9175 106

## C

Certifications 40  
Configuration 32  
Contact addresses 165

## D

Diagnosis 18, 55  
Diagnosis message 24  
Diagnostic message 313 Excessive cycle time overrun 115  
Diagnostic message 317 Cycle time overrun 117

## E

EMC Rules 34  
Examples: 57

## H

Homepage 2, 165

## L

Legal notice 2

## M

MC-4 17  
Modifications 166

## **Q**

Qualification of personnel 10

## **R**

Reactions 59

Risk classification 8

## **S**

Seminars 165

Service addresses 165

SH-Motor characteristics 17

Storage 25

Symbols 8

## **T**

Trademark 2

Training courses 165