PacDrive™ M

- DeviceNet -
Operating Manual

IMPRINT

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Contents

1 Safety

This chapter describes the general requirements for working safely. If the work involves any remaining risk, we will

- point this out in the respective passages,
- warn you of any possible danger and
- describe how the danger can be avoided.

In addition to this operating manual, please observe

the prohibiting, warning and mandatory signs as well as the warnings on the components in the switching cabinet,

- the corresponding laws and regulations,
- the legal requirements concerning accident prevention,
- the operating instructions for the other components.

Always keep the operating manuals close to the machine.

Depiction Conventions

Special characters	Meaning
▪	Marks the first level of an enumeration
-	Marks the second level of an enumeration
➢	Marks instructions for an action
VERSALVE TEXT (capital letters)	Marks an operating element

INFORMATION

Should you not be able to solve problems with the help of this manual, please contact

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1.1 Target Group

This operating manual is aimed exclusively at technically qualified staff with detailed knowledge in the field of automation technology.

Only qualified staff can understand the significance of the notes and explanations and act accordingly.

The Device Net operating manual is a supplement to the PacDrive™ M operating manual and is to enable the end customer to help himself or get help in case of any problems with the PacDrive™ M system.

For the sake of clarity, this operating manual does not contain all details on all functions of the PacDrive™ M system and cannot take into account any feasible case of installation, operation or maintenance. Should you encounter specific problems not described in sufficient detail here, please contact ELAU.

1.2 Explanation of Safety Notes

1.2.1 Risk Categories

We differentiate between different categories of safety notes. The table below shows which danger and possible consequences the symbols (pictographs) and keywords point out.

Pictograph	Damage to	Keyword	Definition	Consequences
	Persons	**DANGER!**	immediately impending danger	death or very serious injuries
		WARNING!	possibly dangerous situation	possibly death or very serious injuries
		CAUTION	less dangerous situation	light or minor injuries
	Things	**ATTENTION**	situation that may result in material damage	damage to - the machine and its environment - the product
	-	**INFORMATION**	tips for usage and other important/useful information and notes	no dangerous or harmful consequences for persons or things

1.2.2 Further Pictographs

Warning! Dangerous Voltage!

Warning! Hot components!

Do not extinguish with water!

Wear protective gloves!

Watch out for environmental protection!

Forward these components for recycling!

Contact address.

1.3 Use as Directed

The components the MAx-4 PacController may only be used for the applications described in this Operating Manual and only in combination with third-party devices and components recommended or approved by ELAU.

Any other application is not regarded as "Use as directed".

WARNING!

Risk of injury due to use other than directed.

If the MAx-4 is used in a different way than described above or modified without ELAU's approval, persons may be injured and material damage may occur.

"Use as Directed" includes that you

▪ observe the Operating Manual,

▪ observe the instructions for inspection and maintenance.

1.4 Duties of the Machine Manufacturer

The machine manufacturer has to carry out a danger, error and risk analysis for the specific situation at his machine and implement appropriate safety arrangements and safety measures in accordance with the valid safety regulations.

Safety is guaranteed if uncontrolled movements from standstill and during controlled movement of the drive can be prevented.

The safety arrangements must be made in such a way that no dangerous situation can occur in case of an error.

Regarding the safety of people, this can be achieved e.g. by preventing people from entering or reaching into the danger zone while the plant is in operation (passive protection by means of blocked access, protective fences…).

The following norms, directives and regulations, among others, must be observed:

▪ DIN EN 60204 machine safety: electric equipment of machines (VDE-0113 section 1).

▪ DIN EN 292 sections 1 and 2 machine safety: basics, general design rules.

▪ Universally valid rules for safety and accident prevention.

▪ Start-up operation is not allowed until it has been proved that the machine in which the products are installed complies with the rules of EC directive 89/392/EEC (machine directive).

▪ Operation is only permitted if the national EMC requirements for the respective application are fulfilled. In the EU, the valid EMC directive is 89/336/EEC.

▪ DIN EN 50178 equipment of high-voltage systems with electronic operating means.

1.5   Further Safety Notes

WARNING!

By all means observe the safety notes in the PacDrive™ M operating manual.

2 Transportation, Storage, Unpacking

2.1 Transportation

➢ Avoid shocks.

➢ Immediately check units for transport damage and inform your transport company, if necessary.

2.2 Storage

➢ Store units in a clean, dry place.

Storage conditions:

▪ air temperature between –25°C and +70°C.

▪ temperature fluctuations max. 30 K per hour.

2.3 Unpacking

➢ Check whether the delivery is complete.

➢ Check all units for transport damage.

2.3.1 Type Plate

The type plate contains all necessary information:

```
MAX-4/10/01/008/99/1/1/00

13130255-008          HW: 630062

507298.0010           SW: 00.05.00
                      00209D00-60AB
```

product name:	e.g. MAX-4/10/01/008/99/1/1/00
article number:	e.g. 13130255-008
serial number	e.g. 507298.0010
production date:	e.g. S33
hardware version	e.g. HW:630062
software version	e.g. SW:00.05.00

3 Description

3.1 In General

DeviceNet

DeviceNet is a layer 7 protocol by Allen-Bradley. The network is based on an object-oriented communication model.

DeviceNet is based on the tried and tested CAN (Controller Area Network) technology and is an open network.

CAN bus

The CAN (Controller Area Network) bus is a serial, message-oriented communication protocol. The CAN bus permits highly efficient communication between stations connected to this bus.

The CAN bus is characterized by the following features:

- transmission rate up to 1 Mbit/sec (for DeviceNet 500 kbit/sec)
- great data security thanks to efficient error recognition mechanisms
- widespread market availability
- priority-controlled message exchange

Moreover, this bus system has multi-master capacity and can even send broadcast messages.

3.2 Technical Data

Product name	optional module DeviceNet Slave
Order number	51 13 02 40
Inputs/outputs	max. 255 Bytes Slave
Process mapping	max. 512 Byte
Dimensions (length x width x height)	90 x 96 x 23 mm PC/104
Admissible ambient temperature - for operation - for storage and transport	 0 ... +55°C -20°C ... +80°C
Supply voltage	DC 5V ±5%, typ. 650mA, internally from the main unit
Interface	ISO 11898, max. 500kBaud, potential-free
Approbation	CE sign EN 55011 class B for emission EN 50082-2 for EMC

Table: Technical data: DeviceNet Slave optional module

4 Installation

4.1 Components with Risk of Electro Static Discharge (ESD)

The assembly group contains electro statically endangered components, which can easily be destroyed if handled inexpertly. If you need to work with electronic assembly groups anyway, please observe the following notes:

➢ Only touch electronic assembly groups if this is inevitable because work must be done on them.

➢ If you need to touch assembly groups anyway, discharge your own body immediately before doing so.

➢ Assembly groups must not get in contact with highly insulating materials – e.g. plastic parts, insulating table tops, clothing made from artificial fiber.

➢ Assembly groups may be placed on conducting surfaces only.

➢ Assembly groups and components may only be stored or transported in conducting packaging (e.g. metal-coated plastic or metal containers).

➢ If the packaging has no conducting capacity, the assembly groups must be wrapped in conducting material before they are packed. In this case, use e.g. conducting foamed material or household aluminum foil.

4.2 Installation of the Optional Modules

If the MAx-4 PacController is ordered with optional functions, it is supplied with the optional modules already installed.

ATTENTION!
Optional modules must be installed by ELAU staff only. If the user himself installs an optional module and/or opens the MAx-4 PacController, the warranty becomes void.

As the MAx-4 PacController must be opened to install the optional modules, absolutely observe the ESD protection measures.
One DeviceNet slave optional module can be installed per MAx-4 PacController.

Procedure:
1. Prepare DeviceNet optional module
   ➢ Set interrupt level:
       connect interrupt 7 or 9 (I7,I9) on jumper side (only one jumper may be connected!)
   ➢ Set IO address (0xCC000) via :

Jumper designation	Setting
ADR 11	connected
ADR 12	connected
ADR 13	connected
ADR 14	not connected
ADR 15	not connected
ADR 16	connected
ADR 17	connected
ADR 18	not connected
ADR 19	not connected

   ➢ Connect the readily supplied flat strip cable to DeviceNet connection
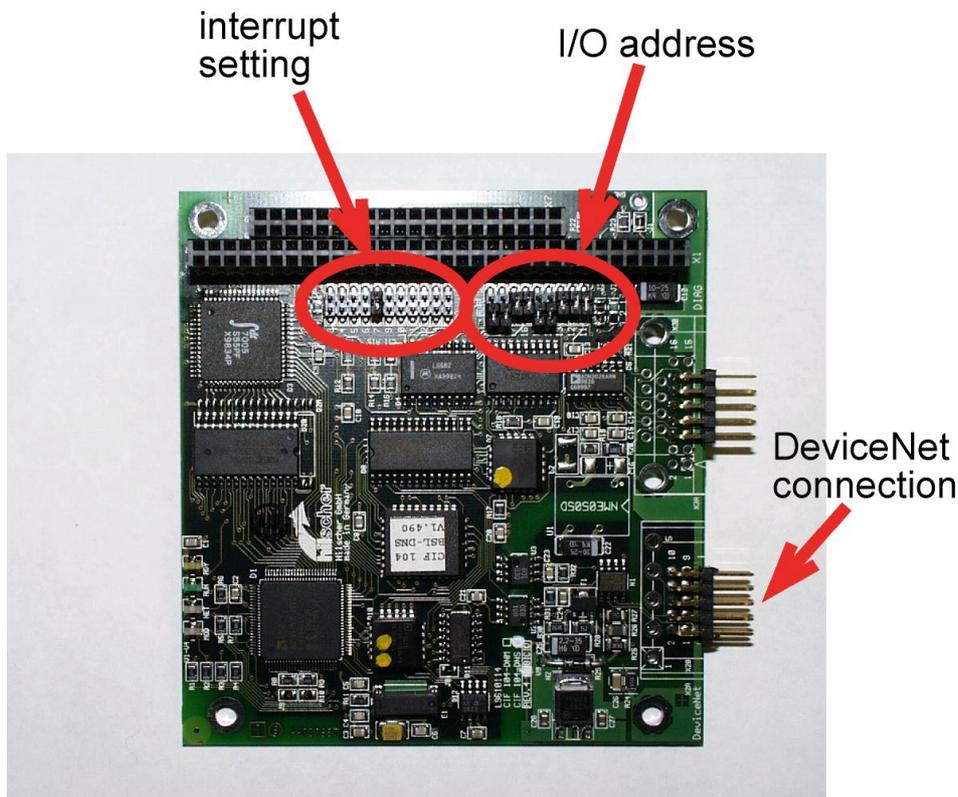
PDM_OptMoDevNetSl_us9912.fh8

2. Prepare MAx-4 PacController
   ➢ Remove cover (4 recessed-head screws)
   ➢ Remove DIE cable on X22
   ➢ Remove front-side D-Sub preparation (on earthing stub) of the MAx-4 PacController casing.

3. Install DeviceNet module
   ➢ Insert DeviceNet module into MAx-4 PacController as shown
   ➢ Screw together 5-pin Combicon outlet and MAx-4 PacController casing, using the readily supplied fixing set.
   ➢ Screw on DeviceNet module, using the readily supplied M3x6 screws
   ➢ Reconnect DIE cable to X22
   ➢ Replace MAx-4 PacController cover and fix with M3x4 screws
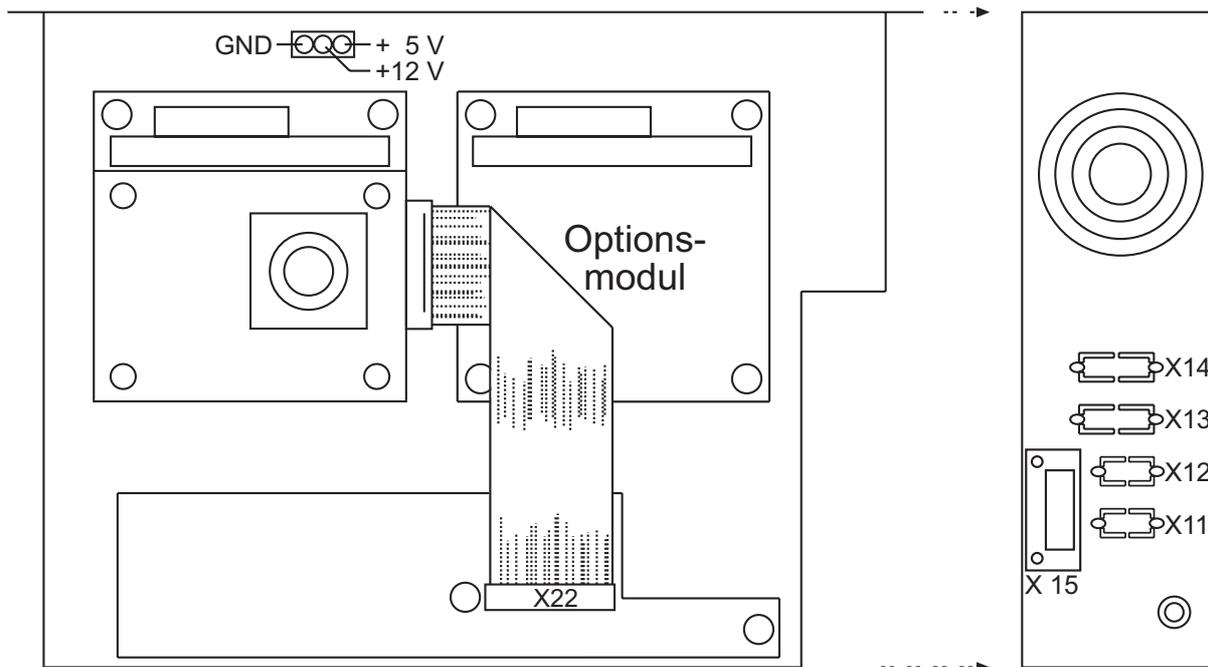
DeviceNet field bus connection

1; *Prepare cable*

KA20541 colored flat strip 10-pin

ST06733
multipoint connector 5-pin for mounting (Combicon-comp.)

ST06650
connector block 10-pin

1	GND
2	CAN_L
3	SH
4	CAN_H
5	24V

1

3
4
5
8
10

10

cover with spout HT-1!

150mm

2; *Mounting of the casing*

3.2 mm bore;
drill through connector!

bottom of the casing!

circuit board
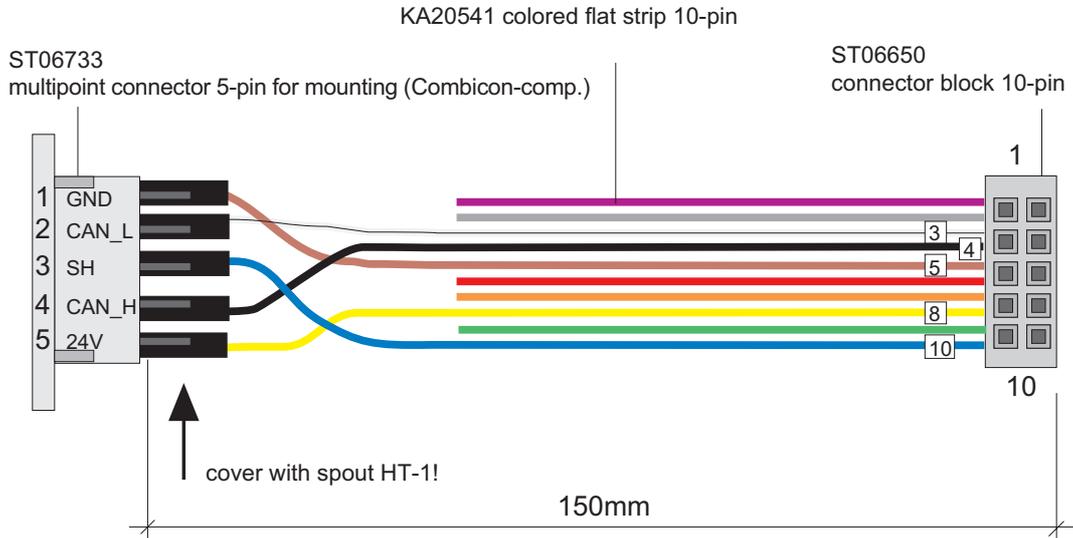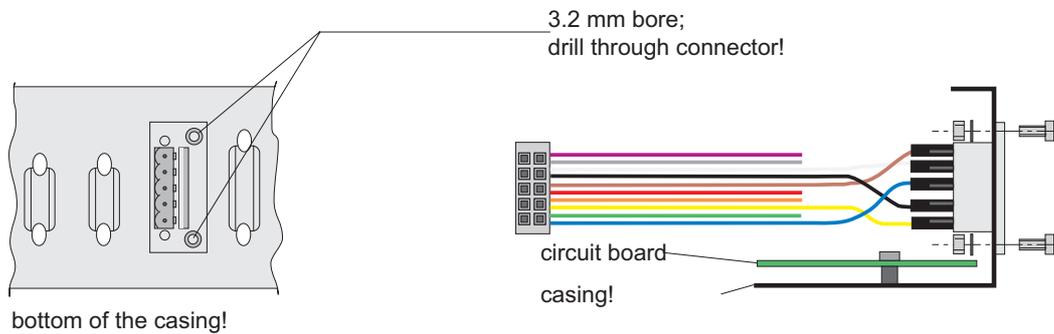
casing!

Installation note!

- preparation of connecting cable
- insert cable from the outside through the recess into the casing (observe position)
- drill two 3.2 mm bores through connector flange
- screw on using screws M3x8, lock shims and nuts

B				D			
A				C			
1999	Datum	Name	A.-Nr.	MAx-4, Multiachsencontroller			
Gez.	28.09.	unger h.					
Gepr.			Fa. ELAU	PC.-Nr.:Ablageheinz\Projekte\MAx-4			

ELAU Elektronik-Automations AG

Kabel+Montage
DeviceNet

Nr.
EL-812-29-01

Ersatz für:

Blatt. 1 ⟶   Anschl. x

INFORMATION

If the front-side D-Sub connection is already occupied, please note that optional master modules usually occupy the front-side connection. If two master modules are connected, e.g. PROFIBUS-DP and CAN, the allocation does not matter.

If two optional modules are connected, the interrupt settings must be different.

4. Adjust type plate
   A type plate that clearly indicates the optional module in the MAx-4 must be fixed on the MAx-4 casing.

4.3 Electrical Connections

The DeviceNet optional module has a 5-pin connector unit (Combicon compatible) designated for connection to the DeviceNet bus.

X1 - DeviceNet
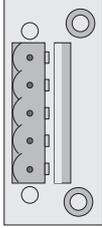
Pin	Designation	Meaning	Range	max. cross section
1	DGND	data receive potential		0.25 mm^2
2	CAN_Low	receive / send data Low		0.25 mm^2
3	Shield	cable shield		0.25 mm^2
4	CAN_High	receive / send data High		0.25 mm^2
5	+24V	power supply for interface		0.25 mm^2

Table: Connections: DeviceNet optional module

ATTENTION!
To ensure trouble-free DeviceNet bus operation, the bus line must be terminated on both ends with bus terminator resistors. The bus line from the first DeviceNet bus client to the last DeviceNet bus client must be regarded as one bus line, so that the DeviceNet bus must be terminated twice.
The termination resistance must be connected between pins 2 and 4.

5 Commissioning

INFORMATION
We urgently recommend using ELAU staff for commissioning. This should be done not only for reasons of warranty. At the same time, the ELAU staff will

- check the equipment
- determine the optimum configuration
- instruct the operating crew.

Procedure

unpacking and checking the units	After removing the packaging, please check the units for any damage. Only undamaged units may be put into operation. Please also check whether the delivery is complete. Please compare the data with the help of the type plates.	see "Transportation, Storage, Unpacking"
installation	If necessary, retrofit optional assembly groups not installed so far. Then install the units, observing the requirements with regard to position, protection means and EMC notes.	see "Installation" and "EMC-compatible structure"
electrical connection of the units	Now connect the units, starting with the earth conductor. Make sure that all clams are tightened, the necessary cross-sections are laid, the shielding is done correctly and there are no interruptions or short-circuits.	see "Electrical Connections" and "EMC-compatible structure"
connection of 24 V control voltage	Check mains and control voltages. Now connect the external 24 V control voltage. The units will now initialize themselves and the LEDs should have the following states: MAx-4: pow: ON err: ON buserr: ON wd: OFF	see "Technical Data"
configuration and program transmission	Use EPAS-4 to enter the optional module in the control configuration and set the parameters. Create the IEC program. Now the project can be transmitted to the MAx-4 PacController.	see "Setting Parameters, Configuration and Programming"
further commissioning depending on the concrete plant		

5.1 General Notes on Setting Parameters, Configuration and Programming

The PacDrive™ M system is adapted to your task with the help of ELAU's programming and archiving software EPAS-4.

In EPAS-4, the system is configured and programmed according to IEC 1131-3.

ATTENTION!
Detailed knowledge of the system and the IEC program are required to make program changes in the PacDrive™ M system. Therefore changes must only be made by your machine supplier or ELAU staff.
ELAU AG is not liable for any damage caused by unauthorized program changes.

5.2 Setting Parameters / Configuration

To be able to use the DeviceNet module, it must be entered in the control configuration of the MAx-4 PacController.

5.2.1 Basic Parameters

No.	Designation	Unit	Data type	I/O	Range	Default
1	Baud rate	kBaud	DINT	ERC	125 - 500	auto. detection
2	State		DINT	AD		
3	Version		String(33)	AF		
4	IOAddress		DINT	AK		
5	SlaveAddress		DINT	ERC	1 – 126	2
6	ModState		USINT	AD		
7	DataExMode		DINT	ERC		0
8	IOTrigger		DINT	ERC	0 – 3	1
9	CycleLoad	ns	DINT	AD		
10	IRQ		DINT	ERC	3 – 15	7
11	ProducedSize	Byte	UINT	ERC	0 – 255	0
12	ConsumedSize	Byte	UINT	ERC	0 – 255	0
13	InputAddr	Byte	UINT	EDC	0 – 65535	0
14	OutputAddr	Byte	UINT	EDC	0 – 65535	0
15	IOReset		DINT	EDC	0 – 3	2

Baud rate
The baud rate is entered here.
Possible values in kBaud: 125 kBaud, 250 kBaud, 500 kBaud, auto. detection

State
State of the DeviceNet module. Shows the firmware-internal error codes of the DeviceNet object.

Error code	Meaning
0	No error
-901	No DeviceNet module recognized (CIF identification not found). No module connected or wrong IOAddress set.
-902	Timeout occurred while awaiting the ready bit of the module after initializing the DeviceNet hardware. Should not occur. Module defective. MAx-4 software error.
-903	Cyclic data exchange interrupted. Either the master is not sending any cyclic data, or the cable connection has been disturbed or interrupted, or the slave address was allocated twice.
-904	Watchdog monitoring for DeviceNet module triggered. Module does not react within the given monitoring time. Module defective.
-918	I/O ranges could not be accessed. Software error in MAx-4 or EPAS-4. IEC program could not be loaded.

Version
Version of the DeviceNet slave module firmware

IOAddress
IO address under which the DeviceNet module was recognized.
See also 4.2 Installation of the Optional Modules.

SlaveAddress

The address of the slave module is entered here.

ModState

Module state shown in 8 Bit.

Bit	Meaning
7	Ready Bit: 1: Firmware of the module running and default initialization completed 0: Initialization not completed
6	Run Bit: 1: Communication enabled (in Init function of the DeviceNet object) and set parameters are correct 0: Communication not enabled (in Init function of the DeviceNet object) and/or set parameters are not correct
5	COM Bit. 1: cyclic data exchange taking place 0: cyclic data exchange not taking place
4	Not used
3	Not used
2	PdAck Bit: With every change of the bit, a data exchange between module and DPM is indicated
1	DevAck Bit: Handshake bit to control mailbox communication between MAx-4 PacController firmware and DeviceNet module
0	HostCom Bit: Handshake bit to control cyclic DeviceNet process data communication between MAx-4 PacController MAx-4 firmware and DeviceNet module

DataExMode

Access mode to DeviceNet data:

Parameter values	Meaning
async. direct firmware access to DN data /1	Access from the IEC program to the DeviceNet data is not synchronized, i.e. only byte-synchronous access is possible. For write/read operations with larger data, it is not ensured that the data bytes were received/sent in the same DeviceNet cycle.
sync. buffered firmware access to DN data /0	Access from the IEC program to the DeviceNet data is synchronized, i.e. consistent access via the system components is possible.

IOTrigger

Source giving the start signal for I/O data matching between DeviceNet card and IEC address ranges.

Trigger source	Meaning
No automatic IO matching / 0	There is no matching between the IEC I/O ranges and the DPM data of the DeviceNet card.
IO matching by field bus cards IRQ / 1	Matching is done by the interrupt of the field bus card. The interrupt takes place as soon as the card's DPM is no longer used by the DeviceNet card software and access by the MAx-4 firmware is permitted. In the task started by the trigger, a receipt for enabling of the DPM range by the MAx-4 firmware is sent to the card after completion of the copy process. Now the card reads out the DPM and sends the data to the bus, or writes the data received to the DPM. Then the card releases the DPM and triggers an interrupt. This procedure is repeated cyclically. The frequency depends on the amount of data to be transmitted, the baud rate and the set DataExMod.
IO matching by IEC program / 2	Matching is done by the IEC program. The copy task is started by calling the system component PrDnTrigger(). The copy task executes a copy procedure and waits for the next PrMaTrigger() call.
IO matching by real-time bus / 3	Matching is done by the real-time bus cycle. The trigger signals are sent in the intervals set in the parameter CycleTime of the real-time bus.

INFORMATION
for DataExMode and IOTrigger:

DataExMode	IOTrigger	Explanations
sync. buffered firmware access to PB data / 0	IO matching by field bus cards IRQ / 1[1]	<u>IEC control passive</u>; i.e. the IEC function PrSlWaitOnTrigger is used -> awaiting IRQ of the field bus card + minimal jitter - unfavourable in cyclic programs due to the wait function
sync. buffered firmware access to PB data / 0	IO matching by IEC program / 2	<u>IEC control active</u>; i.e. the IEC function PrSlTrigger is used -> IEC program triggers IO matching + minimal jitter, data consistency - complicated
sync. buffered firmware access to PB data / 0	IO matching by field bus cards IRQ / 1	<u>no IEC control</u>; i.e. no IEC function used + very easy handling - relatively large jitter

Table: Sensible combinations of DataExMode and IOTrigger

---

[1] > With this setting, the interrupts are checked approximately every 200 microseconds!
i.e. the time given in CycleLoad is required every 200 microseconds. (i.e. 50000 ns in CycleLoad means approx. 25 % use of CPU capacity).
To reduce the CPU capacity, IOTrigger must be set to IO matching by IEC program / 2 and the system component DnSlTrigger() should be called in the IEC program when a data exchange with the card is required.

INFORMATION
on data consistency and copy task:
The copy task carries out the data exchange between the IEC I/O buffer of the MAx-4 PacController and the DPM of the DeviceNet optional module.
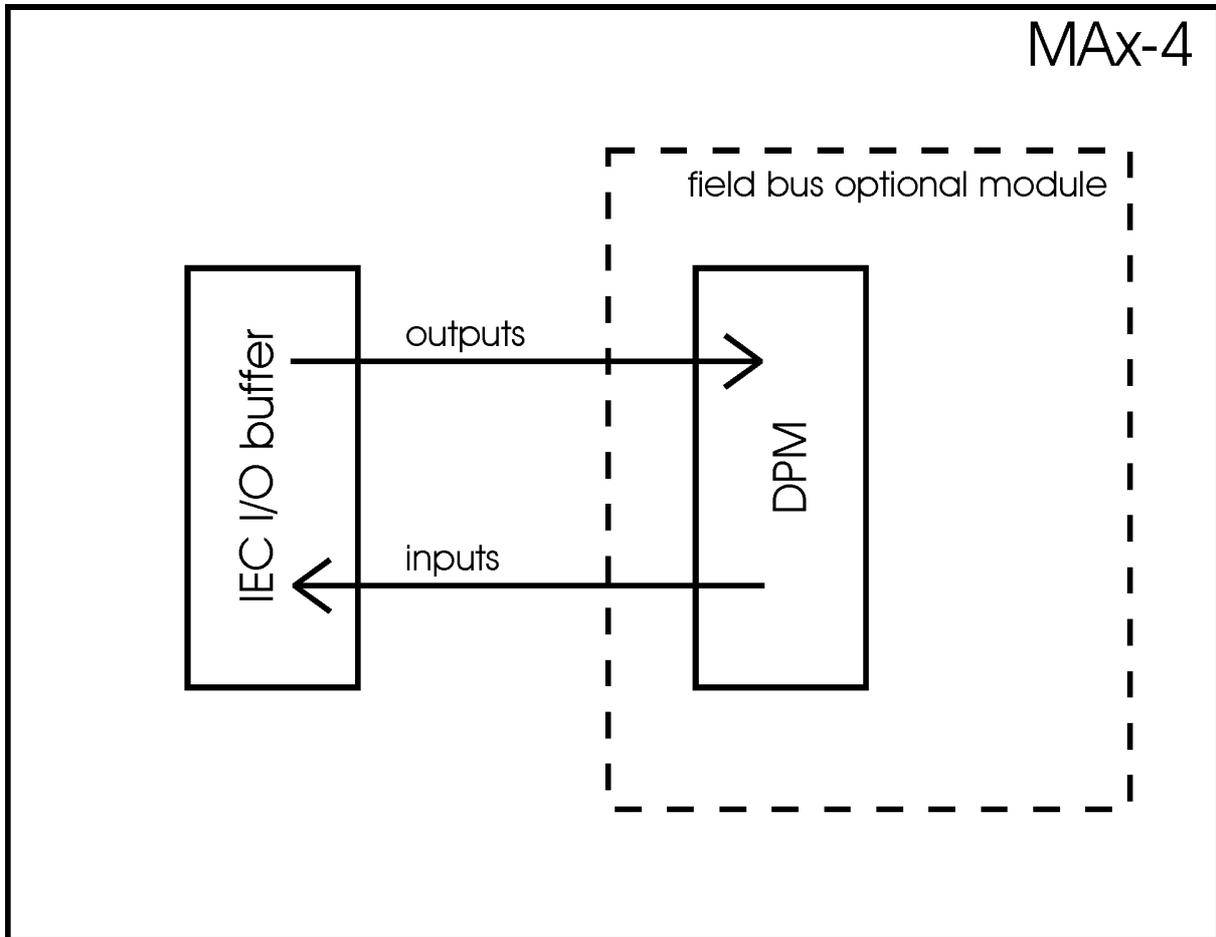

Image: Kopiertask_us.cdr

The I/O copy task has the IEC priority 4.

With DataExMode = "async. direct firmware access to / 1" only one byte consistency is possible.

Element consistency applies, if at least one of the following conditions is fulfilled:
- IOTrigger set to 1 or 3
- IOTrigger set to 2 but IEC trigger component is not called in this task
- IOTrigger set to 2 but IEC trigger component called by several tasks
- IEC-I/O variables defined globally and accessed from several tasks
- IEC task priority >= copy task priority

Consistency for **one task** over the whole IEC I/O range applies if all of the following conditions are fulfilled:
- IOTrigger set to 2
- IEC trigger component called by this task
- IEC I/O variables defined locally in this task or IEC I/O variables defined globally, but accessed only from this task
- Access from other tasks synchronized by system component DnSlWaitOnTrigger() and no access to the same data
- IEC task priority < copy task priority

INFORMATION
In principle, only one consistency can be achieved over several elements or the whole IEC I/O range in the system.

CycleLoad
Duration of the I/O matching for this slave in ns. The data from the IEC output ranges are copied to the data range (DPM) of the DeviceNet card and the input data of the DeviceNet card are copied to the IEC input range.

IRQ
The interrupt selected by the interrupt jumper setting on the DeviceNet hardware must be entered here. You should always use interrupt 7.

ProducedSize
Size of the output data in byte. Must be identical with the set size in the master configuration.

ConsumedSize
Size of the input data in byte. Must be identical with the size set in the master configuration.

InputAddr
Start address of the input data in the IEC input range.

OutputAddr
Start address of the output data in the IEC output range.

IOReset
no reset / 0: The outputs of the object are not put back.
after download / 1: The outputs of the object are put back after a download of the IEC program.
after download or prg. reset / 2: The outputs of the object are put back after a download or a reset of the IEC program.
after download, prg. reset or prg. stop / 3: The outputs of the object become after a download, reset or one stop the IEC program put back.

5.2.2 Input Data

No.	Designation	Unit	Data type	I/O	Range	Default
1	InputData[0]		BYTE	AD	0 – 255	
:	:					
255	InputData[254]		BYTE	AD	0 – 255	

The input data are shown as byte parameters. 255 input bytes are possible. However, only the data determined in ConsumedSize can be read. All other input parameter bytes show ??? in online operation. Likewise, only the configured data can be accessed in the IEC program.

IOTrigger = no automatic IO matching / 0:

The data of the DeviceNet card are shown directly, but only one byte consistency is ensured.

With any other setting of IOTrigger, the data of the IEC input range (%I) are shown.

5.2.3 Output Data

No.	Designation	Unit	Data type	I/O	Range	Default
1	OutputData[0]		BYTE	ED	0 – 255	
:	:					
255	OutputData[254]		BYTE	ED	0 – 255	

The output data are shown as byte parameters. 255 input bytes are possible. However, only the data determined in ProducedSize can be written. All other output parameter bytes show ??? in online operation. Likewise, only the configured data can be accessed in the IEC program.

IOTrigger = no automatic IO matching / 0:

The data of the DeviceNet card can be accessed directly, but only one byte consistency is ensured.

With any other setting of IOTrigger, the data of the IEC output range (%Q) can be accessed.

5.3 Programming

5.3.1 In General

System components form the interface for IEC task to MAx-4 PacController specific functions. Components are subsequently specified in IEC 1131 syntax.

### 5.3.2 Correlation between Configuration and IEC Access

There are two ways of accessing DeviceNet data via IEC:
1. Symbolic access with parameter names
2. AT variable definitions with %I or %Q

5.3.2.1 Symbolic Access with Parameter Names

Writing and reading operations can be made on the parameters of the configured DeviceNet slave module. The parameter type AP can be accessed in reading operation. The parameter type EP can be accessed in writing operation. This kind of access is done on the IEC input or output buffers or the DPM (depending on IOTrigger).

Example:
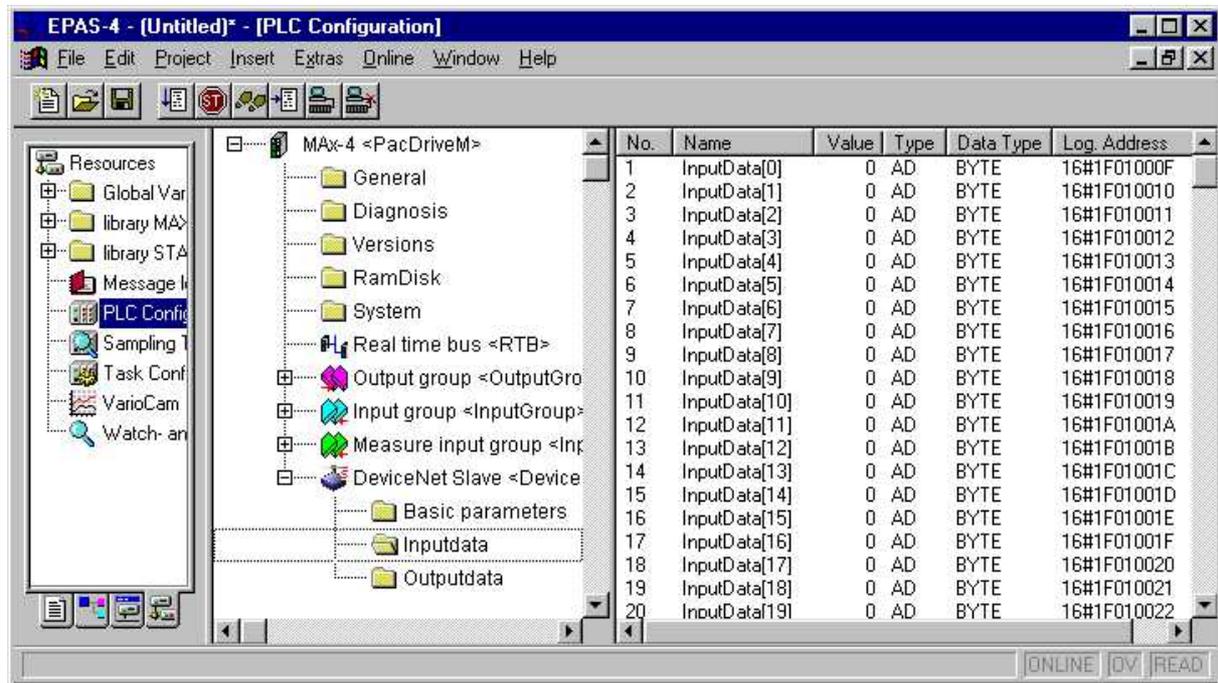
Reading access to data of the DeviceNet hub 'DeviceNetSlave':
```
VAR
      cTestValue          :BYTE;
END_VAR
```

bTestValue := DeviceNetSlave.InputData[3];

Writing access to data of the DeviceNet hub 'DeviceNetSlave':
```
VAR
      cOutputValue        :BYTE;
END_VAR
```

cOutputValue := 47;

DeviceNet_Modul_2.OutputData[7] := cOutputValue;
DeviceNet_Modul_2.OutputData[8] := 47;

5.3.2.2 AT Variable Definitions with %I or %Q

Variables can be laid with direct addresses on the IEC input range (%I) or the IEC output range (%Q). The type of the IEC variable is arbitrary, i.e. you can lay e.g. arrays, real values or structures on the ranges. The IEC address is calculated from the parameters InputAddr or OutputAddr and the array index of the parameters in the parameter groups input data or output data.

IEC AT%IAddress = InputAddr + Array Index of the input parameter byte
IEC AT%QAddress = OutputAddr + Array Index of the output parameter byte

Example:

Reading access to data with InputAddr = 2 and Array Index of the input parameter bytes = 10 and 13:

```
VAR
  bLightBarrierImpulse AT %IX6.2: BOOL;
  lrActPosition AT %IB15: LREAL;

  lrTempActPosition: LREAL;
  bTempBit: BOOL;
END_VAR

lrTempActPosition := lrActPosition;
bTempBit := bLightBarrierImpulse;

IF bLightBarrierImpulse = TRUE THEN
...
END_IF
```

Writing access to data with OutputAddr = 2 and Array Index of the output parameter bytes = 10 and 13:

```
VAR
  bHeater_Switch7 AT %QX6.0: BOOL;
  lrSetPosition AT %QB15: LREAL;

  lrTempSetPosition: LREAL;
END_VAR

bHeater_Switch7 := TRUE;

lrTempSetPosition := 47.11;

lrSetPosition := TempSetPosition;

...

lrSetPosition := 99.99;
```

5.3.3 DeviceNet Slave

5.3.3.1 **DnSlTrigger**

Call:
DnSlTrigger();

Declaration:
```
VAR_INPUT
END_VAR
```

Result:
0 - OK
-1 – No DeviceNet module

Function:
Calling the system component DnSlTrigger() starts the copy task. Data are copied from the IEC output ranges to the DPM memory of the DeviceNet Slave card. Then the input data from the DPM memory of the DeviceNet card are copied to the IEC input range. The copy task executes a copy procedure and waits for the next DnSlTrigger() call. The system component call is only valid if 'IO matching by IEC program / 2' is entered in the parameter IOTrigger.

Example:
DnSlTrigger();

5.3.3.2   DnSlWaitOnTrigger

Call:

DnSlWaitOnTrigger();

Declaration:

```
VAR_INPUT
END_VAR
```

Result:

0 - OK
-1 – no DeviceNet module

Function:

The system component waits until the trigger signal is sent from the source set in the parameter IOTrigger. This component can be used to start IEC tasks synchronously to the copy task.

Example:

DnSlWaitOnTrigger();

5.4 IEC Examples

5.4.1 DeviceNet Slave

no IEC control (asynchronous)

```
PROGRAM SendAxisSynchronous
VAR
      AccessType : ACCESS_TYPES:=AT_DEFINITION;
      bOutputValue:BOOL:= TRUE;
      bDigitalOut AT%QX0.0:BOOL;
      lResultSend:DINT:=99;
END_VAR

CASE AccessType OF
      SYMBOLIC:
            DigitalIO.Output[1] := BOOL_TO_BYTE(bOutputValue);
            O_0.Value := bOutputValue;
      AT_DEFINITION:
            bDigitalOut :=bOutputValue;
            O_0.Value := bOutputValue;
END_CASE;

bOutputValue := NOT bOutputValue;
```

IEC control passive

```
PROGRAM DeviceNetTriggered
VAR
        AccessType : ACCESS_TYPES:=SYMBOLIC;
        bOutputValue:BOOL:= TRUE;
        bDigitalOut AT%QX0.0:BOOL;
        lResultSend:DINT:=99;
END_VAR
VAR_INPUT
        CycleTime:REAL;
END_VAR

WHILE TRUE DO

        DnSlWaitOnTrigger();

        CASE AccessType OF
            SYMBOLIC:
                    DigitalIO.Output[1] := BOOL_TO_BYTE(bOutputValue);
                    O_0.Value := bOutputValue;
            AT_DEFINITION:
                    bDigitalOut :=bOutputValue;
                    O_0.Value := bOutputValue;
        END_CASE;

        bOutputValue := NOT bOutputValue;

        WaitTime(CycleTime);
END_WHILE
```

IEC control active

```
PROGRAM DeviceNetCycleControl
VAR
      AccessType : ACCESS_TYPES:=SYMBOLIC;
      bOutputValue:BOOL:= TRUE;
      bDigitalOut AT%QX0.0:BOOL;
      lResultSend:DINT:=99;
END_VAR

CASE AccessType OF
      SYMBOLIC:
            DigitalIO.Output[1] := BOOL_TO_BYTE(bOutputValue);
            O_0.Value := bOutputValue;
      AT_DEFINITION:
            bDigitalOut :=bOutputValue;
            O_0.Value := bOutputValue;
END_CASE;

bOutputValue := NOT bOutputValue;

DnSlTrigger();
```

6 Diagnosis and Maintenance

6.1 In General

A differentiated error treatment has been implemented in the MAx-4 PacController in order to enable well-aimed reactions to certain events.

For further details, see *Programming Manual* and *Operating Manual* for the PacDrive™ M system.

6.2 Overview

OPTIONAL MODULES

Class (default)	Diagnosis code	Language-specific diagnosis text
4	720	no module found
4	721	module not ready
4	722	no cyclic telegrams
4	724	no I/O range

6.3 Error Causes and Handling

720 no module found

Module ID could not be found. The module name (e.g. 'DevNet Slave') is shown in DiagExtCode.

Cause 1:	There is no DeviceNet module.
Handling:	Order DeviceNet module and install or send in MAx-4 PacController for modification.
Cause 2:	I/O address set incorrectly.
Handling:	Check I/O address.
Cause 3:	Hardware error: DeviceNet module defective.
Handling:	Exchange DeviceNet module or send in for repair.
Cause 4:	Hardware error: MAx-4 PacController defective.
Handling:	Exchange MAx-4 PacController or send in for repair.

721 module not ready

DeviceNet module does not react after initialization by MAx-4 PacController (without additional diagnosis text). With additional diagnosis text "no answer", the watchdog monitoring for the DeviceNet module has triggered. Module does not react within the set monitoring time (see default configuration).

Cause 1:	DeviceNet module defective
Handling:	Exchange DeviceNet module or send in for repair.

722 no cyclic telegrams

Exchange of cyclic data interrupted.

Cause 1:	Master sends no cyclic data
Handling:	
Cause 2:	Cable problem
Handling:	
Cause 3:	Duplicate slave address in the network
Handling:	

724 no I/O range

The IEC I/O ranges could not be accessed.

Cause 1:	IEC program could not be loaded.
Handling:	Retransmit IEC program.
Cause 2:	Software error.
Handling:	Contact ELAU application department.

6.4   Maintenance

Recognizing and clearing an error quickly helps to keep the production loss down to a minimum.

The diagnosis messages of the PacDrive™ M system, which can be checked using EPAS-4, make it possible to look for errors deliberately and effectively.

In case of an error, defective components can be exchanged with no problem. This ensures that the problem can be solved quickly and operation can be resumed soon. This work must be done by qualified maintenance staff only.

When returning a defective unit to the ELAU customer service, please complete the attached error report form.

ATTENTION!
Only units with identical hardware configuration and identical software version may be exchanged.

6.4.1   Spare Parts, Components

Stock keeping of spare parts:
Keeping a stock of the essential components is a key prerequisite for the permanent functionality of the equipment.

When ordering spare parts, please give the following data:
product name: e.g. MAx-4 / 10 / 01 / 008 / 99 / 1 / 1 /00
article number: e.g. 13130255-008
hardware version: e.g. HW: 630062
software version :   e.g. SW:00.05.00

You can find this information on the type plate of the equipment or in the configuration of your PacDrive™ M system.

INFORMATION
You can find this information on the type plate of the equipment (see also Transportation, Storage, Unpacking) or in the configuration of your PacDrive™ M system.

6.4.2 Repair

By all means complete the attached error report form when returning defective components.
You can also make a photocopy of he error report form and use it as a fax message.

ATTENTION!
Electronic parts may only be returned in the original or a comparable packaging. In any case the components must be wrapped in an ESD packaging/foil. Otherwise you will lose your warranty rights.

6.4.3 Service Addresses

For ordering spare parts

ELAU AG
Postfach 1255
97821 Marktheidenfeld

Phone: 09391 / 606 – 0
Fax: 09391 / 606 – 300

For repair

Please send the components to be repaired or checked, along with the error report, to this address:

ELAU AG
Abt. Kundendienst
postal address: house address:
Postfach 1255   Dillberg 12
97821 Marktheidenfeld   97828 Marktheidenfeld

Service team

Should you need to talk to a member of our service team or require on-site service, please contact:

ELAU AG
Abt. Kundendienst / Application
Postfach 1255
97821 Marktheidenfeld

Phone: 09391 / 606 – 142

7 Appendix

7.1 Service Addresses

For ordering spare parts

ELAU AG
Postfach 1255
97821 Marktheidenfeld

Phone: 09391 / 606 – 0
Fax: 09391 / 606 – 300

For repair

Please send the components to be repaired or checked, along with the error report, to this address:

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postal address   house address
Postfach 1255   Dillberg 12
97821 Marktheidenfeld   97828 Marktheidenfeld

Service team

Should you need to talk to a member of our service team or require on-site service, please contact:

ELAU AG
Abt. Kundendienst / Application
Postfach 1255
97821 Marktheidenfeld

Phone: 09391 / 606 – 142

7.2 Sales Regions

Germany

ELAU AG
Dillberg 12
D-97828 Marktheidenfeld

Tel.: 0 93 91 / 606 – 0
Fax: 0 93 91 / 606 – 300
eMail: info@elau.de
Internet: http://www.elau.de

ELAU AG Technisches Büro Münster
An der Alten Ziegelei 36
D-48157 Münster

Tel. 02 51 / 1 41 49 – 0
Fax: 02 51 / 1 41 49 – 20
eMail: elau_tbn@t-online.de

ELAU Automobil Antriebstechnik GmbH
Dillberg 11
D-97828 Marktheidenfeld

Tel.: 0 93 91 / 98 50 – 0
Fax: 0 93 91 / 98 50 – 10
eMail: elau-auto@t-online.de

ELAU SYSTEMS GmbH
Oswald-Greiner-Str. 5
D-04720 Döbeln

Tel. 0 34 31 / 71 78 60
Fax: 0 34 31 / 71 78 69
eMail: elau_systems@t-online.de

Italy

ELAU SYSTEMS ITALIA S.r.l.
Via Tosarelli 300
I-40050 Villanove di Castenaso (BO)

Tel.: 00 39 0 51/78 18 70
Fax: 00 39 0 51/78 18 69
eMail: info@elau.it
Internet: http://www.elau.it/

France

TRANSTECHNIK servomécanismes
17, rue des Grandes Varennes
F-21121 Ahuy

Tel.: 0 03 33 / 80 / 55 69 41
Fax: 0 03 33 / 80 / 53 93 63
eMail: transtechnik@ipac.fr

Scandinavia

SDT Scandinavian Drive Technologies AB
Sabelgatan 4
SE-25467 Helsingborg

Tel.: 00 46 / 42 / 38 08 00
Fax: 00 46 / 42 / 38 08 13
eMail: info@sdt.se
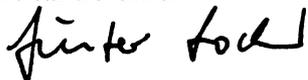Internet: http://www.sdt.se

USA

ELAU, Inc.
4201 West Wrightwood Avenue
Chicago, Illinois 60639
Tel.: 001 / 773 / 3 42 84 00
Fax: 001 / 773 / 3 42 84 04
eMail: sales@elauUS.com
Internet: http://www.elauUS.com

USA (Integrator)

ORBIT Motion Technologies
Madaket Place * Unit 15 * 766 Route 28
Mashpee, Massachusetts * 02649
Tel.: 001 / 508 / 5 39 01 00
Fax: 001 / 508 / 5 39 01 11
eMail: orbit@cape.com
Internet: http://www.orbitmotion.com

7.3 CE Declaration by the Manufacturer

ELAU®	Herstellererklärung / Declaration by the manufacturer / Déclaration du fabricant	ELN 117-01/09.98 Seite 1/1

Produkt :	product:	produit:
Motorcontroller	**Motorcontroller**	**Motorcontroller**
MAx-4 / 10	**MAx-4 / 10**	**MAx-4 / 10**
Der Hersteller erklärt, daß das gelieferte Produkt in Übereinstimmung mit den angewendeten harmonisierten Normen / Spezifikationen hergestellt worden ist.	The manufacturer declares that the product delivered has been manufactured in accordance with the stated harmonized standards / specifications.	Le fabricant déclare que le produit livré a été fabriqué conformément aux indiqués standards / spécifications harmonisés.
Angewendete harmonisierte Normen:	**Applied harmonized standards:**	**Harmonisée standards appliqués:**
EN 60204-1	**EN 60204-1**	**EN 60204-1**
Sicherheit von Maschinen - elektrische Ausrüstung	Safety of machines - electrical equipment	Sécurité des machines - équipement électrique
EN 50081-2	**EN 50081-2**	**EN 50081-2**
Fachgrundnorm für die Störaussendung	generic standard for noisy emission	norme générique pour l'emission brouillée
pr EN 50082-2	**pr EN 50082-2**	**pr EN 50082-2**
Fachgrundnorm Störfestigkeit	generic standard interference-resistant	norme générique résistance au brouillage
Hersteller:	**Manufacturer:**	**Fabricant:**
ELAU AG Dillberg 12 D-97828 Marktheidenfeld	ELAU AG Dillberg 12 D-97828 Marktheidenfeld	ELAU AG Dillberg 12 D-97828 Marktheidenfeld

Stellung im Betrieb / Position :

Vorstand/Chairman

15.9.1998   Günter Locherer
....
(Datum, Date / Unterschrift, Signature)

1.4 Further Literature

ELAU can provide you with these manuals and instructions on the PacDrive™ M system:

Project Manual

German	Art. No. 17 13 00 58 – 000
English	Art. No. 17 13 00 58 – 001
Italian	Art. No. 17 13 00 58 – 002
French	Art. No. 17 13 00 58 – 003

Programming Manual

German	Art. No. 17 13 00 61 – 000
English	Art. No. 17 13 00 61 – 001
Italian	Art. No. 17 13 00 61 – 002

Programming Manual MC-4 MotorController

German	Art. No. 17 13 00 62 – 000
English	Art. No. 17 13 00 62 – 001 *
Italian	Art. No. 17 13 00 62 – 002 *

Operating Manual SDK Gateway Server

German	Art. No. 17 13 00 65 – 000

Operating Manual CAN L2

German	Art. No. 17 13 00 66 – 000

Operating Manual PROFIBUS-DP

German	Art. No. 17 13 00 67 – 000
English	Art. No. 17 13 00 67 – 001

Operating Manual SM Motors

German	Art. No. 17 13 00 68 – 000
English	Art. No. 17 13 00 68 – 001

Operating Manual EPAS-4

German	Art. No. 17 13 00 70 – 000
English	Art. No. 17 13 00 70 – 001

Operating Manual MAx-4 PacController

German	Art. No. 17 13 00 71 – 000
English	Art. No. 17 13 00 71 – 001 *
Italian	Art. No. 17 13 00 71 – 002 *

Operating Manual OPC Server

| German | Art.No. 17 13 00 73 – 000 |
| English | Art.No. 17 13 00 73 – 001 |

Operating Manual PLC Library

| German | Art.No. 17 13 00 74 – 000 |

Operating Manual VarioCam™ Library

| German | Art.No. 17 13 00 75 – 000 |
| English | Art.No. 17 13 00 75 – 001 |

Operating Manual Device Net

| German | Art.No. 17 13 00 76 – 000 |
| English | Art.No. 17 13 00 76 – 001 |

Operating Manual HMI Libraries

| German | Art.No. 17 13 00 77 – 000 |
| English | Art.No. 17 13 00 77 – 001 |

Operating Manual INC-4 Incremental Encoder Module

| German | Art.No. 17 13 00 78 – 000 |
| English | Art.No. 17 13 00 78 – 001 |

Operating Manual CANopen

| German | Art.No. 17 13 00 79 – 000 |
| English | Art.No. 17 13 00 79 – 001 |

* = in preparation

7.5 Product Training

We offer practical workshops and seminars in our training centre in Marktheidenfeld.

Our experienced seminar leaders will enable you to make optimum use of the vast possibilities of the PacDrive™ M system.

NOTE

Please contact us for further information or to order our seminar program.

The seminars are also offered in English and French language.

PacDrive™ M Basic Workshop

4-day basic seminar for design, application, mechanical and electrical engineers, as well as programmers and service engineers.

PacDrive™ M Advanced Workshop

4-day advanced seminar for design, application, mechanical and electrical engineers, as well as programmers and service engineers.

Completion of the PacDrive™ Basic Workshop is a prerequisite!

PacDrive™ M Application Workshop

2-day company-specific seminar for design, application, mechanical and electrical engineers, as well as programmers and commissioning staff.

The focus lies on the subjects of hardware structure, program structures and configuration. The participants will receive valuable tips on installing and commissioning plants.

Completion of the PacDrive™ Basic Workshop is a prerequisite!

VarioCam™ Seminar for Design Engineers

1-day seminar for mechanical and electrical engineers.

This seminar deals with the electronic simulation of cam disks with the help of suitable calculation methods in order to modify motion laws depending on the situation, under real-time conditions.

7.6 Modifications

12 / 1999

- Operating Manual newly written

NOTE

The latest documentation and the modification service for this pd area available at ELAU's homepage (http://www.elau.de).
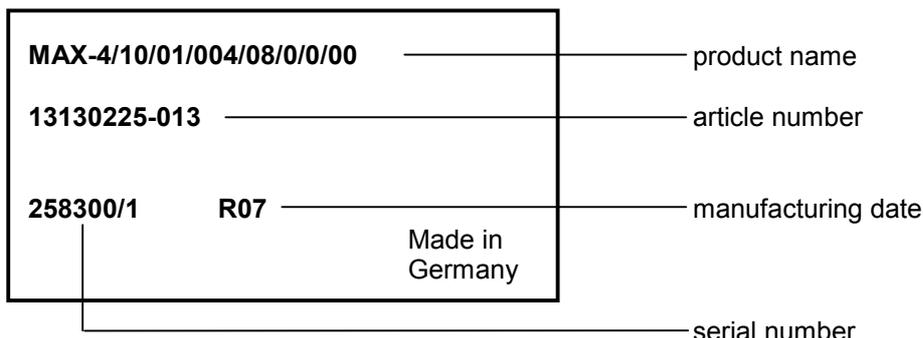
7.7   Index

7.8 Form for Error Report

This error report is <u>absolutely necessary</u> in order to enable efficient processing.
Send the error report to your ELAU representation or to:
ELAU AG, Abt. Kundendienst, Dillberg 12, D-97828 Marktheidenfeld

Error Report from:	Company	City:	Date:
	Department:	Name:	Tel.:

Details on the defective product:

Example of a type plate:

```
MAX-4/10/01/004/08/0/0/00 ──────────────── product name

13130225-013 ───────────────────────────── article number


258300/1      R07 ────────────────────── manufacturing date
                      Made in
                      Germany

              └───────────────────────── serial number
```

Product name: ....

Article number: ....

Serial number: ....

Manufacturing date: ....

Operating system: [ ] Win 95   [ ] Win 98   [ ] Windows NT 4.0

Memory (RAM):..

Parameter enclosed: Yes   [ ]   No   [ ]

IEC program enclosed: Yes   [ ]   No   [ ]

Description of the error:

_____

_____

_____

_____

_____

_____

_____