Manual

Programming Software ProCam 1.10
for Absolute Switching Cam Encoders

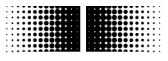# Content

1 Introduction

1.1 Product assignment

This ProCam software is suitable for the following types:

Hollow shaft encoders

Product	Product Family	interface
RXA1H	Cam-operated switchgroup	RS232 or RS485

2 General Information

2.1 System requirements

A PC with the operating system Windows 95/98/NT/2000/XP with one free RS232 serial port.

An RS485/RS232 interface converter with automatic directional switchover is required for encoders with an RS485 interface.

2.2 Installation

The installation is menu-guided.
Please read the file "Readme.txt" on the included CD.

Note: Under Windows NT/2000 and Windows XP, the installation can only be carried out with Administrator rights.

2.3 Software version

The version ProCam 1.10 replaces the earlier ProCam versions and is downward compatible.

2.4 Information on commissioning

- Wiring work on the encoder plug or in the switch cabinet may only be carried out in the deenergized state. Do not connect or disconnect encoder plugs while energized.

- Before switching on, please check and connect all connectors.

- **Caution!**
  Incorrect encoder programming can lead to system failure.

Product information
The content or scope of this documentation can be changed at any time without prior notice.
The contents of this documentation does not represent the assurance of a certain property or function by Baumer IVO GmbH & Co. KG.

3 ProCam Program

3.1 Basics

The ProCam program is a software for programming Baumer IVO cam encoders. It can be used to read out, change, program and display the encoder data. To make programming as simple as possible, the user can select only the fields valid for the respective state. Fields which cannot be selected in the current state have a gray background. Before the encoder can be programmed, the encoder type must be selected. This results in a logical procedure following the program start:

1. Step   Select language with country flags
2. Step   Select encoder type with "Select encoder" button
3. Step   Programming can be started

If your encoder is not automatically detected, or is not contained in the selection list, please contact Baumer IVO.

3.2 Program procedure

After the **Start screen** has run, the following mask appears:
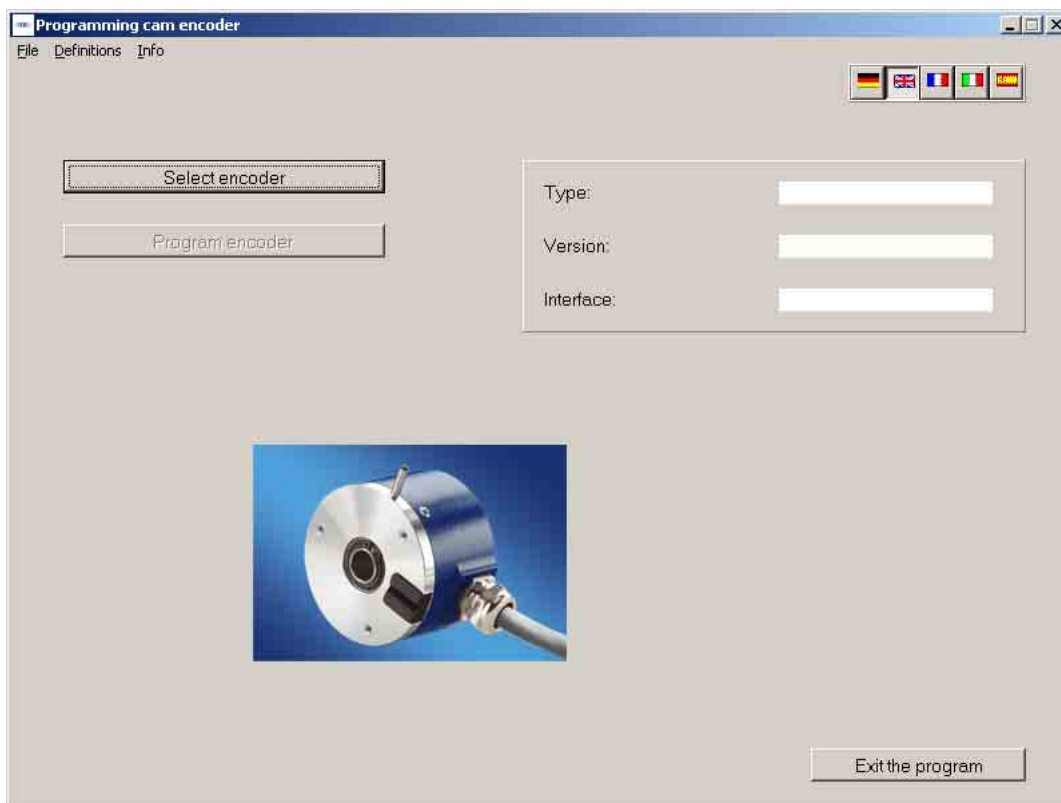
Programming cannot begin until an encoder type has been selected.
Encoder selection is described in the chapters "Encoder connected to PC $\Rightarrow$ Automatic selection" and "Select encoder type from table $\Rightarrow$ Manual selection".

3.2.1 Selecting encoder type

The encoder can be selected in the first step.
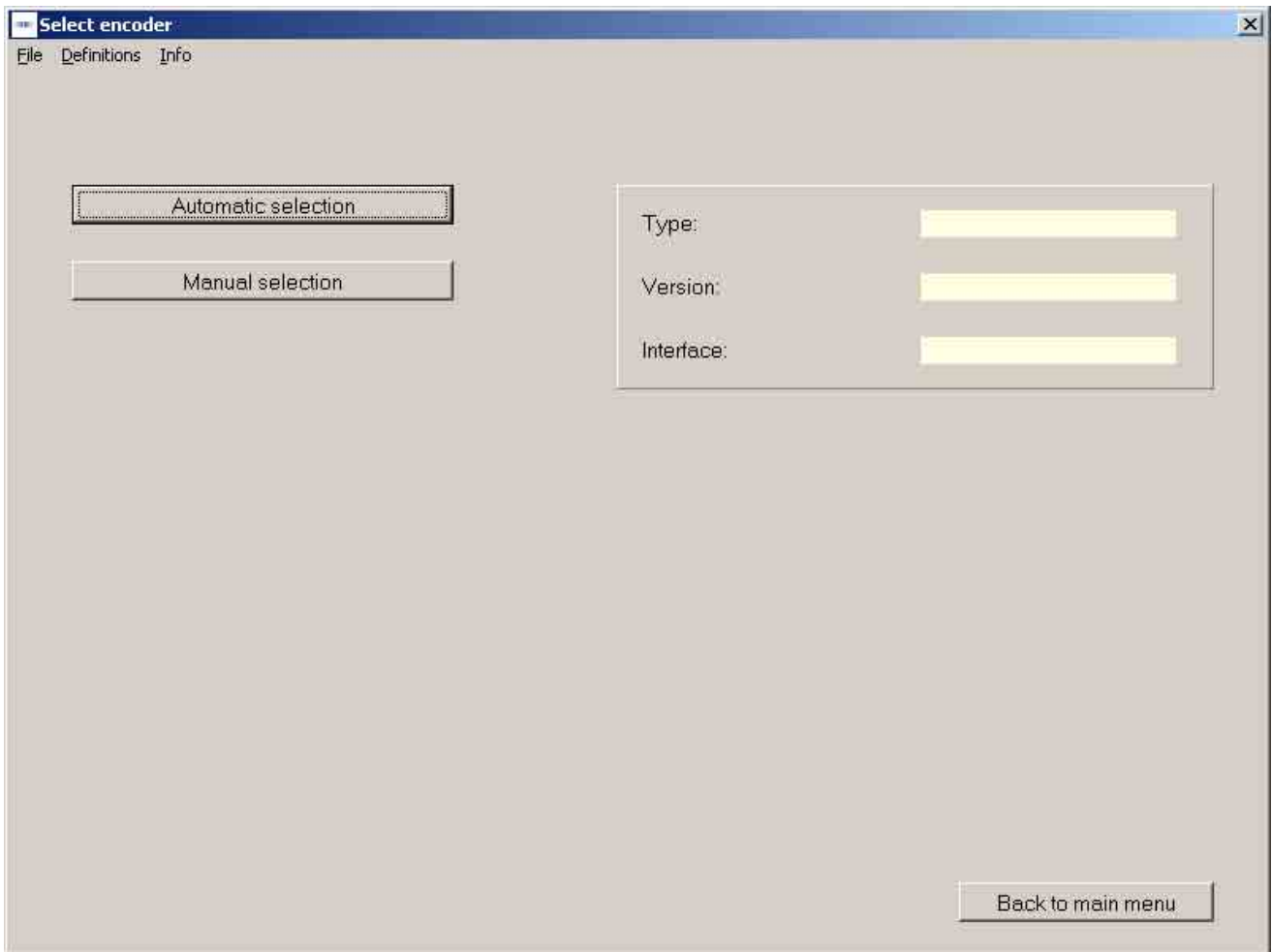
The program offers automatic selection when an encoder is connected to the interface.
If there is no connection to the encoder, a desired encoder type can be selected from the list
with "Manual selection".

3.2.2 Encoder connected to PC - "Automatic selection"
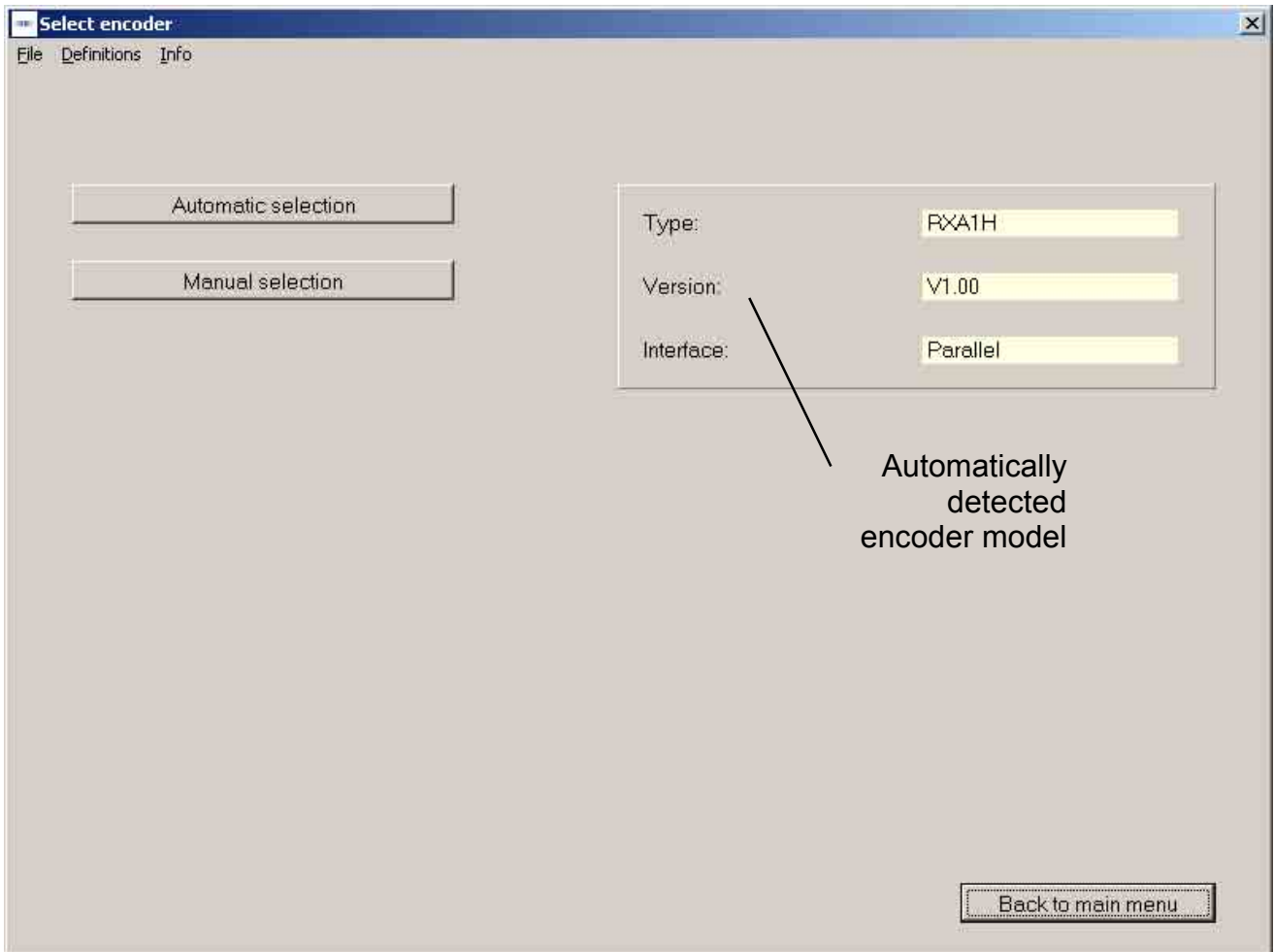
With an encoder selected, the encoder type can be read out (Automatic selection). This information is necessary to provide the corresponding parameters for programming. If the encoder or the cable connection is not properly connected, an error message is displayed. If the automatically detected encoder does not match the encoder rating plate, please contact Baumer IVO.

3.2.3 Selecting encoder type from table - "Manual selection"
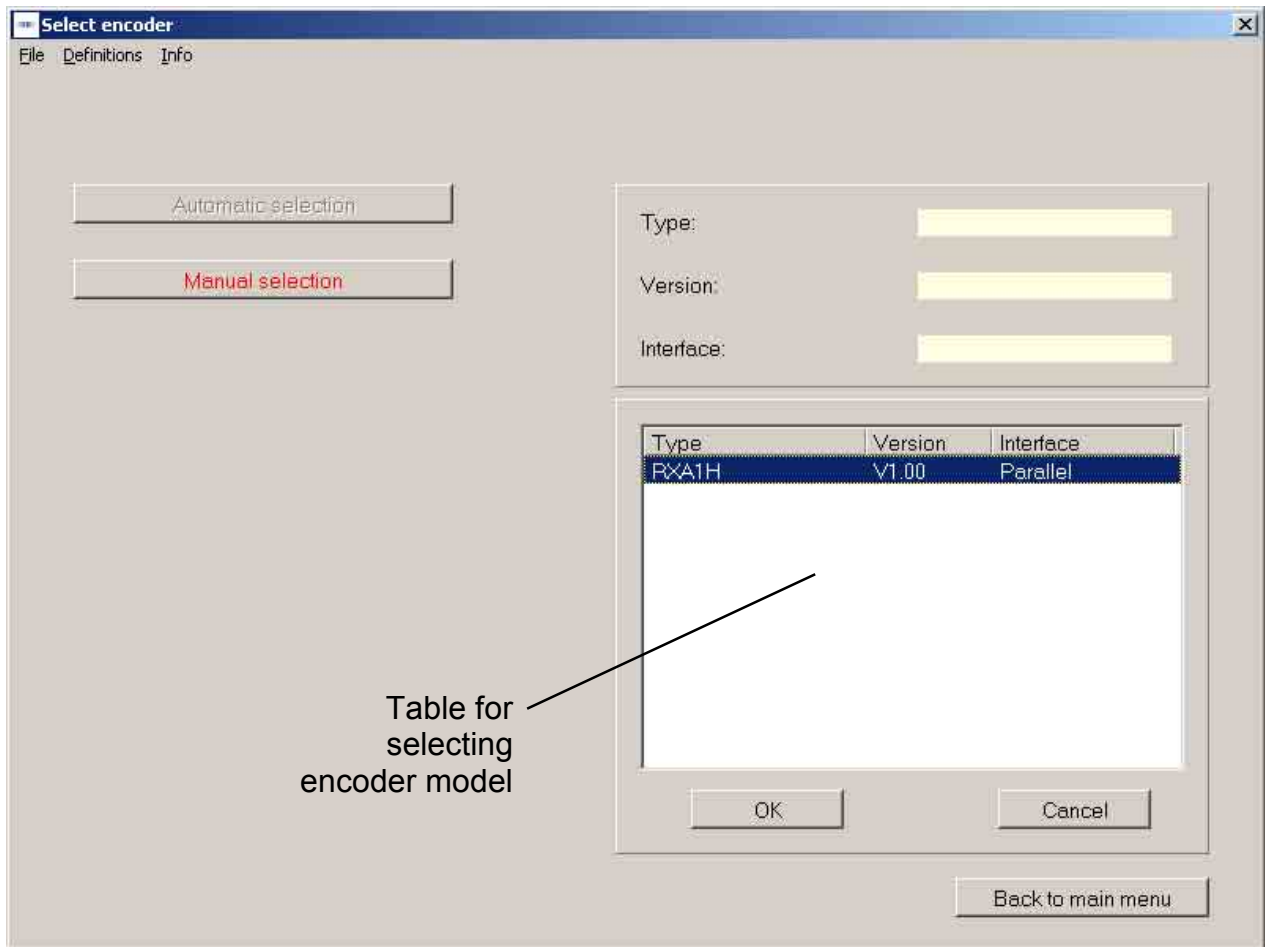
If no encoder is connected to the PC, the encoder type can be selected from the table (Manual selection). The most common types are contained in the table. Not only the type, but also the version is important. If your type is not included, please contact Baumer IVO. The type and version can be read off the encoder rating plate.

3.2.4 Starting encoder programming

After successfully selecting the encoder, programming can be started. The "Program encoder" button is now active. The selected encoder is shown again in the right-hand mask.

Encoder programming is active

Selected encoder
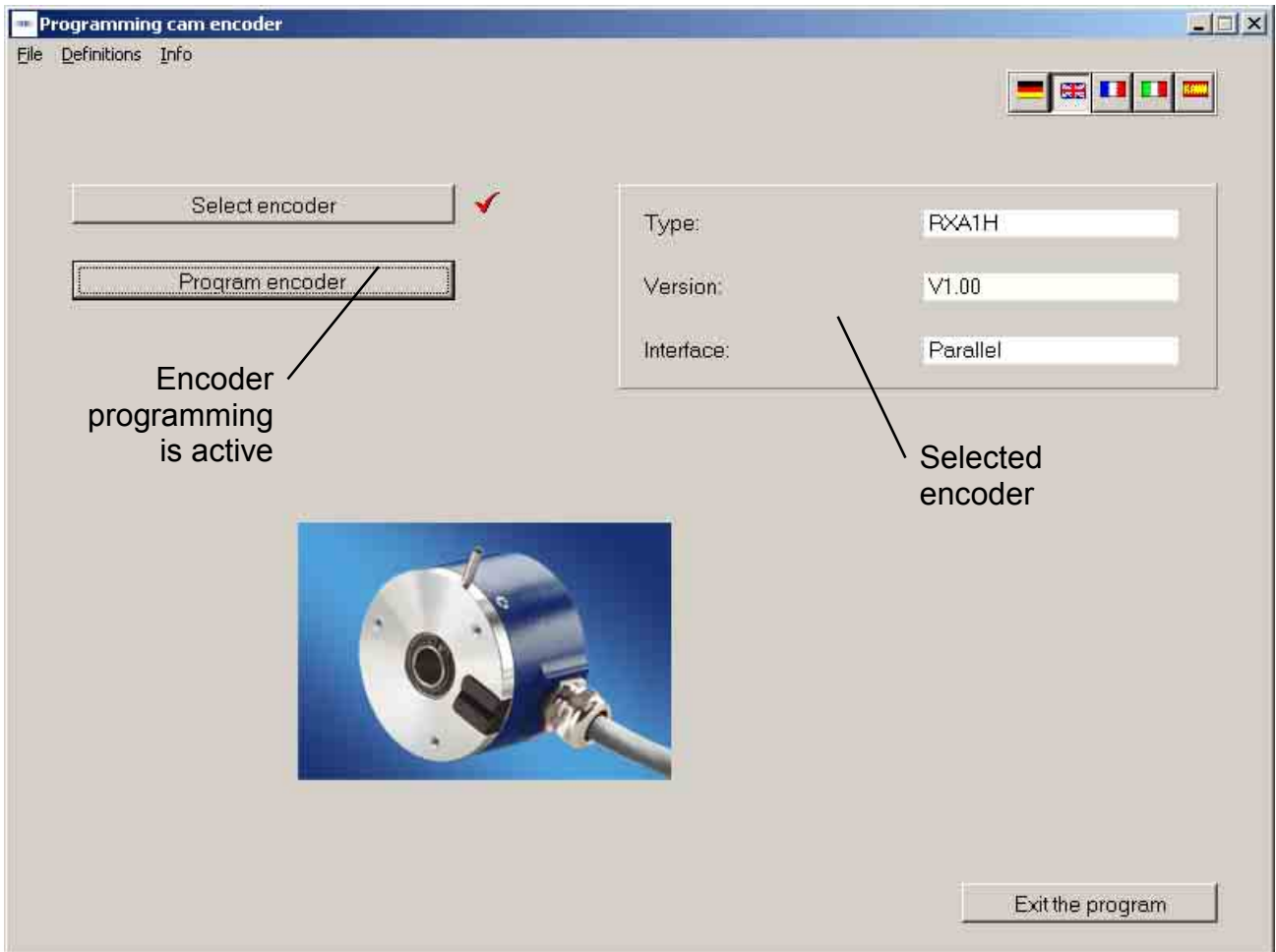
4 Program Encoder

The "Program encoder" mask now enables the programming of all parameters possible for this encoder.

Resolution tab

Outputs tab

Program tab
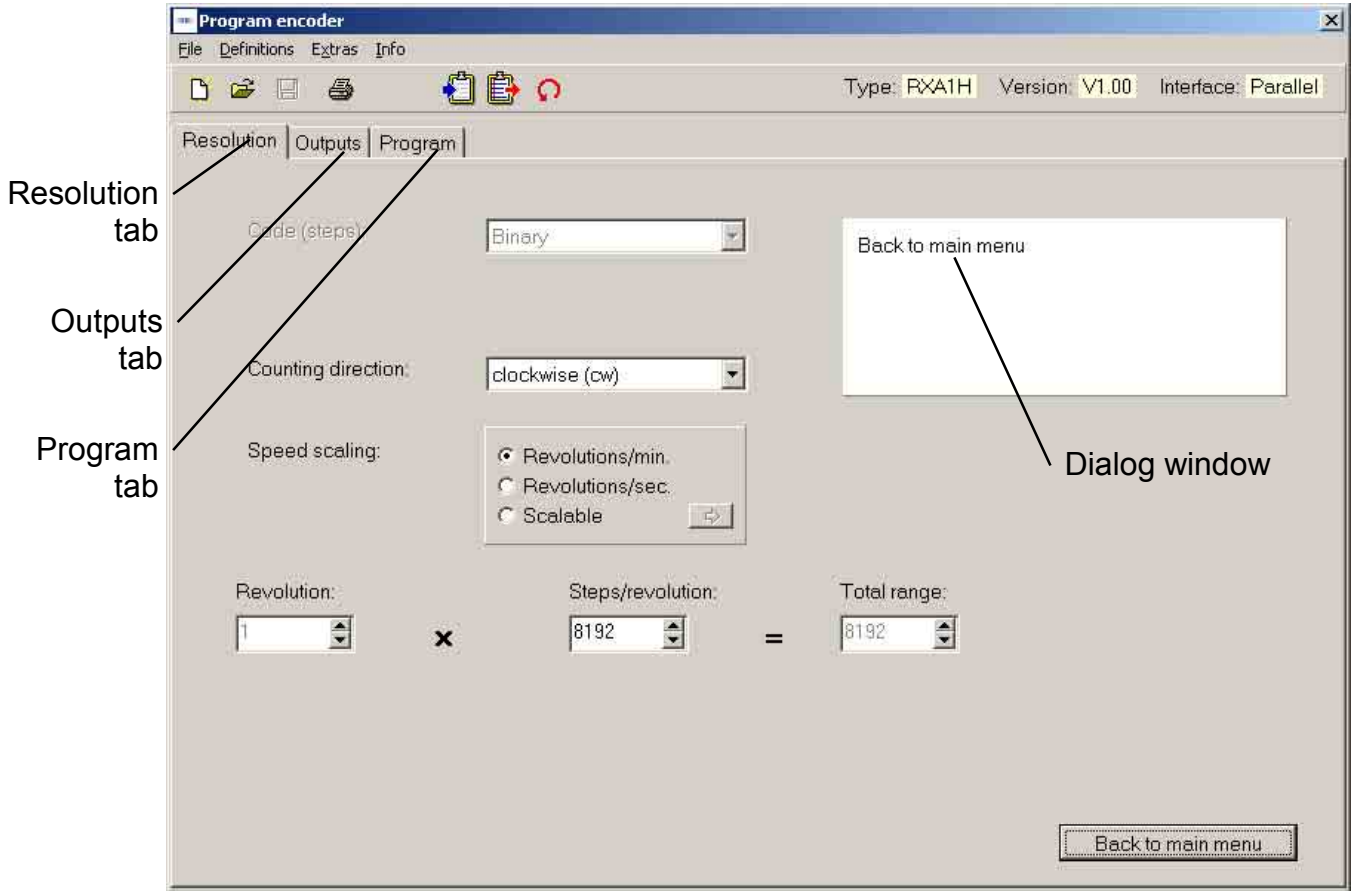
Dialog window

The parameters for the encoder can be set with the tabs "Resolution", "Outputs" and "Program". The dialog window offers additional support and explanations for the selected window.

Tab	Explanations
"Resolution" tab	See Chapter 4.2
"Outputs" tab	See Chapter 4.3
"Program" tab	See Chapter 4.4

4.1 Menu and icon bar
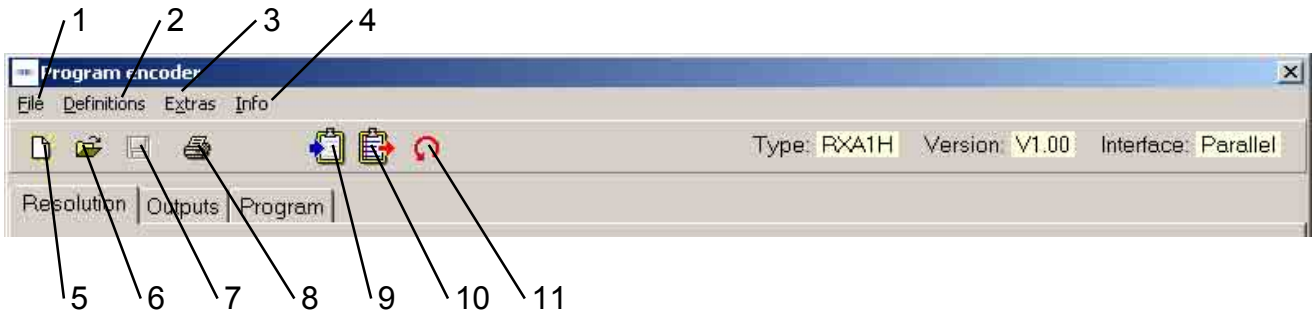
No.	Chapter	Buttons
1	4.1.1	File
2	4.1.2	Definitions
3	4.1.3	Extras
4	4.1.4	Info
5	4.1.5	Reprogramming
6	4.1.6	Open file

No.	Chapter	Buttons
7	4.1.7	Save file
8	4.1.8	Print
9	4.1.9	Load data from encoder
10	4.1.10	Save data in encoder
11	4.1.11	Display position

4.1.1 File

In the "File" menu item the following items can be selected:
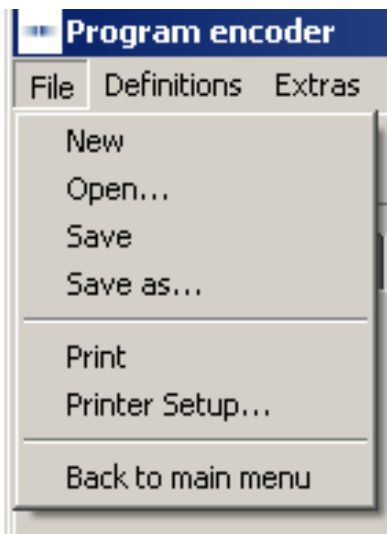
New:	A programming mask with the basic setting is loaded.
Open:	A saved program can be loaded.
Save:	The current data can be saved.
Save as:	The current data can be saved under any desired name in a freely selectable directory.
Print:	The current data can be printed for archiving.
Printer setup:	A printer can be selected.
Back to main menu:	The programming mask is exited.

4.1.2 Settings

Define serial parameters

Port
- ⦿ COM1
- ○ COM2
- ○ COM3
- ○ COM4
- ○ COM5
- ○ COM6

Baudrate
- ○ 1200
- ○ 2400
- ○ 4800
- ○ 9600
- ○ 19200
- ⦿ 38400

Address
99

Parity
- ○ No
- ○ Odd
- ⦿ Even

Stopbits
- ⦿ 1
- ○ 2

Databits
- ○ 5
- ○ 6
- ○ 7
- ⦿ 8

OK   Cancel
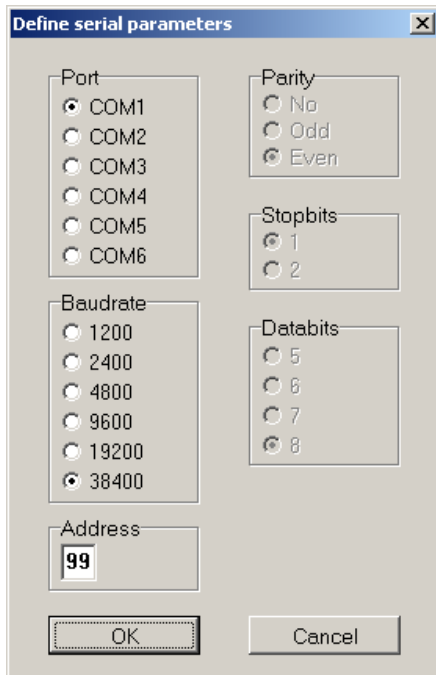
In the "Settings" menu item the COM 1 to COM 6 serial port to which the encoder is connected can be selected. In addition, the baud rate and the address of the encoder can be set. The other parameters such as Parity, Stop bits and Data bits can be checked here.

The port parameters are permanently set for the RXA1H series.
- Baud rate: 38400
- Parity: Even
- Stop bits: 1
- Data bits: 8

4.1.3 Extras

Read data: The data are requested from the connected encoder
Send data: The current programming is saved in the encoder
Display position: The "Display position" screen mask is opened (see Chapter 4.6)
Set position: The mask for assigning a position value is opened (see Chapter 4.7)
Reset: The encoder receives a reset command. The effect is identical to
                    switching the supply voltage off and then on again. No cam programs or
                    stored settings are deleted or changed.
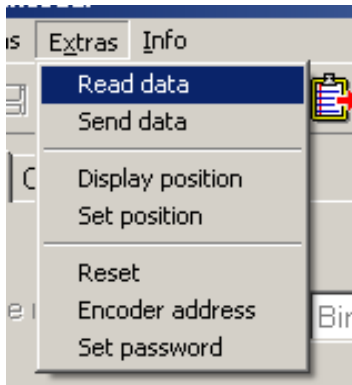Encoder address: The address set for the connected encoder can be requested or set.
Set password: A four-place password can be saved in the encoder. ProCam requests
                    the password during certain actions and compares it with the password
                    stored in the encoder. Among other things, this concerns the "locked
                    outputs" and prevents accidental changes. The default password on
                    delivery is "0000". Permissible characters are 0 - 9 and A - Z, as well as
                    blank spaces. It must especially be noted that a password can only be
                    deleted or changed when the password used up until that point is known.

4.1.4 Info

With Info the version of the ProCam and encoder software can be displayed.

4.1.5 Reprogramming

The display mask is reset to the basic setting. The same function can also be run with "File ⇒ New".

4.1.6 Open file

Programming stored in the PC can be loaded. The same function can also be run with "File ⇒ Open".

4.1.7 Save file

The current data are saved in the PC. The same function can also be run with "File ⇒ Save".

4.1.8 Print

The current encoder data are printed out. The printout can be used for archiving. The same function can also be run with "File ⇒ Print".

4.1.9 Request data from encoder

The data are requested from the connected encoder. The same function can also be run with "Extras ⇒ Read data".

4.1.10 Send data to encoder (save)

The current programming is saved in the encoder. The same function can also be run with "Extras ⇒ Send data".

4.1.11 Display position/activate cam program

The current position and the status of the special outputs are shown. The same function can also be run with "Extras ⇒ Display position".

4.2 "Resolution" programming mask

The resolution and other basic parameters of the encoder can be set with this programming mask. The picture below shows the maximum possible settings. However, only those parameters are shown which are supported by the selected encoder.
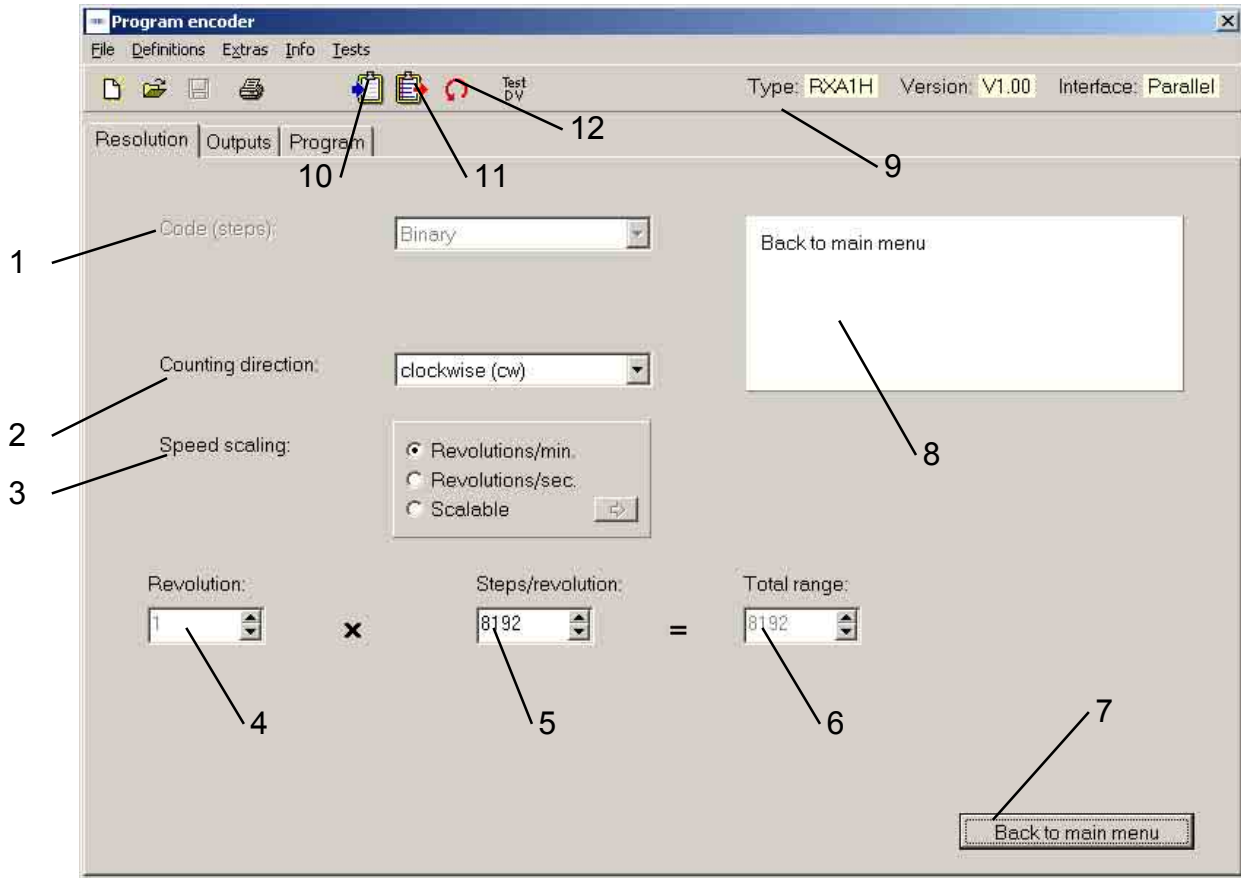
No.	Chapter	Field		No.	Chapter	Field
1	4.2.1	Code (steps)		7	4.2.7	Back to main menu
2	4.2.2	Counting direction		8	4.2.8	Dialog window
3	4.2.3	Speed scaling		9	4.2.9	Display of encoder type
4	4.2.4	Revolutions		10	4.2.10	Read encoder data
5	4.2.5	Steps/revolution		11	4.2.11	Send encoder data
6	4.2.6	Total range		12	4.5	Display position

4.2.1 Code (steps)

The code (steps) is permanently set to binary.

4.2.2 Counting direction

With the counting direction it is possible to choose between "increasing clockwise"and "decreasing clockwise". "Increasing clockwise" means that with clockwise rotation (looking from the front at the encoder shaft), the position values increase, and with "decreasing clockwise" these decrease accordingly.
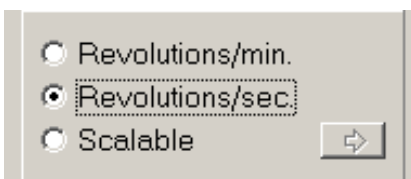
4.2.3 Speed scaling

You can select from three settable functions (Revolutions/min, Revolutions/s or Scaleable) for the display of the speed in the "Display position" window (Chapter 4.6).
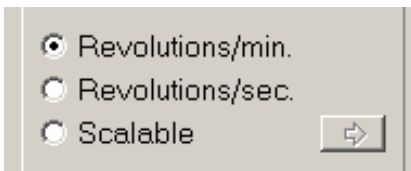
Revolutions/min.
The display is shown in revolutions per minute.

Revolutions/sec.
The display is shown in revolutions per second.
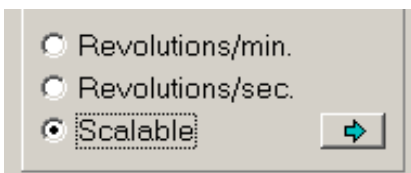
Scaleable
Enter the value in the range from 1 - 6,5000 here which is to be displayed at a speed of 6,000 revolutions/minute in the "Display position" window (see Chapter 4.6).

Example:
The cam encoder is attached to a downstream gear unit that reduces the motor speed in a ratio of 1:3. However, the motor speed (in rpm) is to be displayed. Enter the value 18,000 in the "Speed scaling" window. For an encoder shaft speed of 2,000 rpm, the display is now "6000".

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4.2.4 Revolutions

With singleturn encoders, the value for the rotations cannot be set. It is always set to 1.

4.2.5 Steps/revolutions

Number of steps with which a rotation of the encoder axis is to be resolved. The possible value range lies between 2 and 8192 steps/rotation.

4.2.6 Total resolution

The total resolution is the product of steps/rotation multiplied by the number of rotations.

Calculation formula for the total resolution:
1. Singleturn encoder
    1   X   Steps/revolutions = Total Resolution

2. Multiturn encoder
    Revolutions X Steps/revolutions = Total Resolution

e.g.   For 100 steps/rotation and a desired number of rotations of 10
        the total resolution is 1000.

Depending on the encoder type, either the number of rotations or the total resolution can be set. The other value is highlighted in gray, and can therefore not be changed. However, the value is calculated and displayed.

Information:
This revolution can also be used for movements which run through the zero point several times in the same direction (endless operation).

4.2.7 Back to main menu

The "Return to main menu" button exits the programming mask. If parameters have been changed, these can still be saved.

4.2.8 Dialog window

Information texts on the parameter currently selected are shown in the dialog window.
The information texts describe the respective parameter with brief explanations.

4.2.9 Display of encoder type

The encoder which was selected manually or automatically after the program start is permanently displayed in the programming mask. This makes it possible to monitor whether the selected and the existing encoder are identical.

4.2.10 Read encoder data

The connected encoder is read out. Before the tabs "Resolution", "Outputs" and "Program" are overwritten, they can be saved. If the connected encoder type does not match the one selected, the following error message appears:
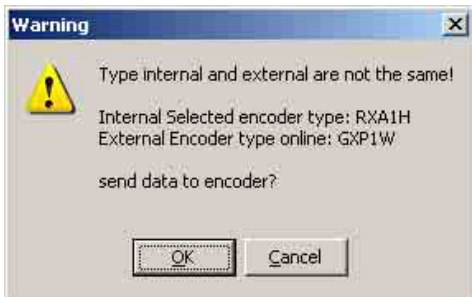
If the set encoder and connected encoder types are identical, the data are read in and displayed.

4.2.11 Send encoder data

The encoder connected to the interface is programmed with the set parameters. If the connected encoder type does not match the one selected, the following error message appears:
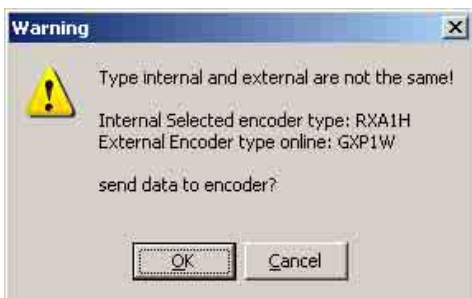
During transfer the data in the encoder are saved in a non-volatile manner. The transfer can take several seconds and is displayed as follows:

4.3 "Outputs" programming mask

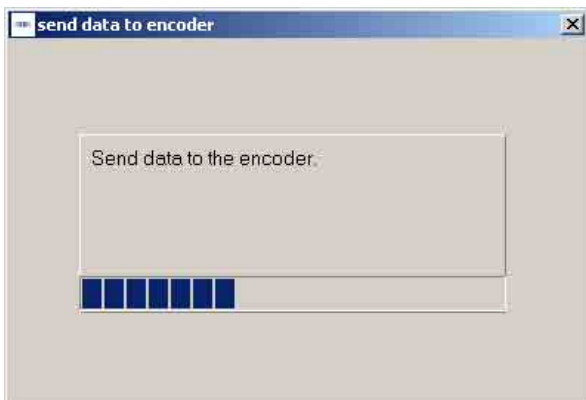Each of the 16 outputs can either switch cams or assume a special task as a special output.

This window controls the properties of each individual output. Each special function carried out (No. 2 - 5) can be assigned to exactly one output. On the other hand, the property "Inverted" (No. 6) can be assigned to any output, regardless of whether it is defined as a cam output or as a special output.
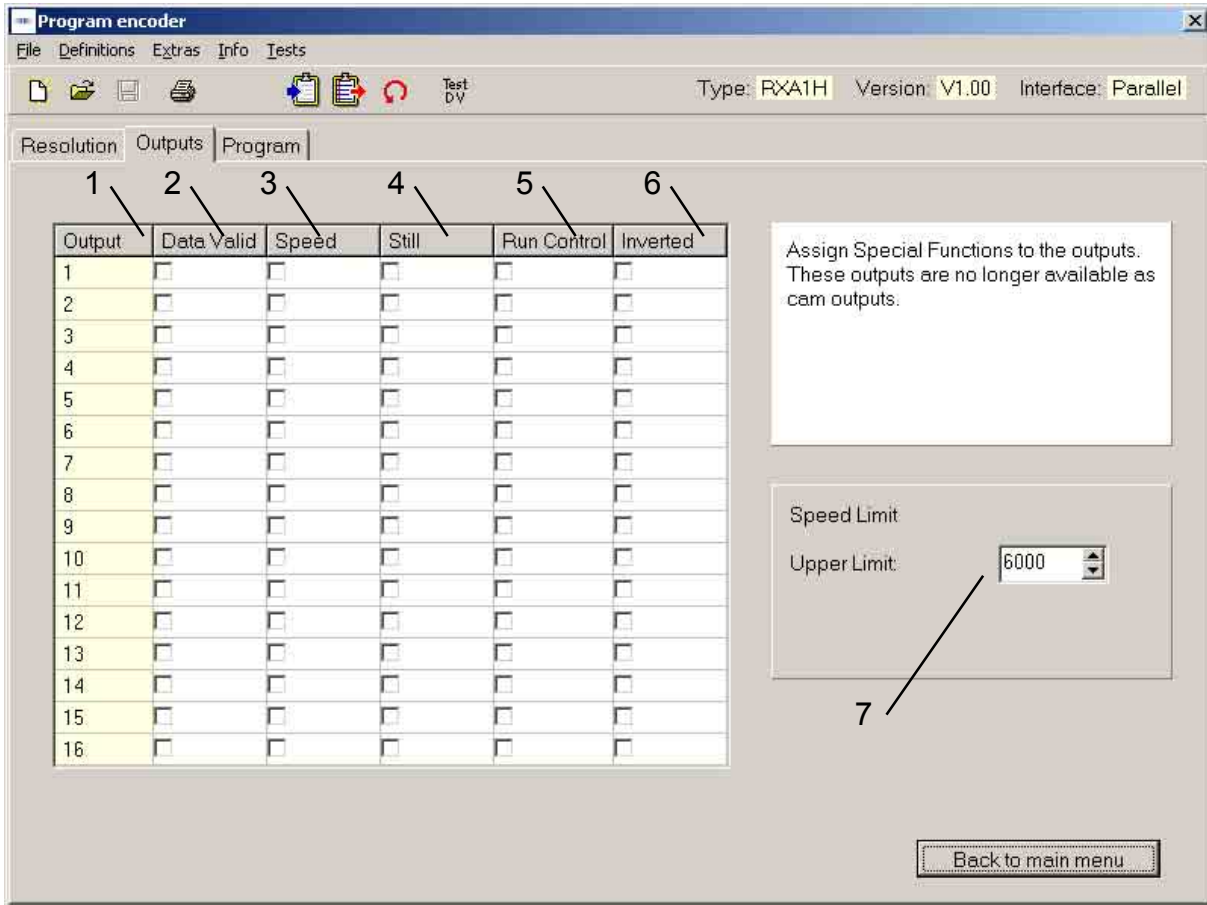
No.	Chapter	Field
1	4.3.1	Output
2	4.3.2	Data Valid
3	4.3.3	Speed
4	4.3.4	Still
5	4.3.5	Run Control
6	4.3.6	Inverted
7	4.3.7	Speed monitoring

4.3.1 Output

The outputs are marked No.1 to No.16. This numbering cannot be changed. However, each output can be assigned an additional plain text designation (see Section 4.6.10)

4.3.2 Data Valid

The output is assigned the special function "Data Valid". It becomes active when the continuous internal self-monitoring function of the encoder has detected a problem, e.g. an overloading of the output driver or an impermissible position value. The output remains active as long as the problem continues, however for at least 2 seconds.

4.3.3 Speed

The output is assigned the special function "Speed monitoring". It becomes active when the set upper speed limit is exceeded. See the explanation No. 7 for this window.

4.3.4 Still

The output is assigned the special function "Still display". It becomes active as soon as the encoder speed has dropped below approx. 1 rotation/minute.

Attention:
No safety-relevant functions may be linked to this function, as the shaft can also turn with the "Standstill display" signal active!

4.3.5 Run Control

The output is assigned the special function "Run Control". The output continuously outputs a slow rectangular signal (approx. 1 Hz) which enables external monitoring of the cam encoder.

4.3.6 Inverted

The output outputs its signal inverted. In the active state, it is at Low level, in the inactive state at High level.

4.3.7 Speed monitoring

Limit value for the output with the special function "Speed monitoring". An input in this window is always made in rpm, regardless of a different scaling of the displayed speed which may be selected. The permissible range for entry is product-specific and is specified in the corresponding product information.

4.4 "Program encoder" programming mask

The programmable cam-operated switchgroup permits the execution of switching processes. Here a total of 1,024 cam switching points distributed over a maximum of 16 cam programs can be set. Each of the 1,024 cams can be assigned to one of the 16 switching outputs.
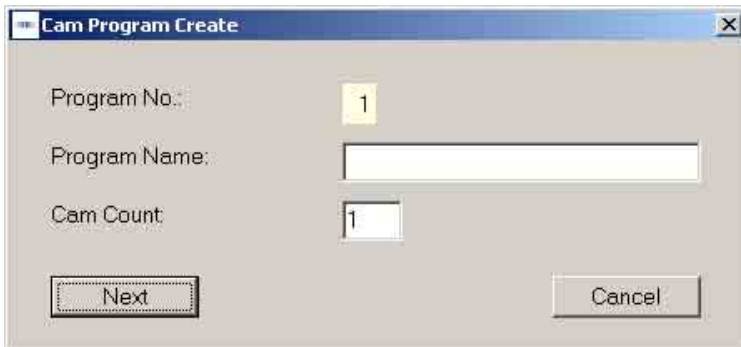
After the "Program encoder" tab is selected, the following window appears:
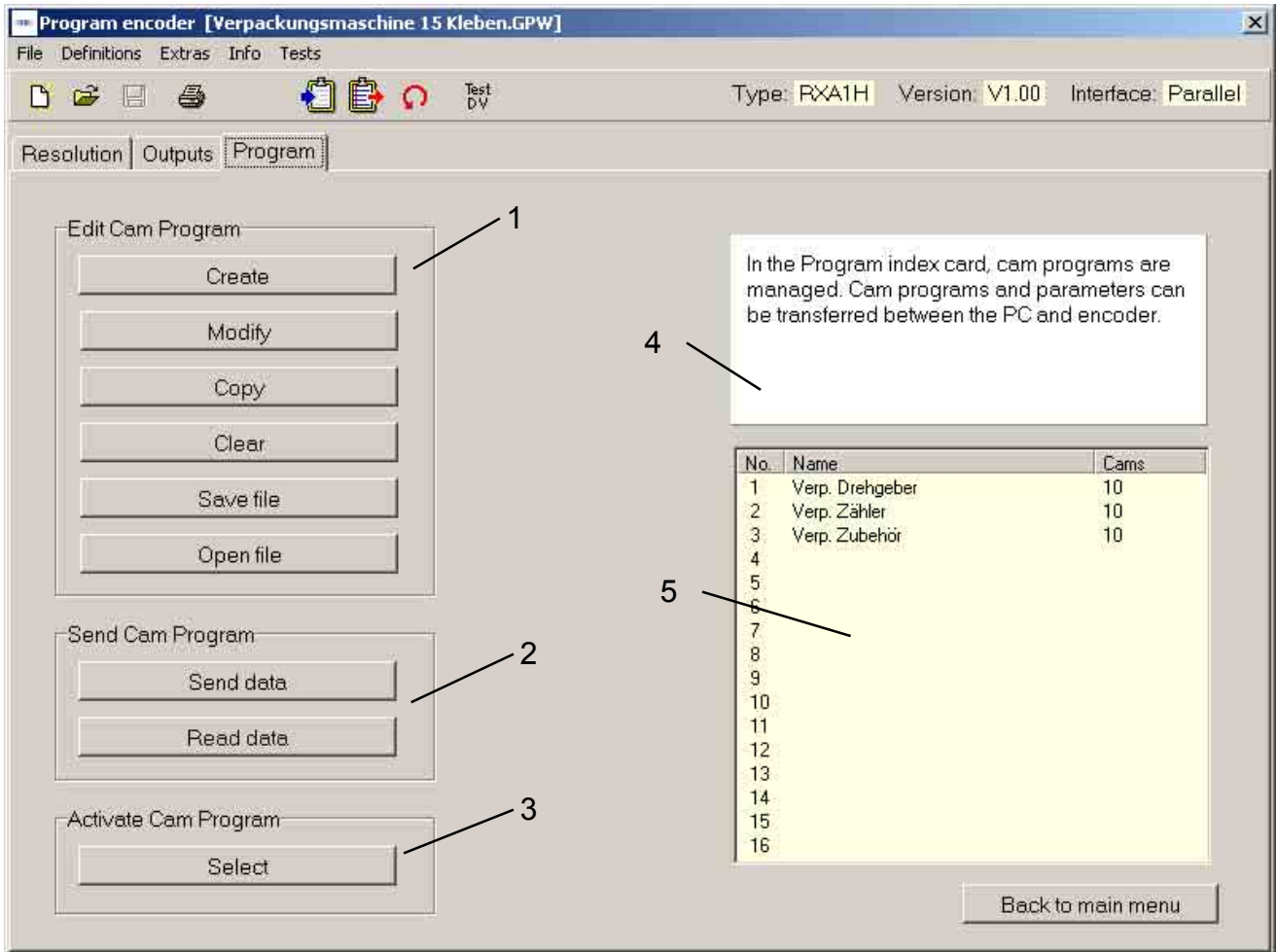
No.	Chapter	Field
1	4.4.1	Edit cam program
2	4.4.2	Send cam program
3	4.4.3	Activate cam program
4	4.4.4	Dialog window
5	4.4.5	Program status

4.4.1 Edit cam program

Create:

Clicking on the "Create" button starts the entry of a new cam program in ProCam. In the process, the next free program number is automatically assigned.
Then the program name and the number of cams can be entered.
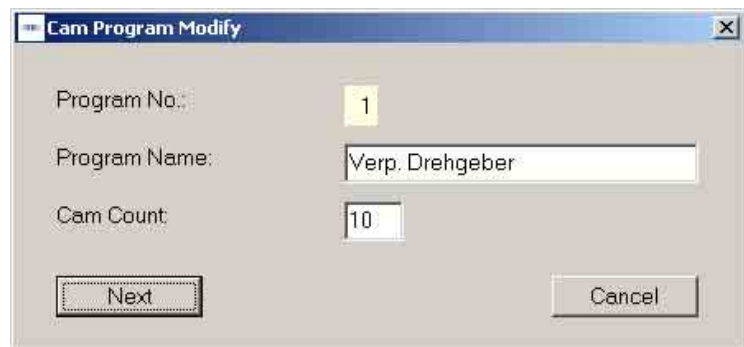
"Continue" opens the "Edit cam program" mask (see Chapter 4.5).

Change:

By clicking the "Change" button, the data of the selected cam program can be changed.
Clicking on "OK" opens the "Change cam program" window. Here the program name and the number of cams can be changed.

"Continue" opens the "Edit cam program" mask (see Chapter 4.5).

Copy:

Clicking on the "Copy" button copies the data of the selected cam program to a new cam program to be selected in ProCam.
The program automatically suggests the next free Program No., whereby a free Program No. and a new program name can also be assigned.
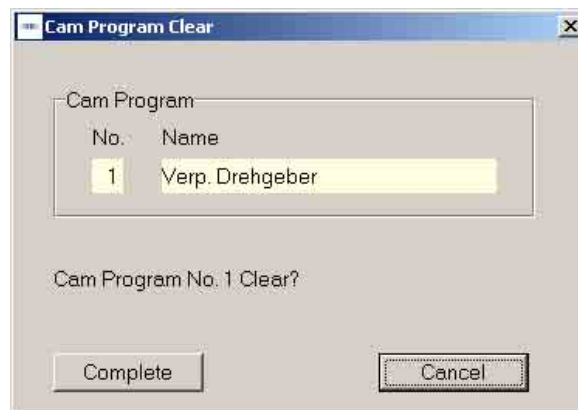Information: It is not possible to overwrite an existing cam program.

Delete:

By clicking on the "Delete" button, the data of the selected cam program can be deleted in ProCam.

Save file:

The current data are saved in the PC. The same function can also be run with "File $\Rightarrow$ Save".

Open file:

Programming stored in the PC can be loaded. The same function can also be run with "File $\Rightarrow$ Open".

4.4.2 Send cam program

Send data

The current programming is saved in the encoder. The same function can also be run with "Extras $\Rightarrow$ Send data".

Request data

The data are requested from the connected encoder. The same function can also be run with "Extras $\Rightarrow$ Data".

4.4.3 Activate cam program

See Chapter 4.6
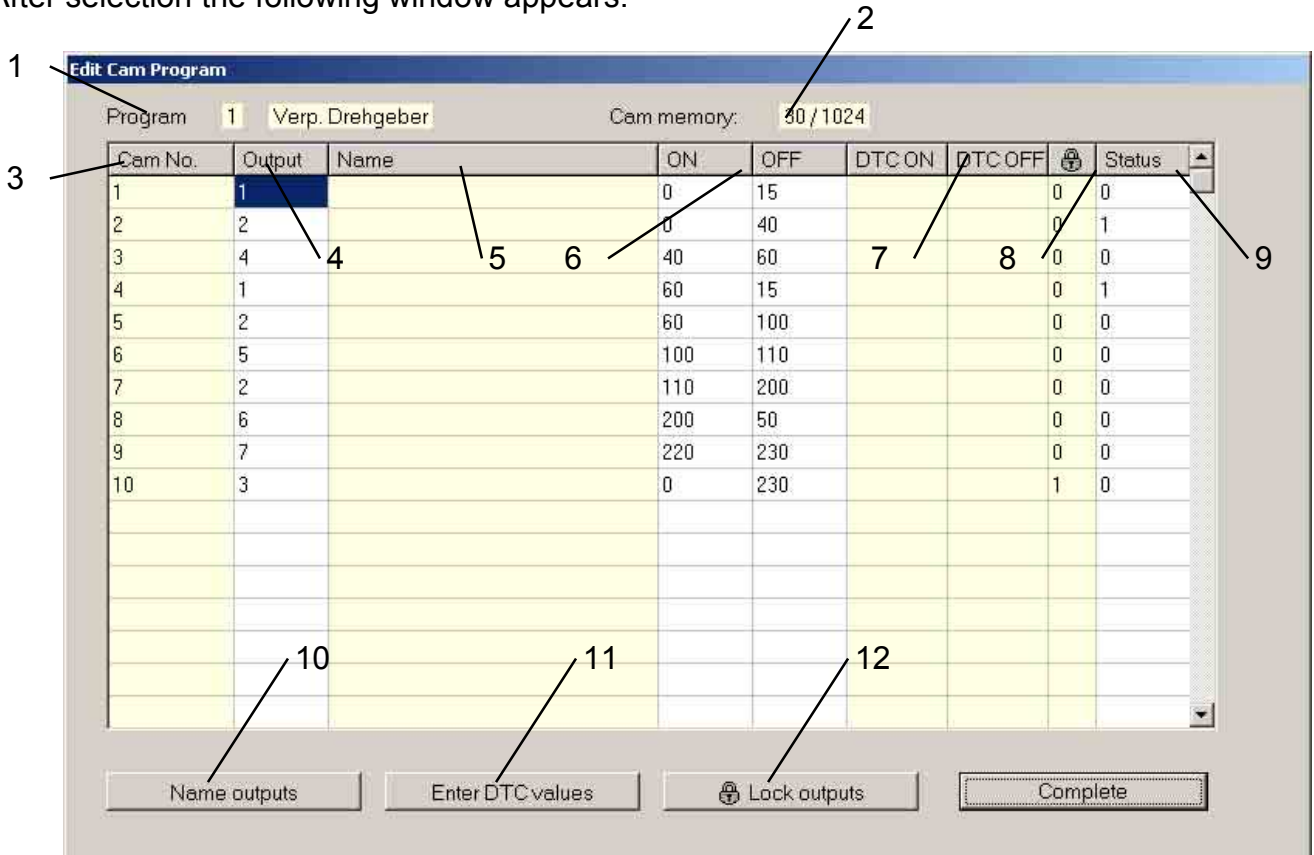
4.4.4 Dialog window

Information texts on the parameter currently selected are shown in the dialog window.
The information texts describe the respective parameter with brief explanations.

4.4.5 Program status

The current programs are displayed in this window.

4.5 "Cam" programming mask

After selection the following window appears:

No.	Chapter	Buttons	No.	Chapter	Buttons
1	4.5.1	Program	7	4.5.7	DTC ON/DTC OFF
2	4.5.2	Cam memory	8	4.5.8	Lock
3	4.5.3	Cam No.	9	4.5.9	Status
4	4.5.4	Output	10	4.5.10	Name outputs
5	4.5.5	Name	11	4.5.11	Enter DTC values
6	4.5.6	ON/OFF	12	4.5.12	Lock outputs

Context messages appear on the mouse pointer which refer to the respective permissible value range in the table column.
The fields with a colored background cannot be changed directly here. These fields are automatically displayed depending on the programming of the outputs.

4.5.1 Program

The program number and, if set, the related program name is displayed via the cam table in the "Program" information line.

4.5.2 Cam memory

The "Cam memory" display shows how many of the total number of available cams have already been used for switching processes (in the picture 30 of 1,024).

4.5.3 Cam No.

The cam number is permanently specified in each case and cannot be changed.

4.5.4 Output

Enter the number of the output this cam is to act on here. The value range is 1 - 16. If you enter a "0", the cam remains inactive.

4.5.5 Name

The field shows the plain text name of the output, provided one has been entered (see Section 4.5.10)

4.5.6 ON/OFF

The information in the fields "ON" and "OFF" determine the switching points of the cam.
The values are the position of the encoder in the previously selected resolution (also see the "Resolution" tab).

If a time cam is to be programmed, the "OFF" field is the switching time of the time cam in ms (1-65000 milliseconds).

4.5.7 DTC ON/DTC OFF

The fields "DTC ON" and "DTC OFF" show the programmed dead-time compensation for the output this cam acts on. To program the dead time itself, see 4.5.11.

4.5.8 Lock

The "Locked" field indicates the locking status of the output on which this cam acts. To set or delete the locking function itself, see 4.5.12.

4.5.9 Status

Input parameters for status:
- 0 = Default cam bidir   (bidirectional, acting in both rotating directions)
- 1 = Time cam bidir   (bidirectional, acting in both rotating directions)
- 2 = Default cam pos   (only acting in the positive rotating direction)
- 3 = Default cam neg   (only acting in the negative rotating direction)
- 4 = Time cam pos   (only acting in the positive rotating direction)
- 5 = Time cam neg   (only acting in the negative rotating direction)

4.5.10 Name outputs

It is possible here to enter a name consisting of up to 16 characters for each output. The names are constantly visible in the cam tables during programming and simplify the entry of the switching points in this way.

As the names of the outputs are saved in the encoder together with the cams, they are not only available on the PC, but also on any connected display and operating device.
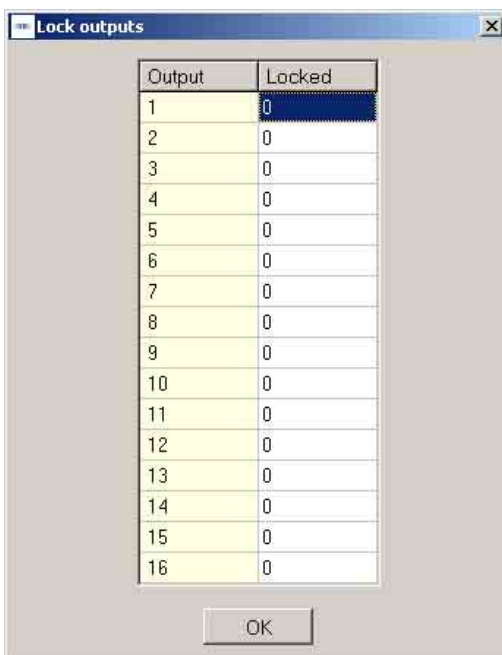
4.5.11 Enter DTC values

Output	DTC ON	DTC OFF
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Compensation times can be entered here to compensate delay times with connected devices and processes. Regardless of the current speed, the outputs are switched earlier by the entered time.

The time unit in this window is milliseconds, and up to 1,000 ms are possible.

The entry is made separately for each output, i.e. always "path-by-path". In addition, different values can be specified for the switch-on and switch-off time.

4.5.12 Lock outputs

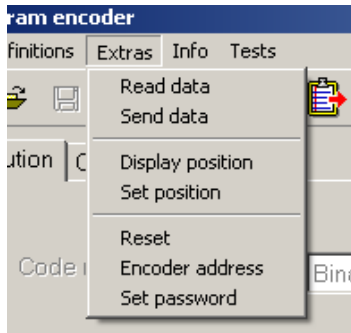| Output	Locked
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0

Each output can be locked individually, i.e. protected against accidental changes.
If cams are entered which act on a locked output, the password is requested. The password is also required to release locked outputs for changes again later.

The password set at the factory is "0000" (also see Chapter 4.1.3).

Permissible parameters for the entry are "0" (free) or "1" (locked). During the entry of the cam tables, the locking status is always visible as a lock symbol.

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## 4.6 "Display position" and "Activate cam program" mask

The display module can display the position and the special outputs of the connected encoder.
This can be selected under "Extras ⇒ Display position".

After the display module starts, the following mask appears.
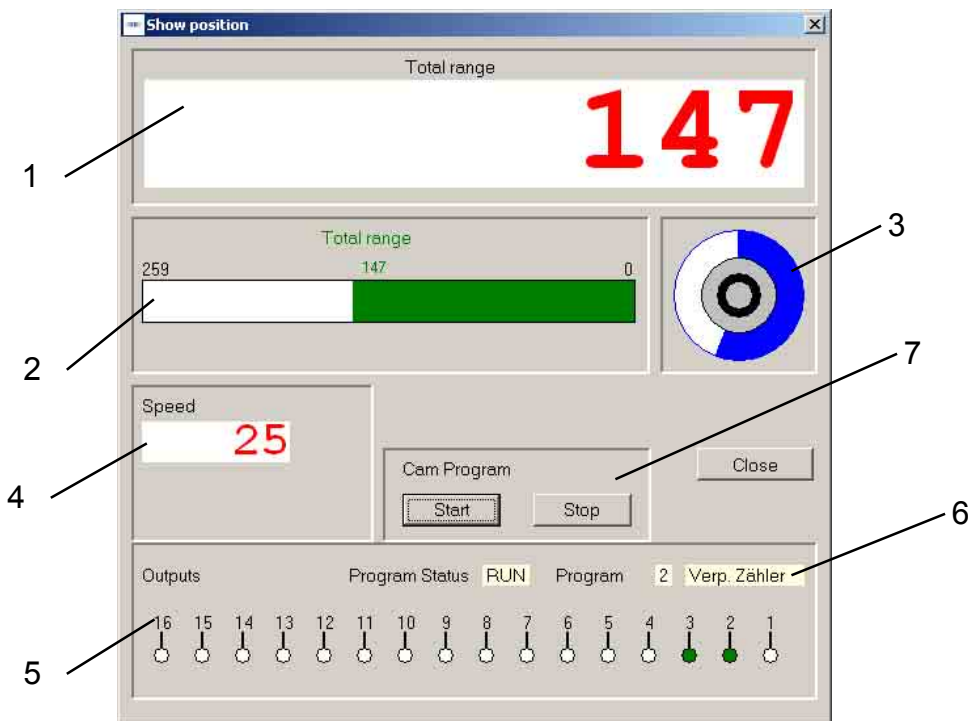
No.	Field
1	Total range
2	Total resolution bar display
3	Display of mechanical shaft position
4	Display of speed (scaled)
5	Display of switching state of outputs
6	Display of active program
7	Start or stop cam program

Start cam program
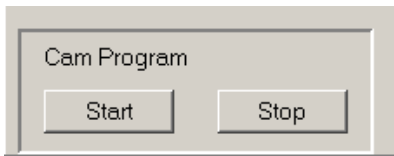
Clicking on the "Start" button starts the selected program. All outputs programmed as cam outputs assume the state corresponding to the cam position.

Time cams are treated as "Time expired" during the program start. Direction cams are set during the program start with the encoder stopped as if the encoder had last run in the positive direction. Positive is the rotating direction in which the position values increase. (See Chapter 4.2.2 "Counting direction" for setting).
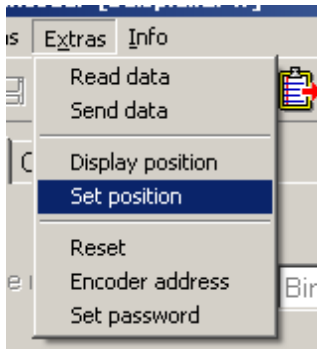

Information window during start

Stop cam program

Clicking on the "Stop" button stops the running program. All cam outputs assume the inactive state. The inactive state is de-energized for non-inverted outputs, and +UB for inverted outputs.

The outputs programmed with a special function (e.g. run control, speed monitoring) are always active.

4.7 "Set position" mask

With this function the cam encoder is assigned a position value ("Preset value").

In the simplest case, the encoder could be set to "0000" in this way to calibrate the mechanical zero position of the shaft with the display "0000". However, any other position value within the set encoder resolution can also be transferred here.
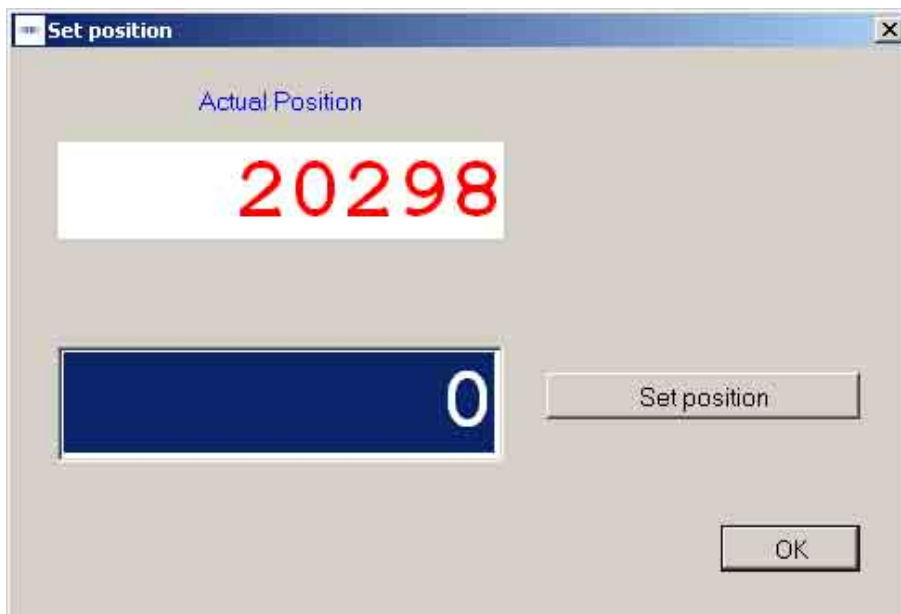
To check this, the current position shown continually updated at the top of the window. After the preset value is transferred with the "Assign position" button, this appears as the current position at the top of the window.

Example: The encoder resolution has been set to 360 steps/revolution.
The permissible value range for the "Set position" function is 0 - 359 in this case.

Please observe the following note on dependence of the counting direction in the "Set position" function.
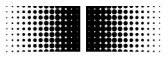
Before assigning a position value, the encoder rotating direction (positive in clockwise direction or opposite) must be specified and programmed in the encoder. This information is transmitted to the encoder together with cam tables and other data as part of the "Send data" function. The "Send data" function should therefore be carried out once with the final rotating direction before the encoder is assigned a position value.

The assignment of a position value may lead to a considerable position jump.

This position jump is not reported via the "Data Valid" special output, as it has been purposely caused. Any running cam program also stops immediately for safety reasons when a position value is assigned.

5 Connecting Encoder

5.1 Connection between PC and encoder

To realize the simplest possible connection to the PC, the encoder is equipped with an RS232 interface. With this the encoder can be connected directly to the PC. If the transfer distance is greater than 30 m, it is advisable to use the RS485 interface. In this case an interface converter with an automatic directional switchover function is required on the PC (not included in the delivery scope).

5.1.1 Encoder programming connection

To program the encoder via a PC, the wires TxD, RxD and GND must be connected as follows.
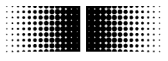
Connection assignment

Encoder Function	5-Pin Encoder Plug	Wire Color	PC Connection 9-Pin Sub-D
-	Pin 1	brown	
RxD	Pin 2	white	Pin 3
GND	Pin 3	blue	Pin 5
$\overline{P}$/R Mode	Pin 4	black	Pin 5
TxD	Pin 5	gray	Pin 2
			Br. 4-6
			Br. 7-8

The encoder must also be connected to the power supply (UB and GND) via the device plug. The wire colors refer to the Baumer IVO cable, which is available as an accessory.

Accessories: Z 139.009   Programming cable
ProCam programming software
Manual on CD

6 Index