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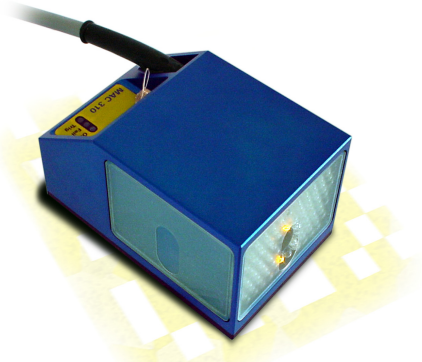

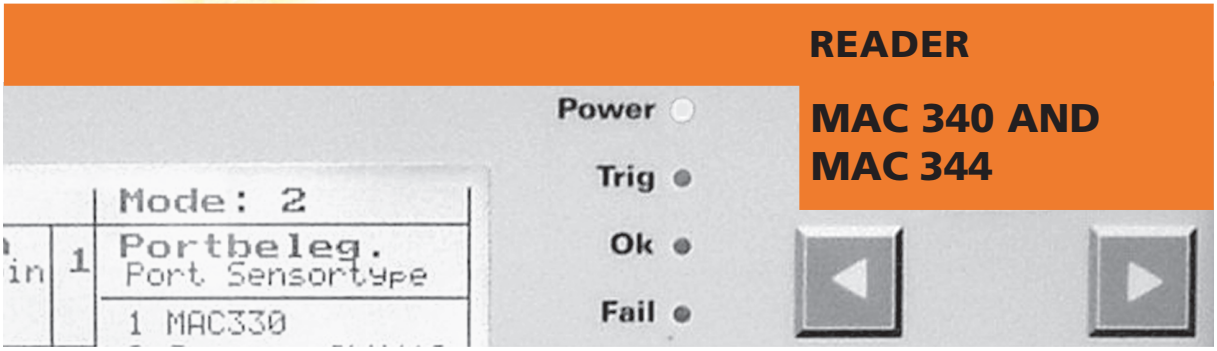

READER

MAC 340 AND MAC 344

TECHNICAL MANUAL

PEPPERL+FUCHS
omnitron

Designation of this documentation:

Technical manual for the Reader MAC 340 and MAC 344

Version of the described product:

2.0

Editorial version of this documentation:

02/05

GENERAL INFORMATION

This documentation has been created with great care.

Nevertheless, progress in technology can cause changes of the product leading to deviations between this documentation and the actual product.

The content of this documentation, the technical data and the specifications of the product may be changed without prior notice.

This technical manual serves to assist the user and does not replace adequate education which is offered by the Omnitron AG and qualified partners.

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FOREWORD

The Data Matrix Code Reader MAC 340 is the reader device offered by Omnitron AG for stationary employment to identify products or to acquire data from a product flow by means of the 2D "data matrix" code. A uniform, international standard exists for this code. Its structure and print quality have been precisely defined. The Reader MAC 340 was developed on the basis of these specifications..

The MAC 340 has been designed for stationary employment. The device reads either stationary or moving code. This allows data to be acquired for either continuous or discontinuous processes. Typical areas of application include labels as data carriers in

– Electronics production,
– Pharmaceutical packaging,
– Automobile component manufacturing.

The MAC 340 reads the code regardless of its orientation (omnidirectional). Aligning circular bodies – bottles, vials, cans, etc. – on whose tops or lids a label is applied is no longer necessary. The code number is always read, provided that it lies within the image field. A special pattern for detection (finder pattern), allows the reader to explicitly determine the location and orientation.

In use, the behavior of the Reader MAC 340 is similar to that of a barcode scanner. All components relevant to its function are integrated in a compact housing. An optical adjustment aid simplifies adjustment during installation or setup.

An external trigger initiates the reading function when the product appears in the reader's image field. Various parameters can be adjusted to the user's specific requirements via a serial interface. This can be done with the aid of a PC or an intelligent terminal – e.g., an Omnitron Terminal TE 2000 – or other, comparable devices.

The MAC 340 offers a means of product verification or data acquisition. An internal comparison function checks the agreement between a programmed reference code and a code from production.

This ensures the 100 percent correct identification of products during a manufacturing process (e.g., pharmaceutical manufacturing). However, data can also be read out of the code and then transmitted via the interface. An example of this would be the monitoring sequential serial numbers during the production process.

We thank you for your decision to purchase the Reader MAC 340, and guarantee that the device will completely meet your personal needs and requirements. Should you have any questions or suggestions, our employees and service partners are at your service.

Omnitron AG

REMARKS CONCERNING THE MAC 344

This documentation represents the technical manual for the MAC 340.

Since the MAC 340 and MAC 344 differ only with regard to their sensors and lighting, all other data – with the exception of the mechanics – are identical.

The electrical connection corresponds to that for the MAC 340. The control commands are the same. The Omnicontrol control software is fully functional.

Where differences exist, these are indicated in the individual sections by correspondingly identified additions.

TABLE OF CONTENTS

1 PRODUCT SPECIFIACTIONS

1.1 Overview

Mechanical specifications	
Dimensions:	**65 x 84 x 132 (mm) without cable**
Housing:	**Anodized aluminum**
Weight:	**740 g**
Protection class:	**IP 65**
Temperature range:	**0 to 45°**

Supplement to the MAC 344 sensor	
Dimensions:	**65 x 40 x 66 (mm) without cable**
Weight:	**500 g**
Protection class:	**IP 54**

Supplement to the MAC 344 evaluation box	
Dimensions:	**152 x 81 x 56,5 (mm) without cable**
Housing:	**Die-casted, coated aluminum**
Weight:	**500 g**
Protection class:	**IP 54**

Optical specifications (standard resolution)

Reading distance:	**90 mm**
Depth of field:	**+/- 7 mm**
Field of view:	**20 mm x 15 mm**
Resolution:	**0,2 mm**
Light source:	**LED flash (660 nm)**

Supplement to the MAC 344 sensor

Reading distance:	**32 mm**
Depth of field:	**+/- 3 mm**
Light source:	**LED flash, white**

Optical specifications (high resolution)

Reading distance:	**90 mm**
Depth of field:	**+/- 3 mm (adjustment with monitor)**
Field of view:	**10 mm x 7,5 mm**
Resolution:	**< 0,2 mm**
Light source:	**LED flash (660 nm)**

Specifications concerning evaluation

Evaluation speed:	**25 Hz**
Max. passage speed:	**6 m/s**
Max. data capacity:	**348 numeric**
	259 alphanumeric

(the same specifications apply to the MAC 344 evaluation box)

Electrical specifications

Power supply:	**24 V DC / 250 mA**
Interface:	**RS 232**

(the same specifications apply to the MAC 344 evaluation box)

Specifications concerning the data matrix code (standard resolution)

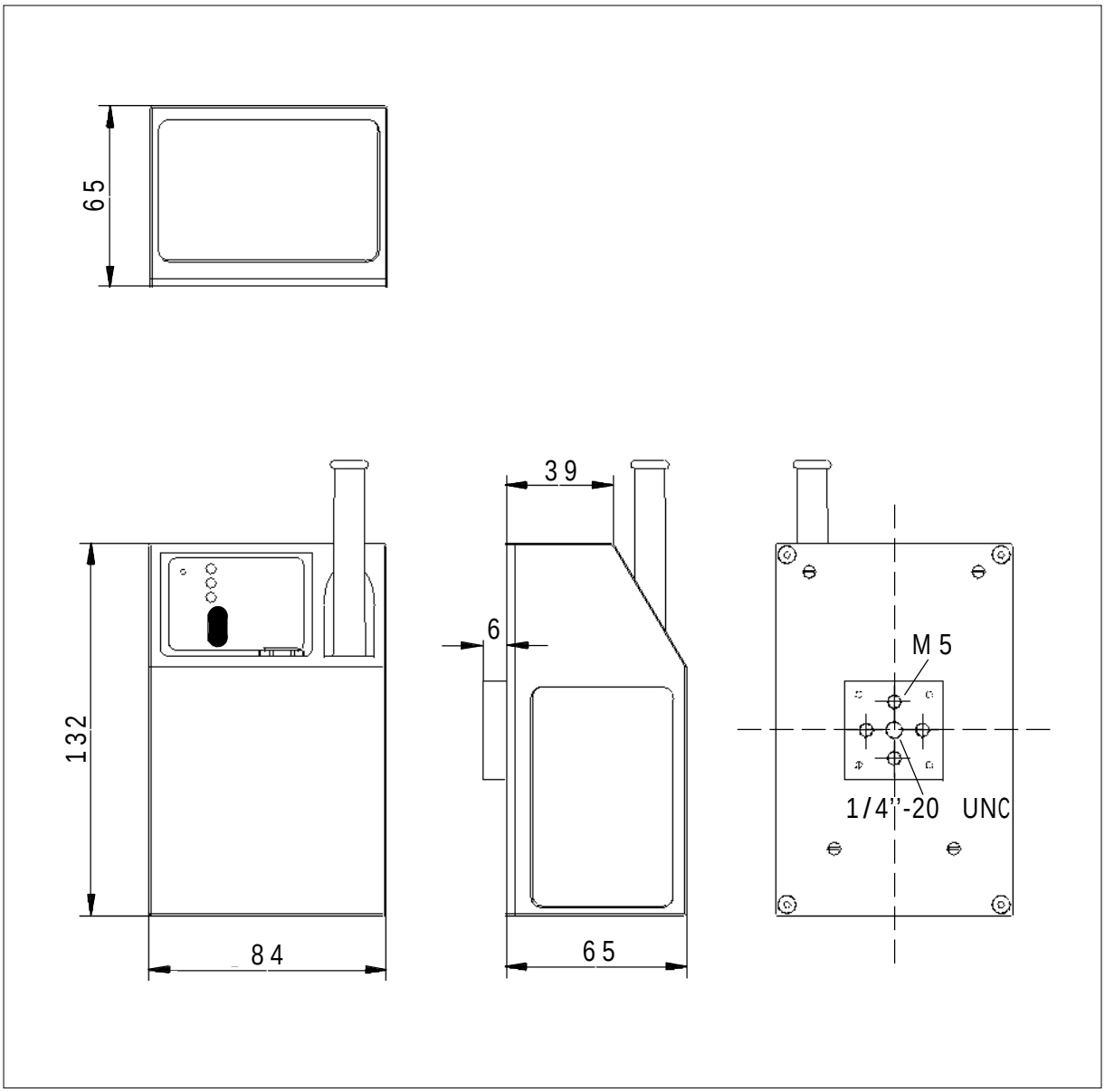
Symbol size:	**10 x 10 bis 48 x 48 modules quadratic**
Min. module size:	**0,17 mm**
Min. code size:	**3 mm x 3 mm**
Max. code size:	**12 mm x 12 mm**
Code orientation:	**Orientation-independent, 360°**
Character set:	**ASCII (default) in accordance with ISO 646**
Error correction:	**Fixed, ECC 200 (Reed-Solomon)**

(the same specifications apply to the MAC 344 evaluation box)

Specifications concerning the data matrix code (high resolution)

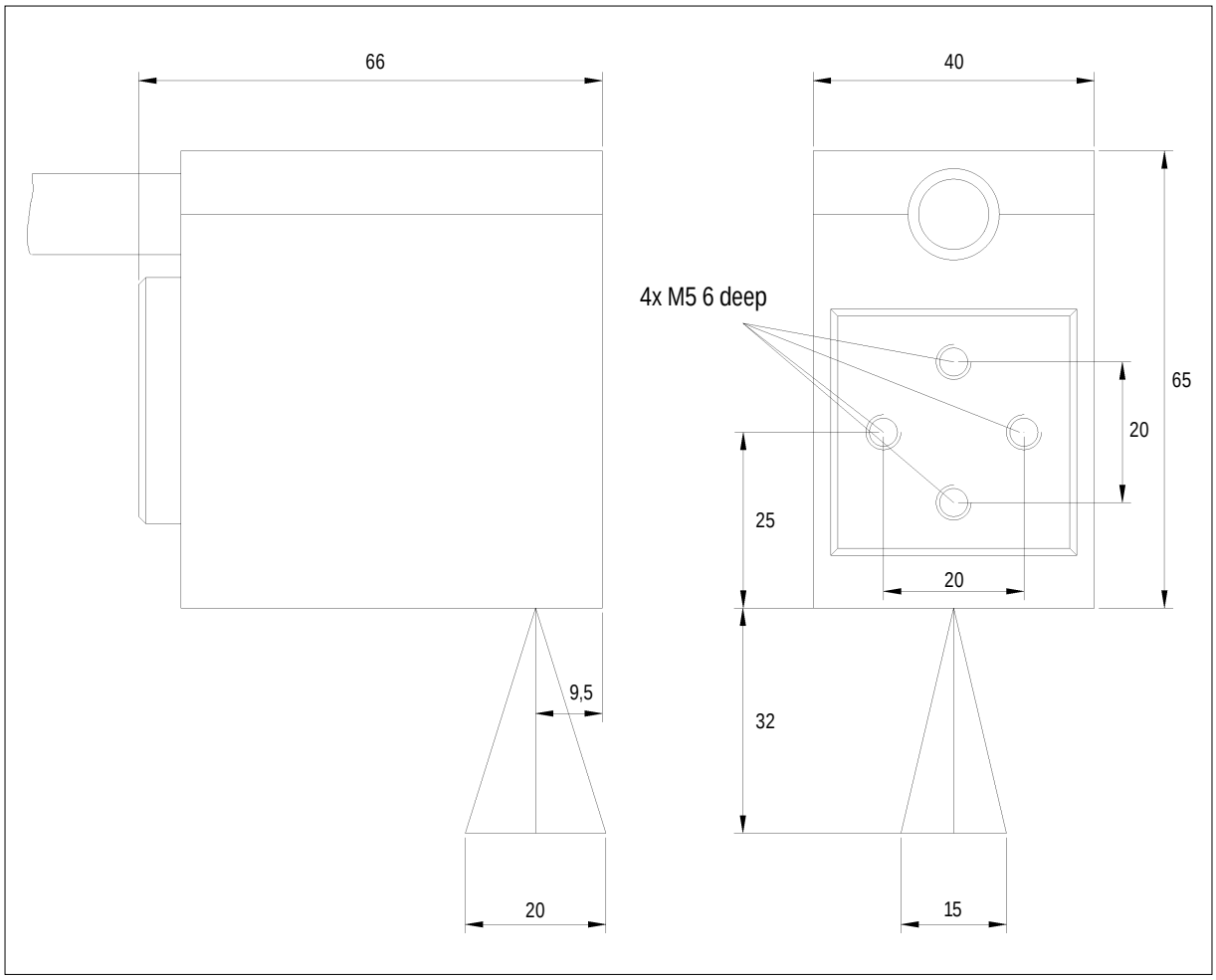
Symbol size:	**10 x 10 bis 48 x 48 modules quadratic**
Min. module size:	**0,09 mm**
Min. code size:	**2 mm x 2 mm**
Max. code size:	**5 mm x 5 mm**
Code orientation:	**Orientation-independent, 360°**
Character set:	**ASCII (default) in accordance with ISO 646**
Error correction:	**Fixed, ECC 200 (Reed-Solomon)**

1.2 Dimensions

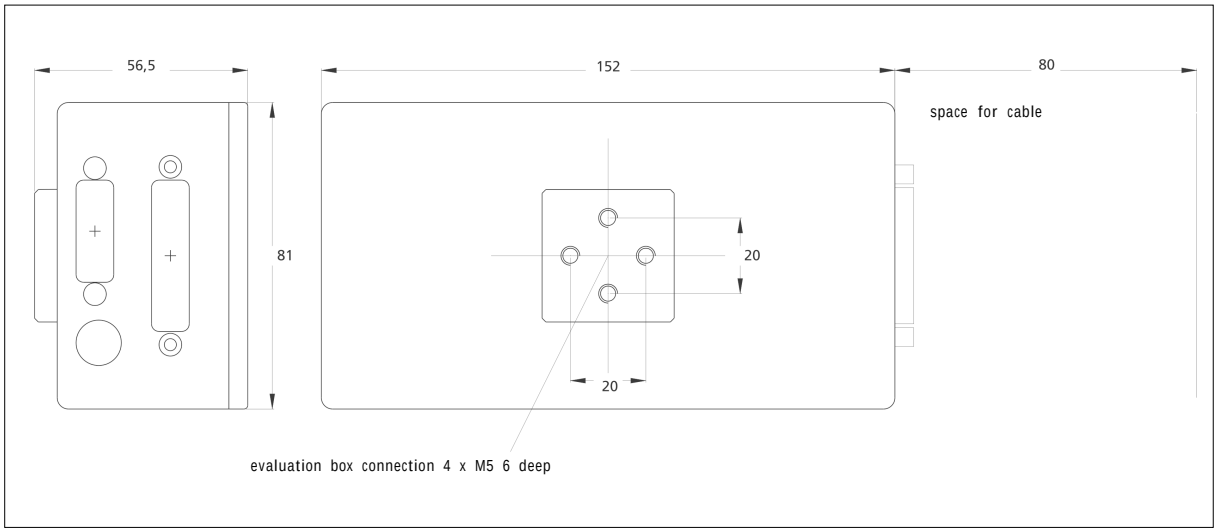


Dimensions of the Reader MAC 340

1.2.1 Dimensions MAC 344

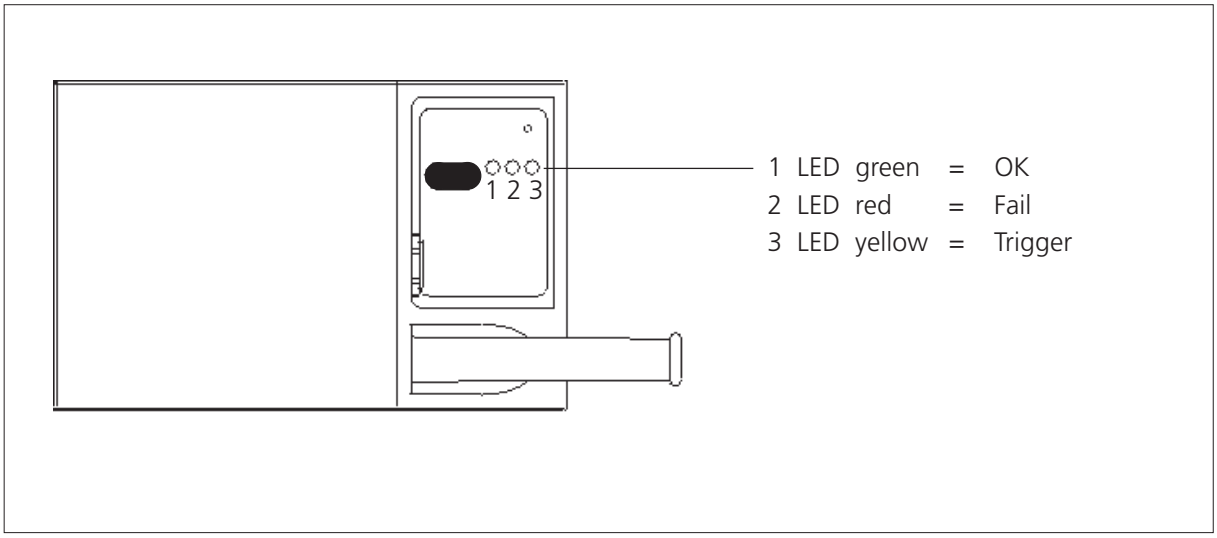


Dimensions of the MAC 344 sensor



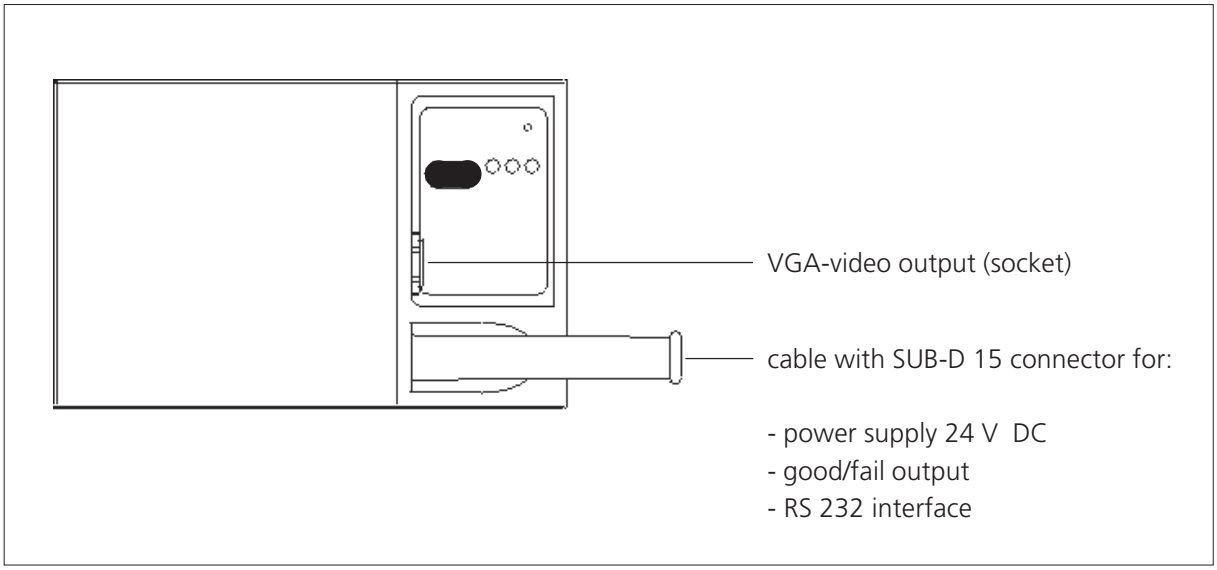
Dimensions of the MAC 344 evaluation box

1.3 Display Elements



LED indicators on the back of the Reader MAC 340

1.4 Connections



Connections on the back of the Reader MAC 340

1.4.1 VGA Video Output Pinout

The following table describes the VGA video output pinout of the MAC 340:

Pin Nr.	Signal Name
1	Vsync
2	GND
3	Red
4	Green
5	GND
6	Blue
7	Hsync

1.4.2 SUB-D 15 Connector Pinout

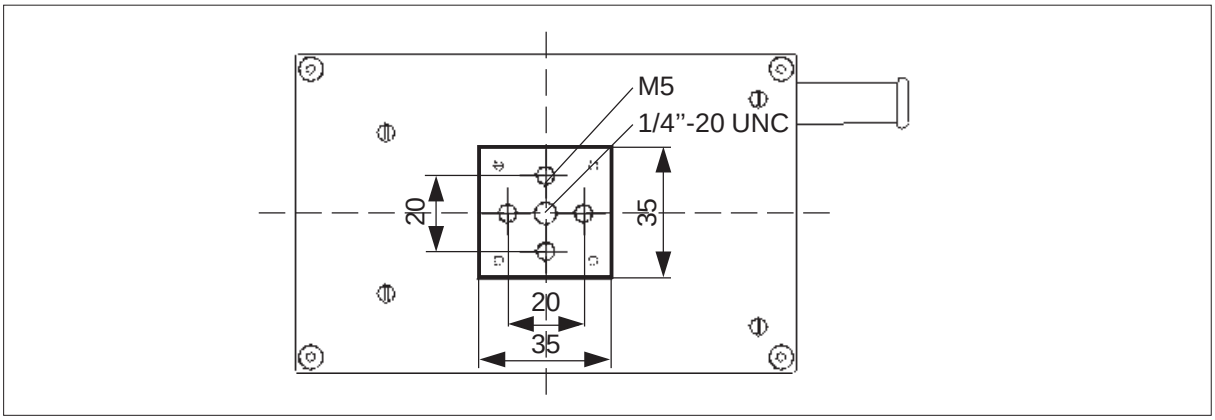
The following table describes the SUB-D 15 connector pinout of the MAC 340:

Pin Nr.	Signal Name	SUB-D 9 for RS 232
1	GND	5
2	GND	
3	GND	
4	+24 Volt	
5	+24 Volt	
6	+24 Volt	
7	RTS (RS 232)	8
8	reserved	
9	Good output	
10	Fail output	
11	Trigger input (activ high)	
12	CTS (RS 232)	7
13	RXD (RS 232)	2
14	TXD (RS 232)	3
15	reserved	

2 INSTALLATION

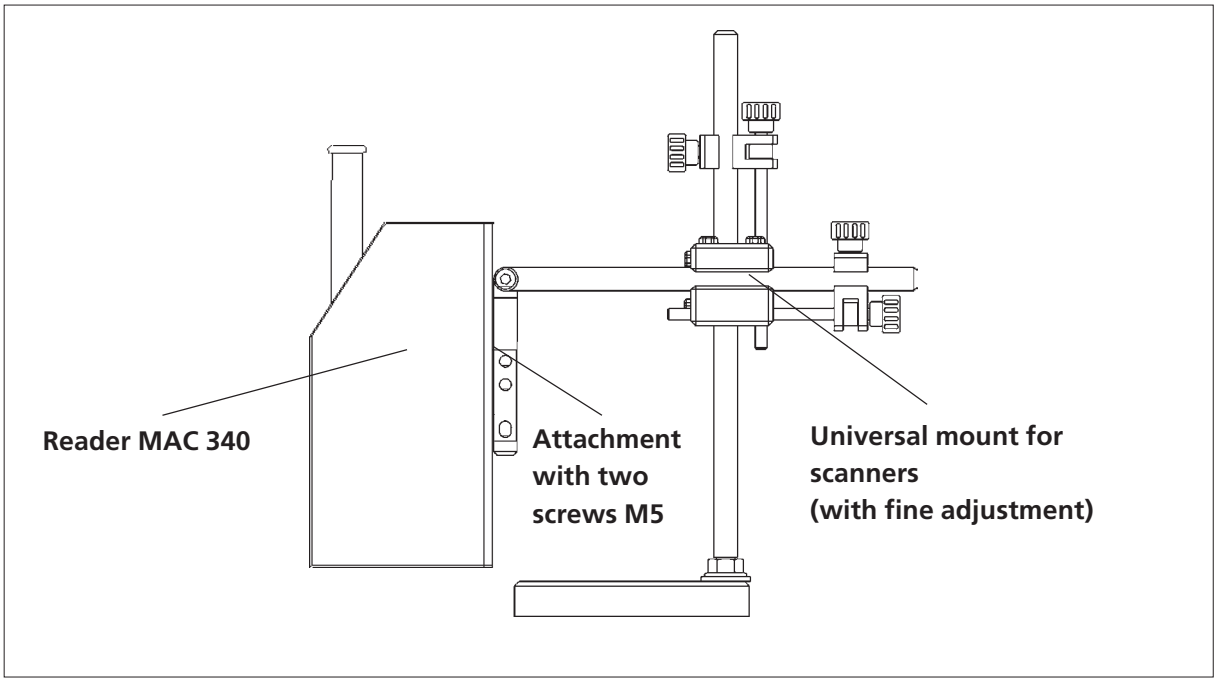
2.1 Mechanical Fastening

For the mechanical fastening of the Reader MAC 340 a mounting flange with threads is provided underneath the housing.



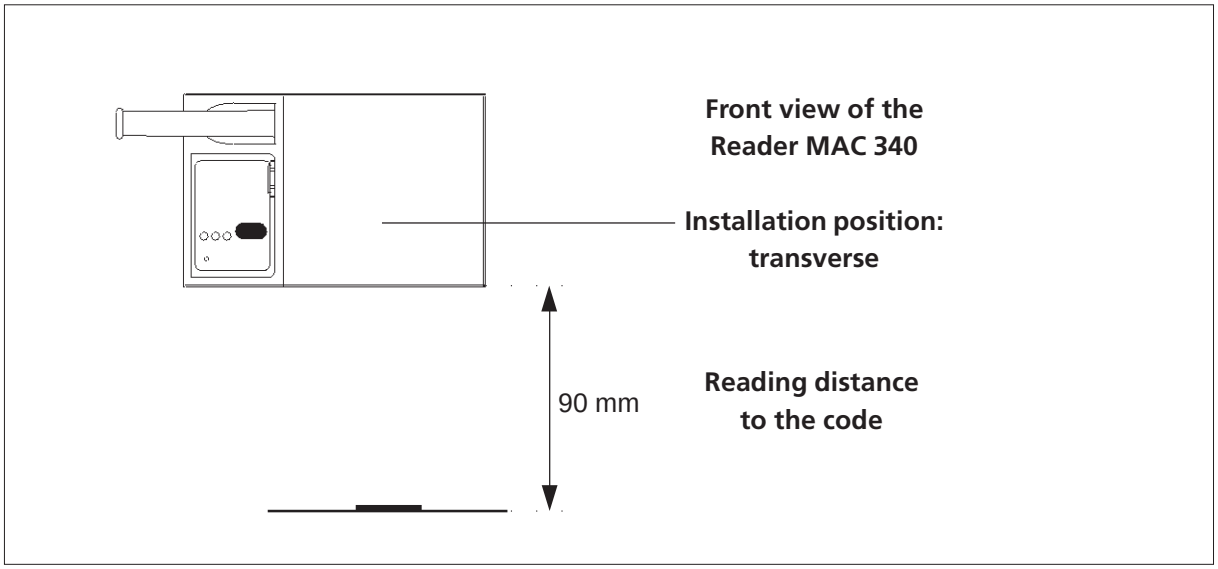
Mounting of the Reader MAC 340

In order to ensure precise adjustment of the device, the attachment to mechanical mounts must be made in such a way that the MAC 340 can be moved towards or away from the code. The universal mount for scanners shown in the picture below is stable, easy to service and available as an accessory.



Attachment of the Reader MAC 340 to the universal mount

With restricted space circumstances the MAC 340 can be reconstructed so that the image scanning occurs through the side window of the MAC 340 housing. The necessary steps for the re-construction are decribed in the attachment. The reading distance remains unchanged.



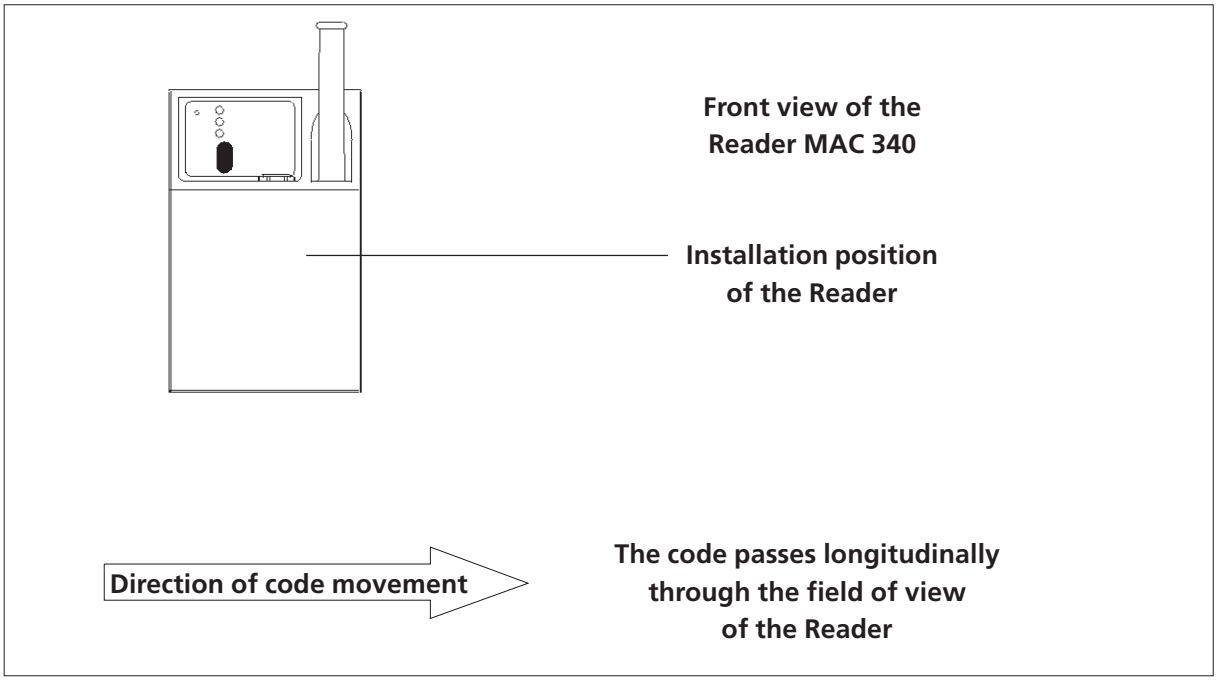
Installation position: transverse

2.2 Installation Position

2.2.1 Preferred Installation Position for the MAC 340

In principle the Reader MAC 340 reads codes omnidirectional.

However, due to the rectangular design of the field of view, the installation position illustrated below is recommended in order to ensure the best possible acquisition of the code by the MAC 340:



Preferred Installation Position for the MAC 340

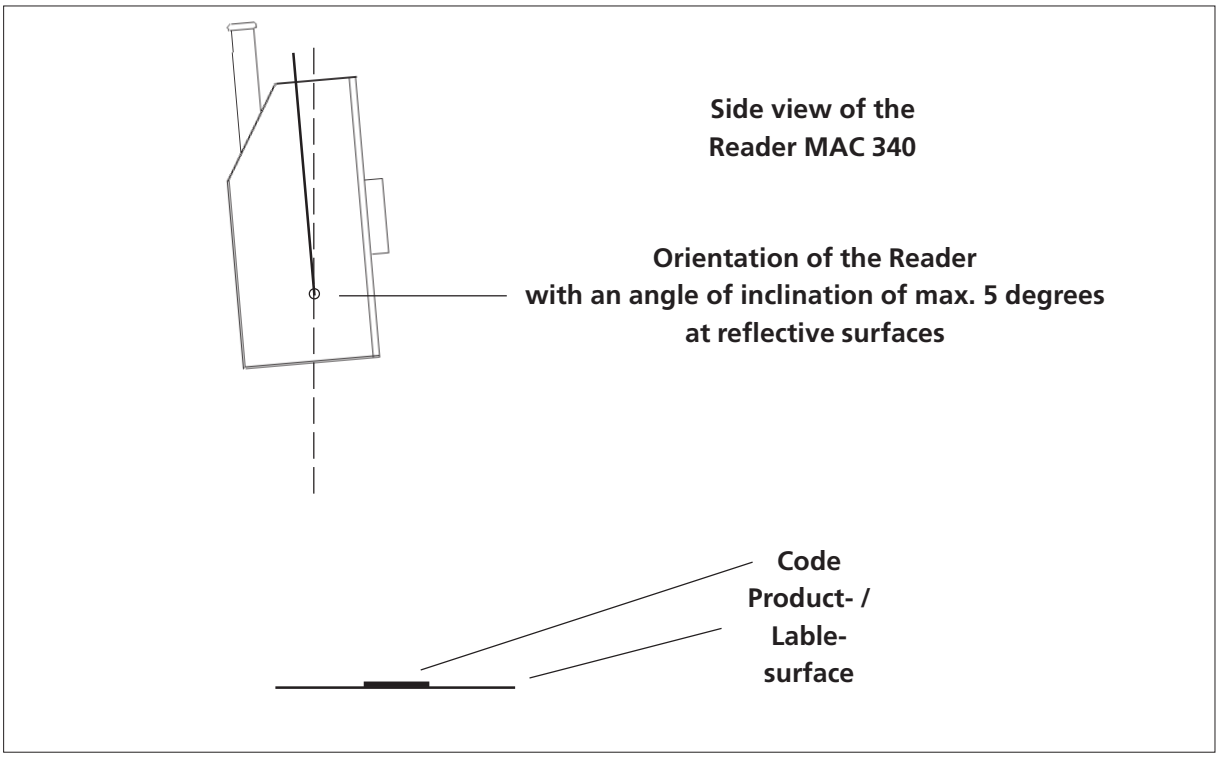
2.2.2 Orientation of the MAC 340 to the Code

The Reader MAC 340 has to be aligned according to the figure shown below.

At readings with high movement speed or at codes on reflective surfaces, in principle, adjusting has to be carried out with help of a monitor.

When required the MAC 340 has to be so far inclined that no direct reflections of the illumination are visible on the screen at reflective surfaces. The required angle of inclination is max. 5° at this across the longitudinal axis of the Reader.

In every case it must be checked with a monitor, whether reflections appear on the screen.

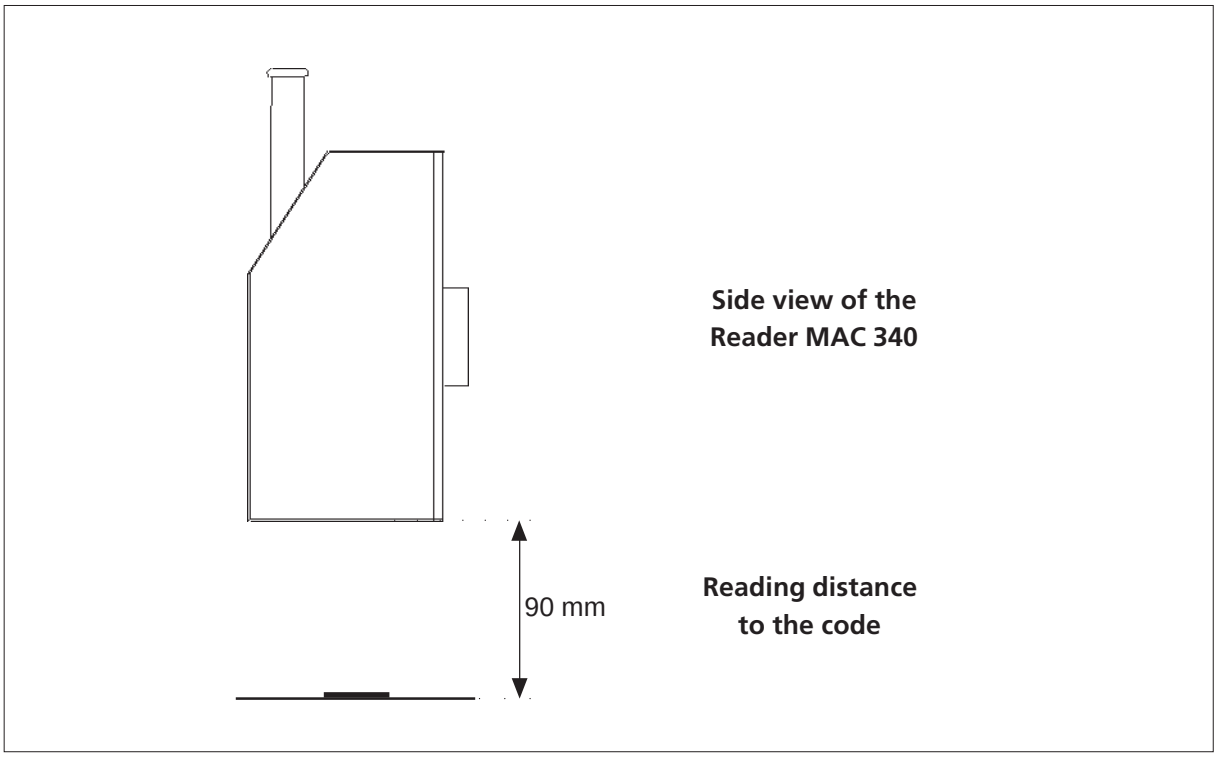


Orientation of the MAC 340 to the code

2.2.3 Reading Distance / Adjustment of the Image Definition

The Reader MAC 340 is delivered as a standard or high-resolution sensor.

The reading distance is 90 millimeters at the two models.



Reading distance to the code

At use of the MAC 340 with standard resolution under uncritical reading conditions [1)] the adjustment of the image definition can be made by the sharp position of the light rings. These are projected by the illumination of the Mac 340 on the product or label surface. Refer to section 2.2.3.1 for information regarding the adjustment procedure.

At use of the MAC 340 with high resolution or under critical reading conditions, in principle, the adjustment of the image definition must be carried out via the screen of an attached monitor. Please, read the section 2.2.3.2 to this.

The minimal readable code size is also dependent on the resolution.

	Standard Resolution	High Resolution
Reading distance	**90 mm**	**90 mm**
Depth of field	**+/- 7 mm**	**+/- 3 mm**
Adjustment of the image definition	**Light rings, monitor**	**Monitor**
Minimal code size	**3 x 3 mm**	**2 x 2 mm**

[1)] no fast moving codes, no reflecting surfaces

2.2.3.1 Adjustment of the Image Definition with Light Rings

At use of the MAC 340 with standard resolution under uncritical reading conditions [1)] the adjustment of the image definition can be made by the sharp position of the light rings. These are projected by the illumination of the Mac 340 on the product or label surface.

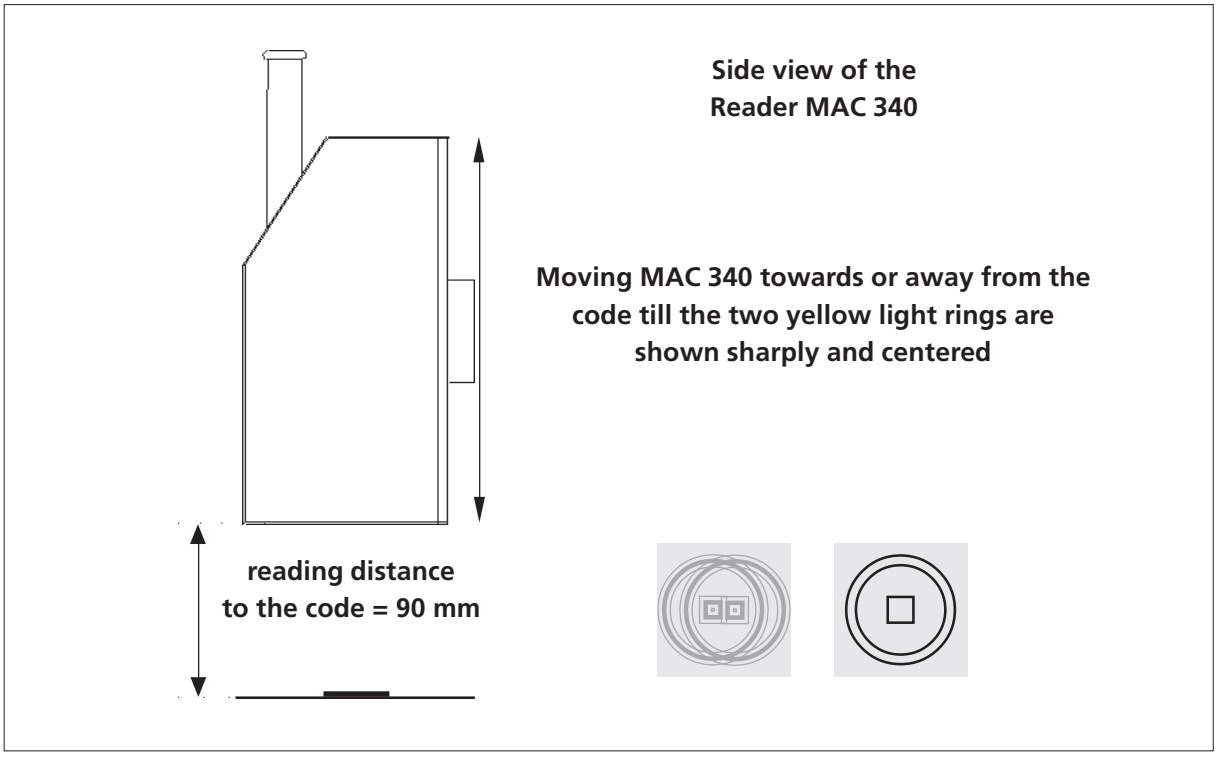
Please, proceed as follows:

1. Installation and alignment of the MAC 340 according to the previously described procedure.

2. Attaching the MAC 340 electrically.

3. Adjusting the reading distance of 90 mm.

4. Moving the MAC 340 towards or away from the code till the two yellow light rings provided by the illumination are shown sharply and centered.



Adjustment of the image definition with light rings

[1)] no fast moving codes, no reflecting surfaces

2.2.3.2 Adjustment of the Image Definition with a Monitor

At use of the MAC 340 with high resolution or at critical reading conditions [1], in principle, the adjustment of the image definition must be carried out via the screen of an attached monitor.

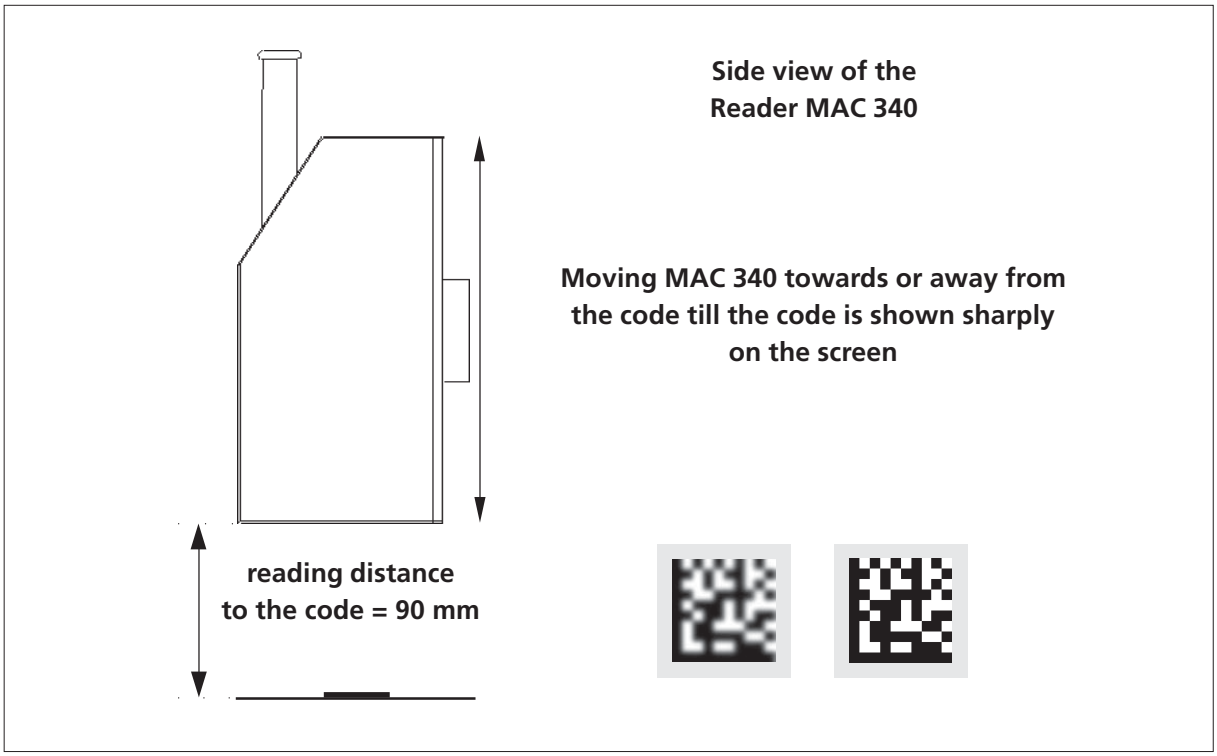
Please, proceed as follows:

1. Installation and alignment of the MAC 340 according to the previously described procedure. Reflections from the illumination on the screen must be stopped by inclining the Reader (see section 2.2.2)

2. Attaching the MAC 340 electrically. The connection to the VGA input of the monitor is carried out via the enclosed VGA connection cable.

3. Adjusting the reading distance of 90 mm.

4. Moving the MAC 340 towards or away from the code till the code is shown sharply on the screen.



Adjustment of the image definition with a monitor

[1] fast moving codes, reflecting surfaces

2.3 Remarks Concerning the Installation of the MAC 344

Regarding connection assignment and software the Mac 344 is identically with the Mac 340. At the installation there are however considerable differences:

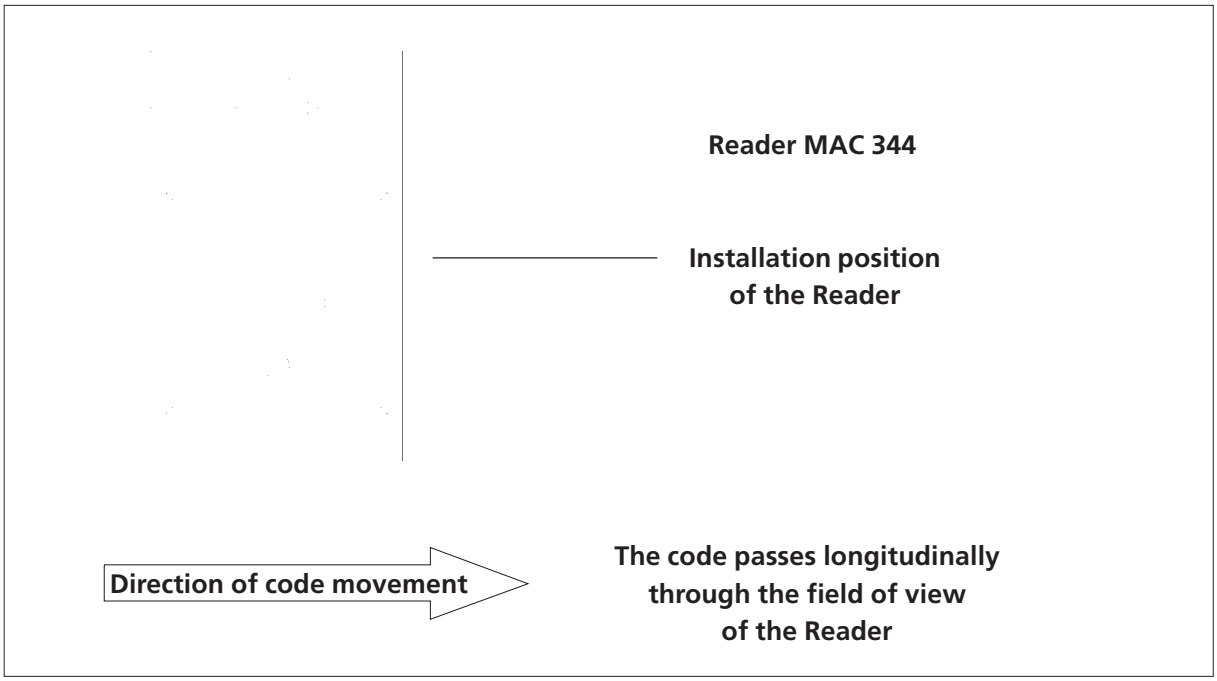
Reader and evaluation box are separated and get connected by the SUB-D 25 plug. If the MAC 344 is installed with the cable to below, a face-down image is the result. The image size is 20 mm in horizontal direction and 15 mm in vertical direction. Of course the installation is possible orientation-independent in all positions. The movement of the code should be carried out in direction of the larger field of view, though (because of possible trigger offset).

2.4 Installation Position

2.4.1 Preferred Installation Position for the MAC 344

In principle the Reader MAC 344 reads codes omnidirectional.

However, due to the rectangular design of the field of view, the installation position illustrated below is recommended in order to ensure the best possible acquisition of the code by the MAC 344:



Preferred Installation Position for the MAC 340

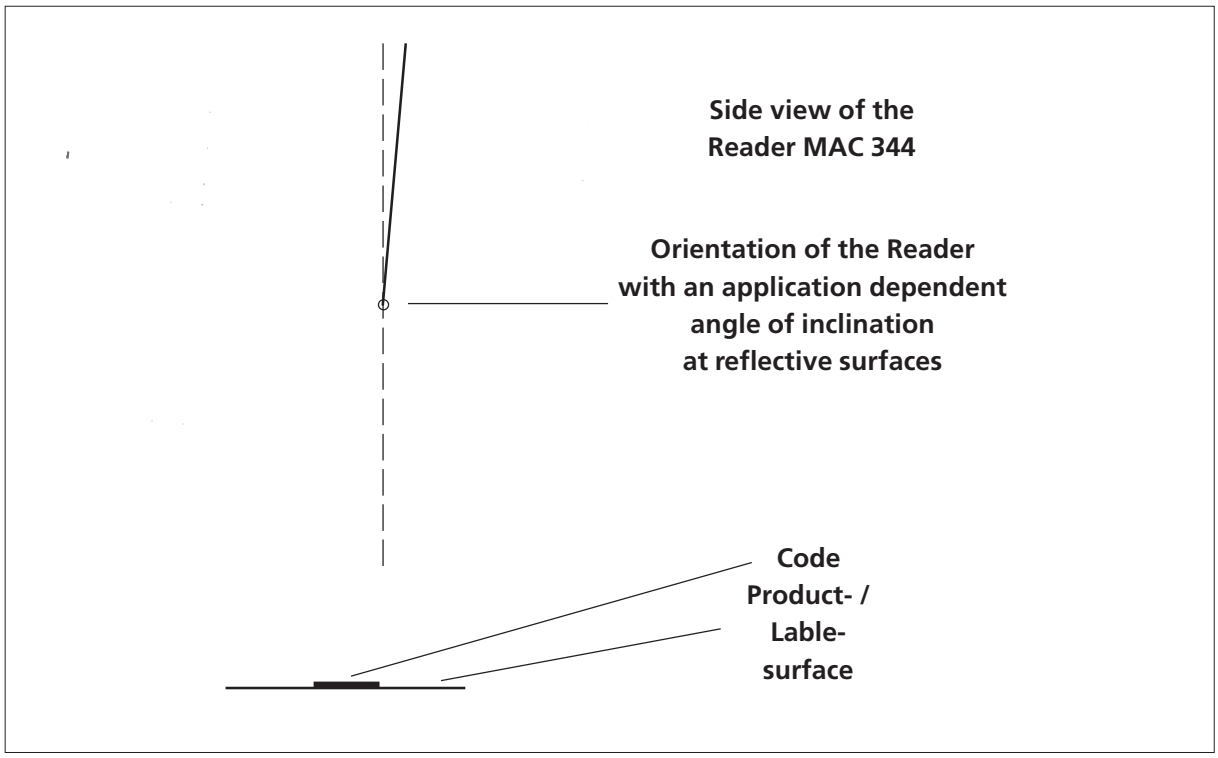
2.4.2 Orientation of the MAC 344 to the Code

The Reader MAC 344 has to be aligned according to the figure shown below.

At readings with high movement speed or at codes on reflective surfaces, in principle, adjusting has to be carried out with help of a monitor.

When required the MAC 340 has to be so far inclined that no direct reflections of the illumination are visible on the screen at reflective surfaces. The perhaps required angle of inclination is application dependent at this.

In every case it must be checked with a monitor, whether reflections appear on the screen.



Orientation of the MAC 344 to the code

2.4.3 Adjustment of the Image Definition with a Monitor

At critical reading conditions [1)], in principle, the adjustment of the image definition must be carried out via the screen of an attached monitor.

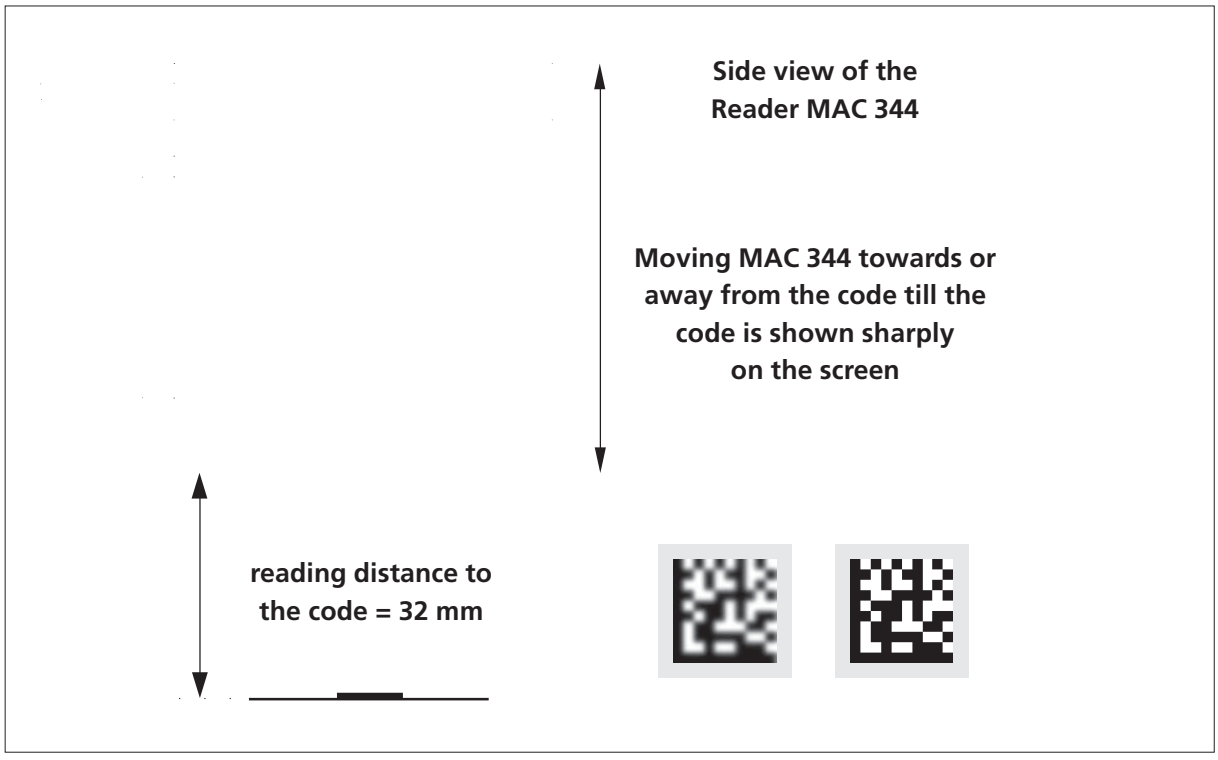
Please, proceed as follows:

1. Installation and alignment of the MAC 344 according to the previously described procedure. Reflections from the illumination on the screen must be stopped by inclining the Reader (see section 2.4.2)

2. Attaching the MAC 344 electrically. The connection to the VGA input of the monitor is carried out via the enclosed VGA connection cable.

3. Adjusting the reading distance of 32 mm.

4. Moving the MAC 344 towards or away from the code till the code is shown sharply on the screen.



Adjustment of the image definition with a monitor

[1)] fast moving codes, reflecting surfaces

3 COMMAND INTERFACE OF THE MAC 340

3.1 System Requirements

The MAC 340 can be connected with a PC compatible computer via the RS 232 interface. For setting the parameters the Hyperterminal of the PC can be used. (The Hyperterminal is contained in the accessories package of Windows.)

3.2 Connection MAC 340 - PC

The Mac 340 has the signals

– RD = Receive Data
– TD = Transmit Data
– GND = Signal Ground

The communication is controlled by the XON/XOFF soft handshake protocol.

3.3 Interface Settings

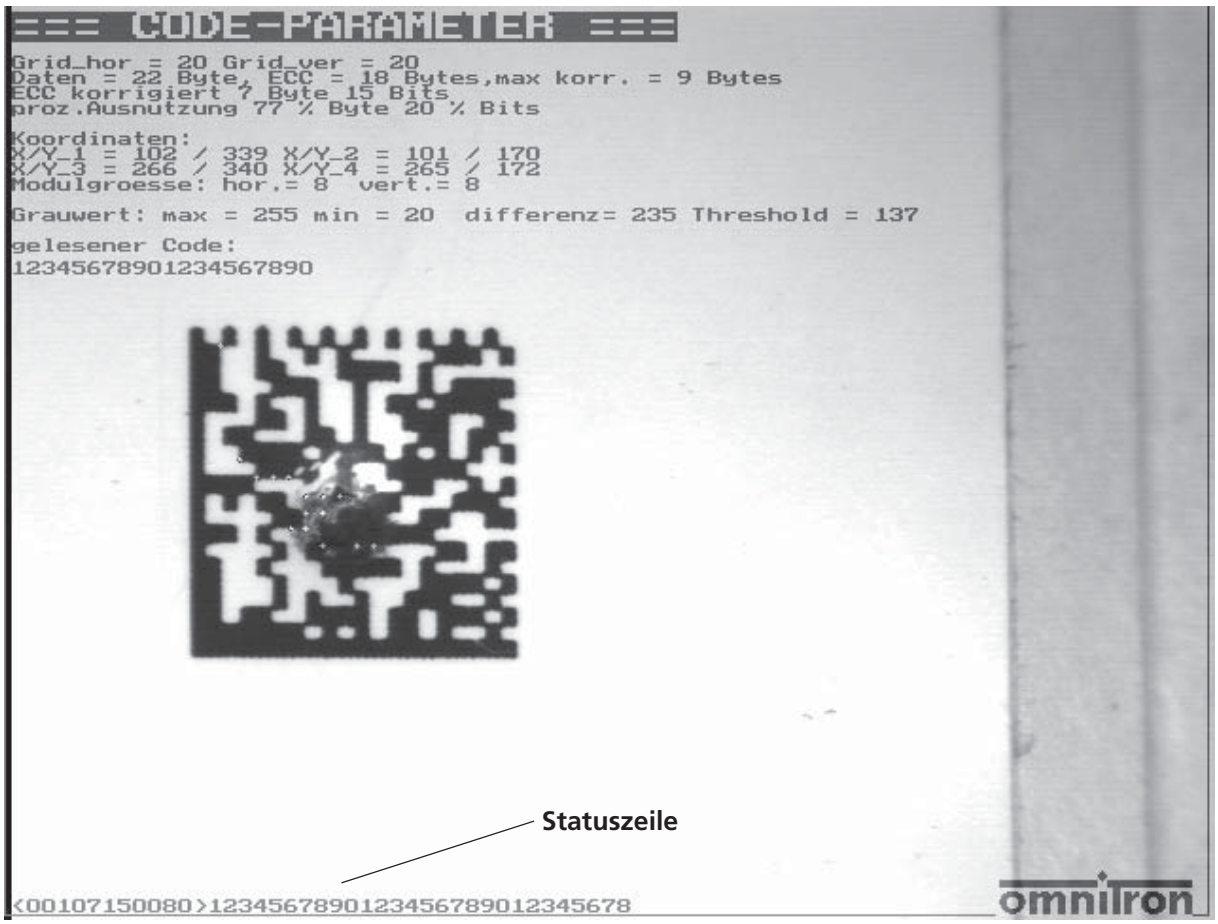
3.3.1 Setting Parameters of the RS-232 Interface

– Interface RS 232
– Transfer rate = 9600 Baud
– 8 Data bits
– 1 Stop bit
– No parity
– No handshake

3.3.2 I/O Interfaces

The MAC 340 has an optically decoupled input (trigger input) and two optically decoupled outputs. The outputs are driven, protected against polarity reversal, and short circuit proof.

3.4 Monitor Display



Screenshot, resolution 640 pixel horizontal, 480 pixel vertical

<00107150080>12345678901234567890123456 78 is the status line which is explained in detail in Chapter 4.

It consists of the status information, indicated by the signs „<“ and „>“, and following of the read code.

The original image or the frozen video image can be displayed on the monitor.

3.5 Structure of the MAC 340

The Mac 340 is equipped with four windows. The windows can be adjusted depending on acquisition of the object within the monitor image. Every single window can be activated and each window can be assigned a function. Window 1 per default is activated, the size of this window is set to 640 x 480 pixels. The function is to read the data matrix code.

All configuration parameters can be saved in the Flash EPROM, and are at the disposal when the MAC 340 is switched on again.

3.6 Command Levels

To query and to edit the parameters as well as to configure the device various commands are defined on two levels:

– User command level (commands for normal operation)
– Service command level (commands for basic settings and service purposes)

After the MAC 340 is switched on, the user command level is started.

3.6.1 User Commands

All user commands are two-digit. They are described in shortened form in the following table and in detail in Section 3.6.1.2.

Command	Short Discription
BZ	Flash duration 0 - 0xFF *10 us, max. 2550 us
MA	Jump into the service menu
DGn	Gray-scale jump of an edge
VM	Verify mode on/off
LW	Rereadings
IN	Inverse reading on/off
RC:xxxxx	Reference code
AM	Status of the evaluation mode; Default = 6
AZ	Evaluation time on/off
AGn	Number of grids without n grid x and y; 1 = grid-ho, 2 = grid-vert
VF	Bright or dark pixels are magnified by 1 pixel
HD	If 0, with VK the bright pixels are magnified, if 1, the dark pixels
FUn	Function for the window n; 1 = data matrix reading
OOn	Window of view n is switched on or off
SP	Mirror option

Command	Short Discription
HI	The digital threshold is determined via a histogram
QU	If 1, quadratic code readings only
KO	Output of the coordinates of the code, too
ORn	Code orientation
ST	Soft trigger
SA	Saves the parameter set into the Flash
SV	Show variable
MC	Matchcode function on/off
DU	Dot environment is evaluated
ID	Output of the identity ID:03
PS	Output of the corrected errors as a percentage
WG	Attempts to decode with various grey-scale values
ZP	Time point of the output signal; 0 = after trigger, 1 = after a successful reading
RM	Read mode, 0 = Trigger, 1 = continuous reading
VE	Amplification of the video signal
SM	Show on the monitor
CM	Show variable on the monitor
CO	Clear Overlay
LA	Language; 0 = german, 1 = english
DC	Switches on/off the Daisy Chain mode
BR	Baud rate; 0 = 9600, 1 = 19200, 2 = 38400, 3 = 57600, 4 = 76800, 5 = 115200
CP	Code values are displayed on the monitor after each reading
BM	Operation mode; 0 = normal, 1 = various codes, 2 = every valid code
TO	Timeout constant
IP	Interpreter; 0 = MAC 340, 1 = MAC 310V1, 2 = MAC 310V2
SH	Shutter time * 30 us
HE	Help menu is called up
QZ	Quiet zone in pixels
LO	Length of the output impulse
TF	Trigger edge: 0 = pos, 1 = neg
PB	Number of the pixels for the thin bar at pharmacode reading
VR	Forward or backward reading at the pharmacode
SXn	Sets the window x at position n; n = 1 start, n = 2 end (coordinate /8)
SYn	Sets the window y at position n; n = 1 start, n = 2 end (coordinate /8)
PM	Switches on/off the programming mode
LU	Counts interruptions in the vertical finder
OF	Output format; defines the format
OH	Output header
OT	Output trailer
PH	Output of the horizontal spacing
ML	Maximum number of gaps

Command	Short Discription
SF	Stop in case of a fault
OB	Orientation of the color bar; 00 = to the left of the code; 01 = to the right of the code
AB	Number of the color bars
GB	Grey-scale difference for the recognition of the color bars
AI	Automatic inverse reading; 00 = inactive, 01 = activ

3.6.1.1 Command Structure at the User Level

Alog mode also can be switched on at the user level. Per default this mode is turned off however.

The command structure is:

XX(n)abb

XX: The command
(n): Window 1, 2, 3, 4
a: „:“ or „=“
bb: Value or data, hexadecimal input (00H - FFH)
For the reference code this can be up to 100 characters in length (normal characters).

3.6.1.2 Description of the Commands

Command	Description
BZ	Flash duration; this parameter is used to set the flash duration. The values are a multiple of 10 us. A value of 5 represents a flash duration of 50 us. The values can range from 1 to 101.
MA	With this command a jump is carried out into the service menu. After this command the short commands are valid in the service mode.
DGn	This parameter specifies the grey-scale jump which is necessary to recognize an edge (the default is 50). At this value, well, there must be a minimum contrast of 50 gray-scales to recognize the edges.
VM	Verify mode; the data matrix possesses a highly developed error correction

Command	Description
	system. If the verify mode is activated the faulty, corrected data modules are marked with a little cross.
LW	Rereadings; with this parameter is defined how many times the reading shall be repeated till the result is a good reading.
IN	Inverse reading; if the parameter is set to 0 the code is read black-on-white. If the value is 1 the inverse code is read, that is a bright code against a dark background.
RC:xxxxx	With this parameter a reference code can be entered. If the read code matches the reference code, then the output status is „good“. If the read code matches the reference code, the output status is “good”. This command switches on the matchcode mode automatically. The reference code can be up to 95 characters in length.
AM	Evaluation mode; at delivery, this value is set to 6. With this parameter the analysis mode can be switch on. At evaluation mode 4 the orientation must be specified. At evaluation mode 6 the orientation is searched automatically.
AZ	When this parameter is switched on the required evaluation time is output in ms in the status string.
AGn	Number of grids without n Grid horizontal und vertical; n = 1 number of horizontal grids; n = 2 number of vertical grids. With this parameter also a rectangular code with a fixed grid can be defined.
VF	Defines the magnification factor to be used for horizontal and vertical magnification. This value is hexadecimal. (HL) H = magnification factor in the vertical direction, L = magnification factor in the horizontal direction. Whether the bright or the dark modules shall be magnified becomes defined in the parameter „HD“.
HD	If the value is 0 the bright modules are magnified and if the value is 1 the dark modules are magnified with VF.
FUn	Function of the single windows: 1 = data matrix code reading; 2 = pharmacode reading; n = 1 is the function for the first window.
OOn	With this parameter the window of view n is switched on or off.
SP	Mirror option; with this parameter also mirrored data matrix codes can be read.

Command	Description
HI	The digital threshold for the data field is determined via a histogram if the value is 1 or 2.
QU	If the value is 1 the Reads reads quadratic codes only.
KO	If this parameter is switched on, the coordinates of the data matrix code read are output, too.
ORn	If the evaluation mode is set to 4, the code orientation must be specified at this parameter. If the finder is collimated as a L the value is 0. The orientation is incremented clockwise in steps of 90 degrees.
ST	Software trigger: with this command a reading is triggered.
SA	Saves the parameter set of the Reader into the Flash EPROM. The data set remains unchanged, even if the device is switched off.
SV	Outputs the most important parameter settings via the serial interface (this is explained followingly).
MC	Matchcode function on/off. If the reference code has been programmed, this mode is switched on automatically. With 0 the matchcode function can be switched off.
DU	The dot environment of the data modules also includes the adjacent pixels.
ID	The Mac 340 sends back a 3 at this ID query.
PS	The corrected errors are output as a percentage in the status string.
WG	Attempts with various grey-scale values to detect the edges. If the value is 0 the DGn value is used. For values greater than 0 the value is corrected up and down and a reading is attempted. This parameter can be useful at codes that are little rich in contrast.
ZP	Time point of the output signal; 0 = the output signal is generated after the trigger signal, 1 = the output signal is generated immediately after a successful reading, in case of a fail-reading, the signal is generated after the trigger signal.
RM	Read mode; 0 = trigger; 1= reading continuously

Command	Description
VE	Amplification of the video signal: at low contrast conditions and short integration times the video signal can be amplified. Default value: 30.
SM	Displays the parameter generated by the code reading on the monitor.
CM	Displays the variables on the monitor (the same variables as with the command SV via the serial interface).
CO	Deletes the monitor overlay.
LA	Language; 0 = german, 1 = english
DC	Switches the Daisy Chain mode on or off. In this mode several MAC 340s can be switched in series. This mode only occupies a single serial interface. The individual readers operate without a logical address.
BR	Baud rate selection; 0 = 9600, 1 = 19200, 3 = 57600, 4 = 76800, 5 = 115200 baud. With this command the transfer rate can be specified.
CP	The determined data such as grey-scale, coordinates, etc., are displayed on the monitor overlay after a carried out reading.
BM	With the operation mode parameter various operation modes can be specified. 0 = normal mode, 1 = each read code must be another than the previous one; 2 = each read code is output, at a fail-reading there is not output.
TO	Timeout constant: if the value is greater than 0 the timeout function is active. If no good reading takes place within the timeout period (in ms), decoding is terminated and it is evaluated as when it was a fail-reading. The timeout value is specified in ms.
IP	The MAC 340 is equipped with one standard interface and two downward compatible interfaces. Interpreter 0 = Standard interface MAC 340; 1 = MAC310V1; 2 = MAC 310V2 interface.
SH	Shutter time * 30 us: with this value the electronic seal time of the imaging sensor is defined. The value is always a multiple of 30 us. Thus the value 3 would represent a shutter of 90 us.
HE	With this command without data a language-dependent help menu of the commands is output.

Command	Description
QZ	Quiet zone; with this parameter a quiet zone can be placed around the code. The default value for the quiet zone is 10 pixels.
LO	Length of the output signal in ms: with this command the length of the output pulse for the two hardware outputs can be set.
TF	This command defines the trigger edge: 0 = positive trigger edge; 1 = negative trigger edge.
PB	Number of pixels of the thin bar of the pharmacode. The width of the thick bar, the bar spacing, and the quiet zone are automatically calculated.
VR	Forward or reverse reading of the pharmacode: depending on the direction of the reading direction of the pharmacode the value of the code changes. With this command the reading direction can be specified.
SXn	With this command the X-position of the window can be set. If n = 1 the beginning of the window is set on the left; for n = 2 the X-end- coordinate is on the right. The value X is multiplied by the factor 8. A command SX1:0a would set the left edge of the window to 80 pixels.
SYn	With this command the Y-position of the window can be set. If n = 1 the beginning of the window is set at the top; for n = 2 the Y-end- coordinate is at the bottom. The value Y is multiplied by the factor 8. A command SX1:0a would set the upper edge of the window to 80 pixels.
PM	With this command the programming mode can be switched on or off. In the programming mode no data are transferred via the interface.
LU	If this command is set to 1 the interruptions in the vertical window are counted.
OF	Output format. If another output format shall divergently be used of the standard format, then this can be carried out with this command.
OH	Header information output string
OT	Trailer information output signal
PH	The horizontal distance of the window edge up to the code as well as the value of the code up to the right window edge are output in the data string, too.

Command	Description
ML	If the parameter LU is set to 1 with this parameter the maximum number of gaps can be specified till a fail-reading is carried out.
SF	If the parameter is set to 1 the reader is stopped after a fail-reading.
OB	Orientation of the color bar; 00 = color bar to the left of the code; 01 = color bar to the right of the code.
AB	Number of color bars
GB	Grey-scale difference for the recognition of the color bars.
AI	00 = the code is only read as long as the inverse flag is set. 01 = the normal code or the inverse code are read without switching over the inverse flag.

3.6.1.3 Parameter Setting

After the the command **SV** has been entered the current parameter set is displayed, example:

```
=========PARAMETER SET =========

Coord. Window 1 x = 1, y = 0, dx = 636, dy = 478
Delta-grey= 50,on/off = 1 funct. = 1 orientation = 00
Verify              = 00      Invers              = 00
Evaluation mode     = 06      Grey-scale Offset   = 00
Histogram bin       = 02      Dot area disp.      = 00
Mirror option       = 00      Flash               = 50 usec
Rereadings          = 00      Shutter             = 50 usec
Output Length       = 20ms    Amplification       = 30
Number grid         = 00      Number grid ver.    = 00
Matchcode           = 00      Magnification fact  = 00
bright or dark      = 00      percent.error corr. = 00
Grey-scale repeat   = 00      Run length dec.     = 00
Time output         = 01      Quadratic           = 01
Quiet zone          = 10      Trigger edge        = 00
Timeout             = 00
```

3.6.2 Service Commands

All service commands are single-digit. They are described in shortened form in the following table and in detail in Section 3.6.2.1.

Command	Short Description
f	Loads a video image
A	Starts automatic image move, stops in case of a fail-reading
C	Starts automatic image move, continues also after a fail-reading End with <CTRL>+C
O	Overlay on
o	Overlay off
V	Video out on
v	Video out off
t	Evaluation out of the image memory
c	Clear overlay
s	Save parameter
g	Switches on the grey-scale flag
p	Switches to the potentiometer mode
+/-	Increments / decrements grey-scale or potentiometer value
0, 1, 2, 3	Selection of window 1 to 4
d	Upper line down (for the selected window)
u	Upper line up (for the selected window)
r	Left line right (for the selected window)
l	Left line left (for the selected window)
D	Lower line down (for the selected window)
U	Lower line up (for the selected window)
R	Right line right (for the selected window)
L	Right line left (for the selected window)
F	Load new FPGA program
K	Load new user program
W	Shutter longer * 30
w	Shutter shorter * 30
j	Flash longer * 10
k	Flash shorter * 10
i	Initialization parameters
h	Load parameters
b	Histogram image memory
e	Setting, continuous imaging without evaluation. End with E.
a	Imaging and evaluation

3.6.2.1 Description of the Commands

Command	Description
	Commands for selecting the windows
0, 1, 2, 3	In the MAC 340 up to four windows can be selected. By the numbers 0, 1, 2, 3 the desired window is selected. All commands refer to this window. The first window is selected with number "0". When the MAC 340 is started, window 1 is automatically set as the active window and adapted. The size of the active window is indicated on the overlay by four bright lines.
	Commands for adjusting the left and right side of the active window
l	With „l" the left side of the window is moved to the left. The key can remain as long as depressed till the desired position of the left side is reached.
r	With „r" the left side of the window is moved to the right. The key can remain as long as depressed till the desired position of the left side is reached.
L	With „L" the right side of the window is moved to the left. The key can remain as long as depressed till the desired position of the right side is reached.
R	With „R" the right side of the window is moved to the right. The key can remain as long as depressed till the desired position of the right side is reached.
	Commands for adjusting the upper and lower side of the active window
d	With "d" for "down" the upper side of the window is moved downwards.
u	With „u" for „up" the upper side of the window is moved upwards.
D	With „D" for „down" the lower side of the window is moved downwards.
U	With „U" for „up" the lower side of the window is moved upwards.

Command	Description
	Commands for other functions
s	With the s-command all parameters of the MAC 340 are saved into the Flash.
f	A video image is loaded and displayed on the monitor.
O	With this command the overlay is switched on.
o	The overlay is switched off.
V	The video output to the monitor is switched on (default = on).
v	The video output to the monitor is switched off.
c	With this command the entire overlay is deleted. The window frame remains intact.
a	An image is taken and evaluated.
t	The code is searched out of the video memory and is decoded.
e	With this command a live image is displayed on the monitor. In this mode the flash is triggered according to the parameters. With the live image the exposure time and the flash duration can be adjusted with the corresponding commands.
A	Starts the endurance test. With <CTRL>+C the mode can be left again. At the occurrence of a reading error the program stops.
C	Identical with the A-command, except that the program doesn't stop at an error. The program can also be left with <CTRL>+C.
g	Switches on the grey-scale flag. With +/- the grey-scale value can be changed now.
P	Switches on the potentiometer mode. With +/- the amplification of the video signal can be changed.
w	With the command w the shutter time is reduced in 30 us increments.
W	The shutter time is increased in 30 us increments.
j	The flash time of the integrated illumination is reduced in 10 us increments.

Command	Description
k	The flash time is increased in 10 us increments.
i	With the i-command an initialization is carried out. All default parameters are reset and saved into the Flash.
h	Loads all the saved parameters out of the Flash.
K	With this command the entire user program can be updated.
F	With this command the FPGA can be programed newly.
b	With this command the grey-scale profile of an image line is displayed. On the left side is a scale from 0 - 255. It is the scaling of the grey-tones. With this function the contrast can be judged.
x	With x or X the program returns to the user mode in which the two-digit commands are valid.

3.6.3 Help Texts

3.6.3.1 User Command List after Entering the Command „HE“

```
=== Command list ====
======================
BZ      Flash duration 0- 0xff *10 us max 2550us default 50us
MA      Jump into the service menu
DGn     Gray-scale jump of an edge default 50
VM      Verify mode on/off default off
LW      Rereadings default 00
IN      Invers reading on/off default off
RC:xxx  Reference code
AM      Status of the evaluation mode: 6 default 6  fixed orientation 04
AZ      Evaluation time on/off
AGn     Number of grids without n grid x and y; 1 = grid-ho, 2 = grid-vert
VF      Bright or dark pixels are magnified by 1 pixel
HD      If 0, with VK the bright pixels are magnified, if 1, the dark pixels
FUn     Function for the window n;  1 = data matrix reading
OOn     Window of view n is switched on or off
SP      Mirror option
```

HI	**The digital threshold is determined via a histogram**
QU	**If 1, quadratic code readings only**
KO	**Output of the coordinates of the code, too**
ORn	**Code orientation**
ST	**Soft trigger**
SA	**Saves the parameter set into the Flash**
SV	**Show variable**
MC	**Matchcode function on/off**
DU	**Dot environment is evaluated**
ID	**Output of the identity ID:03**
PS	**Output of the corrected errors as a percentage**
WG	**Attempts to decode with various grey-scale values**
ZP	**Time point of the output signal; 0 = after trigger, 1 = after a successful reading**
RM	**Read mode, 0 = Trigger, 1 = continuous reading**
VE	**Amplification of the video signal**
SM	**Show on the monitor**
CM	**Show variable on the monitor**
CO	**Clear Overlay**
LA	**Language; 0 = german, 1 = english**
DC	**Switches on/off the Daisy Chain mode**
BR	**Baud rate; 0 = 9600, 1 = 19200, 2 = 38400, 3 = 57600, 4 = 76800, 5 = 115200**
CP	**Code values are displayed on the monitor after each reading**
BM	**Operation mode; 0 = normal, 1 = various codes, 2 = every valid code**
TO	**Timeout constant**
IP	**Interpreter; 0 = MAC 340, 1 = MAC 310V1, 2 = MAC 310V2**
SH	**Shutter time * 30 us**
HE	**Help menu is called up**
QZ	**Quiet zone in pixels**
LO	**Length of the output impulse**
TF	**Trigger edge: 0 = pos, 1 = neg**
PB	**Number of the pixels for the thin bar at pharmacode reading**
VR	**Forward or backward reading at the pharmacode**
SXn	**Sets the window x at position n; n = 1 start, n = 2 end (coordinate /8)**
SYn	**Sets the window y at position n; n = 1 start, n = 2 end (coordinate /8)**
PM	**Switches on/off the programming mode**
LU	**Counts interruptions in the vertical finder**
OF	**Output format; defines the format**
OH	**Output header**
OT	**Output trailer**
PH	**Output of the horizontal spacing**
ML	**Maximum number of gaps**
SF	**Stop in case of a fault**
OB	**Orientation of the color bar; 00 = to the left; 01 = to the right**

AB Number of the color bars; 0 = without bar evaluation > 1 number of bars
GB Grey-scale difference for the recognition of the color bars
AI Automatic inverse reading; 00 = inactive, 01 = activ

3.6.3.2 User Command List after Entering the Command „?“

```
=== Command list ====
======================
```

f	Loads a video image
A	Starts automatic image move, stops in case of a fail-reading
C	Starts automatic image move, continues also after a fail-reading
O	Overlay on
o	Overlay off
V	Video out on
v	Video out off
t	Evaluation out of the image memory
c	Clear overlay
s	Save parameter
g	Switches on the grey-scale flag
p	Switches to the potentiometer mode
+/-	Increments / decrements grey-scale or potentiometer value
0, 1, 2, 3	Selection of window 1 to 4
d	Upper line down (for the selected window)
u	Upper line up (for the selected window)
r	Left line right (for the selected window)
l	Left line left (for the selected window)
D	Lower line down (for the selected window)
U	Lower line up (for the selected window)
R	Right line right (for the selected window)
L	Right line left (for the selected window)
F	Load new FPGA program
K	Load new user program
W	Shutter longer * 30
w	Shutter shorter * 30
j	Flash longer * 10
k	Flash shorter * 10
i	Initialization parameters
h	Load parameters
b	Histogram image memory
e	Setting, continuous imaging without evaluation. End with E.
a	Imaging and evaluation

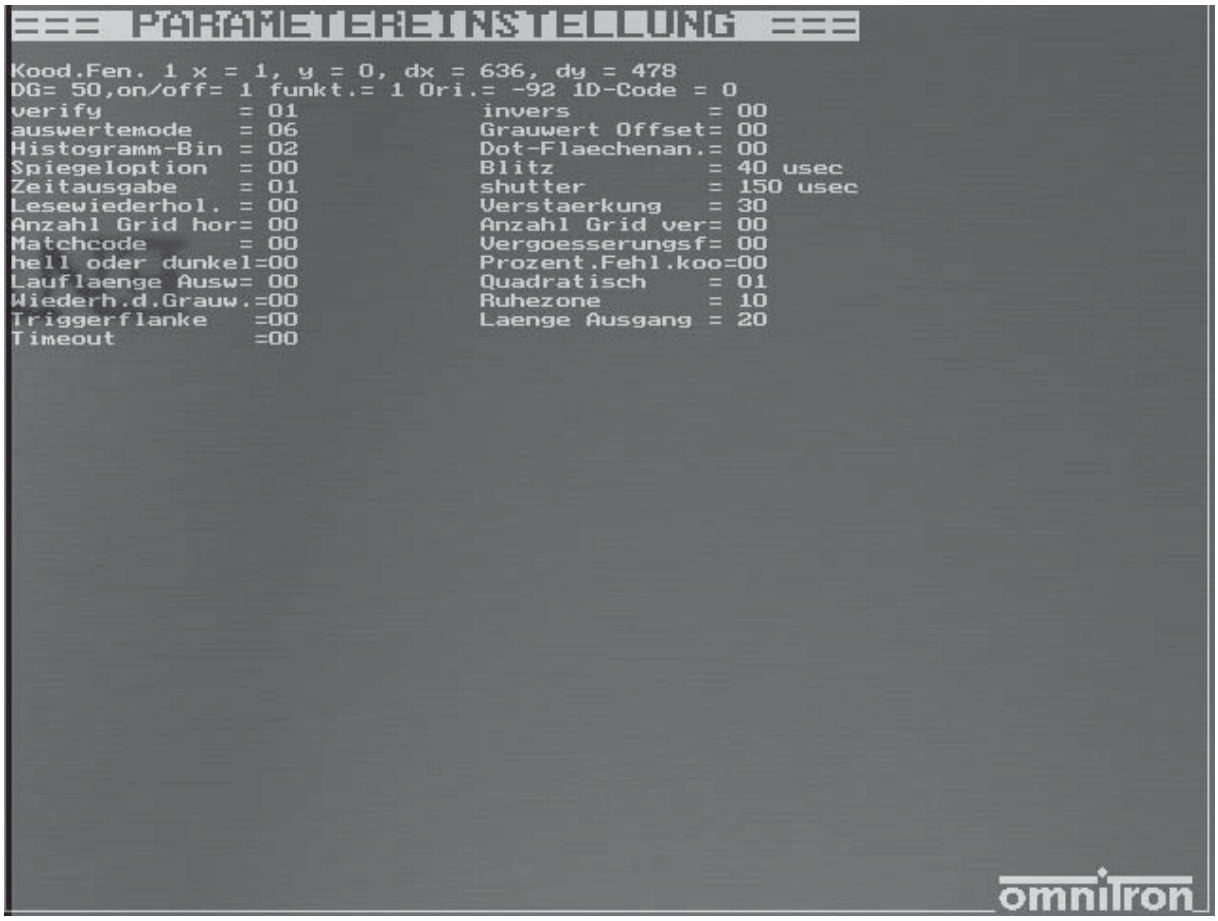
3.6.4 Monitor Output

3.6.4.1 Image Display after Entering the Command „CM“

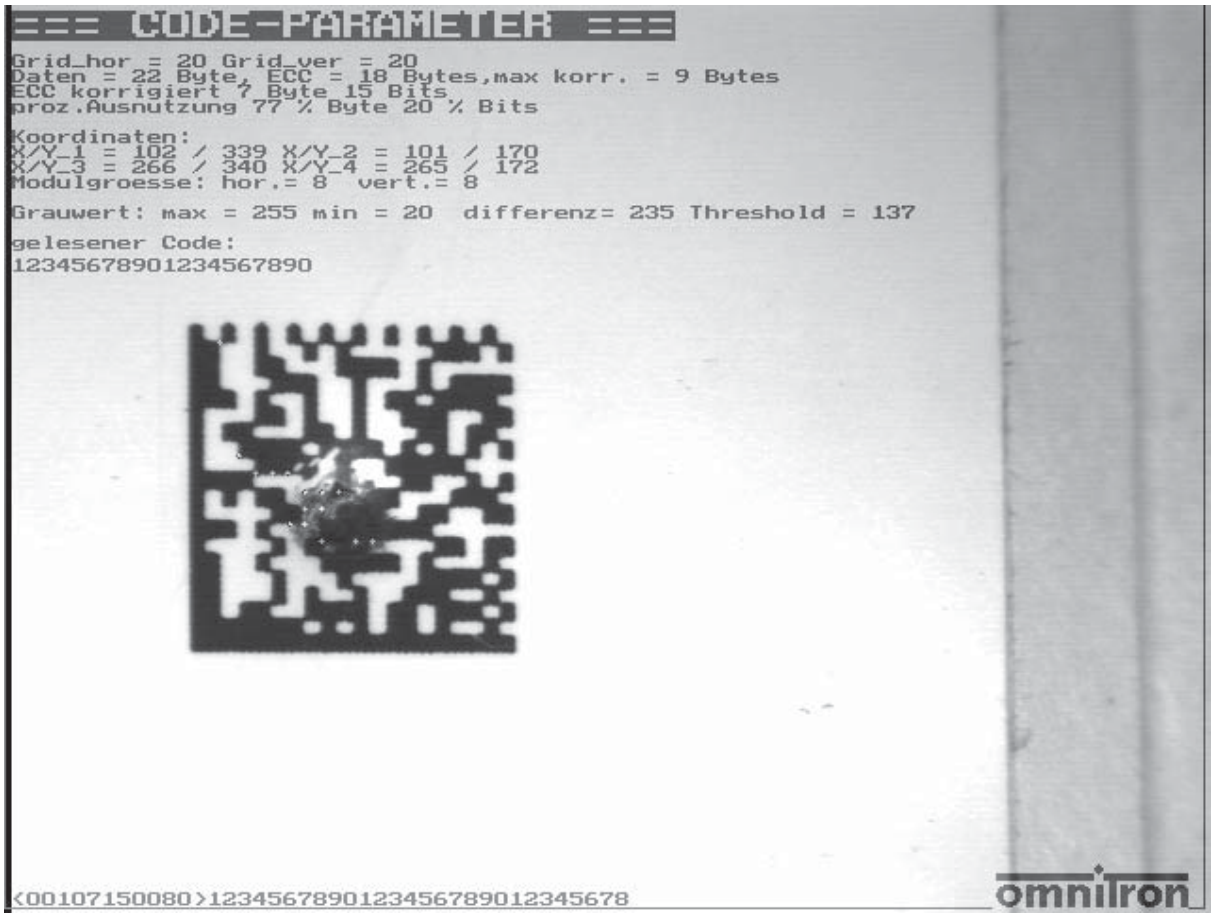
The calculated values of the decoded data matrix code are displayed:

3.6.4.2 Image Display after Entering the Command „SM“

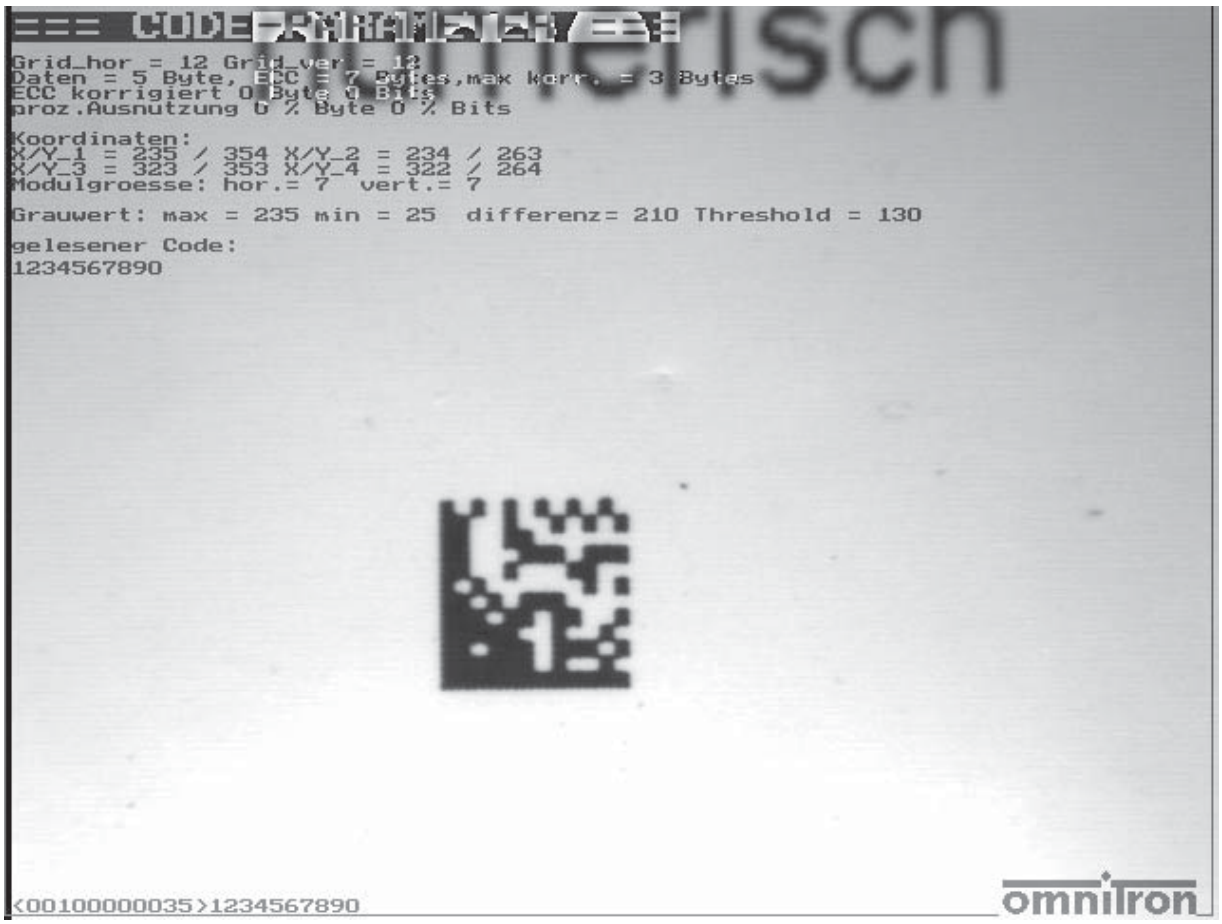
The parameters are displayed:



3.6.4.3 Evaluation of a Data Matrix Code with Errors



3.6.4.4 Standard Code with a Module Width of 0.25 mm



4 STATUS INFORMATION

This chapter deals with the construction and the information of the status line and the code output.

After the trigger signal or the read command a status information and the read code are transferred via the interface.

The output string starts with a control character STX (02H) (Start of Text) in the ASCII table and is completed by the output string with an ETX (03H) (End of Text).

So that the status information can be separated by the read code, the status information is included into a beginning and ending identifier. It starts with the sync-character „<“ and ends with „>“.

The status information is defined with 11 numbers.

4.1 Structure of the Status Information

The status information is structured as follows:

<AABCCDDEEEE>

AA: Status byte
B: At a good reading (OK) a „1“ is set, at a fail-reading a „0“
CC: Number of the corrected bits
DD: Number of the corrected bytes
EEEE: Required evaluation time in ms

4.1.1 Description of the Status Information

Information	Description
AA	**Status byte (see section 4.2)**
B	**If a reading was carried out which could be decoded or the read code agrees with the reference code at a set match code a „1“ is output, otherwise a „0“.**
CC	**In these two numbers the number of the corrected bits is output. If no corrections were necessary, then a „00“ are in these two numbers.**

Information	Beschreibung
DD	In these two numbers the number of the corrected bytes is output. If no corrections were necessary, then a „00“ are in these two numbers.
EEEE	The required reading and decoding time is output decimally in milliseconds (ms) in these four numbers. Depending on code size and printings in immediate proximity the time can differ.

4.2 Structure of the Status Byte

The status byte gives information, whether the MAC 340 had problems at reading or decoding of a code. If the status byte is „00“ then a complete good reading was carried out.

The single bits of the status byte are deleted after positive reading results. If bits remains set can be analyzed where the problems occured.

Status byte (AA)	Short Discription
Bit 7	Found line
Bit 6	Found complete finder
Bit 5	Finder is no quadratic code
Bit 4	Found corners correctly
Bit 3	Contrast error (too low contrast in the data field)
Bit 2	Grid error (Grid differs)
Bit 1	Too many errors (not correctable)
Bit 0	Decoding error (data format can‘t be decoded)

5 DAISY CHAIN MODE

5.1 Daisy Chain Commands

The commands for the daisy chain mode are always active.

If a hardware trigger shall be activated, then the daisy chain mode must be switched on with „DC:01<CR>“. To protect this mode, the parameter must be saved. This is carried out with the input of „SA <CR>“.

At fail-readings no output is carried out, only at good readings a string is output.

5.1.1 Description of the Commands

Command	Description
<STX>S 0 +<CR>	Trigger command After this the read datas tring returns: <STX>R 0[Daten]<CR> At an error message: <STX>R 0<0x18><CR>
<STX>B 0 xxxxxx<CR>	Transmission of the B-command
<STX>P 0 xxxx<CR>	Configuration of the decoder program xxxx is transfered to the decoder, the echo of the decoder is suppressed
<STX>Z 0 f x<CR>	Change baud rate x = 0 9600 baud x = 1 19200 baud x = 2 38400 baud x = 3 57600 baud

Kommando	Beschreibung
	x = 4 76800 baud x = 5 115200 baud f = „:“ baud rate is saved permanently f = „=“ baud rate is saved only temporarily
<STX>M0fx<CR>	Daisy Ccain mode output for hardware trigger x = 0 normal Output x = 1 hardware trigger for daisy chain mode, too f = „:“ daisy chain mode is saved permanently f = „=“ daisy chain mode is saved only temporarily
<STX>Oofx<CR>	Output time of the reading result x = 0 reading result after trigger x = 1 reading result immediately after carried out reading f = „:“ output time is saved permanently f = „=“ output time is saved only temporarily At a positive reading result the reading string is output. If no code was read, then no code string is output either.

6 THE SETUP PROGRAM OMNICONTROL2000

The setup program Omnicontrol2000 offers support during the arrangement of MAC 340 and serves the adjustment of all necessary parameters via the PC.

The program is compatible to Windows 95 / 98 / NT 4.0 / 2000, this means all basic commands are concurring with other applications of these operating systems.

6.1 System Requirements

PC compatible computer with an operating system Windows 95 / 98 / NT 4.0 / 2000
16 MB of RAM
5 MB of available hard disk space

6.2 Connection MAC 340 - PC

The communication between the Reader MAC 340 and the PC uses the RS-232 interface of the scanner. Omnicontrol2000 uses the following parameters:

– Interface RS-232
– 8 data bits
– 1 stop bit
– No parity
– No handshake

The baud rate of the scanner is determined automatically.

6.3 Installation of the Program / Program Start

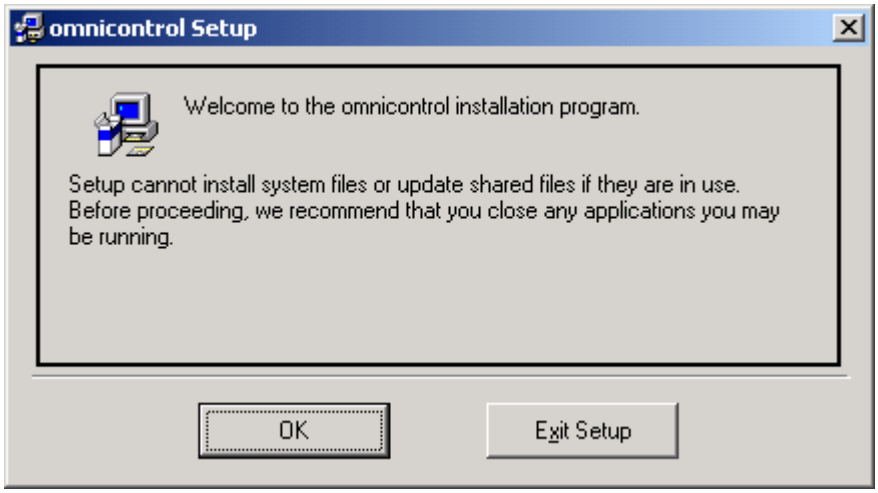
1. Start MS-Windows.

2. Close all other application programs and insert the installation CD with the program **SETUP.EXE**.

3. Start the program **SETUP.EXE** via **Start - Settings - System Programming - Software - Installation** or **Add New Programs – CD or Floppy Disk**.

   For details refer to your Windows manual if necessary, please.

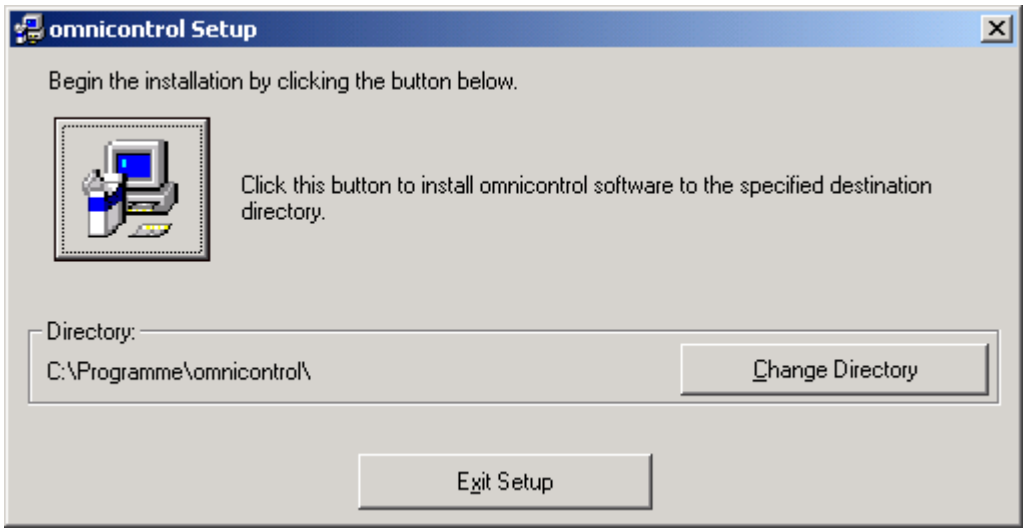
   The welcome screen opens:



The welcome screen

4. Select the button **OK** provided that you have closed all other application programs before. Otherwise it is recommended, to cancel the installation process by selecting the button **Exit Setup**, to close the application programs and to restart the program **SETUP.EXE** as described under step 2.

   The dialogue window for starting the installation opens:



The dialogue window for starting the installation

5. Select the button with the PC symbol to start the installation if you wish to keep the path for the installation directory indicated in the window area **Directory**. Otherwise change the directory path in the dialogue window **Change Directory** which opens by selecting the button of the same name.

   The installation process is started.

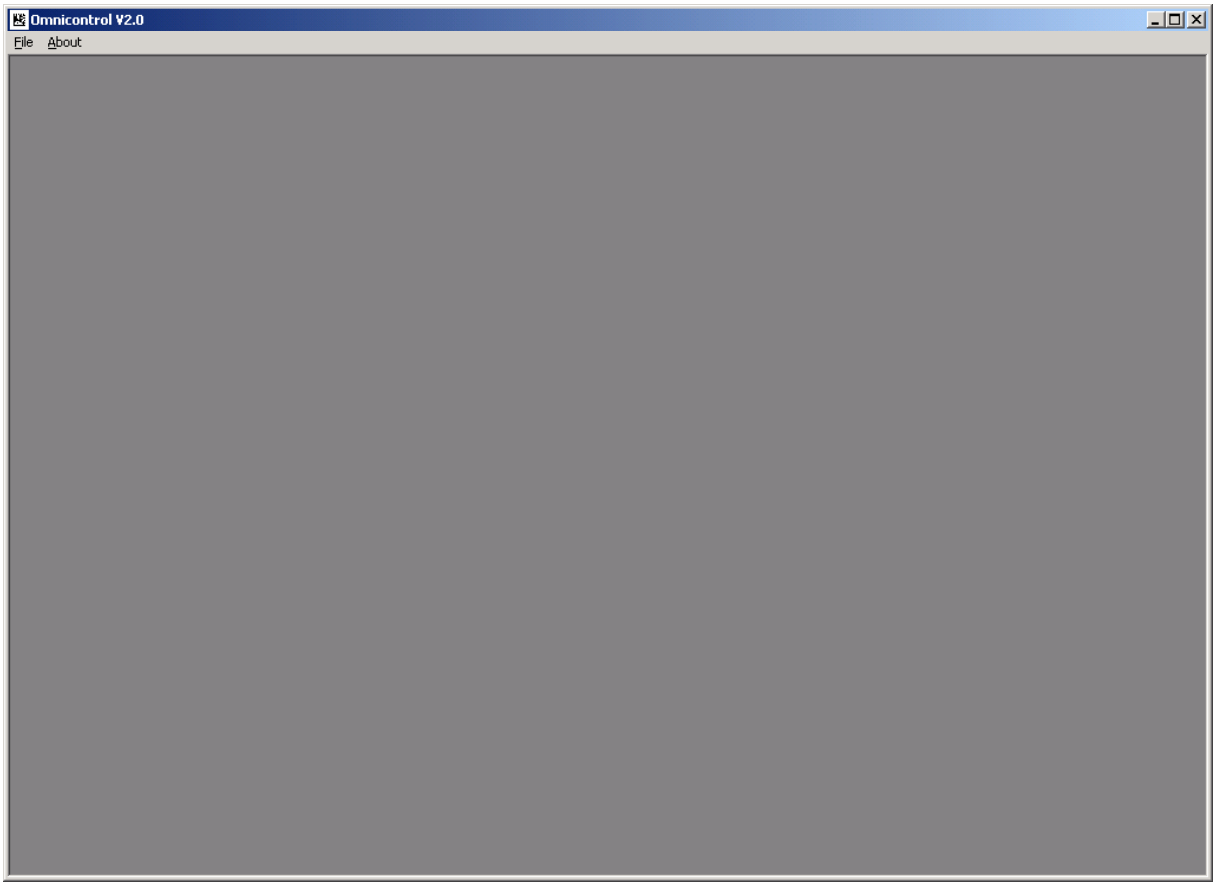
After successful completion of the installation the dialogue window shown below opens:

The dialogue window after successful completion of the installation

5. Select the button **OK**. The program **SETUP.EXE** is ended.

   A new entry **omnicontrol** is at your present in the Windows program group **Start - Programs** now.

6. Start Omnicontrol2000 by selecting the entry and follow the instructions below.



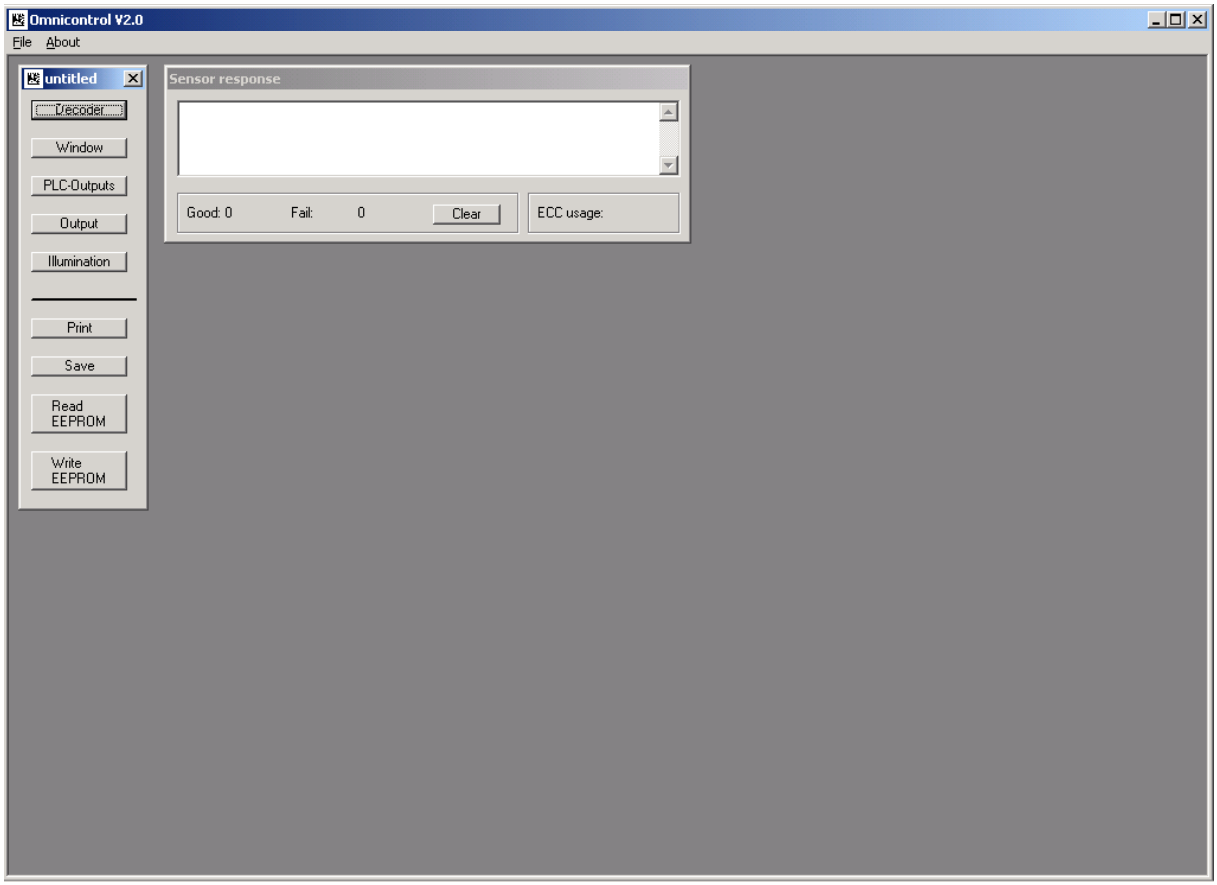
Omnicontrol2000 after the program start

6.4 Generating Parameter Sets

After starting Omnicontrol2000 new parameter sets can be generated as follows:

1. Select the menue items **File - New**. The PC interfaces COM1 to 4 are checked by the program for connected scanners automatically. If a scanner was found the function bar and the scanner output window shown in the picture below opens.

   If no scanner was found, a corresponding error message appears.



Function bar and scanner output window for generating a new parameter set

6.4.1 The Function Bar

6.4.1.1 Read EEPROM

The Reader MAC 340 uses an EEPROM for the permanent saving of operating parameters.

By selecting the button **Read EEPROM** the parameters stored in the MAC 340 will be transferred to the PC.

6.4.1.2 Write EEPROM

By selecting the button **Write EEPROM** the parameters adjusted at present are saved permanently in the EEPROM of the MAC 340.

6.4.1.3 Save

By selecting the button **Save** the parameters adjusted at present are saved on the PC.

At saving the first time the dialogue window **Save file as** opens. For details refer to your Windows manual if necessary, please.

You can access stored parameter sets via the menu items **File – Open**. The dialogue window **Open** which is also described in your Windows manual opens.

The functions **Save** and **Save as** can be also invoked by selecting the entries of the same name in the menu **File**.

6.4.1.4 Print

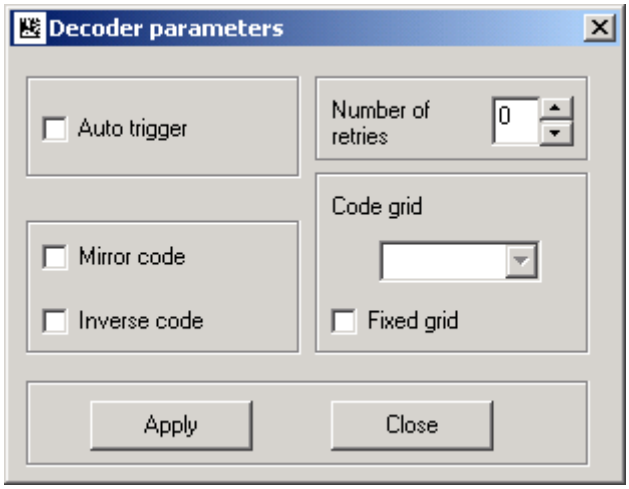
By selecting the button **Print** the parameters adjusted at present are output on the standard printer.

The function **Print** can be also invoked by selecting the entry of the same name in the menu **File**.

6.4.1.5 Decoder

By selecting the button **Decoder** the dialogue window **Decoder parameters** which is described below opens.

The activation or the deactivation of the single functions is carried out by setting or removing the hook in the corresponding check box by mouse click.



*The dialogue window **Decoder parameters***

Auto trigger: By activation of this function the MAC 340 reads continuously (Auto-Trigger-Mode).

Number of retries: The registered value – changeable by selecting the arrow buttons – predefines the maximum number of retries within the trigger window. As long as the trigger signal is active, new readings are started, if no decoding could be obtained.

Mirror code: If the code reading is carried out with the help of a mirror, e. g. due to confined space conditions, the image must be mirrored back again by the MAC 340 bevor further processing. This is carried out by activation of this function.

Inverse code: By activation of this function bright codes can be read on dark surfaces.

Code grid / Fixed grid: By activation of the function **Fixed grid** the module grid of the code can get fixed predefined.

The specification of the grid is carried out by selecting the selection button of the field **Code grid** and the desired entry in the list opening.

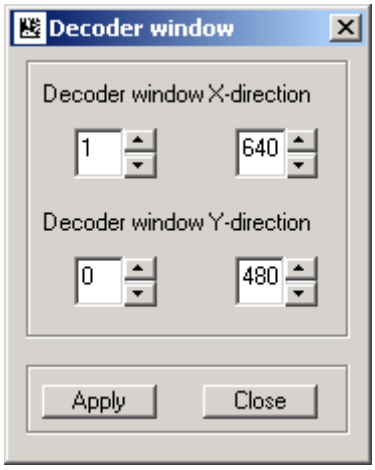
If a fixed grid is adjusted, then all codes which show another module grid are rejected. By predefining the module grid, the reading safety is increased.

Apply: By selecting the button **Apply** the settings of this dialogue window will be transferred to the Reader MAC 340.

Close: By selecting the button **Close** the dialogue window is closed without saving of the settings.

6.4.1.6 Window

By selecting the button **Window** the dialogue window **Decoder window** which is described below opens.



*The dialogue window **Decoder window***

Decoder window X-/Y-direction: If several codes are within the field of view or line structures impair the reading, a window which removes disturbing structures can be defined.

You define the X-/Y-coordinates of the decoder window respectively the start points (left fields) and end points (right fields) by selecting the corresponding arrow buttons.

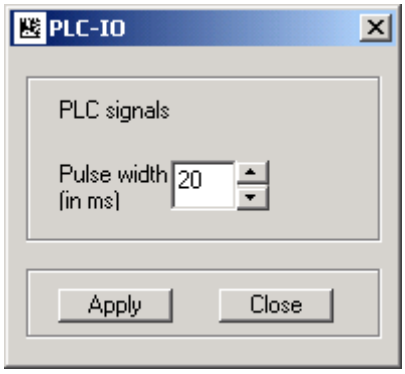
The position and the size of the window can be checked via an attached monitor.

Apply: By selecting the button **Apply** the settings of this dialogue window will be transferred to the Reader MAC 340.

Close: By selecting the button **Close** the dialogue window is closed without saving of the settings.

6.4.1.7 PLC-Outputs

By selecting the button **PLC-Outputs** the dialogue window **PLC-IO** which is described below opens.



*The dialogue window **PLC-IO***

PLC signals – Pulse width (in ms): At a successful reading the good output and at a fail reading the fail output of the MAC 340 can be activated for a duration of 1 to 255 ms.

The registered pulse duration is changeable by selecting the arrow buttons.

Apply: By selecting the button **Apply** the settings of this dialogue window will be transferred to the Reader MAC 340.

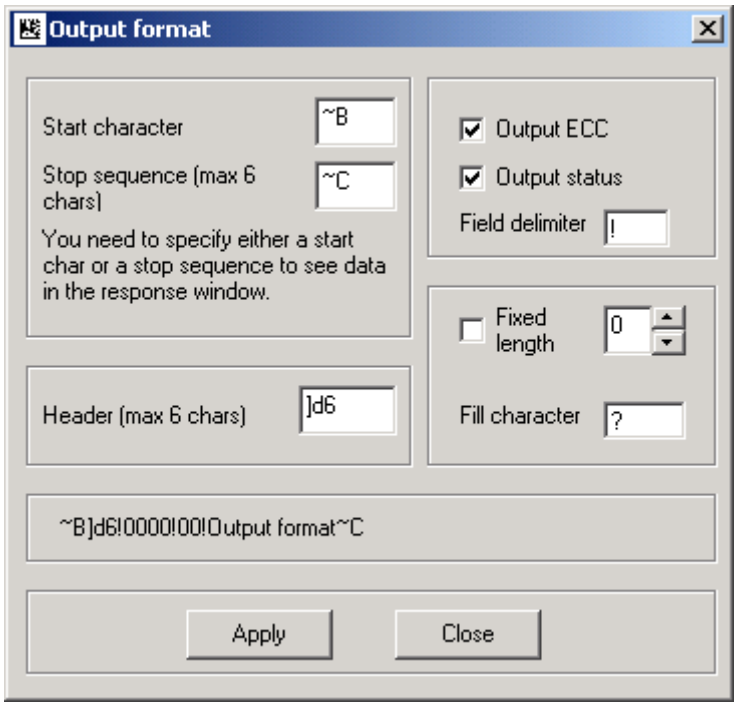
Close: By selecting the button **Close** the dialogue window is closed without saving of the settings.

6.4.1.8 Output

Output

By selecting the button **Output** the dialogue window **Output format** which is described below opens.

Field inputs are carried out manually via the keyboard, the activation or the deactivation of the single functions is carried out by setting or removing the hook in the corresponding check box by mouse click.



*The dialogue window **Output format***

Output format: The output of the MAC 340 can be adapted to a wide range of applications. The output has the following structure at this:

Start character - Header - Separator - Status - Separator - EEC - Separator - Read code / Fill character - Stop sequence - End mark

Good reading: [sta] <header> [sep] [status] [sep] [byte] [sep] [string] <trailer> [CR/LF]
Fail reading: [sta] <header> [sep] [status] [sep] [byte] [sep] [fil] <trailer> [CR/LF]

sta: A single character, for instance STX (ASCII 02).
header: A character string with maximum six characters.
sep: A single character for the separation of the output fields.
status: A four-digit status word which shows whether a reading was successful. Information about the causes of fail readings are also reported here.
byte: Two characters which show how many data bytes of the Data Matrix Code were corrected by the automatic error correction.
string: Several characters depending on the length of the code and whether a fixed length was predefined.
fil: A fill character which is used at a fixed adjusted date length.
trailer: A character string with maximum six characters.
CR/LF: End mark of each output.

Start character / Stop sequence: The start character and the stop sequence form the frame for the output of the read result. The start character is a single ASCII-character, the stop sequence can consist of maximum six alphanumeric characters.

ASCII control characters are entered with a preceeding tilde ("~"), for instance "~B" for the character STX (ASCII02).

Please notice that at least the start character or the stop sequence must be set so that data can be reported in the scanner output window.

Header: The header can contain maximum six alphanumeric characters. E. g. information about the used symbology can be entered in this field ("]d6" is the established indentification in EN796 for Data Matrix ECC200).

ASCII control characters are entered with a preceeding tilde ("~"), for instance "~B" for the character STX (ASCII02).

Output ECC / Output status / Field delimiter: By activation of the function **Output ECC** the number of the bytes is issued for each read code which were corrected by the automatic error correction. The usage level of the error correction can be taken as an indicator for the reading quality. Changes at the process let themselves be seen by an increased or widely fluctuating usage of the error correction.

By activation of the function **Output status** a status word is output for each reading which gives information about the fault cause in case of a fail reading. Further details gather from chapter *4 Status Information*, please.

The input of a **Field delimiter** causes that the single fields of the data output are separated from each other by the entered character.

Fixed length / Fill character: If it is required that the data output of the scanner shows a fixed length independently of the reading result, the length and a fill character can be predefined.

For this at first activate the function **Fixed length** and then set the desired output length by selecting the arrow buttons. The value can be between 0 and 255 characters.

The input of a **Fill character** causes that in case of a fail reading the output field is filled up with the entered character up to the predefined length. If the read code is shorter than the predefined length at a good reading, then the output field is also filled up with the entered character.

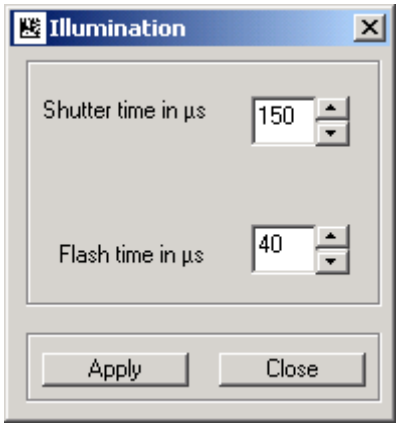
If the read code has more characters then fixed via the length, the „extra“ characters are cut off.

Apply: By selecting the button **Apply** the settings of this dialogue window will be transferred to the Reader MAC 340.

Close: By selecting the button **Close** the dialogue window is closed without saving of the settings.

6.4.1.9 Illumination

By selecting the button **Illumination** the dialogue window of the same name which is described below opens.



*The dialogue window **Illumination***

Shutter time in µs / Flash time in µs: When using the internal illumination the image brightness is usually adjusted via the flash time. The shutter time then has to be set that way that a stable, not flickering image is produced.

The shutter time and the flash time are fixed or changed by selecting the corresponding arrow buttons. At the shuter time values can be chosen between 0 and 1020 µs and at the flash time values between 0 and 7650 µs.

Apply: By selecting the button **Apply** the settings of this dialogue window will be transferred to the Reader MAC 340.

Close: By selecting the button **Close** the dialogue window is closed without saving of the settings.

6.4.2 The Scanner Output Window

6.4.2.1 Text Field

The text field of the scanner output window

In the text field of the scanner output window the result of each single reading is displayed according to the set output format (Details on the output format gather from section *6.4.1.8 Output*, please).

By selecting the arrow buttons corresponding to the text field the complete sequence of all reading results can be seen.

6.4.2.2 Good / Fail Counter

The good / fail counter of the scanner output window

The good / fail counter of the scanner output window show how many of all readings were good or fail readings.

By selecting the button **Clear** the counters are reset to zero.

6.4.2.3 ECC Usage Display

The ECC usage display of the scanner output window

Provided that the function **Output ECC** is activated in the dialogue window **Output format** the number of the bytes is issued for each read code which were corrected by the automatic error correction (further details gather again from section *6.4.1.8 Output*, please).

6.5 Contact Information

By selecting the menu item **About** the dialogue window with the contact data of the Omnitron AG opens:

The dialogue window with the contact data of the Omnitron AG

For closing this window select the button **Ok**, please.

6.6 Ending the Program

By selecting the menu items **File – Exit** you are leaving the program in which the function bar, the scanner output window as well as perhaps opened dialogue windows are closed automatically.