migra MPB PB

Large Format, Graphics Compatible Display with Profibus Interface

User's Manual

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Table of Contents

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Large Format, Graphics Compatible Display with Profibus Interface

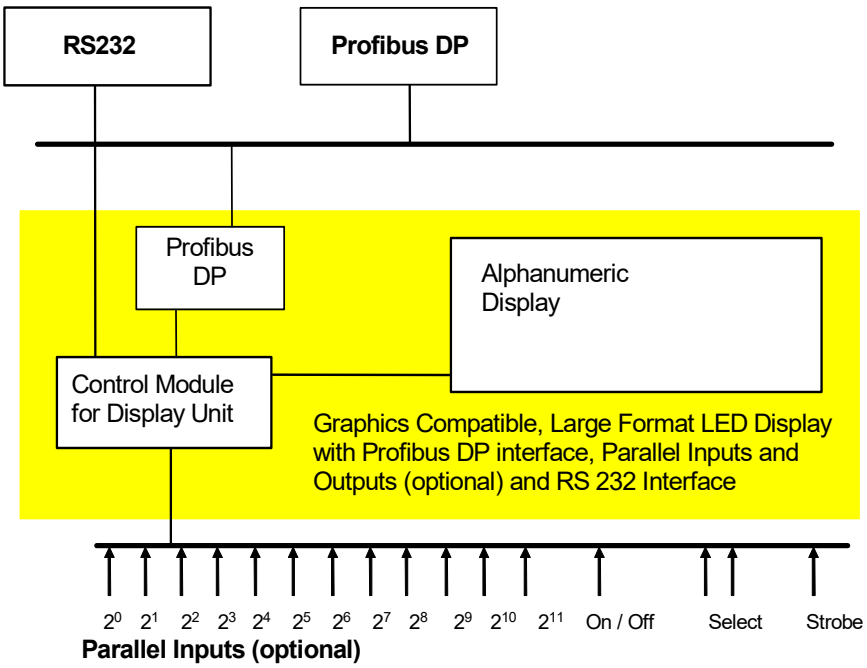
1 General

The large format, graphics compatible display can be used universally for displaying production data, or as an information board.
The modular design allows for cost-effective models of various size, and with different character heights and numbers of digits.
Especially important information can be colour-highlighted with the multicolour model (MC).

Display Functions

- Data transmission: Profibus DP, serial interface RS232 or parallel interface (optional)
- Configuration with PC software (via serial port)
- Visualisation: Texts (different font sizes and types) and graphics
- Standard font, flashing font, moving screen text, scrolling, inverse display
- Monitor display, stored texts and graphics can be queried, variables can be displayed, execution of macros
- Variable size thanks to modular display design.

2 System Overview



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3 Technical Data

General Specifications

Display type:	LED dot matrix display (max. 256x128 (HxV))
Display:	ASCII character set (Windows character sets), graphics
Display colour:	type SC: single colour, type MC: multicolour
View:	single or double sided
Operating voltage:	230 V / 50 Hz, 110 V / 60 Hz or 24 VDC +/-20 %
Interface:	Profibus DP, serial, parallel (optional)
Housing:	powder coated aluminum
Housing dimensions:	see chapter “device configuration”
Mounting:	articulated arm or hanging mount bracket for wall mounting
Protection:	IP54 or IP65
Operating temp.:	0 to +50 °C (optionally -20 to +50 °C)
Storage temp.:	-25 to +70 °C
Graphics:	max. 1000
Texts:	max. 1000 (max. 255 moving screen texts)
Variables:	max. 1000
Macros:	max. 1000
Character sets:	max. 100

The available flash memory capacity for graphics, texts, variables, character sets and macros depends on the vertical resolution of the display:

- Vertical resolution ≤ 64 Pixel: 64 KByte
- Vertical resolution > 64 Pixel: 448 KByte

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3.1 Tips and Tricks

- When putting on the power supply, the following sequence has to be observed:
  - Connect the power supply cable to the display.
  - Connect the power supply cable to the power supply.

- When disconnecting the power supply, the following sequence has to be observed:
  - Disconnect the power supply cable from the power supply.
  - Disconnect the power supply cable from the display.

- Be sure to use a valid colour when creating texts.
  Example: Green lettering may not be used with a red, single colour display (no display appears in this case).

- When selecting x and y coordinates for the purpose of positioning, the desired position must actually exist at the display (resolution in pixels).

- Graphics, texts and variables to be displayed must properly fit into the display unit.

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3.2 Device Configuration

Itemnumber :_____

Number of pixels (horizontal x vertical): _____x_____

Type:
☐ for inside use ☐ for outside use

Display colour:
☐ red ☐ green ☐ yellow
☐ white ☐ blue

View:
☐ single sided ☐ double sided

Operating voltage:
☐ 230 V / 50 Hz ☐ 110 V / 60 Hz ☐ 24 V DC

Protection:
☐ IP40 ☐ IP54 ☐ IP65 ☐ IP _____

Operating temperature:

with type for inside use:	with type for outside use:	special version:
☐ 0...+50 °C (standard)	☐ -20...+50 °C (standard)	☐ _____ °C
	☐ -25...+50 °C (optional with heating)	

Housing dimensions:

_____x_____x_____mm

Housing Material:
☐ Aluminum profile ☐ Stainless steel ☐ Sheet metal

Interface:
☒ Profibus-DP ☐ RS232 ☐ digital output
☐ RS485 ☐ parallel interface
☐ USB

Default settings upon delivery:

Device address: _____ Profibus-DP (slave address)

Device address: 01_D download interface

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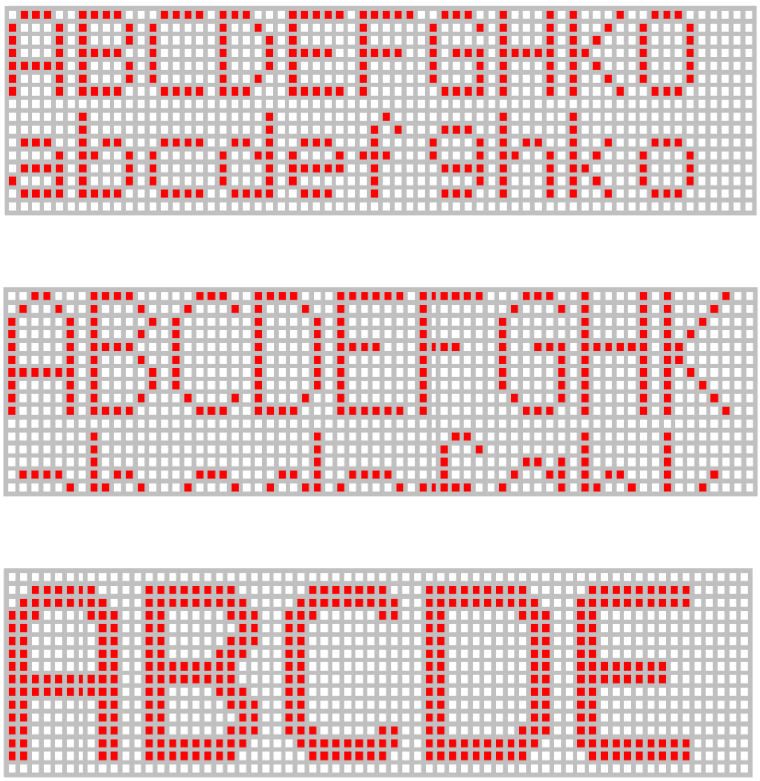
3.3 Display Elements

Alphanumeric display modules with 16 x 16, 64 x 8 or 64 x 16 dot matrices are utilized.

Attention: As far as the software is concerned, there is no difference between modules with 16 pixel lines and modules with 8 pixel lines. The last 8 lines are simply not visible at a module with 8 pixel lines.

The following example depicts a module with 64 x 16 pixels including three different character heights:



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3.4 System and Device Start-Up

The large format display performs internal memory and function tests during power-up (duration: less than one second).

If the display is not illuminated (and if the integrated function LED is slow-ly blinking, i.e. 0,5 Hz), the device is in boot mode. This indicates that the software currently stored on the integrated flash memory is incomplete. This may have been caused by a previously interrupted upload operation. If this is the case, uploading must be repeated (with the help of included PC software MKS).

A configuration message of the serial Interface appears on the display:

- Device address (ID)
- Baud rate
- Number of data bits
- Type of parity bit
- Number of stop bits

After power-up, the macro execution is started with the first macro (if one exists). If the display unit is to be cleared again immediately, a corresponding macro command must exist!

The display unit then waits for valid data from the user.

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3.5 Online Frame Layout

The frame to the large format display consists of 3 parts:

Header	Data Unit	Trail

Frames to the large format display are not evaluated by the device until 3 to 240 ms after the last frame byte has been received (depending upon baud rate settings). The pause between the individual frame bytes may not exceed this period of time! The pause between the individual frames must exceed this period of time!

The next frame can be transmitted immediately after the response frame has been received.

If no response frame is used, the large format display is not ready to receive a new frame until the last received frame has been completely processed. For example, if a large graphic is displayed, a longer waiting period is required than would be the case for reading out an “online character”. As a rule, a pause of „receiving timeout“ + 150 ms between frames is sufficient.

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3.5.1 Header

STX	DA	SA	FC
Start of Text	Destination Address	Source Address	Frame Control
00000010_B	$1XXXXXXX_B$	$1XXXXXXX_B$	$1XXXXXXX_B$

STX: Start of text: 02_H

DA: RS232/485 address of the internal controller:
81_H (, 82_H, 83_H) = 80_H + device address
This is no Profibus address.

SA: Source address: 80_H
This is no Profibus address.

FC: Frame control: Controlling the communication sequence
Bit 7: set permanently to 1
Bits 6-1: reserved (0)
Bit 0: 0 -> do not send response
1 -> send response

3.5.2 Data Unit

Data Unit
Display Data
20_H - FF_H, $0D_H$, $0A_H$, $1B_H$, $1F_H$

Data Unit: ASCII characters, control commands

3.5.3 Trail

ETX
End of Text
00000011_B

End of text: 03_H.

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3.6 Description of the Data Unit for Online Frames

The display must be configured with the PC software (define character sets, graphics, texts, variables and macros). The individual elements included in the configuration which is uploaded to the display can then be used by the frames described in this chapter.

The display is delivered with a pre-programmed default configuration. However, you can create an individualised configuration for your own application and upload it to the display unit with the PC software. The existing default configuration is overwritten in the process.

All indices are 0-based, i.e. “000” is transmitted in order to query the first text. The position 0 / 0 (x / y) is the upper left-hand pixel at the display unit. All variables, graphics and texts are written to the display starting at the selected x and y coordinates, and then proceeding down and to the right. The display’s physical limits may not be exceeded during this process (otherwise no display appears).

Note: All indexes of texts, graphics, variables, character set and bargraphs are 0-based (in PC software and at the controlling)!

Frames which contain no online text (ASCII codes 20_h through FF_h, $0D_h$, $0A_h$), start with the escape character ($1B_h$) as the first data byte.

If response frames are used, the next frame can be transmitted immediately after receipt of the response. However, this may lead to delays in the execution of macros, moving screen texts and scrolling if the frame sequence is to fast.

If response telegrams are not used, a pause must be inserted between the frames as described in chapter “Online Frame Layout”.

Data bytes included in the data unit must be in ASCII format!

Example, Specifying Position:
... 31_h 32_h 33_h ... must be transmitted for declaration of position 123_D.
(ASCII characters “1”, “2” and “3.”)
Refer to chapter “Displayable Characters” for a table of displayable ASCII characters.

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3.6.1 Online Texts

Online texts are transmitted without an escape sequence (ASCII codes 20_H - FF_H, $0D_H$, $0A_H$).

Transmitted ASCII characters are displayed with the current character set at the current cursor position in consideration of current attributes.

Line breaks are accomplished with the help of ASCII code $0A_H$ or $0D_H$, or by transmitting the escape sequence for setting cursor position (ESC-“C”).

If the display limits are exceeded, display output is continued at the next line, or at the first line of the display unit.

3.6.1.1 Select Character Set

Byte 1	Byte 2	Byte 3	Byte 4
ESC	Function	Character set no. tens	Character set no. ones
$1B_h$	“Z”: normal character width “z”: monospaced characters (uniform width for all characters)	“0” – “9”	“0” – “9”

Four character sets are included with the display unit upon delivery:

Character set „Z00“ : Character height 7 pixels (+ 1 pixel descender)
Character set „Z01“ : Character height 10 pixels (+ 1 pixel descender)
Character set „Z02“ : Character height 14 pixels (+ 2 pixel descender)
Character set „Z03“ : Character height 16 pixels (without descender)

Existing character sets are overwritten with the new character sets if a new configuration is downloaded to the display unit.

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3.6.1.2 Position the Cursor

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
ESC	Function	x Position hundreds	x Position tens	x Position ones	y Position hundreds	y Position tens	y Position ones
$1B_h$	“C”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”

3.6.1.3 Configure Attributes

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
ESC	Function	Foreground colour	Background colour	Blinking
$1B_h$	“A”	“0”: black “1”: green “2”: red “3”: yellow	“0”: black “1”: green “2”: red “3”: yellow “T”: transparent	“0”: static “1”: blinking

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3.6.2 Texts, Graphics, Variables and Bargraphs

3.6.2.1 Query Text

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Text no. hundreds	Text no. tens	Text no. ones
$1B_h$	“T“	“+”: display “-”: clear	“0” – “9”	“0” – “9”	“0” – “9”

When the display is cleared, the surface at which the text is displayed is overwritten with the current online background colour (from the last “ESC-A” frame)! Black is used if the background colour has been set to transparent!

3.6.2.2 Adjust Speed for Moving Screen Texts

Byte 1	Byte 2	Byte 3
ESC	Function	Moving Speed
$1B_h$	“L”	“0”: static “1”: 1.8 seconds : “9”: 0.2 seconds

All moving screen texts are set into motion at the selected speed. The default setting is “9” (0.2 seconds per step) after power-on.

3.6.2.3 Query Graphics

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Graphic no. hundreds	Graphic no. tens	Graphic no. ones
$1B_h$	“G”	“+”: display “-”: clear	“0” – “9”	“0” – “9”	“0” – “9”

When the display is cleared, the surface at which the text is displayed is overwritten with the current online background colour (from the last “ESC-A” frame). “Black” is used if the background colour has been set to “transparent”.

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3.6.2.4 Query Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Var. no. hundreds	Var. no. tens	Var. no. ones
$1B_h$	"V"	"+": display "-": clear	"0" – "9"	"0" – "9"	"0" – "9"

When the display is cleared, the surface at which the variable is displayed is overwritten with the current online background colour (from the last "ESC-A" frame). "Black" is used if the background colour has been set to "transparent".

3.6.2.5 Set Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5.	Byte 6	Byte 7...133
ESC	Function	Set	Var. no. hundreds	Var. no. tens	Var. no. ones	Variable values
$1B_h$	"V"	"=": set	"0" – "9"	"0" – "9"	"0" – "9"	20_h...FF_h

Variables may include up to 127 characters (the length of the variables is set during configuration).

The same number of characters are overwritten at the variable as are transmitted with the frame.

In order to avoid flickering, the old display is not cleared until after the new display is outputted!

The background colour, used with the variables, may not be transparent, and a character set with uniform character width should be used in order to assure correct display. Otherwise, the variable must be cleared prior to the change, and then displayed once again!

Variable content is stored to RAM only. After the device has been switched off and back on again, the variables are returned to their pre-configured values.

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3.6.2.6 Increase and decrease Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Increase / Decrease	Var. no. hundreds	Var. no. tens	Var. no. ones
$1B_h$	"V"	"I": increase or "D": decrease	"0" – "9"	"0" – "9"	"0" – "9"

Only numeric characters are changed. Letters, commas etc. are skipped. The numeric characters are interpreted as a associated decimal number. This decimal number is increased or decreased by 1.

In order to avoid flickering, the old display is not cleared until after the new display content is outputted.

The background colour used with the variables may not be transparent, and a character set with uniform character width should be used in order to assure correct display. Otherwise, the variable must be cleared prior to the change, and then displayed once again!

Variable content is stored to RAM only. After the device has been switched off and back on again, the variables are returned to their pre-configured values.

3.6.2.7 Position Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5.	Byte 6
ESC	Function	Set	Var. no. hundreds	Var. no. tens	Var. no. ones
$1B_h$	"V"	"P": set position	"0" – "9"	"0" – "9"	"0" – "9"

Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12
x position hundreds	x position tens	x position ones	y position hundreds	y position tens	y position ones
"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

Variable positioning is stored to RAM only. After the device has been switched off and back on again, the variables are returned to their pre-configured positions.

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3.6.2.8 Query Bargraphs

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Bargraph no. hundreds	Bargraph no. tens	Bargraph no. ones
$1B_h$	“W“	“+“: display “-“: clear	“0“-“9“	“0“-“9“	“0“-“9“

With the display command, the last sent value (or the reference value after RESET) is used for the bargraph. If a variable is connected to the bargraph, it will be displayed, too.

Clearing a bargraph means to fill the bargraph area with the current online background colour (from the last „ESC-A“ frame). “Black“ is used if the online background colour has been set to “transparent“. If a variable is connected to the bargraph, it will be cleared too.

A maximum number of 255 bargraphs (numbers 0 to 254) is possible.

The maximum variable length of assigned variables is 127 characters.

3.6.2.9 Set Bargraph Values

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
ESC	Function	Set	Bargraph no. hundreds	Bargraph no. tens	Bargraph no. ones	Data type
$1B_h$	“W“	“=“: Set	“0“-“9“	“0“-“9“	“0“-“9“	“A“: ASCII coded Decimal Value

Byte 8	Byte 9	Byte 10	Byte 11	Byte 12	Byte 13
Sign	Decimal value ten thousands	Decimal value thousands	Decimal value hundreds	Decimal value tens	Decimal value ones
“+“, “-“	“0“-„9“	“0“-“9“	“0“-“9“	“0“-“9“	“0“-“9“

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If the bargraph is not displayed yet, this will be done automatically now.

The bargraph-bar will be displayed corresponding to its position between the MIN- and MAX-borders which are defined within the configuration. The bar always starts at the configured reference value. It ends at the position of the transmitted value.

The bar will be shown with its configured colour at the position of the reference value.

If the bar exceeds one of the colour-borders (starting at the reference value), it will be shown in the new defined colour after this point.

Four colour-borders are defined. Each of them must be in the range MIN-border to MAX-border:

MIN-border <= colour-border 1 <= colour-border 2 <= colour-border 3 <= colour-border 4 <=MAX-border

The PC-software ensures this rule !

Beside showing the standard bargraph (multi-coloured bar), it is also possible to show it as a single-coloured bar or as a single-coloured mark (depending on the configuration data - see PC-software).
The colour of the single-coloured bar / mark is the same as the colour of the end-position of the standard bar.

If the current value is not in the range “MIN-border” to “MAX-border“, a blinking mark will be shown at the particular border.

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If a variable is linked to the bar graph, it is changed accordingly as well:

All digits occupied with the characters “#” and “*” are overwritten with the new value starting at the right.

If a variable is preset to “#”, preceding zeros are suppressed (replaced with blanks).

If a variable is preset to “*”, preceding zeros are displayed.

If a digit is occupied by the dollar sign “$“, it is overwritten with the new preceding plus or minus sign.

Example:	Variable preset	= “$ #*,* m/s”
	Value	= -9 = “-00009”
	=> Display	= “- 0,9 m/s”

If minimum or maximum values are violated (MIN/MAX-borders), the current values blinks at the display.

The background colour used for variables may not be transparent, and a character set with uniform character width should be used in order to assure correct display.

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3.6.3 Direct Graphic Control

3.6.3.1 Clear Display and Fill

Byte 1	Byte 2	Byte 3
ESC	Function	Colour
$1B_h$	“F”	“0”: black “1”: green “2”: red “3”: yellow

3.6.3.2 Set a Point

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Colour	x pos. hundreds	x pos. tens	x pos. ones	y pos. hundreds	y pos. tens	y pos. ones
$1B_h$	“P“	“0”: black “1”: green “2”: red “3”: yellow	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”

3.6.3.3 Read Out a Point from the Display

Query:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Query code	x position hundreds	x position tens	x position ones	y position hundreds	y position tens	y position ones
$1B_h$	“P”	“?”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”

Response:
Colour information (with header and trail)

Byte 1	Byte 2	Byte 3
ESC	Function	Colour
$1B_h$	“P”	“0”: black “1”: green “2”: red “3”: yellow

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3.6.3.4 Draw a Rectangle

Byte 1	Byte 2	Byte 3	Byte 4
ESC	Function	Foreground colour (perimeter)	Background colour (filling)
$1B_h$	"R"	"0": black "1": green "2": red "3": yellow	"0": black "1": green "2": red "3": yellow "T": transparent

Upper left Corner Position:

Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
x position hundreds	x position tens	x position ones	y position hundreds	y position tens	y position ones
"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

Lower right Corner Position:

Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
x position hundreds	x position tens	x position ones	y position hundreds	y position tens	y position ones
"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

The perimeter of the rectangle is drawn with the foreground colour.
The rectangle is filled with the background colour.

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3.6.3.5 Scrolling the Display Content

3.6.3.5.1 Displays with vertical Resolution < 64 Pixels

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Direction	Speed	Increment	Start line tens	Start line ones	End line tens	End line ones
$1B_h$	“S“	“0”: off “1”: up “2”: down	“0”: static “1”: 1.8 sec “9”: 0.2 sec	“1”: 1 pixel “9”: 9 pixels “0”: no scrolling	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”

This command scrolls once a screen area from the start line to the end line (speed = “static”) or cyclically in steps of 1 to 9 pixels.
The start and end line defines the Y position of the first and last pixel line of the scrolling range (end line > start line!) Only the last selected scrolling range is used!

3.6.3.5.2 Displays with vertical Resolution > 64 Pixels

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
ESC	Function	Direction	Speed	Increment	Start line hun-dreds	Start line tens	Start line ones	End line hun-dreds	End line tens	End line ones
$1B_h$	„S“	“0”: off “1”: up “2”: down	“0”: static “1”: 1.8 sec “9”: 0.2 sec	“1”: 1 pixel “9”: 9 pixels “0”: no scrolling	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”

This command scrolls once a screen area from the start line to the end line (speed = “static”) or cyclically in steps of 1 to 9 pixels.
The start and end line defines the Y position of the first and last pixel line of the scrolling range (end line > start line!) Only the last selected scrolling range is used!

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3.6.4 General Functions

3.6.4.1 Set Blinking Period Duration

Byte 1	Byte 2	Byte 3
ESC	Function	Period duration
$1B_h$	“B”	“0”: 2 seconds : “9”: 0.2 seconds

The selected blinking period duration is assigned to all blinking texts. The default value is “9” (0.2 seconds) is activated each time the device is switched on.

3.6.4.2 Adjust Brightness

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Colour	Brightness hundreds	Brightness tens	Brightness ones
$1B_h$	“H”	“1”: green “2”: red	“0” – “1”	“0” – “9”	“0” – “9”

Each within a range of 0 to 100%:
“1” = green
“2” = red.

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3.6.5 Digital Inputs and Outputs

As an option, the large format display is equipped with up to 16 digital inputs and 16 digital outputs.

Request Frame

Byte 1	Byte 2	Byte 3	Byte 2+n	Byte 18
ESC	Function	Output bit 1	Output bit n	Output Bit 16
$1B_h$	"D"	"0" or "1"	"0" or "1"	"0" or "1"

"0" -> clear output
"1" -> set output
else -> retain previous output status.

Response: (FC byte, bit 0 = 1)

Byte 1	Byte 2	Byte 3	Byte 2+n	Byte 18
ESC	Function	Input bit 1	Input bit n	Input bit 16
$1B_h$	"D"	"0" or "1"	"0" or "1"	"0" or "1"

"0" -> input cleared
"1" -> input set.

The output bits are used to switch the digital outputs (if included).

After switching the device on, all outputs are cleared (0).

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3.6.6 Macros

Macros are predefined command sequences included in the device configuration. They are analogous to the data units in the online frames.

The first macro line is executed after the device is switched on (if one exists). Subsequent macro lines are executed every 100 ms. A macro line can consist of several commands. Macro execution is stopped after the last macro line has been executed.

3.6.6.1 Start Macro Execution

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
ESC	Function	Macro no. hundreds	Macro no. tens	Macro no. ones
$1B_h$	“M“	“0” – “9”	“0” – “9”	“0” – “9”

Execution starts with the indicated macro.
Skipping is also possible during macro execution through the use of this command within a macro sequence.

3.6.6.2 Pause during Macro Execution

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
ESC	Function	Pause duration hundreds	Pause duration tens	Pause duration ones
$1B_h$	“w“	“0” – “9”	“0” – “9”	“0” – “9”

Sets the time which elapses until the next macro line is executed (in steps of 100 ms).

A macro line is normally executed every 100 ms until the last macro has been completed.
After the ESC + “w...” sequence, macro execution is stopped for the indicated pause duration.

This sequence can be used as part of a macro, as well as part of a receive message.

3.6.6.3 Stop Macro Execution

Byte 1	Byte 2
ESC	Function
$1B_h$	“E”

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3.7 Response Frames

A response frame is only transmitted if the corresponding bit (bit 0) was set in the FC byte..

STX	DA	SA	FC	Data-Unit	ETX
Start of text	Destination address	Source address	Frame control	Error code	End of text
02_H	80_H	81_H (82_H, 83_H)	80_H	"0"..."5" (30_H...35_H)	03_H

Error Codes and their Meanings:

Value (ASCII character)	Meaning
"0"	No error
"1"	Reserved
"2"	Reserved
"3"	Invalid ESCAPE sequence
"4"	Element (text, variable, graphic, character set or macro) is missing, invalid parameter
"5"	Invalid flash

The queried information is returned instead of error code "0" for frames which require a response ("read out point from the display", "digital in-puts and outputs").

The error code in the response frame always relates to the last partition frame (at multiple ESC-sequences).

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3.8 Multiple ESC-Sequences

It is possible to combine several partition frames in one complete frame. This applies to the standard controlling and to the macro list.

The partition frames can be a ESC-sequence or a online text each.

If a online text shall follow after the ESC-sequence, it must be separated with the “separator sign“ $1F_H$ from the ESC-sequence. The separator itself is not evaluated.

The maximum length of the data unit of a complete frame is 230 characters (maximum 193 characters with Profibus).

Example:

Data unit = $1B_H$ “Z01“ $1B_H$ “C002003“ $1B_H$ “A301“ $1F_H$ “online text“

=> An “online text” with character set 1, at cursor position x=2, y=3 with foreground colour “yellow“ and background colour “black“ is displayed (blinking).

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3.9 Examples

All of the following examples are requesting a response frame.

After processing the control frame, the Migra notifies its anew readiness with the response frame:

```
02 80 81 80 30 03
\_________/ \/ \/
     |      |  |
  Header    |  Trail
          Error
          Code
```

3.9.1 Write Online Text “Hello World“

STX	DA	SA	FC
Start of Text	Display Address	Source Address	Frame Control
02_H	81_H	80_H	81_H

→

→

Data Unit (Online-Text)											ETX
“H“	“e“	“l“	“l“	“o“	“ “	“W“	“o“	“r“	“l“	“d“	End of text
48_H	65_H	$6C_H$	$6C_H$	$6F_H$	20_H	57_H	$6F_H$	72_H	$6C_H$	64_H	03_H

3.9.2 Query Text No. 0

STX	DA	SA	FC
Start of Text	Display Address	Source Address	Frame Control
02_H	81_H	80_H	81_H

→

→

Data Unit (Querying Text)						ETX
ESC	“T“	“+“	“0“	“0“	“0“	End of Text
$1B_H$	54_H	$2B_H$	30_H	30_H	30_H	03_H

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3.9.3 Query Variable No. 1

STX	DA	SA	FC
Start of Text	Display Address	Source address	Frame Control
02_H	81_H	80_H	81_H

→

→

Data Unit (Querying Variables)						ETX
ESC	"V"	"+"	"0"	"0"	"1"	End of Text
$1B_H$	56_H	$2B_H$	30_H	30_H	31_H	03_H

3.9.4 Set Variable No. 1 to "3000"

STX	DA	SA	FC
Start of Text	Display Address	Source Address	Frame Control
02_H	81_H	80_H	81_H

→

→

Data Unit (Setting Variables)										ETX
ESC	"V"	"="	"0"	"0"	"1"	"3"	"0"	"0"	"0"	End of Text
$1B_H$	56_H	$3D_H$	30_H	30_H	31_H	33_H	30_H	30_H	30_H	03_H

3.9.5 Increase Variable No. 1

STX	DA	SA	FC
Start of Text	Display Address	Source Address	Frame Control
02_H	81_H	80_H	81_H

→

→

Data Unit (Increasing Variables)						ETX
ESC	"V"	"I"	"0"	"0"	"1"	End of Text
$1B_H$	56_H	49_H	30_H	30_H	31_H	03_H

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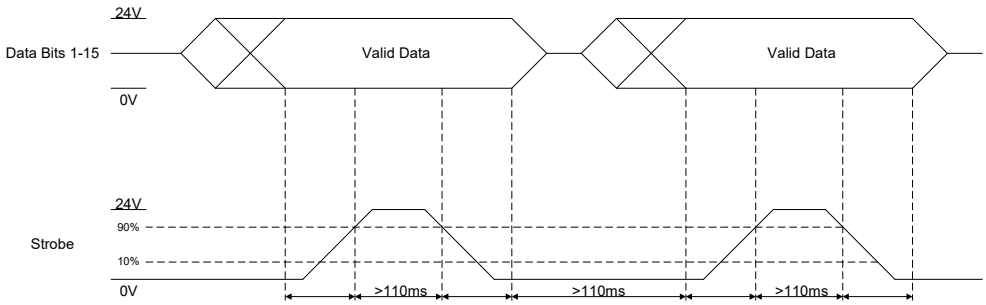
3.10 Parallel Interface

Functions can be initialised via the 16 digital inputs, which are analogous to the online frames used for the serial interface.

3.10.1 Timing at the Parallels Inputs



3.10.2 Input Levels at the parallel Inputs

Level	Voltage Range
U (low)	+ 0 to 1.6 V DC
U (high)	+ 18 to 30 V DC

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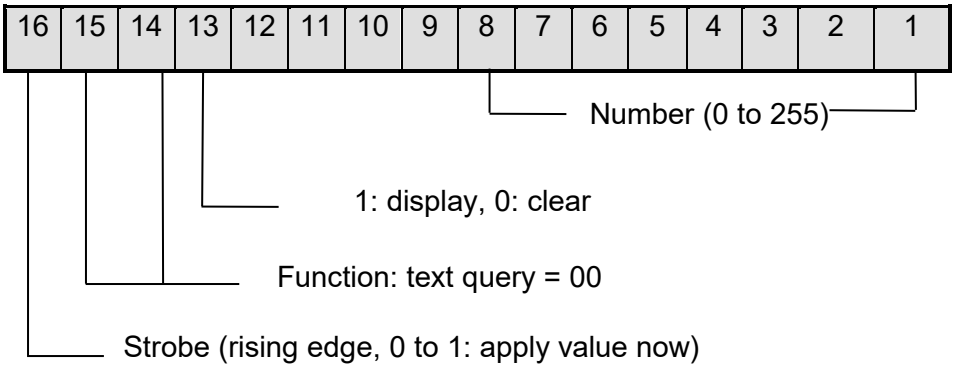
3.10.3 Query Text



For example, the following assignments are used to display text 12:

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

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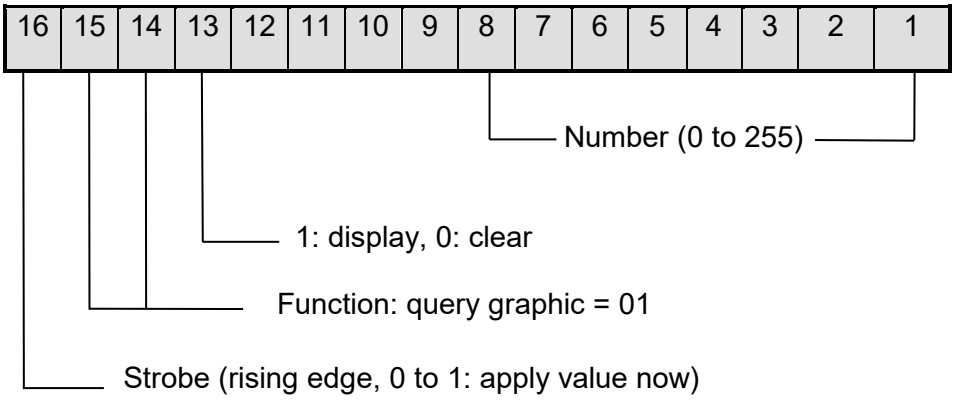
3.10.4 Query Graphics



For example, the following assignments are used to clear graphic 7:

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

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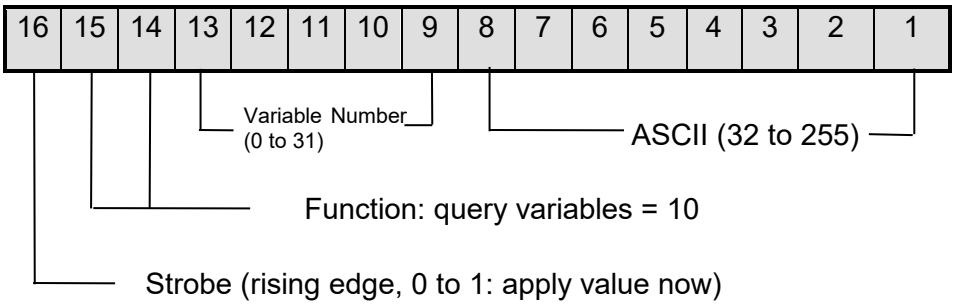
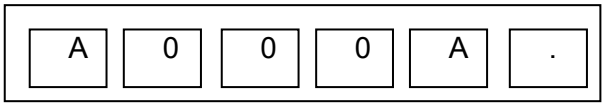
3.10.5 Set Variables

Variables with a single character can be set directly:



Example: The variable at the fourth digit is to be changed at a display with 6 variables.



Each digit is implemented by means of a variable (numbers 0 through 5). In order to display a “9” at the fourth digit, ASCII value 39_H must be assigned to variable 3 (fourth digit).
Therefore the inputs must be set up as follows:

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

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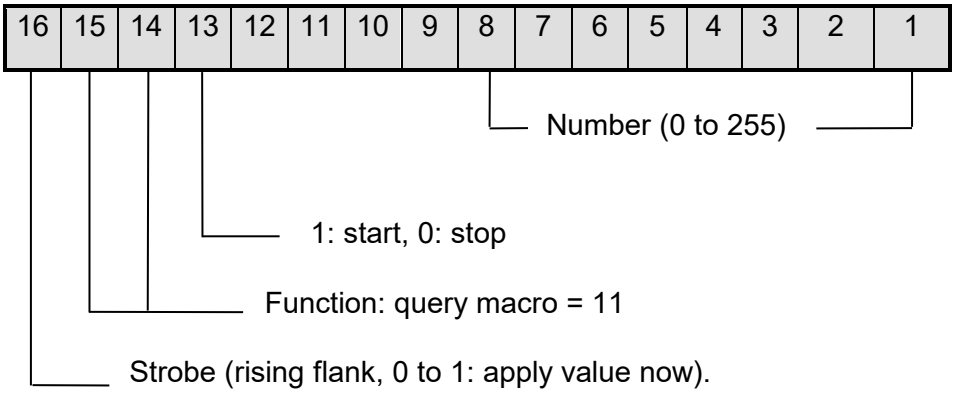
3.10.6 Querying Macros



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3.11 Profibus DP Interface

ID Number:	$05D0_h$
GSD File:	MICR05D0.GSD
Cyclical User Data:	max. 200 bytes output, max 200 bytes input, max. 300 bytes output + input
Standard Configuration:	2x 0x3F (32 input-/output bytes)
Parameter Data:	Standard 7 Byte
User PRM:	none
Diagnosis:	Standard 6 Byte
External Diagnosis:	none
Transmission Speed:	9.6 kBaud / 19.2 kBaud / 93.75 kBaud / 187.5 kBaud / 500 kBaud / 1.5 MBaud / 3 MBaud, 6 MBaud, 12 MBaud
Protocol:	Profibus DP DIN19245, part 3

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3.11.1 DP Configuration Data

The configuration of the Profibus interface normally happens using the GSD file. It is initially imported into the "Device Catalog" of the configuration software. Subsequently, the Profibus interface can be “dragged” into the bus system and then be configured.

With the configuration, the user can individually adapt data width within the data transfer. Identifiers with data widths of 1 to 16 bytes maximum are possible.
By specifying these identifiers in any order, the desired total data width is set for both the input and the output data.

Data Identifier	Number of Bytes	Function / Description
0x10	1	Input data
0x11	2	Input data
:	:	:
0x1F	16	Input data
0x20	1	Output data
0x21	2	Output data
:	:	:
0x2F	16	Output data
0x30	1/1	Input / output data (1 byte each)
0x31	2/2	Input / output data (2 bytes each)
:	:	
0x3F	16/16	Input / output data (16 bytes each)

The maximum number of input and output bytes is 200 bytes each. However a total number of 300 bytes (input + output) may not be exceeded.

⇨ Default configuration: 2x 0x3F = 32 input and 32 output bytes

Attention:

The configured output data width must me at least 2 bytes (toggle and length byte) greater than the longest used MIGRA control frame.

The configured input data width must me at least 2 bytes (toggle and length byte) greater than the longest MIGRA response frame to be evaluated.

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3.11.2 DP Diagnosis Data

The interface does not support any extended diagnosis data. Default diagnosis is utilised.

3.11.3 DP Parameter Data

The User_Prm_Data are not utilised by the interface. However, a test is run to determine whether or not User_Prm_Data are transferred by the Profibus master. If User_Prm_Data are transferred, Profibus initialisation is disabled and the slave must be reconfigured and parameterised.

Note:
Standard parametrisation is required and is normally installed by the utilised DP configurators.

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3.11.4 DP Output Data

The user must enter MIGRA control frames into the DP output data:

DP Output					
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**...**	**Byte n + 2**
Toggle byte	Length byte = n	Frame byte 1	Frame byte 2	...	Frame byte n

In order to transmit a frame to the MIGRA, the individual frame bytes must be entered at the Profibus side as output bytes 3 through (n + 2). After the length byte (= frame length n) has been entered, the toggle byte must be changed in order to start transmission.

Before the next frame can be transmitted, the MIGRA must get enough time for executing the current command!

For this, it is strongly recommended to wait for the MIGRA response frame (see chapter “DP Input Data”).

Alternatively, a minimum waiting time has to be ensured. It depends on the type and content of the respective control frame and must be determined experimentally (if the the waiting time is too short, the new message will be ignored). Thereby, there must be added a “security buffer” of about 30%, because the execution times for commands may vary within a certain range (depending on firmware version)!

3.11.5 DP Input Data

MIGRA response frames are notified to the user in the DP input data:

DP Input					
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**...**	**Byte n + 2**
Toggle byte	Length byte = n	Frame byte 1	Frame byte 2	...	Frame byte n

Each time a response frame has been received from the MIGRA, it is entered as input bytes 3 through (n + 2), and the frame length (n) is entered as input byte 2 (= length byte). The toggle byte is finally increased by 1.

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3.11.6 Complete Example: Display Online Text “ABC“

1. Start of Profibus DP Communication (32 I/O-Bytes in this case)

```
Output: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Input : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

2. Enter Control Frame

```
Output: 00 1D 02 81 80 81 1B 46 30 1B 43 30 30 30 30 30 30 1B 5A 30 30 1B 41 33 30 30 1F 41 42 43 03 00
          \/ \_________/ \______/ \_____________________/ \_________/ \_____________/ \/ \______/ \/
          |       |          |                |                |            |       |      |    |
          |    Header     ESC-F0         ESC-C000000          ESC-Z00      ESC-A300   Sepa-  Text Trail
          |   (Request    (Fill      (Cursor to X-Pos.0      (Char     (Yellow signs rator  (ABC)
                        |    response)  display    and Y-Pos.0)           set 0)    at black
          |              black)                                        background,
          |                                                            not blinking)
          Length Byte = Frame Length = 29D = 1DH
```

3. Change Toggle Byte = Transmit Control Frame

```
Output: 01 1D 02 81 80 81 1B 46 30 1B 43 30 30 30 30 30 30 1B 5A 30 30 1B 41 33 30 30 1F 41 42 43 03 00
        \/
        |
     Changed Toggle Byte
```

4. Wait for Response Frame

```
Input : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
…
Input : 01 06 02 80 81 80 30 03 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        \/ \/ \_______________/
        |  |          |
        | Length   Response
        |  Byte     Frame
        |
   Toggle Byte
```


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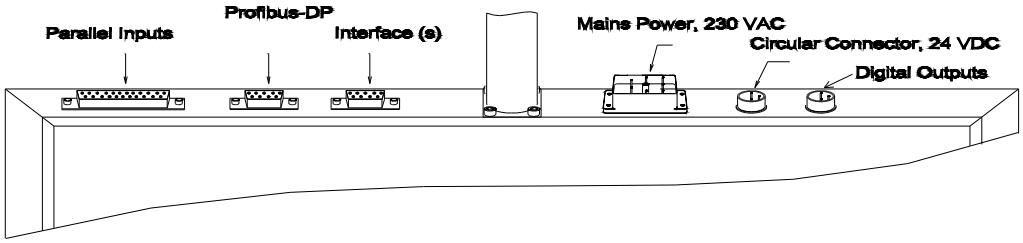
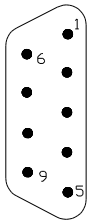
4 Connector Pin Assignments

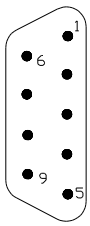


9-Pin Sub-Miniature Plug Connector (download interface, RS232)



Pin	RS 232
1	n.c.
2	RxD
3	TxD
4	n.c.
5	GND
6	n.c.
7	n.c.
8	n.c.
9	n.c.

9-Pin Sub-Miniature Plug Connector (download interface, RS485 optional)



Pin	RS 485
1	n.c.
2	n.c.
3	Rx+ / Tx+
4	n.c.
5	GND *
6	5VDC *
7	n.c.
8	Rx- / Tx-
9	n.c.

* If an external bus termination is needed, these pins can be used.

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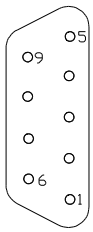
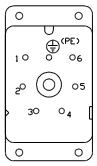
9-Pin Sub-Miniature Socket Connector (Profibus DP)



Pin	Profibus DP
1	n.c.
2	n.c.
3	Rx+ / Tx+ (B strand)
4	RTS
5	GND, electrically isolated
6	5 VDC, electrically isolated
7	n.c.
8	Rx- / Tx- (A strand)
9	n.c.

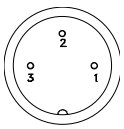
Note: At a specific point of time, a frame can be sent to display only via one of the two interfaces (download or Profibus DP).

7-Pole Mains Plug (230 VAC)



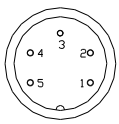
Pin	Assignment
1	L1
2	N
(PE)	PE

3-Pin Circular Plug (only with 24 VDC supply power)



Pin	Assignment
1	GND
2	+ 24 VDC
3	PE

5-Pin Circular Plug (only with optional digital outputs)



Pin	Assignment
1	Relay 1, closing contact a
2	Relay 1, closing contact b
3	Relay 2, closing contact a
4	Relay 2, closing contact b
5	n.c.

Relay 1 / 2 is controlled by digital output 1 / 2 (frame: ESC+“D”, optionally expandable).

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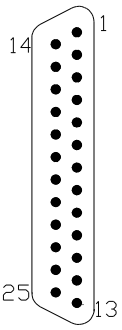
25-Pin Sub-Miniature Plug Connector (only with optional parallel inputs)



Pin 1	Binary data 2^0	
Pin 2	Binary data 2^1	
Pin 3	Binary data 2^2	
Pin 4	Binary data 2^3	
Pin 5	Binary data 2^4	
Pin 6	Binary data 2^5	
Pin 7	Binary data 2^6	
Pin 8	Binary data 2^7	
Pin 9		Variable no. 2^0
Pin 10		Variable no. 2^1
Pin 11		Variable no. 2^2
Pin 12		Variable no. 2^3
Pin 13	Display / clear (1: display, 0: clear)	Variable no. 2^4
Pin 14	Function selection 2^0	
Pin 15	Function selection 2^1	
Pin 16	Strobe (1: apply value now)	
Pin 17-24	n.c.	
Pin 25	GND	

Binary data: Data with a value ranging from 0 to 255 as the number of a text, a graphic or a macro, or as the ASCII character of a variable to be displayed.

Display / clear: Displays or clears the selected object.

Query text: Displays or clears the selected text.

Query graphic: Displays or clears the selected graphic.

Query variable: Displays the ASCII character defined by means of binary data at the position of the selected variable.

Query macro: Starts / stops macro execution at the selected macro.

Strobe: If high level is applied to pin 16 (> 110 ms), the selected data are transferred (command is executed no later than 100 ms after the rising edge, except when the display unit has not yet completed processing of any other command).

Please refer to chapter “Parallel Interface” for details concerning the parallel inputs.

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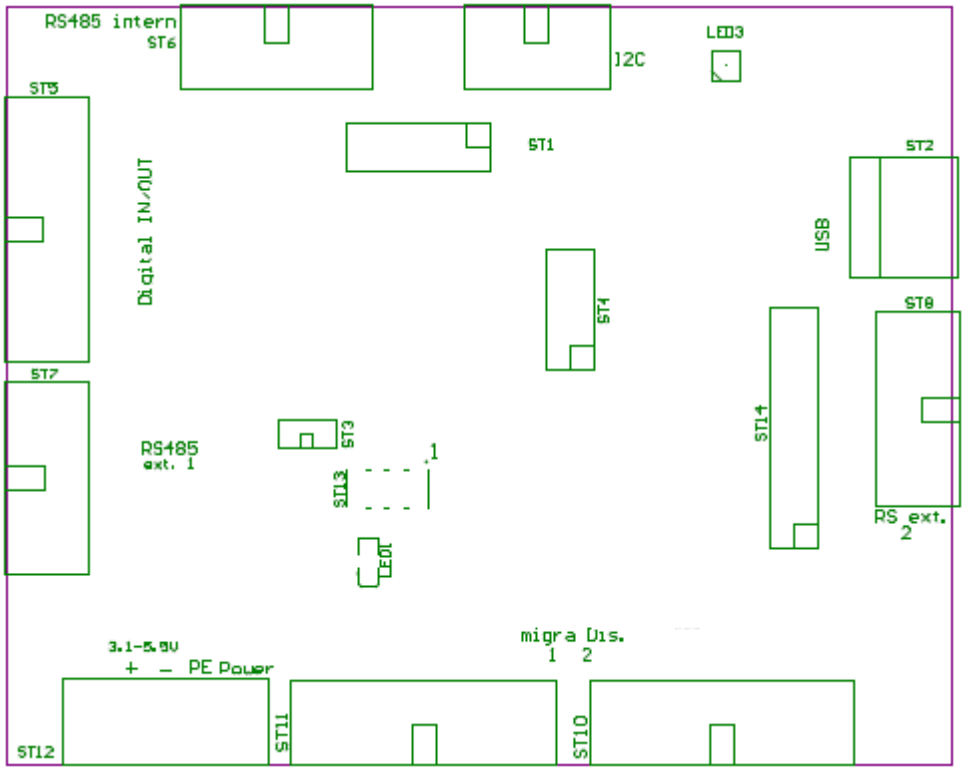
4.1 Interface Configuration / LEDs



The display unit is delivered with the following default settings:

* Baud rate: 19200 baud
* Data bits: 8
* Parity: even
* Stop bits: 1.

For setting the serial interfaces the PC software MKS is mandatory.

LED	Function / Description	
LED 1 (green)	Power-up: Normal operation: Boot mode: Software upload: Configuration: Defective MKS: Defective Micon:	Blinks at a frequency of approx. 2,5 Hz Blinks at a frequency of approx. 5 Hz Blinks at a frequency of approx. 0,5 Hz Flickers during the upload Blinks with an Error Code: 1x Blinks with an Error Code: 2x
LED 3 (blue)	Video-signal: No Video-signal:	On Off

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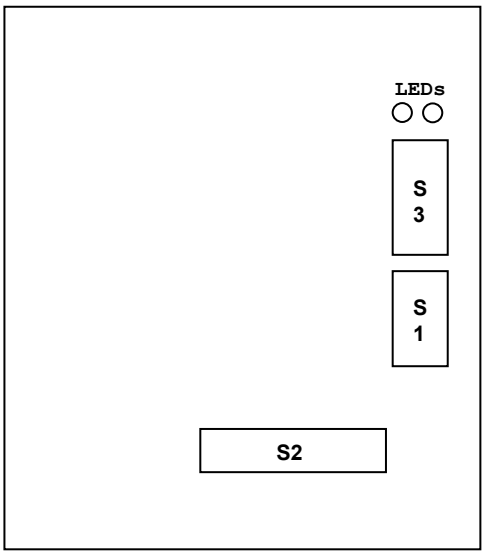
4.2 Profibus DP Interface



Default settings: grey-coloured

S2

DIP Switch	Function	OFF	ON
1	**Profibus address 2^0**	0	1_D
2	**Profibus address 2^1**	0	2_D
3	**Profibus address 2^2**	0	4_D
4	**Profibus address 2^3**	0	8_D
5	**Profibus address 2^4**	0	16_D
6	**Profibus address 2^5**	0	32_D
7	**Profibus address 2^6**	0	64_D
8	reserved	X	
9	**Internal Profibus bus termination**	not set	set
10			

Only DP addresses 0 through 126 are allowed (default setting = 3)!

A bus termination must be set (internally or externally) at the beginning and at end of a Profibus line.

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S1

DIP Switch	Function	OFF	ON
1	Internal (do not change)	X	
2	“		X
3	“		X
4	“		X
5	“		X
6	“		X

S3

DIP Switch	Function	OFF	ON
1	Internal (do not change)	X	
2	“	X	
3	“		X
4	“		X
5	“	X	
6	“	X	
7	“	X	
8	“	X	

LEDs

LED	Status	Meaning
red (FAULT)	ON	no Profibus DP connection or RAM error (if green LED OFF)
	OFF	Profibus DP connection established
green (RUN)	OFF	Controller is not running (hardware error)
	ON	Controller is running
	temporary OFF (blinking)	UART communication (frame has been sent or received)

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5 Appendix

5.1 Displayable Characters

Data bytes are ASCII coded.
Character set: all ASCII characters within a range of 20H to FFH.

Sample character set:

Lower \ Higher	bin 0000 hex 0	0001 1	0010 2	0011 3	0100 4	0101 5	0110 6	0111 7	1000 8	1001 9	1010 A	1011 B	1100 C	1101 D	1110 E	1111 F
bin xxxx0000 hex 0	X	X		0	@	P	`	p	X	X	X	X	X	X	X	X
xxxx0001 1	X	X	!	1	A	Q	a	q	ü	X	X	X	X	X	X	X
xxxx0010 2	X	X	"	2	B	R	b	r	ß	X	X	X	X	X	X	X
xxxx0011 3	X	X	#	3	C	S	c	s	X	X	X	X	X	X	X	X
xxxx0100 4	X	X	$	4	D	T	d	t	ä	ö	X	X	Ä	X	ä	X
xxxx0101 5	X	X	%	5	E	U	e	u	X	X	X	X	X	X	X	X
xxxx0110 6	X	X	&	6	F	V	f	v	X	X	X	X	X	Ö	X	ö
xxxx0111 7	X	X	'	7	G	W	g	w	X	X	X	X	X	X	X	X
xxxx1000 8	X	X	(	8	H	X	h	x	X	X	X	X	X	X	X	X
xxxx1001 9	X	X	)	9	I	Y	i	y	X	Ö	X	X	X	X	X	X
xxxx1010 A	<CR>*	X	*	:	J	Z	j	z	X	Ü	X	X	X	X	X	X
xxxx1011 B	X	X	+	;	K	[	k	{	X	X	X	X	X	X	X	X
xxxx1100 C	X	X	,	<	L	\	l	|	X	X	X	X	X	Ü	X	ü
xxxx1101 D	<CR>*	X	-	=	M	]	m	}	X	X	X	X	X	X	X	X
xxxx1110 E	X	X	.	>	N	^	n	~	Ä	X	X	X	X	X	X	X
xxxx1111 F	X	X	/	?	O	_	o	▩	X	X	X	X	X	ß	X	X

X means not available

*Carriage Return: The cursor jumps to the beginning of the next line.

Any Windows character set, as well as any user defined character set, can be used.

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5.2 Maintenance and Care

Observe the following instructions:

- Make sure that the housing can be opened for adjustment and maintenance even after the display has been installed. Allow for adequate clearance at the back, front and top of the display unit in order to allow for sufficient ventilation (if vent slots are included).
- Display quality is impaired by direct illumination with bright light sources and/or direct sunlight.
- The display must be switched off before cleaning.
- Protect the display from excessive humidity, extreme vibration, direct sunlight and extreme temperatures. Non-observance may lead to malfunctioning or destruction of the device. Under certain circumstances electrical shock, fire and explosion may occur as well. Information concerning allowable ambient conditions, including recommended temperature ranges, can be found in the chapter entitled “Technical Data”.
- The display may not be placed into service if the device and/or the power cable are known to be damaged.
- Do not attempt to repair the device yourself. The guarantee is rendered null and void if the device is tampered with by unauthorised persons.
- Observe all notes and instructions included in this user’s manual.

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5.3 Declaration of Conformity

EU-Konformitätserklärung
EU Declaration of Conformity

Produktbezeichnung: migra
Product name:

Typenreihe: migra PB
Type code:

Hersteller: microSYST Systemelectronic GmbH
Manufacturer: Am Gewerbepark 11
92670 Windischeschenbach

Das bezeichnete Produkt stimmt mit der folgenden Europäischen Richtlinie überein: *We herewith confirm that the above mentioned product meets the requirements of the following standard:*		**Die Übereinstimmung des bezeichneten Produktes mit den Vorschriften der angewandten Richtlinie(n) wird nachgewiesen durch die Einhaltung folgender Normen / Vorschriften:** *The conformity of the product described above with the provisions of the applied Directive(s) is demonstrated by compliance with the following standards / regulations:*
Richtlinien / *Directives*		**Europäische Norm** / *Standard*
EMV Richtlinie *EMC Directive*	**2014/30/EU**	EN61000-6-2:2005
		EN61000-6-4:2007 +A1:2011
Niederspannungs-Richtlinie *Low Voltage Directive*	**2014/35/EU**	EN IEC 62368-1:2021-05
RoHS Richtlinie *RoHS Directive*	**2011/65/EU**	EN50581:2012

Windischeschenbach, 04.05.2021

Manuel Raß

Geschäftsführer / *General Manager*

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5.4 Guarantee

The display is guaranteed for the duration described in the “General Terms and Conditions regarding manufactured products and services rendered for the electrical industry” against defects which existed at the time the device was delivered to the buyer.

The device is subject to technical change without notice. Errors and omissions are excepted. No claims can be honoured for the shipment of a new product. The buyer is required to make notification of defects within 2 weeks after identification of such. Non-observance of notification requirements is equated with acceptance of the defect.

Defects and their symptoms must be described as accurately as possible in order to allow for reproducibility and elimination. The buyer must provide for access to all required and/or useful information regarding defects at no charge, as well as to the affected devices, and must make all of the required data and machine time available free of charge.

The guarantee does not cover defects which result from non-observance of the prescribed conditions of use, or from improper handling.

If the device has been placed at the disposal of the buyer for test purposes and has been purchased subsequent to such testing, both parties agree that the product is to be considered “used” and that it has been purchased “as is”. No guarantee claims may be made in such cases.

The “General Terms and Conditions” regarding manufactured products and services rendered for the electrical industry apply as well.

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5.5 Versions Overview

Version	Date	Remark, Description
1.00	2000-05-23	
2.00	2000-11-15	Bargraph
3.00	2001-01-17	new DP-Interface
3.01	2001-12-04	Example: Onlinetext
3.10	2001-12-12	Kreuzer: Layout
3.20	2001-12-19	Kreuzer: Housing dimensions changed
3.30	2002-02-06	Kreuzer: Receiving timeout changed
3.40	2002-05-06	Kreuzer: New dummy „*“ added
3.50	2002-06-18	Kreuzer: Some examples added
X-M32-9AXX3X-004	2002-08-30	Landgraf: Pin assignmet RS232/RS485 download interface changed.
4.10	2002-12-16	Kreuzer: New logo
4.20	2003-01-23	Kreuzer: New designation Rx/Tx (+/-)
4.30	2003-10-08	Kreuzer: New control unit
4.40	2005-08-16	Kreuzer: Maximum resolution is 4x12 display modules, several ESC sequences in a row are possible, signed integer coded decimal values at bargraphs removed
4.50	2006-03-07	Kreuzer: Separator between several partition frames
4.60	2009-10-01	Kreuzer: Standard values for the bytes DA, SA
4.70	2010-08-16	Technical data updated
5.00	2012-09-24	Nickl: Modifications due to new Profibus interface “miface PB Universal” (HL0115-V1.03 auf HE1018)
5.10	2013-11-22	Company address
5.20	2013-11-23	Logo
5.30	2015-03-11	Designation, declaration of conformity, description of controller board
5.40	2016-04-28	Declaration of conformity
6.00	2016-10-20	Migra ➔ migra MPB
6.10	2017-11-13	Change of address and title MPB
6.20	2021-04-05	Declaration of conformity

Certified per **DIN EN ISO 9001.**

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