migra MPB PN

Large Format, Graphics Compatible Display with Profinet IO Interface

User's Manual

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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: Profinet IO (device), serial interface RS232 (or RS485) or parallel interface (option).
- Configuration with PC software (via serial port)
- Both texts (different font sizes and types) and graphics can be displayed
- 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.

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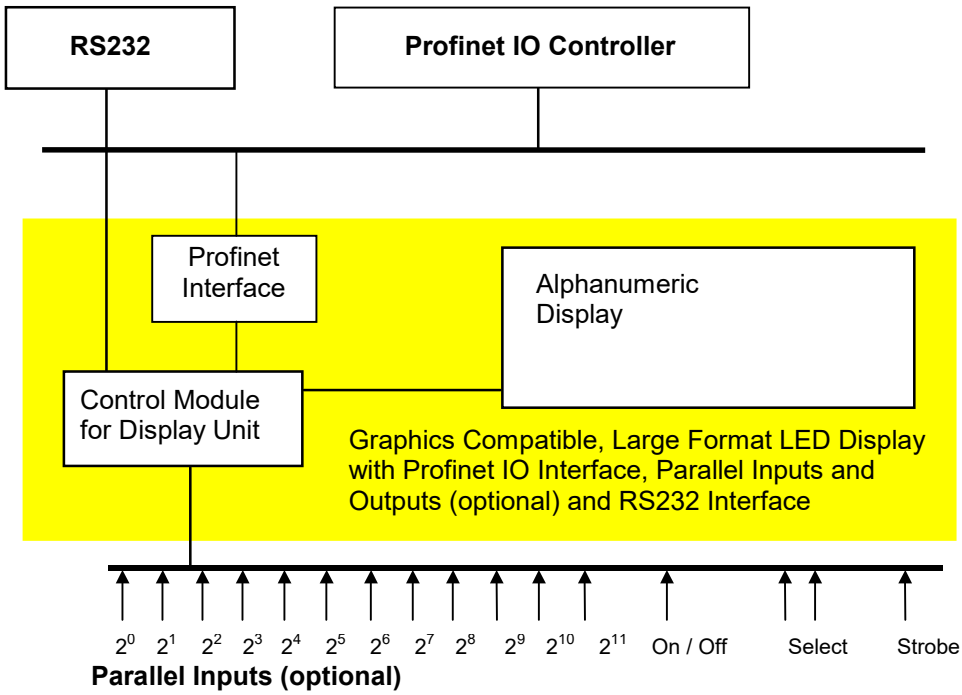
2 System Overview

Schematic diagram of the display unit at the interface:



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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 %
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

Profinet IO Data

Interface:	2 x Profinet IO (with integrated switch)
Baud rate:	100 Mbit/s
Standards:	IEC 61158 / 61784 Profinet IO device RT (conformance class B) Profinet IO device IRT (conformance class C)
Features:	- Base: Siemens ERTEC200 - Real-time classes 1, 2 and 3 - RTA, LLDP, SNMP, MIB-II, LLDP-MIB - MRP (media redundancy) - DCP - Fast Startup - Send clock = 0.25, 0.5, 1, 2, 4 ms - Clock divider = 1…512 (RT), 1…16 (IRT) - Output data width = 0…250 bytes - Input data width = 0…250 bytes - Vendor-/Device-ID = $01CF_h$ / 0001_h

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:
☒ Profinet IO RT ☐ RS 232 ☐ digital output
☐ RS 485 ☐ parallel interface ☐ USB

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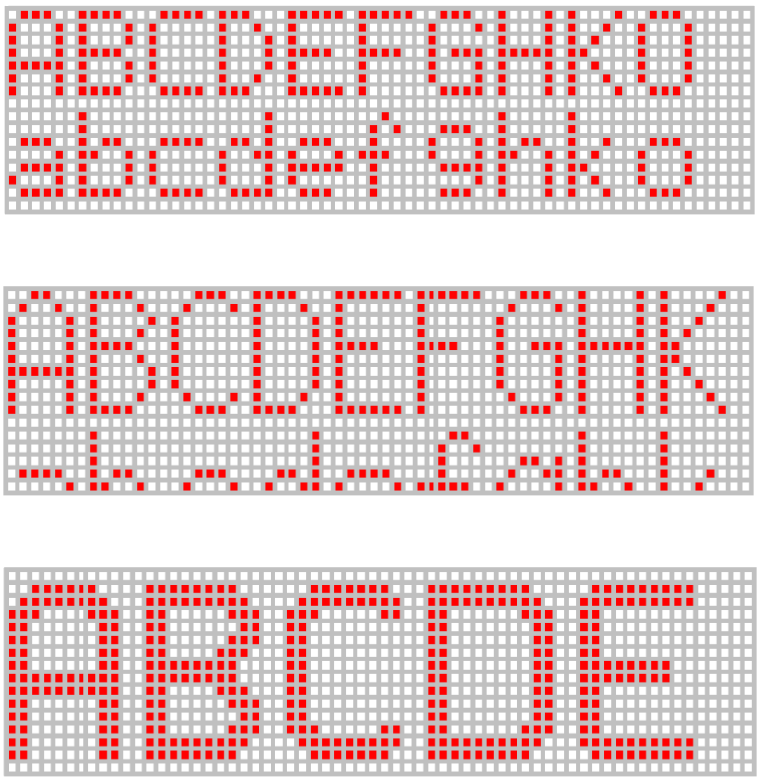
3.3 Display Elements

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 slowly 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

These parameters have no meaning for the Profinet interface.

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

The display unit then tries to connect with the Profinet IO controller.

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3.5 Profinet Interface

Device name at delivery:	None
Max. user data:	250 bytes output data, 250 bytes input data
GSD file:	Is part of the delivery

3.5.1 Communication

The communication between the Profinet controller and the display (Profinet device) happens in cyclic data traffic. The input and output data width is specified by means of the configuration via the Profinet controller.

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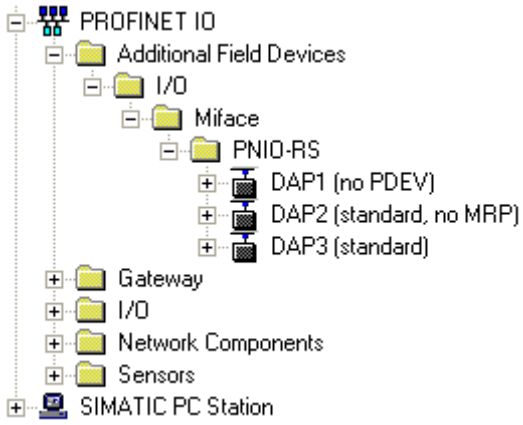
3.5.2 Configuration of the Profinet Controller

The Profinet controller must be configured properly in order to communicate with the Profinet device.

The following descriptions refer to the "HW Config" tool from Siemens and are intended to represent the principle. This works of course with the tools of other manufacturers.

First, the GSDML file (“GSDML-V2.2-microSYST-01CF-MifacePNIO-....xml“) has to be added to the „device catalogue“ of the configuration tool (menu item „Options/Install GSD File...“). Then, the interface is shown in the catalogue view as follows:



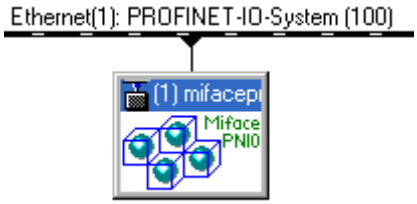
Now you can choose between 3 different „Device Access Points“:

- DAP1 (no PDEV),
  if your Profinet controller does not know a „physical device“
  (usually only with older Profinet controllers)

- DAP2 (standard, no MRP),
  if the MRP ability of the interface shall not be activated.

- **DAP3 (standard)**,
  if the MRP ability of the interface shall be activated.

„Drag“ the needed „DAP“ to your Profinet system:



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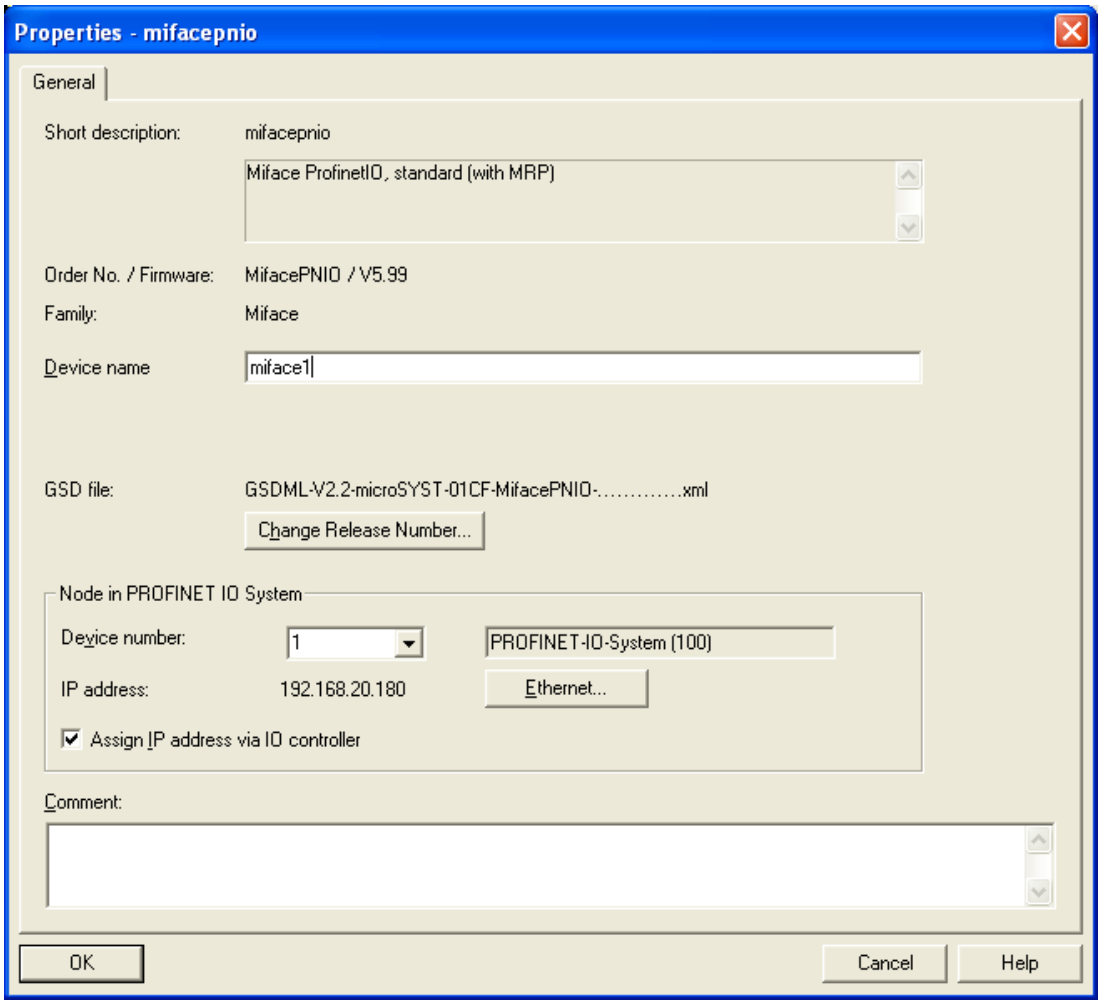
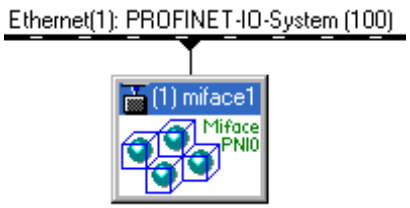
Consider a meaningful name for the device and rename the interface (here “**miface1**”) accordingly:





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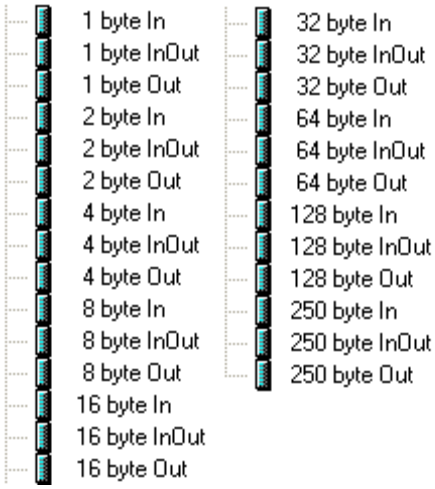
In the next step the I/O data width of the cyclic Profinet communication must be defined.

The output data width must be at least 2 bytes higher than the largest data frame, that shall be transmitted via the RS interface.
(If no RS frames have to be sent, the output data width can be set to 0.)

The input data width must be at least 2 bytes higher than the largest data frame, that shall be received via the RS interface.
(If no RS frames have to be received, the input data width can be set to 0.)

There are Profinet IO modules with a data width of 1…250 bytes available:



Adjust the necessary “total I/O data width” with any combination of the modules above (max. 4). Therefore “drag” the I/O-modules into the slots of the Profinet interface and obey that a maximum of 250 output- and 250 input-bytes are allowed.

Example: 240 bytes output, 240 bytes input

Slot	Module	Order number	I Address	Q address
0	*miface1*	*MifacePNIO*		
X1	*Interface*			
X1 P1	*Port 1*			
X1 P2	*Port 2*			
1	128 byte InOut		0...127	0...127
2	64 byte InOut		128...191	128...191
3	32 byte InOut		192...223	192...223
4	16 byte InOut		224...239	224...239

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Example: 40 bytes output, 16 bytes input

Slot	Module	Order number	I Address	Q address
0	*miface1*	*MifacePNIO*		
X1	*Interface*			
X1 P1	*Port 1*			
X1 P2	*Port 2*			
1	32 byte Out			0...31
2	8 byte Out			32...39
3	16 byte In		0...15	
4				

Do not forget to define the I/O-addresses according to your needs!

The setting “Slot X1 / IO Cycle / Update time” should be 8 ms at least (avoid unnecessary network load)!

After finishing the Profinet configuration, it must still be loaded into the Profinet controller:

-  „Station/Save and Compile“
-  „PLC/Download...“

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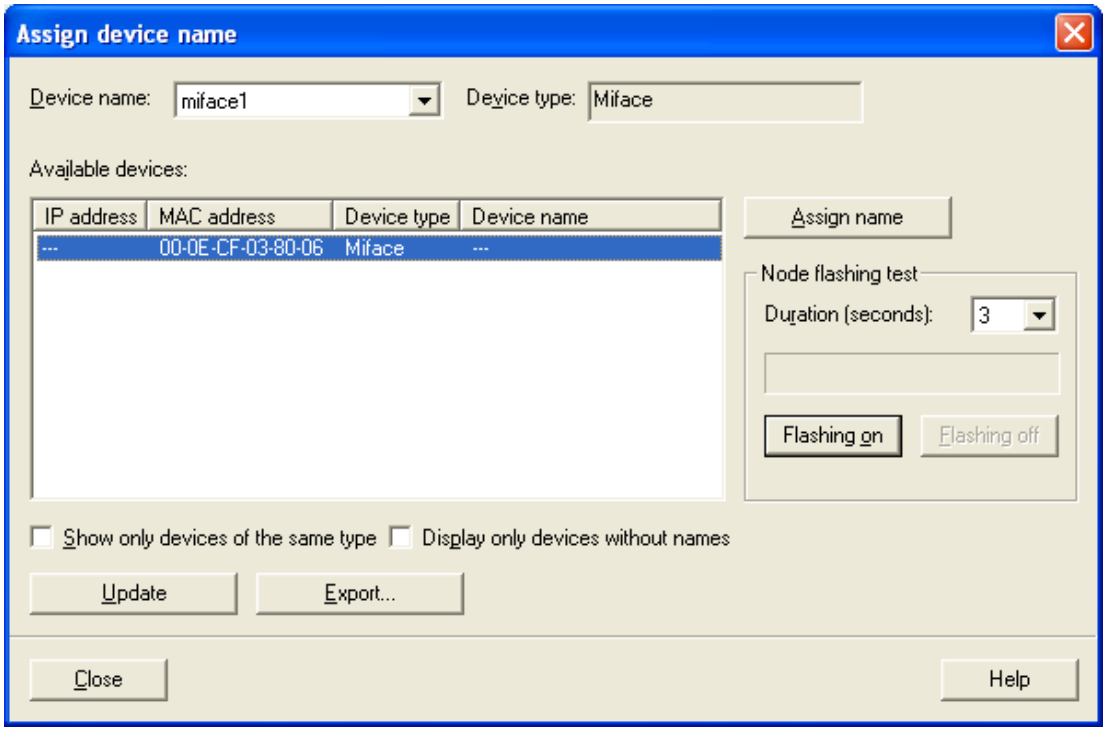
3.5.3 Profinet Device: Assign Name

The Profinet device must be assigned (one time) the device name, which also was chosen in the Profinet controller configuration ("**miface1**" in the example above).

For this, connect the device to the Profinet network and establish its power supply.

Start the tool for setting the device name:

- Mark(click) the concerned device in the bus overview
- Select the menu item „PLC/Ethernet/Assign Device Name...“
- Mark(click) the line with the corresponding device (see MAC-address)
- Click „Assign name“
- Close window



Tip: If you want to find the device of the marked line, you can click on „Flashing on“. The LED 1 (green) of the corresponding interface starts to blink then.

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3.5.4 Start of Profinet Communication

After power-on of the device, the connection between the Profinet controller and the Profinet device is established automatically (this can last up to approximately 10 seconds). To let this happen, the PN controller must be correctly configured and the PN device must have the matching name.

The LED 2 (red) of the interface goes out, as soon as the Profinet connection is established.

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3.5.5 Send Data Frame (Profinet Output -> Display)

Profinet Output Data					
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**...**	**Byte n**
Toggle byte	Frame length	Interface data according to chapter „Online Frame Layout (Interface Data)“			

In order to transmit a frame to the display, the individual frame bytes must be entered at the Profinet side in output bytes 3 through n.
After the frame length has been entered (output byte 2), the toggle byte (output byte 1) must be changed in order to start transmission.

The toggle byte is not checked again until the current frame has been transmitted over the internal serial interface.

Example frames can be found in the chapter “Examples”.

3.5.6 Receive Data Frame (Display -> Profinet Input)

Profinet Input Data					
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**...**	**Byte n**
Toggle Byte	Frame length	Response data according to chapter “Response frames”			

Each time a “response frame” has been received from the display, received data bytes are entered as input bytes 3 through n, and the frame length is entered as byte 2.
Finally the toggle byte is increased by 1.

Thus only the toggle byte needs to be monitored at the Profinet controller side. As soon as it changes, data of the received frame can be read out (and the next telegram can be sent).

Example frames can be found in the chapter “Examples”.

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3.6 Online Frame Layout (Interface Data)

Each of the frames transmitted to the large format display consist of 3 parts:

Header	Data Unit	Trail

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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3.6.1 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: RS485 address of the internal controller: 81_H
This is a static value.

SA: Source address: 80_H
This is a static value.

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

3.6.2 Data Unit

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

Data Unit: Data bytes (ASCII characters, control commands).

3.6.3 Trail

If bit 1 is not set in the FC byte (do not use checksum):

ETX
End of Text
00000011_B

End of text: 03_H.

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3.7 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 texts, graphics, variables, character set and bargraphs are 0-based (even in the PC software)!

Frames which contain no online text (ASCII codes 20_h through FF_h, 10_h and 13_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 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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3.7.1 Online Texts

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

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, read-out is continued at the next line, or at the first line of the display unit.

3.7.1.1 Selecting a 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": uniform character width	"0" – "9"	"0" – "9"

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

50 mm (1.97'') character set (character set "Z00", "z00")
75 mm (2.95'') character set (character set "Z01", "z01")
100 mm (3.94'') character set (character set "Z02", "z02").

Existing character sets are overwritten with the new character sets if a new configuration is uploaded to the display unit!

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3.7.1.2 Positioning 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”

3.7.1.3 Configuring 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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3.7.2 Texts, Graphics, Variables and Bargraphs

3.7.2.1 Querying 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!

3.7.2.2 Adjusting Speed for Moving Screen Texts

Byte 1	Byte 2	Byte 3
ESC	Function	Moving Screen 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), and this setting is always activated each time the device is switched on.

3.7.2.3 Querying 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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3.7.2.4 Querying 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!

3.7.2.5 Setting the 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”	“=”: put	“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 read out!

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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3.7.2.6 Increasing and Decreasing 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 single 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 is read out!

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.

3.7.2.7 Positioning the 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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3.7.2.8 Querying Bargraphs

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Bargraph-No. 100s	Bargraph-No. 10s	Bargraph-No. 1s
$1B_h$	„W“	„+“: display „-“: clear	„0“-„9“	„0“-„9“	„0“-„9“

Displaying a bargraph means to show the last sent value (which is equal to the reference value after RESET). If a variable is connected to the bargraph then 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 then it will be cleared, too.

At the moment no more than 255 bargraphs (numbers 0 to 254) are allowed.

Each connected variable may have a maximum number of 127 characters.

3.7.2.9 Setting Bargraphs

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
ESC	Function	Set	Bargraph-No. 100s	Bargraph-No. 10s	Bargraph-No. 1s	Kind of Data
$1B_h$	„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 10000s	Decimal Value 1000s	Decimal Value 100s	Decimal Value 10s	Decimal Value 1s
„+“, „-“	„0“-„9“	„0“-„9“	„0“-„9“	„0“-„9“	„0“-„9“

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

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

At the position of the reference value the bar will be shown in its configured colour.

Passing one of the colour-borders (starting at the reference value) the bar will be shown in a new colour (defined with the border) after this point.

Four colour-borders are defined. Each one must be in the range „MIN-border ... 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 bargraph as a multi-coloured bar (standard), 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 multi-coloured bar.

If the current value is not in the range „MIN-border ... MAX-border“ then a blinking mark will be shown at the MIN- or MAX-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 (i.e. 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, 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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3.7.3 Direct Graphic Control

3.7.3.1 Clear Display and Fill

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

3.7.3.2 Setting the Decimal Point

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Colour	x pos. hun-dreds	x pos. tens	x pos. ones	y pos. hun-dreds	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”

3.7.3.3 Reading Out the Decimal 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 pos. hun-dreds	x pos. tens	x pos. ones	y pos. hun-dreds	y pos. tens	y pos. 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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3.7.3.4 Drawing 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-Hand 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-Hand 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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3.7.3.5 Scrolling

3.7.3.5.1 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”

Scrolls once through a portion of the screen from the start line to the end line (speed = “static”) or cyclically in steps with a value ranging from 1 to 9 pixels.

The Y positions of the first and last pixel lines within the scrolling range define the start and end lines (end line > start line!). Only the last selected scrolling range is used!

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3.7.3.5.2 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”

Scrolls once through a portion of the screen from the start line to the end line (speed = “static”) or cyclically in steps with a value ranging from 1 to 9 pixels.
The y position of the first and last pixel lines within the scrolling range define the start and end lines (end line > start line!). Only the last selected scrolling range is used!

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3.7.4 General Functions

3.7.4.1 Selecting Blinking Period Duration

Byte 1	Byte 2	Byte 3
ESC	Function	Blinking 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 (“9”) is activated each time the device is switched on.

3.7.4.2 Adjusting 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” – “2”	“0” – “1”	“0” – “9”	“0” – “9”

Within a range of 0 to 100% for each of the following colours:
“1” = green
“2” = red.

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3.7.5 Digital Inputs and Outputs

The large format display can be equipped with up to 16 digital inputs and 16 digital outputs (optional).

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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3.7.6 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.

3.7.6.1 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.

3.7.6.2 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.

3.7.6.3 Stop Macro Execution

Byte 1	Byte 2
ESC	Function
$1B_h$	“E”

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3.8 Response Frames

A response frame is only transmitted if the corresponding bit (bit 0) was set in the FC byte, and if the broadcast address (127) has not been used as the destination address.

Example: display address = 1, master address = 0

Response frame from the display to the master:

STX	DA	SA	FC	Data-Unit	ETX
Start of text	Destination address	Source address	Frame control	Error code	End of text
00000010_B	10000000_B	10000001_B	10000000_B		00000011_B
2	128	129	128	“0” – “5”	3

Error Codes and their Meanings:

Value (ASCII character)	Meaning
“0”	No error
“1”	Incorrect checksum
“2”	Reserved
“3”	Incorrect number of data bytes (LEN-H/L), 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 (“reading out decimal point from the display”, “digital inputs and outputs”).

The error code in the response frame always relates to the last partition frame.

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3.9 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“ $31_D = 1F_H$ from the ESC-sequence. The separator itself is not evaluated.

The maximum length of the data unit of a complete frame is 230 characters.

Example:

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

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

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3.10 Examples

3.10.1 Write Online Text „Hello“ (with response frame)

This example shows the operation with a response frame (byte FC = 81_H). In principle, the controlling works without a response (FC = 80_H) if you keep enough time for operation of the command after the frame transmission.

1. Write to Output-Area:

TB	LB	STX	DA	SA	FC
Toggle-Byte	Length	Start of Text	migra address	Source address	Frame Control
00_H	$0A_H$	02_H	81_H	80_H	81_H

→

→

Data Unit (Online-Text)					ETX
„H“	„e“	„l“	„l“	„o“	End of text
48_H	65_H	$6C_H$	$6C_H$	$6F_H$	03_H

2. Change Toggle-Byte:

TB	LB	STX	DA	SA	FC
Toggle-Byte	Length	Start of Text	migra address	Source address	Frame Control
01_H	$0A_H$	02_H	81_H	80_H	81_H

→

→

Data Unit (Online-Text)					ETX
„H“	„e“	„l“	„l“	„o“	End of text
48_H	65_H	$6C_H$	$6C_H$	$6F_H$	03_H

3. The response frame appears in the input data. The value of the toggle byte has been changed:

TB	LB	STX	DA	SA	FC	Data-Unit	ETX
Toggle-Byte	Length	Start of Text	Destination Address	Source Address	Frame Control	Error Code	End of text
01_H	06_H	02_H	80_H	81_H	80_H	30_H	03_H

4. Display is ready for reception of the next frame.

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3.10.2 Query Text No. 0

1. Write to Output-Area:

TB	LB	STX	DA	SA	FC
Toggle-Byte	Length	Start of Text	migra address	Source address	Frame Control
00_H	$0B_H$	02_H	81_H	80_H	80_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

2. Change Toggle-Byte

3. Wait for execution of the telegram (duration according to selected function and size of the character/graphics approx. 100 ms).

3.10.3 Query Variable No. 1

1. Write to Output-Area:

TB	LB	STX	DA	SA	FC
Toggle-Byte	Length	Start of Text	migra address	Source address	Frame Control
00_H	$0B_H$	02_H	81_H	80_H	80_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

2. Change Toggle-Byte

3. Wait for execution of the telegram (duration according to selected function and size of the character/graphics approx. 100 ms).

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3.10.4 Set Variable No. 1 to „3000“

1. Write to Output-Area:

TB	LB	STX	DA	SA	FC
Toggle-Byte	Length	Start of Text	migra address	Source address	Frame Control
00_H	$0F_H$	02_H	81_H	80_H	80_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

2. Change Toggle-Byte

3. Wait for execution of the telegram (duration according to selected function and size of the character/graphics approx. 100 ms).

3.10.5 Increase Variable No. 1

1. Write to Output-Area:

TB	LB	STX	DA	SA	FC
Toggle-Byte	Length	Start of Text	migra address	Source address	Frame Control
00_H	$0B_H$	02_H	81_H	80_H	80_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

2. Change Toggle-Byte

3. Wait for execution of the telegram (duration according to selected function and size of the character/graphics approx. 100 ms).

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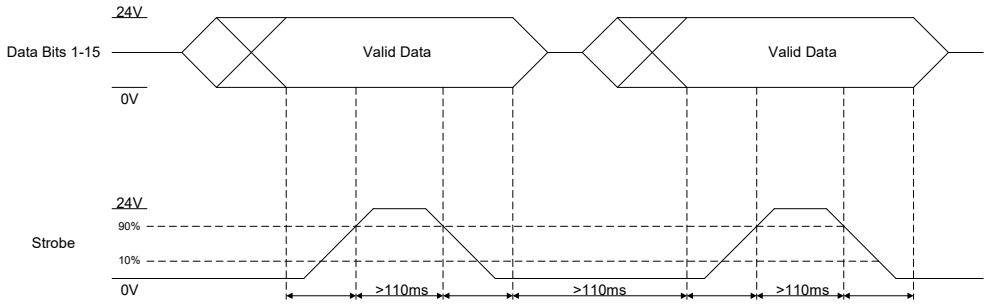
3.11 Parallel Interface

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

3.11.1 Timing at the Parallels Inputs



3.11.2 Input Level 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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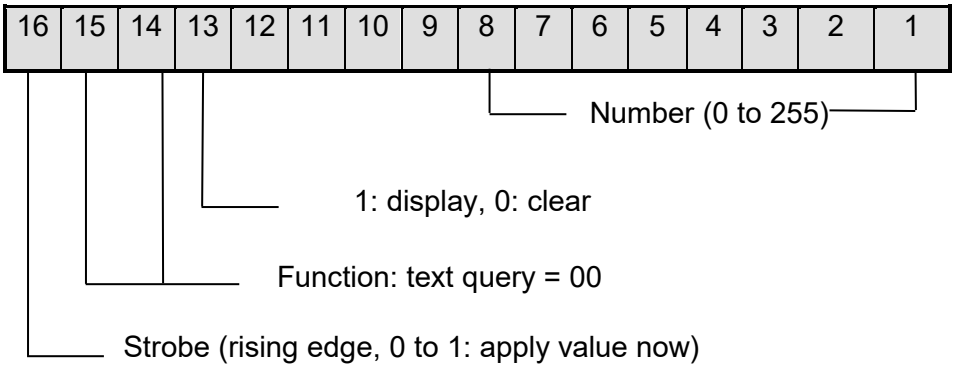
3.11.3 Querying Text



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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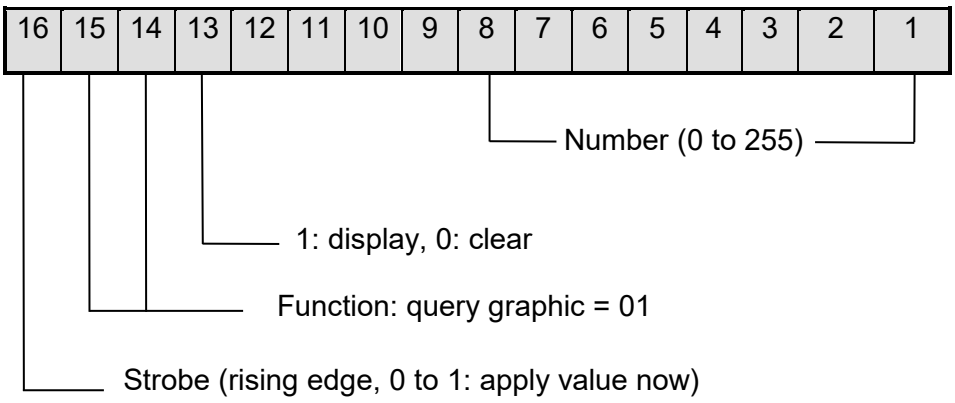
3.11.4 Querying Graphics



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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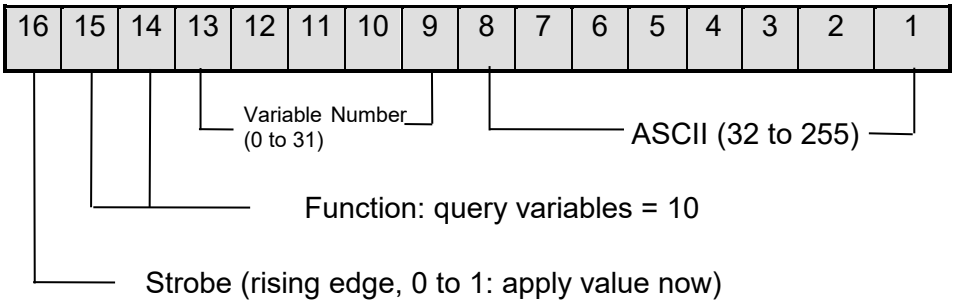
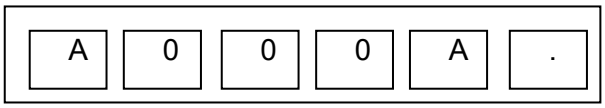
3.11.5 Setting the Variables

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). The inputs must be set up as follows to this end:

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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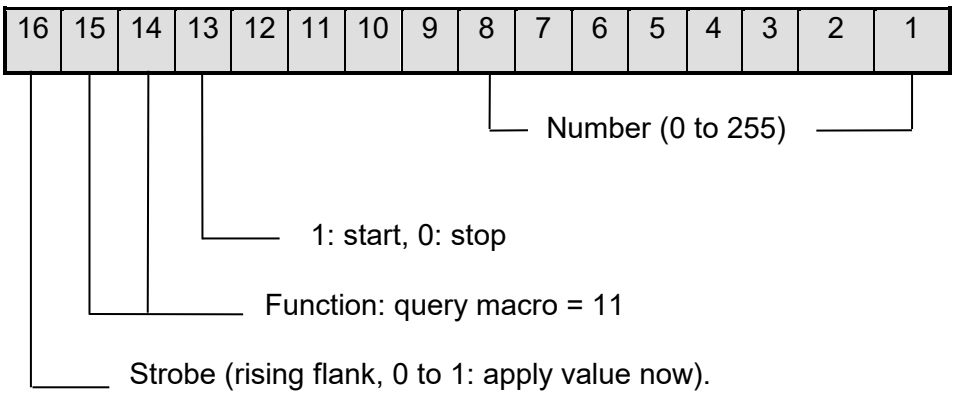
3.11.6 Querying Macros



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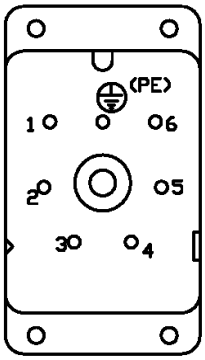
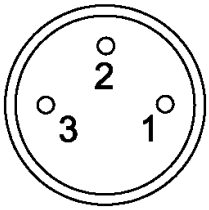
4 Connector Pin Assignments

7-Pin Mains Plug (230 VAC)



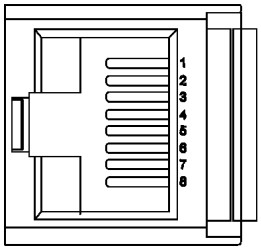
Pin	Assignment
1	L1
2	N
(PE)	PE

3-Pin Round Plug (24 VDC, optional)



Pin	Assignment
1	GND
2	+24 VDC
3	PE

Profinet In / Out



Pin	Assignment
1	Tx +
2	Tx -
3	Rx +
4	n.c.
5	n.c.
6	Rx -
7	n.c.
8	n.c.

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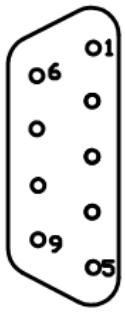
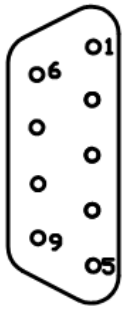
Download RS232



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

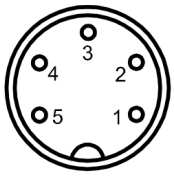
Download RS485 (optional)



Pin	Assignment
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.

Digital Outputs (optional)



Pin	Assignment
1	Relay 1, normally open, a
2	Relay 1, normally open, b
3	Relay 2, normally open, a
4	Relay 2, normally open, b
5	n.c.

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

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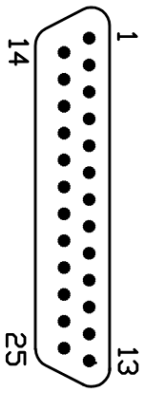
Parallel Input (optional)



Pin		
1	Binary data 2^0	
2	Binary data 2^1	
3	Binary data 2^2	
4	Binary data 2^3	
5	Binary data 2^4	
6	Binary data 2^5	
7	Binary data 2^6	
8	Binary data 2^7	
9		Variable no. 2^0
10		Variable no. 2^1
11		Variable no. 2^2
12		Variable no. 2^3
13	Display / clear (1: display, 0: clear)	Variable no. 2^4
14	Function selection 2^0	
15	Function selection 2^1	
16	Strobe (1: apply value now)	
17 … 24	n.c.	
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 occurrence of the rising edge, except when the display unit has not yet completed processing of a previous command).

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

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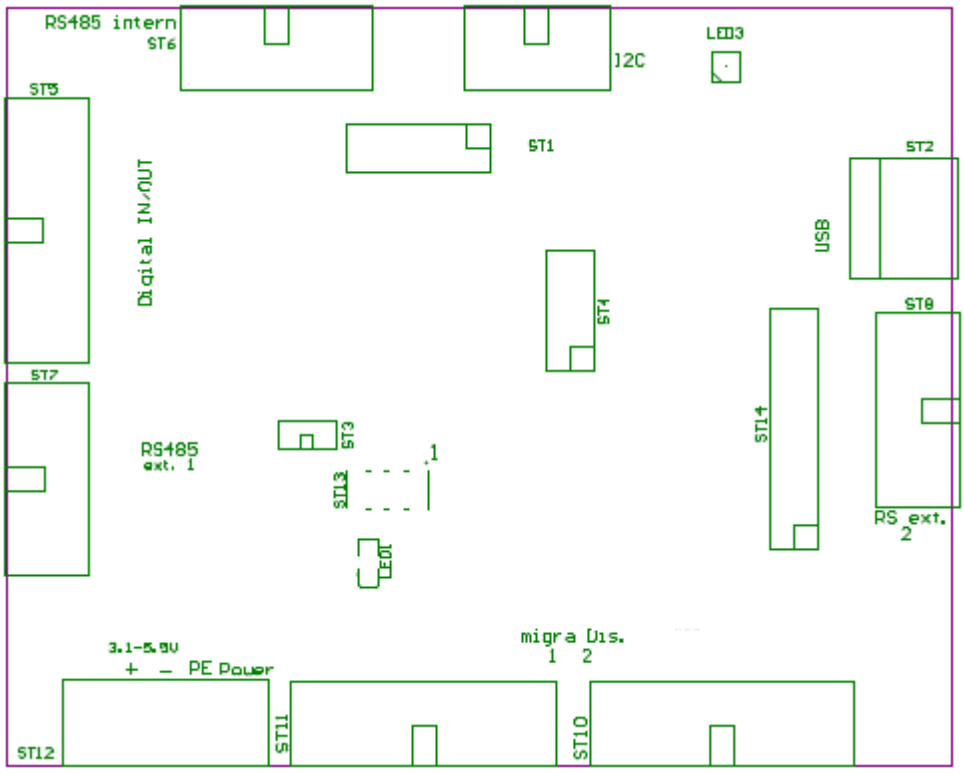
4.1 Interface Configuration / LEDs



LEDs

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

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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.

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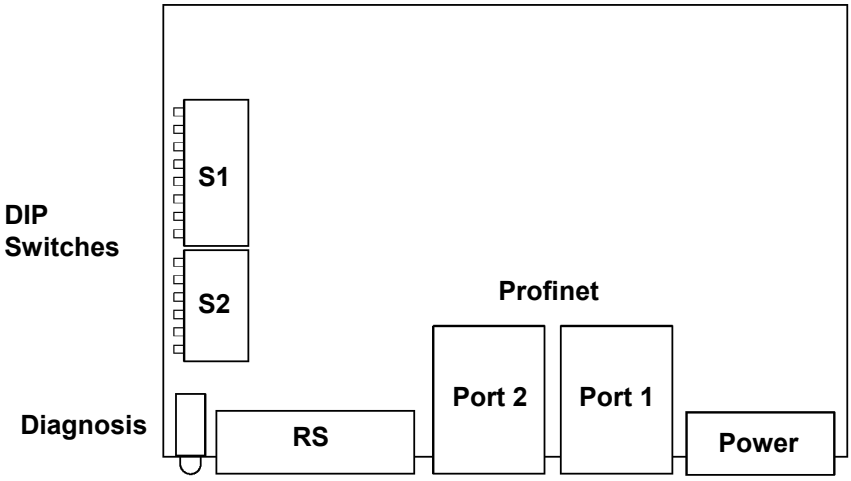
4.2 Profinet Interface



DIP-Switches

The DIP-Switches are set at delivery and must not be changed!

Standard Settings:

DIP-Switch	DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	DIP 7	DIP 8
S1	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
S2 (*1)	ON	OFF	OFF	OFF	OFF	OFF	-	-
S2 (*2)	OFF	ON	ON	ON	ON	ON	-	-

*1: Interface connected via RS232 or „piggyback“ to the Migra-PCB
*2: Interface connected via RS485 to the Migra-PCB

Diagnosis

LED green	Normal: Normal with DCP signalling: Hardware error:	ON blinking OFF
LED 2 red	No Profinet connection: Cyclic Profinet communication runs:	ON OFF

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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 in order to assure best possible performance of the display:

- 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 PN
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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5.1 Warranty / Liability

For the product, liability is assumed for defects, which existed at the delivery date according to our General Terms and Conditions.

Technically changes as well as errors are accepted. A claim for delivery of a new product does not exist. The buyer has to check the received product immediately and indicate evident defects at the latest 24 hours after detection. Non-observance of notification requirements is equated with acceptance of the defect. Not immediately visible defects have to be indicated immediately after their perception too.

Generally, 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 the relevant device and all required and/or useful information at no charge 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 of microSYST Systemelectronic GmbH in current version apply as well.

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5.2 Versions Overview

Version	Date	Remark, Description
1.00	28-9-10	Document created
1.10	13-10-10	Updates
1.20	9-6-11	Chapter “Configuration” changed
1.30	7-2-12	Information to GSD file
1.40	7-3-12	new GSD file, configuration/setup with Siemens-Software, LEDs of the Hilscher module
2.00	17-04-12	Several changes due to a new Profinet Interface
2.01	26-04-12	Standard Settings for DIP S2 more precisely defined
2.10	22-03-13	Company address, declaration of conformity, warranty changed
2.20	18-10-13	Logo
2.30	20-03-15	SC/MC removed
2.40	01-02-16	Declaration of conformity
2.50	29-04-16	Declaration of conformity
3.00	20-10-16	migra ➔ migra MPB
3.10	13-11-17	Change of address and title MPB
3.20	04-05-21	Declaration of conformity

Certified per **DIN EN ISO 9001**.

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