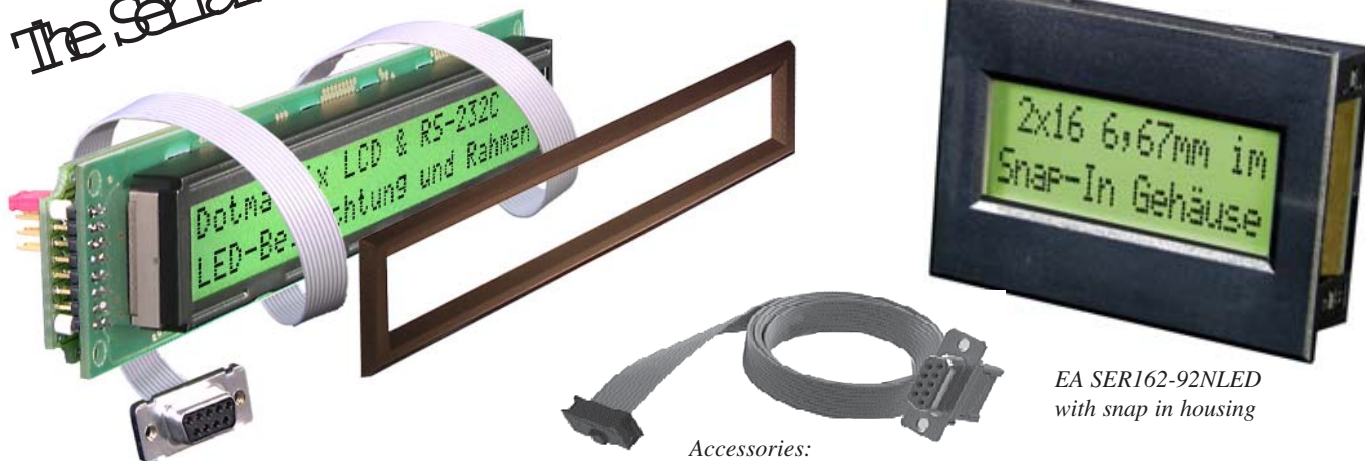


# THE SERIALS

## DOTMATRIX DISPLAYS WITH RS-232

The Serials



EA SER162-92NLED  
with snap in housing

Accessories:  
cable EA KV24-9B  
length: 1,50 m

### FEATURES

- \* 32 DIFFERENT SIZES OF DISPLAYS AVAILABLE (1x8 UP TO 16x40)
- \* SUPPLY VOLTAGE +5V OR OPTIONAL 9..35V<sup>1)</sup>
- \* INCL. LED-ILLUMINATION SWITCHABLE BY MEANS OF SOFTWARE
- \* 25 DISPLAYS WITH YELLOW/GREEN LED-BACKLIGHT
- \* 7 DISPLAYS WITH LOW POWER WHITE LED-BACKLIGHT
- \* 3 DISPLAYS WITH SNAP IN HOUSING
- \* HIGH CONTRAST SUPERTWIST LCD
- \* INCL. FRONTAL BEZEL WITH ANTIGLARE GLASS<sup>2)</sup>
- \* AUTOMATIC LINE MANAGEMENT
- \* CR / LF / SCROLL / CURSOR POSITIONING
- \* BAUDRATE SETTING BY JUMPER: 300, 1200, 2400 OR 9600 BAUD
- \* POTI FOR CONTRAST ADJUSTMENT ON BOARD
- \* MULTIPLE DISPLAYS ON SINGLE RS-232C

### OPTIONS

- \* SUPPLY +9..35V= INSTEAD OF +5V=
- \* RS-422 INTERFACE INSTEAD OF RS-232 (STANDARD)
- \* DIP-SWITCH FOR ADDRESS INSTEAD OF SOLDERBRIDGE

EA OPT-9/35V<sup>1)</sup>  
EA OPT-RS422<sup>1)</sup>  
EA OPT-DIP6<sup>1)</sup>

### ACCESSORIES

- \* CABLE WITH 9-PIN D-SUB FEMALE PLUG FOR PC

EA KV24-9B

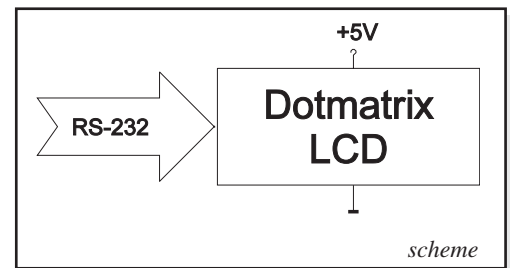
<sup>1)</sup> not available with SER308, SER408, SER3016 and SER4016

<sup>2)</sup> not available with SER082-C, SER204-4, SER242-B, SER3016 and SER4016

**ELECTRONIC  
ASSEMBLY**  
making things easy

## General

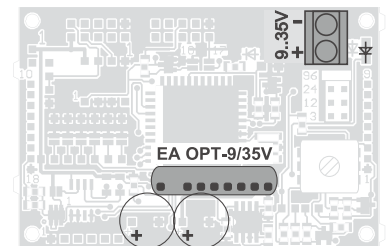
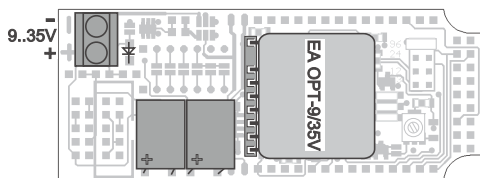
**The Serials** represents a complete LCD-Dotmatrix family with input circuit and frontal bezel. These LCD-modules also includes a RS-232 interface (or optional RS-422). The mounting is done through holes of the LCD-module, the data connection is made to a standard RS-232C/RS-422 interface. Transfer rate can be set by jumper on 300, 1200, 2400 or 9600 Baud. All cursor controls (line feed etc.) are performed automatically. All displays feature LED-backlight illumination. Matching frontal bezel with antiglare glass is included also.



## Power SUPPLY / CONTRAST ADJUSTMENT

Supply voltage is +5V, current consumption depends on type of display and its illumination (100-800 mA, see table on page 20). The Serials can be connected to power either by screw terminals or with RS-232 connector. Display contrast is adjustable by potentiometer.

important: It is imperative that the polarity is correct. Even very brief polarity reversal can damage the entire operating unit immediately and irreparably.

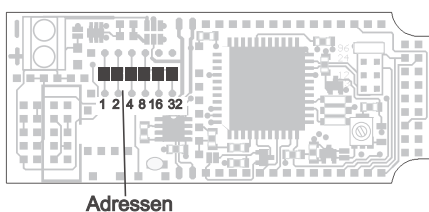


9..35V Versorgung bei Displays im Snap-In

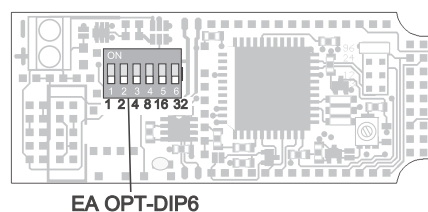
## Multiple Displays on a single RS-232C

A single RS-232C can operate a number of displays. For that an individual address must be assigned to each display. Commands "Select/Deselect" will target each individual display.

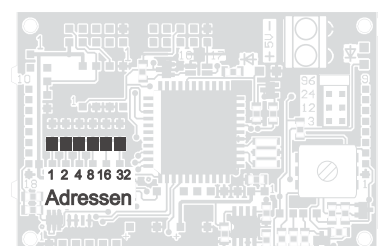
Adresseinstellung per Lötbrücken



Adresseinstellung über DIP-Schalter



Adresseinstellung bei Displays im Snap-In



<sup>1)</sup> not available with SER308, SER408, SER3016 and SER4016

<sup>2)</sup> not available with SER082-C, SER204-4, SER242-B, SER3016 and SER4016

**COMMANDS, DATA TRANSFER**

All incoming datas will be largely interpreted as ASCII datas. When display fills up, the characters automatically scroll to the top. CR/LF will be recognized and executed. FF (12d/\$0C) clears the display. Cursor can be set manually by command i.e. "ESC O" (ESC=27d/\$1B).

TABLE OF COMMANDS					after Reset	
Command	Code				Remark	
Formfeed FF (dec.:12)	^L				Clear screen and place cursor to home position (1,1)	
Carriage Return CR (13)	^M				Set cursor into first column left hand	
Linefeed LF (dec.:10)	^J				Move cursor down to next line	
Cursor positioning	ESC	O	n1	n2	n1=column; n2=line; home-position (1,1) top left hand	1,1
Cursor Form	ESC	C	0		Hidden cursor	3
			1		Cursor in form of a flashing block	
			2		Cursor as an underscore	
			3		Cursor in form of a flashing block with an underscore	
Display Mode	ESC	M	1		Clear-mode; autoflow OFF	4
			2		Clear-mode; autoflow ON	
			3		Scroll-mode; autoflow OFF	
			4		Scroll-mode; autoflow ON	
Select / Deselect	ESC	S	adr		Select interface adress adr=0..254; (adr 255=all)	selected
		D			Deselect interface adress adr=0..254; (adr 255=all)	

The 1-line, 2-line and 4-line displays offer beside standard-commands additional options:

additional commands for 1..4 line displays					after Reset	
Command	Code				Remark	
Display Mode	ESC	M	5		Overwrite-mode; autoflow OFF	4
			6		Overwrite-mode; autoflow ON	
Convert Character Code	ESC	U	0		no character code conversion	1
			1		convert character code to IBM-Code (for english/japanisch character set)	
Define character	ESC	Z	n1	8 x data...	n1=character no. (0..7); data = 8x bytes for new character	
LED backlit on/off	ESC	L	n1		LED backlit n1=0: off, n1=1: on; n1=2: invert; n1=3..255 n1/10 sec. on	on
Write output port	ESC	Y	n1	n2	n1=0: Set all 6 output ports in accordance with n2 (=6-bit binary value) n1=1..8: Reset output port n1 (n2=0); set (n2=1); invert (n2=2)	all 1
Version Number	ESC	V			Shows the version number on the display	
Reset	ESC	R			Resets and re-initializes the display and controller. Before sending new data over the RS-232/RS-422 wait 500.	

The 8-line and 16-line displays offer beside standard-commands additional options:

additional commands for 8- and 16-line displays					after Reset	
Command	Code				Remark	
Display Mode	ESC	M	5		Clear-mode; autoflow OFF	4
			6		Clear-mode; autoflow ON	
			7		Scroll-mode; autoflow OFF	
			8		Scroll-mode; autoflow ON	
Set letter type	ESC		N		Set standard type; black letters; bright background	N
			I		Set inverse letters; bright letters; black background	
			B		Flashing letters; black letters flash on bright background	
			L		Invers+flashing; bright letters flash on black background	
Save actual settings	ESC	P			Saves cursorform, display-mode and font-type in EEPROM	
Select / Deselect	ESC	A	adr		Assignes a new select/deselect adress (8 bit) to the interface	

## RS-232C Connection / Baud rates

Connection to RS-232C or RS-422 interface is made on a 2x5 pin type socket. With cable EA KV24-9B (accessories not for RS-422) **The Serials** are ready to be connected directly to a PC. Transfer rate can be set by jumper on 300, 1200, 2400 or 9600 Baud.

Data format:



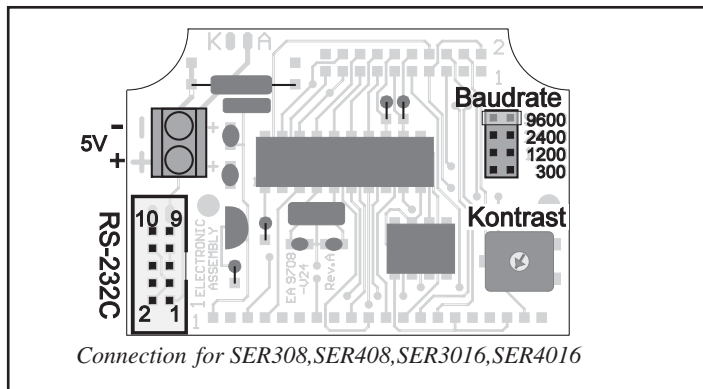
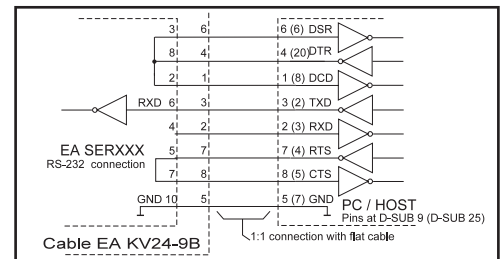
If no jumper is set during power on, the display switches into self test mode and shows its character set.

If the operating unit is ordered together with the EA OPT-RS422 option, special RS-422 drivers are fitted. The pin assignment in the table on the right then applies.

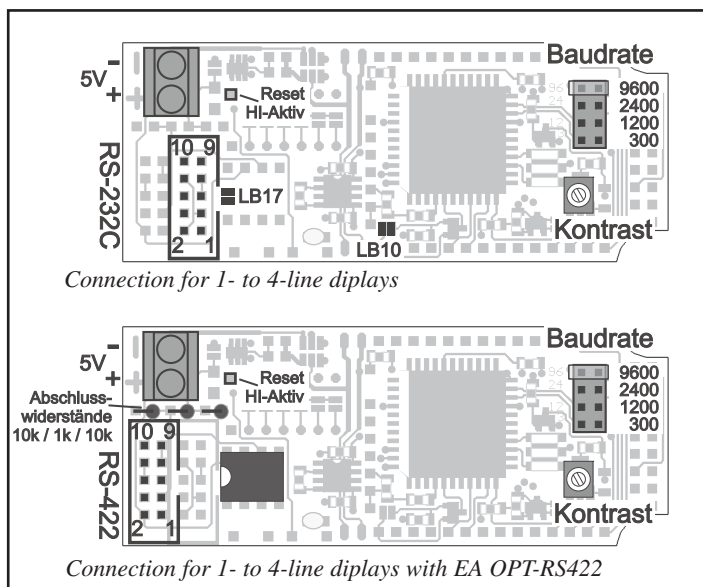
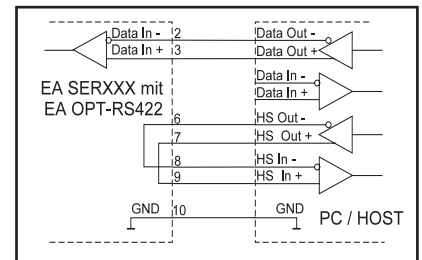
Incidentally, the same serial data with 5V level and CMOS logic is available at Pin 9. These level are suitable for direct connection to a  $\mu$ C. If these signal is used, the solder straps LB 10 + LB 17 must be closed!

RS-232C socket (2x5 pins)					
Pin	Symbol	Function	Pin	Symbol	Function
1	VDD	+5V	2	DCD	connection to DSR and DTR
3	DSR	connection to DCD and DTR	4	NC	not connected
5	CTS	CTS and RTS bridged	6	RXD	data input
7	RTS		8	DTR	connection to DSR and DCD
9	RXD5 CMOS	close LB10+LB17	10	GND	0V

RS-422 socket (2x5 pins)					
Pin	Symbol	Function	Pin	Symbol	Function
1	VDD	+5V	2	Data In-	Receive Data
3	Data In+	Receive Data	4	NC	not connected
5	NC	not connected	6	HS In-	HS In- and HS Out-bridged
7	HS In+	HS In+ and HS Out+ bridged	8	HS Out-	
9	HS Out+		10	GND	0V

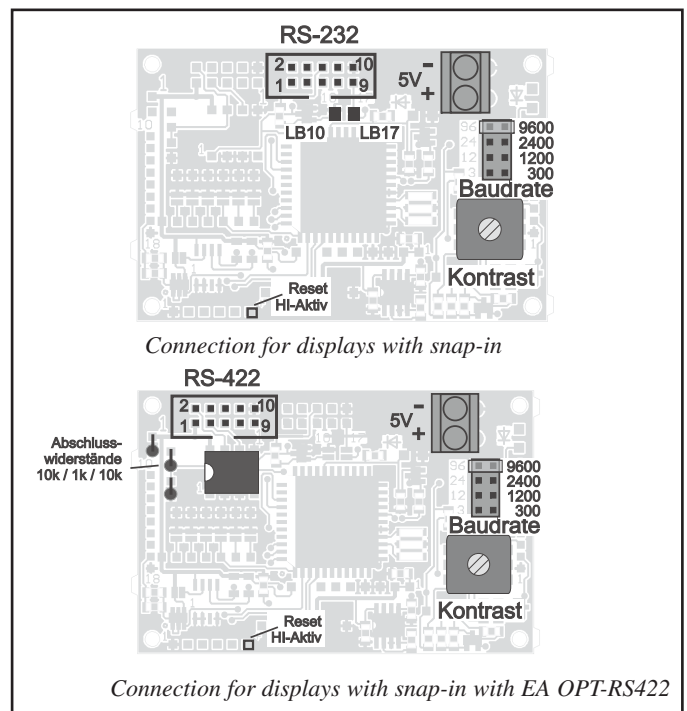


Connection for SER308, SER408, SER3016, SER4016



Connection for 1- to 4-line displays

Connection for 1- to 4-line displays with EA OPT-RS422

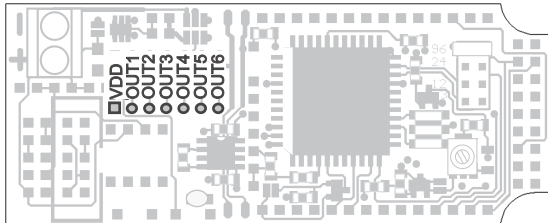


Connection for displays with snap-in

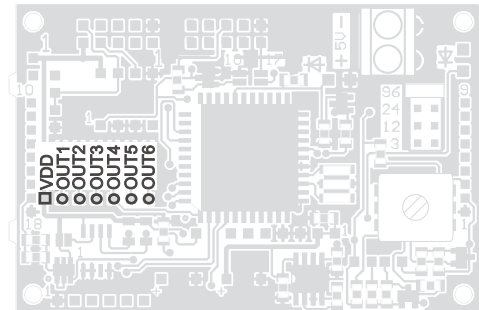
Connection for displays with snap-in with EA OPT-RS422

**Digital output<sup>1)</sup>**

There are up to 6 digital outputs OUT1..OUT6. They share with the solder link for address setting (cannot be used with EA OPT-DIP6). When one or more outputs are used, the possibility for address set is limited automatically.



All versions except EA S ERxx-92



Displays with Snap-In case (EA SERxx-92)

After Power-On all output are set to HIGH. Setting an output will be done by following command:

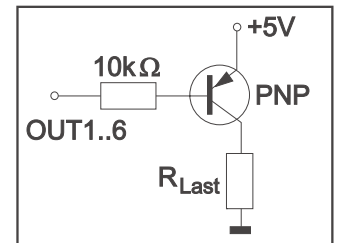
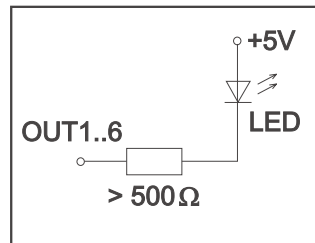
**'ESC Y n1 n2'**

**n1:** Output no. 1, 2, 3, 4, 5 or 6

**n2=0:** Output set to LOW (0V); **n2=1:** Output set to HIGH (5V); **n2=2:** Invert output

**Application example<sup>1)</sup>**

Each output line provides a NPN transistor with about 50kOhm pull-up resistor; i.e. only LO level is able to supply about 10mA. In summary current for OUT1..OUT6 may not exceed 15mA. HIGH level is able to source up to 100µA only. Driving a higher load signal must be amplified by an external transistor or MOSFET.



<sup>1)</sup> not for SER308, SER408, SER3016 and SER4016

**Self defined character<sup>1)</sup>**

8 character (ASCII codes \$00..\$07) are presetted with " ", "±", "2", "3", "β", "Ä", "Ö", "Ü" and can be redefined with the command "ESC Z n1 data...". After re-definition the presetted codes are no longer available. It makes sense to switch off the relocation of ASCII codes via command 'ESC U 0'.

After power-on or reset the predefined codes are available again.

**Example:**

ESC Z \$00 \$04 \$04 \$04 \$04 \$15 \$0E \$04 \$00

After that, character code \$00 is defined as an downside arrow.

Note: For definition 8 data bytes are necessary.

character data						
bit value						hex (dez)
16	8	4	2	1		
0	0	1	0	0		\$04 (4)
0	0	1	0	0		\$04 (4)
0	0	1	0	0		\$04 (4)
0	0	1	0	0		\$04 (4)
1	0	1	0	1		\$15 (21)
0	1	1	1	0		\$0E (14)
0	0	1	0	0		\$04 (4)
0	0	0	0	0		\$00 (0)

<sup>1)</sup> not for SER308, SER408, SER3016 and SER4016: only the complete character set can be exchanged



Character set:

1- to 4-line displays

All character listed beside are built-in for the 1- to 4-line displays.

Table mapping 4-bit codes to characters for 1- to 4-line displays. Columns: Lower 4 bit (xxxx0000 to xxxx1111), Upper 4 bit (0000 to 1111). Rows: \$x0 to \$xF.

Character set:

EA SER204-92HNLED

The EA SER204-92HNLED do have a different character set.

Character set:

8- and 16-line displays

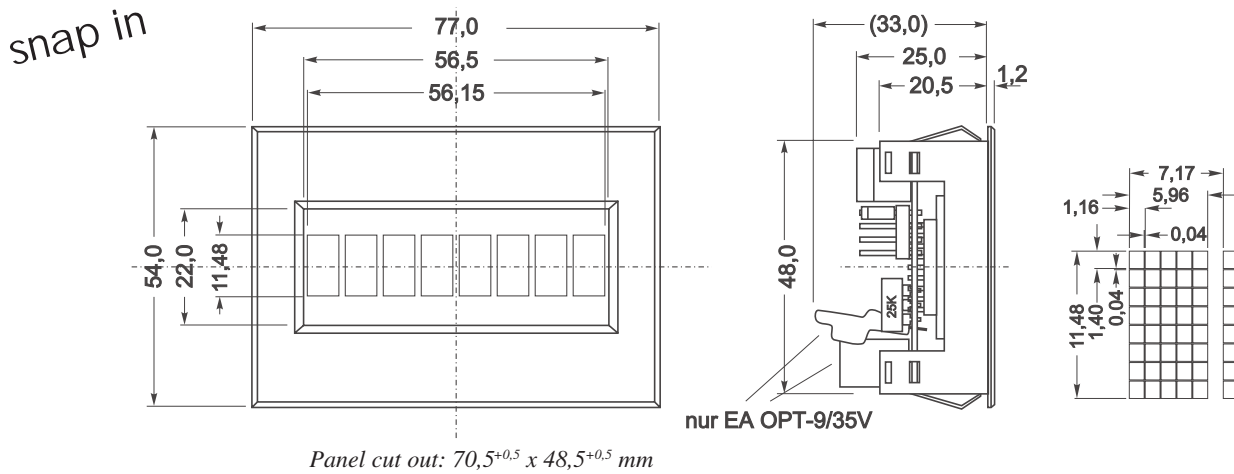
All 8- and 16-line displays EA SER308, SER408, SER3016 und SER4016 do provide the extended IBM character set (codes 32..255) incl. frame symbols. It is also possible to exchange the character set totally (e.g. for cyrillic or special codes). This can be done together with the tools on EA DISK9708\*).

Table mapping codes to characters for 8- and 16-line displays. Columns: + Lower Upper (\$0 to \$F), Lower bits (\$0 to \$F). Rows: \$20 (dez: 32) to \$F0 (dez: 240).

\* also in internet at http://www.lcd-module.de/deu/disk/disk9708.zip

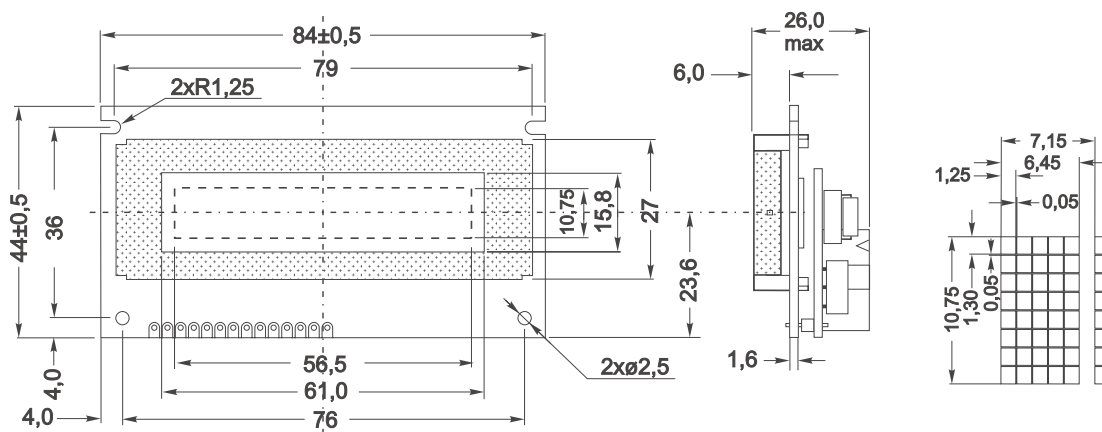
**EA SER081-92NLED**

incl. snap in housing EA 0092-KE  
1x8,ZH 11.48mm



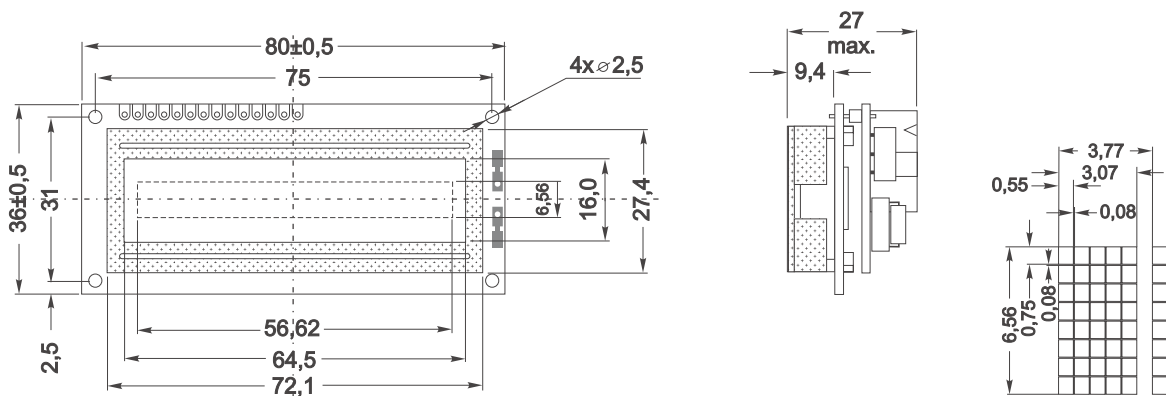
**EA SER081-CNLED**

incl. frontal bezel EA 017-2UKE  
1x8,ZH 10.8mm



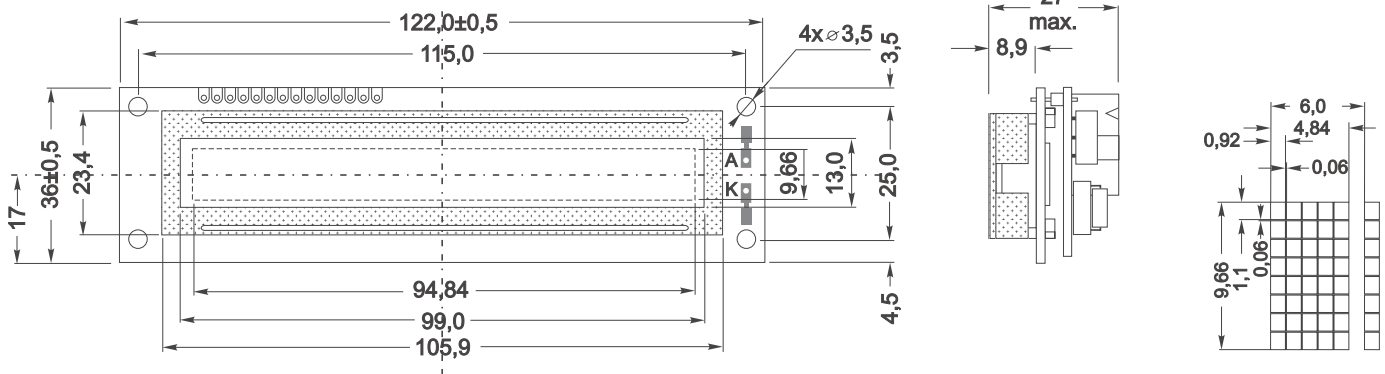
**EA SER161-DNLED**

incl. frontal bezel EA 017-1UKE  
1x16,ZH 6.6mm



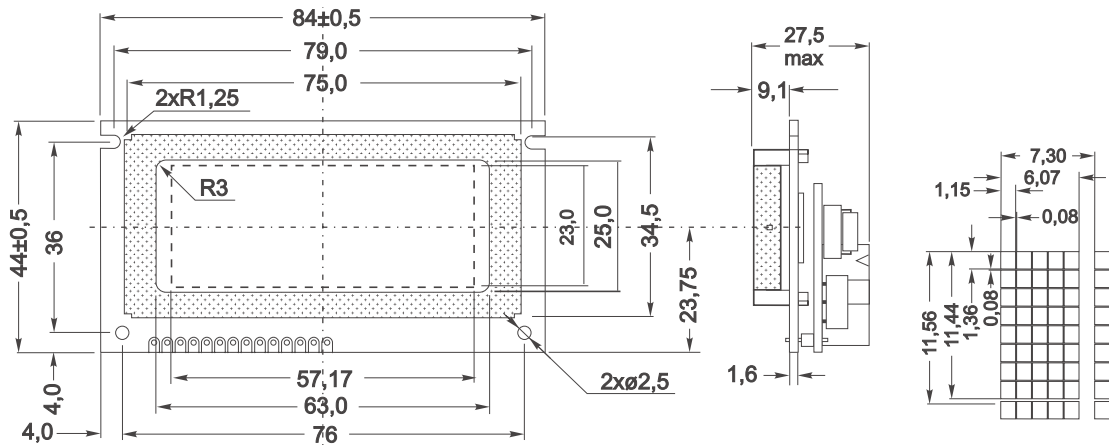
## EA SER161-ENLED

incl. frontal bezel EA 017-6UKE  
1x16,ZH 9.66mm



## EA SER082-CNLED

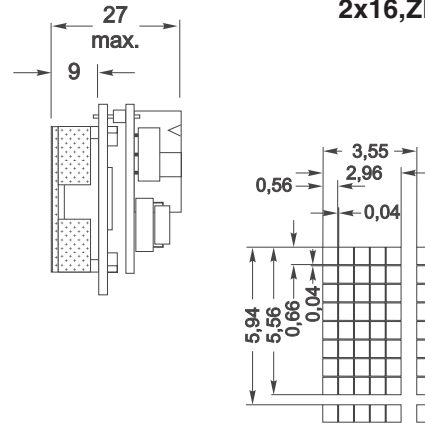
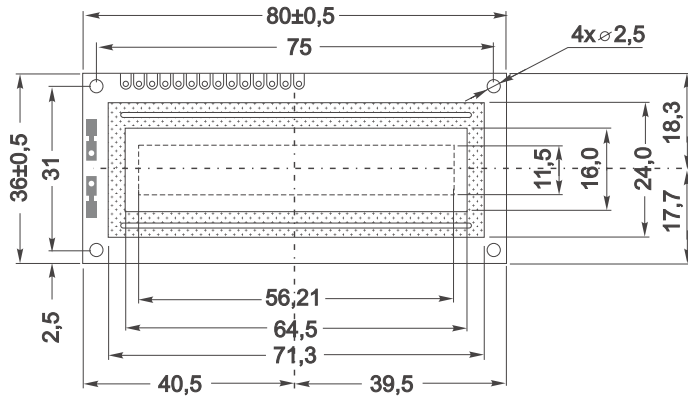
incl. frontal bezel EA 017-8UKE  
1x8,ZH 11.44mm





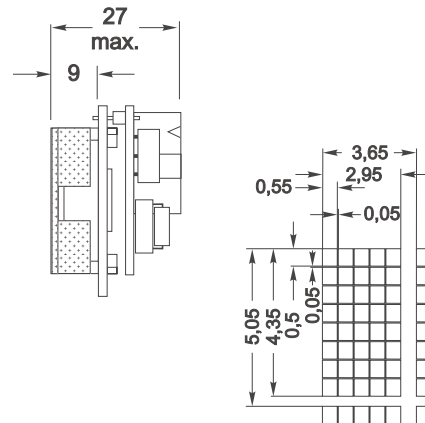
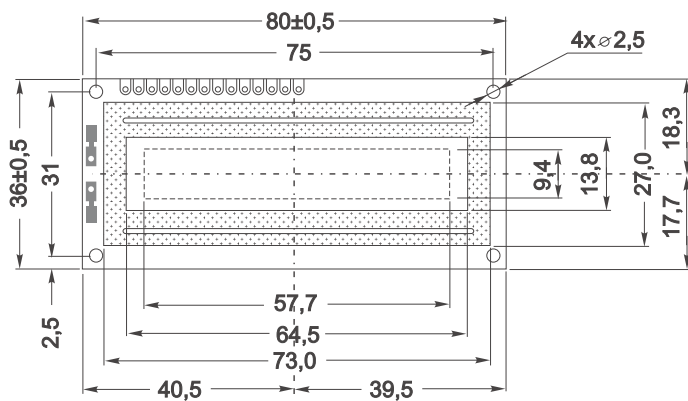
## EA SER162-N3LW *blue/white*

incl. frontal bezel EA 017-2UKE  
2x16,ZH 5.55mm



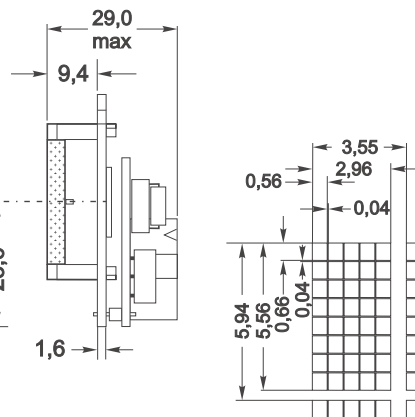
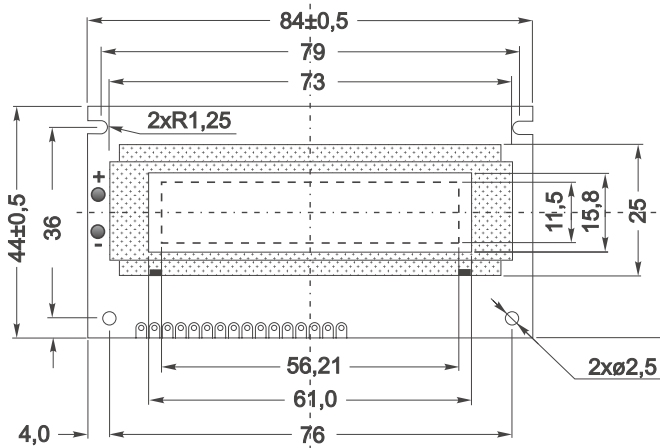
## EA SER162-CNLED

incl. frontal bezel EA 017-1UKE  
2x16,ZH 4.35mm



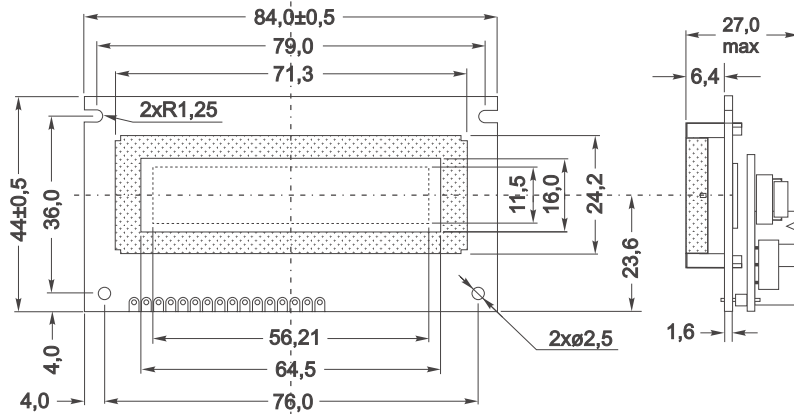
## EA SER162-NLED

incl. frontal bezel EA 017-2UKE  
2x16,ZH 5.55mm

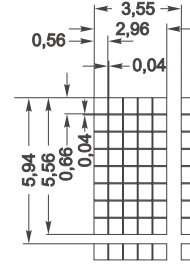


## EA SER162-NLW

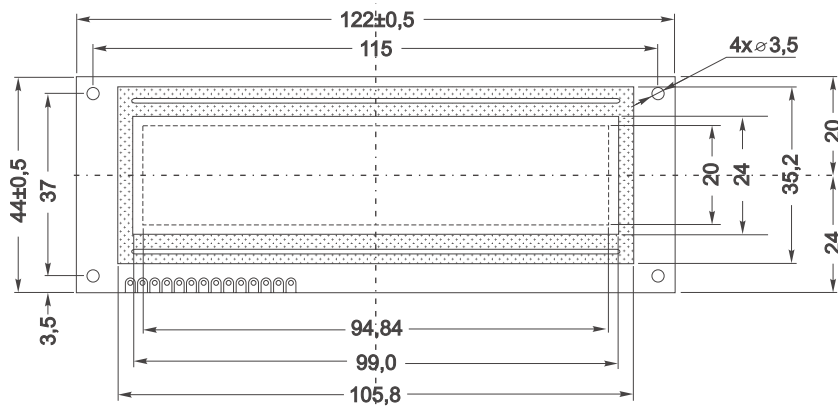
blue/white



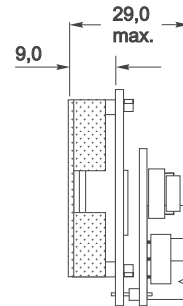
incl. frontal bezel EA 017-2UKE  
2x16,ZH 5.55mm



## EA SER162-BNLED

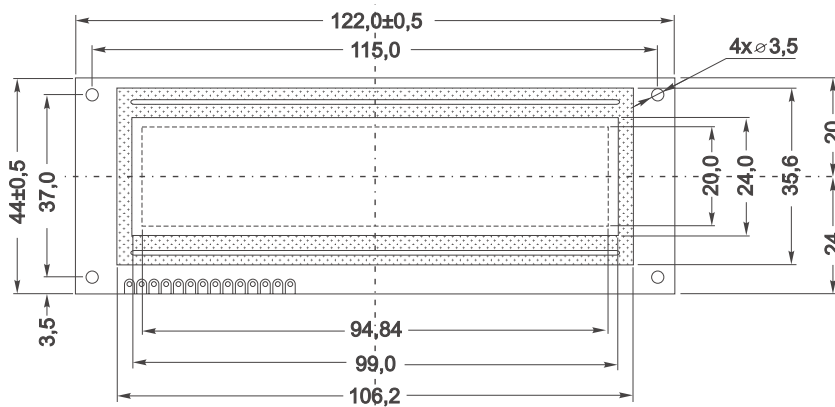


incl. frontal bezel EA 017-12UKE  
2x16,ZH 9.66mm

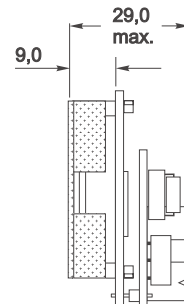


## EA SER162-BNLW

blue/white

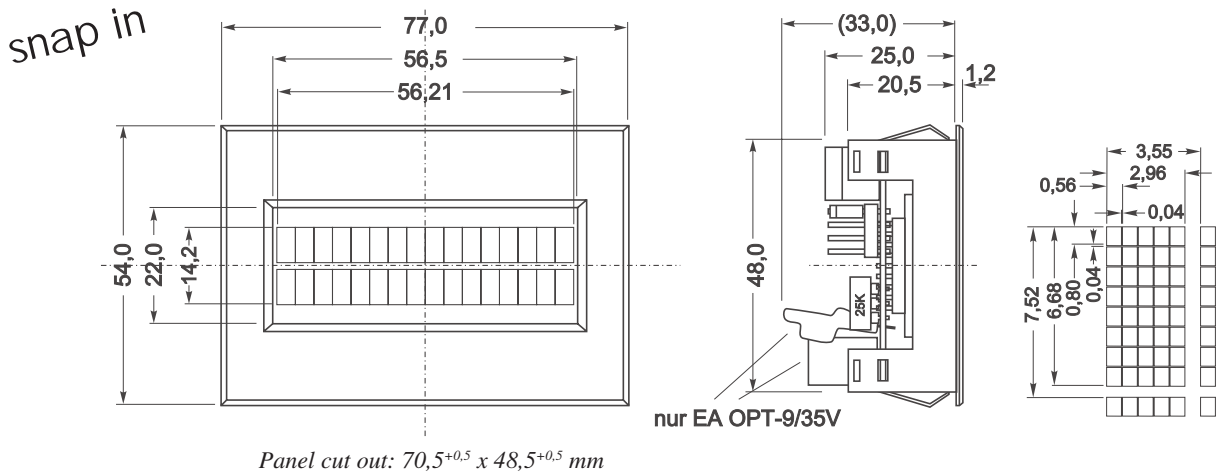


incl. frontal bezel EA 017-12UKE  
2x16,ZH 9.66mm



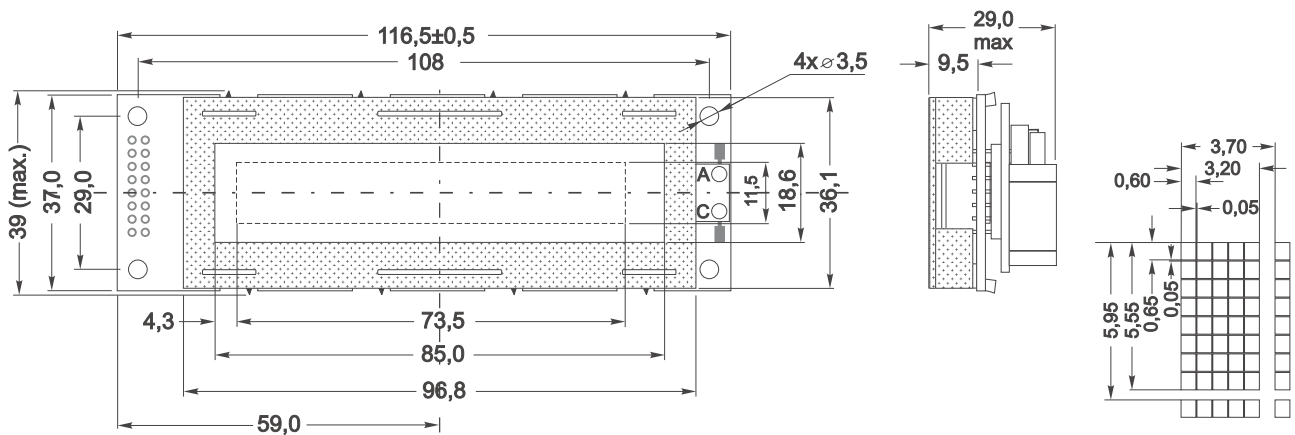
**EA SER162-92NLED**

incl. snap in housing EA 0092-KE  
2x16,ZH 6.68mm



**EA SER202-NLED**

incl. frontal bezel EA 017-7UKE  
2x20,ZH 5.55mm

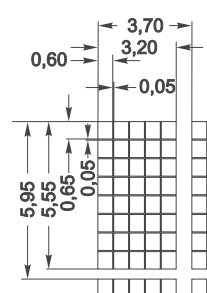
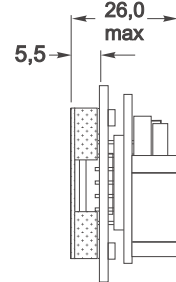
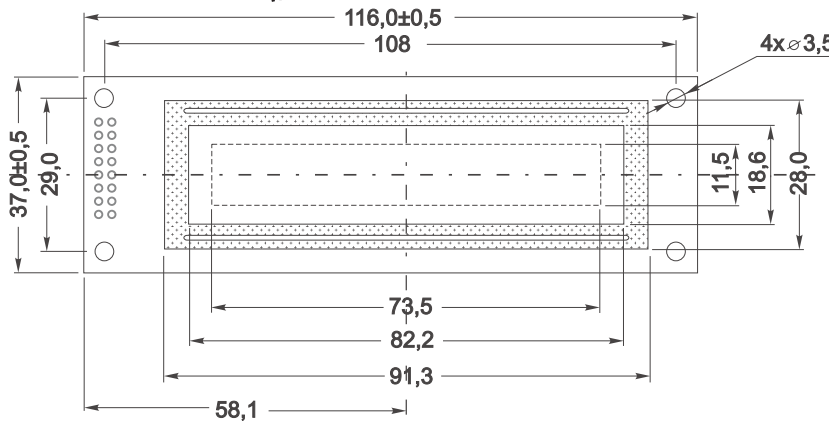


## EA SER202-NLW

blue/white

incl. frontal bezel EA 017-7UKE

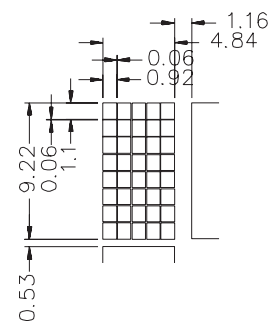
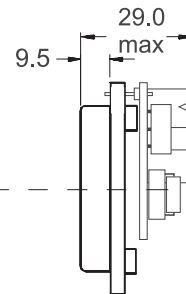
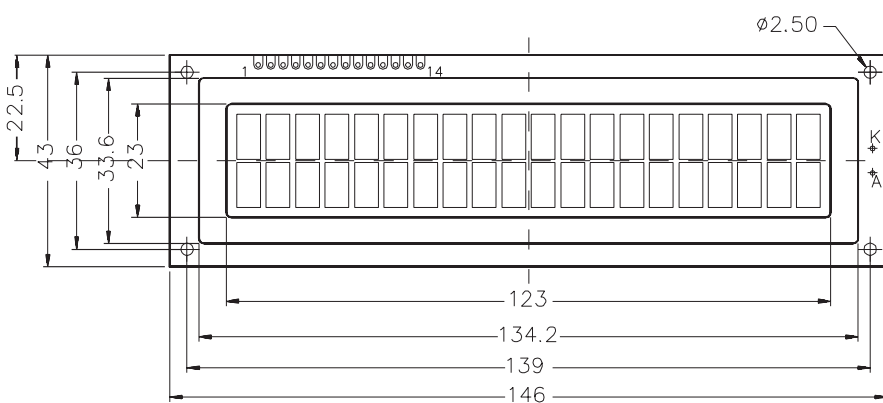
2x20, ZH 5.55mm



## EA SER202-BHNLED

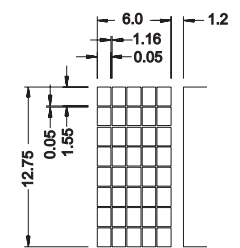
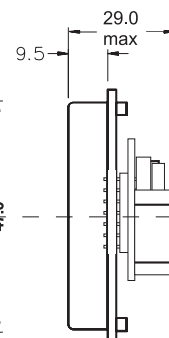
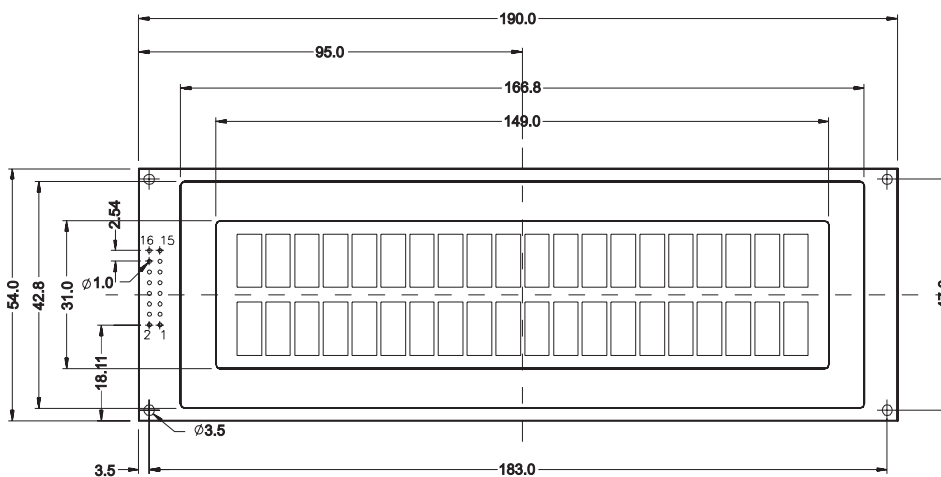
without frontal bezel

2x20, ZH 9.2mm



## EA SER202-CNLW

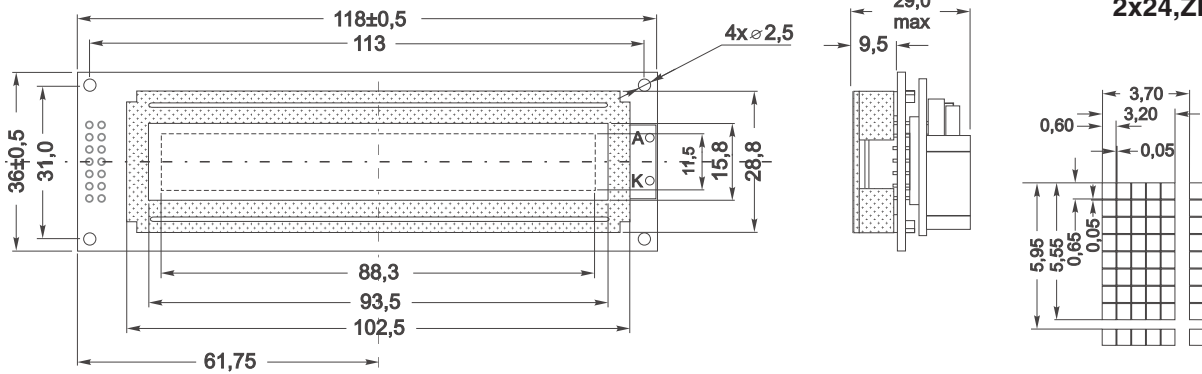
2x20, ZH 12.7mm



## EA SER242-NLED

incl. frontal bezel EA 017-14UKE

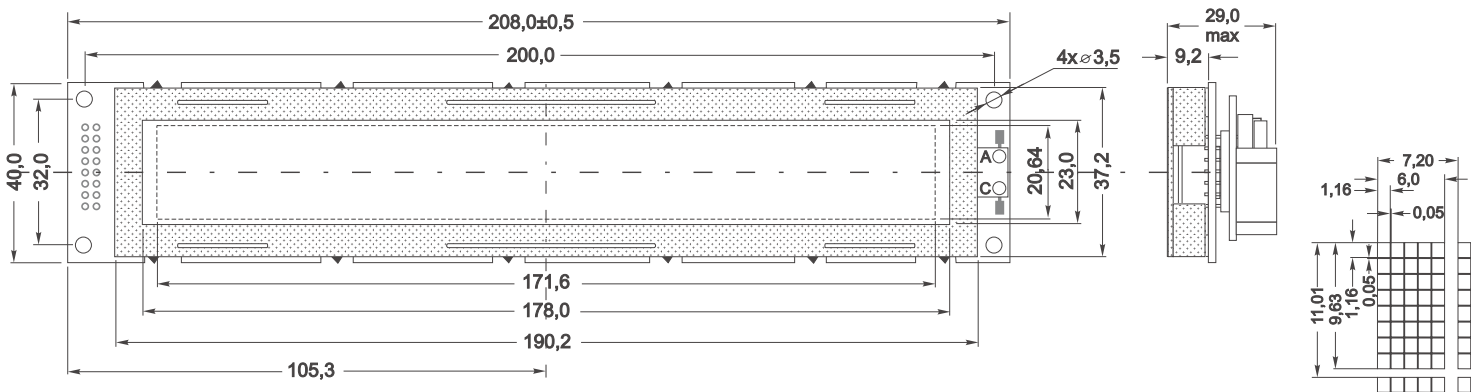
2x24,ZH 5.55mm



## EA SER242-BNLED

without frontal bezel

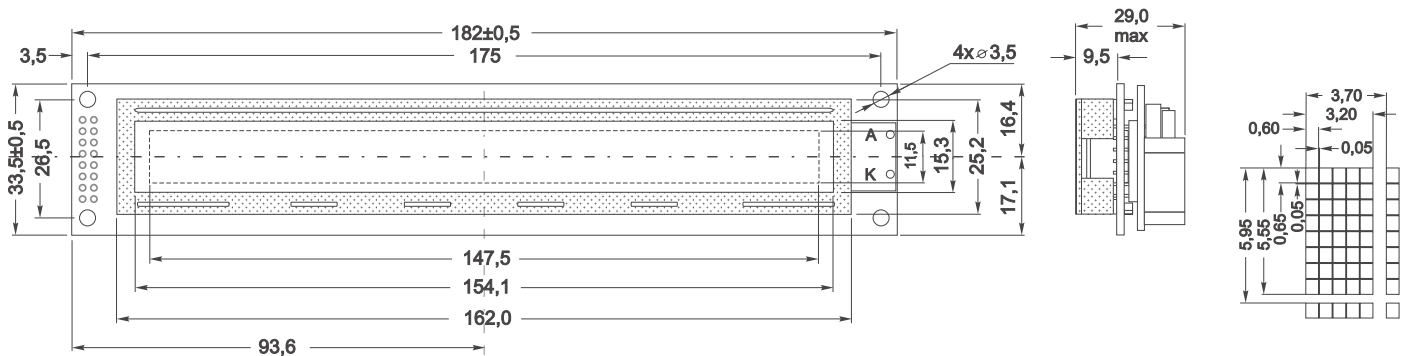
2x24,ZH 9.66mm



## EA SER402-NLED

incl. frontal bezel EA 017-4UKE

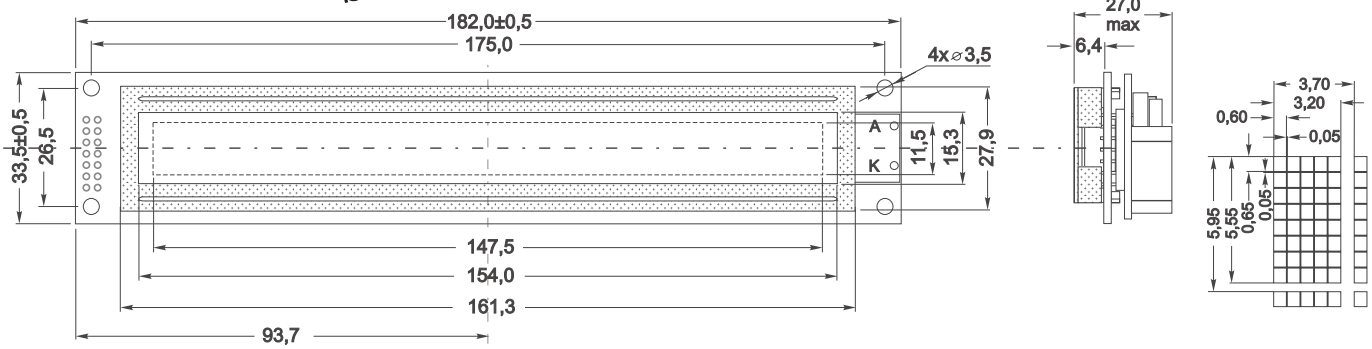
2x40,ZH 5.55mm



## EA SER402-NLW

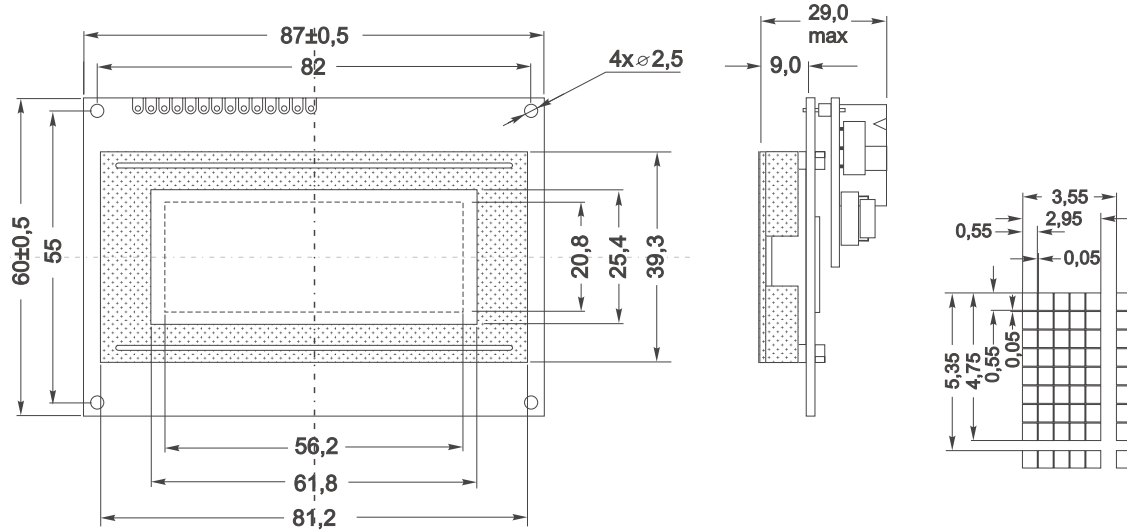
blue/white

incl. frontal bezel EA 017-4UKE  
2x40,ZH 5.55mm



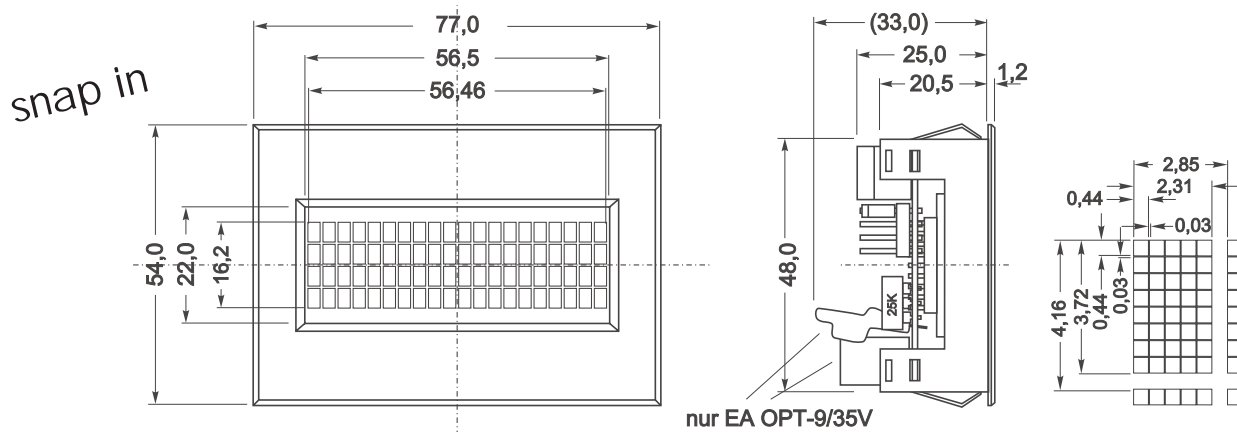
## EA SER164-NLED

incl. frontal bezel EA 017-8UKE  
4x16,ZH 4.75mm



## EA SER204-92HNLED

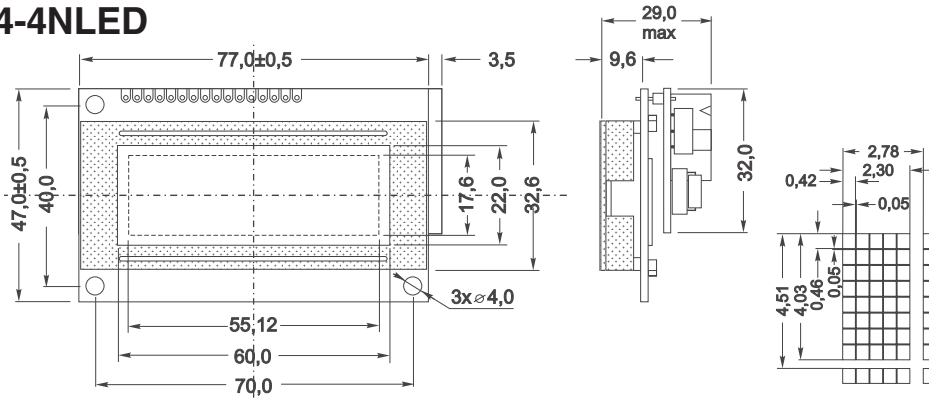
incl. snap in housing EA 0092-KE  
4x20,ZH 3.73mm



Panel cut out: 70,5<sup>+0,5</sup> x 48,5<sup>+0,5</sup> mm

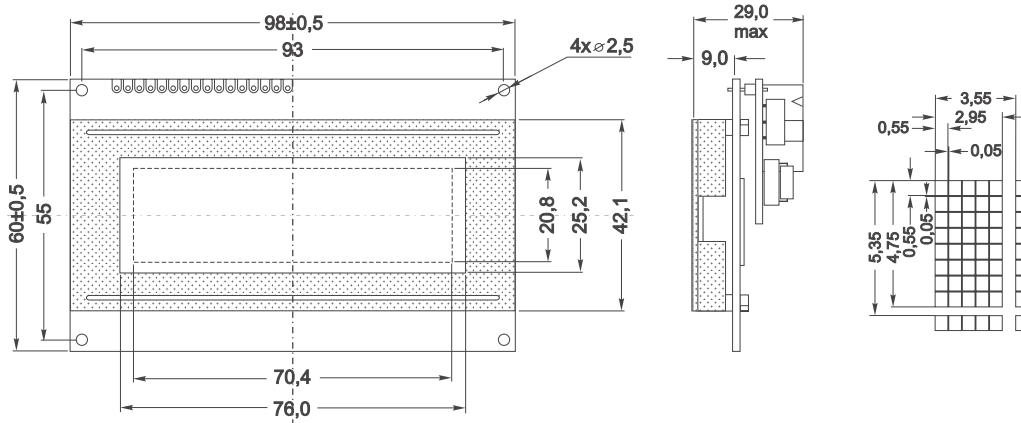


**EA SER204-4NLED**



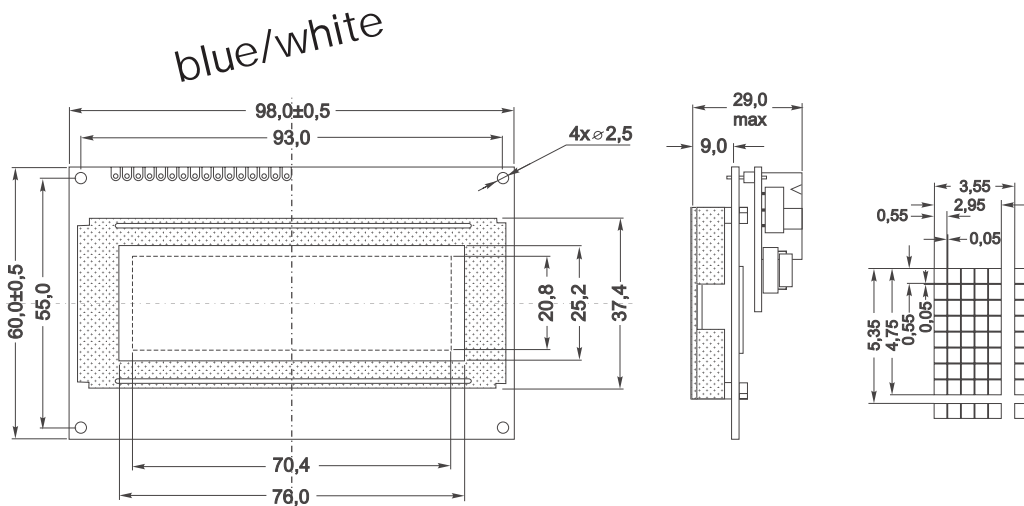
without frontal bezel  
4x20,ZH 4.03mm

**EA SER204-NLED**



incl. frontal bezel EA 017-9UKE  
4x20,ZH 4.75mm

**EA SER204-NLW**

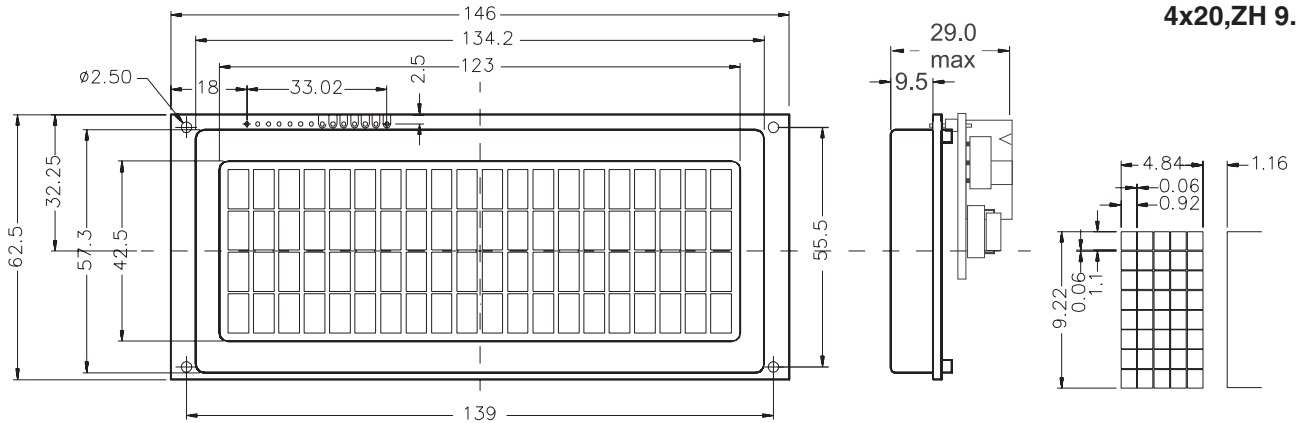


incl. frontal bezel EA 017-9UKE  
4x20,ZH 4.75mm

## EA SER204-BNLED

incl. frontal bezel EA 017-25KE

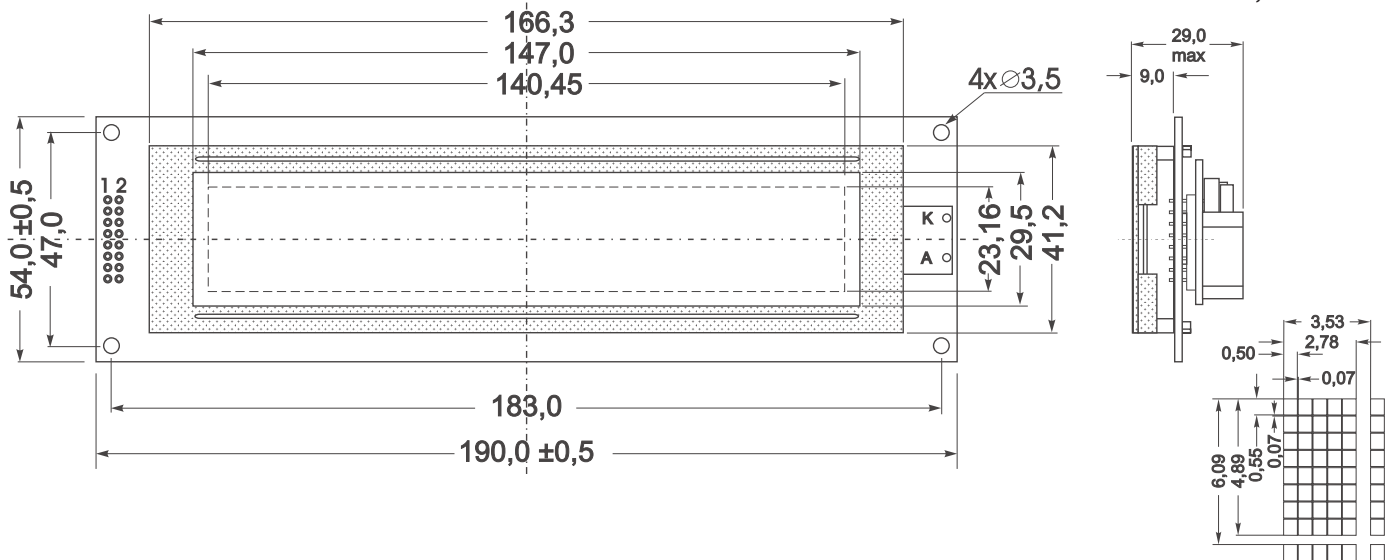
4x20,ZH 9.2mm



## EA SER404-HNLED

incl. frontal bezel EA 017-13UKE

4x40,ZH 4.89mm

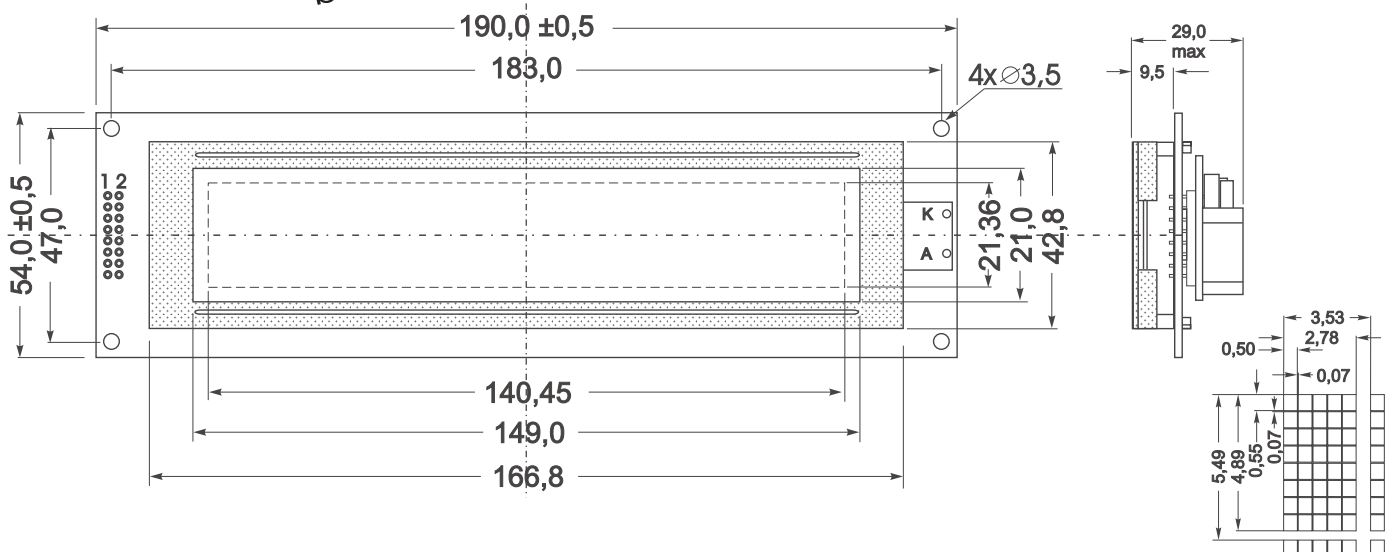


## EA SER404-NLW

blue/white

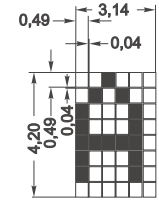
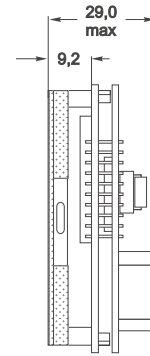
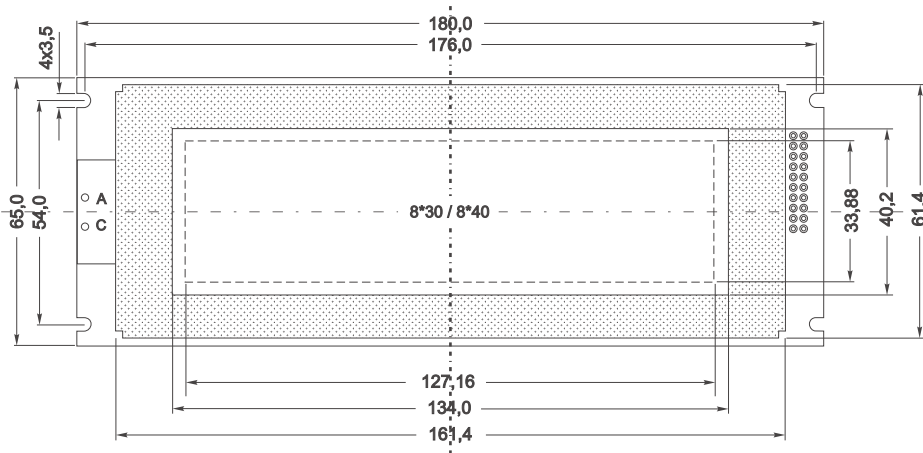
incl. frontal bezel EA 017-13UKE

4x40,ZH 4.89mm

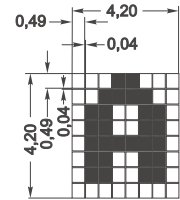


## EA SER308-NLED / SER408-NLED

incl. frontal bezel EA 017-10UKE  
8x30 bold / 8x40,ZH 4.2mm



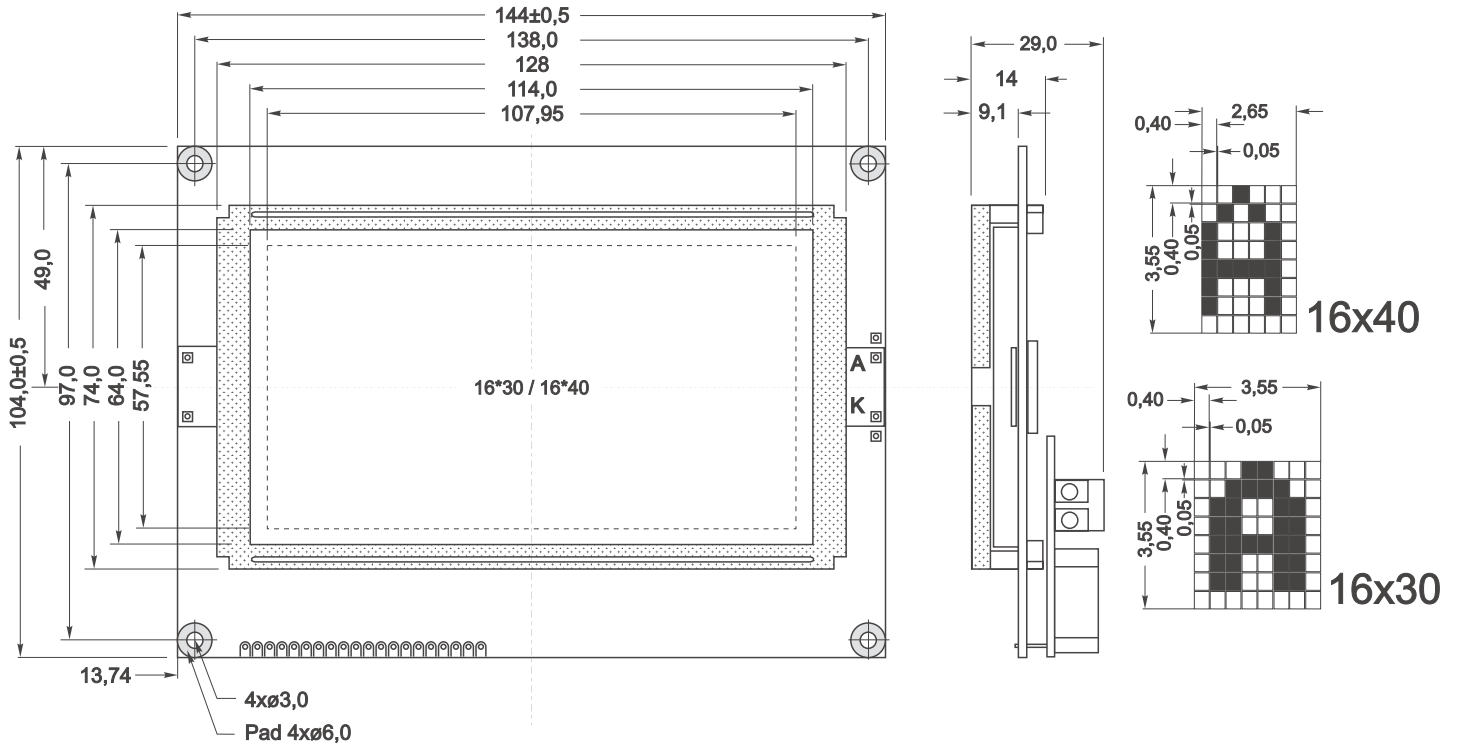
8x40



8x30

## EA SER3016-NLED / SER4016-NLED

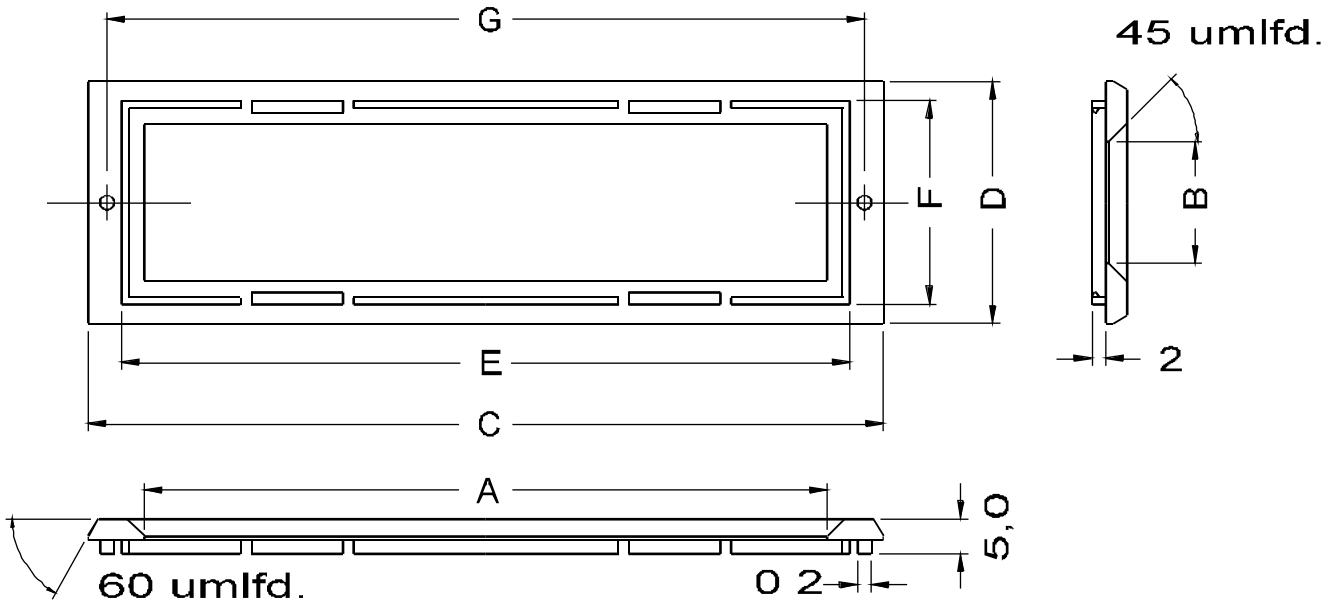
without frontal bezel  
16x30 bold / 16x40,ZH 3.55mm



**CAUTION!**  
Use ESD precautionary procedures  
Electrostatic sensitive components



**FRONTAL BEZEL / DIMENSIONS**



*Drawing shows the nose piece for frontal bezels EA 017-xxUKE; EA 017-xxKE have a rim on full circumference.*

Display type	Viewing area		Outside dim.		Mounting size		G	Frontal Bezel
	A	B	C	D	E	F		
<b>1 line displays</b>								
EA SER081-CNLED	60,0	14,8	76,0	27,0	66,2	21,2	71,0	EA 017-2U
EA SER161-DNLED	63,5	12,8	79,5	25,0	69,7	19,2	74,5	EA 017-1U
EA SER161-ENLED	98,5	12,8	114,5	25,0	104,7	19,2	109,5	EA 017-6U
<b>2 line displays</b>								
EA SER162-N3LW	60,0	14,8	76,0	27,0	66,2	21,2	71,0	EA 017-2U
EA SER162-CNLED	63,5	12,8	79,5	25,0	69,7	19,2	74,5	EA 017-1U
EA SER162-NLED EA SER162-NLW	60,0	14,8	76,0	27,0	66,2	21,2	71,0	EA 017-2U
EA SER162-BNLED EA SER162-BNLW	97,4	22,4	113,4	34,6	103,6	28,8	108,4	EA 017-12U
EA SER202-NLED EA SER202-NLW	81,5	17,2	97,5	29,4	87,7	23,6	92,5	EA 017-7U
EA SER242-NLED	92,0	14,8	108,0	27,0	98,4	21,2	103,0	EA 017-14U
EA SER402-NLED EA SER402-NLW	153,0	14,8	169,0	27,0	159,2	21,2	164,0	EA 017-4U
<b>4 line displays</b>								
EA SER164-NLED	60,8	24,2	76,8	36,4	67,0	30,6	71,8	EA 017-8U
EA SER204-NLED EA SER204-NLW	75,0	24,2	91,0	36,4	81,2	30,6	86,0	EA 017-9U
EA SER204-BNLED	121,0	41,5	137,0	53,7	127,2	47,9	132,0	EA 017-25
EA SER404-NLED EA SER404-NLW	145,0	28,0	161,0	40,2	151,2	34,4	156,0	EA 017-13U
<b>8 line displays</b>								
EA SER308-NLED EA SER408-NLED	131,0	38,0	147,0	50,2	137,2	44,4	142,0	EA 017-10U

*Dimensions in mm*

## All Serials Overview

Serial displays with RS-232 and LED backlight													
Ordering information	Lines x Char.	Char. height	Module dimension			Viewing area		Bezel	Cutout bezel		Current typ.	New !	Keypad EA OPT-TAST5x5
			W	H	D	W	H		W	H			
<b>1 line displays</b>													
EA SER081-92NLED	1 x 8	11.48	77.0	54.0	26.0	56.5	22.0	0092-KE	70.5	48.5	100	Snap-In	
EA SER081-CNLED	1 x 8	10.8	84.0	44.0	26.0	61.0	15.8	017-2UKE	66.2	21.2	30		optional
EA SER161-DNLED	1 x 16	6.56	80.0	36.0	27.0	64.5	16.0	017-1UKE	69.7	19.2	100		optional
EA SER161-ENLED	1 x 16	9.66	122.0	33.0	27.0	99.0	13.0	017-6UKE	104.7	19.2	170		optional
<b>2 line displays</b>													
EA SER082-CNLED	2 x 8	11.44	84.0	44.0	27.5	63.0	25.0	017-8UKE	67.0	30.6	90		optional
EA SER162-N3LW	2 x 16	5.55	80.0	36.0	27.0	64.5	16.0	017-2UKE	66.2	21.2	40	blue	optional
EA SER162-CNLED	2 x 16	4.35	80.0	36.0	27.0	64.5	13.8	017-1UKE	69.7	19.2	90		optional
EA SER162-NLED	2 x 16	5.55	84.0	44.0	29.0	61.0	15.8	017-2UKE	66.2	21.2	120		optional
EA SER162-NLW	2 x 16	5.55	84.0	44.0	27.0	64.5	16.0	017-2UKE	66.2	21.2	40	blue	optional
EA SER162-92NLED	2 x 16	6.68	77.0	54.0	26.0	56.5	22.0	0092-KE	70.5	48.5	100	Snap-In	
EA SER162-BNLED	2 x 16	9.66	122.0	44.0	29.0	99.0	24.0	017-12UKE	103.6	28.8	360		optional
EA SER162-BNLW	2 x 16	9.66	122.0	44.0	29.0	99.0	24.0	017-12UKE	103.6	28.8	65	blue	optional
EA SER202-NLED	2 x 20	5.55	116.5	39.0	29.0	85.0	18.6	017-7UKE	87.7	23.6	210		optional
EA SER202-NLW	2 x 20	5.55	116.5	39.0	26.0	85.0	18.6	017-7UKE	87.7	23.6	40	blue	optional
EA SER202-BHNLED	2 x 20	9.2	146.0	43.0	29.0	123.0	23.0	-	127.2	28.4	270		optional
EA SER202-CNLW	2 x 20	12.7	190.0	54.0	29.0	149.0	31.0	-	-	-	100	blue	optional
EA SER242-NLED	2 x 24	5.55	118.0	36.0	29.0	93.5	15.8	017-14UKE	98.4	21.2	150		optional
EA SER242-BNLED	2 x 24	9.66	208.0	40.0	29.0	178.0	23.0	-	-	-	190		optional
EA SER402-NLED	2 x 40	5.55	182.0	33.5	29.0	154.1	15.3	017-4UKE	159.2	21.2	150		optional
EA SER402-NLW	2 x 40	5.55	182.0	33.5	27.0	154.1	15.3	017-4UKE	159.2	21.2	40	blue	optional
<b>4 line displays</b>													
EA SER164-NLED	4 x 16	4.75	87.0	60.0	29.0	61.8	25.4	017-8UKE	67.0	30.6	220		optional
EA SER204-92HNLED	4 x 20	3.73	77.0	54.0	26.0	56.5	22.0	0092-KE	70.5	48.5	100	Snap-In	
EA SER204-4NLED	4 x 20	4.03	80.8	47.0	29.0	60.0	22.0	-	-	-	90		optional
EA SER204-NLED	4 x 20	4.75	98.0	60.0	29.0	76.0	25.2	017-9UKE	81.2	30.6	260		optional
EA SER204-NLW	4 x 20	4.75	98.0	60.0	29.0	76.0	25.2	017-9UKE	81.2	30.6	45	blue	optional
EA SER204-BNLED	4 x 20	9.2	146.0	62.5	29.0	123.0	42.5	017-25KE	127.2	47.9	810		optional
EA SER404-HNLED	4 x 40	4.89	190.0	54.0	29.0	147.0	29.5	017-13UKE	151.2	34.4	440		optional
EA SER404-NLW	4 x 40	4.89	190.0	54.0	29.0	147.0	29.5	017-13UKE	151.2	34.4	75	blue	optional
<b>8 line displays</b>													
EA SER308-NLED	8 x 30	4.2 bold	180.0	65.0	29.0	134.0	40.2	017-10UKE	137.2	44.4	300		
EA SER408-NLED	8 x 40	4.2	180.0	65.0	29.0	134.0	40.2	017-10UKE	137.2	44.4	300		
<b>16 line displays</b>													
EA SER3016-NLED	16 x 30	3.6 bold	144.0	104.0	29.0	114.0	64.0	---	-	-	700		
EA SER4016-NLED	16 x 40	3.6	144.0	104.0	29.0	114.0	64.0	---	-	-	700		

Dimensions in mm  
Current in mA



**CAUTION!**  
Use ESD precautionary procedures  
Electrostatic sensitive components

**ELECTRONIC  
ASSEMBLY**

making things easy