LCM
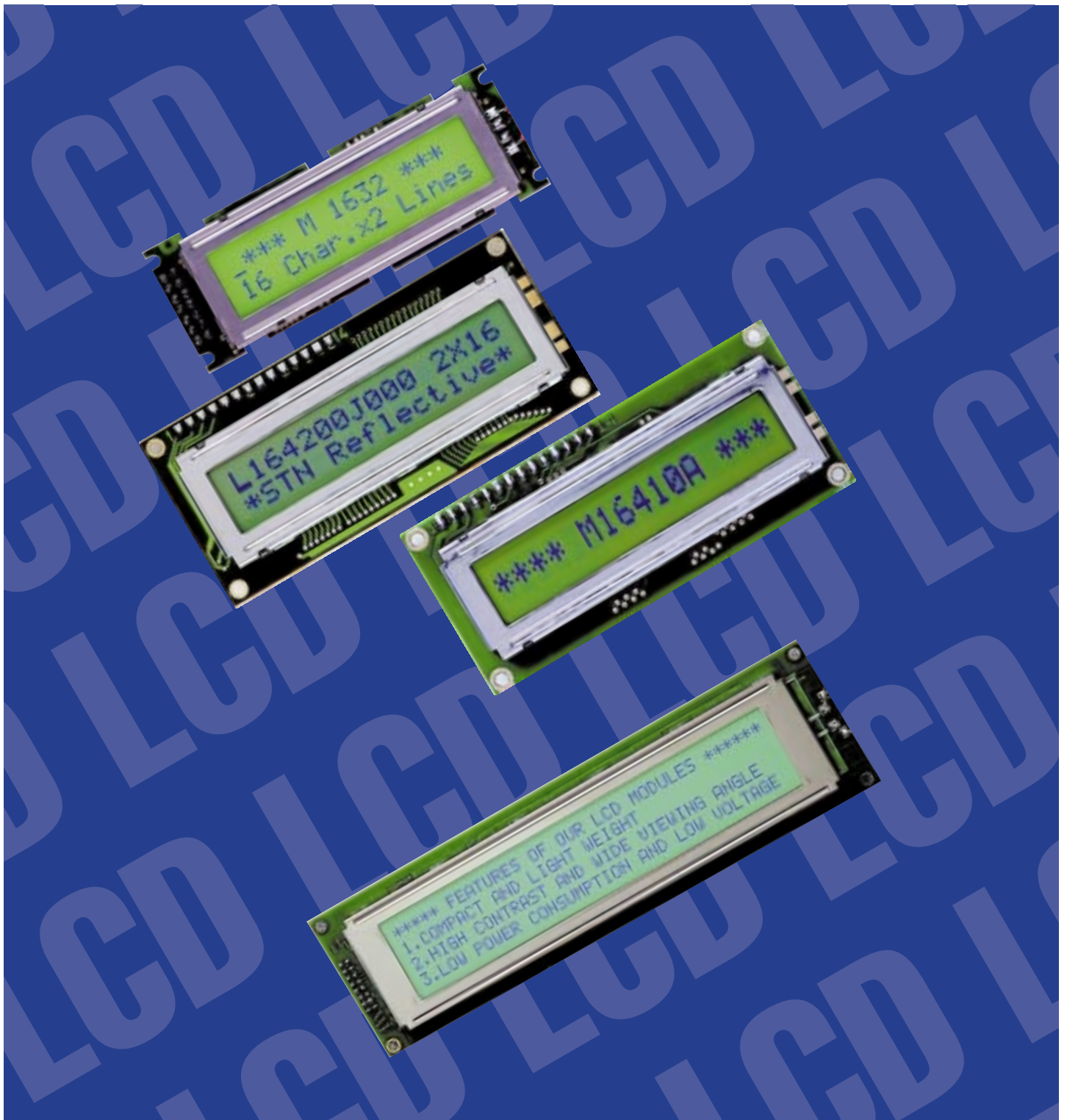## Liquid Crystal Display Modules

Seiko Instruments GmbH

Dot Matrix Liquid Crystal Display Modules

CHARACTER TYPE

• FEATURES :

- Slim, light weight and low power consumption
- High contrast and wide viewing angle
- Built-in controller for easy interfacing
- LCD modules with built-in EL or LED backlight

M1641

L1642

L1614

M1632

L1652

L2012

• SPECIFICATIONS :

▨ : Standard products   ▢ : Products of optional specification

Character Format (character x line)		16 x 1	16 x 2	16 x 2	16 x 2	16 x 4	20 x 2
Model		M1641	M1632	L1642	L1652	L1614	L2012
Reflective		M16410AS	M16320AS	L164200J000S	L165200J200S	L161400J000S	L201200J000S
EL backlight		M16419DWS	M16329DWS	L164221J000S	L165221J200S	L161421J000S	L201221J000S
LED backlight		M16417DYS	M16327DYS	L1642B1J000S	L1652B1J200S	L1614B1J000S	L2012B1J000S
Reflective (wide temp)		M16410CS	M16320CS	L164200L000S	L165200L200S	L161400L000S	L201200L000S
LED backlight (wide temp)		M16417JYS	M16327JYS	L1642B1L000S	L1652B1L200S	L1614B1L000S	L2012B1L000S
Character font		5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor
Module size (HxVxT) mm	Reflective	80,0 x 36,0 x 11,3	85,0 x 30,0 x 10,1	80,0 x 36,0 x 11,3	122,0 x 44,0 x 11,3	87,0 x 60,0 x 11,6	116,0 x 37,0 x 11,3
	EL backlight	80,0 x 36,0 x 11,3	85,0 x 30,0 x 10,1	80,0 x 36,0 x 11,3	122,0 x 44,0 x 11,3	87,0 x 60,0 x 11,6	116,0 x 37,0 x 11,3
	LED backlight	80,0 x 36,0 x 15,8	80,0 x 30,0 x 15,8	80,0 x 36,0 x 15,8	122,0 x 44,0 x 15,8	87,0 x 60,0 x 15,8	116,0 x 37,0 x 15,8
Viewing area (HxV) mm		64,5 x 13,8	62,0 x 16,0	64,5 x 13,8	99,0 x 24,0	61,8 x 25,2	83,0 x 18,6
Character size (HxV) mm *1		3,07 x 5,73	2,78 x 4,27	2,95 x 3,80	4,84 x 8,06	2,95 x 4,15	3,20 x 4,85
Dot size (HxV) mm		0,55 x 0,75	0,50 x 0,55	0,50 x 0,55	0,92 x 1,10	0,55 x 0,55	0,60 x 0,65
Power supply voltage (VDD-VSS) V		+ 5 V	+ 5 V	+ 5 V	+ 5 V	+ 5 V	+ 5 V
Current consumption (mA,typ)	IDD	1,5	2,0	1,6	2,0	2,7	2,0
	ILC *4	0,2	0,2	0,3	0,4	1,1	0,4
Driving method (duty)		1/16	1/16	1/16	1/16	1/16	1/16
Built-in LSI		KS0066 or equivalent	KS0066 MSM5839 or equivalent	KS0066 MSM5839 or equivalent	KS0066 MSM5839 or equivalent	KS0066 KS0063 or equivalent	KS0066 KS0063 or equivalent
Operating temperature (°C)	normal temp.	0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50
	wide temp. *2	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70
Storage temperature (°C)	normal temp.	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60
	wide temp.	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80
Weight (g, typ.)	Reflective	25	25	25	50	50	40
	EL backlight	30	30	30	55	55	45
	LED backlight	35	40	35	65	65	60
Inverters for EL	Model	5S	5S	5S	5C	5A	5A
	Power supply (V)	+ 5.0	+ 5,0	+ 5.0	+ 5.0	+ 5.0	+ 5.0
	current consumption (mA) *3	10	10	10	35	45	45
LED backlight	Forward current consumption (mA)	100	112	100	240	200	154
	Forward input voltage (V,typ.)	+ 4,1	+ 4,1	+ 4,1	+ 4,1	+ 4,1	+ 4,1

*1 : Excluding cursor

*2 : With external temperature compensation

*3 : Including EL backlight

*4 : Based on normal temperature range

H : Horizontal   V : Vertical   T : Thickness (max)

Since our policy is one of continues improvements we reserve the right to change the specifications for the products in the catalogue without notice.

L2022

L2432

L2014

L4042

M4024

• SPECIFICATIONS :

		20 x 2	20 x 4	24 x 2	40 x 2	40 x 4
Character Format (character x line)		20 x 2	20 x 4	24 x 2	40 x 2	40 x 4
Model		L2022	L2014	L2432	L4042	M4024
Reflective		-	L201400J000S	L243200J000S	L404200J000S	M40240AS
EL backlight		-	L201421J000S	L243221J000S	L404221J000S	M40249DWS
LED backlight		-	L2014B1J000S	L2432B1J000S	L4042B1J000S	M40247DYS
Reflective (wide temp)		L202200P000S	L201400L000S	L243200L000S	L404200L000S	M40240CS
LED backlight (wide temp)		L2022B1P000S	L2014B1L000S	L2432B1L000S	L4042B1L000S	M40247JYS
Character font		5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor
Module	Reflective	180,0 x 40,0 x 10,5	98,0 x 60,0 x 11,6	118,0 x 36,0 x 11,3	182,0 x 33,5 x 11,3	190,0 x 54,0 x 10,1
size	EL backlight	180,0 x 40,0 x 10,5	98,0 x 60,0 x 11,6	118,0 x 36,0 x 11,3	182,0 x 33,5 x 11,3	190,0 x 54,0 x 10,1
(HxVxT) mm	LED backlight	180,0 x 40,0 x 14,8	98,0 x 60,0 x 15,8	118,0 x 36,0 x 15,8	182,0 x 33,5 x 16,3	190,0 x 54,0 x 16,3
Viewing area (HxV) mm		149,0 x 23,0	76,0 x 25,2	94,5 x 17,8	154,4 x 15,8	147,0 x 29,5
Character size (HxV) mm *1		6,00 x 9,66	2,95 x 4,15	3,20 x 4,85	3,20 x 4,85	2,78 x 4,27
Dot size (HxV) mm		1,12 x 1,12	0,55 x 0,55	0,60 x 0,65	0,60 x 0,65	0,50 x 0,55
Power supply voltage (VDD-VSS) V		+ 5 V	+ 5 V	+ 5 V	+ 5 V	+ 5 V
Current consumption	IDD	4,2	2,9	2,5	3,0	8,0
(mA,typ)	ILC *4	2,6	1,2	0,5	1,0	3,0
Driving method (duty)		1/16	1/16	1/16	1/16	1/16
Built-in LSI		KS0066 KS0063 or equivalent	KS0066 MSM5839 or equivalent	KS0066 KS0063 or equivalent	KS0066 KS0063 or equivalent	KS0066 MSM5839 or equivalent
Operating temperature (°C)	normal temp.	-	0 to + 50	0 to + 50	0 to + 50	0 to + 50
	wide temp. *2	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70
Storage temperature (°C)	normal temp.	-	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60
	wide temp.	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80
Weight	Reflective	80	55	40	70	90
(g, typ.)	EL backlight	-	60	45	75	105
	LED backlight	110	70	60	95	140
Inverters for EL	Model	-	5A	5A	5C	5D
	Power supply (V)	+ 5.0	+ 5.0	+ 5.0	+ 5.0	+ 5.0
	current consumption (mA) *3	-	45	45	25	80
LED backlight	Forward current consumption (mA)	320	240	150	260	480
	Forward input voltage (V,typ.)	+ 4,1	+ 4,1	+ 4,1	+ 4,1	+ 4,1

: Standard products   : Products of optional specification

*1 : Excluding cursor   H : Horizontal   V : Vertical   T : Thickness (max)

*2 : With external temperature compensation

*3 : Including EL backlight

*4 : Based on normal temperature range

Dot Matrix Liquid Crystal Display Modules

GRAPHIC TYPE

• FEATURES :

- •Wide viewing angle and high contrast
- •Full dot configuration fits any application
- •Slim, light weight and low power consumption
- •Available in STN and FSTN

• SPECIFICATIONS :

Dot format (HxV,dot)			97 x 32	128 x 32	128 x 64	128 x 64
Model			Y97031	G1213	G1216	G1226
STN type (Gray mode)	Reflective	built-in RAM	-	-	-	-
	Reflective wide temp.	built-in RAM	-	G121300N000S	G121600N000S	-
	LED backlight	built-in RAM	-	-	-	G1226B1J000S
	LED backlight wide temp	built-in RAM	-	G1213B1N000S	G1216B1N000S	-
FSTN type (B&W mode)	Transmissive	-	-	-	-	-
	with CFL backlight	built-in controller	-	-	-	-
	Transflective	built-in RAM	Y97031LF60W	-	-	-
Module size (H x V x T) mm	Reflective (no backlight)		47,5 x 65,4 x 2,1	75,0 x 41,5 x 6,8	75,0 x 52,7 x 6,8	-
	LED backlight		-	75,0 x 41,5 x 8,9	75,0 x 52,7 x 8,9	93,0 x 70,0 x 11,4
	CFL backlight		-	-	-	-
Viewing area (HxV) mm			43,5 x 23,9	60,0 x 21,3	60,0 x 32,5	70,7 x 38,8
Dot size (H x V) mm			0,35 x 0,48	0,40 x 0,48	0,40 x 0,40	0,44 x 0,44
Dot pitch (H x V) mm			0,39 x 0,52	0,43 x 0,51	0,43 x 0,43	0,48 x 0,48
Power supply voltage (V)		(VDD - VSS)	+ 5,0	+ 5,0	+ 5,0	+ 5,0
		(VLC - VSS)	-	- 8,0	- 8,1	-8,2
Current consumption (mA, typ.)		IDD	0,10	2,0	2,0	3,0
		IDD (built-in controller)	-	-	-	-
		ILC	-	1,8	1,8	2,0
Driving method (duty)			1/33	1/64	1/64	1/64
Built-in LSI		Driver	SED1530 or equivalent	HD61202 HD61203 or equivalent	HD61202 HD61203 or equivalent	KS0107 KS0108 or equivalent
		Controller	-	-	-	-
Operating temperature range (ºC)			- 20 to + 70	- 20 to + 70	- 20 to + 70	0 to + 50
Storage temperature range (ºC)			- 30 to + 80	- 30 to + 80	- 30 to + 80	- 20 to + 60
Weight (g, typ.)	Reflective (Transflective no backlight)		10	23	35	-
	LED backlight		-	35	45	72
	CFL backlight		-	-	-	-
LED backlight	Forward current consumption (mA)		-	40	90	125
	Forward input voltage (V, typ.)		-	3,8	4,1	4,1
Inverter for CFL	Mode		-	-	-	-
	Power supply voltage (V)		-	-	-	-
	Current consumption (mA, typ.)		-	-	-	-

*1 : built-in DC/DC converter (single power source)

*2 : Use with external temperature compensation circuit

Since our policy is one of continues improvements we reserve the right to change the specifications of the products in the catalogue without notice.

Dot format (HxV,dot)			240 x 64	240 x 128	320 x 200	320 x 240	640 x 200
Model			G2446	G242C	G321D	G324E	G649D
STN type	Reflective	built-in RAM	-	-	-	-	-
(Gray mode)	Reflective wide temp.	built-in RAM	-	-	-	-	-
	LED backlight	built-in RAM	-	-	-	-	-
	LED backlight wide temp	built-in RAM	-	-	-	-	-
FSTN type	Transmissive	-	G2446X5R1A0S	G242CX5R1ACS	G321DX5R1A0S	G324EX5R1A0S	G649DX5R010S
(B&W mode)	with CFL backlight	built-in controller	G2446X5R1ACS	G242CX5R1A0S	G321DX5R1ACS	G324EX5R1ACS	-
	Transflective	built-in RAM	-	-	-	-	-
Module size	Reflective (no backlight)			-	-	-	-
(H x V x T)	LED backlight			-	-	-	-
mm	CFL backlight		191,0 x 79,0 x 15,1	180,0 x 110,0 x 15,1	166,0 x 134,0 x 15,1	166,0 x 134,0 x 15,1	260,0 x 122,0 x 15,7
Viewing area (HxV) mm			134,0 x 41,0	134,0 x 76,0	128,0 x 110,0	128,0 x 110,0	216,0 x 83,0
Dot size (H x V) mm			0,49 x 0,49	0,47 x 0,47	0,34 x 0,48	0,32 x 0,39	0,30 x 0,36
Dot pitch (H x V) mm			0,53 x 0,53	0,51 x 0,51	0,38 x 0,52	0,36 x 0,43	0,33 x 0,39
Power supply voltage (V)		(VDD - VSS)	+ 5,0	+ 5,0	+ 5,0	+ 5,0	+ 5,0
		(VLC - VSS)	*1	*1	-24,0	-24,0	-24,0
Current consumption		IDD	12	30	8	7,5	11
		IDD (built-in controller)	15	40	23	23	-
(mA, typ.)		ILC	-	-	6	6,5	9
Driving method (duty)			1/64	1/128	1/200	1/240	1/200
Built-in LSI		Driver	MSM5298 MSM5299 or equivalent	KS0103 KS0104 or equivalent	MSM5298 MSM5299 or equivalent	HD66204 HD66205 or equivalent	MSM5298 MSM5299 or equivalent
		Controller	SED1330FB	SED1330FB	SED1330FB	SED1330FB	-
Operating temperature range (°C)			0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50
Storage temperature range (°C)			- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60
Weight	Reflective (Transflective no backlight)		-	-	-	-	-
(g, typ.)	LED backlight		-	-	-	-	-
	CFL backlight		200	280	350	350	420
LED backlight	Forward current consumption (mA)		-	-	-	-	-
	Forward input voltage (V, typ.)		-	-	-	-	-
	Mode		4800210	4800210	4800210	4800210	4800120
Inverter for CFL	Power supply voltage (V)		+ 5,0	+ 5,0	+ 5,0	+ 5,0	+ 12,0
	Current consumption (mA, typ.)		250	350	365	365	390

*1 : built-in DC/DC converter (single power source)

*2 : Use with external temperature compensation

Since our policy is one of continous improvemets, we reserve the right to change the specifications of the products in the catalogue without notice.
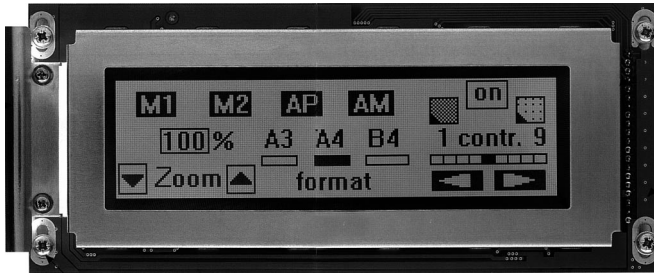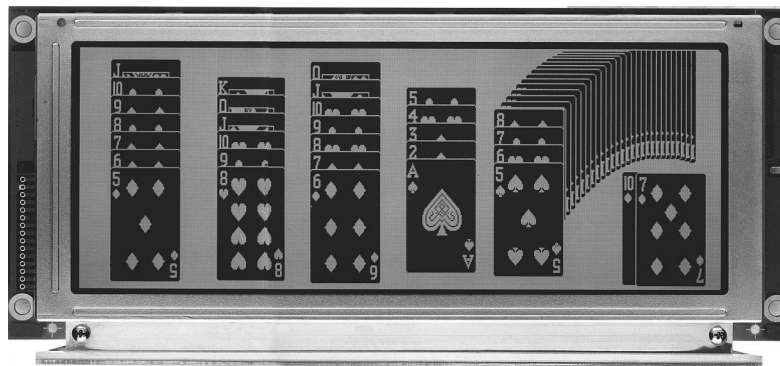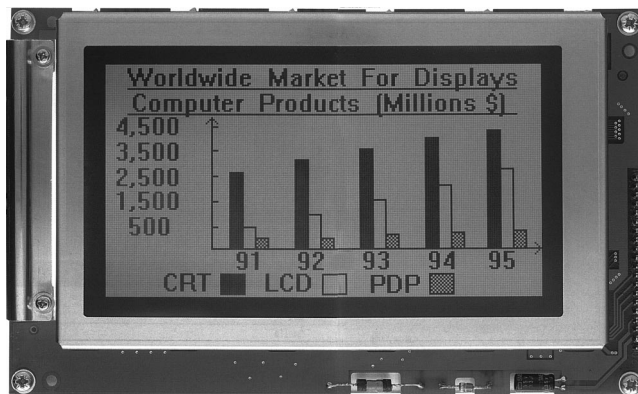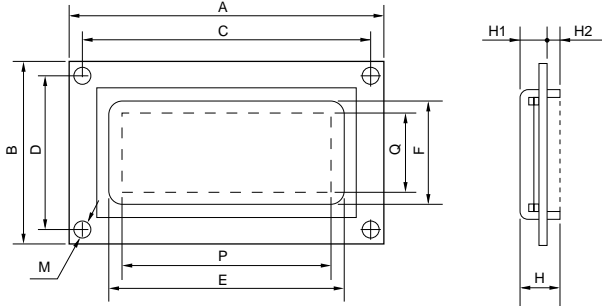
G2446
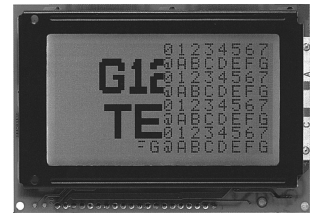
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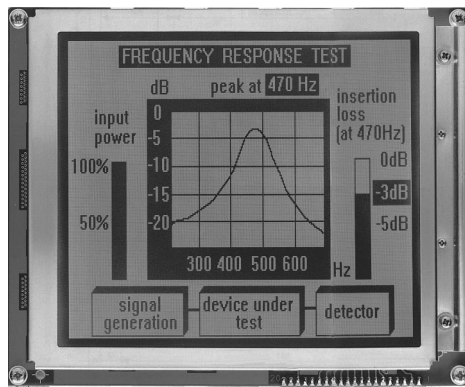
G1216

G321D
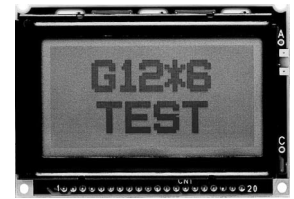
G1213

G649D

G242C

G324E

CHECK LIST FOR CUSTOM DESIGNED LCD MODULE

1. Company_____ **2. Application**_____ **3. Customer Specified Part No.**_____

4. Design

☐ New ☐ Modified : Manufacturer_____ , Part No._____ , Remarks _____

☐ Equivalent: Manufacturer _____ , Part No._____ , Remarks _____

5. LCM Dimensions

A x B : Module size _____ x _____ mm

E x F : Viewing area _____ x _____ mm

P x Q : Active display area_____ x _____ mm

C : Length between mounting holes_____mm

D : Length between mounting holes_____mm

M : Diameter of mounting hole_____mm

H : Total thickness _____mm

H1 : Upper thickness _____mm

H2 : Lower thickness_____mm

6. Display Contents

☐ Character type:_____characters_____lines

Character font_____x_____dots + cursor

Character pitch_____x_____mm

Dot pitch _____x_____mm

Dot size _____x_____mm

☐ Graphics (Full dot) type:_____x_____dots

Dot pitch_____x_____mm

Dot size _____x_____mm

☐ Segment type: _____digits_____lines

☐ Others _____

7. LCD Panel

Viewing angle: ☐ 6 o'clock ☐ 12 o'clock ☐_____o'clock

Type: ☐ TN ☐ FSTN (Black and white)

　　　 ☐ STN (☐ Yellow green ☐ Gray ☐ Blue)

　　　　　 Chromaticity coordinates

　　　　　　　 (_____ $\leqq$ x $\leqq$ _____ , _____ $\leqq$ y $\leqq$ _____)

☐ Positive type ☐ Negative type

☐ Reflective ☐ Transflective ☐ Transmissive

☐ Others _____

Gray scale: ☐ Yes_____ gray scale ☐ No

Preferential specifications:

☐ Response time t_{on}____ ms (___°C) t_{off}____ ms (___°C)

☐ Viewing angle____deg. (___°C) ☐ Contrast____(___°C)

☐ Others_____

LCD surface finishing:

☐ Normal ☐ Anti-glare ☐_____

Polarizer color: ☐ Normal (neutral gray) ☐ Red

☐ Green ☐ Blue ☐_____

8. Driving Method

Multiplexing:1/ _____ duty, 1/_____ bias

Frame frequency: _____ Hz

9. IC

LCD driver: ☐ Specified ☐ Unspecified

　　Segment driver _____(Manufacturer_____)

　　Common driver _____(Manufacturer_____)

Controller: ☐ Internal ☐ External

　Type No._____(Manufacturer_____)

MPU: ☐ Internal ☐ External

　Type No._____(Manufacturer_____)

RAM: ☐ Internal ☐ External

　Type No. /Memory size_____(Kbit) (Manufacturer_____)

10. Power Supply

☐ Single power supply: ☐ 5V ☐_____V

☐ 2 power supplies

　For logic: (V_{DD}-V_{SS}) : ☐ 5V ☐_____V

　For LC drive: (V_{LC}-V_{SS}) : ☐_____V

11. Temperature Compensation Circuit

☐ Internal ☐ External ☐ Unnecessary

Compensation range: ☐ 0°C to 50°C ☐ ___°C to ____°C

12. Current Consumption

For logic: typ._____mA, max._____mA

For LC drive: typ._____mA, max._____mA

Others ( ) : typ._____mA, max._____mA

13. Contrast Adjustment

☐ Internal ☐ External ☐ Unnecessary

Method: ☐ Temp. compensation circuit ☐ Volume ☐____

14. Temperature Range

Operating temperature range: ☐ 0°C to 50°C ☐____°C to____°C

Storage temperature range: ☐ - 20°C to 60°C ☐____°C to____°C

15. Input/Output Terminals

Specifying allocation: ☐ Yes ☐ No

Specifying position: ☐ Yes ☐ No

16. Weight

　　typ._____ g, max. _____g

17. Connector

☐ Internal ☐ External ☐ Unnecessary

　Type No._____(Manufacturer_____)

18. Backlight

☐ Internal ☐ External ☐ Unnecessary

　☐ EL: ☐ Green ☐ White ☐_____

　☐ LED: ☐ Yellow green ☐ Amber ☐_____

　☐ CFL: ☐ White ☐_____

　☐ Incandescent lamp ☐ Others_____

☐ Backlight type ☐ Edge backlight type

Brightness: _____cd/m²

Inverter: ☐ Internal ☐ External ☐ Unnecessary

Power supply voltage_____V

Current consumption (backlight included)_____ mA

Brightness control: ☐ Yes ☐ No

19. Others

_____

_____

_____

20. Schedule

Estimate: _____

Sample: Delivery_____, Quantity:_____pcs

Mass production: Target price: _____

　Delivery _____ , Total quantity: _____pcs
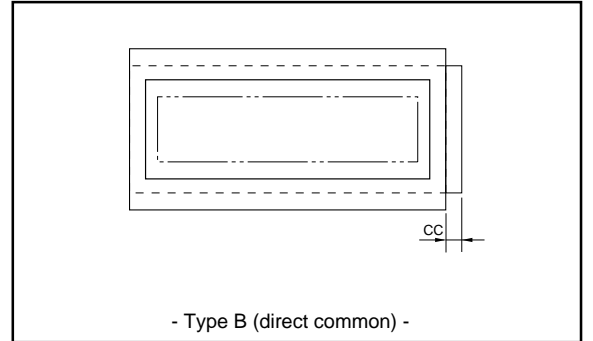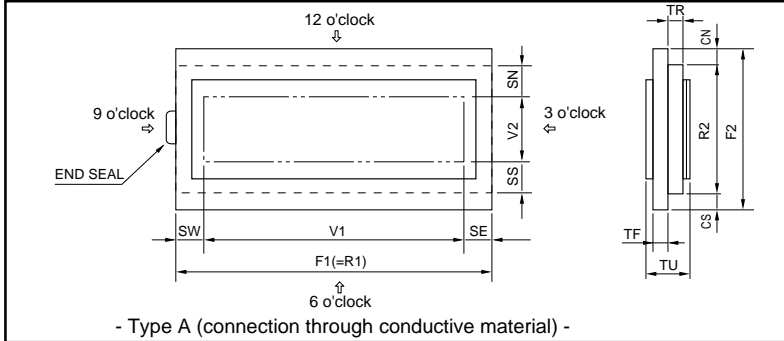
　Quantity per month_____ pcs

Liquid Crystal Displays

CHECK LIST FOR CUSTOM DESIGNED LCD

1. Company_____ **2. Application**_____ **3. Customer Specified Part No.**_____

4. Design

☐New ☐Modified: Manufacturer _____ , Part No. _____ , Remarks _____

☐Equivalent: Manufacturer _____ , Part No. _____ , Remarks_____

5. Panel Dimensions
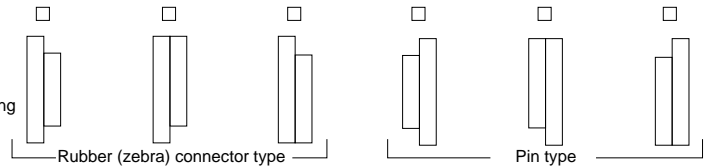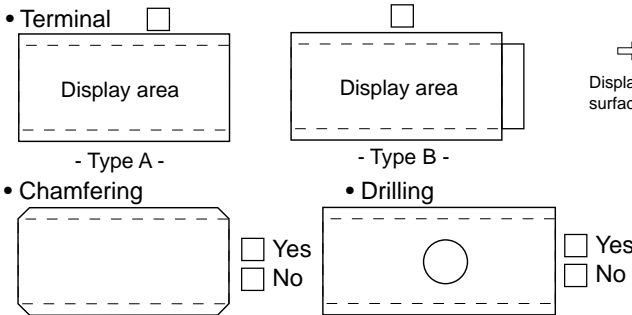

- Type A (connection through conductive material) -

- Type B (direct common) -

F1: Horizontal length of upper glass _____ mm

F2: Vertical length of upper glass_____ mm

R1: Horizontal length of lower glass_____the same as F1

R2*: Vertical length of lower glass_____ mm

 *R2 is generally longer than F2 when terminals are with pin.

TF, TR***: Thickness of glass _____ mm

 ***Standard type: 1.1 mm or 0.7 mm

TU: Thickness of LCD_____ mm

End seal:☐Right ☐Left ☐Right or Left

V1 :Horizontal length of viewing area _____ mm

V2 :Vertical length of viewing area _____ mm

CN**: Terminal length_____ mm

CS**:Terminal length_____ mm

 **CN or CS=0 in case of one side terminal type.

CC: Terminal length_____ mm

SE,SW,SN,SS : Seal width

(According to design or manufacturing condition:

 about 2.0 mm to 4.0 mm)

6. Panel Form

• Terminal ☐ ☐

- Type A - - Type B -

Displaying surface ⇒ Rubber (zebra) connector type Pin type

• Chamfering • Drilling

☐ Yes ☐ No   ☐ Yes ☐ No

7. Display Mode

Viewing angle : ☐6 o'clock ☐12 o'clock ☐_____o'clock

Type:☐TN ☐FSTN (Black and white)

☐STN: (☐ Yellow green ☐ Gray ☐ Blue)

 Chromaticity coordinates (____ ≦ x ≦ ____ , ____ ≦ y ≦ ____)

☐Positive type ☐Negative type

☐Reflective ☐Transflective ☐Transmissive

Preferential specifications:

☐Response time t_{on}　　 ms (　　°C) t_{off}　　 ms (　　°C)

☐Viewing angle _____ deg. (　°C) ☐Contrast____(　°C)

☐Others _____

8. Polarizer

Surface finishing: ☐Normal ☐Anti-glare ☐_____

Color: ☐Normal (neutral gray) ☐Red ☐Green

 ☐Blue ☐_____

Front polarizer : ☐ Attached type ☐ Separate type

Rear polarizer : ☐ Attached type ☐ Separate type

9. Driving Method

☐ Static ☐ Multiplexing: (1/_____duty, 1/_____bias)

Operating voltage (V_{opr}) :_____ V

Frame frequency:_____ Hz

Driving IC:_____(Manufacturer _____)
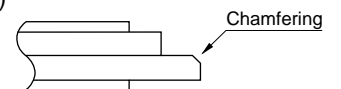
Current consumption: _____ μA

10. Temperature Range

Operating temperature range

☐With temperature compensation circuit (or volume)

 (☐ 0°C to 50°C ☐_____°C to _____°C)

☐Without temperature compensation circuit

 (☐ 0°C to 50°C ☐_____°C to_____°C)

Storage temperature range

 (☐ - 20°C to 60°C ☐_____°C to_____°C)

11. Terminal Connecting Method

☐Rubber connector (Zebra rubber)

☐Pin: ☐DIL ☐SIL ☐_____

 Pitch (☐2.54 ☐ _____mm) Length (_____mm)

☐Heat seal: ☐Equipped ☐Unnecessary

12. Others

Print (Characters, lines, masks etc.) : ☐Yes ☐ No

Protective film:

☐Yes (Color: ☐ Red ☐Translucent ☐Transparent) ☐No

Chamfering (for heat-seal connector) :

☐Yes (Position:_____)

 (Quantity:_____)

☐No

Chamfering

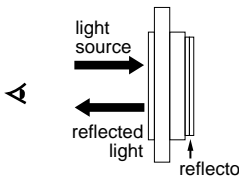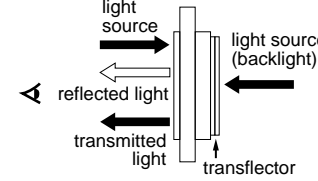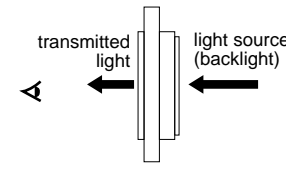**13. Schedule**

Estimate :_____

Sample : Delivery_____ , Quantity :_____ pcs

Mass production : Target price : _____

 Delivery _____ , Total quantity:_____ pcs
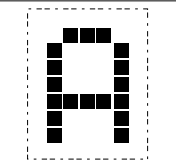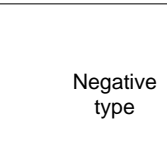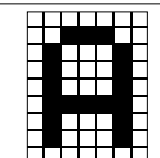
 Quantity per month:_____ pcs

Liquid Crystal Display Modules

■ REFLECTIVE/TRANSFLECTIVE/TRANSMISSIVE LCD

❶ Reflective LCD
Reflector bonded to the rear polarizer reflects the incoming ambient light. Low power consumption because no backlight is required.

❷ Transflective LCD
Transflector bonded to the rear polarizer reflects light from the front as well as enabling lights to pass through the back. Used with backlight off in bright light and with it on in low light to reduce power consumption.

❸ Transmissive LCD
Without reflector or transflector bonded to the rear polarizer. Backlight required. Most common is transmissive negative image.

■ POSITIVE/NEGATIVE MODE

Positive type

Negative type

Negative type (inverse image) (when data is inverted)

■ TN TYPE/STN TYPE/FSTN TYPE

TN	(Background/dot color) Gray/Black	TN(Twisted Nematic) type is most conventional and economical. It is used for static drive LCD and low-duty drive LCD (watch,calculator, etc.)
STN	Yellowgreen/Dark blue Gray/Dark blue White/Blue	STN (Super Twisted Nematic) type has a higher twist angle, and thus provides clear visibility and wider viewing angle. This is suitable especially for high-duty drive LCD.
FSTN	White/Black	FSTN (Film Super Twisted Nematic) type utilizes RCF (Retardation Control Film) to remove the coloring of STN LCD. Thus FSTN type provides easy-to-read black-and-white display.

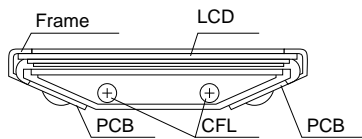## ■ STRUCTURE AND FEATURE OF LCD MODULE WITH BACKLIGHT

CFL (Cold Cathode Fluorescent Lamp) backlight
Features: high brightness, long service life, inverter required

- Edge backlight type
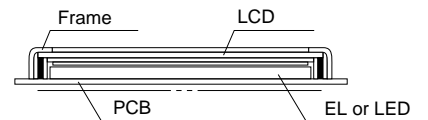 (G2446,G242C)
  (G321D, G649D)

Frame LCD CFL
Light guide PCB

- Backlight type

Frame LCD
PCB CFL PCB
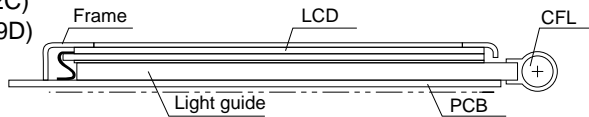
EL (Electroluminescent Lamp) backlight
LED (Light Emitting Diode) backlight

Features: EL: thin, inverter required
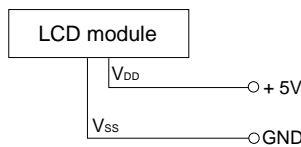LED: long service life, low voltage driving, no inverter required

Frame LCD
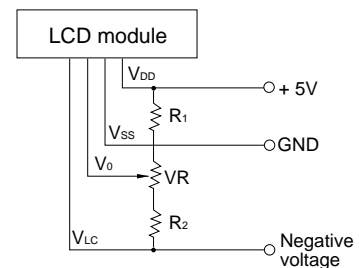PCB EL or LED

■ POWER SUPPLY

- Character modules (single power supply)

LCD module
V_{LC} V_{DD} — +5V
VR
V_{SS} — GND

- Character Modules(Dual power supply)

LCD module
V_{DD} — +5V
V_{SS} — GND
V_{LC} VR — -2V (min)
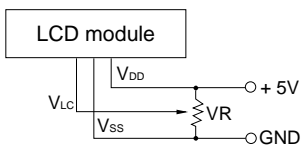
- G2446,G242C (Built-in DC-DC conv.)

LCD module
V_{DD} — +5V
V_{SS} — GND

- Y1206 and G1226

LCD module
V_{DD} — +5V
V_{SS} — GND
V_{LC} — Negative voltage

·Negative voltage should be variable for contrast adjustment.

- G321D, G324E and G649D

LCD module
V_{DD} — +5V
R_1
V_{SS} — GND
V_0 VR
R_2
V_{LC} — Negative voltage
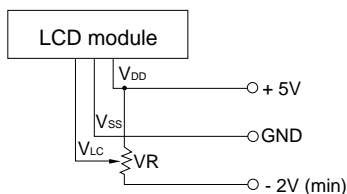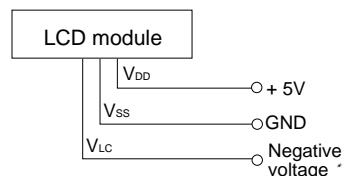
Note 1:Contrast can be adjusted by VR.
Note 2:For module with backlight, power supply for backlight is necessary.

Precautions

Safety Instructions
- If the LCD panel is damaged, be careful not to get the liquid crystal in your mouth and not to be injured by crushed glasses.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then, drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal should get in your eye, flush your eye with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.
- EL or CFL backlight is driven by a high voltage with an inverter. Do not touch the connection part or the wiring pattern of the inverter.
- Do not use inverters without a load or in the short-circuit mode.
- Use the LCD module within the rated voltage to prevent overheating and/or damage. Also, take steps to ensure that the connector does not come off.

Handling Precautions
- Since the LCD panel has glass substrate, avoid applying mechanical shock or pressure on the module. Do not drop, bend, twist or press the module.
- Do not soil or damage LCD panel terminals.
- Since the polarizer is made of easily-scratched material, be careful not to touch or place objects on the display surface.
- Keep the display surface clean. Do not touch it with your skin.
- CMOS LSI is used in the LCD module. Be careful of static electricity.
- Do not disassemble the module or remove the liquid crystal panel or the panel frame.
- Do not damage the film surface of the EL lamp; otherwise the lamp will be damaged by humidity.
- To set an EL lamp in an LCD module, push the EL lamp with its emitting side up, without pushing the rubber connectors too hard. If you damage them, the LCD module may not work properly.

Mounting and Designing
- To protect the polarizer and the LCD panel, cover the display surface with a transparent plate (e.g., acrylic or glass) with a small gap between the transparent plate and the display surface.
- Keep the module dry. Avoid condensation to prevent the transparent electrodes from being damaged.
- Drive LCD panel with AC waveform in which DC element is not included to prevent deterioration in the LCD panel.
- Contrast of LCD varies depending on the ambient temperature. To offer the optimum contrast, LC drive voltage should be adjusted. LCD driven in a high duty ratio must be provided with drive voltage adjustment method.
- Mount a LCD module with the specified mounting part/holes.

- Design the equipment so that input signal is not applied to the LCD module while power supply voltage is not applied to it.
- Do not locate the CFL tube and the lamp lead wire close to a metal plate or a plated part inside the equipment. Otherwise stray capacity causes a drop in voltage, decreasing the brightness and the ability to start-up.

Cleaning
- Do not wipe the polarizer with a dry cloth, as it may scratch the surface.
- Wipe the LCD panel gently with a soft cloth soaked with a petroleum benzine.
- Do not use ketonic solvents (ketone and acetone)or aromatic solvents (toluene and xylene), as they may damage the polarizer.

Storing
- Store the LCD panel in a dark place, where the temperature is 25°C±10°C and the relative humidity below 65%. If possible, store the LCD panel in the packaging situation when it was delivered.
- Do not store the module near organic solvents or corrosive gases.
- Keep the module (including accessories) safe from vibration, shock and pressure.
- Use an LCD module with built-in EL backlight within six months of delivery.
- EL backlight is easily affected by environmental conditions such as temperature and humidity; the quality may deteriorate if stored for an extended period of time. Contact Seiko Instruments GmbH for details.
- Some parts of the backlight and the inverter generate heat. Take care so that the heat does not affect the liquid crystal or any other parts.
- Dust particles attached to the surface of the LCD or the surface of the backlight degrade the display quality. Be careful to keep dust out in designing the structure as well as in handling the module.
- Black or white air-bubbles may be produced if the LCD panel is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD panel.

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Notes :
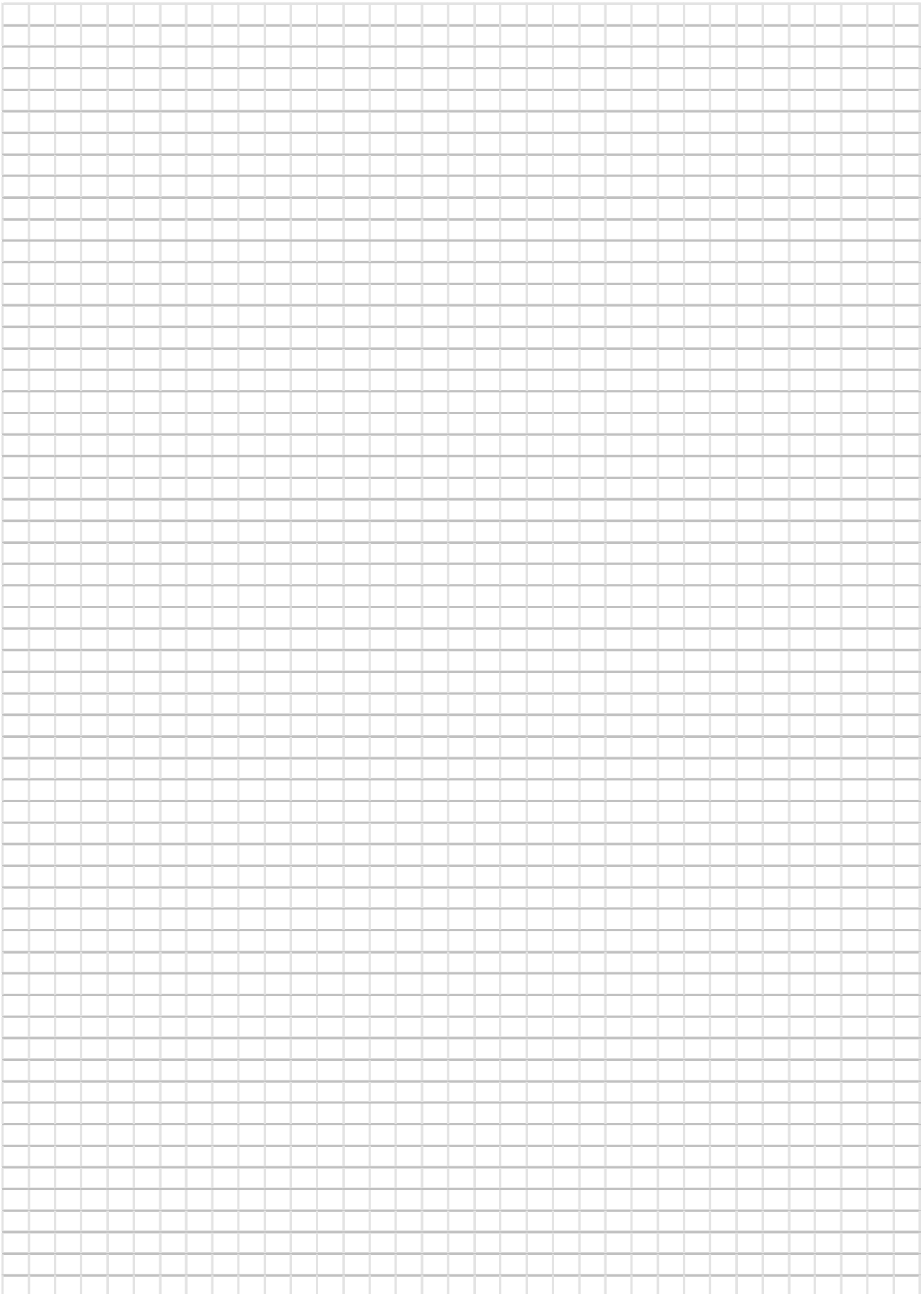
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the products decribed in this
catalogue holds the ISO 9001
quality system certificate.

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

IQNet Registration No. IT-0279

This is to state that

TECDIS S.p.A.
Rue de la Gare, 41 - 11024 CHATILLON (AO)

holds the
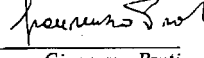*Quality System Certificate*

CISQ/CSQ 9170.TED1

for the scope specified thereon and for the standard

ISO 9002

Signed for and on behalf of IQNet

Klaus Petrick *President of IQNet*	**1996-10-7** *Date*	**CISQ** *Gianrenzo Prati* *CISQ President*

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