Distributed by:

**TEXIM**
E U R O P E

**www.texim-europe.com**

**WINSTAR**

# WINSTAR Display Co.,Ltd.
# 華凌光電股份有限公司

# Winstar Display Co., LTD
## 華凌光電股份有限公司

# SPECIFICATION

## CUSTOMER :

## MODEL NO. :  **WL0F00050000FGAAASA01**

| APPROVED BY:<br><br>( FOR CUSTOMER USE ONLY ) | |
|---|---|

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|---|---|---|---|
|  |  | Eason Chang<br>ShiWei Yang<br>Jason Ni | Corina Yeh |

| VERSION | DATE | REVISED PAGE NO. | SUMMARY |
|---|---|---|---|
| 0 | 2022/06/14 |  | First issue |

TFT Display Inspection Specification: https://www.winstar.com.tw/technology/download.html
Precaution in use of TFT module: https://www.winstar.com.tw/technology/download/declaration.html

## Winstar Display Co., LTD
華凌光電股份有限公司

MODLE NO：

# Contents

# 1. Smart Display Classification Information

| W | L | 0F | 000500 | 00F | G | A | AA | S | A | 01 |
|---|---|----|--------|-----|---|---|----|----|----|----|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ | ⑪ |

| ① | W: WINSTAR products | | |
|---|---|---|---|
| ② | Type: L:Standard    K:Customization | | |
| ③ | Display Type: | Standard: | 0H: Character STN    0G: Graphic STN<br>0X: Graphic STN (TAB/COF)    0P: Graphic STN (COG)<br>0F: TFT<br>EH: Character OLED    EG: Graphic OLED<br>EX: OLED (TAB/COF)    EP: OLED (COG) |
| | | Customization: | DH: Character    DG: Graphic STN<br>DN: Graphic    0J: TFT<br>ED: OLED |
| ④ | Display size: (diagonal) / Display format: (resolution) | Character STN:<br>Graphic STN: | e.g., 8x1: 000801    16x2: 001602    24x4: 002404<br>e.g., 128x64: 012864    320x240: 320240 |
| | | TFT Size (inch): | 000096-0.96" / 000350-3.5" / 000430-4.3" / 000570-5.7"<br>000700-7.0" / 000800-8.0" / 001020-10.2" / 001210-12.1"<br>(The last two digits are two digits after the decimal point) |
| | | OLED: | e.g., 128x64: 012864 Customization: 0001XX |
| ⑤ | Serial No: | 0A1 ~ 0ZZ | Customization STN: 000 |
| ⑥ | Touch Panel Type: | N: Without TP   T: RTP   G: CTP | |
| ⑦ | Model Interface: | A: CAN    H: HDMI    X: Combined<br>B: Bluetooth    R: Memory Specified    Y: Proprietary interface<br>C:Controller Specified   N: Ethernet<br>D: RS485    J: Analog I/O<br>E: RS232    K: USB<br>F: USART    L: WIFI<br>G: Logic I/O    M: Zigbee | |
| ⑧ | Interface Serial No.: | AA ~ ZZ | |
| ⑨ | Control Category: | S: Smart Display    E: Entry    N: Non-specified | |
| ⑩ | Special Code: | A → Generic    B → Industrial    C →Automotive    D →Medical | |
| ⑪ | Model code: | 00 ~ ZZ | |

# 2. Summary

**5 Inch Smart Display Feature**

1. DC 5V working voltage, low power consumption for USB to drive.

2. Self testing after booting function.

3. CAN bus communication interface.

4. Support CANopen negotiation. Default baud rate is 250KB.

5. Built in flash memory, store the font and Object Dictionary Data.

6. Support capacitive touch panel (CTP).

7. Smart Display scenario is slave device display and action from Master Device instruction.

8. Embedded buzzer controlled by Master Device.

9. Demo set HOST can be used on multiple platforms, such as Computer (with USB to CAN Dongle), MCU, Raspberry Pi (with PiCAN2).
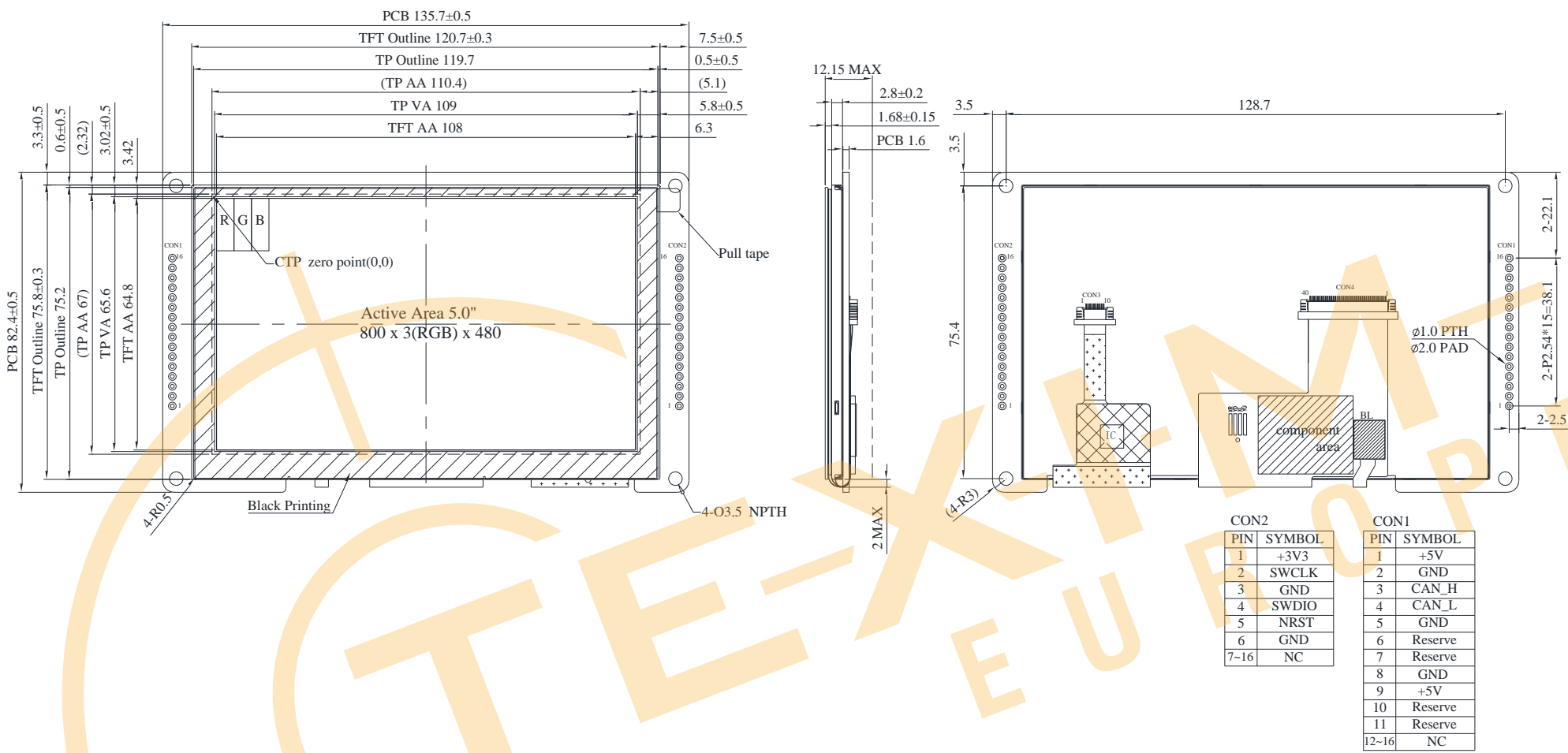
# 3. Product information

## General information

| Item | Standard Value | Unit |
|---|---|---|
| Operating voltage | 5 | Vdc |
| Communication Interface | CAN bus differential ± 3.3 | Vpp |
| MCU | STM32F750 | N/A |
| Flash Memory | 16 | MB |
| SDRAM Frequency | 108 | MHz |
| LCD display size | 5.0 | inch |
| Dot Matrix | 800× 3(RGB) × 480 | dot |
| Module dimension | 135.7(W) ×82.4(H) ×12.15 | mm |
| Active area | 108(W) ×64.8 (H) | mm |
| Dot pitch | 0.135(W) ×0.135(H) | mm |
| Brightness | Min: 650; Typ: 750 | cd/m$^2$ |
| LCD type | TFT, Normally Black, Transmissive | |
| View Direction | 80/80/80/80 | |
| Aspect Ratio | 5:3 | |
| With /Without TP | With CTP | |
| Surface | Glare | |

# 4. Contour Drawing



PCB 135.7±0.5
TFT Outline 120.7±0.3
TP Outline 119.7
(TP AA 110.4)
TP VA 109
TFT AA 108

7.5±0.5
0.5±0.5
(5.1)
5.8±0.5
6.3

3.3±0.5
0.6±0.5
(2.32)
3.02±0.5
3.42

PCB 82.4±0.5
TFT Outline 75.8±0.3
TP Outline 75.2
(TP AA 67)
TP VA 65.6
TFT AA 64.8

R G B
CTP zero point(0,0)

Active Area 5.0"
800 x 3(RGB) x 480

Pull tape

Black Printing

4-R0.5
4-O3.5 NPTH

12.15 MAX
2.8±0.2
1.68±0.15
PCB 1.6
2 MAX
(4-R3)

3.5
128.7
3.5
75.4

2-22.1
2-P2.54*15=38.1
2-2.5

ø1.0 PTH
ø2.0 PAD

CON2
CON3 10
40 CON4
component area
IC
BL

| CON2 | |
|---|---|
| PIN | SYMBOL |
| 1 | +3V3 |
| 2 | SWCLK |
| 3 | GND |
| 4 | SWDIO |
| 5 | NRST |
| 6 | GND |
| 7~16 | NC |

| CON1 | |
|---|---|
| PIN | SYMBOL |
| 1 | +5V |
| 2 | GND |
| 3 | CAN_H |
| 4 | CAN_L |
| 5 | GND |
| 6 | Reserve |
| 7 | Reserve |
| 8 | GND |
| 9 | +5V |
| 10 | Reserve |
| 11 | Reserve |
| 12~16 | NC |

The non-specified tolerance of dimension is ±0.3 mm .

# 5. Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|------|--------|-----|-----|-----|------|
| Operating Temperature | TOP | -30 | — | +80 | ℃ |
| Storage Temperature | TST | -30 | — | +80 | ℃ |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above
1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

# 6. Electrical Characteristics

| Item | Symbol | Min | Typ | Max | Unit |
|------|--------|-----|-----|-----|------|
| Supply Voltage | VCC | 4.75 | 5 | 5.5 | V |
| Supply Current | ICC | | 550 | | mA |

# 7. BOM

| Item | Description | Remark |
|------|-------------|--------|
| LCM | WF50FSWAGDNG0# | |
| PCBA | SV10005R000FE00N0100 | |

# 8. Block diagram
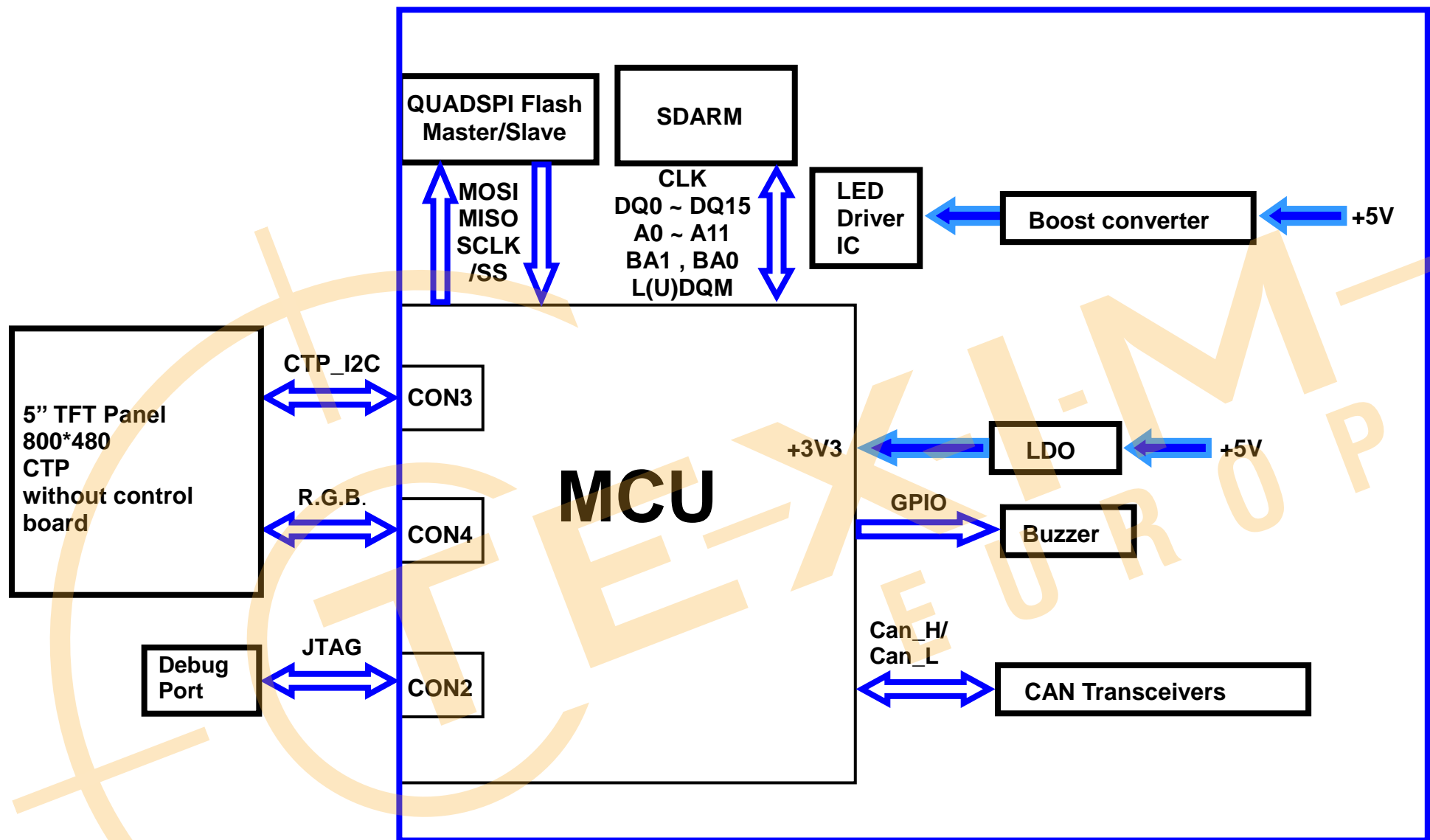
# 9. Interface

**CON1 definition:**
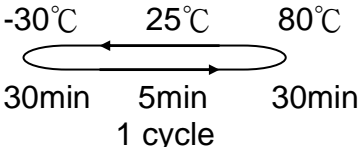
| Pin | Symbol | Function | Remark |
|---|---|---|---|
| 1 | +5V | Power supply 5V input | Input |
| 2 | GND | Power supply GND input | Input |
| 3 | CAN_H | CAN bus D+ | I/O |
| 4 | CAN_L | CAN bus D- | I/O |
| 5 | GND | GND | Output |
| 6 | Reserve | -- | Reserve |
| 7 | Reserve | -- | Reserve |
| 8 | GND | GND | Output |
| 9 | +5V | +5V | Output |
| 10 | Reserve | -- | Reserve |
| 11 | Reserve | -- | Reserve |
| 12-16 | NC | -- | - |

**CON2 definition:**

| Pin | Symbol | Function | Remark |
|---|---|---|---|
| 1 | +3V3 | 3.3V power for JTAG interface | Output |
| 2 | SWCLK | CLK pin for JTAG interface | Input |
| 3 | GND | GND for JTAG interface | Output |
| 4 | SWDIO | Data pin for JTAG interface | I/O |
| 5 | NRST | Reset pin for JTAG interface | Input |
| 6 | GND | GND | Output |
| 7-16 | NC | -- | - |

# 10. <u>Reliability</u>

Content of Reliability Test (Wide temperature, -30℃~80℃)

| Environmental Test | | | |
|---|---|---|---|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80℃ 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30℃ 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 80℃ 200hrs | ____ |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -30℃ 200hrs | 1 |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60℃,90%RH max | 60℃,90%RH 96hrs | 1,2 |
| Thermal shock resistance | The sample should be allowed stand the following 10 cycles of operation<br><br>-30℃　　25℃　　80℃<br><br>30min　　5min　　30min<br>1 cycle | -30℃/80℃ 10 cycles | ____ |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes | 3 |
| Static electricity test | Endurance test applying the electric stress to the terminal. | VS=±2KV~±6KV(contact),±2KV~±8KV (air), RS=330Ω CS=150pF 10 times | ____ |

Note1: No dew condensation to be observed.
Note2: The function test shall be conducted after 4 hours storage at the normal
Temperature and humidity after remove from the test chamber.
Note3: The packing have to including into the vibration testing.

# 11. Product inspection check list

**Check samples by meter $V_{IN}$, $I_{system}$**

| Item | No 1 | No 2 | No 3 | Note |
|---|---|---|---|---|
| $V_{IN}$ (V) | 5 | 5 | 5 | |
| $I_{System}$(mA) | 556 | 558 | 554 | |

**Check sample Reliability Test**

| Item | Result | Note |
|---|---|---|
| Thermal shock | | -30℃/80℃ 20 cycles |
| High Temperature Operation | | 80℃<br>200hrs |
| Low Temperature Operation | | -30℃<br><br>200hrs |
| Static electricity test | | VS=±2KV~±6KV(contact),±2KV~±8KV (air),<br>RS=330Ω<br>CS=150pF<br>10 times |
| Vibration test | – | Total fixed amplitude : 1.5mm<br>Vibration Frequency : 10~55Hz<br>One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes |

- Prepare sets for testing

---

# 12. Display Usage

**Functional description**

Smart Display can be used to display the coordinate, status and data information provided by the connected HOST device. Customers can configure the position coordinates they want to display in normal operation mode (Node ID = 0x7B).

The Display is designed to be easily connected to a controller network, and to operate with minimum setup or knowledge of the SDO configuration on the controllers.

**Splash Screen**

The default splash image is shown below.
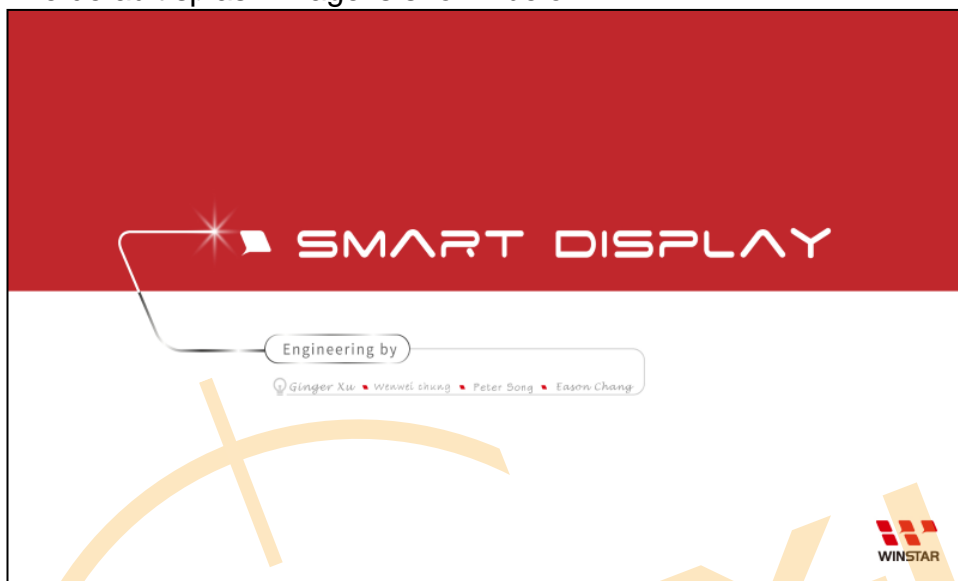


✓  This product is produced as a generic product. If you require a custom splash image for your application, contact us to discuss.

**Default Selection**

Press the preferred application and hold for 3 seconds for the first time power on.
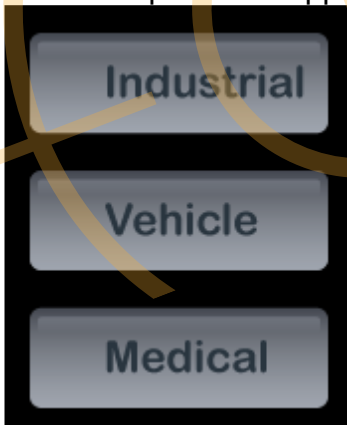


**Acquisition of Displayed Data**

The Smart Display can acquire the data that it displays by using the CANopen SDO protocol.

On Pre-operational mode, customers can set the coordinates of objects through SDO; On operational mode, customers can send data of objects through SDO, please see below.

---

Example:
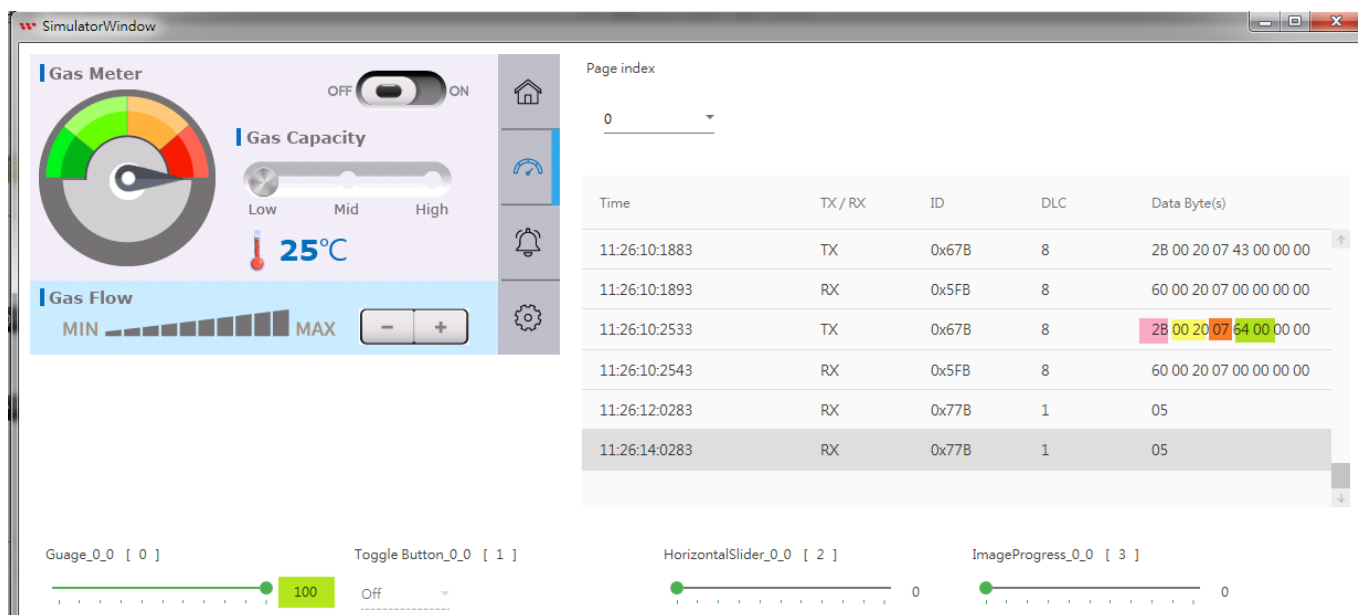




The client request :

| 600 + Serv NodeId | 0 | 2B | Index | Sub index | d1 | d0 | x | x |
|---|---|---|---|---|---|---|---|---|

Data length = 2 bytes

X : undefined. Put 0

To write the 2 byte data : 0x0064 in the object dictionary of node 7B at index 0x2000, sub-index 7, sends :

    67B    2B 00 20 07 64 00 00 00

If success, the node 7B responds :

    5FB    60 00 20 07 00 00 00 00

**Configuring the Display**
Winstar Smart Display CAN series offers an out-of-the-box CANopen development experience that will lower customers' development costs and speed time-to-market expectations.

The Smart Display can use wide-temperature are designed to support control applications in harsh operating conditions, which designed to be connected to a variety of different situation combinations, such as automotive, marine, power generation and oil-and-gas.

The Smart Display comes with standard UI objects to get customers project off the ground quickly. If customers need custom UI objects support, our engineers are here to help. Send over your contents in PNG/JPG format, we will send over a new set of UI objects within 3~5 working days.

The Smart Display is defined as a slave device, which is controlled by master device via CAN bus command to render display content on the display screen and return touch event data with protocol objects.

**Node ID when Standalone**

If the display is powered up standalone, the node id will default to 0x7B.

**Configuring the Main Screen**

The screen on the display is 800 x 480 pixels.

The co-ordinate system used to specify the location of an item on the screen is shown in the diagram below. The coordinates are (x,y) where 'x' is the horizontal offset from the left, and 'y' is the vertical offset from the top.
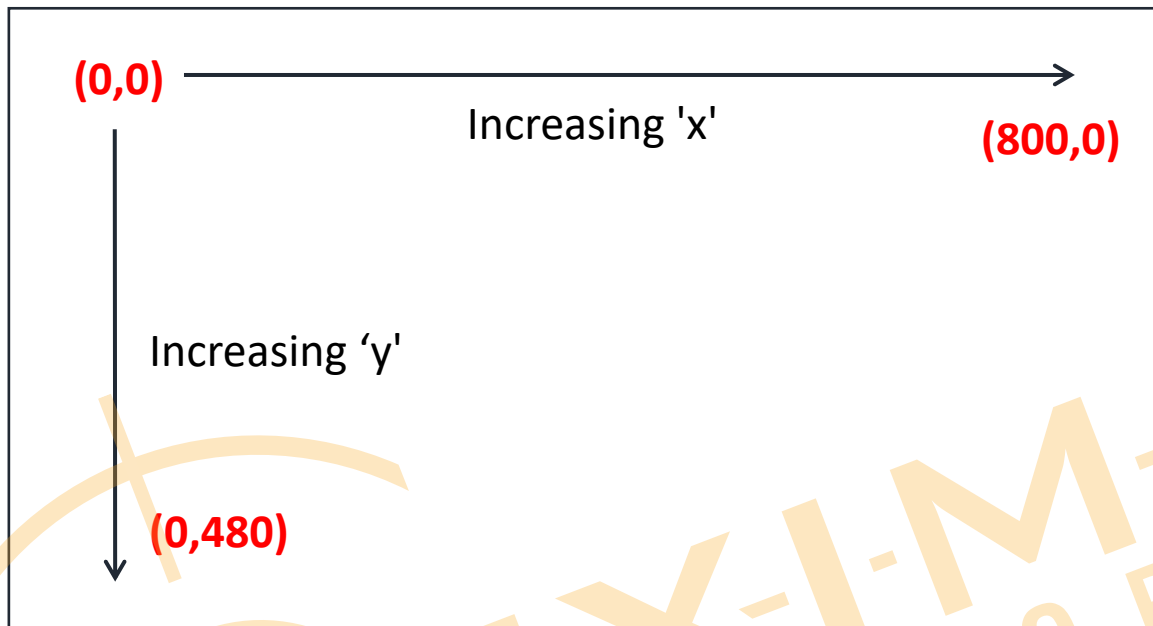


**Item Object Dictionary**

There are 64 objects entries which are for configuration of the items that can be displayed on the screen in the latest F/W version. These are at location 0x2000 to 0x203F. Each object fully defines one screen item.
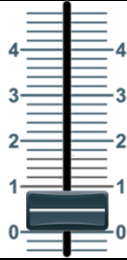
Each item has a set of sub-index items which are used to control the coordinate of the item. The exact functionality varies depending on the type of item selected. The template object is shown below:
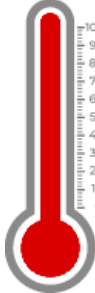
## Object List(0x2000 to 0x203F)

| Object Index 0x2000 to 0x2009 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Number of Entries | UNSIGNED8 | 9 |
| Sub 1 | Type | UNSIGNED8 | style of Object |
| Sub 2 | Reserve | | |
| Sub 3 | X position | INTEGER16 | The object's X position |
| Sub 4 | Y position | INTEGER16 | The object's Y position |
| Sub 5 | Number of Style | UNSIGNED16 | The photo of style |
| Sub 6 | Reserve | | |
| Sub 7 | Value 1 | UNSIGNED16 | Data to smart display from HOST |
| Sub 8 | Value 2 | UNSIGNED16 | Data from smart display to HOST |
| Sub 9 | Text | VISIBLE_STRING | Show strings (Unicode)max to 50 Character |

## Sub 1 – Type
The item type is selected according to the table below:

| Data | Description | Example Image |
|---|---|---|
| 0 | No Item This entry is not used | |
| 1 | Reserve | |
| 2 | **Gauge** |  |
| 3 | Reserve | |
| 4 | **Button** |  |
| 5 | **Toggle Button** |  |
| 6 | **Vertical Slider** |  |
| 7 | **Horizontal Slider** |  |
| 8 | **Check Box** |  |

| | | |
|---|---|---|
| 9 | Temperature | |
| 10 | Battery | |
| 11 | Graph | |
| 12 | Indicator | |
| 13 | CircleProgress | |
| 14 | ImageProgress | |
| 15 | Radio Button | |
| 16 | Reserve | |
| 17 | Number String | 65535 |

| 18 | **Text String** | ABC |
|---|---|---|
| 19 | Reserve | |
| 20 | **Digital Clock** | AM 00:45 2021/09/17 |
| 21 | Reserve | |
| 22 | **MultiState** | Ⓟ |

## Sub 3&4 – x and y position

Each item is drawn on screen by setting a draw rectangle. This rectangle is a bounding rectangle sized to fully enclose the item that is being drawn. The co-ordinates specify the position of the top left of this bounding rectangle.

## Sub 5 –Number of Style

Various types of icons
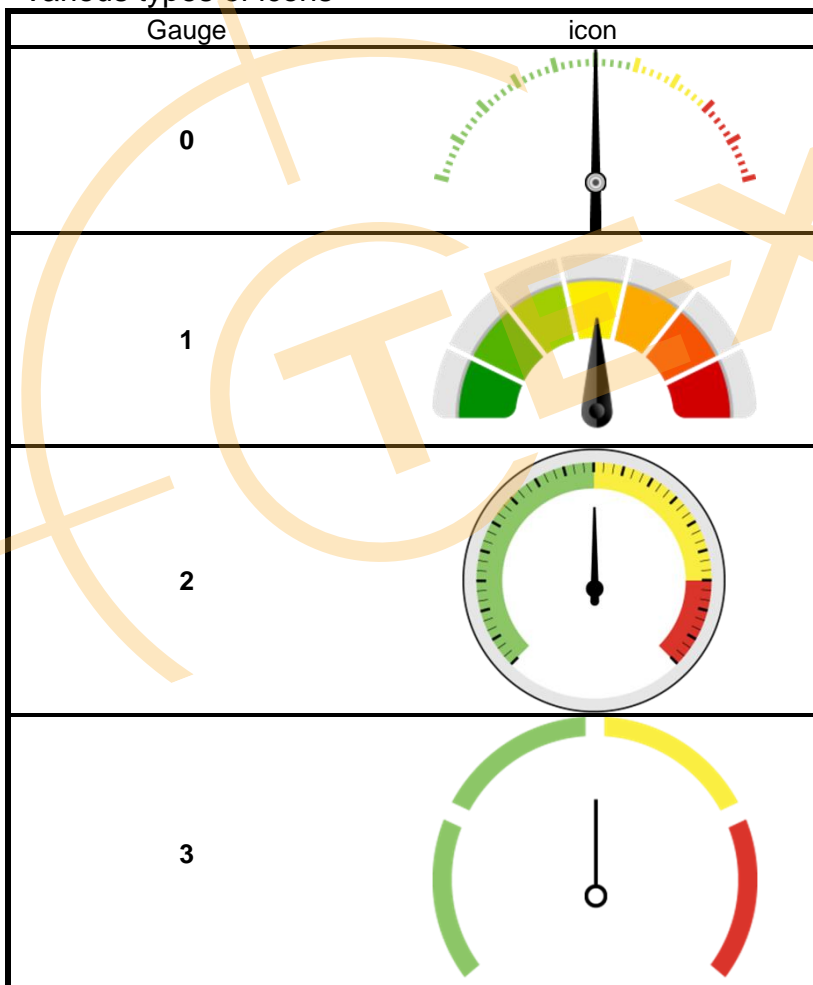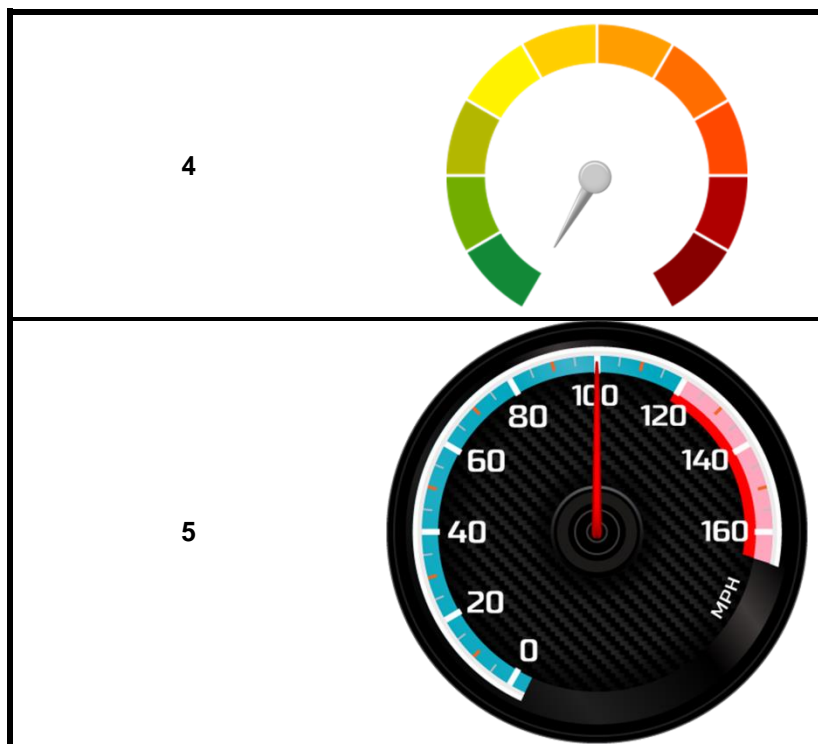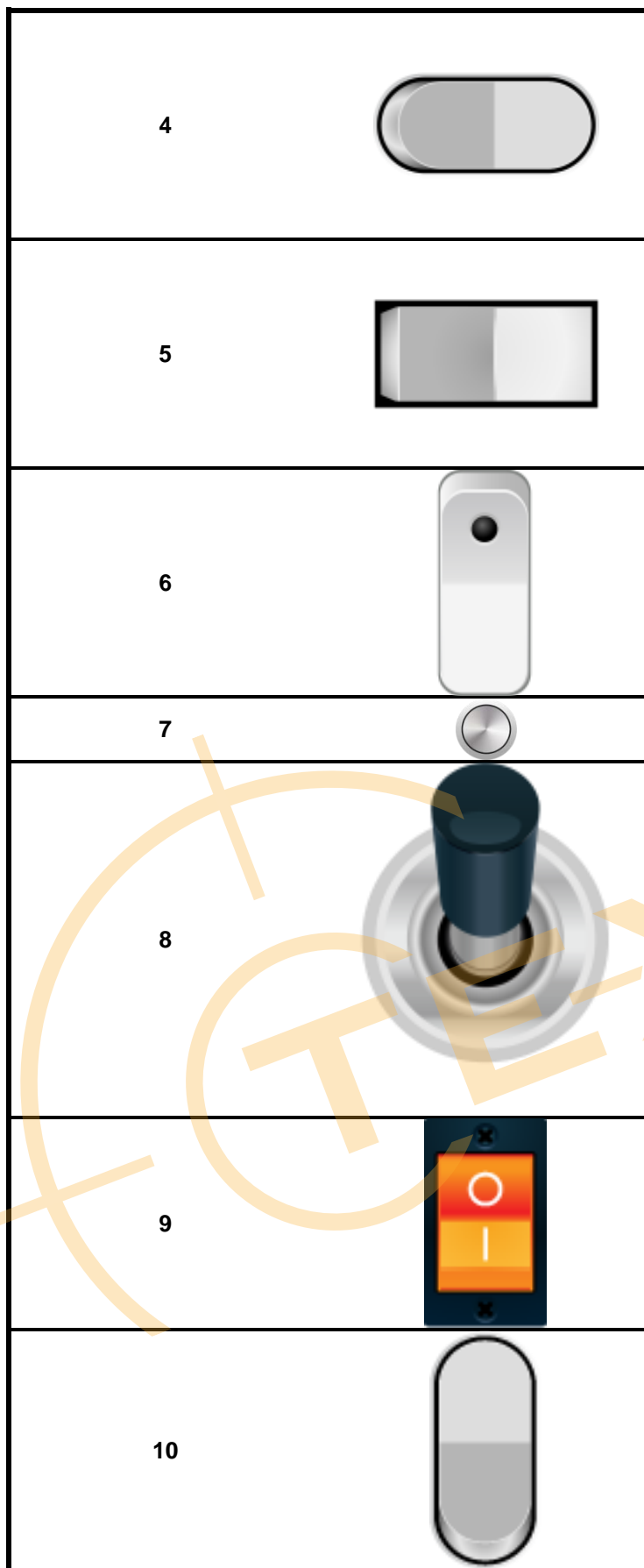
| Gauge | icon |
|---|---|
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |

| | |
|---|---|
| 4 |  |
| 5 |  |

| Button | icon |
|---|---|
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |

| | |
|---|---|
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |

| Toggle Button | icon |
|:---:|:---:|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |

| | |
|---|---|
| 8 |  |
| 9 |  |
| 10 |  |

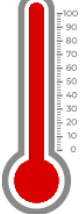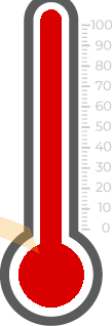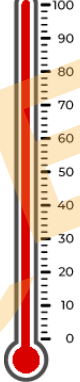| Vertical Slider | icon |
|---|---|
| 0 |  |

| Horizontal Slider | icon |
|---|---|
| 0 |  |

| Check Box | icon |
|---|---|
| 0 |  |
| 1 |  |

| Temperature | icon |
|:---:|:---:|
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |

| Battery | icon |
|:---:|:---:|
| 0 |  |

| | |
|---|---|
| **1** | |

| Graph | icon |
|---|---|
| **0** | |

| Indicator | icon |
|---|---|
| **0** | |
| **1** | |

| CircleProgress | icon |
|---|---|
| **0** | |
| **1** | |

| ImageProgress | icon |
|---|---|
| **0** | |
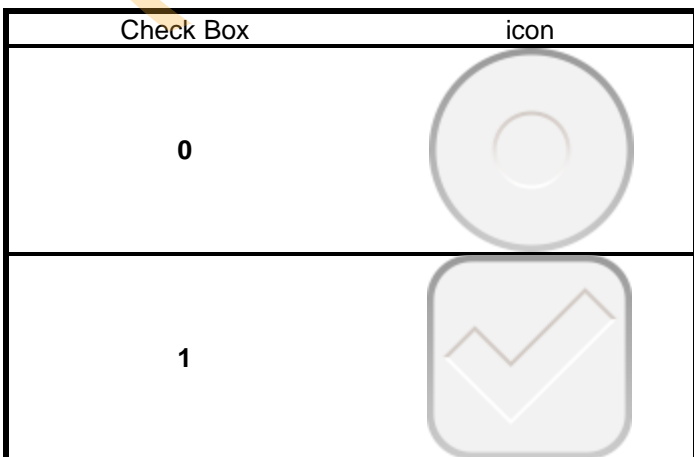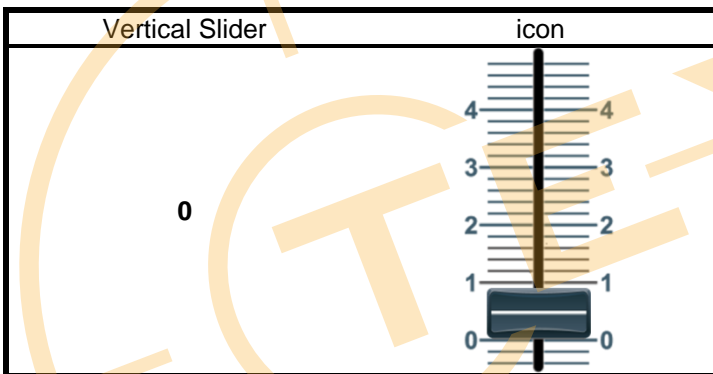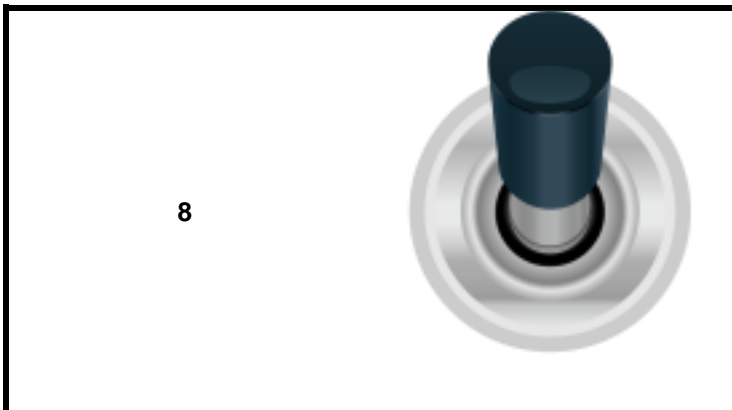
WL0F00050000FGAAASA01 　　第 25 頁，共 31 頁
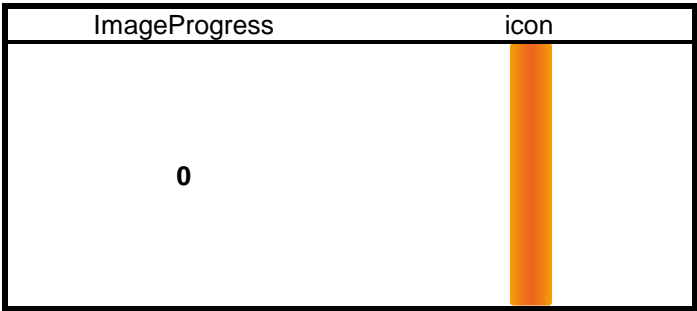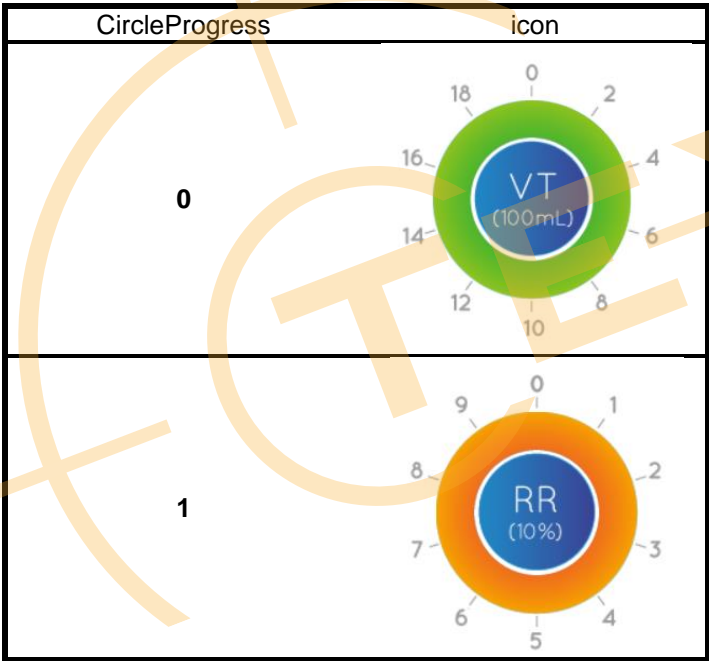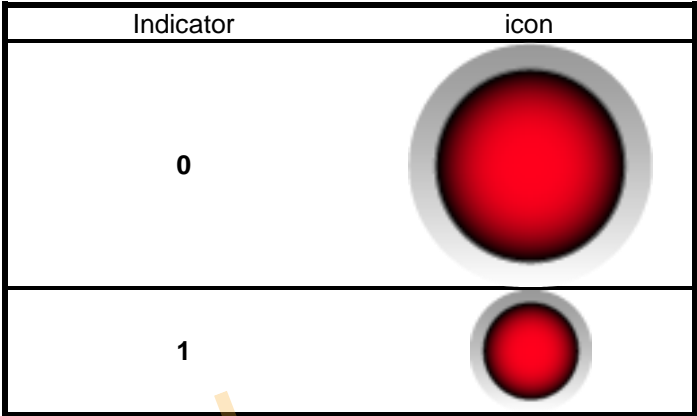
| Radio Button | icon |
|---|---|
| 1 | |
| 0 | |

| Number String | icon |
|---|---|
| 0 | **65535** |
| 1 | 65535 |
| 2 | 65535 |

| Text String | icon |
|---|---|
| 0 | ABC |
| 1 | ABC |
| 2 | ABC |
| 3 | ABC |
| 4 | ABC |
| 5 | ABC |

| Digital Clock | icon |
|---|---|
| 0 | 00:00 |
| 1 | AM 00:45 2021/09/17 |

| Multi State | icon |
|---|---|
| 0 |  |

## Sub 7&8 –Data send and receive

HOST sends numeric data to Sub 7 to control Smart Display objects another HOST receives numerical data from Sub8.

HOST can be used on multiple platforms, such as **Computer**, **MCU**, **Raspberry Pi(with PiCAN2)**.

## Background(0x2100)

| Object Index 0x2100 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Data | UNSIGNED8 | Background of number |

## Backlight(0x2101)

| Object Index 0x2101 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Data | UNSIGNED8 | Value(0~100) |

## Buzzer(0x2102)

| Object Index 0x2102 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Number of Entries | UNSIGNED8 | |
| Sub 1 | Cycle | UNSIGNED8 | Number of repetitions |
| Sub 2 | High | UNSIGNED8 | High level |
| Sub 3 | Low | UNSIGNED8 | Low level |
| Sub 4 | Active | BOOLEAN | Send reverse status to turn on the buzzer. Ex: If the current active bit is true, send false bit and the buzzer is turned on. |

## Page(0x2103)

| Object Index 0x2103 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Number of Entries | UNSIGNED8 | |
| Sub 1 | Count | UNSIGNED8 | Return to page number |
| Sub 2 | Index | UNSIGNED8 | Jump to number page |

## Mode(0x2104)

| Object Index 0x2104 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Number of Entries | UNSIGNED8 | |
| Sub 1 | Mode | UNSIGNED8 | '0x00' enter pre-operation '0x01' enter operation |

## Control_Index

| Object Index 0x2105 | Name | type | Description |
|---|---|---|---|
| Sub 0 | Number of Entries | UNSIGNED8 | |
| Sub 1 | Control_Index | UNSIGNED64 | Request to return the currently used object. Ex. Sends,  67B, 40 05 21 01 00 00 00 00 responds 5FB, 41 05 21 01 08 00 00 00 Sends,  67B, 60 00 00 00 00 00 00 00 responds 57B, 00 FF 07 00 00 00 00 00 Object id 0x2000~0x200B has been used |

# 13. Example Screen Layout (Industry application)

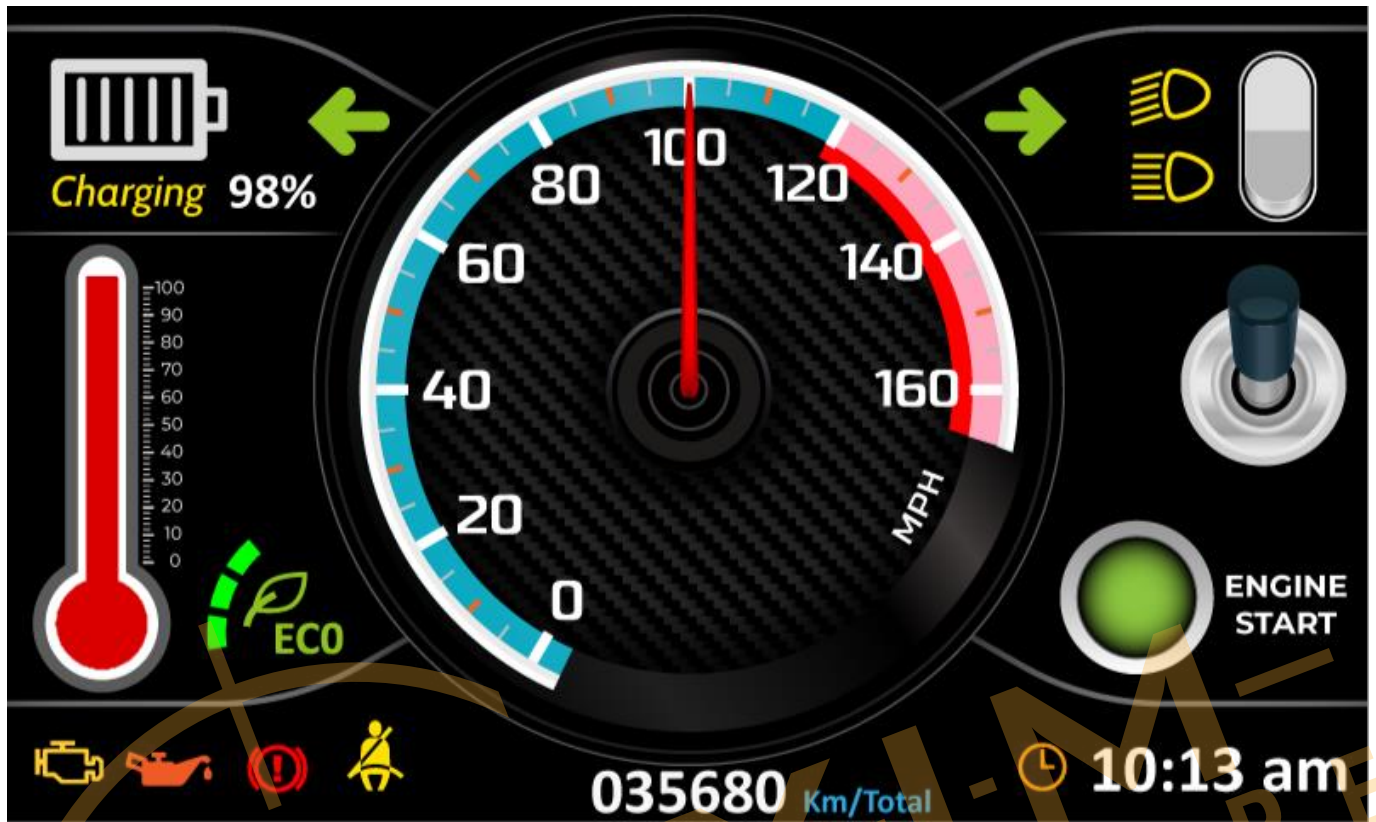**Example Layout**

The screen layout described in this section is intended to demonstrate the settings of screen items that can be used in an industry application situation.



---
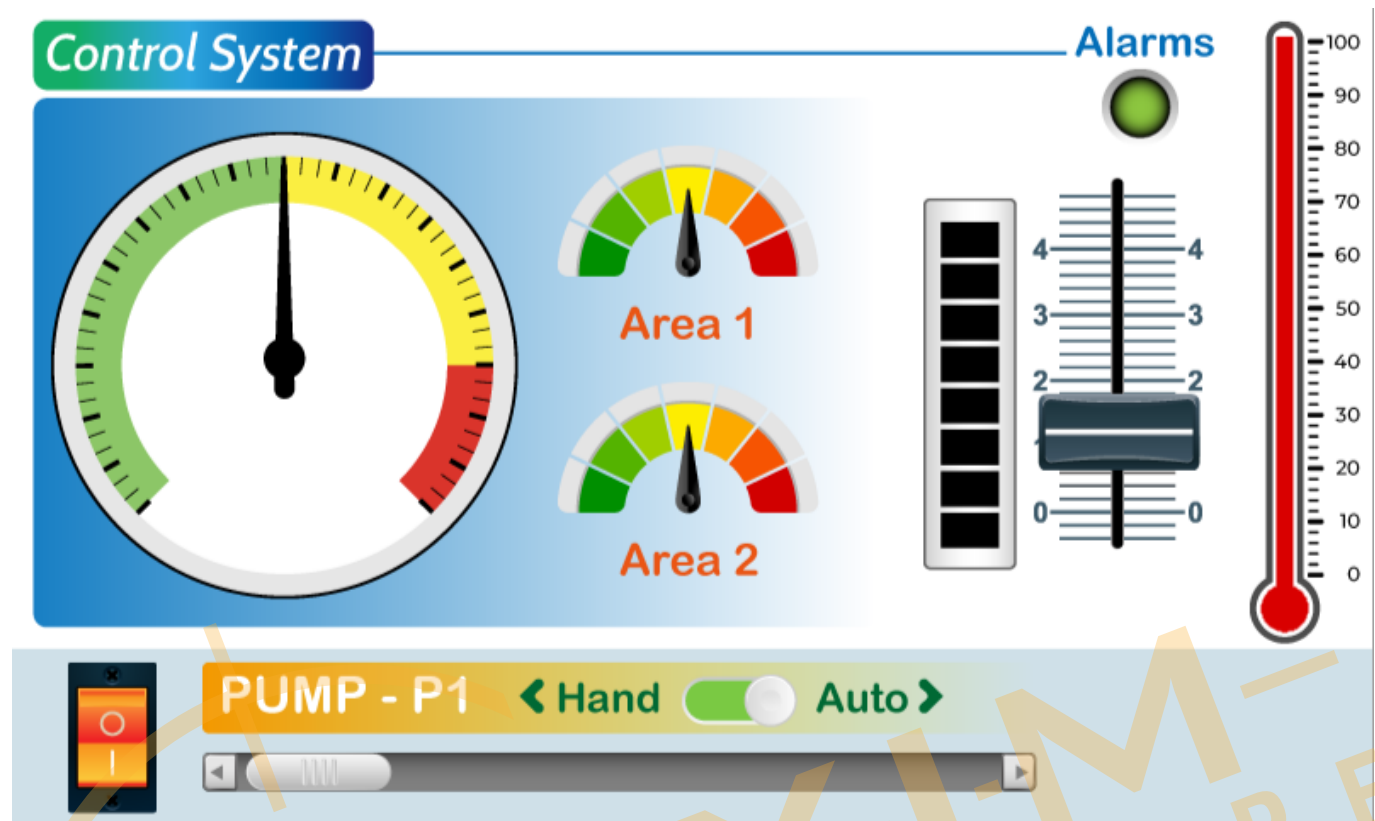
# 14. Example Screen Layout (Vehicle automotive)

**Example Layout**

The screen layout described in this section is intended to demonstrate the settings of screen items that can be used in a vehicle automotive situation.

# 15. Example Screen Layout (Medical application)
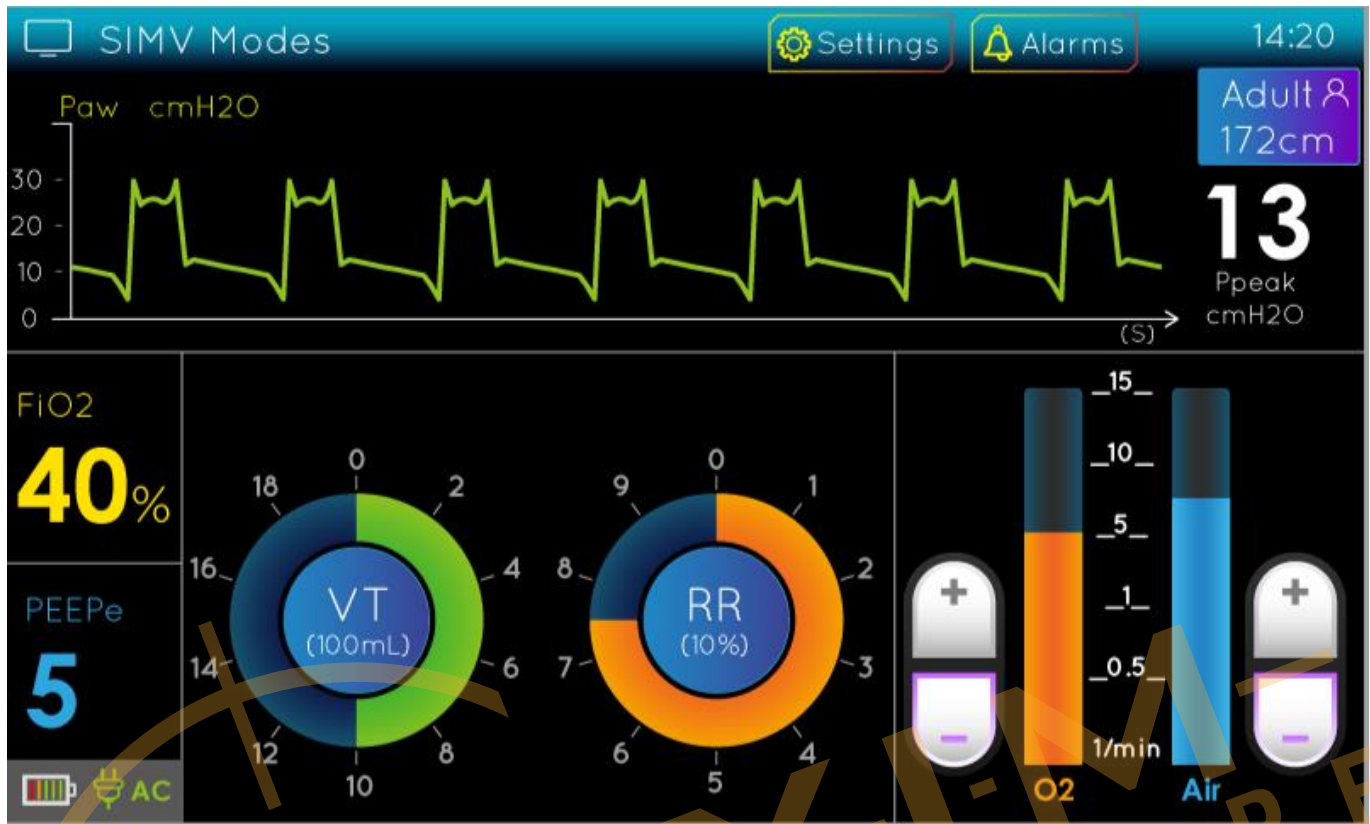
**Example Layout**

The screen layout described in this section is intended to demonstrate the settings of screen items that can be used in a Medical application situation.



# 16. References

Sample code for Arduino Mega 2560

---

**Disclaimer**

ALL PRODUCTS, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Texim Europe B.V. its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Texim"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Texim makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product.

It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application.

Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time.

All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts.

Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.

# Texim Europe - contact details
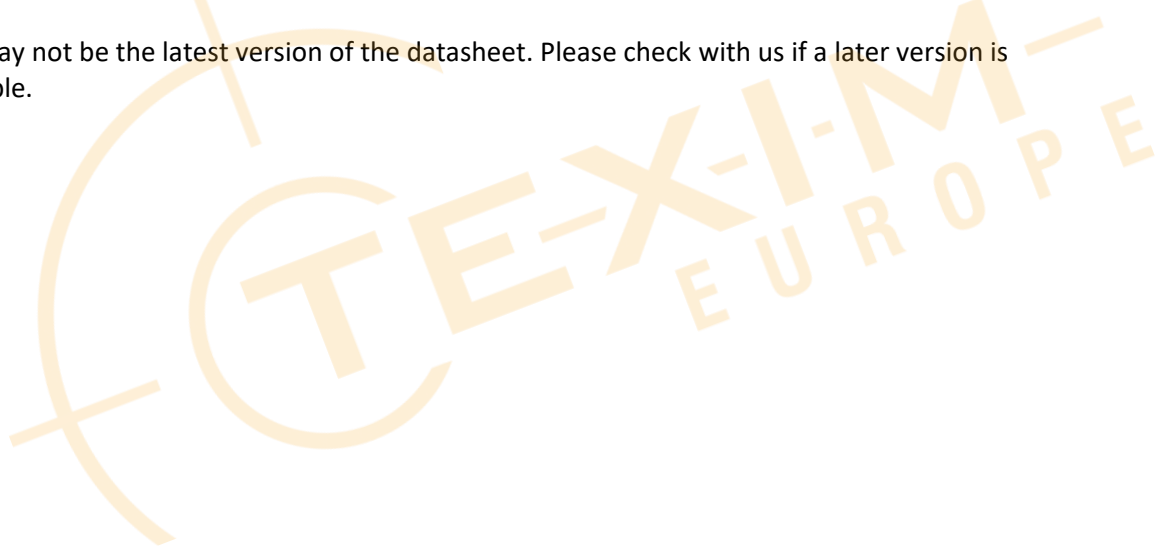
## Headquarters & Warehouse

Elektrostraat 17
NL-7483 PG Haaksbergen
The Netherlands

| | |
|---|---|
| T: | +31 (0)53 573 33 33 |
| E: | info@texim-europe.com |
| Homepage: | www.texim-europe.com |

### The Netherlands

Elektrostraat 17
NL-7483 PG Haaksbergen

T: +31 (0)53 573 33 33
E: nl@texim-europe.com

### Belgium

Zuiderlaan 14, box 10
B-1731 Zellik

T: +32 (0)2 462 01 00
E: belgium@texim-europe.com

### UK & Ireland

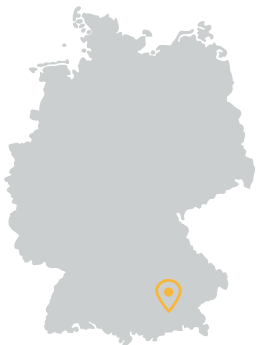St Mary's House, Church Lane
Carlton Le Moorland
Lincoln LN5 9HS

T: +44 (0)1522 789 555
E: uk@texim-europe.com

### Germany

Bahnhofstrasse 92
D-25451 Quickborn

T: +49 (0)4106 627 07-0
E: germany@texim-europe.com

### Germany

Martin-Kollar-Strasse 9
D-81829 München

T: +49 (0)89 436 086-0
E: muenchen@texim-europe.com

### Austria

Warwitzstrasse 9
A-5020 Salzburg

T: +43 (0)662 216 026
E: austria@texim-europe.com

### Nordic

Stockholmsgade 45
2100 Copenhagen

T: +45 88 20 26 30
E: nordic@texim-europe.com

### Italy

Martin-Kollar-Strasse 9
D-81829 München

T: +49 (0)89 436 086-0
E: italy@texim-europe.com