DEEP SEA ELECTRONICS

DSEM812 CODESYS Manual

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DSEM812 CODESYS Manual

Revision History

Issue No.	Comments
1	First Release

TABLE OF CONTENTS

Section **Page**

1 Introduction

This document details the operation and setup requirements of the DSEM812 CODESYS Controller and Display, part of the DSEControl® range of products.

The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.
This is not a *controlled document.* DSE do not automatically inform on updates. Any future updates of this document are included on the DSE website at www.deepseaelectronics.com

Observe the operating instructions. Non-observance of the instructions, operation not in accordance with use as prescribed below, wrong installation or incorrect handling seriously affects the safety of the product, operators and machinery.

A robust metal case designed for chassis mounting houses the module. Connections are via locking plug and sockets.

The controller is supplied with no application program. The equipment manufacturer is responsible for creating and managing the application program and installing it in the controller. This is achieved using CODESYS V3.5 programming. Contact DSE Technical Support for further details.

1.1 CLARIFICATION OF NOTATION

Clarification of notation used within this publication.

NOTE:	**Highlights an essential element of a procedure to ensure correctness.**
CAUTION!	**Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.**
WARNING!	**Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.**

1.2 GLOSSARY OF TERMS

Term	Description
Application	The application is the program that allows the DSEM812 to control the machine it is connected to. The Application within the DSEM812 is designed and provided by the manufacturer of the complete machine.
Bootloader	The Bootloader is the program within the DSEM812 responsible for loading the Operating System.
CAN	Control Area Network. A high-speed data transmission system used extensively within the Automotive and Off-Highway industries.
CODESYS (Previously stylised as CoDeSys)	Integrated Development Environment for programming controller applications according to the international industrial standard IEC 61131-3. DSEM812 supports CODESYS V3.5
ECU	Electronic Control Unit. For example, the DSEM812 device.
Firmware	The Firmware of the DSEM812 is the Operating System of the DSEM812 that reads and executes the Application program.
FSD	Full Scale Deflection. For example, 0 mA to 20 mA is the Full Scale Deflection of a current sink input.
I/O	Input / Output. For example, “The I/O is taken out to an external terminal strip in the user panel”.
IDE	Integrated Development Environment. For example, the CODESYS V3.5 application that runs on the host PC is an IDE.
Ixyyy	An Input, where x is the connector and yyy is the input number. For example, IC003 means Input 3 on Connector C.
PLC	Programmable Logic Controller. Industrial computer used primarily for the automation of electromechanical machinery.
PWM PWMi	A digital signal is used to represent an analogue value by using Pulse Width Modulation. The mark-space ratio of a square wave changes to represent the value. Used for many control applications including proportional valves. PWM= Duty Cycle control. PWMi = Current control.
Off-Highway	An industrial vehicle used primarily “off road”. For example, construction and farm machinery. A wider interpretation includes on road access platforms, emergency vehicles and other industrial machinery, used either on the road, or off road.
Pin	A male or female pin connection in a housing (plug or socket).
Qxyyy	An Output, where x is the connector and yyy is the output number. For example, QC002 means Output 2 on Connector C.

1.3 RELATED INFORMATION

This document refers to and is referred by the following DSE publications which are obtained from the DSE website: www.deepseaelectronics.com or by contacting DSE technical support: support@deepseaelectronics.com.

1.3.1 TECHNICAL INFORMATION

DSE Part	Description
055-267	DSEM812 Datasheet
057-317	DSEM812 Installation and Operation Manual

1.4 SAFETY INSTRUCTIONS

1.4.1 GENERAL

- These instructions are for authorised persons according to the EMC and low-voltage directives. The device must be installed, connected and put into operation by a qualified electrician.

- It is not permissible to open the controller or to modify or repair the controller. Modification or repairs to the wiring could result in dangerous malfunctions. Repairs to the controller must be performed by DSE. Contact your original equipment supplier in the case of malfunction.

- When the device is unpowered, ensure that no connection pins are connected to a voltage source. Thus, when the supply is switched off, the supply for the electronics, the power outputs and the external sensor supply must be switched off together.

- The controller heatsink at the rear heats up beyond normal ambient temperature during operation. To avoid danger caused by high temperatures, protect against contact.

- The customer is responsible for performing risk analysis of the mobile working machine and determining the possible safety related functions. The user is responsible for the safe function of the application programs created. If necessary, they must additionally carry out an approval test by corresponding supervisory and test organisations according to the national regulations.

- All connectors must be unplugged from the electronics during electrical welding and painting operations.

1.4.2 INSTALLATION NOTES

- Follow the instructions of the connector manufacturer, specifically with respect to preventing water from entering the device. See Section entitled *Cables, Connectors, Harnesses and Spare Parts* for details of DSE Part Numbers.

- To maintain IP67 rating where connectors have unused pins, ensure the use of a suitable Blanking Insert. In the case of a completely unused connector, the plug must be inserted, fully populated with Pin Blanking Inserts. See Section entitled *Cables, Connectors, Harnesses and Spare Parts* for details.

- M12 protection plugs (supplied) must be installed in both the USB and Ethernet interfaces to ensure IP67 rating when the connectors are not in use. Tighten to 0.8 Nm (0.6 lbf ft). Where IP protection is required when the interfaces are in use, suitable O-rings must be fitted.

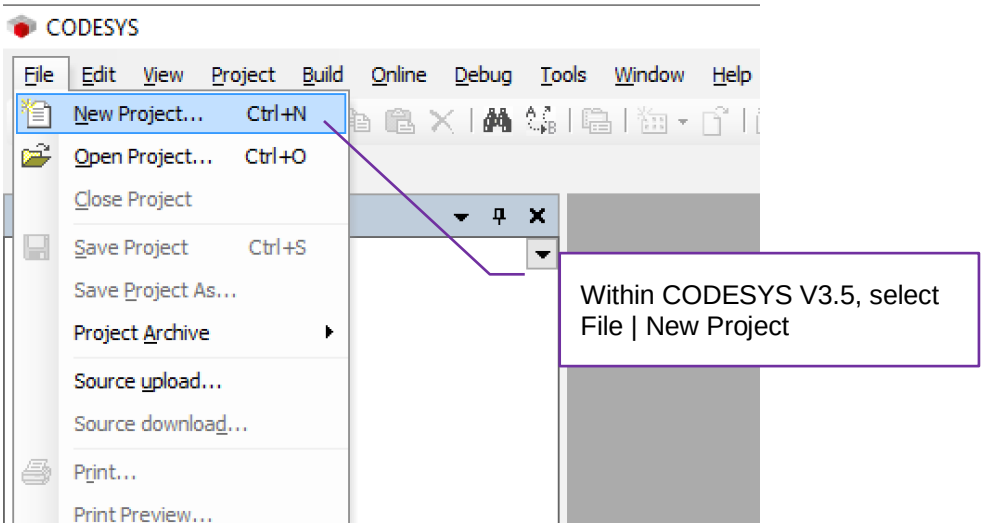
- The heatsink must be wired to vehicle ground to comply with EMC guidelines. A screw connection point is provided for this purpose. A metallic screw must be used to create an electrical connection to vehicle / machine ground.

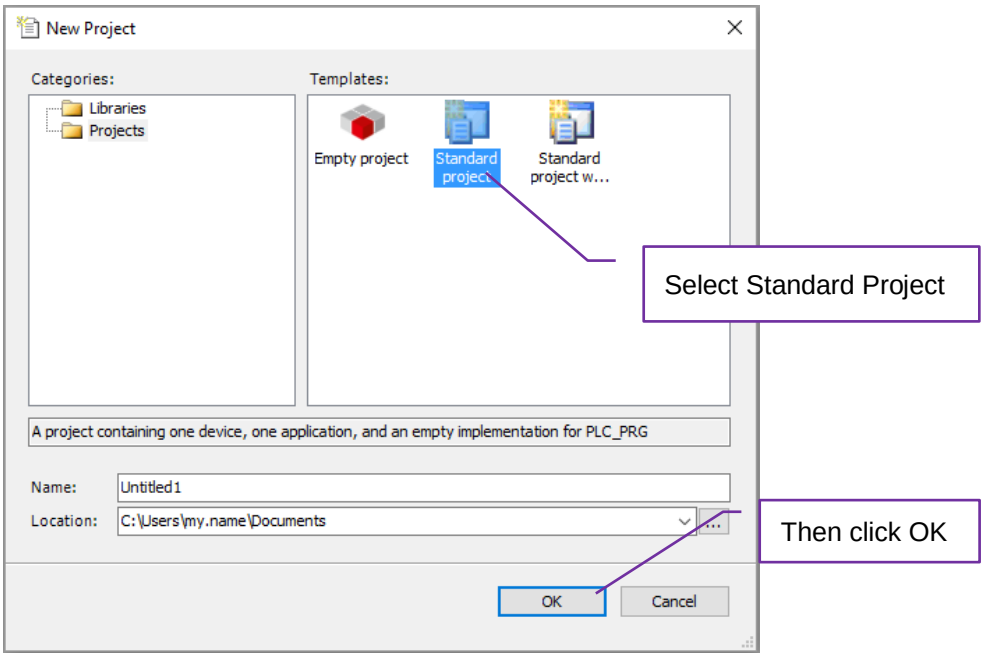
2 CONNECTING TO CODESYS

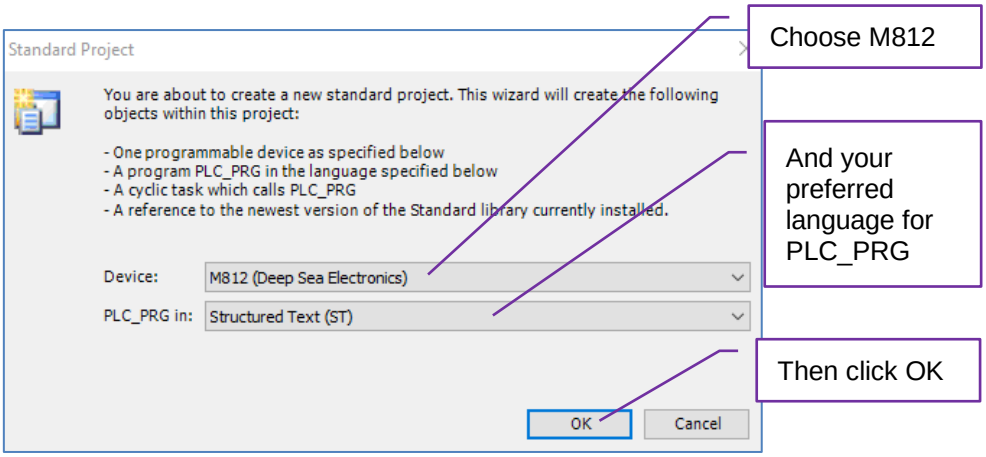
DSEM812 communicates with, and is programmed by, the CODESYS V3.5 Integrated Development Environment (IDE).

2.1 START NEW PROJECT

To begin, start a new project as shown.



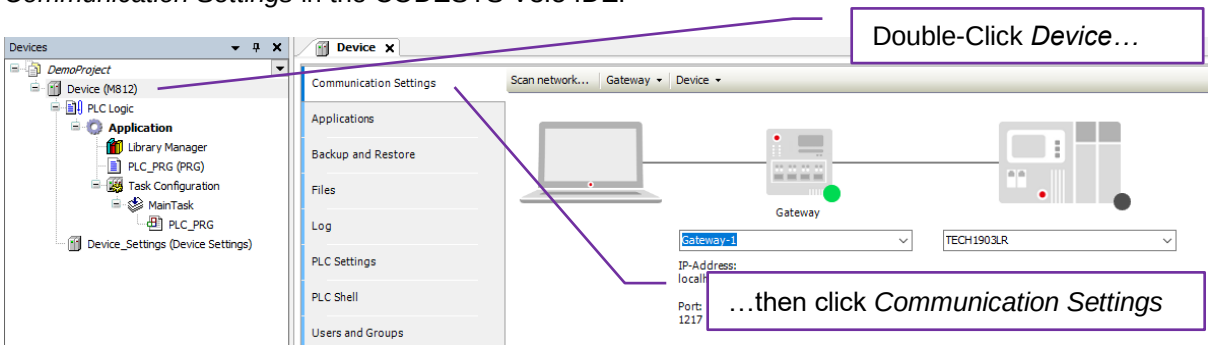


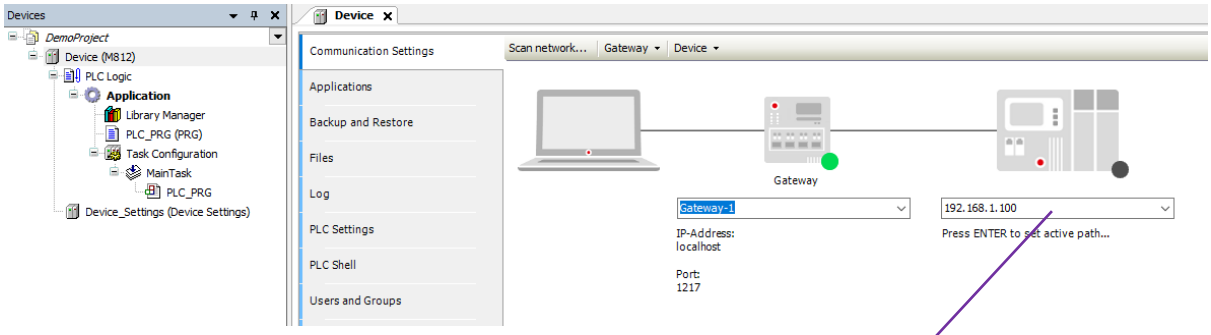


2.2 ETHERNET TCP

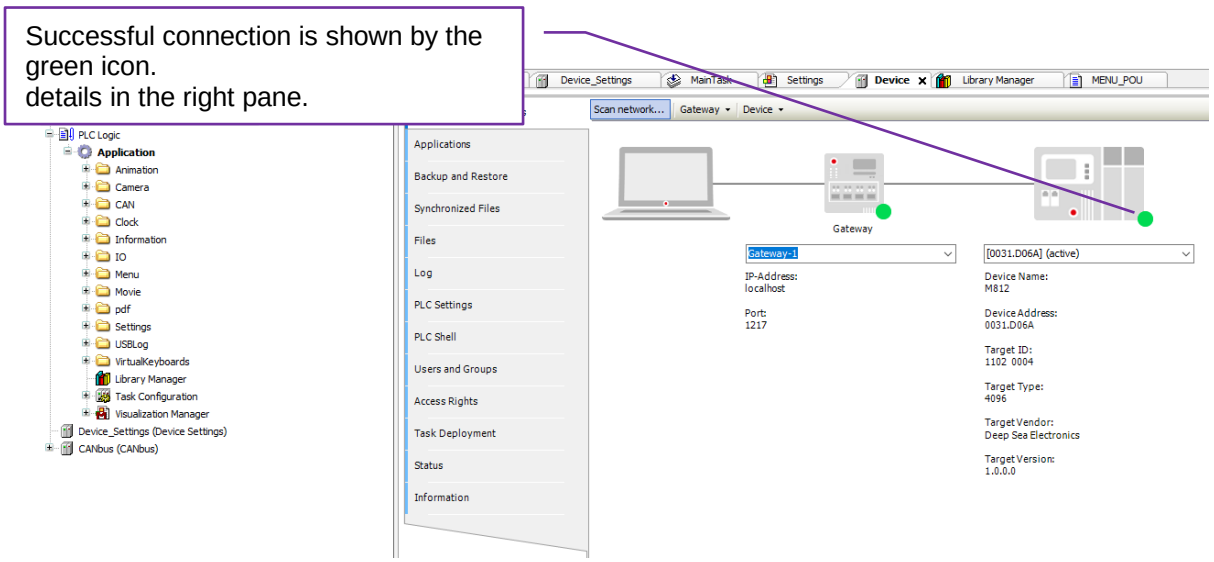
NOTE: If the IP address of the device is not known, see the section entitled *Ethernet UDP* elsewhere in this document.

With the DSEM812 connected to the same Ethernet network as the PC, Select *Device* | *Communication Settings* in the CODESYS V3.5 IDE.





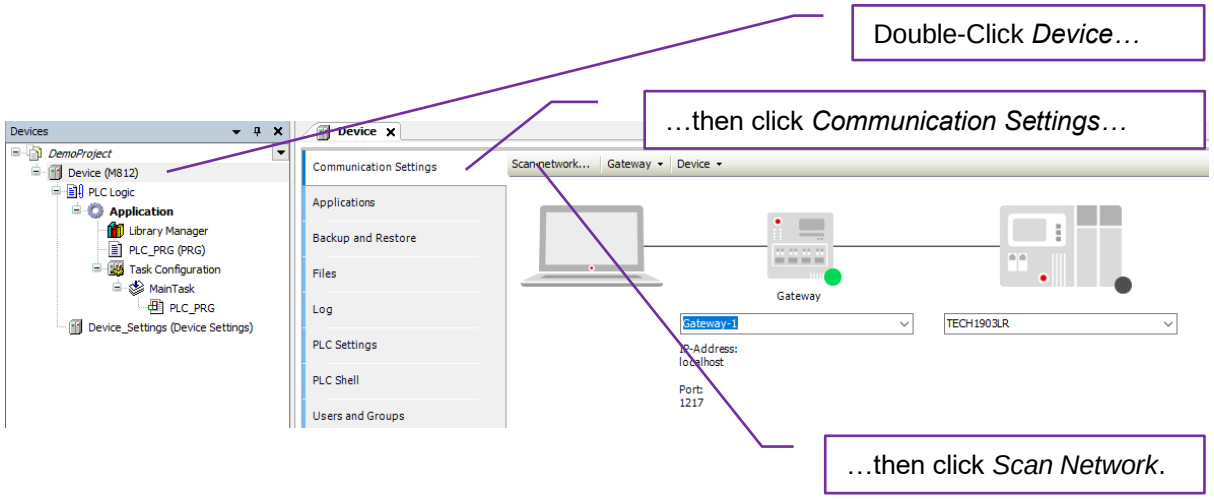
Where the IP address of the DSEM812 is known, this is entered directly into the address bar. Press *Enter* to make the connection.



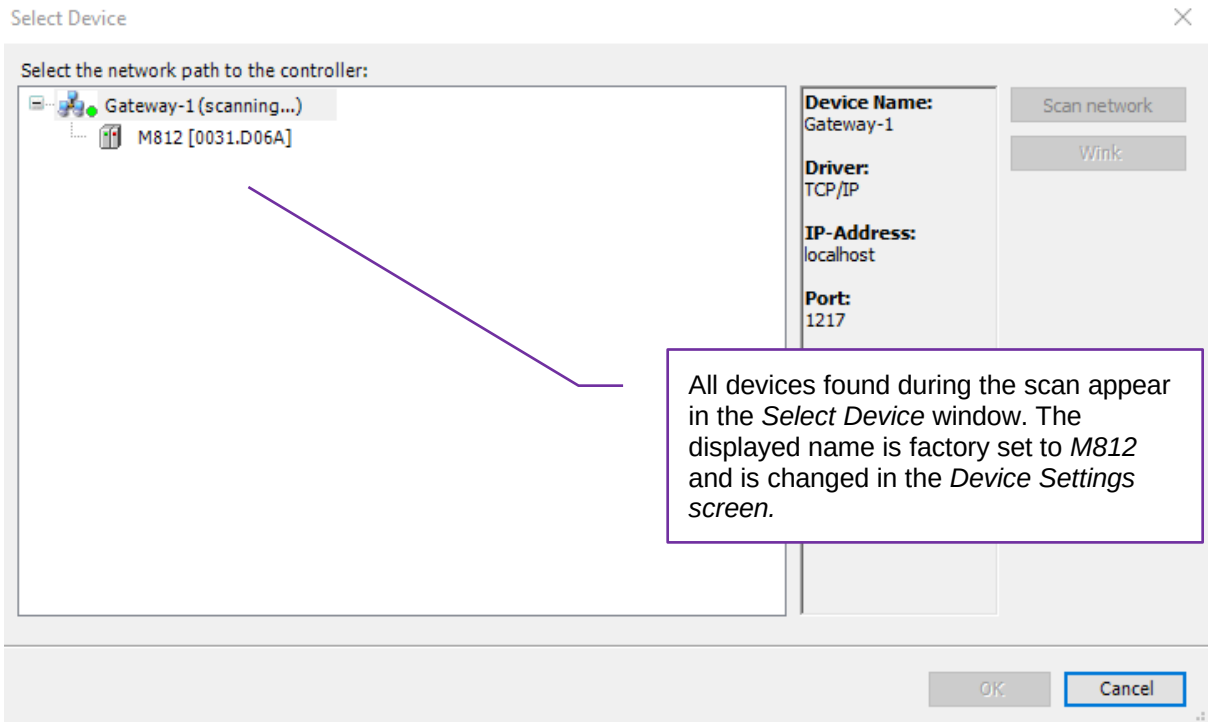
2.3 ETHERNET UDP

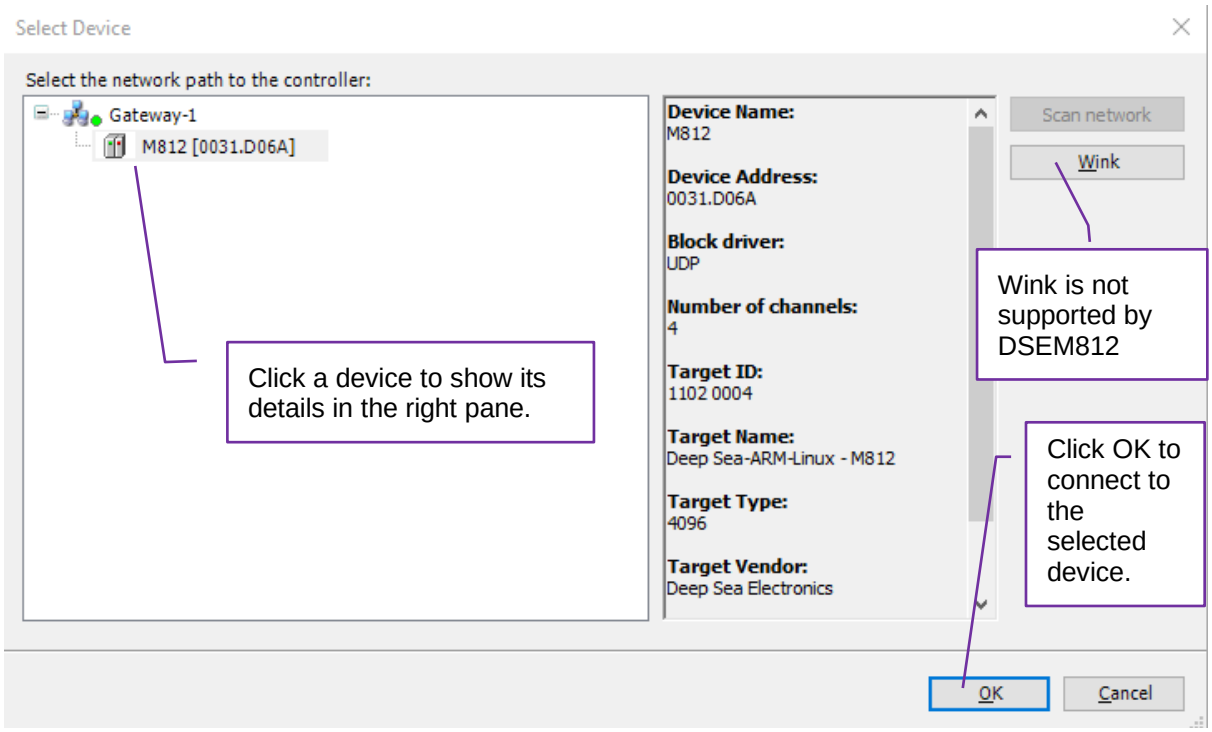
NOTE: If the IP address of the device is known, connection may also be achieved manually as detailed in the section entitled *Ethernet TCP* elsewhere in this document.

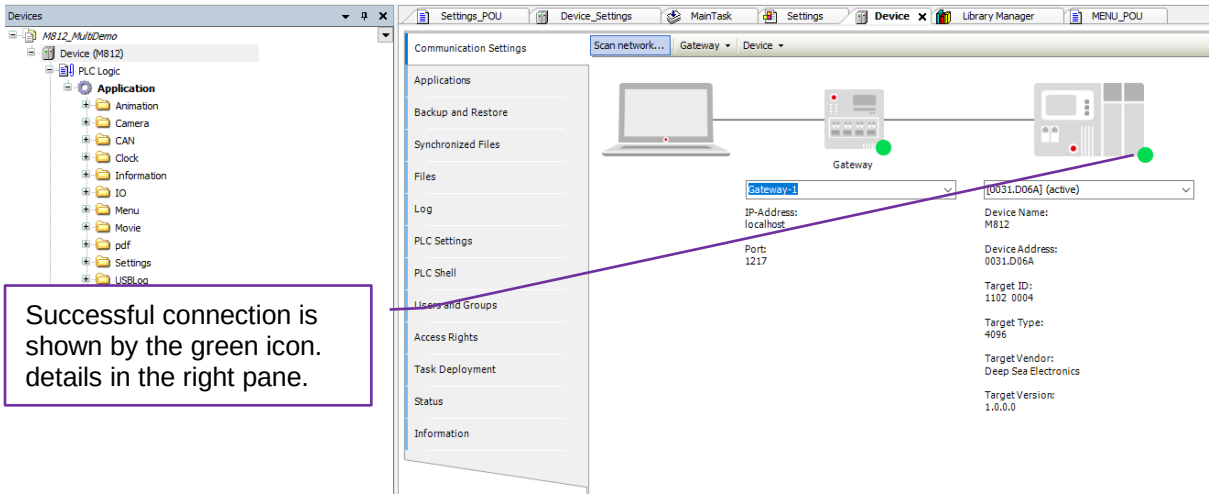
With the DSEM812 connected to the same Ethernet network as the PC, Select *Device* | *Communication Settings* in the CODESYS V3.5 IDE.



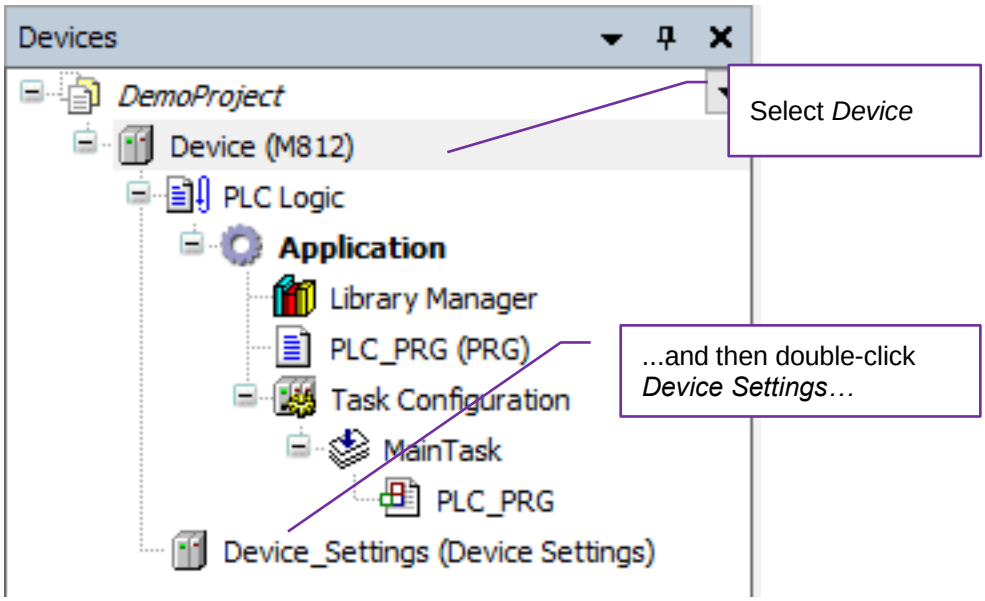
NOTE: A device in *Setup* mode is not discoverable by the Scan.







2.4 CONFIGURE SETTINGS AND MONITOR THE DEVICE



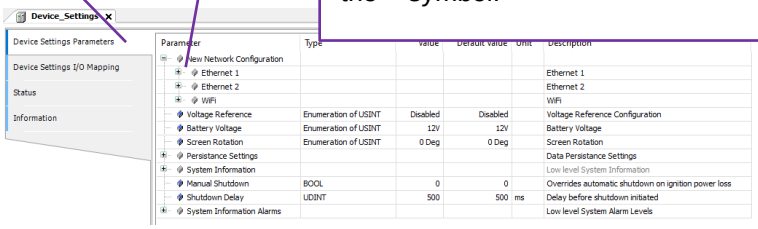
See the following subsections for details of the Device Settings pages.

2.4.1 DEVICE SETTINGS PARAMETERS

NOTE: After changing the setting of *Screen Rotation, DSEM812 must be power cycled for the change to take effect.*

Select *Device Settings Parameters* …

...and then expand sections as required by clicking the + symbol.



2.4.1.1 NEW NETWORK CONFIGURATION

Parameter	Description
Save Config	**NOTE: After making changes, choose *Yes* in the *Save Config* section to save the changes made when the project is downloaded to the DSEM812 device.**
Enable	**NOTE: Disabling Ethernet Ports that are not required within the Application improves (decreases) the start-up time of the device.** ***No:*** This Ethernet port is disabled. ***Yes:*** This Ethernet port is disabled.
Hidden SSID (Wifi only)	***No:*** The Wifi SSID is not broadcast so cannot be seen during a wifi network scan. ***Yes:*** The Wifi SSID is not broadcast so cannot be seen during a wifi network scan.
DHCP Server (Wifi only)	***No:*** Dynamic Host Configuration Protocol Server is not enabled. ***Yes:*** Dynamic Host Configuration Protocol Server is enabled. DSEM812 is able to configure devices that connect to the Wifi server providing they are set to *DHCP*.
Channel (Wifi only)	Wifi channel to use (1 to 11)
IP Mode (Ethernet 1,2 only)	***DHCP:*** Enables Dynamic Host Configuration Protocol. ***Static:*** Network setup is manual.
IP Address	The IP address used when *IP Mode* is set to *Static.*
Subnet Mask	The Subnet Mask applied to *IP address* used when *IP Mode* is set to *Static.*
Gateway Address	The Default Gateway used when *IP Mode* is set to *Static.*
DNS Address	The IP address of the Domain Name Service used when *IP Mode* is set to *Static.*
Hostname	Hostname by which the device makes itself known on the network.
SSID (Wifi only)	The SSID of the Wifi network served by the DSEM812.
Password	Password required by clients wishing to connect to the SSID of the Wifi network served by the DSEM812.

2.4.2 MANUAL SHUTDOWN

NOTE: Ensure *Ignition* is not active when calling *DSE.SystemShutdown*.

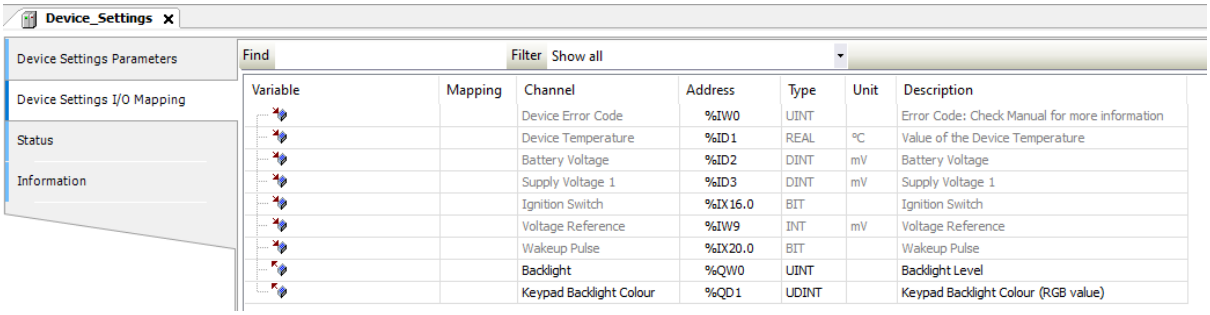
Parameter	Description
Manual Shutdown	***0:*** Removal of the *Ignition* pin begins the shutdown process after *Shutdown Delay* has expired. ***1:*** Removal of the *Ignition* pin does not begin the shutdown process. Instead, the application can monitor the *Ignition* pin, performing a graceful machine shutdown, before programmatically instructing DSEM812 to shutdown using the function: `DSE.SystemShutdown();` Ignition pin is monitored either by mapping *Ignition Switch* within the *Device Settings I/O Mapping* page, or by using: `DSE.SystemGetIgnition(Ignition => bIgnitionState);` Where `bIgnitionState` is a BOOL variable used to store the state of the system *Ignition* pin. To restart the DSEM812 application, reapply *Ignition* pin.
Shutdown Delay	Delay before shutdown is initiated.

2.4.2.1 OTHER SETTINGS

Parameter	Description
Voltage Reference	Enables the *VREF* output. This is an auxiliary output supply used for example, to supply external input sensors. ***Disabled:*** The outputs is OFF. ***5V:*** The output gives 5 V dc. ***10V:*** The output gives 10 V dc.
Screen Rotation	**NOTE: After changing the setting of *Screen Rotation, the device must be power cycled for the change to take effect.*** **NOTE: For Screen Rotation ROT_90 and ROT_270 (portrait mode) the Visualisation must be created accordingly to fit to the full screen size as detailed below. CODESYS does not automatically adjust the Visualisation Size upon changes to the Screen Rotation setting.** Sets the device screen rotation. ***ROT_0:*** Visualisation is not adjusted, to suit the 'normal' device orientation with connectors A & C on the left when viewed from the rear. (Landscape 1280 px X 800 px)  ***ROT_90:*** Visualisation is rotated 90° clockwise to suit the device orientation with connectors A & C on the top when viewed from the rear. (Portrait 800 px X 1280 px).  ***ROT_180:*** Visualisation is rotated 180° suit the device orientation with connectors A & C on the right when viewed from the rear. (Landscape 1280 px X 800 px).  ***ROT_270:*** Visualisation is rotated 270° clockwise to suit the device orientation with connectors A & C on the bottom when viewed from the rear. (Portrait 800 px X 1280 px). 
System Information	Allows monitoring of Memory, Storage and CPU usage.
System Information Alarms	Allows user alarms to be set for Memory, Storage and CPU usage.

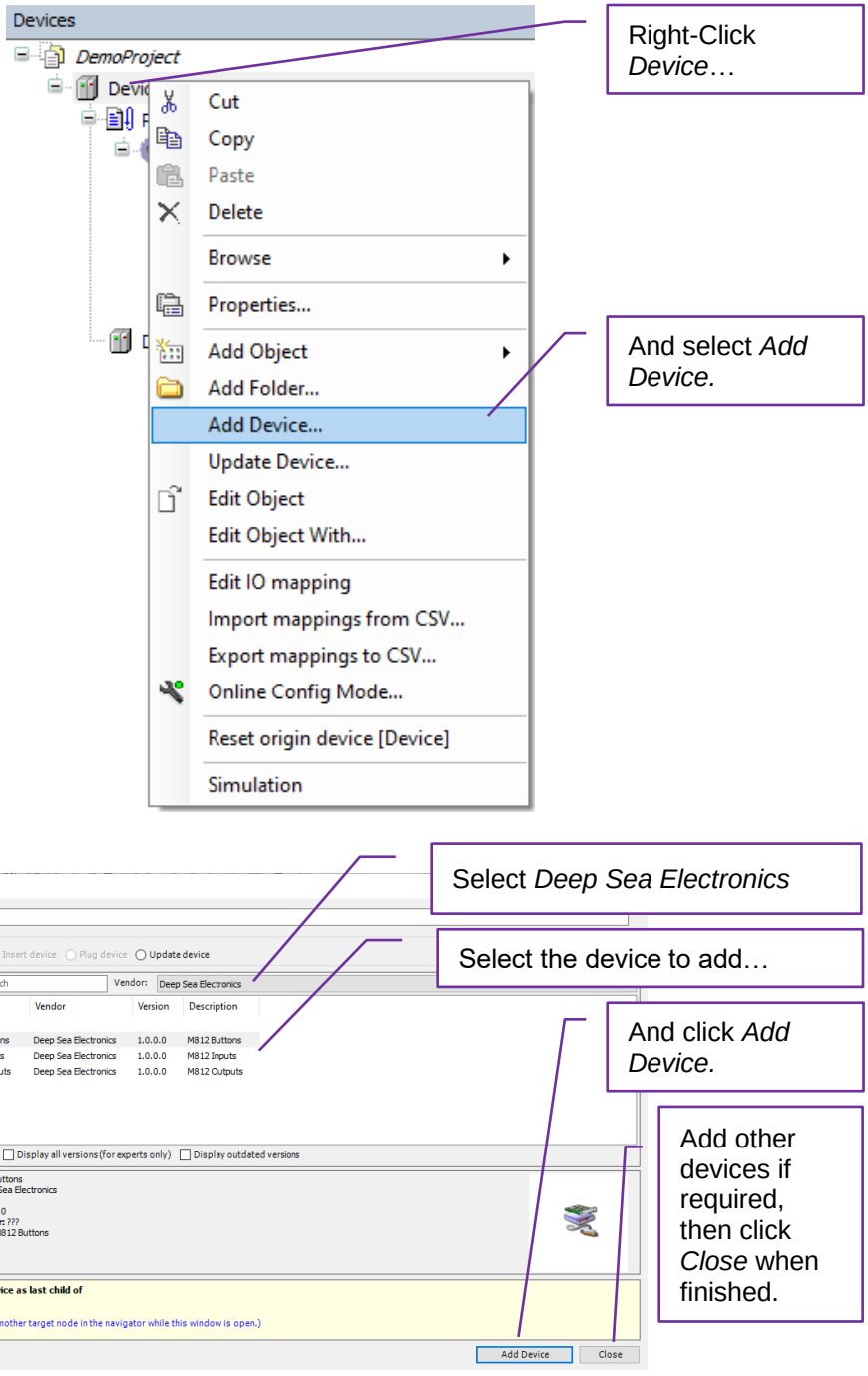
2.4.3 DEVICE SETTINGS I/O MAPPING

This page is used to monitor the device, and if required, to map the monitored values to program variables.



Parameter	Description
Device Error Code	A bitfield to allow the error code to be mapped to a variable. This enables the application to decode and display internal errors. See Section Entitled DSE*M812 CODESYS ERROR CODES* elsewhere in this document for more details.
Device Temperature	The actual temperature (°C) as measured within the device. Typical temperatures are more than 25°C above ambient temperature and vary depending upon device usage.
Battery Voltage	The voltage measured at the *ECU Power* terminals, PINs A1 (-ve) and A7 (+ve).
Supply Voltage 1	The voltage measured at the *Supply Voltage 1* terminals, PINs C1 (-ve) and C7 (+ve). This voltage is used to supply the device outputs on PINS C2, C3, C4 and C5 when configured as *Active High*.
Ignition Switch	Contains the state of the *Ignition Switch* on PIN A13. Upon ignition removal the variable changes from TRUE to FALSE. A short time later the device completes the shutdown process and the application is shutdown.
Voltage Reference	Provides the voltage of the *VREF* output on PINS C6 (-ve) and C18 (+ve). This output is used as an auxiliary DC supply for example, to power input sensor devices.
Wakeup Pulse	With DC power applied, activating the *Wakeup Pulse* (minimum 1 second) silently begins the device start up process. Subsequent application of *Ignition* results in a faster application start up. A typical example, is to apply this pulse upon the vehicle door opening.
Backlight	Sets the percentage of the display LCD Backlight. (0 = minimum, 100 = maximum). Setting *Backlight* to the value 255 enables *Automatic Backlight Control* whereby brightness automatically increases as ambient light levels increase.
Keyboard Backlight Colour	Sets the colour of the Keyboard surround Backlight as an RGB Value. Increasing values for each colour increases the brightness of that colour. Examples: 16#FF0000 = Red 0xff, Green 0, Blue 0 (full brightness Red) 16#008000 = Red 0xff, Green 0x80, Blue 0 (half brightness Green) 16#C0C0C0= Red, Green Blue 0xC0 (3/4 brightness White) 16#FFFFFF = Red 0xff, Green 0xFF, Blue 0 (full brightness White)

2.5 ADD INPUTS, OUTPUTS AND BUTTONS TO THE PROJECT



2.5.1 BUTTONS

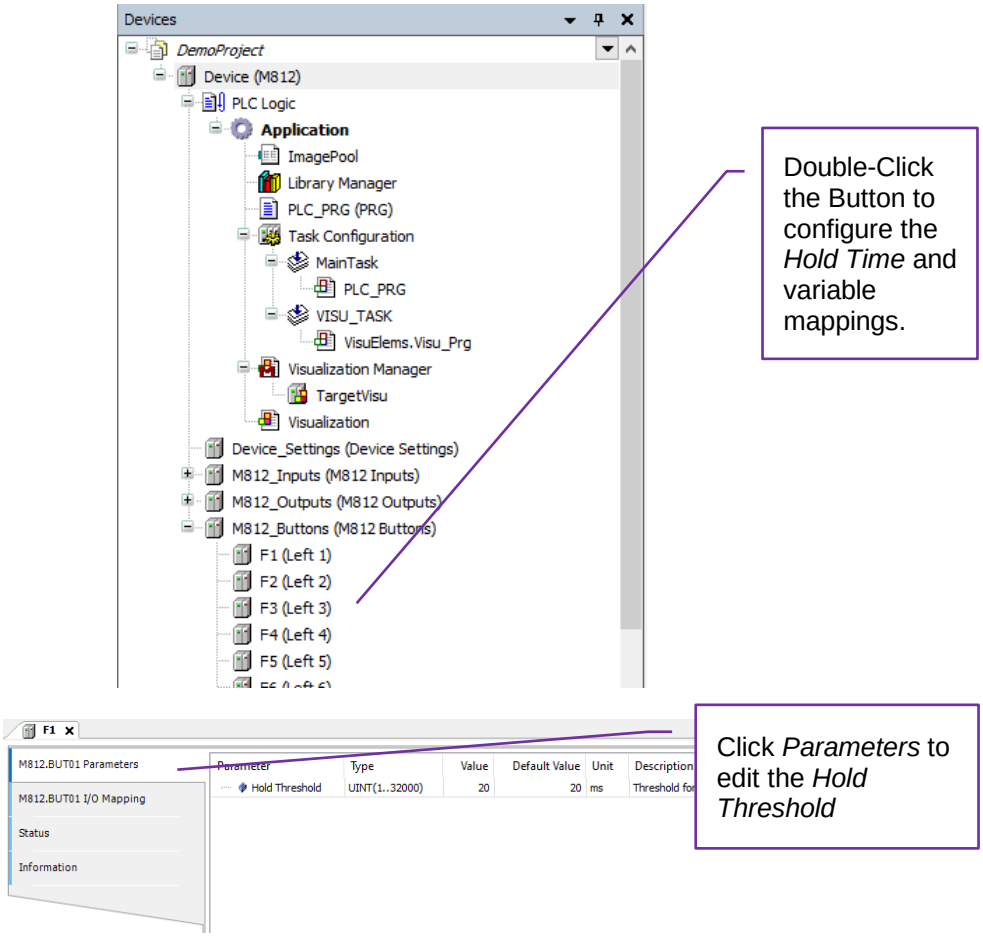
2.5.1.1 BUTTON LOCATION

2.5.1.2 BUTTON POSITION ON THE VISUALISATION

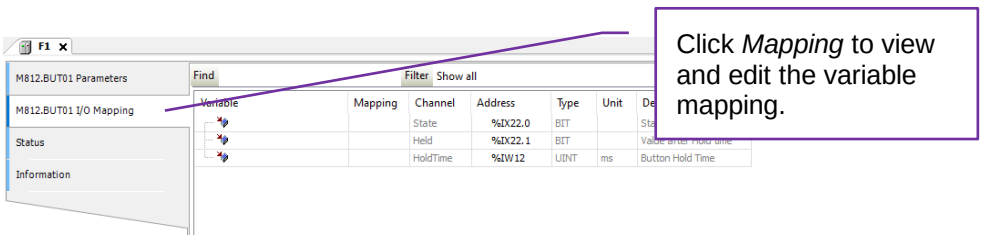
To aid positioning of icons on the visualisation, the vertical position of the centre of each button is as follows.

Button	Pixel Position From Top of Display
F1 & F9 (centre)	40
F2 & F10 (centre)	142
F3 & F11 (centre)	244
F4 & F12 (centre)	346
F5 & F13 (centre)	448
F6 & F14 (centre)	550
F7 & F15 (centre)	652
F8 & F16 (centre)	754

2.5.1.3 BUTTON SETTINGS

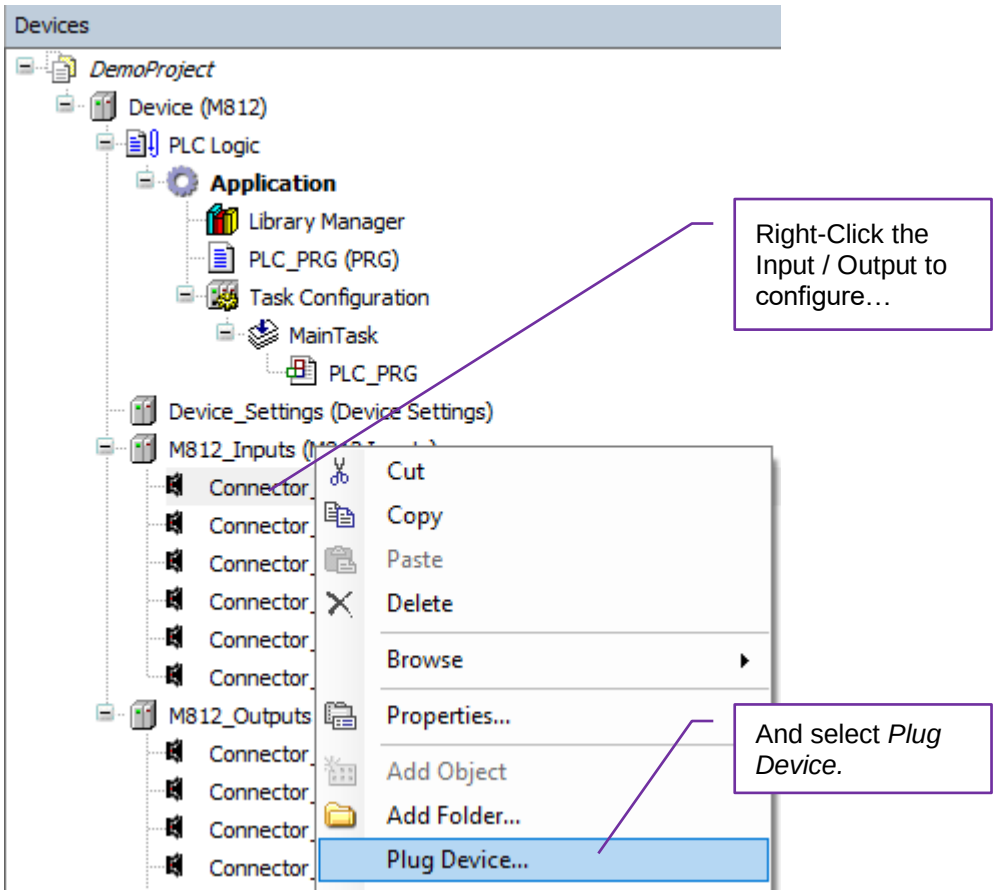


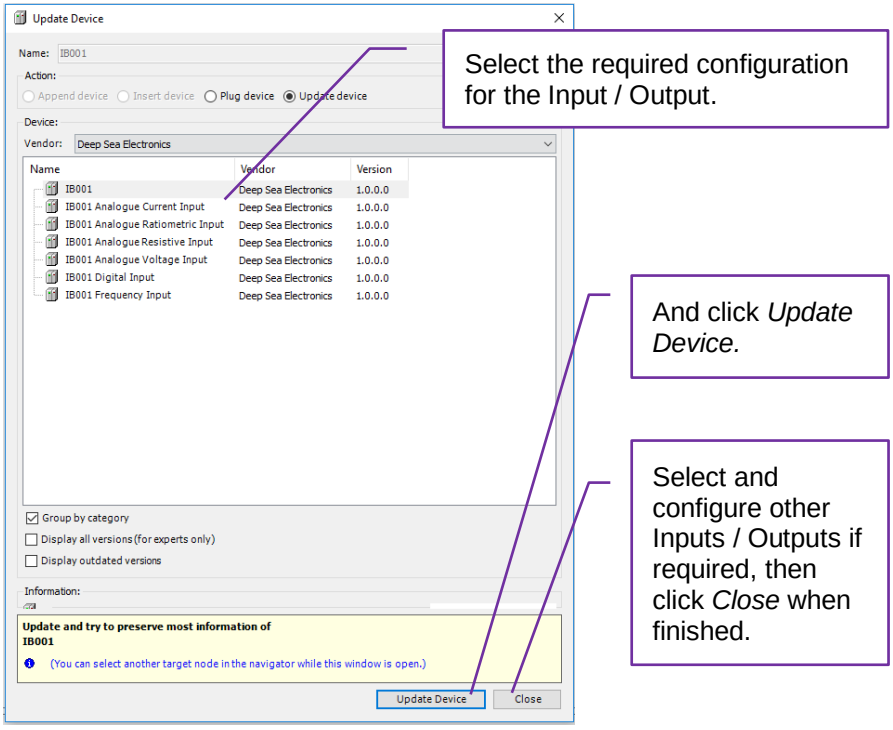
Parameter	Description
Hold Threshold	Amount of time (in milliseconds) that the button must be pressed before it is considered 'held down'.



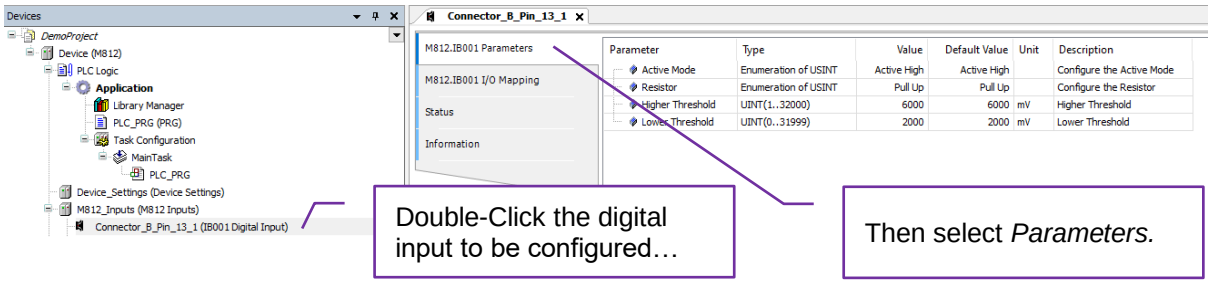
Parameter	Description
State	Indicates if the button is pressed (1) or not pressed (0).
Held	Indicates if the button has been held for longer than the duration of the *Hold Threshold* (1) or not (0).
Hold Time	The amount of time (in milliseconds) that the button has been pressed for (zero if not currently pressed).

2.5.2 INPUTS AND OUTPUTS





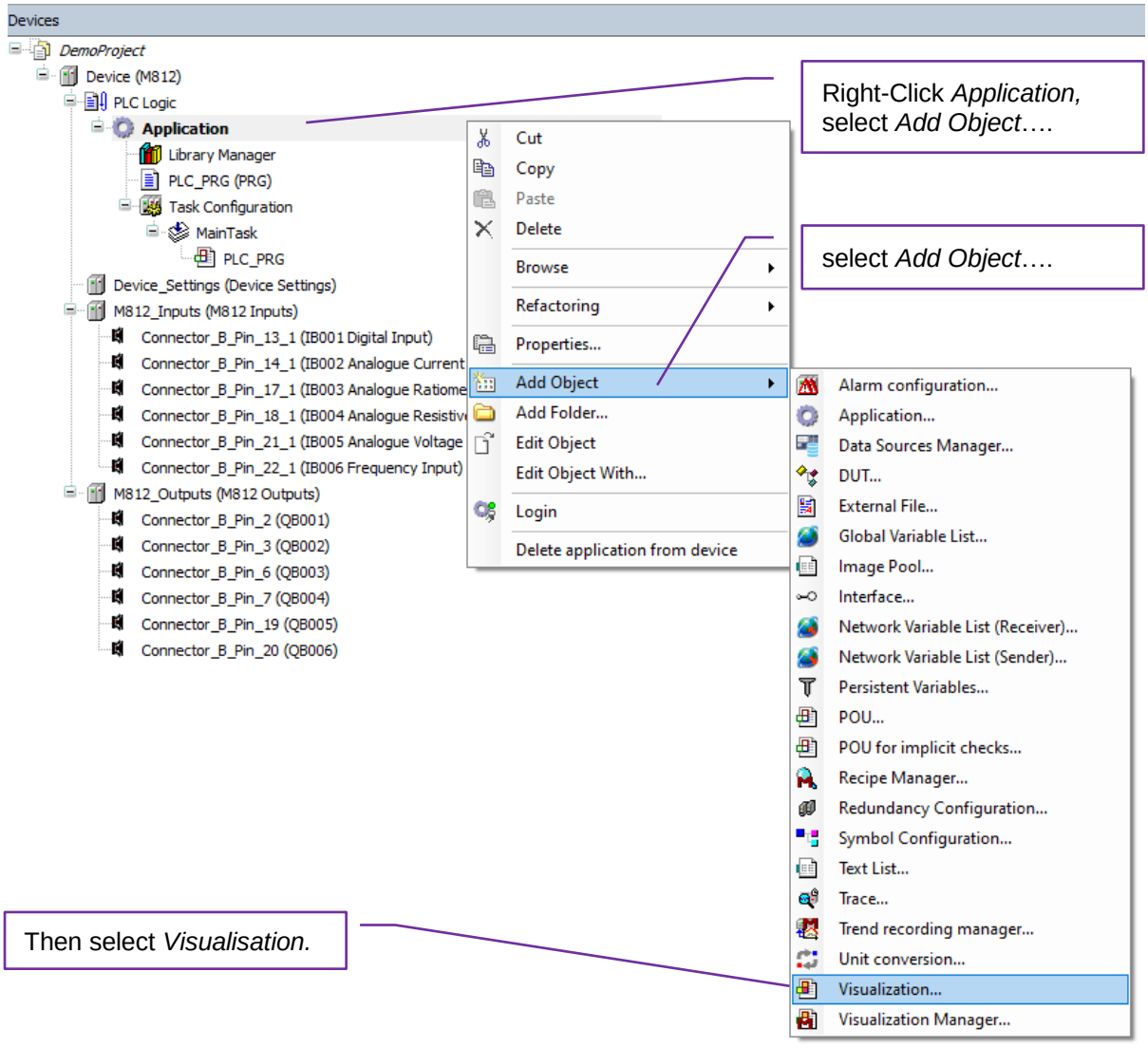
2.5.3 DIGITAL INPUT PARAMETER CONFIGURATION

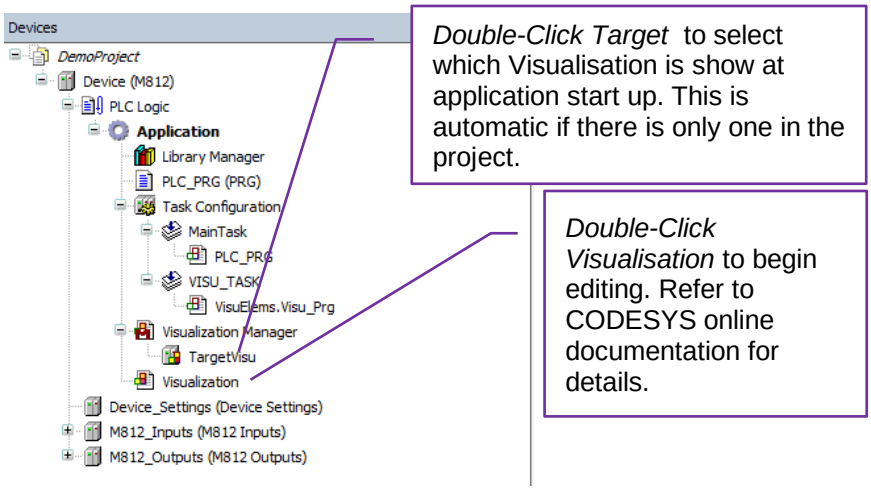


Parameter	Description
Active Mode	***Active High*****:** The input connects to the positive supply rail when activated. ***Active Low*****:** The input connects to the negative supply rail when activated.
Resistor	***Float*****:** The input is floating when no connection is made. Commonly used with PNP (Sourcing) type switched sensors. ***Pull Up*****:** An internal pull up resistor biases the input to the positive supply rail when no connection is made. Commonly used with NPN (Sinking) type switched sensors and volt-free contacts. ***Pull Down*****:** An internal pull down resistor biases the input to the negative supply rail when no connection is made. Commonly used with volt-free contacts.
Higher Threshold	For *Active High* inputs, the input is detected as being active when above this threshold with respect to the negative supply rail.
Lower Threshold	For *Active Low* inputs, the input is detected as being active when below this threshold with respect to the negative supply rail.

2.6 USING THE DISPLAY VISUALISATION IN THE PROJECT

CODESYS 3.5 includes the facility to design and manipulate the LCD of the device. While the operation of the CODESYS environment is detailed within the CODESYS online document, this section provides a quick-start guide to using the *Visualisation* component of CODESYS 3.5.



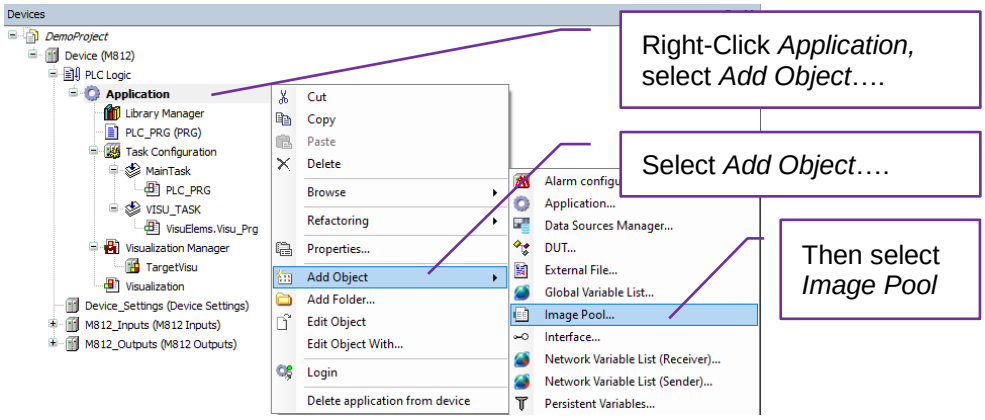


2.6.1 USING CUSTOM IMAGES ON THE DISPLAY

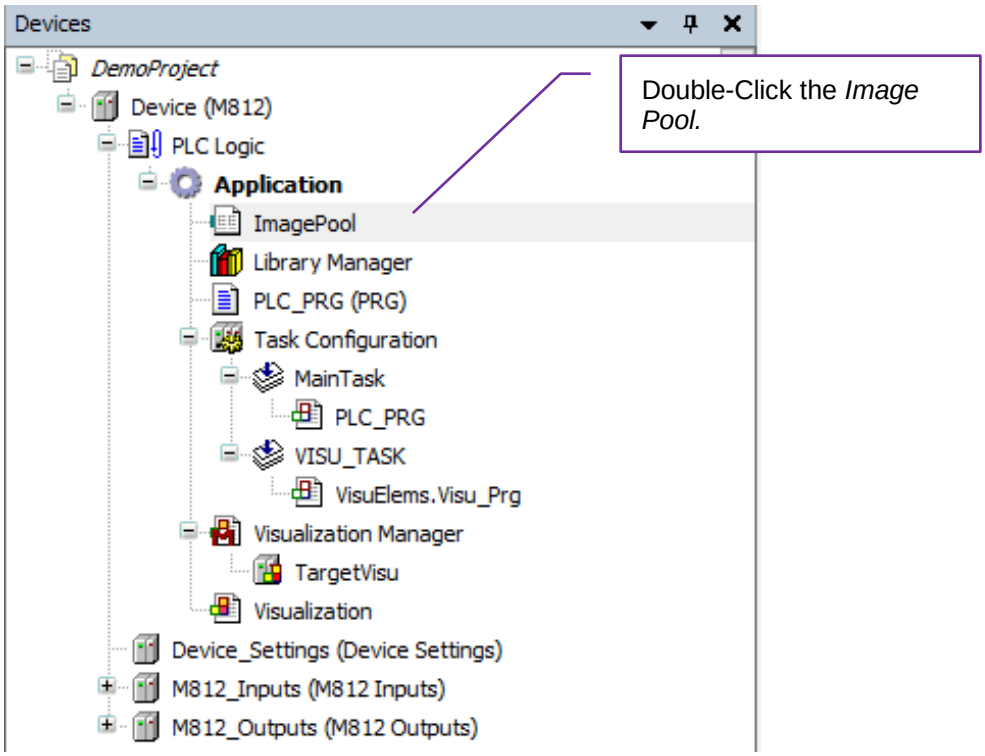
NOTE: It is recommended that image filenames contain only alphanumeric characters and the underscore character. Use of other characters may lead to incompatibility with the Linux filesystem in use on the device and/or incompatibility with the automatic ID generation of the image in the CODESYS imagepool.

Many applications require custom images to be placed on the DSEM812 display. This is controlled using an *Image Pool* within CODESYS. The Image Pool acts as a container for the images, which are then selected for display.

2.6.1.1 ADDING AN IMAGE POOL



2.6.1.2 ADDING IMAGES TO THE IMAGE POOL



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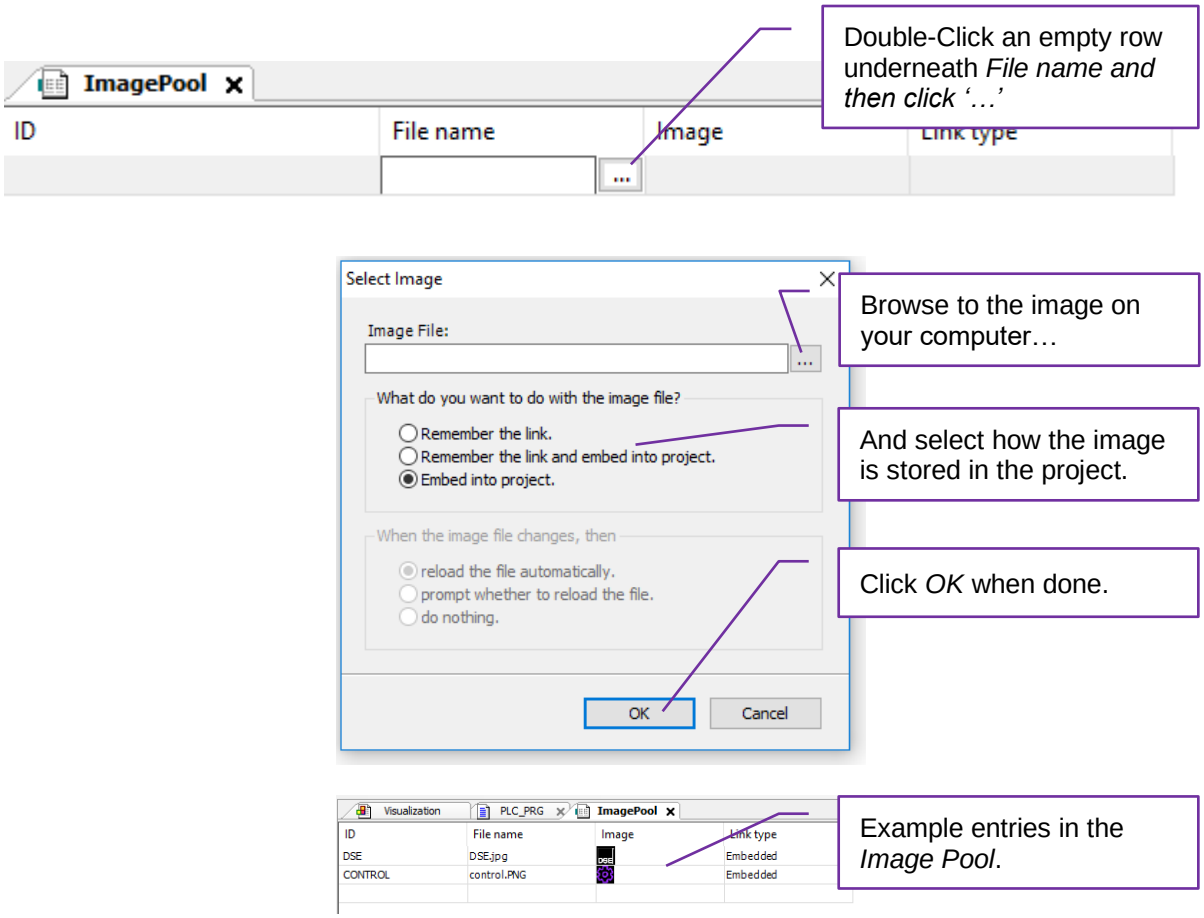
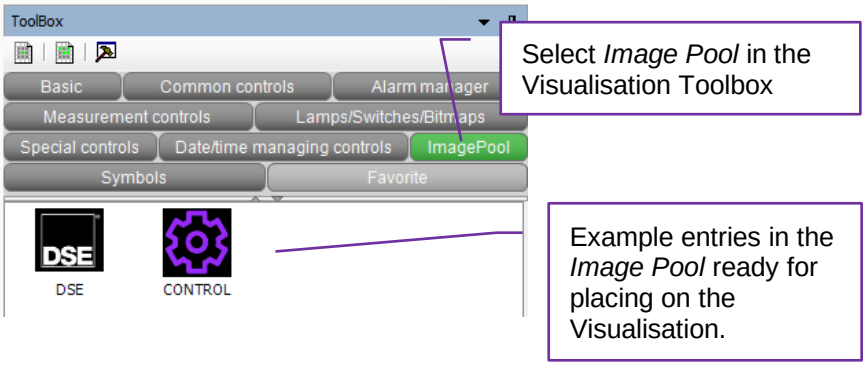


2.6.1.3 USING THE IMAGE POOL ON THE DISPLAY

Entries within the Image Pool are automatically detected by the CODESYS Visualisation Toolbox and are available for placing on the Visualisation.



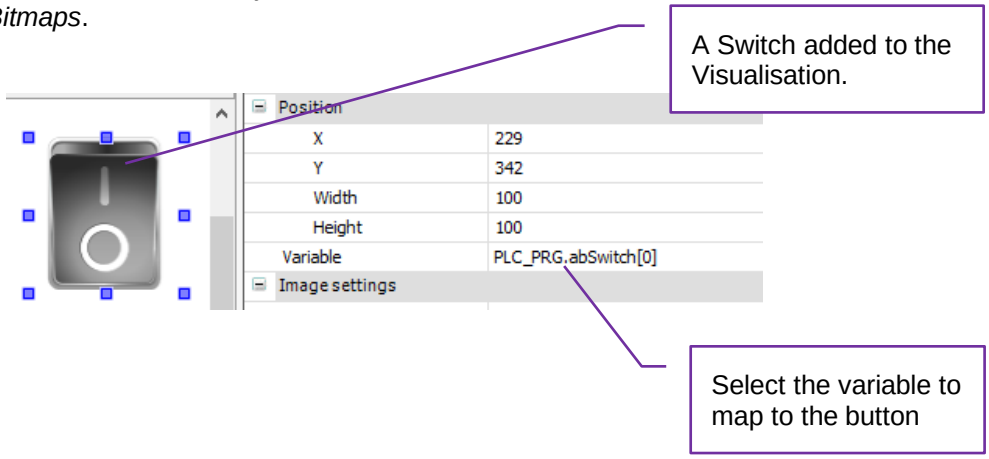
2.6.2 UTILISING THE TOUCHSCREEN

The capacitive touchscreen of DSEM812 mimics the operation of a mouse within the CODESYS environment. The following examples show how to utilise this functionality within the Visualisation.

2.6.2.1 SWITCHES, SLIDERS, COMBO BOXES, RADIO BUTTONS

Many CODESYS visualisation elements require no additional coding or settings to enable them for use with the Touchscreen. These include Switches, Sliders, Combo Boxes and Radio Buttons. Simply add them to the Visualisation and map a variable to them. Touch them on the screen to operate them.

Example:
Add a switch to the Visualisation. Usually these are found in the *Toolbox* under *Lamps/Switches/Bitmaps*.



During the execution of the application, simply touch the switch on the screen to operate it.

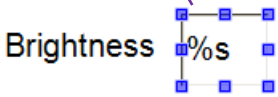
2.6.2.2 NUMBER AND TEXT ENTRY

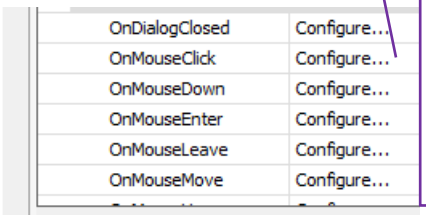
NOTE: *M812Multidemo* application contains a UK keyboard. To obtain this, contact support@deepseaelectronics.com

Number entry via the DSEM812 Touchscreen requires the use of a *Virtual Numpad.*
Text entry via the DSEM812 Touchscreen requires the use of a Virtual Keypad.

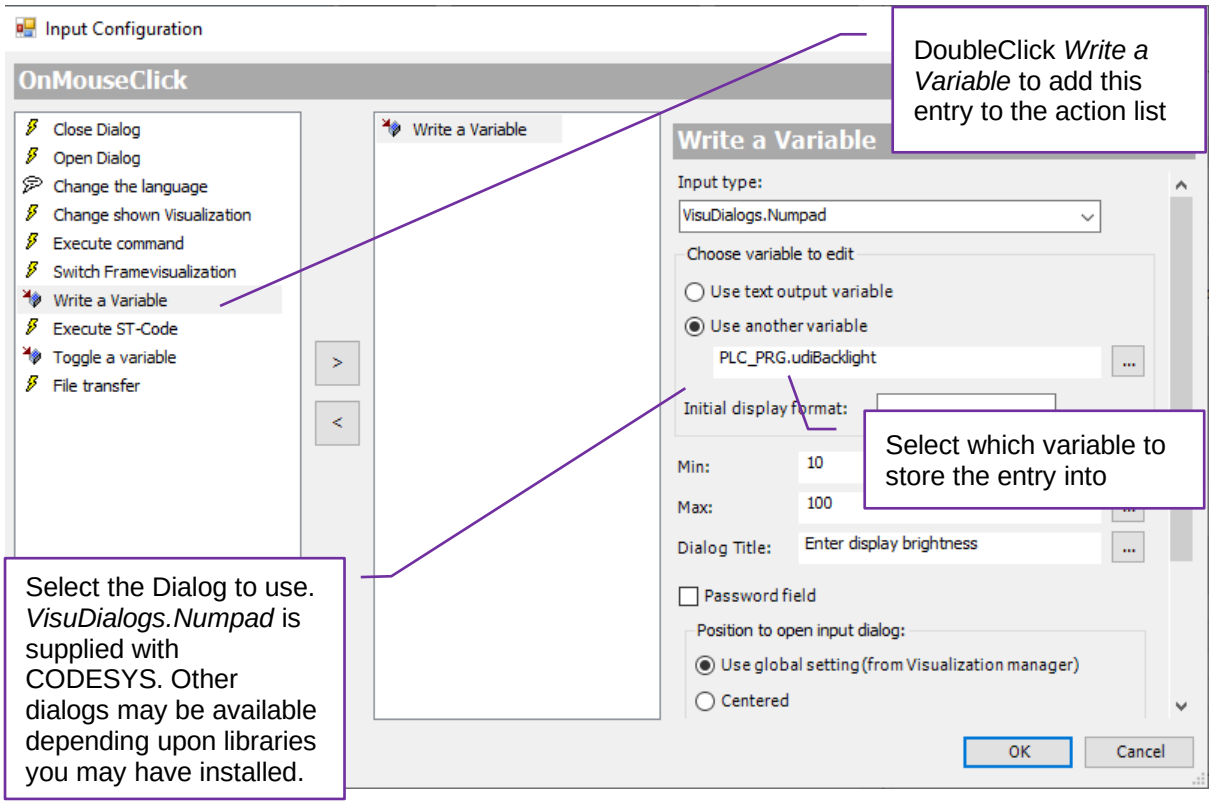
CODESYS includes a simple number pad and a German layout keypad as a *Dialog* and are utilised as follows.

A *TextField* added to the Visualisation.





Locate *Input configuration* in the properties and click *Configure* next to *OnMouseClick*



DoubleClick *Write a Variable* to add this entry to the action list

Select which variable to store the entry into

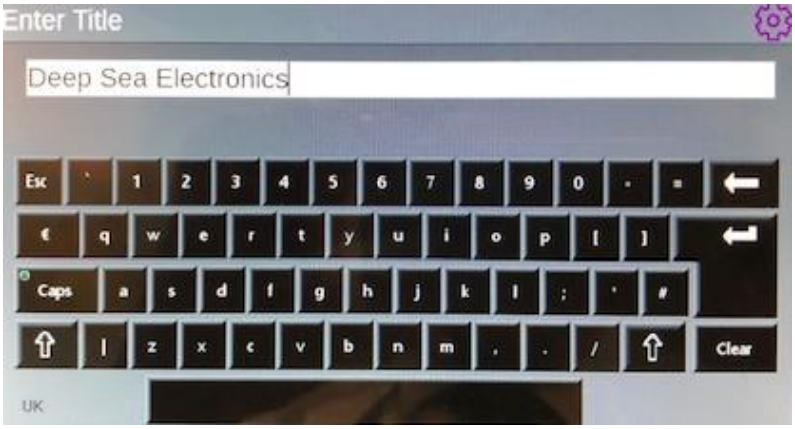
Select the Dialog to use. *VisuDialogs.Numpad* is supplied with CODESYS. Other dialogs may be available depending upon libraries you may have installed.

Example:

Upon touching the screen on the Visualisation element, CODESYS displays the selected Dialog.
Enter the value required.
ESC: Exit without saving the value.

OK or  : Exit and update the variable with the text or value entered.

Should the value be outside the configured range, this is indicated, and the dialog remains on screen to allow the correction to be made.



Virtual Keypad

Virtual Numpad

2.7 USING THE MOVIE PLAYER

NOTE: DSEM812 blends the Movie overlay with CODESYS visualisation and the camera display allowing all to be visible at the same time. For Overlay details see section entitled *Using the Overlay* elsewhere in this document.

2.7.1 ADDING THE MOVIE FILE

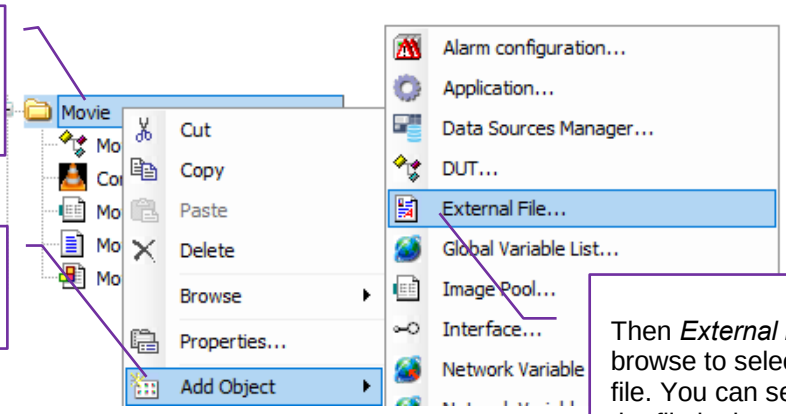
NOTE: DSEM812 supports H264 and DivX video formats.

NOTE: An example, using a video file is contained within *M812MultiDemo.project.* Contact support@deepseaelectronics.com for further details.

NOTE: For details how to refer to the added file, see section entitled *File Path* elsewhere in this document.

Right Click where you want to add the file

Select *Add Object*



Then *External File…* and browse to select the movie file. You can select to *embed* the file in the project, or link to it on your PC/Network.

2.8 FILE PATH

A file added to the project using *Add Object* | *External File…* is placed by CODESYS into the following location in the device file system:

`'PlcLogic/Application/MyFileName'`

This is the path to the file when using functions from the *SysFile* library.

For the purposes of the movie player, a file added as *External File* has the additional prefix:

`'file:///home/codesys/'`

Making the complete path for use with the movie player:

`'file:///home/codesys/PlcLogic/Application/MyFileName'`

2.9 USING THE OVERLAY

NOTE: DSEM812 blends the camera/video overlay with CODESYS visualisation and the camera/video display allowing all to be visible at the same time.

2.9.1 OVERLAY SETTINGS

NOTE: DSEM812 utilises existing DSEM870 Camera functions. Therefore, some items in the DSE_LINUX library reference DSEM870.

Structs *M870CameraOverlaySettings* and *VideoOverlaySettings_t*, contains options to Enable/Disable the overlay and control the transparency.

Structure used for DSEM812 overlay display.

Variable	Type	Description
Enable	BOOL	Turns overlay ON / OFF ☐: Camera/video is displayed. ☑: Camera is displayed according to the settings of *Transparency* and *FileName* below.
Transparency	UDINT	**NOTE: This parameter is NOT applicable if *FileName* is specified.** Specifies the transparency of the overlay over the camera/video display. ***0:*** Overlay is not visible, camera/video Only. ***1 to 254:*** Overlay is 'more visible' the higher the value. ***128:*** Overlay and camera/video are equally visible. ***255:*** Camera is not visible.
FileName	STRING	**NOTE: Leave this parameter empty if an overlay image is not required. In this case, use *Transparency* to control the blending of camera/video and Visualisation.** Overlay Image Filename (png, jpg, bmp). The image should be sized to match the size of the camera/video display within the application. If not the same size, it is scaled to fit. *Transparency* setting is not used, and the overlay image transparency is taken from the *Alpha Channel* value contained within the image. Some PC 'Paint' applications may call this *Transparency* or use similar wording.

2.10 ALTERNATIVE METHODS TO LOAD THE APPLICATION

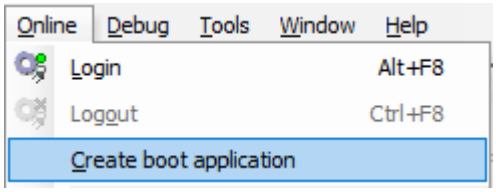
While a live connection to the device by Ethernet is the most common method to load the application, alternatives exist as detailed below. Both options require the creation of a 'Boot Application' and the use of *DSEServicetool PC Software.* First we must connect by Ethernet to a device in order to create the .pkg file.

2.10.1 CREATION OF THE BOOT APPLICATION

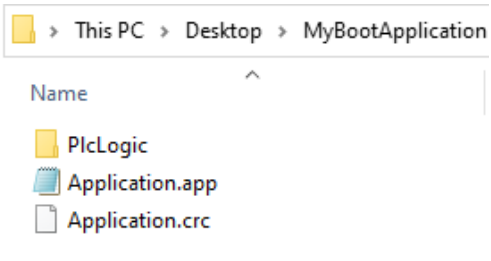
NOTE: For details using DSEServicetool PC Software see DSE publication *057-265 DSE Servicetool PC Software Manual.*

NOTE: The boot application includes the folder *PlcLogic*. This contains all images, text files and associated visualisation files.

Within CODESYS select *Online* | *Create boot application*



Browse to select the location to store the files. It is convenient to put the files into a new (empty) folder. The example, to the right shows the boot application files in the new folder.
All these files (including the sub folder) make up the boot application and must be kept together.

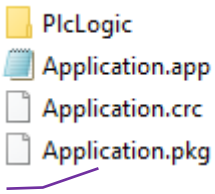


Continued overleaf.

2.10.2 UPDATE USING DSESERVICETOOL AND ETHERNET CONNECTION

NOTE: The *.pkg* file is a compressed folder, containing all images, text files and associated visualisation files.

Within DSEServicetool PC Software scan for and select the device, then select the file *Application.app* and transfer it to the device. The process of transfer creates *Application.pkg* and stores it along with the *Application.app* file.



.pkg (Package) file created by DSEServicetool PC Software.

2.10.3 UPDATE USING USB

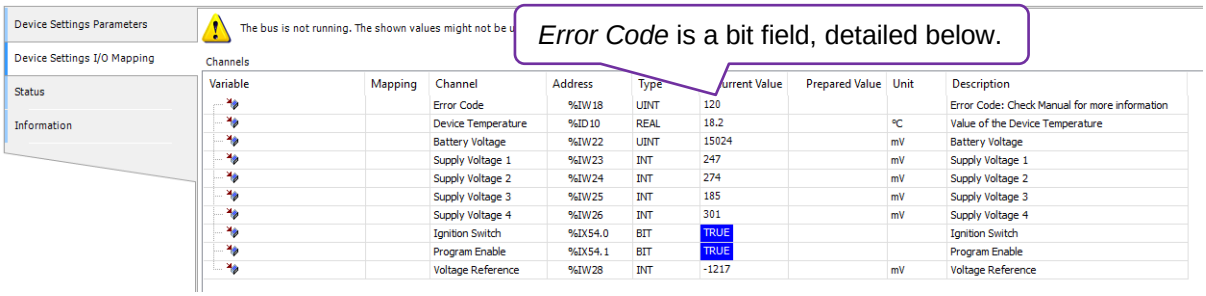
NOTE: For further details entering Recovery Mode and installing from USB, see DSE Publication *057-317 DSEM812 Installation and Operation Manual.*

NOTE: The *.pkg* file is a compressed folder, containing all images, text files and associated visualisation files.

Store the *.pkg* file on a USB memory stick. Restart the device into *Recover Mode* | *USB Upgrade.*

3 DSEM812 CODESYS ERROR CODES

DSEM812 returns error codes to CODESYS when appropriate. Individual bits are set within the returned value to indicate one or more error conditions. This can be mapped to a variable if required and is available to view within CODESYS under the *Device Settings I/O Mapping* as shown below.



Examples:

A *Device* error value of 120 (01111000 in binary) indicates that all four *Output Supplies* are *Under Voltage.*

A *Device* error value of 2 (00000010 in binary) indicates *Over Temperature.*

3.1 DEVICE

MSB 8	7	6	5	4	3	2	LSB 1
Output Reference Outside Limits	Under Voltage Output Supply 4	Under Voltage Output Supply 3	Under Voltage Output Supply 2	Under Voltage Output Supply 1	Under Voltage Supply	Over Temperature	Error

3.2 ANALOGUE INPUTS

Input Configuration	MSB 8	7	6	5	4	3	2	LSB 1
Digital	Invalid Parameter	Reserved	Reserved	Invalid Threshold	Reserved	Reserved	Reserved	Error
Voltage	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Range	Inverted Input (<10 mV)	Error
Current	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Range	Wire Break (<4 mA)	Error
Resistance	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Range	Reserved	Error
Ratiometric	Invalid Parameter	Reserved	Invalid Reference	Reserved	Reserved	Over Range	Reserved	Error

3.3 DIGITAL INPUTS

Input Configuration	MSB 8	7	6	5	4	3	2	LSB 1
	Bit							
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Error
Frequency	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Freq Over Range	Reserved	Error

3.4 DIGITAL OUTPUTS

Output Configuration	MSB 8	7	6	5	4	3	2	LSB 1
	Bit							
Digital	Invalid Parameter	Reserved	Reserved	Reserved	Reserved	Over Current	Wire Break (Config)	Error

4 MAINTENANCE AND WARRANTY

The device is *Fit and Forget*. As such, there are no user serviceable parts within the controller.
In the case of malfunction, you should contact your original equipment manufacturer (OEM).

DSE Provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, refer to the original equipment supplier (OEM).

5 DISPOSAL

5.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

If you use electrical and electronic equipment you must store, collect, treat, recycle and dispose of WEEE separately from your other waste

6 MISCELLANEOUS

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