



# **SD2DUG24**

## **Dupline generator software manual**

rev. 0.2, 10/08/2018

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## 2 INTRODUCTION

### 2.1 General description

Welcome to the SD2DUG Software manual. This guide will cover the essentials of setting up and using the SD2DUG software included with your Dupline® System.

This software tool has been designed for the configuration and updating of the Dupline channel generator SD2DUG24: the communication parameters and the channel programming are set-up locally in the PC, and then transferred to the generator through a USB port. Likewise, data from the generator can be uploaded and modified.

To connect the PC to the SD2DUG any Micro-USB cable can be used (standard cable to connect to Android smart-devices).



#### Important note:

Out of the factory, the SD2DUG24 has the following settings:

- It repeats the input channels onto the output ones
- The generated Dupline frame has 128 channels
- The Modbus parameters are:
  - Address = 1
  - Speed = 9600
  - Data bits = 8
  - Parity = None
  - Stop bit = 1

***Should these settings fit the ones of the system, no further configurations are needed and the SD2DUG24 can be directly powered and connected without any programming.***

## **2.2 Hardware requirements**

- The program operates with Windows 7 or higher, with Microsoft .Net 4.5 or higher installed
- A free USB port

## **2.3 Installation**

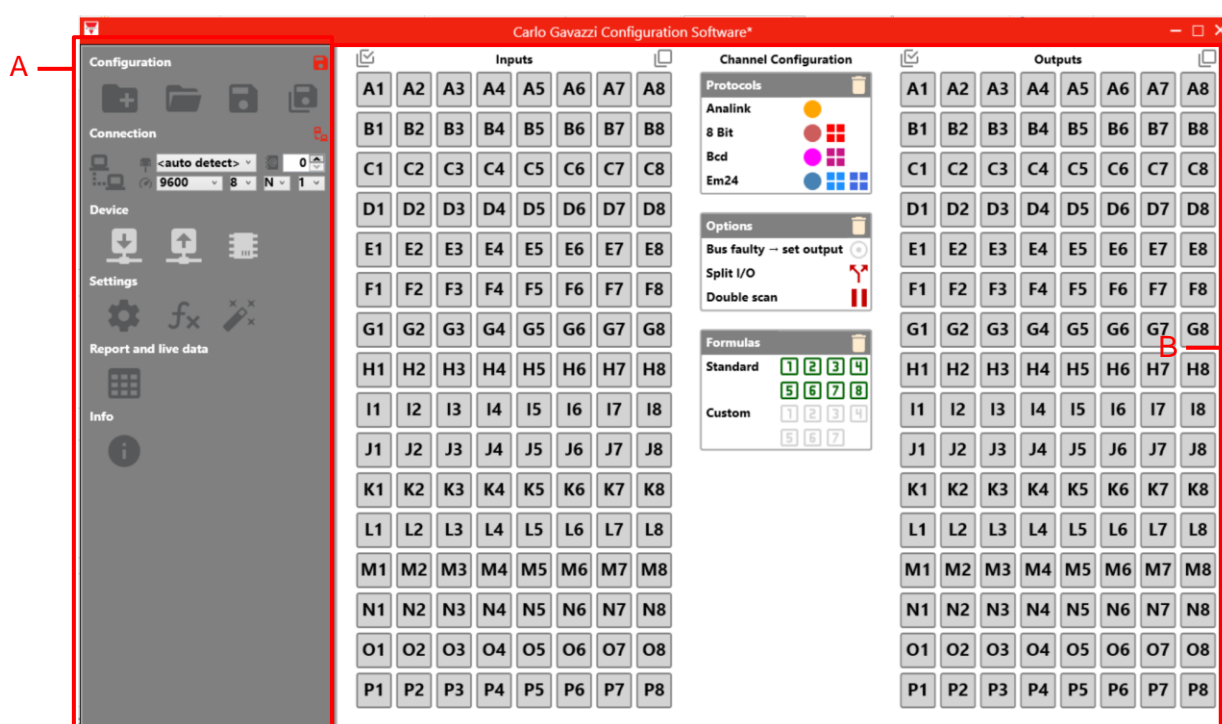
Download the software file from the link...

Run the Setup DUG xxxx.exe file.




























## 3 USER INTERFACE

### 3.1 Main page

When the DUG software is started, the following window will open:




The different areas are as follows:

Area	Description														
<b>A</b>	The <b>left panel</b> contains:														
	<table> <tr> <th>Tab</th><th>Description</th></tr> <tr> <td> <b>Configuration</b></td><td>To open new or already saved configuration or to save a configuration</td></tr> <tr> <td> <b>Connection</b></td><td>To connect the PC to a SD2DUG24 module</td></tr> <tr> <td> <b>Device</b></td><td>To read a configuration from an SD2DUG24, to write a configuration into an SD2DUG24, to update the firmware of an SD2DUG24</td></tr> <tr> <td> <b>Settings</b></td><td>To set different parameters, to set customised formulas, to copy the setting of a G34900000 or a G34960005</td></tr> <tr> <td> <b>Report and live data</b></td><td>To export the Modbus map, to see live data on the Dupline bus</td></tr> <tr> <td> <b>Info</b></td><td>To see info relevant to the software and firmware version, to open the online manual</td></tr> </table>	Tab	Description	 <b>Configuration</b>	To open new or already saved configuration or to save a configuration	 <b>Connection</b>	To connect the PC to a SD2DUG24 module	 <b>Device</b>	To read a configuration from an SD2DUG24, to write a configuration into an SD2DUG24, to update the firmware of an SD2DUG24	 <b>Settings</b>	To set different parameters, to set customised formulas, to copy the setting of a G34900000 or a G34960005	 <b>Report and live data</b>	To export the Modbus map, to see live data on the Dupline bus	 <b>Info</b>	To see info relevant to the software and firmware version, to open the online manual
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<b>B</b>	The <b>right panel</b> contains:														
	<table> <tr> <th>Tab</th><th>Description</th></tr> <tr> <td> <b>Inputs</b></td><td>Matrix of the Dupline input channels</td></tr> <tr> <td> <b>Channel configuration</b></td><td>To select the Dupline protocols</td></tr> <tr> <td> <b>Outputs</b></td><td>Matrix of the Dupline output channels</td></tr> </table>	Tab	Description	 <b>Inputs</b>	Matrix of the Dupline input channels	 <b>Channel configuration</b>	To select the Dupline protocols	 <b>Outputs</b>	Matrix of the Dupline output channels						
Tab	Description														
 <b>Inputs</b>	Matrix of the Dupline input channels														
 <b>Channel configuration</b>	To select the Dupline protocols														
 <b>Outputs</b>	Matrix of the Dupline output channels														

## 3.2 Procedures


### 3.2.1 Create a new configuration

To create a new configuration, follow this procedure:

Step	Action
1	Click on 
2	If a configuration is already open, choose an operation from: <ul style="list-style-type: none"> <li>a) Save</li> <li>b) Do not save</li> <li>c) Cancel action "New configuration"</li> </ul>



### 3.2.2 Open an existing configuration

To open a configuration, follow this procedure:

Step	Action
1	Click on 
2	Select the configuration to open

### 3.2.3 Save a configuration




To save a configuration, follow this procedure:

Step	Action
1	Click on  (Save) or  (Save as)
2	Select the folder where the configuration has to be saved.



















### 3.2.4 Program analink channel

To program one or more channels as analink, follow this procedure:

Step	Action
1	<p>Click on the <b>channel</b> to be programmed (from A1 to P8): if one or more channels are selected, the underline is marked with a thicker line</p> <p> Not selected channel</p> <p> Selected channel</p> <p>To select more channels, click and drag them</p>
2	<p>Click on the orange circle on the right side of <b>Analink</b>: the channels will be marked in <b>orange</b></p> <p></p>



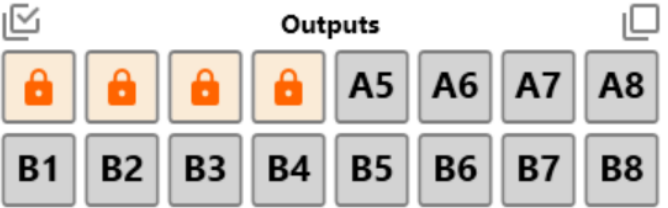
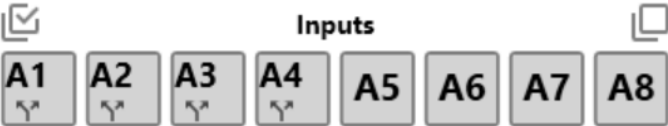
### 3.2.5 Program 8-bit binary protocol

To program as 8-bit binary protocol, follow this procedure:

Step	Action
1	<p>Click on <b>one</b> of the channels belonging to the group to be programmed:</p> <p>       </p>
2	<p>Click on the brown circle on the right side of <b>8-bit</b>: all the 8 bits belonging to the group will be marked in brown</p> <p>       </p>


### 3.2.6 Program 8-bit binary protocol with multiplexer

To program as 8-bit binary protocol with multiplexer, follow this procedure:

Step	Action
1	Click on <b>one</b> of the channels belonging to the group to be programmed: 
2	Click on the red square on the right of <b>8-bit binary</b> : the whole group will be marked in red and A1 to A4 output channels will be reserved for the multiplexer    A1 to A4 input channels are automatically set as split I/O.

### 3.2.7 Program 3 ½ digit BCD protocol

To program as 3 ½ digit BCD protocol, follow this procedure:

Step	Action
1	Click on <b>one</b> of the channels belonging to the first group to be programmed: 

- 2 Click on the pink circle on the right side of **3 ½ digit BCD**: all the 8 bits belonging to the selected and following group will be marked in pink



### 3.2.8 Program 3 ½ digit BCD protocol with multiplexer

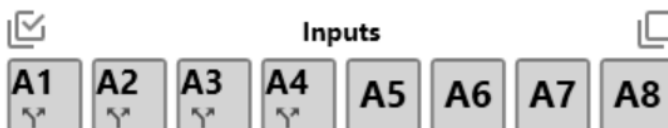
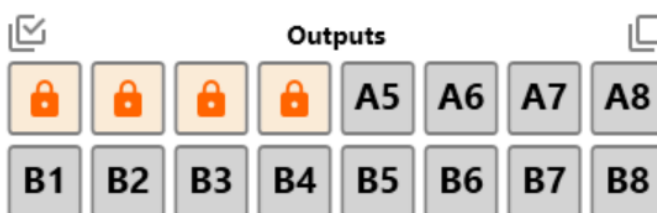
To program as 3 ½ digit BCD protocol, follow this procedure:

Step	Action
------	--------

- 1 Click on **one** of the channels belonging to the first group to be programmed:








- 2 Click on the violet square on the right side of **3 ½ digit BCD**: all the 8 bits belonging to the selected and following group will be marked in violet and A1 to A4 output channels will be reserved for the multiplexer



A1 to A4 input channels are automatically set as split I/O.



### 3.2.9 Multiplexer settings for 3 ½ digit BCD and 8-bit binary

To set the multiplexer parameters, follow this procedure:

Step	Action
1	Click on 
2	To set how long the value of the multiplexer has to be maintained for, fill in the field <b>Keep multiplexer value for ...</b>  
3	The multiplexer values have to be defined in the <b>Multiplexer values</b> field: To add a new value, click on  To switch between single value or more values, click on  To delete an existing value, click on 


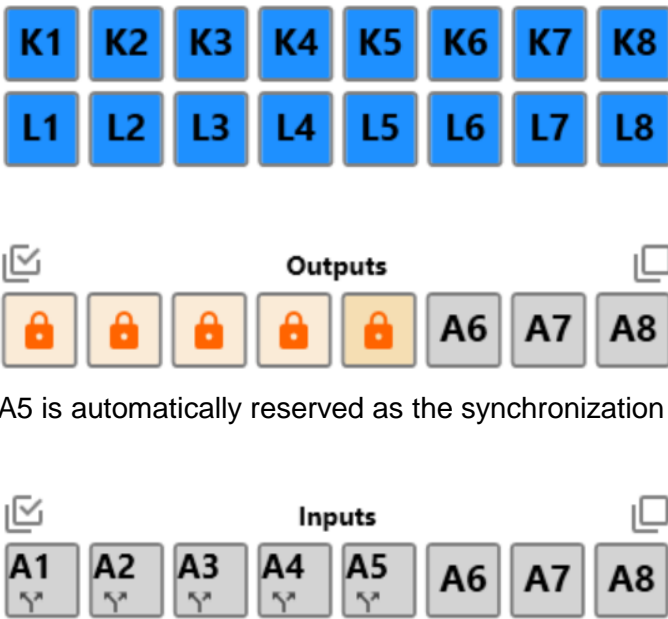
### 3.2.10 EM24 alarms

To dedicate one input channel to the alarm output of the EM24, follow this procedure:

Step	Action
1	Click on the channel to be programmed as retransmission of setpoint alarms:  A maximum of two input channels can be programmed as alarm signals from EM24
2	Click on the blue circle on the right side of <b>EM24</b> : the channel will be marked in blue 

### 3.2.11 EM24: multiplexer (transmission of analogue data)

To program the channels to detect the analogue values sent by one or more EM24s, follow this procedure:

Step	Action
1	<p>Click on <b>one</b> of the channels belonging to the first group to be programmed from G to P:</p> 
2	<p>Click on the light-blue square on the right side of <b>EM24</b>: all the 8 bits belonging to the selected and following group will be marked in light-blue and A1 to A4 output channels will be reserved for the multiplexer</p>  <p>A5 is automatically reserved as the synchronization channel.</p> <p>A1 to A5 input channels are automatically set as split I/O.</p>

### 3.2.12 Set A5 channel as DMD synchronization or tariff management

The A5 output value can be set in two ways:

- Copying the status of any input channel
- Via Modbus

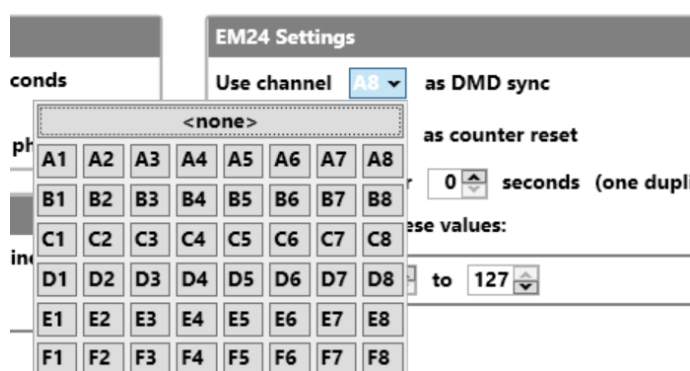
Step	Action
------	--------

- Copying the status of any input channel

- Click on



- Select the input channel from the list, as shown below:



The status of this input will be reproduced on the sync channel A5

### 3.2.13 EM24: multiplexer (transmission of counter values)

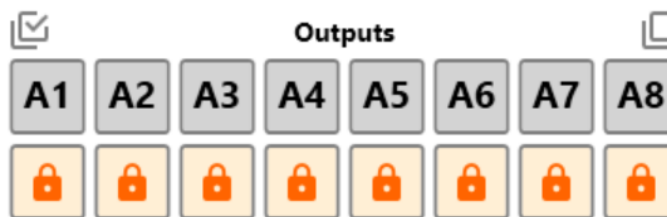
To program the channels to detect the counter values sent by one or more EM24s, follow this procedure:

Step	Action
------	--------

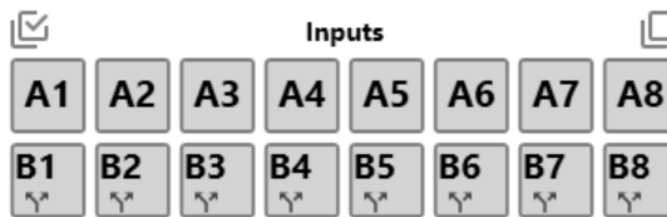
- Click on **one** of the channels belonging the first group to be programmed from C to F:



- 2 Click on the blue square on the right side of **EM24**: all the 32 bits belonging to the C, D, E and F groups will be marked in blue and B2 to B8 output channels will be reserved for the multiplexer



B1 is automatically reserved as the reset channel.




B1 to B8 input channels are automatically set as split I/O.

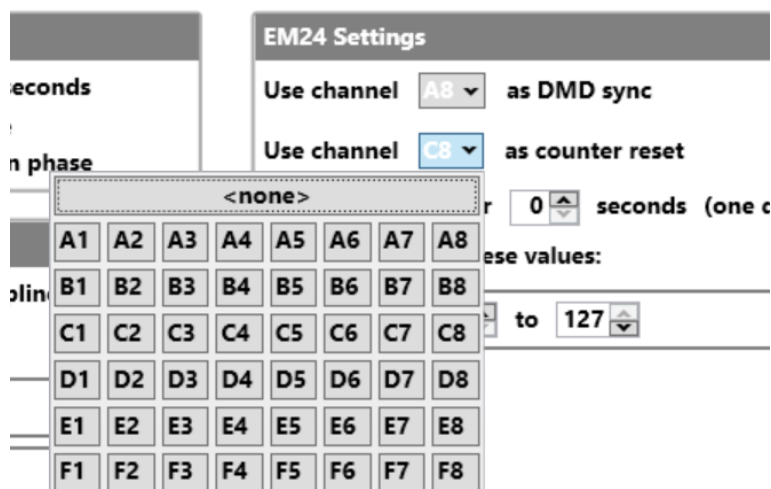
### 3.2.14 Set B1 channel as reset of the EM24 counter

The B1 output value can be set in two ways:

- c) Copying with the status of any input channel
- d) Via Modbus

Step	Action
1	Copying with the status of any input channel
	c) Click on 

- d) Select the input channel from the list, as shown below


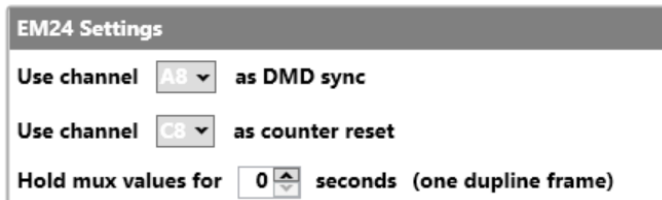





The status of this input will be reproduced on the reset channel B1




### 3.2.15 Multiplexer settings for EM24 protocol

To set the multiplexer parameters, follow this procedure:

Step	Action
1	Click on 
2	<p>To set how long the value of the multiplexer has to be maintained for, fill in the field <b>Keep multiplexer value for ...</b></p>  <p>The EM24 Settings dialog box shows: 'Use channel A8 as DMD sync', 'Use channel C8 as counter reset', and 'Hold mux values for 0 seconds (one dupline frame)'.</p>
3	<p>The multiplexer values have to be defined in the <b>Multiplexer values</b> field:</p> <p>To add a new value, click on </p> <p>To switch between single value or more values, click on </p> <p>To delete an existing value, click on </p>





### 3.2.16 Clear output when bus is faulty

To program the output channels so that they are reset when the bus is faulty, follow this procedure:

Step	Action
1	<p>To enable this function, click on the icon </p> <p>Check <b>Clear ouput....</b></p> <p>Set after how many seconds the output has to be reset</p> <p>Click on <b>Save</b></p> <p>The action will automatically be applied to all the output channels</p>



### 3.2.17 Set an output when bus is faulty

To program an output channel so that it is set when the bus is faulty, follow this procedure:

Step	Action
1	<p>To enable this function, click on the icon </p> <p>Check <b>Clear ouput....</b></p> <p>Set after how many seconds the output has to be reset</p> <p>Click on <b>Save</b></p>
2	<p>Click on the <b>output channel</b> to be programmed (from A1 to P8): if one or more channels are selected, the underline is marked with a thicker line</p> <p> Not selected channel</p> <p> Selected channel</p> <p>To select more channels, click and drag them</p>
3	<p>Click on the red circle on the right side of <b>Bus faulty – set output</b>: the channels will be marked with a small circle next to the channel name</p> <p></p> <p>The status of the selected channel will be activated each time the bus is faulty</p>

### 3.2.18 Split I/O

To program an input channel as split I/O, follow this procedure:




Step	Action
1	<p>Click on the <b>input channel</b> to be programmed (from A1 to P8): if one or more channels are selected, the underline is marked with a thicker line</p> <p> Not selected channel</p> <p> Selected channel</p> <p>To select more channels, click and drag them</p>

- 2 Click on the red arrows on the right side of **Split I/O**: the channels will be marked with the same symbol below the channel name



### 3.2.19 Double scan

To enable the double scan on one or more input channels, follow this procedure:

Step	Action
1	<p>Click on the <b>input channel</b> to be programmed (from A1 to P8): if one or more channels are selected, the underline is marked with a thicker line</p> <p>  Not selected channel         </p> <p>  Selected channel         </p> <p>To select more channels, click and drag them</p>
2	<p>Click on the red double bar on the right side of <b>Double scan</b>: the channels will be marked with the same symbol next to the channel name</p> <p>  </p>

### 3.2.20 Connect the PC to the SD2DUG24

To connect to the SD2DUG24 generator, follow this procedure:

Step	Action
1	<p>Connect the SD2DUG24 to your PC, using one of the following ports:</p> <ol style="list-style-type: none"> <li>a) The Micro-USB port in the front part of the module – using a standard USB cable</li> <li>b) The RS485 port on the bottom of the module – using an RS485 to USB converter</li> </ol>

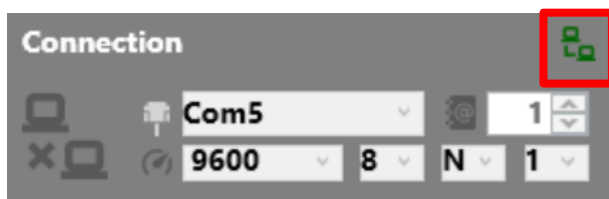
- 2 Select **<auto detect>** in the **Connection** menu, alternatively a **Com** port can be selected together with the connection parameters

### Things to know

- The software shows all the detected Com ports
- **<auto detect>** mode is available only when the Micro-USB port is used and the connection parameters are 9600, 8, N, 1 and they cannot be changed
- If the Micro-USB port is used, address 0 can be used as the default address
- If the RS485 port is used, the modbus address of the SD2DUG24 has to be used together with the proper connection parameters (the default address out of the factory is 1, while the default parameters are 9600, 8, N,1)

- 3 Click on 

- 4 The Dupline generator will connect to the PC and a green icon will be shown:



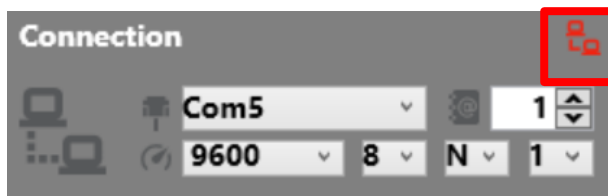
### 3.2.21 Disconnect the PC from the SD2DUG24

To disconnect, follow this procedure:

Step	Action
------	--------


- 1 Click on 

- 2 The Dupline generator will disconnect from the PC and a red icon will be shown:




### 3.2.22 Send a configuration to the SD2DUG24

To send a configuration to the SD2DUG24 generator, follow this procedure:

Step	Action
1	Connect the SD2DUG24 to your PC
2	Click on 


### 3.2.23 Read a configuration from the SD2DUG24

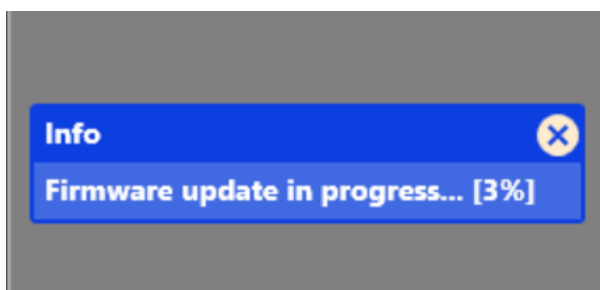
To read a configuration from the SD2DUG24 generator, follow this procedure:

Step	Action
1	Connect the SD2DUG24 to your PC
2	Click on 

### 3.2.24 Upgrade the SD2DUG24 firmware

To upgrade the firmware of the SD2DUG24 generator, follow this procedure:

Step	Action
1	Connect the SD2DUG24 to your PC
2	Click on 
3	The following blue window will appear, showing the status of the update:





#### ***Things to know***

While a firmware upgrade is in progress, no other operation can be carried out


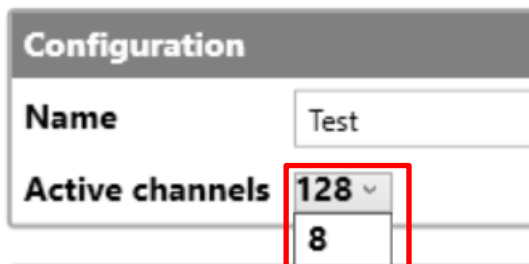
### 3.2.25 Set the name of a configuration

To set the name, follow this procedure:

Step	Action
2	Click on 
3	Type-in the name: <div data-bbox="406 560 1002 687" data-label="Form">  </div> <p>Click on <b>Save</b></p>


### 3.2.26 Set the number of Dupline channels

To set this number, follow this procedure:

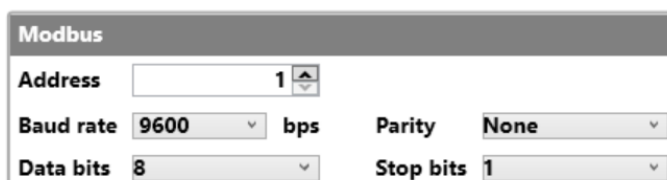
Step	Action
2	Click on 
3	Select the number required in the <b>Active channels</b> field: <div data-bbox="402 1281 932 1543" data-label="Form">  </div> <p>Click on <b>Save</b></p>

### 3.2.27 Set the communication parameters

To set the communication parameters, follow this procedure:

Step	Action
2	Click on 

3 Select the proper setting in **Modbus**:



The image shows a 'Modbus' configuration window with the following settings:

- Address: 1
- Baud rate: 9600 bps
- Parity: None
- Data bits: 8
- Stop bits: 1

Click on **Save**


#### *Things to know*

These settings are applied only to the RS485 port.

The parameters are fixed and cannot be changed on the USB port

### 3.2.28 Output status

To set the output status after writing a configuration, follow this procedure:


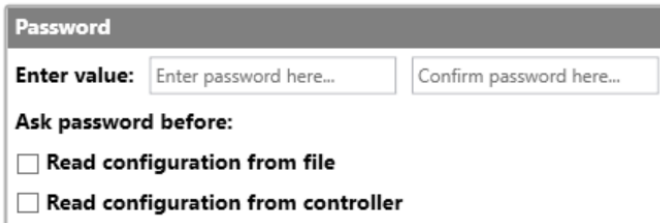
Step	Action
2	Click on 

3 To reset the Modbus data after writing a configuration, enable **Reset Modbus data after configuration phase**

To keep the output status after writing a new configuration, enable **Keep output status after configuration phase**

### 3.2.29 Set the password

To set the password to read the configuration file or to read the configuration from the controller, follow this procedure:

Step	Action
2	Click on 
3	<p>Enter and confirm the password</p> <p>Check <b>Read configuration from file</b>, if the password has to protect the configuration file</p> <p>Check <b>Read configuration from SD2DUG24</b>, if the password has to protect the reading from the SD2DUG24</p> 



# 4 FORMULAS

## 4.1 Procedures

### 4.1.1 Link a formula to an analogue value

To apply a formula to an analogue signal, follow this procedure:

Step	Action
1	Select the channel or the group to which the formula has to be applied
2	Click on the formula

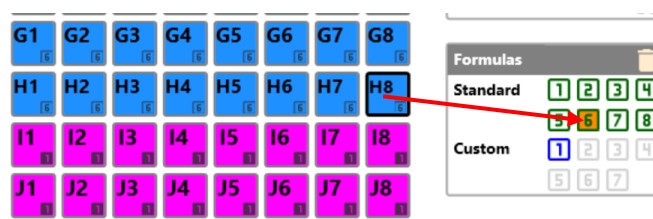


A small number will appear at the bottom right of the channel to indicate that a formula has been applied



### Things to know

- The formula is applied to the raw data of the associated channels and the output will be available in the relevant Modbus address
- If the formula is a standard one, the small number indicating the formula is black and the background is the same colour of the tile containing the name of the channel
- If the formula is a customised one, the small number indicating the formula is same colour as the tile containing the name of the channel and the background is black
- If a channel with an associated formula is selected, the number indicating the formula will have a coloured background






## 4.1.2 Standard formula

Number and name	Formula
1 – Lux type A (5 – 5000 lux)	$\text{Lux} = (10 (3 * \text{ANALINK}) / 255)) * 5$
2 – Lux type B (3000-300000 lux)	$\text{Lux} = (10 (2 * \text{ANALINK}) / 255)) * 3000$
3 – Wind speed	$\text{Speed [m/s]} = ((\text{ANALINK} * 25) / 255) + 5$
4 – Humidity 5-95%rH	$\text{Humidity [\%rH]} = ((\text{ANALINK} * 90) / 255) + 5$
5 – Temperature 10-35°	$\text{Temperature [°C*10]} = ((\text{ANALINK} * 250) / 255) + 100$
6 – Temperature 0-50°	$\text{Temperature [°C*10]} = ((\text{ANALINK} * 500) / 255)$
7 – G432111120	$\text{Lux} = (10 (3 * \text{ANALINK}) / 128)) * 0.1$
8 – BSI-TEMANA temperature	See table in Appendix

Temperatures in formulas 5 and 6 are calculated in tenths of degrees, in the Modbus map temperature values are shown in tenths of degrees as well.

## 4.1.3 Customised formula

To create a customised formula, follow this procedure:

Step	Action
1	Click on 
2	Enable the formula to set and name it 
3	Set the formula 

- 
- 4 Associate the formula to the relevant channel




# 5 REPORT AND LIVE DATA

## 5.1 Procedures

### 5.1.1 Modbus map

To access the Modbus map, follow this procedure:


Step	Action
1	Click on 


2 The modbus map relevant to the programmed channel will be shown:

Register Type	I/O	Address	Data mask	Address (hex)	Data mask (hex)	Num words	Description
HR	Input	0	65535	H0000	HFFFF	1	Realtime input status A-B
HR	Input	1	65535	H0001	HFFFF	1	Realtime input status C-D
HR	Input	2	65535	H0002	HFFFF	1	Realtime input status E-F
HR	Input	3	65535	H0003	HFFFF	1	Realtime input status G-H
HR	Input	4	65535	H0004	HFFFF	1	Realtime input status I-J
HR	Input	5	65535	H0005	HFFFF	1	Realtime input status K-L
HR	Input	6	65535	H0006	HFFFF	1	Realtime input status M-N
HR	Input	7	65535	H0007	HFFFF	1	Realtime input status O-P
HR	Output	256	65535	H0100	HFFFF	1	Realtime output status A-B
HR	Output	257	65535	H0101	HFFFF	1	Realtime output status C-D
HR	Output	258	65535	H0102	HFFFF	1	Realtime output status E-F
HR	Output	259	65535	H0103	HFFFF	1	Realtime output status G-H
HR	Output	260	65535	H0104	HFFFF	1	Realtime output status I-J
HR	Output	261	65535	H0105	HFFFF	1	Realtime output status K-L
HR	Output	262	65535	H0106	HFFFF	1	Realtime output status M-N
HR	Output	263	65535	H0107	HFFFF	1	Realtime output status O-P

### 5.1.2 Export the Modbus map

To export the Modbus map, follow this procedure:

Step	Action
1	Click on 

2 Click on 



#### **Thing to know**

The map can be exported only if live signals are not active

3 Save the pdf file

### 5.1.3 Live data




To check the activity of the Dupline bus, follow this procedure:

Step	Action
1	Click on 
2	Click on 


#### **Thing to know**

When live data is active, the icons will turn white

- On the top of the page all dupline channels are shown and it is possible to change their status by clicking on them

Force output channels status																																							
Group A 1 2 3 4 5 6 7 8 										Group B 1 2 3 4 5 6 7 8 										Group C 1 2 3 4 5 6 7 8 										Group D 1 2 3 4 5 6 7 8									
Group E 1 2 3 4 5 6 7 8 										Group F 1 2 3 4 5 6 7 8 										Group G 1 2 3 4 5 6 7 8 										Group H 1 2 3 4 5 6 7 8									
Group I 1 2 3 4 5 6 7 8 										Group J 1 2 3 4 5 6 7 8 										Group K 1 2 3 4 5 6 7 8 										Group L 1 2 3 4 5 6 7 8									
Group M 1 2 3 4 5 6 7 8 										Group N 1 2 3 4 5 6 7 8 										Group O 1 2 3 4 5 6 7 8 										Group P 1 2 3 4 5 6 7 8									

#### **Things to know**

By clicking on the small square at the end of each group  , the status of all the 8 channels will be as follows:

First click: all the channels are activated

Second click: all the channels are deactivated


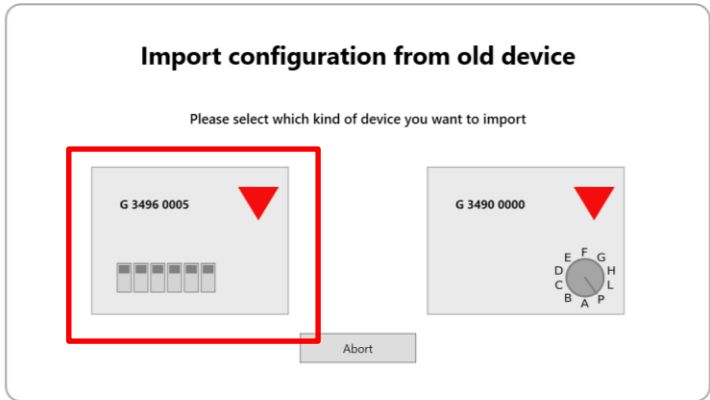
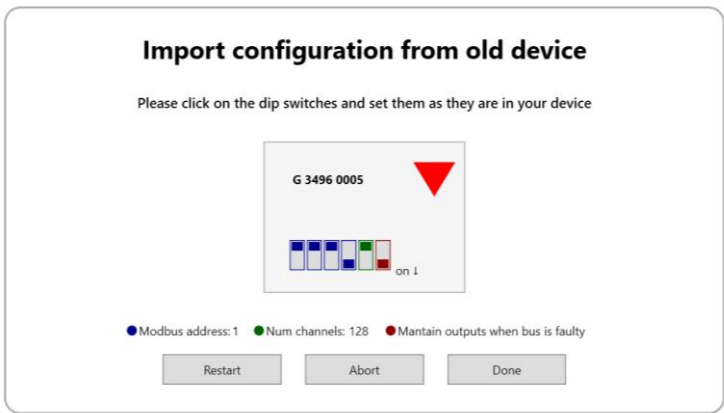
Third click: all the channels are set back to the status they had before the first click

# 6 G34960005 OR G34900000 QUICK SUBSTITUTION

## 6.1 Procedures


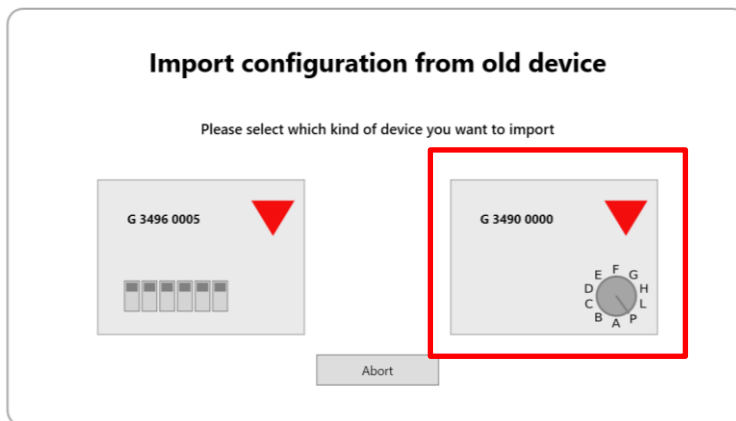
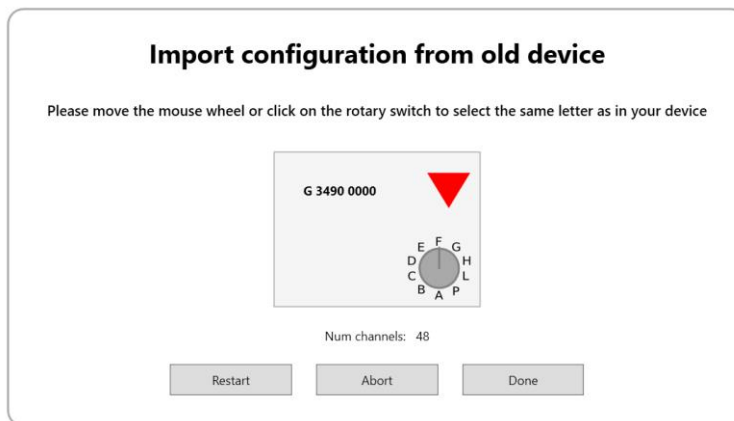
### 6.1.1 Substitute a G34960005

To easily and quickly copy the settings of a G34960005xxx to be substitute by an SD2DUG24, follow this procedure:

Step	Action
1	Click on 
2	Select the device by clicking on the relevant icon: <div data-bbox="427 878 1139 1276">  </div>
3	Set the “virtual” dip-switches, copying the ones of the G34960005 <div data-bbox="424 1384 1150 1794">  </div>
4	Click on <b>Done</b> and then on <b>Save</b>
5	<b>Write</b> the configuration into the SD2DUG24

## 6.1.2 Substitute a G34900000

To easily and quickly copy the settings of a G34900000xxx to be substituted by an SD2DUG24, follow this procedure:

Step	Action
1	Click on 
2	Select the device by clicking on the relevant icon: <div data-bbox="421 580 1160 999" data-label="Image">  </div>
3	Set the “virtual” rotary switch, copying that of the G34900000 <div data-bbox="426 1160 1163 1579" data-label="Image">  </div>
4	Click on <b>Done</b> and then on <b>Save</b>
5	<b>Write</b> the configuration into the SD2DUG24

# 7 APENDIX

## 7.1 BSI-TEMANA conversion table

Analink	Temp. (°C)	Analink	Temp. (°C)	Analink	Temp. (°C)	Analink	Temp. (°C)	Analink	Temp. (°C)
0	-30	52	-11,6	104	6,7	156	24,7	208	43,4
1	-30	53	-11,2	105	7	157	25,4	209	43,7
2	-29,6	54	-10,9	106	7,4	158	25,7	211	44,4
3	-29,5	55	-10,5	107	7,7	159	26,1	212	44,4
4	-28,9	56	-10,2	108	8,1	160	26,4	213	45,1
5	-28,5	57	-9,8	109	8,4	161	26,8	214	45,5
6	-28,2	58	-9,5	110	8,8	162	27,1	215	45,8
7	-27,5	59	-9,1	111	9,1	163	27,5	216	46,2
8	-27,1	60	-8,8	112	9,5	164	27,8	217	46,6
9	-26,8	61	-8,4	113	9,8	165	28,2	218	46,9
10	-26,4	62	-8,1	114	10,2	166	28,2	219	47,3
11	-26,1	63	-7,7	115	10,5	167	28,5	220	47,6
12	-25,7	64	-7,4	116	10,9	168	29,3	221	48
13	-25,4	65	-7	117	11,3	169	29,6	222	48,3
14	-25	66	-6,7	118	11,6	170	30	223	48,3
15	-24,7	67	-6,3	119	12	171	30,3	224	48,7
16	-24,3	68	-5,9	120	12,3	172	30,3	225	49,4
17	-23,9	69	-5,6	121	12,7	173	30,7	226	49,7
18	-23,6	70	-5,2	122	13	174	31	227	50,1
19	-23,2	71	-4,9	123	13,4	175	31,4	228	50,4
20	-22,9	72	-4,5	124	13,7	176	32,1	229	50,8
21	-22,5	73	-4,2	125	14,1	177	32,4	230	51,1
22	-22,2	74	-3,8	126	14,4	178	32,8	231	51,5
23	-21,8	75	-3,5	127	14,8	179	33,1	232	51,8
24	-21,5	76	-3,1	128	15,1	180	33,5	233	52,2
25	-21,1	77	-2,8	129	15,5	181	33,8	234	52,6
26	-20,8	78	-2,4	130	15,8	182	33,1	235	52,9
27	-20,4	79	-2,1	131	16,2	183	34,2	236	53,3
28	-20,1	80	-1,7	132	16,5	184	34,5	237	53,6
29	-19,7	81	-1,4	133	16,9	185	35,3	238	53,6
30	-19,4	82	-1	134	17,3	186	35,6	239	54,3
31	-19	83	-0,7	135	17,6	187	36	240	54,7
32	-18,7	84	-0,3	136	18	188	36,3	241	55
33	-18,3	85	0	137	18,3	189	36,7	242	55,4
34	-17,9	86	0,3	138	18,7	190	37,4	243	55,7
35	-17,6	87	0,7	139	19	191	37,4	244	56,1
36	-17,2	88	1	140	19,4	192	37,7	245	56,4
37	-16,9	89	1,4	141	19,7	193	38,1	247	57,1
38	-16,5	90	1,7	142	20,1	194	38,4	248	57,5
39	-16,2	91	2,1	143	20,4	195	38,8	249	57,8
40	-15,8	92	2,4	144	20,8	196	38,8	250	58,2
41	-15,5	93	2,8	145	21,1	197	39,1	251	58,6
42	-15,1	94	3,1	146	21,5	198	39,8	252	58,9
43	-14,8	95	3,5	147	21,8	199	40,2	253	59,3
44	-14,4	96	3,8	148	22,2	200	40,6	254	59,6
45	-14,1	97	4,2	149	22,5	201	40,9	255	60
46	-13,7	98	4,5	150	22,9	202	40,9		
47	-13,4	99	4,9	151	23,3	203	41,3		
48	-13	100	5,2	152	23,6	204	42		
49	-12,7	101	5,6	153	24	205	42,3		
50	-12,3	102	6	154	24,3	206	42,7		
51	-11,9	103	6,3	155	24,7	207	43		