



MVB physical layer order options

Application Note

This document further explains the options regarding the physical layer available on duagon MVB products.

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1. MVB physical layer order options

1.1 Introduction

To comply with different project requirements, duagon products offer a variety of options on the MVB interface. Since these options affect the actual hardware, the customer should specify them at order time according to the needs in a respective project.

This document explains the relevant options and gives advice on how to select them properly.

1.2 Duagon MVB options

The options available for each product are listed in the respective product datasheet in the "order information" section. Please check in each datasheet, which options are available. This document presents a summary over all duagon products.

1.2.1 MVB Type

duagon supports all types of MVB deployments as defined in the IEC61375 standard:

Order Option	Description
T	EMD: Electrical middle distance
D	ESD+: Electrical short distance
F	OGF: Optical glass fibre

Typically the EMD variant is used for train applications. In some Bombardier projects, the default type of MVB is ESD+. Please note that there are differences in the frame format and line termination in each version. Although a MVB network with mixed EMD and ESD+ nodes may work, this is not recommended and mostly prohibited by the train operator.

OGF MVB links are mostly used in projects where a MICAS control system is deployed. Some duagon boards are available with OGF transceivers on board. duagon offers also adapter boards to convert ESD+ to OGF or MVB repeaters and star couplers to convert EMD or ESD+ to OGF.

1.2.2 MVB Connector and screw locks

IEC61375 specifies that two SUB-D9 connectors, one male, one female with metric screws are used for the bus attachment (Note that Siemens specifies two female SUB-D9 connectors for MVB projects. This option is not available on duagon products, but usually standard MVB attachments can be handled by Siemens).

duagon offers the following options regarding MVB connectors:

Order Option	Description		
A	<table border="1"> <tr> <td>Add. Order Options for A</td> <td>Header: 10 pin header. Used if the MVB board is mounted inside the case of the device and additional wiring is required to the SUB-D connectors at the housing.</td> </tr> </table>	Add. Order Options for A	Header: 10 pin header. Used if the MVB board is mounted inside the case of the device and additional wiring is required to the SUB-D connectors at the housing.
Add. Order Options for A	Header: 10 pin header. Used if the MVB board is mounted inside the case of the device and additional wiring is required to the SUB-D connectors at the housing.		
L	Long cable locks for headers		

Order Option		Description
B	Add. Order Options for B	SUB-D: 2 SUB-D connectors, one male, one female are mounted on the duagon interface board.
	H	SUB-D with long hangover: SUB-D connectors "stand out" more than the default option (Please check images in respective datasheet).
	U	SUB-D with UNC4/40 screw locks: SUB-D connectors with UNC screw locks instead of M3. According to duagon experience, this is required in projects for Siemens.
	N	SUB-D without screw locks: No screw locks on the D-SUB connectors.

1.2.3 MVB Receive Threshold

In IEC61375-3-1 there are several sections which describe requirements for the MVB receiver. For some, there are also specifications on how to test these.

ESD attachments

For ESD type MVB attachments, the following sections apply:

- Section 4.4.9 a) The receiver shall generate
 - a) a HIGH level when the input voltage difference is higher than +0.2 V
 - b) a LOW level when the input voltage difference is lower than -0.2V
- Section 4.4.9 b) the receiver shall have a hysteresis of at least 0.050V, but of no more than 0,2V.

To ESD receivers the datasheet of the receiver "shall guarantee" the items a), b) and c) of section 4.4.9. In ESD attachments, the line idle level is biased by the active termination, providing a high immunity against noise. Therefore the test for insensitivity is omitted.

EMD attachments

- Section 4.5.10.2 The receiver shall generate
 - a) a HIGH level when the input voltage difference is higher than +0.2 V
 - b) a LOW level when the input voltage difference is lower than -0.2V

The receiver shall have a hysteresis of >50mV and <250mV.

Optionally (for environments which require high EMI), a) and b) shall read as

- c) a HIGH level for input voltages between +0.2 V and +0.5 V
 - d) a LOW level for input voltages between -0.2 V and -0.5 V
- Section 4.5.10.4 EMD receiver insensitivity: The receiver shall not detect a valid frame when the test signal amplitude is less than 0.1V.

According to the standard, this threshold may be raised in certain applications.

- Section 4.5.10.1 specifies the EMD receiver test signal and defines that for insensitivity test, the amplitude "does not exceed a prescribed value"

The test defined by IEC 61375-3-2 for EMD devices specifies the value to be used in a conformance test as an amplitude of 300mV (Section 5.2.5.1.5). It should be checked that frames with this low amplitude are still accepted and answered by the device

under test. There is no test specified, which explicitly checks whether devices do not receive frames with an amplitude below a certain level.

duagon options

Given the ambiguous specifications in IEC61375, different train manufacturers may demand compliance with different requirements regarding the signal receive threshold, and specify additional tests on top of the IEC61375-3-2 standard.

duagon offers the following options to assure compliance to these requirements:

Order Option	Description
-11	-50/-150mV: This options used for most EMD and ESD(+) projects (IEC61375-3-1 default).
-13	+/- 350mV: In EMD type applications, which require a high immunity against noise in the MVB receiver, this is the preferred option. This option was introduced to comply with specific requirements in Siemens projects.
<empty>	Standard RS485: A standard RS485 transceiver is used for the MVB attachment. MVB frames with a low amplitude can still be recognized and decoded. Digital filters in the MVB decoder prevent spikes or disturbances on the MVB lines to be decoded as MVB data.

1.2.4 MVB EMD Options

To measure the basic integrity of an MVB line, some operators / train manufacturers check the DC resistance value between P and N of one line. In EMD deployments, the devices can be attached to the MVB line by a transformer. In a DC measurement this transformer presents a short circuit to the DC measurement and therefore voids this integrity check.

For this reason, on some duagon MVB products with transformer attachment (EMD) the following option is available:

Order Option	Description
-X	High differential input resistance (>500kOhm DC): If this is selected, a capacity is introduced in series between the N Line and one end of the coupling transformer. This does not affect bus communication. When a DC measurement of the resistance between P and N is taken at the MVB connector, the resulting value will be a high impedance.

1.3 Conclusion

When developing a device with MVB attachment, requirements given by the project lead must be taken into consideration. Starting from the decision if EMD or ESD bus attachment is required, checking if a special receive threshold should be applied up to further train manufacturer specific requirements.

duagon offers the possibility to comply with all requirements regarding MVB attachments as given by the major train manufacturers. However these options may require a special hardware variant, so this must be fixed in a design before an acceptance test is done with a MVB device.

duagon can give advice on which options may apply. In case of doubt consult with duagon and your project lead, to find the correct set of options.