Common External Interfaces (CEI)

Common Protocols for UL325 Monitored External Entrapment Protection Devices

OVERVIEW

Currently, testing for UL325 requires that each operator be tested with every monitored external device that is intended for use as entrapment protection. Based on the number of devices, this could be expensive and time consuming. Most manufacturers only test a limited number of devices, which creates limitations and sometimes confusion for the installers.

However, there are certain communication schemes that are fairly common within the industry. Those products that employ these common interfaces could be tested against a set of parameters without having to test every combination of operator and external device. Additionally, the specifics of these communication protocols can be defined, and those that subscribe to this may benefit from additional flexibility in terms of choices.

UL has agreed to provide independent test verification against these parameters, and to permit labeling which allows devices and operators to be used together even though they have not been tested in combination for that specific configuration. **This means that for the cost of a single evaluation, it is possible to achieve compliance with many different devices or operators.**

The name for this set of protocols is the **Common External Interface** (CEI) in the context of UL325.

The CEI is currently presented as an industry reference. In time (6-12 months) the protocol will be introduced potentially through an industry association (DASMA) or directly to UL via STP ballot.

Common External Interface

Common Interfaces

Normally Closed

The Normally Closed interface is one of the simplest options. It is fairly easy for operators to convert from Normally Open to Normally Closed, with little or no hardware changes. It does require some form of power cycling to verify the monitored operation.

Pulsed Output

A pulsed output is standard practice for photo-eyes in the garage door operator industry. This may be challenging to implement for gate operators without significant hardware changes. Separating the power from the pulses simplifies this greatly.

Terminations

Most commonly used with safety edges, a termination (e.g. 10K resistor) can be used to verify the integrity of wiring. This usually requires extra logic or processor functions in the operator.

Defined Protocols for Common External Interface (CEI)

UL has indicated that if there was an "industry standard" set of protocols, this could simplify the testing for both operator and accessory manufacturers that share or subscribe to a common external interface. The tables below list the various parameters and their recommended values. These parameters would also be validated during certification of the gate operator and/or external device.

Common External Interface

NORMALLY CLOSED COMMON PARAMETERS

In this configuration, the operator expects the device to be “shorted” when Good, and “open” when in Fault. The device should also be open when power is removed. To confirm proper monitoring, the operator must turn the power off and on once per cycle. A “cycle” is considered one continuous open and close movement with a very short time between changing directions (eg encountering an obstacle).

Name	Description	Min Value	Max Value
Operating Voltage	Power supplied by the operator.	10VAC / 10VDC	30VAC / 42VDC
Max Operating Current	Power consumed by the accessory.	N/A	200mA
Wake-up Time (1)	Time between Power On and Good signal (Closed).	100mS	500mS
Fault Pulse Width	Minimum period for any Fault	500mS	N/A
Fault Recovery Time	Time from when obstacle is removed and signal reports Good	0	500mS
Power Off Time	Time between Power Off and Power On	500mS	N/A
Off Resistance	Value when not conducting	100k ohm	N/A
On Resistance	Equivalent Resistance when output is Closed.	0	100 ohm @10mA

(1) Must remain in Fault state for this period.

Common External Interface

PULSED OUTPUT COMMON PARAMETERS - 4-WIRE METHOD

In this configuration, the operator expects to see short pulses on the output signal wires (2) when Good, and no pulses when in Fault. The power is provided by separate wires (2).

Name	Description	Min Value	Max Value
Pulse Frequency	Frequency of low-going pulses	100Hz	500Hz
Pulse Width	Percentage of cycle that is ON (conducting)	10%	20%
Fault Period	Minimum period for Fault condition	500mS	N/A
Off Resistance	Value when not conducting	100k ohm	N/A
On Resistance	Equivalent Resistance when Pulse is conducting.	0	100 ohm @10mA
LO Voltage	Voltage when pulse is LO (Conducting)	0V	1.6V
Separate Power Supply	Power supplied by the operator. 4-wire system	10VAC / 10VDC	30VAC / 42VDC
Max Operating Current	Power consumed by the accessory.	N/A	200mA

Common External Interface

PULSED OUTPUT COMMON PARAMETERS – 2-WIRE METHOD

In this configuration, the output pulses are driven on the same pair of wires that provides the power (comm.-over-power). The operator expects to see short pulses on the output signal wires (2) when Good, and no pulses when in Fault.

Name	Description	Min Value	Max Value
Pulse Frequency	Frequency of low-going pulses	100Hz	500Hz
Pulse Width	Percentage of cycle that is ON (conducting)	10%	20%
Fault Period	Minimum period for Fault condition	500mS	N/A
Common Power Supply	DC voltage available when not pulsing. 2-wire system	10VDC	24VDC
Max Device Current	Operating current when not conducting	N/A	200mA
LO Voltage	Voltage when pulse is LO (Conducting)	0V	1.6V
Max LO Current	Current when pulse is LO	N/A	500mA

Note: The 2-wire system parameters are difficult to specify, as different operators supply the power in different ways. Finding the best balance of Voltage and Resistance or Current is not easily described.

10K-Termination Common Parameters

In this configuration, the operator expects to see 10Kohms resistance between the output wires when Good, and either an open or short when in Fault.

Name	Description	Min Value	Max Value
Normal Termination	Resistance between two wires in the Normal/Good condition	9.2K ohms	10.8K ohms
Fault LO Resistance	Resistance between the two wires in a Fault condition	0 ohms	1K ohms
Fault HI Resistance	Resistance between the two wires in a Fault condition	100K ohms	Infinite

Device Certification And Flexibility Of Choice In The Field

To gain the most benefit from these protocols, MillerEdge has been working collaboratively with UL. The goal is to test the safety interfaces of a given operator or external device to verify that it works within the relevant parameters above, and thus eliminate the need for extensive cross-product combination testing for each device.

Each operator or device will be required to meet all of the UL325 requirements (and UL991 as applicable), including proper operation in a representative system. Additional tests would be performed to confirm that the operator or device falls within the parameters of the protocol(s) above.

Compliance with these protocols and evaluation by UL provide a level of assurance for manufacturers, dealers, installers, users, and authorities, that the system is compliant as well as compatible with systems using the same Common External Interface. You can contact UL (Steve Kuscsik) for more details on the parameters of the testing protocol, and options for using the UL Mark on gate operators and external devices that meet these criteria.

Markings (preliminary)

Any operator or accessory that meets the requirements of one or more protocols listed above would add a marking similar to this:

CEI-P2 or **CEI-P3/P4**

Where:

P1 = Resistive Termination

P2 = Normally Closed

P3 = Pulsed 2-wire

P4 = Pulsed 4-wire

REVISION HISTORY

Rev 1.0 (February 2015) – Add further descriptions to the different modes. Widen the range of acceptable pulse frequencies. Lower the minimum voltage from 12V to 10V. Add the specific fault resistances for the 10K mode. Add revision formatting. Remove “DRAFT” watermark.

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