GATE OPERATOR & ACCESS CONTROL POINT SYSTEMS DIVISION
DASMA TECHNICAL DATA SHEET
#353

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# Gate Operators and the ANSI/UL 325 Standard

## Introduction

UL 325 is a standard for safety that addresses the automatic operation of garage doors, vehicular gates, louvers, and windows. In this Technical Data Sheet, we will provide you with some background information about UL, UL standards, and the requirements in UL 325 that apply to vehicular gate operators. In addition to this Technical Data Sheet, DASMA has produced a brochure that summarizes safety issues related to automated vehicular gates. The brochure is available on the DASMA website on the following web page:

http://www.dasma.com/pdf/publications/brochures/GateSystemsSafetyBrochure.pdf

## What is UL

Underwriters Laboratories, Inc., established in 1894, is self-described as "the leading third-party certification organization in the United States and the largest in North America." UL's primary stated mission is "to evaluate products in the interest of public safety." Note that while UL declares it is the "leading" third-party certification organization, it is not the only one. There are other testing laboratories and certification organizations in the United States and in many other countries.

## What is a UL Standard

UL standards are voluntary standards that establish minimum requirements for a product. The standards are developed via an open, non-exclusionary process, and they continually evolve over time. "Voluntary" means that the standard has not been initiated through any government or similar regulatory agency mandate. "Minimum" means that the industry and those who developed the standard believe that the requirements should be met by all participants and products governed by the standard and that more stringent provisions may be adopted by some in the industry. Finally, an "open, non-exclusionary process" indicates that any interested party can participate in the development of a UL standard. In addition, a number of UL standards have undergone a review and voting process in order to obtain additional recognition as American National Standards.

The purpose of this process is to gain a wider acceptance of a specific standard. The process typically includes interested individuals and organizations that may have direct or material interest in a particular standard. UL 325 is one of the standards that have attained the ANSI (American National Standards Institute) designation.

What is the UL 325 Standard

For products within the scope of the standard, UL 325:

1. Contains the basic qualifying factors that products must meet in order to be documented (listed) and marked (labeled) as complying with the requirements of the UL 325 voluntary Listing and Labeling program;
2. Provides methods for testing products, primarily related to safety performance;
3. Covers installation of products in accordance with the National Electrical Code, which is maintained by the National Fire Protection Association (NFPA) and is in force nationwide. UL 325 is to be harmonized with this Code;
4. Addresses safety concerning potential fire and electrical hazards, as well as the safety of the general public.

How is UL 325 Used

UL 325 is used as a basis to test products at a nationally recognized testing laboratory. Gate operator manufacturers that choose to participate in a listing and labeling program submit their products for testing. If they are found to be in compliance with the UL 325 standard, they are "Listed" and receive a "Mark." It is very important to remember two facts:

- There are laboratories other than UL that are capable of listing and labeling products to the UL 325 standard, including Intertek Testing Services NA, Inc., Met Laboratories, Inc., and TUV Rheinland of North America, Inc. A "UL label" is not a generic term. For example, many people use "Kleenex" and "Band-Aid" as generic terms when, in fact, they are specific brand names. UL is a brand name, and "UL label" should not be used generically.

- Products are not approved by UL or other laboratories. Approval implies acceptance of responsibility for compliance with standards. This responsibility lies with the listing and labeling applicant and not with the laboratory. The burden of proof regarding data always lies with the manufacturer.

Development of UL 325

The first edition of UL 325 was released in 1973. That edition was primarily focused on the electric operation of garage doors and did not contain provisions for gates. DASMA members of the gate operator industry initiated the inclusion of vehicular gate operator provisions within UL 325 in the early 1990's.

Overview of UL 325 and Gates

Highlights of UL 325 include the following:

- A glossary which defines each type of operator
- Different classes of gate operators
- Entrapment* protection criteria for types of operators
- Requirements for gate construction and installation (for detailed requirements regarding construction, see ASTM F2200, *Standard Specification for Automated Vehicular Gate Construction)*
- Instructional requirements and warning requirements

*In the document, entrapment is defined as "the condition when an object is caught or held in a position that increases the risk of injury."

The heart of the UL 325 provisons for gate operators and entrapment protection is section 32 and tables 32.1 and 32.2. These parts of the UL 325 standard outline the options for different means of protecting against entrapment and state the minimum quantities of entrapment protection sensors for each type of gate operator.

Section 32.1.1 states: "A vehicular gate operator or vehicular barrier (arm) operator shall:

a. Have provisions for or be supplied with, a minimum of two independent entrapment protection means as specified in Table 32.1 for each entrapment zone.
b. Operate only after installation and enabling of the minimum number of acceptable entrapment protection means, as specified in Table 32.2…"

**Table 32.1**
**Protection against entrapment**
Table 32.1 effective August 1 2018

| Gate operator category | |
|---|---|
| **Horizontal slide, vertical lift, and vertical pivot** | **Swing and vehicular barrier (arm)** |
| **Entrapment protection types[a]** | **Entrapment protection types[a]** |
| A, B1, B2 or D | A, B1, B2, C or D |
| Note - The same type of device shall not be utilized for both entrapment protection means. Use of a single device to cover both the opening and closing directions is in accordance with the requirement. | |
| [a] Entrapment protection types: | |
| Type A - Inherent entrapment protection system. See 32.1.6. | |
| Type B1 - Non-contact sensor (photoelectric sensor or the equivalent). See 32.1.7 - 32.1.15. | |
| Type B2 - Contact sensor (edge device or the equivalent). See 32.1.8 and 32.1.17 - 32.1.19. | |
| Type C - Inherent force limiting, inherent adjustable clutch or inherent pressure relief device. See 32.1.21 and 32.2.1.1 (b) . | |
| Type D - Actuating device requiring continuous pressure to maintain opening or closing motion of the gate. See 32.1.22 and 32.1.23. | |

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**Table 32.2**
**Minimum quantity of entrapment protection means**
Added Table 32.2 effective August 1, 2018

| | Opening | Closing |
|---|---|---|
| Horizontal Slide Gate | 2 | 2 |
| Horizontal Swing Gate | 2* | 2* |
| Vertical Pivot Gate | 2 | 2 |
| Vertical Lift Gate | 1 | 2 |
| **For a horizontal swing gate operator, at least two independent entrapment protection means are required in each direction of travel. Except, if there is no entrapment zone in one direction of travel, only one means of entrapment protection is required in that direction of travel; however, the other direction must have two independent entrapment protection means.* | | |

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Gate Definition and Types

UL 325 defines a gate as "a moving barrier such as a swinging, sliding, raising, lowering, rolling, or the like, barrier that is a stand-alone passage barrier or is that portion of a wall or fence system that controls entrance and/or egress by persons or vehicles and completes the perimeter of a defined area." The main types of gate operators/systems addressed in UL 325 are barrier, vertical pivot gate, horizontal slide gate, swing gate, and vertical lift gate. It is important to note that all gate operators included in UL 325 are defined to be used with vehicular gates and NOT PEDESTRIAN GATES. Property owners must provide a separate entrance for pedestrian access because pedestrian gates provide a safe way for pedestrians to enter or exit a property and help to keep people away from vehicles and automatic vehicular gate systems.

Gate Operator Classifications

Four distinct types of classifications have been established:

- Class I: "A vehicular gate operator (or system) intended for use in garages or parking areas associated with a residence of one-to four single families."
- Class II: " Avehicular gate operator (or system) intended for use in a commercial location or building such as a multi-family housing unit (five or more single family units), hotel, garages, retail store, or other buildings accessible by or servicing the general public."
- Class III: "A vehicular gate operator (or system) intended for use in an industrial location or building such as a factory or loading dock area or other locations not accessible by or intended to service the general public."
- Class IV: "A vehicular gate operator (or system) intended for use in a guarded industrial location or building such as an airport security area or other restricted access locations not servicing the general public, in which unauthorized access is prevented via supervision by security personnel."

Provisions of Note Regarding Gate Operators

We have identified the following notable provisions included in UL 325 that are relevant to gate operators and related entrapment protection devices.

1. *For MOST installations, at least 2 independent means of protecting against entrapment are required in each direction of travel. For ALL installations, at least 2 independent means of protecting against entrapment are required in each direction WHERE THERE IS A RISK OF ENTRAPMENT.*

2. ALL external means of protecting against entrapment must be monitored.

3. *Slide gate operators for Classes I and II, and vertical lift-gate operators shall not exceed a speed of 1 foot per second when the operator is pulling 75 pounds or more.*

4. *Manufacturers will be required to specify a brand and model number of external sensors compatible for connection to an operator.* This provision arose from concern over the gate operator and external devices acting in tandem as a system, with a maximum allowable fault rate of 6 failures in 1 million hours of use (which equates to 115 years of continuous operation).

5. *After sensing an obstruction, reversing must begin within 2 seconds.* This requirement is intended to keep a person from being entrapped in a stationary position by the gate system. After the first contact the gate must reverse and travel a minimum of 2 inches. If a second contact is detected by a Type A device (inherent sensor), the gate must stop only and not reverse. If a second contact is detected by Type B1 or B2 device (photoelectric sensor or edge sensor), the gate must stop but may also reverse.

6. *After any obstruction stop or reversal by either an A or B2 device, the timer-to-close is disabled until reset.* Both *A* and *B2* devices sense direct gate contact with an obstruction, and the devices must perform their intended function without interference from a timer-to-close action.

7. *A Type A (inherent sensor) must stop the gate upon sensing a second sequential obstruction, must activate an audio entrapmetn alearm, and must not operate until an intended hard wired input is received*. A person within the line of sight of the gate must see what has caused the second sequential obstruction and must resolve this obstruction before operating the gate.

8. *If a Type C device is chosen, swing gates must not exert more than 40 pounds of force at the leading edge of the shortest recommended gate length, two seconds after initial start-up.*

Installation Effects

The UL 325 gate operator provisions have an effect on gate and fence dealers:

1. Gate and fence dealers should look for an indication of the class of each operator, which will be specified by the gate operator manufacturer.
2. Fence dealer sales personnel must match the site application with the class of operator. The gate operator manufacturer should be contacted if there is any question about the site application.
3. Ensure that all potential entrapment zones are protected as required in Tables 32.1 and 32.2, which must be described in the instruction manual for the gate operator. For most automatic gates, external entrapment protection sensors will be required. The expertise of dealers is required to apply the provisions of the standard to the wide variety of site specific conditions that are encountered in the field.

4. The gate operator manufacturer will provide extensive guidance and instructions which must be followed at all times. Any questions should be directed to the gate operator manufacturer.
5. A minimum of two (2) warning signs must be displayed in the area of the gate. UL 325 includes specific requirements on the format, content, and placement of these signs.

Factors Related to Automatic Gate Construction and Installation

- Vehicular gate operators can ONLY be used on vehicular gates and never pedestrian gates.
- A separate pedestrian gate must be provided for all sites where pedestrain access is likely.
- The design and construction of all automatic gates and the adjacent fence must conform to ASTM F2200.
- Adequate clearance should be provided between a swinging gate and adjacent structures to reduce risk of entrapment.
- A sliding gate should work smoothly with easy rolling/movement in both directions prior to the installation of the operator.
- All gate activation controls should be as far away from the gate as possible and must be at least 6 feet from the gate to reduce the opportunity for “reach-through” injury.
- Warning signs and placards must be installed and be must visible in the area of the gate opening from both sides of the gate.
- See DASMA TDS-370 and ASTM F2200, *Standard Specification for Automated Vehicular Gate Construction* for information about gate construction.

Device-Specific Installation Instructions

There are also specific installation requirements for each type of external entrapment protection sensor. These specific requirements emphasize the care and attention that each device must be given prior to and during installation.

All external entrapment protection sensors must be monitored, and the operator must verify the presence of every device at least once during each open and close cycle. According to the standard, "Upon monitoring, should any device not be present, or a fault condition occur that precludes the sensing of an obstruction, including an interruption of the wireless signal to the wireless device or an open or short circuit in the wiring that connects the external entrapment device to the operator and the device’s supply source, the operator shall function with constant pressure…for the direction of travel being protected, or shall only be able to be moved manually…."

There shall be no modification made in the field to bypass, interfere with, or otherwise defeat the monitoring function by adding, suppressing, or changing, either on the operator or on external entrapment protection

device(s) by the connection of wires; terminals; switches; jumpers; or components supplied with the operator or with the external entrapment protection device.

For gate operators utilizing non-contact sensor devices (Type B1), instructions should be consulted for placement for each application and care should be exercised to reduce the risk of nuisance tripping. One or more of these devices must be installed in all potential entrapment zones.

For gate operators utilizing contact sensor devices (Type B2), several requirements are spelled out in UL 325. One or more contact sensors shall be located in all potential entrapment zones.

A wired contact sensor shall be located, and its wiring arranged, so that communication between the sensor and the gate operator is not subjected to mechanical damage. A wireless contact sensor shall be located where the transmission of the signals is not obstructed or impeded by building structures, natural landscaping, or similar obstructions, and shall function under the intended end use conditions.

For gate operators utilizing a continuous pressure activating device (Type D), controls must be placed so that a user has full view of the gate area when the gate is moving. A placard must be placed adjacent to the controls, and no other activation device shall be connected. Most importantly, an automatic closing device shall not be employed.

Statements in Manufacturer's Instructions Concerning Installation

Gate and fence dealers can expect to see detailed information regardign compliance with the UL 325 standard in gate operator instruction manuals. It is essential that dealers and installers follow all instructions provided by the operator manufacturer.