

ReFlx 100 COLLISION AVOIDANCE SYSTEM

The ReFlx 100 collision avoidance system is intended for use with bridges and trolleys to prevent collisions or to limit the approach of adjacent bridges or trolleys. The system is designed to be immune to most electrical noise including that which can be created by variable frequency drives and other parasitic interference affecting the reliability of RF based systems.

The **ReFlx 100** system utilizes a two channel light sensor, a diamond grade reflective target, and a controller containing the power supply and relay outputs.

System Includes:

- 1 -RFX100-2 Dual Channel Sensor with 5 meter control cable
- 1 -ST100-3 Controller
- 1 -2ft. X 2ft. (T2X2) Diamond Reflective Target

ST100-3 Controller

The ST100-3 controller features two 10 Amp relays for inter-connection with the crane motion controls. The power supply is normally 120/1/60. The system can be specified in voltages of 220 VAC, 250 VDC, or 350 VDC.

RFX 100-2 Sensor

The RFX 100-2 sensor has two channels in a single compact housing that can be individually adjusted to a scanning range of 120 feet by using a diamond grade reflective material. One channel is used to provide the primary stop command to the motion control, while the second channel is utilized to provide a backup stop command.

An infrared LED light source sends a pulsed light that is reflected back when the reflective material comes within the set range (maximum 120 feet).

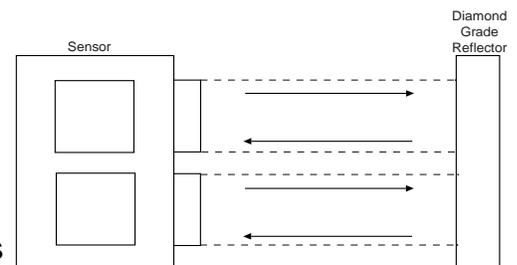
The sensor is in the dark switching mode. Meaning, the controlling relay contacts close on power up and will open if there is a loss of power or the diamond grade material is detected.



ST100-3 Controller



RFX 100-2



ReFlx 100 Application Guidelines

Contactor Control

Bridge and trolley motions using reversing contactors for control, rely on the crane's mechanical brakes for stopping. Therefore, the buffer zone (minimum distance to mating crane or obstruction) should be sized to allow for future brake wear.

Adjustable Frequency Crane Control

Because adjustable frequency drives (AFD) have various programmable stopping options, consideration should be given to these various means when setting up the ReFlx 100 system.

Using the AFD Limit Switch Inputs

Most modern AFDs include programmable limit switch input terminals for each direction of travel (Upper Limit 1 & Upper Limit 2). When the bridge reaches the sensing distance for Channel 1, the drive will "decelerate at stop command" or provide "immediate stop at stop command" (see definitions below), depending on how the drive is programmed. The input to the drive from Channel 2 can be run parallel to that of Channel 1, or run to a multi-function input terminal on the AFD.

Decelerate at "Stop Command"

Upon receiving a "Stop Command" from the ReFlx 100 system, the output frequency of the AFD decreases to near zero at the programmed deceleration ramp; and the brake is commanded to set. See Table I, Bulletin A260.10, for approximate stopping distances at various deceleration times. These stopping distances will be slightly longer when the AFD is programmed with an S-Curve ramp.

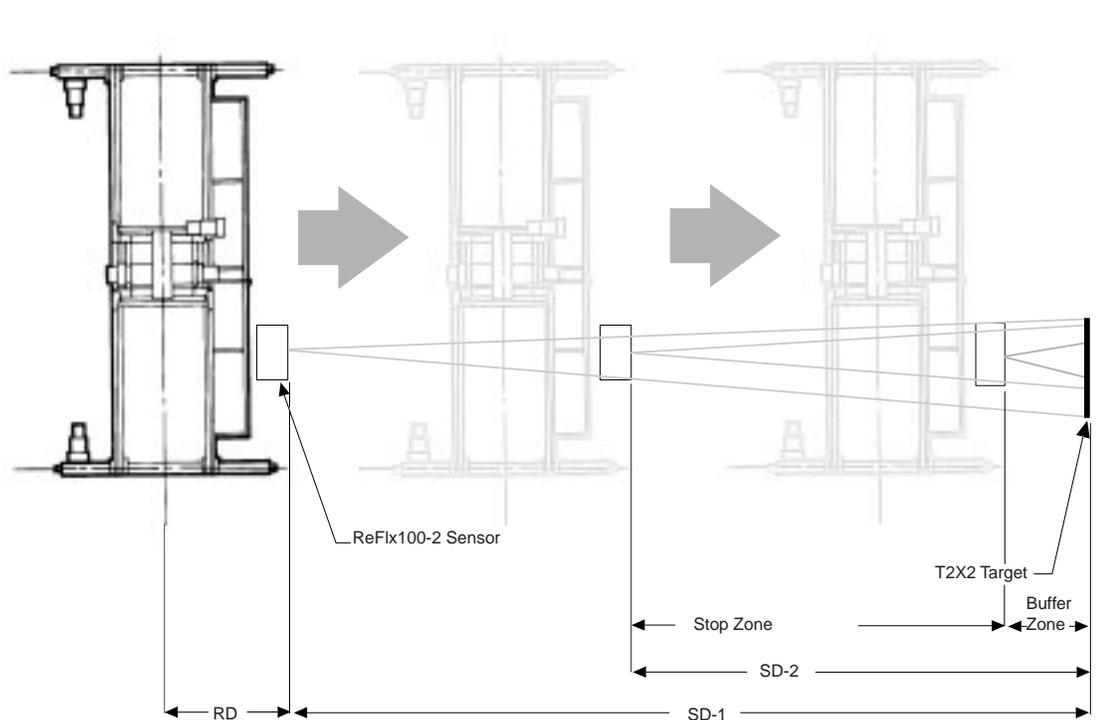
Immediate Stop at Stop Command

Upon receiving a "Stop Command" from the ReFlx 100 system, the AFD base blocks the main output transistors, thereby electrically disconnecting the motor from the AFD, and through the brake interlock, commands the brake to set. In this mode, the crane functions similar to Contactor Control and relies on the crane's mechanical brakes for stopping. Therefore, the buffer zone (minimum distance to mating crane or obstruction) should be sized to allow for future brake wear.

NOTE: It may be necessary to re-calibrate the ReFlx 100 system whenever the deceleration time is changed. Test all motions under worst case scenario before putting crane into operation.

Contact Electromotive Systems for applications involving other types of controls or options.

Crane to Wall Collision Avoidance



SD-1 =Sensing Distance for Channel No. 1

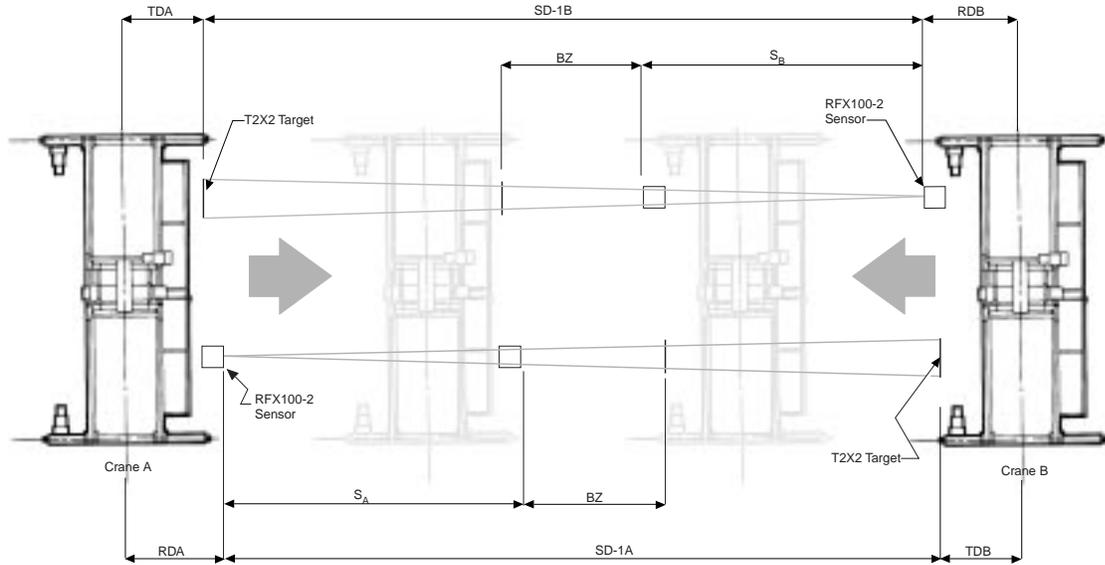
SD-2 =Sensing Distance for Channel No. 2

RD = Distance – CL of Crane to ReFlx Sensor

Mounting Guidelines

When the system is installed as a single device without other sensors in the area, no special precautions need to be taken. The T2X2 reflector is used as the target. The sensor should be installed with the optical axis parallel to the line of travel and approximately three (3) feet away from the walls and ceilings. The sensor and target are to be mounted horizontally and perpendicular to each other, in both the horizontal and vertical planes.

Crane to Crane Collision Avoidance



SD - 1A = Sensing Distance for Channel 1
SD - 2A = Sensing Distance for Channel 2
RDA = Dist. -- CL of Crane A to ReFlx Sensor
TDA = Dist. -- CL of Crane A to Target B
 S_A = Stopping Distance for Crane A @ Max. Velocity
BZ = Buffer Zone

SD - 1B = Sensing Distance for Channel 1
SD - 2B = Sensing Distance for Channel 2
RDB = Dist. -- CL of Crane B to ReFlx Sensor
TDB = Dist. -- CL of Crane B to Target B
 S_B = Stopping Distance for Crane B @ Max. Velocity

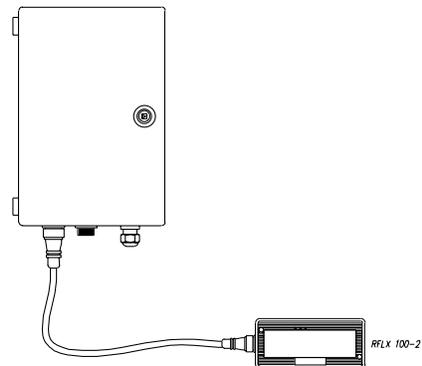
Mounting Guidelines

The sensor should be installed with the optical axis parallel to the line of travel and approximately three (3) feet away from the walls and ceilings. The sensor and target are to be mounted horizontally and perpendicular to each other, in both the horizontal and vertical planes. To avoid cross-talk when mounting two or more sensors facing each other, separate them by at least three feet on either the vertical or horizontal axis. When the sensors are mounted on cranes that travel more than 100 feet apart, allow an additional foot of spacing between them for every fraction of 100 feet. For example, if two cranes are separated by 165 feet, allow 3 feet plus 1 foot for the additional 65 feet. Stopping distances should be determined to allow for a buffer zone with both cranes traveling toward each other at maximum velocity.

For outdoor applications, additional protection may be needed to protect the sensors from the elements. Contact Electromotive Systems for application assistance.

Connecting the RFX 100-2 Sensor to the ST100-3 Controller

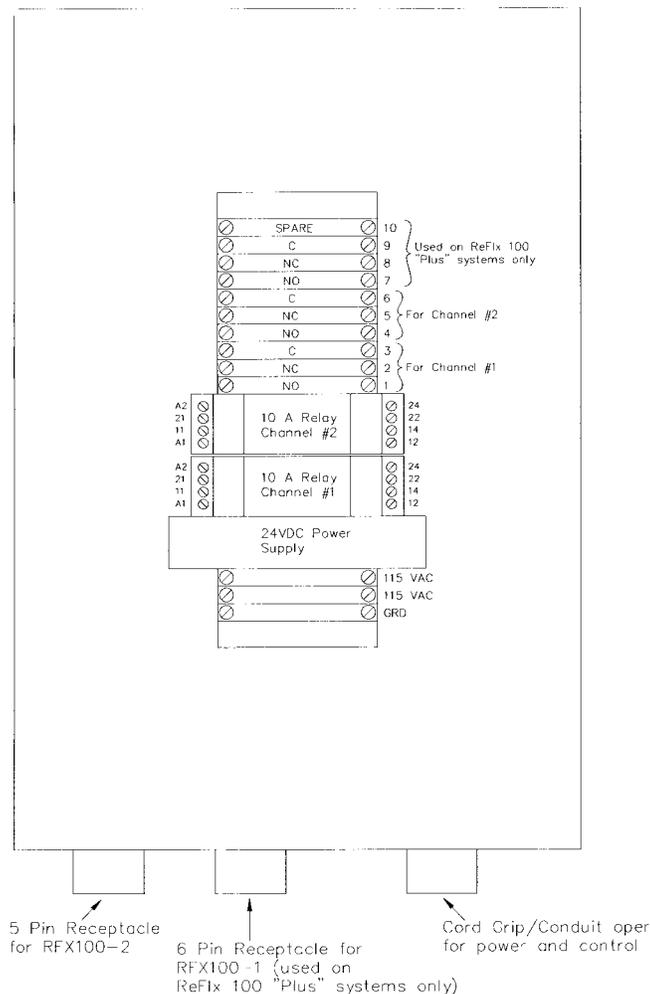
The shielded connector cable is furnished with a 5 pin Amphenol Mil Spec plug at both ends. Plug the angled connector into the socket on the RFX 100-2 two channel sensor, and the straight connector into the left hand receptacle on the ST100-3 controller. The right hand receptacle on ST100-3 is reserved for use with the RFX 100-1 single channel sensor used only on Reflx 100 "Plus" systems. (The third channel can be added at any time by merely plugging in the RFX 100-1 sensor.)



The RFX 100-2 sensor will not operate when plugged into the receptacle for the RFX 100-1 sensor (Channel 3).

Electrical Installation

NOTE: Installation should be performed by qualified personnel only. National Electric Code and local electrical installations requirements and codes should be followed.



ST100-3 Controller

Terminal Description/Wiring Notes:

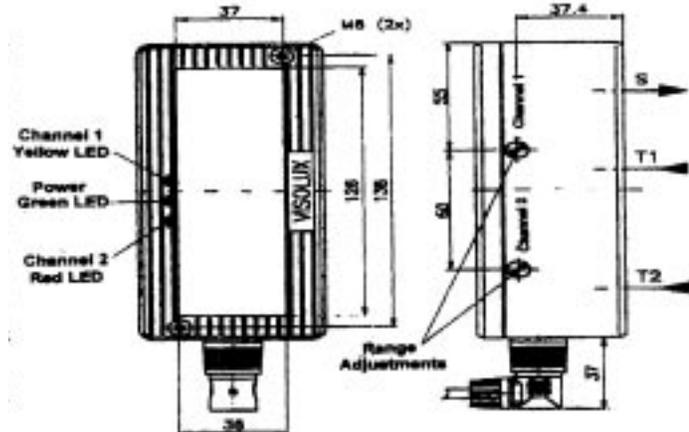
1. Terminals 1 & 4 are open with power "Off". Upon "power-up", the restrictive relay contacts change state, unless the reflector for that particular channel is within the set range. The relay contacts will open upon loss of power or if the reflector is within the set range.
2. Terminals 2 & 5 are closed with power "Off". Upon "power-up", the respective relay contacts change state, unless the reflector for that particular channel is within the set range. The relay contacts will close upon loss of power or if the reflector is within the set range.
3. Terminals 10 & 12 are used for the 120/1/60 input power supply. A grounding lug is furnished on the inside of the enclosure door.

RFX 100-2 Two Channel Sensor Set-Up Guidelines:

Adjustment:

Tools required: regular screwdriver, adjustable wrench

1. To adjust the range of the RFX 100-2, look at the face of the sensor (side with optics window and tag). The adjustment for channel 1 is closest to the yellow indicator and the adjustment for channel 2 is closest to the red indicator.



2. Upon powering up the RFX 100-2 the green indicator light should come on and the normally open contacts on the relays in the control enclosure should close. The other indicator lights (red and yellow) should be off, unless the diamond grade reflective material is in the scanning range. If the red or yellow indicator LED is on, turn the corresponding adjustment clockwise until the indicator goes off. If either the red or yellow LED fails to turn off, return the unit.
3. Move the crane so that the diamond grade reflective material in the sensing path is at the far range adjustment distance. Channel 1 is used to provide a primary stop command to the motion control. Turn the adjustment on channel 1 counterclockwise until the yellow indicator comes on.

Now move the crane so it is 3 to 4 feet further from the face of the target and turn the channel 1 adjustment clockwise until the yellow indicator just turns off.

4. Channel 2 is used as a backup to channel 1 and should be set at the same sensing range as channel 1.
5. It may be necessary to re-calibrate the ReFlx 100 system whenever the deceleration time is changed. Test all motions under worst case scenario before putting crane into operation.

WARNING: Detection systems which are not operational cannot stop crane motion or warn about possible collision. Trusting an inoperative device can result in collisions causing severe injury, death or property damage. Avoid sudden stops. The RFX 100-2 two channel system requires that a diamond grade reflective grade material be present and that the reflective properties of this material not be compromised.

RFX 100-2 Two Channel Sensor Technical Data:

Scanning Range: To 120 feet per channel with a square diamond grade reflective material.

Light Beam: Modulated infrared

Transmitter: IRED

Receiver: Photo-diode

Minimum Input Pulse Duration: 30ms

Switching Frequency: 10/s

Current Consumption: 100mA max., no load

Output: One 10 Amp SPDT relay per channel

Switching Mode: Dark switching

Output Indicators: Red indicates function of channel 2, Yellow indicates function of channel 1

Supply Voltage Indicator: Green LED, lit when supply voltage is applied

Test Input: Available on request

Test Input Current Consumption: 5mA max.



RFX 100-2 Sensor

Housing: Makrolon, black ribbed

Protection Category: IP 60, DIN 400 50

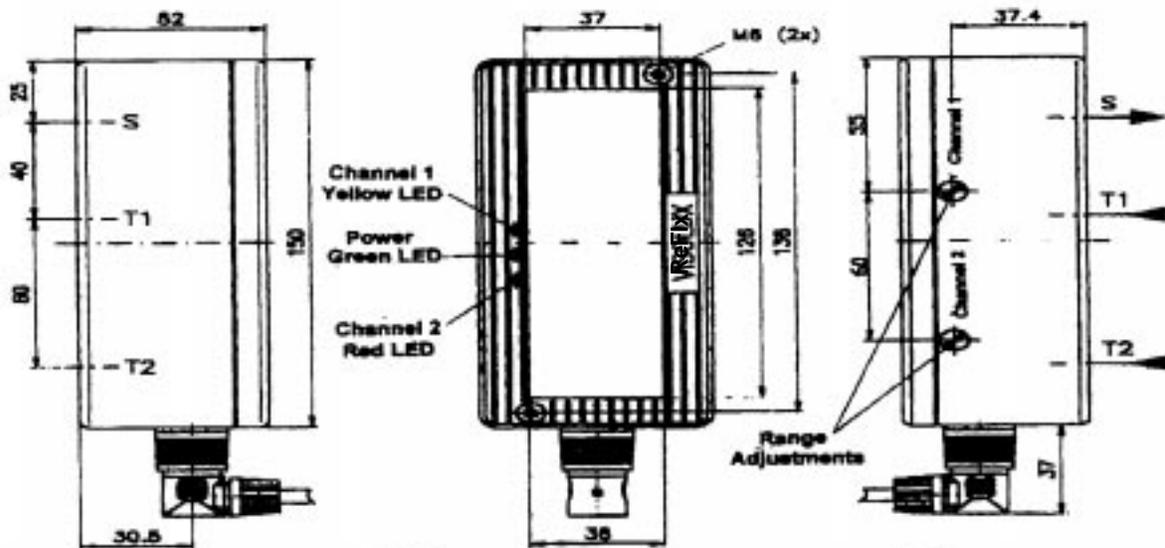
Optical Surface: Glass plate

Type Connection: 5 meter cable with 5 pin Amphenol Mil spec connector

Operating Temperature: -20 C to 60 C

Storage Temperature: -20 C to 75 C

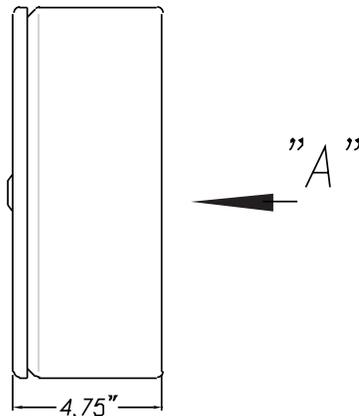
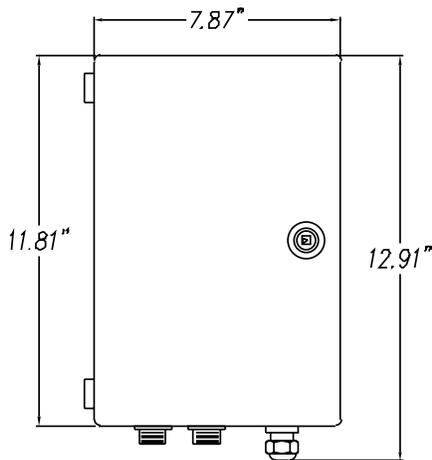
Weight: 500 g



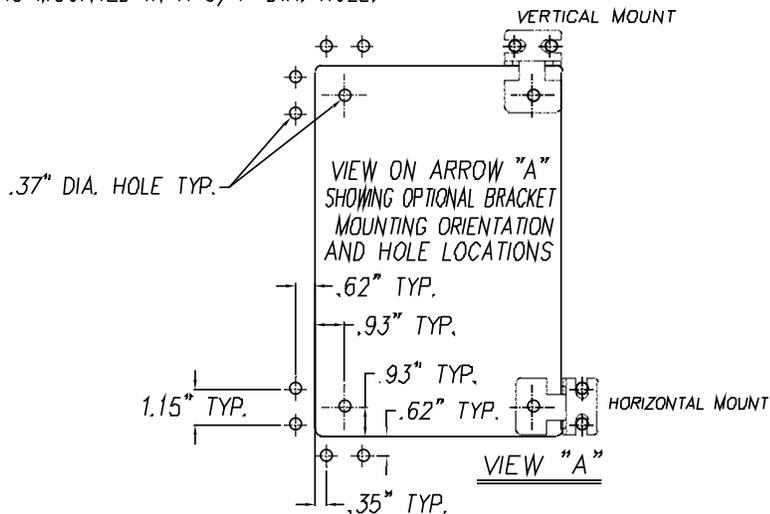
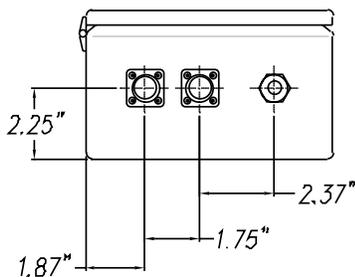
Dimensions

ST100-3 Controller

The ST100-3 controller consists of a power supply for the sensors and features one 10 Amp SPDT relay each, for channels No. 1 & 2 for output to the crane motion controls, all mounted in a NEMA 12 enclosure. The power supply is normally 120/1/60. The system can be specified in voltages of 220 VAC, 250 VDC, or 350 VDC on special order.



CORD GRIP WILL ACCEPT CABLE DIA. .20" TO .39".
CORD GRIP CAN BE REMOVED AND IS MOUNTED IN A 3/4" DIA. HOLE.



ENCLOSURE COMES WITH ONE SET OF MOUNTING BRACKETS
THE BRACKETS CAN BE MOUNTED IN TWO ORIENTATIONS.
HOLES FOR INSTALLATION OF BRACKETS ARE INCLUDED IN ENCLOSURE

Dimensions