

Safety Rated Eclipse® Servomotor Brake Spring Engaged, Air Released with Clamp Collar Servo Motor Sizes 3, 4, 5, 7, 9 and 11




nexsafe™
Certified Safety Products



In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

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| | | |
|---|---|---|
|  | <div data-bbox="553 556 850 611"> DANGER</div> <p>Read this manual carefully before installation and operation. Follow Nexen's instructions and integrate this unit into your system with care. This unit should be installed, operated and maintained by qualified personnel ONLY. Improper installation can damage your system, cause injury or death. Comply with all applicable codes.</p> |  |
|---|---|---|

This document is the original, non-translated, version.

Conformity Declaration: In accordance with Appendix II B of CE Machinery Directive (2006/42/EC):

A Declaration of Incorporation of Partly Completed Machinery evaluation for the applicable EU directives was carried out for this product in accordance with the Machinery Directive. The declaration of incorporation is set out in writing in a separate document and can be requested if required.

This machinery is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the applicable provisions of the Directive.

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ISO 9001 Certified

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GENERAL SPECIFICATIONS

TABLE 1






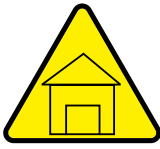
| Size | Min Holding Torque | Torsional Rigidity (Estimated) | Inertia (Calculated)* | Weight | Min. Disengagement Air Pressure** | Ambient Temperature |
|---------|-------------------------|-------------------------------------|--|-----------------------|-----------------------------------|--------------------------------|
| Size 3 | 8 Nm [5.9 ft•lb] | 9613 Nm/RAD [7090 ft•lb/RAD] | 0.00008 kg•m ² [0.0019 to 0.0020 lb•ft ²] | 1.5 kg [3.2 lbs] | 5.5 bar [80 psi] | 4.5 to 65.5°C [40 to 150°F] |
| Size 4 | 15 Nm [11.1 ft•lb] | 23,796 Nm/RAD [17,550 ft•lb/RAD] | 0.00034 to 0.00044 kg•m ² [0.008 to 0.011 lb•ft ²] | 3 kg [8.5 lbs] | 5.5 bar [80 psi] | |
| Size 5 | 32.8 Nm [24.2 ft•lb] | 36,184 Nm/RAD [26,690 ft•lb/RAD] | 0.0014 to 0.0015 kg•m ² [0.033 to 0.036 lb•ft ²] | 6.3 kg [13.8 lbs] | 5.5 bar [80 psi] | |
| Size 7 | 88 Nm [64.9 ft•lb] | 54772 Nm/RAD [40390 ft•lb/RAD] | 0.005 to 0.006 kg•m ² [0.119 to 0.142 lb•ft ²] | 13.6 kg [30 lbs] | 5.5 bar [80 psi] | |
| Size 9 | 88 Nm [64.9 ft•lb] | 102733 Nm/RAD [75757 ft•lb/RAD] | 0.0053 to 0.0067 kg•m ² [0.126 to 0.159 lb•ft ²] | 16.1 kg [35.5 lbs] | 5.5 bar [80 psi] | |
| Size 11 | 88 Nm [64.9 ft•lb] | 211695 Nm/RAD [156110 ft•lb/RAD] | 0.0041 to 0.0046 kg•m ² [0.097 to 0.109 lb•ft ²] | 28.5 kg [63 lbs] | 5.5 bar [80 psi] | |

* Note: Dependent on unit shaft and bore diameter.

** Note: Units with reduced release pressure are available upon request.

Pneumatic units accept an optional solenoid valve (normally closed) controlled by 24VDC at 104 mA. Solenoid valves are fitted with 18" flying leads standard. To order the solenoid valve (optional), please refer to Nexen product #964650.

GENERAL SAFETY PRECAUTIONS

| | |
|--|---|
|  | CAUTION Use lifting aids and proper lifting techniques when installing, removing, or placing this product in service. |
|  | CAUTION Use appropriate guarding for moving components. Failure to guard could result in serious bodily injury. |
|  | WARNING Ensure proper guarding of the product is used. Nexen recommends the machine builder design guarding in compliance with OSHA 29 CFR 1910 "Occupational Safety and Health Hazards". |
|  | WARNING This product is capable of emitting a spark if misused, therefore it is not recommended for use in any explosive environment. |
|  | CAUTION Watch for sharp features when interacting with this product. The parts have complex shapes and machined edges. |
|  | WARNING Keep indoors. This product is intended for indoor environments only. Use of the brake outdoors will damage components. No Excessive Dust or humidity permitted. |

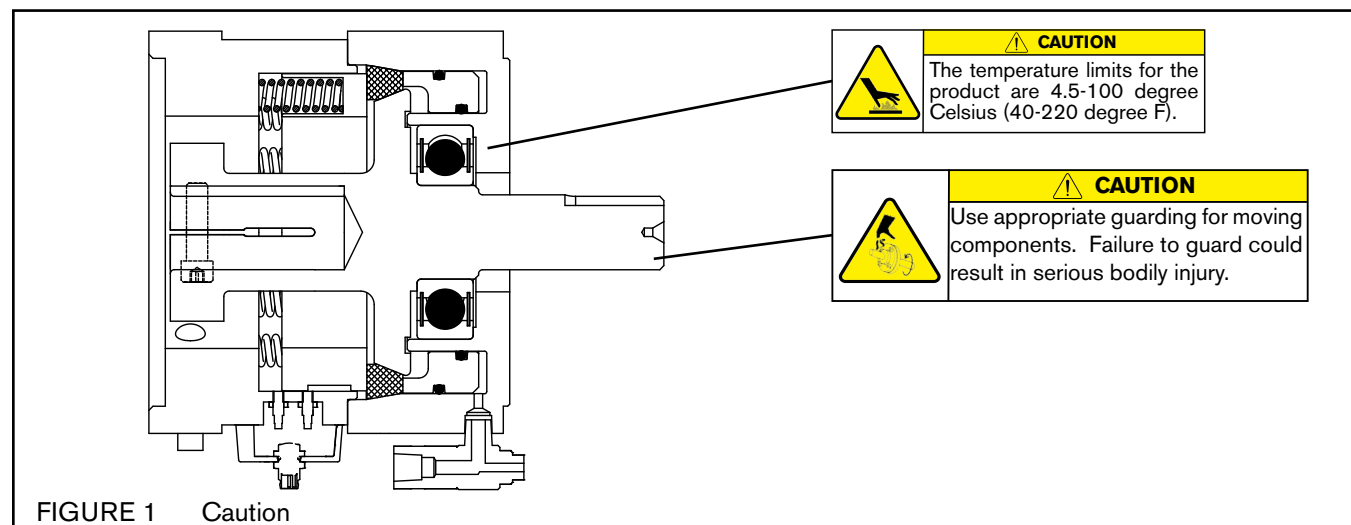


FIGURE 1 Caution

PRODUCT DESCRIPTION

The Eclipse Servo Motor Brake has been developed for braking on the shaft end of a motor or between a motor and gear reducer. These spring engaged, air released brakes are designed to hold in a safe position by default. Brakes are intended for static holding applications and Emergency Stop situations.

NOTE

The proper installation and maintenance of these brakes must be observed for proper use of unit and to prevent damage.

Engaged State: In the engaged state, compression springs push on the friction material backing plate to wedge itself against the hub/shaft, therefore holding the shaft position. If air pressure is lost, the unit will default to the brake engaged state.

Disengaged State: When air pressure is applied, the piston will push back on the friction material allowing the rotatable hub/shaft to rotate.

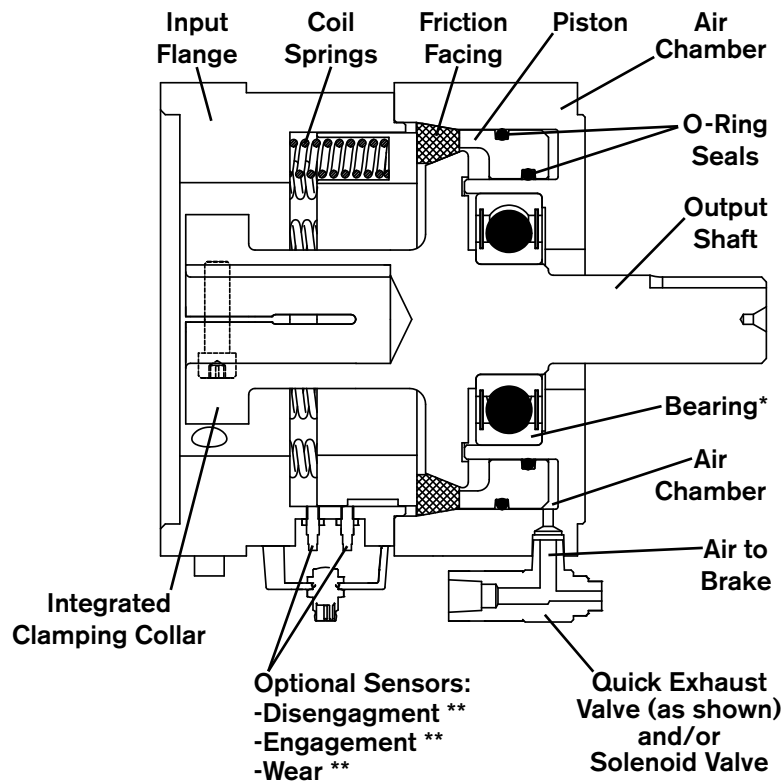


FIGURE 2 Safety Rated Servo Brakes Size 3, 4, 5, 7, 9 and 11

*Note: Servo Brakes may use single or double row Ball Bearings depending on size and configuration.


Note: **Optional Operating Mode Sensor Definitions:

Disengagement Sensor Definition: Sensor is activated when the rated air pressure is applied and the piston and facing pair move to a disengaged position.

Engagement Sensor Definition: Sensor is activated when the piston and facing pair move out of the "disengaged position" into a position in which the facing will transmit torque.

Wear Sensor Definition: Sensor is activated when product is engaged and facing is worn to a state that it should be replaced.

OPERATION




WARNING

Never exceed maximum operating speeds listed for your product. (See Table 2).


TABLE 2

| Sizes | Max RPM |
|-----------------|---------|
| Sizes 3, 4 & 5 | 10,000 |
| Sizes 7, 9 & 11 | 5,000 |



CAUTION

Never exceed life of facing material. Facing life depends on the volume of material and the total energy over the life of the unit. Expected life (in hrs) can be found by: $\text{Time} = \text{Volume} / (\text{Power} * \text{Wear Rate})$.



CAUTION

The temperature limits for this product line are 4.5 to 65.6 Degree Celsius (40 to 150 Degree F).

SAFETY STANDARD COMPLIANCE

ISO 13849 is a Safety Standard which applies to machines and systems, and aims to reduce risk, in event of machine failure. This section clarifies our Servomotor Brake's intended use as a part of a system or machine that must comply with this standard.

Brakes intended for safety related applications are to be installed in accordance with the required performance level/ category level per ISO 13849-1:2015. The category rating of safety channels and performance level of the machine is the responsibility of the system manufacturer. For fulfillment of the safety function, the brake is to be viewed as an individual component.

Braking Function: All Safety Rated Servomotor Brakes use multiple compression springs to provide the necessary spring force over the life of the brake. The use of multiple springs ensures that a reduced braking torque will be available in the event of spring failure.

Safety Guidelines: Adhere to the guidelines for safe and reliable braking and error-free operation:

- Brake is required to be installed and maintained per this literature
- Observe intended use of the brake
- Brake sized and applied correctly per system requirements
- Servomotor Brakes are to be selected and integrated into the safety machine in accordance with ISO 13849-1:2015 by the system manufacturer.

Refer to Table 3 for effects on safety if brake is used outside of Nexen specification range.

TABLE 3

| Specification Deviation | Effect on Safety Function |
|----------------------------|---------------------------------|
| Air pressure too high | Unit will leak, not hold torque |
| Air pressure too low | Fail to disengage |
| Apply too much torque | Brake will slip |
| Exceed environmental specs | Not operate as intended |



INSTALLATION

MOUNTED ON MOTOR SHAFT

NOTE: Refer to Figures 3, 4 & 5.

NOTE: Safety Rated Servo Brakes have a clamp collar integrated into the female end of the output shaft, with two cap screws to provide necessary clamp load.

1. Remove the Access Plugs (Item 14) from the Input Flange (Item 10). Rotate the Clamping Collar (Item 1 or 7) until the cap screw(s) are lined up with the access hole(s). Then insert an Allen driver or a T-handle wrench through and engage the head of the cap screw(s). Leave this driver or wrench in place while you perform the next two steps.

CAUTION: Do not lubricate either the Clamping Collar or the Shaft. Any lubricant on the contact surfaces could result in torque transfer failure. If necessary, clean the Shaft with a non-petroleum based solvent, such as isopropyl alcohol, and wipe dry before assembly.

2. Slide the Motor Shaft into the input (female) end of the Output Shaft (Item 1) until the Flanges of the Motor and Brake come together. On safety rated units a key should be used between the Motor Shaft and Brake Input.
3. Using four customer-supplied Socket Head Cap Screws (See Table 5), bolt the Flanges together. Tighten the cap screws evenly to the recommended torques listed in Table 5 (Page 8). Ensure fasteners are fully tightened.
4. Using the Allen driver or wrench used in Step 1, tighten the cap screw(s) in the Clamping Collar (Item 7) to the recommended torque listed in Table 4 (Page 8).

CAUTION: Under tightening the Collar may cause slippage between the motor and the Brake. This can cause damage to the System, Motor and/or Brake.

5. Reinstall the Access Plugs (Item 14) into the access holes on the Input Flange (Item 10).
6. Attach the Gear Reducer or the load to the Brake Shaft. On safety rated units a key should be used between the brake output shaft and the gear reducer or load.

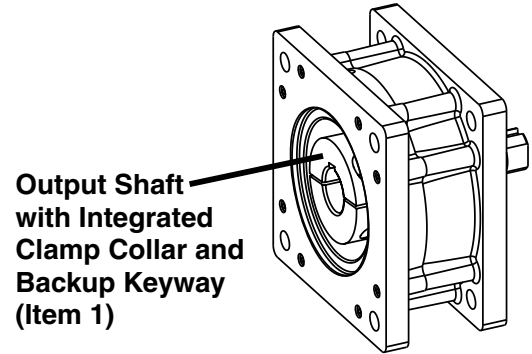
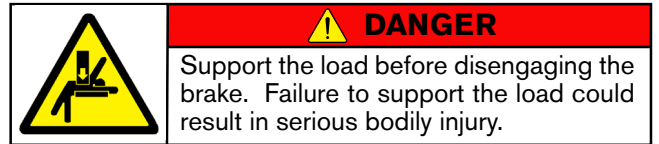


FIGURE 3

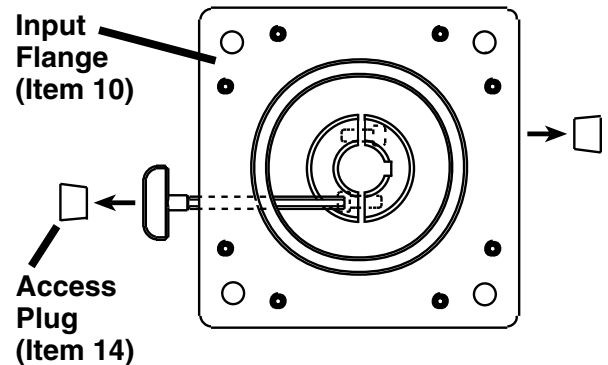


FIGURE 4

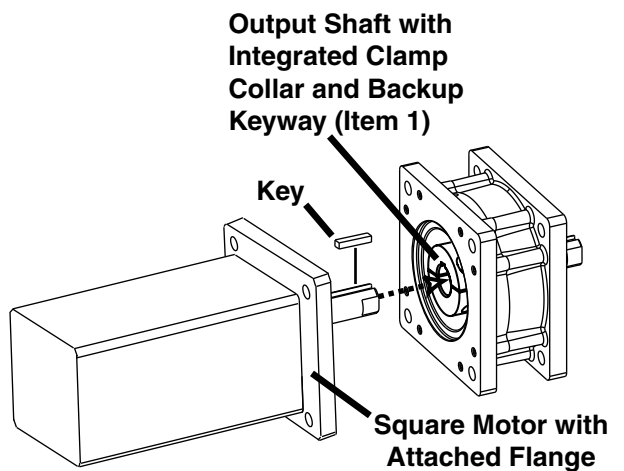


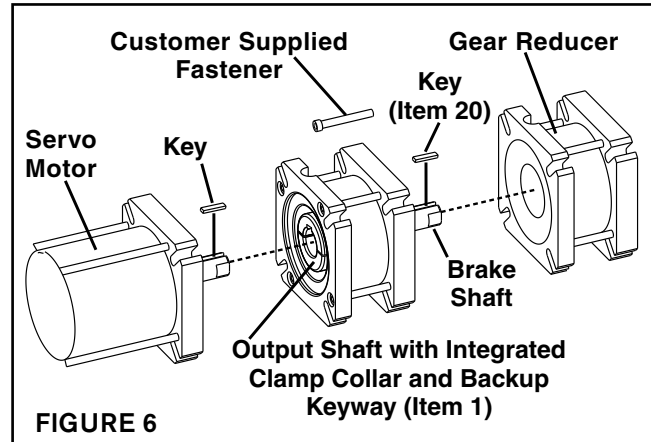
FIGURE 5

INSTALLATION

MOUNTED BETWEEN A GEAR REDUCER AND A MOTOR

NOTE: Refer to Figure 6.

1. To mount the brake to the Motor, follow steps 1-7 on page 7.
2. Insert the Brake Shaft into the customer supplied gear reducer coupling. Use the supplied Key (Item 20) (if required). Key should be used on safety rated units.
3. Use customer supplied screws, washers and nuts to bolt the flanges together. Apply Loctite® 242 the threads of the screws. For recommended torque values, refer to Table 5.
4. Tighten the Coupling. Refer to the instructions that are supplied with the Gear Reducer. Ensure that coupling is fully tightened.
5. Install any plugs or related items that are detailed in the Gear Reducer instructions.



⚠ DANGER

Support the load before disengaging the brake. Failure to support the load could result in serious bodily injury.

TABLE 4 Screws to Tighten Clamp Collar

| Brake Model | Input Shaft Diameter | Cap Screw | Recommended Collar Screw Torque |
|-------------|----------------------|-----------|---------------------------------|
| Size 3 | 9mm to 14mm | M5 | 10.3 Nm [91.2 in-lb] |
| | 14mm to 19mm | M4 | 5.1 Nm [45.1 in-lb] |
| Size 4 | 14mm to 22mm | M6 | 17.5 Nm [154.9 in-lb] |
| | 22mm to 28mm | M5 | 10.3 Nm [91.2 in-lb] |
| Size 5 | 19mm to 28mm | M8 | 42.6 Nm [377.0 in-lb] |
| | 28mm to 38mm | M6 | 17.5 Nm [154.9 in-lb] |
| Size 7 | 24mm to 42mm | M10 | 84.4 Nm [747.0 in-lbs] |
| Size 9 | 32mm to 42mm | M10 | 84.4 Nm [747.0 in-lbs] |
| | 42mm to 55mm | M8 | 42.6 Nm [377.0 in-lb] |
| Size 11 | 35mm to 42mm | M10 | 84.4 Nm [747.0 in-lbs] |
| | 42mm to 65mm | M8 | 42.6 Nm [377.0 in-lb] |

TABLE 5 Screws to Bolt Flanges to Motor/Gearbox/Load

| Brake Model | Socket Head Cap Screw (Customer Supplied) | Recommended Fastening Torque |
|-------------|--|------------------------------|
| Size 3 | M6 | 12 Nm [107 in-lb] |
| Size 4 | M8 | 29 Nm [260 in-lb] |
| Size 5 | M10 | 58 Nm [520 in-lb] |
| Size 7 | M12 | 158 Nm (117 ft-lbs) |
| Size 9 | M12 | 158 Nm (117 ft-lbs) |
| Size 11 | M14 | 180 Nm (133 ft-lbs) |

LUBRICATION

NOTE

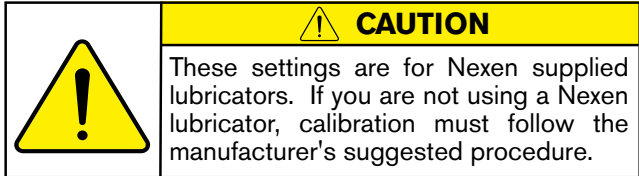
Nexen pneumatically actuated devices require clean, pressure regulated air for maximum performance and life. All seals in Nexen pneumatically operated devices are lubricated for life, and do not require additional lubrication.

However, some customers prefer to use an air line lubricator, which injects oil into the pressurized air, forcing an oil mist into the air chamber. This is acceptable, but care must be taken to ensure once an air mist lubrication system is used, it is continually used over the life of the product as the oil mist may wash free the factory installed lubrication.

Locate the lubricator above and within ten feet of the product, and use low viscosity oil such as SAE-10.

Synthetic lubricants are not recommended.

Nexen product's bearings are shielded and pre-lubricated, and require no further lubrication.



LUBRICATOR DRIP RATE SETTINGS

1. Close and disconnect the air line from the unit.
2. Turn the Lubricator Adjustment Knob counterclockwise three complete turns.
3. Open the air line.
4. Close the air line to the unit when a drop of oil forms in the Lubricator Sight Gage.
5. Connect the air line to the unit.
6. Turn the Lubricator Adjustment Knob clockwise until closed.
7. Turn the Lubricator Adjustment Knob counterclockwise one-third turn.
8. Open the air line to the unit.

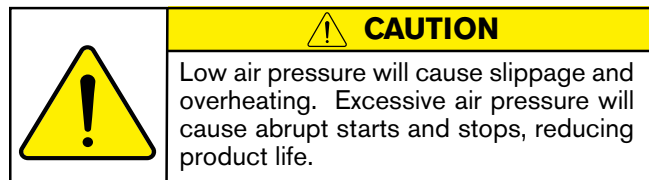
AIR CONNECTIONS

All Nexen pneumatically actuated devices require clean and dry air, which meet or exceeds ISO 8573.1:2001 Class 4.4.3 quality.

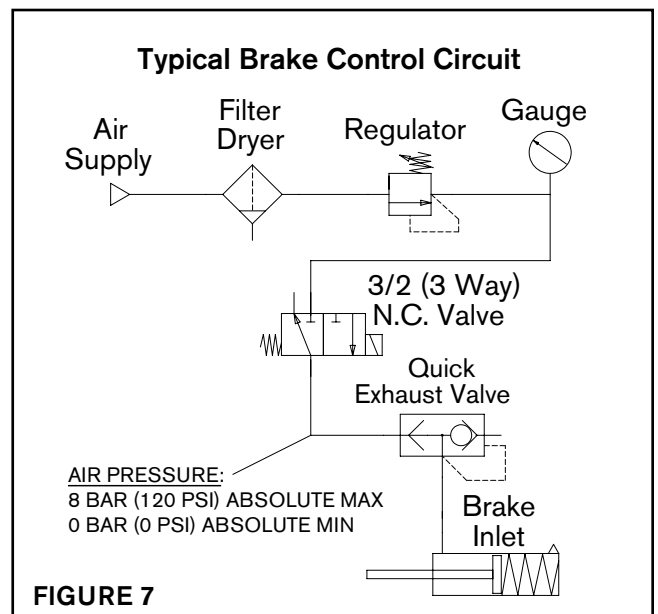
Note: Pneumatic components are in accordance with ISO 4414.

NOTE

For quick response, Nexen recommends a quick exhaust valve and short air lines between the Control Valves and the unit. Align the air inlet ports to a down position to allow condensation to drain out of the air chambers of the product.



The following is a common air supply scheme used with this product. This is an example and not an all-inclusive list. All air circuits to be used with this product must be designed following ISO 4414 guidelines.



AIR CONNECTIONS *(continued)*



DANGER

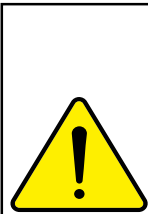
Support the load before disengaging the brake. Failure to support the load could result in serious bodily injury.

1. **Standard Configuration:**

Attach the Quick Exhaust Valve (Item 23) to the brake. Use Teflon tape and/or pipe sealant on the threads.

With Optional Solenoid:

If you are using the optional Solenoid Valve (Nexen Part #964650), the Quick Exhaust Valve is unnecessary. Assemble the optional Solenoid Valve directly to the brake using the supplied fittings. Use Teflon tape and/or pipe sealant on the threads. Refer to Figure 8.



CAUTION

The brake will disengage if you depress the domed button at the top of the Solenoid Valve (if air pressure is applied). The LED will illuminate when the Solenoid Valve is actuated and the brake is disengaged. Pressure needed to disengage should NOT exceed 80 psi.

NOTE: Align the air inlet ports in the down position to allow condensation to drain out of the air chamber.

2. Assemble the air line to the valve.
3. If using optional solenoid valve, attach DIN Connector cable to valve by pressing DIN Connector onto valve power pins and tightening DIN Connector fastener. Then connect DIN Connector cable wires, using the following chart, to the appropriate power supply, see Table 3.

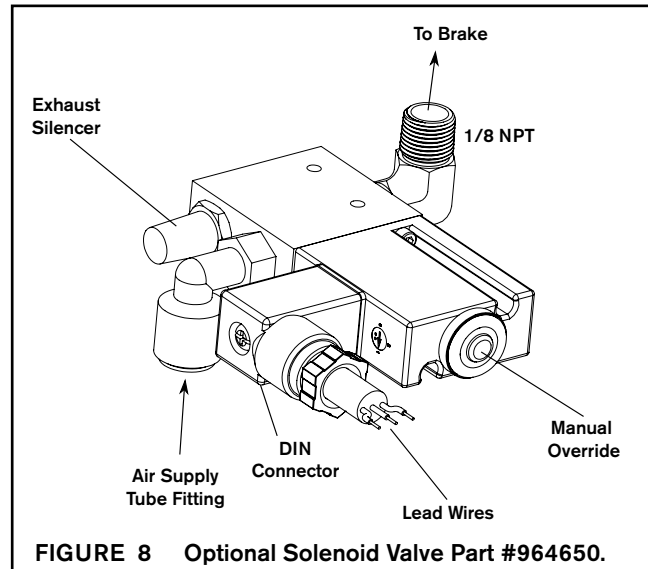


FIGURE 8 Optional Solenoid Valve Part #964650.

| DIN Connector Cable Wire Color | Valve | |
|--------------------------------------|--------|-----------|
| | 24 VDC | Valve Pin |
| Brown | + | 1 |
| White | - | 2 |
| Green | Ground | Ground |



CAUTION

24 VDC valve connector has a suppression diode installed across the coil. Observe proper voltage polarity or connector damage will result.

TABLE 3

| Optional Solenoid Valve Specifications | | | | |
|--|-------|------------|---------|-----|
| Voltage | Power | Resistance | Current | Cv |
| 24 VDC | 4 W | 145 ohms | .17 A | .25 |

OPTIONAL OPERATING MODE SENSORS

Nexen's compact proximity sensors are available to gather operational data from the Servomotor Brake. These sensors may be used by system manufacturers to gain higher safety category ratings per ISO 13849-1. Rating of the safety function is the responsibility of the system manufacturer.

The Safety Rated Servomotor Brake can come equipped with up to three proximity sensors to sense the following functions of the Brake:

Disengagement Sensor Definition:

Sensor is activated when the rated air pressure is applied and the piston and facing pair move to a disengaged position.

Engagement Sensor Definition:

Sensor is activated when the piston and facing pair move out of the disengaged position into a position in which the facing will transmit torque.

Wear Sensor Definition:

Sensor is activated when product is engaged and facing is worn to a state that it should be replaced.

SENSOR WIRING

Nexen's Inductive Proximity Sensor is available in the following modes:

PNP Mode (Sourcing)

Normally Open (N.O.) PNP type Sourcing Output, see **Figure 9**. Typically this will be matched with a PLC Sinking Input. This sensor defaults to PNP mode, but is also capable of IO-Link communications.

IO-Link is an industry standard communication protocol for simple sensors and actuators. It allows for monitoring sensor operation, diagnostics and warnings. If sensor is connected to an IO-Link hub, then the IO-Link functionality is automatically enabled, otherwise the sensor acts in the PNP mode (see above). Follow IO-Link hub manufacturer's literature for wiring and setup. The IO-Link Device Description file (IODD) is provided by www.contrinex.com (see **Figure 9**).

NPN Mode (Sinking)

Normally Open (N.O.) NPN type Sinking Output, see **Figure 10**. Typically this will be matched with a PLC Sourcing Input.

SENSOR OPERATION

The servomotor brake can come equipped with up to three inductive proximity sensors. These sensors can be configured to detect redundant or individual engaged, disengaged and/or wear conditions. If sensors are setup for redundant detection, the sensor states should always match. If sensors are setup for individual, opposing detection, the sensor states should always be opposite. To ensure proper operation, compare the expected state to the measured state.

The sensors are factory set and not customer serviceable.

PNP Mode (Sourcing)

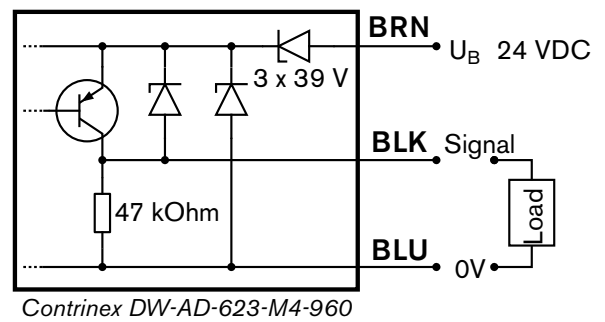


FIGURE 9
PROXIMITY SENSOR OUTPUT

NPN Mode (Sinking)

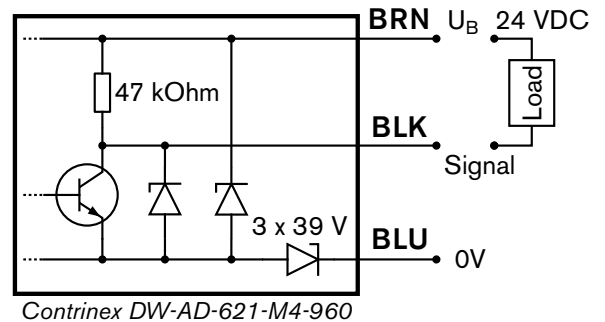


FIGURE 10
PROXIMITY SENSOR OUTPUT

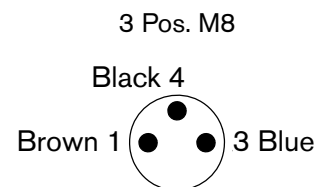


FIGURE 11
3-PIN PROXIMITY SENSOR CONNECTOR

SERVICE

Note: Safety Rated Units are not customer serviceable. Please contact Nexen for repair or replacement.

Mission Time: 10 years maximum*

* Dependent upon cycle rate and useful time per ISO 13849-1:2015

Nexen recommends only properly trained personnel in the installation and maintenance procedures allowed to install and perform maintenance on product.

People do not interact directly with this product during operation, but maintenance personnel may interact with this product. Adequate space must be allowed to ensure safety, Nexen recommends a minimum of 3 feet.

Disposal of product is responsibility of machine builder or end user.



WARNING

Working with spring or tension loaded fasteners and devices can cause injury. Wear safety glasses and take the appropriate safety precautions.

TRANSPORT, HANDLING & STORAGE

During transport, the product will be in the default (engaged) position, eliminating the possibility of parts shifting. Servomotor Brakes can be handled without the use of special equipment.

Nexen products have a shelf life of 7 years beginning on the date of packaging serialization located on the original shipping container of the item.

The following criteria must be maintained to achieve full shelf life of the product:

1. Original packaging must remain unopened and intact.
2. Product must have been stored in a temperature and humidity controlled environment.
 - Temperature range of 65°F ±15°F (18.3°C ±8.3°C)
 - Relative humidity range of 35%-55%

TROUBLESHOOTING

Note: Safety Rated Units are not customer serviceable. Please contact Nexen for repair or replacement.

| Problem | Probable Cause | Solution |
|----------------------------|---|---|
| Failure to engage (brake). | Weak or broken springs. | Replace broken springs. |
| Failure to disengage (1). | Control valve malfunction - air not getting to the brake. | Check for low air pressure or replace the control valve. Note: Pressure needed to disengage is shown in the specifications table, page 4. |
| Failure to disengage (2). | Air is leaking around the O-ring seals. | Replace the O-rings. |
| Loss of torque. | Friction Facing is worn or dirty. | Replace the Friction Facing. |

WARRANTY

Warranties

Nexen warrants that the Products will (a) be free from any defects in material or workmanship for a period of 12 months from the date of shipment, and (b) will meet and perform in accordance with the specifications in any engineering drawing specifically for the Product that is in Nexen's current product catalogue, or that is accessible at the Nexen website, or that is attached to this Quotation and that specifically refers to this Quotation by its number, subject in all cases to any limitations and exclusions set out in the drawing. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if: (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

Exclusive Remedy

The exclusive remedy for the Buyer for any breach of any warranties provided in connection with this agreement will be, at the election of Nexen: (a) repair or replacement with new, serviceably used, or reconditioned parts or products; or (b) issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

Agent's Authority

Buyer agrees that no agent, employee or representative of Nexen has authority to bind Nexen to any affirmation, representation, or warranty concerning the Products other than those warranties expressly set forth herein.

Limitation on Nexen's Liability

TO THE EXTENT PERMITTED BY LAW NEXEN SHALL HAVE NO LIABILITY TO BUYER OR ANY OTHER PERSON FOR INCIDENTAL DAMAGES, SPECIAL DAMAGES, CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY KIND OR NATURE WHATSOEVER, WHETHER ARISING OUT OF BREACH OF WARRANTY OR OTHER BREACH OF CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE, EVEN IF NEXEN SHALL HAVE BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH POTENTIAL LOSS OR DAMAGE. For all of the purposes hereof, the term "consequential damages" shall include lost profits, penalties, delay damages, liquidated damages or other damages and liabilities which Buyer shall be obligated to pay or which Buyer may incur based upon, related to or arising out of its contracts with its customers or other third parties. In no event shall Nexen be liable for any amount of damages in excess of amounts paid by Buyer for Products or services as to which a breach of contract has been determined to exist. The parties expressly agree that the price for the Products and the services was determined in consideration of the limitation on damages set forth herein and such limitation has been specifically bargained for and constitutes an agreed allocation of risk which shall survive the determination of any court of competent jurisdiction that any remedy herein fails of its essential purpose.

Inspection

Buyer shall inspect all shipments of Products upon arrival and shall notify Nexen in writing, of any shortages or other failures to conform to these terms and conditions which are reasonably discoverable upon arrival without opening any carton or box in which the Products are contained. Such notice shall be sent within 14 days following arrival. All notifications shall be accompanied by packing slips, inspection reports and other documents necessary to support Buyer's claims. In addition to the foregoing obligations, in the event that Buyer receives Products that Buyer did not order, Buyer shall return the erroneously shipped Products to Nexen within thirty (30) days of the date of the invoice for such Products; Nexen will pay reasonable freight charges for the timely return of the erroneously shipped Products, and issue a credit to Buyer for the returned Products at the price Buyer paid for them, including any shipping expenses that Nexen charged Buyer. All shortages, overages and nonconformities not reported to Nexen as required by this section will be deemed waived.

Limitation on Actions

No action, regardless of form, arising out of any transaction to which these terms and conditions are applicable may be brought by the Buyer more than one year after the cause of action has accrued.

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