

**Operating Manual
for
5LX7 _ _ _ - _ _ - _ _ _
Gas/Vapour Explosion-Proof
Limit Switches for Outdoor Applications,
Compliant with IEC Explosion-Proof Standards
(Ex d e IIC T6)**

Thank you for purchasing this product.

Please be sure to read and understand this manual before use to ensure safety and effectiveness.

After installation, keep this manual for handy reference.

Azbil Corporation

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact the azbil Group.

In no event is Azbil Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

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Conventions Used in This Manual

- To prevent injury to the operator and others, and to prevent property damage, the following types of safety precautions are indicated:



Warnings are indicated when mishandling this product might result in death or serious injury.



Cautions are indicated when mishandling this product might result in minor injury to the user, or physical damage to the product.

- In describing the product, this manual uses the icons and conventions listed below.



Use caution when handling the product.



The indicated action is prohibited.



Be sure to follow the indicated instructions.

Handling Precautions:

Handling Precautions indicate items that the user should pay attention to when handling the 5LX7___ series .



Note:

Notes indicate information that might benefit the user.

(1), (2), (3):

Numbers within parentheses indicate steps in a sequence or parts of an explanation.

Safety Precautions

Safety precautions are intended to ensure the safe and correct use of this product, to prevent injury to the operator and others, and to prevent damage to property. Be sure to observe these safety precautions. Please make sure you understand the safety guidelines before reading the rest of this manual.

The use of this product in a manner not specified by the manufacturer will impair its built-in safety features.

WARNING



Use this limit switch within the ranges specified on page 1.
Use outside of this range may lead to a serious accident.



To maintain explosion-proof integrity, do not disassemble the limit switch, except when removing the cover to do wiring work or when changing the orientation of the lever and head.
If other disassembly is done, the switch is not explosion-proof.

CAUTION



The environmental conditions for using this limit switch as explosion-proof are described on the product specification sheet.
Be sure to use the switch within the allowed range for each property listed on the specification sheet.



Check the limit switch periodically to make sure that it is operating normally.



Replace the limit switch immediately if there is any irregularity (dent, fissure, crack, etc.) in its cover or appearance.
The seal or explosion-proof integrity may be compromised.



Wiring work should conform to local laws and standards.

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⚠ This symbol indicates the presence of safety instructions.

Chapter 1. Overview

■ Features

- Increased-safety explosion-proof limit switch incorporates an internal switch with a flameproof structure.
- Compliant with KEMA (Europe), NEPSI (China), KOSHA (Korea), and IECEx.
- Two-circuit double-break internal switch
- Can be used in hydrogen gas atmospheres.
- IP67 protective structure, suitable for outdoor use.

■ Applicable laws and standards

 WARNING	
	This limit switch is certified to comply with the following standards. Please use it within its range of certification. Use outside of this range may lead to a serious accident.

1. This limit switch is certified to comply with the following standards.

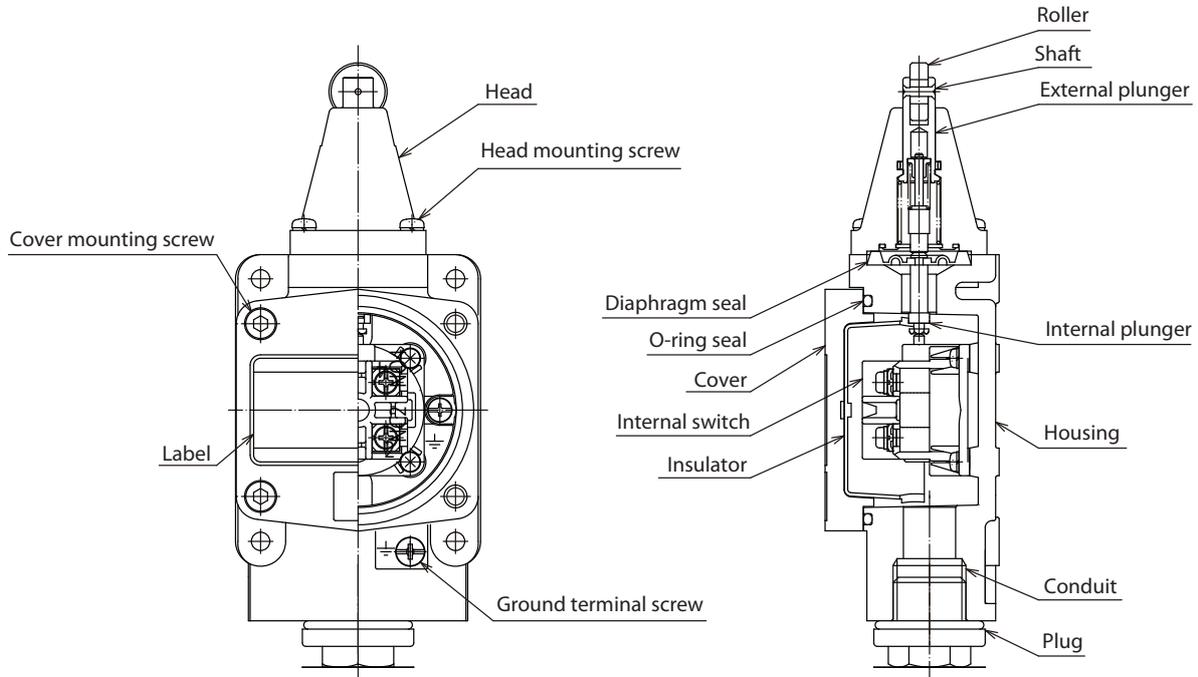
Certifying organization	Certification details	Standard	Hazardous area
ATEX	II 2 G Ex d e II C T6	EN60079-0: 2006	Category 2G (Zone 1)
		EN60079-1: 2007	
		EN60079-7: 2007	
IECEX	Ex d e II C T6 Gb	IEC60079-0: 2007	Zone 1
		IEC60079-1: 2007	
		IEC60079-7: 2007	
NEPSI	Ex d e II C T6	GB3836.1-2000	Zone 1
		GB3836.2-2000	
		GB3836.3-2000	
KOSHA	Ex d e II C T6	KSCIEC60079-0	Zone 1
		KSCIEC60079-1	
		KSCIEC60079-7	

2. Operating temperature : -10 to +60 °C
3. Operating humidity : 45 to 85 % RH
4. Storage temperature : -10 to +60 °C (General environment models)
-10 to +100 °C (Tropical area models)
-40 to +60 °C (Cold area models)
-10 to +60 °C (if stored with the conduit section plug inserted)
5. Storage humidity : Max. 98 % RH (if stored with conduit section plug inserted)
6. Protective structure : IP67
7. Example of explosive gas group classification :
For classification, refer to IEC 60079-10.

Chapter 2. Names of Parts

■ Appearance and structure of the limit switch

The force applied from outside the limit switch is transferred to the roller → plunger → internal plunger → internal switch to switch the electrical circuit.



■ Composition of model numbers

5LX7001 -	<ul style="list-style-type: none"> └─ Environment <ul style="list-style-type: none"> None : For general environments 901 : For tropical areas 902 : For cold areas └─ Contact <ul style="list-style-type: none"> None : Silver alloy (general use) K : Gold-plated (for low voltage/current load) └─ Standard and Conduit part <ul style="list-style-type: none"> None : ATEX G1/2 C : ATEX M20 ×1.5 E : IECEx G1/2 F : IECEx M20 ×1.5 P : NEPSI G1/2 Q : NEPSI M20 ×1.5 S : KOSHA G1/2 V : KOSHA M20 ×1.5
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Chapter 3. Installation and Adjustment

This section describes how to install the limit switch.

WARNING

-  Never leave or use the switch with the cover or conduit section open. The limit switch may explode, causing a serious accident.

CAUTION

-  Do not remove the cover or plug of the limit switch until you are ready to do the wiring. Dust or liquid may enter the switch, causing a malfunction or a problem with the connections or insulation.
-  After wiring, never leave the limit switch with the cover off. Dust or liquid may enter the switch, causing a malfunction or a problem with the connections or insulation.
-  Before using the limit switch for the first time, keep it protected using a dustproof, waterproof sheet to prevent cement or paint from adhering to the switch, as this may cause malfunction of the actuator.
-  Never leave the limit switch in an atmosphere with gas (H_2S , SO_x , etc.) that can have an adverse effect on the contacts or other material.
-  Never let the seal section come in contact with a solvent (benzine, petroleum, alcohol, etc.) that can have an adverse effect on the limit switch's sealing material.
-  Never stand on, place heavy objects on, or strike the limit switch. Do not step on the limit switch, place heavy objects on it, or hit it with a hard object. Never apply to the switch lever a force three times larger than its operating force (O.F.). Failure to observe this precaution may result in malfunction.
-  Before using a sealing agent or lock adhesive on the conduit section, make sure that it will not produce a gas that can adversely affect the contacts.
-  Use insulation or heat shielding when installing the limit switch so that radiant heat and conductive heat do not cause the operating temperature to exceed the limit.
-  Take appropriate protective countermeasures if the limit switch is installed in a location subject to continuous vibration or impact.

■ Installation

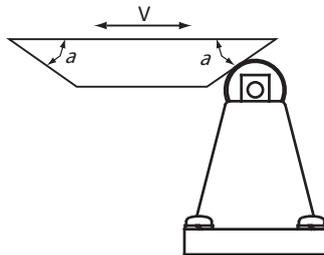
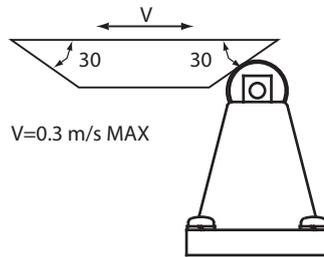
● Installation

Make sure that the material, thickness, and shape of the surface on which the limit switch is mounted provide sufficient strength so that the operating force of the limit switch does not change the shape of the surface.

When installing the limit switch, use a washer or the like to prevent it from coming loose. See the table below for the proper tightening torque.

Mounting direction	Screw size	Tightening torque
Front mounting	M5 (hexagon socket head cap screw)	5 to 6 N·m
Back mounting	M6 (hexagon socket head cap screw)	5 to 6 N·m

● DOG angle and speed

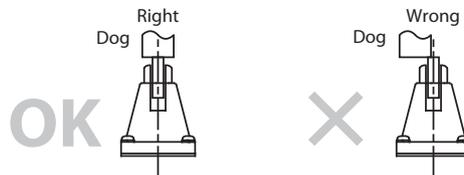


When moving at higher than $V=0.3$ m/s plunger set angle (α)

α	V (m/s)
25°	0.4
20°	0.5

! Handling Precautions

- Dog shall not touch any portion other than the roller.
- The roller shall contact the mating dog with its total width.



● Dog surface

When designing the dog, its surface finish (roughness and hardness) shall be as follows.

	Suitable value
Surface roughness	About Ra 6.3
Vickers hardness	HV450

📖 Note

- By applying grease to dog surface smoother action of roller can be attained.

● Movement and force after operation

To ensure stable operation, overtravel, defined as any movement of the limit switch lever after operation, must be adjusted within 30 to 70 % of the specification value (minimum value).

! Handling Precautions

- Do not operate beyond operating range.

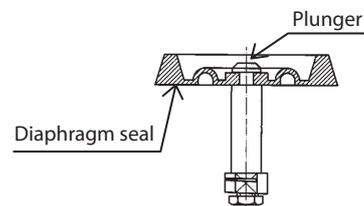
■ Changing the roller position

For application flexibility roller position can be changed in any of four 90° positions.

! WARNING



When turning over a direction of a head and a diaphragm seal has come off, please be sure to insert in a plunger as before. See figure on the right.



● Procedure

- (1) Remove the four head fixing screws.
- (2) Remove the head assembly and position in the desired position.
- (3) And then securely tighten the four screws according to the tightening torque shown in the table below.

Tightening torque
1.3 to 1.7 N·m

! Handling Precautions

- Do not be tighten more than regulation for torque value to avoid fracturing screws or housing.
- Make sure seal shall be assembled.

Chapter 4. Wiring

⚠ WARNING

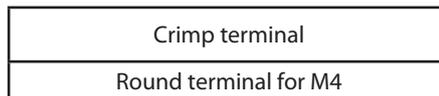
- ⚠ Before removing, mounting, or wiring the 5LX7_ ___, be sure to turn off the power to the the 5LX7_ ___ and all connected devices. Failure to do so might cause electric shock.

⚠ CAUTION

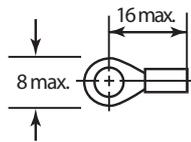
- ⚠ Wiring work should conform to local laws and standards.
- ⚠ Make certain the cover is tightened firmly to the housing. The explosion-proofing may be compromised if the cover is not tightened properly.
- ⚠ Make sure the unit is grounded using an external or internal grounding screw.
- ⚠ Do not use silicone rubber wire, silicone adhesive, or grease that contains silicone. Doing so may cause poor connections.
- ⚠ For connection to a wiring conduit with G1/2 pipe thread, screw in to a depth of at least 5 threads and secure with a lock nut. If the connection needs to be waterproof, apply a sealing agent to the thread.

⚠ Handling Precautions

- Select wires or cables that are suitable for the operating environment.
- Lead wires connected to the terminal block, whether solid or stranded, should have a nominal cross-sectional area between 0.5 mm² and 1.5 mm² (from AWG 20 to AWG 16). If direct attachment of the wires is not desired, use M4 size insulated crimp terminals made by Japan Solderless Terminal (JST), or the equivalent.



- See the figure below for the size of the round crimp terminal.



- Make sure that wires and insulated crimp terminals do not touch the cover.
- Insulated crimp terminals must be bent downward so that the cover closes properly.
- Make sure that no wires touch the plunger. Any contact can cause a malfunction.
- When using flexible tubing, make sure the wires inside do not get twisted.

- **Removing the cover**

Use a hexagon wrench (4 mm) to remove the M5 hexagon socket head cap screw.

- **Connecting the limit switch**

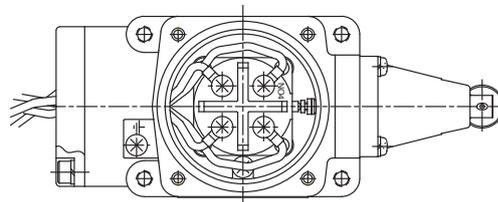
⚠ CAUTION



Make sure the wiring is done properly according to this operating manual and the specification sheet.

- See the table below for the proper tightening torque of terminal screws.

Screw size	Tightening torque
M4 (pan-head screw with square washer)	1.3 to 1.7 N·m



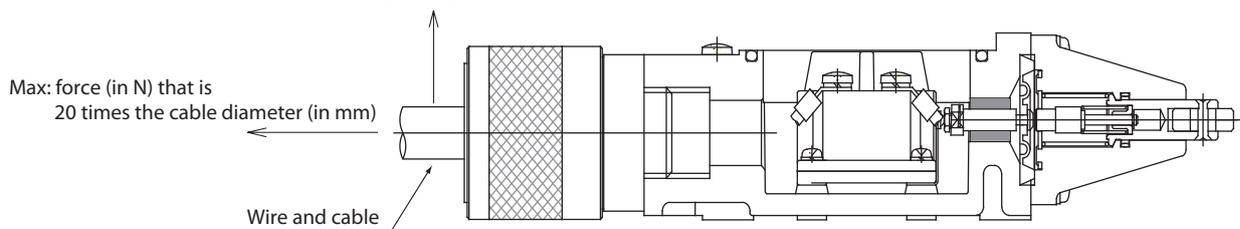
Typical wire routing

- **Tensile strength of terminals**

When the wiring is finished, do not pull the wire or cable in the direction of the conduit with a force (in N) that is more than 20 times the cable diameter (in mm).

For other directions, do not pull with a force of 98 N or more.

98 N max.



⚠ Handling Precautions

- Never exceed these values even if multiple wires are bundled together.

● **Installation of cover**

When the wiring is finished, attach the cover.

Tighten the four cover mounting screws evenly, alternately moving between screws in a diagonal pattern.

See the table below for the proper tightening torque.

Screw size	Tightening torque
M5 (hexagon socket head cap screw)	5 to 6 N·m

 **Handling Precautions**

- When attaching the cover, make sure that it does not touch wires or terminals and does not pinch the wiring insulation.
- Over-tightening the screws, in excess of the rated torque, may damage the thread of the housing.

● **Continuity tester**

When using a continuity tester on the limit switch, use a tester with a measurement current of 100 mA or less.

Chapter 5. Adjustment

■ Items to be Checked before Operation

Check the following items before operating the limit switch:

- (1) Wiring must be completed correctly.
- (2) Mounting screws, lever mounting screw, and cover mounting screws must be fastened tightly.

■ Adjustment

- (1) Adjust the operating position of the limit switch either by changing the position of the dog of the equipment or by shifting the limit switch mounting.
- (2) To ensure stable operation, overtravel, defined as any movement of the limit switch roller after operation, must be adjusted within 30 to 70 % of the specification value (minimum value).

❗ Handling Precautions

- At the time of adjustment, do not apply more than three times operation force to the actuator to avoid a defective operation.

Below table shows three times of operation force.

Force
80 N

- Do not operate beyond operating range.

Chapter 6. Maintenance and Inspection

WARNING

-  Use this limit switch within the ranges specified on page 1. Use outside of this range may lead to a serious accident.

CAUTION

-  As part of periodic inspections, securely tighten the cover and conduit section. Insufficient tightening because of corrosion, etc., not only results in the loss of sealing and insulating performance, but also compromises the switch's explosion-proofing.
-  Parts of this limit switch other than the lever cannot be replaced. If other replacement seems necessary, the entire limit switch should be replaced.
-  For the safe use of this product, conduct periodic inspections. The interval between periodic inspections depends on usage conditions.

■ Maintenance Checklist

The table below shows the inspection items for maintenance of the limit switch. As a guideline, the service life of the limit switch is about five years. However, this may vary according to the environmental conditions.

● Required tools and equipment for inspection

- Screwdriver
- Insulation resistance tester (Megger)
- Circuit tester
- Hexagon socket screw key

No.	Location	Item	How to check	Countermeasures	Frequency
1.	Roller plunger	<ul style="list-style-type: none"> • Damage of roller rotation • Roller rotation 	<ul style="list-style-type: none"> • Visually check roller for any damage check rotation 	<ul style="list-style-type: none"> • Replace the limit switch. 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months
2	Head	<ul style="list-style-type: none"> • Loose head mounting screws • Damage to the exterior 	<ul style="list-style-type: none"> • Check that the head mounting screws are fastened tightly. • Check that the exterior of the cover is not damaged. 	<ul style="list-style-type: none"> • Re-tighten loose mounting screws at the correct torque. (For details on tightening torque, see Chapter 3.) • If other defects are found, replace the limit switch. 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months
3	Cover	<ul style="list-style-type: none"> • Loose cover mounting screws • Damage to the exterior 	<ul style="list-style-type: none"> • Check that the cover mounting screws are fastened tightly. • Check that the exterior of the cover is not damaged. 	<ul style="list-style-type: none"> • Re-tighten loose mounting screws at the correct torque. (For details on tightening torque, see Chapter 4.) • If other defects are found, replace the limit switch. 	<ul style="list-style-type: none"> • Tighten screws to the correct torque whenever necessary. • At least every 6 months for other items.
4	Housing	<ul style="list-style-type: none"> • Damage to the exterior 	<ul style="list-style-type: none"> • Visually check that the housing exterior is not damaged. 	<ul style="list-style-type: none"> • Replace the limit switch. 	<ul style="list-style-type: none"> • Every 2 years
5	Terminal box (internal switch)	<ul style="list-style-type: none"> • Operation 	<ul style="list-style-type: none"> • Visually check that the internal switch operates correctly. 	<ul style="list-style-type: none"> • Replace the limit switch. 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months
		<ul style="list-style-type: none"> • Electrical continuity 	<ul style="list-style-type: none"> • Check the electrical continuity of all the terminals using the circuit tester. 	<ul style="list-style-type: none"> • Replace the limit switch. 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months
		<ul style="list-style-type: none"> • Insulation 	<ul style="list-style-type: none"> • Check that each terminals properly insulated using the insulation resistance tester. 	<ul style="list-style-type: none"> • Replace the limit switch. 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months
		<ul style="list-style-type: none"> • Loose screws • Corrosion 	<ul style="list-style-type: none"> • Check for loose terminal screws, any potentially serious cracking, rust, etc. 	<ul style="list-style-type: none"> • Re-tighten loose terminal screws at the correct torque. (For details on tightening torque, see Chapter 4.) 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months
6	Check operation	<ul style="list-style-type: none"> • Check operation 	<ul style="list-style-type: none"> • Check operation. Manually operate the roller lever and check that it operates smoothly. 	<ul style="list-style-type: none"> • Replace the limit switch. 	<ul style="list-style-type: none"> • Whenever necessary • Every 6 months

Note: Internal parts of the limit switch cannot be replaced. If replacement seems necessary, the entire limit switch should be replaced.

Chapter 7. Specifications

Detailed specifications for this limit switch can be found on the specification sheet.

The relevant specification sheet numbers are shown below. To request a specification sheet please contact us or one of our distribution partners.

Model No.	Certifying organization	Spec. No.
5LX700 _ - _ - _ - _ - _ - _ -	ATEX	AD15637E
5LX700 _ - C _ - _ - _ - _ - _ -		
5LX700 _ - E _ - _ - _ - _ - _ -	IECEX	AD15642E
5LX700 _ - F _ - _ - _ - _ - _ -		
5LX700 _ - P _ - _ - _ - _ - _ -	NEPSI	AD16030E
5LX700 _ - Q _ - _ - _ - _ - _ -		
5LX700 _ - S _ - _ - _ - _ - _ -	KOSHA	AD15996E
5LX700 _ - V _ - _ - _ - _ - _ -		

-MEMO-

-MEMO-

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products. You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's products has any failure attributable to azbil during the aforementioned warranty period, azbil shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place.

Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of Azbil Corporation's products (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's products;
- (3) Failure caused by any modification or repair made by any person other than azbil or azbil's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's products in a manner not conforming to the intended usage of that product;
- (5) Failure that the state of the art at the time of Azbil Corporation's shipment did not allow us to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's products in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use. Although Azbil Corporation is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down.

You are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, safety design, or the like so that the said Equipment may satisfy the level of the reliability and safety required in your use, whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth.

3. Precautions and restrictions on application

Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil limit switch for Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).

Any Azbil Corporation's products shall not be used for/with medical equipment.

In addition,

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use Azbil Corporation's products for any purposes specified in (1) through (6) below.

Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design and other designs of protection/safety circuit on your own responsibility to ensure the reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:
 - * Nuclear energy/radiation related facilities
[For use outside nuclear energy controlled areas] [For use of Azbil Corporation's limit switch for Nuclear Energy]
 - * Machinery or equipment for space/sea bottom
 - * Transportation equipment
[Railway, aircraft, vessels, vehicle equipment, etc.]
 - * Antidisaster/crime-prevention equipment
 - * Burning appliances
 - * Electrothermal equipment
 - * Amusement facilities
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
- (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
- (5) Machinery or equipment that may affect human lives, human bodies or properties
- (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations. In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. Field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by Azbil Corporation are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's products may be discontinued without notice. For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For field instruments, we may not be able to undertake parts replacement for similar reasons.



Azbil Corporation
Advanced Automation Company

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan

URL: <http://www.azbil.com>

Specifications are subject to change without notice. (09)

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