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SAFETY IN THE FACTORY / DISTRIBUTION CENTER - THE NEED FOR CABLE PULL SAFETY SWITCHES

A Honeywell White Paper



Abstract



Safety is considered as the top priority in the manufacturing and distribution facilities all over the world. Safety measures not only provide a safe and healthy environment for the millions of workers in these facilities but it also safe guards the companies from any potential mishaps thereby protecting company assets and reputation.

One of the most stressful, regretful and disastrous events a factory floor manager can experience is the injury of a colleague due to an accident. In today's world, companies are always trying to optimize the time of a factory worker. Companies are providing them with high tech gadgets and machineries to improve and increase the productivity and efficiency. As a result, it is quite possible that a factory worker can easily get behind his or her daily schedule. This type of situation has the potential of resulting in an accident on a factory floor.

This is where Honeywell can be a good asset to the distribution and manufacturing facilities all around the globe. Honeywell has to offer a wide variety of safety limit switches for various factory floor applications. One particular safety product offered by Honeywell that plays a major role in the well-being of a factory worker is the cable pull safety switches. Cable Pull Safety Switches save critical time in case of an emergency by providing a means of shutting down the machinery at any point along the cable's length.

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Introduction

There are various safety regulatory organizations around the globe whose only priority is worker safety and health. Occupational Safety and Health Administration (OSHA), The American National Standards Institute (ANSI), National Safety Council (NSC), European Safety Federation (ESF), Canadian Center for Occupational Health and Safety (CCOHS), British Safety Council (BSC) etc. are some of the top safety committees.

It is true that companies spend thousands of dollars every year to train the working personals on how to use the various machineries that one would see in a manufacturing and distribution facilities. Some companies have its own internal safety departments who offer high quality safety programs and seminars for the well-being of the working personal. While others hire industry experts to provide a comprehensive and thorough training on how to do their daily jobs to the working personals.

But one thing that we must not overlook is “human error”. Some of the causes that can lead to human error are, maybe an individual did not follow certain operating protocols and procedures to implement a task or maybe an individual did not wear the proper protective gear. Simply put, no amount of training can eliminate human error. Otherwise, there would be zero number of accidents in manufacturing and distribution centers all around the world, which unfortunately is not the case. As a matter of fact, it does not matter how much precautions has been taken or how much training has been provided, accidents can still happen.

To emphasize the above mentioned causes of an accident, let’s consider a factory floor environment. A factory floor would consist of various industrial machineries and equipment’s that are used by working personals day in and day out. It is very challenging to determine which group of workers should have access to certain sections or areas of a factory floor. There will be workers who will be operating those pieces of equipment as part of their daily jobs and then there will another group of workers who will be performing service and maintenance activities on the equipment as part of their job.

For instance, picture a 100-foot long conveyor belt that is transporting cartons of product from the packaging area to the shipping area. We need to have a way to allow a worker who gets a sleeve caught in a conveyor belt to stop the line. But to put switches every two to three feet around the perimeter is not practical from safety and cost perspective.

Here, a good solution would be to consider Honeywell's cable pull safety switch. The cable will encircle the entire conveyor perimeter and a worker simply pulls on the cable to activate the switch and stop the machine. Honeywell's cable pull safety switches are an affordable, sensible way to provide protection around conveyors and work cell perimeters. It's like having an infinite number of emergency stop switches.

Some of the common factory floor applications for the cable pull safety switch are –

- Long conveyor systems found in warehouses and distribution center
- Conveyor systems with a high amount of vibration
- Conveyor systems that experience wide temperature swings
- Long conveyor systems where easy-through wiring, or highly visible trip status, is required
- Perimeter guarding in hose-down conditions
- Packaging equipment
- Assembly lines
- Waste recycle facilities

Cable Pull Safety Switch



1CPS (left) and 2CPS (right)

Honeywell's MICRO SWITCH™ CPS Series Cable-Pull Safety Switches provide a readily accessible emergency stop signal, a cost-effective means compared to using multiple emergency stop push-buttons. The CPS Series Cable Pull Safety Switch's internal mechanism latches on both slackened cable (push) and pulled cable.

One key feature of the CPS series switches is the positive or direct opening. This means that the positive opening contacts help ensure opening of even a welded contact by applying force directly to a normally closed contact, in the event of a switch contact malfunction. The direct opening switch contacts are held closed when the actuating cable is under proper tension and the reset knob is set to the RUN position. When the actuating cable is pulled, slackened, or broken, a cam positively opens the NC (Normally Closed) switch contacts.

The snap-action operation causes the switch contacts to change state and mechanically

latch almost simultaneously when the cable is pulled, slackened, or broken. The NC switch contacts remain open until the CPS is reset by properly tensioning the cable and manually rotating the reset knob.

When the direct opening switch contacts open, the auxiliary contacts also actuate (i.e. NO contacts closes). The auxiliary contacts are electrically isolated from the direct-opening switch contacts. These NO (Normally Open) contacts may be used for monitoring or signaling.

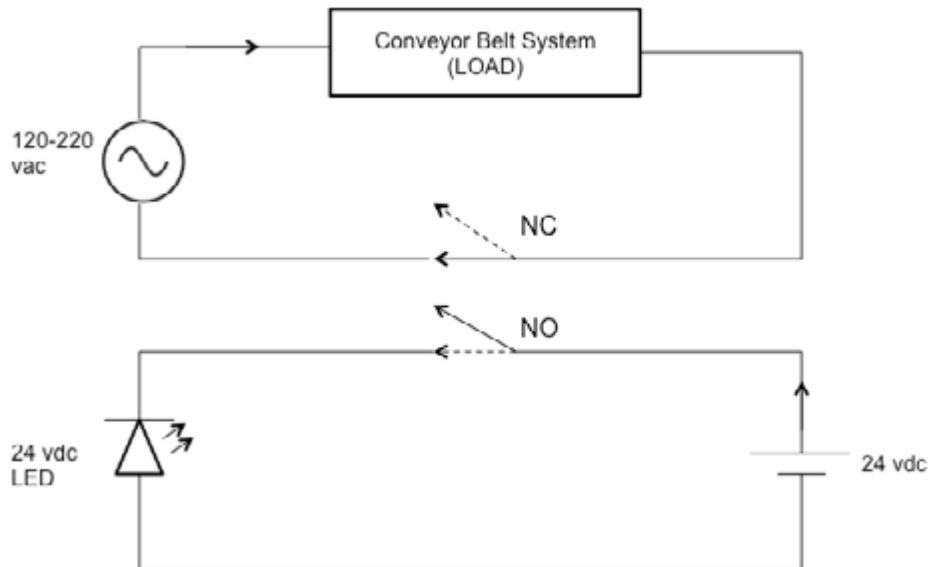
Operating Mechanism of a CPS Switch



Conveyor Belt System

Let's take a look at how a cable pull safety switch functions. In this example, we are using a cable pull safety switch (P/N 2CPSA2A3A) in a conveyor belt system which is one of the most common applications in a manufacturing and distribution center.

Wiring Schematic of Switch 1 of 2CPSA2A3A



It is to be noted that the 2CPSA2A3A has two switches where each switch has 1NC/1NO contacts. The above figure shows the application and wiring schematic for switch 1 with 1NC/1NO contacts within the 2CPSA2A3A switch. Switch 1 is being used to control and monitor the ON/OFF status of one conveyor belt system. The other contact block (Switch 2) of the 2CPSA2A3A can be used to control and monitor the status of an adjacent conveyor belt system.

In this particular application, the conveyor belt system is powered off by 120 – 220 vac power supply. Let's assume that the perimeter of the conveyor belt is 100 meters and the cable pull safety switch being used here has a cable span of 200 meters so that the cable can encircle the perimeter of the conveyor system. This way, a working personal working anywhere within the conveyor perimeter will have the ability to stop the conveyor in case of an emergency.

As we know, conveyor belts are typically used for transporting materials, objects, packages etc. from point A to point B. There are factory workers who would be handling these materials, objects or packages as these loads are moving along the conveyor belt. Now, if for some reason there is a mechanical issue with the conveyor belt system, then it is required to shut down the system to prevent further mechanical or electrical damage to the system. A conveyor belt system can be very expensive to replace and can also cost a fortune to repair. Furthermore, it is not very economical from production and efficiency standpoints to shut down a conveyor system during normal operating hours.

Another scenario could be, say, if a workers clothing gets stuck in the blades of the conveyor belt, then the worker can pull the cable of a cable pull safety switch, if the conveyor system is equipped with a cable pull safety switch. This way, the worker can protect himself or herself from any potential harm. In both of the two above scenarios, it is required to shut down the conveyor belt system.

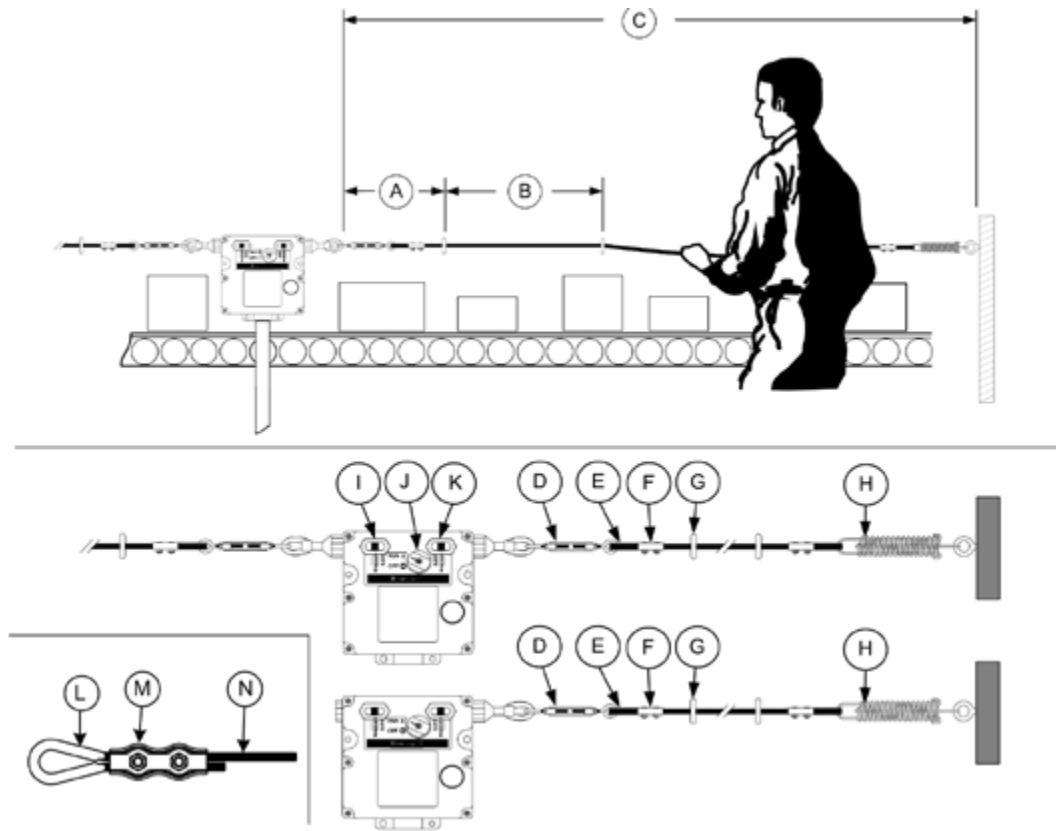
In this system, the NC contact of Switch 1 is wired in series with the 120-220 vac power supply of the conveyor belt. And the NO contact of the Switch 1 is wired in series with the 24 vdc power supply. When the factory worker pulls the cable, the NC contact opens thereby breaking the ac circuit so that power is removed from the conveyor belt system resulting in the shutdown of the conveyor.

At the same time, the NO contact closes thereby making the dc circuit and allowing dc power to flow through the 24 vdc LED. The 24 vdc LED is an indicator light and when lighted it means that the cable pull safety switch has been activated. To turn off the LED, it is required to reset the cable pull safety switch manually.

Typical Installation of a 2CPS Switch on a Conveyor Belt System

Note: For more detailed product specification of the 1CPS and 2CPS series switches, please refer to the CPS datasheet in Honeywell S&PS website:

http://sensing.honeywell.com/index.php?ci_id=50552



Definition of the items that makes up a 2CPS series switch –

- | | |
|--|------------------------------|
| A – defines the total length of J-hook turnbuckle, thimble, cable clamp and eyebolt which is around 18 inches maximum | G – Cable support |
| B – defines the distance between cable support which is around 8 feet | H – Endspring |
| C – defines the total cable length which is around 250 feet | I – Tension indicator |
| D – J-hook turnbuckle | J – Reset knob |
| E – Thimble | K – Tension indicator |
| F – Cable clamp | L – Thimble |
| | M – Cable clamp |
| | N – Cable |

Part Number Selection from the Product Nomenclature Tree

In the previous application example, the part number of the cable pull safety switch being used is “2CPSA2A3A”. The product nomenclature tree can be used to select the part number of a cable pull safety switch for a specific application.

Switch Type	Conduit	Contact Mounting Code	Basic Switch Code	Actuation Code	Indicator-Pilot Light Code
2CPS Series Dual-Head Cable-Pull Safety Switch	A 1/2 NPT	1 Standard: contact block mounted to housing	A 2NO/2NC, direct acting Switch 1: 1NO/1NC Switch 2: 1NO/1NC	1 Maintained, both sides	A 24 Vdc LED cluster
	B PG 13.5	2 Removeable: contact blocks with receptacles	B 1NO/3NC, direct acting Switch 1: 1NO/1NC Switch 2: 2NC	2 Maintained, left side No actuation, right side	B 120 Vac LED cluster
	C 20 mm		D 4NC, direct acting Switch 1: 2NC Switch 2: 2NC	3 Maintained, right side No actuation, left side	
	D PF 1/2			4 Maintained, both sides w/o broken cable detection	
				5 Maintained, left side No actuation, right side w/o broken cable detection	
				6¹ Maintained, right side No actuation, left side w/o broken cable detection	

NOTE: Not all combinations of model code are available. Please contact your Honeywell provider/representative for assistance.

¹ Not valid on 4NC switches

2CPS – defines the switch series type, 2CPS in this case

A – defines that the switch has 0.5 inch NPT conduit thread

2 – defines that the switching contact block is removable with receptacles

A – defines that the switching contact block has 2 switches, Switch 1 and Switch 2 and both has 1NO/1NC contacts with direct/positive opening feature

3 – defines that the switch has maintained contact operating mechanism on the left side of the 2CPS switch and no actuation on the right side

A – means that the switch comes with a 24 vdc LED cluster

Benefits of Honeywell's Cable Pull Safety Switch



- Direct opening action of NC (Normally Closed) contacts
- 2CPS: 2NO/2NC, 1NO/3NC, or 4NC contact configurations
- 1CPS: 1NO/1NC, 2NO/2NC, 1NO/3NC, or 4NC contact configurations
- Typical cable span of 76 m [250 ft] in an environment with a temperature change of $\pm 17^{\circ}\text{C}$ [$\pm 30^{\circ}\text{F}$]. Longer spans are possible depending upon temperature change and installation
- Choice of three actuator configurations (2CPS)
- Removable contact block version available (2CPS)
- J-hook turnbuckle included (2CPS)
- Large wiring cavity with straight-through wiring
- Models available without broken cable, slack-cable detection
- 24 Vdc or 120 Vac bright, multi-cluster high-intensity LED status indicator light available on 2CPS. Single LED on 1CPS
- Gold-plated contacts are standard on 2CPS, available on 1CPS
- Electrostatic, epoxy-coated, die-cast zinc housing
- Optional hardware packets available

Conclusion

Honeywell's cable pull safety switches are playing a major role in keeping the working personals safe in the various manufacturing and distribution centers by providing consistent, predictable, failsafe control response. The cable pull safety switch is intended to be used in conveyor belt applications. The CPS switches can be fitted with from 1 to 4 switching contact block, where each switching contact block consists of 1NC/1NO contacts. The switching contact blocks come in both fixed and removable versions.

The CPS switches has an enclosure made of die cast zinc alloy and cover made of cold rolled steel. The switches are extremely rugged and easy to install. It has been designed to withstand harsh environmental conditions and is UL approved and CSA certified for IP67, NEMA 1, 4, 12, 13 ratings.

The switch cable is made of red vinyl coated stainless steel, aircraft grade cable. This special aircraft grade cable enables the switch to perform reliably and effectively in a broad spectrum of operating temperatures. Furthermore, this feature also enhances productivity by reducing nuisance stops which can be due to variations in temperature, stretch of cable over time, or other application variables.

The positive or direct opening characteristic of the normally closed (NC) contact blocks significantly increases the reliability and safety of the cable pull safety switches. It ensures that no matter what, the NC contacts will be forcibly forced open and thereby cutting of power to the load which is the conveyor system in our case.

The cable pull safety switches comes with both silver and gold plated contacts on the switching blocks. A gold plated contact is standard for the 2CPS series and is an option for the 1CPS series. Silver is the most common choice due to its chemical, electrical, thermal, mechanical properties and low cost. When silver contacts are contaminant free and clean, there is no lower limit to what voltage or current can be used and that can be controlled reliably. Silver contacts also have a very low contact resistance, thus allowing the switching to be more reliable in industrial-pollutant free environments. Gold plated contacts

should be used in low level, or dry circuit applications. Gold will not tarnish as easily when exposed to moisture and airborne acids thereby making it a good solution for low current and voltage applications. One example where a gold plated contact over silver is useful is in a double pole switch where one pole is switching the power circuit and the other pole is switching the logic level.

Honeywell's cable pull safety switch comes in red color making it easier to notice on a factory floor environment. Both the 2CPS and 1CPS series has indicator LEDs that indicates whether the cable pull safety switch has been activated or not. 24 Vdc or 120 Vac bright, multi-cluster high-intensity LED status indicator light available on 2CPS. Single LED on the 1CPS.

For more information

To learn more about Honeywell's sensing and control products, call 1-800-537-6945, visit sensing.honeywell.com, or e-mail inquiries to info.sc@honeywell.com.

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