

Application Report AS-Interface

Well done – material handling by AS-i

AS-i Safety Monitors with integrated muting facilitate economical safety solutions in handling applications



NORD DRIVESYSTEMS in Bargteheide, Germany

By means of the monitored and time-limited suppression of protective functions, the productivity of automated systems can be increased significantly. With the muting technology developed by Leuze electronic for the AS-i Safety Monitor, this can now easily be achieved with AS-Interface Safety at Work up to category 4 acc. to EN 954-1 or PI e acc. to EN ISO 13849-1. This is clearly demonstrated in an application at “Getriebebau NORD” (NORD DRIVESYSTEMS), realized by system manufacturer Daifuku in collaboration with UCS and Leuze electronic.

For the implementation of a Sorting Transfer Vehicle (STV) application at NORD, the automation specialist UCS, together with system manufacturer Daifuku, chose to realize the safety circuit on the basis of AS-Interface. The decisive factor here was the muting function integrated in the AS-i Safety Monitor from Leuze electronic (see box 1 "AS-i", box 2 "NORD DRIVESYSTEMS", box 3 "Daifuku", box 4 "UCS", box 5 "Leuze electronic", box 6 "Muting"). Christian Fornée, project leader and responsible for software development at UCS says: "We realize many AS-i applications, primarily in the area of conveyor systems. Frequency-controlled motors are increasingly used in these systems. In this regard, AS-i is the more economical and functionally sufficient variant of Profibus, because often only two speeds with reversal of rotational direction are required."

System design

The complete application at NORD includes five E-STOP areas – three based on AS-i Safety at Work and two conventional areas that utilize hard-wired transducers.

A typical E-STOP area with muting at NORD consists of:

- 2 x AS-i Safety Monitors
- 9x Multiple Light Beam Safety Devices
- 9x Muting Sensors
- 3x AS-i E-STOP Buttons

Each E-STOP area acts on its respective region of interest and on the STV loop. Located to the left and right of the safety light barrier are parking spaces on the chain and roller conveyors. The STV loop is fenced-in and can only be entered for service purposes through an entry door provided for this purpose. This was realized with a key concept in such a way that even after entering the danger area, the loop can again be put under voltage. This gives the maintenance employee opportunity to operate the vehicles in set-up mode.

Operating sequence and requirements

Euro pallets and wire-mesh boxes are moved on the roller conveyors. The STVs pass corresponding loading devices to the conveyor system. Due to the tight dimensioning of the system construction, the main problem was implementing a smooth, automated transfer from the STV to the conveyor system via muting areas. The loading device comes to a standstill in front of the hard guard: it cannot move in immediately, as a parking space would otherwise be lost. There is very little space in front of the hard guard, and the loading device stops just 12 cm in front of the protective field of the safety light barrier used for monitoring the transfer area. During this waiting phase, both muting sensors (Light Beam Devices) must not be damped, as a muting error would otherwise occur with this muting operating mode, "parallel muting". Therefore, due to the AS-i query cycle, the muting Light Beam Devices must be arranged with a slight offset. Because the loading device moves in at a speed of 0.5 m/s, it must also be ensured that the muting sequence is initiated in good time while the protective field is being passed through. A major challenge here was the offset switching of the muting sensors, as not all loading devices are always parallel to the conveyor system.

AS-i muting solution in detail

After many test settings, UCS decided to realize parallel muting via a sensor signal and a machine signal. As a result, the loading device that is not parallel is still able to pass through the protective grid. Commenting on the principle structure, Christian Fornée says: "AS-i Safety was used here for the first time. We chose this because we are evaluating 20 Multiple Light Beam Safety Devices for monitoring the transfer areas and eight E-STOP buttons via the safe AS-i bus. The protective sensors with AS-i connection are a very economical solution if the muting functionality is moved to the AS-i Safety Monitor. The amount of wiring required is then very low compared to conventional wiring."

With Leuze electronic, UCS has chosen a competent partner who can supply precisely the right solution for the described muting application with the ASM AS-i Safety Monitor (see box 7 "ASM") – because Safety Monitor models ASM1E-m and ASM2E-m are equipped with selectable muting functions. As a result, they facilitate the time-monitored bridging of the protective device based on AS-i during material transport, without any process interruptions. The entire muting configuration is performed easily and quickly via the asimon configuration and diagnostics software (see box 8 "asimon").

Economical up to safety category 4

The integration of the muting function in the AS-i Safety Monitor results in a particularly economical and flexible automation solution through AS-Interface, as the sensor peripherals of the system required for the muting evaluation – the muting and safety sensor – can be queried directly via AS-Interface and evaluated by the AS-i Safety Monitor.

The main cost advantage here is in the possible realization of multiple muting areas with just one AS-i Safety Monitor. To accomplish this in the past, each protective sensor needed to be provided with the muting function or a separate muting controller was necessary for each muting area as a built-in switching cabinet device.

For access guarding, Leuze electronic also offers Multiple Light Beam Safety Devices with integrated AS-i interface and M12 connection, as well as safe, electronic AS-i input modules for connecting economical Safety Light Curtains. The muting sensors are simply integrated in the AS-i network via standard AS-i input slaves. The Multiple Light Beam Safety Devices with integrated AS-i interface can be directly connected to the AS-i cable. This considerably reduces the amount of wiring.

Result

With support from UCS and Leuze electronic, Daifuku was able to realize a custom muting solution for NORD on the basis of AS-i. All drives in the application at NORD are equipped with the company's own drive motors with decentral inverter technology (SK 200E) with AS-i connection. The result is a very economical solution. The good cooperation with Leuze electronic allowed the entire project to be completed quickly, economically and smoothly.

Text modules

Box 1: AS-i

AS-Interface has been in existence since the early 90s. The concept has established itself as one of the few standards. Today, AS-Interface is the market leader in the area of sensors/actuators. The system is used by numerous automators for optimizing their wiring work. Cost savings of more than 30 % are not uncommon. The sales figures are clear: more than 16 million AS-Interface nodes are in use, more than 1500 certified products are available, and more than 300 members support the system. Annual sales of AS-Interface products total approximately 300 million euros.

The first AS-Interface specification was adopted in 1991. Since then, the system has continued to open new application areas with undiminished innovative strength. Having started as one of the driving pioneers for safety-oriented bus systems, AS-Interface, with the Safety at Work technology, is today the backbone of modern sensor/actuator communication.

The AS-Interface system is characterized by ease of use and its openness. This openness is particularly important on the sensor/actuator level, as it facilitates communication with the range of systems available on the control level. Today, AS-Interface offers gateways to all important host systems. The compatibility that distinguishes AS-Interface is based on AS-Interface certification. The AS-Interface certificate confirms that AS-Interface specifications are met. The certification symbol on the products confirms adherence to AS-Interface standards. As a result, AS-Interface has achieved consistent system quality that is not bound by individual manufacturers. ((End box))



Box 2: NORD DRIVESYSTEMS

NORD DRIVESYSTEMS, headquartered in Bargteheide near Hamburg, is among the leaders in the drive technology industry worldwide and has been working with AS-Interface for many years. The company both manufactures gear motors and frequency inverters with onboard-AS-i technology as well as utilizes the advantages of AS-Interface within the scope its own manufacturing and logistics systems. A system from Daifuku is currently used at NORD for the handling of the drive products. For example, so-called Sorting Transfer Vehicles (STV) from Daifuku are used for transporting pallets, as this system ensures a considerably higher pallet throughput rate than conventional pallet transport systems.

NORD was founded in 1965 and now reports group sales totaling approx. 264 million euros. The successful climb to the elite group of manufacturers in the drive technology sector can be attributed to the company's commitment to its customers. In addition to the headquarters in Bargteheide near Hamburg, the company is represented around the world in over 60 countries. The group's more than 2,400 employees and 35 subsidiaries ensure minimal delivery times and maximum service in every corner of the planet. Products from NORD DRIVESYSTEMS combine compact mechanics with intelligent electronics. The company develops, produces and markets a complete product line of mechanical and electronic drive components, including high-quality gears and gear motors, frequency inverters, servo controllers and peripheral technology. ((End box))

Box 3: Daifuku

Founded in 1937, the company today employs more than 5,400 people and records an annual business volume of approximately 1.6 billion euros. As one of the leading international providers of materials handling systems, the company's share of the global market is approximately 20%; in Japan and Spain, the market share is 50% or more. In addition to three highly modern production facilities in Japan, the group owns additional manufacturing plants in Malaysia and the USA. Independent subsidiaries in Great Britain and Germany (Mönchengladbach), as well as contractual partners in Spain, Portugal and Scandinavia, are also part of the group. Worldwide, more than 28,000 high-bay storage devices and more than 3,000 Sorting Transfer Vehicles, or STVs, are currently in use. Reference customers include, among others, ICA, Netto, SuperGros, Canon, Samsung, DeLaval, Levi Strauss, Lever Fabergé, Nissin, IBM and Opel. Further information on DAIFUKU Europe Ltd. can be found at www.DAIFUKUEurope.com.
((End box))

Box 4: UCS

U.C.S. Industrieelektronik GmbH, or simply UCS, is today among the leading automation specialists. UCS, based in the German town of Wedel, offers high-performance, high-availability PLC systems for sequential control and process visualization, as well as guidance systems. The company develops innovative, custom solutions and networks systems over all common bus and network systems. As it has grown, the company has maintained the flexibility and customer proximity of a medium-sized company. UCS supports its customers with individual system solutions for a wide range of application areas, such as with automatic control systems, which are easy to use and perform reliably in applications. In addition, the company retrofits and modernizes existing systems without disturbing the process and production flow.
((End box))

Box 5: Leuze electronic

The extensive line of sensor products from Leuze electronic in Owen/Teck is used around the world in the automobile industry, in conveyor/storage systems and in packaging technology as well as in printing machines and analysis technology. These include technologically trendsetting identification systems, data transmission systems and image processing systems that have become an essential part of automatic processes in industry and logistics. Optoelectronic Protective Devices for safety at work and industrial automation round out the range of solutions. ((End box))

Box 6: Muting

The muting function currently finds use in numerous safety-relevant automation applications that employ optoelectronic sensors. Muting means the intended and time-limited suppression of the protective function of a vertically mounted Optoelectronic Protective Device without the generation of a shut-down signal. Muting is always initiated by at least 2 muting sensor signals, e.g. through the use of function Light Beam Devices. The advantage for the user is obvious: by speeding up the transport of e.g. pallets into or out of the danger area without interrupting the material flow while, at the same time, ensuring personnel protection, muting results in a direct improvement in the automation process. This almost always leads to an increase in the processing rate. ((End box))

Box 7: ASM

With the ASM Safety Monitor from Leuze electronic, safety-oriented AS-i actuators can be monitored and safely disabled as an actuator group. The direct coupling to a second AS-i network for area-wide E-STOP applications is particularly economical. All Leuze electronic Safety Monitors satisfy Category 4 and Performance Level PL e acc. to EN ISO 13849-1 as well as SIL 3 acc. to IEC/EN 61508. Both the ASM1E-m as well as the ASM2E-m are equipped with selectable muting functions (2-sensor parallel, 4-sensor sequential). As a result, they facilitate the time-monitored bridging of the protective device based on AS-i during material transport, without any process interruptions. Multiple muting areas can be realized with just one AS-i Safety Monitor. The entire muting configuration is performed easily and quickly via the asimon configuration and diagnostics software. ((End box))

Box 8: asimon

The Safety Monitor has an RS 232 diagnostics interface for the PC-supported configuration and diagnostics. Logical links can be easily created with the graphic user interface of the Windows® based software. The user can combine safety sensors and command devices with a mouse click and assign different release circuits for switching off the dangerous movement. Depending on the device type, two dependent or independent release circuits with configurable contactor monitoring are available. The asimon module library contains so-called function modules. With the "Muting" and "Muting Start" function modules, a muting application can very easily be configured via Drag & Drop. Changes to the muting parameters can also be made quickly. With the "Muting" function module, various application modes are selected and configured. The "Muting Start" module is used to realize the override mode of the transport material out of the muting area: if, e.g., a pallet is caught in the muting area due to an interruption in the system supply voltage, a command released via a so-called muting-restart button can be used for transporting the pallet out of the area in a controlled manner. This function can be achieved by a function button via configuration of a standard AS-i slave or by a safety-oriented key switch. The module is docked directly onto the muting module. ((End box))

Selection of images



Christian Fornée from UCS is delighted with the AS-i solution



Transfer stations in an overview with STV and loading device



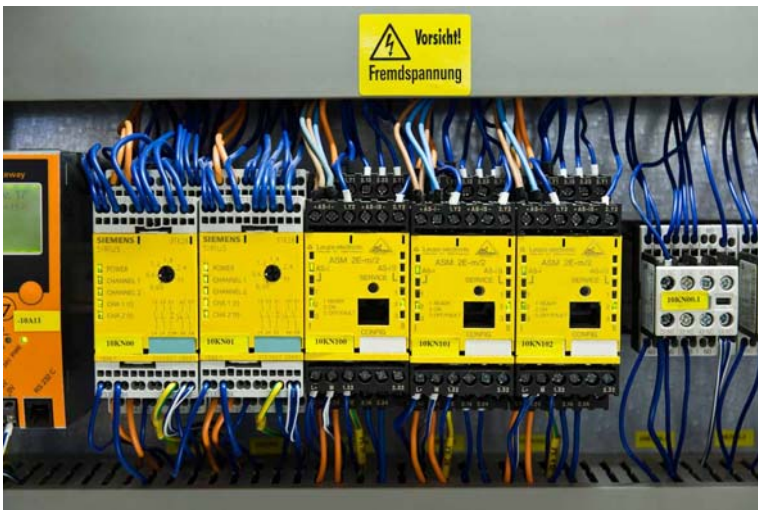
Safety sensors with integrated AS-i Safety Interface



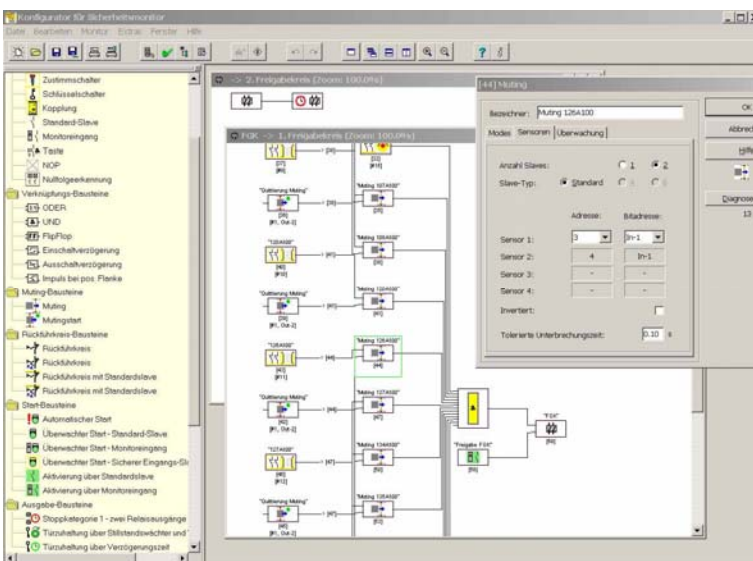
Transfer of wire-mesh boxes



Transfer of Euro pallets



Muting controlled by AS-i Safety Monitor



Simple muting configuration with asimon software

Press inquiries

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