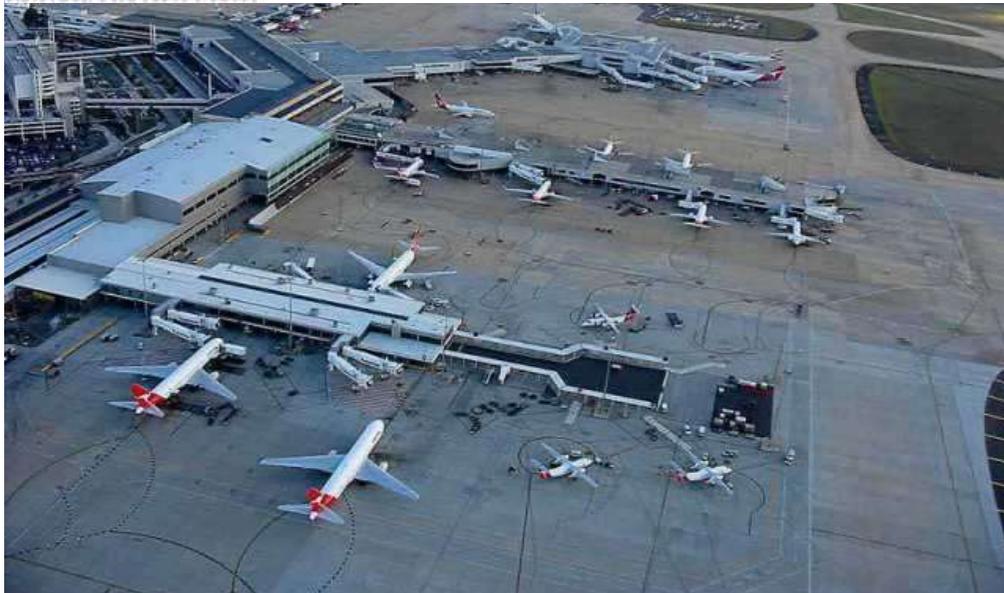


# Project:

# Melbourne Airport

## Baggage conveyor system



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and ifm products  
in conveying

## **Baggage is reliably distributed by means of AS-interface**

Everyone has probably experienced it already: the anxious wait at the luggage carousel after landing - hoping that their own suitcase has made it to its destination. What only a few know is that lost suitcases have mostly landed in the wrong aeroplane after check-in. Sophisticated logistics ensure that the checked-in baggage is transferred from each check-in desk to the right aeroplane. The baggage is weighed at the check-in desk where a barcode tag is attached and it is then transported underground, to the inaccessible area of the airport, via conveyor belts to their next station. The barcode tag is read on the fly and ensures that the baggage is transported to the correct baggage vehicle via turnouts and conveyor belts and then onto the corresponding aeroplane.



This process is greatly simplified upon arrival where the baggage is transported to a specific conveyor, which transfers the baggage from the restricted area to the baggage collection area.



Figure 1: Baggage conveyor belt

Transport logistics are similarly structured at all airports worldwide. The use of AS-interface (AS-i) in conjunction with AS-i Safety at Work, as well as the resulting advantages for the plant operator, are shown in the following example of a baggage handling system at Melbourne Airport in the Australian state of Victoria.



## **General advantages of AS-interface**

First of all, we must look at the differences between planning new systems and retrofitting existing systems. If new logistics systems are consistently planned with AS-i, time can be saved in creating wiring diagrams and general set-up of the system. As several hundred signals can be transmitted via one cable, time-consuming wiring with many individual wires is now obsolete. The AS-i system is quicker to install, faults occur less frequently and unplanned expansions can be dealt with at a minimal cost.

When retrofitting existing systems, other aspects need to be examined. In the past, with conventional Safety systems, faults took time to be located and reset, which caused substantial delays in the delivery of baggage to the aeroplanes. Baggage Sortation Management Pty Ltd, the company responsible for maintenance, was looking for a simple, standardised wiring system which would deliver more diagnostics, be easy and quick to mount and able to transmit security related signals for the protection of their personnel.

## Why choose AS-interface from ifm electronic?

AS-interface from ifm electronic was chosen because it met all the above-mentioned requirements. ifm electronic also offers on-site training and after sales support.

### **Extract from ifm's company philosophy:**

"ifm has a special attitude towards its customers ... Each employee - whether directly or indirectly - is a sales person."

## Implementation of e-stop functions via AS-i safety at work

All e-stops, which were previously wired conventionally, were replaced by AS-i compatible units. An e-stop and a reset button were installed every metre along the conveyor belts. More fail-safe sensors, such as lanyards, were integrated into the system via safe input modules.

Voltage was supplied by ifm power supplies. The communication to the higher-level controller was done by means of the controllerE family with Profibus connection and the safe switch-off of the motors was ensured via AS-i safety monitors.



**Figure 2: e-stop and reset button**

All the safety and wiring technology was delivered from one source and the system has run faultlessly for the past year.



**Figure 3:**  
**Controller, power supplies, safety monitor**

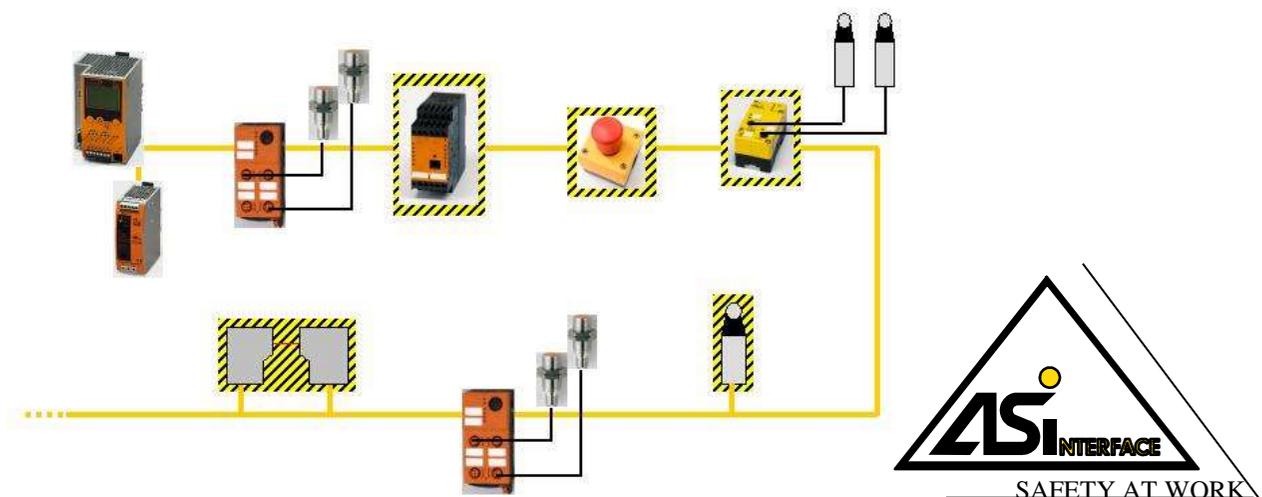
If a fail-safe sensor or an e-stop is triggered, a message specifying the position in the system is delivered to the control room where the message is indicated in the process control system so that the service staff can easily find and remove the fault in a short time.

This AS-i Safety at Work installation serves, on the one hand, for safely stopping the conveyor belts when a manual intervention is necessary e.g. in case of wedged baggage, on the other hand it also ensures the safety of the operators via the e-stop circuit.



## Why AS-interface?

Based on the intelligent (wiring) system AS-interface (Actuator Sensor Interface) it is possible to implement consistent and, most of all, economical systems from the sensor / actuator to the control level due to the easy system structure. AS-interface does compete with other higher-level bus systems because its structure is open to such systems via the use of gateways. AS-i should be seen as an extension of the existing plant structure, which makes sense from a technological and economic point of view. The wiring complexity alone and the associated installation time can be reduced by up to 30 % using AS-i. Commissioning times are considerably minimised due to the high diagnostic capability of the system. For these reasons, it is often used in conveying, process, industrial and building system automation. With the wide range of products of many manufacturers and its comprehensive compatibility, AS-interface provides integration solutions for various sensors and actuators in almost all automation systems.

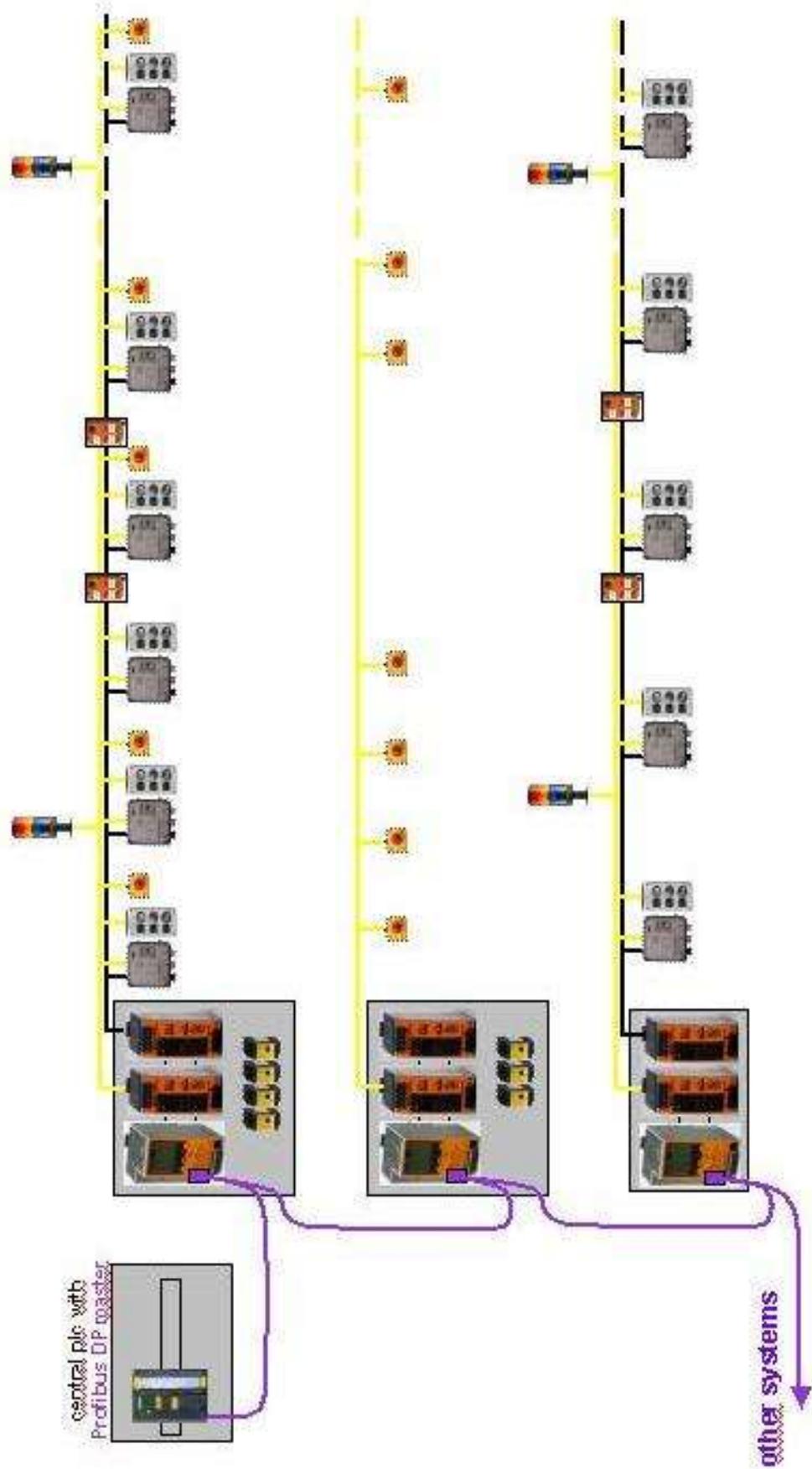


## AS-i safety at work for safety applications

Safety at Work is the extension of the existing AS-interface system for safety applications. It is thus possible for the user to integrate all binary safety-related components, e.g. e-stop, safety light curtains or gate interlocks. The great advantage is that standard and safety-related components can be used in one system. Therefore a mixture of safe and non-safe AS-i slaves is possible without any problems.

AS-interface Safety at Work is based on the standard AS-i protocol. This enables the AS-i system to transmit safety relevant information. It is based on the transmission of dynamic code sequences (8 x 4-bit data sequence) which are stored in each AS-i safety slave. These code sequences have to be learned by the AS-i safety monitor during set-up. During operation the AS-i safety monitor permanently compares the preset and the actual sequences of the AS-i safety slave. If the AS-i safety slave transmits a wrong code sequence (e.g. 4 x 0 bits), the AS-i safety monitor ensures safe switch-off.

## Controller concept Baggage conveyor system



## AS-i controllerE

In the baggage conveyor system at the Melbourne Airport four freely programmable AS-i controllerE of the type AC1305/06 from ifm electronic were mounted for the communication with the higher-level process control system.

The AS-i ControllerE family has a modular structure. One or two AS-i masters, a PLC controller, a serial interface, and a fieldbus interface are integrated in a compact housing. The Profibus DP fieldbus interface used in this project supports baud rates of up to 12 Mbaud and the extended diagnosis for identifying missing AS-i slaves in the higher-level system.

The AS-i controllerE offers a PLC capability, which can be used



Figure 4: AS-i controllerE

for pre-processing of binary and analogue I/O signals.

Information, which is only important for the process control system, can be dealt with locally by the AS-i controllerE PLC. The AS-i controllerE can also be used as a pure Profibus DP gateway. In this case, all AS-i data is transmitted to the process control system. AS-i relevant information is displayed on the integrated multifunction display and the LEDs,

located on the front of the housing, indicate important information from the AS-i network.

## AS-i safety at work safety monitor



Figure 5: Safety monitor

AS-i safety at work monitors were used for safely switching off the drives. The AS-i safety monitor listens for the code sequences, which are transmitted by each safety slave. In the case of message deviations or timeouts it ensures the safe state of the system is achieved. The unit is available in two versions: with either one or two redundant output switching elements.

It can be connected anywhere on the AS-i network. Several

AS-i safety monitors can be operated via one AS-i master.

Known safety relay functions like "e-stop", "stop categories 0 or 1", "two-hand operation" and "enable switch" can be implemented via the software. One AS-i safety monitor thus replaces many traditional safety relays.

Due to the extension of Safety at Work it is possible to transmit safe signals and standard I/O signals via the one AS-i bus cable. The safety-related extension is fully downward compatible and can therefore be retrofitted on existing installations. All masters, power supplies and other bus components can still be used. The wiring advantages of the bus system are now transferable to the wiring of safety applications.

The safe data transmission on the AS-interface has already been approved by TÜV and

BIA and is suitable for the transfer of signals up to the highest category 4 to EN 954-1.

## Safe e-stops

Apart from safety monitors with one or two redundantly designed outputs, ifm electronic offers e-stops with integrated safe AS-i connection. The connection to the AS-i system is possible by means of an M12 connector and a flat cable insulation displacement connector to the yellow AS-i flat cable.

Safety monitors, e-stops and input modules are certified by TÜV, the monitors additionally are UL and CSA approved (cULus).



Figure 6: e-stop



Figure 7:

Baggage conveyor belt with e-stops

## Non-contact fail-safe inductive sensor



Figure 8:  
Fail-safe inductive sensors

Fail-safe sensors are used wherever a high degree of operator and machine safety must be ensured. A special counterpart such as a magnet or coded target is no longer necessary for the function of the fail-safe sensor. The fail-safe inductive sensor detects metals such as stainless steel or ST37 and it operates with an enable zone, which is monitored for target position and dwell time. An adjustment mode facilitates mounting. Up to 10 fail-safe sensors can be connected in series.

For the first time it is possible to use this principle and so benefit from the advantages of inductive sensors for safety applications. Wear-free, non-contact operation and a high protection rating guarantee high uptime of the machine and installations.

Therefore, non-contact and safe detection of safety devices is possible. For applications in conveying processes roller lever switches or counterparts such as magnets are no longer necessary.

The input and output signals of the sensors comply with DIN EN 61131-2, which is why they are fully compatible to the inputs and outputs of a PLC.

These sensors are very versatile as they can be connected to ifm evaluation relays, the AS-i Safety at Work bus system, PROFIsafe, Interbus Safety, safe PLC and logic modules via TÜV-certified software.

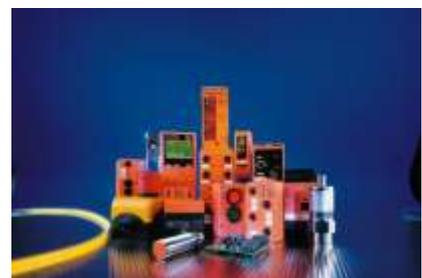
## Components used in this project

- AC1306 AS-i DP controllerE
- AC004S AS-i safety monitor
- AC010S e-stop illuminated
- AC005S Safe AS-i input module
- AC4000 AS-i flat cable
- AC1146 AS-i tuner IP 67
- AC1147 AS-i bus termination
- AC2215 SmartLine25 AS-i repeater
- AC1216 AS-i power supply 115/230 V AC
- DN2012 Switched-mode power supply 24 V DC
- O5P500 Retro-reflective sensor
- E20005 Prismatic reflector TS-80



## Components from ifm electronic for conveying

- AS-i as wiring and control system of conveying systems
- AS-i safety at work
- Safety technology
- 24 V DC power supplies
- Inductive, capacitive and magnetic sensors for position detection
- Photoelectric sensors for object recognition and position detection
- Motor starters with integrated AS-i connection
- RFID identification systems and Data Matrix code
- efector octavis (rolling element bearing monitoring) on motors
- Compressed air monitoring



## Conclusion

The advantages of using AS-interface Safety at Work are as follows:

- Simple system structure -
  - Quick and easy to mount
  - Error reduction
- Good diagnostic capabilities
- Easy fault detection
- Reduction in commissioning time
- Easy fault removal by the customers by using push buttons on ControllerE

## A brief remark

By the way, "only" 30 million bags of 2 billion airline passengers do not arrive in time at their final destination, 204,000 of those disappear forever which corresponds to a rate of 0.01 % of all bags. At airports all over the world ifm AS-interface helps to ensure that the baggage reliably arrives at its destination.

## Profile of ifm electronic gmbh

ifm electronic stands for the optimisation and solution of technical processes by means of sensors, networking and control systems. Close customer contact, quality and innovations have made us the market leader in many areas. Planning and project support make ifm electronic a system supplier on the lower automation level.

## Products and systems from ifm electronic

### ***Position sensors and object recognition***

Inductive sensors, capacitive sensors, magnetic sensors, cylinder sensors, safety technology, valve sensors, Photoelectric sensors, object recognition, encoders

### ***Fluid sensors and diagnostic systems***

Level sensors, flow sensors, pressure sensors, temperature sensors, diagnostic systems

### ***Evaluation systems and power supplies***

### ***Bus systems***

(Communication and control systems for process and industrial applications)

### ***Identification systems***

***Control systems*** (controllers for mobile and robust applications)

### ***Connection technology***



8<sup>th</sup> December 2006

To Whom It May Concern

**Re: Reference for ifm efector Pty Ltd**

During a recent installation of a materials handling system, Baggage Sortation Management installed an ASi bus network as the safety emergency stop system. We found that this task was straight forward and went according to schedule. The ASi product was supplied by **ifm efector Pty Ltd**.

We found **ifm** to be very professional and competent in all our dealings with them. Their product is reliable and easy to install with minimal wiring required.

Their after sales service is exceptional with any assistance required, promptly attended to.

The training our technicians received was first class and conducted at a time and in a way that suited us, on several occasions. This was provided at no additional cost and conducted at a level that all could understand.

Regards,

AVGaylor

Anthony Gaylor  
Operations Manager Melbourne  
Baggage Sortation Management Pty Ltd

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**We thank**

**Baggage Sortation Management Pty Ltd**

**for their good cooperation**

**If you have any questions regarding this project report or if you are interested in other reports please contact:**

**ifm electronic gmbh**

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