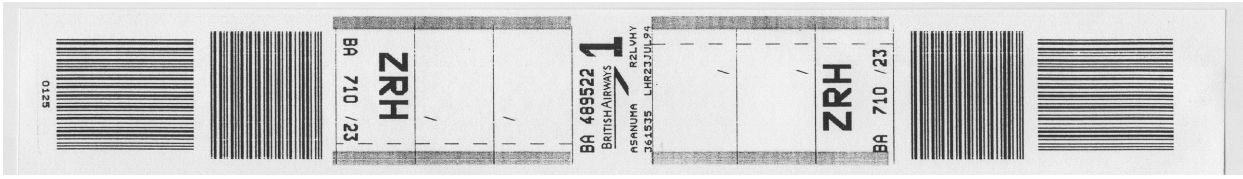
ALIS 400

Airport Luggage Identification System

System Description



SICK

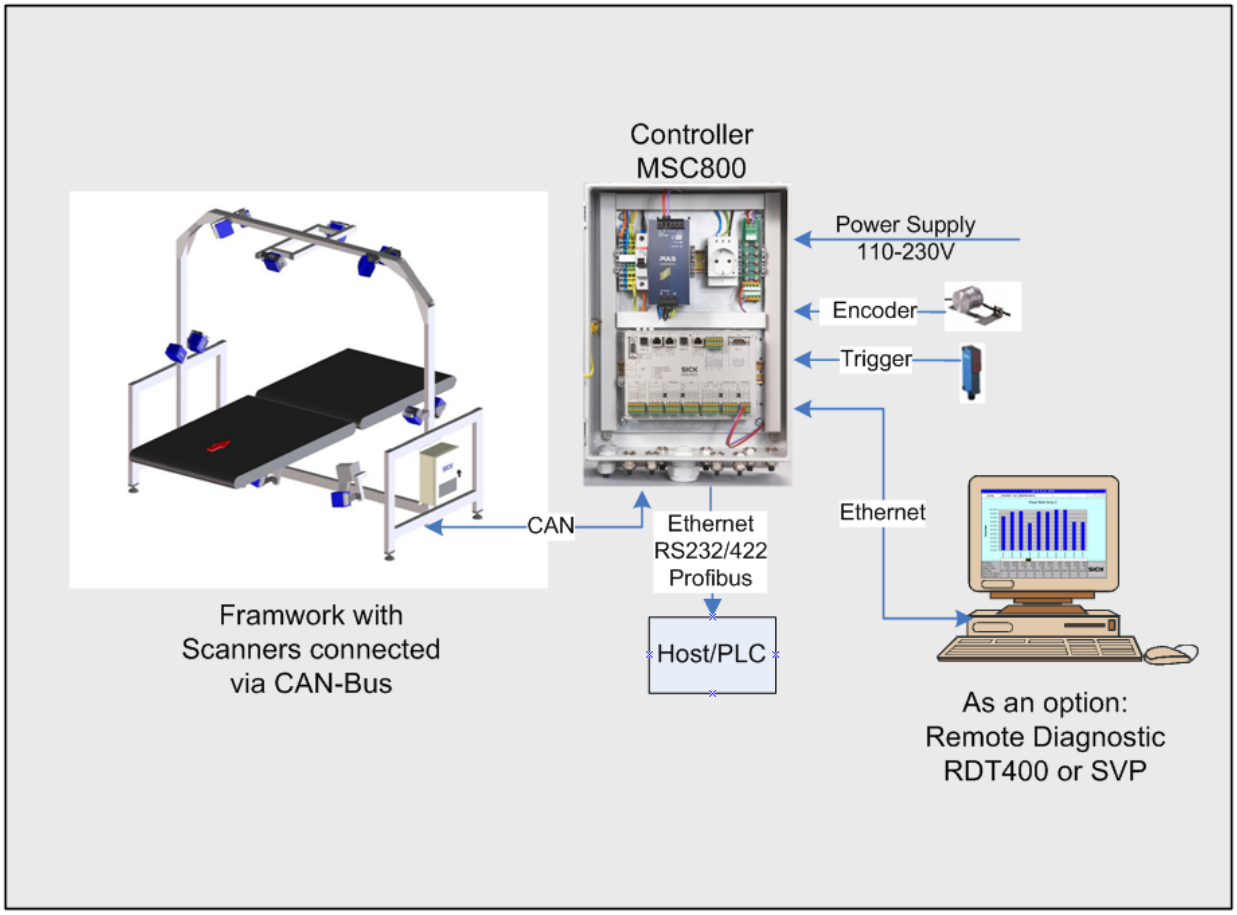
SICK – a global player in sensor technology

One of the world's leading producers of sensors and sensor solutions for industrial applications. SICK is a technology and market leader in both factory and process automation.
Founded in 1946 and based in Waldkirch, Germany, the company today employs over 5.000 people around the world and has a global presence with more than 50 sub-subsidiaries, participations and sales offices.
With its Industrial Sensors, Industrial Safety Systems, Auto Ident and Process Instrumentation divisions the SICK Group attained sales of EUR 697 million in fiscal year 2009.
Visit our homepage www.sick.de or www.sick.com if you need more information.
Division Auto Ident:
The main focuses of the Auto Ident division's automatic identification and laser measurement systems include identifying bar codes, automatic reading of two-dimensional codes and measuring objects of all kinds.
With more than 2.500 systems world-wide the division Auto Ident is market-leader with its Airport Luggage Identification System ALIS400.

1 General System Description

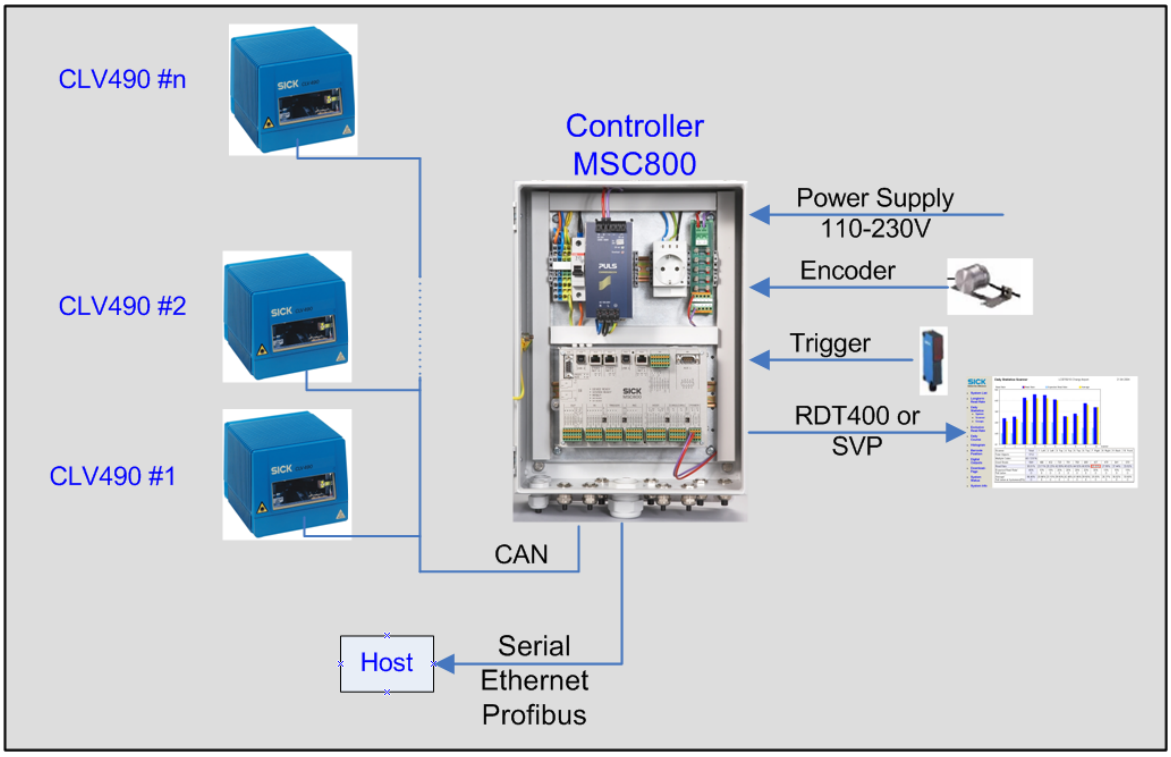
The ALIS400 "Airport Luggage Identification System" is a full automatic reading gate including all framework, scan heads with on board decoder, local network-controller and host communication to read the IATA-Barcodes on belt-conveyors or tilt-tray sorter-systems.
The local network-controller MSC800 incorporates a controller for the local CAN-Scanner-network, opto-isolated digital I/O's, flexible HOST-Interface and a interface supplying diagnostic data for use with the RemoteDiagnosticTool RDT400 or SVP. The HOST-interface can be adapted to customers specific requirements in terms of HOST-Protocol and physical interface.
The complete system consists up to 24 CLV bar code readers - depending on the application -, the control unit MSC800 unit, photoelectric switches for object-trigger, any cables and as option an increment encoder.

Basic system design:

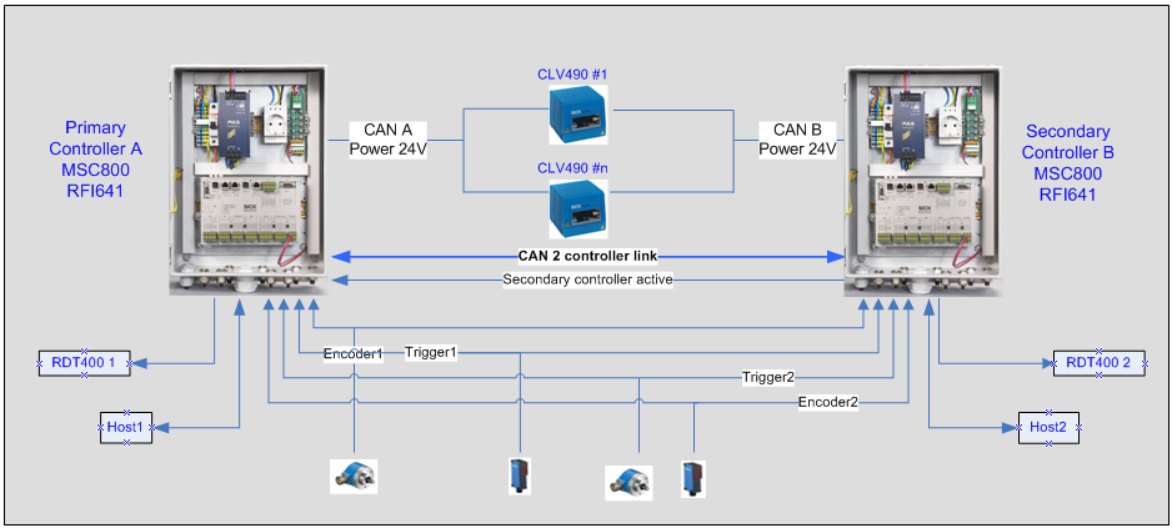


2 Basic Hardware-Design

Schematic of System Components and its Function



Configuration of the 100% Redundant Design



2.1 Functions of the controller MSC800

The control-unit MSC800 operates as a system controller and is connected to the following components:

Connection	To component	Function
CAN-network	Optional CLV bar code reader	Transmits the bar code result, controls the bar code readers
Digital I/O's 24V PNP	Photoelectric switches HOST-Computer	- Object-Trigger - Increment encoder - NoRead, GoodRead
Digital signal cable	Host computer	"Read signal" gate (optional)
RS232/RS422 Profibus DP Ethernet	Host computer	Transmits read codes, reports system errors
Serial connection 2 or Ethernet	Remote Diagnostic Tool	Transmits any kind of diagnostic data

Basic functions of the Control-unit:

- Scanning the digital inputs (proximity switches and read signal)
- Collecting any read results from all bar code readers via CAN-Bus
- Evaluating and filtering the individual results, calculation of the read result
- Host communication
- Transmitting any kind of diagnostic data for Remote Monitoring

2.2 Features of the Controller MSC800

Function	Scanning the digital inputs (proximity switches and read signal) Collecting any read results from all bar code readers via CAN-Bus or any RFID-Data from RFID-Reader Evaluating and filtering the individual results, calculation of the read result Host communication Transmitting any kind of diagnostic data for Remote Monitoring
No. of barcode scanners per system	24
Optical display elements	26 x LED status- and functional displays
Data interface "HOST"	RS-232, RS-422/485, Ethernet, Profibus-DP data output format selectable
Data transmission rate "HOST"	Serial: 300 ... 57 600 Bit/s Ethernet: 10/100 MBit/s Profibus-DP: 12 MBaud
Protocols "HOST"	SICK-Standard, all standard system integrator interfaces, customer-specific protocols upon request
Data interface "Terminal"	RS-232, 9600 Bit/s, 8 data bits, no parity, 1 stop bit Ethernet TCP/IP
Functional switching inputs	16 (all inputs are visualised via LEDs, opto-isolated and reverse polarity protected
Functional switching outputs	4 x PNP Imax=30mA, short-circuit proof, signal length selectable, 2 x Relais
Electrical connections	1 x connector, AUX (9-pin D-SUB for diagnosis, serial) 3 x connector, Ethernet (RJ-45)
Operation voltage	AC 100 ... 264V/ 50 ... 60 Hz
Housing	Steel, varnished
Enclosure rating	IP65 (to DIN 40 050)
Protection class	Class 3 (acc. to VDE 0106/IEC 1010-1)
Compliance with standards	Acc. to EN55011, EN 50082-1, EN 50082-2 / acc. to IEC 68-2-6 Test FC / acc. to IEC68-2-27 Test EA
Weight	Approx. 15kg (incl. power supply)
Operating Temperature	0 to +50 °C
Storage Temperature	-20 to +70 °C
Max. rel. humidity	95%, non-condensing
Dimensions	500mm x 400mm x 155mm

2.3 Scanner technology

- Scanner type : CLV490 line scanner
- Integrated Decoder with real time decoding and patented SMART code reconstruction capabilities
- Scanrate: 600 … 1200Hz
- Reading distance: 500 … 2100mm
- Autofocus
- Low running temperature due to the use of laser diodes
- Low operating voltage (24VDC)
- Low power consumption: 12VA
- Enclosure rate IP65
- Laser protection class 2
- Low weight: approx. 1,5kg
- Scanner configuration stored in scanner plug
  (Cloning plug for automatic upload of scanner configuration)

2.4 Features/Benefits of the whole System

- Use of an industrial Controller
- All interfaces opto isolated (HOST, Network, digital I/O)
- Central access to all scanners via Controller
- Service- and maintenance tools integrated in the
- Remote-Diagnostics-Tool
- Extended display for system relevant information:
  - Scanner Read Rate Statistics
  - Total Read Rate Statistics
  - Daily Read Rate Statistics
- Up to 365 days recording of all results
- Adjustable and adaptable for T-Code and Linear-Code
- Adjustable and adaptable for belt conveyors and tray sorter
- 100% redundant design according to BNP-Specification
- Option “Heating” for ambient temperature below 0°C
- Highest performance due to uniform coverage of reading zone
- Use of the same Scanner-Type for any configuration
- Use of Quick release brackets for easy scanner replacement
- All cables halogen free / low smoke / low fume
- Flexible mechanical construction
- Lowest Maintenance Costs
- Highest read rates due to optimised system design regarding number of scan heads and geometrical position
- High read redundancy (Typical loss of read rate is less then 1% in case of a single scanner failure)
- Improved read rates due to adaptive code assignment (ACA)
  (SICK patent)
- Complete design (HW + SW ALIS and scanners) from SICK / Reute

3 ALIS System Variants

The ALIS-System is of modular design and can be adapted to 5 basic application conditions:

1. Reading T-Barcodes on a belt-conveyor
2. Reading T-Barcodes on a tilt-tray-sorter
3. Reading T-Codes on Induction Lines (Linear Codes only in ± 45° orientation)
4. Reading Linear-Barcodes on a belt-conveyor
5. Reading Linear-Barcodes on a tilt-tray-sorter

3.1 Reading T-Barcodes on a belt-conveyor: TCB750/8

System is consisting of 8 Scan-heads including the reading from underneath through a belt-gab of min. 40mm. The underneath-scanners are equipped with special blowers to keep clean the scanner front-window.

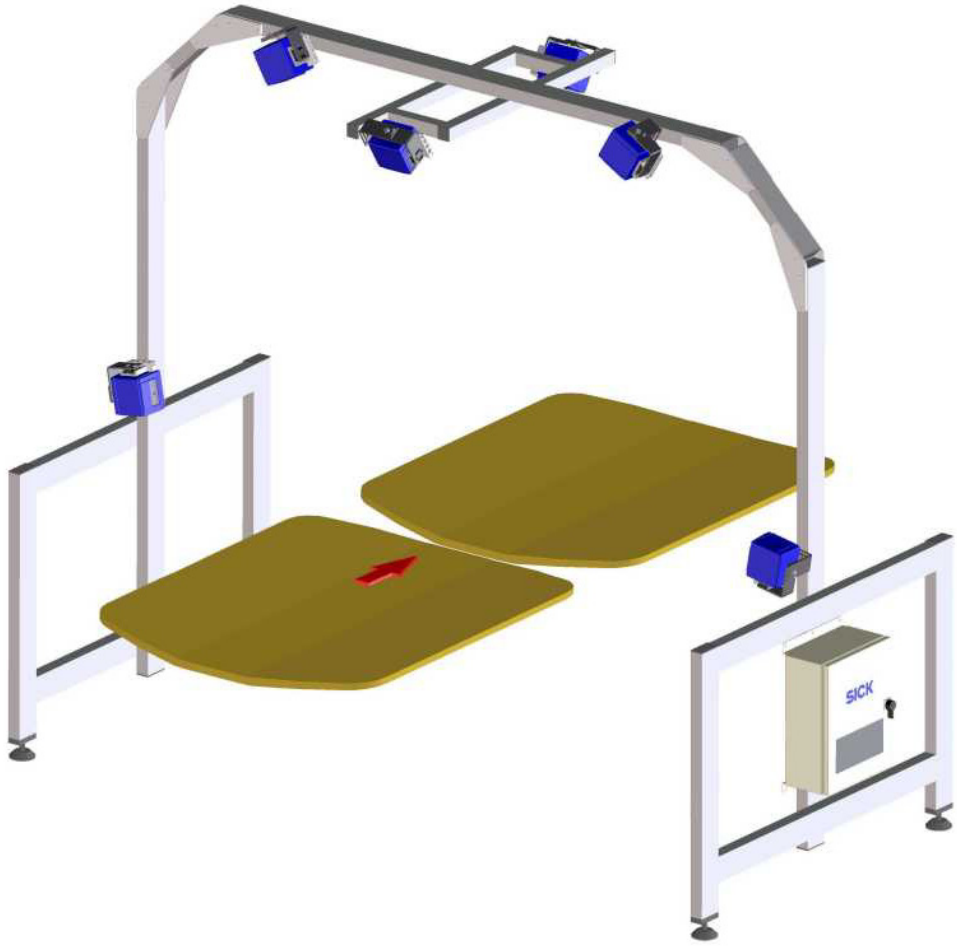
Barcode-example:

Schematic of the system:

3.2 Reading T-Barcodes on a tilt-tray-sorter TCT750/6

System is consisting of 6 Scan-heads. The reading from underneath is on the induction-lines through a belt-gab of min. 40mm. The underneath-scanners are equipped with special blowers to keep clean the scanner front-window.

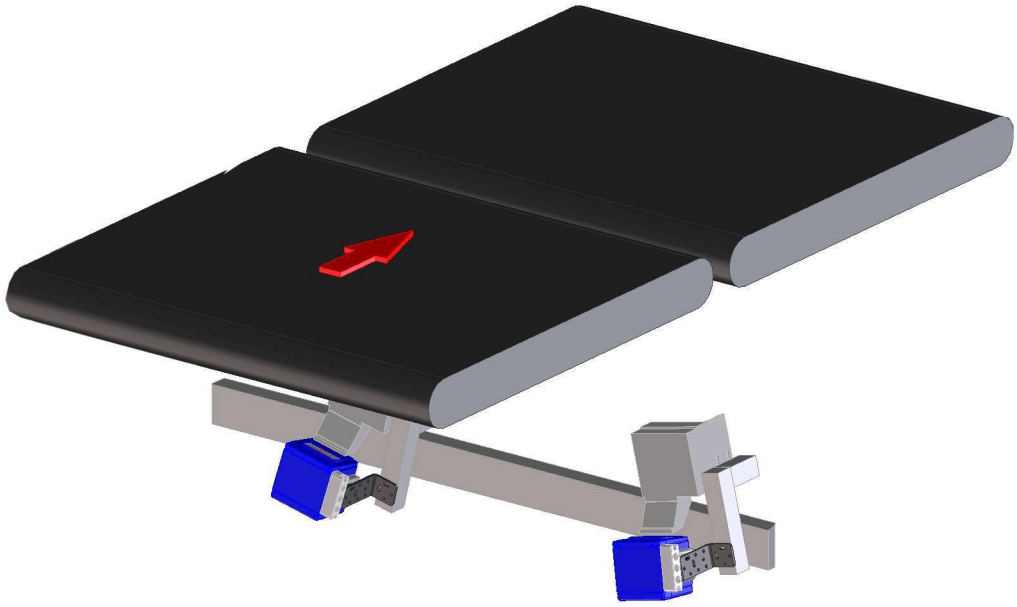
Schematic of the system over the tilt-tray-sorter:



3.3 Reading T-Barcodes on an Induction Line: UCB2

System is consisting of 2 Scan-heads. The underneath-scanners are equipped with special blowers to keep clean the scanner front-window.

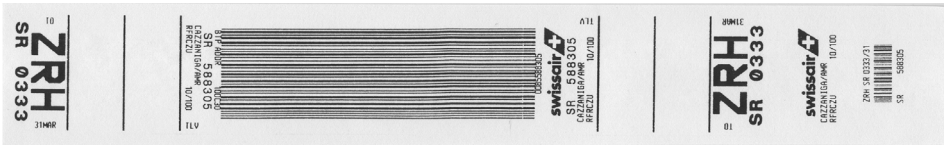
Schematic of the system:



3.4 Reading Linear-Barcodes on a belt-conveyor: LCB750/12

System is consisting of 12 Scan-heads including the reading from underneath through a belt-gab of min. 40mm. The underneath-scanners are equipped with special blowers to keep clean the scanner front-window.

Barcode-example:

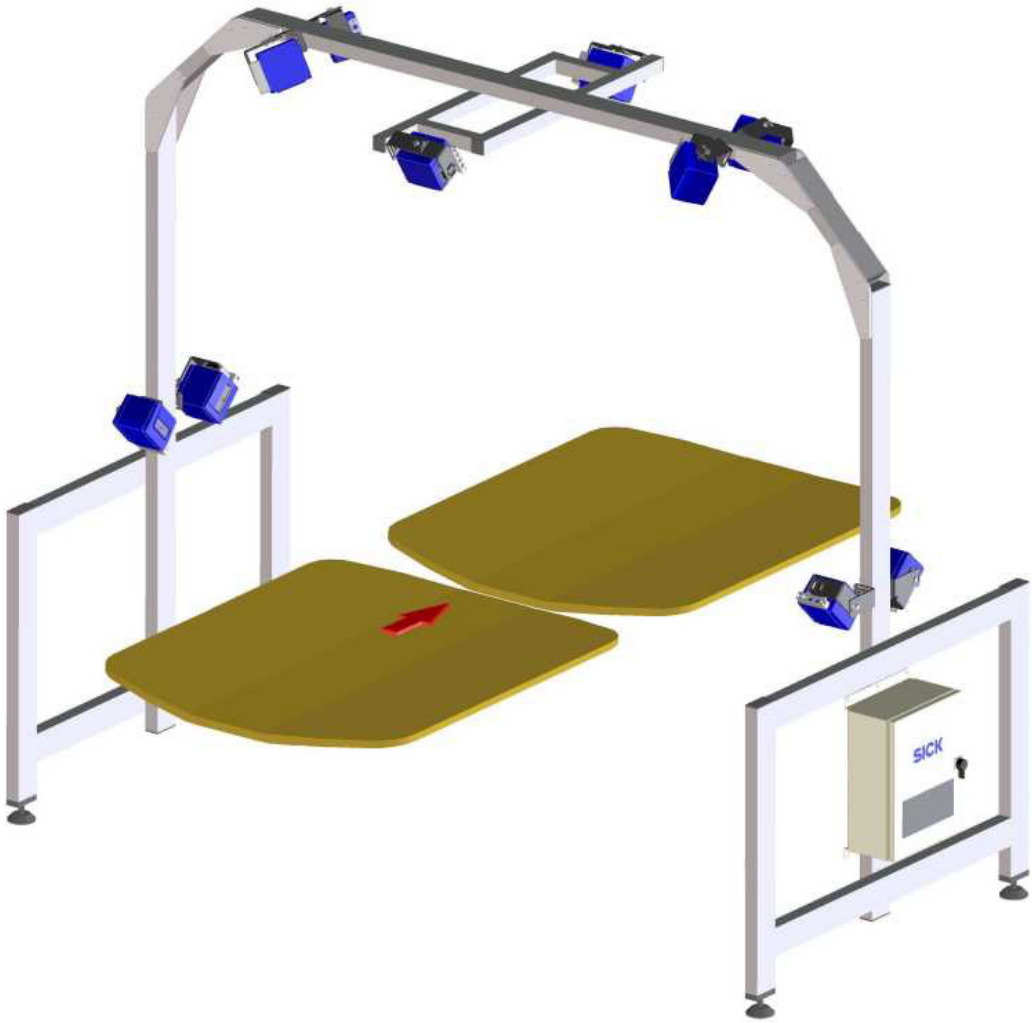


Schematic of the system:

3.5 Reading Linear-Barcodes on a tilt-tray-sorter: LCT750/10

System is consisting of 10 Scan-heads. The reading from underneath is on the induction-lines through a belt-gab of min. 40mm. The underneath-scanners are equipped with special blowers to keep clean the scanner front-window.

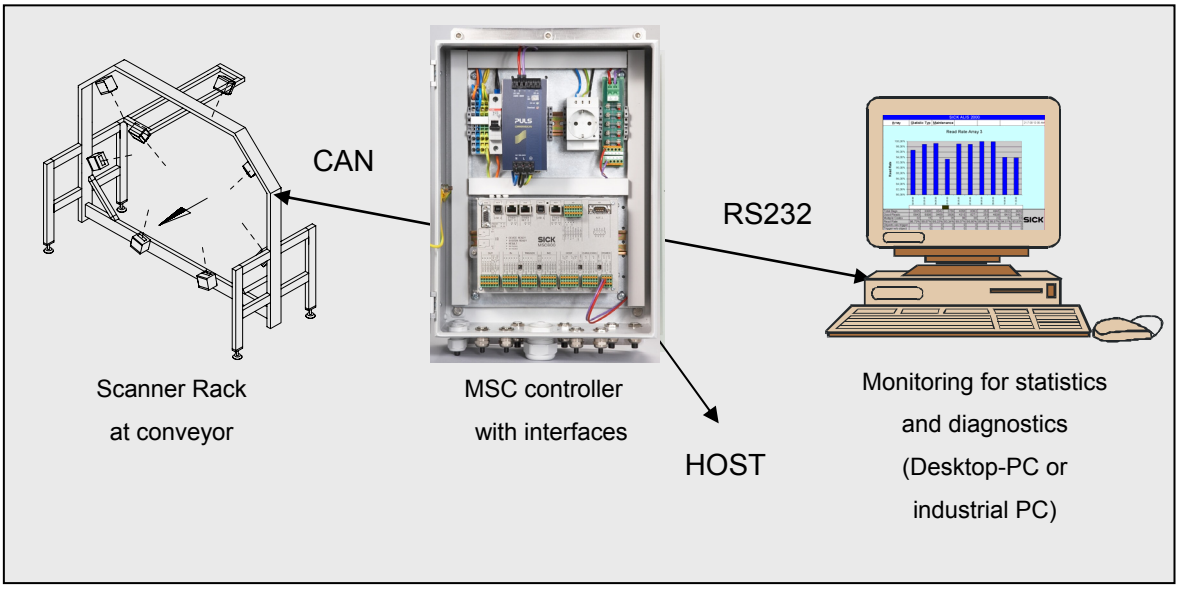
Schematic of the system over the tilt-tray-sorter:



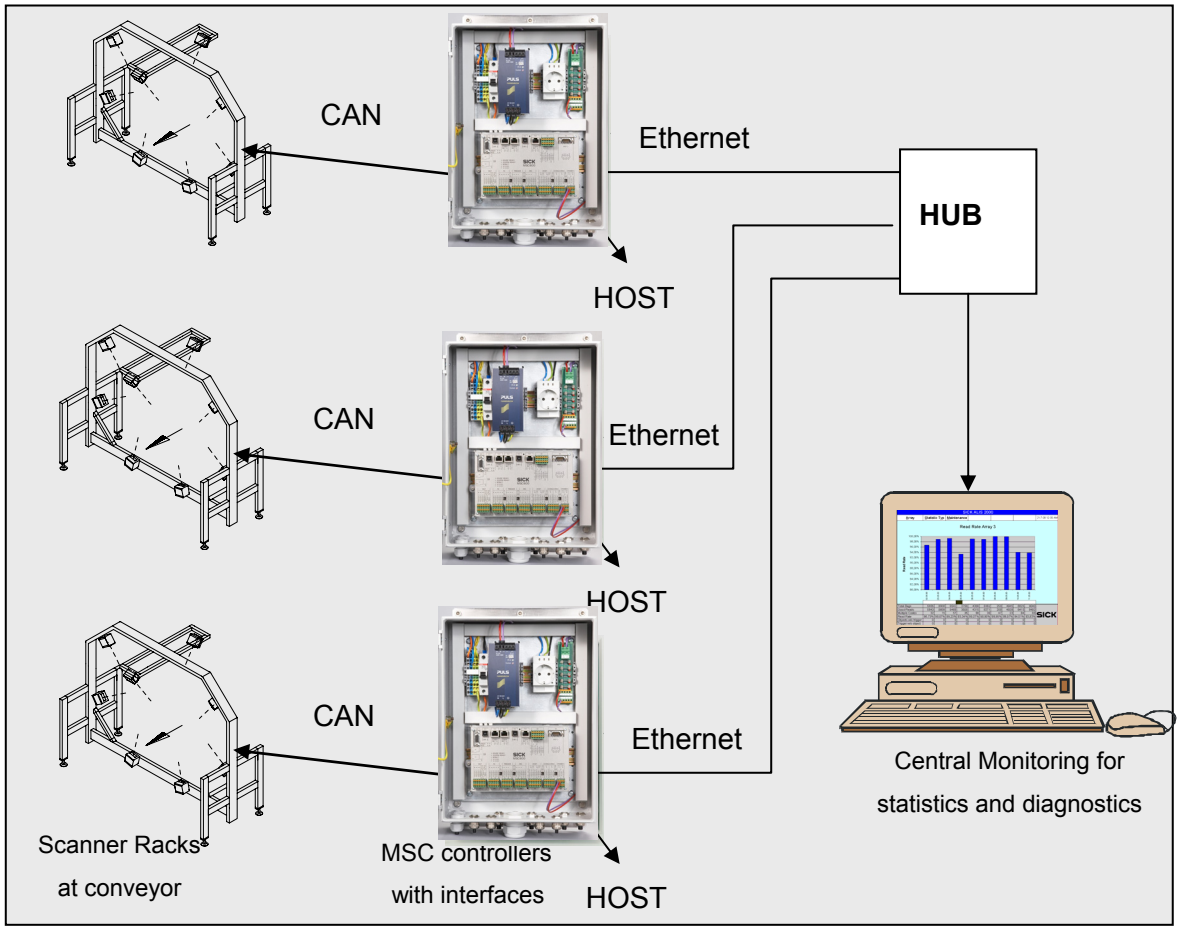
4 Remote Diagnostic Tool RDT400

The Remote Diagnostic Tool RDT400 is an option, but is needed for any kind of graphical visualisation of reading-performance. The visualisation can be done locally at each system or in a central control-room.

4.1 Local Visualisation on each system



4.2 Central Visualisation of all systems in a control-room



5 Summary ALIS 400 System Features

5.1 Mean Time To Repair/Replace (MTTR)

The SICK Reading gate is based upon a modular structure, with careful consideration being given to replacement of individual components. The replacement of the code reader heads and the photocells (object-trigger) can be achieved in approximately max. 10 minutes. The scanner configuration is stored in an EEPROM included in the plug.

When connecting a scanner, the configuration is downloaded automatically.

The Controller OPS400 is preloaded with all the necessary parameters, so replacement can be facilitated in less than 10 minutes.

5.2 Mean Time Between Failure (MTBF)

The MTBF figures for the system-components, based upon manufacturers figures and field experience are 80.000 h.

5.3 Reading-Redundancy

The SICK reading gates are designed to give highest read rates.

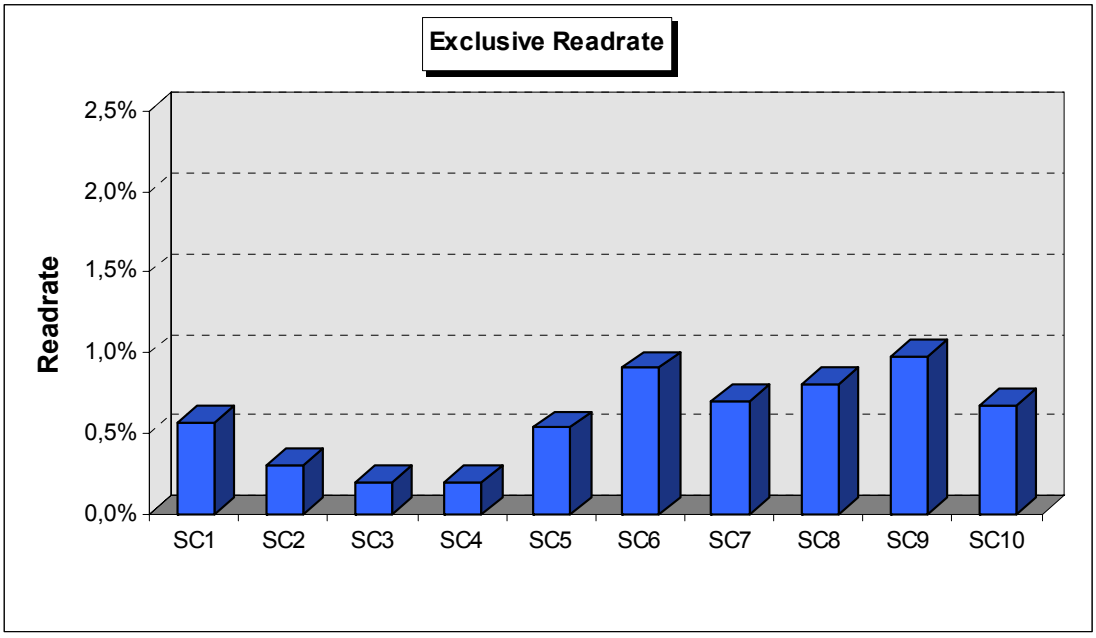
Highest Read Rates can be achieved only by using a system configuration with an uniform coverage of reading zones.

This can be achieved by using a high number of scan heads.

The high number of scan heads results in an optimum Read Redundancy.

A typical loss of read rate is 0,5% to 1% in case of a single scanner failure. Even in case of a double scanner failure, the Read Rate will typically not be decreased more than 5%.

The diagrams below are showing typical "Read Rates" of particular scanners for 10 Head Configuration and "Only Read Rates" for the particular scanners.



6 Technical Data

Technical data for a T-Barcode Reading System:	
Label type	T- Code Label according to IATA Resolution 740 and RP1740a/b
Scanning height	750 mm
Head room clearance	900 mm max.
Mounting space for underneath scanners	distance floor - surface belt 750 mm min.
Conveyor width	1000 mm
Necessary space above conveyor	1500 mm
Necessary space on left and right side	800mm
Bag spacing	150 mm min
Label spacing	50 mm min
Conveyor gap for reading from underneath	40 mm min
Conveyor speed	2.2 m/s max

Technical data for Linear-Barcode Reading Systems	
Label type	Linear-Code-Label, IATA Resolution 740 and/or T- Code Label IATA Resolution 740 and RP 1740a/b
Scanning height	750 mm
Head room clearance	900 mm max.
Mounting space for underneath scanners	distance floor - surface belt 750 mm min.
Necessary space above conveyor	1500 mm
Necessary space on left and right side	800 mm
Conveyor width	1000 mm
Bag spacing	150 mm min
Label spacing	50 mm min
Conveyor gap for reading from underneath	40 mm min
Conveyor speed (constant)	2.2 m/s max

Barcode Specification according to IATA Resolution 740 and RP 1740a/b	
Symbology	Interleaved 2 of 5
No of Characters	10
Narrow module width	0,5 mm, Tolerance ±5%
Print ratio	2:1
Code height	48 mm
Code contrast (PCS)	80% at 633nm
Check digit	none
Quiet zone	Min: 7 times narrow element

7 Service Support

7.1 Maintenance

The SICK Airport Reading Gates are designed to be maintenance free. There is no re-calibration required for the optical heads and their position is fixed bay the quick release brackets. Ease of access is greatly improved by the use of small, light optical heads unhindered by ambient light protective screens. All the connections to the code reader heads, and the controlling light beam switches are plug and socket. The ALIS Control Cabinet is free standing and can be mounted in such a position as to allow easy access to logically arranged internal wiring connections, via the hinged and glass fronted door.

The code reader heads do require varying periodical cleaning depending upon their position in the configuration, for example the heads positioned underneath the conveyor would attract more debris that the overhead ones. To assist in the programming of this cleaning function, the ALIS PC has a built in threshold monitor which gives an alarm output when an individual head falls below the normal percentage read rate. The use of blower motors on the underneath code reader heads is strongly recommended.

7.2 Preventative Maintenance

The SICK array does not require maintenance, due to the fact that the optical heads do not need any re-calibration, laser-tube exchange and cleaning of internal optical parts.

We do however feel that a yearly visit would be productive for both parties to establish an ongoing contact between our Engineers and the Operations Personnel. The following tasks could be undertaken:

- Scanner Check
  - clean front window
  - reading distances
- Check of all light switches
- Prepare a report on the reading gates performance
- Evaluate the diagnostics and check the alarm thresholds
- Upgrade the software where appropriate
- Train any new operators and refresh the existing staff's knowledge
- Check the on-site spares

7.3 Technical Service

The redundancy built into the SICK system and the ease of replacement if necessary by an airport's own staff should make 24 hour telephone support and a 4 hour response unnecessary. However we can understand the desire of the airport operations staff requiring the comfort of being able to summon support.

We therefore make the following proposal:

During normal office hours telephone support will be available from our local subsidiaries or representatives which are located in nearly all countries or from our registered office in Germany

8 Training of staff on Site

The training of the staff on site consists of the following program:

8.1 Components and Technical Basics of the ALIS

- Bar-code Reading with Laser Scanners
- Features of Sick Bar-code Readers CLV490
- Configuration of the Scanner Array
- Function of the Photoelectric Switches
- ALIS Reading Cycle including Host Communication
- The Controller MSC800
- Maintenance of the ALIS System
- Trouble Shooting Guide

8.2 Practical Training: Maintenance and Trouble Shooting

- Demonstration of the ALIS
- Showing the Locations of all Components
- Operation of the System Controller
- Showing all Spare Parts on site; Usage of the Spare Parts
- Scanner Configuration
- Scanner Replacement
- Working with the Trouble Shooting Guide
- Practising System Diagnostics and Trouble Shooting

9 References

See separate Reference list.

10 Terms and Conditions

10.1 General

The quotation is based on the General Conditions of Export of the SICK group, latest edition. Further specifications, unless otherwise noted, are not considered in this quotation.

10.2 Prices

The prices are ex works Reute, according to INCOTERMS 2000, without packaging and insurance. All prices are in EUR without VAT.
Customs, duties and taxes of any kind being due in the country of the customer shall be fully to the account of the customer and shall be paid directly and in due time by the customer

10.3 Validity

The quotation is valid for 3 months from the date of this quotation as long as there are no changes in terms of techniques or other conditions

10.4 Payment conditions

As per SICK "Subsidary" conditions

10.5 Warranty

SICK AG specifies a warranty period of 2 year (unless otherwise stated/quoted) for components which are part of the delivered systems. This period will begin after the acceptance test by SICK's customer, latest 3 months after the delivery of each system. The warranty includes all hardware components and software functions as commonly agreed upon. It excludes wear and tear parts on consumable items such as filters, blowers etc. This warranty covers a free of charge repair of the system when returned to our facilities.

10.6 Costs for access authorisation

In case that cost for access authorisation occur, SICK only bears costs of up to € 50,- per person.

10.7 Delivery time

Time for delivery ex works will be approximately 10-12 weeks for small quantities from coming into force of the contract and technical and commercial clarification of all open points, if any. Delivery times for large quantities to be defined case by case.

10.8 Rights of using software and documentation

SICK grants the customer a time-wise unlimited, non-exclusive and non-transferable right of use for the software and documentation delivered under the contract. This right of use refers exclusively to the intended purpose of use on the hardware supplied by SICK under the contract. For standard software bought by SICK from third parties, the customer accepts the original licence conditions of the third party as being part of the contract.
The copyright on the software and documentation remains with SICK for all originals and copies, irrespective of any modifications or developments which the customer may have done in the software and/or documentation.

10.9 Technical changes

We expressly reserve the right to make changes to the hardware and software that improve or do not impair the functioning of the system.

11 Installation/Commissioning

All work conducted at the customer's site including final acceptance tests are defined as part of the set-to-work phase. This work is only included if specifically stated in this quotation. Where it is not stated, it will be charged based on actual working, travelling and waiting time together with actual costs for travel and accommodation.
The customer is responsible for making sure that the site is ready on the agreed date so that the SICK system can be installed without delay. Our service engineers require free access to the site during normal working hours and must be allowed to complete all work on the system without hindrance.
The customer is also responsible for providing the connections specified by SICK.
Furthermore it is assumed that the customer will make available skilled staff to assist with the operation of the plant and installation work during the set to work phase, and for acceptance testing.
Waiting times and additional overtime charges will be invoiced if the installation and commissioning has to occur outside normal working hours, as will costs incurred as a result of conditions at the customer's site delaying the project completion date, where not previously agreed to by SICK in writing.
Installation is carried out on regular working days between 8:00 and 18:00 and is max. 10h per day.

12 Acceptance tests

The site acceptance tests will be carried out immediately upon completion of the set to work activities.

The customer is required to sign the site acceptance test report on successful completion. Logs of working time and materials are also required to be signed by the customer on site.

If a formal acceptance test does not take place, use of the system in a manner consistent with the specifications for which it was designed and installed will be deemed to constitute acceptance of all goods delivered.

13 Read-rates

A read rate of 98% on real luggage is achieved during controlled site acceptance tests according to the following test conditions:

- Each object has a code/tag according to IATA Resolution 740 and RP1740a/b
- Codes/tags are visible for the scanner (not rumpled or hidden by other tags, objects etc.)
- If linear-codes have to be read from underneath, bar code orientation must be ±-45° in conveying direction (as no omni-reading from underneath is possible)

14 Requirements to the Customer

14.1 For technical clarification:

- Drawings of the planned installation-site with confirmed dimensions in any 3 directions
- HOST-Interface and protocol-specifications.
- Particular specifications relevant for the ALIS-configuration
- Special considerations such as:
  - restricted accessibility
  - restricted maximum allowed weight of the components
  - delivery-specifications

14.2 For installation/commissioning:

In general:

- provision of a clean installation area
- Adaptation of machines and devices which are not part of SICK's scope of delivery
- adequate number of test-objects for execution of an acceptance test (objects of any relevant size with original barcodes)

For Tilt-Tray-Sorters:

- Tray-occupied-Signal (24V PNP)
- Speed-Signal (24V PNP, resolution 10-50mm)
- Power Supply 230/300VA (Fuse 10AT)
- Host-Connection
- Ethernet-cabling (STP) from the system(s) to the control- room if RDT400 is used
- A permanent installed mounting platform on left and right side of the system (1mx2m) if distance conveyor to mounting base >1200mm

For 360° Belt-Conveyors:

- Increment-signal (Resolution 10-20mm)
- Power Supply 230/300VA (Fuse 10AT)
- Object-Trigger-Signal 24V PNP
- Host-Connection
- Ethernet-cabling (STP) from the system(s) to the control-room if RDT400 is used
- A permanent installed mounting platform on left and right side of the system (1mx2m) if conveyor to mounting base distance >1200mm

For 90° Induction-line scanners:

- Power Supply 24VDC/50VA
- Host-Connection
- Object-Trigger-Signal 24V PNP