**AS-Interface Introduction**

**Common Industrial Protocol**

AS-i (Actuator Sensor Interface) was designed as a simple system for the quick data exchange of binary signals. Research, spawned by market demands, has made it possible to transmit analog data as well (also see “The new AS-i-specification V2.1”). That data, however, must not be time-critical, since the transmission of an analog value requires several data cycles.

The biggest advantage of AS-i is the quick and uncomplicated installation of the system. Communication (Manchester Encoding) and power supply are transmitted via a 2-wire cable. By using piercing technology for contacting the cable it is possible to insert a new slave at any point in the system. In addition, the arbitrary structure of the bus (line, tree, star, ...) permits the perfect adaptation to the relevant plant or machine.

AS-i is mainly used for small machines, as a subsystem for more complex bus systems (e.g. PROFIBUS-DP) or as an easy introduction to bus technology.

AS-Interface is an open standard. Thus, it is possible to operate different bus participants made by different manufacturers in one network.

**About Lumberg Automation**

**AS-i Products**

Lumberg Automation remains true to the AS-i easy installation concept and offers compact, solid module technology to the customer. The IP67 components have been designed to use directly on machines.

The flat cable shown below is commonly used with AS-i. However, for some applications such as C-tracks, Lumberg provides connections for round cable for all modules as well.

**Technical Data**

Transmission media: Unshielded 2-wire cable for power supply (module electronics and sensors) and data transmission (Manchester Encoding) and optionally mechanically encoded flat or round cable.

**Network Topology**

The bus can be built arbitrarily (line, star, tree, ...). Terminating resistors are not required.

**Bus Access**

- Monomaster system
- Master-slave access

**Number of Slaves**

- 31 slaves by using standard slaves
- 62 slaves by using A/B slaves with profile 2.1

**Standard Transmission Rates and Segment Lengths**

- Transmission rate: 167 kbaud
- Max. segment length: 100 m Bus cycle time
- Standard slaves max. 5 ms in case of full arrangement (31 slaves)
- Just A or B slave per address max. 5 ms in case of full arrangement (31 slaves)
- A and B slave per address max. 10 ms in case of full arrangement (62 slaves)
### Addressing

AS-i slaves are generally addressed via software (the default address is generally "0" for all AS-i slaves). This can be done in several ways:

- **Via the master:** The slaves are connected to the master consecutively. The latter automatically identifies the kind of slave and starts communicating. Then the slave can be addressed.

- **Via an addressing unit:** All AS-i slaves can be addressed with the standard addressing unit "0913 ATL 003" (the Lumberg flat cable modules require the adapter "0913 ATL 002 / 0.35M"; modules according to profile 2.1 require the adapter "0913 ATL 004 / 1 M").

- **Automatic addressing:** If a slave in a network fails, AS-i offers the option of automatic addressing. The defective slave is replaced by an identical one. The master identifies this slave and automatically addresses it to the address of the missing slave.

### Diagnostic system

According to the AS-i specification 2.1 periphery errors like short circuit or overload can be sent to the master in the form of a collective diagnostic. In addition, there is a status LED on the relevant slave.

### The New AS-i Specification Version 2.1

With the introduced AS-i specification V. 2.1 some innovations have been integrated into the AS-i system. The most important alteration is the possibility to operate 62 (instead of 31) slaves in one network. This became possible by the introduction of a differentiation between A and B slaves (e.g., 1A + 1B). To achieve that, the system had to be designed with one output per slave less (max. 4I/3O).

The new specification is downward compatible, and old AS-i slaves can be operated in one network together with new ones. In addition to that, the processing of analog values was improved. The transmission of analog values are integrated in the master. This means that specific function blocks need not be used any more.

### Table 1: Admissible transmission rates

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Slave</td>
<td>Standard</td>
<td>A/B Slave</td>
</tr>
<tr>
<td>Max. Number of Slaves</td>
<td>31</td>
<td>64</td>
</tr>
<tr>
<td>Max. Number of Inputs</td>
<td>4 Inputs x 31 slaves = 124 Inputs</td>
<td>4 Inputs x 62 slaves = 248 Inputs</td>
</tr>
<tr>
<td>Max. Number of Outputs</td>
<td>4 Outputs x 31 slaves = 124 Outputs</td>
<td>3 Outputs x 62 slaves = 186 Outputs</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>5ms for 31 slaves</td>
<td>10ms for 62 slaves</td>
</tr>
<tr>
<td>Analog Value Processing</td>
<td>via functional blocks</td>
<td>integrated in the master</td>
</tr>
</tbody>
</table>

### Product Characteristics

- **Especially suitable for robotic applications (resistance to torsion).**
- **Very good resistance to oils, coolants and lubricants as well as emulsions.**
- **Suitable for use in C-Tracks.**
- **Very good resistance to flying weld slag (e.g.) unfinished constructions.**
- **Very good resistance to acids, lye and chemical cleaning agents.**
- **Very good electromagnetic resistance (EMC) and shielded systems.**
- **Very good vibration and shock resistance.**
- **UL approved.**
- **UL/CSA approved.**

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Integrated AS-i application.