

Function

Modern manufacturing facilities in all areas of industry contain a large number of sensors and actuators for monitoring sequences. The automated sequences are controlled using computers. In most cases, a PLC, a PC or a higher level BUS.

AS-Interface® eliminates all the previous cable nightmares where each and every sensor and actuator had to be individually wired to the control.

The components are directly wired to the standardized, unshielded 2-wire AS-Interface® cable. The result is a sensor and actuator tree with just a single central cable.

In a string, up to 124 sensors and 124 actuators can be operated. With 31 slaves, the cycle time is just 5 ms, whereby up to 4 binary elements can be connected to each slave. Doubling the number of slaves is possible by using version 2.1. Up to 62 slaves can be handled on a single master. The cycle

time must then also be doubled. Full compatibility allows existing and new slaves to be used together. The energy supply for the components is also provided on the AS-Interface® line. As an option, a component may also have its own separate power supply.

In operation, the distinction is made between two types of binary elements: on the one side AS-Interface®-compatible sensors and actuators with integrated AS-Interface® chip, on the other side traditional sensors and actuators which are not yet adapted to AS-Interface®.

These older versions require an additional AS-Interface® modules with an integrated AS-Interface® chip (ASIC for Application Specific Integrated Circuit) which contains all slave functions and converts the parallel sensor data into serial, AS-Interface®-compatible data.

In the case of AS-Interface®-compatible sensors and actuators, the ASIC is already integrated, so that the component can be connected at any desired point of the 2-wire cable using a special wire terminal. Especially convenient is the miniature coupling modules with which all AS-Interface® sensors and actuators can be terminated.

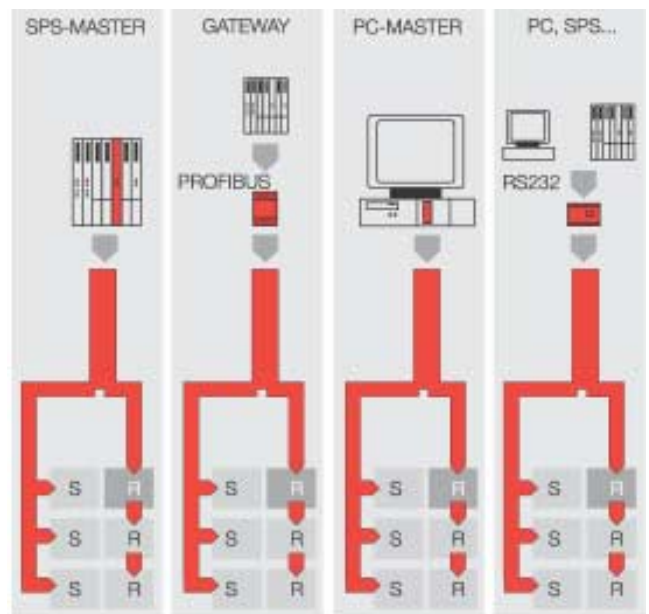
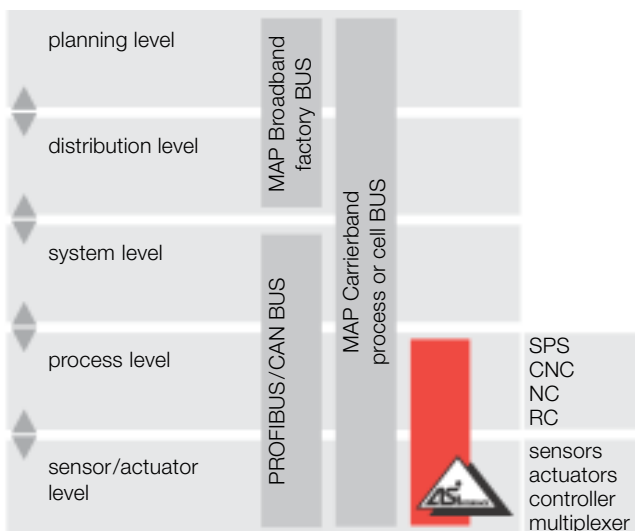
The data processed by the ASIC are sent on the AS-Interface® line to the master, which coordinates the dialog with the slaves and passes the current data on to the controller.

The AS-Interface® master

The AS-Interface® master takes over the entire management of the data traffic in the AS-Interface® network and makes the connection to the control. Thus an AS-Interface® network behaves for the user like a cable tree. The user program sends actuator data to the AS-Interface® master instead of to an output module. In addition, data from master functions are used for monitoring the network and system diagnostics.

The master is available in the form of a self-contained unit which can communicate on an RS232 line, or as a rack-mount card for integration in a PLC, PC, or other microprocessor-based systems.

Along with specific PLC and PC masters, gateway masters can be used, e. g. for use with PROFIBUS, or CAN-BUS based systems such as DeviceNet or SDS. In addition universal masters are available for further processing of data.



Protocol

In order to achieve a short cycle time, the AS-Interface® telegram has been kept very short. Following each master request (from master to slave) is a slave reply. Following both the start and control bits is a 5-bit address (0...31) and information. The request is ended with a check bit and a stop bit. Then follows in the same protocol block a 4-bit answer from slave to master.

In the information part (bits 8...12) for the slave, 3 types of information can be transmitted:

- 4 bits of data
These are the data for standard operation for controlling the actuators
- 4 bits of parameters
Data for parametering of sensors. These parameters are sent once per cycle to one slave each (e. g. selecting, sensing distance).
- 5-bit command
Command data for the slave (e. g. for programming of the addresses).

AS-Interface® profile

The profile of an AS-Interface® slave is critical for component compatibility. The goal of the profile specification is to assure a uniform identity for the various slaves having the same functionality.

The AS-International Association has defined profiles for masters using the letter M and slaves identified by the letter S.

Three profiles with different functionality are defined for the masters:

- M0 Minimal master for data exchange only
- M1 Full master with having all functions for data/parameter exchange and addressing capability
- M2 Simple master for data exchange and minimal parameter setting.

Two pieces of information are provided for as coding. Firstly, the configuration of the four I/O's of the slave are specified as to whether they function as an input, output, or bi-directional. Secondly, an additional code is provided for which describes the meaning of the data and the parameter bits.

The I/O and ID codes are closely related, and together they represent the slave profile.

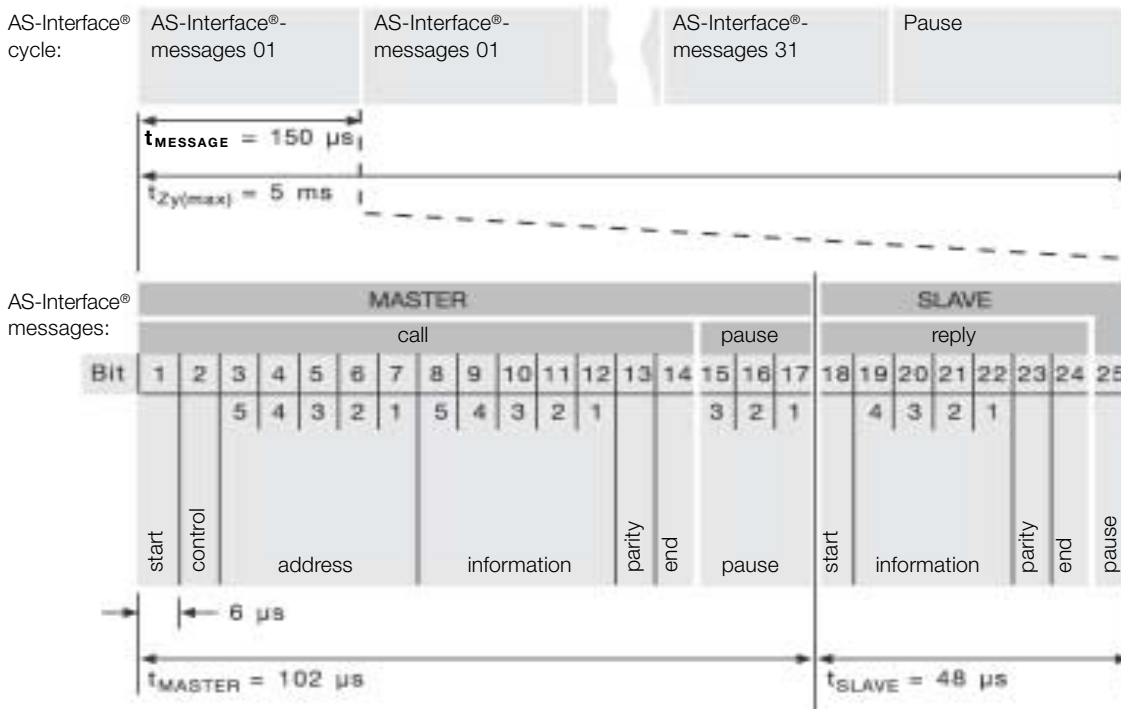
The slave profile consists of the I/O code (1st position) and the ID code (2nd position), and is stored (non-volatile) in the slave by the slave manufacturer.

The user is not permitted to change but may read the slave profile.

The coding is stored in hex format (i. e., the values A through F are also represented).

An "F" in the I/O code indicates that there is no valid configuration present. "F" in the ID code however is specified for company-specific uses, and allows even non-standard products which do however meet the AS-Interface® specification to be connected.

The profile information is included with the technical data for the respective product.



AS-Interface® modules

AS-Interface® modules are used for connecting peripheral devices to the AS-Interface® network. They are screwed onto coupling modules or simply clamped to the line and make immediate contact to the AS-Interface® ribbon cable. The network can thus be constructed very quickly, reliably and cost-effectively.

Active AS-Interface® modules

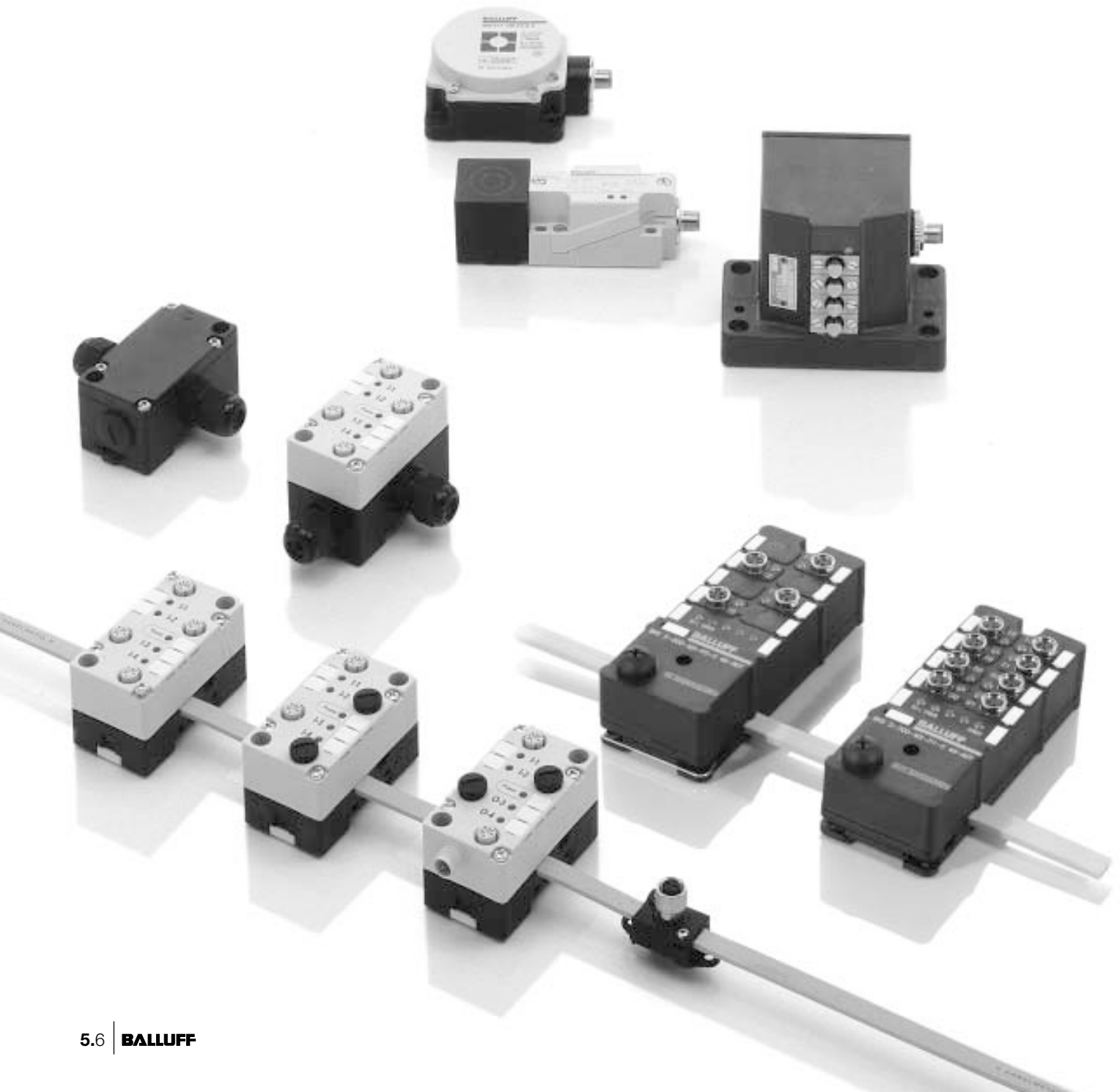
The active AS-Interface® modules contains the required electronics for slave operation when connecting conventional peripheral devices. Up to four of these sensors or actuators of traditional, on-the-shelf design can be connected.

Passive AS-Interface® modules

The passive AS-Interface® modules contains no electronics. It permits connecting of peripheral devices with AS-Interface® chip and is simply clamped to the AS-Interface® ribbon cable.

AS-Interface®-compatible sensor

This sensor with integrated AS-Interface® chip is AS-Interface®-compatible without a modules and can be addressed directly by the master. Four data bits can be used for the binary switching signal and for utility functions such as contamination checking, self-test, ready signal, reset, end-of-travel control and similar.



AS-Interface® power unit

This is required for powering the AS-Interface® string. Its use with a master or repeater permits a current capacity of max. 2 A per string and max. 100 mA for AS-Interface® components directly over the AS-Interface® cable.

The AS-Interface® power unit includes short circuit and overload protection. This indicates whenever the permissible limits are exceeded.

A standard power supply for external supply of sensors or actuators, e. g. for higher current draw, can be used. External supply in the case of actuators can be provided by the user directly at the site.

In practice it is almost always possible to power all sensors in an AS-Interface® string from the AS-Interface® power unit.

The AS-Interface line

The AS-Interface® line permits simpler and faster installation.

The special profile prevents lead reversal when connecting wires.

Contact is made with two spade contacts. They penetrate the ribbon cable when the slave upper part is screwed down on the lower part. The protective shell of the AS-Interface® cable consists of self-repairing insulation material which closes the contact point upon release.

This cable is not absolutely required. A standard 2-conductor round cable can also be used (but here a different modules lower part must also be used).

Maximum cable length 100 m. Through use of a repeater, longer distances are permitted.

AS-Interface® addressing unit

This unit permits the modules as well as the AS-Interface®-compatible sensors and actuators to be manually addressed with the desired address.

The operation of this unit is quite simple, and uses just 5 buttons:

- <+> = increment slave address
- <-> = decrement slave address
- <PROG> = address slave
- <ADR> = read slave
- <MODE> = function select

In addition, the display indicates any error conditions which may occur.

