

## Installation of the AS-i control head Ki Top

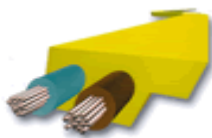
### General information about the bus design

As the name (**Actuator Sensor Interface**) implies, the bus is designed for the installation level.

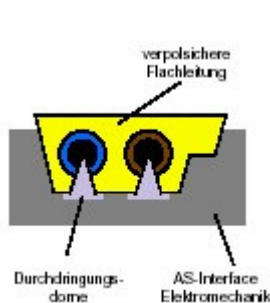
Up to 31 slaves can be connected to the AS interface with the A bus and 62 slaves with the A/B bus (master slave structure).

3 binary actuators are connected at each slave. In addition, up to 2 external sensors can be connected. The master permanently monitors the slaves by inquiring those cyclically (<5ms/10ms). The cycle time adapts automatically to the number of connected slaves (6 slaves approx. 1ms, 31 slaves approx. 5ms).

The **AS-i version 2.1** allows 62 slaves (10ms) and offers an extended diagnosis and an easy analogue value transmission.



**Data and power** (max. 8A) are transferred over a reverse polarity protected and unshielded two-wire circuit (2x1.5mm<sup>2</sup>).



#### AS-i -: light blue, AS-i +: brown

Contacting at the AS interface is made by piercing needles which penetrate the cable jacket. Protection class IP67 is guaranteed, even after interruption of a connection (self-healing).

The cable length is limited to 100m, but can be lengthened by means of the interconnection of repeaters.

The standard cable is yellow. If a supplementary voltage is required, **black** (up to 30V DC) or **red** actuator supply cables (230V AC) are used.

### Component parts of the bus

#### AS-i power pack

The AS-i power pack consists of two functional blocks: a conventional power pack and a data decoupling, so that the data modulated upon the operational voltage are not short-circuited over the power pack.

Voltage levels mostly range between 26.5V and 30.6V at its terminals. The centre of the balancing capacities represents a reference point identical for AS-i + and AS-i - and is the chassis ground of an AS-i system.

The power packs are overload- and short circuit-proof.

### **AS-i Master**

Sends one-address messages and directly gets back the answer from the addressed slave.

### **AS-i Gateway**

AS-i has been developed in order to complete the higher bus systems, such as Profibus, CAN or Interbus. There are so-called gateways which act as a connecting link, for the subsequent treatment of data. An AS-i master is integrated.

### **AS-i Sensors**

An AS-i chip is integrated into these sensors. They can be directly connected to the bus. There are capacitive and inductive proximity switches, limit switches, light key buttons, light curtains and laser scanners AS interface. In addition to that, there are emergency stops and safety position switches.

### **AS-i Repeater**

The bus length can be lengthened with the repeater. It does not require any additional supply voltage and does not occupy any address.

### **AS-i Power Extender**

The distance between power pack and bus segment can be lengthened with it.

### **AS-i Addressing device**

The modules, actuators and sensors can be manually addressed with this device.

## **System conditions**

- A Bus        If a bus with 31 nodes (slaves) shall be created, you need a master which can manage these 31 nodes.
  
- A/B Bus     In order to create a bus with 62 nodes, you need an A/B master. It can manage 62 nodes. The integration of 62 nodes has been made over the output bit 4 of the AS-i slave chip. The master detects over this output bit if an A slave or a B slave has been selected at the bus.

## Cable length and calculation

The cable length of a standard bus is fixed to 100 m. The cable length is calculated as follows:

Cable length with cross section 1.5 mm 100m

In case of smaller cross sections such as M12 connections, the cable length has to be calculated double; i.e. if the length of the connection cable M12 / 0.24mm = 1 m, then the total length of the bus is only 98m.

## Connection

There are different possibilities to connect the slave to the master.

### Method 1

Generally, the bus can be connected over the AS-i special terminals. The connection is made either over the yellow cable or over the additional black or red cable in case of wiring for auxiliary power.

### Method 2

The slaves are connected to a bus over M12 connecting cables.

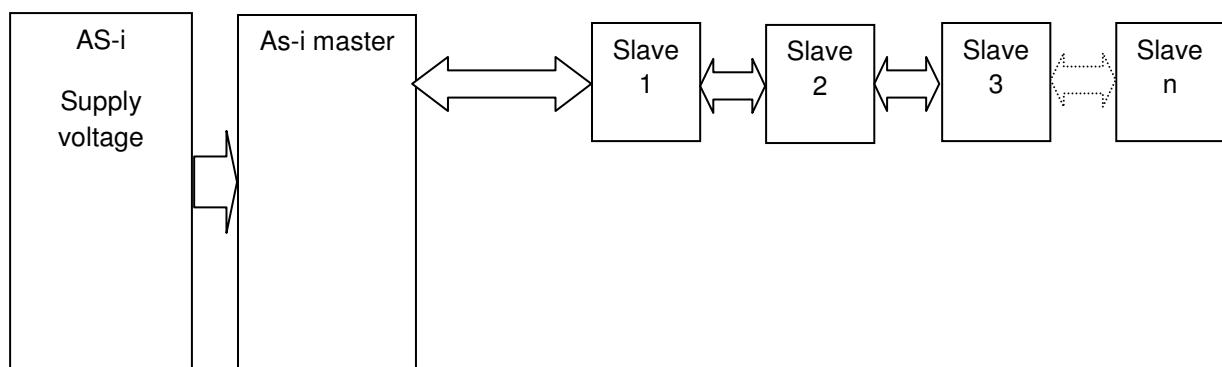
The cable which is fitted with cable connectors, can then be the docking station of the slave.

Connection boxes are another possibility to connect slaves.

### Method 3

The slaves are directly wired and inserted in the Ki Top over the screwed cable glands. There the connection is made over a threaded 4-contacts connector.

## Design of the bus



## Planning of the bus

A timely careful planning of the bus structure which shall be integrated into a plant, must be a general condition. Then it has to be determined what node shall have which slave address and what function the individual nodes shall have. Only then the technical structure is defined.

There are different ways to reach this.

1. The slave is addressed over the master / gateway. In order to do this, the master must be in the configuration mode. Then one slave after the other is connected to the master and the address is set at the master. The master sends the address to the slave. The slave is separated from the bus. The next slave is programmed as just described. After all slaves had been programmed, the bus can be connected according to planning. The current configuration is stored at the master. Then the master is set in the secured mode.
2. The manual programming device developed for AS-i is used to address the slaves as planned. The slaves are added to the bus, the master having to be in the configuration mode. The current configuration must be stored after junction of the bus. Then the master is set in the secured mode.
3. If the master is in the automatic insert mode and an already known configuration is stored, a slave, if it has address 0, can be automatically integrated into the bus. The slave which is recognized first to be missing, is integrated into the bus.

**ATTENTION!** Insertion is possible only if a known configuration is filed.

## Installation hints for the bus

### Power supply

As-i is an earth-free system. When setting the power supply, make sure that only AS-i power packs with data decoupling are used. Only the earthing of the power pack intended for it is connected with the system earth.

Extension of the 100m standard cable of the As-i network

The whole cable length must not exceed 100 m, a reduction of the cross section basically resulting in a reduction of the bus length. For example, with M12 cables, the length of the cable is multiplied by 2 and this length is subtracted from the bus length of 100 m. Every branch and terminal must be generally included in the bus length.

### Extender

If the standard length of the bus must be longer, an extender can be mounted, if necessary. The maximum cable length between the extender and the master must be no more than 100 m. Neither As-i slaves nor power supplies may be between the master and the extender. The + and – cables must not be mixed up.

### Repeater

2 repeaters at most can be connected in series into the AS-i loom, i.e. the cable length is then 300 m. Please consider that the directives regarding the cable length must always be observed. Thus 3 segments will be produced, each having a length of 100 m. Every repeater has to be fitted with an AS-i power pack.

**Attention!!** An extender must not follow to a repeater.

### Slaves

Each slave must have a unique address.

A bus version: Addresses 1 – 31, i.e. 31 slaves, can be allocated.

A/B bus version: Addresses A1 - A31 and B1 – B31, i.e. 62 slaves, can be allocated.

**ATTENTION!!** Slaves which are fitted with an SAP 4.0 chip, can be reprogrammed 15 times at most. Then they will keep the addressed stored at last.

## **Auxiliary power**

If an auxiliary power is required for the slaves, the black shaped cable can be used with a 24 V DC supply. If an auxiliary power of 230 V AC is required, the red shaped cable can be used.

It is possible, of course, to make cabling with appropriate round cables having the same quality and to seal them with cable bushings. In so doing, a safe design of the complete system is possible.

## **Wiring**

The AS-i wiring should always be separated from energy and power cables. Despite the insensitiveness to electromagnetic compatibility of the AS-i signal, you should prefer a separation of power and signal cables. If possible, the yellow shaped cable is used to power the AS-i. The brown lead is used for the + supply and the blue lead for the – supply of the slaves. Always make sure that every AS-I loom is led with a separate cable. The looms must not be laid in a bus. Individual leads should always be cabled or laid in parallel.

## **Electromagnetic compatibility**

Inductivities must always be wired with protective diodes or varistors. Frequency converters are always connected with shielded cables. In order to suppress interferences, always mount input and output filters at the frequency converters.

Attention!! Always observe the recommendations of connection mentioned in the operating instructions of the converters. It is essential to observe earthing and its professional wiring.

## **Supply of sensors and actors**

Sensors and actors must be connected over the intended input and/or outputs of the slave. The cables should be as short as possible. Make sure that the power cables are separated.