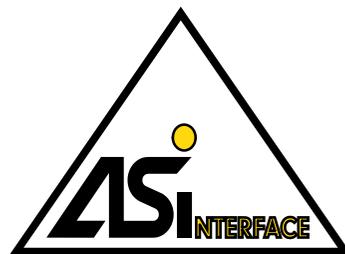# Project:

Special milling machine

in machine build

Retrofitting of the existing machine with automatic feed and stacking area for material

A 25 year old milling machine was fitted with an automatic feed and stacking area for material. This milling machine is used to mill round steels into squares at one end for further machining. In the wake of plant rebuilding the basic machine was overhauled. A requirement for the control concept of the plant was that the system to be used should enable easy and low-cost wiring and flexible commissioning of individual plant sections. As the wiring complexity was to be considerably reduced the decision could only be for an intelligent field bus system -> AS-Interface.
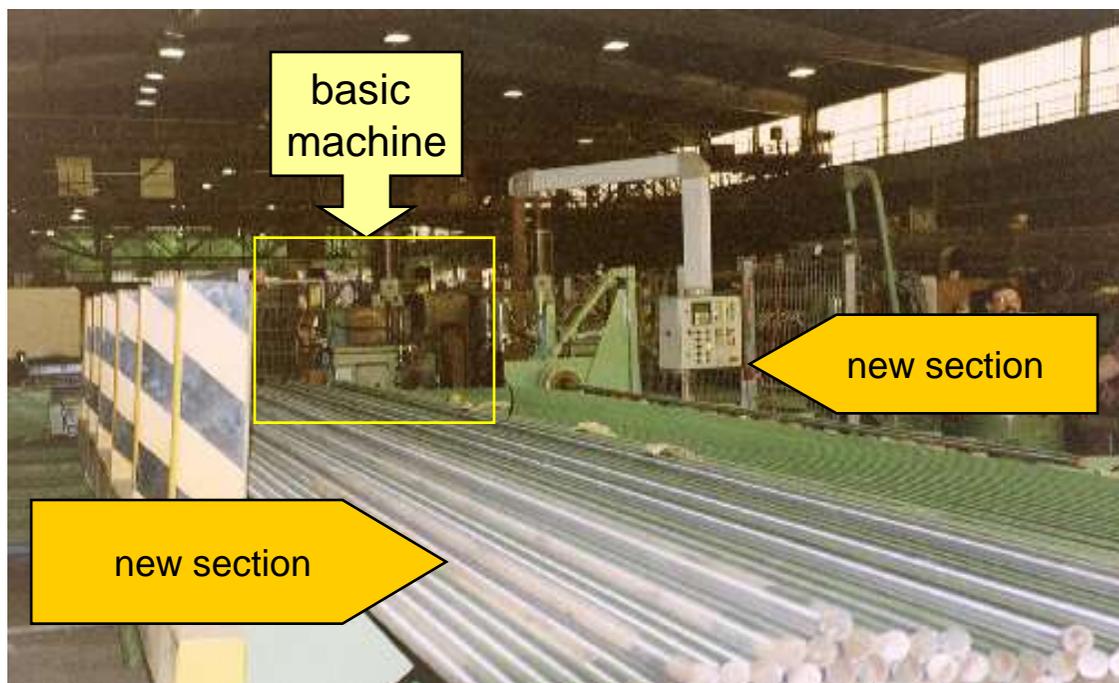

Figure 1: View of the material feed

Project planning

The company Elektro Arnold implemented the build of control cabinets, electrical installation, programming and commissioning of the control system.

The control system is based on the Siemens PLC S5. Approx. 80 inputs/outputs are managed. In the control cabinet I/O modules are the conventional interface with the power part. The slaves in the field are integrated via the AS-i master card. Using AS-i in the field enables quick extension or modification in the plant at any time during retrofitting. All components are premounted and tested thus reducing mounting and commissioning time.

Planning

⬇

Premounting

⬇

| Final assembly |
|:---:|

⬇

Commissioning
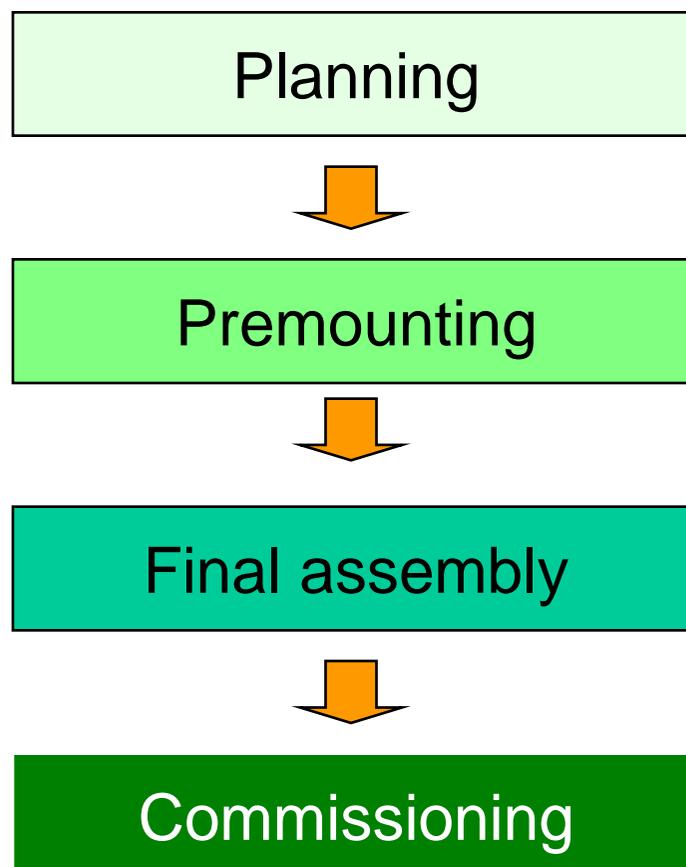
Description of AS-Interface (AS-i)

AS-Interface has been available on the market for approx. 10 years and was developed for industrial automation by the AS-Interface International Association founded by a group of companies (Festo, Siemens, ifm electronic, etc.). AS-i is now used in many aeras (process technology, conveying, etc.). The most important basis of the development is a manufacturer-independent compatibility of all AS-i products. Furthermore, the transmission of data and supply voltage to the sensors and actuators in the field via an unscreened two-wire cable is another cornerstone of the system. The 2-wire cable can be a common round cable (min. 2x1.5 mm²) or a yellow profiled cable.


Bild 2: AS-i classic module (2DI/2DO) with flat cable lower part and M12 connector

AS-i cable

isolation displacement contacts

AS-i electromechanics
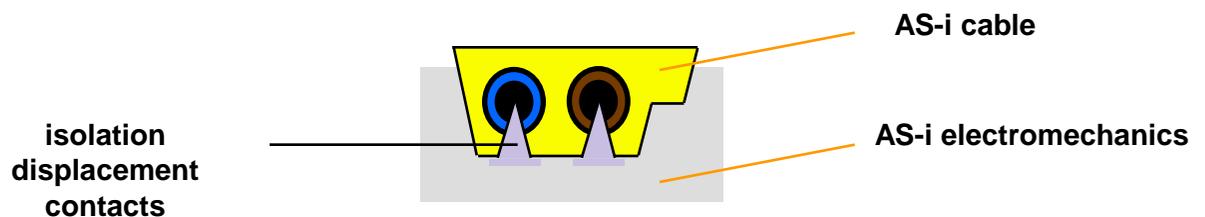
This cable is the AS-i flat cable which is connected to the AS-i slaves via the standardised flat cable lower parts using IDC technology. The AS-i flat cable thus ensures fast wiring protected against reverse polarity. This allows saving of time and money when new systems are installed. AS-i is controlled via a central control unit, the AS-i controller (with 1 or 2 AS-i masters). The masters in the AS-i controller ensure communication of the controller with up to max. 62 AS-i slaves (I/O modules and AS-i system solutions) per AS-i master which are distributed in the whole installation. AS-i system solutions can for example be AS-i AirBoxes for the control of pneumatic cylinders, AS-i valve islands, proximity switches with integrated AS-i slaves, SmartLogic for connection to encoders, etc.

Another feature of AS-i is a standardised connection of the system to other systems (e.g. Profibus DP, Interbus, Modbus, LON, etc.) via the AS-i controller. This is the only way to create continuous systems from sensors/actuators through to the control room.
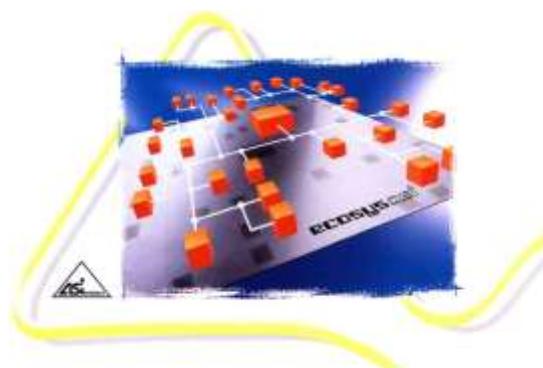
Description of the AS-Interface (AS-i)

## Parallel wiring:
the (often still) common method

- ✍ **Each sensor/actuator is directly connected to the PLC.**
- ✍ **Many distributed terminals make fault location difficult.**
- ✍ **Cable harnesses of several 100 cables are not rare.**
- ✍ **Large control cabinets are required for I/O modules and terminals.**
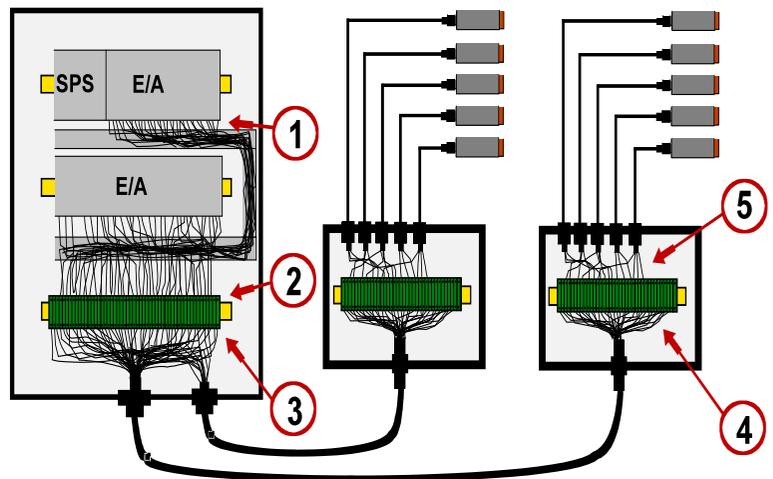
1-5: Many terminals and marshalling points

The alternative:
Actuator-Sensor-Interface

- ✍ **The AS-i master in the controller replaces the I/O modules, i.e. smaller control cabinets**
- ✍ **Sensors and actuators can be connected to the AS-i cable in any way.**
- ✍ **Few terminals and better diagnostic options make fault location easier.**
- ✍ **Modular design without software adaptation.**
- ✍ **Commissioning of sections of complex systems is no problem.**
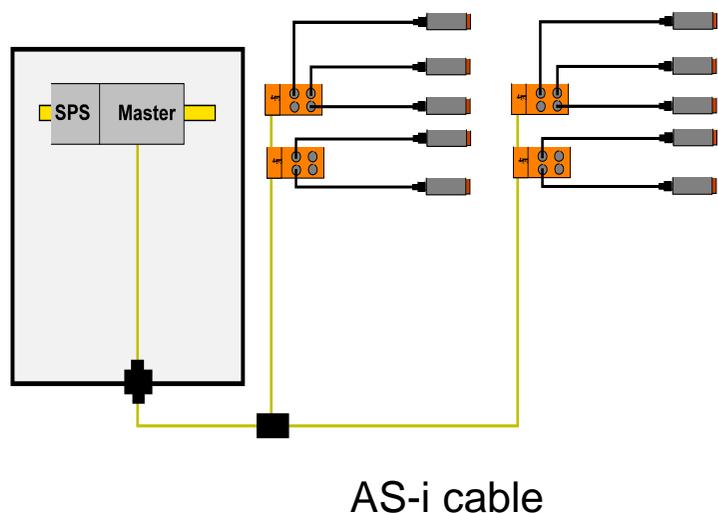
AS-i cable

Operating module with AS-Interface solution

Figure 3: Combination of an illuminated push-button module for front panel mounting (AC2351) and SmartLine control cabinet modules (AC2250, AC2251)

The operating module of the system is a combination of common mechanical switches and lamps which are connected to AS-i via the AC2250 and AC2252 control cabinet modules. With respect to push buttons wiring complexity was minimised by using AC2351. The LEDs of the illuminated push-button module are supplied via the AS-i cable requiring no external voltage supply. A wide range of coloured caps allows easy adaptation of the push buttons to the requirements of the installation.

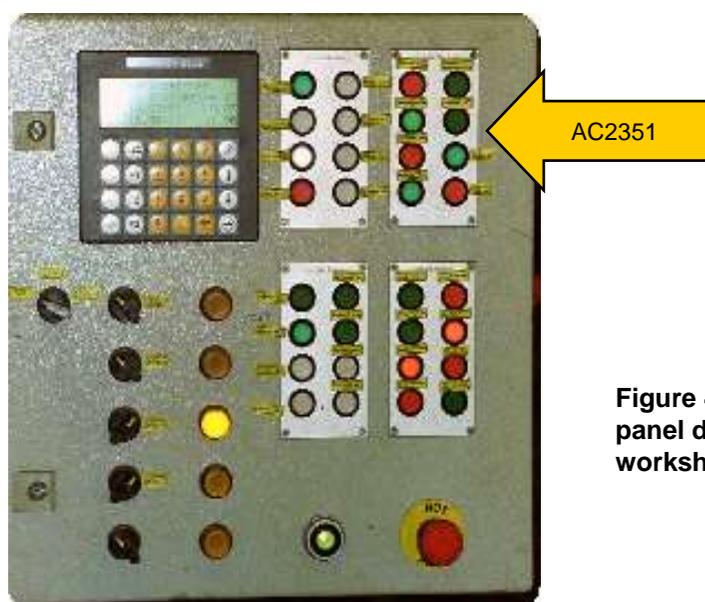Part of the operating panel was commissioned in the workshop.

Figure 4: Front view of the operating panel during commissioning in the workshop.

Robust compact modules in the field

Vibration and the environment in a metalworking plant place high demands on the field components. The compact modules of ifm electronic provide the right solution due to their design and full potting of the housing. They allow implementation of all common I/O combinations of the AS-Interface.

Figure 5: Compact modules on the milling machine

Figure 6: Compact module under the stacking area for material

Minimised control cabinet

Figure 7: Control cabinet with power part

AS-i components need little space in the control cabinet.

AS-i power supply AC1209

AS-i master AC1050

AS-Interface components installed

♦ AC1050 AS-i master for Siemens PLC S5/CP2433
♦ AC1209 AS-i combined power supply 2.8A AS-i / 6A 24V DC
♦ AC2351 AS-i illuminated push-button module for front panel mounting
♦ AC2250 AS-i SmartLine module for control cabinets, 4DI
♦ AC2252 AS-i SmartLine module for control cabinets, 4DO
♦ AC2410 AS-i compact module, 4DI
♦ AC2417 AS-i compact module, 4DO
♦ AC2411 AS-i compact module, 2DI / 2DO
♦ AC2412 AS-i compact module, 4DI / 4DO
♦ AC4000 AS-i flat cable, yellow
♦ AC4002 AS-i flat cable, black

Conclusion

Using AS-Interface (AS-i) allowed installation and commissioning of the plant in a relatively short time. Due to the AS-i technology the plant can now be extended quickly and easily at any time without having to modify the control cabinet.

Mr Arnold:
Using AS-Interface we could achieve our project goals quickly and easily. Premounting of the individual components and commissioning went smoothly. Since then the installation has been in operation without problem. We will include AS-Interface in our future design concepts.

Companies involved:

Design and build: **Klaus Peter Arnold Elektroinstallationen**
                      Im Gewerbepark Mark
                      58300 Wetter
                      Contact partner: Mr Arnold
                      Tel.: 02335 / 977- 311

We thank the company
Arnold Elektroinstallationen
for the good cooperation.

The following ifm employees were responsible for the project:

Mr Knollmann	**ifm office mitte-west**	**Tel.: 0 20 51 / 28 78 0**
Mr Törker	**ifm office mitte-west**	**Tel.: 0 20 51 / 28 78 0**

ifm electronic gmbh
vertrieb mitte west
Siemensstraße 28
42551 Velbert

If you have any questions concerning this application report, please contact:

ifm electronic gmbh
vertrieb mitte-west
Nottebohmstraße 25
D-58511 Lüdenscheid
Tel.:   0 23 51 / 43 01 0
Fax: 0 23 51 / 43 01 39
e-mail: info@ifm-electronic.com

You find more application reports on our website:

www.ifm-electronic.com / Service / Project service