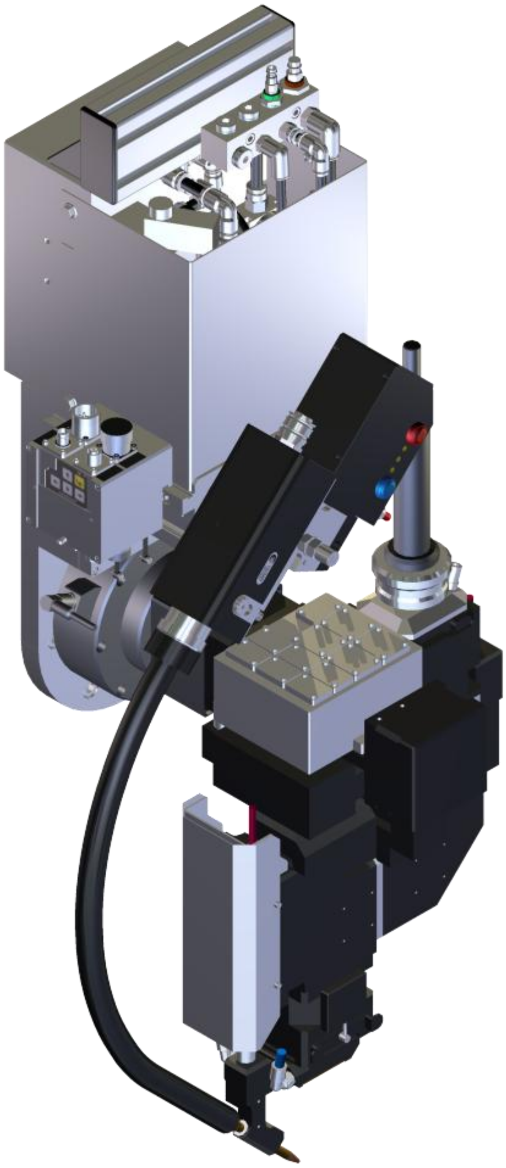
ALO3/APN1 Controller | Automatic System Check

DESCRIPTION OF FUNCTION

The ALO3 and APN1 processing units are equipped with a wide variety of sensors and actuators. It would be possible for the ALO3/APN1 controller itself to check the function of these sensors and actuators, but this would require additional measure equipment.
The master machine recognizes the current situation at the processing unit and can automatically carry out a plausibility check on the sensor readings from the ALO3/APN1. This automatic system check can be used to catch any deviations from the predefined reference value.

Since not all measurements can be directly output on the Fieldbus as binary variables, the MUX protocol should be used for the robot controller.



An application example: ALO3 with the wire-feed module and GAS media coupling

THE ADVANTAGE:

- After unexpected situations (such as a crash), the automatic system check can be used to determine if the affected processing unit can still be used in your production process.
- This speedy, automated test helps you to save both time and money.
- By monitoring the measurement trends, it is possible to detect any gradual deterioration of the processing unit.
- All functionally relevant modules (such as the swivel axis, the force sensor and the telescoping arm) can be checked.
- Only with the ALO3:
  An external laser power measurement is used to determine if there is a power drop in components along the entire optical path. This include the laser generation, transmission along the optical cable, the optical shaping in the processing optics and protective equipment (such as protective glass).

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THE ALO3/APN1 PLATFORM

The ALO3 / APN1 processing units consist of modules: including the swivel axis, force sensors, telescoping arm unit (TA) and autofocus module (for the ALO3) or linear drive (for the APN1).

All modules have a sensor system for detecting their current position and/or state. This illustration shows an ALO3 with its corresponding modules.

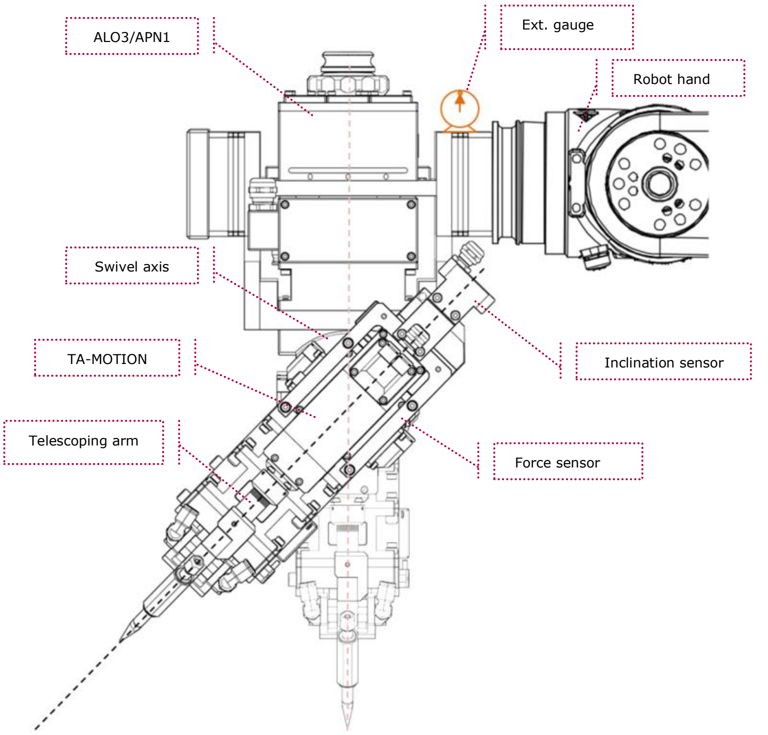

Figure 1: Actuator/sensor modules on the ALO3 processing unit

The following measurement signals are taken at the modules. They can then be read and processed at the Basis HMI-B or via the MUX protocol.

The position of the swivel axis (**1** + **2**) is detected by an encoder.

The absolute angle in the area of the swivel axis (**3**) is measured by the inclination sensor.

The force acting on the wire guide module (**4**) is detected using the force sensor.

The immersion depth of the wire guide module (**5**) is measured at the telescoping arm and then processed.

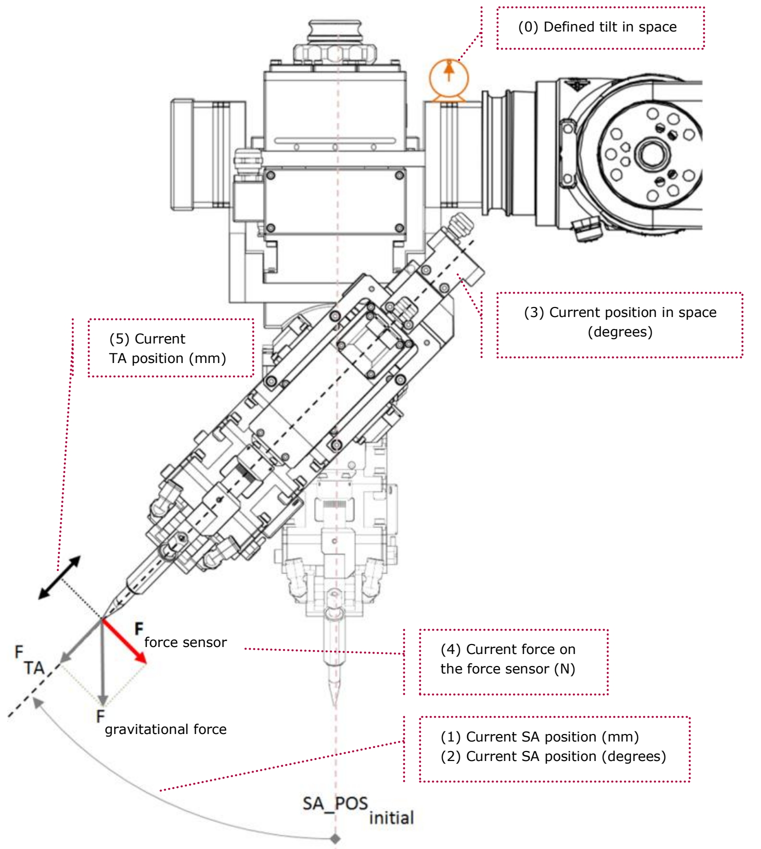

Figure 2: Measuring signals from the ALO3 processing unit

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THE MEASURING MECHANISMS

For the swivel axis:
The processing unit must be aligned horizontally (refer to **0** in Figure 2) and the swivel axis should be positioned at 0°. In this position, the actual values for the swivel axis (**1** + **2**) must acknowledge the correct position. The inclination sensor (**3**) must indicate approximately 0°.

If, for example, the swivel axis is now positioned at 45°, the measured value from the inclination sensor must be identical (within the tolerance range) with the measurement from the swivel axis. This makes it possible to check the inclination sensor against the alignment and sensors of the swivel axis.

For the force sensor:
When the swivel axis pivots from its zero-position, the weight of the wire guide module acts on the force sensor. This is depicted by the forces parallelogram shown in Figure 2.

The force measured at the default (delivered) state for a 45° angle must be saved by a program to the robot controller and then compared with the actual measured value. This should also be carried out for the negative-side swivel in order to assess whether the measurements function properly in both directions. The measured weight force at +45° must have the same magnitude as the measure force at -45°. However, an asymmetric routing of the hose packets can lead to deviating results.

For the telescoping arm:
The telescoping arm is tested using a relative movement of the robot. The wire tip or contact tip is positioned on a solid surface (at SA position 0°) and the telescoping arm is moved to its centre position (refer to Figure 4). If the robot is now specifically moved 5 mm deeper or higher, the actual value from the telescoping arm must correspond to this movement.

Make sure here that the wire is shortened or withdrawn completely.

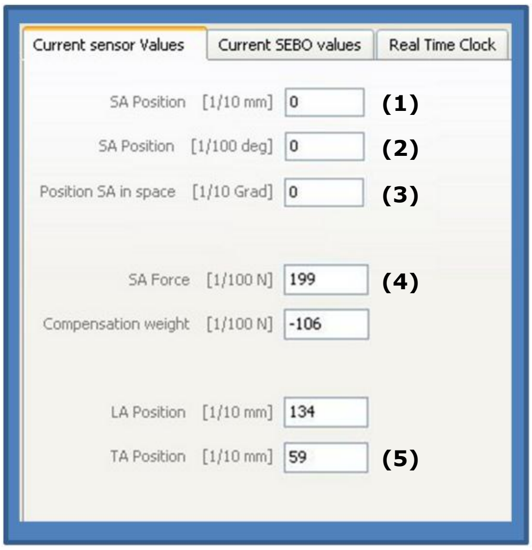

Figure 3: Sensor measurements in the Basis HMI-B parameterization software

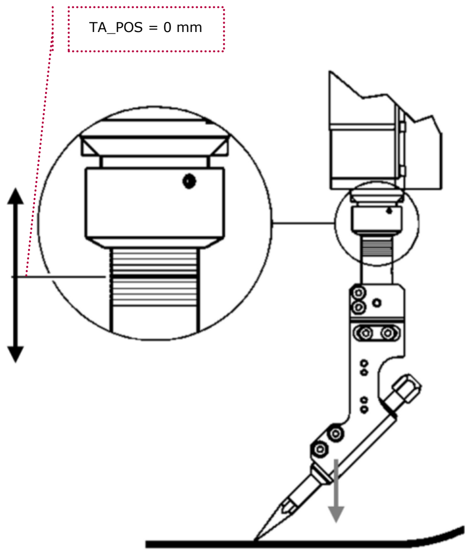

Figure 4: Immersion depth of the telescoping arm