

# AST10

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**Sequence Controller with  
integrated Power Supply**

## **Operating Instructions**

### **F-Function**

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## 1 General

The F-function of the AST10 offers – besides the supervised values of torque and angle – the following additional possibilities:

Supervision of total duration of an assembly and with this option it is possible to detect incorrect screw threads, missing washers or an indirect depth control.

The number of screw joints per product. With this option it is possible to assure that each product is completely assembled.

The F-Functionality is only possible with handheld screwdrivers!

The adjustment for the F-function is located in the menu at:

Setup->Optional Parameters->F-function

## 2 Functionality

If the F-function is activated and adjusted to the screw-joint, then the assembly can be started. Position the Screwdriver directly and perpendicular to the screw location. The screwing sequence starts according to the design of the screwdriver either with push-to-start or with button start.

Once the programmed shut-off condition is achieved, the screwdriver shuts off. However, the total cycle time of the screwdriver has to be within a pre-determined time-frame. If this is the case, then the screwdriver is ready for the next assembly.

Otherwise, an error message is shown on the display, the RED LED glows and the controller doesn't release the screwdriver (no Ready-Signal, i.e. no green LED). After resetting the error (either with the reset button on the controller or through the PLC-port), the screwdriver is again ready for operation.

If additionally the number of screw joints per part has to be controlled, then the controller will give an acoustical signal – once the pre-programmed number of o.k. Ascrew joints are reached – and the display indicates that the part has to be changed. The screwdriver is blocked by the AST10 controller, until a new parts is presented (loaded). Thereafter, the assembly continues as before.

The screwdriver programs 1 through 15 can be extended to include an individual time-window, as well as the number of screw joints per part.

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However, per product only one program can be used, which means that a program change is only possible with a corresponding part change.

The screwdriving program 16 can be used as well, but it is not supervised by the F-function, which means that errors do not have to be reset and O.K. Ascrew joints will not increase the number of O.K. Ascrew joints per part. The program 16 may be used as a loosening program to correct errors. If this is not allowable, then deactivate program 16, or remove program 16 if it is already activated!

The error evaluation is identical to the error evaluation under normal operation of the AST10; however, the following additional supervisory criteria's are evaluated:

- Time-Frame for the total-time of the screw-process
- If a part-presence sensor is used: Presence of the part

The following additional errors or informational notes are shown:

displayed Text	Meaning
OK	No Error
TOO SHORT	The predetermined minimum time of the screw-process was not reached
TOO LONG	The predetermined maximum time of the screw-process was exceeded
PART MISSING	No part is present
CHANGE PART	The predetermined number of individual O.K. screw-joints per part has been reached! Change part!
...	

**2.1 Operation with supervision of number of screw-joints per part**

This operational mode is activated if the amount of individual screw-joints per part is input into the screwdriving program with a number larger than ZERO.

With this operational mode, the time-frame in the menu item “Settings->Programs->Time Frame“ will be activated. The number of individual screw joints in the menu item “Settings->Programs->number of screw joints“ will be controlled as well.

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If the screwdriver does not shut-off within the predetermined time-frame, then an error message will be shown on the display and the RED status-light glows.

If the part is removed prior to reaching the predetermined number of O.K. screw-joints per part, then an error „Part Missing“ is displayed.

If the correct number of O.K. screw-joints is reached, the controller will give an acoustical signal and the display indicates „Change Part“. If the screwdriver is used on the same, already assembled part, the AST10 controller blocks the screwdriver, until a new part is presented (loaded). Thereafter, the screwdriver is ready for the next screwing sequence.

This operational mode also allows to lock the part, e.g. with a locking-cylinder. For this option use the output „Magnetic Valve“ on the Interface F-controller. The part will only be released, when the correct amount of O.K. screw-joints per part are reached.

If the part has to be removed prior to reaching the predetermined number of O.K. Screw-screw joints (because of an error), then the output can be released through the PLC or by using the right function key on the controller (if activated).

## **2.2 Operation without the supervision of number of screw-joints per part**

This operational mode is active, if the number of screw-assemblies per part is input into the screwdriving program with a ZERO.

Then the AST10 reacts to incorrect screw-joints as described under item *“Operation with supervision of screw-assemblies per part“*. However, the monitoring of O.K. screw-assemblies per part is inactive. If a part-sensor for part presence or a PLC is connected, then this operational mode will not be evaluated.

## **3 Menu Functions for the F-Function**

### **3.1 Settings**

#### **3.1.1 Activate**

The system offers a choice between „Activate F-Function“ yes or no.

Make your selection with the cursor keys. Confirm your selection with the ENTER-key and exit this menu with the ESC-key.

#### **3.1.2 Reset Button**

The system offers a choice between „Reset by Button“ yes or no.

Make your selection with the cursor keys. Confirm your selection with the ENTER-key and exit this menu with the ESC-key.

If the reset button is active, then an error reset is possible on the controller, otherwise a reset signal has to be given over the PLC-port.

#### **3.1.3 Part Clearance**

The system offers a choice between „Part Clearance by Button“ yes or no.

Make your selection with the cursor keys. Confirm your selection with the ENTER-key and exit this menu with the ESC-key.

If the part clearance by button is active, then the right function key on the controller can make the part clearance, otherwise the part clearance signal has to be given over the PLC-port.

#### **3.1.4 Programs**

Use the menu item „Programs“ to change the parameter for the F-function of each individual program.

First, input the program number, then change the number of screw-joints per part and the time frame.

##### **3.1.4.1 Number of Screw-joints**

You may input the number of the required O.K. screw-joints per part.

To change the value, proceed as follows:

Use the left function key „Modify?“, input value and confirm your input with the ENTER-key.

Use the right function-key „Set?“ to activate your setting.

### 3.1.4.2 Time Frame

The time frame for the screw-joint may be changed.

To change the value, proceed as follows:

Use the left function key „Modify?“, then first input the value for the minimum cycle time – confirm the input with the ENTER-key, then input the value for the maximal cycle time and again confirm your input with the Enter-key.

Use the right function-key „Set?“ to activate your setting.

## 3.2 Diagnostic Functions

The diagnostic functions allow the operator to analyze each screw-joint and to automatically establish values for the time-frame. These values are only estimates and have to be fine adjusted, if needed.

The analysis acquires values from 5 screw-joints.

Proceed as follows:

First, input the program number, which is used for the analysis.

Thereafter, process the first screw-joint; the actual screwdriving time is displayed.

Now, process the next screw-joint, and so on.

After the fifth screw-joint, the minimum and maximum screwing time is displayed, with an added upper and lower 20% offset. Use the left function key to activate this setting.

Error screw-joints will be ignored!

You may leave the diagnostic function at any time by pressing the ESC-key, without saving any of the adjustments.

If a feeder is attached to the screwdriver, the screw has to be manually reloaded, so that this diagnostic analysis can be made.

## 4 Ports

A detailed description of the ports can be found in the handbook

„AST10 Controller – Hardware Description“.