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**HEINZMANN®**  
**Electronic Speed Governors**

# **Actuator Calibration Unit ACU**

**for**  
**Heinzmann Actuators**  
**with analogue Feedback**

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## 1 General

**Please study the complete manual before you will start to test and repair actuators.**

The actuator calibration unit ACU is Heinzmann designed and manufactured to calibrate the feedback at all Heinzmann actuators which have installed the analogue feedback type. This calibration and checking of values has to be done during maintenance and repair of actuators in the workshop.

The ACU will not drive the actuators with the maximum possible current. The used current is limited to drive the actuators against the stop ends when no linkage is connected. Therefore the ACU cannot be used to check the output torque of the actuator when energized.

But beside the feedback calibration an additionally general working test of these specified actuators can be done with the ACU.

The following picture shows the Actuator Calibration Unit.



**Fig. 1: Photo of Actuator Calibration Unit**

### **Insulation Test:**

Please note that during maintenance and repair of actuators, also an insulation test has to be performed. The insulation test can not be done with the ACU and therefore the insulation test unit has to be bought separately from the local market. The insulation test has to be carried out with a testing voltage of 500 VDC.

The needed testing cables for the insulation test are part of the included testing harness.

## 2 Types of actuators to be calibrated with the ACU

The actuators of the following series can be calibrated with the ACU:

- StG 6 to StG 10
- StG 16 to StG 40
- StG 64 to StG 90 with or without brake
- StG 180 with or without brake
- StG 2010 to StG 2040 with standard Cannon plugs
- StG 2080 with standard Cannon plugs

The actuators of the following series cannot be calibrated with the ACU:

- StG 1-02-F to StG 2-02-F
- Linear actuators of the LStG series
- Directly mounted actuators of the StG 20xxDP series
- Actuators of the 3000 series
- Actuators with integrated positioner electronic

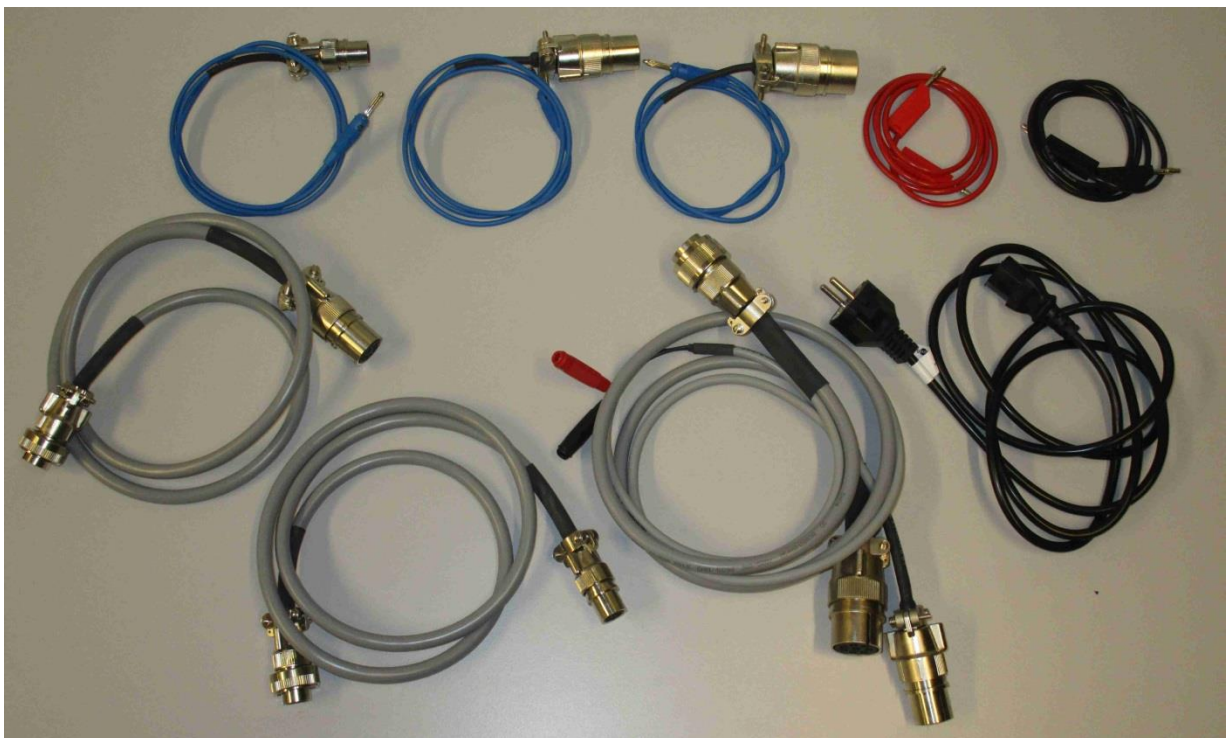
### 3 Scope of delivery

The complete kit has a part-no. of its own and consists of the following components:

- 600-00-120-01 Actuator Calibration Unit ACU
- 010-00-634-00 Power supply cable
- 010-00-633-00 Test cable red
- 010-00-633-01 Test cable black
- 600-81-115-00 Insulation test cable with 5-pole plug
- 600-81-116-00 Insulation test cable with 6-pole plug
- 600-81-117-00 Insulation test cable with 8-pole plug
- 600-81-119-00 Connection cable for actuators with 5-pole plugs
- 600-81-118-00 Connection cable for actuators with 6-pole plugs
- 600-81-120-00 Connection cable for actuators StG 64/90/180 with two plugs
- This manual

Please note that the local grid voltage will be different depending on the country location. The internal AC/DC converter has to be adjusted to the used voltage by an internal dip switch. Therefore the voltage has to be known and set before delivery of the ACU.

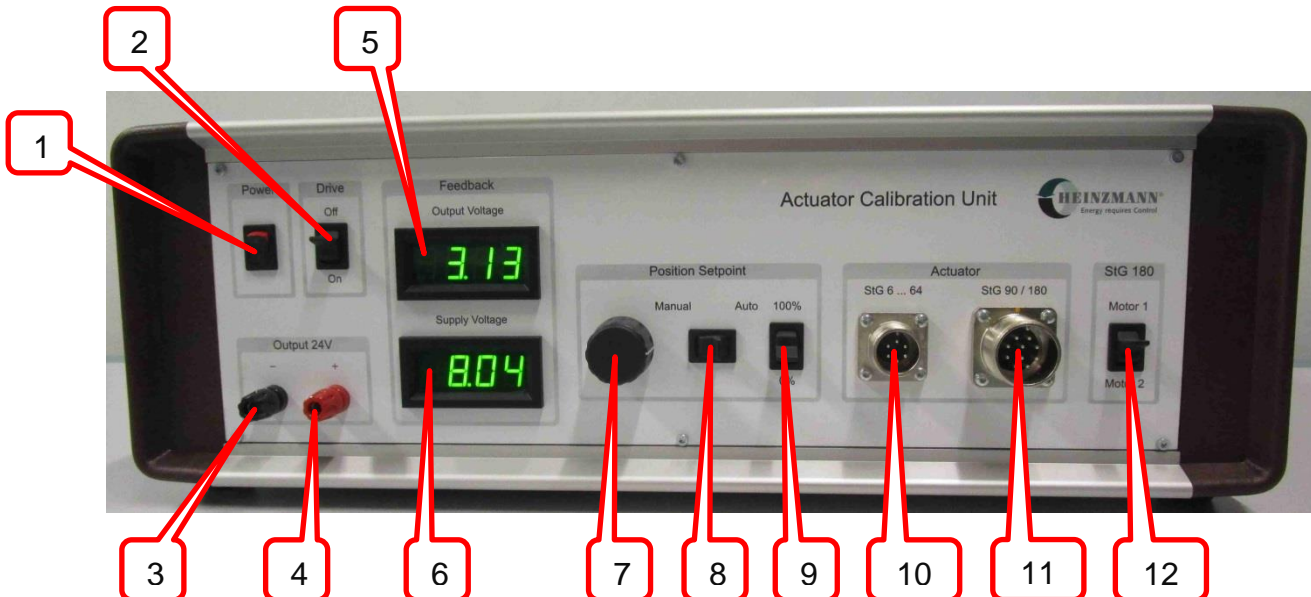
The following picture shows the complete harness.



**Fig. 2: Belonging Harness**

## 4 Description of front plate

The following picture shows the frontplate of the ACU.



**Fig. 3: Description of Front Plate**

List of components with explanation:

- 1.) Power switch
- 2.) Drive activation switch (at off, the drive motor of the actuator cannot be energized)
- 3.) -24 VDC for brake supply
- 4.) +24 VDC for brake supply
- 5.) Display to indicate the feedback output voltage (normal range is 1.6 ... 2.8 VDC)
- 6.) Display to indicate the feedback reference voltage (normally it should be 8.0 VDC)
- 7.) Potentiometer to set manually the actuator position setpoint
- 8.) Selection between manually position and auto calibration mode
- 9.) Selection between 0 % and 100 % position setpoint in auto calibration mode
- 10.) Connection plug for actuator cable with 5 or 6 pole plug
- 11.) Connection plug for actuator cables with two plugs
- 12.) Selection between disk motor 1 and disk motor 2 at StG 180



## 5 Protection fuse of the ACU

There are two protection fuses existing. Both are located at the back plate of the ACU in the connection terminal plug of the power supply cable.

To change the fuses, you have to open the fuse cover and to pull out the drawer. Refer to the picture below.



**Fig. 4: Location of Fuses**

Fuse specification: 10 A, slow



## 6 Procedure to calibrate the feedback of the actuators

With reference to chapter 4 where all the parts of the front plate of the ACU are described, the feedback test and calibration of the different actuator types has to be carried out as follows:

### 6.1 Actuators with 5 pole plug

- For the first tests the actuator should be not disassembled.
- Start the testing of the actuator with carrying out the insulation test described in chapter 7
- Connect a lever arm to the actuator and check if you can move manually the actuator lever between zero and 100 % position without any big friction.
- Connect the belonging testing cable 600-81-119-00 with the plug with thread ring to the plug 10 of the ACU.
- Connect the other plug to the belonging actuator for testing.
- Set the switch 2 to Drive On.
- Set the switch 8 to Auto.
- Set the switch 9 to 0%.
- Switch on the power supply with switch 1.
- Then the voltage display 6 should show  $8.0 \pm 0.04$  Volt as a supply voltage for the feedback board. If the displayed voltage is out of range, the feedback board has maybe an internal short circuit and is pulling down the supply voltage or the ACU controller has a fault. To verify that the ACU is healthy, a second good actuator can be connected to check the feedback supply voltage. If the failure is belonging to the actuator, the feedback board of the actuator needs to be replaced.
- Now the actuator is pulling with determined current the actuator to zero position. If the display 6 shows the supply voltage  $8 \text{ Volt} \pm 0.04$ , the display 5 should show the belonging feedback voltage  $1.6 \pm 0.04$  Volt.
- Set the switch 9 to 100 %.
- Then the actuator should move with determined current to 100 % position. At this time the display 5 should show the belonging feedback voltage  $2.8 \pm 0.04$  Volt.
- When the actuator can reach both mechanically stop ends at the tests described before, and display 6 shows the belonging voltages in range, the feedback is well adjusted.
- If the feedback voltages are only slightly out of range, the feedback has only to be recalibrated. If the feedback voltage does not follow or has big differences to the specified values, the feedback board has to be exchanged.
- After maintaining the actuator, the feedback has to be checked again or calibrated according to the actuator repair training.

- Here the actuator position has to be switched by the switch 9 several times between zero and 100 % actuator position and reading the belonging feedback voltages. The calibration of the actuator has to be done by changing the board position and changing a resistor value on the feedback board. With each cycle you will come closer to the specified voltage values.
- When the calibration is finished, the zero position value has to be  $1.6 \pm 0.02$  Volt and the 100 % position value has to be  $2.8 \pm 0.02$  Volt.
- When the actuator is assembled again, a final test should be carried out.
- When switching the switch 8 to Manual during testing, the actuator position can be set manually to any position by using the potentiometer 7.
- After changing the switch 2 to position Drive Off, the drive disc motor is not energized anymore. Therefore the actuator position can be changed manually by turning the outputshaft by hand.

## 6.2 Actuators with 6 pole plug

- For the first tests the actuator should be not disassembled.
- Start the testing of the actuator with carrying out the insulation test described in chapter 7
- Connect a lever arm to the actuator and check if you can move manually the actuator lever between zero and 100 % position without any big friction.
- Connect the belonging testing cable 600-81-118-00 with the plug with thread ring to the plug 10 of the ACU.
- Connect the other plug to the belonging actuator for testing.
- Set the switch 2 to Drive On.
- Set the switch 8 to Auto.
- Set the switch 9 to 0%.
- Switch on the power supply with switch 1.
- Then the voltage display 6 should show  $8.0 \pm 0.04$  Volt as a supply voltage for the feedback board. If the displayed voltage is out of range, the feedback board has maybe an internal short circuit and is pulling down the supply voltage or the ACU controller has a fault. To verify that the ACU is healthy, a second good actuator can be connected to check the feedback supply voltage. If the failure is belonging to the actuator, the feedback board of the actuator needs to be replaced.
- Now the actuator is pulling with determined current the actuator to zero position. If the display 6 shows the supply voltage  $8 \text{ Volt} \pm 0.04$ , the display 5 should show the belonging feedback voltage  $1.6 \pm 0.04$  Volt.
- Set the switch 9 to 100 %.
- Then the actuator should move with determined current to 100 % position. At this time the display 5 should show the belonging feedback voltage  $2.8 \pm 0.04$  Volt.
- When the actuator can reach both mechanically stop ends at the tests described before, and display 6 shows the belonging voltages in range, the feedback is well adjusted.
- If the feedback voltages are only slightly out of range, the feedback has only to be recalibrated. If the feedback voltage does not follow or has big differences to the specified values, the feedback board has to be exchanged.
- After maintaining the actuator, the feedback has to be checked again or calibrated according to the actuator repair training.
- Here the actuator position has to be switched by the switch 9 several times between zero and 100 % actuator position and reading the belonging feedback voltages. The calibration of the actuator has to be done by changing the board position and changing a

resistor value on the feedback board. With each cycle you will come closer to the specified voltage values.

- When the calibration is finished, the zero position value has to be  $1.6 \pm 0.02$  Volt and the 100 % position value has to be  $2.8 \pm 0.02$  Volt.
- When the actuator is assembled again, a final test should be carried out.
- When switching the switch 8 to Manual during testing, the actuator position can be set manually to any position by using the potentiometer 7.
- After changing the switch 2 to position Drive Off, the drive disc motor is not energized anymore. Therefore the actuator position can be changed manually by turning the outputshaft by hand.

### 6.3 Actuator StG 90 with two plugs

- For the first tests the actuator should be not disassembled.
- Start the testing of the actuator with carrying out the insulation test described in chapter 7
- Connect a lever arm to the actuator and check if you can move manually the actuator lever between zero and 100 % position without any big friction.
- Connect the belonging testing cable 600-81-120-00 with the plug with thread ring to the plug 11 of the ACU.
- Connect the other two plugs to the actuator StG 90 for testing.
- The two banana connectors at the harness are not used for this application.
- Set the switch 12 to Motor 1.
- Set the switch 2 to Drive On.
- Set the switch 8 to Auto.
- Set the switch 9 to 0%.
- Switch on the power supply with switch 1.
- Then the voltage display 6 should show  $8.0 \pm 0.04$  Volt as a supply voltage for the feedback board. If the displayed voltage is out of range, the feedback board has maybe an internal short circuit and is pulling down the supply voltage or the ACU controller has a fault. To verify that the ACU is healthy, a second good actuator can be connected to check the feedback supply voltage. If the failure is belonging to the actuator, the feedback board of the actuator needs to be replaced.
- Now the actuator is pulling with determined current the actuator to zero position. If the display 6 shows the supply voltage  $8 \text{ Volt} \pm 0.04$ , the display 5 should show the belonging feedback voltage  $1.6 \pm 0.04$  Volt.
- Set the switch 9 to 100 %.
- Then the actuator should move with determined current to 100 % position. At this time the display 5 should show the belonging feedback voltage  $2.8 \pm 0.04$  Volt.
- When the actuator can reach both mechanically stop ends at the tests described before, and display 6 shows the belonging voltages in range, the feedback is well adjusted.
- If the feedback voltages are only slightly out of range, the feedback has only to be recalibrated. If the feedback voltage does not follow or has big differences to the specified values, the feedback board has to be exchanged.
- After maintaining the actuator, the feedback has to be checked again or calibrated according to the actuator repair training.

- Here the actuator position has to be switched by the switch 9 several times between zero and 100 % actuator position and reading the belonging feedback voltages. The calibration of the actuator has to be done by changing the board position and changing a resistor value on the feedback board. With each cycle you will come closer to the specified voltage values.
- When the calibration is finished, the zero position value has to be  $1.6 \pm 0.02$  Volt and the 100 % position value has to be  $2.8 \pm 0.02$  Volt.
- When the actuator is assembled again, a final test should be carried out.
- When switching the switch 8 to Manual during testing, the actuator position can be set manually to any position by using the potentiometer 7.
- After changing the switch 2 to position Drive Off, the drive disc motor is not energized anymore. Therefore the actuator position can be changed manually by turning the outputshaft by hand.

## 6.4 Actuator StG 180

Please note that the StG 180 has two single disc motors in parallel on one outputshaft. But the ACU can only drive one disc motor. The calibration of the feedback can be performed with only disc motor 1 is used. To vary the functionality and right connection of disc motor 2, the using of discmotor 2 can be selected by a switch.

- For the first tests the actuator should be not disassembled.
- Start the testing of the actuator with carrying out the insulation test described in chapter 7
- Connect a lever arm to the actuator and check if you can move manually the actuator lever between zero and 100 % position without any big friction.
- Connect the belonging testing cable 600-81-120-00 with the plug with thread ring to the plug 11 of the ACU.
- Connect the other two plugs to the actuator StG 180 for testing.
- The two banana connectors at the harness are not used for this application.
- Set the switch 12 to Motor 1.
- Set the switch 2 to Drive On.
- Set the switch 8 to Auto.
- Set the switch 9 to 0%.
- Switch on the power supply with switch 1.
- Then the voltage display 6 should show  $8.0 \pm 0.04$  Volt as a supply voltage for the feedback board. If the displayed voltage is out of range, the feedback board has maybe an internal short circuit and is pulling down the supply voltage or the ACU controller has a fault. To verify that the ACU is healthy, a second good actuator can be connected to check the feedback supply voltage. If the failure is belonging to the actuator, the feedback board of the actuator needs to be replaced.
- Now the actuator is pulling with determined current the actuator to zero position. If the display 6 shows the supply voltage  $8 \text{ Volt} \pm 0.04$ , the display 5 should show the belonging feedback voltage  $1.6 \pm 0.04$  Volt.
- Set the switch 9 to 100 %.
- Then the actuator should move with determined current to 100 % position. At this time the display 5 should show the belonging feedback voltage  $2.8 \pm 0.04$  Volt.
- When the actuator can reach both mechanically stop ends at the tests described before, and display 6 shows the belonging voltages in range, the feedback is well adjusted.



- If the feedback voltages are only slightly out of range, the feedback has only to be recalibrated. If the feedback voltage does not follow or has big differences to the specified values, the feedback board has to be exchanged.
- For checking the general functionality of disc motor 2, the switch 12 has to be set to Motor 2. Then change the setting of switch 2 (actuator position selection) and check if the actuator position is following accordingly.
- After maintaining the actuator, the feedback has to be checked again or calibrated according to the actuator repair training.
- Here the actuator position has to be switched by the switch 9 several times between zero and 100 % actuator position and reading the belonging feedback voltages. The calibration of the actuator has to be done by changing the board position and changing a resistor value on the feedback board. With each cycle you will come closer to the specified voltage values.
- When the calibration is finished, the zero position value has to be  $1.6 \pm 0.02$  Volt and the 100 % position value has to be  $2.8 \pm 0.02$  Volt.
- When the actuator is assembled again, a final test should be carried out including testing of both disc motors.
- When switching the switch 8 to Manual during testing, the actuator position can be set manually to any position by using the potentiometer 7.
- After changing the switch 2 to position Drive Off, the drive disc motor is not energized anymore. Therefore the actuator position can be changed manually by turning the outputshaft by hand.

## 6.5 Actuators with brake

Some few actuators of the StG 90 and StG 180 series are having a brake implemented.

The indication for this implementation is a B and the end of the type designation like StG 180-xx-B.

The brake will cloth with some Nm torque by a spring when the PRIAMOS control unit is not energized anymore to keep the actual actuator position. This is only useful in some applications and only done on special request of the customer.

During normal operation the brake is energized to open via a solenoid against a spring.

The repair and maintenance of the brake needs special repair training.

The actuator with brake needs a special modified PRIAMOS control unit. Actuators and control units prepared for brake or not, cannot be mixed.

For testing and calibrating the actuators StG 90 and StG 180 with brake, you can follow the procedure described in the former chapters. To energize and open the brake, you have to connect the red and black cables with banana plugs between the belonging plugs of the test harness and the plugs 3 & 4 of the ACU.

When you move the actuator position by hand when the drive is deenergized by switch 2, you should feel a difference between energized and not energized brake.

## 7 Insulation test at actuators

The feedback circuit and the drive circuit of the actuator has to be isolated against housing to avoid any disturbance or potential problems at the feedback signal or to avoid any disturbance somewhere outside of the actuator caused by the drive current.

Therefore before and after maintenance and repair of actuators, also an insulation test has to be performed. The insulation test can not be done with the ACU.

You have to use a separate insulation test unit which is normally not a part of Heinzmann delivery scope.

Heinzmann has prepared different testing cables for different actuator plugs which are part of the included testing harness.

At one side of the blue cables, actuator plugs are fixed. They have internally connected all pins to the testing cables. At the other side banana plugs are fixed. They have to be connected to the insulation testing unit.

During insulation test, a second cable provided by the insulation testing unit has to be connected between actuator housing and insulation testing unit.

The insulation test has to be carried out with a testing voltage of 500 VDC according to the belonging manual.