

# ECON-4

## Speed governor for gas and diesel engines

### SW version 1.8.0

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# 1 General information

This document supplements the ECON-4 Global Guide 1.8.0.

## 1.1 Version information

This version contains change of range of several objects.

## 1.2 Clarification of Notation

**Note:** *This type of paragraph calls the reader's attention to a notice or related theme.*

**IMPORTANT:** This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or improper function of the equipment if not performed correctly and may not be clear at first sight.

**WARNING:** This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or improper function of the equipment if not performed correctly and may not be clear at first sight.

**Example:** This type of paragraph contains information that is used to illustrate how a specific function works.

## 2 Changes in the version 1.8.0

### 2.1 New features

- Max value of setpoints *Nominal RPM* and *Overspeed* changed from 2500 RPM to 3500 RPM.
- Max range of setpoints *Speed gain*, *Speed int*, *Speed der*, increased to 1000.
- Max range of setpoints *Load gain*, *Load int*, *Load der* increased to 1000.

# 3 Changes in the version 1.7.0

## 3.1 New features

### > Protection against loss of RPM signal

- » In case there is a sensor fail like a broken wire or broken sensor the engine speed is dropped down very fast (sometimes due to broken sensor it is not always exactly zero rpm). The actuator would normally react as low speed and due to active regulation it would try to more and more open the actuator and it leads automatically to overspeed which is not desired.
- » To prevent this situation there is a function which can identify loss of RPM signal. There is a new setpoint RPMdropFail which is defined as the maximal RPM drop in 100 ms. In case the rpm drop is higher than value of this setpoint during 100 ms, the speed governor evaluates the situation as speed sensor fail and immediately closes the actuator. The output BO9 from the speed governor LBO PickupFail is activated for 3 s (in case the speed drops immediately to zero it will be possible to catch the situation).
- » It is strongly recommended to configure **user protection Level 2** on the PickupFail signal in the configuration tool, to prevent unwanted behavior or next starts. When LBO PickupFail is deactivated (after the 3 s delay), the speed governor starts opening the actuator again.
- » When the Run/Stop signal is deactivated, the LBO PickupFail is not activated.

### > Renaming of binary states

- » Binary input **Bin1** was renamed to **Bin1 Reserve**
- » Binary input **Bin8** was renamed to **Bin8 Reserve**
- » Binary input **Reserve** (BI9) was renamed to **PickUpFail**
- » Binary input **Reserve** (BI10) was renamed to **InvalActSetp**
- » Binary output **Reserve** (BO1) was renamed to **MCB Feedback**

| Binary inputs |            | Used: 16/32    |
|---------------|------------|----------------|
| ±             | IGS-NT     | Used: 16/16    |
| ±             | ECON-4 (1) | Used: 0/16     |
|               | BI1        | Bin1 Reserve   |
|               | BI2        | Bin2 GCBFdbck  |
|               | BI3        | Bin3 Nominal   |
|               | BI4        | Bin4 SpeedUp   |
|               | BI5        | Bin5 SpeedDown |
|               | BI6        | Bin6 Run/Stop  |
|               | BI7        | Bin7 Droop     |
|               | BI8        | Bin8 Reserve   |
|               | BI9        | PickUpFail     |
|               | BI10       | InvalActSetp   |
|               | BI11       | Engine running |
|               | BI12       | OverSpeed Sd   |
|               | BI13       | PID limit      |
|               | BI14       | ActFdbErr      |
|               | BI15       | ActOverldProt  |
|               | BI16       | InvalSetpoints |

| Binary outputs |                | Used: 16/21  |
|----------------|----------------|--------------|
| ±              | IGS-NT         | Used: 16/16  |
| ±              | ECON-4 (1)     | Used: 0/5    |
|                | BO1            | MCB Feedback |
|                | BO2            | GCB Feedback |
|                | BO3            | Idle/Nominal |
|                | BO4            | Run/Stop     |
|                | BO5            | Droop        |
| ±              | Analog inputs  | Used: 4/6    |
| ±              | Analog outputs | Used: 0/3    |

# 4 Changes in the version 1.6.1

## 4.1 Repairs

- ActuatorType function has been fixed
  - In case there is chosen the ActuatorType 2-4, the function is still evaluated from the setting in ActuatorType1.

# 5 Changes in the version 1.6.0

## 5.1 New features

- Deactivation of the actuator feedback control on steady engine
  - » To avoid situations, when the actuator is controlled to the fully closed position also when engine is not rotating, there was implemented deactivation of the position feedback control in certain moments, below described.
  - » The actuator feedback position control **is deactivated** in the following situation:
    - (parameter: ECON-4 mode is in AUTO) AND {10 seconds after detection of [(Engine RPM are 0 (<10RPM)) AND (BI:RUN is in log 0)]}
    - This covers also the situation, when ECON-4 mode is switched from MAN to AUT, after the actuator feedback PID was tested.
  - » The actuator feedback control is activated again by any of the following conditions:
    - BI: RUN is activated (in case the Run signal is being sent over DATA, then both the Physical BI and the BI over DATA has to be ON)
    - Non-zero RPM are detected by ECON-4
    - Parameter ECON-4 mode is set to MAN

## 5.2 Repairs

- Reaction of the Fuel amount to deactivation and reactivation of the BI:Run, when engine is running
  - » When the engine is running, and the Run signal is removed (deactivated) ECON-4 shuts immediately the fuel to 0%. In case the Run signal is activated again in a moment, when the engine is still moving (means non-zero RPM are measured), in previous sw versions ECON-4 increased the fuel amount close to 100% and regulated from this value on the requested RPM. In sw version 1.6.0, when the Run signal is activated again and engine RPM are non-zero in that moment, ECON-4 sets the fuel amount to value given by parameter: Main PID: Idle Fuel and from this value continue the RPM regulation to the Requested RPM.

# 6 Changes in the version 1.5.1

## 6.1 New features

- ECON-4 parameters values are used for a CRC code calculation, which is used with a specific fw branch of a gen-set controller.

# 7 Changes in the version 1.5.0

## 7.1 New features

- Change of range for PWM rate
  - New range is 100-10000Hz

## 7.2 Repairs

- Fixed bug with PWM output
  - PWM output under 733Hz was deformed



# 8 Changes in the version 1.4.1

## 8.1 Repairs

- > Due error in firmware ECON-4 1.4.0 under some conditions (actual GasDose is higher than IdlePosition in moment when parallel operation is entered - GCB is closed) Throttle is opening to MaxFuel position 1min after parallel. It stays in this position forever, regardless of SGO Output until Parallel operation is finished.
- > Workaround
  - » It can be fixed temporarily changing nominal RPM - increasing by 1 and then decreasing to original value. But this will solve situation just until Power to ECON-4 is cycled. Final fix is just using new firmware - version 1.1.1 or newer in ECON-4

# 9 Changes in the version 1.4.0

## 9.1 New features

- Added setpoint for modification of Offset removal
  - New setpoint - SGOoffsetRamp
  - When the genset is in island (GCB closed), throttle is in higher position than Idle position. When we go to parallel (MCB and GCB closed), throttle position and requested speed is not in line selected via SGOBias, SGO HiLim, Idle Fuel and MaxFuel. Difference is removed after 1min of parallel operation using fixed ramp.
  - To modify this is used this setpoint
- Send value from AI2 to Misfiring Amplitude and Misfiring Angle
  - To allow proper collaboration with ECON4Slave we need to read feedback from slave Actuator via CAN.
  - Analog input AI2 (Active power) is used, value from AI2 is sent to both Misfiring Amplitude and Misfiring Angle
  - When AI2 is used for feedback from slave, PowerAnticipation setpoint must be set to 0, otherwise wrong value will be used for actuator control
- Increased range of the PerChSpdNom parameter
  - to allow to use the ECON for variable speed application is enlarged the range of parameter PerChSpdNom to 1...50%
  - for parallel mode is still valid, that the PerChSpdNom has to be set to 10%

## 9.2 Repairs

- Fixed bug with limitation due MaxFuel
  - in case the throttle reached MaxFuel level during first minute after closing to parallel and the offset regulation is running, then the throttle was not limited by MaxFuel but was closed just according the offset value
- ECON didn't reached the throttle position
  - in the BRIDGE configuration and connection of Heinzmann STG2080 was possible to manually move the actuator to more open and ECON didn't react on that

# 10 Related information

## 10.1 Available files

|                         |
|-------------------------|
| <b>Firmware (*.mhx)</b> |
| <b>For ECON-4</b>       |
| ECON4-1.8.0.mhx         |

## 10.2 Overview of all available hardware

|                        | <b>ECON-4</b> |
|------------------------|---------------|
| <b>Binary Inputs</b>   | 8             |
| <b>Binary Outputs</b>  | -             |
| <b>Analog Inputs</b>   | 2             |
| <b>Analog Outputs</b>  | 1             |
| <b>Communications</b>  | CAN1          |
| <b>RPM Inputs</b>      | 2             |
| <b>Actuator Output</b> | 1             |

# 11 Notes

## 11.1 Document history

| Revision number | Related sw. version | Date      | Author        |
|-----------------|---------------------|-----------|---------------|
| 8               | 1.8.0               | 13.4.2023 | Lubomír Brož  |
| 7               | 1.7.0               | 27.9.2019 | Daniel Madara |
| 6               | 1.6.1               | 11.9.2018 | Lubomír Brož  |
| 5               | 1.6.0               | 4.5.2018  | Lubomír Brož  |
| 4               | 1.5.1               | 9.5.2018  | Lubomír Brož  |
| 3               | 1.5.0               | 1.8.2017  | Lubomír Brož  |
| 2               | 1.4.1               | 26.9.2016 | Jiří Schiller |
| 1               | 1.4.0               | 1.4.2016  | Jiří Schiller |