HEINZMANN®
Digital Electronic Speed Governors

Digital Basic System

PANDAROS - I

DG 6.6-01 up to -05
DG 10.6-01 up to -05

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All rights reserved. This publication may not be reproduced by any means whatsoever or passed on to any third parties.
The appropriate manuals must be thoroughly studied before installation, initial start-up and maintenance.

All instructions pertaining to the system and safety must be followed in full. Non-observance of the instructions may lead to injury to persons and/or material damage.

HEINZMANN shall not be held liable for any damage caused through non-observance of instructions.

Independent tests and inspections are of particular importance for all applications in which a malfunction could result in injury to persons or material damage.

All examples and data, as well as all other information in this manual are there solely for the purpose of instruction and they may not be used for special application without the operator running independent tests and inspections beforehand.

HEINZMANN does not guarantee, neither expressly nor tacitly, that the examples, data or other information in this manual is free from error, complies with industrial standards or fulfils the requirements of any special application.

To avoid any injury to persons and damage to systems, the following monitoring and protective systems must be provided:

- Overspeed protection independent of the rpm controller

HEINZMANN shall not be held liable for any damage caused through missing or insufficiently rated overspeed protection.

- Thermal overload protection

The following must also be provided for alternator systems:

- Overcurrent protection
- Protection against faulty synchronisation for excessively-large frequency, voltage or phase difference
- Directional contactor

The reasons for overspeeding may be:

- Failure of positioning device, control unit or its auxiliary devices
- Linkage sluggishness and jamming

The following must be observed before an installation:

- Always disconnect the electrical mains supply before any interventions to the system.
- Only use cable screening and mains supply connections that correspond with the European Union EMC Directive
- Check the function of all installed protection and monitoring systems
**NOTICE**

Please observe the following for electronically controlled injection (MVC):

- For **common rail** systems each injector line must be equipped with a separate mechanical flow-rate limiter
- For **unit pump** (PLD) and **pump-injector unit** (PDE) systems, the fuel enable is first made possible by the solenoid valve’s control plunger motion. This means that in the event of the control plunger sticking, the fuel supply to the injection valve is stopped.

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**WARNING**

As soon as the positioning device receives power, it can actuate the controller output shaft automatically at any given time. The range of the controller shaft or control linkage must therefore be secured against unauthorised access.

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**HEINZMANN** shall not provide any guarantee for the design and planning of the overall technical system. This is a matter of the operator its planners and its specialist engineers. They are also responsible for checking whether the performances of our devices match the intended purpose. The operator is also responsible for a correct initial start-up of the overall system.
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1 Safety instructions and related symbols

This publication offers wherever necessary practical safety instructions to indicate inevitable residual risks when operating the engine. These residual risks imply dangers to

- Personnel
- Product and machine
- The environment

The primary aim of the safety instructions is to prevent personal injury!

The signal words used in this publication are specifically designed to direct your attention to possible damage extent!

**DANGER** indicates a hazardous situation the consequence of which could be fatal or severe injuries if it is not prevented.

**WARNING** indicates a hazardous situation which could lead to fatal injury or severe injuries if it is not prevented.

**CAUTION** indicates a hazardous situation which could lead to minor injuries if it is not prevented.

**NOTICE** indicates possible material damage.

Safety instructions are not only denoted by a signal word but also by hazard warning triangles. Hazard warning triangles can contain different symbols to illustrate the danger. However, the symbol used is no substitute for the actual text of the safety instructions. The text must therefore always be read in full!

This symbol does not refer to any safety instructions but offers important notes for better understanding the functions that are being discussed. They should by all means be observed and practiced.

In this publication the Table of Contents is preceded by diverse instructions that among other things serve to ensure safety of operation. It is absolutely imperative that these hints be read and understood before commissioning or servicing the installation.
1.1 Basic safety measures for normal operation

- The installation may be operated only by authorized persons who have been duly trained and who are fully acquainted with the operating instructions so that they are capable of working in accordance with them.
- Before turning the installation on please verify and make sure that
  - only authorized persons are present within the working range of the engine;
  - nobody will be in danger of suffering injuries by starting the engine.
- Before starting the engine always check the installation for visible damages and make sure it is not put into operation unless it is in perfect condition. On detecting any faults please inform your superior immediately!
- Before starting the engine remove any unnecessary material and/or objects from the working range of the installation/engine.
- Before starting the engine check and make sure that all safety devices are working properly!

1.2 Basic safety measures for servicing and maintenance

- Before performing any maintenance or repair work make sure the working area of the engine has been closed to unauthorized persons. Put on a sign warning that maintenance or repair work is being done.
- Before performing any maintenance or repair work switch off the master switch of the power supply and secure it by a padlock! The key must be kept by the person performing the maintenance and repair works.
- Before performing any maintenance and repair work make sure that all parts of engine to be touched have cooled down to ambient temperature and are dead!
- Refasten loose connections!
- Replace at once any damaged lines and/or cables!
- Keep the cabinet always closed. Access should be permitted only to authorized persons having a key or tools.
- Never use a water hose to clean cabinets or other casings of electric equipment!

1.3 Before putting an installation into service after maintenance and repair works

- Check on all slackened screw connections to have been tightened again!
- Make sure the control linkage has been reattached and all cables have been reconnected.
- Make sure all safety devices of the installation are in perfect order and are working properly!
2 General

The HEINZMANN Digital Governors of the PANDAROS series have been designed as speed governors for diesel and gas engines with low and medium power. In addition to their primary purpose of controlling speed, these governors are capable of performing some other tasks and functions.

The control system consists of the control unit, the actuator, the setpoint adjusters, the sensors, and the connection cables.

The control unit includes the control electronics. At the core of the control unit is a very fast and powerful 16 bit microprocessor. The actual controller program on which the processor operates, is permanently stored in a FLASH-EPROM.

The current engine speed is sensed by a magnetic pick-up on the flywheel or a measuring wheel.

One temperature sensor can measure the engine temperature and can cause changings of governor parameters or alarm messages.

The speed setpoint, additional sensor inputs and the inputs for the analogue accessory are depending on variations.

In the case of the DC 6-00 variant, which offers the largest functional scope and flexibility, the user must configure all inputs and outputs themselves.

With regard to the other variants, no additional outputs are provided aside from the error message output. In certain cases, the inputs are already specifically pre-configured and all parameters that are not required for the respective application are omitted so as to maintain a clearer overview of the controller and to make start-up easier to perform.

With the serial interface ISO 9141 resp. RS 232 is communication to other devices possible.
3 Functions

The HEINZMANN digital controllers from the PANDAROS series are speed governors in which, depending on the variant in question, further variant-specific functions are available in addition to the speed control and the general functions.

3.1 General functions

a) Start fuel adjustment
   For setting start fuel, minimum start quantity or maximum start quantity may alternatively be selected. If necessary either can be configured in dependence of temperature. Furthermore, variable start quantity can be provided, by which start quantity is automatically increased during start-up.

b) Speed ramps
   For applications where speed is not supposed to respond to changes of setpoint values as fast as possible, a speed ramp is available. According to requirements, it may be parametrized separately for increasing or decreasing speed. In addition, a separate speed ramp is provided for start-up which will make the engine ramp slowly to operating speed after starting.

c) All speed governing with adjustable droop
   Several applications e.g. generators in parallel without HEINZMANN load measuring unit might require speed control with droop (proportional band). The droop can be adjusted as desired. With droop adjusted to 0, the governor operates in isochronous mode.

d) Setting the speed range
   The minimum and maximum speed adjustable by the (external) setpoint, can be parametrized.

e) Engine stop
   When the switch input for engine shutdown is activated, the governor will cause the actuator to fully pull to stop direction until the engine has stopped.

f) Overspeed protection
   An overspeed point can be parametrized. If this point is overcome, the governor will issue an alarm and the actuator will fully pull to stop direction.

g) Gradient monitoring
   The engine speed signal can be monitored for a permissible change speed (gradient).
h) **Correction of PID parameters**
   To optimize the dynamics for every operating point, the PID parameters may be corrected in dependence of speed, temperature and load by means of freely programmable stability maps.

i) **Speed dependent fuel limitation**
   It is possible to program fuel limitation curves in dependence of speed so that for all speeds there can be torque reduction as is admissible for the engine or desired by the user.

j) **Temperature dependent idling speed and fuel limitation**
   At low temperatures, the engine can be run at some higher idling speed. With the engine warming up, idling speed is reduced to its normal value. It is possible to program fuel limitation curves in dependence of temperature so that for every temperature there will be torque reduction available as is admissible for the engine or desired by the user.

k) **Operating hour meter**
   The operating hours when the engine is turning (speed is detected) will be added.

l) **Failure diagnosis and display**
   If a sensor or the actuator is at fault, an alarm is issued and there will be a change-over to emergency operation if so provided or an engine shutdown. Internal errors get detected also and they will be stored as all other failures. All failures can be read out with an external hand programmer or with a communication program on a PC or laptop with communication cable.

m) **Communication**
   An ISO 9141 interface is provided to enable communication with a Heinzmann communication tool.
3 Functions

3.2 Variation specific additional functions

3.2.1 Variation DC 6-01 (Standard Generator)

(refer to connection diagram DC 6-01)

The speed setpoint is realized with two push buttons: increase speed and decrease speed.

3.2.2 Variation DC 6-02 (Standard General)

(refer to connection diagram DC 6-02)

The speed setpoint is given by an analogue setpoint source (voltage source 0 … 5 V, current 4 … 20 mA or potentiometer 5 kΩ) and one switch input for fixed speed.

3.2.3 Variation DC 6-03 (Extended Generator)

(refer to connection diagram DC 6-03)

The assignment of the function and the calibration of the inputs must be performed by the customer themselves in this context. The following functions are also available, although the limited number of inputs means that they cannot all be used simultaneously:

a) Free configurability of inputs
   Five digital inputs are available in total, up to three of which can also optionally be configured as analogue inputs featuring 0 … 5 V or 4 … 20 mA if required.

b) Speed offset selection
   All analogue or digital control signals that are conventionally used on the market for the purpose of generating a speed offset selection for a superordinate generator control may be applied. This naturally also includes signals from ComAp, Deapsea, Deif, Kuhse, Stucke, etc. as well as analogue additional devices from Heinzmann.

c) Communication with Heinzmann generator management DGM-02
   If the corresponding parameter settings have been made, the digital generator management from Heinzmann (THESEUS DGM-02) can be connected via CAN bus.

d) Idling speed
   It is possible to switch to the idling speed for a warm-up or cool-down phase.

e) P-range changeover
   It is possible to switch between two different P-ranges.

f) Speed range changeover
   It is possible to switch between two different speed ranges.
g) Manual/automatic mode
   It is possible to switch between manual and automatic mode.

h) Generator switch
   In order to make quicker adjustments when opening the power generator switch, it is possible to activate a special function that queries the status of the power generator switch. This status can be assigned to a digital input.

i) Deleting errors
   The current errors can be deleted by pressing an assigned button at a digital input.

j) Automatic calibration of the actuator
   After replacing the control device or the actuator, the feedback of the actuator can be recalibrated by pressing an assigned button (actuator and control device are adjusted in line with one another).

3.2.4 Variation DC 6-05 (Extended General, especially vehicle)
(refer to connection diagram DC 6-05)

a) Speed setpoint
   The speed setpoint is given by an analogue setpoint source (voltage source 0 … 5 V, current 4 … 20 mA or potentiometer 5kΩ) and a switch input for fixed speed.

b) Boost pressure sensor
   An analogue input is already specified for use with a boost pressure sensor. The input can be configured for a 0 … 5 V or 4 … 20 mA signal.
   For turbocharged engines, fuelling can be reduced to achieve smokeless operation whenever there is no boost pressure (e.g., during start-up or on load changes). The respective limit curves can be programmed accordingly.

c) Oil pressure sensor
   An analogue input is already specified for use with an oil pressure sensor. The input can be configured for a 0 … 5 V or 4 … 20 mA signal.
   For the purpose of oil pressure monitoring, speed/pressure dependent limit curves can be provided. If oil pressure is low, an alarm is issued; if oil pressure continues to drop, the engine is shut down.

d) Idle-/Maximum speed governor
   The governor may also be adjusted as an idle/max speed governor.
3.2.5 Variation DC 6-00 (full flexibility)

This variant is not pre-configured and contains all the previously described functions of the different variants.

The only option that is not provided is that of communication with the digital generator management THESEUS via CAN bus.

This variant continues to feature the following additional functions:

a) **Second speed sensor**
   A digital input can be reconfigured in order to support the use of a second speed sensor (featuring a Hall design).

b) **Second fixed speed**
   It is possible to assign a second fixed speed.

c) **Setpoint selection via notches**
   For simple applications for locomotive operation, the speed setpoint selection can be performed via notches. In this context, the bit combinations of up to four digital inputs can be assigned to corresponding speed setpoints.

d) **Changeover between limiting curves**
   It is possible to switch between two different limiting curves.

e) **Jet Assist**
   A Jet Assist function can also be activated in order to perform quick adjustments for load compensation at low levels of boost pressure.

f) **Analogue outputs**
   The multifunctional ports (terminals 1 and 2) can also be configured as analogue outputs featuring 4 … 20 mA. In this way, every available analogue measured value or calculated setpoint can be output.

g) **PWM outputs**
   The multifunctional ports (terminals 1 and 2) can also be configured as PWM outputs. In this way, every available analogue measured value or calculated setpoint can be output.

h) **Digital outputs**
   The multifunctional ports (terminals 1 and 2) can also be configured as digital outputs. This makes it possible for every digital measured value to be output.
i) **PWM inputs**

The multifunctional ports (terminals 1 and 2) and digital input 3 can also be configured as PWM inputs. In this way, every available analogue measured value or calculated setpoint can be output.

j) **PE module adjustment**

Via CAN bus, it is possible to communicate with an additional PE module of type DC 6. This can then control a second actuator and provide additional inputs and outputs that can be configured from the speed governor. The typical application in this regard is the control of V-type engines with two actuators.

### 3.2.6 Variation DC 6-06 (positioner)

This variant does not feature an integrated speed governor. In this context, the corresponding actuator is controlled via an actuator setpoint position signal received from an external source. This variant is described in a dedicated publication.
4 Further information

This publication describes in detail the technical data and connections of the control electronics, of the sensors, of the setpoint adjusters and of the actuators.

The functions of the different adjustment parameters and characteristics are described in detail in the manual

Basic Information Control device for conventional injection Manual DG 07 001-e

The mode of operation of the communication program DcDesk 2000 is described in detail in the manual

Operation Instructions of Communication Program DcDesk 2000, Manual-No. DG 00 003-e
According to the different types, there are not all functions and inputs available!
### 6 Sensors

#### 6.1 Overview

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Speed</th>
<th>Coolant Temperature</th>
<th>Oil Pressure</th>
<th>Boost Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>HZM - Designation</td>
<td>1A ..</td>
<td>TS 01-28-PT1000</td>
<td>DSO 01-6, DSO 01-10</td>
<td>DSL/G 0..-2, DSL/G 0..-5, DSL/G 0..-10</td>
</tr>
<tr>
<td>Connection</td>
<td>SV 6-IA-2K, 2 pole</td>
<td>SV 6-IA-2K, 2 pole</td>
<td>DIN 43650 A 2 line system</td>
<td>DIN 43650 A 2 line system</td>
</tr>
<tr>
<td>Measuring Procedure</td>
<td>inductive, active</td>
<td>PT1000, passive</td>
<td>active</td>
<td>active</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>50 ... 9.000 Hz</td>
<td>-50 ... +150°C</td>
<td>0 ... 6 bar, 0 ... 10 bar</td>
<td>0 ... 2 bar, 0 ... 5 bar, 0 ... 10 bar</td>
</tr>
<tr>
<td>Supply Voltage Range</td>
<td>passiv</td>
<td>10 ... 34 V DC</td>
<td>12 ... 36 V DC</td>
<td></td>
</tr>
<tr>
<td>Output Signal Range</td>
<td>0 ... 10 V AC</td>
<td>ca. 700 ... 1500 Ohm</td>
<td>4 ... 20 mA</td>
<td>4 ... 20 mA</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-55 ... +120°C</td>
<td>-50 ... +150°C</td>
<td>-25 ... +125°C</td>
<td>-40 ... +100°C</td>
</tr>
</tbody>
</table>

In order to ensure maximum flexibility with regard to the sensors, the minimum/maximum current values and the measuring ranges of the pressure and temperature sensors have been provided programmable.
6.2 Magnetic pick-up IA ...

6.2.1 Technical data

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<th>Specification</th>
<th>Details</th>
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<tr>
<td>Operating principle</td>
<td>inductive sensor</td>
</tr>
<tr>
<td>Distance from sensing gear</td>
<td>0.5 ... 0.8 mm</td>
</tr>
<tr>
<td>Output</td>
<td>0 ... 10 V AC</td>
</tr>
<tr>
<td>Signal form</td>
<td>Sine (depending on tooth shape)</td>
</tr>
<tr>
<td>Resistance</td>
<td>approx. 52 Ohm</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-55°C ... +125°C</td>
</tr>
<tr>
<td>Protection grade</td>
<td>IP 55</td>
</tr>
<tr>
<td>Vibration</td>
<td>&lt; 10g, 10 ... 100 Hz</td>
</tr>
<tr>
<td>Shock</td>
<td>&lt; 50g, 11 ms half sine wave</td>
</tr>
<tr>
<td>Corresponding plug</td>
<td>SV 6-IA-2K (EDV- No.: 010-02-170-00)</td>
</tr>
</tbody>
</table>

6.2.2 Installation

The installation of the pick-up has to be arranged in such a way as to obtain a frequency as high as possible. Normally, the HEINZMANN governors of the series Pandaros are designed for a maximum frequency of 9000 Hz. Frequency (by Hz) is calculated according to the formula

\[ f (\text{Hz}) = \frac{n(1/\text{min}) \times z}{60} \]

\[ z = \text{number of teeth on the pick-up wheel} \]

Example:

\[ n = 1.500 \]
\[ z = 160 \]
\[ f = \frac{1500 \times 160}{60} = 4.000 \text{ Hz} \]

It should be taken care that the speed can be measured by the pulse pick-up without any bias. For best results therefore, the speed pick-up should take the engine speed from the crankshaft. A suitable position for this is, e.g., the starter gear but not the injection pump wheel.

The pick-up gear must consist of magnetic material (e.g., steel, cast iron).
6.2.3 Tooth profile

Any tooth profile is admissible. The top width of the tooth should be 2.5 mm minimum, the gap and the depth of the gap at least 4 mm. For index plates the same dimensions are valid.

Due to tolerances, a radial arrangement of the magnetic pick-up is preferable.

6.2.4 Clearance of magnetic pick-up

The distance between the magnetic pulse pick-up and the tooth top should range from 0.5 and 0.8 mm. (It is possible to screw in the magnetic pick-up till it touches the tooth and then unscrew it for about half a turn)
6.2.5 Dimensions

Fig. 3: Dimensions of pick-up

<table>
<thead>
<tr>
<th>Measures Type</th>
<th>L (mm)</th>
<th>G</th>
<th>Remarks</th>
</tr>
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<tr>
<td>01-38</td>
<td>38</td>
<td>M 16 x 1,5</td>
<td></td>
</tr>
<tr>
<td>02-76</td>
<td>76</td>
<td>M 16 x 1,5</td>
<td></td>
</tr>
<tr>
<td>03-102</td>
<td>102</td>
<td>M 16 x 1,5</td>
<td></td>
</tr>
<tr>
<td>11-38</td>
<td>38</td>
<td>5/8&quot;-18UNF-2A</td>
<td>appropriate plug</td>
</tr>
<tr>
<td>12-76</td>
<td>76</td>
<td>5/8&quot;-18UNF-2A</td>
<td>SV 6-IA-2K (010-02-170-00)</td>
</tr>
<tr>
<td>13-102</td>
<td>102</td>
<td>5/8&quot;-18UNF-2A</td>
<td></td>
</tr>
</tbody>
</table>

Ordering specification, e.g. IA 02-76
6.3 Coolant temperature sensor TS 01-28-PT1000  
(EDV- No.: 600-00-053-00)

- Measuring range: -50°C … +150°C
- Precision: ±1.5°C
- Resistance at 25 °C (R25): 1000 Ohm ±0.5 %
- Maximum operating voltage: 5 V
- Maximum operating current: 3 mA
- Recommended operating current: approx. 1 mA
- Time constant in fluids: approx. 13 seconds
- Admissible temp. range of connector: -40°C … +105°C
- Protection grade: IP 65
- Vibration: < 20 g, 10 … 300 Hz
- Shock: < 50 g, 11 ms half-sine wave
- Tightening torque: 50 Nm ±15 %
- Appropriate connector: SV 6-1A-2K (EDV- No.: 010-02-170-00)

**Fig. 4: Temperature sensor TS 01-28-PT1000**
6.4 Pressure sensors

6.4.1 Oil pressure sensor

Measuring range 0 … 6 bar or 0 … 10 bar
Over pressure 15 bar resp. 20 bar
Supply voltage 10 … 34 V DC
Output signal 4 … 20 mA
Storage temperature -25°C … +85°C
Ambient temperature -25°C … +85°C
Oil temperature -25°C … +125°C
Protection grade IP 65
Vibration < 20 g, 10 … 300 Hz
Shock < 50 g, 11 ms half-sine wave
Tightening torque max. 25 Nm
Connection DIN 43650-A, 2-line system

Fig. 5: Oil pressure sensor

<table>
<thead>
<tr>
<th>Pressure Sensor</th>
<th>EDV- No.</th>
<th>Max. Oper. Pressure (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSO 01-6</td>
<td>600-00-058-00</td>
<td>6</td>
</tr>
<tr>
<td>DSO 01-10</td>
<td>600-00-058-01</td>
<td>10</td>
</tr>
</tbody>
</table>
6.4.2 Boost pressure sensors

The boost pressure sensors are also available in an additional housing with terminal strip.

Measuring range: 0 ... 2 bar, 0 ... 5 bar or 0 ... 10 bar
Over pressure: 4 bar resp. 10 bar resp. 16 bar
Supply voltage: 12 ... 36 V DC
Output signal: 4 ... 20 mA
Storage temperature: -55°C ... +100°C
Ambient temperature: -40°C ... +100°C
Protection grade: IP 65
Vibration: < 2 g, 5 ... 500 Hz
Shock: < 50 g, 11 ms half-sine wave
Connection: DIN 43650-A or terminal strip, 2-line system

6.4.2.1 Boost pressure sensor with plug

![Diagram of Boost pressure sensor with plug]

Fig. 6: Boost pressure sensor with plug

<table>
<thead>
<tr>
<th>Pressure Sensor</th>
<th>EDV- No.</th>
<th>Maximum Operating Pressure (bar rel.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL 01-2</td>
<td>600-00-057-00</td>
<td>2</td>
</tr>
<tr>
<td>DSL 01-5</td>
<td>600-00-057-01</td>
<td>5</td>
</tr>
<tr>
<td>DSL 01-10</td>
<td>600-00-057-02</td>
<td>10</td>
</tr>
</tbody>
</table>
6.4.2.2 Boost pressure sensor with housing and terminal strip

Fig. 7: Boost pressure sensor with housing

<table>
<thead>
<tr>
<th>Pressure Sensor</th>
<th>EDV- No.</th>
<th>Maximum Operating Pressure (bar rel.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSG 04-2</td>
<td>600-00-056-00</td>
<td>2</td>
</tr>
<tr>
<td>DSG 04-5</td>
<td>600-00-056-01</td>
<td>5</td>
</tr>
<tr>
<td>DSG 04-10</td>
<td>600-00-056-02</td>
<td>10</td>
</tr>
</tbody>
</table>
7 Setpoint adjusters

With regard to the variety of applications, various setpoint adjusters are available for the HEINZMANN digital speed governors of series PANDAROS. The customer specifies the setpoint selection type by means of parameter settings. As a result, it is not necessary for HEINZMANN to adapt the hardware prior to delivering the controller.

7.1 Setpoint potentiometer SW 01-1-b (1 turn)  
(EDV- No.: 600-00-041-01)
- Displacement angle: approx. 312°
- Resistance: 5 kOhm
- Temperature range: -55°C … +120°C
- Protection grade: IP 00

![Fig. 8: Potentiometer SW 01-1-b](image)

7.2 Setpoint potentiometer SW 02-10-b (10 turn)  
(EDV- No.: 600-00-042-01)
- Displacement angle: 10 turns
- Resistance: 5 kOhm
- Temperature range: -55°C … +105°C
- Protection grade: IP 00

![Fig. 9: Potentiometer SW 02-10-b](image)
On request, the potentiometers, as specified under 6.1. and 6.2. can be supplied with analogue adjustment knob with lock in place of the standard rotating knob. In this case, ordering specification is SW..-..-m.

Likewise, a clamping fixture can be installed instead of the knob. The ordering specification will then be SW ..-..-k.

### 7.3 Setpoint value adjustment by current signal

For the speed setpoint value a current signal of 4 ... 20 mA can be directly connected to the control unit. If the signal fails, the governor will adjust minimum speed according to the 4 mA value or use a pre-programmed substitute value.

### 7.4 Digital presetting of setpoint values

With the corresponding configuration, a digital setpoint selection (e.g. digital synchronization performed manually or via PLC) can be implemented directly via two switch inputs (higher/lower speed).

### 7.5 Setpoint value adjustment by pedal

The electronical foot pedal EFP is basically an angular position transducer that translates gas pedal positions into a proportional current or voltage for 0 ... 45° rotational displacement. The resulting output can be used for speed setting. For more information refer to manual E 83 005 - e.

### 7.6 Pneumatic setpoint adjuster

If pneumatic setpoint adjustment is desired, the boost pressure sensors may be used to supply the signals. For detailed specifications of these sensors refer to chapter 6.4.2.
8 Control unit DC 6-00 ... 05

8.1 Specification

8.1.1 General

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>12 V DC or 24 V DC</td>
</tr>
<tr>
<td>Min. voltage</td>
<td>9 V DC or 18 V DC</td>
</tr>
<tr>
<td>Max. voltage</td>
<td>33 V DC</td>
</tr>
<tr>
<td>Max. ripple voltage</td>
<td>max. 10 % at 100 Hz</td>
</tr>
<tr>
<td>Maximum power rating</td>
<td>max. 7 A, and</td>
</tr>
<tr>
<td>zapmax. 11 A for max. 60 seconds</td>
<td></td>
</tr>
<tr>
<td>Permissible voltage dip at maximum current</td>
<td>max. 10 % at control unit</td>
</tr>
<tr>
<td>consumption</td>
<td></td>
</tr>
<tr>
<td>Fuse protection of governor</td>
<td>12 A</td>
</tr>
<tr>
<td>Storing temperature</td>
<td>-40°C … +85°C</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40°C … +80°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>up to 98% at 55°C</td>
</tr>
<tr>
<td>Dynamic strength</td>
<td>max. 2 mm at 10 … 20 Hz, max. 0.24 m/s at 21 … 63 Hz, max. 7 g at 64 … 2000 Hz</td>
</tr>
<tr>
<td>Shock</td>
<td>50 g, 11 ms- half-sine wave</td>
</tr>
<tr>
<td>Protection grade</td>
<td>IP 00</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>&gt; 1 MOhm at 48 V DC</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 0.5 kg</td>
</tr>
<tr>
<td>EMC directives</td>
<td>2004/108/EG</td>
</tr>
<tr>
<td></td>
<td>2004/104/EG</td>
</tr>
<tr>
<td>according to EMC standards:</td>
<td>ISO 11452-2</td>
</tr>
<tr>
<td></td>
<td>ISO 7637-2 / -3</td>
</tr>
<tr>
<td></td>
<td>DIN EN 61000-6</td>
</tr>
</tbody>
</table>
8.1.2 Inputs and outputs

All inputs and outputs are protected against reverse-voltage and short circuit to battery plus and minus.

**Speed input**
for inductive sensor, with  
\( f_i = 25 \ldots 9000 \text{ Hz}, U_i = 0.5 \ldots 30 \text{ V AC} \)

**Temperature input**
for PT1000 / Ni1000 sensors  
tolerance: < ±2°C at 0°C … 130°C, rest < ±4°C

**Reference voltage setpoint adjuster**
\( U_{\text{ref}} = 5 \text{ V} \pm 1 \% \), \( I_{\text{ref}} < 30 \text{ mA} \)

**Analogue input 1**
\( U = 0 \ldots 5 \text{ V}, R_i > 100 \text{ kΩ} \),  
when for HZM SyG, \( R_{pu} > 100 \text{ kΩ} \)  
or \( U = 0 \ldots 10 \text{ V}, R_i > 17 \text{ kΩ} \),  
or \( I = 4 \ldots 20 \text{ mA}, R_i > 250 \text{ Ω} \)

**Analogue input 2**
\( U = 0 \ldots 5 \text{ V}, R_i > 100 \text{ kΩ} \),  
when for HZM LMG, \( R_{pu} > 10 \text{ kΩ} \)  
or \( U = 0 \ldots 10 \text{ V}, R_i > 17 \text{ kΩ} \),  
or \( I = 4 \ldots 20 \text{ mA}, R_i > 250 \text{ Ω} \)

**Analogue input 3**
\( U = 0 \ldots 5 \text{ V}, R_i > 100 \text{ kΩ} \),  
or \( I = 4 \ldots 20 \text{ mA}, R_i > 250 \text{ Ω} \)

**Digita inputs 1 to 5**
\( U_0 < 1.0 \text{ V}, U_1 > 3.5 \text{ V}, R_i > 100 \text{ kΩ} \)

**PWM inputs 1 to 3**
\( U_0 < 1.0 \text{ V}, U_1 > 3.5 \text{ V} \) typical 5 V max. 24 V,  
\( R_i > 100 \text{ kΩ} \),  
frequency = 50 … 500 Hz

**Analogue outputs 1 and 2**
\( I = 0 \ldots 22 \text{ mA}, R_{L\text{max}} = 420 \text{ Ohm} \)

**Digital outputs 1 and 2**
\( I_{\text{max}} = 300 \text{ mA}, \text{low side switched} \)

**PWM outputs 1 and 2**
\( I_{\text{max}} = 300 \text{ mA}, \text{low side switched} \)  
frequency = 50 … 500 Hz

**Digital output failure lamp**
\( I_{\text{max}} = 300 \text{ mA}, \text{low side switched} \)

**Actuator position sensing**
internal in actuator with reference feedback  
**anologue**
\( U = 1.4 \ldots 3.0 \text{ V}, U_{\text{ref}} = 8 \text{ V} \pm x \% \), \( I_{\text{ref}} < 20 \text{ mA} \)  
**digital**
only with HEINZMANN-StG and Bosch EDC

**Drive output**
\( I < 7 \text{ A}, I < 11 \text{ A} \) for \( T < 60 \text{ s} \), PWM

**Serial interface ISO 9141,**
variable from 2.4 kbit/s … 57.6 kbit/s  
standard 9.6 kbit/s
8.2 Dimensions

Fig. 10: Housing of control unit DC 6-01 ... 05
8.3 Mounting

When selecting the location, care should be taken for easy access in order to facilitate read-out of the failure indication and replacement of the device under field conditions. Any mounting position is admissible. When fitting the device directly on the engine, it should be mounted using vibration absorbers.
9 Actuators

9.1 Design and mode of operation

The actuator torque is generated by a DC disk armature motor and transmitted to the governor output shaft by way of a gearbox.

The use of special materials and long-time lubricants assures maintenance-free operation and long working life of the actuators.

A feedback cam is mounted on the governor output shaft which is scanned contactlessly by a probe, thus transmitting the precise position of the output shaft to the control unit.

If the actuator strikes against a stop, as may occur, e.g., under parallel mains operation or may be caused by engine overload or cylinder failure, the current limitation will take effect. This reduces the current via an e-function such that no damage can occur on the actuator.
Altogether, this type of actuator provides the following advantages:

- High regulation power working in both directions.
- Extremely low current consumption during steady state and relatively low current consumption on change of load.
- Indifference to slow voltage changes of the supply; abrupt voltage changes cause governor disturbances.

### 9.2 Installation

The actuator must be mounted firmly on the engine by means of reinforced brackets. Unstable arrangements, as caused by weak bracket material or missing stiffenings, have to be avoided by all means; they are bound to intensify vibrations, which will lead to premature wear of the actuator and the connecting linkage!

Generally any mounting position is possible; however, the actuators should not be mounted with the plug connection pointing straight upward.
### 9.3 Specification

<table>
<thead>
<tr>
<th></th>
<th>StG 6-01</th>
<th>StG 6-02V</th>
<th>StG 10-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective rotation at output shaft</td>
<td>42°</td>
<td>42°</td>
<td>42°</td>
</tr>
<tr>
<td>Max. torque at actuator output shaft</td>
<td>approx. 4 Nm</td>
<td>approx. 6 Nm</td>
<td>approx. 10 Nm</td>
</tr>
<tr>
<td>Torque in steady state condition</td>
<td>approx. 1.3 Nm</td>
<td>approx. 2 Nm</td>
<td>approx. 3.3 Nm</td>
</tr>
<tr>
<td>Response time 0-100 % without load</td>
<td>approx. 70 ms</td>
<td>approx. 75 ms</td>
<td>approx. 80 ms</td>
</tr>
<tr>
<td>Current consumption of whole governor</td>
<td>approx. 5 A</td>
<td>approx. 1.7 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>maximum current</td>
<td>safe current in steady state condition</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-55°C … +110°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambiente temperature in operation</td>
<td>-25°C … +90°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambiente temp., special application</td>
<td>-40°C … +90°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>up to 98 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection grade</td>
<td>IP 55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 3.5 kg</td>
<td>ca. 4.3 kg</td>
<td></td>
</tr>
</tbody>
</table>
9.4 Dimensions

Fig. 12: Actuators StG 6 - 01 and StG 6 - 02 - V
Fig. 13: Actuator StG 10 - 01
10 Regulating linkage

10.1 Length of lever arm

The length of the lever arm is determined in such a way that approx. 90% of the governor output shaft adjustment angle can be used. Based on this, the rack length L of governors with 36° adjustment angle is calculated as L = 1.8 a, "a" being the travel distance of the injection pump or the carburetor.

10.2 Order specification for lever arm

Please order: RH 6-01 (EDV- No.: 502-80-017-00)

10.3 Connecting linkage

The connecting linkage from the governor to the injection pump or the carburetor should be length-adjustable and have a (pressure or tension) elastic link. If the actuators torque is less than 10 Nm, the elastic link is not needed. If possible, joint rod heads in accordance with DIN 648 should be used as connecting links. The linkage must operate easily and without clearance.

In case of friction or backlash in the linkage connecting actuator and injection pump resp. throttle valve no optimal control is possible.
10.3.1 Linkage adjustment for diesel engines

The length of the connecting linkage is adjusted in such a way that with the governor in stop position the injection pump is set to 0 - 2 fuel marks. (Travel of the injection pump control rack is limited by the governor.)

The resistance of the pressure elastic link is overcome when the control rack has reached the full load stop and the speed continues to decrease (overload). Furthermore, the elastic link is overcome when stopping via the emergency switch.

Fig. 14: Linkage for diesel engines
10.3.2 Linkage adjustment for carburetor engines

For carburetor or gas engines, the length of the connecting linkage is adjusted in such a way that with the governor in full load position the throttle valve is completely open. In idling speed position, the elastic link must be slightly overcome. This allows adjustment of the idle screw without changing the governor adjustment.

Fig. 15: Linkage for carburettor and gas engines

If carburettor or injection pump are to the right of the actuator as opposed to their position on the drawings, then the direction of motion of the elastic link must also be reversed.
11 Electrical connection

The electrical connection possibilities are depending on the variation of the control unit.

As the pin connections for the DG 6-00 variant support highly flexible configuration, a terminal connection diagram for this purpose would be too unclear. In the case of this variant, the potential connection options and functions of the inputs and outputs are therefore identified using a table.

Terminal connection diagrams are available for all other variants.

The parameter settings for the configurable terminals and the functions of the individual parameters are described in detail in the publication *Basic information on control units for conventional injection via actuators, publication no. DG 07 001-d.*

### 11.1 Connection table for variation DG 6-00

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>CAN communication high-connection</td>
</tr>
<tr>
<td>L</td>
<td>CAN communication low-connection</td>
</tr>
<tr>
<td>1</td>
<td>Digital input 2 (switch to +24 V), or Analogue input 2, 0 … 5 V or 0 … 10 V or 0 … 22 mA, or PWM input 2, or Digital output 2 (low side switched), or Analogue output 2, 0 … 20 mA, or PWM output 2</td>
</tr>
<tr>
<td>2</td>
<td>Digital input 1 (switch to +24 V), or Analogue input 1, 0 … 5 V or 0 … 10 V or 0 … 22 mA, or PWM input 1, or Digital output 1 (low side switched), or Analogue output 1, 0 … 20 mA, or PWM output 1</td>
</tr>
<tr>
<td>3</td>
<td>GND for terminals 1 and 2</td>
</tr>
<tr>
<td>4</td>
<td>Temperature sensor signals</td>
</tr>
<tr>
<td>5</td>
<td>GND for temperature sensor</td>
</tr>
<tr>
<td>6</td>
<td>+5V reference supply voltage for setpoint potentiometer</td>
</tr>
<tr>
<td>7</td>
<td>Digital input 3 (switch to +24 V), or Analogue input 3, 0 … 5 V or 0 … 22 mA, or</td>
</tr>
</tbody>
</table>
## 11.2 Optional assignment of inputs and outputs, variation DG 6-00

### 11.2.1 Digital Inputs

The following parameters are available for assignment of digital inputs:

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>GND</td>
</tr>
<tr>
<td>9</td>
<td>Digital input 4 (switch to +24 V)</td>
</tr>
<tr>
<td>10</td>
<td>Error output (low side switched)</td>
</tr>
<tr>
<td>11</td>
<td>Digital input 5 (switch to +24 V), or PWM input 3, or speed sensor 2 (Hall sensor)</td>
</tr>
<tr>
<td>12</td>
<td>Speed sensor GND</td>
</tr>
<tr>
<td>13</td>
<td>Speed sensor signal</td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
</tr>
<tr>
<td>15</td>
<td>Actuator feedback GND, pin E at actuator plug</td>
</tr>
<tr>
<td>16</td>
<td>Actuator feedback signal 1.6 ... 2.8 V, pin A at actuator plug</td>
</tr>
<tr>
<td>17</td>
<td>Actuator feedback + 8 V reference, pin D at actuator plug</td>
</tr>
<tr>
<td>20</td>
<td>Power supply GND</td>
</tr>
<tr>
<td>21</td>
<td>Power supply +24 V</td>
</tr>
<tr>
<td>24</td>
<td>Actuator drive line minus, pin B at actuator plug</td>
</tr>
<tr>
<td>25</td>
<td>Actuator drive line plus, pin C at actuator plug</td>
</tr>
</tbody>
</table>

810  FunctEngineStop  
811  FunctIdleSpeed  
812  FunctDroop2Or1  
813  FunctForcedLimit  
814  FunctSpeedRange2Or1  
815  FunctSpeedFix1  
816  FunctSpeedFix2  
817  FunctSpeedLimit2Or1  
819  FunctNotch3  
820  FunctNotch2  
821  FunctNotch1  
822  FunctNotch0  
825  FunctSpeedInc
11.2.2 Analogue and PWM Inputs

The following parameters are available for assignment of analogue or PWM inputs:

900   AssignIn_Setp1Ext
901   AssignIn_Setp2Ext
902   AssignIn_LoadCtrlInp
903   AssignIn_SyncInput
904   AssignIn_BoostPress
905   AssignIn_OilPress
907   AssignIn_CoolantTemp
908   AssignIn_ChAirTemp
909   AssignIn_OilTemp
910   AssignIn_FuelTemp
911   AssignIn_ExhaustTemp
918   AssignIn_MeasPower
923   AssignIn_FuelLimExt

11.2.3 Digital Outputs

All parameters that can only adopt a value of 0 or 1 can be assigned to digital outputs, regardless of whether these are set parameters or measured value parameters.

11.2.4 Analogue and PWM Outputs

All parameters that feature an analogue value range can be assigned to analogue or PWM outputs, regardless of whether these are set parameters or measured value parameters.
11.3 Connection for variation DG 6-01 (standard generator)

Fig. 16: Connection diagram for variation DG 6-01
11.4 Connection for variation DG 6-02 (standard general)

Fig. 17: Connection diagram for variation DG 6-02
11.5 Connection for variation DG 6-03 (extended generator)

As a result of the numerous options for assigning analogue and digital inputs, the following terminal connection diagram only indicates the types of the potential inputs. The functions that can be assigned to these inputs are listed below.

![Diagram]

Fig. 18: Connection diagram for variation DG 6-03

(* Note: Depending on assignment each input is available either as analogue or digital input! For analogue inputs shielding is necessary!)
11.5.1 Digital Inputs

The following parameters are available for assignment of digital inputs:

810  FunctEngineStop
811  FunctIdleSpeed
812  FunctDroop2Or1
814  FunctSpeedRange2Or1
815  FunctSpeedFix1
825  FunctSpeedInc
826  FunctSpeedDec
828  FunctErrorReset
834  FunctSyncEnable
835  FunctLoadEnable
836  FunctAutoOrManual
845  FunctAutoAdjust
846  FunctGenBreaker

11.5.2 Analogue and PWM Inputs

The following parameters are available for assignment of analogue or PWM inputs:

900  AssignIn_SetpExt
902  AssignIn_LoadCtrlInp
903  AssignIn_SyncInput
904  AssignIn_BoostPress
907  AssignIn_CoolantTemp
918  AssignIn_MeasPower
11.6 Connection for variation DG 6-05 (extended general)

Fig. 19: Connection diagram for variation DG 6-05
11.7 Harness

It is not possible to use all offered signals at the same time, because some inputs have to be assigned differently depending on the variation.

![Diagram](image.png)  
*Fig. 20: Cable designation*
The allowed length and necessary cross-sections of the cables to connect are as follows:

<table>
<thead>
<tr>
<th>Cable No.</th>
<th>Description</th>
<th>Max. Length</th>
<th>Cross-Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 1</td>
<td>Power supply</td>
<td>max. 15 m</td>
<td>2 x 2.50 mm²</td>
</tr>
<tr>
<td>L 2.1</td>
<td>Actuator feedback</td>
<td></td>
<td>3 x 0.75 mm² shielded</td>
</tr>
<tr>
<td>L 2.2</td>
<td>Actuator drive</td>
<td>up to 10 m</td>
<td>2 x 2.50 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>over 10 … 20 m</td>
<td>2 x 4.00 mm²</td>
</tr>
<tr>
<td>L 3.1</td>
<td>Setpoint potentiometer</td>
<td></td>
<td>3 x 0.75 mm² shielded</td>
</tr>
<tr>
<td>L 3.2</td>
<td>4 ... 20 mA input</td>
<td></td>
<td>2 x 0.75 mm²</td>
</tr>
<tr>
<td>L 3.3</td>
<td>0 … 5 V input</td>
<td></td>
<td>2 x 0.75 mm² shielded</td>
</tr>
<tr>
<td>L 3.4</td>
<td>Synchronizer</td>
<td></td>
<td>2 x 0.75 mm² shielded</td>
</tr>
<tr>
<td>L 3.5</td>
<td>Load measuring unit</td>
<td></td>
<td>2 x 0.75 mm² shielded</td>
</tr>
<tr>
<td>L 4</td>
<td>Magnetic pick-up</td>
<td></td>
<td>2 x 0.75 mm² shielded</td>
</tr>
<tr>
<td>L 5.1</td>
<td>Temperature sensor</td>
<td></td>
<td>2 x 0.75 mm²</td>
</tr>
<tr>
<td>L 5.2</td>
<td>Boost pressure sensor</td>
<td></td>
<td>2 x 0.75 mm²</td>
</tr>
<tr>
<td>L 5.3</td>
<td>Oil pressure sensor</td>
<td></td>
<td>2 x 0.75 mm²</td>
</tr>
<tr>
<td>L 6.1</td>
<td>Engine stop</td>
<td></td>
<td>1 x 0.75 mm²</td>
</tr>
<tr>
<td>L 6.2</td>
<td>Increase speed</td>
<td></td>
<td>1 x 0.75 mm²</td>
</tr>
<tr>
<td>L 6.3</td>
<td>Decrease speed</td>
<td></td>
<td>1 x 0.75 mm²</td>
</tr>
<tr>
<td>L 6.4</td>
<td>other switch functions</td>
<td></td>
<td>1 x 0.75 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(the switches have to be supplied with battery plus)</td>
</tr>
<tr>
<td>L 7</td>
<td>Error message</td>
<td></td>
<td>1 x 0.75 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(the error lamp has to be supplied with battery plus, ground is switched)</td>
</tr>
<tr>
<td>L 13</td>
<td>CAN communication with DGM 02</td>
<td></td>
<td>2 x 0.14 mm² shielded</td>
</tr>
</tbody>
</table>
12 Parametrization options

The software of the HEINZMANN digital controllers is designed in such a way that the parameter settings can be implemented both at the premises of the engine manufacturer and, with the help of corresponding resources (communication tools), also at the premises of the end customer. Upon leaving the HEINZMANN factory, only selected parameters are preset to practical values. This means that the digital control device normally receives its final parameter setting from a source other than HEINZMANN.

Controllers featuring larger piece counts are an exception to this rule. If HEINZMANN is able to provide a final parameter setting, this can be integrated ex works.

As a principle, first programming should always be conducted by experienced personnel and must be checked before first commissioning the engine.

The publication 'Basic information 2000' provides a detailed description of the significance of the parameters and how they are set.

The following sections describe the possibilities of parametrizing the control unit:

12.1 Parametrization at the factory

During final inspection at the factory, the functionality of the unit is checked by a test programme. If the operational data for the control unit is available, the test programme is carried out using this data. It is then only the dynamics data and if need be the fuel limitations and sensors that will have to be calibrated on the engine.

12.2 Parametrization with the Hand Held Programmer HP 03

All parametrization can also be done by means of the hand held programmer ‘Programmer 3’. This handy device is particularly suited for development and series calibration as well as for servicing. The device does not require an external voltage supply.

12.3 Parametrierung mit dem PC / Laptop

Parametrization can also be conducted using a PC and the comfortable HEINZMANN software DcDesk 2000. As compared with the hand held programmer, it offers the great advantage of having various curves graphically represented on the screen and being at the same time able to introduce changes as well as of having time diagrams displayed without an oscilloscope when commissioning the control unit on the engine. Furthermore, the PC offers a better overview as the PC programme has a menu structure and allows to have several parameters continuously displayed.
DcDesk 2000 also makes it possible for operating data to be saved to and loaded from data carriers. This results in the following practical application:

Once the parameter settings for an engine design and its application have been specified, the parameter setting can be saved. If there are other applications of the same type, the setting can simply be transferred to new controllers.

### 12.4 Parametrization with user mask

Principally, parametrization may be performed with the help of user masks that have been provided by HEINZMANN or may conveniently be created by the user himself. Within a user mask, only those parameters are accessible which are actually needed.

### 12.5 Transferring data sets

Once parametrizing a particular engine model and its application has been completed, the data set can be saved (in the hand held programmer or on a floppy disk). For other applications of the same kind the data set can then be downloaded into the respective control units.

### 12.6 Assembly line end programming

This type parametrizing is used by the engine manufacturer during the test bench run when the control unit is programmed in accordance with the engine requirements as laid down in the order.
13 Starting the engine - brief instruction

13.1 Adjust clearance of magnetic pulse pick-up.

13.2 Check program with respect to relevant parameters: number of teeth, speed, etc.

13.3 Calibrate sensors and setpoint adjusters, if necessary.

13.4 Make autoadjustment of actuator. Autoabgleich.

13.5 Set point potentiometer in mid-position

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Gain</td>
<td>to 10</td>
</tr>
<tr>
<td>I</td>
<td>Stability</td>
<td>to 5</td>
</tr>
<tr>
<td>D</td>
<td>Derivative</td>
<td>to 5</td>
</tr>
</tbody>
</table>

If the dynamic values have already been determined for an installation, they can be programmed directly at this point.

> Additional overspeed protection independent of the speed controller is compulsory!

13.6 Start engine and run it up to nominal speed using the set point potentiometer.

13.7 Increase gain (P-fraction) up to instability and reduce until stability is attained.
Increase stability (I-fraction) up to instability and reduce until stability is attained.
Increase derivative (D-fraction) up to instability and reduce until stability is attained.

With these values set, engine speed is to be disturbed briefly (e.g., by shortly pressing the stop switch), and the transient oscillations are to be observed.

13.8 Check over the entire speed range.

If for maximum and minimum speed other values than the programmed ones should result, this will be due to tolerances of the set point potentiometer. If the speed derivation is not acceptable, it will be necessary to measure the setpoint source.

13.9 Gain-correction (P-correction) for gas engines resp. for variable speed governors with larger speed ranges; adjust map if necessary.

13.10 Checking the remaining program items, e.g., starting fuel injection, ramp time, etc.
14 Ordering details

Control device:
Designation DC X .6-0Y
X = actuator type used 16, 30 or 40
Y = application variant 0 … 5 (see terminal connection diagrams)

The hardware and software of the control device are adapted prior to delivery in line with the application variant, including the control device type. All other settings that are required, such as the number of teeth, speed range, limiting curves, dynamic parameters and start procedure, must be set by the customer themselves.

In the case of the variants Y = 0 or Y = 3, the customer must also configure the inputs and outputs. This requires a Heinzmann communication tool with access to level 6 parameters (access to all parameters).

Actuator:
One of the types listed in chapter 9.3 must be specified here.

Lever arm:
The type listed in chapter 10.2 must be specified here.

Speed pickup:
One of the types listed in chapter 6.2.5 must be specified here.

Additional sensors:
If additional sensors or a setpoint adjuster are required, the ordering details can be found in the corresponding chapters.

Harness:
It is recommended to have the cable set produced at HEINZMANN. The necessary cable lengths must be stated for the individual connections.

The cabling to the actuator and to the speed pickup must be performed by HEINZMANN in all cases, as it is necessary in this context to use HEINZMANN plugs: the cables are soldered onto the contacts of these plugs.

The order designations of the individual cables can be found in chapter 11.7.
15 Download of manuals

Technical manuals can be downloaded in pdf-format from our homepage:

www.heinzmann.com

If the desired manual should not be available there, send an e-mail to:

info@heinzmann.de

or write to:

HEINZMANN GmbH & Co. KG
Technische Redaktion
Am Haselbach 1
D-79677 Schönau/Germany

Please include the following information:

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- name and address of your company
- e-mail or address where you want the manuals to be sent to (if different from above)
- item code (as on front page, bottom right) and title of the desired manual or alternatively the technical data of your HEINZMANN equipment.

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Send your comments to the e-mail or address shown above please.