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HEINZMANN®
Digital Speed Governors

Hand Held Programmer

Programmer 2

Manual DG 95 106-e / 07-07

Warning	Read this entire manual and all other publications appertaining to the work to be performed before installing, operating or servicing your equipment. Practice all plant and safety instructions and precautions.
Danger	Failure to follow instructions may result in personal injury and/or damage to property. HEINZMANN will refuse all liability for injury or damage which results from not following instructions
Danger! High Voltage **Danger**	**Please note before commissioning the installation:** Before starting to install any equipment, the installation must have been switched dead! Be sure to use cable shieldings and power supply connections meeting the requirements of the *European Directive concerning EMI*. Check the functionality of the existing protection and monitoring systems.
Danger	**To prevent damages to the equipment and personal injuries, it is imperative that the following monitoring and protection systems have been installed:** Overspeed protection acting independently of the speed governor Overtemperature protection HEINZMANN will refuse all liability for damage which results from missing or insufficiently working overspeed protection **Generator installation will in addition require:** Overcurrent protection Protection against faulty synchronization due to excessive frequency, voltage or phase differences Reverse power protection
	Overspeeding can be caused by: Failure of the voltage supply Failure of the actuator, the control unit or of any accessory device Sluggish and blocking linkage

Warning	**Electronically controlled injection (MVC) will in addition require to observe the following:** With **Common Rail** systems a separate mechanical flow limiter must be provided for each injector pipe. With **Pump-Pipe-Nozzle (PPN)** and **Pump Nozzle (PNE)** systems fuel release may be enabled only by the movement of control piston of the solenoid valve. This is to inhibit fuel from being delivered to the injection nozzle in case of seizure of the control piston.
Warning	The examples, data and any other information in this manual are intended exclusively as instruction aids and should not be used in any particular application without independent testing and verification by the person making the application.
Danger	Independent testing and verification are especially important in any application in which malfunction might result in personal injury or damage to property.
	HEINZMANN make no warranties, express or implied, that the examples, data, or other information in this volume are free of error, that they are consistent with industry standards, or that they will meet the requirements for any particular application.
	HEINZMANN expressly disclaim the implied warranties of merchantability and of fitness for any particular purpose, even if **HEINZMANN** have been advised of a particular purpose and even if a particular purpose is indicated in the manual.
	HEINZMANN also disclaim all liability for direct, indirect, incidental or consequential damages that result from any use of the examples, data, or other information contained in this manual.
	HEINZMANN make no warranties for the conception and engineering of the technical installation as a whole. This is the responsibility of the user and of his planning staff and specialists. It is also their responsibility to verify whether the performance features of our devices will meet the intended purposes. The user is also responsible for correct commissioning of the total installation.

Contents

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

persons

product and engine

environment.

The symbols used in this publication are in the first place intended to direct your attention to the safety instructions!

Warning

This symbol is to indicate that there may exist dangers to the engine, to the material and to the environment.

Danger

This symbol is to indicate that there may exist dangers to persons. (Danger to life, personal injury).

Danger! High Voltage

This symbol is to indicate that there exist particular danger due to electrical high tension. (Mortal danger).

Note

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. The respective text is printed in italics.

The primary issue of these safety instructions is to prevent personal injuries!

Whenever some safety instruction is preceded by a warning triangle labelled "Danger" this is to indicate that it is not possible to definitely exclude the presence of danger to persons, engine, material and/or environment.

If, however, some safety instruction is preceded by the warning triangle labelled "Caution" this will indicate that danger of life or personal injury is not involved.

The symbols used in the text do not supersede the safety instructions. So please do not skip the respective texts but read them thoroughly!

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

2.1 General System Description

The HEINZMANN Digitals Controls are designed as universal speed controls for diesel engines, gas engines, and other prime movers. In addition to their basic purpose of controlling speed, these governors are capable of performing a multitude of other tasks and functions.

At the core of the control unit is a very fast and powerful microprocessor (CPU). The controller programme itself based on which the microprocessor operates is permanently stored in a so-called Flash-ROM.

Actual engine speed is measured by a magnetic pickup on the starter gear. For fail-safe operation, either an additional speed pickup can be installed, or the control can use the alternator signal from terminal W as a default speed signal. Thus, there will be no interruption of operation if the first pickup should happen to fail.

Engine speed is set by one or more setpoint adjusters. These adjusters can be designed to be analogue or digital ones. Further digital inputs permit to switch on functions or to change over to other functions.

Furthermore, there are various sensors provided to feed the control all the data it needs to adjust the engine's operating state. As an example, it is possible to have several temperature and pressure signals transmitted from the engine.

The actuator regulating fuel supply to the engine is driven by a PWM signal. By this, both two-quadrant actuators (working electrically one way) and four-quadrant actuators (working electrically both ways) can be driven.

The control generates analogue and digital signals which are used to indicate the engine's operating conditions or serve other purposes and functions. Communication with other units is established via a serial interface and a CAN bus.

2.2 Further Informations

This manual contains mainly the description of programming the HEINZMANN governors with the hand held programmer PG 02. The error handling is also discussed in detail.

The functionality of the software, the speed governing in general, the specifications and connections of the control electronics, sensors, setpoint adjusters and actuators are described in detail in the manuals:

Basic Information for Digital Governors Level 6, Manual No.. DG 95 105 - e

Basic Information 2000 for Digital Governors Level 6, Manual No. DG 00 001 - e

Digital Basic System PRIAMOS I, Manual No. DG 93 101 - e

Digital Basic System PRIAMOS II, Manual No. DG 94 111 - e

Digital Basic System PRIAMOS III, Manual No. DG 95 111 - e

Digital Basic System PRIAMOS IV, Manual No. DG 96 004 - e

Digital Basic System PRIAMOS V, Manual No. DG 97 013 - e

Digital Basic System HELENOS I, Manual No. DG 93 102 - e

Digital Basic System HELENOS II, Manual No. DG 95 100 - e

Digital Basic System HELENOS III, Manual No. DG 96 005 - e

Digital Basic System HELENOS IV, Manual No. DG 96 003 - e

Digital Basic System HELENOS V, Manual No. DG 97 014 - e

Dual Fuel Operation, Manual No. DG 97 016 - e

The HEINZMANN Digital Controls are shipped tailored to custom requirements and have been configured as far as possible at the factory. To execute an order properly it is absolutely necessary for the customer to complete and return to HEINZMANN the brochure

Order Information for Digital Controls, Manual No. DG 96 012-e.

The Sensors available from HEINZMANN are described in the manual

Product Overview Sensors, Manual No. E 99 001-e

The functionality of the communication programme DcDesk 2000 is described in the manual

Operating Instructions Communication Programme DcDesk 2000,
Manual No. DG 00 003-e

2.3 Parameter Lists

In developing the HEINZMANN Digital Controls top priority was given to realizing a combination of universal applicability and high grade functionality. As various adjustable parameters had to be provided for each individual function, some system was needed to conveniently organize the great multitude of parameters that would inevitably result from the numerous functions to be implemented. So for the sake of clarity and easy access, the parameters have been grouped into four lists.

1.Parameters   Parameters used for adjusting the control and the engine (parameter numbers 1..1999)

2.Measurements   Parameters (measuring or monitor values) serving to indicate the actual states of the control and the engine (parameter numbers 2000..3999)

3.Functions   Parameters used for activating and switching over functions (parameter numbers 4000..5999)

4.Curves   Parameters used for parameterizing characteristic curves and characteristic maps (parameter numbers 6000..7999)

Each parameter is assigned a number and an abbreviation. The parameter number indicates which list the parameter belongs to. Within these lists, the parameters are arranged by groups to facilitate identification and reference for more detailed information.

> **i**
> **Note**
>
> *There are different ways of writing of the parameter names. With older software-versions all letters of the abbreviation largely written (e.g. SPEED_RAMP_UP) with the newer versions are used large and lower case (e.g. SpeedRampUp). Crucially for the function of the parameter is however the parameter number. This was as far as possible maintained with the modification of the software.*

The following overview table shows where the individual parameters are to find.

A detailed parameter list, with which each individual parameter is described, is at the end of the respective manual with the appropriate software description.

Parameters		Measurements		Functions		Curves	
No.	Designation	No.	Designation	No.	Designation	No.	Designation
1	Number of Teeth, Speed	2000	Speed Pickup, Speed	4000	Speed Pickup, Speed	6000	
100	Stability, Droop	2100	Stability, Droop	4100	Stability Map, Droop	6100	Stability Map
200	Ramp, Start	2200		4200	Ramp	6200	Stability Map (Correction Values)
300	Actuator Travel	2300	Actuator Travel	4300		6300	
400	CAN	2400	CAN	4400	CAN	6400	Boost Pressure dependent Fuel and Load Limitation
500	Oil Pressure, Boost Pressure, Temperature	2500		4500	Oil Pressure, Boost Pressure, Temperatuer	6500	Oil Pressure Monitoring
600	Excitation Control	2600	Excitation Control	4600	Excitation Control	6600	Excitation Control
700	Limitations	2700	Limitations	4700	Limitations	6700	Speed dependent Fuel Limitation 1
800	Switch Functions, Digital Outputs	2800	Switch Functions, Digital Outputs	4800	Digital Inputs, Digital Outputs	6800	Speed dependent Fuel Limitation 2
900	Setpoint Adjusters, Sensors	2900	Setpoint Adjusters, Sensors	4900	Setpoint Adjusters, Sensors	6900	Speed Notches Speed dependent Load Limitation
1000	Error Handling	3000	Current Errors	5000	Error Handling	7000	
1100		3100	Error Memroy	5100	Error Handling	7100	
1200	Generator	3200		5200	Generator	7200	Pump Map
				5250	Marine		
1350	Locomotive	3350	Locomotive	5350	Locomotive	7300	
1500	Analogue Inputs	3500	PWM-Inputs, Analogue Inputs	5500	Channel Type	7500	
1600	PWM-Outputs Analogue Outputs	3600		5600	Analogue Outputs	7600	
1700	Positioner	3700		5700	Positioner	7700	
1800	Status	3800	Status	5800		7800	
1900	Servo Loop, Feedback	3900	Servo Circuit, Feedback	5900	Servo Loop, Feedback	7900	Temperature Sensors Feedback

Table 1: Parameter Overview

2.4 Levels

As it is the Digital Control's primary function to control the operational behaviour of the engine with regard to speed, power, etc., parameterizing should remain entrusted exclusively to the engine manufacturer. However, to let also the ultimate customer participate in the advantages of the Digital Control, the parameters of the HEINZMANN Digital Control have been classified according to seven levels.

◆ Level 1: <u>Level for the ultimate customer</u>
> On this level, it is possible to have the basic operational values (e.g., set values and current values of speed and injection quantity) and errors displayed. This level, however, does not allow any manipulation of the control data or the engine data.

◆ Level 2: <u>Level for the device manufacturer</u>
> The device manufacturer can set speeds within the permissible ranges. Besides, the control's dynamic parameters and the dynamics map may be modified and power output reduced.

◆ Level 3: <u>Level for the service</u>
> With the exception of the most significant engine specific parameters, such as engine output and boundaries of various characteristic map, all types of modifications are permitted on this level.

◆ Level 4: <u>Level for the engine manufacturer</u>
> On this level, the entire programme as needed to programme the control is accessible.

◆ Level 5: <u>Level for manufacturers of engines with user-specific software</u>
> This level is provided for parameters that are required for customer specific software modifications or expansions.

◆ Level 6: <u>Level for the control manufacturer</u>
> On this level, the control functions may be manipulated directly. Therefore, access on this level remains restricted to HEINZMANN.

◆ Level 7: <u>Level for development</u>
> This level remains reserved for the HEINZMANN development department.

As will have become evident from this survey any superior level is a proper superset of the previous level, providing upward compatibility. At the end of the software manuals a detailed list of all parameters together with their respective levels is available. The maximum level is determined by the diagnostics device used (PC or Hand Held Programmer) and cannot be changed. There exists, however, the option of reducing the currently valid level by means of a special menu item of the PC-programme or via the parameter 1800 *Level*. Reducing the level is, however, bound to affect the number of parameters and functions that can be accessed.

3 Parameterization of HEINZMANN Speed Governors

3.1 Possibilities of Parameterization

There exist various possibilities of parameterizing HEINZMANN Digital Controls. For testing and initial commissioning HEINZMANN recommend using the PC software DcDesk 2000 as a tool for diagnostics and parameterization. DcDesk 2000 can also be used for servicing purposes where, in addition, the Hand Programmers PG 02 and HP 03 are available.

The below list gives an overview of all available options of parameterization:

◆ Parameterization by HEINZMANN
During final inspection at the factory, the functionability of the control is checked by means of a test programme. If customer specific operational data is available, the test programme is executed using those data. When mounted on the engine, it is only the dynamic values and, if necessary, the fuel quantity limitations and the sensors that remain to be calibrated.

◆ Parameterization Using the Hand Programmer
Depending on the level, parameterization can be completely conducted using the Hand Programmers PG 2 or HP 3. These handy devices are particularly suited for maintenance and servicing.

◆ Parameterization by DcDesk 2000
Using the PC programme DcDesk 2000, it is possible to have several parameters continuously displayed and accessible to modification. Besides, the PC-programme is capable of graphically displaying limitation curves, characteristics, etc., and of adjusting them easily and quickly. The control data can be stored by the PC or downloaded from the PC to the control. A further advantage of the PC programme is its ability to visualize measured values (such as speed, injection quantity) as functions of time or as functions of each other (e.g., actuator position versus speed).

◆ Parameterization with User Masks
Parameterization can always be conducted by means of user masks that are provided by HEINZMANN or can easily be created by the user himself. A user mask will display only those parameters that are really needed.

◆ Downloading Data Sets
Once parameterization has been completed for a specific engine type and its application, the data set can be stored within the Hand Programmer or on a disk. For future applications of the same type, any such data sets can be readily downloaded to the new controls.

◆ Check-Out Parameterization

This type of parameterization is performed by the engine manufacturer during the final bench tests of the engine. By this procedure, the control is tuned to engine requirements and to ordering specifications.

3.2 Saving Data

On principle, the above mentioned communication programmes and devices will modify parameters only in the volatile memory of the control unit. Although the control unit will immediately operate using the new values these modifications will get lost as soon as the the voltage supply is switched off. In order to permanently save the parameter adjustments in the control unit a storing command must be given. To execute this command DcDesk 2000 uses the function key F6, whereas the Hand Programmers use the key or menu item "Save Parameter", and it is this operation that is meant whenever it is required in this manual that the parameters be saved.

3.3 DcDesk 2000

The HEINZMANN PC programme DcDesk 2000 serves for adjustment and transmission of operating data for all digital HEINZMANN systems, and, in particular, for the PRIAMOS and HELENOS systems. Designed as a Windows programme, it offers all numerical and graphical features required for testing, initial commissioning and servicing, and helps with preparing the respective documentation.

DcDesk 2000 also allows to produce hard copy printouts of its screens and of its data records. The data is recorded in a standard text format for further processing and for incorporation into reports, etc.

The data set of any connected control unit can be processed, and, at the same time, the responses to parameter changes can be observed. Even without a control unit connected, it will be possible to process a parameter set and evaluate the recorded data. Any parameter set generated that way can later on be downloaded to the control unit.

Any adjustment can be made by directly accessing the respective parameter numbers. There exist, however, additional windows to simplify adjustment of specific functions and, particularly, parameterization of characteristics and maps.

Current measurements are displayed numerically and/or graphically. In a separate window, up to ten freely selectable measuring values can simultaneously be displayed as functions of time. There is a further window that permits to have nine measurements represented in dependence of a tenth. All of these records can be logged to be evaluated later on and eventually printed out.

Any of the characteristics and maps available within the control unit can be displayed two- or three-dimensionally in separate windows. By this, the profile and shape of any specific characteristic or map can immediately be viewed. The actual point within the characteristic or map at which the system is currently operating will be displayed online. To make any adjustments does not require detailed knowledge of the interrelation between the parameter numbers and the points of the characteristic or map since a special input section has been provided offering assistance with regard to the peculiarities of parameterizing characteristics and maps. This feature will prove very helpful to avoid erroneous input.

DcDesk 2000 is being continuously updated and enhanced by additional functions.

HEINZMANN particularly recommend the use of DcDesk 2000 for testing and initial commissioning. Similarly, when servicing the system, DcDesk 2000 will prove a great advantage for diagnosis and trouble shooting.

3.4 Parameter Value Ranges

Each parameter is assigned a particular value range. As there is a multitude of parameters and functions, there also exists a great number of value ranges. Furthermore, the parameter value ranges can be viewed by means of the PC or the hand held programmer.

For speed parameters, however, a common value range is provided. As a standard, it is set to 0..4000 rpm which allows to run engines up to maximum speeds of approx. 3.500..3.600 rpm. There must exist some reserve for overspeed monitoring.

For certain parameters the value ranges cannot be explicitly specified in advance, but must be communicated to the control by the user. This applies to all parameters indicating physical measurements such as measurements from pressure or temperature sensors.

Some parameters are assigned a value range that is capable of two states only, viz. 0 or 1. This type parameters are used to activate or switch over particular functions or to indicate states of errors or of external switches, etc. Parameters with this value range are confined to the lists 2 (Measurements) and 3 (Functions).

In that case, state "1" signifies that the respective function is active or that the respective error has occurred, whereas state "0" signals the function to be inactive resp. that no error has occurred.

The identifiers of change-over switches or of parameters selecting between two functions always in clude an *Or* (e.g.: 2812 *SwitchDroop2Or1*). The function preceding *Or* will be active when the parameter value is = 1 whilst the function after *Or* will be active when the parameter value is = 0.

3.5 Activation of Functions

With regard to the activation of functions, the following alternatives are provided:

- ◆ permanently active: These functions cannot be turned off (e.g., overspeed monitoring).

- ◆ parameters: Parameters contained in list 3 enable functions that after being selected by the user will remain permanently active (e.g., speed dependend fuel limitation.

- ◆ switching functions :   By means of external switches the control can be instructed to adopt certain requested operational states that are subject to frequent changes during operation (e.g., change-over of droop or limitation curves). The states of the external switches can be viewed by the parameters that have been assigned the numbers from 2800 on upward.

3.6 Parameterization of Characteristics

Parameterization of characteristics is done by one and the same procedure. The number of pairs of variates, however, will be different for different functions. A pair of variates consists of one x-value and one y-value both with the same index. Intermediary values between adjacent pairs of variates will be interpolated by the control.

When parameterizing a characteristic, the following instructions must be observed:

- ◆   The characteristics must always begin with the pair of values indexed 0.

- ◆   The x-values must be sorted in ascending order.

- ◆   Each x-value may occur only once.

- ◆   For unused pairs at the end of the characteristic, the x-variate must be set to the smallest possible value.

Parameterization of any characteristic does not require all pairs of variates to be assigned a value. It will suffice to assign values only to as many parameters (beginning with index 0) as will be needed. Similarly, it will not be necessary that the distances between the base points (or nodes) be the same.

When the current x-value of any characteristic is below the first base point (supporting point), the value of the characteristic will be set to the y-value of the first base point (supporting point), and when it is beyond the last base point, the y-value of this base point will be used. In other words, the first and last of the y-values will be retained in case the current x-value is outside the characteristic's domain.

3.7 Parameterization of Maps

Parameterization of maps will always follow the same procedure. The number of base points, however, will be different for different functions. A supporting point consists of one x-value and one y-value and the associated z-value. Intermediary values between adjacent pairs of variates will be interpolated by the control.

When parameterizing a map, the following instructions must be observed:

◆ The x- and y-values must always begin with index 0.

◆ The x- and y-values must be arranged by ascending order.

◆ Each x- and y-value may occur only once.

◆ For unused base points at the end of the map, the x- and y-variates must each be assigned their respective smallest possible values.

Parameterization of any map does not require all pairs of variates to be assigned a value. It will suffice to assign values only to as many parameters (beginning with index 0 for the x- and y-values) as will be needed. Similarly, it will not be necessary that the distances between the base points be the same.

As an illustration of how parameter indexes are assigned to a map, the following example shows a map table with a domain of 5 times 5 base points:

y-values	x-values				
	x index 0	x index 1	x index 2	x index 3	x index 4
y index 0	z index 0	z index 1	z index 2	z index 3	z index 4
y index 1	z index 5	z index 6	z index 7	z index 8	z index 9
y index 2	z index 10	z index 11	z index 12	z index 13	z index 14
y index 3	z index 15	z index 16	z index 17	z index 18	z index 19
y index 4	z index 20	z index 21	z index 22	z index 23	z index 24

If the current values in direction of the x- and/or y-axes are outside the domain of the map as defined by the base points, the respective border value of the map will be used instead.

If it should prove necessary to restrict dependence to only one direction this can be achieved by setting the base points for the other direction to their minimum value. In other words, if there is functional dependence only in direction of the y-axis, all x index values are to be set to minimum value. The base points for z will then be those of the series with x-index 0.

HEINZMANN recommend to use DcDesk 2000 for parameterizing maps and characteristics as this programme will takes care of all particulars to be paid attention to and will simplify parameterization considerably. Thus, the above table is included in

DcDesk 2000 in an identical form and offers easy access to any of the base points. Furthermore, the characteristics and maps can be represented graphically by this tool.

3.8 Reset of Control Unit

A reset is tantamount to powering down the control and restarting it. This can be achieved by shortly turning off the power supply.

A reset will clear any data that has not been saved in the control's permanent memory. It is, therefore, imperative that before executing a reset all data be transferred to the control's permanent memory if this data is to be preserved.

Certain functions of the Digital Control can be activated only following a reset. These are mostly functions that serve the purpose to put the control into some other operating state, or parameters that for safety reasons cannot be modified during operation. The parameters and functions belonging to this category will be explained in detail in the respective chapters.

A reset has to be executed only with the engine stopped.

Warning

4 Starting the Engine

On first commissioning the control on the engine, the below instructions should be strictly followed. This is the only way to ensure that the engine can be started without any problems later on.

These instructions, however, can give only some brief information on how to commission the governor. For more detailed information you are requested to refer to the respective chapters or manuals.

The instructions cover all parameters that must be adjusted before the engine is started. It should be noted, however, that the parameter values used for these instructions are adduced only by way of example. For actual operation they must at any rate be replaced by appropriate values that suit the engine and the specific application.

1. **Adjust distance of speed pickup**

   - The distance between the pickup and the top of the teeth should be approx. 0.5 to 0.8 mm. For more detailed information see the manuals of the basis systems.

2. **Check linkage.**

   - The linkage must operate smoothly and easily, and it must be capable of moving to the stop and maximum fuel positions.

3. **Check wiring**

   - Check switching functions and digital inputs

     On actuating any switch, the respective indication parameter should reflect the change. If several switches are provided this check must be conducted for all of them.

   - Check analogue inputs

   On first commissioning the engine, it is only the setpoint adjusters that are needed since the functions operating by signals from the analogue inputs (such as boost pressure dependent fuel limitation, speed dependent oil pressure monitoring, etc.) must not yet be activated. Nevertheless, all analogue inputs should be checked.

   Example: Let us assume that setpoint adjuster 1 has been connected to analogue input 1. When altering the set value, the parameter 3511 *AnalogIn1_Value* is expected to change accordingly. If there is no change, the wiring of the setpoint adjuster must be at fault. Together with 3511 *AnalogIn1_Value*, the parameter 3510 *AnalogIn1* and the specific setpoint adjuster parameter 2900 *Setpoint1Extern* are also bound to change from 0 to 100 % when the setpoint adjuster is turned from minimum into maximum position. If this is not the case, the input will have to be normalized.

- Adjust and check the actuator

Calibration of the actuator can be performed with the aid of the PC program or the hand held programmer.

Automatic calibration of the actuator is to be carried out with the linkage removed from the governor and the injection pump or the gas mixer, respectively, to make sure that the actuator is capable of traveling to its minimum and maximum positions.

To check the actuator, the positioner mode can be enabled by setting the parameter 5700 *PositionerOn* = 1. By this procedure, the actuator position can be preset directly by 1700 *PositionerSetpoint* and then checked by having the actual actuator position indicated by parameter 2300 *ActPos*. Again, the actuator should be able to move across its total displacement range from 0 % to 100 %. To perform this check, the actuator is activated by setting 5910 *ActuatorOn* = 1. This check cannot be performed if any speed signal is coming in, i.e. positioning is not possible unless the engine is at a standstill.

Number	Parameter	Value	Unit
1700	PositionerSetpoint	50	%

Activation:

Number	Parameter	Value	Unit
5910	ActuatorOn	1	
5700	PositionerOn	1	

Indication:

Number	Parameter	Value	Unit
2300	ActPos	50	%

4. Parameterizing the most significant parameters.

- Begin by parameterizing number of teeth, minimum and maximum speeds, and overspeeds:

Number	Parameter	Value	Unit
1	TeethPickup1	160	
10	SpeedMin1	700	rpm
12	SpeedMax1	2100	rpm
21	SpeedOver	2500	rpm

- Preset PID-values:

Number	Parameter	Value	Unit
100	Gain	15	%
101	Stability	10	%
102	Derivative	0	%

- Parameterize the absolute limits of actuator travel:

Number	Parameter	Value	Unit
310	ActPosSecureMin	3	%
312	ActPosSecureMax	97	%

- Adjust starting actuator position (type 1):

Number	Parameter	Value	Unit
250	StartType	1	
251	LimitsDelay	3	s
255	StartSpeed1	10	rpm
256	StartSpeed2	400	rpm
260	StartFuel1	60	%

- Save values to the governor's memory and reset the governor.

5. Check speed pickup and determine starter speed.

- Operate the engine stop switch so that the engine cannot be started.

    Indication:

Number	Parameter	Value	Unit
2810	SwitchEngineStop	1	

⚠️ **Danger**

In case of a failure of the speed governor system or with a wrong parametrizing the engine can go into overspeed!

Before the start of the engine therefore the function of the separate overspeed protection must be guaranteed.

- Operate starter and check the measured speed as indicated by 2000 *Speed*. At this point, the parameter should display cranking speed.

- Check on the speed above which the control recognizes that the engine is running (256 *StartSpeed2*). This speed must be higher than cranking speed.

6. **Start the engine and adjust control circuit stability**

    - Put engine stop switch back into ON position.

        Indication:

Number	Parameter	Value	Unit
2810	SwitchEngineStop	0	

    - Start the engine and run it up to rated speed using the setpoint adjuster.
    - Optimize the PID-values.

        Increase gain (P-factor) 100 *Gain* until the engine becomes unstable, then reduce it until stability is restored.

        Increase stability (I-factor) 101 *Stability* until the engine becomes unstable, then reduce it until stability is restored.

        Increase derivative (D-factor) 102 *Derivative* until the engine becomes unstable, then reduce it until stability is restored.

        With this adjustment, disturb engine speed shortly and observe the transient response.

7. **Perform this checking procedure across the entire speed range.**

    If for minimum and maximum speeds this checking procedure results in values differing from the parameterized ones, the setpoint adjuster needs to be calibrated. The parameter 2031 *SpeedSetp* will indicate whether the value has been set correctly.

8. **Correction of PID parameters**

    Adjustment of speed and/or fuel dependent correction of PID parameters over the whole speed range.

9. **Adjust of remaining functions**

    Adjustment of functions such as speed ramp and speed dependent fuel limitation etc.

10. **Save the data thus determined by storing it in the control.**

5 Configuring the Governor with the Hand Held Programmer
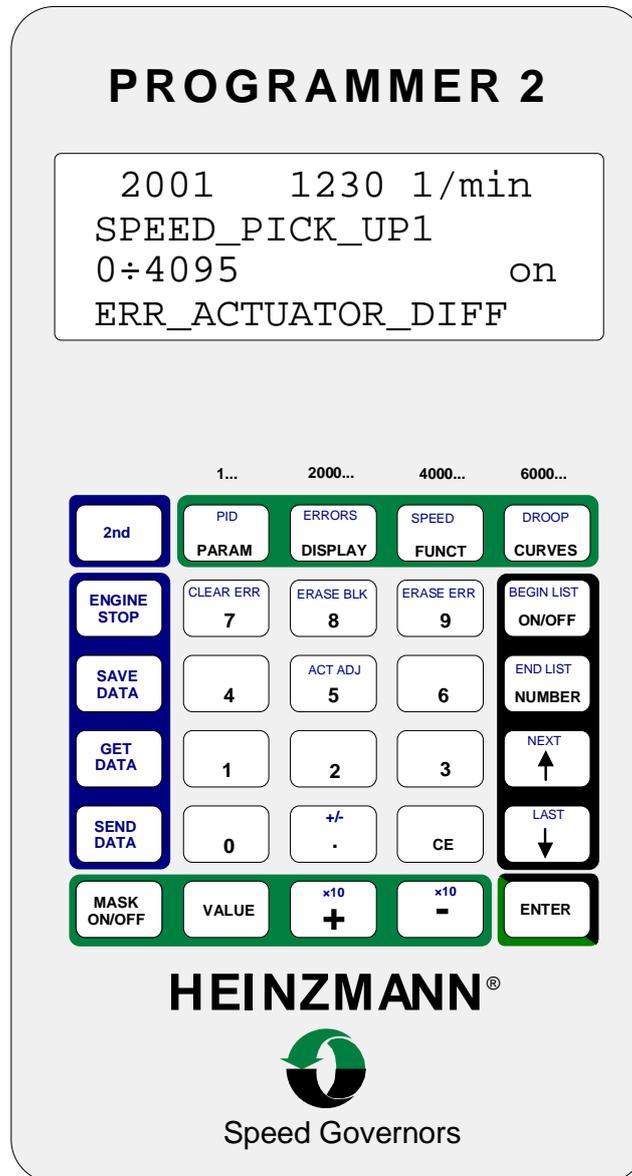
Figure 1: Hand Held Programmer

After connecting the hand held programmer to the governor's communication interface, the parameters of the governor can displayed and altered. Any parameter may be selected directly by its number or by using the arrow keys while moving through the lists. The parameter value is altered either directly (by entering a value) or by increasing/decreasing it step-by-step with the keys [+] und [-]. The parameters contained in the DISPLAY list and numbered 2000 through 3999 are not subject to alteration since they represent measuring and display values. The Programmer 2 also includes several additional features, such as the capability of storing the governor's complete data set in its memory.

i
Note

The hand held programmer is supplied power through the governor's communication interface so there will be no need for any additional supply by batteries or the like. Similarly, data transfer between the Hand Held Programmer and a PC will require using a special adapter cable to ensure current supply to the Hand Held Programmer.

5.1 The Display Panel
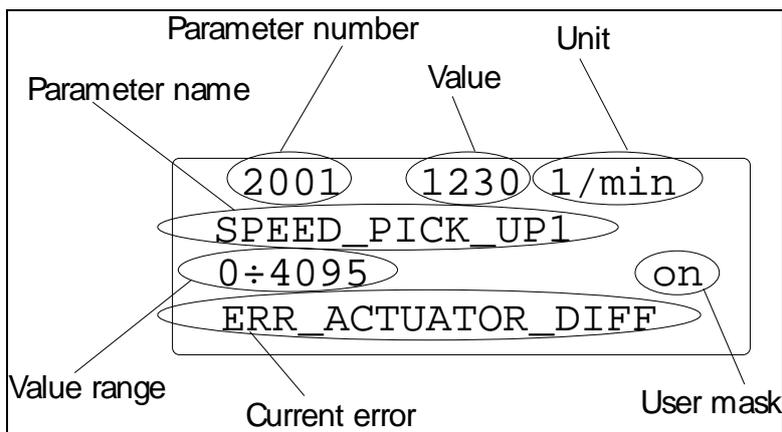
Figure 2: The Display Panel

Figure 2 shows the display panel with a standard parameter representation. The parameter currently selected is the actual speed value as measured by speed pickup 1. This measurement has been assigned the parameter number 2001 and the parameter name SPEED_PICK_UP1. Current speed is 1230 revolutions per minute (1/min), the total value range being from 0 through 4095 1/min. The small field for the user mask indicates, whether the parameter specified has been programmed for inclusion in the user mask (see section 3.5). This label can read three states:

on   The parameter specified has been programmed for the user mask. The user mask, however, is not activated.

off   The parameter specified has not been programmed for the user mask. The user mask is not activated.

MASK   The parameter specified has been programmed for the user mask. The user mask has been activated.

The bottom line displays messages about current errors. In the above example, the error "Excessive difference in actuator travel" is signalled to have occurred. If no error is being detected, the message NO ERROR will show up.

The programmer's display is illuminated to ensure legibility in insufficiently lighted environments.

5.2 The Control Panel
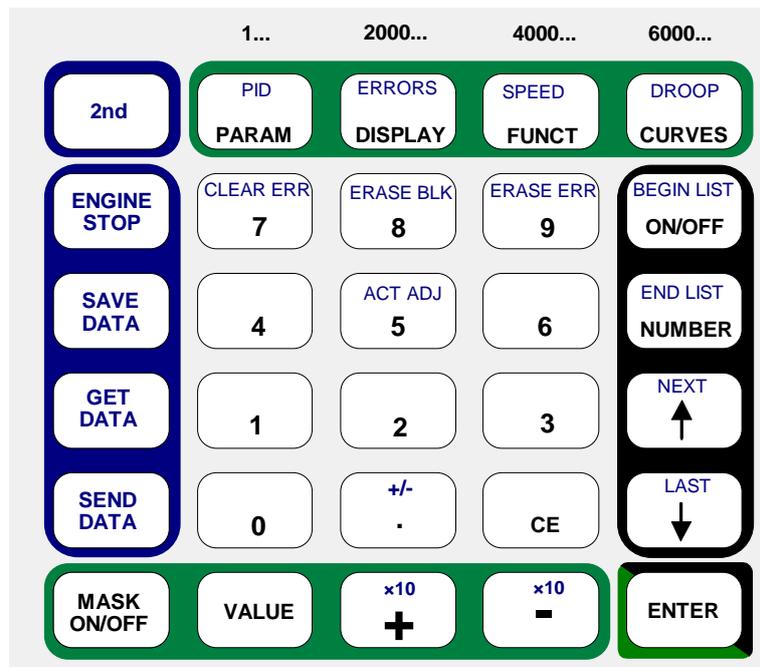
Figure 3: The Control Panel

The programmer's control panel is divided into several groups some of which are distinguished by different background colors. In addition to their standard functions, a number of keys are assigned a second function which is denoted by the blue legend and activated by the topmost left key [2nd]. Keys exhibiting exclusively blue captions have no effect unless in combination with the [2nd]-key.

5.2.1 The Standard Functions

These keys (background green) permit to switch between the different lists (standard functions). In doing so, the last-selected list item is kept in memory.

Example: If the parameter 10 SPEED_MIN1 had been accessed while working in the parameter list (PARAM) and if after switching to the function list (FUNCT) any parameters had been altered there, then on returning to the parameter list (PARAM) the parameter 10 SPEED_MIN1 would be displayed again.

0 to **9** The numeric keys (no particular background color) serve to enter parameter numbers and the parameter values.

+/- The point key is used for entering decimal places. The allowable number of decimal places after the point is to be seen from the third line of the display (value range).

CE If a typing mistake occurs while entering parameter numbers or values, entry can be aborted with the [CE] key (CE = **C**lear **E**ntry). The blinking cursor will disappear from the topmost line and the previous value will be displayed again.

BEGIN LIST / ON/OFF With this key, the user mask for the currently selected parameter is activated or deactivated. The Hand Held Programmer must, however, have been programmed to at least level 4 if this key is to be used.

END LIST / NUMBER
NEXT ↑
LAST ↓
ENTER
These keys (background black) are destined for selecting parameters. For direct input, the [NUMBER] key is to be pressed first. The parameter number will be replaced by a blinking cursor indicating that a new number may be entered. Entry is terminated by pressing the [ENTER] key (background black/green) which will bring the desired parameter into display. In case the parameter number entered does not exist, the parameter with the next higher number is selected. Pressing the key [↑] will select the next parameter, pressing [↓] the preceding one.

MASK ON/OFF With this key, the user mask of the Hand Held Programmer is switched on and off. It has to be recalled that the Hand Held Programmer must have been programmed to at least level 4 if this key is to be used.

VALUE
×10 +
×10 −
ENTER
With these keys (background green), the value of the parameter selected can be altered. For direct input, the key [VALUE] is to be pressed first. The topmost line will display a blinking cursor indicating that a new value may be entered. Entry is terminated with the key [ENTER], and the entered value is accepted by the governor. Should the entered value happen to be smaller than the lower limit or larger than the upper one, the respective limit value will be set instead. An alternative option provides for continuously changing the values. Thus, by pressing the [+] key the value displayed will be increased and by pressing the [-] key decreased. The increment of these changes can be set through the parameter 1876 VALUE_STEP. VALUE_STEP always refers to the smallest adjustable unit of a parameter (with two decimal places this will be hundredths, with integer numbers units, etc.).

> **i**
> **Note**
>
> *The parameters contained in the DISPLAY list and numbered 2000 through 3999 are measuring and display values that are not subject to alteration.*

| ENGINE STOP | SAVE DATA | GET DATA |

These keys placed to the left of the control panel (background blue) have not been allocated any standard functions.

5.2.2 The Second Functions

| 2nd |

With this key, the second or special functions can be invoked. After pressing the key, an "S" is displayed to the right of the bottom line, and the Hand Held Programmer will be waiting for the next key to be entered (like a pocket calculator). If inadvertently pressed, correction is possible by pressing the [2nd] key once more, which will also make the "S" disappear.

| PID PARAM | ERRORS DISPLAY | SPEED FUNCT | DROOP CURVES |

The second functions allocated to these keys are jumps to the most relevant parameter groups. Their significations are:

[PID]   Jump to the parameters for PID adjustment

[ERRORS]   Jump to the parameters for error display

[SPEED]   Jump to the parameters for speed adjustment

[DROOP]   Jump to the parameters for droop adjustment.

The following keys open a way to moving through the lists very fast. By pressing the [2nd] key and then the specified key the following jump functions are performed:

| BEGIN LIST ON/OFF | Jump to the first parameter of the currently selected list

| END LIST NUMBER | Jump to the last parameter of the currently selected list

| NEXT ↑ | Jump to the first parameter of the next parameter group

| LAST ↓ | Jump to the first parameter of the previous parameter group

The increment for the last two keys is 100.

Example:

Sequence of keys:	Status:
	The parameter 2120 DROOP has been selected
[2nd] [NEXT]	Selects the parameter 2300 ACT_POS
[2nd] [LAST]	Selects the parameter 2100 PID_CORR
[2nd] [BEGIN LIST]	Selects the parameter 2000 SPEED.

The second functions of these keys enable to increase and decrease parameter values considerably faster. The encrement will be ten times the value of the parameter 1876 VALUE_STEP (increment).

With this key, the sign of the parameter value can be changed (if permitted by the parameter value range).

5.2.3 Special Functions

Special functions are selected in like manner using the [2nd] key. After pressing the [2nd] key, an "S" is displayed to the right of the bottom line, and the Hand Held Programmer is waiting for input from some special key.

5.2.3.1 Engine Stop

By shortly pressing this key, the transient behaviour of the engine can be checked. When the key is pressed, the governor will pull the actuator to its stop position and keep it there as long as the key is held down. If the key is released before the engine comes to a standstill, the governor will run up the engine again to set speed.

5.2.3.2 Saving Values in the Governor

Parameter values that have been altered during operation are stored only in the governor's RAM and are bound to get lost as soon as the power supply is turned off. This feature permits of testing various governor adjustments without interfering with the governor's configuration. If, however, the changes are to be retained, it is necessary that they be permanently saved in the governor.

With this key, the current values and the programmed mask are permanently saved in the governor. During storage, the message "Saving data in governor" is issued.

5.2.3.3 Data Transfer Governor → Hand Held Programmer→ Governor

The hand held programmer is capable of storing one complete data set. This provides a possibility to transfer data sets from one governor to another.

> **i**
> **Note**
>
> *It is always the complete data set that will be transferred.*

This implies that also values that might be different for different governors will be overwritten, particularly the reference values for the actuator and for the analog inputs. It is, therefore, imperative that an automatic adjustment of the actuator be carried out each time data have been transferred. If necessary, the reference values for the analog inputs should also be adjusted.

GET DATA With this key, the complete data set of the governor is stored in the hand held programmer. The display will read "Receiving data", and a slide bar will indicate the stage of data transfer in per cent. Depending on the number of parameters to be transmitted, transfer will be completed after approx. 2–4 minutes, and all values will be permanently stored in the hand held programmer.

SEND DATA With this key, the values are downloaded from the hand held programmer to the governor. Before starting transmission, the hardware and software numbers are displayed to make sure that the governor and the data set are compatible. Transmission must be started by pressing [ENTER]. If any other key is pressed instead, the hand held programmer will switch over to standard parameter representation without transmitting any data. After pressing the [ENTER] key, the messages "Transmitting data" and "Transmission complete" are briefly displayed, followed by the instruction "Save data and restart the governor to work with the new data set". This instruction signals that the values transferred from the hand held programmer have to be permanently stored in the governor by the key sequence [2nd] and [SAVE DATA]. After that, the governor must be restarted.

There are two ways of restarting the governor. One is by pressing the [RESET] key (if available) on the governor's mother board, the other by switching power supply to the governor off and on (which will always work).

Restarting the governor is necessary because, for reasons of security, some of the values, such as number of teeth of the speed pick-up, become effective only after a reset.

5.2.3.4 Data TransferPC → Hand Held Programmerr → PC

Similarly, the data set of the hand held programmer may be downloaded to a PC. Vice versa, the hand held programmer may be programmed with a data set from the PC. Connecting the hand held programmer and a PC will require a special adapter cable that ensures power supply to the hand held programmer. To put the hand held programmer into communication mode, it is necessary to keep either the [SEND DATA] key or the [GET DATA] key pressed for about 5 seconds while the hand held programmer is connected to the power supply. After issuing the switch-on message, the display reads "Waiting for a command", signalling that the hand held programmer is ready for communication with the PC. In addition, the hardware and software numbers of the data set stored are displayed. Using the HEINZMANN® PC program DC_DESK, the data set stored in the hand held programmer can now be read out and stored in the PC. Storage is commented by the hand held programmer with the message "Transmitting data".

In similar fashion, data can be downloaded from the PC to the hand held programmer. In this case, transmission is no longer confined to complete data blocks but will equally work for a restricted choice of parameters (see description of PC program). Receipt of data sets by the hand held programmer is acknowledged through the message "Receiving data".

5.2.3.5 Error Memory

For more detailed information about the error memory, please refer to later chapters of this manual. At this point, it will suffice to explain the functions of each single key.

[CLEAR ERR 7] This key serves to clear the error memory of actual errors. The display will show the message "Clear error memory".

[ERASE ERR 9] With this key, the errors saved permanently in the governor are erased. The action is confirmed by the message "Erasing errors".

5.2.3.6 Data Blocks

The governor is capable of accomodating several data blocks each containing a complete data set.

[ERASE BLK 8] On pressing this key, the existing data sets are listed, and the number of the data block to be deleted can be entered. Entry may be aborted with the key [CE] without deleting any data sets.

5.2.3.7 Automatic Adjustment of Actuator

`ACT ADJ 5` After pressing this key, the instruction "Confirm actuator adjust! Press ENTER to continue" is displayed. It is now possible to either carry out automatic adjustment (autoadjust) or abort the procedure by pressing any other key. Automatic adjustment may be performed only with the engine at a standstill.

If more than one actuators are connected to the governor, the hand held programmer will offer a choice for which actuator automatic adjustment is to be performed.

Automatic adjustment of the actuator corresponds to adjusting feedback voltage for an analogue governor.

5.3 Parameter Selection

5.3.1 Entering Parameter Numbers

`END LIST NUMBER` After pressing the [ENTER] key, the parameter number is replaced by a blinking cursor, and the hand held programmer will be waiting for a number of maximum four digits to be entered.

`ENTER` Entry has to be terminated with the [ENTER] key. The parameters are automatically included in the user mask. If a number has been entered that does not exist in the governor, the parameter with the next higher number is selected. It is only possible to select parameters that have been programmed for the previously set level.

`CE` Input can be cancelled with the key [CE].

5.3.2 Selection by Arrow Keys

`PID PARAM` `ERRORS DISPLAY` `SPEED FUNCT` `DROOP CURVES` First, select the desired list with one of the keys PARAM, DISPLAY, FUNCT or CURVES.

`NEXT ↑` `LAST ↓` By shortly pressing the arrow keys, one can then move on to the next parameter or go back to the preceding one. Keeping the keys pressed permits to quickly browse through the lists. By using the second functions, parameter selection becomes considerably faster. The function [NEXT] performs a jump to the first parameter of the next group, the function [LAST] a jump to the first parameter of the preceding group.

`BEGIN LIST ON/OFF` `END LIST NUMBER` The function [BEGIN LIST] performs a jump to the beginning of the list and the function [END LIST] to ist end.

In order to make use of any second function, the key [2nd] *must have been pressed beforehand.*

Note

5.4 Changing Values

5.4.1 Entering Values

[VALUE] On pressing the [VALUE] key, a blinking cursor appears in place of the value, and the hand held programmer will be waiting for input of a new value. Value range and number of decimal places can be read from the third line of the display. If the value entered is outside the value range, the respective limit value will be set.

[+/- .] The point preceding decimal places is entered with the point key. The sign of the value may be changed by means of the second function [+/-].

[CE] Input can be cancelled by pressing the key [CE]. In this case, the previous value is displayed again.

[ENTER] Entering values is terminated by pressing [ENTER].

5.4.2 Changing Values Directly

[x10 +] [x10 -] With the help of the keys [+] and [-], the value of the currently displayed parameter can be directly changed without having to leave the standard parameter display. By shortly pressing the keys, the value is altered by one step, and by keeping the keys pressed, it is altered continuously. The value will, however, change only within the limits of the value range as indicated in the third line of the display. The increment can be set by means of the parameter 1876 VALUE_STEP. Using the second functions [x10], the value will be altered by ten times the increment.

Note

In order to delete a value, only the keys [VALUE] and [ENTER] are to be pressed. There is no need to enter zero. Direct entry is particularly suited to switching functions on and off since their values vary only between 0 and 1. Thus, pressing the key [+] will suffice to switch any function on and [-] to switch it off.

The parameters contained in the list DISPLAY and numbered 2000 through 3999 are measuring and display values that are not subject to direct (or any other) alteration.

5.5 User Masks

5.5.1 General

From level 4 upward, the user is granted access to a great number of the governor's parameters. To facilitate access and survey, the possibility of creating user masks has been provided. Any desired parameter can be readily allocated to a user mask. With the user mask activated, only the allocated parameters will be displayed. In order to take advantage of this function the hand held programmer must have been programmed to level 4 at least.

5.5.2 Activating and Deactivating the User Mask

[MASK ON/OFF] With this key, the user mask is activated or deactivated. If the user mask is activated and no parameter has been programmed for inclusion in the user mask, the message "No parameter in mask" will be issued. If a parameter has been programmed for the user mask, this will be indicated by displaying "Mask" at the end of the third line. If the user mask is deactivated, the third line will read "on" or "off". These messages indicate whether the specified parameter has been programmed for inclusion in the user mask ("on") or not ("off"). On powering up the hand held programmer, the mask is activated by default.

5.5.3 Creating and Deleting User Masks

[BEGIN LIST ON/OFF] With this key, the selected parameter is assigned to the mask or removed from it. If the user mask is already activated, the current parameter is deleted from the user mask, and the following parameter is displayed. With the user mask activated, a parameter can be directly programmed for inclusion in the user mask by means of the key [NUMBER].

> **Note**
>
> *To delete a user mask completely, the user mask is to be activated first with the third line reading "MASK" as described before. Then, the key [ON/OFF] is to be pressed so many times until the message "No parameter in mask" appears.*
>
> *In the same way as any value changes, programming the masks will take place only in the governor's volatile memory. If the results of programming are to be made permanent, the function [SAVE DATA] must be executed.*

6 Data Management

The control provides various parameters for information on governor type, software version, hardware version, etc.

6.1 Serial Number of Control Unit

Each individual control unit is unambiguously identified by a serial number. The first four digits indicate year of production and month of delivery. The other digits represent the serial production number. The serial number is to be found on the HEINZMANN type plate or can be viewed by the following parameters:

3844 *SerialDate*	Year and month of production
3845 *SerialNumber*	Serial production number

6.2 Identification of Control

The application dependent functionality of a control is unambiguously defined by the software running on exactly one definite type hardware.

3840 *HardwareVersion*	Version number of control hardware
3841 *AddHardwareVersion*	Version number of hardware modifications
3842 *SoftwareVersion*	Version number of control software
3843 *BootSoftwareVersion*	Version number of boot loading software

The software version identifier consists of a unique two to four digit customer number defined by HEINZMANN, by a one to two digit variant number and by a two digit revision index. DcDesk and the hand held programmers will permit the customer access only to control devices including software of the specific customer number. The variants serve to define different implementations, e.g., for different engines of a manufacturer or for different applications of a certain type engine. Due to software extensions there can exist different revision stages for the same variant with every higher ranking revision index including the next lower one and replacing it completely.

6.3 Identification of PC Programme / Hand Held Programmer

Every PC programme and every hand held programmer has a specific identification number that is passed on to the control. The current identification number of the PC programme or Hand Held Programmer is displayed by the parameter 3850 *Identifier*. The identification number of the PC programme or Hand Held Programmer which was utilized last for storing parameter changes in the control can be viewed by the parameter 3851 *LastIdentifier*.

7 Error Handling

7.1 General

The HEINZMANN Digital Controls include an integrated error monitoring system by which errors caused by sensors, speed pickups, etc., may be detected and reported. By means of two different permanently assigned digital outputs the error types can be output via some visual or audible signal at nearly all HEINZMANN speed governors.

There is also the possibility of having a basic diagnosis performed by means of error indications by LEDs and, when working with the PRIAMOS series, an additional diagnosis by means of seven segment display.

The different errors can be viewed by the parameters 3000..3099. A currently set error parameter will read the value "1", otherwise the value "0".

Generally, the following errors types can be distinguished:

- Errors in configuring the control and adjusting the parameters
  These errors are caused by erroneous input on the part of the user and cannot be intercepted by either the PC or the Hand Held Programmer. They do not occur with controls from series production.

- Errors occuring during operation
  These errors are the most significant ones when using governors produced in series. Errors such as failure of the speed pickups, setpoint adjusters, pressure and temperature sensor or logical errors such as excessive temperatures or low boost pressure are typical of this category.

- Internal computational errors of the control
  These errors may be due to defective components or other inadmissible operating conditions. Under normal circumstances, they are not likely to occur.

To cancel an error one should first establish and eliminate its cause before clearing any of the current errors. Some errors are cleared automatically as soon as the failure cause has been eliminated. Errors can be cleared by means of the PC, by the Hand Held Programmer or, if accordingly configured, by the digital input 2828 *SwitchErrorReset*. If the system does not stop reporting an error, the search for its cause must go on.

Principally, the control starts operating on the assumption that there is no error and will only then begin to check for possible occurrences of errors. This implies that the control can be put into an error free state by a reset of the control unit, but will immediately begin to report any errors that are currently active.

There are two categories of errors. One category comprises errors that permit of maintaining engine operation though functionality will in some cases be restricted (e.g.,

sensor failures). The other category consists of what are called fatal errors that will cause emergency shutdown of the engine (e.g., overspeeding, failure of both speed pickups).

These error categories are signalled by the following two parameters:

3800 *EmergencyAlarm*   Emergeny alarm

3801 *CommonAlarm*   Common alarm.

The parameter 3801 *CommonAlarm* will be set on the occurrence of any error, 3800 *EmergencyAlarm* only for fatal errors. Thus, 3800 *EmergencyAlarm* will never occur alone by itself.

These two parameters are ouput each to a permanently assigned digital output in order to enable signalization of the error state. The emergency alarm is usually output inverted (low-active) and interpreted as the signal "Governor ready" which would also signal a fatal error in case of missing power supply.

With this assignment, the outputs are to be interpreted as follows:

Status „Common alarm"	Status „Governor ready"	Signification
not active	not active	no power supply
not active	active	no error
active	not active	emergency alarm
active	active	common alarm

The "Governor ready" output, i.e., the inverted emergency alarm signal, is usually used to activate the overspeed protection device.

As to the common alarm, there also exists the option to make the output blink at a frequency of 1 Hz for identifying warnings (e.g., for speed dependent oil pressure monitoring or coolant temperature warning). For this purpose, the parameter 5101 *CommAlarmWarnFlashOn* is to be set to "1". As soon as any true error (no warning) is coming in, he common alarm will be continuously active.

The common alarm output can also be configured such that the output is reset for 0.5 seconds on the occurrence of any new error. An SPS connected to the output will thus be able to detect the new error. For this configuration, the parameter 5102 *CommonAlarmResetOn* should be set to "1" and the above function disabled (5101 *CommAlarmWarnFlashOn* = 0).

7.2 Error Memories

When the control is powered down it will lose any existing information on actual errors. In order to be able to check upon which errors have occurred, a permanent error memory has been incorporated in the control. Any errors that have occurred at least once will be stored there, the order and the time of their occurrence, however, will be ignored.

The values stored in the error memory are treated by the control merely as monitor values and are not any further taken account of. In other words, it is only the errors occurring during operation that the control will respond to.

The permanent error memory can be inspected by means of the parameters that have been assigned numbers from 3100 upward so that the numbers of permanently stored errors will differ by 100 from those of the respective actual errors.

The permanent error memory can be cleared by means of the PC or the Hand Programmer only. After clearance, the control will revert to accumulating any occurring errors in the empty error memory.

i **Note**	*When the parameter 5100 NoStoreSerrOn is set to "1" and the error memory is then cleared, no errors will be stored in the error memory before the next ↑ 3.8 Reset of Control Unit. This feature is to provide the possibility of shipping a control with customer specific data in an error-free state without having to stimulate the inputs with the correct values. The parameter 5100 itself cannot be stored.*

7.3 Emergency Shutdown Errors

The following list offers a summary of all errors that will cause an emergency shutdown during operation or inhibit engine start. When at least one so-called fatal error has occurred 3800 *EmergencyAlarm* is activated and the signal "Governor ready" is cancelled.

i **Note**	*If a fatal error has occurred automatic actuator calibration cannot be performed.*

Error	Reason
3001 *ErrPickup1*	Error at pickup 1
3002 *ErrPickup2*	Error at pickup 2
3004 *ErrOverspeed*	Overspeedl
3031 *ErrOilPressEcy*	Oil pressure below speed dependent shutdown threshold
3050 *ErrFeedback*	Error at feedback of actuator 1
3051 *ErrFeedback2*	Error at feedback of actuator 2 (PRIAMOS III)
3052 *ErrFeedback3*	Error at feedback of actuator 3 (PRIAMOS III)
3056 *ErrFeedbackRef*	Error at feedback reference of actuator 1
3059 *ErrFeedbackAdjust*	Error at automatic actuator adjustment with actuator 1
3060 *ErrFeedbackAdjust2*	Error at auto. actuator adjust. with act. 2 (PRIAMOS III)
3061 *ErrFeedbackAdjust3*	Error at auto. actuator adjust. with act. 3 (PRIAMOS III)
3075 *ErrClearFlash*	Error at erasing the flash memory
3076 *ErrParamStore*	Error at saving of the parameters in flash memory
3077 *ErrProgramTest*	Error during permanent check of programme memory
3078 *ErrRAMTest*	Error during permanent check of RAM memory
3089 *ErrWatchdog*	Undefined programme flow, internal programming error
3090 *ErrData*	No parameters or check sum over parameters wrong
3091 *ErrLogical*	Error of parameter structure
3093 *ErrStack*	Stack overflow, internal programming error
3094 *ErrIntern*	Exception, internal programming error

7.4 Error Parameter List

The below error parameter list contains descriptions of the causes of each single error and of the control's response. Furthermore, it lists the appropriate actions to be taken to remove the respective error.

The errors are stored in the volatile error memory under the parameter numbers 3000 and higher and (as far as provided) in the permanent error memory under the parameter numbers from 3100 onward.

The errors are sorted by ascending numbers with the parameter on the left indicating the actual error as stored in the volatile memory and with the parameter on the right indicating the one stored as a sentinel in the permanent error memory. As explained above, the control will only react to actual errors whereas the permanent error memory serves no other purpose than to accumulate information on the occurrences of errors.

3001 ErrPickUp1   3101 SErrPickUp1

Cause:
- Speed pickup 1 is at fault.
- Distance between speed pickup 1 and gear rim is too large.
- Speed pickup 1 is supplying faulty redundant pulses.
- Interruption of cable from speed pickup 1.
- Speed pickup 1 wrongly mounted.

Response:
- Control continues operation by speed pickup 2 if available.
- Emergency shutdown if speed pickup 2 is not provided or is also at fault.

Action:
- Check distance between speed pickup 1 and gear rim.
- Check preferred direction of speed pickup.
- Check cable to speed pickup 1.
- Check speed pickup 1, replace if necessary.

3002 ErrPickUp2   3102 SErrPickUp2

Cause:
- Speed pickup 2 is at fault.
- Distance between speed pickup 2 and gear rim is too large.
- Speed pickup 2 is supplying faulty redundant pulses.
- Interruption of cable from speed pickup 2.
- Speed pickup 2 wrongly mounted.

Response:
- Control continues operation by speed pickup 1.)
- Emergency shutdown if speed pickup 1 is not provided or is also at fault.

Action:
- Check distance between speed pickup 2 and gear rim.
- Check preferred direction of speed pickup.
- Check cable to speed pickup 2.
- Check speed pickup 2, replace if necessary.

3004 ErrOverSpeed   3104 SErrOverSpeed

Cause: Engine speed was/is exceeding overspeed.

Response: Emergency shutdown

Action:
- Check overspeed parameter (21 *SpeedOver*).
- Check adjustment of set speed.
- Check PID adjustment.
- Check mechanical parts, linkage is possibly jamming.
- Check actuator
- Check cable to actuator

- Exchange actuator
- Check numbers of teeth (1 *TeethPickUp1* and 2 *TeethPickUp2*)
- With vehicle operation, check whether overspeed was due to thrust operation.

3005 ErrSetpoint1Extern	**3105 SErrSetpoint1Extern**
3006 ErrSetpoint2Extern	**3106 SErrSetpoint2Extern**
3007 ErrLoadInput	**3107 SErrLoadInput**
3008 ErrSyncInput	**3108 SErrSyncInput**
3009 ErrBoostPressure	**3109 SErrBoostPressure**
3010 ErrOilPressure	**3110 SErrOilPressure**
3012 ErrCoolantTemp	**3112 SErrCoolantTemp**
3013 ErrChargeAirTemp	**3113 SErrChargeAirTemp**
3014 ErrOilTemp	**3114 SErrOilTemp**
3019 ErrExcitReduct	**3119 SErrExcitReduct**
3020 ErrSpeedReduct	**3120 SErrSpeedReduct**
3021 ErrCoolantPressure	**3121 SErrCoolantPressure**

Cause: Some error has been detected for the respective sensor input (e.g., short circuit or cable break).

Response: - Depending on the selection, the error may disappear automatically when the values measured by the control are back within the error limits.

Action: - Check sensor cable for short circuit or cable break.
- Check the respective sensor, replace if necessary.
- Check error limits for this sensor.

3030 ErrOilPressWarn **3130 SErrOilPressWarn**

Cause: Oil pressure has dropped below the speed dependent oil pressure warning characteristic.

Response: - Error message.
- Error is cleared automatically when oil pressure is back above the oil pressure warning characteristic.

Action: - Check engine (oil level, oil pump, etc., ...).
- Check oil pressure sensor.
- Check cable of oil pressure sensor.
- Check oil pressure warning characteristic

3031 ErrOilPressEcy **3131 SErrOilPressEcy**

Cause: Oil pressure has fallen below the speed dependent oil pressure emergency
             stop characteristic.

Response: - Emergency shutdown.

Action: - Check engine (oil level, oil pump, etc., ...).
             - Check oil pressure sensor.
             - Check cable of oil pressure sensor.
             - Check oil pressure emergency stop characteristic

---

3032 ErrCoolantTempWarn   **3132 SErrCoolantTempWarn**

Cause: Coolant temperature has exceeded the warning threshold..

Response: - Error message.
             - Error is cleared automatically when coolant temperature returns
               below the warning characteristic.

Action: - Check coolant.
             - Check coolant temperature sensor.
             - Check cable to coolant temperature sensor.
             - Check warning threshold.

3033 ErrChargeAirTempWarn   **3133 SErrChargeAirTempWarn**

Cause: Charge air temperature has exceeded the warning threshold.

Response: - Error message.
             - Error is cleared automatically when charge air temperature is again
               below the warning characteristic.

Action: - Check charge air.
             - Check charge air temperature sensor.
             - Check cable to charge air temperature sensor.
             - Check warning threshold.

3034 ErrOilTempWarn   **3134 SErrOilTempWarn**

Cause: Oil temperature has exceeded the warning threshold.

Response: - Error message.
                - Error is cleared automatically when oil temperature is again
                  below the warning characteristic

Action: - Check oil.
                - Check oil temperature sensor.
                - Check cable to oil temperature sensor.
                - Check warning threshold.

3044 ErrCoolantPressWarn   **3144 SErrCoolantPressWarn**

Cause: Coolant pressure has dropped below the speed dependent coolant pressure
                warning characteristic.

Response: - Error message.
                - Error is cleared automatically when coolant pressure is back above the
                  coolant pressure warning characteristic.

Action: - Check engine (coolant level, coolant pump, etc., ...).
                - Check coolant pressure sensor.
                - Check cable of coolant pressure sensor.
                - Check coolant pressure warning characteristic

---

3045 ErrCoolantPressIdle   **3145 SErrCoolantPressIdle**

Cause: Coolant pressure has dropped below the speed dependent coolant pressure
                forced idle speed characteristic.

Response: - Forced idle speed.
                - Error message.
                - Error is cleared automatically when coolant pressure is back above 10 %
                of   the coolant pressure forced idle speed characteristic.

Action: - Check engine (coolant level, coolant pump, etc., ...).
                - Check coolant pressure sensor.
                - Check cable of coolant pressure sensor.
                - Check coolant pressure forced idle speed characteristic

---

3050 ErrFeedback   **3150 SerrFeedback**

Cause: Error in feedback system of actuator, actuator not connected.

Response: - Governor cannot be put into operation.
                - Emergency shutdown.

Actions: - Check feedback cable to actuator.
                - Check actuator, replace if necessary.
                - Check error limits for feedback:
                   1952 *FeedbackErrorLow* / 1953 *FeedbackErrorHigh*

3051 ErrFeedback2   **3151 SerrFeedback2**

Cause: Error in feedback system of actuator 2, actuator 2 not connected.

Response: - Governor cannot be put into operation.
                - Emergency shutdown.

Actions: - Check feedback cable to actuator.
                - Check actuator, replace if necessary.
                - Check error limits for feedback:
                   1962 *FeedbackErrorLow2* / 1963 *FeedbackErrorHigh2*

Note: *These parameters are implemented only in the PRIAMOS III series.*

3052 ErrFeedback3   **3152 SerrFeedback3**

Cause: Error in feedback system of actuator 3, actuator 3 not connected.

Response: - Governor cannot be put into operation.
                - Emergency shutdown.

Actions: - Check feedback cable to actuator.
                - Check actuator, replace if necessary.
                - Check error limits for feedback:
                   1972 *FeedbackErrorLow* / 1973 *FeedbackErrorHigh*

Note: *These parameters are implemented only in the PRIAMOS III series.*

3053 ErrActuatorDiff   3153 SerrActuatorDiff

Cause: The difference between set actuator travel and actual actuator travel has exceeded 10 % of the total actuator travel for more than one second. This error will occur if the injection pump or the actuator are jamming or are not connected.

Response: - Error message.
             - Error will be cleared automatically, as soon as the difference is again below 10 %.

Actions: - Check injection pump resp. throttle valve, replace if necessary.
             - Check mechanical parts (linkage).
             - Check cables to actuator.
             - Check actuator, replace if necessary.

3054 ErrActuatorDiff2   3154 SerrActuatorDiff2

Cause: The difference between set actuator travel and actual actuator travel at actuator 2 has exceeded 10 % of the total actuator travel for more than one second. This error will occur if the injection pump or the actuator are jamming or are not connected.

Response: - Error message.
             - Error will be cleared automatically, as soon as the difference is again below 10 %.

Actions: - Check injection pump resp. throttle valve, replace if necessary.
             - Check mechanical parts (linkage).
             - Check cables to actuator.
             - Check actuator, replace if necessary.

Note: *These parameters are implemented only in the PRIAMOS III series.*

3055 ErrActuatorDiff3   3155 SerrActuatorDiff3

Cause: The difference between set actuator travel and actual actuator travel at actuator 3 has exceeded 10 % of the total actuator travel for more than one second. This error will occur if the injection pump or the actuator are jamming or are not connected.

Response: - Error message.
             - Error will be cleared automatically, as soon as the difference is again below 10 %.

Actions: - Check injection pump resp. throttle valve, replace if necessary.
            - Check mechanical parts (linkage).
            - Check cables to actuator.
            - Check actuator, replace if necessary.

Note: *These parameters are implemented only in the PRIAMOS III series.*

3056 ErrFeedbackRef   **3156 SerrFeedbackRef**

Cause: Error in feedback system of actuator, actuator not connected.

Response: - Governor cannot be put into operation.
            - Emergency shutdown.

Actions: - Check feedback cable to actuator.
            - Check actuator, replace if necessary.
            - Check error limits for feedback reference:
              1956 *FeedbackRefErrLow* / 1957 *FeedbackRefErrHigh*

3059 ErrFeedbackAdjust   **3159 SerrFeedbackAdjust**

Cause: Automatic calibration of the actuator could not be performed, wrong input of reference values for actuator.

Response: - Governor cannot be put into operation.

Actions: - Check voltage supply and supply lines to actuator.
            - Check feedback cable to actuator.
            - Check actuator, replace actuator if necessary.
            - Engine stop switch must be opened (indication parameter 2810 *SwitchEngineStop* = 0) to perform automatic calibration of actuator with 2-quadrant-operation.
            - Check reference values and error limits for feeedback
            - Programme feedback error limits
              1952 *FeedbackErrorLow* = 0
              1953 *FeedbackErrorHigh* = 65535
              1956 *FeedbackRefErrLow* = 0
              1957 *FeedBackRefErrHigh* = 65535,
              store values, restart governor by reset and repeat automatic calibration.
            - Set error limits again.

3060 ErrAmplifier   **3160 SErrAmplifier**

Cause: Overload, overtemperature at amplifier .

Response: - Error message.

Actions: - Restart governor by reset.
                - Notify HEINZMANN.

Note: *These parameters are implemented only in the HELENOS series.*

3060 ErrFeedbackAdjust2   **3160 SerrFeedbackAdjust2**

Cause: Automatic calibration of the actuator 2 could not be performed, wrong input
                of reference values for actuator.

Response: - Governor cannot be put into operation.

Actions: - Check voltage supply and supply lines to actuator 2.
                - Check feedback cable to actuator 2.
                - Check actuator 2, replace actuator 2 if necessary.
                - Engine stop switch must be opened (indication parameter 2810 *Switch-
                  EngineStop* = 0) to perform automatic calibration of actuator 2 with 2-
                  quadrant-operation.
                - Check reference values and error limits for feeedback
                - Programme feedback error limits
                  1962 *FeedbackErrorLow* = 0
                  1963 *FeedbackErrorHigh* = 65535
                  store values (↑*3.2 Saving Data*), restart governor by reset and repeat
                automatic calibration.
                - Set error limits again.

Note: *These parameters are implemented only in the PRIAMOS III series.*

3061 ErrFeedbackAdjust3   **3161 SerrFeedbackAdjust3**

Cause: Automatic calibration of the actuator 3 could not be performed, wrong input
                of reference values for actuator.

Response: - Governor cannot be put into operation.

Actions: - Check voltage supply and supply lines to actuator 3.
                - Check feedback cable to actuator 3.
                - Check actuator 3, replace actuator 3 if necessary.
                - Engine stop switch must be opened (indication parameter 2810 *Switch-
                  EngineStop* = 0) to perform automatic calibration of actuator 3 with 2-

quadrant-operation.
- Check reference values and error limits for feeedback
- Programme feedback error limits
  1972 *FeedbackErrorLow* = 0
  1973 *FeedbackErrorHigh* = 65535
  store values, restart governor by reset and repeat automatic calibration.
- Set error limits again.

Note: *These parameters are implemented only in the PRIAMOS III series.*

3061 ErrDigiIO1   **3161 SErrDigiIO1**
3062 ErrDigiIO2   **3162 SErrDigiIO2**
3063 ErrDigiIO3   **3163 SErrDigiIO3**
3064 ErrDigiIO4   **3164 SErrDigiIO4**

Cause: Hardware component has detected overload.

Response: - Error message.

Actions: - Check digital IOs.
                - Clear error.

Note: *These parameters are implemented only in the HELENOS series.*

3065 ErrISOCommLine   **3165 SErrISOCommLine**

Cause: Error at hardware component.

Response: - Communication is impossible.

Actions: - Restart governor by reset.
                - Notify HEINZMANN.

Note: *These parameters are implemented only in the HELENOS series.*

3070 ErrCanBus1   **3170 SErrCanBus1**

Cause: The CAN controller for CAN bus 1 reports errors such as BusStatus, ErrorStatus or DataOverrun. In spite of re-initializing the controller it is not possible to eliminate the errors permanently.

Response: - Depending on the specific application.

Action: - Check CAN module.
                - Check CAN connection.

3071 ErrCanComm   3171 SErrCanComm

Cause: There is an overrun in the destination buffer or a message cannot be fed into CAN bus.

Response: - Depending on the application.

Action: - Check CAN module.
            - Check CAN connection.

3075 ErrClearFlash   3175 SErrClearFlash

Cause: Occurrence of an error on clearing the control's flash memory.

Response: - Control cannot be put into operation.
            - Emergency shutdown.

Action: - Restart governor by a reset.
            - Notify HEINZMANN.

3076 ErrParamStore   3176 SErrParamStore

Cause: Occurrence of an error on programming the control's flash memory.

Response: - Control cannot be put into operation.
            - Emergency shutdown.

Action: - Restart governor by a reset.
            - Notify HEINZMANN.

3077 ErrProgramTest   3177 SErrProgramTest

Cause: Current monitoring of the programme memory reports an error.

Response: - Engine cannot be started.
            - Emergency shutdown.

Action: - Restart governor by a reset.
            - Notify HEINZMANN.

3078 ErrRAMTest   3178 SErrRAMTest

Cause: Current monitoring of the working memory reports an error.

Response: - Engine cannot be started.
            - Emergency shutdown.

Action: - Note down the values of the parameters 3895 *RAMTestAddrHigh* and 3896 *RAMTestAddrLow*.

- Restart governor by a reset.
- Notify HEINZMANN.

3085 ErrVoltage   **3185 SErrVoltage**

Cause: The supply voltage for the governor is not within the permissible range from 18 to 33V.

Response: - Error message.
                  - Error is cleared automatically as soon as the voltage is back within the normal range.

Action: - Check voltage supply.

3087 ErrCPU 2   **3176 SErrCPU2**

Cause: CPU 2 is out of order.

Response: - Error message.

Action: - Notify HEINZMANN.

Note: *These parameters are implemented only in the PRIAMOS series.*

3087 ErrMainCheckSum

Cause: Check-sum of control programme is wrong.

Response: - Governor cannot be put into operation.

Action: - Restart governor by a reset.
                  - Notify HEINZMANN.

Note: *This error will only be displayed by the bootloader.*

3089 ErrWatchdog

Cause: Internal computing error, so-called "Watchdog Error".

Response: - Governor cannot be put into operation.
                  - Emergency shutdown.

Action: - Restart governor by a reset.
                  - Notify HEINZMANN.

Note: *This error will only be displayed by the bootloader.*

3090 ErrData   **3190 SErrData**

Cause: No data found or check sum over data is wrong.

Response: - Engine cannot be started.
                - Governor is operating by default parameters.

Action: - Check data for correct setting, save parameters and restart control unit by a
                reset.

Note: This error will occur only when adjusting and saving parameters.

3091 ErrLogical   **3191 SErrLogical**

Cause: Error of data structure.

Response: - Control cannot be started.
                - Governor is operating by default parameters.

Action: - Check data for correct setting, restart governor by a reset.
                - Notify HEINZMANN.

3093 ErrStack   **3193 SErrStack**

Cause: Internal programming or computing error, "stack-overflow".

Response: - Control cannot be started.
                - Emergency shutdown.

Action: - Write down the value of parameter 3897 *StackTestFreeBytes* and notify
                  HEINZMANN
                - Restart control by a reset.

3094 ErrIntern   **3194 SErrIntern**
3095 ExceptionNumber   **3195 SExceptionNumber**
3096 ExceptionAddr1High   **3196 SExceptionAddr1High**
3097 ExceptionAddr1Low   **3197 SExceptionAddr1Low**
3098 ExceptionAddr2High   **3198 SExceptionAddr2High**
3099 ExceptionAddr2Low   **3199 SExceptionAddr2Low**

Cause: Internal programming or computing error, so-called "EXCEPTION" error.

Response: - Control cannot be started.
                - Emergency shutdown.

Action: - Write down the values of the parameters 3095 *ExceptionNumber*,
                  3096 *ExceptionAddr1High*, 3097 *ExceptionAddr1Low*,
                   3098 *ExceptionAddr2High* and 3099 *ExceptionAddr2Low* and
                  notify HEINZMANN.
                - Restart control by a reset.

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