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HEINZMANN®

Digital Electronic Speed Governors

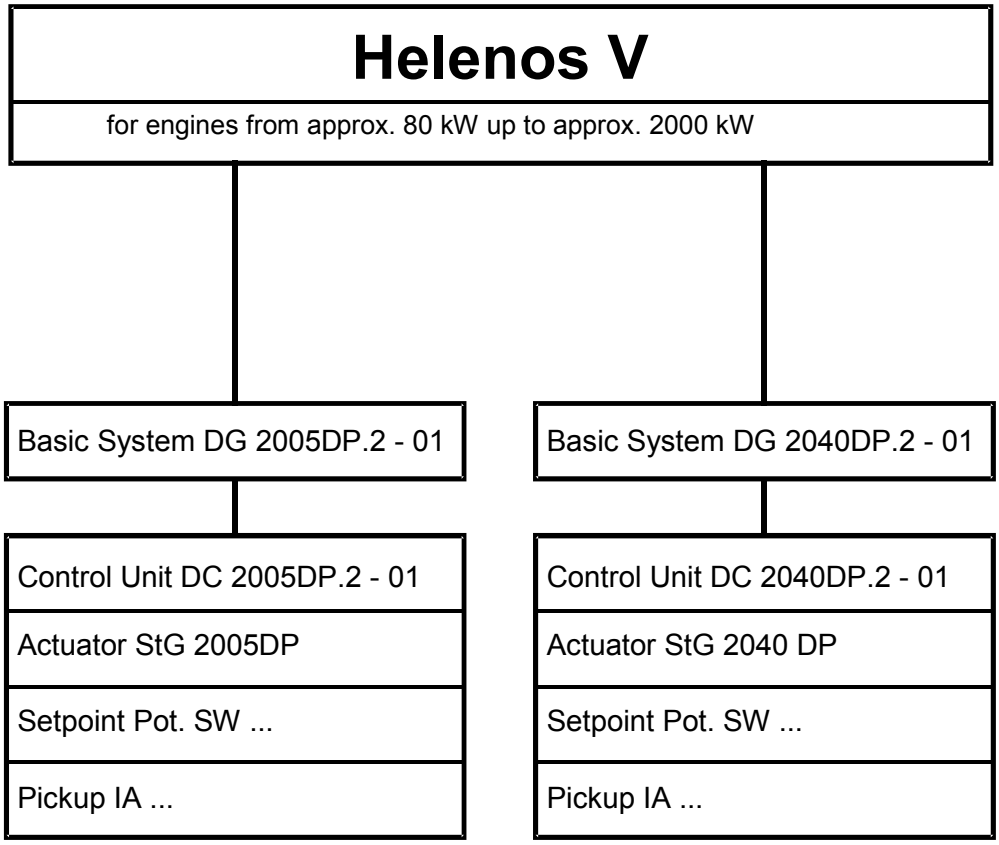
Basic Systems

HELENOS V

DC 2005DP.2-01

DC 2040DP.2-01

7011 Druckschrift DG 97 014-e / 04-06



D : **D**igital
DG : **D**igital **G**overnor (Basic System)
DC : **D**igital **C**ontrol Unit
StG : Actuator (**St**ell**g**erät)
SW : Setpoint Potentiometer (**S**oll**w**ertpot)
IA : Pickup (**I**mpuls**a**ufnehmer

 **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

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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

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

The HEINZMANN Digitals Controls of the HELENOS series are designed as universal speed controls for diesel engines, gas engines, and other prime movers. In addition to their primary 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.

In addition to the main processor, the HEINZMANN control unit is optional equipped with an auxiliary processor (CPU2) performing two monitoring functions. On the one hand, the auxiliary processor will monitor engine speed for overspeeding independently of the main processor, on the other hand, it will supervise the operatability of the main processor itself. If the auxiliary processor detects overspeed or if the main processor is at fault, the auxiliary processor will execute an emergency engine shutdown.

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 substitute for the 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.

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.

3 Functions

HEINZMANN digital governors with control units of the series HELENOS V constitute speed governors offering a midium range of functions.

In addition to speed regulation, the following functions are available:

a) Adjustment of Speed Range

The minimum and maximum speed which can be reached by setpoint value is adjustable by parameter setting. Two different speed ranges are available.

b) Speed Ramp

For applications in which speed is not supposed to respond as fast as possible to changes of setpoint values (e.g., locomotive operation), a speed ramp is available which according to requirements may be programmed separately for increasing or decreasing speed.

c) Start Quantity Adjustment

For setting start quantity, 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.

d) Fixed Fuel Limitation

For the stop-position and the maximum fuelling position "electric catches" can be provided. This will prevent the governor's thrust from affecting the terminal stops of the injection pump, etc.

e) Speed Dependent Fuel Limitation

For variable speed governors, there is provided an option of programming speed dependent limit curves. Thus, for any speed, torque can be reduced as is permissible for the engine or desired by the user.

f) Boost Pressure Dependent Fuel Limitation

For turbocharged engines, fuelling can be reduced to achieve smokeless operation in case of missing boost pressure (e.g., starting or load change). The respective limit curves can be programmed accordingly.

g) Temperature Dependent Idling Speed

For 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. To protect the engine against possible damages from high temperatures the full load characteristic can be decreased in dependence of temperature.

h) Oil Pressure Monitoring

For the purpose of oil pressure monitoring, speed/pressure dependent limit curves can be provided. If oil pressure is too low, an alarm is given; if oil pressure continues to drop, the engine is shut down.

i) 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.

j) All Speed Governing with adjustable Droop

Some applications require speed governing with droop, e,g, generator parallel operation without HEINZMANN-load measuring unit. The droop can be adjusted as desired. With droop adjusted to 0, the governor operates in isochronuous mode.

k) Idling and Maximum Speed Control

For vehicle application, the governor can be made to operate as an idling and maximum speed controller. In addition, one fixed intermediate speed is available, e.g., for an application combining driving and stationary mode (e.g., generator at power take-off). If necessary, a change-over switching of the droop can be provided, i.e., during stationary operation also droop zero is possible.

l) 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.

m) Overspeed Protection

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

n) Output Signals

The control unit has four analogue outputs available, two current outputs (4..20 mA) and two voltage outputs (0..5 V).

o) Failure Diagnosis and Display

If a sensor or the actuator is at fault, an external alarm is issued and there will be 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 handprogrammer or, if a communication program with communication cable is existing with a PC or laptop computer.

p) Velocity Limitation and Velocity Control

In vehicle operation the velocity of the vehicle can be limited or controlled (cruise control).

q) Locomotive Operation

In locomotive operation, setpoints can be defined by means of analogue setpoint or by using up to 16 digital speed stage switches.

For Diesel-electric locomotives the excitation of generator can be controlled depending on speed and load by an analogue signal.

An anti stick slip device can be provided.

r) Generator Operation

In generator operation the synchronisation and load sharing can be done either in manual mode (analogue input / digital input) with droop or isochronous in automatic mode with accessory units from HEINZMANN.

s) CAN-Bus

Accessories such as synchronizing units, load measuring units, disturbance variable compensation units can be connected via a CAN-Bus within the control unit. The CAN-Bus may also be used to implement load distribution by equal fuelling (e.g., two engines on one gear).

When selecting and determining the functions, it has to be ascertained whether the hardware equipment suffices with respect to the total range of functions.

4 Mode of Operation

The actual speed of the engine is read by a pulse pickup from a cog wheel, preferably from the starter gear. The microprocessor (CPU) of the control unit compares the actual speed with the preset value. If differences are stated, the new actuator signal is calculated by the CPU and transmitted to the actuator via the output stage. Feedback from the actuator indicates the current position of the output shaft thus allowing optimum signal adjustment by the CPU.

As the governor comprises an I-fraction and as for any load level the speed is permanently compared with a fixed preset value, speed can be kept constant also in steady state, i.e., droop is zero.

For applications requiring droop, the speed related to the respective fuelling is calculated by the CPU and entered as correction of the setpoint value.

During standstill, a particular circuit ensures that only the current of the control unit is received by the governor, but no current flows to the actuator motor.

5 Further information

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

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

Basic Information 2000, Manual-No. DG 00 001-e

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

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

The HEINZMANN governors series HELENOS are customized produced and preadjusted. Therefore it is necessary to get the filled in manual

Order-Information Digital Speed Governors, Manual No. DG 96 012-e

from the customer.

6 Block Diagram of the Digital Governor HELENOS

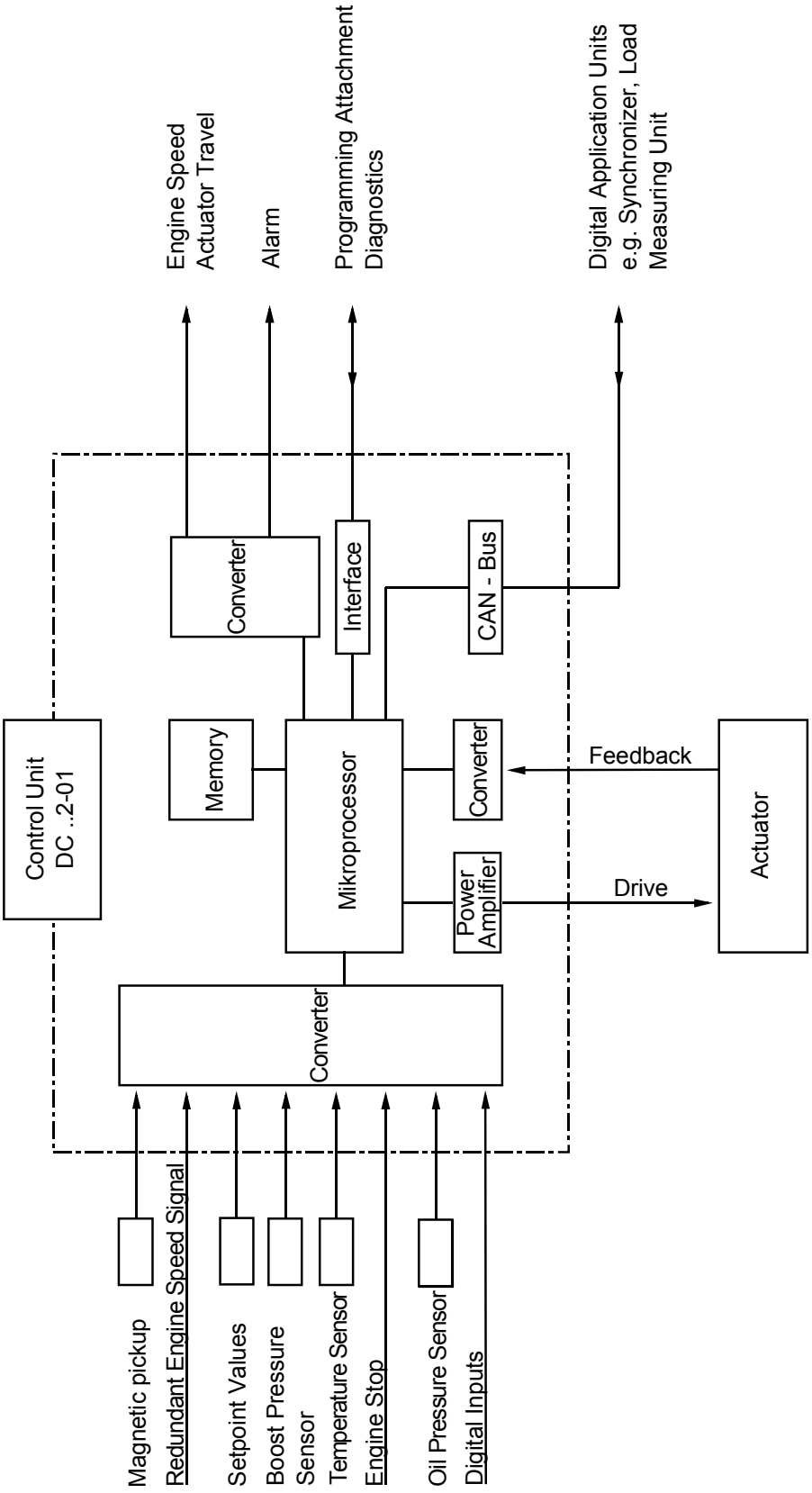


Figure 1: Blockdiagram DG 16.1 - 03 up to DG 40.1 - 03

7 Sensors

7.1 Overview

Sensor	Speed	Coolant Temperature	Oil Pressure	Boost Pressure
HZM Designation	IA ..	TS 01-28-PT1000	DSO 01-6 DSO 01-10 DSO 01-16	DSL/G 0..-2 DSL/G 0..-5 DSL/G 0..-10
Connection	SV 6-IA-2K 2 pole	SV 6-IA-2K 2 pole	DIN 43650 A 2 Line System	DIN 43650 A 2 Line System
Measuring Procedure	inductive, active	PT1000, passive	active	active
Measuring Range	50...6.000 Hz	-50...+150°C	0...6 bar 0...10 bar	0...2 bar 0...5 bar 0...10 bar
Supply Voltage Range		passive	10...34 V DC	12...36 V DC
Output Signal Range	0...10 V AC	ca. 700...1500 Ohm	4...20 mA	4...20 mA
Operating Temperature Range	-55...+120°C	-50...+150°C	-25...+125°C	-40...+100°C

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.

7.2 Magnetic Pickup IA ...

7.2.1 Technical Datas

Operating principle	inductive sensor
Distance from sensing gear	standard 0.5 to 0.8 mm with IA 22.. and IA 23.. 2.5 to 3 mm
Output	0 V .. 10 V AC
Signal form	Sine (depending on tooth shape)
Resistance	approx. 52 Ohm, with IA 22.. and IA 23.. approx. 130 Ohm
Temperature range	-55°C up to +125°C
Protection grade	IP 55
Vibration	< 10g, 10 .. 100 Hz
Shock	< 50g, 11 ms half sine wave
Corresponding plug	SV 6 - IA - 2K (EDV- No.: 010-02-170-00)

7.2.2 Installation

The installation of the pickup has to be arranged in such a way as to obtain a frequency as high as possible. Normally, the HEINZMANN digital governors DG 16.1 - 03 up to DG 40.1 - 03 are designed for a maximum frequency of 6.000 Hz. The frequency (by Hz) is calculated according to the formula:

$$f_{(Hz)} = \frac{n(1/\min) * z}{60}$$

z = number of teeth on the pickup wheel

Example:

n = 500
z = 80

$$f = \frac{500 * 80}{60} = 666.67 \text{ Hz}$$

It should be taken care that the speed can be measured by the pulse pickup without any bias. For best results therefore, the speed pickup 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 pickup gear must consist of magnetic material (e.g., steel, cast iron).

7.2.3 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 (8 mm at IA 22 - 76 and IA 23 - 102). For index plates the same dimensions are valid.

Due to tolerances, a radial arrangement of the magnetic pickup is preferable.

7.2.4 Clearance for IA 02 - 76 up to IA 13 - 102

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

7.2.5 Clearance for IA 22 - 76 and IA 23 - 102

The distance between the magnetic pulse pickup and the tooth top should range from 2.5 to 3 mm. (It is possible to screw in the magnetic pickup till it touches the tooth and then unscrew it for about two turns.)

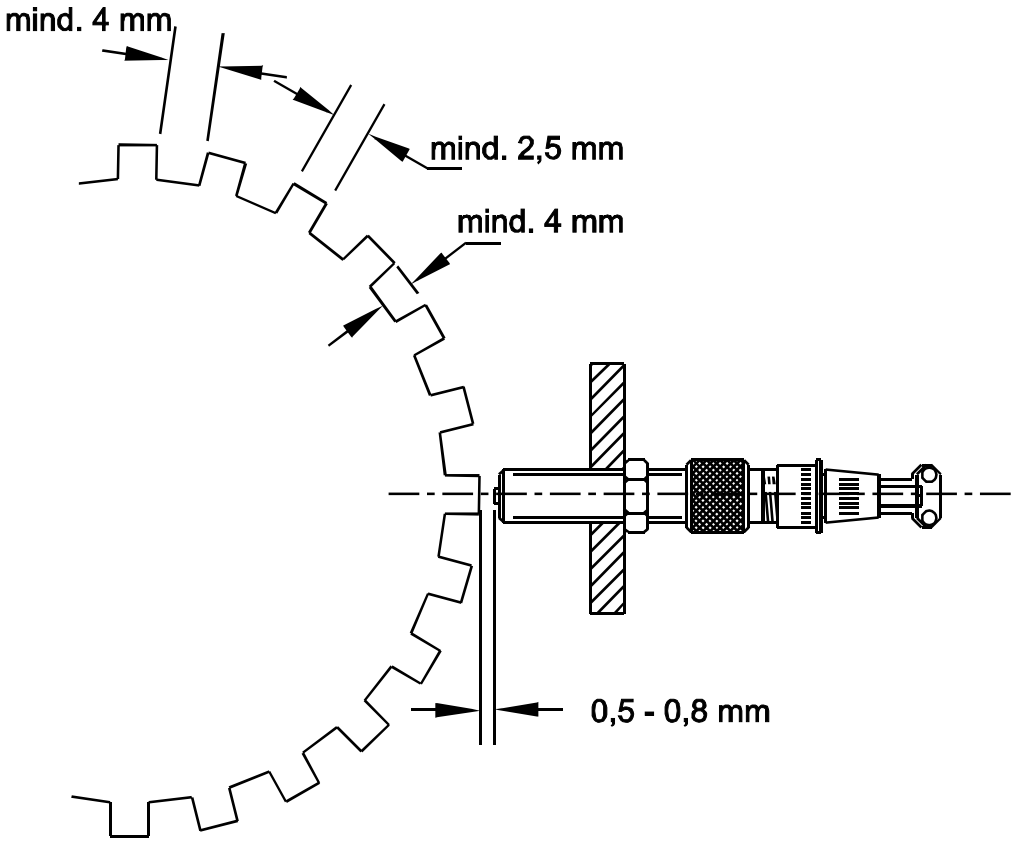


Figure 2: Clerance of Pickup

7.2.6 Mounting Measurements

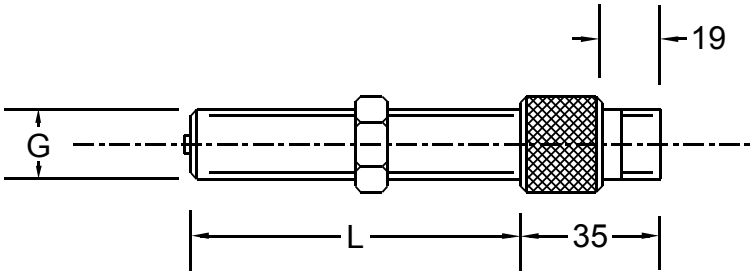


Figure 3: Magnetic Pickup

Measures / Type	Thread Length L (mm)	Thread Size G	Remarks
01 - 38	38	M 16 x 1,5	
02 - 76	76	M 16 x 1,5	
03 - 102	102	M 16 x 1,5	
11 - 38	38	5/8"-18UNF-2A	appropriate
12 - 76	76	5/8"-18UNF-2A	plug
13 - 102	102	5/8"-18UNF-2A	SV6-IA-2K
22 - 76	76	M 24 x 1,5	
23 - 102	102	M 24 x 1,5	

Ordering specification, e.g. IA 02-76.

7.2.7 Redundant Speed Signal

If precautions are to be taken with regard to failures od the pulse pickup, a second pulse pickup can be connected to the control unit. In case that an electric generator with terminal W is available, this signal may be used for emergency operation as well as any other signal of a tachogenerator.

In case of a failure on puls pickup 1, the governor automatically switches over to the redundant speed signal and gives an alarm.

7.3 Cooling Medium Temperature Sensor TS 01 - 28 - PT 1000

Measuring range	-50°C up to +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 1mA
Time constant in fluids	approx. 13 seconds
Admissible temperature range of connector socket	-40°C up to +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 %
Connector	SV 6 - IA - 2K (EDV- No.: 010 02 170 00)
EDV-No.:	600-00-053-00

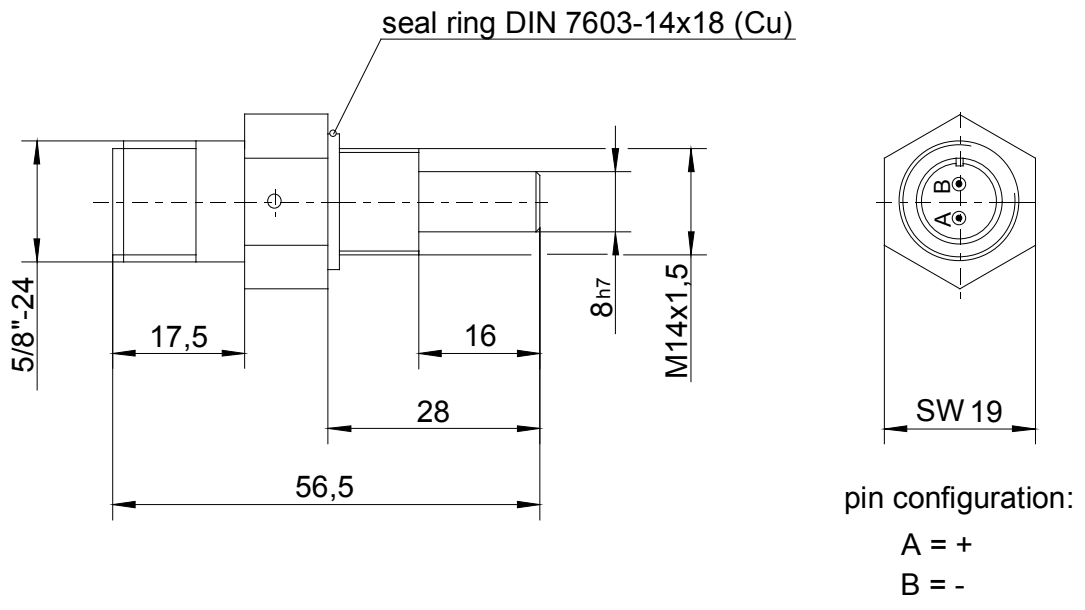


Figure 4: Temperature Sensor TS 01 - 28 - PT 1000

7.4 Pressure Sensors

7.4.1 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 up to +85°C
Ambient temperature	-25°C up to +85°C
Oil temperature	-25°C up to +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

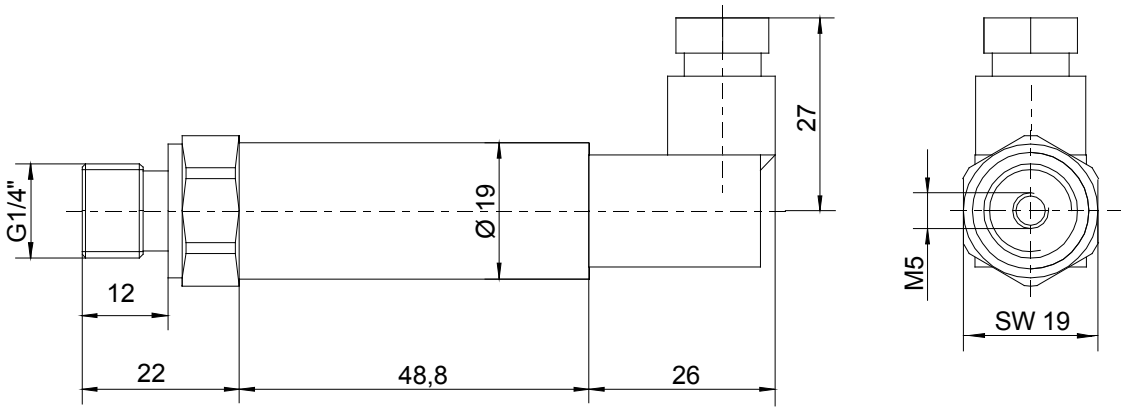


Figure 5: Oil Pressure Sensor

Pressure Sensor	EDV- No.	Max. Operating Pressure (bar)
DSO 01 - 6	600-00-058-00	6
DSO 01 - 10	600-00-058-01	10

7.4.2 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 up to +100°C
Ambient temperature	-40°C up to +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

7.4.2.1 Boost Pressure Sensor with Plug

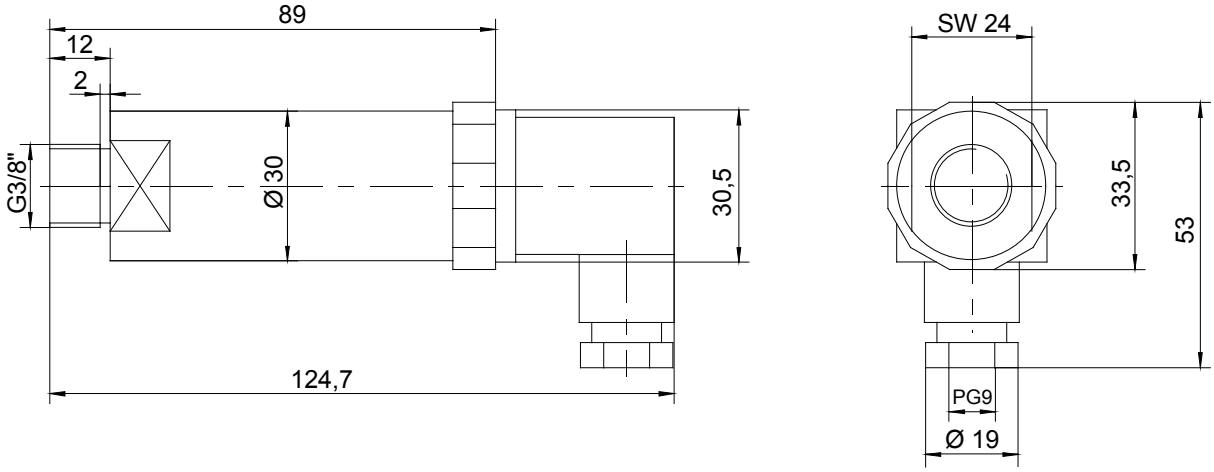


Figure 6: Boost Pressure Sensor with Plug

Boost Pressure	EDV- No.	Max. Operating Pressure (bar rel.)
DSL 01 - 2	600-00-057-00	2
DSL 01 - 5	600-00-057-01	5
DSL 01 - 10	600-00-057-02	10

7.4.2.2 Boost Pressure Sensor with Housing and Terminal Strip

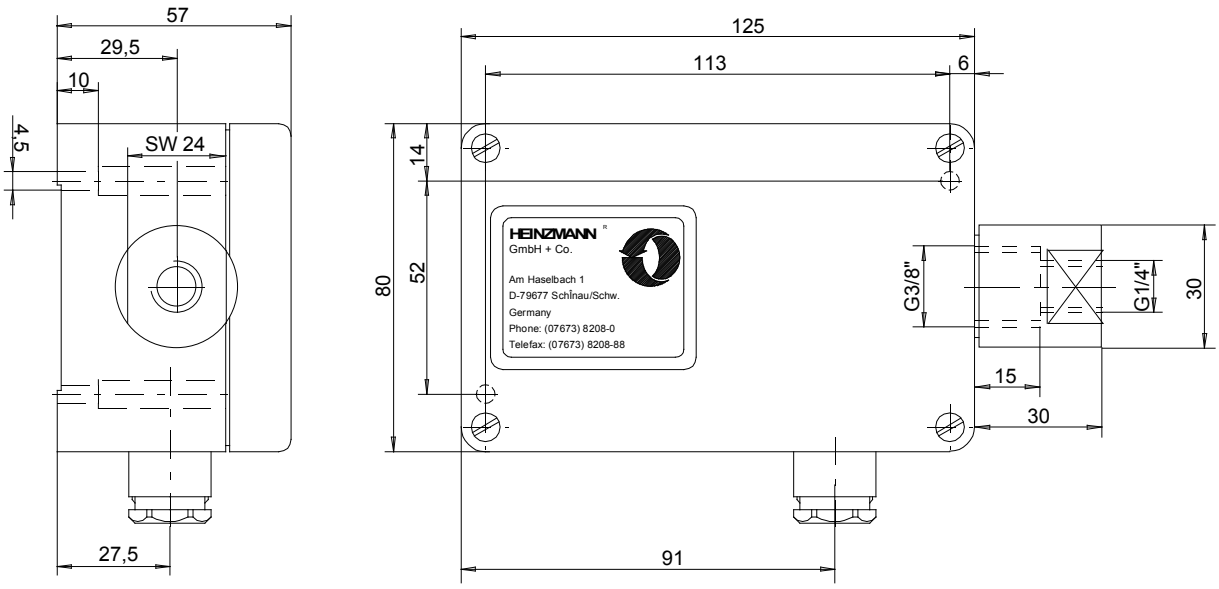


Figure 7: Boost Pressure Sensor with Housing

Pressure Sensor	EDV- No.	Max. Operating Pressure (bar rel.)
DSG 04 - 2	600-00-056-00	2
DSG 04 - 5	600-00-056-01	5
DSG 04 - 10	600-00-056-02	10

8 Speed Setpoint Adjusters

Dependent on particular applications, a series of setpoint adjusters are available for the HEINZMANN Digital Controls.

8.1 Setpoint Potentiometer SW 01 - 1 - b (1 turn)

Displacement angle	approx. 312°
Resistance	5 kOhm
Temperature range	-55°C to + 120°C
Protection grade	IP 00

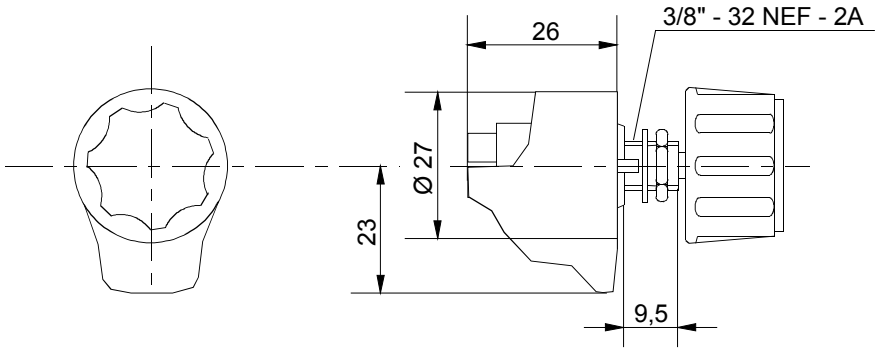


Figure 8: Potentiometer SW 01 - 1 - b

8.2 Setpoint Potentiometer SW 02 - 10 - b (10- turn)

Displacement angle	10 turns
Resistance	5 kOhm
Temperature range	-55°C to + 120°C
Protection grade	IP 00

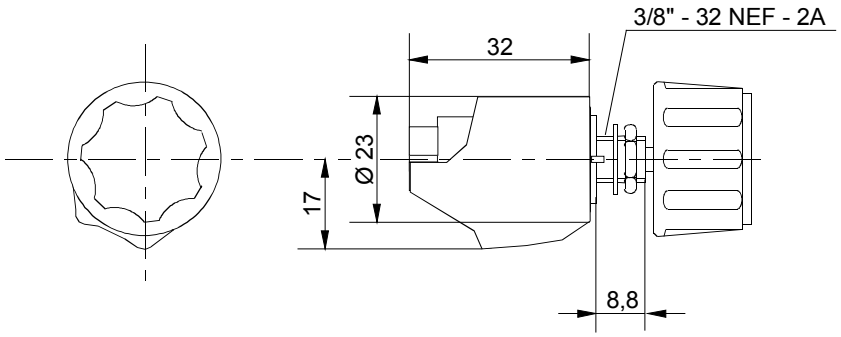


Figure 9: Potentiometer SW 02 - 10 - b

On request, the potentiometers, as specified under 8.1 and 8.2, can be supplied with analogue adjustment knob with lock in place of the standard rotating knob. In this case, ordering specification is SW..-..-m.

Equally, instead of the knob a clamping fixture can be installed. Ordering specification is to changed to SW ..-..-k.

8.3 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 set minimum speed according to the 4 mA value or a programmable substitute value.

8.4 Digital Presetting of Setpoint Values

A 4 bit binary coded digital input for 16 speed levels from n_{min} to n_{max} can be directly connected to the control unit.

8.5 Setpoint Value Adjustment by Pedal

This unit is basically an angular position transducer that translates a foot pedal into a proportional current or voltage for 0 - 45° rotation. The resulting output can be used for speed setting. For more information refer broschure E 83 005 - e.

8.6 Pneumatic Setpoint Adjusters

For pneumatic setpoint adjustment are the boost pressure sensors usable. For more informations of the sensors refer to chapter 7.5.2.

9 Control Unit DC 2005DP.2 - 01 up to DC 2040DP.2 - 01

9.1 Specification

9.1.1 General

Supply Voltage	24 V DC (12 V DC)
Maximum Voltage	35 V DC
Minimum Voltage	18 V DC (9 V DC)
Maximum Ripple Voltage	maximum 10 % with 100 Hz
Current Consumption	approx. 200 mA + current of actuator
Permissible voltage dip at maximum current consumption	max. 10 % in Control unit
Fuse protection of governor	16 A
Storing Temperature	-55°C up to +85°C
Operating Temperature	-40°C up to +70°C
Humidity	up to 98% at 55°C,
Shock	50 g, 11 ms- half-sine wave
Protection grade	
DC ...2 - 01 - 00	IP 00
DC ...2 - 01 - 55	IP 55
Weight	
DC ...2 - 01 - 00	approx. 1.2 kg
DC ...2 - 01 - 55	approx. 3 kg
Insulation resistance	> 1 MOhm at 48 V DC

9.1.2 Inputs and Outputs

Supply voltage sensors		Input voltage
Reference Voltage setpoint adjuster		U_{ref} = 5 V DC, I_{max} = 20 mA (10 mA)
2 Speed inputs		for Inductive sensor
1 Temperature input		for PT 1000
1 Temperature input		for NTC
4 Analogue inputs		U = 0..5 V, f_g = 16 Hz
	or	I = 4 .. 20 mA, f_g = 16 Hz
4 Digital inputs		R_{pd} = 2,2 kΩ, f_g = 160 Hz
4 Digital /PWM- In- Outputs		R_{pu} = 2,2 kΩ, I_{sink} < 0,1 A, f_g = 160 Hz
2 Analogue Outputs Current		I_{out} = 0 .. 22,5 mA, R_{max} = 470 Ω (125 Ω)
2 Analogue Outputs Voltage		U_{out} = 0 .. 5 V, R_{min} = 250 Ω (500 Ω)
1 PWM-Output		I_{sink} < 3 A
2 Digital Outputs failure lamp		High-Side-Switch, I_{max} < 3 A
Actuator position sensing		$U_{Reg.weg}$ = 1,4 ..3,0 V, U_{ref} = 8 V, I_{ref} < 20 mA
Drive output		PWM with 2000 Hz, I_{eff} < 6,4 A
Serial Interface		ISO 9141, Heinzmann Communication

9.2 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.

9.3 Measurements

Control Unit with plug-in connectors (DC ... 2 - 01 - 55)

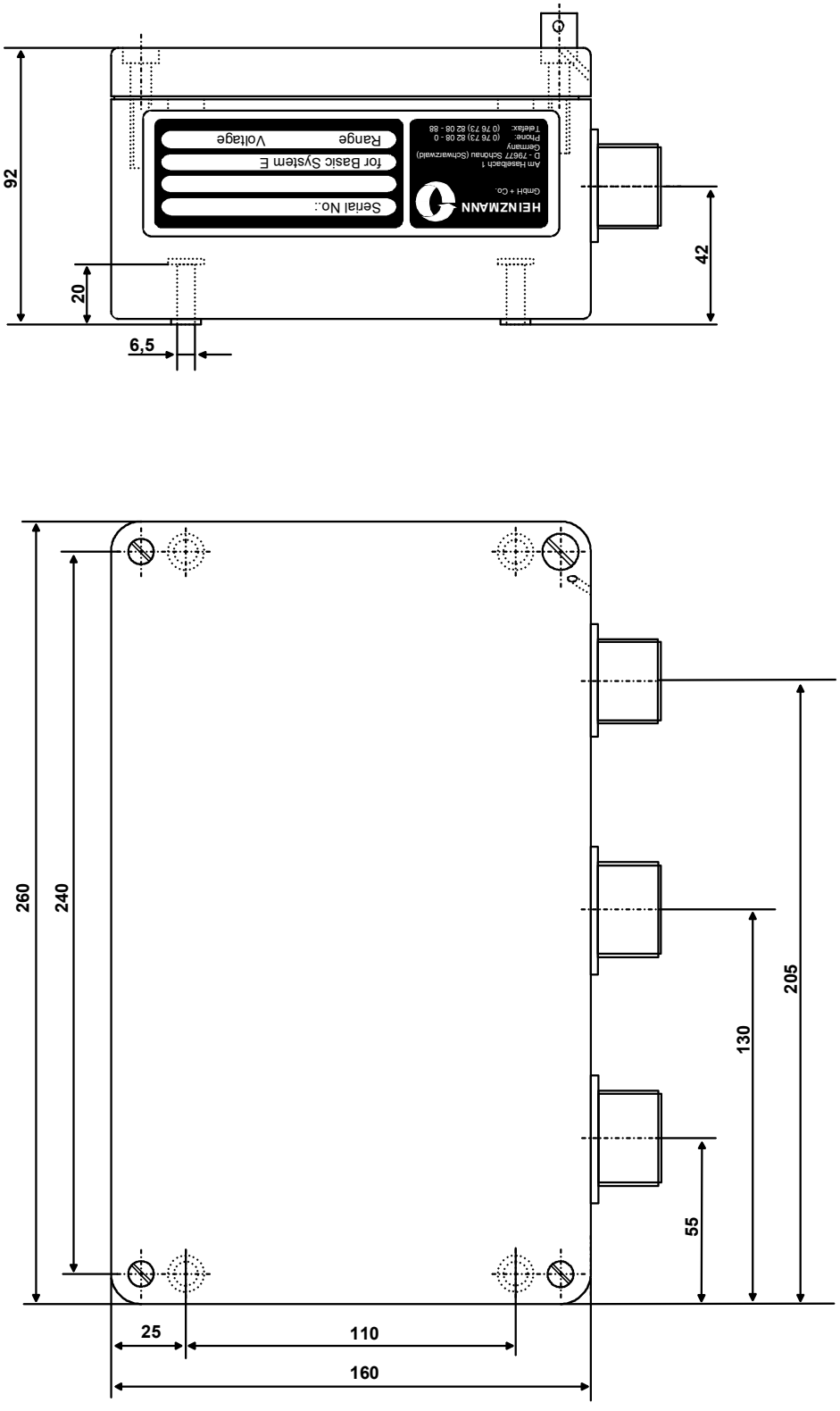


Figure 10: Control Unit DC 2005DP.2 - 01 up to DC 2040DP.2 - 01

Control Unit with terminal strip (DC ... 2 - 01 - 55)

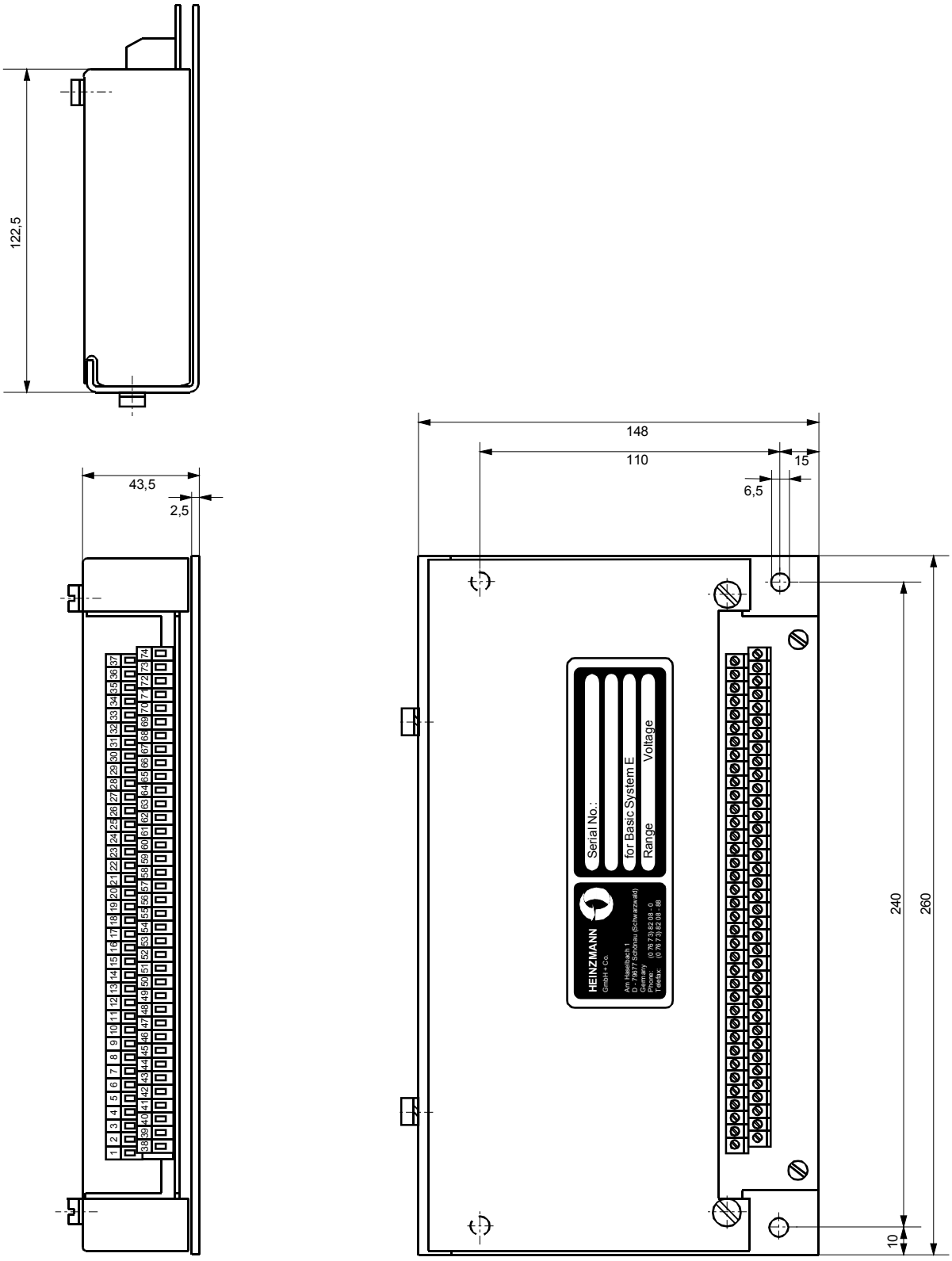


Figure 11: Control Unit DC 2005DP.2 - 01 up to DC 2040DP.2 - 01

10 Actuators

10.1 Design and Mode Operation

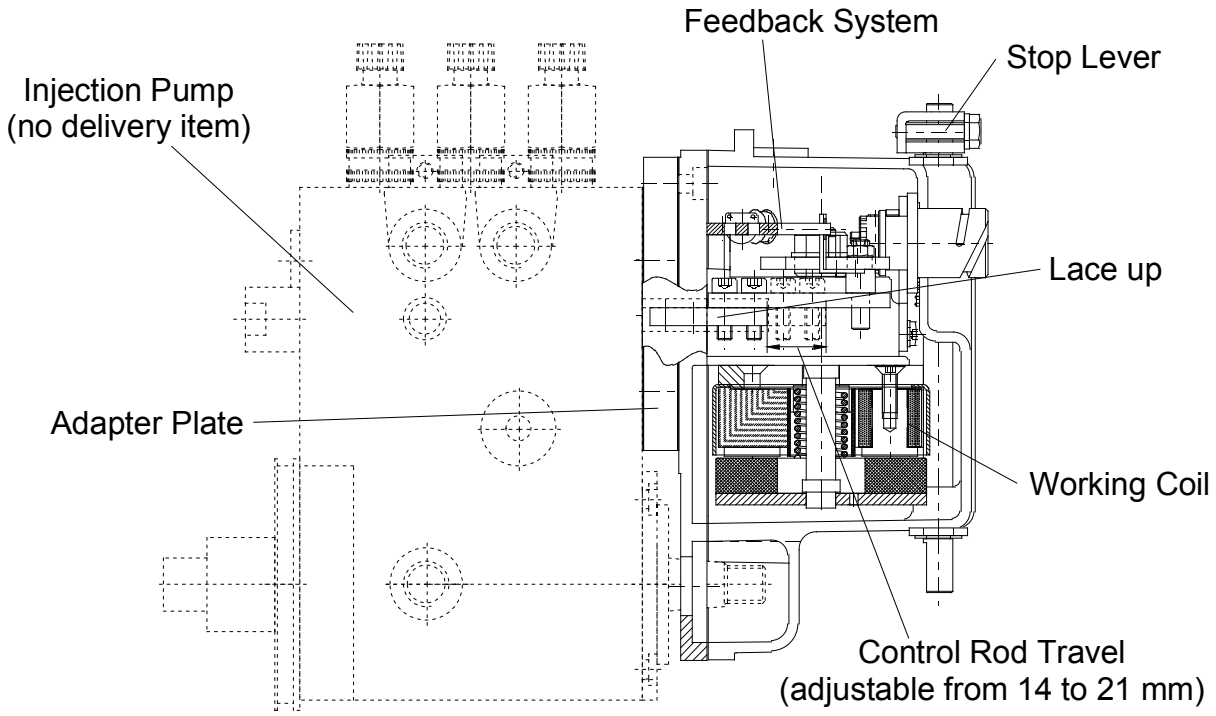


Figure 12: Sectional Drawing of Actuator

A multipole-magnetised permanent magnet is mounted on the internal actuator shaft. Opposite the permanent magnet a coil shell with the working coils is fixed. On feeding current through the coils, torque and rotary motion in one direction is produced. Reversing current polarity will produce torque in the opposite direction.

The lever which is fixed to the internal shaft is connected to the control rod of the injection pump by a special linkage system. By this, the rotary motion of the internal shaft is directly transmitted as a linear motion to the control rod.

On the actuator shaft, also the governor feedback is firmly mounted which operates contact-free and transmits the position of the governor output shaft accurately to the control unit. By this, the control unit is able to rapidly calculate the linkage adjustment as required by speed changes, and to accommodate current accordingly.

An additional external lever provides the possibility of executing an emergency shutdown. However, in order to stop the engine by means of this stop lever it will be necessary to overcome the electric positioning force working in the direction of 100%. Therefore, before executing an emergency shutdown by the stop lever, the voltage supply should first be switched off.

Due to the closed assemblage, the control linkage is fully protected for maintenance-free operation and long durability of the actuators.

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 after approx. 20 seconds; by this the current to the actuator is reduced to a value that cannot harm the motor.

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 disturbance.
- Due to direct assemblage, the linkage is fully protected and maintenance-free, and there is no need for complicated linkage adjustment.

10.2 Installation

For the different pump systems, a variety of assembly kits is provided consisting mainly of the adapter plate and the customer-specific linkage connection.

The assembly kits come with detailed assembling instructions which will help the user to do the mounting easily by himself.

10.3 Specification

	StG 2005 DP	StG 2040 DP
Maximum control rod travel	21 mm	21 mm
Spring power of back spring in stop position	approx. 9 N	approx. 30 N
Spring power of back spring in full position	14 N	50 N
Maximum positioning force	approx. 20 N	approx. 110 N
Maximum current consumption	6 A	6 A
Current consumtion in operation	1.5 ... 3 A	1.5 ... 3 A
Coil resistance of governing magnet	1.4 Ohm	2 Ohm
Storage temperature	-55°C … 110°C	-55°C … 110°C
Ambient temperature in operation	-25°C … 90°C	-25°C … 90°C
Vibration level	± 1 mm at 1 ... 20 Hz max. 0.24 m/s at 21 ... 63 Hz max. 9g at 64 ... 2000 Hz	± 1 mm at 1 ... 20 Hz max. 0.24 m/s at 21 ... 63 Hz max. 5g at 64 ... 300 Hz
Shock level	30 g, 11 ms, half sine	30 g, 11 ms, halb sine
Protection grade	IP 55	IP 55
Weight	approx. 2.4 kg	approx. 4.2 kg

10.4 Measurements

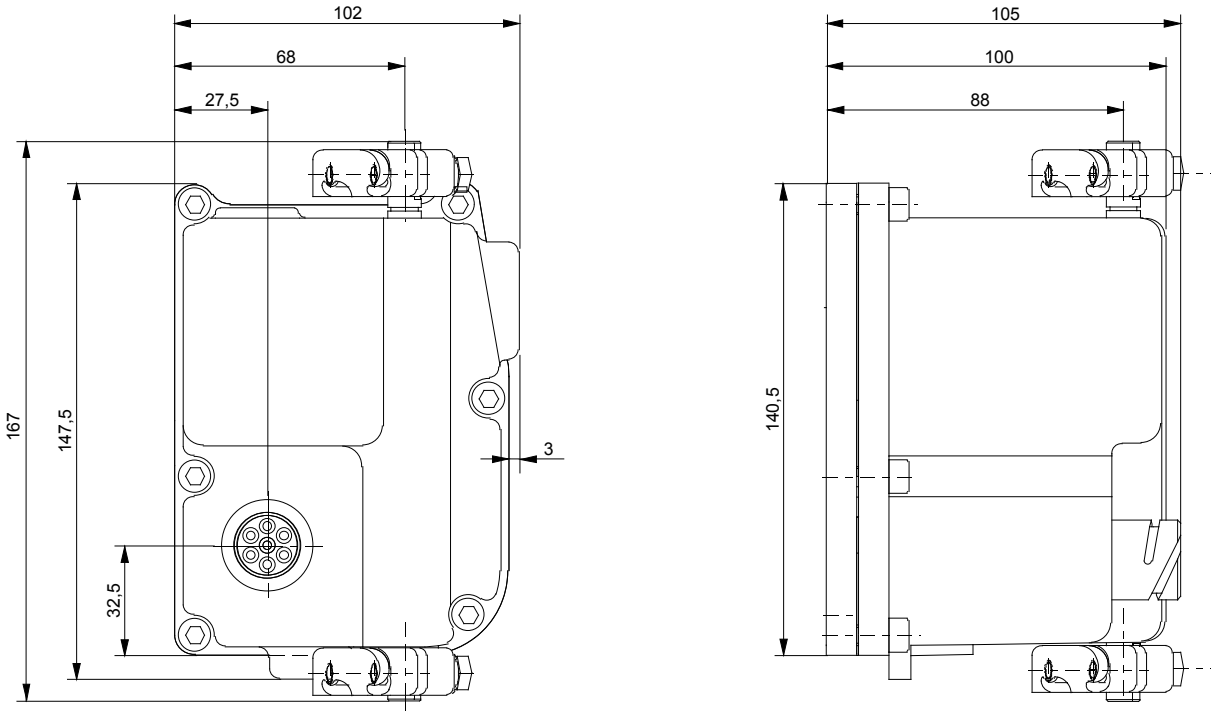


Figure 13: Actuator StG 2005 DP

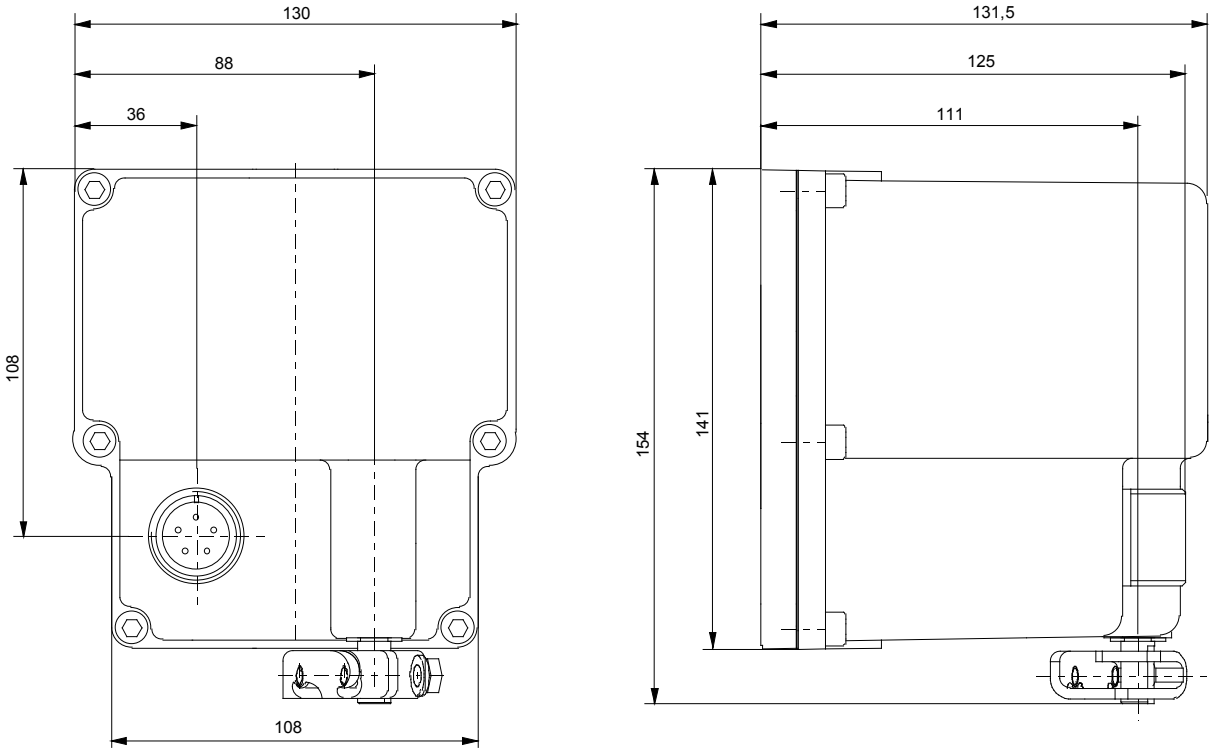


Figure 14: Actuator StG 2040 DP Measurements

11 Electric Connection

11.1 Connection of Shielding

To avoid elektromagnetic influences it is necessary to connect cable shields at both ends. This includes shielding from control housing to sensors, from control housing to potentiometers, from control housing to actuator and from control housing to accessory units. If there is a potential difference between the control housing and any of these other componets, to avoid currents via the shielding it is necessary to run a separate wire from the control housing to each of these components.

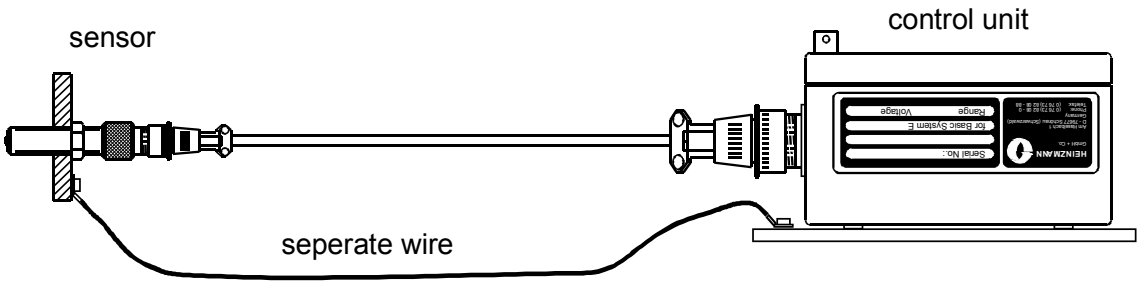


Figure 15: Connection of seperat Wire

At cable ends without plugs (e.g. terminal strip or pins) the shielding must be connected at the housing near the contacts.

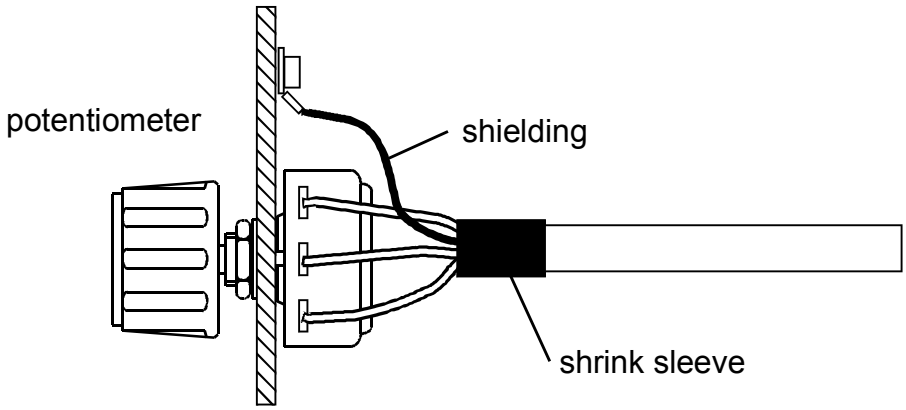


Figure 16: Shield Connection without Plug

In case of a plug connection the shielding is jamed in the strain relief of the plug.

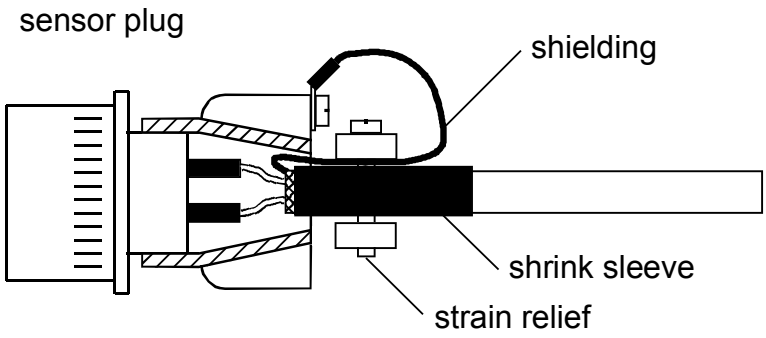


Figure 17: Shield Connection in the Plug

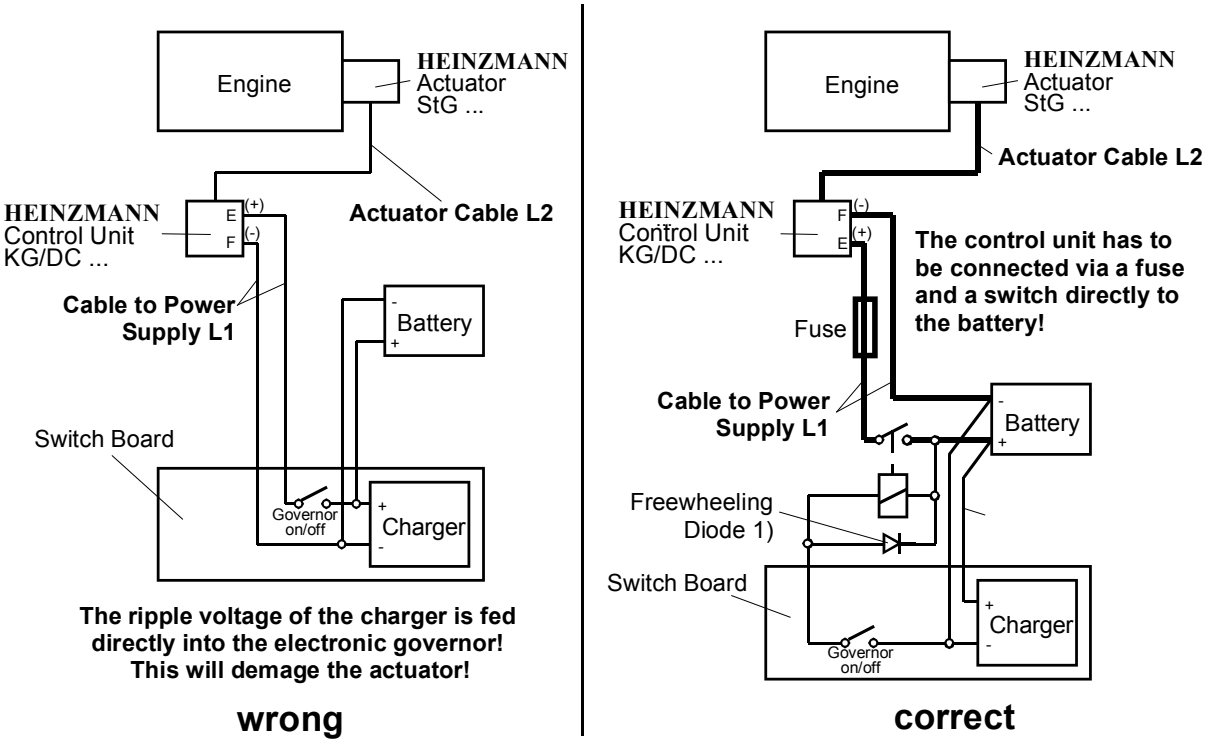
11.2 Connection of Power Supply

Inappropriate choice of power supply or insufficient battery capacitance or incorrect connection of the power supply line or too small cable sizes of the feed line and the motor line of the actuator are bound have an adverse effect upon the performance of the speed governor. In steady state operation, this will cause a heavy increase of current consumption and unnecessary vibration of the actuator drive. The high current consumption will in its turn lead to overheating of the actuator or the amplifier in the control unit, and the vibration will result in premature wear of the gear and bearing parts or of the linkage.

Note

In altogether, the lifetime of the control system is distinctly reduced by the errors described above.

The following figure shows both a wrong and a correct cabling:



1) Coils (e.g. stopping solenoid, gas valve) have to be equipped with a protective circuit to eliminate high indunctance votages. Diode type e.g. 1N4002

Figure 18: Correct Connection of Power Supply

Warning

If there are battery chargers with rapid charge mode installed in the plant, the rapid charge mode should no be used during operation.

If there is no battery provided, **it is absolutely necessary** that a three phase power supply or a **stabilized** one phase power supply with at least 24 V DC, 10 Amps output power **be used** as a power source.

HEINZMANN offers for the control system PRIAMOS I the power supply NG 01 and if an additional backup system is required, the power supply NG 01 + NSV 01 and NG 04. For more informations, refer to the separate manuals E 88 002-e and E 97 002-e.

Warning

The cable sizes and cable lengths described in the wiring diagrams must not be exceeded!

When power supply, battery and cabling have been correctly dimensioned, then on starting the engine or with the actuator operating at maximum current consumption (approx. 6.4 Amps), a drop of the supply voltage directly at the control unit of approx. 2 Volts maximum only will be admissible.

11.3 Example of Connection for Generator Set with digital Accessories

(Island parallel- and mains operation)

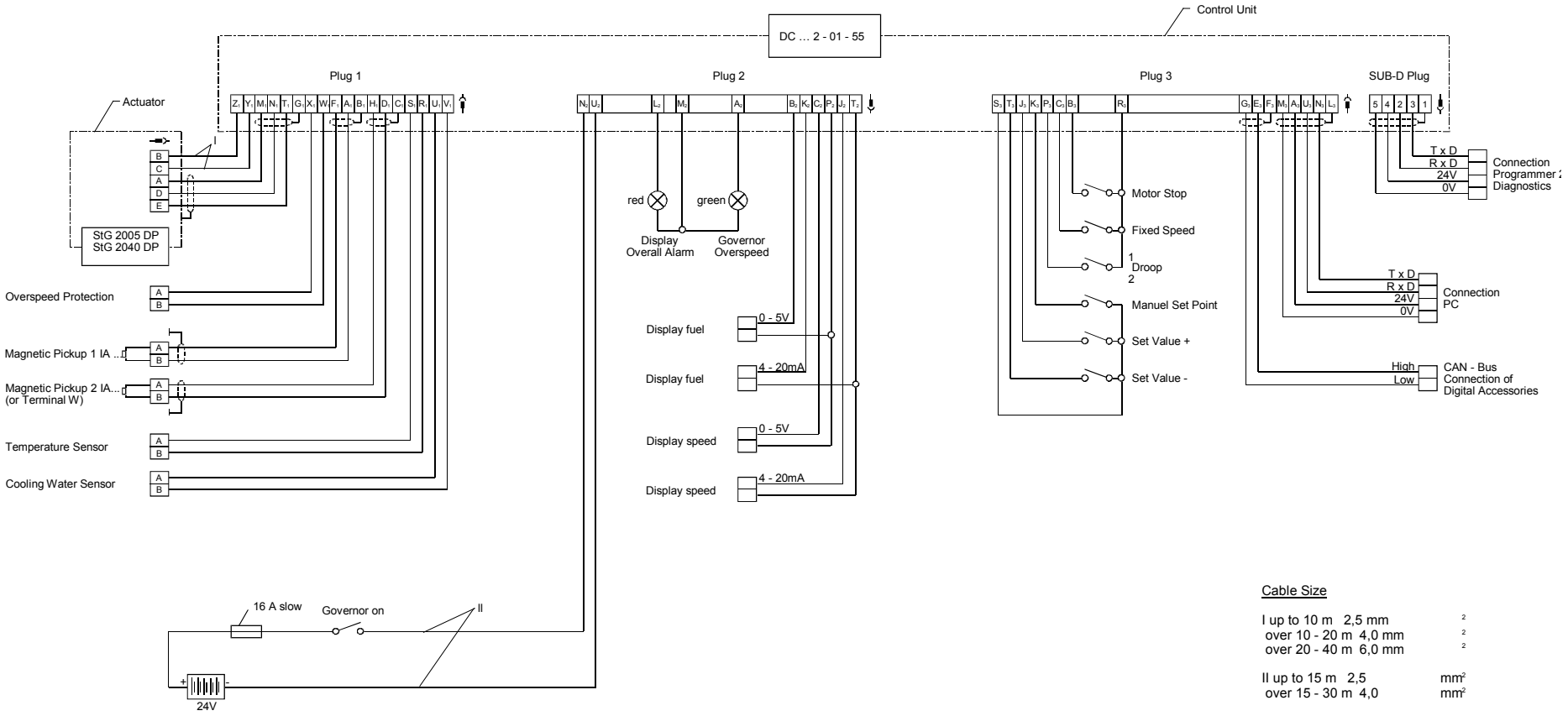


Figure 19: Connections with Plug (IP 55) for Genset with digital Accessories

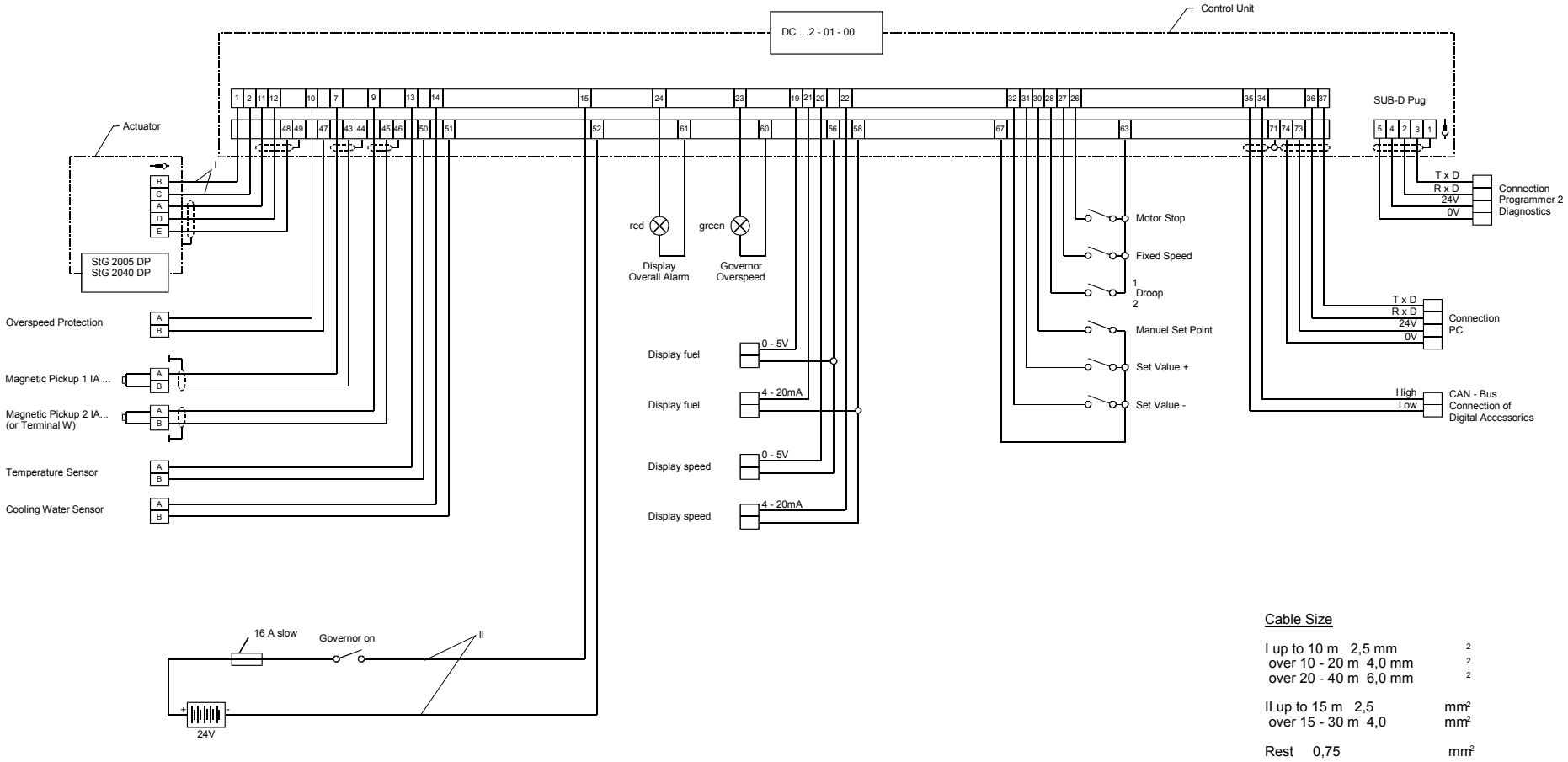


Figure 20: Connections with Terminal Strip (IP 00) for Genset with digital Accessories

11.4 Example of Connection for Generator Set with analogue Accessories

(Island parallel- and mains operation)

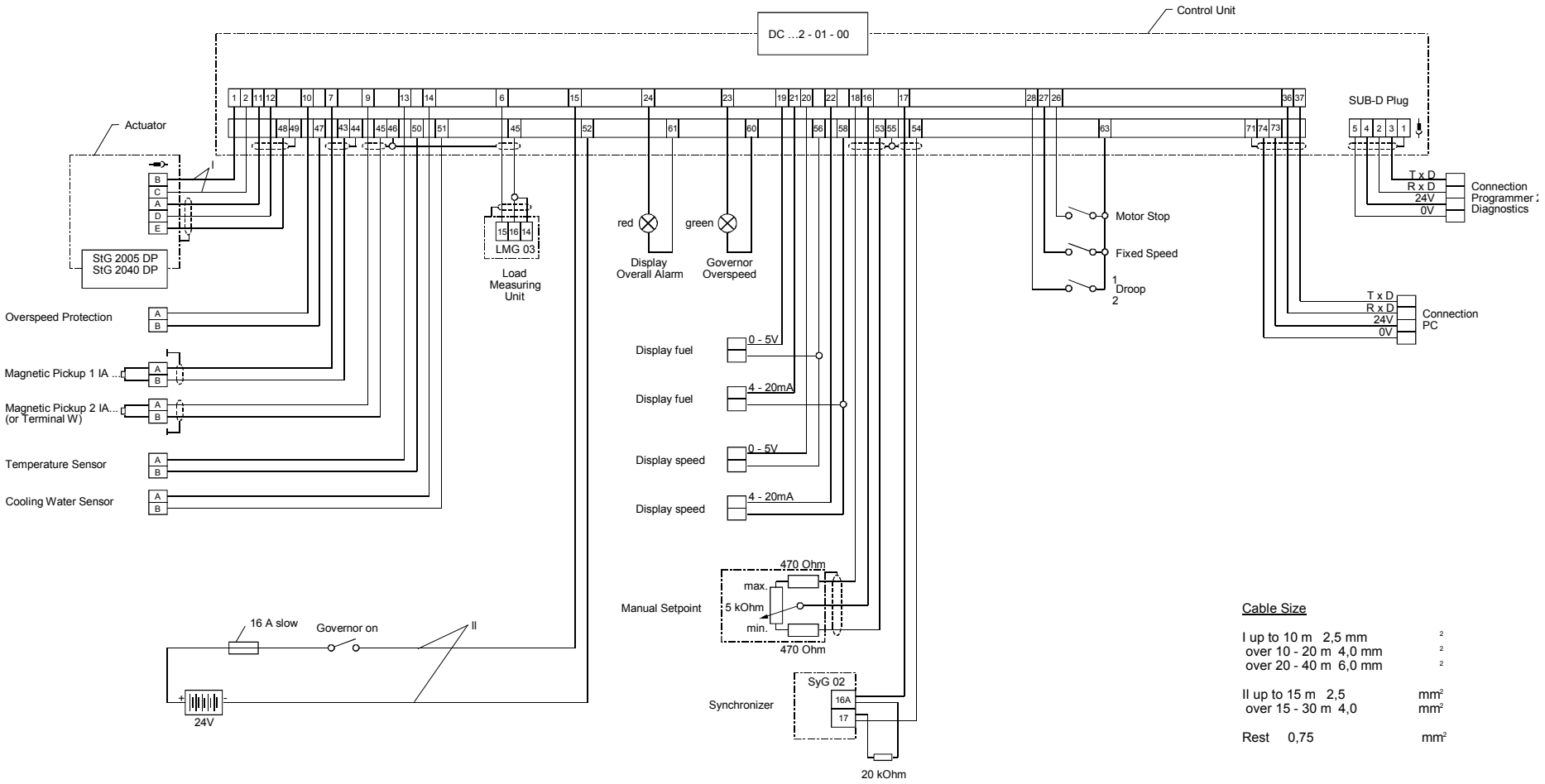


Figure 21: Connection with Plugs (IP 55) for Genset with analogue Accessories

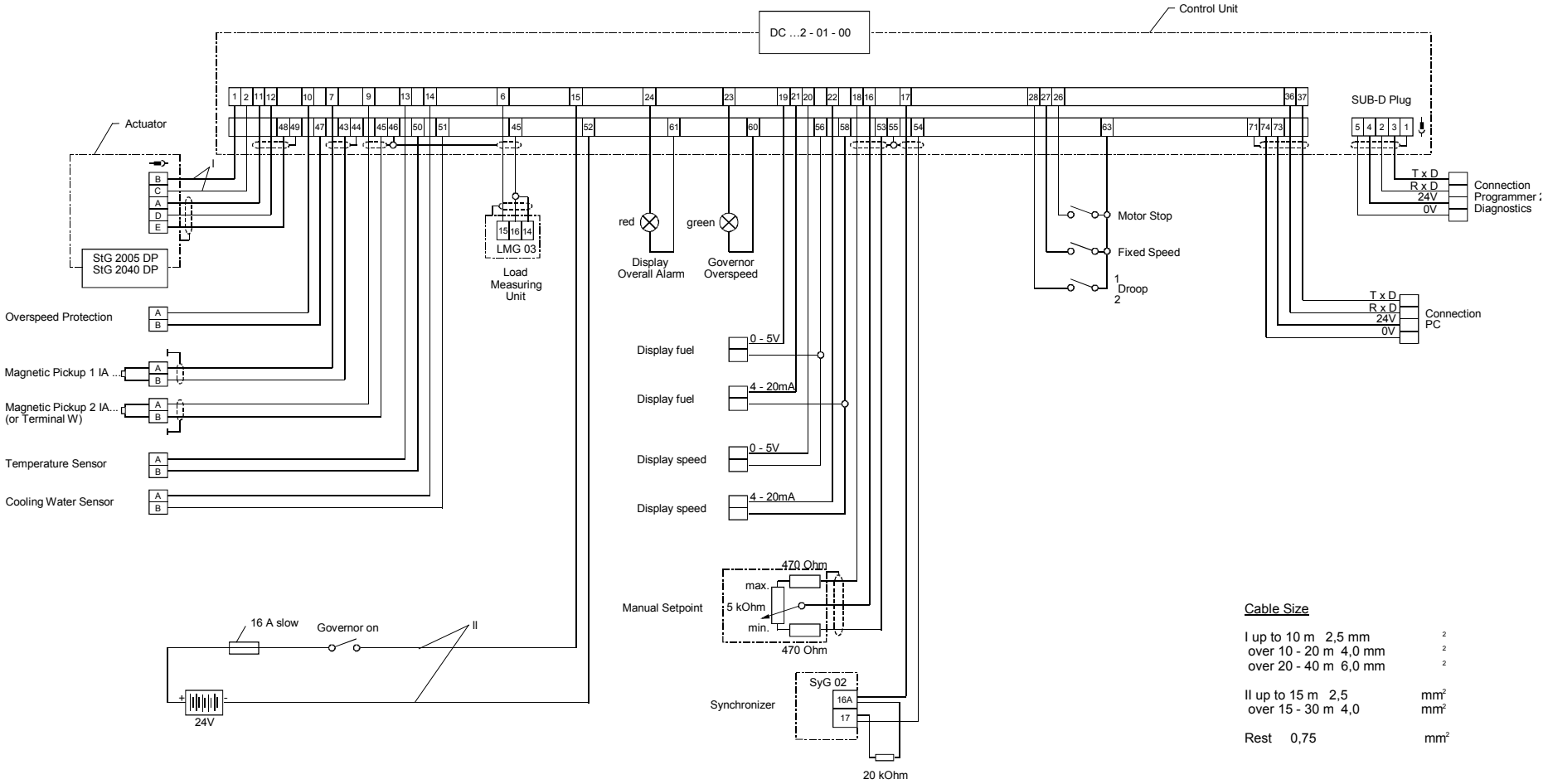


Figure 22: Connection with Terminal Strip (IP 00) for Genset with analogue Accessories

11.5 Example of Connection for Vehicle Operation

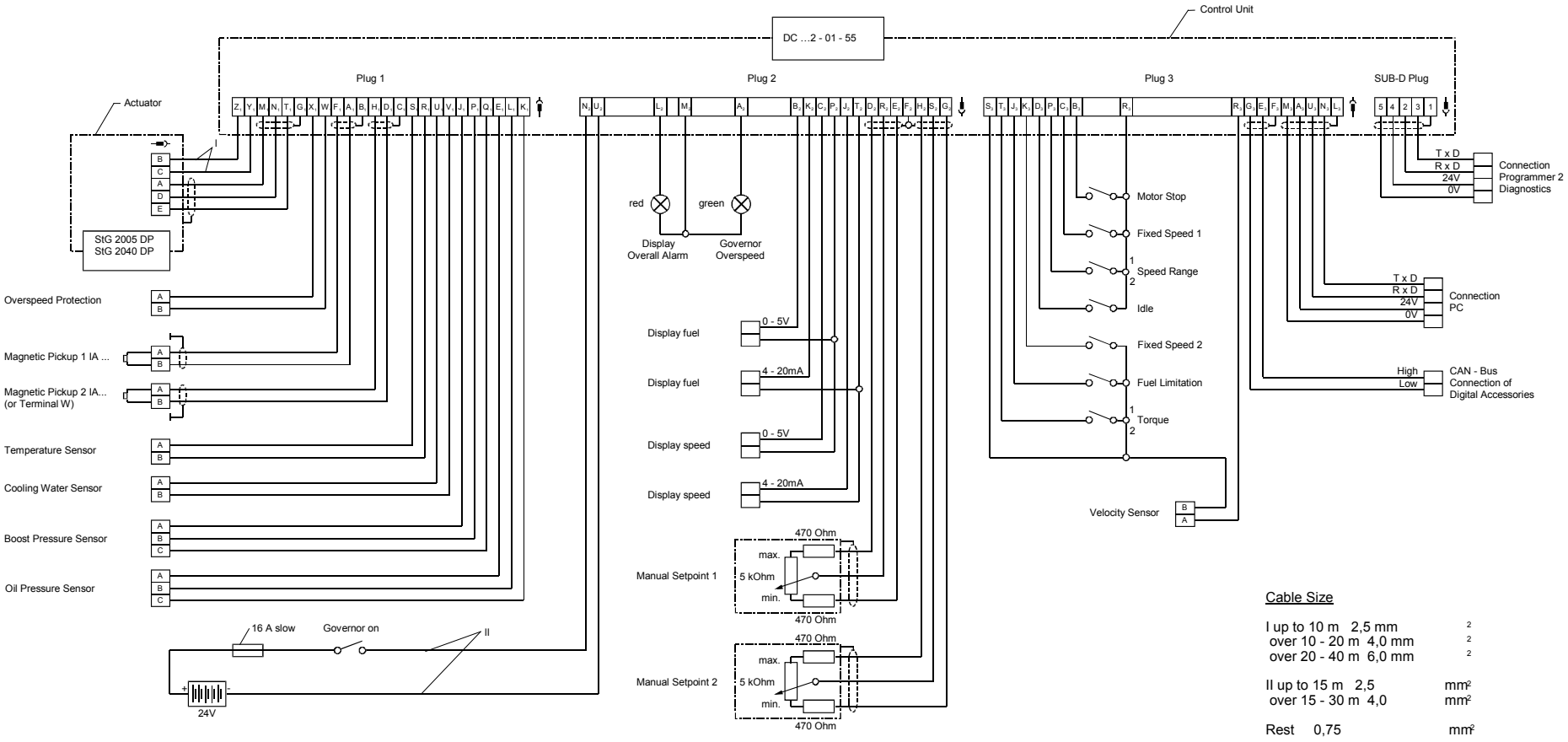


Figure 23: Connection with Plugs (IP 55) for Vehicle Operation

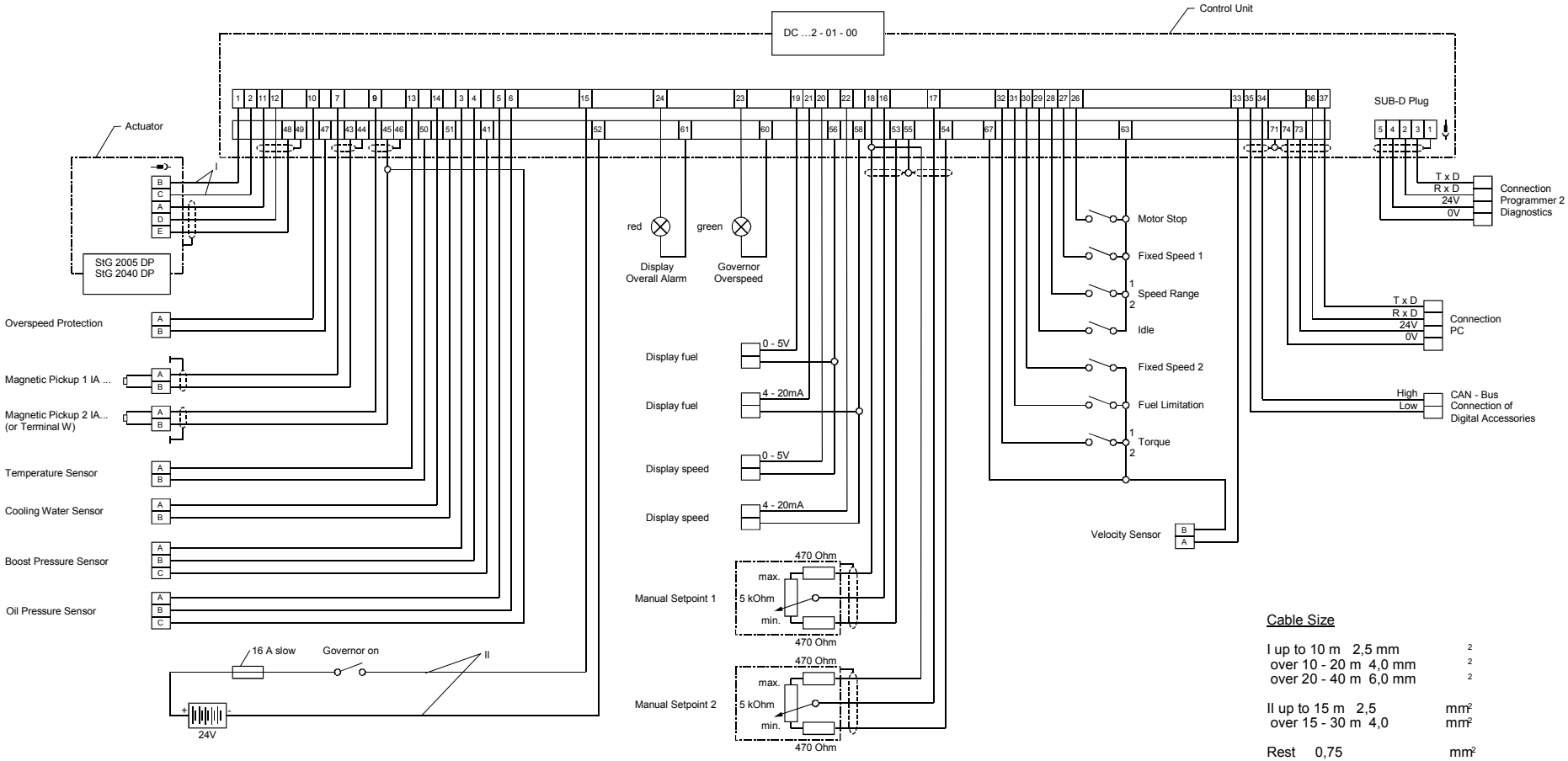


Figure 24: Connection with Terminal Strip (IP 00) for Vehicle Operation

11.6 Example of Connection for Locomotive Operation with 16 Notches

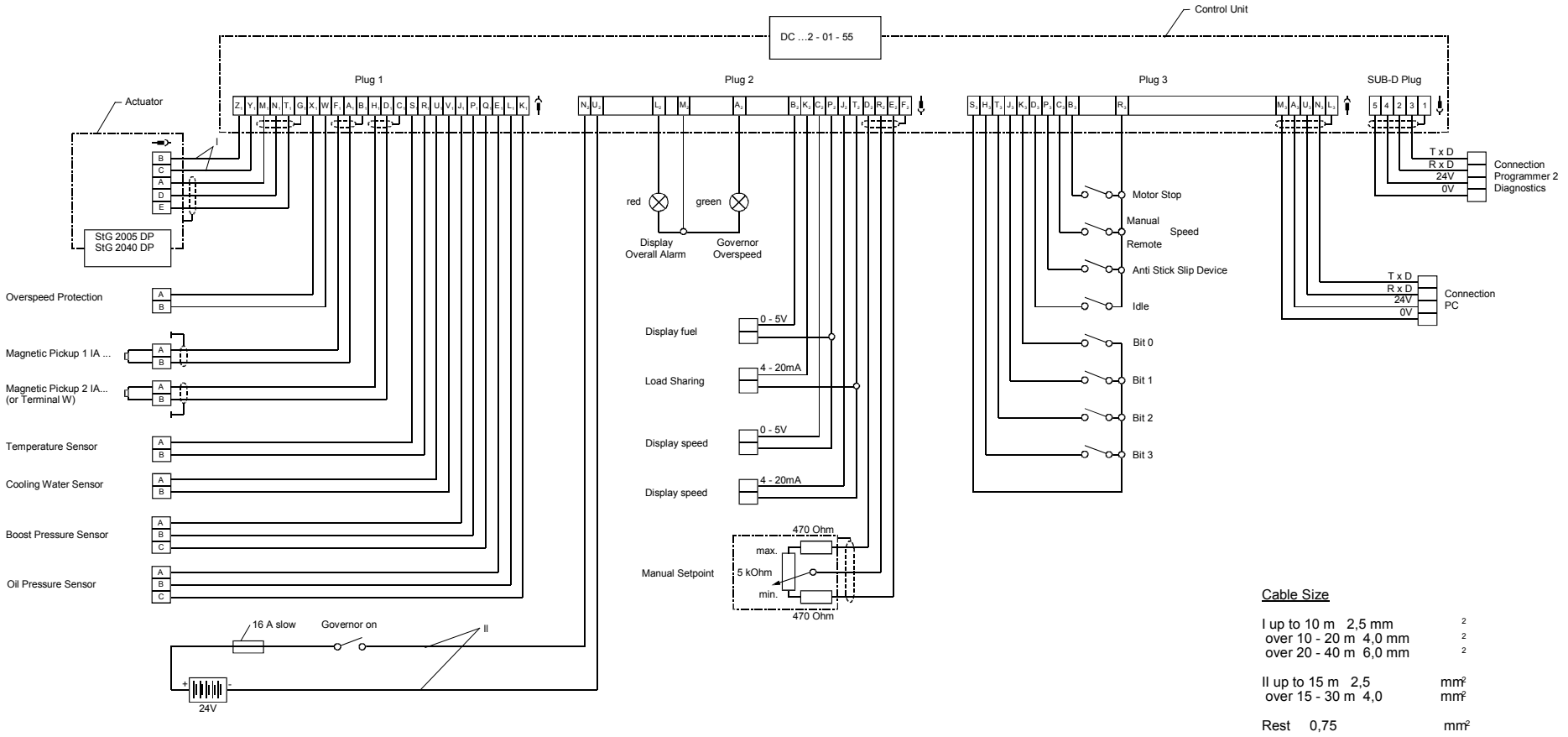


Figure 25: Connection with Plugs (IP 55) for Loco Operation with 16 Notches

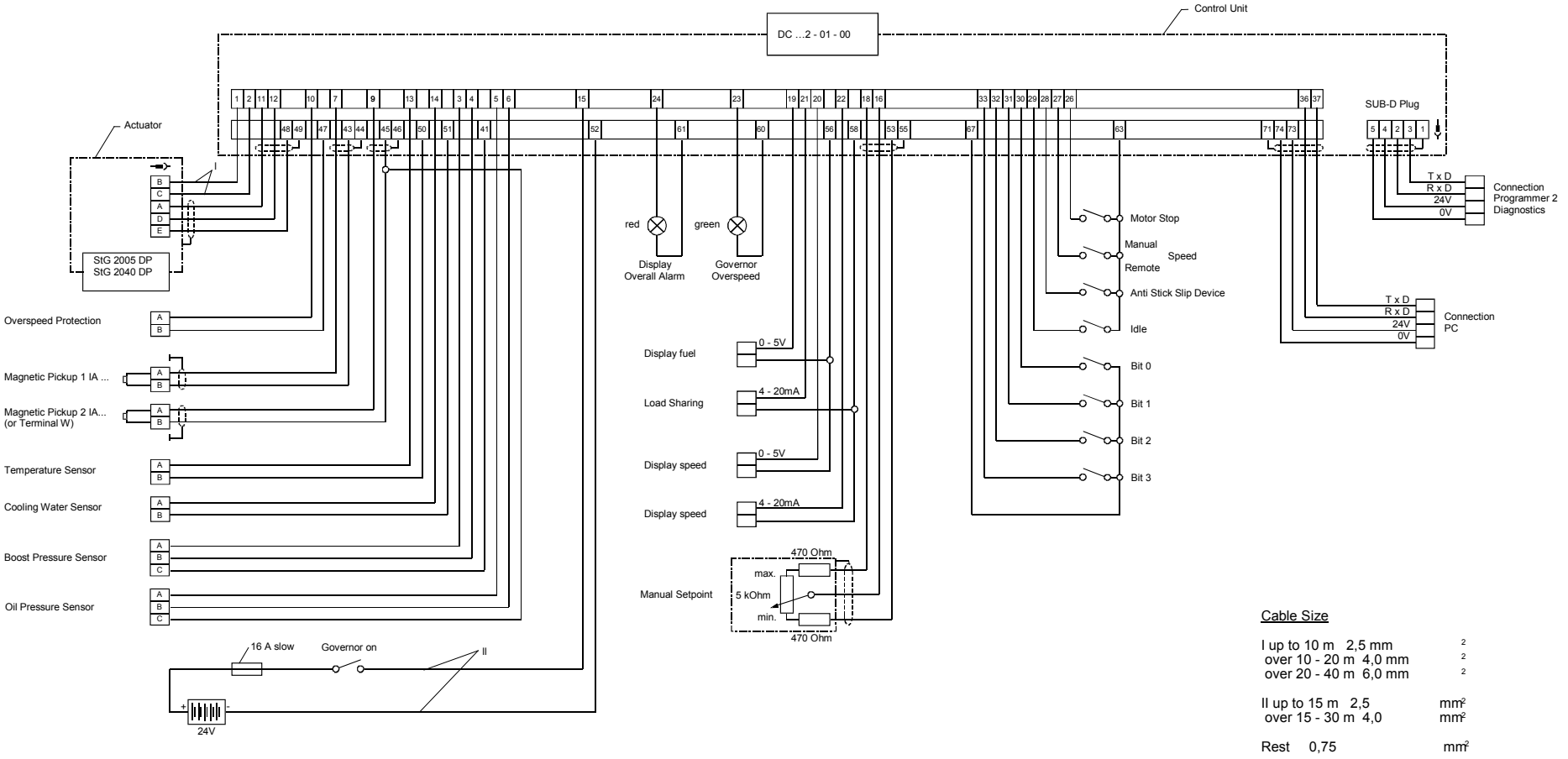


Figure 26: Connection with Terminal Strip (IP 00) for Loco Operation with 16 Notches

11.7 Example of Connection for Locomotive Operation with Speed Setpoint via Current Signal

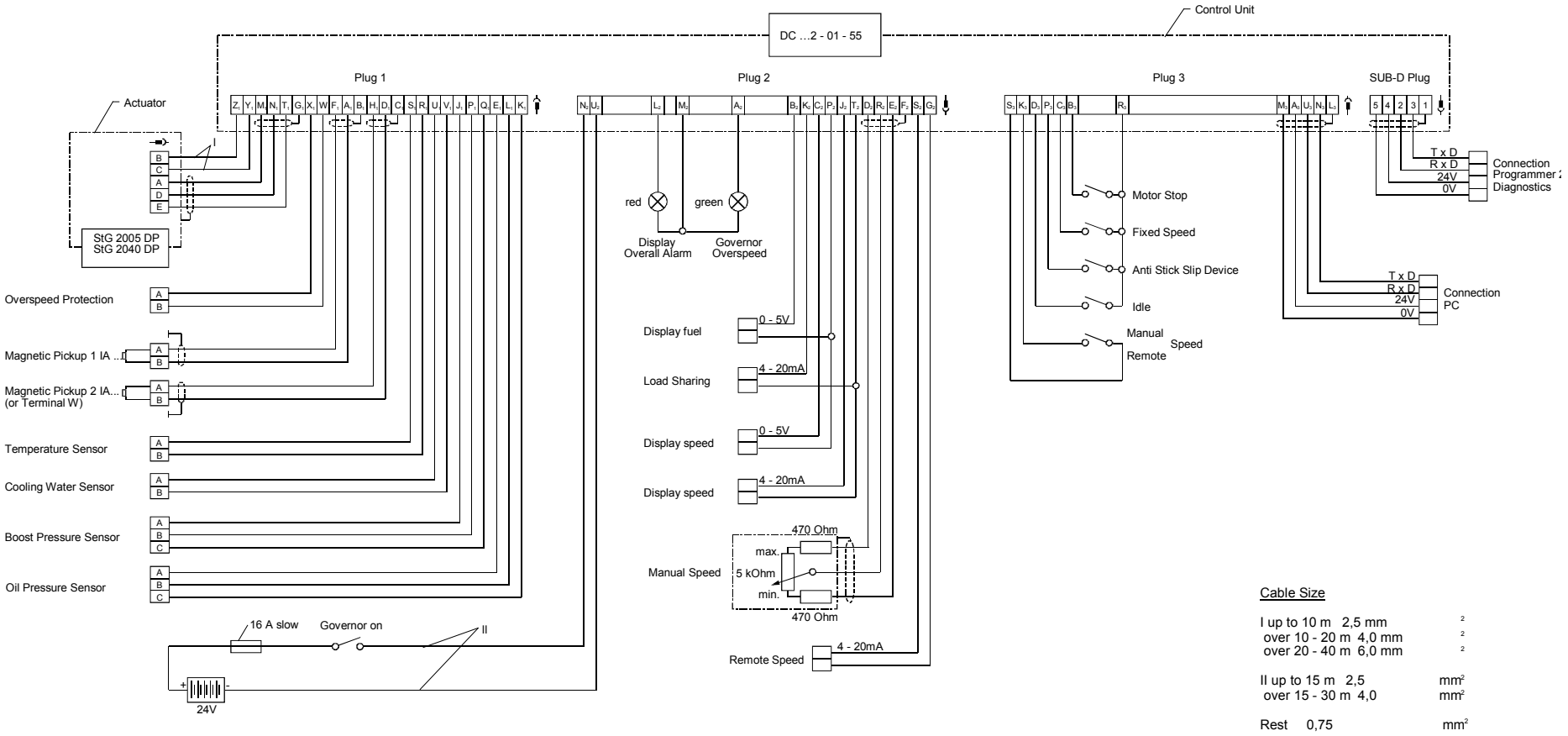


Figure 27: Connection with Plugs (IP 55) for Loco Operation with Speed Setpoint via Current Signal

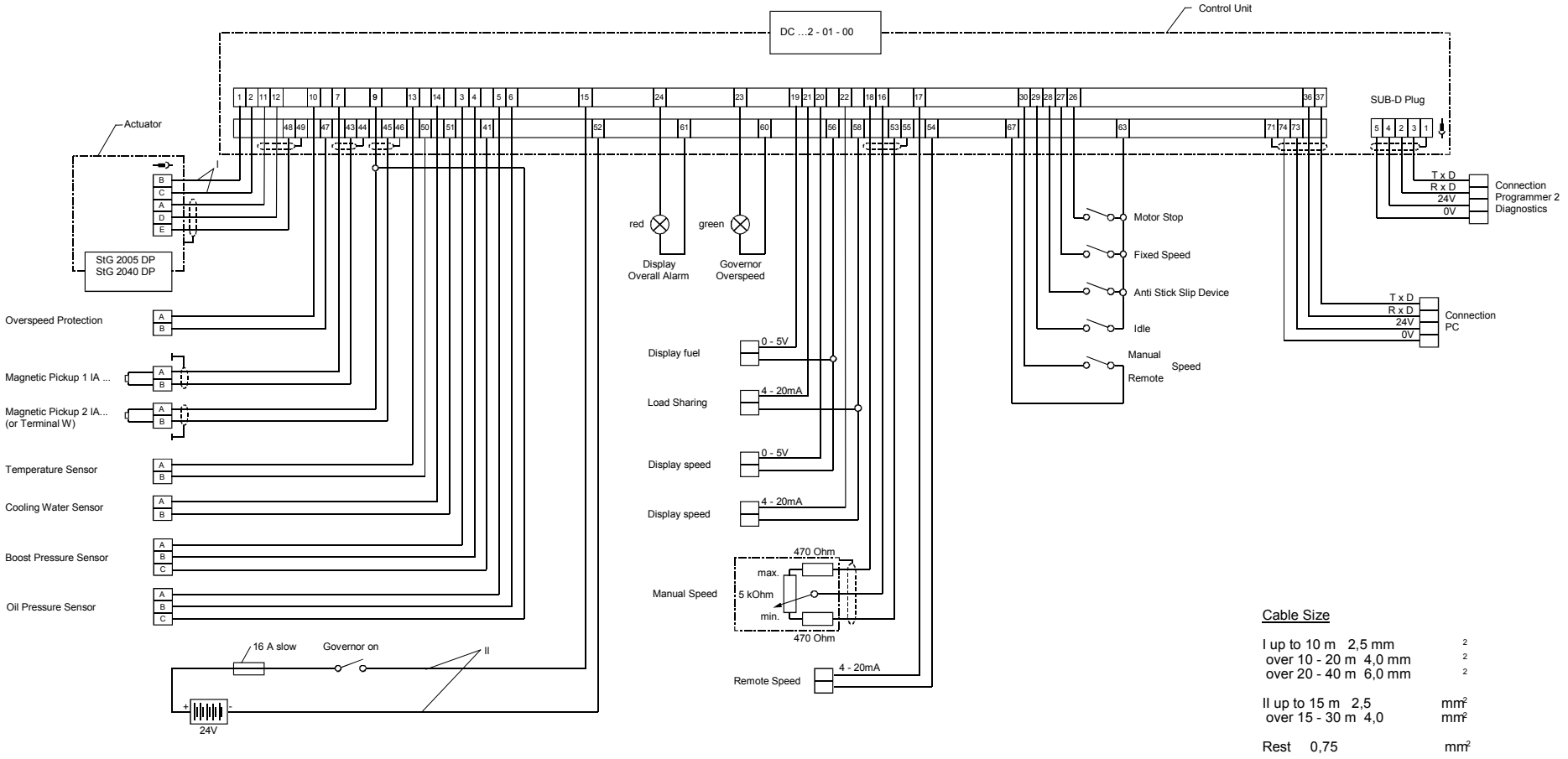


Figure 28: Connection with Terminal Strip (IP 00) for Loco Operation with Speed Setpoint via Current Signal

11.8 Example of Connection for Marine Operation with Master/Slave

(Twin operation: 2 engines on one shaft)

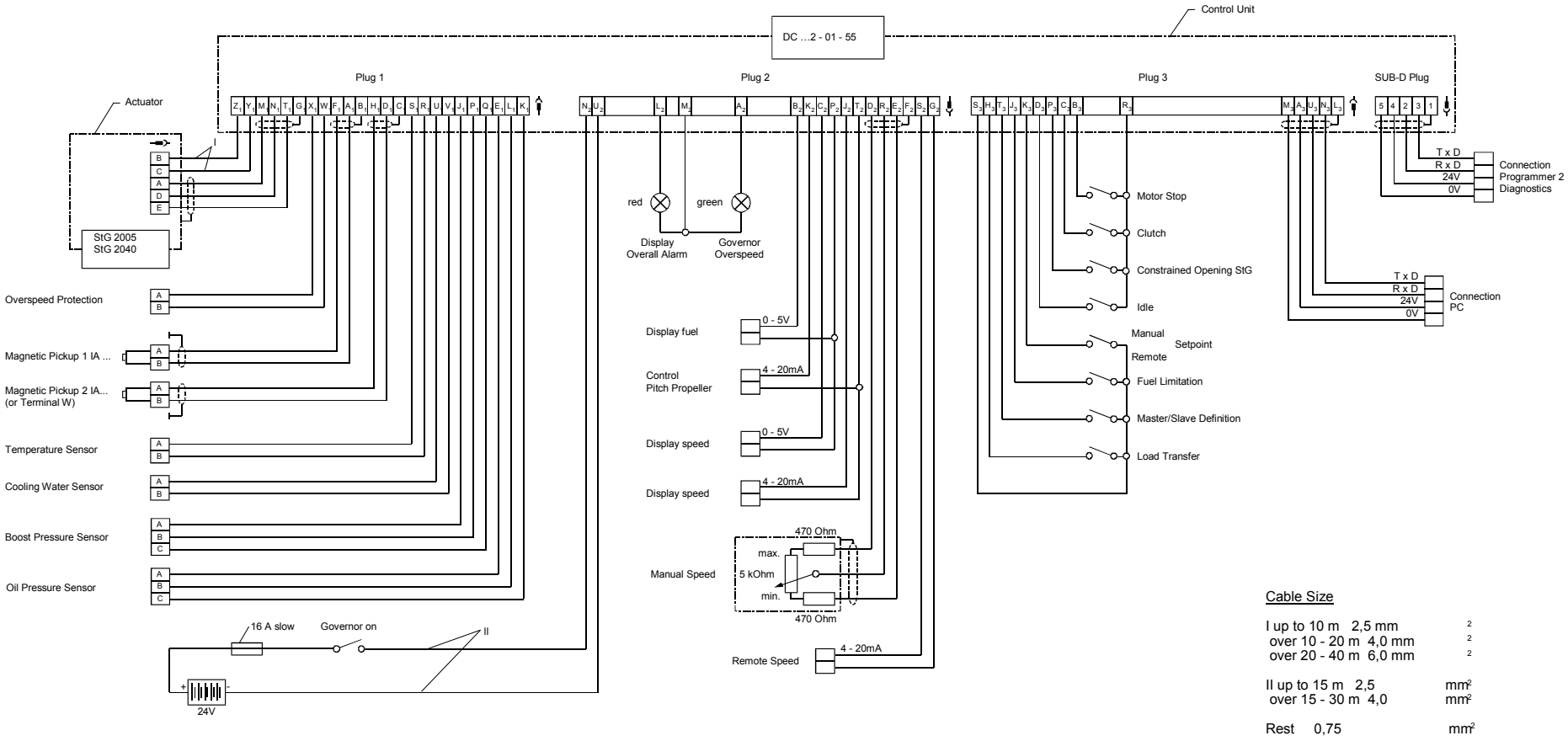


Figure 29: Connection with Plugs (IP 55) for Marine Operation with Master/Slave

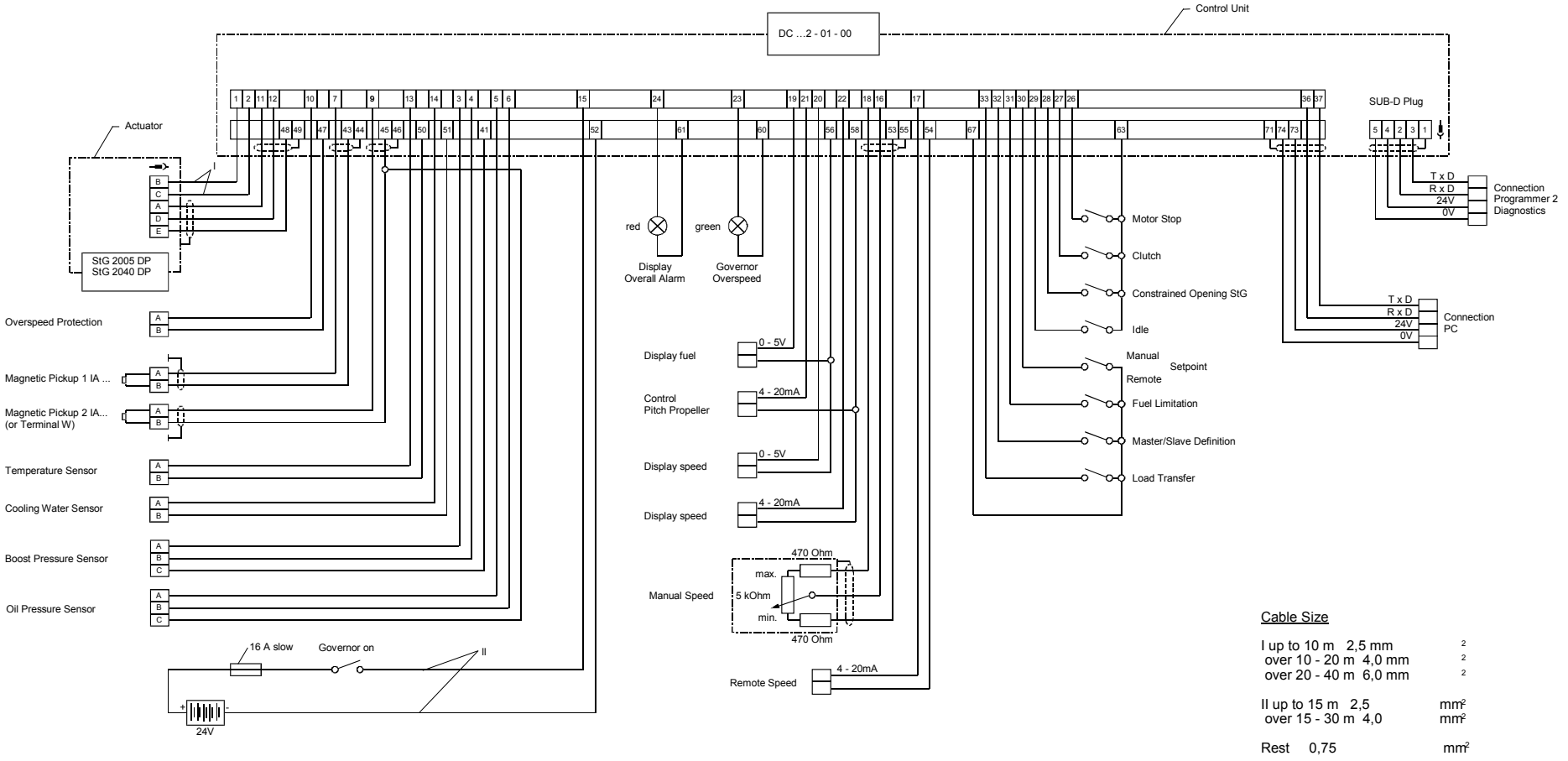


Figure 30: Connection with Terminal Strip (IP 00) for Marine Operation with Master/Slave

11.9 Example of Connection for Marine Operation in single Operation

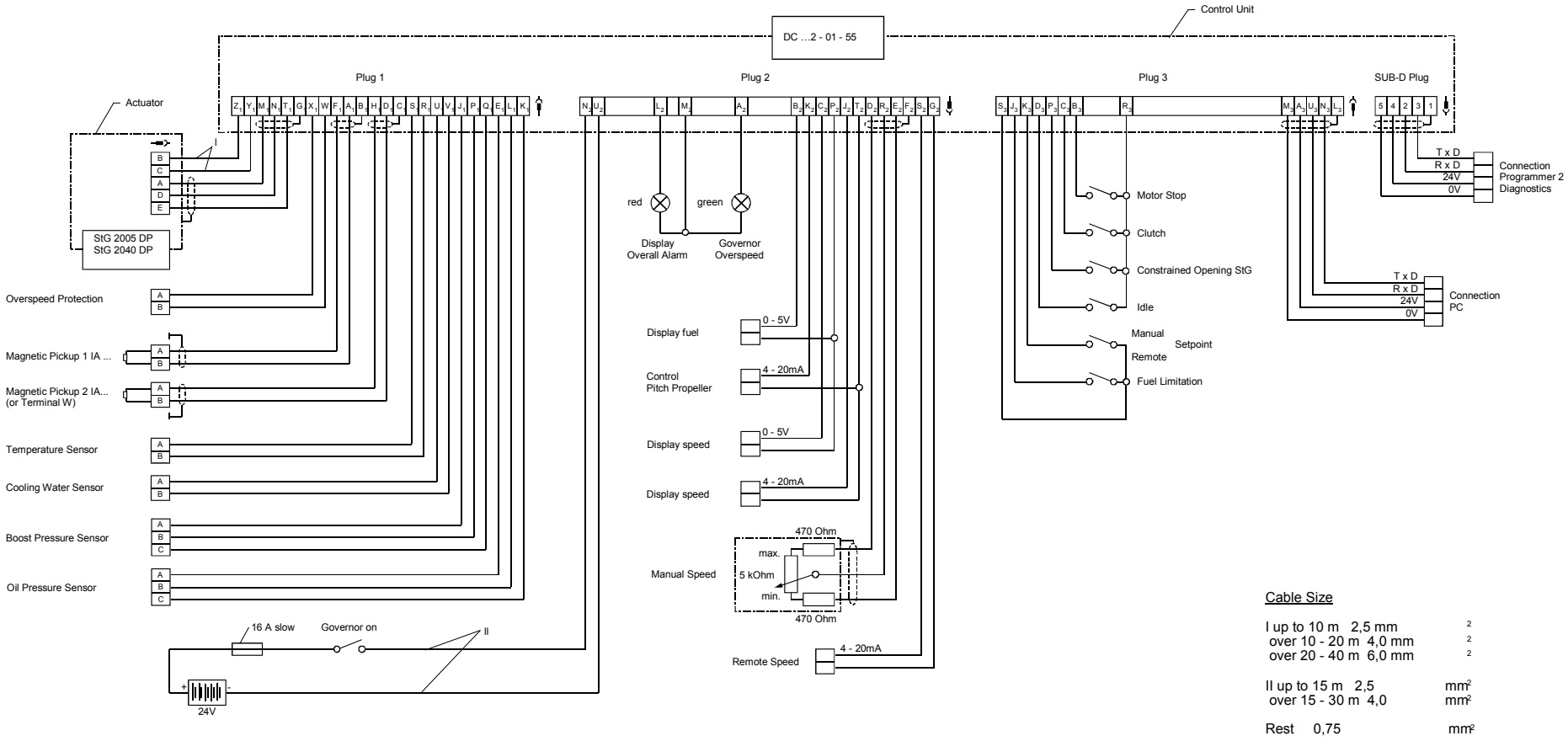


Figure 31: Connection with Plugs (IP 55) for Marine Operation in single Operation

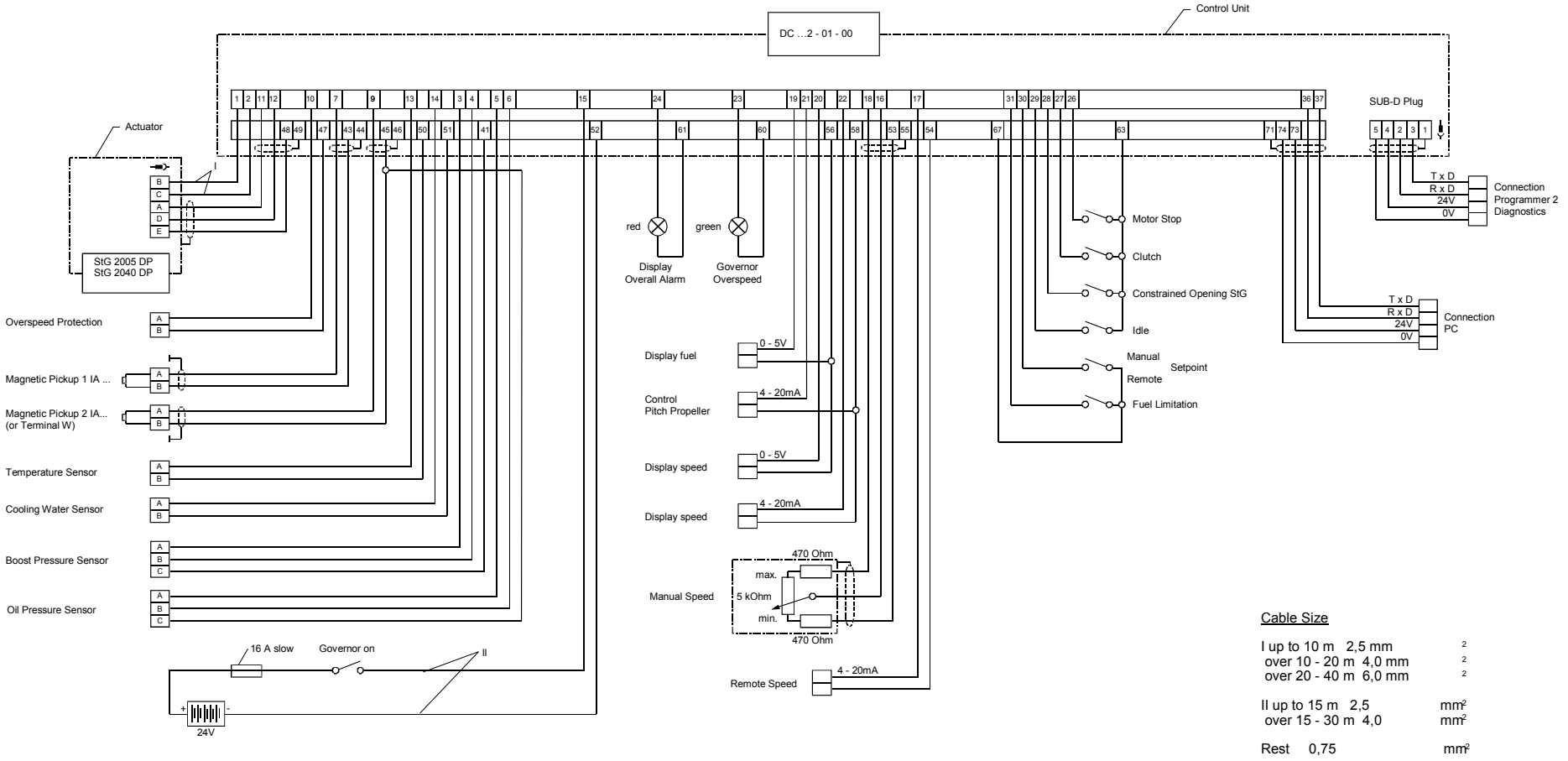


Figure 32: Connection with Terminal Strip (IP 00) for Marine Operation in single Operation

12 Harness

12.1 Cable Lenghts

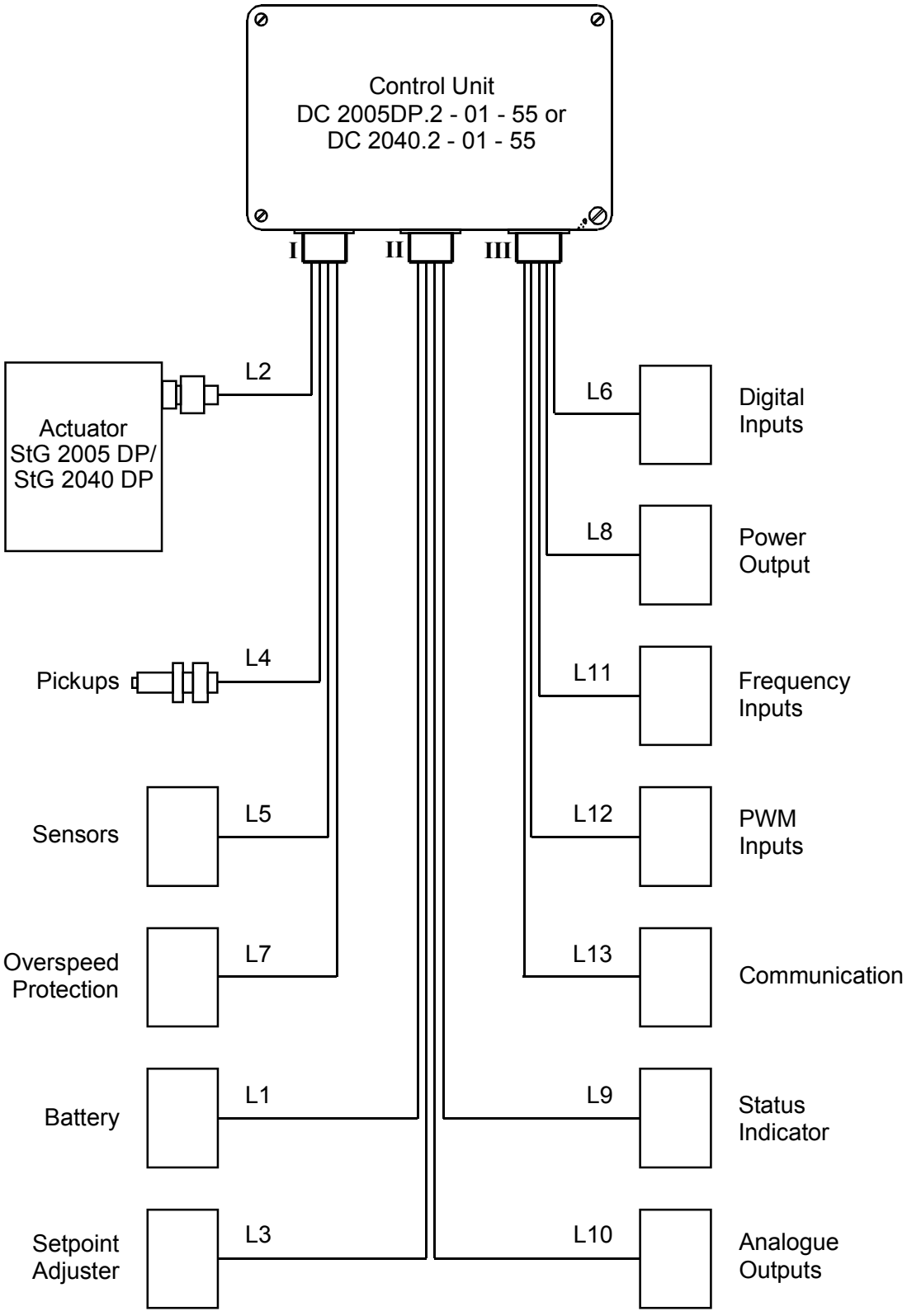


Figure 33: Harness with Cable Numbers

12.2 Plug Designations

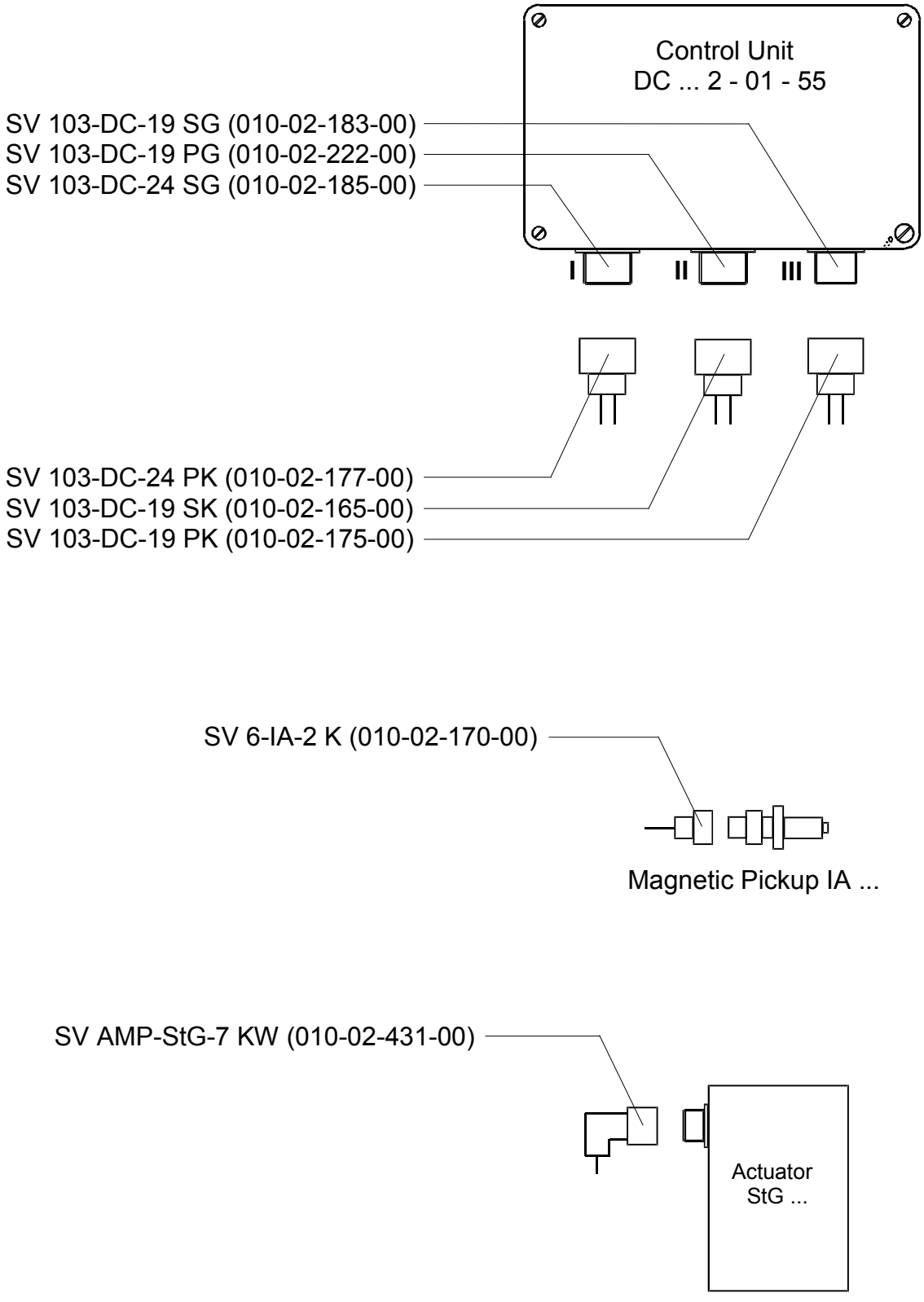


Figure 34: Plugs with Designation

13 Programming Possibilities

Programming the HEINZMANN Digital Governor can be performed according to the possibilities described below:

13.1 Programming by the Manufacturer

During final inspection by the manufacturer, the functionability of the governor is checked by means of a test program. If the operational data for the governor are available, the test program is executed using those data. On the engine, only the dynamic values and, if necessary, the actuator position limits and sensors have to be adjusted.

13.2 Programming with the Hand- Held Programmer 2

The entire programming can be performed using the Hand-Held Programmer 2. This handy device may be conveniently used for development and for serial adjustment as well as for service purposes.

13.3 Programming by PC

Programming can also be performed using the PC. In comparison with the hand-held programmer, this method offers advantages with respect to the possibilities of having characteristic curves readily displayed on the screen and easily varied; the same holds for the time diagrams when putting the governor into operation on the engine. Furthermore, the PC offers a better overview, as the PC program presents a menu structure and is able to continuously display several parameters at a time.

The PC program also permits to save and load governor data to and from diskettes.

13.4 Programming with User Masks

Principally, programming 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 that are actually needed.

13.5 Transferring Data Sets

Once programming with respect to a specific engine type and its application has been completed, the data set can be stored (in the hand-held programmer or on diskette). For future cases of similar applications, the data set may be downloaded into the new governors.

13.6 Assembly Line End Programming

This method of programming is applied by the engine manufacturer during the final bench tests of the engine. On this occasion, the governor is programmed with regard to operation requirements and to ordering specifications.

14 Starting the Engine - Brief Instructions

14.1 Adjust clearance of magnetic pulse pickup.

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

14.3 Set point potentiometer in mid-position:

P - Gain to 50

I - Stability to 0

D- Derivative to 0

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

Warning

Overspeed protection must be guaranteed!

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

14.5 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.

Increse 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.

14.6 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.

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

14.8 Checking the remaining program items, e.g., starting fuel injection, ramp time, etc.

Note

The adjustment procedures as required for items 14.2 up to 14.8 and any further options of adjustemnt are in detail described in brochure DG 95110 - e.

15 Ordering Specifications

15.1 General

To know which informations we need, we have made a special order information for digital governors. It has the No. DG 96 012-d. This form has to be filled in and send to HEINZMANN together with the order.

15.2 Cable Length

It is of advantage to obtain the harness together with the governor.


Note

It is not possible to use all signals simultaneous because some inputs and outputs of the governor have various options depending on the application.

Version of Control Unit:

with plugs (IP55) ☐ with terminal strip (IP00) ☐

Version of Actuator:

with plug (IP55) ☐ with terminal strip (IP00) ☐

a) L1 = Control Unit - Power Supply

L 1	Control unit - power supply		.....cm	
	Cable size	up to 15 m		2 x 2.50 mm²
		over 15 - 30 m		2 x 4.00 mm²

b) L2 = Control Unit - Actuator

L 2.1	Control unit - actuator (feedback)		.....cm	3 x 0,75 mm² shielded
L 2.2	Control unit - actuator (power)		.....cm	
	Cable size	up to 10 m		2 x 2.50 mm²
		over 10 - 20 m		2 x 4.00 mm²
		over 20 - 30 m		2 x 6.00 mm²

c) L3 = Control Unit - Setpoint Adjuster

L 3.1	Control unit - setpoint poti 1	.....cm	3 x 0,75 mm² shielded
L 3.2	Control unit - setpoint poti 2	.....cm	3 x 0,75 mm² shielded
L 3.3	Control unit - 4..20 mA input	.....cm	2 x 0,75 mm²
L 3.4	Control unit - synchronizer	.....cm	2 x 0,75 mm² shielded
L 3.5	Control unit - load measuring unit	.....cm	2 x 0,75 mm² shielded

d) L4 = Control Unit - Magnetic Pickup

L 4.1	Control unit - magnetic pickup 1	.....cm	2 x 0,75 mm² shielded
L 4.2	Control unit - magnetic pickup 2	.....cm	2 x 0,75 mm² shielded

e) L5 = Control Unit - Sensors

L 5.1	Control unit - temperature 1 sensor	.....cm	2 x 0,75 mm²
L 5.2	Control unit - coolant temp. sensor	.....cm	2 x 0,75 mm²
L 5.3	Control unit - boost pressure sensor	.....cm	3 x 0,75 mm²
L 5.4	Control unit - oil pressure sensor	.....cm	3 x 0,75 mm²

f) L6 = Control Unit - Digital Inputs

L 6.1	Control unit - switch 1 - 4	.....cm	5 x 0,75 mm²
L 6.2	Control unit - switch 5 - 8	.....cm	5 x 0,75 mm²

g) L7 = Control Unit - Overspeed Protection

L 7	Control unit - overspeed protection	.....cm	2 x 1.5 mm²

h) L8 = Control Unit – Controlled Current Output

L 7	Control unit – contr. current output	.....cm	2 x 1.5 mm²

i) L9 = Control Unit - Status Indicator

L 9.1	Control unit - common alarm	.....cm	2 x 0,75 mm²
L 9.2	Control unit - overspeed	.....cm	2 x 0,75 mm²

j) L10 = Control Unit - Analogue Outputs

L 10.1	Control unit - display voltage 1	.....cm	2 x 0,75 mm²
L 10.2	Control unit - display current 1	.....cm	2 x 0,75 mm²
L 10.3	Control unit - display voltage 2	.....cm	2 x 0,75 mm²
L 10.4	Control unit - display current 2	.....cm	2 x 0,75 mm²
L 10.5	Control unit - load sharing	.....cm	2 x 0,75 mm²
L 10.6	Control unit - pitch propeller control	.....cm	2 x 0,75 mm²

k) L11 = Control Unit - Frequency Input

L 11	Control unit - tacho	.....cm	2 x 0,75 mm²

l) L12 = Control Unit - PWM Input

L 12	Control unit - PWM input	.....cm	2 x 0,75 mm²

m) L13 = Communication

L 13.1	Control unit - CAN - Bus	.....cm	2 x 0.14 mm² shielded
L 13.2	Control unit - PC	.....cm	4 x 0.14 mm² shielded

16 Figure List

17 Order Specifications for Manuals

There is no charge for our technical manuals ordered in reasonable quantities.

Order the necessary manuals on our speed governors from your nearest

HEINZMANN location.

(Please click on “HEINZMANN location” to see the list of our subsidiaries and agents in the world).

Please include the following information:

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