



Heinzmann GmbH & Co. KG
Engine & Turbine Controls

Am Haselbach 1
D-79677 Schönau (Schwarzwald)
Germany

Telefon +49 7673 8208-0
Telefax +49 7673 8208-188
E-Mail info@heinzmann.com
www.heinzmann.com

USt-IdNr.: DE145551926

HEINZMANN[®]

Digital Speed Governors

Digital Basic System

PRIAMOS IV






DG EDC 1-03




Priamos IV
for engines from approx. 200kW up to approx. 1500kW

Basic System	DG EDC 1 - 03
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Control Unit	DC EDC 1 - 03
Actuator	Bosch EDC
Setpoint Pot.	SW ...
Pickup	IA ...

- D : **D**igital
- DG : **D**igital **G**overnor (Basic System)
- DC : **D**igital **C**ontrol Unit
- StG : Actuator (**S**tell**g**erät)
- SW : Setpoint Potentiometer (**S**ollwertpot.)
- IA : Pickup (**I**mpuls**a**ufnehmer)

 <p>Warning</p>	<p>Read this entire manual and all other publications appertaining to the work to be performed before installing, operating or servicing your equipment.</p> <p>Practice all plant and safety instructions and precautions.</p>
 <p>Danger</p>	<p>Failure to follow instructions may result in personal injury and/or damage to property.</p>
 <p>Danger! High Voltage</p>  <p>Danger</p>	<p>Please note before commissioning the installation:</p> <p>Before starting to install any equipment, the installation must have been switched dead!</p> <p>Be sure to use cable shieldings and power supply connections meeting the requirements of the <i>European Directive concerning EMI</i>.</p> <p>Check the functionality of the existing protection and monitoring systems.</p>
 <p>Danger</p>	<p>To prevent damages to the equipment and personal injuries, it is imperative that the following monitoring and protection systems have been installed:</p> <p>Overspeed protection acting independently of the speed governor</p> <p>Overtemperature protection</p> <p>Generator installation will in addition require:</p> <p>Overcurrent protection</p> <p>Protection against faulty synchronization due to excessive frequency, voltage or phase differences</p> <p>Reverse power protection</p>
	<p>Overspeeding can be caused by:</p> <p>Failure of the voltage supply</p> <p>Failure of the control unit or of any accessory device</p>

 <p>Warning</p>	<p>Electronically controlled injection (MVC) will in addition require to observe the following:</p> <p>With Common Rail systems a separate mechanical flow limiter must be provided for each injector pipe.</p> <p>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.</p>
 <p>Warning</p>	<p>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.</p>
 <p>Danger</p>	<p>Independent testing and verification are especially important in any application in which malfunction might result in personal injury or damage to property.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>

Subject to change!

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Remarks

1. General Remarks

Robert Bosch Company delivers size „P“ in-line injection pumps where the all electric actuator is directly mounted on the pump.

According to an agreement between **HEINZMANN** and Bosch the delivery of the controller as well as the customer service, e.g. training, application service, technical service, will in certain cases be done by **HEINZMANN**.

This agreement covers the following business parts:

- Stationary applications, such as gensets, total energy plants
- Heavy duty machines, such as crawlers
- Agriculture machines, such as tractors, harvestors
- Locomotive applications
- Marine applications
- Special vehicles, such as mobile cranes

This agreement does not cover any truck applications.

In order to cover the various functions **HEINZMANN** offers 3 different lines of governor systems:

- Priamos IV - DG EDC 1 - 03
Systems with complex functions
- Helenos IV - DG EC 2 - 01
Systems with medium number of functions
- Alexandros IV - DG EDC 3 - 01
Systems with low number of functions

This brochure describes the Priamos IV system

System Helenos IV	please refer to brochure DG 96 003-e
System Alexandros IV	please refer to brochure DG 97 006-e

2. Functions

The **HEINZMANN** basic system Priamos with the digital control unit DC EDC 1 - 03 is a speed governor offering a wide range of functions.

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

a) Starting Fuel Flow Adjustment

When setting starting fuel flow, starting minimum fuel flow or starting maximum fuel flow are available as alternatives. If necessary both also can depend on temperature. Furthermore, variable starting fuel flow can be provided, by which starting fuel flow is increased automatically during start-up.

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) 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.

d) 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.

e) 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.

f) 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.

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.

h) Velocity Limitation

For vehicles velocity limitations may be provided.

i) Velocity Regulation

For vehicles velocity regulation can be provided, by which the vehicle is made to maintain some preset velocity.

j) 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.

k) Load Regulation System

For diesel-electric locomotive operation, a load regulation system can be provided, by which generator output is regulated in dependence on speed resp. load.

l) Anti Stick Slip Device

For locomotive operation, an anti stick slip device can be provided.

m) Accessories

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).

n) Output Signals

For speed and actuator travel, proportional signals are available in the range of 4–20 mA. They can be used for purposes of display or for further processing (e.g., switches). Furthermore, if errors occur at the sensors or within the control system, an alarm is given.

o) Operating Data Storage

On request, operating data storage can be provided, by which in cases of disturbances and failures the causes may be traced back even at some later time.

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

3. 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.

Diagram

4. Block Diagram of the Digital Governor DG EDC 1 - 03

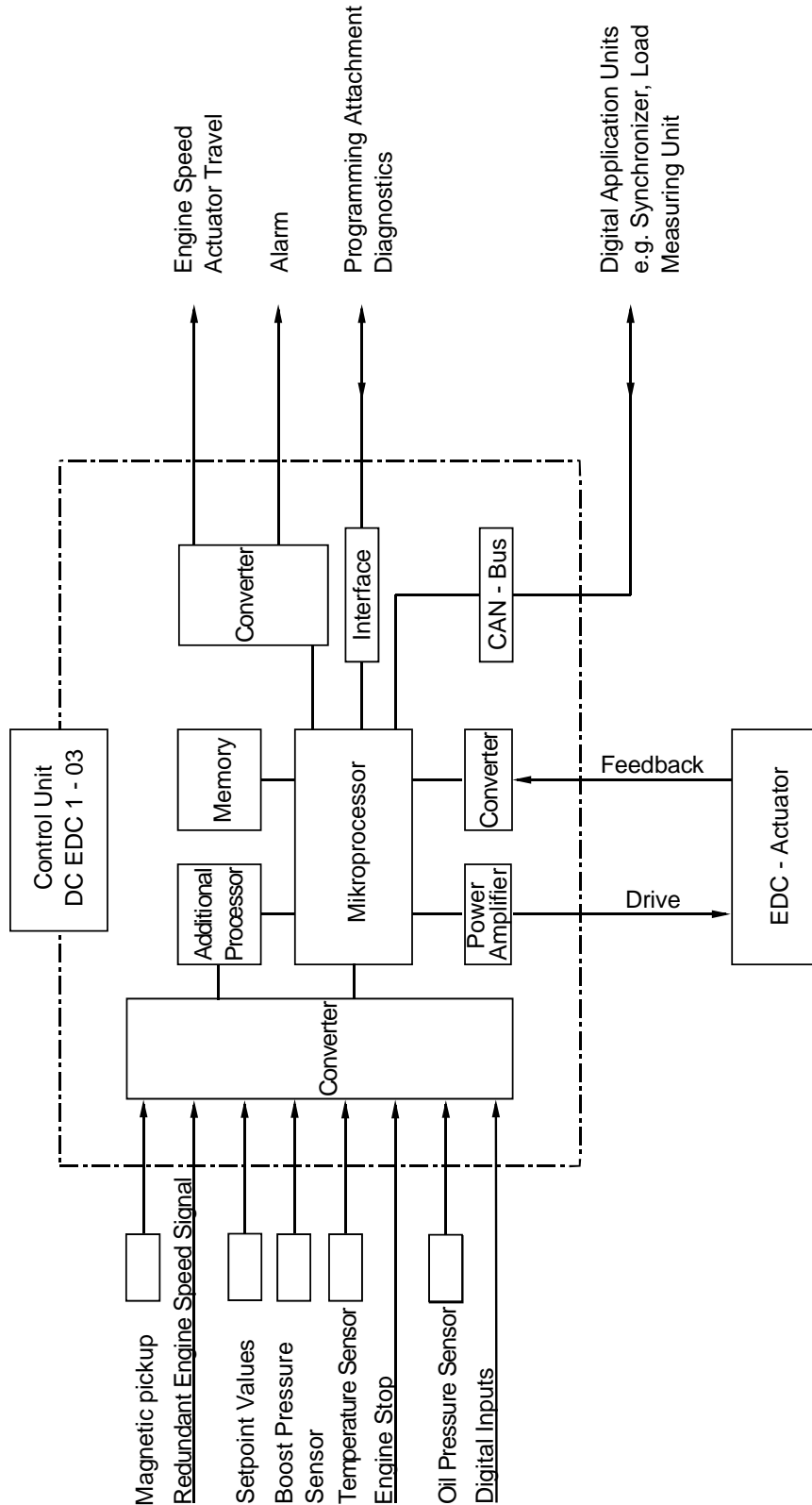


Fig. 1: Block Diagram DG EDC 1 - 03

5. Pickup IA ...

The pickup integrated inside the Bosch actuator is normally not used because its resolution is not high enough (half engine speed, low number of teeth).

5.1. Specification

Temperature Range:	-55°C to +120°C
Output Voltage:	0.5 to 10V AC
Resistance:	about 52 Ohms
Distance from Pickup Wheel:	0.5 to 0.8 mm
Type of protection	IP 55

5.2. 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** governors are designed for a maximum frequency of 6000 Hz. Frequency (by Hz) is calculated according to the formula

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

z = number of teeth on the pickup wheel

Example:

$$n = 1.500$$

$$z = 160$$

$$f = \frac{1500 * 160}{60} = 4000 \text{ Hz}$$

NB: 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).

5.3. Tooth Profile

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

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

5.4. Clearance of Magnetic Pickup

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.)

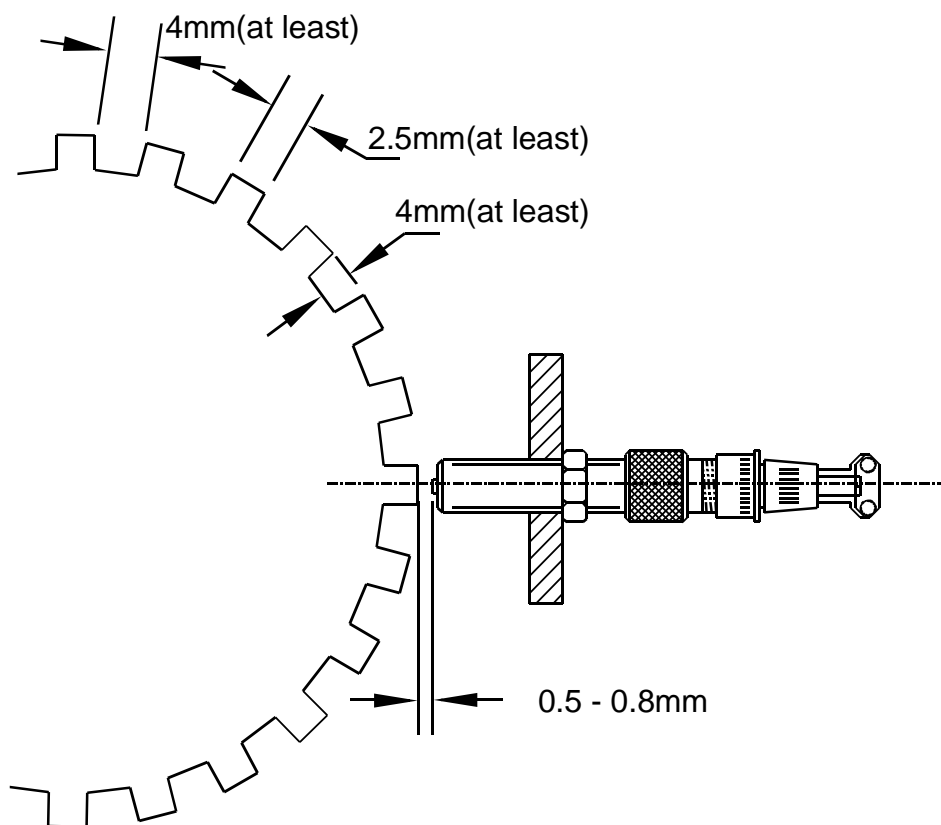


Fig. 2: Clearance of Pickup

5.5. Mounting Measurements

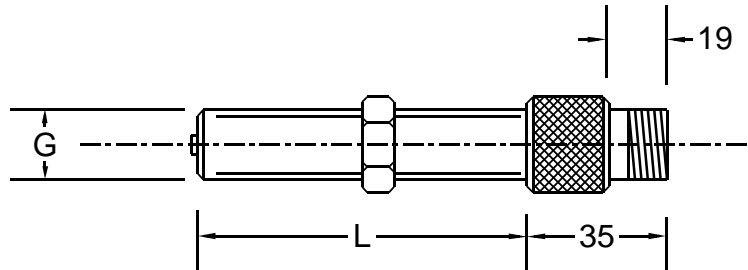


Fig. 3: Measurements of Pickup

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

Ordering specification, e.g. IA 02-76

5.6. Redundant Speed Signal

If precautions are to be taken with regard to failures of 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 pulse pickup 1, the governor automatically switches over to the redundant speed signal and gives an alarm.

6. Speed Setpoint Adjusters and Sensors

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

6.1. Speed Setpoint Potentiometer SW 01 - 1 - B (one turn) (EDV- No.: 600 00 041 01)

Displacement Angle	approx. 312°
Resistance	5 kOhm pot. and 2 x 470 Ohm pre-resistors
Temperature Range	-55 °C to + 120 °C
Protection	IP 00

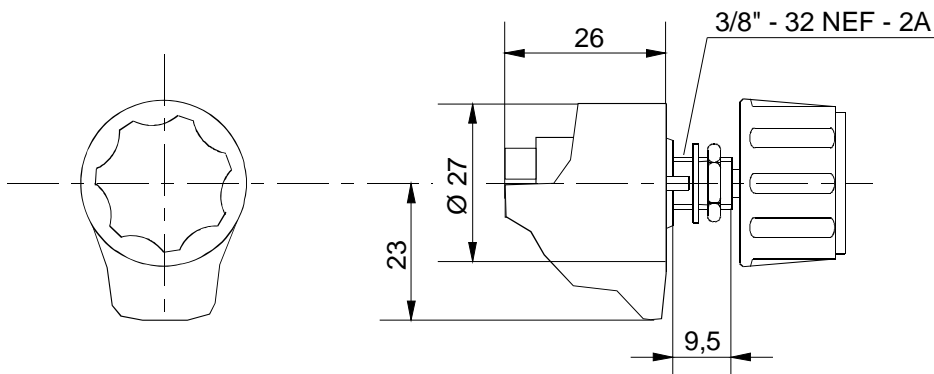


Fig. 4: Potentiometer SW 01 - 1 - B

6.2. Speed Setpoint Potentiometer SW 02 - 10 - B (10 turns) (EDV- No.: 600 00 042 01)

Displacement Angle	10 turns
Resistance	5 kOhm pot. and 2 x 470 Ohm pre-resistors
Temperature Range	-55 °C to + 105 °C
Protection	IP 00

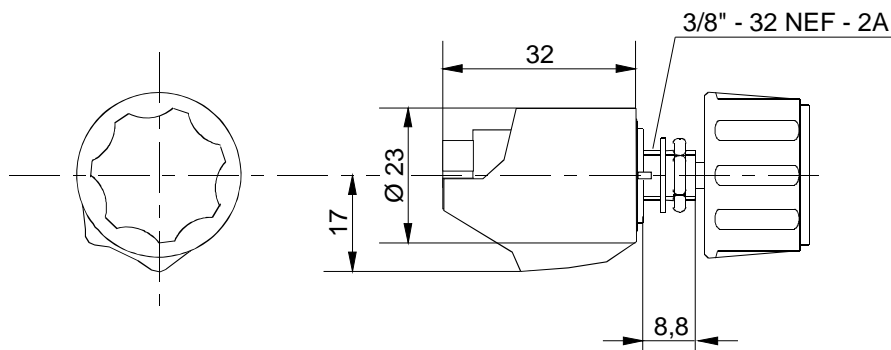


Fig. 5: Potentiometer SW 02 - 10 - B

On request, the potentiometers, as specified under 6.1 and 6.2, can be supplied with analogue adjustment knob with lock in place of the standard rotating knob. In this case, ordering specification is SW...-m.

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

6.3. 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.

6.4. 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 brochure E 83 005 - e.

6.5. Pressure Sensors

For pneumatic setpoint adjustment are pressure sensors available as follows:

pressure range	up to 10 bar	DSG 01 (EDV- No.: 604 00 026 00)
	up to 5 bar	DSG 02 (EDV- No.: 604 00 026 01)

As boost pressure sensor for a range up to 2 bar the pressure sensor DSG 03 (EDV- No.: 604 00 024 02) is available.

6.6. Temperature Sensor TS - 2000 F for Measuring Fluid Temperatures (EDV- No.: 600 00 034 00)

Measuring range	-20°C to +130°C
Accuracy	± 1.5°C
Resistance at 25°C (R25)	2,000 Ohm ±0.5%
Maximum operating voltage	10 V
Maximum operating current	5 mA
Recommended operating current	approx. 1 mA
Time constant in fluids	approx. 13 s
Admissible socket temperature range	-40°C to +105°C
Protection type	IP 65
Vibration	<10g. 10 – 100 Hz
Shock	<50g. 11 ms half-sine wave
Tightening moment	100 Nm ± 15%
Corresponding connector	SVM - TS - 2K (EDV- No.: 010 02 170 00)

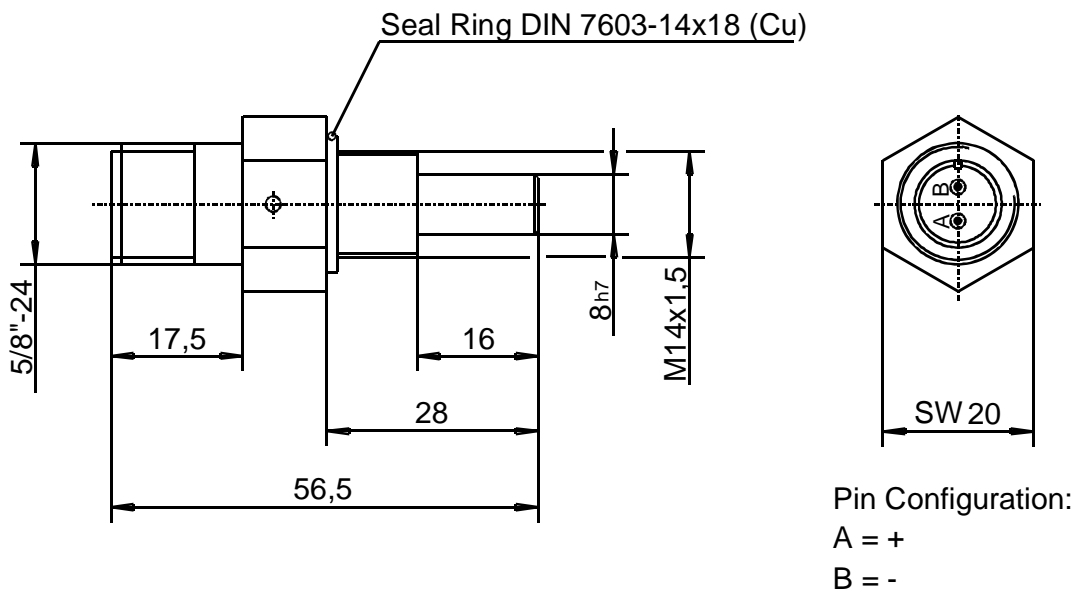


Fig. 6: Temperature Sensor TS - 2000 F

PT 1000- types can be used alternatively.

For measuring gas temperatures PT 1000- types must be used.

7. Control Unit DC EDC 1 - 03

7.1. Specification

Operating Voltage	24 V DC (12 V DC)
Maximum Voltage	35 V DC
Minimum Voltage	18 V DC (9 V DC)
Maximum Ripple Voltage at max. actuator current	maximum 10 % with 100 Hz
Permissible Voltage Dip at Maximum Voltage of Actuator	maximum 10 % in control device
Fuse Protection of Governor	
Electronic	3 A
Power stage	16 A
Current Consumption	approx. 200 mA + current of actuator
Inputs	<ul style="list-style-type: none"> 1 x power supply 1 x feedback actuator 10 x binary inputs 3 x analogue input setpoint 2 x pressure sensor 2 x temperature sensor 2 x magnetic pickup 1 x PWM / frequency 1 x CAN- bus
Outputs	<ul style="list-style-type: none"> 1 x motor actuator 1 x relais stop magnet 2 x alarm indicator 2 x analogue display 1 x controlled current
Storing Temperature	-55°C to +85°C
Operating Ambient Temperature	-40°C to +70°C

Humidity	up to 100 %
Control Frequency	200 to 6000 Hz
Steady State Variation	± 0.25 %
Speed Variation due to Temperature for Frequency greater than 500 Hz between -40 °C and $+70$ °C	± 1 %
Protection grade	IP 55
Weight	approx. 3.5 kg

7.2. Remark

The exact governor type together with identification of housing, software version and serial number is printed on the type plate.

Example: DC EDC 1 - 03 - 12700

7.3. Measurements

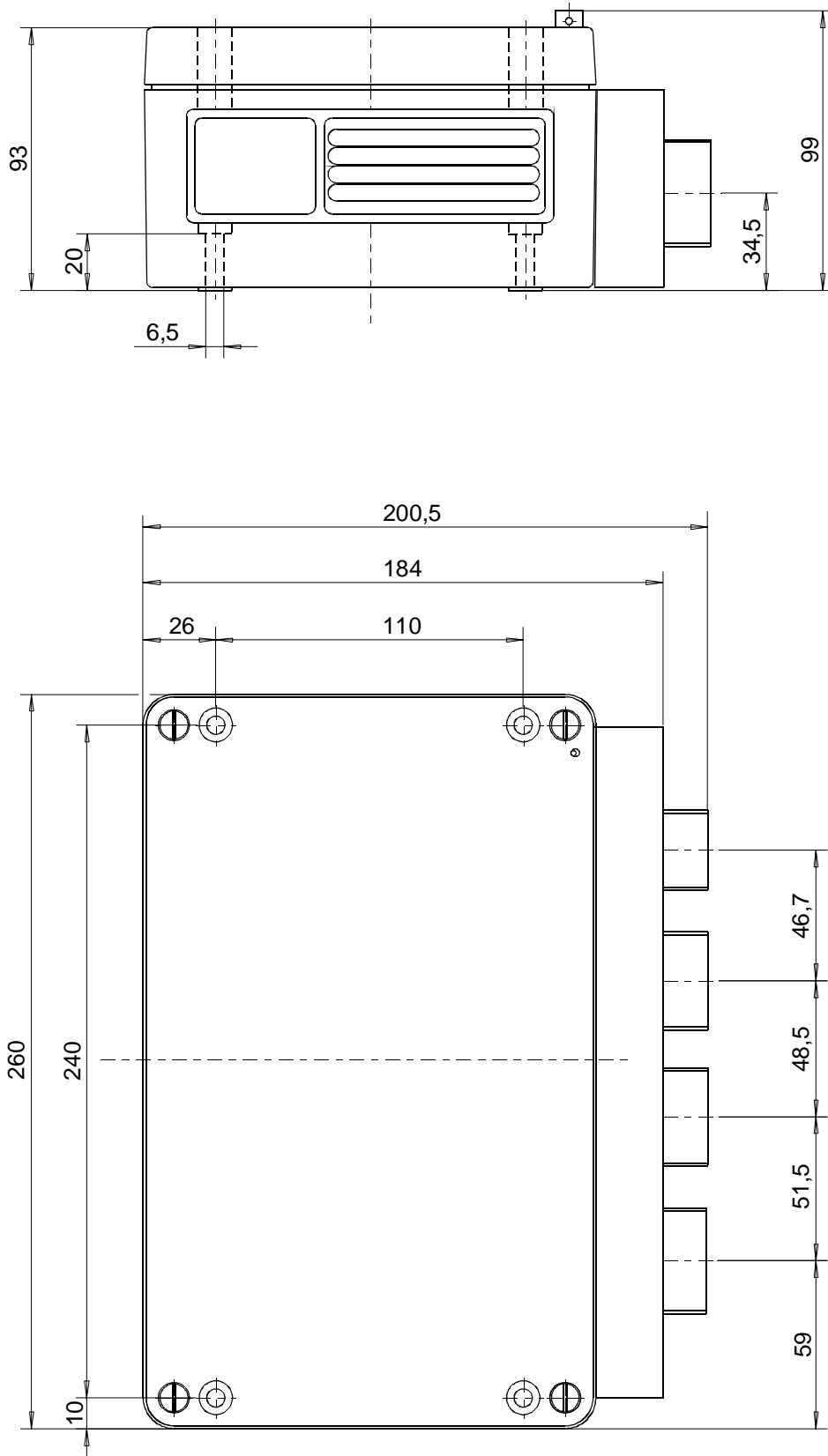


Fig. 7: Control Unit DC EDC 1 - 03

8. Actuator

8.1. Design and Mode of Operation

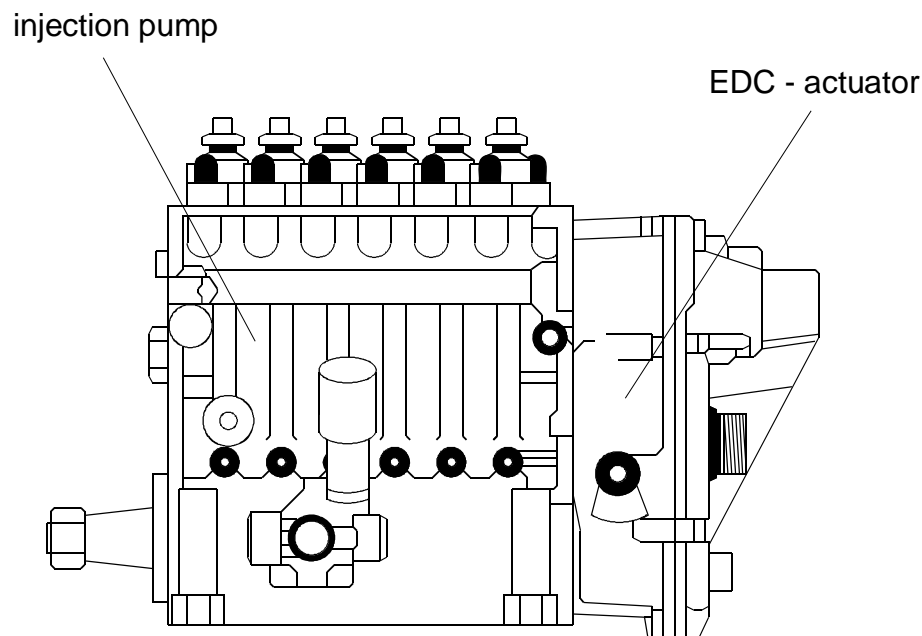


Fig. 8: Sectional Drawing of Actuator

The Bosch - EDC - actuator (RE...) is directly mounted on the in-line pump so that there is no linkage necessary.

The spring loaded control rack is moved by a magnet, where the spring power moves the control rack to stop position and the magnet power to max. fuel.

The position of the control rack is monitored by a no-touch feedback system and transferred to the control unit.

8.2. Specification

(For information only! Refer to appropriate Bosch- documents)

	Bosch - EDC
Max. actuator travel	21mm
Spring power of back spring in stop position	approx. 10 N
Spring power of back spring in full position	approx. 50 N
Max. magnetic power	approx. 75 N
Max. current consumption	approx. 11 A
Current consumption in operation	approx. 4-6 A
Coil resistance of governing magnet	R ₂₀ approx. 0,6 Ohm
Storage temperature	-55°C to +90°C
Ambient temperature in operation	-40°C to +80°C
Ambient temperature with reduced governor functions	-40°C to 0°C
Protection grade	IP 55

9. Electrical Connection

9.1. 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.

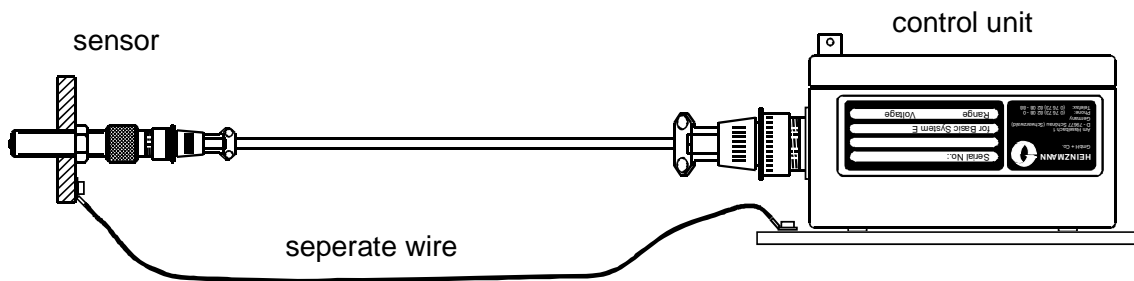


Fig. 9: Connection of seperat Wire

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

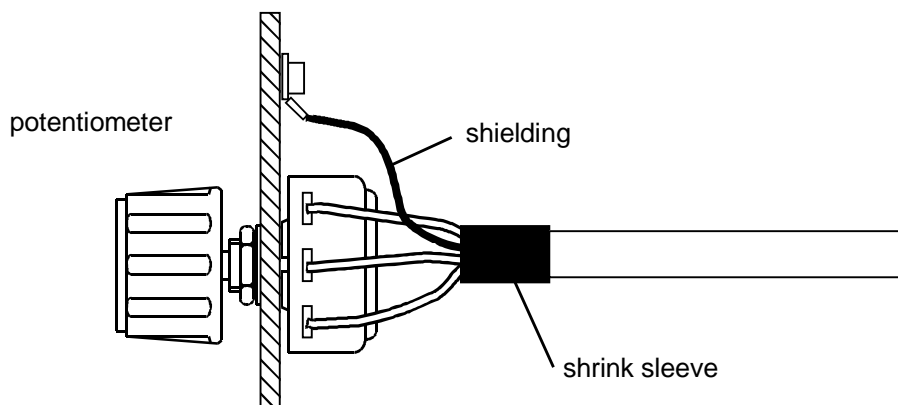


Fig. 10: Shield Connection without Plug

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

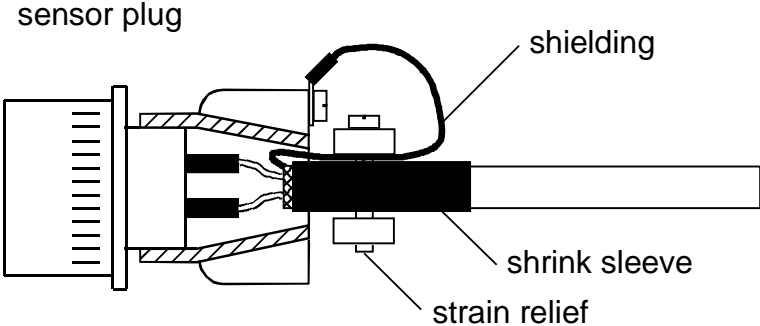


Fig. 11: Shield Connection inside the Plug

9.2. Example of Connection for Generator Set (Parallel- and mains operation with digital accessories)

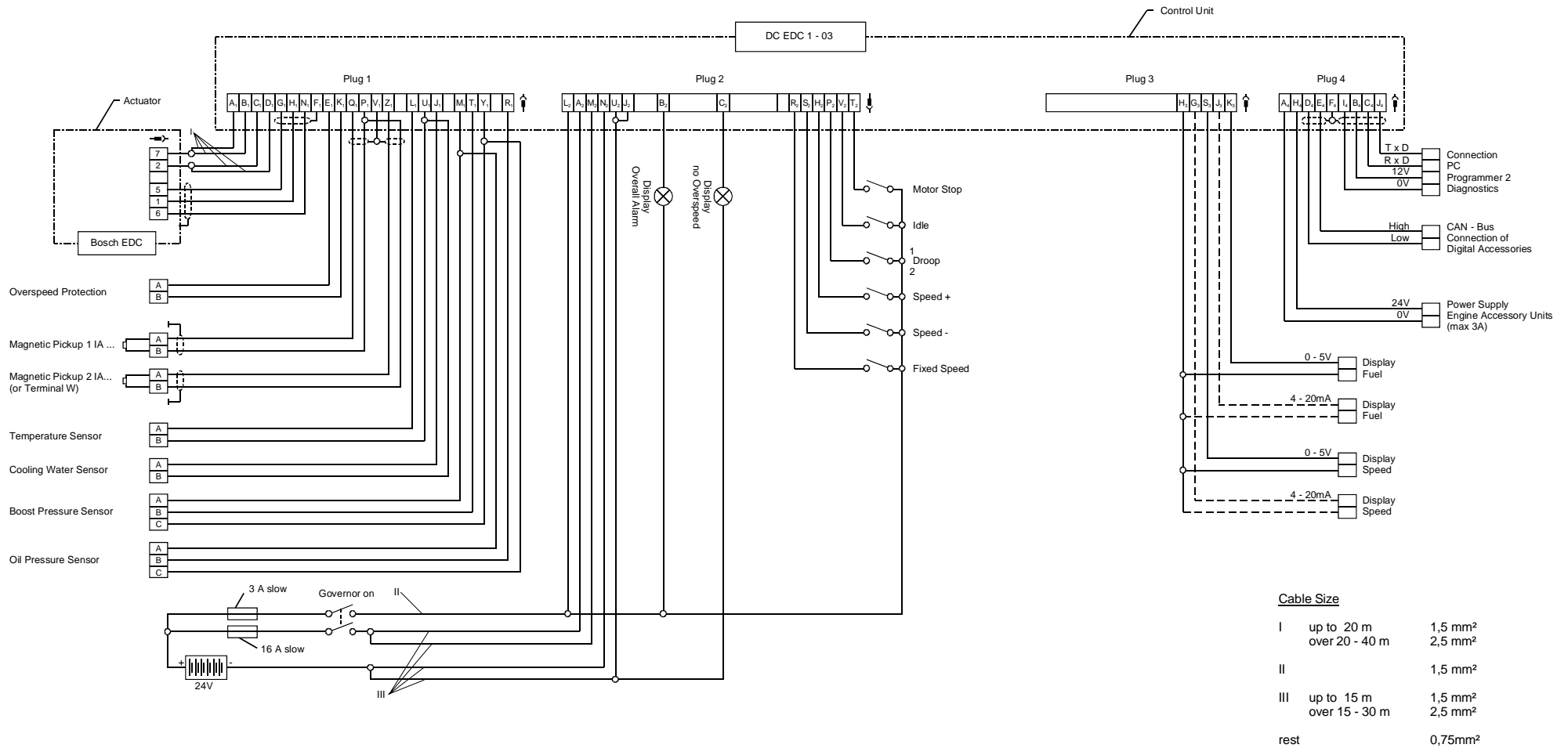


Fig. 12: Connections for Genset with Digital Accessories



9.3. Example of Connection for Generator Set (Parallel- and mains operation with analogue accessories)

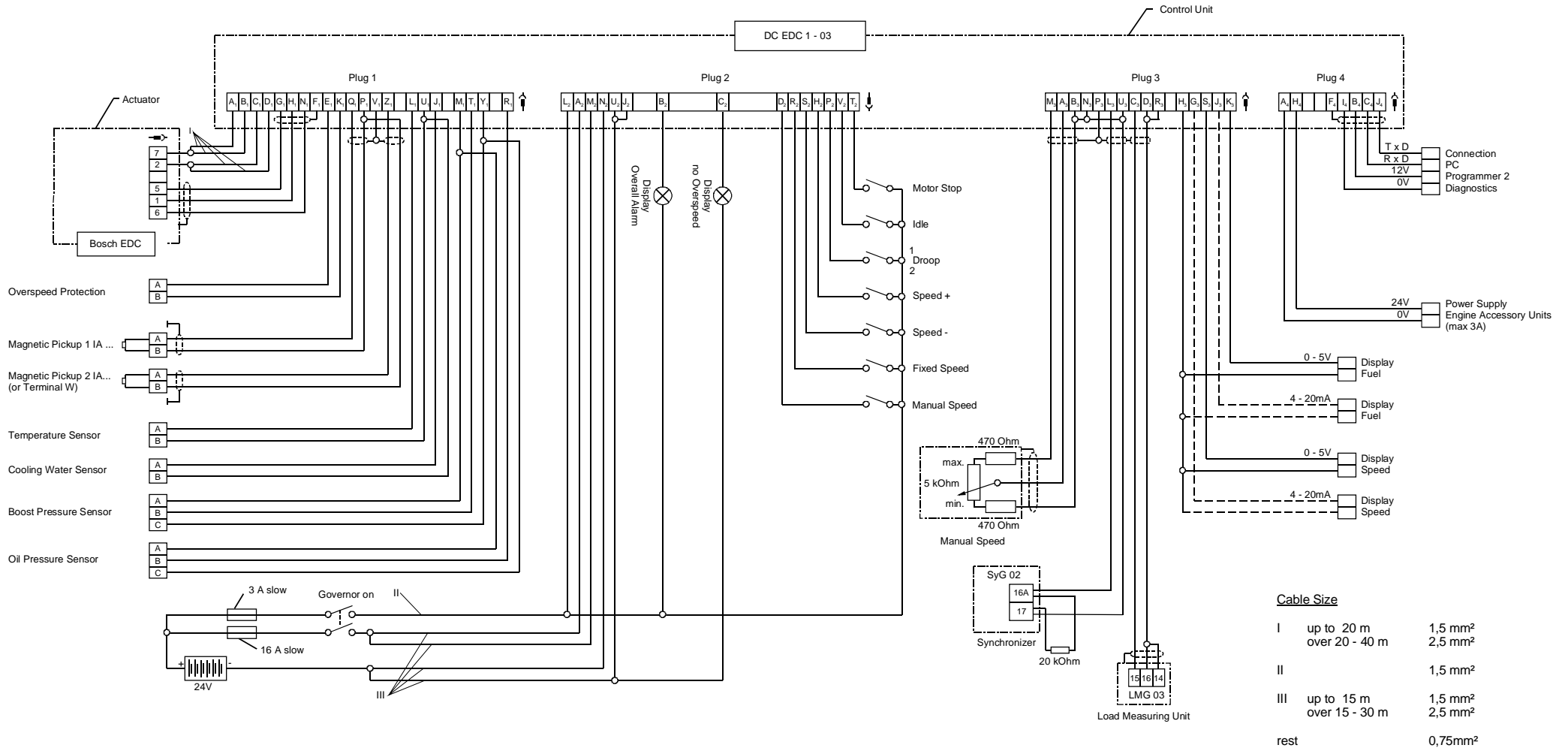


Fig. 13: Connections for Genset with Analogue Accessories



9.4. Example of Connection for Vehicle Operation

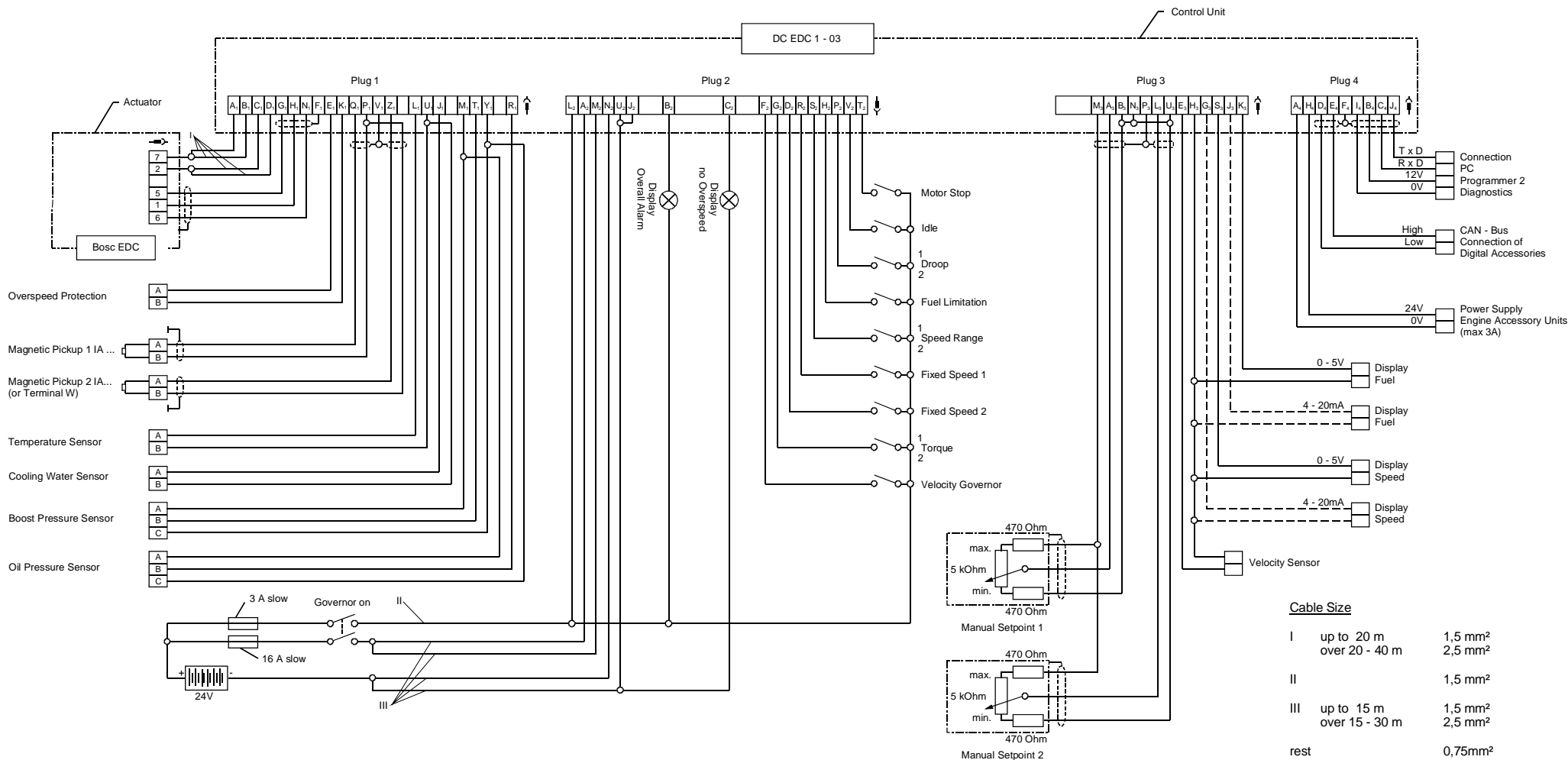


Fig. 14: Connections for Vehicle Operation



9.5. Example of Connection for Locomotive Operation (16 speed levels)

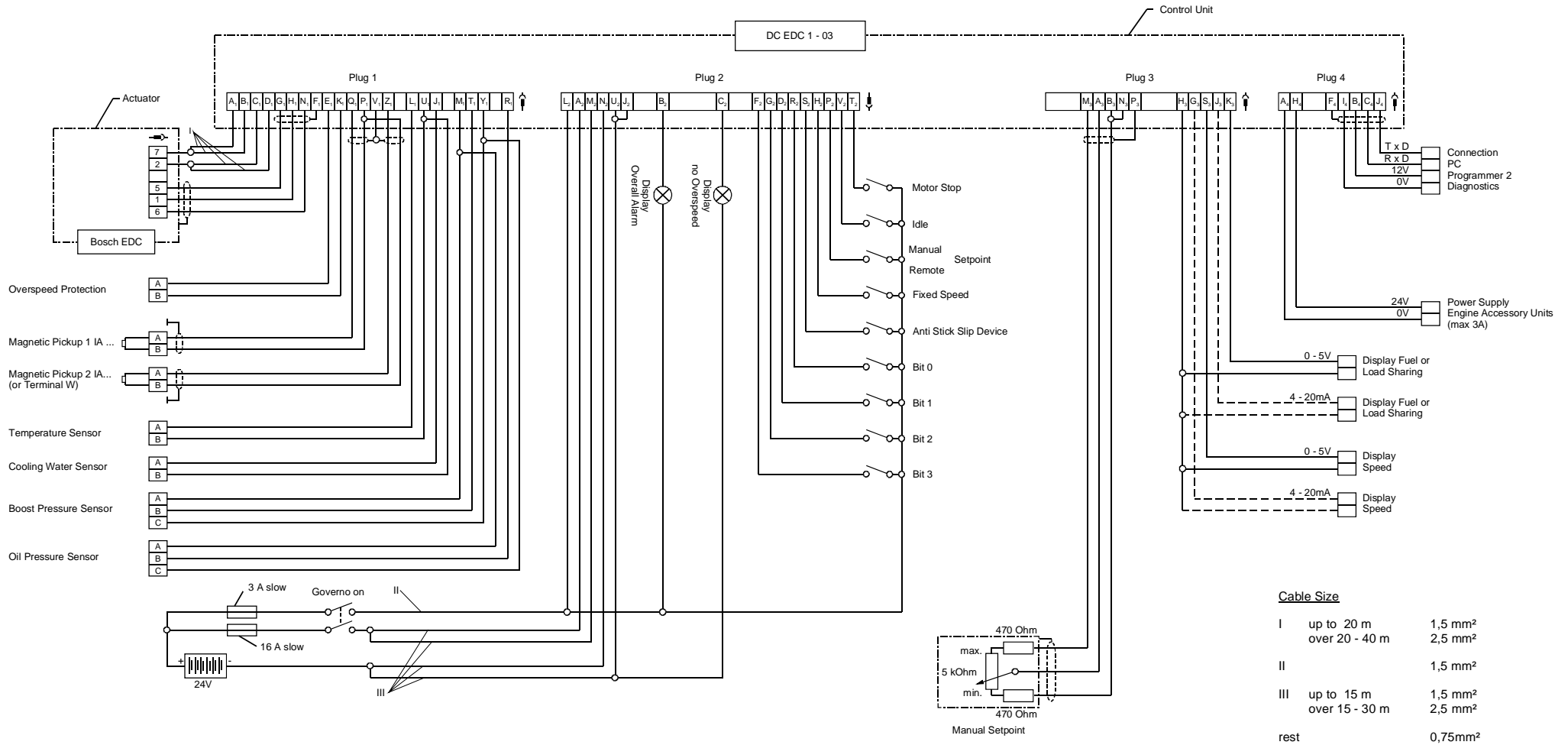


Fig. 15: Connections for Locomotive with Speed Steps



9.6. Example of Connection for Locomotive Operation (Speed adjustment by current signal)

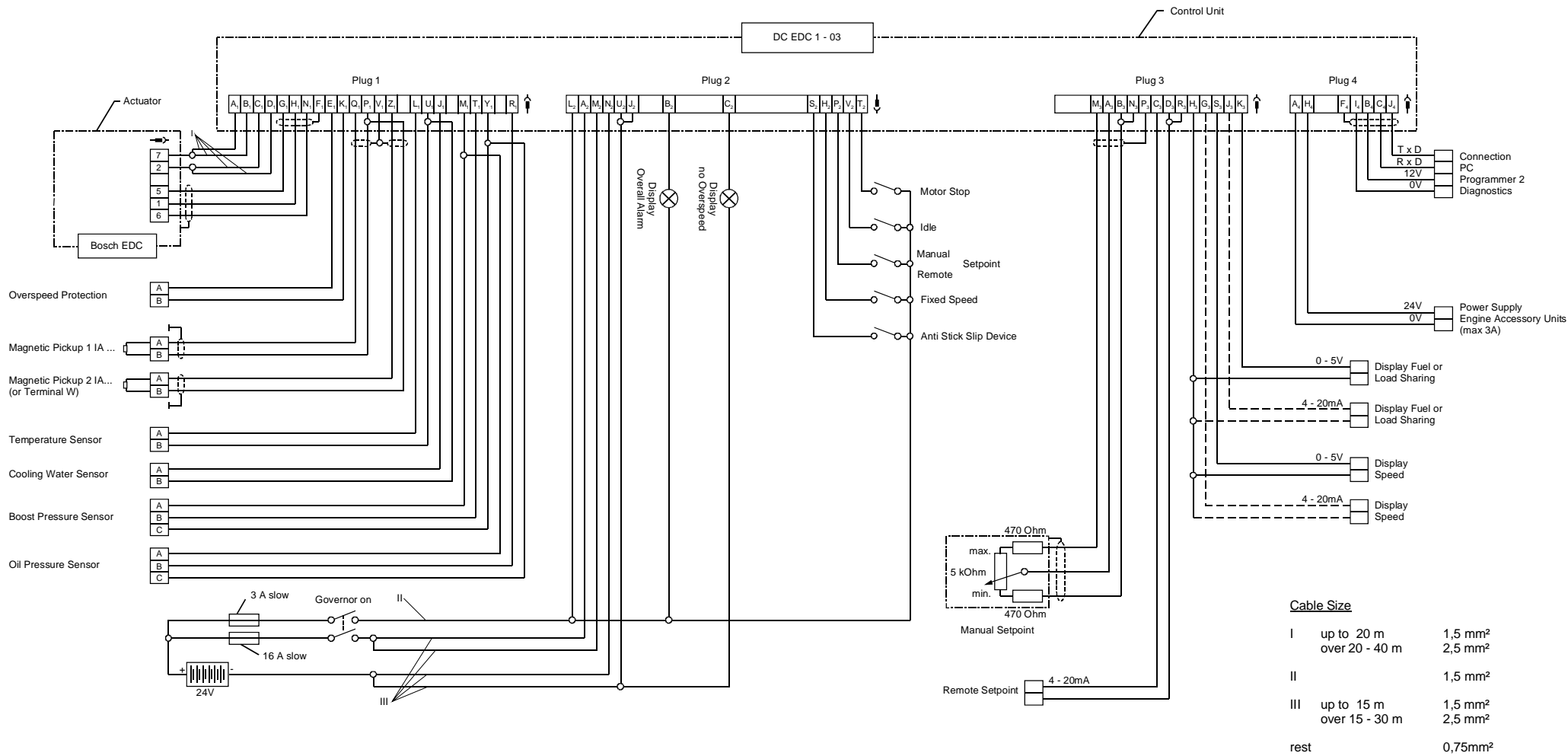


Fig. 16: Connections for Locomotive with Current Input



9.7. Example of Connection for Marine Operation (Twin operation: 2 engines with 1 propeller)

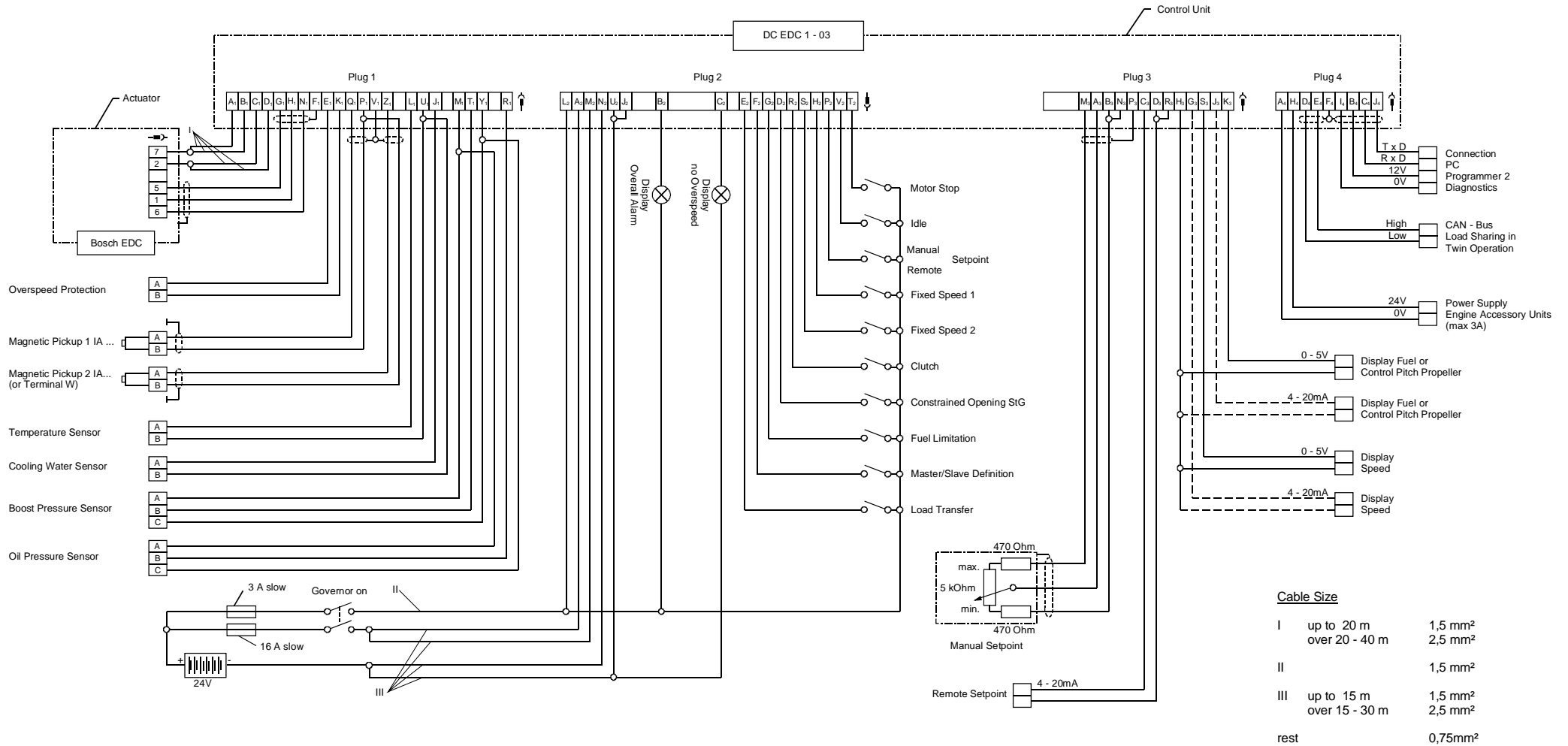


Fig. 17: Connections for Marine Twin Operation



9.8. Example of Connection for Marine Operation (Single engines)

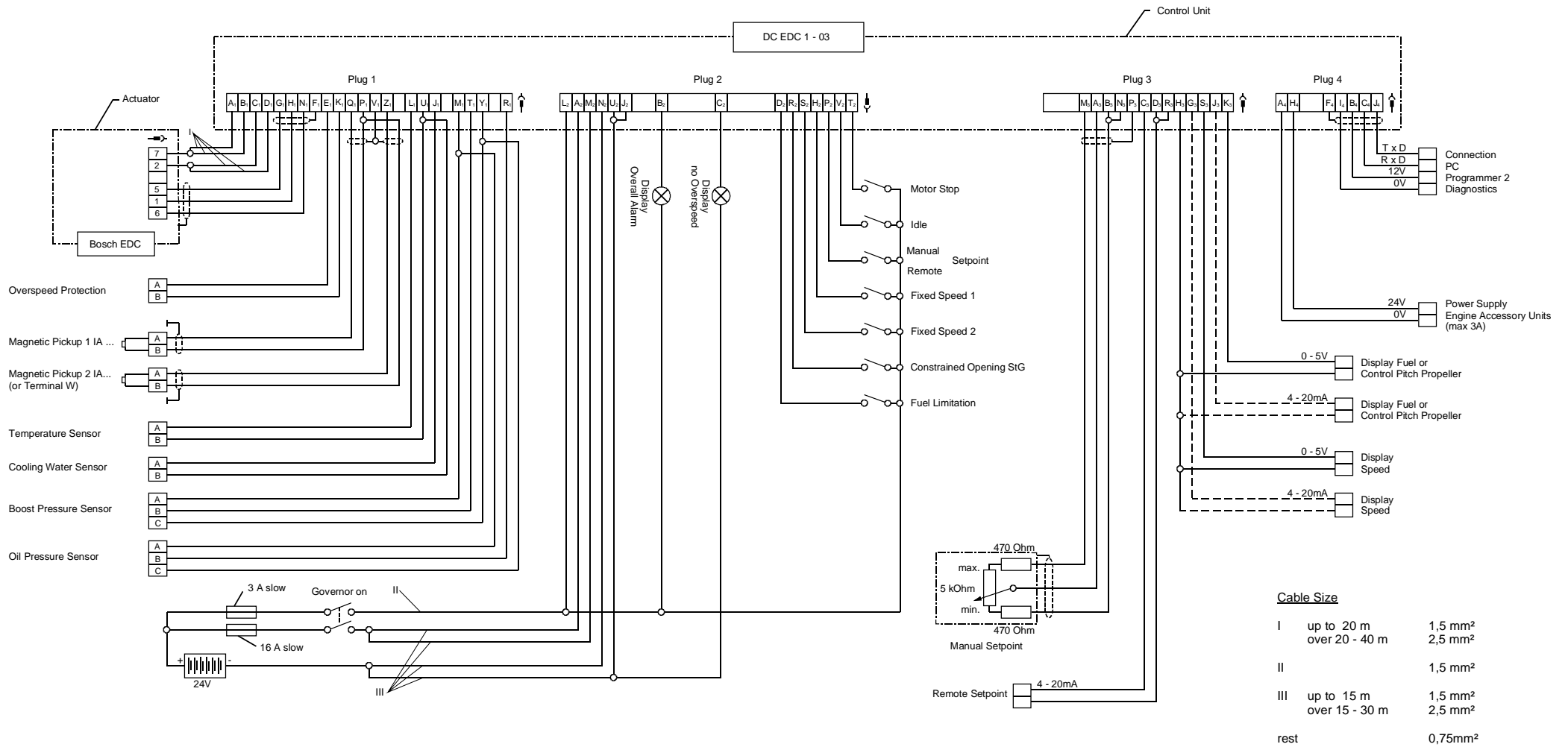
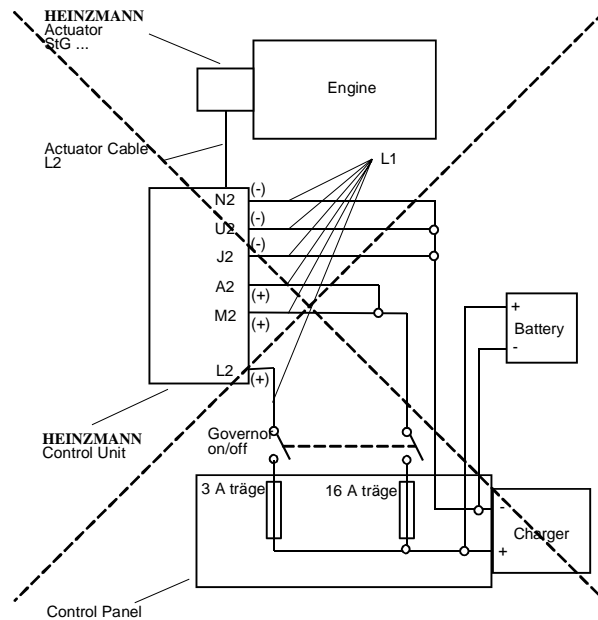


Fig. 18: Connections for Marine Single Operation

9.9. Connection of Power Supply

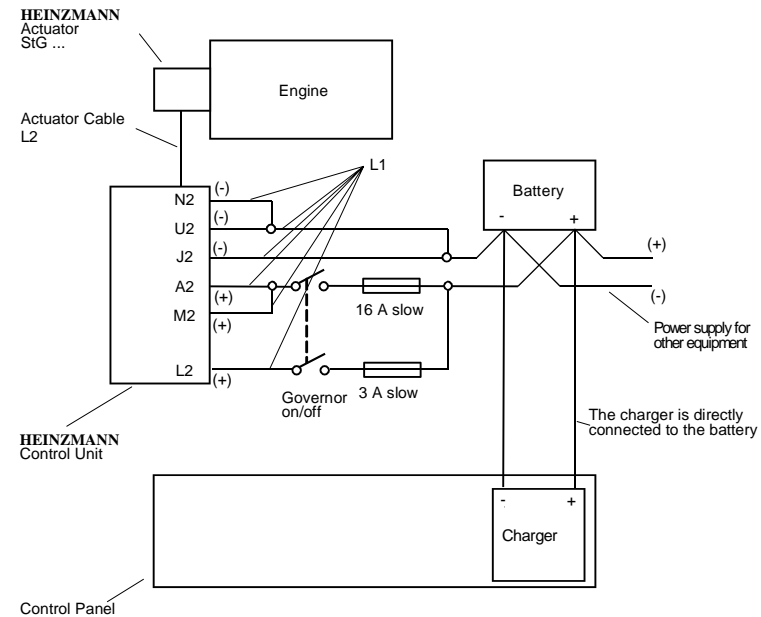


Power Supply has to be supplied via two separate leads directly from the battery. This leads must not be connected to any other equipment.



WRONG, because the ripple voltage of the charger is fed directly into the electronic governor!
This will damage the actuator

Please note! Coils (e.g. stopping solenoid, gas valve) must be equipped with a protective circuit to eliminate high inductance voltages. Diode type e.g. 1N4002



CORRECT, because the control unit is connected **directly to the battery**, so that the battery buffers the ripple voltage of the charger.



figure 19: Connection of Power Supply

10. Programming Possibilities

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

10.1. Programming by the Manufacturer

During final inspection by the manufacturer, the functionality 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.

10.2. 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.

10.3. 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.

10.4. 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.

10.5. 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.

10.6. 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.

For more details consult the special manual DG 95 110 - e.
--

11. Starting the Engine - Brief Instructions

11.1. Adjust clearance of magnetic pulse pickup.

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

11.3. 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.

Attention: Overspeed protection must be guaranteed!

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

11.5. 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.

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

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

11.6. 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.

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

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

The adjustment procedures as required for items 11.2. bis 11.8. and any further options of adjustment are in detail described in brochure DG 95110 - e.

12. Ordering Specifications

12.1. General Informations

Every data as

- supply voltage and kind of usage
- parameters, such as speeds and number of teeth on the flywheel
- sensors, such as speed probes, pressure and temperature sensors
- limitation curves
- additional functions
- monitoring funktions
- input / output configuration

are noted in the brochure “**Order Information Digital Speed Governors**“
Nr. DG 96012-e and should be transferred to **HEINZMANN**.

12.2. Harness

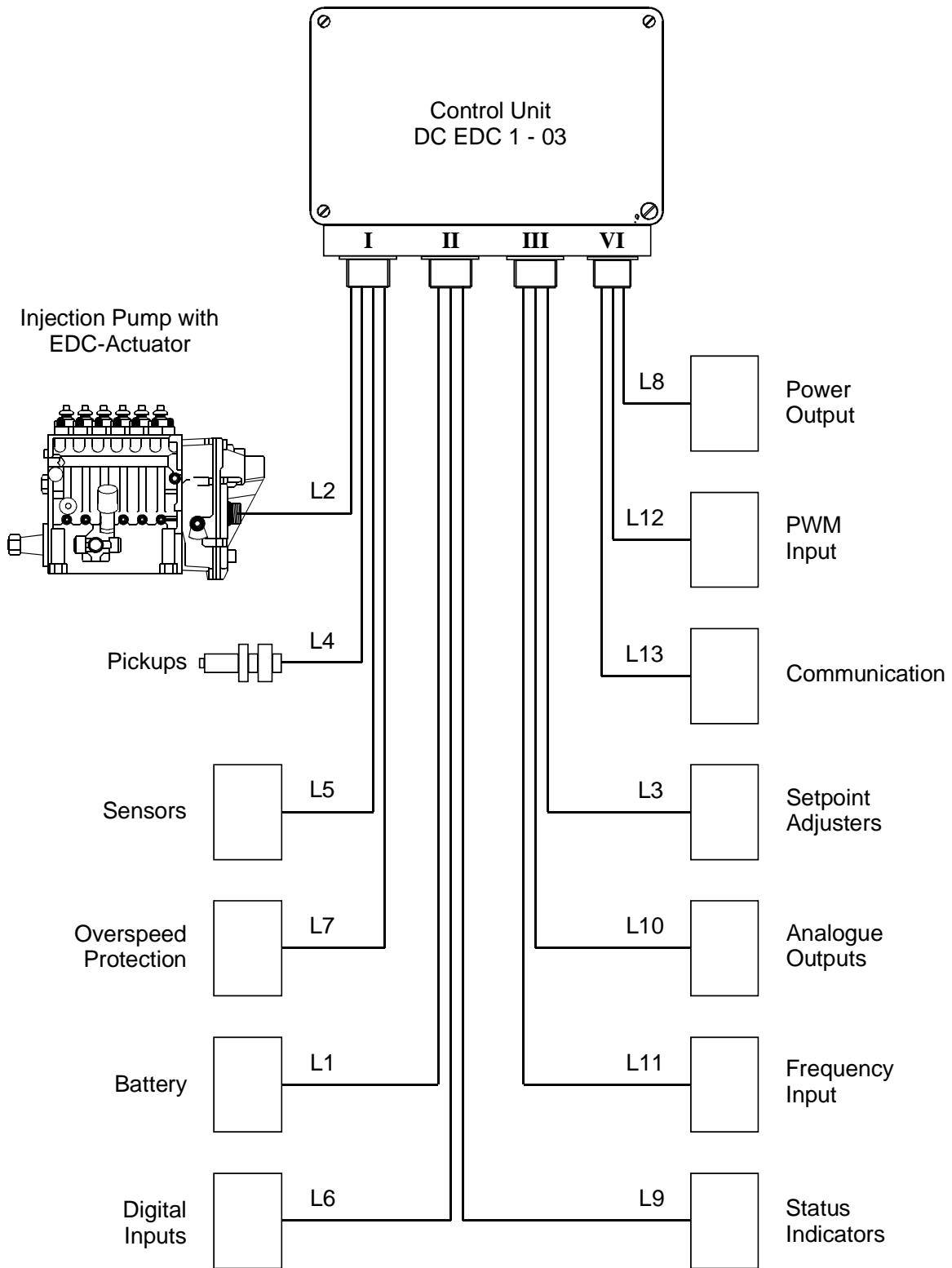
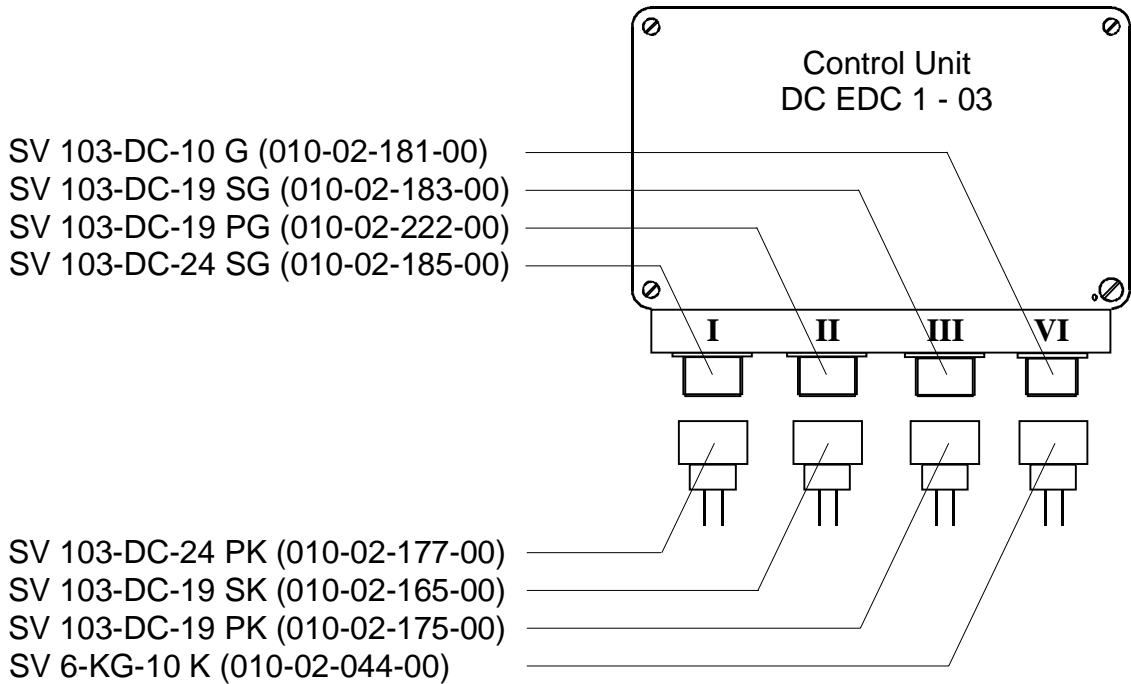
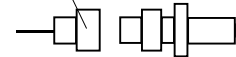


Fig.20: Harness with Cable Numbers

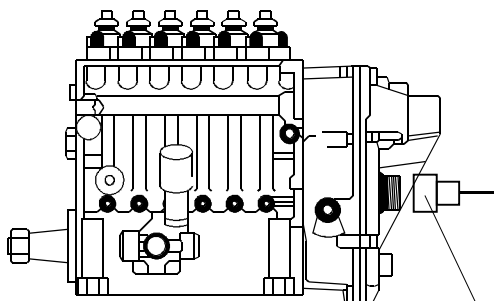
12.3. Plug Connections



SV 6-IA-2 K (010-02-170-00)



Magnetic Pickup IA ...



SV EDC-7 K (010-02-335-00)

Injection Pump with
EDC-Actuator

Fig.21: Plugs with Designation

12.4. Table of possible In- and Outputs

Selectable inputs and outputs of the digital governor DC EDC 1 - 03														
Governor In- and Outputs	Pin	Standard application											Special Version	
		Generator 1	Generator 2	Vehicle	Locomotive 1	Locomotive 2	Marine 1	Marine 2						
Sensor Inputs	Q1	X	Pickup 1	X	Pickup 1	X	Pickup 1	X	Pickup 1	X	Pickup 1	X	Pickup 1	
	Z1		Pickup 2		Pickup 2		Pickup 2		Pickup 2		Pickup 2		Pickup 2	
	L1		Temperature sensor		Temperature sensor		Temperature sensor		Temperature sensor		Temperature sensor		Temperature sensor	
	J1		Cooling water sensor		Cooling water sensor		Cooling water sensor		Cooling water sensor		Cooling water sensor		Cooling water sensor	
	T1		Boost pressure sensor		Boost pressure sensor		Boost pressure sensor		Boost pressure sensor		Boost pressure sensor		Boost pressure sensor	
	R1		Oil pressure sensor		Oil pressure sensor		Oil pressure sensor		Oil pressure sensor		Oil pressure sensor		Oil pressure sensor	
	E3						Velocity							
Digital Inputs	T2	X	Motor stop	X	Motor stop	X	Motor stop	X	Motor stop	X	Motor stop	X	Motor stop	X
	V2		Idle		Idle		Idle		Idle		Idle		Idle	
	P2		Droop 1/2		Droop 1/2		Droop 1/2		Manual / remote setpoint		Manual / remote setpoint		Manual / remote setpoint	
	H2		Speed +		Speed +		Fuel limitation		Fixed speed		Fixed speed		Fixed speed 1	
	S2		Speed -		Speed -		Speed range 1/2		Anti stick slip device		Anti stick slip device		Fixed speed 2	
	R2		Fixed speed		Fixed speed		Fixed speed 1		Bit 0				Clutch	
	D2				Manual speed		Fixed speed 2		Bit 1				Constrained opening StG	
	G2						Torque 1/2		Bit 2				Fuel limitation	
	F2						Velocity		Bit 3				Master / slave definition	
Analogue Inputs	A3				Manual setpoint		Manual setpoint 1		Manual setpoint		Manual setpoint		Manual setpoint	
	L3				Synchronizer		Manual setpoint 2							
	C3				Load measuring unit					Remote setpoint (4-20 mA)		Remote setpoint (4-20 mA)		Remote setpoint (4-20 mA)
Analogue Outputs	0 - 5V Voltage 4 - 20mA Current	K3	Display fuel		Display fuel		Display fuel		Load sharing		Load sharing		Control pitch propeller	
		S3	Display speed		Display speed		Display speed		Display speed		Display speed		Display speed	
		J3	Display fuel		Display fuel		Display fuel		Load sharing		Load sharing		Control pitch propeller	
		G3	Display speed		Display speed		Display speed		Display speed		Display speed		Display speed	
Digital Outputs	H4		controlled current output max. 3A		controlled current output max. 3A		controlled current output max. 3A		controlled current output max. 3A		controlled current output max. 3A		controlled current output max. 3A	
	E1		Overspeed protection relais		Overspeed protection relais		Overspeed protection relais		Overspeed protection relais		Overspeed protection relais		Overspeed protection relais	
	C2		Indicator overspeed		Indicator overspeed		Indicator overspeed		Indicator overspeed		Indicator overspeed		Indicator overspeed	
Communication In- Outputs	B2		Indicator overall alarm		Indicator overall alarm		Indicator overall alarm		Indicator overall alarm		Indicator overall alarm		Indicator overall alarm	
	E4		CAN H		CAN H		CAN H		CAN H		CAN H		Lastteilung	
	D4		CAN L		CAN L		CAN L		CAN L		CAN L		Lastteilung	
	C4		R x D		R x D		R x D		R x D		R x D		R x D	
	J4		T x D		T x D		T x D		T x D		T x D		T x D	

12.5. Cable lengths

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

The necessary cable lengths have to be registered here and transferred to **HEINZMANN**.

Please 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.

a) L1 = Control unit - battery

L 1	Control unit - battery	..... cm	
	Cable size	up to 15 m	5 x 1.50 mm ²
		over 15 to 30 m	5 x 2.50 mm ²

b) L2 = Control unit - actuator

L 2.1	Control unit - actuator (feedback)	..... cm	3 x 0.75 mm ²	shielded
L 2.2	Control unit - actuator (power)	..... cm		
	Cable size	up to 20 m	4 x 1.50 mm ²	
		over 20 to 40 m	4 x 2.50 mm ²	

c) L3 = Control unit - setpoint adjusting unit

L 3.1	Control unit - setpointpoti 1	..... cm	3 x 0.75 mm ²	shielded
L 3.2	Control unit - setpointpoti 2	..... cm	3 x 0.75 mm ²	shielded
L 3.3	Control unit - 4-20 mA input	..... cm	2 x 0.75 mm ²	shielded
L 3.4	Control unit - synchronizer	..... cm	2 x 0.75 mm ²	shielded
L 3.5	Control unit - load measuring unit	..... cm	2 x 0.75 mm ²	shielded

d) L4 = Control unit - pickup

L 4.1	Control unit - pickup 1	..... cm	2 x 0.75 mm ²	shielded
L 4.2	Control unit - pickup 2	..... cm	2 x 0.75 mm ²	shielded

e) L5 = Control unit - sensor inputs

L 5.1	Control unit - temperature	..... cm	2 x 0.75 mm ²	
L 5.2	Control unit - water temperature	..... cm	2 x 0.75 mm ²	
L 5.3	Control unit - boost pressure	..... cm	3 x 0.75 mm ²	

L 5.4 Control unit - oil pressure cm 3 x 0.75 mm²

f) L6 = Control unit - digital inputs

L 6.1	Control unit - switch 1-5	..... cm	6 x 0.75 mm ²
L 6.2	Control unit - switch 6-10	..... cm	6 x 0.75 mm ²

g) L7 = Control unit - overspeed protection

L 7	Control unit - overspeed protection cm	2 x 0.75 mm ²
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h) L8 = Control unit - controlled current output

L 8	Control unit - con. current output cm	2 x 0.75 mm ²
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i) L9 = Control unit - status indicator

L 9.1	Control unit - "Overall alarm" ind. cm	2 x 0.75 mm ²
L 9.2	Control unit - "Overspeed" ind.	..... cm	2 x 0.75 mm ²

j) L10 = Control unit - analogue outputs

L 10.1	Control unit - display fuel (V)	..... cm	2 x 0.75 mm ²
L 10.2	Control unit - display fuel (A)	..... cm	2 x 0.75 mm ²
L 10.3	Control unit - display speed (V)	..... cm	2 x 0.75 mm ²
L 10.4	Control unit - display speed (A)	..... cm	2 x 0.75 mm ²
L 10.5	Control unit - load sharing	..... cm	2 x 0.75 mm ²
L 10.6	Control unit - controll pitch propeller	..... cm	2 x 0.75 mm ²

k) L11 = Control unit - frequency input

L 11	Control unit - tacho cm	2 x 0.75 mm ² shielded
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l) L12 = Control unit - PWM input

L 12	Control unit - PWM-in cm	2 x 0.75 mm ² shielded
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m) L13 = Communication

L 13	Control unit - CAN - Bus cm	2 x 0.75 mm ² shielded
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13. 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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