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HEINZMANN[®]

Elektronic Speed Governors

Basic Systems

E 16, E 30 and E 40

 <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>HEINZMANN will refuse all liability for injury or damage which results from not following instructions</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>HEINZMANN will refuse all liability for damage which results from missing or insufficiently working overspeed 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 actuator, the control unit or of any accessory device</p> <p>Sluggish and blocking linkage</p>



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.

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1 Abbreviations

E	Complete Basic System
EA-KG	Flexible Mount for Control Unit
EFP	Electronic Foot Pedal (Transducer)
FSchG.....	Frequency / Speed Switch Unit
IA.....	Magnetic Pickup
KB	Harness
KG	Control Unit
LKG.....	Load Control Unit
LMG	Load Measuring Unit
LR.....	Load Ramp
LSchG.....	Load Switch Unit
LTG	Load Sharing Unit
NG + NSV	Power Unit with Emergency Power Supply
PG.....	Test Unit
SA.....	Load Anticipation Unit
SFBG.....	Start Fuel Limitation Unit
StG.....	Actuator
SyG.....	Synchronizer
SV	Plug Connection
SW	Setpoint Adjuster
ÜG	Monitoring Unit

2 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.

2.1 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!

2.2 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!

2.3 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!

3 Application

Electronic **HEINZMANN** - governors are fully electronic and therefore do not require mechanical drive. This provides for very simple and cost- efficient installation on the engine, so that these governors can be used for relatively simple governing tasks.

Their use is especially recommendable when the demands on governing quality are high. These governors provide for very short response times with little overshooting and high speed accuracy with zero droop on the standard model.

Tasks such as automatic synchronization, load sharing, load anticipation, etc. can be handled in a very simple manner through a series of accessories (please refer to our leaflet “Accessories“ and to our accessory manuals).

4 Block Diagram of Control Circuit

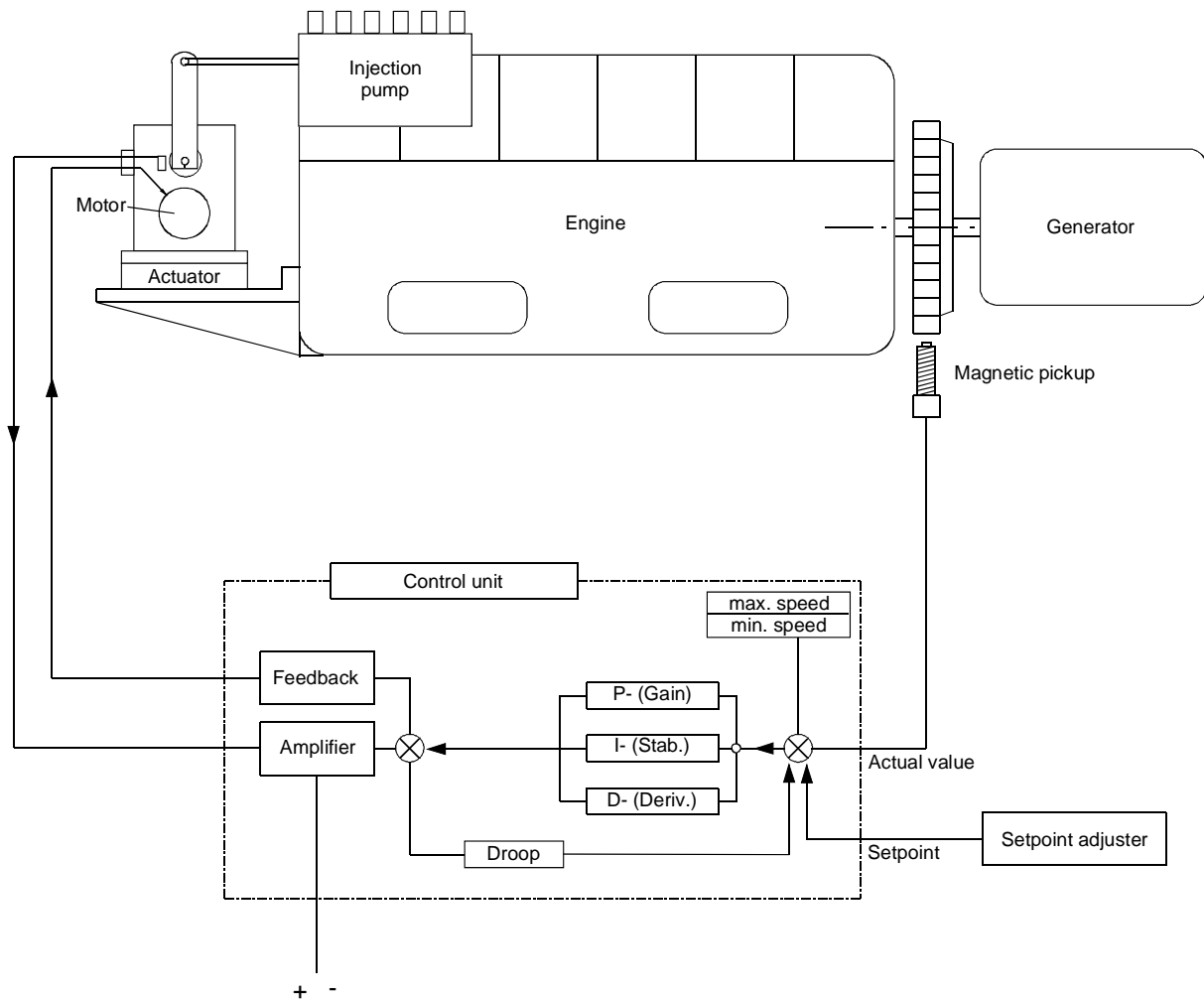


Figure 1: Block Diagram of Control Circuit

5 Mode of Operation

The magnetic pickup detects the actual speed from a gear or punched disk and passes it on to the control unit where it is compared with the required present speed. Output current is directed through various control circuits in the control unit to the actuator. Any deviation in speed from the preset speed modifies the strength of actuator setting and alters the level of fuel injections accordingly. Since the engine speed is compared with a fixed, present value at every stage of loading, the speed in a steady-state condition is always the same, i.e. droop is zero. It is possible, however, to operate the governor with a droop, if required.

In case a magnetic pickup cable cable breaks, the actuator will move to the stop position with full power for approx. 5 seconds. In case a setpoint potentiometer breaks, the actuator will move to the stop position until the engine has stopped.

In the steady state, a special control circuit permits the governor to pickup the current only from the control unit, taking care that is no current flow towards the actuator motor.

However it is possible to adjust full load at the actuator even in the steady state by closing a switch at the contacts H_3 and J_3 . The switch may only be activated during the starting operation because the safety functions of the governor are in this mode switched off.

6 Block Diagram of Governors E 16, E 30 and E 40

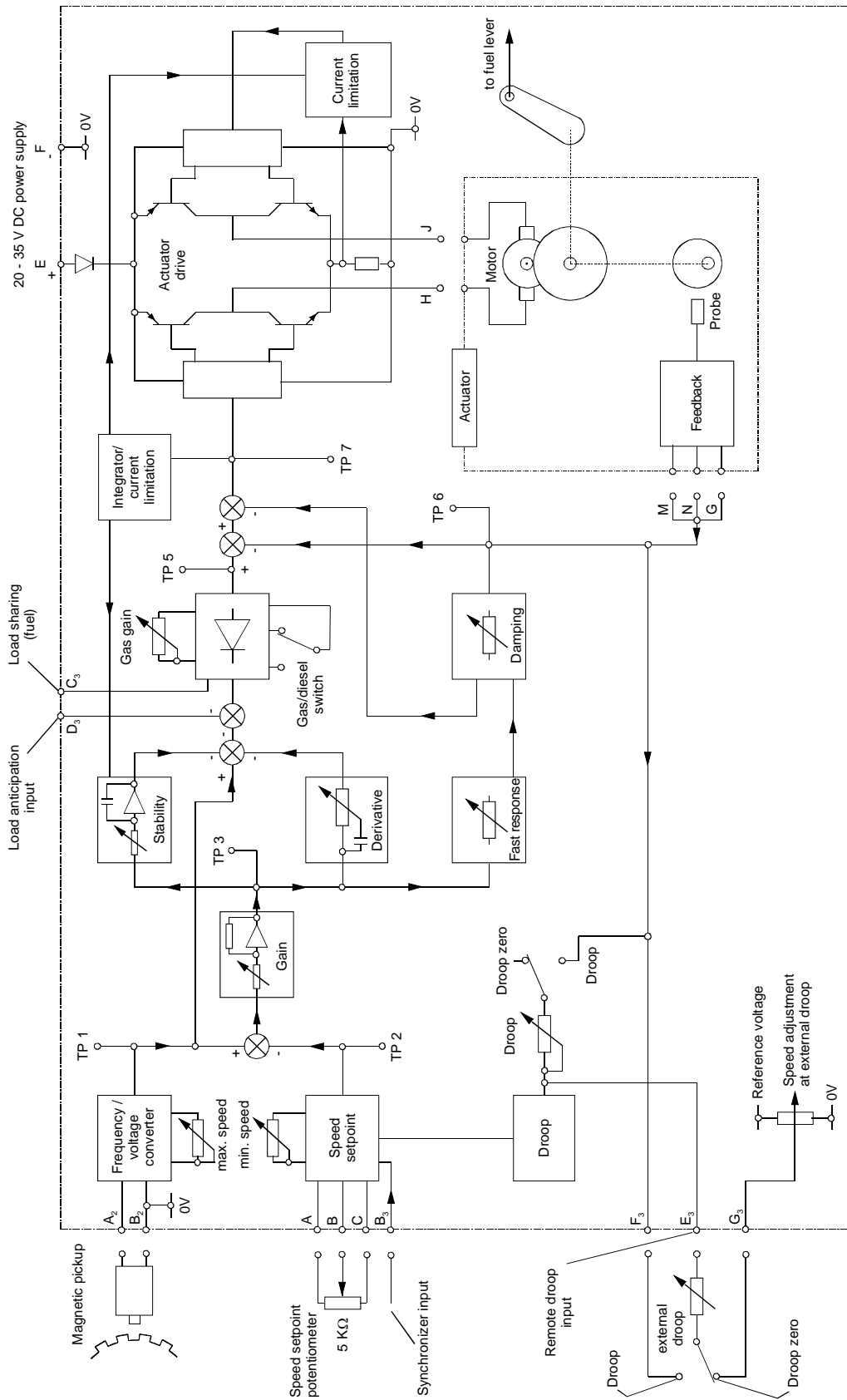


Figure 2: Block Diagram of Governors E 16, E 30 and E 40

7 Magnetic Pickup IA ...

7.1 Specification

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

7.2 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 of the series E 16 up to E 40 are designed for a maximum frequency of 6000 Hz. Frequency (by Hz) is calculated according to the formula

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

$$z = \text{number of teeth on the pickup wheel}$$

Example:

$$n = 1500$$

$$z = 160$$

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

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).

7.3 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.

7.4 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.)

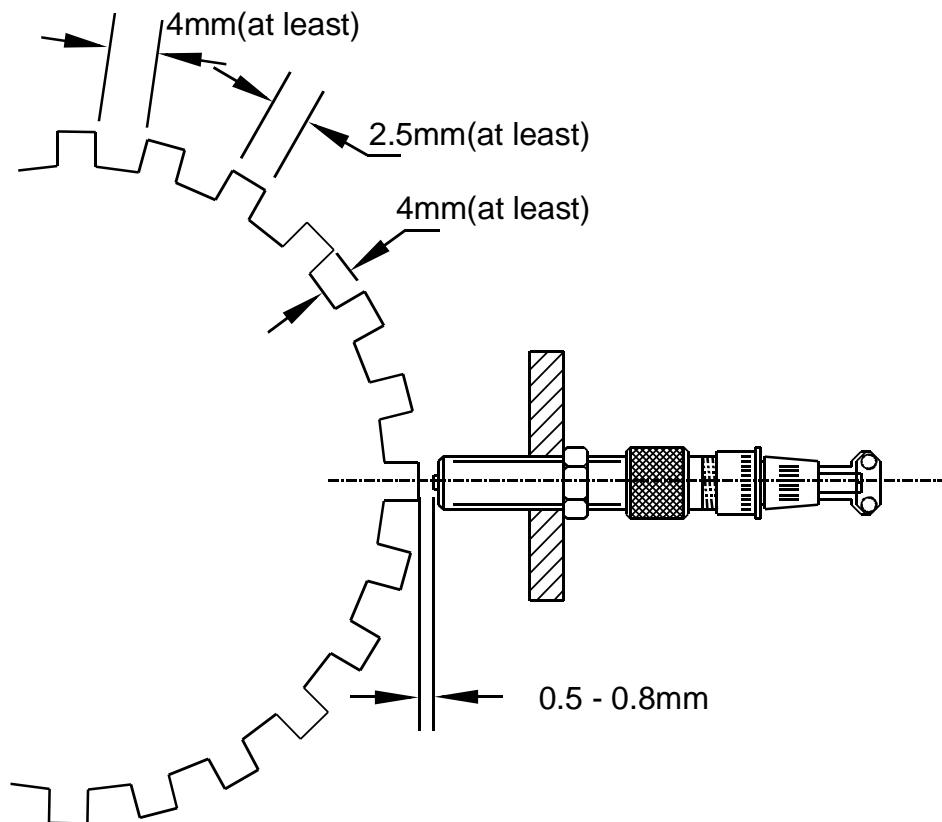


Figure 3: Clearance of Pickup

7.5 Mounting Measurements

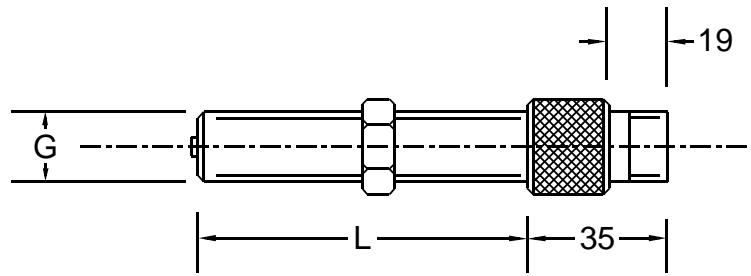


Figure 4: Magnetic Pickup

TYP	Thread Length (mm)	Thread Size	Remarks
IA 01-38	38	M 16 x 1,5	corresponding plug: SV6-IA-2K
IA 02-76	76	M 16 x 1,5	
IA 03-102	102	M 16 x 1,5	
IA 04-125	125	M16 x 1,5	
IA 11-38	38	5/8"-18UNF-2A	
IA 12-76	76	5/8"-18UNF-2A	
IA 13-102	102	5/8"-18UNF-2A	

Please order e.g. IA 02 - 76

8 Setpoint Adjuster

The speed setting potentiometer or resistor link must always be connected. When not connected, the governor will not work. The actuator will then always be in a shutdown condition.

Depending on the different applications, various speed set point potentiometers are available for the **HEINZMANN** electronic speed governors.

8.1 Setpoint Potentiometer SW 01 - 1 (one turn)

Displacement Angle	approx. 312°
Resistance	5 kOhm
Temperature Range	-55°C to +120°C
Protection	IP 00

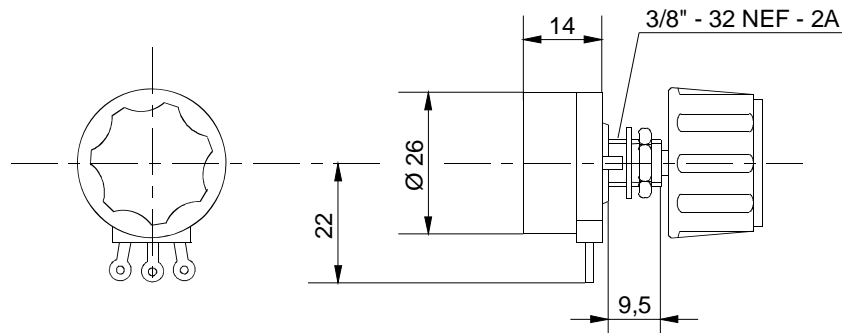


Figure 5: Potentiometer SW 01 - 1

8.2 Setpoint Potentiometer SW 02 - 10 (10 turns)

Displacement Angle	10 turns
Resistance	5 kOhm
Temperature Range	-55°C to +105°C
Protection	IP 00

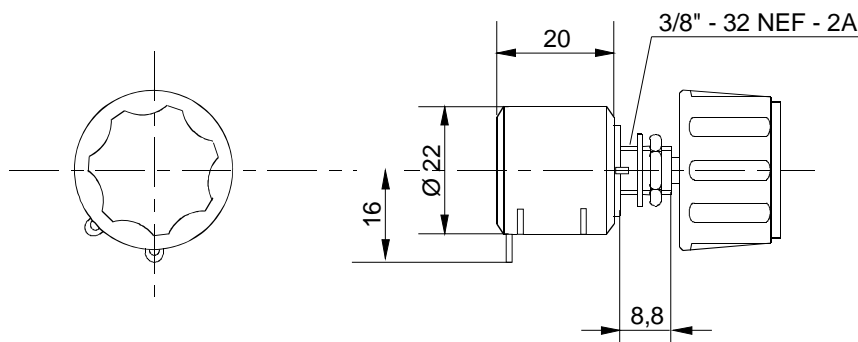


Figure 6: Potentiometer SW 02 - 10

On request, the potentiometers, as specified under 7.1 and 7.2 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.

8.3 Motor Potentiometer

These potentiometers permit manual adjustment via the potentiometer or electrical adjustment from various positions via switchers. Motor potentiometer with different adjustment times and with or without optional limit switchers are available. For more information refer manual E 83 006 - e.

8.4 Setpoint Range

The electronic governors of the series E 16 up to E 40 have a maximum and minimum speed adjustment. The minimum speed is fully adjustable from approx. 25% up to approx. 80% with respect to the adjusted maximum speed. This high adjusted minimum speed level is very useful with genset applications.

The desired max. pickup frequency should be advised with the order. We will adjust the governor to 4000 Hz if there is no information available.

8.5 Limiting the Adjustment Range of Setpoint Potentiometers

When working with a maximum frequency of 1500 Hz, for example, the "min. speed" potentiometer in the control unit allows the setting of a lower frequency limit of between 375 and 1200 Hz. If the adjustment range is to be further limited, then the set point potentiometer must be wired in the following way.

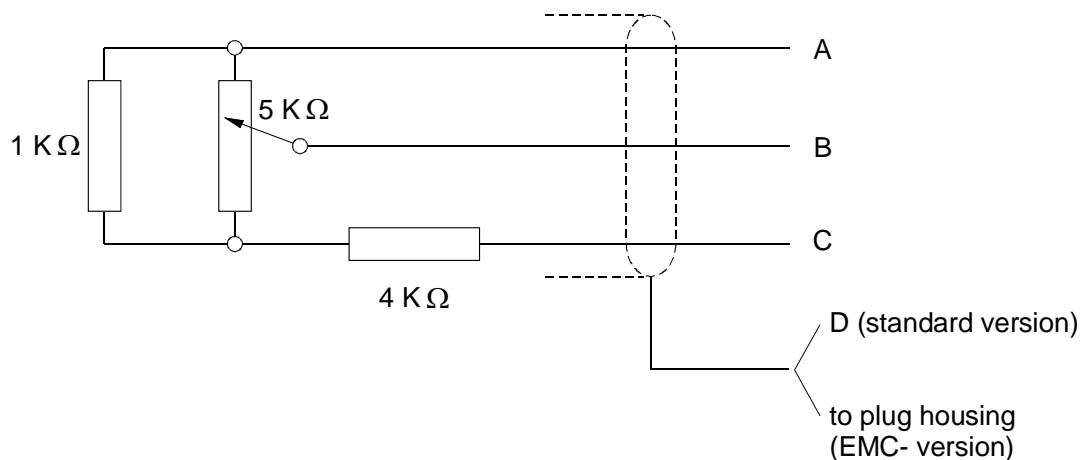


Figure 7: Connection of Limiting Resistors

If the maximum frequency is again 1500 Hz, then the minimum frequency can now be adjusted in the range between approx. 1310 and 1450 Hz.

8.6 Setpoint Value Adjustment by Current or Voltage Signal

The setpoint adjuster SW 09 - URI allows setpoint adjustment using voltages between 1 and 5 V or currents between 4 and 20 mA. If the signal fails, the governor will set minimum speed according to the 4 mA or 1 V value. For more information refer manual E 85 003 - e.

8.7 Setpoint Value Adjustment by Adjusting Pulses

The electronic setpoint potentiometer ESW 1 - 01 may be used as an interconnection unit between **HEINZMANN** speed governors and devices by other companies. It will mainly be used for gensets, perhaps in combination with other load governing equipment. An internal potentiometer is used to adjust the basic speed which may be decreased or increased by pulses from the external equipment. The sensitivity of the unit is adjustable. For more information refer manual E 97 001 - e.

8.8 Setpoint Value Adjustment by Pedal

The non- contact signal transducer unit EFP 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 manual E 83 005 - e.

8.9 Setpoint Value Adjustment by Pressure

The pneumatic speed setting unit BG 03 can be used for pneumatic speed adjustment. The following types are available:

pressure range	up to 5 bar	BG 03 - 5
	up to 10 bar	BG 03 - 10



Note

In case that electrical setpoint units such as SW 09 - URI, ESW 01 - 1, EFP or other non- HEINZMANN units are used, the common negative for this setpoint unit must be taken from the HEINZMANN governor. If this is not done, differences in the electrical potential will guide to a worse governing quality or even to failure of the governor.

9 Monitoring Unit ÜG 01

Plants with an increased safety operation (e.g. main gears of a ship) should be provided with the monitoring unit ÜG 01. The monitoring units monitor the feedback voltage of the electronic governors, making it possible to issue an alarm or to stop the engine immediately upon detection of one of the main types of governor failure.



Warning

The Monitoring Unit does not supersede overspeed protection!

Feedback voltage amounts to 1.5 V in stop position and to 5.0 V in 100% fuel position. Whenever feedback voltage drops below 0.7 V or rises above 6.5 V the relay in the monitoring unit will operate.

The monitoring unit is connected in such a way that an alarm is given even in case of power failure of the ÜG 01.

The main causes for the monitoring unit to respond are:

Failure of governor power supply	feedback voltage	< 0.7 V
Actuator connector unplugged	feedback voltage	> 6.5 V
Break of feedback cable	feedback voltage	< 0.7 V
	or	> 6.5 V
Failure of feedback electronics	feedback voltage	< 0.7 V
	or	> 6.5 V

If the monitoring unit is applied then this must be mentioned when ordering, because TP 6 (feedback test point) is not fitted to the plug in series.

For more information refer manual E 85 008 - e.

10 Control Units KG 16 - 04 up to KG 40 - 04

10.1 General

The control units are contained in an aluminium housing sealed with an O- ring to protect against dust and humidity.

In this brochure only the speed governor is described. Load anticipation, load sharing, synchronizer, etc., are shown in our accessories leaflet and in the corresponding manuals.

10.2 Specification

supply voltage	24 V DC
maximum voltage	35 V DC
minimum voltage	20 V DC
maximum ripple voltage at max. actuator current	10 % at 100 Hz
acceptable voltage drop at max. actuator current	max. 10 % at control unit
fuse protection of governor	16 A
current consumption	approx. 250 mA + current of actuator
storing temperature	-55°C to +85°C.
operating ambient temperature	-40°C to +70°C.
humidity	up to 98 %.
control frequency	300 to 6000 Hz.
steady state variation	±0.25 %.
speed variation due to temperature for frequency greater than than 500 Hz between -40°C and +70°C	±1 %.
droop at full rotation angle	0 - 10 %
protection grade	IP 44
weight	approx. 2.6 kg

10.3 Measurements

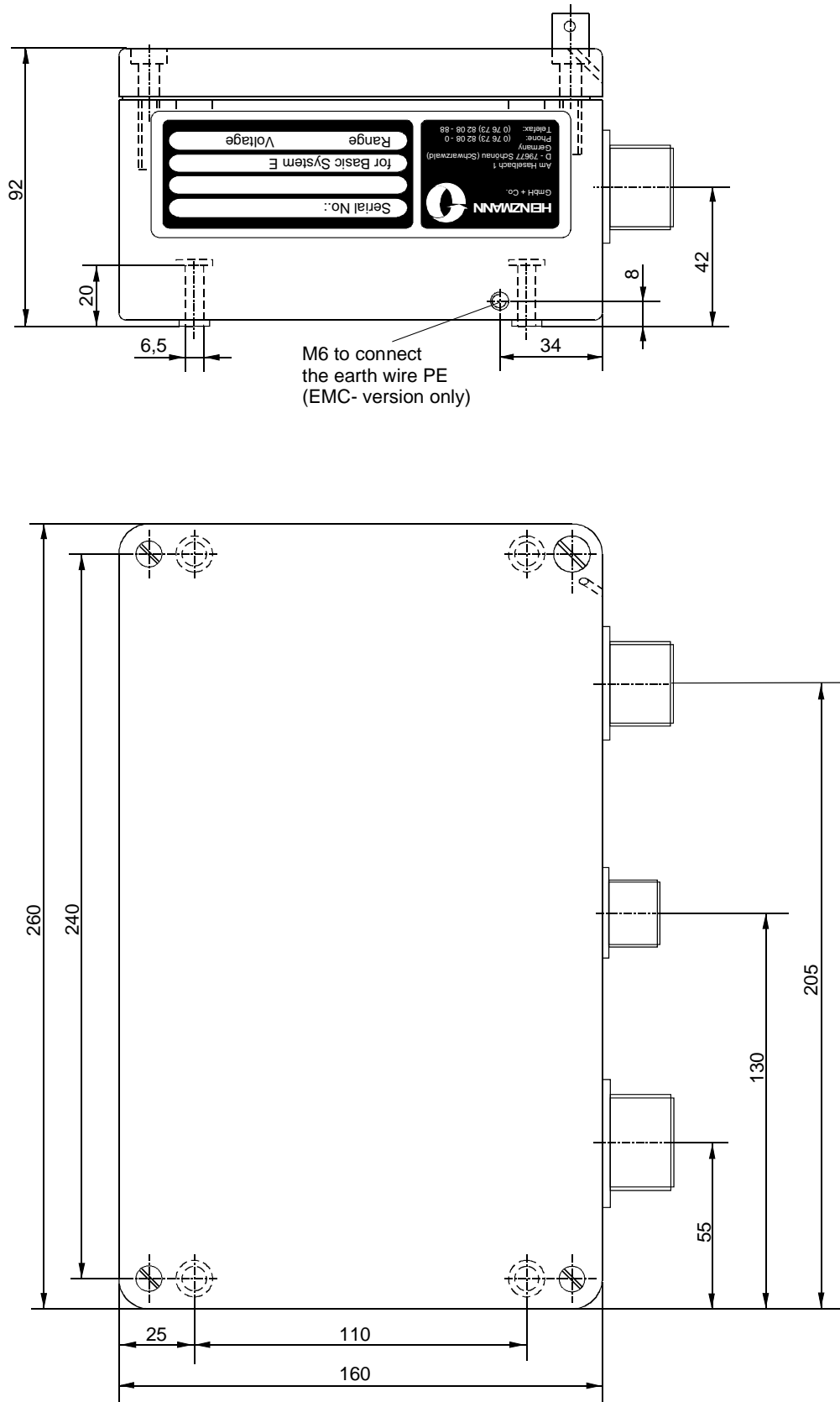


Figure 8: Housings of KG 16 - 04 up to KG 40 - 04

10.4 Installation

The installation can be done in any place with the least amount of vibration possible and the lowest ambient temperature possible; the maximum cable lengths have to be taken into consideration. There should be no strong magnetic fields in the vicinity of the control unit to avoid disturbances.

The unit cover must be removed for mounting. The mounting positions are outside the housing seal, so that the tightness of the control unit is not negatively influenced by mounting.

11 Actuators

11.1 Design and Mode of Operation

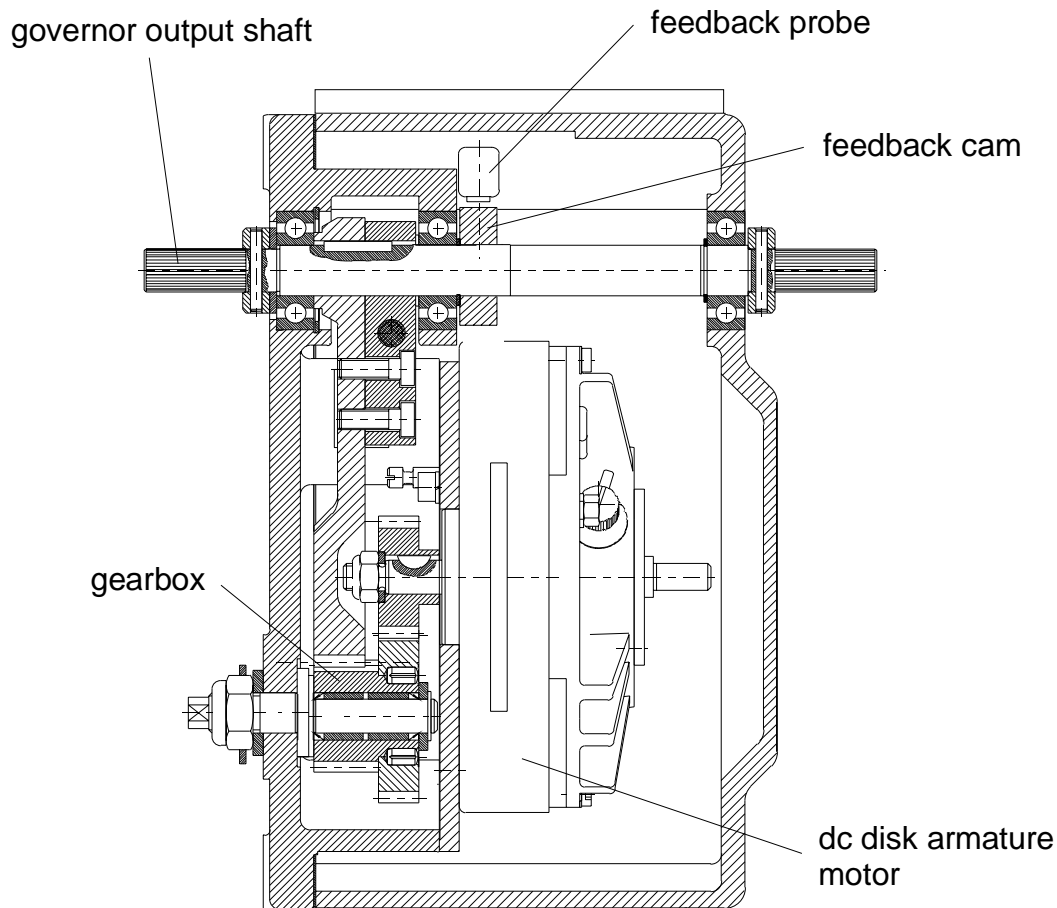


Figure 9: Sectional Drawing of Actuator

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

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

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

If the actuator strikes against a stop, as may occur, e.g., under parallel mains operation or may be caused by engine overload or cylinder failure, the current limitation will take effect 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 disturbances.

11.2 Installation

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

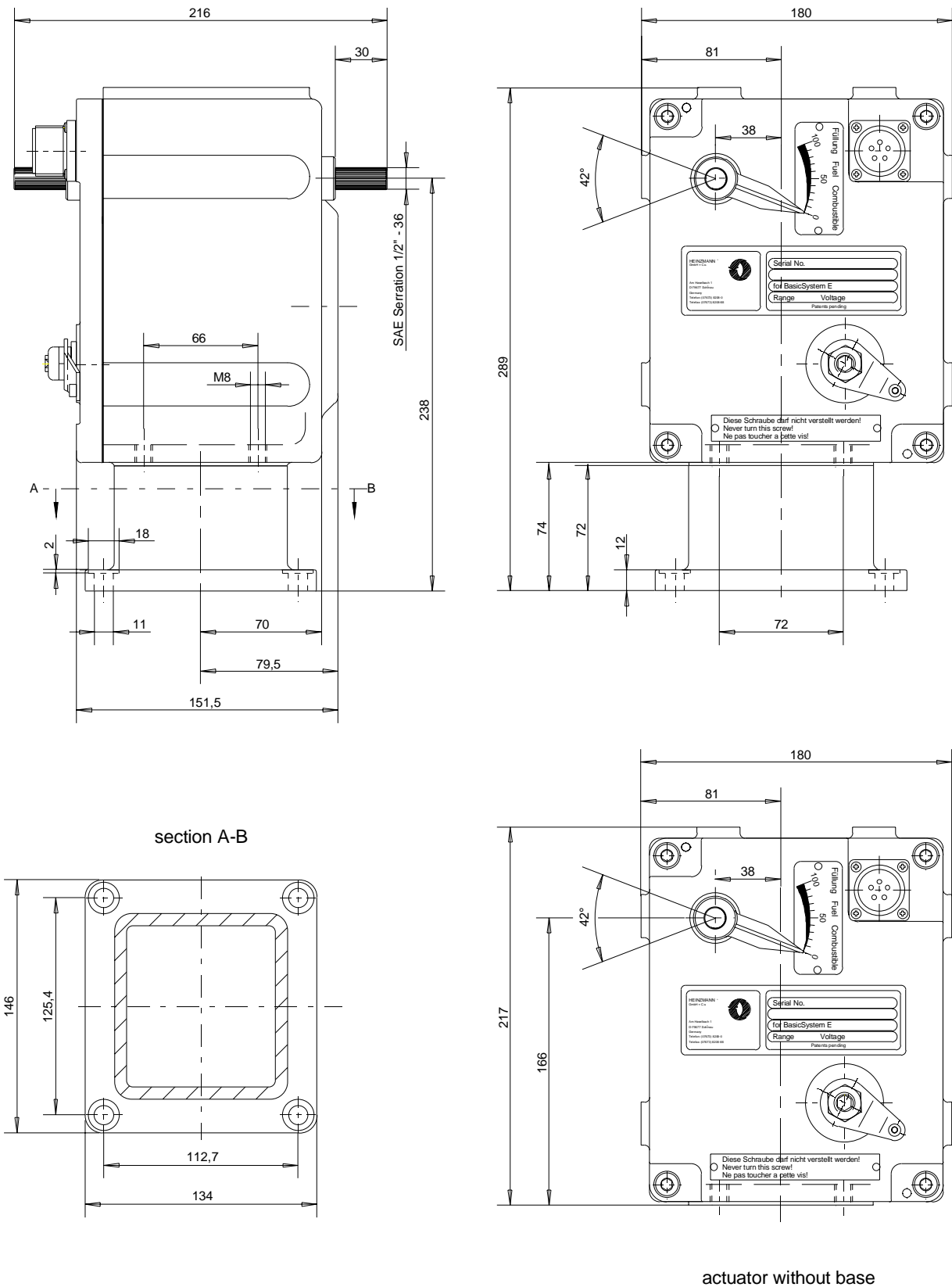
Generally any mounting position is possible; however, the actuators should not be mounted with the plug connection pointing straight upward.

11.3 Specification

	StG 16 - 01	StG 30- 01
Efective rotation at the output shaft	42°	42°
Max. torque at the governor output shaft	approx. 15 Nm	approx. 28 Nm
Torque in steady state condition	approx. 5 Nm	approx. 9 Nm
Response time 0-100 % without load	approx. 120 ms	approx. 170 ms
Current consumption of whole governor		
maximum current	approx. 5 A	approx. 5 A
safe current in steady state condition	approx. 1.7 A	approx. 1.7 A
Storage temperature	-55°C up to +110°C	-55°C up to +110°C
Ambiente emperature in operation	-25°C up to +90°C	-25°C up to +90°C
Ambiente temperature special version	-40°C up to +90°C	-40°C up to +90°C
Humidity	up to 98 %	up to 98 %
Protection grade	IP 55	IP 55
Weight without base	approx. 12.3 kg	approx. 12.3 kg
Weight of base	approx. 1.3 kg	approx. 1.3 kg

	StG 40 - 01
Efective rotation at the output shaft	42°
Max. torque at the governor output shaft	approx. 44 Nm
Torque in steady state condition	approx. 14.5 Nm
Response time 0-100 % without load	approx. 190 ms
Current consumption of whole governor	
maximum current	approx. 7 A
safe current in steady state condition	approx. 2.3 A
Storage temperature	-55°C up to +110°C
Ambiente emperature in operation	-25°C up to +90°C
Ambiente temperature special version	-40°C up to +90°C
Humidity	up to 98 %
Protection grade	IP 55
Weight without base	approx. 12.3 kg
Weight of base	approx. 1.3 kg

11.4 Measurements



actuator without base

Figure 10: Actuators StG 16 - 01, StG 30 -01 and StG 40 - 01

12 Regulating Linkage

12.1 Length of Lever Arm

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

12.2 Order Specification for Lever Arm

Please order RH 16 - 01 (EDV- No.: 504 170 02 00)

12.3 Connecting Linkage

The connecting linkage from the governor to the injection pump or the carburettor should be length-adjustable and have a (pressure or tension) elastic link. If possible, joint rod heads in accordance with DIN 648 should be used as connecting links. The linkage must operate easily and without clearance.

In case of friction or backlash in the linkage connecting actuator and injection pump resp. throttle valve no optimal control is possible.

12.4 Linkage Adjustment for Diesel Engines

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

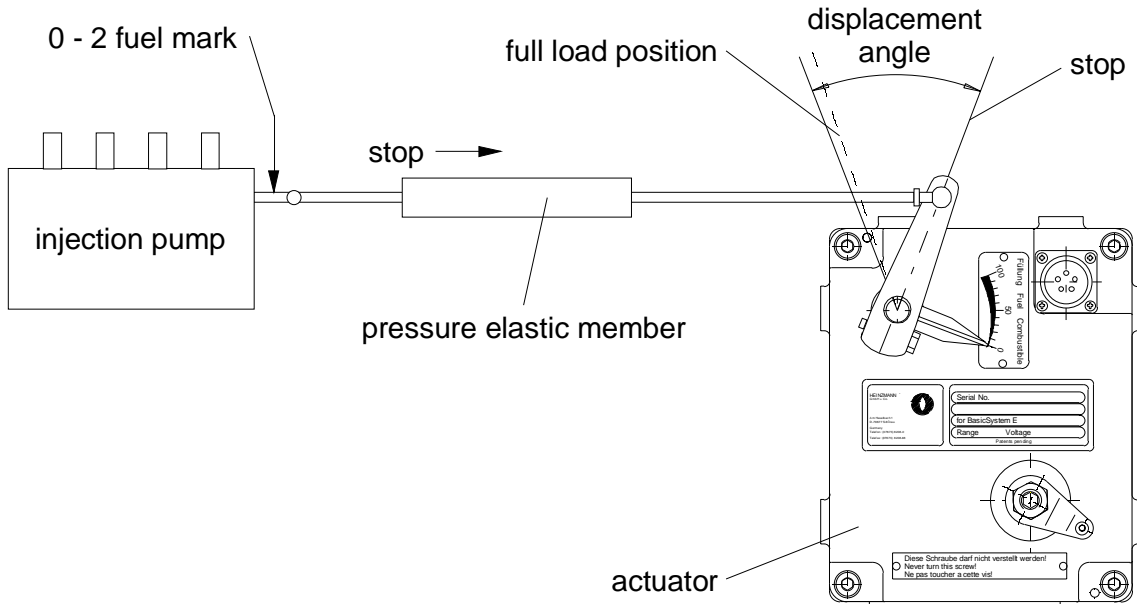


Figure 11: Linkage for Diesel Engines

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

12.5 Linkage Adjustment for Carburettor Engines

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

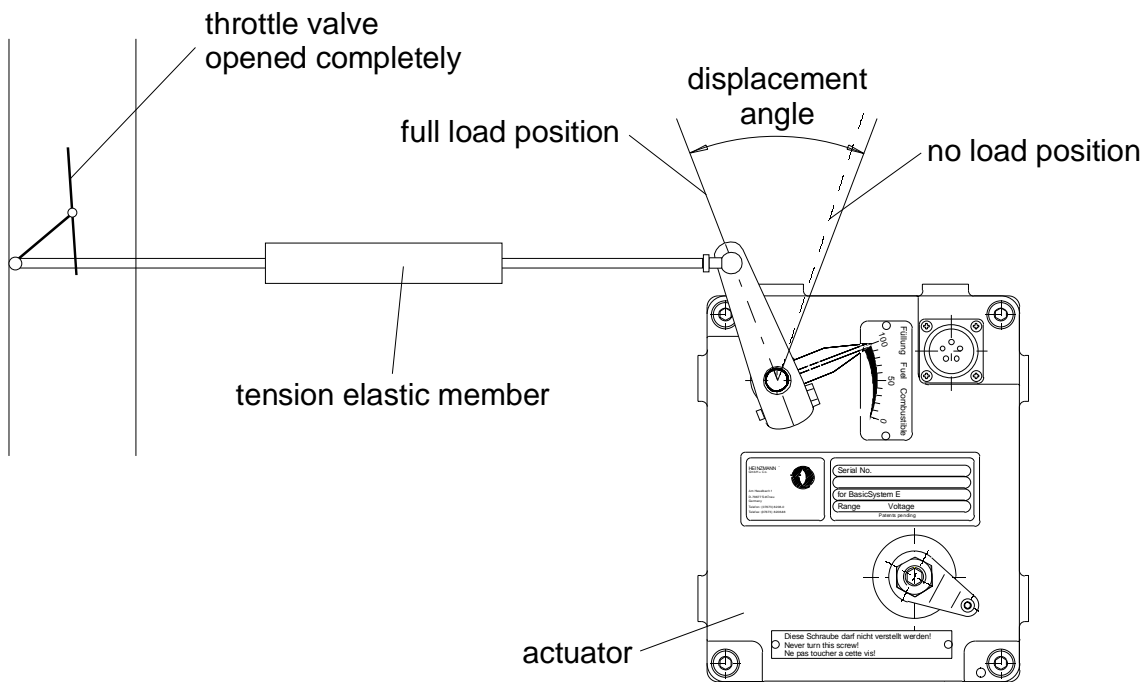
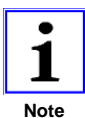


Figure 12: Linkage for Gas Engines



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

13 Electrical Connection

13.1 Governor Connection Diagram KG 16 - 04 up to KG 40 - 04 without EMC

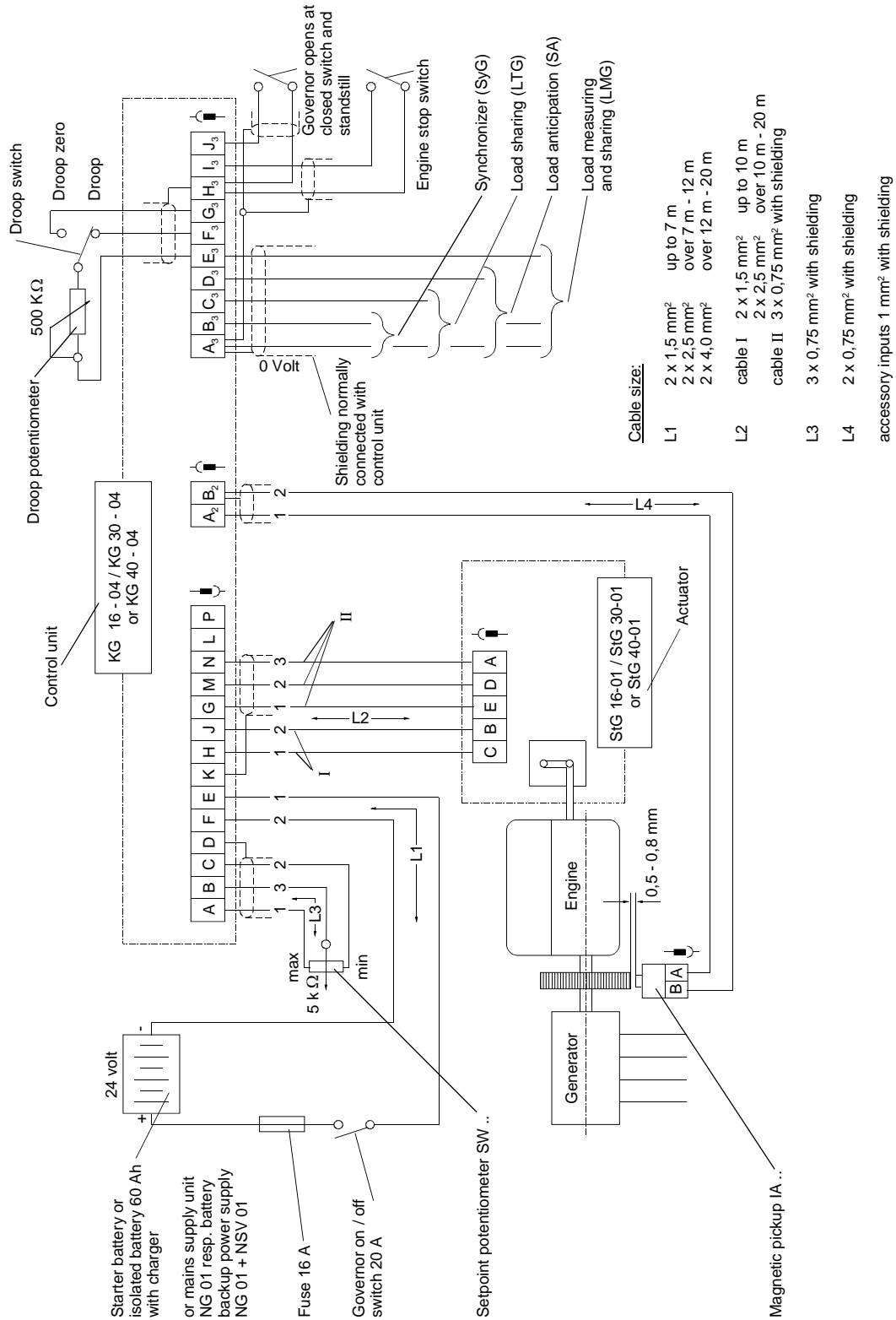


Figure 13: Governor Connection Diagram KG 6 - 04 up to KG 10 - 04 without EMC

13.2 Governor Connection Diagram KG 6 - 04 up to KG 10 - 04 with EMC

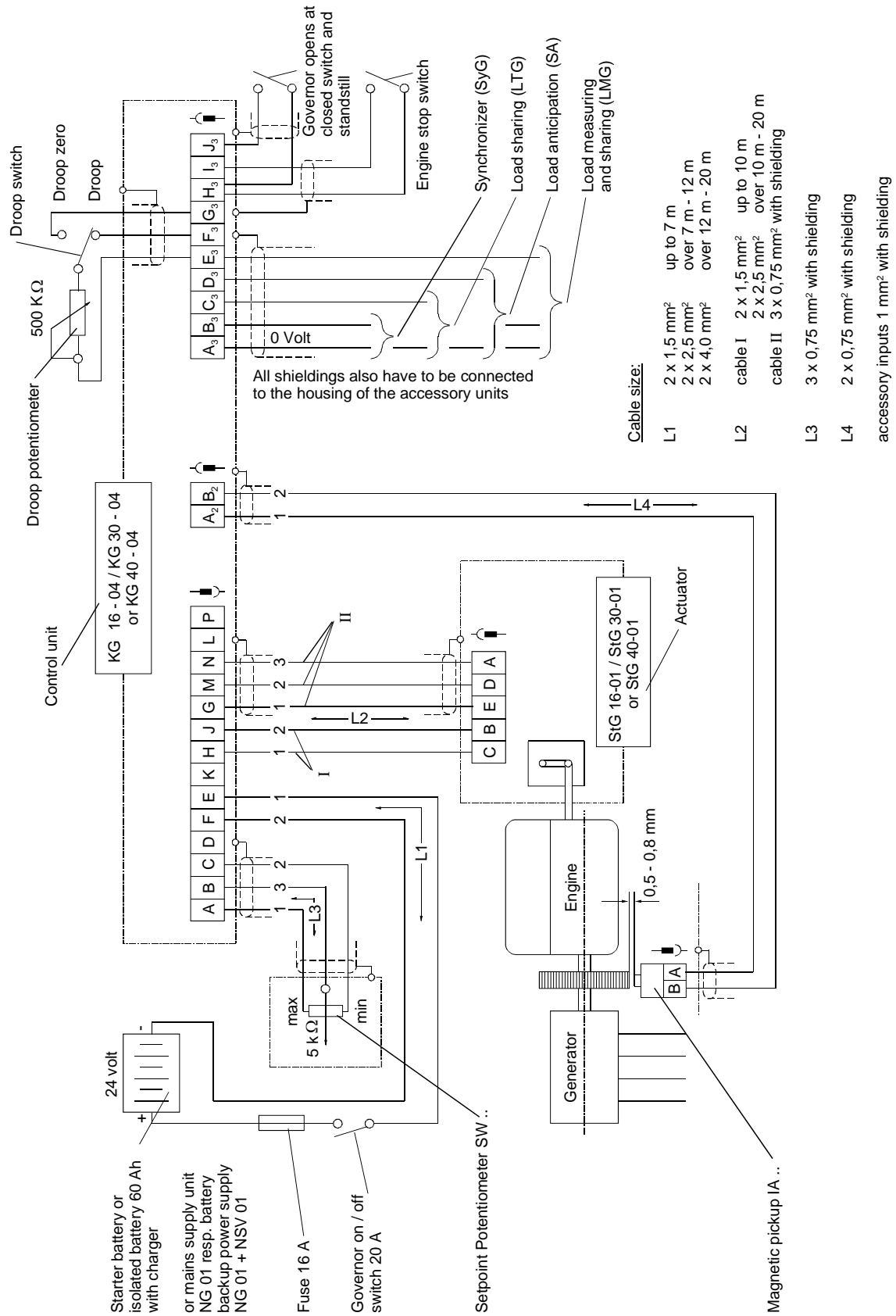


Figure 14: Governor Connection Diagram KG 6 - 04 up to KG 10 - 04 with EMC

13.3 Connection of Power Supply

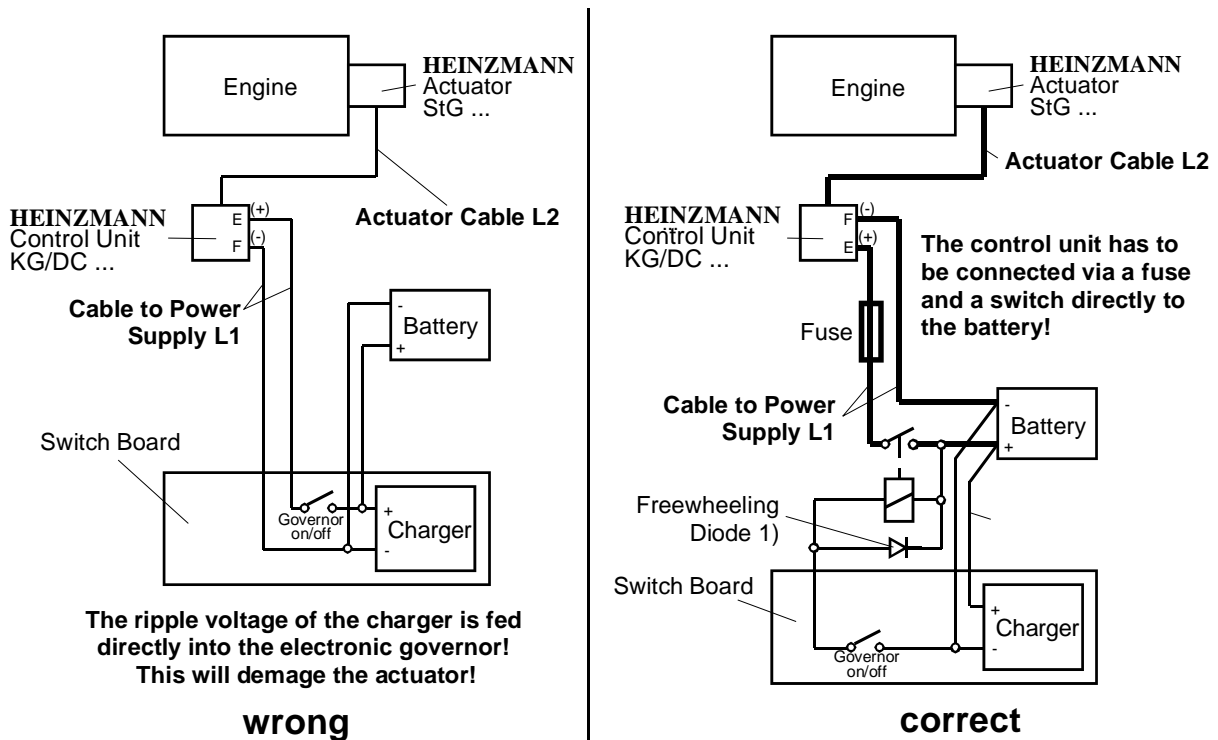
Inappropriate choice of power supply or insufficient battery capacitance or incorrect connection of the power supply line or too small cable sizes of the feed line and the motor line of the actuator are bound have an adverse effect upon the performance of the speed governor. In steady state operation, 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 inductance voltages. Diode type e.g. 1N4002

Figure 15: 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.



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.

13.4 Checking the Power Supply including Supply Cable and possible Intermediate Terminals (at Engine Stop)

1. Switch off power supply.
2. Clip voltmeter (rang 200 V DC) as shown in the following figure to terminals 3 and 4. Care must be taken to avoid a short circuit.
3. Switch on supply voltage. Read the voltage value from the voltmeter and keep in mind.
4. Switch off power supply.
5. Connect the link shown in the figure with dotted line.
6. When switching on power supply again actuator will be forced to 100 %- stop with full power. In this condition read voltage value from voltmeter.

The difference between value 1 (at min. current) and value 2 (at max. current) must be less than 10 %.



Note

The max. current will be reduced to the half after approx. 20 seconds.

7. Switch off power supply, disconnect voltmeter and link.

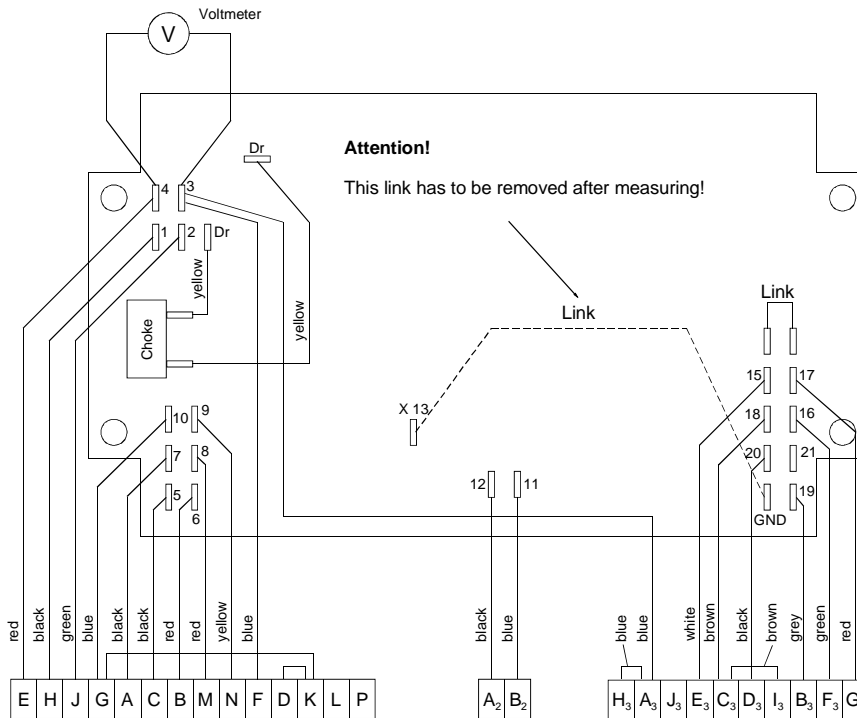


Figure 16: Internal Governor Wiring

13.5 Connection of Shielding without EMC

Trouble-free operation of the electronic governor requires a shielding for important connection lines.

The shielding has to be connected to minus potential of the control unit or the accessories of the governor.

In this case the shielding **has to be connected on one side only**, the other side has not to be connected and has not to be any connection to ground.

Example: magnetic pickup for governors E 16 up to E 40

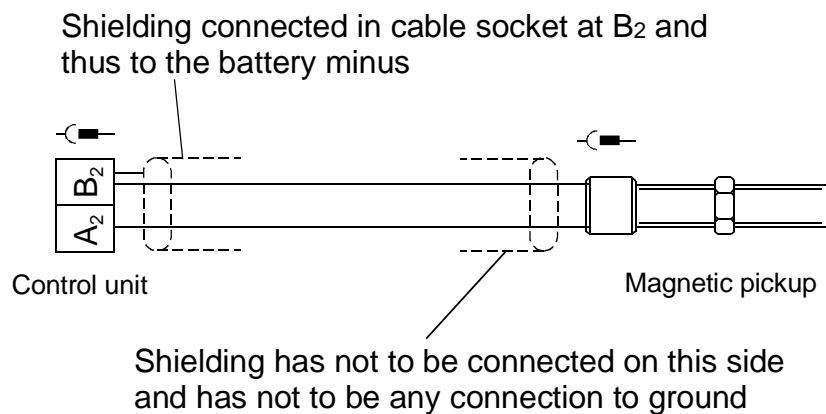
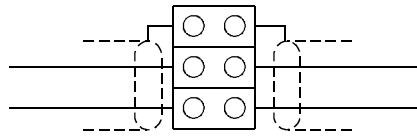


Figure 17: Shielding Magnetic Pickup without EMC

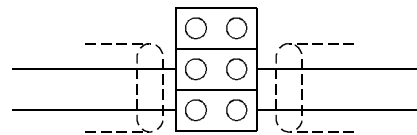
If a line with shielding is wired via a terminal strip, the the shielding has to be connected to the terminal strip without contact to a negative line or ground.



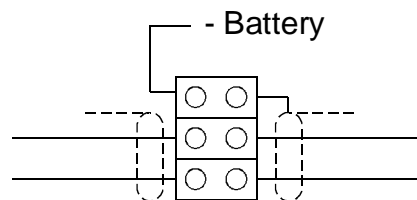
Correct shielding connection

Figure 18: Shielding via Terminal Strip

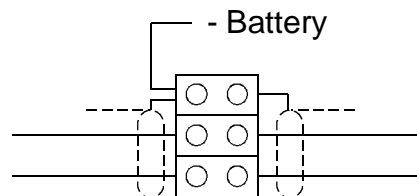
The following arrangements are frequently encountered, but they may cause governor disturbances.



Wrong! Shielding is discontinued



Wrong! Right and left side of shielding connected to different negative terminals



Wrong! Shielding is additionally connected to minus on the terminal strip

Figure 19: Failure at Shielding without EMC

To sum it up, the following can be said:

Shieldings of governor cables have to be connected to the control unit or the governor accessories (connected to the control unit via the 0 volt line). The shielding has to be connected in no other place with minus or ground.

13.6 Checking of Shielding without EMC

- a) Remove plug at control unit and check shielding terminals D, F, G, K, B₂, A₃ and H₃ at cable socket against ground. No connection has to be indicated.
- b) With screwed plug connect the other side of the shielding to the negative line via the test instrument. The test instrument must indicate a connection. If no negative flow is detected in the cable, then for testing purpose only, a connection with an other line must be established via a link in the cable socket.

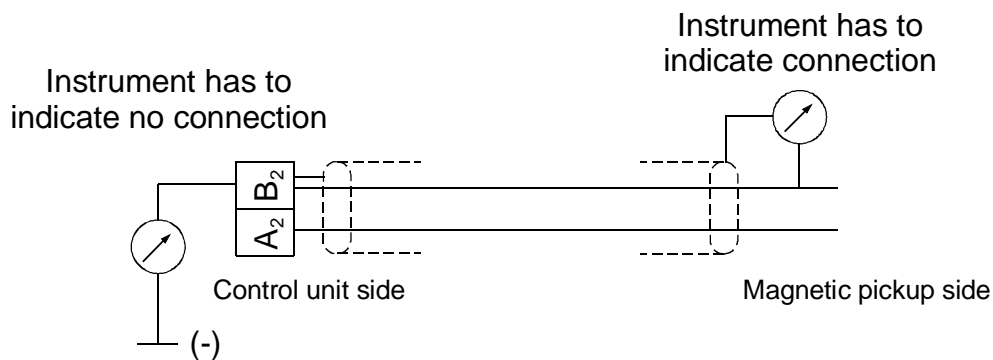


Figure 20: e.g. Magnetic Pickup Shielding Check



Note

Installed HEINZMANN- cables have already been checked at the factory.

13.7 Connection of Shielding with EMC

To avoid electromagnetic influences here it is necessary to connect cable shields at both ends to the housing unlike described in chapter 13.5 and 13.6. They must not be connected to the negative battery also. 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 controller housing and any of these other components, to avoid currents via the shielding it is necessary to run a separate wire from the controller housing to each of these components.

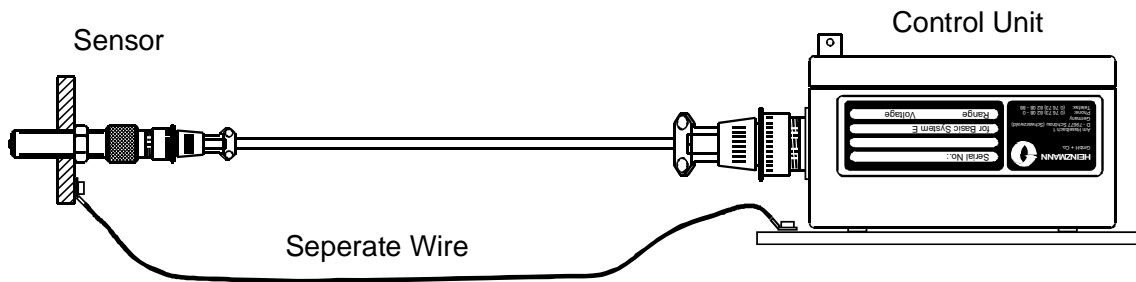


Figure 21: Connection of Seperat Wire

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

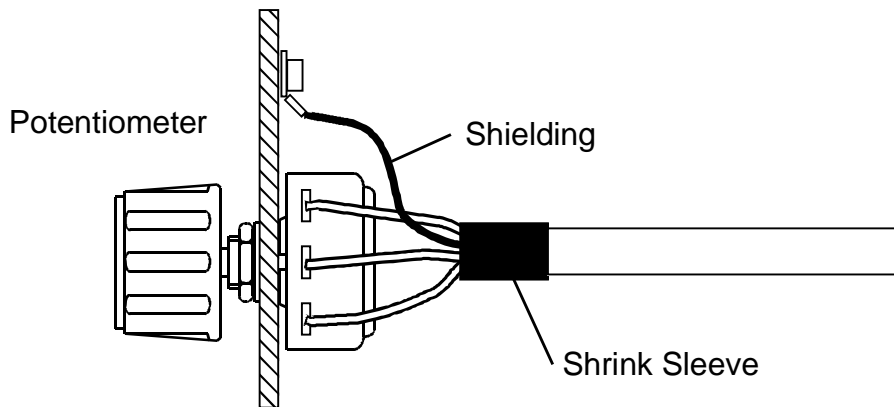


Figure 22: Shield Connection without Plug

With the plug the strain relief presses directly on the cable screen. In addition, a separate wire connects the strain relief section to the plug housing.

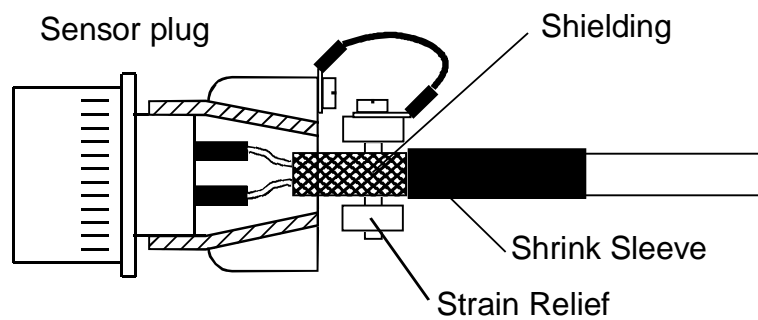


Figure 23: Shield Connection in the Plug

14 Harness

14.1 Cable Lengths

It is best to obtain the harness from the same source as the governor.

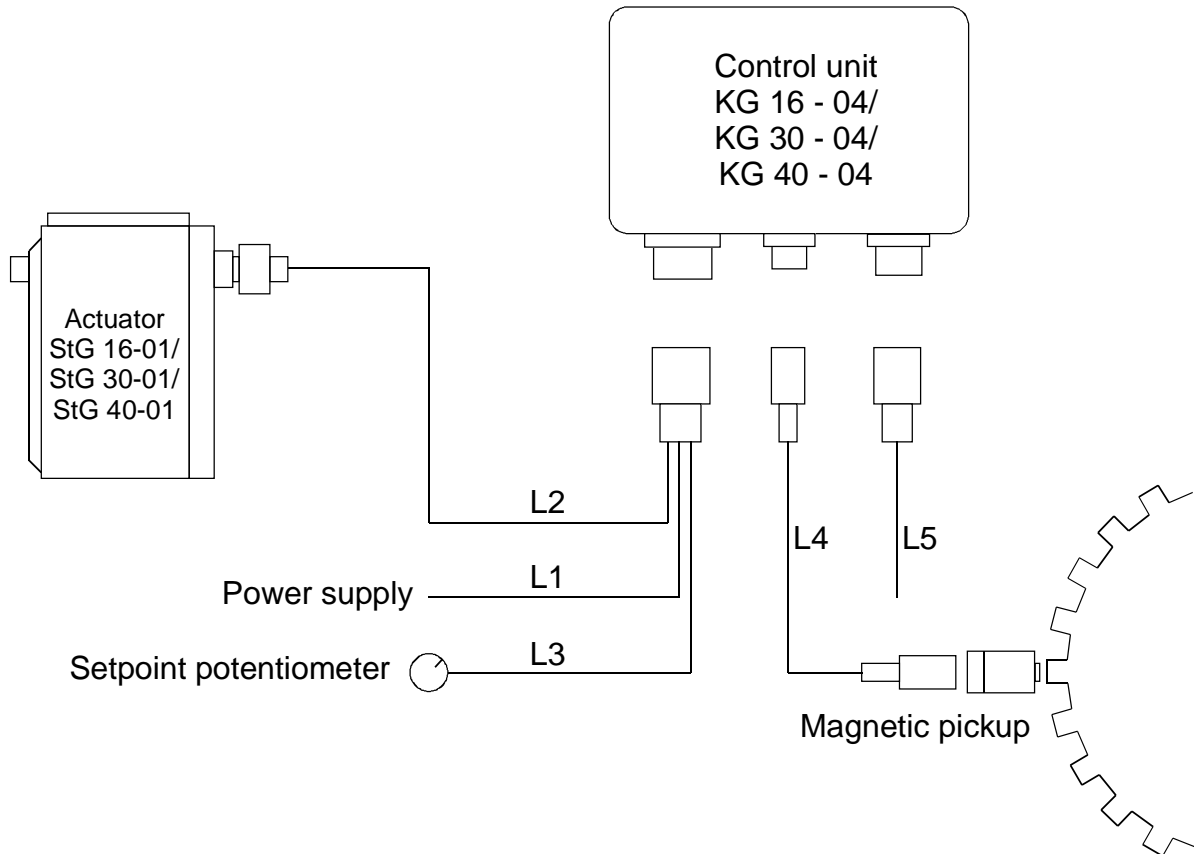


Figure 24: Cable Lengths for E 16 up to E 40

Cable Lengths

L1	=	control unit	-	battery
L2	=	control unit	-	actuator
L3	=	control unit	-	setpoint potentiometer
L4	=	control unit	-	magnetic pickup
L5	=	control unit	-	accessory unit

When ordering, please indicate the length in cm and advise if you would like to have an EMC harness or not.

14.2 Plug Connections

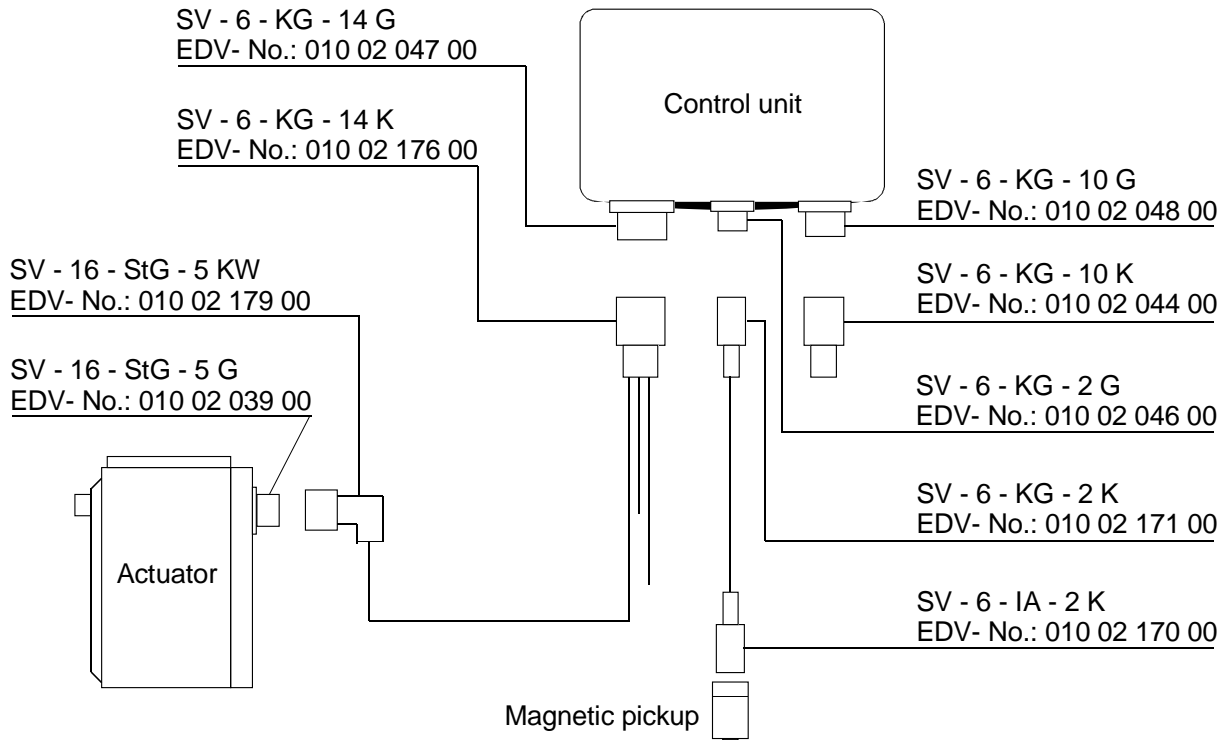


Figure 25: Plug Designations

15 Adjustment of Analogue Governors E 16 up to E 40

15.1 Governor Adjustment Sheet

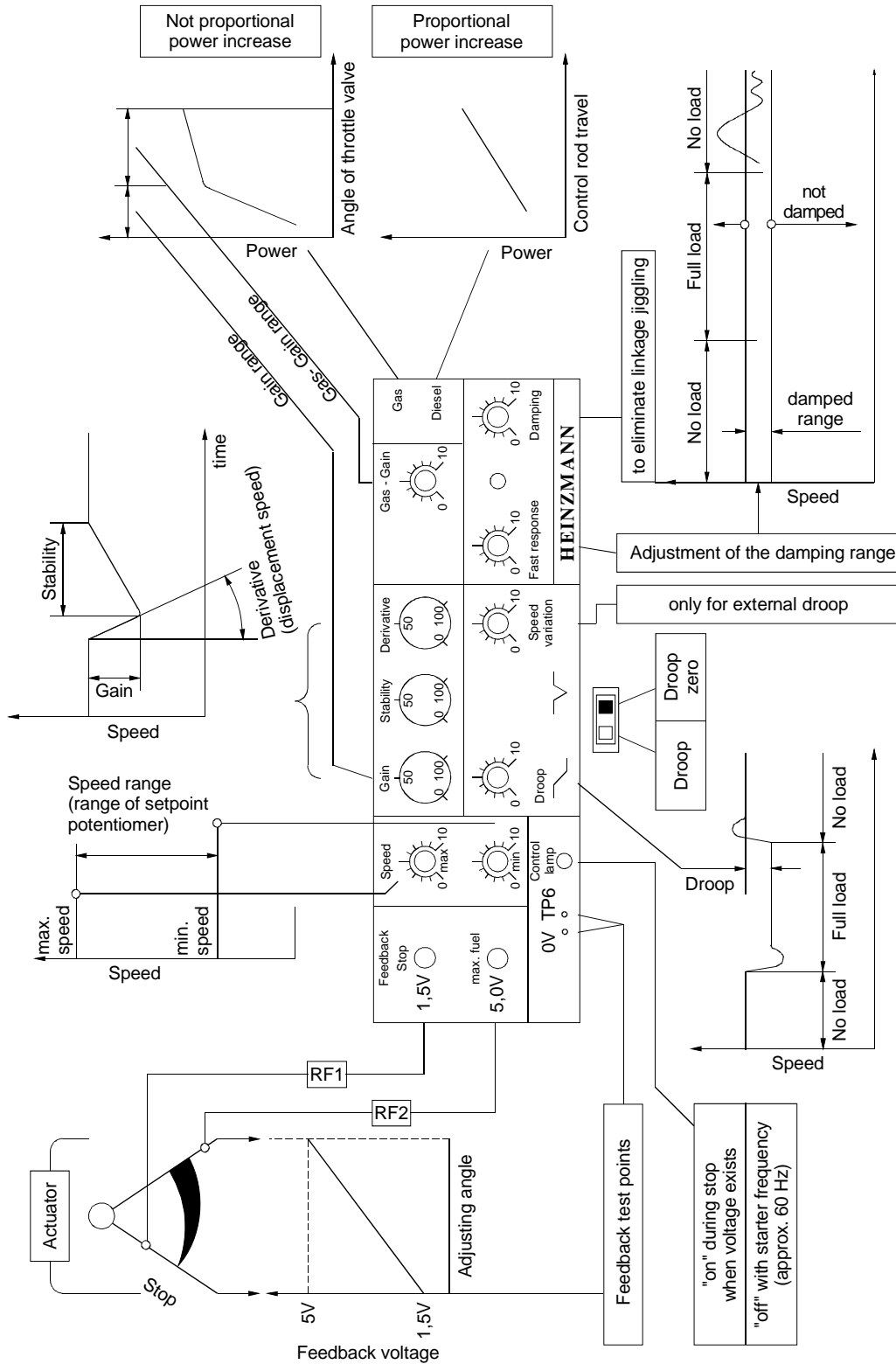


Figure 26: Governor Adjustment Sheet

- 15.2** Set the pickup distance on 0.5 to 0.8 mm from the highest point of the gear wheel (refer chapter 6.4). At cranking speed the voltage must be 0.5 V AC or more.
- 15.3** Make cable connections between the control box and the pickup, speed setpoint potentiometer, actuator and battery (connect plug 1 with control unit).
- 15.4** Mount the linkage between the actuator and the fuel system according to instructions (refer chapter 12).
- 15.5** Withdraw magnetic pickup plug (plug II) and accessory plug (plug III) from control unit. Connect lead of test instrument PG 01 (for more information refer manual E 83 008 - e) to magnetic pickup socket at control unit and test point TP 6.

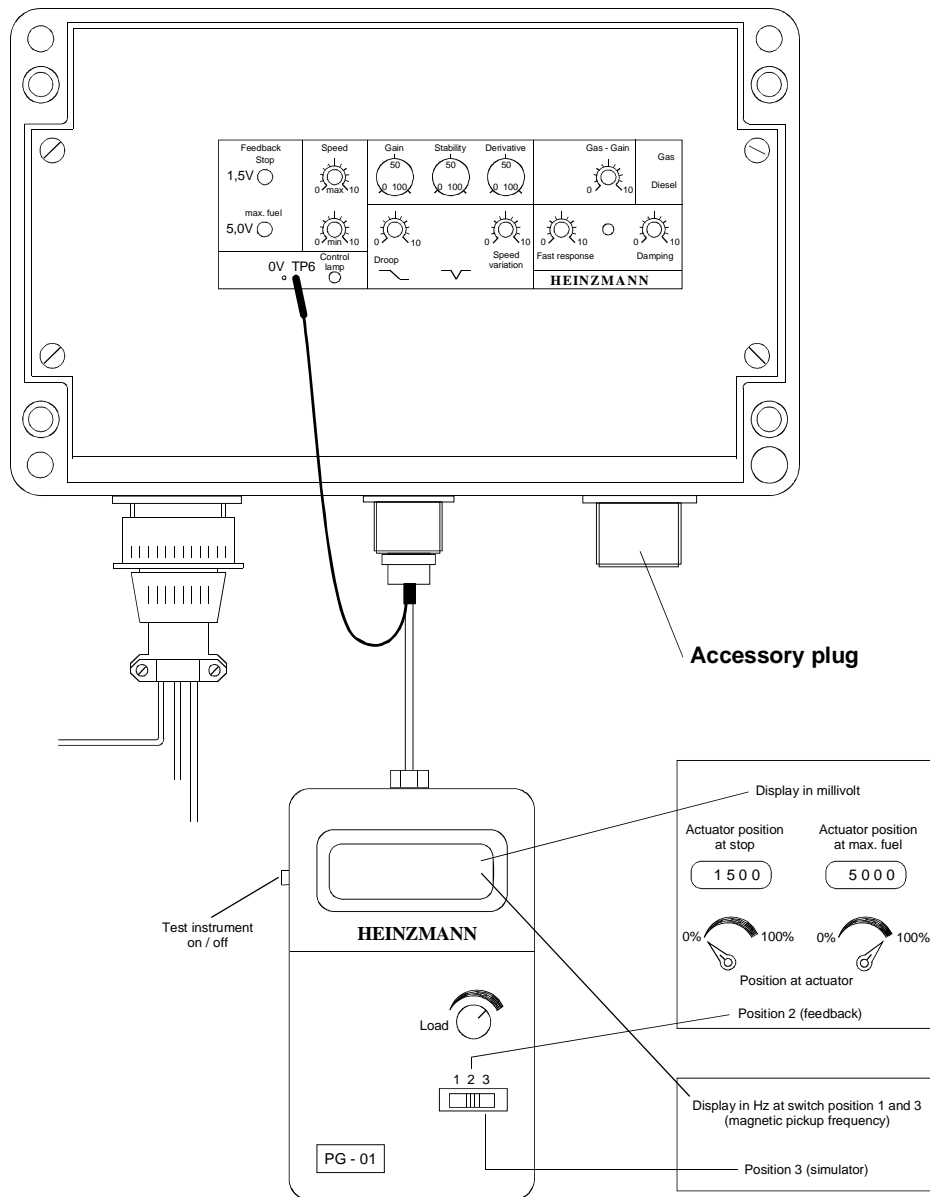


Figure 27: Connection of Test Instrument PG 01 with Control Unit

15.6 Set switch of test instrument to position 2.

Turn on power supply to control unit and turn on test instrument.



Note

The actuator will turn to stop with power for a time of 20 seconds after turning on the power supply.

1.5 V \pm 0.1 V in stop position with feedback potentiometer RF 1

5.0 V \pm 0.1 V at max. fuel injection with feedback potentiometer RF 2

For this adjustment, set the actuator on 100 % fuel injection by hand, disconnecting the control linkage if necessary. Check all adjustments, readjust if necessary.

All actuators and control units are matching and are interchangeable if required, so that only feedback adjustment may be necessary in exceptions.

15.7	External Setpoint Potentiometer SW ...	↶ to the stop
	Gain	to position 3
	Stability	to position 3
	Derivative	↶ to the stop
	Gas Gain	↶ to the stop
	Diesel/Gas selektor with diesel engine	to diesel position
	Diesel/Gas selector with gas or gasoline engine	to gas position
	Min. speed with governor for genset	↶ to the stop
	other applications	to position 5
	Droop	↶ to the stop
	Speed variation	↶ to the stop
	Fast response	↶ to the stop
	Damping	↶ to the stop
	Droop switch	to position droop zero

15.8 Place test instrument PG 01 switch in position 3. Turn instrument off, then on again or carefully move regulating linkage. Test instrument will now simulate the engine.



Warning

The engine must not be started during testing, otherwise it will overspeed!

Adjust frequency with the "max. speed" potentiometer on the control unit. Frequency must be approx. 2 % above rated speed.

15.9. Turn external setpoint potentiometer counterclockwise ↶ to the stop and adjust min. frequency with "min. speed" potentiometer if necessary. Turn external SW ... to maximum and check upper value. SW ...in mid way.

15.10 Remove test instrument and connect magnetic pickup cable



Warning

Overspeed protection must be connected and tested. Prior to engine start!

Start engine and bring speed up to rated value using SW ...

15.11 Turn stability counterclockwise ↶ to the stop

Gain turn clockwise ↷ until unstable, then counterclockwise ↶ until stable

Stability turn clockwise ↷ until unstable, then counterclockwise ↶ until stable

Derivative turn clockwise ↷ until unstable, then counterclockwise ↶ until stable

15.12 If there is governor linkage flutter, turn damping potentiometer clockwise ↷ to eliminate flutter. If fast response on change of load is desired, turn fast response potentiometer slowly clockwise ↷ until the LED between the damping potentiometers lights on, then counterclockwise ↶ until it goes off again (also see 15.16.2 within this context).



Warning

Never attempt to electrically compensate mechanical errors e.g. friction or vibration at the actuator caused by weak brackets. (Potentiometer gain must not be at 100 % stop)

15.13 Gas-gain adjustment

The governor systems E 6 up to E 10 have the ability to change their dynamic gain for gas engine applications when the diesel gas switch is changed to the gas position. Two distinct gains can be adjusted to compensate the nonlinearity of the throttle valve and to increase the dynamic in higher power levels. The first gain is that of the basic governor and is adjusted to a value for stability with a no load rated speed engine. The break point at which the gas gain comes in, is at about 35 % to 45 % fuel indicated at the actuator pointer. When 50% load or more is applied to the engine, adjust the gas gain for optimum results.

Load engine with approx. 60% of load and turn gas- gain clockwise ↷ until engine speed goes up and down, then turn counterclockwise ↶ to stability.

15.14 Turn setpoint potentiometer counterclockwise ↶ and adjust min. operating speed using min. speed potentiometer. Check motor over entire speed and load range and readjust governor if necessary.

15.15 Droop Adjustment - if necessary

$$X_p = \frac{n_o - n_v}{n_v} * 100 \%$$

$$X_p = \text{Droop in } \%$$

$$n_o = \text{No load speed}$$

$$n_v = \text{Full load speed}$$

Example:

$$n_o = 1560 \text{ 1/min}$$

$$n_v = 1500 \text{ 1/min}$$

$$X_p = \frac{1560 - 1500}{1500} * 100 \% = 4 \%$$

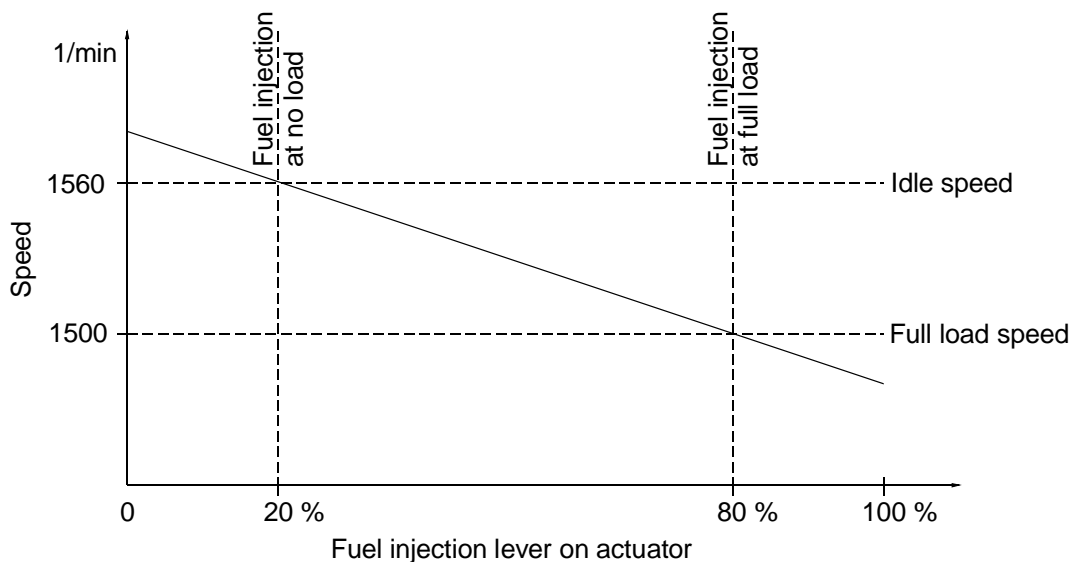


Figure 28: Droop

Droop- switch in position droop

Droop- potentiometer in position 8

Connect test instrument PG 01

Prior to making the droop adjustment, the fuel injection levels at no load and full load should be known. If these values are not known, for purposes of approximation the following values are assumed. No load position of engine at 20 % fuel injection on actuator and full load position of engine at 80 % fuel injection on actuator

Adjust actuator to 80 % fuel injection using test instrument and adjust full load frequency using setpoint potentiometer SW ... Adjust 20 % fuel injection with test instrument and read no load frequency.

If no load frequency does not correspond to the rated value, slightly adjust droop potentiometer (by approx. $\frac{1}{4}$ or $\frac{1}{2}$ mark) and restart adjustment (see last paragraph).

The droop adjustment is followed by the max. frequency adjustment in accordance with **15.8**.

If a system is to be operated with and without droop as desired, then an external droop potentiometer and a two-way switch are required. In this case, the speed may be adjusted in the zero droop position using the alignment potentiometer, so that the changeover e.g. at no load does not result in a speed change. The droop switch in the control unit must be always in the zero droop position during this operation.

15.16. Control Lamps

15.16.1 Control Lamps below the Speed Potentiometers

The electronic HEINZMANN- governors are equipped with a device that prevents the actuator from receiving power when the engine is stationary and the governor is turned on. The actuator is switched on at a speed below the starting speed. This state is indicated on the E 6 up to E 10 governors with a control lamp which is on while the engine is stationary and the governor is on, and which goes off below starting speed when the engine is started.

15.16.2 Control Lamp between Fast Response and Damping Potentiometers

In case of governor linkage flutter, e.g. when causing a small movement every time a diesel engine ignites at low speeds, the entire system can be dampened using the damping potentiometer, which will also stabilize the linkage (refer **15.12**).

This will, however, result in considerably poorer response during load changes. The fast response potentiometer allows setting a speed band for which the damping is effective. The damping is turned off outside this speed band, resulting in faster response. With the aid of the control lamp, the governor can be adjusted to the speed band very easily (refer **15.12**) The control lamp is on outside the speed band, inside the speed band it is off. It is therefore quite normal for the control lamp to go on and off or flicker during operation.

15.17 Governor Adjustment without HEINZMANN Test Unit

a) Feedback

Connect multimeter with 10 V - range on TP 6 and 0V and adjust feedback according to **15.6**.

b) Frequency Adjustment

If the frequency is stated on delivery, the control unit will be already adjusted to operation frequency in the factory and noted on the type label.

c) In case of a new adjustment one has to take action as follows:

External setpoint potentiometer counterclockwise ↺ to the stop

Turn potentiometer "max. speed" counterclockwise ↺ 20 revolutions

Turn potentiometer "min. speed" counterclockwise ↺ to the stop

Start engine (**Overspeed-protection has to be safeguarded!**)

If the motor does not start, turn setpoint potentiometer clockwise ↻ until the engine starts running; If necessary turn pot. "max. speed" clockwise ↻

Turn external setpoint potentiometer clockwise ↻ to the stop

Adjust with pot. "max. speed" the max. speed

Turn external setpoint potentiometer counterclockwise ↺ to the stop

Adjust with pot. "min. speed" the min. speed

Control high and low range and if necessary adjust

For further controls see **15.11**.

If a droop is necessary the adjustment will be made by load intrusion.

16 Accessories

A series of accessories, e.g. load sharing unit, load measuring unit, load control unit, synchronizer, etc. are available for the basic system.

These accessories are described in separate manuals.

17 Governors for No Brake Systems

17.1 General

In no brake systems the generator is driven by an electric motor. If mains failure occurs the combustion engine is connected and is brought up to the operation speed and supplies the power. From the time of the mains failure until the time of power supply by the combustion engine, the energy is taken from a centrifugal storage mass. Due to the high inertia in the system a normal governor cannot be used.

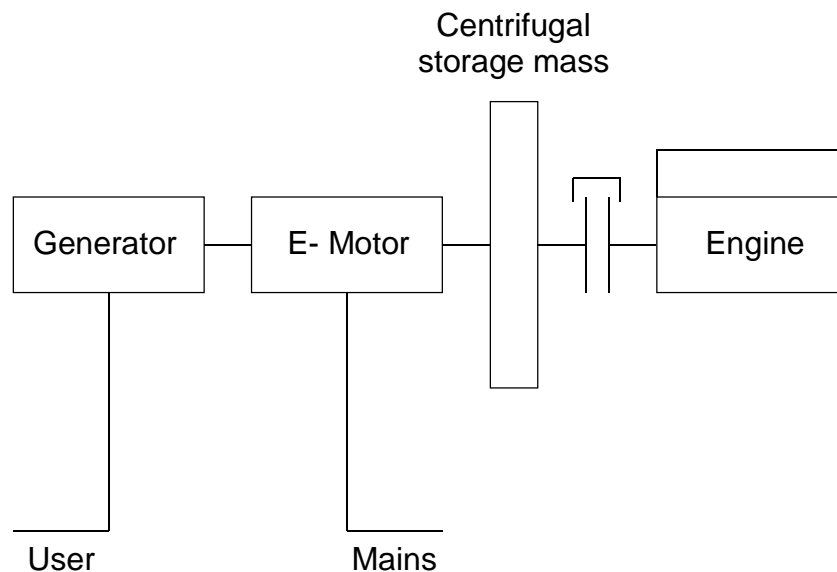


Figure 29: No Break System

A special high sensitivity HEINZMANN electronic governor can be supplied for this duty that is:

for governor E 16	KG 16 - 05 - SB
for governor E 30	KG 30 - 05 - SB
for governor E 40	KG 40 - 05 - SB

For after- cooling operation (engine without additional centrifugal mass) the governor must be adapted to these conditions. For this, the governor is switched to a higher droop when the clutch opens in order to achieve stable conditions also in this mode of operation.

If overspeed must be avoided during upspeeding the whole plant then a higher droop will be necessary for this mode of operation as well. The switching to zero droop or smaller droop is effected just before reaching nominal speed. The upspeeding procedure of the engine must be done with zero droop or droop less than 1 %.

For back synchronisation to mains the HEINZMANN synchronizer unit SG 02 - SB is available.

17.2 Electrical Connection

The electrical connection is done according to figures 14 resp. 15. The potentiometer between E₃ and F₃ is not applicable and is replaced by droop constant at approx. 8 - 10 %.

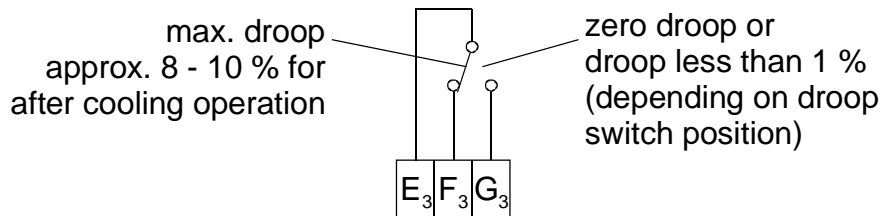


Figure 30: Droop Switch at No Break System Application

The switch is automatically switched by the clutch.

17.3 Setting of No Brake Systems with Diesel Engines

17.3.1 Basic setting according to 15.1 up to 15.4

17.3.2. External Setpoint Potentiometer SW ...

Gain	to middle position
Stability	to middle position
Derivative	↶ to the stop
Gas Gain	↶ to the stop
Diesel/Gas selektor	↶ to the stop
Min. speed	to diesel position
Speed variation	↶ to the stop
Fast response	↶ to the stop
Damping	↶ to the stop
Droop switch	to desired position
Droop potentiometer	
Operation with droop	to middle position
Operation with zero droop	↶ to the stop



Warning

Be prepared to use emergency stop if necessary when starting the engine!

17.3.3 Start engine with opened clutch

Set the speed with the external setpoint potentiometer and eventually the “max. speed“ potentiometer in the control unit which is approx. 3% higher than the nominal speed.

17.3.4 Upspeeding of whole plant

Readjust the nominal speed with the speed adjusting potentiometer

Gain turn clockwise ↻ until unstable, then counterclockwise ↻ until stable

Stability turn clockwise ↻ until unstable, then counterclockwise ↻ until stable

Deriv. turn clockwise ↻ until unstable, then counterclockwise ↻ until stable

If no instability is occurring at a potentiometer then it stays at the ↻ stop.

17.3.5 Loading of engine

Set droop potentiometer during droop operation. Readjust Gain and stability if necessary.

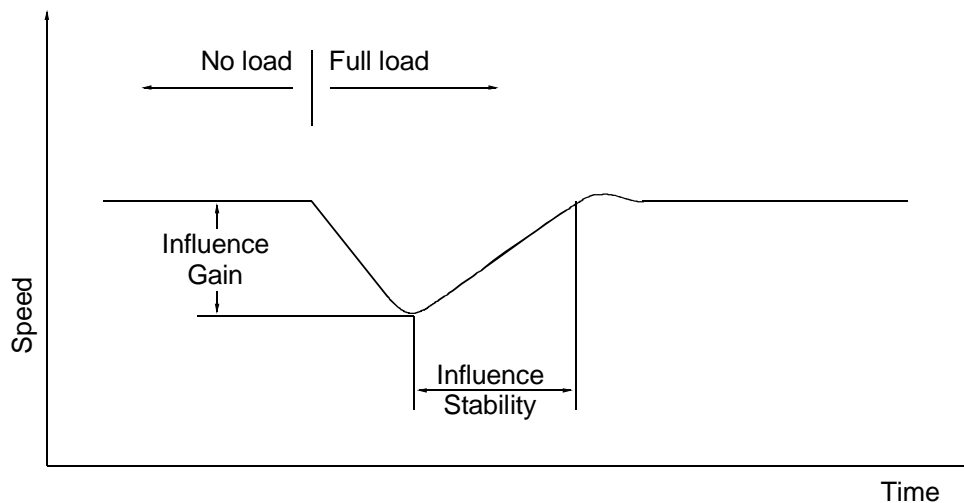


Figure 31: Influence of Dynamic Parameters

17.4 Notice Concerning the Bench Testing of the Engine

During bench testing of the engine, e.g. on the water brake, stable condition can only be achieved in operation position “after- cooling operation“.

18 Troubleshooting

Symptoms	Possible Causes
<p>Governor does not open on starting</p>	<p>No signal from magnetic pickup</p> <p>Excessive pickup clearance (approx. 0,5 mm - 0,8 mm)</p> <p>Check resistance at unscrewed cable socket of control unit A₂/B₂ (approx. 52 Ohm)</p> <p>Check starting speed voltage at unscrewed cable socket of control unit A₂/B₂ (approx. 0.5 V AC)</p> <p>Wiring fault</p> <p>Magnetic pickup defective</p> <p>Control lamp must be lit when power supply is on and must go out from starting frequency upwards.</p> <p>Setpoint potentiometer connection wrong or incomplete</p> <p>Check resistance at unscrewed cable socket I of control unit</p> <p>A/C = 5 kOhm, A/B and B/C = 0 to 5 kOhm</p> <p>Setpoint potentiometer, potentiometer “max. speed“ or potentiometer “min. speed“ settings too low</p> <p>Wiring fault in harness</p> <p>Shutdown switch on</p> <p>Supply voltage inadequate or poles reversed</p> <p>No DC voltage at control unit</p> <p>Actuator impeded or linkage adjusted wrongly</p> <p>Actuator defective</p> <p>Check resistance at terminals B/C on actuator (approx. 2 Ohm)</p> <p>Check feedback voltage at TP6 (1.5 - 5 V)</p> <p>Control unit defective</p>

Symptoms	Possible Causes
Governor moves to maximum fuel when power supply is on	Wiring fault in harness Faults in magnetic pickup cable Check shielding Control unit defective
Engine overspeeds on starting	Potentiometer “max. speed“ setting too high Excessive magnetic pickup clearance; only a proportion of gear- teeth recorded Poor contact in magnetic pickup line Linkage cannot move freely Feedback voltage incorrectly adjusted Actuator or control unit defective If the actuator applies effort on one side only, the fault is the control unit
Governor unstable	Faults in magnetic pickup cable Check shielding Faults in setpoint potentiometer cable Check shielding Load fluctuations Faults in setpoint signal, e.g. control of a motor potentiometer or setpoint by external voltage Supply voltage too low Poor electrical contact Play or excessive friction in linkage Feedback voltage not adjusted properly Governor adjusted incorrectly In case of carburetor and gas engines, check ignition and spark plugs

Symptoms	Possible Causes
Reduced speed under load	Droop selector switch not in zero position Actuator on 100% fuel stop linkage adjusted wrongly Engine is overloaded In case of gas engines, poor fuel quality
Governor linkage is hunting	Residual ripple of supply voltage is too high Faults at the shieldings Poor setpoint signal

19 Order Specification

When ordering, please note the individual units:

control unit	KG ...
actuator	StG ...
lever arm	RH 16 - 01
magnetic pickup	IA ...
setpoint adjuster	SW ...

Harness with Cable Length:

L1	=	control unit	-	power supply	=	cm
L2	=	control unit	-	actuator	=	cm
L3	=	control unit	-	setpoint adjuster	=	cm
L4	=	control unit	-	magnetic pickup	=	cm
L5	=	control unit	-	=	cm

Further details:

Control unit and harness with or without EMC

supply voltage V
number of teeth
speed	

Note:

As a basic system you can order:

control unit	KG 16 - 04, KG 30 - 04 or KG 40 - 04
actuator	StG 16 - 01, StG 30 - 01 or StG 40 - 01
magnetic pickup	IA 02 - 76
setpoint potentiometer	SW 01 - 1 (1- turn)

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21 Order Specifications for Manuals

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