Product Manual

www.vdo.com

E-Gas® compact

Cruise control, speed limitation and speed control

Overview of Chapter

1. Description of Functions

Contents **Page**

1. Description of Functions

1.1 Introduction

The VDO E-Gas® compact is an electronic drive-pedal control. It has several additional vehicle speed and engine-speed functions.
Perfect functioning of the VDO E-Gas® compact depends essentially on the quality of the installation.

Therefore please read these installation instructions carefully.
(Keep these installation instructions). We will be pleased to help you, if you have questions or problems.

1.1.1 Requirements for Installation

- You have participated in a training for VDO E-Gas® compact.
- The on-board vehicle network runs on 12V/24V, minus grounded.
- You have the testing equipment for adjusting, operation and fault diagnosis.
- You have the vehicle type specific knowledge of the required drive pedal control safety functions.

It is not allowed to install the system together with the electronic controller 412-413-011-001 in on-road vehicles with automatic gearbox.

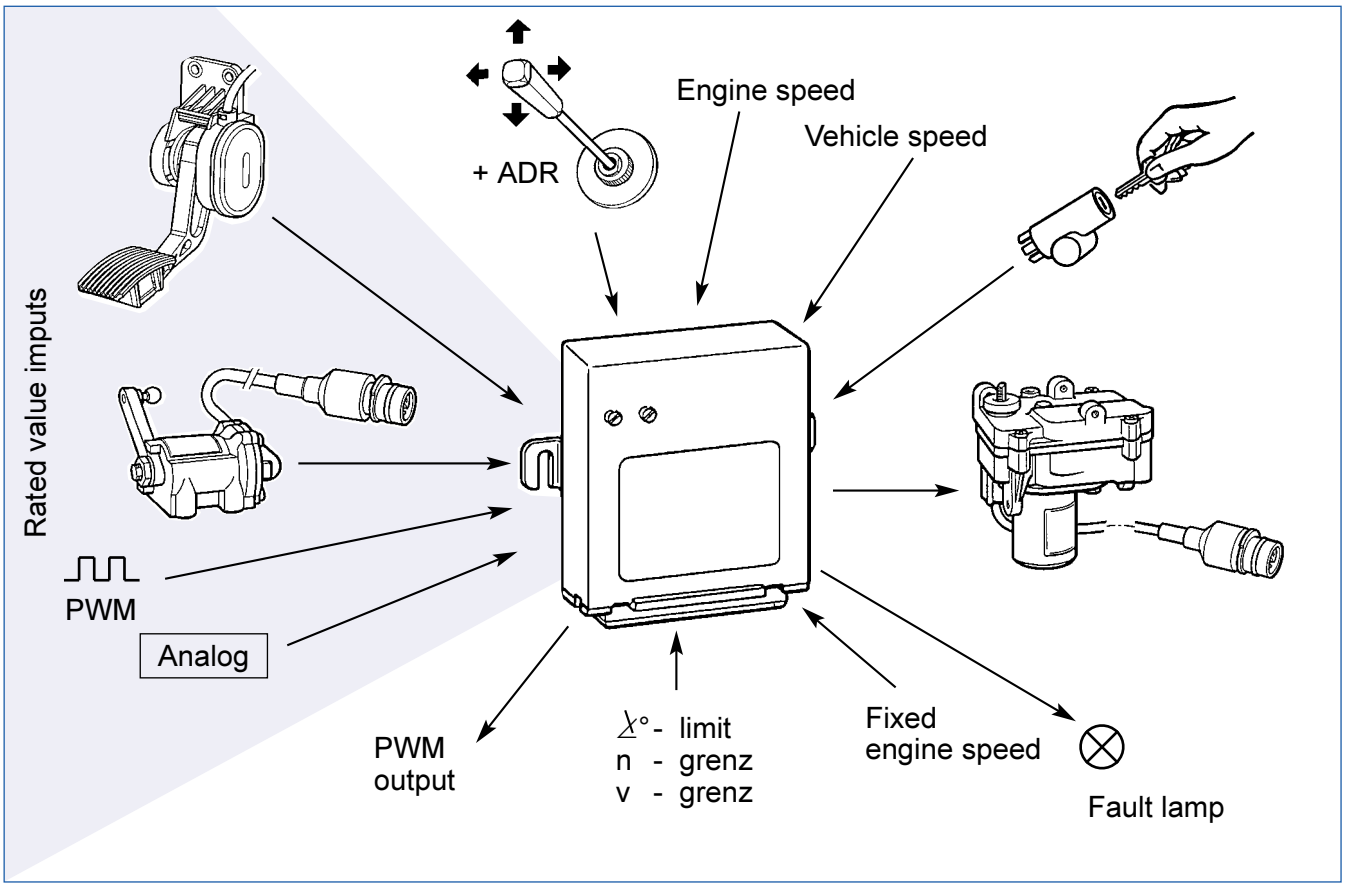
1.1.2 Explanation of Symbols

Texts marked with this symbol contain important safety instructions to prevent injuries, material or environmental damages.

This symbol indicates texts containing comments, notes or tips.

1. Description of Functions

1.1.3 System Overview



1.1.4 Safety Aspects

VDO E-Gas compact is designed for special-vehicle applications.
When installing the system, the safety regulations specified in this section have to be observed.

If in the case of special applications the safety regulations are not to be adhered to in their entirety, an alternative safety concept is to be worked out and to be approved by a competent authority (manufacturer, Technical Control Board/TÜV etc.).

The electronic controller 412-413-011-002 is equipped with a 2nd watchdog system. The watchdog interrupts the actuator clutch of the actuator in case of errors.

1. Description of Functions

VDO E-Gas® compact is a system for communicating accelerator(gas)-pedal positions to the injection-pump lever. For use as an accelerator-pedal-position sensor various systems configurations can be designed. In addition, this systems offers a variety of RPM and speed functions superimposed on the communication of the accelerator road-pedal positions.

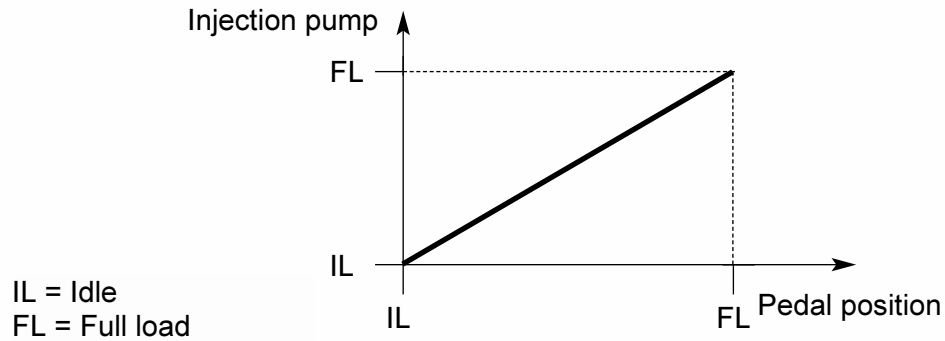
The system is in accordance with EU Directives
– 95/54 EMC
– 92/24 Speed Limitation

The following system functions can be configured:
– Road-speed limitation
– Engine-speed limitation
– Cruise control
– Special road-speed limitation
– Special engine-speed limitation
– Position limiting
– Working RPM with a fixed set point
– Working RPM with a variable set point
– Working RPM with four fixed set points
(no E-Gas accelerator-pedal function possible)
– Fault indication and fault indication command
– Diagnosis via PC

It is not allowed to install the system together with the electronic controller 412-413-011-001 in on-road vehicles with automatic gearbox.

1.2 Basic Functions

1.2.1 Follower Control (Drive Pedal Transmission)

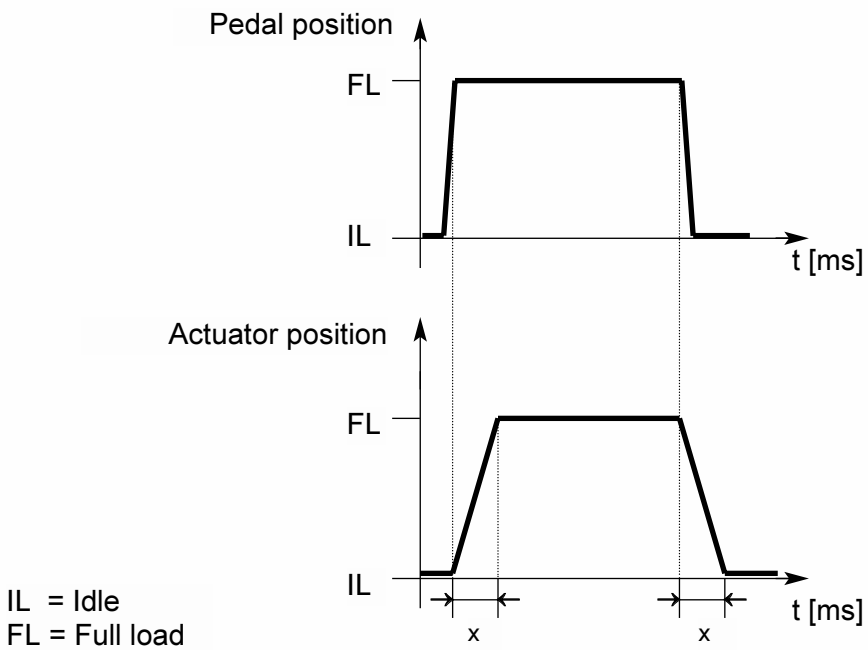


The linear transmission of the set-point value from the set-point sensor, the accelerator pedal unit or the external set-point specification is called “follower control”.
The set-point sensor or the accelerator-pedal unit in the vehicle is controlled by the driver using the accelerator pedal.
Control by a separate electronic control system (external set-point specification) is an alternative.
The actuator adjusts the injection-pump lever according to this set-point.

The direction of rotation of the actuator can be programmed with a special diagnostic software.

1. Description of Functions

1.2 Basic Functions



A linear transmission, however, is not feasible under practical conditions. Depending on the actuator the time delay is between 250ms and 2s. This means that the actuator attains the condition of the set-point specification at a later time.

24V actuator 408-422-006-001 ➠ X ~ 750ms approx.
12V actuator 408-221-005-001 ➠ X < 2s approx.
24V actuator 408-411-005-013 ➠ X ~ 250ms approx.
24V actuator 408-411-005-013 ➠ X ~ 500ms approx. (operating voltage 12V)

The following parameters can be configured as input variables:

- Set-point sender (Analog)
- Pedal unit (two PWM outputs)
- External PWM signal 10%-90%, 200-400Hz
- External analog 0 Volt -5 Volt signal
- Set-point sensor and external PWM signal (external PWM signal reduces position)
- Set-point sensor and external PWM signal (external PWM signal increases position)
- Pedal unit with two PWM outputs and external analog signal (external analog signal reduces speed)
- Pedal unit with two PWM outputs and external analog signal (external analog signal increases position)

In the case of a configuration with two input signals, both signals having the same direction of action, the second input signal will only be taken into consideration at speeds below = 0 km/h.
If 2 input signals are connected, you have to ensure that only 1 signal is being used.

(PWM signal = Pulse-Width-Modulated Signal)

1. Description of Functions

1.2 Basic Functions

1.2.2 Engine Idle Increase

Starting from the absolute idle position the lower idle stop can be raised by a push-button (such as S+B) or lowered by a push-button (such as S-B) when the vehicle is stationary. No adjustment is possible at speeds above 0 km/h and active working-speed controller. For safety reasons, the maximum adjustment of the entire actuator-adjustment range must be limited to allow a specified engine-speed change only. The upper limit is programmed in the EEPROM. The diagnosis software allows setting the maximum adjustment angle between 0% and 100%.

The response time of the idle increase can be set in a range from 1s to 60s.

The actuator clutch opens when the brake is applied; in this case the mechanical idle stop prevails (drop of the idle speed).

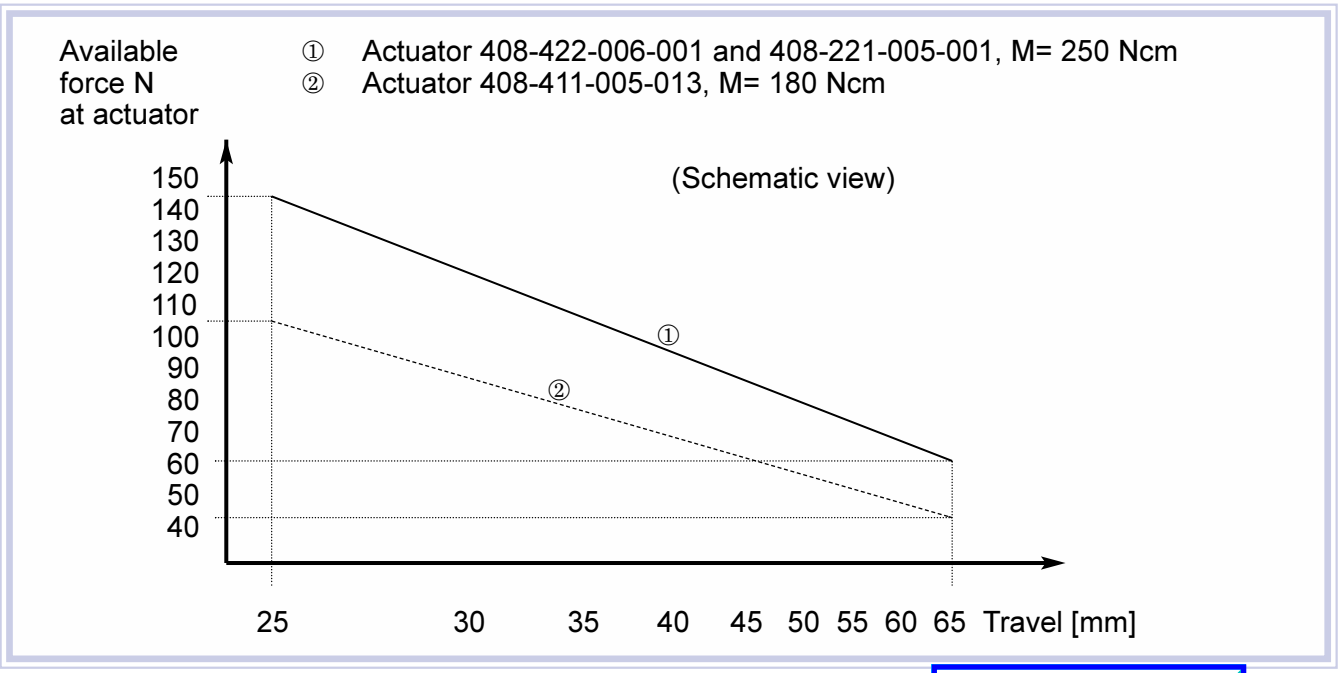
1.2.3 Idle and Full-Load Positions

Electronic controller 412-413-011-001:
The accelerator-pedal unit, i.e. the set-point sensor are being adjusted automatically. After having installed the sender and started the ignition, the idle-speed value will after 5 seconds be stored in EEPROM as the lower stop. Thereafter the accelerator pedal will have to be kept at the full-load position for more than 5 seconds. The corresponding value will also be stored. When the pedal unit is replaced, the fault memory must be erased in order to erase the stored values.
Electronic controller 412-413-011-002:
Actuator position is set at 100% via the test software menu function test, sub-menu outputs. Leave pedal unit or set-point sensor 5 seconds in idle position and then leave 5 seconds in full position.

If the pedal unit or set-point sensor are being exchanged, the fault memory must be erased by the test software to delete the stored data of the set-point sensor or pedal unit.
Mechanical adjustment is required to adjust the actuator travel to the travel of the injection-pump lever. The adjustment is described in the installation instructions.

1.2.4 Actuator Torques

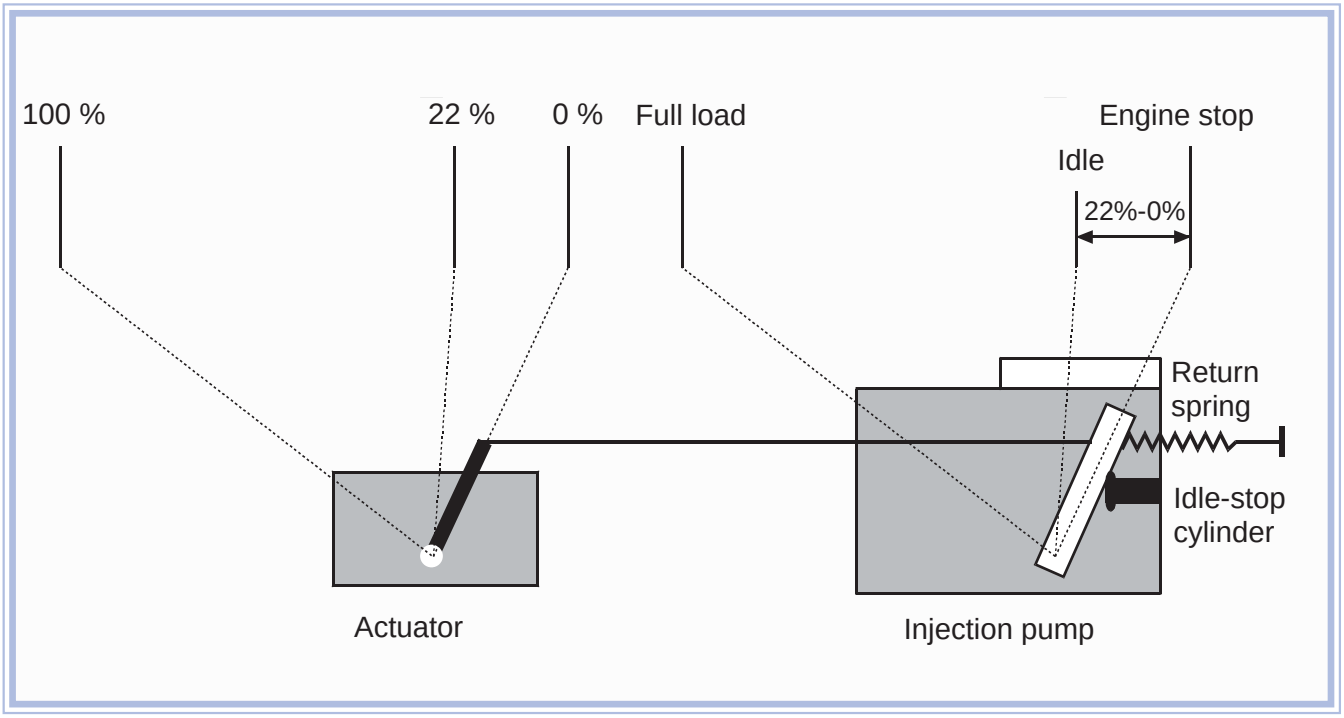
The actuators used for VDO E-Gas® compact provide the following forces; these should be taken into consideration when designing the mechanical linkage.



1. Description of Functions

1.2 Basic Functions

1.2.5 Actuator Idle Point for Single-Lever Injection Pumps



In the case of single-lever pumps the engine-stop function is obtained with the same lever as the idle and the full load position.
The engine stop function can be obtained by a return spring.
For these pumps the electrical idle position can be adjusted between 0 and 22% to allow for the mechanical engine stop compensation in the travel of the actuator.
In this case the actuator with its linkage provides the mechanical engine-stop function (if provided).

An idle-stop cylinder releasing the engine-stop position must be provided to prevent stopping the engine when applying the brake and opening the actuator coupling.
The adjustment is described in the installation instructions.

1.2.6 Output actuator position

The electronic controller sends at pin 10 the following output:
selective output, 10mA at U_{Sat} < 2.5V,
Inner to high= 15KΩ to U_{Batt},
Inner C to ground = 2nF.
Frequency = 300Hz

PWM 10% = idle position
PWM 90% = full load position

With the exception of external PWM:
PWM 90% = idle postition
PWM 10% = full load position

or

PWM 16% = idle position (SAE J 1843)
PWM 82.5% = full load position (SAE J 1843)

PWM 82.5% = idle position (SAE J 1843)
PWM 16% = full load position (SAE J 1843)

The interface according to SAE J 1843 can only be downloaded by a special data set in the electronic controller.
(Only when connected with the electronic controller 412-413-011-002!).

1. Description of Functions

1.3 Additional Functions

1.3.1 tempostat® Function

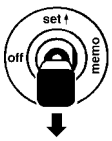
The current vehicle speed can be kept constant with the tempostat® function. No control of the drive pedal is needed, driving comfort is increased.

1. set↑: Switch the tempostat® function on.
The desired vehicle speed can be attained and stabilized by several methods.

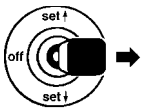
1. Accelerate with the drive pedal and move the selector lever to "set↑" position when the desired speed is attained.
2. In the lower speed range, above the v_{min} threshold (30km/h), hold the selector lever in "set↑" position. The vehicle accelerates until the selector lever is released. The attained speed is stored.

The controlled speed can be exceeded by the driver with the tempostat® activated. Push the drive pedal until the programmed maximum speed is attained.

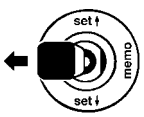
2. set↓: Hold the selector lever in "set↓" position to decrease the speed setting.
Release the lever when the desired speed is attained. The attained speed is stored in the electronic controller.



3. memo: The electronic controller of the system has been designed to memorize the last stored speed value after a brake or clutch actuation. This speed can be resumed at any time if the vehicle speed exceeds the v_{min} threshold by pushing the selector lever to "memo" position.
In this case the acceleration is controlled for economic operation. To prevent excessive engine speeds, "memo" should only be called in the gear previously used to drive at the stored speed.
The speed value is also stored when the selector lever is pushed to "off" position, and can be resumed again.
The memory of the electronic controller is erased when the engine is stopped (ignition off). In this case the desired speed must be stored again.



4. off: Pushing the selector lever to "off" position ends the controlled drive phase. The system will also cut out when the brake is applied, or when the clutch is disengaged on vehicles with manual shift transmission. It will also cut out if the deceleration exceeds 2.0m/s² (see also page 1 - 9, note 4).



Tip-up, Tip-down: Short tipping of the selector lever in "set↑" direction increases the vehicle speed by 1km/h, tipping in "set↓" direction decreases the vehicle speed by 1km/h. With this function the set-point value can be offset by 5km/h max.

1. Description of Functions

1.3 Additional Functions

1.3.2 Vehicle Speed Limitations

Three different speed limitations can be implemented with VDO E-Gas® compact:

- Maximum speed limitation: Programmed in the electronic controller, always active (range 30km/h to 127.5km/h).
- Variable speed limitation: Limitation of the current vehicle speed by actuation of the S-B push-button on the tempostat® control lever. (Range 30km/h to maximum speed limitation).
- Special speed limitation: Programmed in the electronic controller, active when, for instance, a flashing beacon is switched on (pin 6). (Range 2km/h to maximum speed limitation).

Note 1: Only one single input is available for special speed limitation, actuator-position limitation and special engine-speed limitation.
These three functions depend on each other. The most severe limitation applies to actuator-control-lever positioning if valid values are programmed for all functions.

Note 2: In the case of gearboxes without synchronization, an internal clutch function guarantees that the gearbox can be shifted by a short drive-pedal actuation, even with an active speed limitation.
A constant relation between engine speed and vehicle speed corresponds to an engaged gear. The clutch has been disengaged if this ratio changes. The electronic controller determines the change of the ratio. The actuator is controlled again by the drive pedal if the change exceeds a threshold value or if the engine speed drops below 900rpm.
This function can be activated or deactivated in the electronic controller.

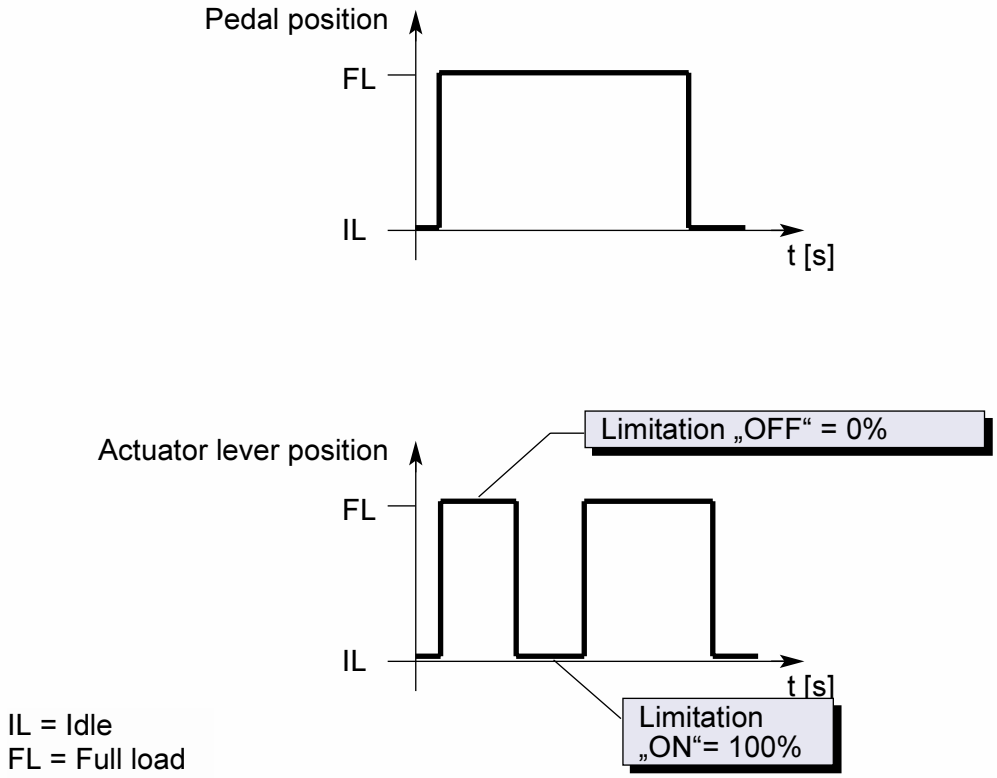
Note 3: If only the road speed signal is used and not the rpm signal, the road speed signal must be connected to pin 9 (rpm input) and pin 21 because the rpm input is being monitored at road speeds > 25km/h.

Note 4: The speed signal is being monitored by the electronic controller.
If the delay of a vehicle is more than $2 m/s^2$ and there is no active brake signal, an arror is detected, the tempostat® is switched off and blocked till the next ignition reset.
In special cases, this monitoring function can be switched off by downloading a special data set.

1. Description of Functions

1.3 Additional Functions

1.3.3 Actuator Travel Limitation



Specific operating conditions risking injuries or damages to machines can be prevented by adequate programming of the electronic controller. Switches, terminal 15 at pin 6 (such as temperature or pressure switches) determine auxiliary set-point values. The electronic controller responds by a corresponding limitation of the engine power. Examples are low oil pressure, excessive temperatures or low oil levels in engines or in the hydraulic system.

1. Description of Functions

1.3 Additional Functions

1.3.4 Engine Speed Limitations

Two different engine speed limitation can be obtained with the VDO E-Gas® compact:

- Maximum engine speed limitation: Programmed in the electronic controller, always active, range: idle speed to 8000rpm.
- Special engine speed limitation: Programmed in the electronic controller, active when, for instance, the power take-off is switched on (pin 6), range: idle speed to 32766rpm.

1.3.5 Engine Speed Controls / RPM Functions

Note:: The engine speed controls disregard drive pedal positions.

- Variable working speed control (PTO)
- Fixed engine speed contol
- Only fixed engine speed control

Variable working speed control can be called up if a maximum RPM limiting is being programmed. The following requirements have to be observed:

Vehicle is stationary (v = 0km/h)
Brake is not actuated
Fault lamp off
Engine speed > n_{min} (500RPM)
Input pin 6 to terminal 15
Input pin 3 to ground (clutch switch)

Working RPM is being activated by actuation of the push button S+B; the current RPM is set as nominal value. Via push buttons S+B and S-B RPM can be fixed between minimum and programmed maximum RPM. Working RPM will be deactivated via the off-switch and if activating requirements are not observed. Via memo switch, RPM can be activated again with the last RPM value. When activating the memo switch longer than 4 seconds, RPM will be stored in the electronic regulator and can be called up when the system is being activated again.

- Fixed RPM control

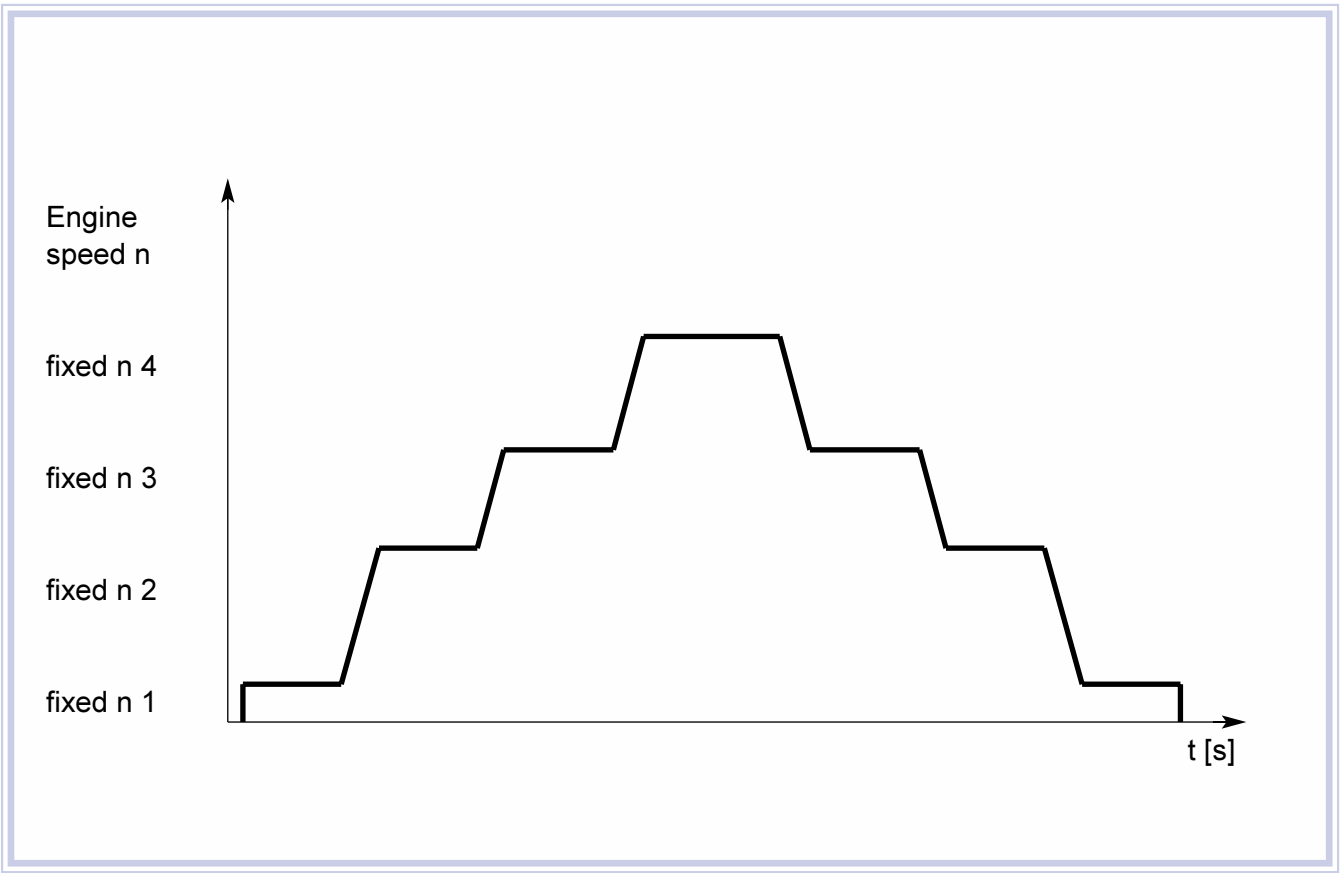
Activating requirements are the same as with the variable working RPM control.

Fixed RPM control is activated via input pin 6 to terminal 15.
RPM is being controlled according to programming.
Fixed RPM control is deactivated via imput pin 6 and 4.

1. Description of Functions

1.3 Additional Functions

- Only fixed engine speed control (no follower control)



If the electronic is conditioned to this function the system operates as a simple engine speed controller (without set-point sender or pedal unit). After ingition is activated the actuator lever has to move to a pre-programmed start position that corresponds to a higher engine speed than n fixed 1. Activating pin 22 ensures that the engine speed control is only enabled if, for instance, an oil pressure is detected (cut off if pin 22 or 3 is not connected to ground).
Time-out after first activation = 7s
Time-out in operation = 3s

The amplificaton of the electronic controller is adjustable separately for all fixed engine speeds. An additional adjustable amplification (effects all fixed engine speeds) can be activated throught pin 6 (for example if the engine is cold).

This adjustable amplification is active when Pin 6 is open.

The following conditions must be met:

None brake
Fault lamp not energized
Engine speed > n_{min}
Input Pin 22 and
Pin 3 to ground (time-out)
α° startposition > n fixed 1
(α° startposition only for n fixed 1 necessary!)

Pin 4	Pin 19	Pin 20	Engine speed
open/ground	open/ground	open/ground	n fixed 1
open/ground	open/ground	Ignition / +	n fixed 2
open/ground	Ignition / +	open/ground	n fixed 3
Ignition / +	open/ground	open/ground	n fixed 4

1. Description of Functions

1.4 Safety Functions

Fault analysis distinguishes between critical and non-critical faults.

Non-critical faults disable certain functions but guarantee limited operation of the system.
The fault lamp lights, the vehicle should be serviced.
Critical faults move the actuator lever to idle position or open the electrical clutch of the actuator.
At idle speed the vehicle can be removed from the emergency situation, service should be performed on the site.
The fault lamp lights.

The following faults are monitored by the system (1 = critical; 2 = noncritical)

• Voltage drops below minimum operating voltage	1
• Electronic failure (ROM, RAM, CPU tests)	1
• Vehicle speed signal fault	2
• Engine speed signal fault	2
• Fault of pedal unit	1 / 2
• Fault of set-point sensor	1
• Fault of external set-point specification by PWM signal	1
• Clutch switch failure	2
• tempostat® control lever failure	2
• Brake signal failure	2
• Fault of actuator potentiometer check back signal	1
• Fault of electric actuator motor	1
• Fault of actuator linkage	1 / 2
• Fault of actuator disconnect coupling check back signal	1
• Fault of electronic controller configuration data	1
• Fault on EEPROM access	1

The safety concept of VDO E-Gas® compact covers two areas:

- Internal check of the ECU (see above).
- Opening of the actuator clutch via the brake or cutting off the engine circuit via a relay (E-Gas II actuator).
- Opening the electrical clutch inside the actuator through the brake signal.
  It must be guaranteed, if the brake signal does not switching off the clutch at mailfunctioning, leads in to an uncritical operation condition.

1. Description of Functions

1.5 Spezification In/Output

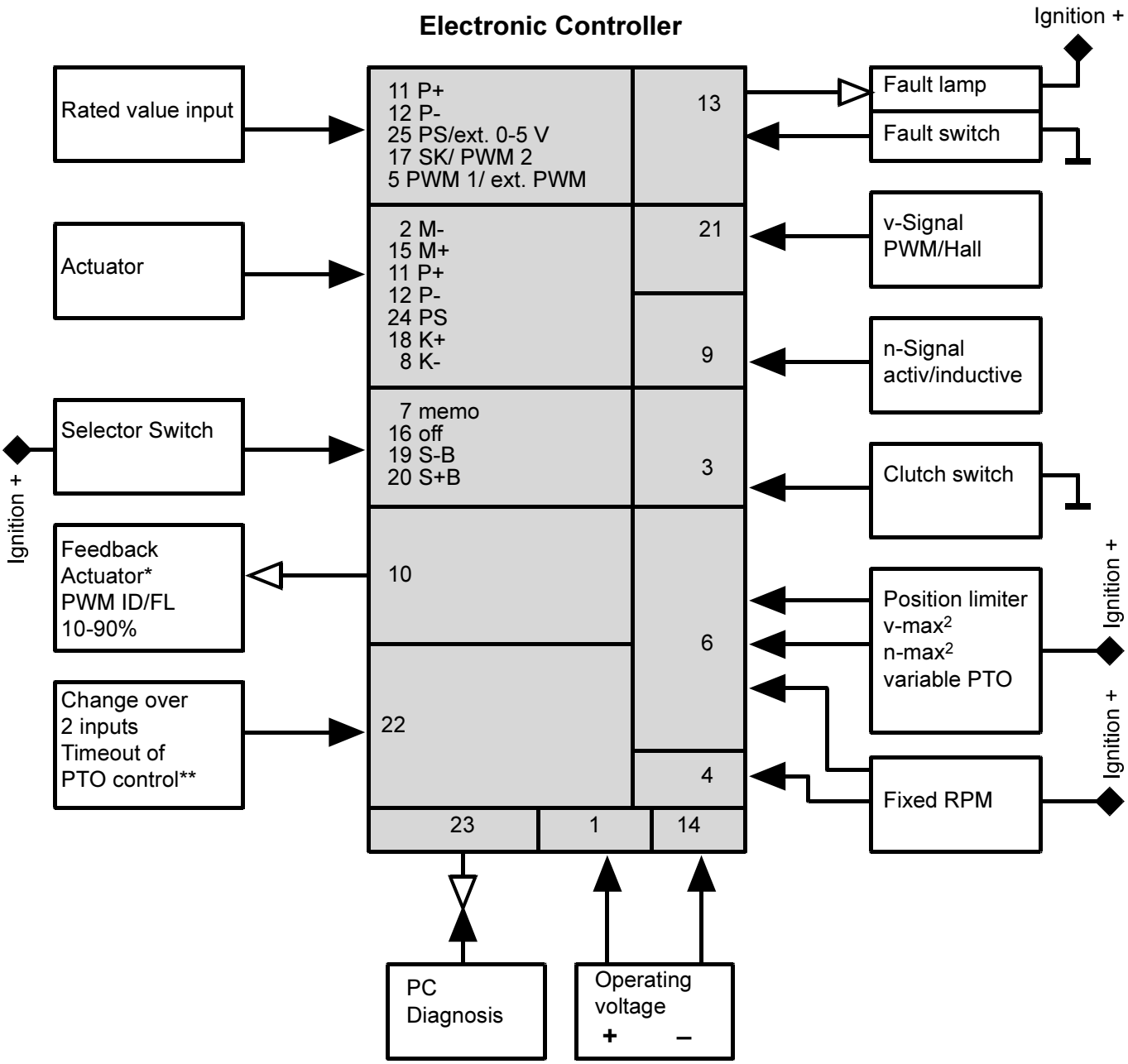
Pin	Function	Technical Data	Page
1	Operating voltage (+) Ignition	9.5V - 32V	1-16 3-16
2	Power supply (-) to actuator	generated from ECU (PWM: 1kHz)	1-16 3-16
3	tempostat off / PTO off. Pin 3 to ground (if road speed function is required through clutch switch)	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Switch to ground (NCC)	1-11 1-12 1-16 3-16
4	Fixed rpm (Pin 4 and Pin 6 to plus) Fixed rpm (n fixed 4)	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Treshold High > 8V Switch to battery (+ 12V / + 24V) (NOC)	1-11 1-12 1-16 3-16
5	PWM 1 Pedal unit connector Pedal unit Pin 2 or external PWM-Signal (pulse with modulated signal)	Treshold Low < 2.5V, Treshold High > 6.4V PWM1: Idle = 90%-74%, Full = 56%-26%, Input frequency 200Hz - 30% Ext. PWM: Idle = 90%, Full = 10%, Input frequency 200Hz - 10% to 400Hz + 10%	1-5 1-16 3-16
6	Actuator position limitation, special road speed limitation, special engine speed limitation and variable PTO (Pin 6 to plus)	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Treshold High > 8V Switch to battery (+ 12V / + 24V) (NOC)	1-9 1-10 1-11 1-16 3-16
7	Tempostat >MEMO<, variable PTO >MEMO<	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Treshold High > 8V Switch to battery (+ 12V / + 24V) (NOC)	1-8 1-16 3-16
8	Power supply - to actuator clutch via brake light or separate emergency switch	Treshold Low < 20% $U_{Battery}$ Treshold High > 80% $U_{Battery}$	1-8 1-16 3-16
9	Engine speed signal	On Resistor ca. 40kΩ, 27n F 10Hz < f < 10kHz — $10V_{SS}$ < V < $30V_{SS}$	
10	Actuator positon, PWM-signal	Selective Output, max. current against ground 10mA at U_{Sat} < 2.5V, Internal Resistance to HIGH 15kΩ against $U_{Battery}$, Internal capacity to ground ca. 2nF, Output frequency = 300Hz, 10% PWM = Idle (16% SAE J 1843) 90% PWM = Full position (82.5% SAE J 1843)	1-7 1-16 3-16
11	Potentiometer (+) power supply actuator and set point sensor	5V ± 0.25V to ground	1-16 3-16
12	Potentiometer (-), power supply actuator and set point sensor	1.9V - 2.1V ± 40mV to ground	1-16 3-16
13	Fault lamp and error code via Pin 13	On Resistor < 4Ω Off Resistor > 10kΩ U_{SAT} < 1.5V at I < 1.0A Error code: tip switch to ground	1-13 1-16 3-16 8-1 8-2

1. Description of Functions

Pin	Function	Technical Data	Page
14	Operating voltage (-) ground	Central ground	1-2 1-16 3-16
15	Power supply (+) to actuator	from ECU generated (PWM: 1kHz)	1-16 3-16
16	Tempostat >OFF< variable PTO >OFF<	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Treshold High > 8V Switch to battery (NCC)	1-8 1-16 3-16
17	PWM 2 Pedal unit connector Pedal unit Pin 4 or safety switch set point sensor (connector pin 7)	LOW Pegel < 2.5V, HIGH Pegel > 6.4V PWM 2: LL = 10%-26%, VL = 44%-74%, Output frequency 200Hz - 30% Ext. PWM: LL = 90%, VL = 10%, Output frequency 200Hz - 10% at 400Hz + 10%	1-16 3-16
18	power supply to actuator clutch from ECU generated	Power supply from ECU generated ($U_{Kl.\ 15}$ - 1.8V)	1-16 3-16
19	Tempostat retard (S-B), variable PTO retard (Tip-down), (Tip-down) idle increase retard, Fixed rpm (nfix 3)	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Treshold High > 8V Switch to battery (+ 12V / + 24V) (NOC)	1-6 1-8 1-12 1-16 3-16
20	Tempostat accelerate (S+B), variable PTO accelarate, Tip-up, idle increase accelerate Fixed rpm (nfix 2)	On Resistor < 10Ω Off Resistor > 20kΩ Treshold Low < 3V Treshold High > 8V Switch to battery (+ 12V / + 24V) (NOC)	1-6 1-8 1-12 1-16 3-16
21	Road speed signal	Low Signal < 1.5V High Signal > 6.0V Tacho: Internal Resistance LOW 1425Ω-2750Ω PWM Internal Resistance HIGH 2.7kΩ ± 50% C3 / B7 / ... Cable capacity < 2.2n F Hall sensor: Internal Resistance LOW < 4.0Ω Internal Resistance HIGH < 4.5Ω Cable capacity < 2.2n F	1-16 3-16
22	ECU only engine speed control (nfix 1) (e.g. oil pressure switch) or 2 set point sensor switch	Switch to ground (NOC)	1-12 1-16 3-16
23	Diagnosis part to PC/Interface (Diagnosis K-wire ISO-Norm)	Connection Interface E-Gas Input power supply LOW > 20% / U_{Batt} Input power supply HIGH > 80% / U_{Batt} Open Kollektor Pull-up Resistor at 24V: 1.0kΩ - 3.0kΩ Pull-up Resistor at 12V: 500Ω - 1.5kΩ Sinkfähigkeit at Low Output 35 mA	1-16 3-16
24	Actuator potentiometer feedback IPS	Actuator plug Pin 3	1-16 3-16
25	Set point sensor potentiometer nominal position External input 0V - 5V	Set point sensor plug Pin 3 (external set point analog 0V - 5V)	1-16 3-16

1. Description of Functions

1.6 Block diagram



* Input through external PWM
ID / FL 90-10% or 82,5 - 16%
** Opening electrical clutch after 3 sec.,
if pin 22 is deactivated

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1118*02

T y p g e n e h m i g u n g s b o g e n

EEC type-approval certificate

Benachrichtigung über die Typgenehmigung

für ein Bauteil gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 95/54/EG.

Communication concerning the type-approval

of a type of component with regard to Directive 72/245/EEC, as last amended by Directive 95/54/EC

Typgenehmigungsnummer: **e1*72/245*95/54*1118*02**
Type-approval No.

Grund für die Erweiterung - Reason for extension:
Anpassung von Schaltungen und Layouts für neue Fahrzeuganwendungen. Änderung des Herstellernamens.
Adaption of circuit diagrams and PCB layouts to new types of vehicles. Change of name of the manufacturer.

ABSCHNITT I

0.1. Fabrikmarke (Handelsname des Herstellers) -
Make (trade name of manufacturer):
Mannesmann VDO AG

0.2. Typ - Type
E-GAS Compact

Handelsbezeichnung(en) - general commercial description(s):

Elektronik E-Gas Compact	**412.413/011/???**
Stellglied	**408.422/006/??? (24 V)**
	408.221/005/??? (12 V)
	408.404/???/??? (24 V)
	408.211/004/??? (12 V)
	408.411/005/??? (24 V)
Sollwertgeber	**445.804.005/???**
Pedaleinheit	**445.803/???/???**

0.3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden
Means of identification of type, if marked on the component:
412.413/011/???

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1118*02

-2-

0.3.1. Anbringungsstelle dieser Merkmale -
Location of that Marking:
Klebeschild auf dem Gehäuse der Regelelektronik
stick-on-label on the housing of the control unit

0.5. Name und Anschrift des Herstellers -
Name and address of manufacturer:
Mannesmann VDO AG
D-60388 Frankfurt am Main

0.7. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des EG-Genehmigungszeichens - In the case of components and separate technical units, location and method of affixing of the EEC approval-mark:
Klebeschild auf dem Gehäuse der Regelelektronik
stick-on-label on the housing of the control unit

0.8. Anschrift(en) der Fertigungsstätte(n) - Address(es) of assembly plant(s):
Mannesmann VDO AG
D-61184 Karben (Regelelektroik / control unit)

Mannesmann VDO AG
D-36179 Bebra (Sollwertgeber und Stellglieder /
nominal value transmitter and setting device)

ABSCHNITT II
Section II

1. Zusätzliche Angaben (erforderlichenfalls): **siehe Anlage**
Additional information (where applicable): **see Appendix**

2. Für die Durchführung der Prüfungen zuständiger technischer Dienst -
Technical service responsible for carrying out the tests:
Verband Deutscher Elektrotechniker (VDE)
D-63069 Offenbach

3. Datum des Prüfprotokolls - Date of test report:
01.12.1999

4. Nummer des Prüfprotokolls - Number of test report:
12835-2003/A1N2

5. Gegebenenfalls Bemerkungen: **siehe Anlage**
Remarks (if any): **see Appendix**

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1118*02

-3-

6. Ort: **D-24932 Flensburg**
Place:

7. Datum: **11.01.2000**
Date:

8. Unterschrift: **Im Auftrag**
Signature:

Asmussen

KRAFTFAHRT-BUNDESAMT 18

9. Das Inhaltsverzeichnis der bei den zuständigen Behörden hinterlegten Typgenehmigungsunterlagen, die auf Antrag erhältlich sind, liegt bei.
The index to the information package lodged with the approval authority, which may be obtained on request is attached.

1. Anlage zum EWG-Typgenehmigungsbogen
   Appendix to the EEC type-approval certificate

2. Inhaltsverzeichnis zu den Beschreibungsunterlagen
   Index to the information package

3. Beschreibungsunterlagen
   information package

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1118*02

Anlage
Appendix

zu dem EWG-Typgenehmigungsbogen Nr. **e1*72/245*95/54*1118*02**
betreffend die Typgenehmigung einer elektrischen/elektronischen Unterbaugruppe gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 95/54/EG
to EEC type-approval certificate No. **e1*72/245*95/54*1118*02**
concerning the type-approval of an electric/electronic sub-assembly with regard to Directive 72/245/EEC, as last amended by Directive 95/54/EC

1. Ergänzende Angaben - Additional information:

1.1. Nennspannung des elektrischen Systems - Electric system rated voltage:
12 Volt bzw./respectively 24 Volt,
Batterieminus an Fahrzeugmasse / battery(-) at the body

1.2. Dieses Bauteil kann für jeden Fahrzeugtyp mit folgenden Einschränkungen verwendet werden -
This component can be used on any vehicle type with the following restrictions:
entfällt - not applicable
(Nennspannung siehe 1.1 / rated voltage refer to 1.1)

1.2.1. Einbauvorschriften (gegebenenfalls) - Installation conditions, if any:
Die Einbauvorschriften sind der Einbauanleitung zu entnehmen
The restrictions are in the operating instructions

1.3. Diese selbständige technische Einheit kann nur für die folgenden Fahrzeugtypen verwendet werden - This ESA can only be used on the following vehicle types:
entfällt - not applicable

1.3.1. Einbauvorschriften (gegebenenfalls) - Installation conditions, if any:
entfällt - not applicable

1.4. Angewandte(s) spezielle(s) Prüfverfahren und Frequenzbereiche zur Ermittlung der Störfestigkeit - The specific test method(s) used and the frequency ranges covered to determine immunity were:
Siehe Prüfbericht Nr.: 12835-2003/A1N2 vom 01.12.1999
See technical report

1.5. Beauftragtes/anerkanntes Labor (für die Zwecke von Anhang IV dieser Richtlinie), zuständig für die Durchführung der Prüfungen - Approved/recognized laboratory (for the purpose of this Directive) responsible for carrying out the tests:
Verband Deutscher Elektrotechniker (VDE), Offenbach

5. Bemerkungen - Remarks:
entfällt - not applicable

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1118*02

Inhaltsverzeichnis zu den Beschreibungsunterlagen
Index to the information package

Ausgabedatum: **16.12.1996** letztes Änderungsdatum: **11.01.2000**
Date of issue last date of amendment

1. Nebenbestimmumgen und Rechtsbehelfsbelehrung
   By-clauses and informations to legal remedy

2. Beschreibungsbogen Nr.: **412.413.001.XXX** Datum: **19.11.1996**
   Beschreibungsbogen Nr.: **412.413.001.XXX** Datum: **07.04.1997**
   Änderungsstand 1
   Beschreibungsbogen Nr.: **412.413.011.XXX** Datum: **02.09.1999**
   (Nachtrag 2)
   Information document No.: date:

   letztes Änderungsdatum: **02.09.1999**
   last date of amendment

3. Prüfbericht(e) Nr.: **12835-2003/A1** Datum: **02.12.1996**
   Prüfbericht(e) Nr.: **12835-2003/A1N** Datum: **17.04.1997**
   Prüfbericht(e) Nr.: **12835-2003/A1N2** Datum: **01.12.1999**
   Test report(s) No.: date:

4. Beschreibung der Änderungen:
   Description of the modifications

   Anpassung von Schaltungen und Layouts für neue Fahrzeuganwendungen. Änderung des Herstellernamens.
   Adaption of circuit diagrams and PCB layouts to new types of vehicles. Change of name of the manufacturer.

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1118*02

Nebenbestimmungen und Rechtsbehelfsbelehrung

Nebenbestimmungen

Die sich aus der Genehmigung ergebenden Pflichten gelten sinngemäß auch für die Erweiterung. In den bisherigen Genehmigungsunterlagen treten die aus dieser Erweiterung ersichtlichen Änderungen bzw. Ergänzungen ein.

Rechtsbehelfsbelehrung

Gegen diese Genehmigung kann innerhalb eines Monats nach Bekanntgabe Widerspruch erhoben werden. Der Widerspruch ist beim **Kraftfahrt-Bundesamt, Fördestr. 16, D-24932 Flensburg,** schriftlich oder zur Niederschrift einzulegen.

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*92/24*0070*00

E W G - T y p g e n e h m i g u n g s b o g e n
(Technische Einheit)

EEC type-approval certificate
(separate technical unit)

Benachrichtigung über die Typgenehmigung

eines Typs einer gesonderten technischen Einheit gemäß der Richtlinie 92/24/EWG über Geschwindigkeitsbegrenzungseinrichtungen oder vergleichbare Geschwindigkeitsbegrenzungssysteme für bestimmte Kraftfahrzeugklassen.

Communication concerning the type approval

of a type of separate technical unit with regard to Directive 92/24/EEC relating to speed limitation devices or similar speed limitation on-board systems of certain categories of motor vehicles.

EWG-Typgenehmigung Nr.: **e1*92/24*0070*00**
EEC-type-approval No.:

Teil I
Section I

0. Allgemeines
General

0.1. Fabrikmarke (Firmenbezeichnung des Herstellers) -
Make (trade name of manufacturer):
VDO

0.2. Typ - Type
VDO E-Gas compact Nr. 412.413/011

Handelsbezeichnung (ggf. unterschiedliche Ausführungsarten):
commercial description (mention any variants):
VDO E-Gas compact

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*92/24*0070*00

-2-

0.3. Typenkennmerkmale, sofern auf der technischen Einheit vorhanden -
Means of identification of type, if marked on the technical unit(b):

Elektronik	**412.413.011.---(12/24V)**
electronic	
Stellglied	**408.422.006.---(12V)**
actuator	**408.211.004.---(12V)**
	408.411.005.---(24V)
Sollwertgeber	**445.804.005.---**
set-point sender	
Pedaleinheit	**445.803.005.---**
accelerator unit	

0.3.1 Anbringungsstelle dieser Kennmerkmale -
Location of that marking:
siehe Anlage 1 bis 4
see appendix 1 to 4

0.5. Name und Anschrift des Herstellers -
Name and address of manufacturer:
Mannesmann VDO AG
D-60388 Frankfurt am Main

0.7. Im Fall von Bauteilen und technischen Einheiten:
Anbringungsstelle und Anbringungsart des EWG-Typgenehmigungszeichens: -
In the case of components and separate technical units, location and method of affixing of the EEC-approval mark:
siehe Anlage 2
see appendix 2

Teil II
Section II

1. Zusätzliche Angaben -
Additional information

1.1. Geschwindigkeitsbegrenzungseinrichtung: -
Speed limitation device:
elektronisch
electronic

1.2. Fahrzeugtyp(en), in die die Einrichtung eingebaut werden kann
Vehicle type(s) on which the device may be installed:
Klasse M und N
class M and N

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*92/24*0070*00

-3-

1.3. Geschwindigkeit oder Bereich der Geschwindigkeiten, auf die die Geschwindigkeitsbegrenzung eingestellt werden kann km/h
Speed or range of speeds at which the speed limitation may be set km/h within the range established for vehicle(s) on which the device may be installed:
30 km/h bis - to 127,5 km/h

1.4. Höchstleistung des Motors im Verhältnis zur Leermasse des Fahrzeugtyps -
Maximum engine power to unladen mass ratio of the vehicle typ:
bis - to 41,2 kW/t

1.5. Größtes Verhältnis der Motordrehzahl zur Fahrzeuggeschwindigkeit im höchsten Gang des Fahrzeugtyps -
Highest ratio of engine speed to vehicle speed on top gear of the vehicle typ:
1300 1/min bei - by 88 km/h
1500 1/min bei - by 103 km/h

1.6. Anleitungen zum Einbau der Einrichtung für jeden Fahrzeugtyp:
Instructions for the installation of the device for each type of vehicle:
siehe Anlage 5
see appendix 5

2. Für die Durchführung der Prüfungen zuständige Prüfstelle -
Technical department responsible for carrying out the tests:
TÜV Automotive GmbH
Unternehmensgruppe TÜV Süddeutschland
D-85748 Garching

3. Datum des Prüfprotokolls - Date of test report:
04.09.1997

4. Nummer des Prüfprotokolls - Number of test report:
353-532-97-FBTN

5. Grund (Gründe) für die Erweiterung der Typgenehmigung (falls zutreffend)-
Ground(s) for extending type-approval (where appropriate):
entfällt - not applicable

6. Bemerkungen(ggf) - Comments (if any)
entfällt - not applicable

2. EC directives and approvals

Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*92/24*0070*00

-4-

7. Ort: **D-24932 Flensburg**
Place

8. Datum: **05.11.1997**
Date

9. Unterschrift: **Im Auftrag**
Signature:

Mayer

10. Eine Liste der bei der Typgenehmigungsakte enthaltenen Dokumente, die bei der Verwaltungsbehörde, die die Typgenehmigung erteilt hat, hinterlegt ist, liegt bei. Diese können auf Antrag eingesehen werden.

Inhaltsverzeichnis zur EWG-Typgenehmigung

A list of documents making up the type-approval file lodged with the administrative department that has granted type-approval, which may be obrained on request, is attached.

Index to EEC approval certificate

3. Installation Instructions

Contents

3. Installation Instructions

3.1 Safety Instructions

No smoking!
No naked flames or lights!

- The product was developed, manufactured and inspected in compliance with the basis safety requirements of the EC Directives and in accordance with the generally recognised present level of technology.
- The product must only be used for service in vehicles restricted to the ground (with the exception of motorcycles) or in stationary systems.

Prior to installation of the product, please observe the following instructions:

- For proper installation of the product, basic knowledge of motor vehicle electrical and mechanical equipment is required in order to prevent damage.
- Write down all the data of volatile electronic memories.
- Remove the ignition key from the ignition lock.Then disconnect the minus pole of the battery (including the minus pole of any auxiliary batteries).
  When the minus pole of the batteries are disconnected, all volatile electronic memories lose their input values.
- Failure to disconnect the minus pole of the battery can cause short-circuits in the vehicle electrical system and then result in cable fires, battery explosions and damage to other electronic systems.
- Prior to installation of the product, refer to the motor vehicle registration documents for information on the vehicle type and any special equipment features and refer to the design plans for further information on the positions of fuel, hydraulic, compressed-air and electrical lines.
- Use the product as intended. Do not change or modify.
  Improper use, alteration or modification of the product can result in injuries, property damage or environmental damage or have an effect on safety.

3. Installation Instructions

3.1 Safety Instructions

Please note:

During installation of the product, please observe the following instructions:

- Observe the safety instructions of the manufacturers of the vehicle, system, motor and tools in each instance!
- Select the installation location so that the product and its components:

  - do not affect or hinder any functions of the vehicle or system.
  - are not damaged by any functions of the vehicle or system.
  - do not obstruct the driver's view.
  - are not positioned in locations where the driver and front-seat passenger can strike their heads in case of an accident
  - are not positioned in the mechanical and electrical airbag area.
  - have sufficient clearance behind the drilled holes or installation opening.

- Do not make drilled holes or installation openings in supporting or stabilising braces or struts!

Following installation of the product, please observe the following instructions:

- Connect the ground cable firmly to the minus pole of the battery.
- Enter / program the values of the volatile memories again.
- Check all (!) vehicle functions.
- When measuring the voltages and currents in the vehicle, only use multimeters or diode testing lamps that are designed to be used for such measurements. The use of conventional testing lamps can cause damage to the control units or other electronic systems.

Special cases:

- Please be extremely careful whenever you must perform any required work on the running motor. Wear suitable working clothes only, since risk of suffering injuries such as bruises or burns exists. If your hair is long, wear a hairnet.

3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator (408-422-006-001 or 408-221-005-001)

The actuator is installed close to the injection pump. It is mounted on the engine and is equipped with engine vibration dampers. Fix the actuator in at least three points on the actuator support bracket, using special damping elements (included in the actuator bracket kit order No. X39-397-112-014).
- see figure 1 -
The actuator dimensions can be found in the VDO customer drawings.

The damping grommet hole diameter is 20mm.
- see figure 2 -

Figure 1

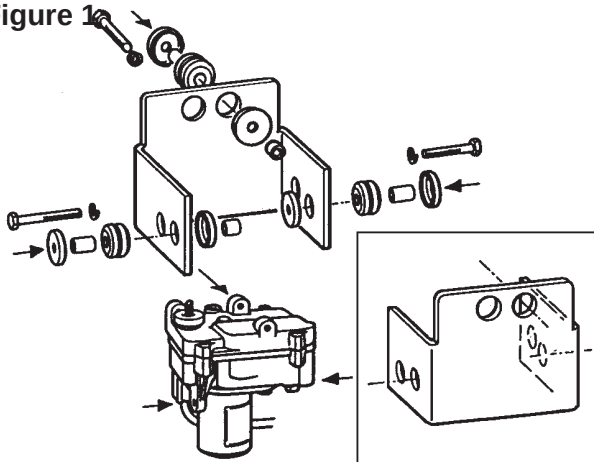
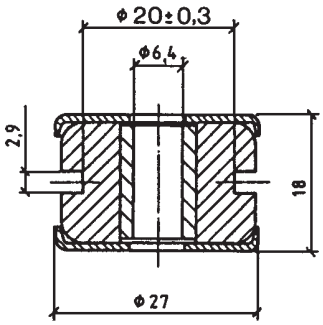
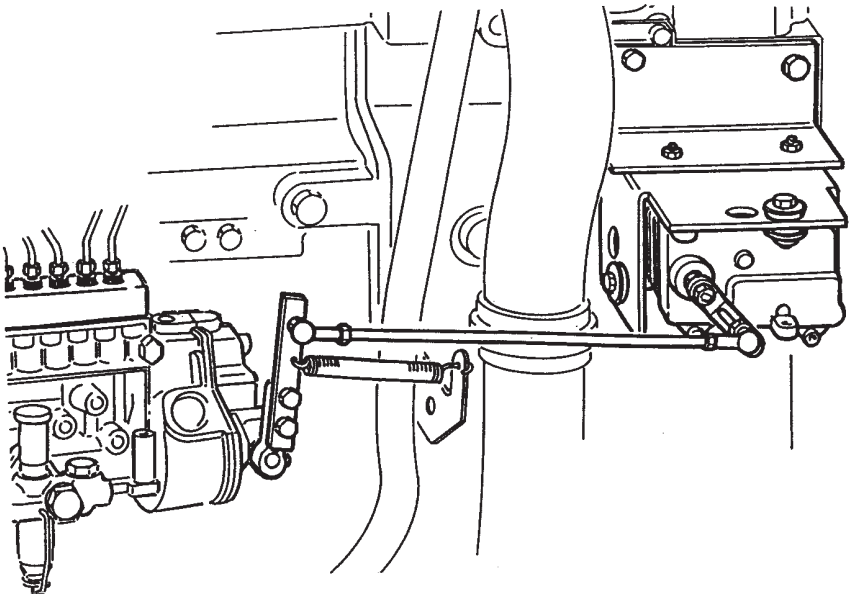


Figure 2



Make the actuator support bracket and strengthen it to obtain a rigid structure (sheet metal thickness 4mm). The linkage diameter is 6mm.
Mount a return spring on the injection-pump lever. Select the spring force to prevent an actuator torque (return spring force and injection-pump adjustment force) exceeding 250Ncm. The return force should increase from 30Ncm to 60Ncm. - see figure 3 -

Figure 3



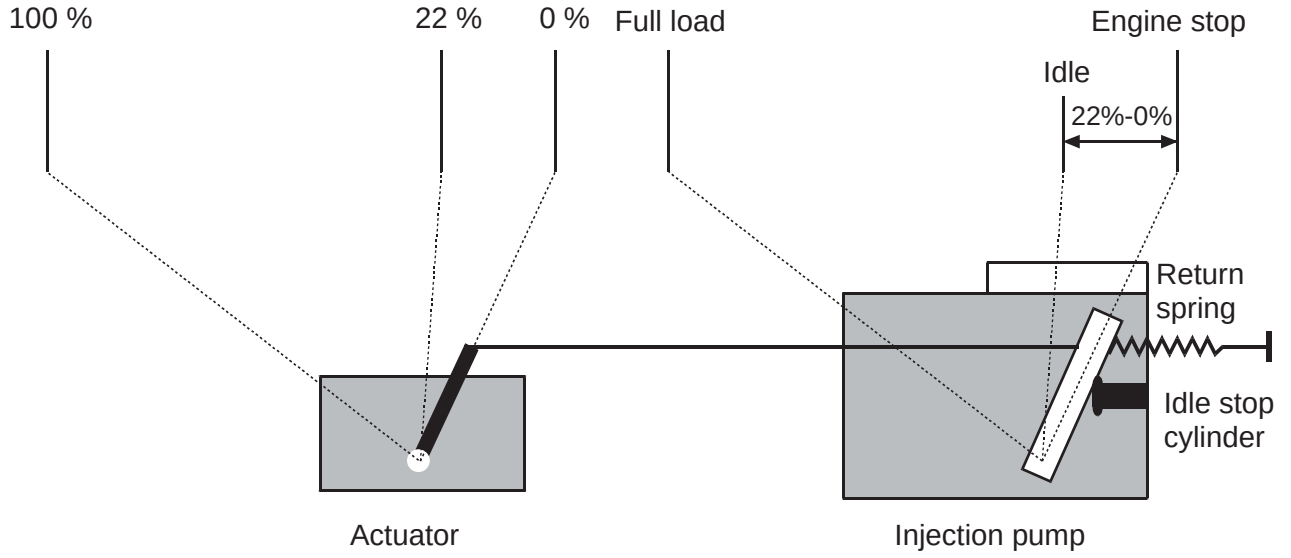
3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator

Install an additional idle-stop cylinder in the case of a one-lever injection pump. This cylinder prevents an engine-stop position when the clutch is opened or in the case of a fault. For engine stop the cylinder enables the engine-stop position.
The engine-stop range can be 0% to 22%.
This means that in the electronic controller the electrical idle-stop position can be programmed in a range of 0% to 22% of the entire electrical angular travel.
To do this, adjust the mechanical idle position at the actuator (it must be in the range of 0% to 22% of the electrical angular travel). This value is set with the testing software, and is stored as idle position. - see figure 4 -

Figure 4



A condition for actuator setting is that an adjustment of the idle and full-load points of the set-point sensor or the accelerator unit has been made (see installation set-point sendsor or accelerator unit).

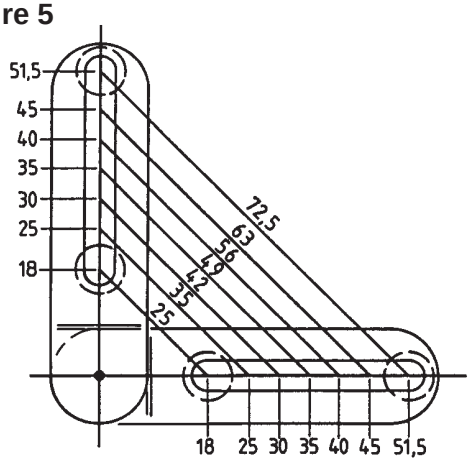
Disconnect the linkage to make the adjustment.

Idle and full-load points of the injection pump are precisely adjusted with the slot in the actuator lever. - see figure 5 -

a. Determine distance between idle and full-load positions at the control point on the injection pump lever.
b. Transfer determined value to actuator-lever adjustment.
c. Mechanical idle and full-load idle positions must correspond to the electrical idle and full-load positions of the actuator.

This adjustment must be made very carefully to prevent destruction of the actuator (breakage of the gears).

Figure 5



3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator (408-411-005-013)

Installation notes

- The actuator should be mounted on a mounting bracket in accordance with local requirements, insulated from engine vibrations.

- When designing the linkage in connection with a single-lever pump, the following problem might occur:
  In the event of failure of the supply voltage, the actuator is returned to the idle or stop position by return spring.

- The bracket must be made of sheet metal of 4 mm thickness. The diameter of the 3 bores used to accommodate the damping elements (order No. 240-110-001-001P) is 20mm (for arrangements see VDO customer drawing). The bracket should be designed in such a way that the rigid structure is obtained (reinforcement ribs).

- In order to minimise the actuating forces, load and path hysteresis the installation should be mounted as close as possible to the injection pump.

- Because of the adjustment to the actuating distance, only spherical sockets made of metal should be used between actuating unit and injection-pump lever.

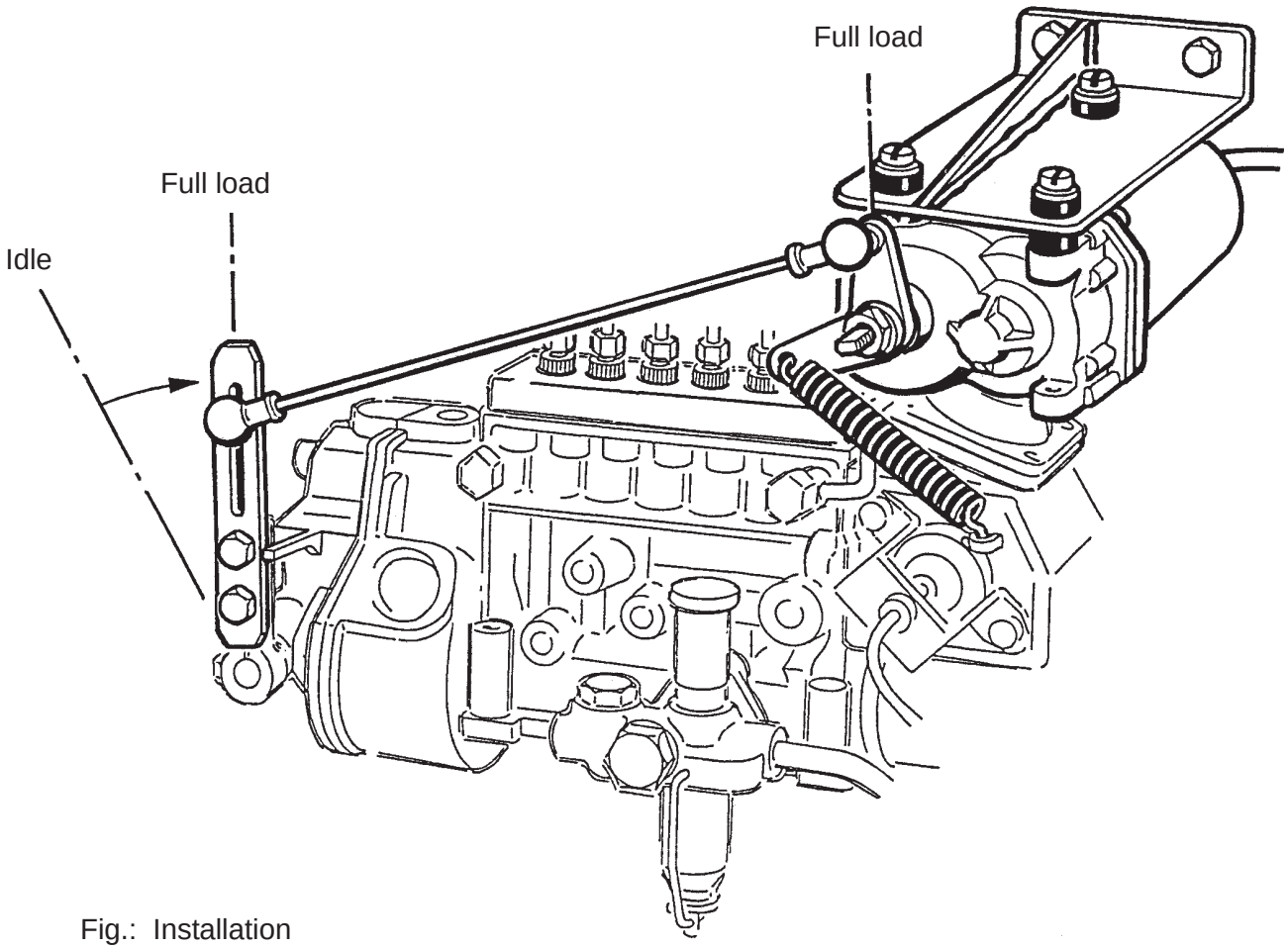


Fig.: Installation

3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator (408-411-005-013)

- When designing the linkage, allowance should be made for the maximum permitted actuating torque of 180Ncm at the actuating member.
  (Important, remember the return spring!).
  To prevent consequential damage to the actuating motor, the actuating torque should be determined at the injection-pump lever, for every installation of a VDO E-Gas® installation.

  The following dimensions and forces must be recorded:
  1. Maximum force necessary to move the accelerator regulator from the idling position to the full-load position (with engaged return spring).
  2. Length of the lever at the actuating motor from the fulcrum to the centre of the spherical head.

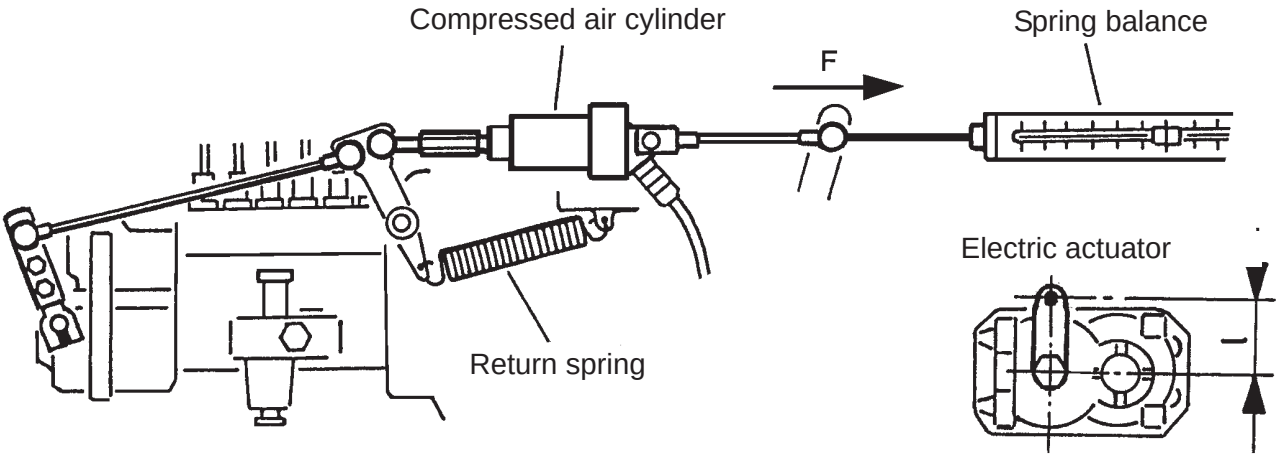


Fig.: determination of the injection pump forces

Formula: M = l x F
M = Actuating torque max 180Ncm.
L = Length of lever at the actuator (cm).
F = Force required for adjustment (N).

- The actuating member is returned to the idle position by means of a mechanical return spring. The return torque of the spring must increase from 30Ncm to 60Ncm.

- In order to prevent damage of the gears in the actuating unit, the internal abutment must be approached slowly before tightening the fixing nut of the drive lever **(tightening torque 10Nm max.).**

- The movement of the injection-pump lever and the actuator must be adjusted to suit and should be set in accordance with the adjusting instructions. If there is a free-wheeling mechanism to prevent the pump governour from overspeeding, this function must remain enabled.

3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator (408-411-005-013)

Adjusting instructions (preconditions: single-lever pump: engine in warm condition)

a) Basic setting

- Switch on ignition, the actuator moves into its electrical idle position.
- Injection-pump lever in idle position.

Length of connecting rod: distance K1 and K2

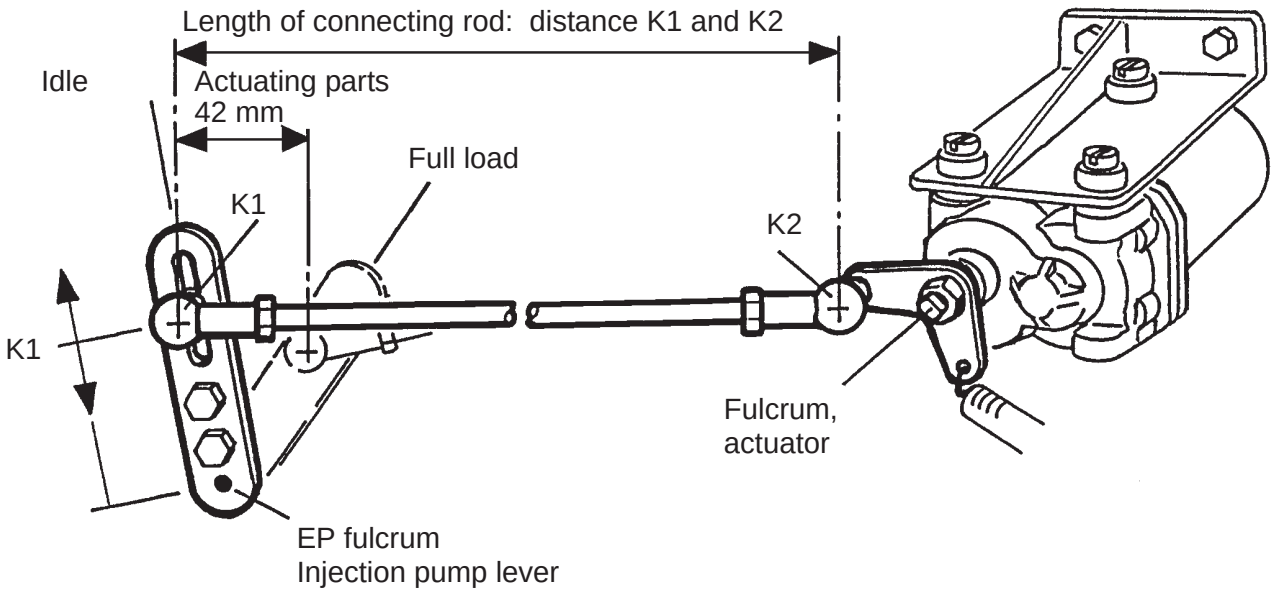


Fig.: basic setting

- Determine the fulcrum point for spoil head K1 at the lever of the injection pump. The distance between the fulcrum EP of the injection-pump lever and the ball head K1 should be chosen in such a way that the unit moves through an actuating path of x mm* between idle and full-load (* Lever 993-620-079 = 35mm, lever 993-620-082 = 42mm).
- The length of the connecting rod should be determined by measuring the distance between ball heads K1 and K2.
- Fit the connecting linkage and adjust length in such a way that the required engine idle speed is achieved.

3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator (408-411-005-013)

b) Adjustment of actuating parts

- Operate engine stop (engine off).
- Disengage connecting rod from ball head K2.
- Press accelerator pedal (actuator moves to full-load position).
- Keep adjusting pump lever in full-load position.

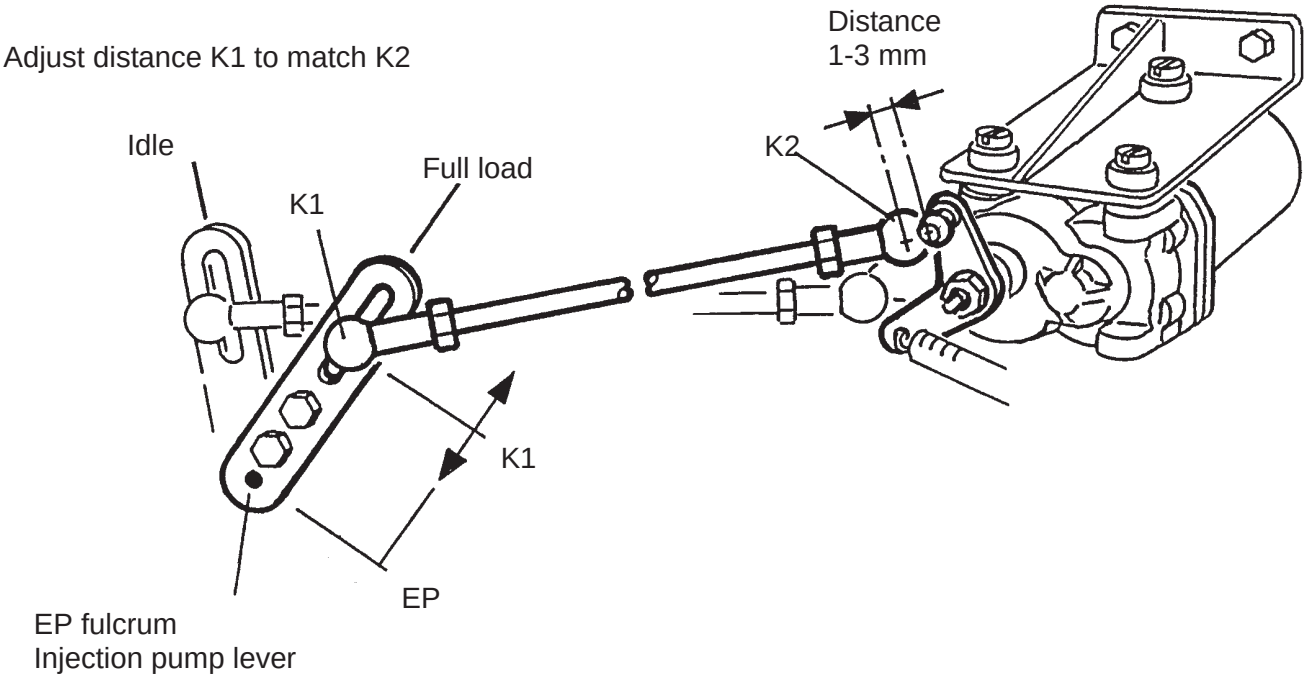


Fig.: adjustment of actuating parts

- Adjust actuating parts (distance: change the distance between EP and K1) so that in full-load position of the injection pump and actuator lever there is a distance of 1-3mm between the ball socket K2 and the ball head of the actuator lever.
- Engage the connecting rod into ball head K2.
- Check engine idle, if necessary repeat adjustment process.
- If adjustment control required: switch on motor-engine speed transducer.
- The ball head should be greased and protected from disengagement.
- After insertion, the safety cap should be fitted to the plug.

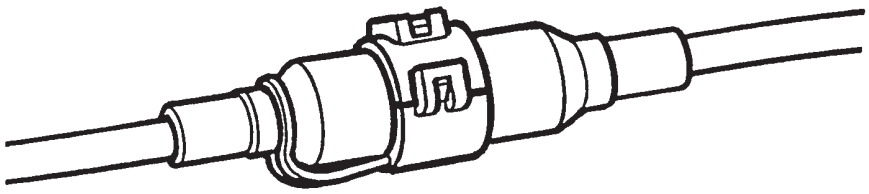
3. Installation Instructions

3.2 Installation

3.2.1 Electric Actuator

Install the retainer cap. - see figure 6 -

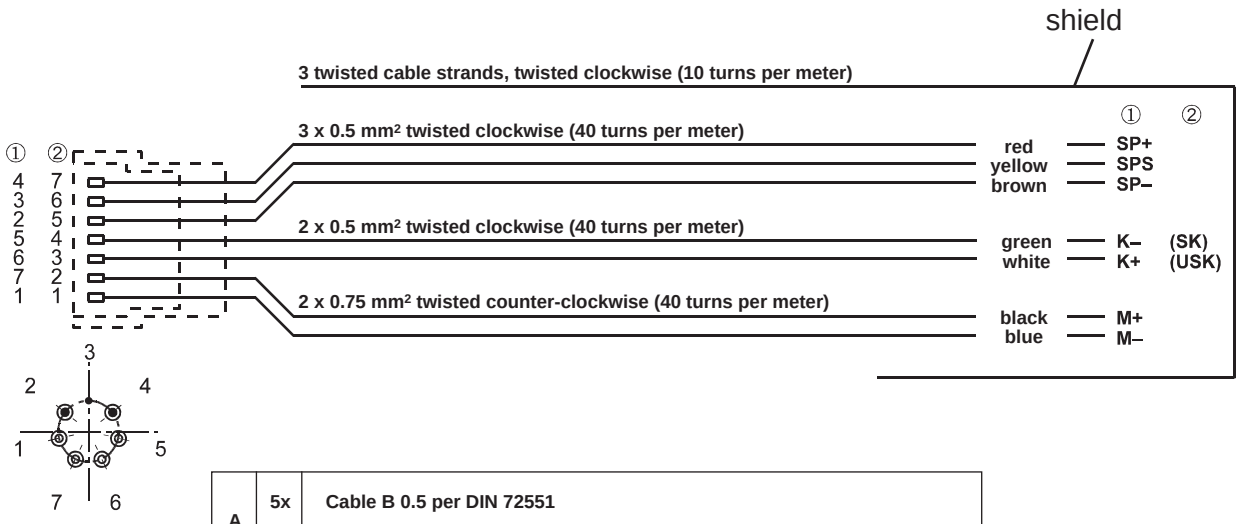
Figure 6



NOTE: Twist and shield the wires - see figure 7 - if you do not use the original VDO actuator cable (Order-No. X39-397-112-012 or X39-397-112-016) to connect the actuator.

Figure 7

① X39-397-112-016 = Actuator 408-422-006-001
② X39-397-112-012 = Actuator 408-411-005-013



A	5x	Cable B 0.5 per DIN 72551
B	2x	Cable B 0.75 per DIN 72551
C	1x	7-pin Connector (Sure Seal) ITT-CANNON 120-8551-007
D	3x	Pin (Sure Seal) ITT-CANNON 330-8672-001
E	4x	Bushing (Sure Seal) ITT-CANNON 031-8703-001
F	1x	Housing (Sure Seal) ITT-CANNON 317-8657-000

Cable dia.
7.2 mm - 8.4 mm

3. Installation Instructions

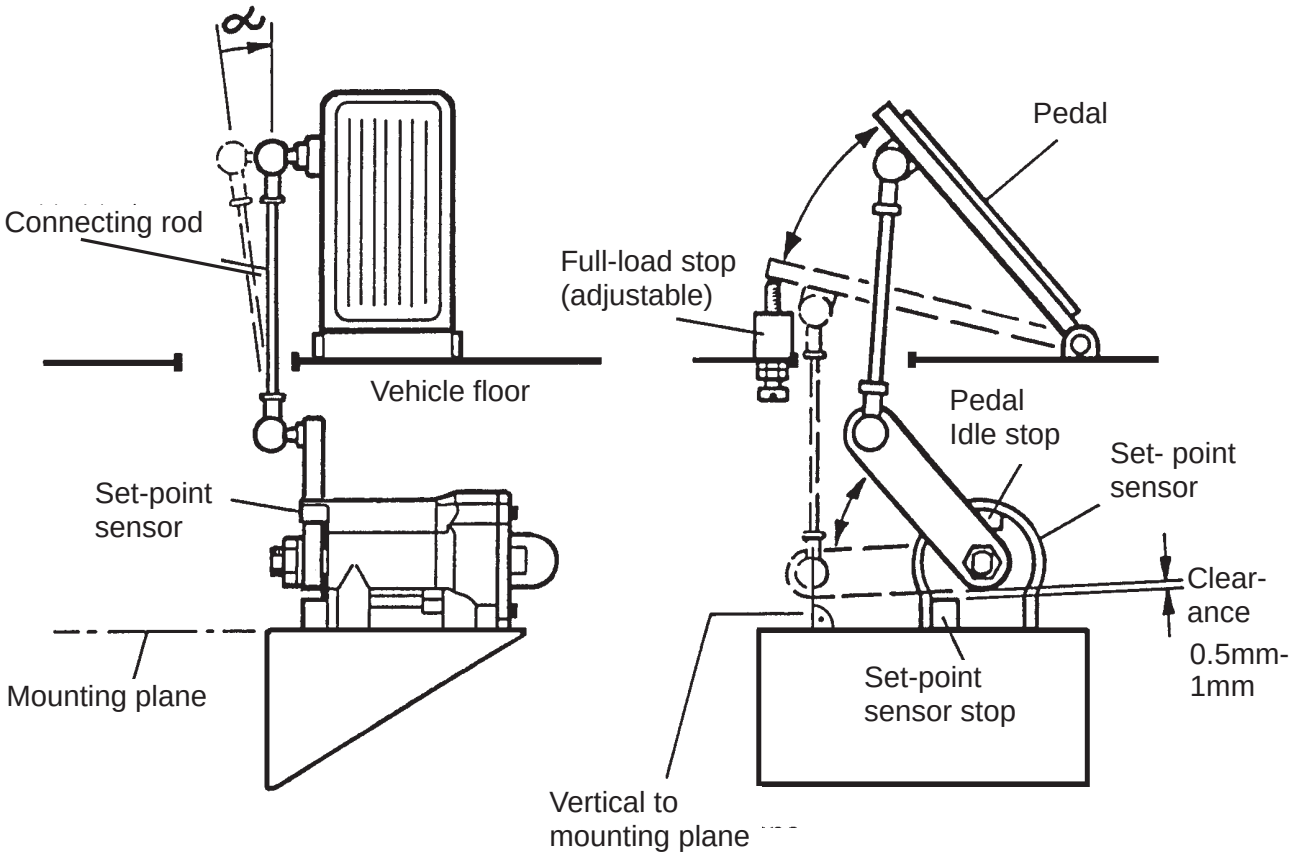
3.2 Installation

3.2.2 Set-point Sensor

The set-point sensor has protection type IP 66. It can be installed outside the driver cabin.
Mount the set-point sensor - see customer drawing for dimensions - on a sheet metal support, thickness at least 4 mm. Strengthen the structure to obtain a rigid unit, which is bolted or welded to the vehicle at an adequate location.
Install the set-point sensor so that the connecting rod (6mm dia.) from the set-point sensor to the pedal is practically vertical to the fixation plane of the set-point sensor.
- see figure 8 -

Figure 8

Parallel offset angle: $\alpha \leq 7$ degrees



3. Installation Instructions

3.2 Installation

3.2.2 Set-point Sensor

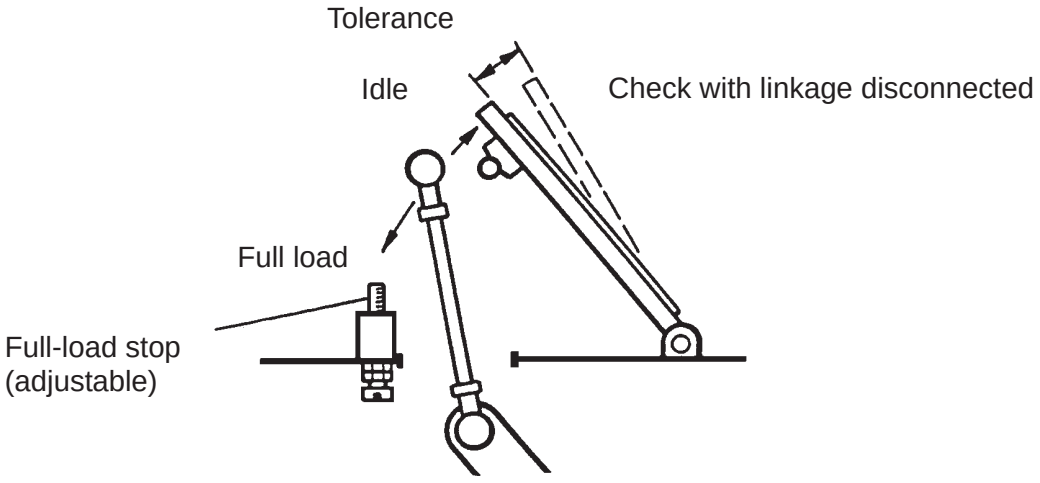
Install a stop below the pedal or the set-point sensor lever. Adjust this stop so that a clearance of 0.5mm to 1 mm is guaranteed between set-point sensor lever and sensor-lever stop with the pedal in full-load position.

In drive-pedal-idle position the set-point-sender lever must be against the set-point sensor idle stop.
A spring force of at least 20N must exist in idle position to guarantee a return position of the pedal. - see figure 9 -

After mechanical installation adjust the set-point sender idle- and full-load points in the electronic controller (5 sec. idle, 5 sec. full load).

Condition: the linkage from actuator to injection pump is disconnected.
Electronic controller 412-413-011-001
a. The VDO E-Gas® system is completely connected.
b. No current fault exists.
c. Erase fault memory.
d. Set-point sensor to idle position for 5 sec.
e. Set-point sensor to full-load position for 5 sec.
f. Check idle position and full-load position at actuator.
Electronic controller 412-413-011-002
a. The VDO E-Gas® system is completely connected.
b. No current fault exists.
c. Erase fault memory.
d. 100%-actuator position **via test software**.
e. Set-point sensor to idle position for 5 sec.
f. Set-point sensor to full-load position for 5 sec.
g. Check idle position and full-load position at actuator.

Figure 9



3. Installation Instructions

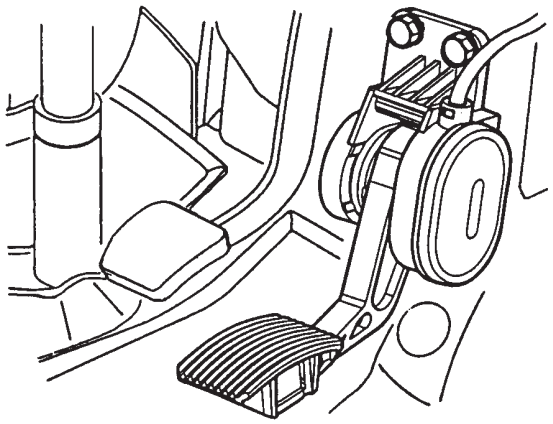
3.2 Installation

3.2.3 Accelerator Unit

Considering ambient temperature, vibration load and protection type IP54 the pedal unit has been designed for installation inside the cabin.
The accelerator unit - dimensions can be found in the VDO customer drawing - can be directly mounted onto the front wall inside the cabin.
- see figure 10 -

It is also possible to mount it on a sheet-metal bracket, minimum thickness 4mm, reinforced so as to obtain a rigid structure. This is bolted or welded to an adequate location in the cabin. - see figure 11 -

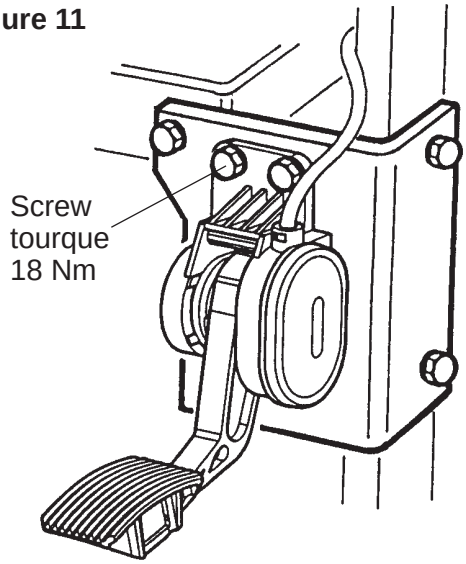
Figure 10



Install the accelerator unit so that idle- and full-load stops (on the pedal unit) are attained, and that the pedal can be operated by the vehicle driver without problems.

After mechanical installation the pedal idle- and full load-points must be adjusted by the electronic controller.

Figure 11



Condition: the linkage from actuator to injection pump is disconnected.

Electronic controller 412-413-011-001
a. The VDO E-Gas® system is completely connected
b. No current fault exists.
c. Erase fault memory.
d. Set accelerator unit to idle position for 5 sec.
e. Set accelerator unit to full-load position for 5 sec.
f. Check idle position and full-load position at actuator.

Electronic controller 412-413-011-002
a. The VDO E-Gas® system is completely connected
b. No current fault exists.
c. Erase fault memory.
d. 100%-actuator position via test software.
e. Set accelerator unit to idle position for 5 sec.
f. Set accelerator unit to full-load position for 5 sec.
g. Check idle position and full-load position at actuator.

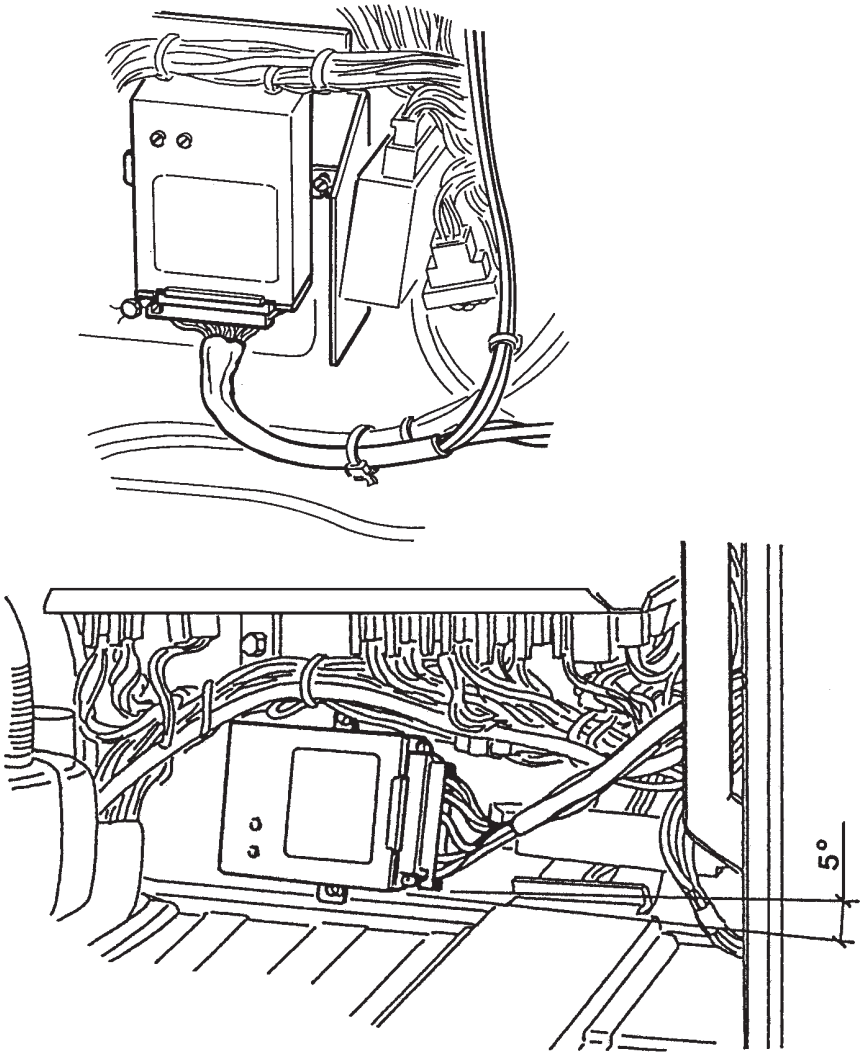
3. Installation Instructions

3.2 Installation

3.2.4 Electronic Controller

Install the electronic controller in the cabin (if possible, in the central electronics area).
The dimensions can be found in the VDO customer drawing.
The connector of the electronic control unit must be directed downwards.
If the electronic control unit is installed horizontally, the connector should be angled downwards by more than 5 degrees.

Figure 12



3. Installation Instructions

3.2 Installation

3.2.5 Electrical Connection

Use the prescribed cable harness for electrical connections (page 3-18).

Connect the cables according to the electrical terminal connection diagram.

Incorrect terminal connections can result in short-circuits!

Safety instructions:

- Danger of short-circuits due to defective connecting points or pinched cables!
  All connections of the voltage supply system must therefore be soft-soldered or provided with weldable joint connectors and sufficiently insulated.
  You may use commercially available standard-type crimp connectors to make other connections.
  Make sure the ground connections are perfectly made!
  Insulate any cable ends that are not required!

- Take the cable cross-sectional area into account!
  A reduction of the cable cross-sectional area will result in higher current density. The can cause overheating of the affected cable section!

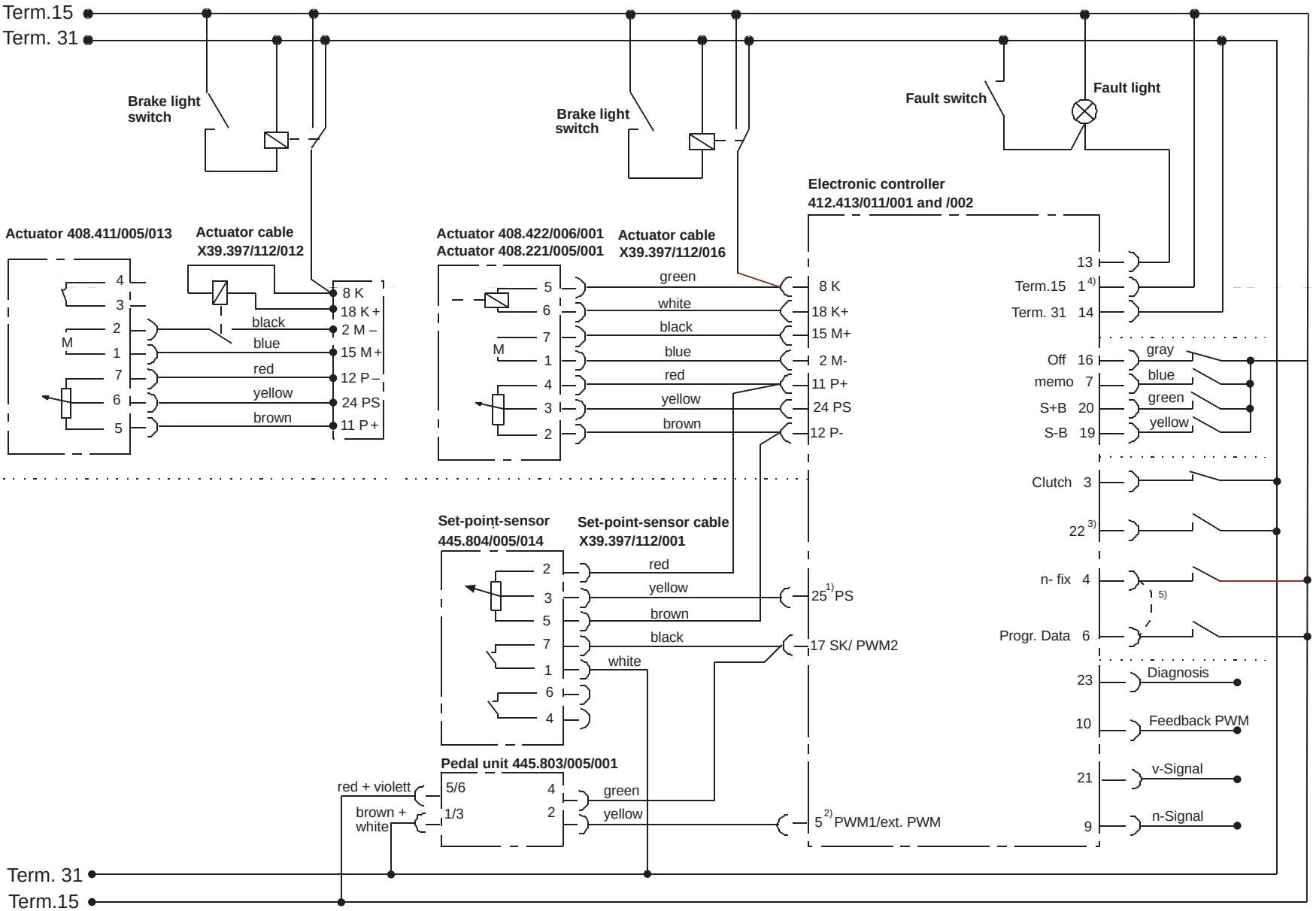
- Cables must be stripped using a wire stripper only. Adjust the wire stripper to prevent any strands from being damaged or cut off!

- Crimped connections must be made using a pair of cable crimping pliers only.

- When installing the cables, use the existing cable conduits and cable harnesses, but do not install the cables parallel to the ignition cables or cables that run over to high-capacity power consumers! Fasten the cables with cable straps or adhesive tape!

- Make sure the cables are not subjected to pulling, pressing or shearing forces!

- If the cables are run through drilled holes, protect the cables by means of rubber sleeves or similar parts.



1. Alternative, external analog set-point specification
2. Alternative, external PWM set-point specification
3. Only if used as working speed controller or to switch between two pedal units/ set-point-sensor
4. **The power supply has to be connected to the brake light fuse (no voltage difference between brake switch and Term. 15 ECU). The current consumption of E-Gas compact is max. 1.5A.**
5. By using n-fix: Pin 4 and Pin 6 to Term. 15.

Overview of Chapter

3. Installation Instructions

3.3. Functional Check, Maintenance

3.3.1 Functional Check

Check all vehicle functions before starting the functional check. Especially check the lighting system and all brakes (as far as this test can be made on the stationary vehicle).

Operate the VDO E-Gas® compact system as described in the operating manual.

Check all connected VDO E-Gas® compact functions.

Especially check the cutout function for all brakes (standard brake, engine brake and/or retarder) if the tempostat® function has been installed.

Drive actuator position to 100% by test software and control switch-off of the actuator clutch via the brake.

3.3.2 Maintenance

The control electronics are maintenance-free.

In addition to the normal maintenance work on the vehicle we recommend:

- Grease ball heads of linkages to actuator and set-point sensor; use a commercial lubricant.
- Check idle- and full-load adjustments.
- Check all installed VDO E-Gas® compact functions.

3. Installation Instructions

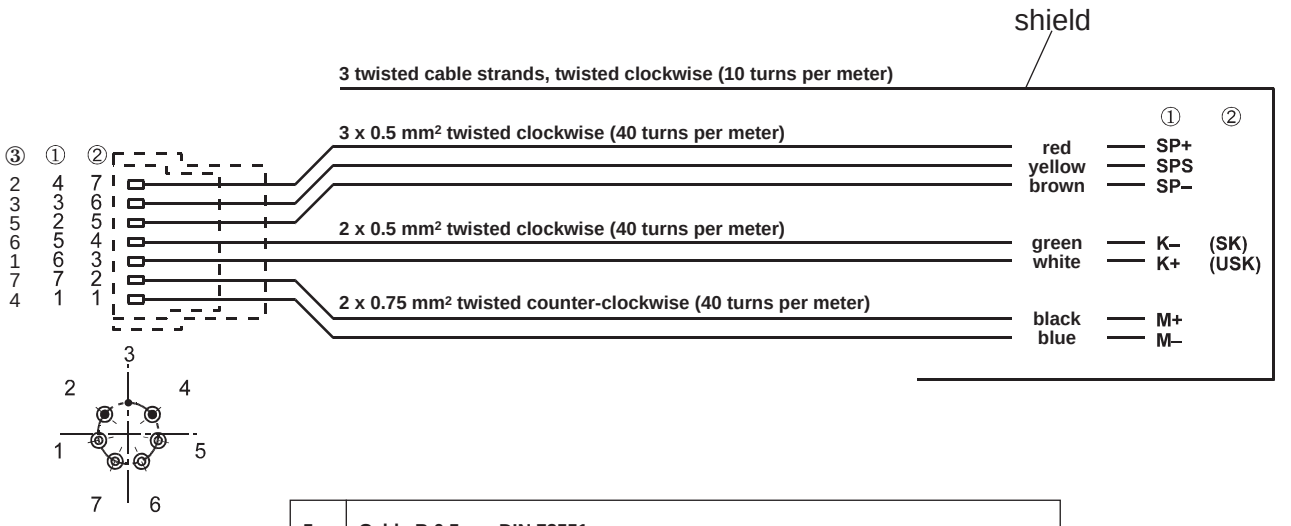
3.3. Functional Check, Maintenance

3.3.3 Actuator Cable, Set Point Sensor Cables

Twist and shield the wires - see figure 7 - if you do not use the original VDO actuator cable (order No. X39-397-112-012 or X39-397-112-016) or original VDO set point sensor cable (order No. X39-397-112-002) to connect the actuator.

Figure 7

① X39-397-112-016 = Actuator 408-422-006-001
② X39-397-112-012 = Actuator 408-411-005-013
③ X39-397-112-002 = Set point sensor 445-804-005-014P



5x	Cable B 0.5 per DIN 72551
2x	Cable B 0.75 per DIN 72551
1x	7-pin Conector (Sure Seal) ITT-CANNON 120-8551-007
3x	Pin (Sure Seal) ITT-CANNON 330-8672-001
4x	Bushing (Sure Seal) ITT-CANNON 031-8703-001
1x	Housing (Sure Seal) ITT-CANNON 317-8657-000

Cable dia. 7.2mm-8.4mm

4. Testing Software VDO E-Gas® compact

Contents **Page**

4. Testing Software VDO E-Gas® compact

4.1 Program Specification

Program name	:	EGADIAG
Variant designation	:	mono1*
Workshop number	:	D 0000*
Version designation	:	3.00*

* The variant designation, workshop number and version designation are given to the respective by Mannesmann VDO Kienzle Vertrieb und Service GmbH. The workshop number also contains the country code (here D for Germany).

Task:

EGADIAG is required for programming, adjustment and error detection.

As well as the function test for the entire system, it offers help in maintenance and installation work. EGADIAG also offers the option of reading and deleting the error memory of the electronic controller. The errors are displayed in plain text.

For the installation and adjustment of the VDO E-Gas® compact system to the relevant vehicle, EGADIAG offers the option of changing the most important system parameters.

Communication is effected via a diagnostics interface in accordance with ISO 9141 using an VDO E-Gas® interface. Before the program is handed over, it is individually configured for the customer. Besides the configuration of the existing hardware (type of monitor, name and baud rate of the diagnostics interface) and of the desired language (German, English) the program is also assigned the workshop number of the customer.

Important!

The individually assigned workshop number of the customer is written into the electronic controller for all parameter changes, thus making it possible to check who carried out the last change in a parameter in the connected electronic controller.

4. Testing Software VDO E-Gas® compact

4.1 Program Specification

Hardware Requirements:

These are the minimum requirements for running EGADIAG:

- IBM or compatible PC with MS-DOS operating system, Version 3.3 or higher
- Hercules, mono or CGA mono/colour screen
- 1 serial port for data transmission
- 1 serial port for the mouse (optional)
- VDO E-Gas® interface for connecting an electronic controller

EGADIAG also supports the following equipment:

- WINDOWS operating system extension, Version 3.0 or higher
- EGA or VGA screen
- Microsoft mouse (or compatible) connected to second serial port

Memory requirements: Approx. 250 KB

Program requirements: MS-DOS 3.3 or higher
The device driver ANSI.SYS must also be installed in CONFIG.SYS with device = ANSI.SYS.

4. Testing Software VDO E-Gas® compact

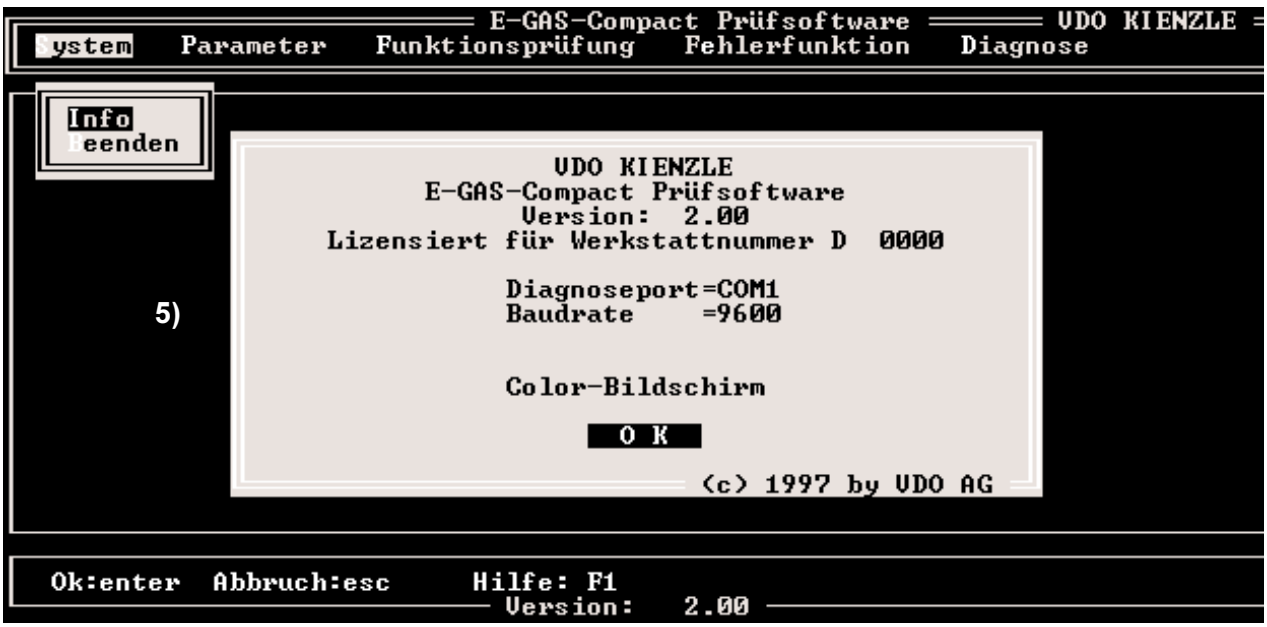
4.2 Program Description

User Interface

EGADIAG begins by displaying a welcome screen, which gives the program names and the workshop number assigned to the program. After 5 seconds or by pressing any key (or the left mouse button, if a mouse is connected) the EGADIAG screen appears.

The EGADIAG screen consists of a main menu bar (1), the workspace (2) and the status bar (3). The VDO Kienzle logo and the program name are shown in the frame of the main menu bar, the EGADIAG version number in the frame of the status bar. The submenu items of the main menu bar are available as pulldown menus (4). In the workspace of the EGADIAG screen, all information, input and output are displayed in windows (5). Error messages and context-sensitive help are overlaid over the current EGADIAG screen in the workspace. At all times the status bar (3) gives instructions as to which key leads to the next step.

Typical EGADIAG screen: Main menu ***"System";*** Submenu ***"Info"***



4. Testing Software VDO E-Gas® compact

4.2 Program Description

How to Use EGADIAG

Starting EGADIAG:

The configured program EGADIAG is started by entering the program name without any further information. In this case, the program runs with the configured parameters. Optionally, the monitor type and the name of the communication port can be entered for the program as command line parameters. The program is then executed with the given parameters, but without saving them. The transfer parameter after "m:" adapts the selection of colours to the given type of monitor (grey-scale, LCD or colour monitor) in order to provide optimum contrast. The transfer parameter after "c:" determines the communications port. Only COM1 or COM2 may be used. Input errors are displayed.

Program Call: **EGADIAG** {m:(grey/LCD/colour)}{c:(com1/com2)}

Closing the Welcome screen:
The Welcome screen of EGADIAG is closed by pressing any key on the keyboard or connected mouse, or automatically after 5 seconds.

Selecting the Menu Items:
All EGADIAG menu items can be selected with the help of the cursor keys (arrow up, down, left, right). The cursor key <down> or <Enter> activates the pulldown menu of the current main menu item, the <Escape> key deactivates the current pulldown menu. The <Enter> key is used to execute the selected menu item. The current main or submenu item is highlighted.

Hotkeys:
Hotkeys allow faster access to the submenu items. When the pulldown menu is deactivated, the main menu items can be accessed with the help of the highlighted characters (hotkeys). In this way the submenu items can be selected within the active pulldown menus. The hotkeys are recognised as lower and upper case letters, and also in combinations with the Alt key. After a menu item has been selected, it can be executed with <Enter>.

Using the Mouse:
All menu items can also be selected with the help of the mouse pointer. When the left mouse button is pressed while the pulldown menu is deactivated, the current pulldown menu is activated, and when the pulldown menu is activated the selected menu item is executed. When the pulldown menu is activated, it is deactivated by pressing the left mouse button and positioning the mouse pointer outside the active pulldown menu and outside the main menu bar.

Dialog with the User:
The information, input and output windows contain default selection options or numerical input boxes. The default options are executed by clicking them with the mouse (position the mouse pointer in the highlighted area and press the left mouse button) or by pressing the keys given in the status bar.
Input in the numerical input boxes is effected directly with the keys "0" to "9". If decimal points are required, this is achieved with ",". The "backspace" key causes the character last entered to be deleted. All input is checked for compliance with the permitted value range. Incorrect entries are displayed in an error window.

4. Testing Software VDO E-Gas® compact

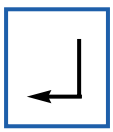
4.2 Program Description

How to Exit the Program:
The program is normally exited by selecting the menu item "Exit System". If a diagnostics connection has been established, this is first closed.
The program can also be interrupted at any time with the key combination CTRL-BREAK.

Help for starting EGADIAG from disk and for using the drives

The configured EGADIAG program is supplied on 3.5" disks according to dealer specifications. The program is started from disk as follows:

- Switch on computer, wait till C:\> appears
- Push disk into drive A or B
- Enter C:\>**A:** to switch to drive A, or C:\>**B:** to switch to drive B. Then press <Enter>.

  Enter key 
- If the wrong drive is entered, that is, drive A instead of drive B or vice versa, the following display appears in German:

  Nicht bereit beim Lesen von Laufwerk A (oder B)
  (A)bbrechen, (W)iederholen, (U)bergehen?

  or in English:

  Not ready reading drive A (or B)
  (A)bort, (R)eturn, (F)ail?
- Press key U (Übergehen) or I (Ignore). Then confirm by pressing the <Enter> key.

  The following display appears:

  Aktuelles Laufwerk nicht mehr gültig >

  or

  Current drive is no longer valid >
- Enter the correct drive name, e.g. **A:** for drive A and confirm by pressing the <Enter> key.
  The current drive is then displayed, A:\> or B:\>.
- The program is started by entering A:\>**EGADIAG** or B:\>**EGADIAG** and pressing the <Enter> key (to start the program with additional options, see " Starting EGADIAG").
- Return to the hard disk root directory (C:\>) by entering A:\>**C:** or B:\>**C:** and pressing the <Enter> key

For further information please refer to the MS-DOS manual.

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.1 Main Menu System

Submenu Info:
Displays information about the EGADIAG program and the settings of the most important configuration parameters (see typical EGADIAG screen on page 4 - 4).

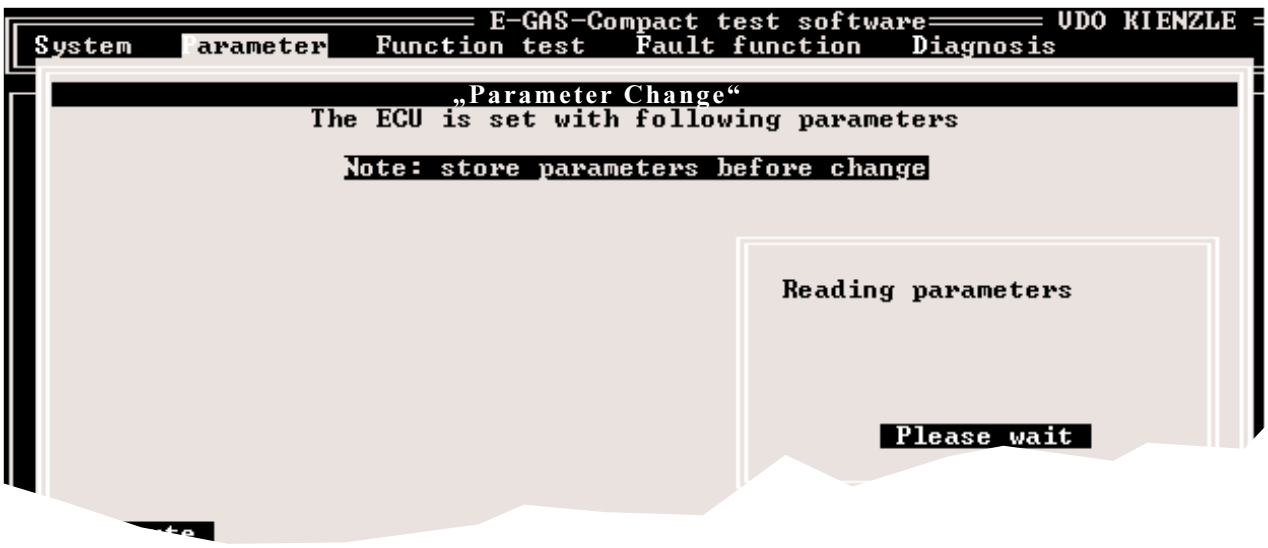
Submenu Exit:
Terminates communication with the electronic controller (if communication is enabled) and returns to the operating system.

4.3.2 Main Menu Parameter

Submenu Change:

Operation and messages
This menu is for changing the parameters stored on the memory (EEPROM) of the VDO E-Gas® compact electronic controller.
Each parameter displayed can be changed, as long as this is not disabled by another parameter.
Changes in parameters are stored immediately in the EEPROM of the VDO E-Gas® compact electronic controller.

If the main menu ‘paramenter change’, is called up, the message „Note: Store parameters before change“ appears during initialization (parameters are read).
Storage of the indicated parameters is required, if new data is to be entered to the ECU and the previous settings are to be reused.



Operation:
The parameters can be selected either directly, using the mouse, or with the "up/down" cursor keys. The "up/down" cursor keys select the first parameter of the next window.
To change the selected parameter, press the <Return> key or the <Run> button; a double click on the relevant parameter value has the same effect as pressing the <Return> key.

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.2 Main Menu Parameter

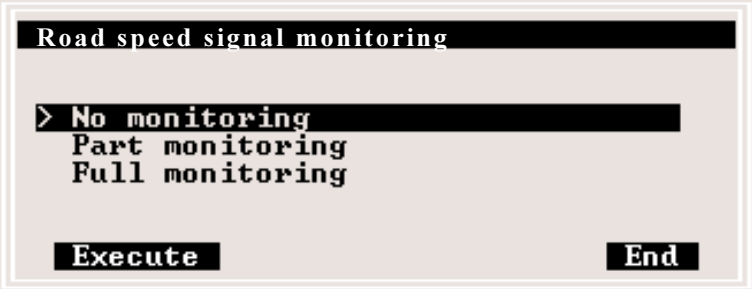
A window then appears to allow new data to be entered:

A numerical value, which must be within the predefined value range, can be entered here. Otherwise the input is not accepted.

The <Return> key or the "OK" button complete the input; pressing the <Escape> key or the <Cancel> button means that no change in value is carried out.

Another input option allows only individual selections:

Here, one of the options shown can be selected with the help of the mouse or the cursor keys.



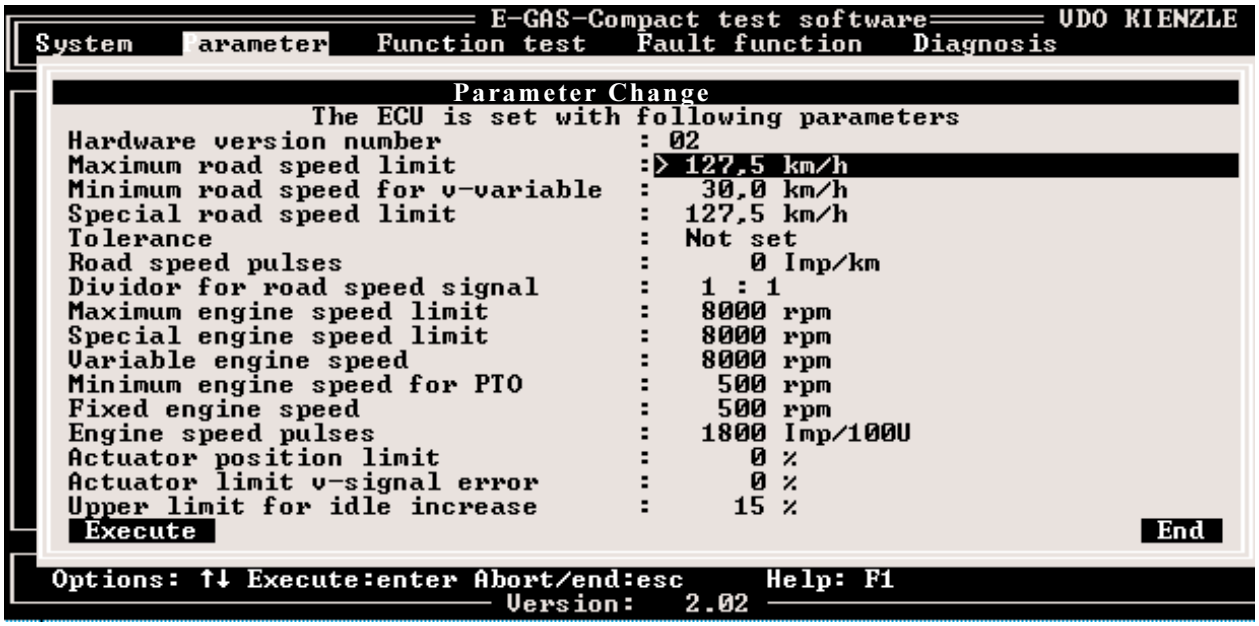
The <Return> key or the "Run" button complete and terminate the selection; pressing the <Escape> key or the <Cancel> button terminates the selection without any change.

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.2 Main Menu Parameter

E-Gas compact EGADIAG screen: Main Menu ***"Parameter"***,
Submenu ***"Parameter Change"***; window 1



Maximum Road Speed Limit:
The maximum limiting road speed v_{set} which the electronic controller should set can be entered directly here in the range from 30kmh to 127kmh (18.6mph- 79.2mph) in increments of 0.5kmh.

Minimum road speed for v-variable:
The value for the minimum road speed as of which the electronic controller can be enabled in the variable speed mode can be entered directly here in the range of 30kmh -v_{set} (or 18.6mph -v_{set}) in increments of 0.5kmh.

Special road speed limit:
The special road speed which the electronic controller should set can be entered directly here in the range from 2kmh to v_{set} (or 3.218mph to v_{set}) in increments of 0.5kmh.

Tolerance:
The controller tolerance can be switched on and off here. It affects the maximum road speed limit, the variable intermediate speed and the special road speed limit.

Road speed pulses:
The road speed pulses of the sensor installed in the system can be entered directly in the range from 2400 pulses per km - 25000 pulses per km (or 1491.6 pulses per mile - 15537.6 pulses per mile) in increments of 1 pulse per km. The road speed pulses 0 pulses per km (or 0 pulses per mile) must always be entered when a PWM v signal from the electronic tachograph (e.g. C3, B7) is connected.

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menue Items

4.3.2 Main Menu Parameter

Divider for road speed signal:
The divider ratio used in the VDO E-Gas® compact for the road speed signal can be defined here. The following options are available (range 2400 pulses per km - 250000 pulses per km):

Input pulses 25.000 pulses per km ⇒ 1 : 1 ⇒ 25.000 pulses per km
Input pulses 250.000 pulses per km ⇒ 10 : 1 ⇒ 25.000 pulses per km

Maximum Engine Speed Limit:
The value of the maximum engine speed limitation can be set in a range between 500rpm to 8000rpm in increments of 1rpm.

Special Engine Speed Limit:
The value for the special engine speed limitation can be set the range from 500rpm to the preset speed limitation in increments of 1rpm.

Variable Engine Speed:
The value for the variable engine speed can be entered directly here in the range from 500rpm to the preset special engine speed limit in increments of 1rpm.

Minimum Engine Speed for PTO:
The value of the minimum engine speed for PTO can be set between 500rpm to the preset maximum Engine speed limit in increments of 1rpm.

Fixed Engine Speed:
The value for the fixed engine speed can be set between 500 rpm to the preset engine speed limit in increments of 1 rpm.

Engine speed pulses:
The rotational pulse figure can be entered in the range from 100 pulses per 100 rotations - 16000 pulses per 100 rotations. The figure is set by entering a frequency and a related speed. The value of the rotational pulse figure in pulses per 100 rotations is calculated from the two settings.
If a frequency of 0Hz is entered, input is effected directly in the unit of pulses per 100 rotations.

Actuator Position Limit:
The position limitation of the electric actuator can be set in the range between 0% and 100% in increments of 1%.

Actuator Limit v-Signal Error:
In the event of v-signal error the limitation can be set between 0% and 100% in increments of 1%.

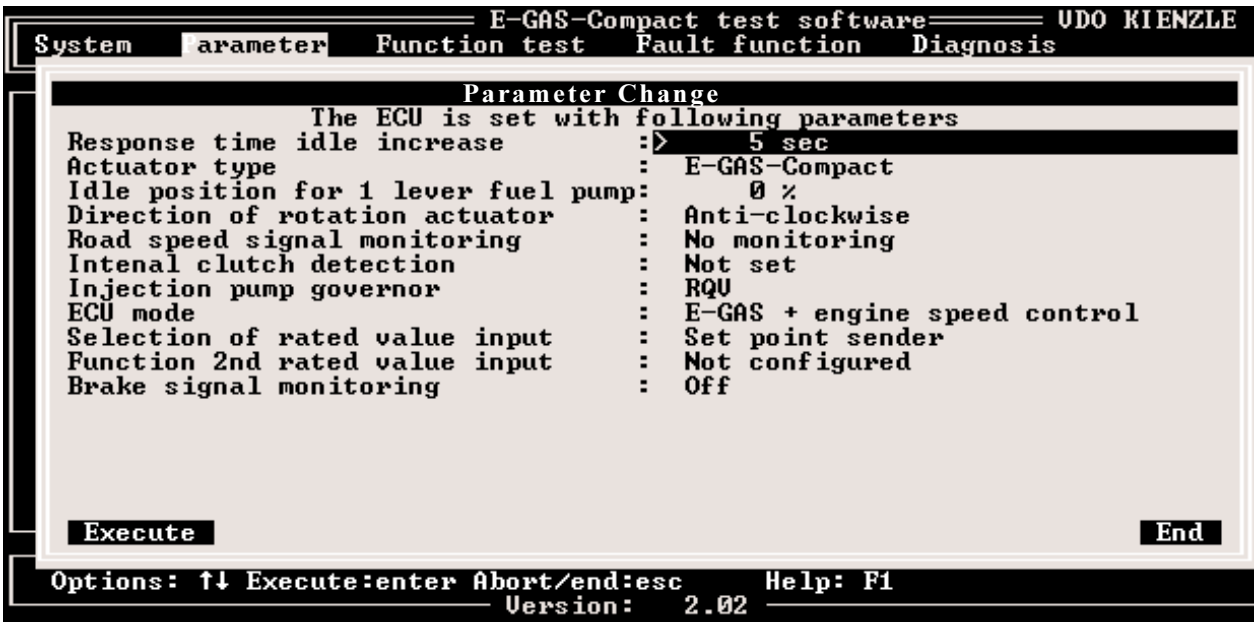
Upper Limit for Idle Increase:
The upper limit for raising idling speed can be entered directly in the range between 0% and 100% limitation in increments of 1%.

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.2 Main Menu Parameter

E-Gas compact EGADIAG screen: Main Menu ***"Parameter"***,
Submenu ***"Parameter Change"***; window 2



Response time Idle Increase:
The response time can be set between1 sec - 60 sec in increments of 1 sec.

Actuator Type:
The actuator type used in the VDO E-Gas® compact system can be defined here. The following options are available:

* E-Gas compact
* E-Gas II 24 V

Idle Position for One-Lever Fuel Pump:
The value of the idling position for one-lever fuel pump can be entered here in the range from 0% and 22% of the actuator movement. If an old idling position value is already stored in the memory, the old value must be deleted before the new idling position is transferred. Only then can the new, current value be seted.

Direction of Rotation Actuator:
The direction of rotation of the actuator can be defined here. The following options are available:

* anticlockwise
* clockwise

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.2 Main Menu Parameter

Road Speed Signal Monitoring:
The monitoring of the road speed signal line (only possible with PWM input C3, B7) can be changed here.
Three monitoring options are available:

* no monitoring (if hall sensor is used)
* partial monitoring (interruption and short circuit to U_{bat})
* full monitoring (interruption and short circuit to earth or U_{bat}).

Internal Clutch detection:
The internal clutch detection can be switched on or off here. If this function is switched on, the neutral position of the gearing is recognised automatically (Engine speed signal has to be connected).

Injection Pump Governor:
The injection governor type used in the VDO E-Gas® compact can be defined here. The following types are available:

* RQ
* RQV
* Special Governor▼

▼ Do not change before safe datafile!

ECU Mode:
The following options are available:

* E-Gas and engine speed control
* engine speed control only

Selection of rated value input:
The following options are available:

* set-point sensor
* accelerator unit
* ext. PWM
* ext. 0V - 5V
* set-point + ext. PWM
* accelerator unit + ext. 0V - 5V

Function 2nd rated value input:
The function of the second setpoint input can be defined here. The following types are available:

* reducing
* accelerating

This submenu can only be selected if a second rated value input has been programmed.

Brake Signal Monitoring:
The monitoring of the brake signal input can be switched on and off here. This function is switched off in stationary use (no brake signal).

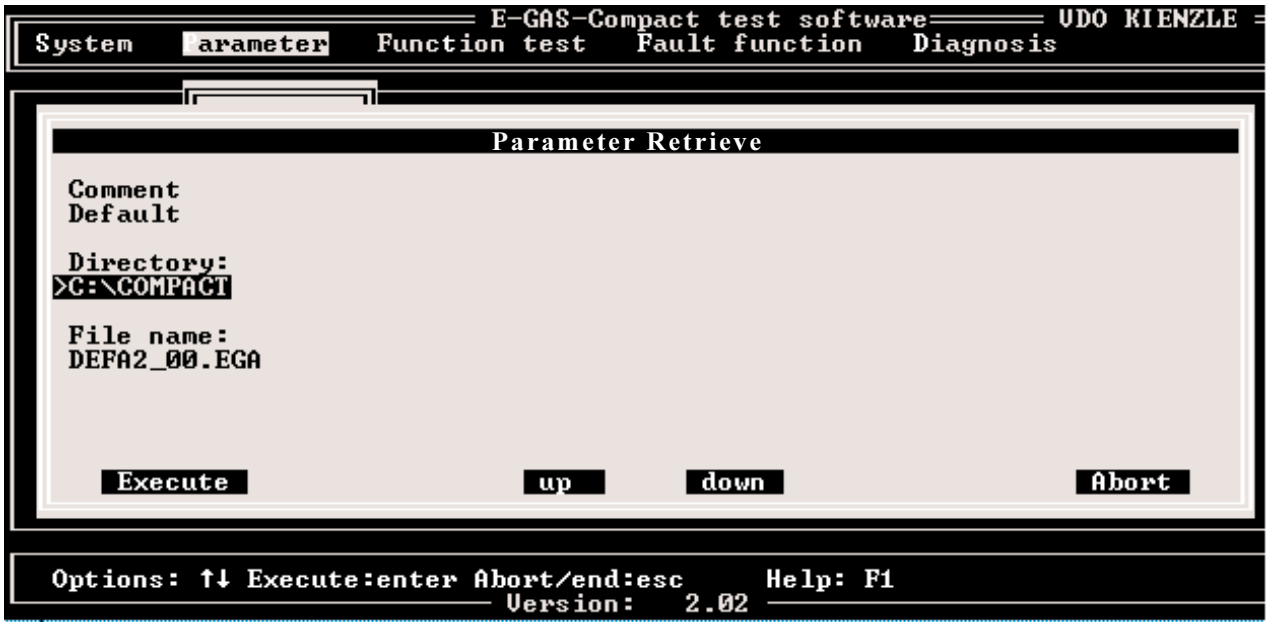
4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.2 Main Menu Parameter

Submenu Retrieve:
This menu makes it possible to load the complete configuration data of the EEPROM media. An appropriate parameter file can be selected using the following window.

E-Gas compact EGADIAG screen: Main menu ***"Parameter"***, Submenu ***"Retrieve"***



On this screen, the next parameter file in this directory can be selected using the cursor keys "up/down", or by clicking the mouse button on "up/down".
Note: The DOS operating system only allows a forward search, i.e. "up/down" have exactly the same effect.

The commentary which was stored with the data at the time the file was saved is displayed immediately. Apart from the file name, this assists the search for certain stored data.

The following texts might appear:

1. "No further data files found."

This means that the search for further parameter files was unsuccessful. The next search operation in this directiory starts again.

2. "No such file in the current directory."

This message means that the current directory does not contain any file with the extension*. EGA

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.2 Main Menu Parameter

If the directory name is to be changed, then the key <return> needs to be pressed, or the mouse needs to be clicked on the button "execute". The following question appears:
"Load file? No Yes"

If the <return> key is pressed for the default button <No> at this stage, the directory name can be edited. Only inputs in capital letters, and the character "_" and the symbol "\" and the sign "." are permitted.

To load the selected file, the above question must be answered with "Yes". This is done using the "J" ("Y") key or by clicking mouse button "Yes". The data are now read from the selected media. A safety check is made:
"Really overwrite parameter data in EGAS?"

If the key "J" ("Y") or the button "Yes" is chosen, then the parameter data are written into the E-Gas compact electronic controller. If the key <return> or <escape> is pressed or the "No" button is activated, the parameter files read in are discarded again.

Submenu Save:
This menu makes it possible to write the complete EEPROM configuration data onto media. First of all the menu "Parameter", sub-menu "Change" needs to be called up. This reads all saveable data from the EEPROM of the electronic controller. If this has not been the case, the following message appears:
"No data found. Go first to menu "Parameter change" to read data".

E-Gas compact EGADIAG screen: Main menu ***"Parameter"***, Submenu ***"Save"***

Here in the line "Comment" the text can be edited by pressing the <return> key or by selecting the "execute" button (inverse display). By double clicking the mouse, text can be called up for editing as well. The maximum length of the comment which may be input is 70 characters. This facilitates the search later of files previously saved.

4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.3 Main Menu Function Test

Submenu Outputs:
The outputs being tested depending on the option selected (actuator position, error lamp and actuator clutch). It is necessary that the vehicle be at a standstill there must be no errors reported. The connections for the electric actuator are tested by moving the electric actuator between positions 0% (minimum) and 100% (maximum). The connections for the error lamp and actuator clutch are tested by switching the outputs on and off.

E-Gas compact EGADIAG screen: Main Menu ***"Function Test"***, Submenu ***"Outputs"***

If the actuator position is set at 100%, the set-point sensor or pedal unit of the electronic controller 412-413-011-002 can be adjusted (adjustment see pages 3-12, 3-13).

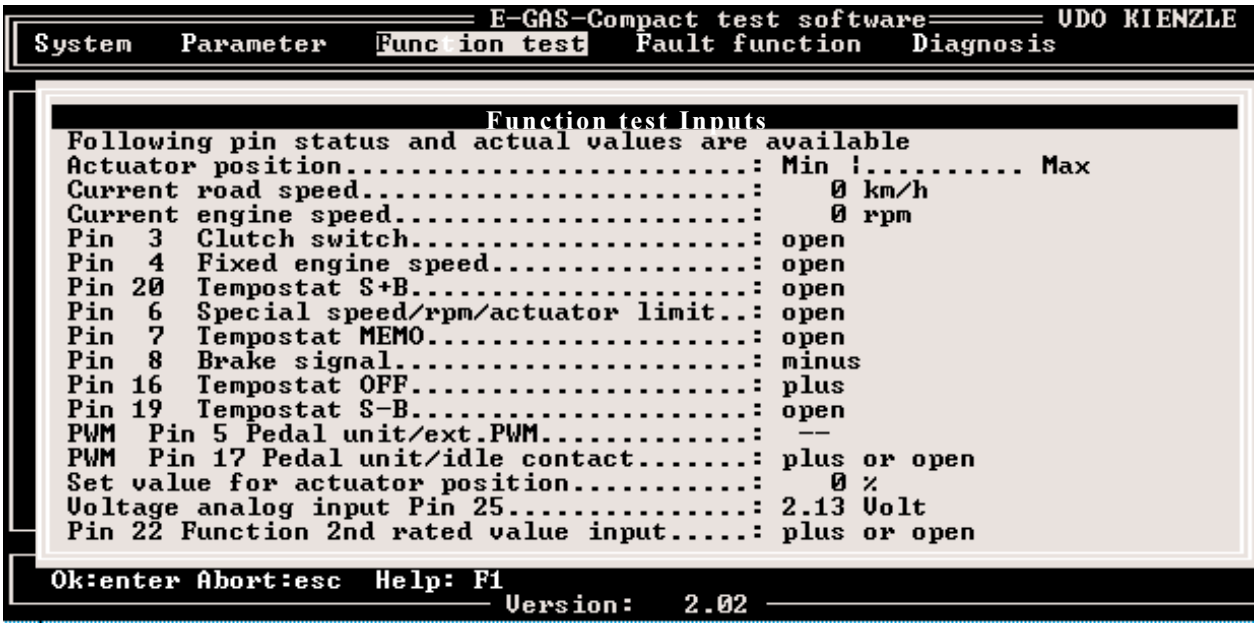
4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.3 Main Menu Function Test

Submenu Inputs:
Analog and digital inputs are indicated, depending on specified the inputs, the pins are represented as "open", "plus", "minus", "volt" or "%".

E-Gas compact EGADIAG screen: Main Menu ***"Function Test"***, Submenu ***"Inputs"***



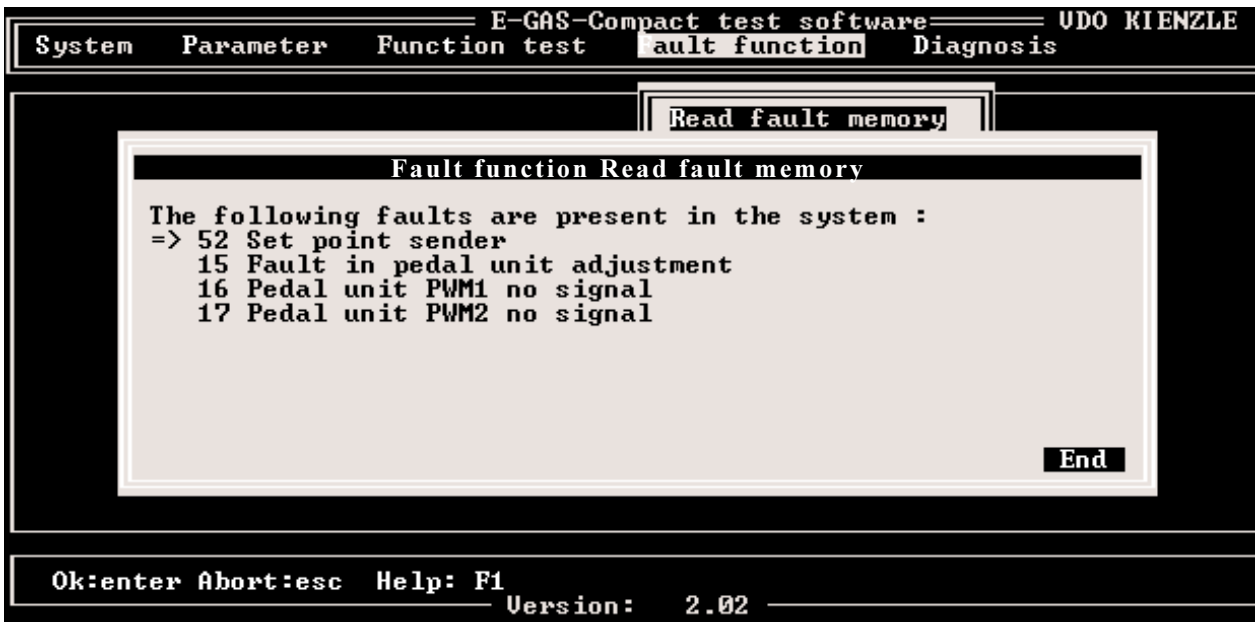
4. Testing Software VDO E-Gas® compact

4.3 Description of the Menu Items

4.3.4 Main Menu Fault Function

Submenu Read Fault Memory:
All faults stored in the electronic controller are displayed in plain text. The current faults are marked "=>". If the reply options Up and Down appear, there are more faults than can be displayed. To show these, the display can be scrolled up and down. Every fault is only once displayed.

E-Gas® compact EGADIAG screen: Main Menu ***"Fault Function"***, Submenu ***"Read Fault Memory"***



Submenu Delete Fault Memory:
The faults stored in the electronic controller are deleted. If there are still current faults in the system after this deleting operation, this is displayed.

This function also erase the ajusted values of the set-point sensor and the accelerator unit. The set-point sensor or accelerator unit have to adjusted afterwards (see page 3-12, 3-13).

4. Testing Software VDO E-Gas® compact

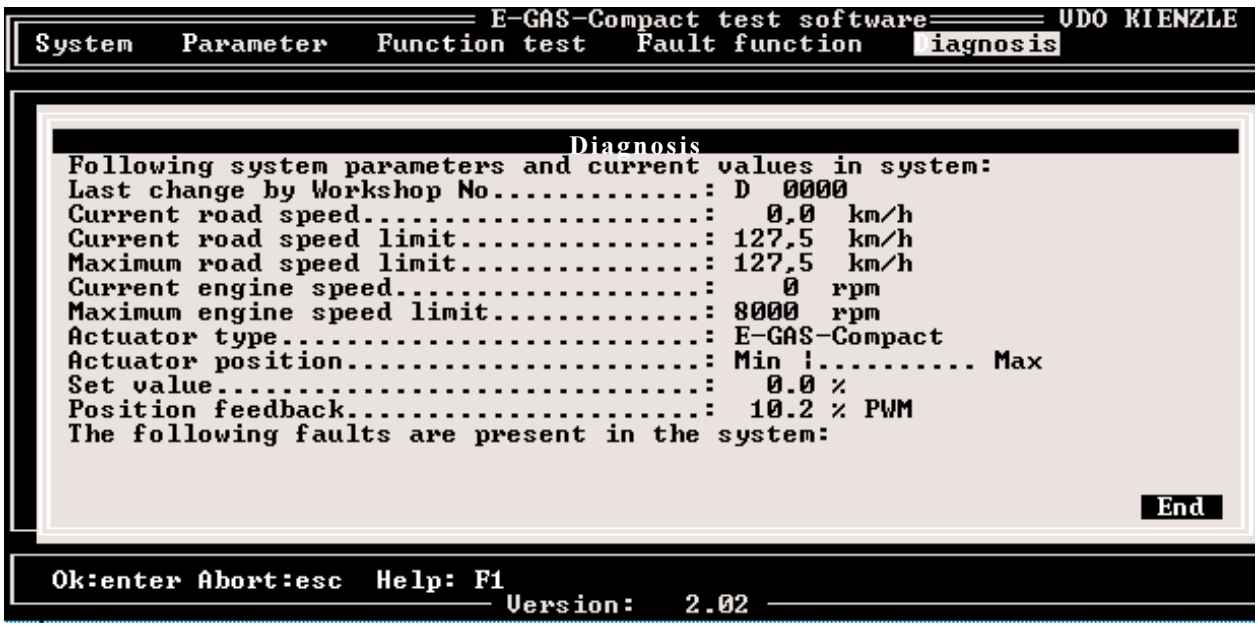
4.3 Description of the Menu Items

4.3.5 Main Menu Diagnosis

Displays all important system parameters, the most important current values and the current faults of the electronic controller.

* Workshop number of the workshop that carried out the last change to a parameter in the connected electronic controller (all menu items in the main menu change).
* Current vehicle speed as determined by the electronic controller.
* Speed limit value currently being set. This may be the maximum limiting speed, the variable road speed limit or the special road speed limit.
* Defined maximum road speed limit
* Current engine speed as determined by the electronic controller.
* Engine speed limit or special engine speed limit set in the electronic controller.
* Current actuator type configured in the electronic controller.
* Current actuator position as determined by the electronic controller.
* Current rated value detected by the electronic controller.
* PWM output actuator position.
* Display of all current faults. The errors are numbered consecutively. If the reply options Up and Down appear, there are more errors than can be displayed. To show these, the display can be scrolled up and down.

E-Gas compact EGADIAG screen: Main Menu ***"Diagnosis"***,



4. Testing Software VDO E-Gas® compact

4.4 Error Handling

The program distinguishes between two types of error. System errors are errors related to the hardware used. They lead to the program being aborted and to an appropriate error message at operating system level. Communication and input errors are errors related to the execution of the program. These errors lead to an error message in the EGADIAG operator screen and in some cases might cause interruption of the diagnostics connection.

System Errors
Various tests are carried out during the initialisation of the EGADIAG program. If discrepancies are detected, the program returns to the operating system level with an error message.

Video Adapter not Defined
The connected video adapter cannot be identified by the system. This error will not occur if the hardware specified on Page 3 - 3 is used.

The Installed Graphic-Card is not Supplied
The program has identified a video adapter that does not correspond to the hardware specified in the program specification.

Not Enough Memory Available
Before the program is started, the memory given in the program specification should be available. This error can also occur while the program is running.

Invalid Configuration Parameter
One of the configured parameters has an undefined value.

If the electronic controller error "Data error in EEPROM" appears after a parameter has been changed with a command from the main menu item Change (error lamp lights up continuously) the change in parameter must be repeated.

4. Testing Software VDO E-Gas® compact

4.4 Error Handling

Communication Error

The communication between the EGADIAG program and the electronic controller is constantly monitored. If discrepancies occur while the diagnostics protocol is running, an error message is displayed in the EGADIAG operator screen. In some cases the error leads to interruption of the diagnostics connection.

The Following Errors are Detected by the Program:

Communication error (timeout when sending or receiving a byte)

If the permitted timeout duration is exceeded when sending or receiving a byte, diagnostics are interrupted. A re-initialisation of the diagnostics function is not possible within the next 10 seconds.
If this error is detected, the error message "Diagnostics line cannot be initialised" appears.

Checksum error (line fault)

EEPROM error (fault in electronic controller)

Invalid command (line fault)

Access refused (VDO E-Gas® compact system error)

User code incorrect (VDO E-Gas® compact system error)

When the EGADIAG program detects one of these errors, the last command is repeated once in order to rule out sporadic errors as far as possible. If the error repeats itself, an appropriate error message is displayed. Depending on the meaning of the command, the user is requested to repeat the menu item command.

Diagnostics Line cannot be Initialised

If a connection cannot be established due to the absence of a diagnostics line, defective electronic controller, lack of power supply, incorrect connection of the PC to the VDO E-Gas® interface, or the like, the error message "Diagnostics line cannot be initialised" appears.

The establishment of the connection can be attempted again after the cause of the error has been rectified.

Input Errors

The input of all numerical values is checked for the permitted value range. In the event of incorrect input, this is displayed on the EGADIAG user interface by means of an error message and the user is requested to make a new entry. If other values are directly linked to the changed value, they are changed accordingly in order to avoid a system error in the electronic controller.

5. Check List

The VDO E-Gas® compact installation must be checked by qualified personnel by reference to the check list in conjunction with the installation instructions and description of operation, by reference to the check list provided.

In the case of motor vehicles, the vehicle manufacturer has the responsibility for the proper function of the systems. In order to facilitate checking, all operating systems of the vehicle must be operational.

The sequence of testing must be complied with.

The VDO E-Gas® compact installation must only be taken into use if all points checked correspond to the requirements.

Installation took place in the following vehicle:

Customer name: .....

Address: .....

.....

Vehicle type: .....

Manufacturer: .....

Chassis No.: .....

Registration mark: .....

.....	.....	.....
Signature	Date	Stamp

5. Check List

5.1 Electronic Controller

5.1.1 Has the electronic controller been attached in accordance with assembly instructions? .....

5.1.2 Has the system plug been properly inserted? .....

5.1.3 Has the safety shut-off circuit (actuator clutch) been correctly wired up? .....

5.1.4 Is there a fault warning lamp? .....

5.2 Set-point sensor/Accelerator unit

5.2.1 Does the installation of the set-point sensor/accelerator unit correspond to the installation instructions? .....

5.2.2 Is the bracket of a robust construction and properly bolted on? .....

5.2.3 Do the linkages between accelerator pedal and control move freely and easily? .....

5.2.4 Does the set-point sensor lever properly contact the idle end stop every time the accelerator pedal returns, irrespective of whether this happens quickly or slowly. In addition, does the accelerator pedal have an over-travel of 5mm ± 2mm with the linkage disengaged? .....

5.2.5 With the accelerator pedal floored, is there an air gap of 1mm ± 0.5mm at the set-point sensor end stop? .....

5.2.6 Are the ball sockets greased and protected from disengagement? .....

5.2.7 Is the safety cap fitted to the plug coupling? .....

5.3 Electric Actuator

5.3.1 Does the installation of the actuator correspond to the installation instructions ? .....

5.3.2 Is the bracket of a robust design and properly bolted on ? .....

5.3.3 Have all required damping elements been used ? .....

5.3.4 Is the actuating lever properly fixed ? .....

5.3.5 To check the actuating path, disengage the connecting link and move the actuator to the full load position using the accelerator.
Re-engage linkage bar. Is the full load end stop at the injection pump reached ? .....

5.3.6 Is the return spring fitted and does it correspond to the installation instructions? .....

5.3.7 Are the ball sockets lubricated and secured to prevent disengagement? .....

5.3.8 Is a safety cap fitted to the coupling plug? .....

5. Check List

5.3.9 Start vehicle engine. .....

5.3.10 Does the idling speed of the vehicle engine after installation of the actuator correspond to the speed prescribed by the manufacturer (actuator clutch must be open and close) ? .....

5.4 Safety Functions

5.4.1 Function testing of the safety shut off unit (engine running)

a) Switch on ignition and start engine
b) Press accelerator pedal to full load
c) Brake or safety switch in function
d) Release accelerator pedal

Does the idle rpm's reached when brake or safety switch is in function? .....

5.4.2 Function test in the event of failure of the power supply.

a) Does the actuator reach the idle position in the event of power loss? .....

5.4.3 Has the range for idling speed increase been limited? ..... [%]

5.4.4 Other safety concept?

Description _____

_____

_____

_____

_____

_____

_____

_____

_____

5. Check List

5.5 Setting Parameters

5.5.1 To provide documentation of the control parameters that have been set, please complete the enclosed Listing of VDO E-Gas® compact parameters and safe it togehter with the vehicle specific datas.

Parameter		Default	Modification
Max set speed Vset	:	127.5km/h	
Min speed for Vvar	:	30.0km/h	
Special speed Vspec	:	127.5km/h	
Tolerance	:	Not set	
Tacho o/p	:	0 Imp/km	
Distributor for v signal	:	1 : 1	
Upper rpm limit	:	8000rpm	
Special rpm limit	:	8000rpm	
Variable working rpm	:	8000rpm	
Min rpm for var PTO	:	500rpm	
Fixed rpm	:	500rpm	
Engine rpm coordination	:	1800 Imp/100U	
Actuator movement	:	0%	
Emergency running limit	:	0%	
Upper limit for idling increase	:	15%	
Adjustement ramp idling increase	:	5 sec	
Actuator type	:	E-Gas compact	
Idle position for 1 lever fuel pump	:	0%	
Running direction actuator type	:	Anti-clockwise	
Speed signal supervision	:	No supervision	
Clutch detection	:	Not set	
Type of injection type	:	RQV	
Control electronics function	:	E-GAS+rpm function	
Selection set value	:	Set-point sensor	
Function 2nd input	:	Not configured	
Brake signal check	:	Off	
Designation of file	:	defa2_00.ega	
Control paramenter data	:	RQV	

Date: Signature:

5. Check List

5.5.2 In addition, the sticker for the electronic controller VDO E-Gas® compact should be completed and attached to the rear panel of the electronic controller VDO E-Gas® compact.

The warning label „Please note tune-up specification on rear of ECU → (electronic regulator)“ should be affixed to the front panel of the electronic controller E-Gas compact.

Sticker, electonic controller VDO E-Gas® compact (reverse)

VDO KIENZLE

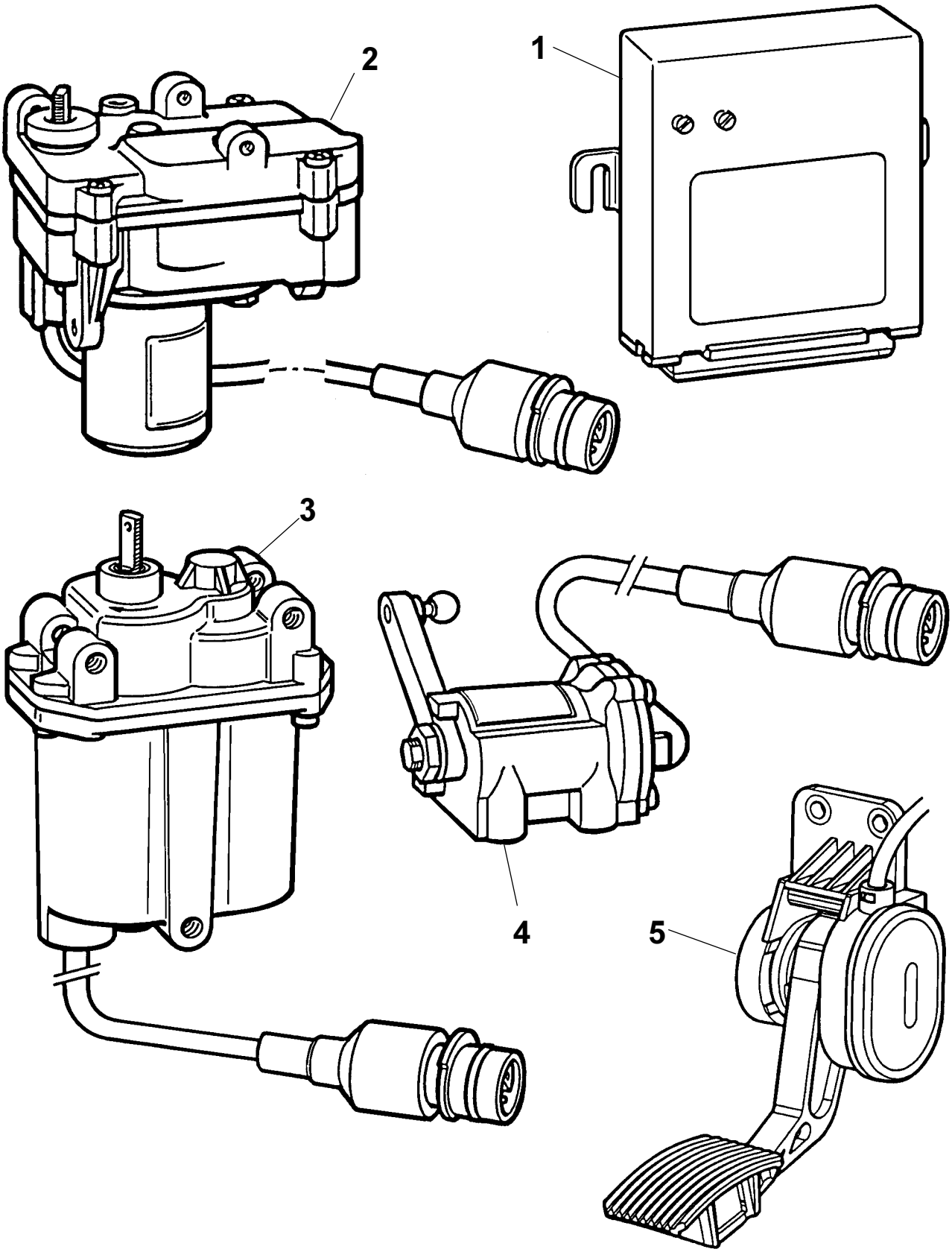
Parameter		Modification
Max set speed Vset	:	
Min speed for Vvar	:	
Special speed Vspec	:	
Tolerance	:	
Tacho o/p	:	
Distributor for v signal	:	
Upper rpm limit	:	
Special rpm limit	:	
Variable working rpm	:	
Min rpm for var PTO	:	
Fixed rpm	:	
Engine rpm coordination	:	
Actuator movement	:	
Emergency running limit	:	
Upper limit for idling increase	:	
Adjustement ramp idling increase	:	
Actuator type	:	
Idle position for 1 lever fuel pump	:	
Running direction actuator type	:	
Speed signal supervision	:	
Clutch detection	:	
Type of injection type	:	
Control electronics function	:	
Selection set value	:	
Function 2nd input	:	
Brake signal check	:	
Designation of file	:	
Control paramenter data	:	

Marking plate (front)

Please note tune-up specification on rear of ECU → (electronic regulator)

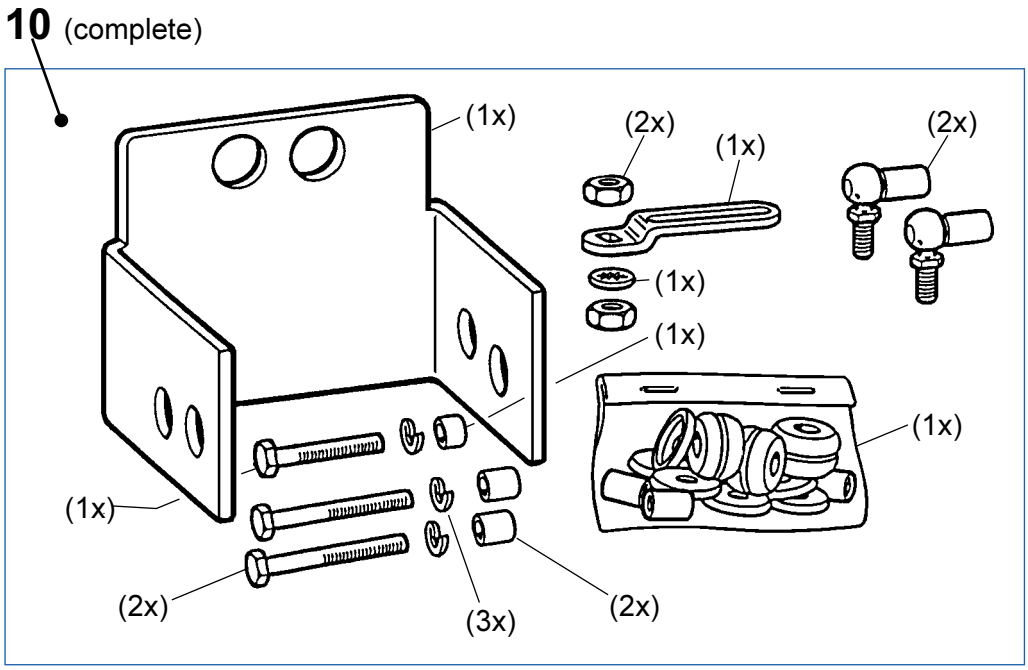
Part-No. X11-397-112-033 (Adhesive sticker and marking plate)

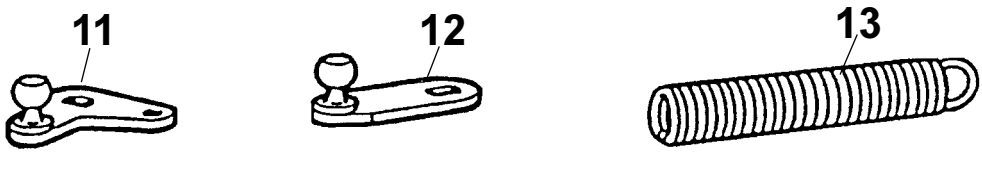
6. Parts List and Accessories

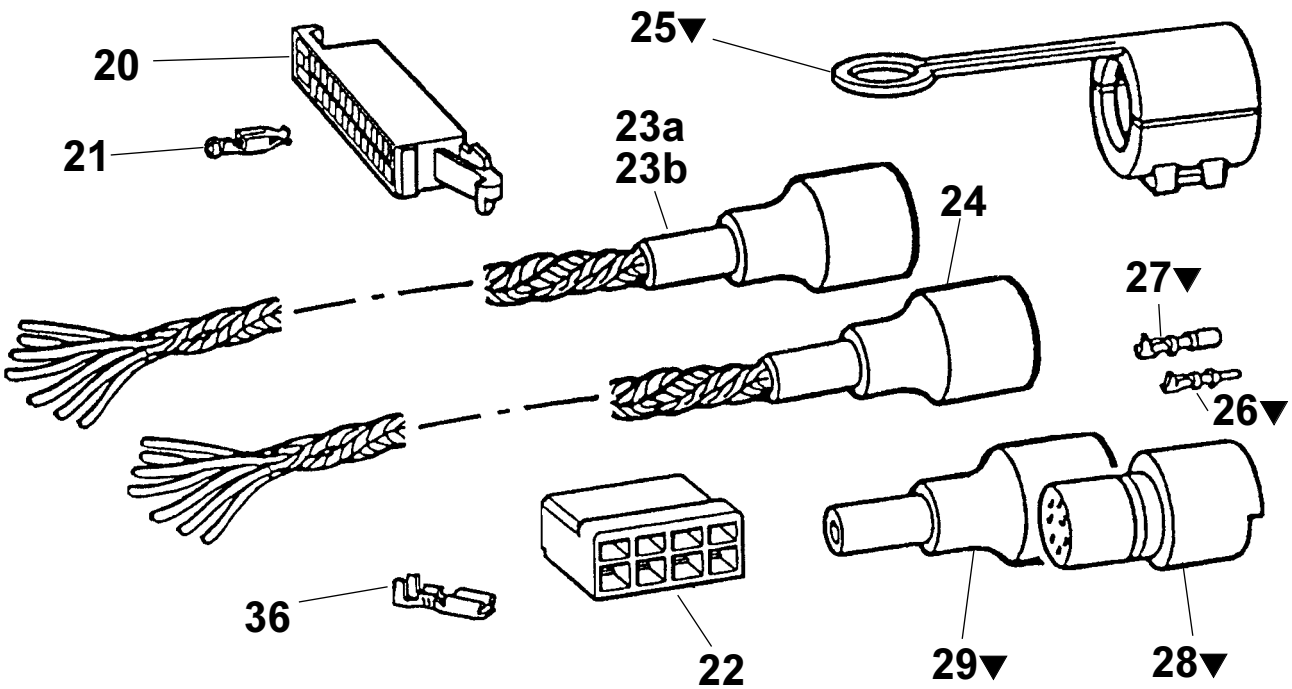


Part No. see page 6 - 5

6. Parts List and Accessories



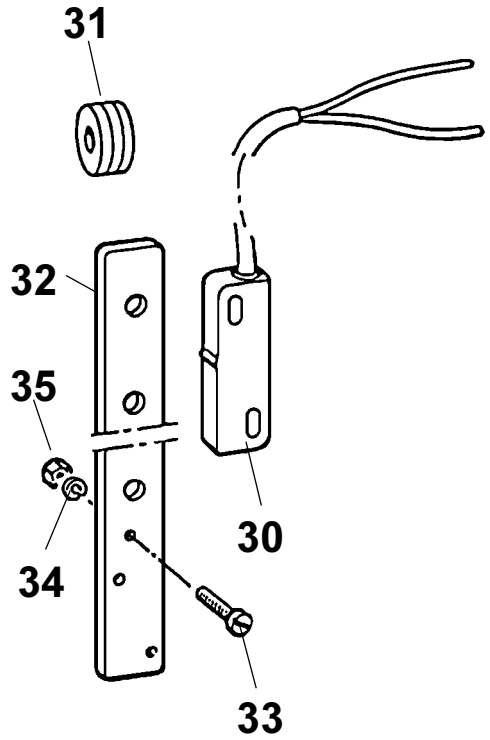


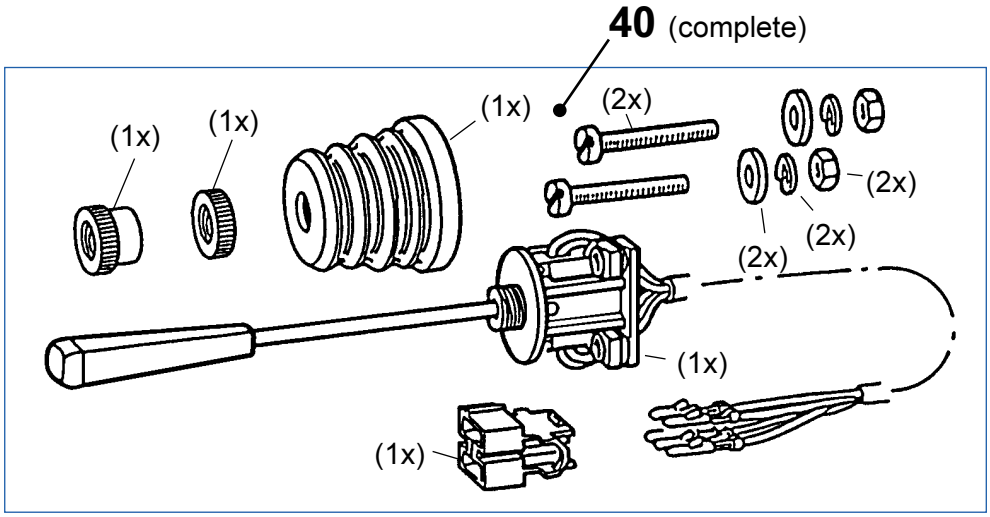


▼ complete = **37**

Part No. see page 6 - 5

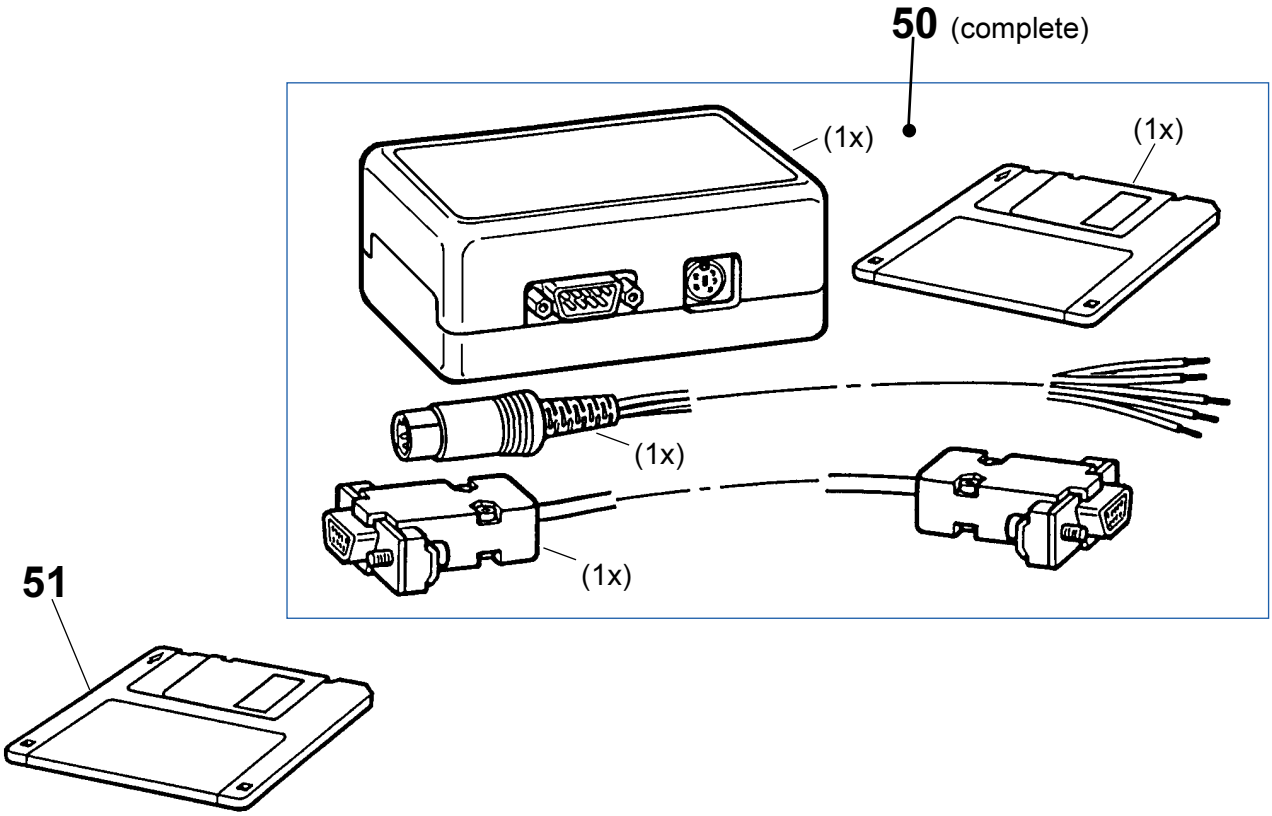
6. Parts List and Accessories



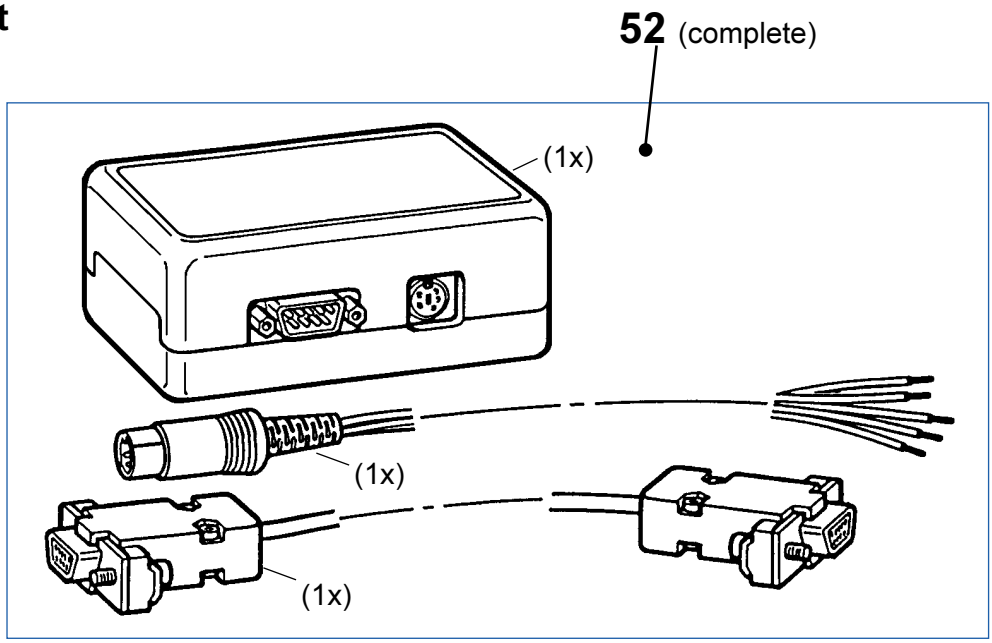


Part No. see page 6 - 5

6. Parts List and Accessories



Replacement part



Part No. see page 6 - 5

6. Parts List and Accessories

Parts Number

Pos.	Description	Order No.
1	Electronic controller (available till stocks last))	412-413-011-001P
	Electronic controller	412-413-011-002P
2	Electric actuator 24V (750ms)	408-422-006-001P
	Electric actuator 12V (< 2s)	408-221-005-001P
3	Electric actuator 24V (250ms)	408-411-005-013P
4	Set-point sensor	445-804-005-014P
5	Accelerator unit	445-803-005-001P
	Accelerator unit (SAE J 1843)	445-803-007-001G
10	Actuator bracket kit (only for actuator 408-422-006-001P and for actuator	X39-397-112-014
	408-221-005-001P)	
11	Lever (actuator), angled	993-620-079-1143
12	Lever (actuator), straight	993-620-082-1143
13	Release spring	X11-397-112-006
20	Terminal block cover, black	X11-397-109-003
21	Female connector	X11-397-109-004
22	Female connector housing, 8-pole (pedal unit)	X11-397-112-031
23a	Actuator cable, 20m (for 408-411-005-013)	X39-397-112-012
23b	Actuator cable, 20m (for 408-422-006-001)	X39-397-112-016
24	Set-point sensor cable, 5m	X39-397-112-002
25	Retaining clamp	81-378-001
26	Pin contact	21-813-156-1351
27	Socket contact	45-031-033-1351
28	Connector shell	88-400-137
29	Rubber grommet	89-563-058
30	Clutch switch	X39-397-106-127
31	Magnet	X39-397-106-128
32	Clutch switch holder	X39-397-106-125
33	Cheese hd. screw, M 3x16-ISO 1207 (DIN 84)	
34	Lock washer, A3 DIN 127-St	
35	Hex nut, M3 ISO 4032 (DIN 934)	
36	Spade connector (6.3)	X11-000-002-021
37	Connector kit Cannon (consisting of pos. 25 to pos. 29)	X39-397-112-015
40	Control switch kit	X39-397-106-149
50	Testing software, incl. Interface (VDO E-Gas® compact)	X12-397-046-001
51	Testing software (VDO E-Gas® compact)	X12-397-046-002
52	Interface (Replacement part)	X12-397-041-601

7. Data Sheets

Enclosures

Components:	Documentation No.:	
Electric actuator (750ms)		
408-422-006-001P	TU00-0781-5404620	0900 (page 1-2)
Electric actuator (250ms)		
408-411-005-013P	TU00-0781-5204620	0900 (page 1-2)
Electric actuator (2s)		
408-421-005-001P	TU00-0781-5304620	0799 (page 1-2)
Electronic controller		
412-413-011-002P	TU00-0782-5604620	0100 (page 1-2)
Accelarator unit		
445-803-005-001P	TU00-0783-5104620	0900 (page 1-2)
Set-point sensor		
445-804-005-014P	TU00-0784-5104620	0900 (page 1-2)
Control switch kit		
X39-397-106-149	TU00-0785-5104620	0799 (page 1-2)

Elektrisches Stellglied

Systemkomponente für E-Gas® compact

Beschreibung:

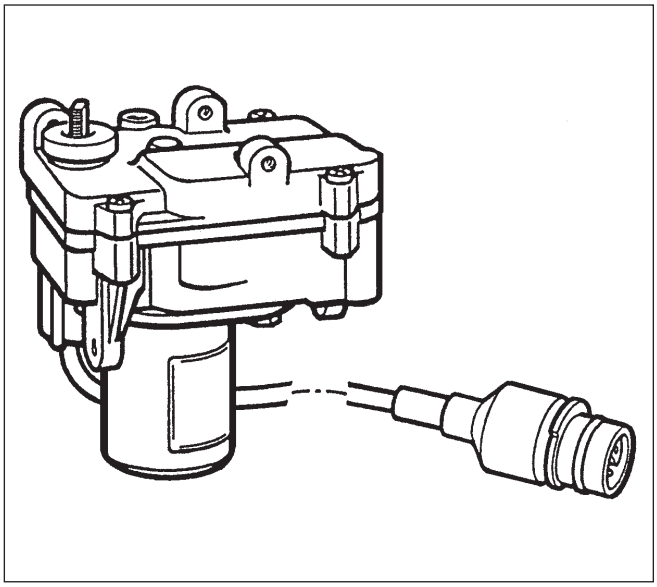
Das elektrische Stellglied wurde von VDO zur Betätigung des Einspritzpumpenhebels von Dieselmotoren in Zusammenhang mit elektronischen VDO Reglern konzipiert.
Die elektrische Ansteuerung des permanenterregten Gleichstrommotors erfolgt durch ein pulsweitenmoduliertes Signal.
Aufbau:
Wasserdichtes Alu-Druckgussgehäuse mit PTFE-Membrane zum Druckausgleich. Dreistufiges Getriebe, das über eine elektromagnetische Kupplung den Kraftfluss zwischen Gleichstrommotor und Abtriebsachse herstellt.
Leitplastikpotentiometer zur Rückmeldung.
Anschlusskabel mit Stecker.

Technische Daten:

Nennspannung:	24 V
Nenndrehmoment:	250 Ncm
Aufregelzeit:	< 1 Sek.
Aufregelzeit (typisch):	750 ms
Isolationswiderstand:	> 500 KΩ
Durchschlagfestigkeit:	500 V
Betriebstemperatur:	– 25°C bis + 90°C
Schutzart:	IP56 DIN 40050 Teil 9
Max. Anzugsdrehmoment für die Antriebsachse:	10 Nm
Max. Anzugsdrehmoment für die Befestigungs-schrauben:	12 Nm (bei 9mm Einschraubtiefe)
Mechanischer Winkel:	103° ± 5°
Anschlussstecker:	ITT Canon Sure Seal, 7polig

Electric Actuator

System component for E-Gas® compact



Description:

VDO has designed the electric actuator for actuating the injection-pump lever of diesel engines to be used with VDO electronic control systems.
A pulse width modulated (PWM) signal controls the electric motor (permanently activated direct-current motor).
Design:
Waterproof aluminium diecast housing with a PTFE membrane for pressure-compensation. Via an electromagnetic clutch, the three-speed gearbox connects the direct-current motor with the output axle.
Conductive-plastic feedback potentiometer.
Connecting cable with plug.

Technical Data:

Rated voltage:	24 V
Rated torque:	250 Ncm
Up-regulation time:	< 1 sec.
Up-regulation time (typical):	750 ms
Insulating resistance:	> 500 KΩ
Dielectric strength:	500 V
Operating temperature:	– 25°C to + 90°C
Protection:	IP56 DIN 40050 part 9
Maximum tightening torque for the output shaft:	10 Nm
Maximum tightening torque for fastening screws:	12 Nm (relating to a screw depth of 9mm)
Mechanical angle:	103° ± 5°
Connecting plug:	ITT Canon Sure Seal, 7-pole

TU00-0781-5404620 I 0108 I

Overview of Chapter

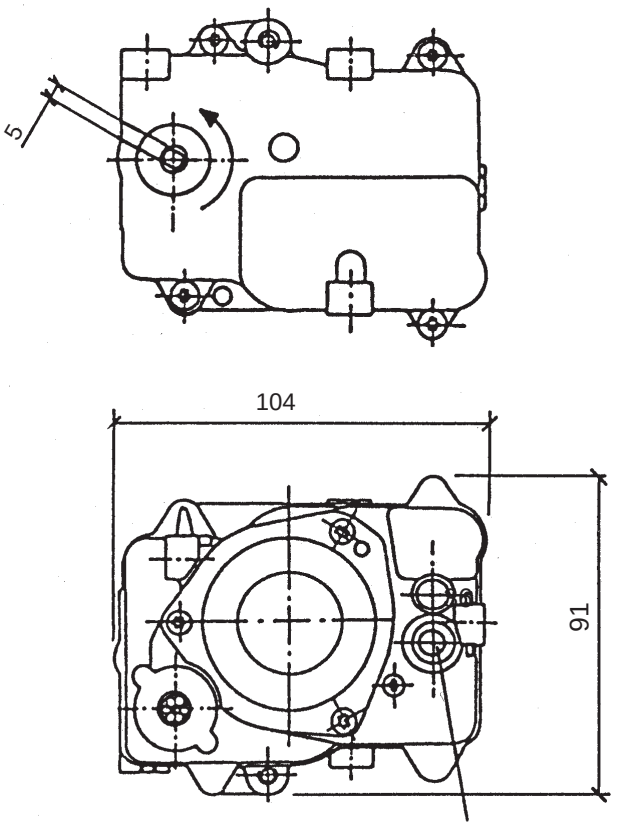
Elektrisches Stellglied

Systemkomponente für E-Gas® compact

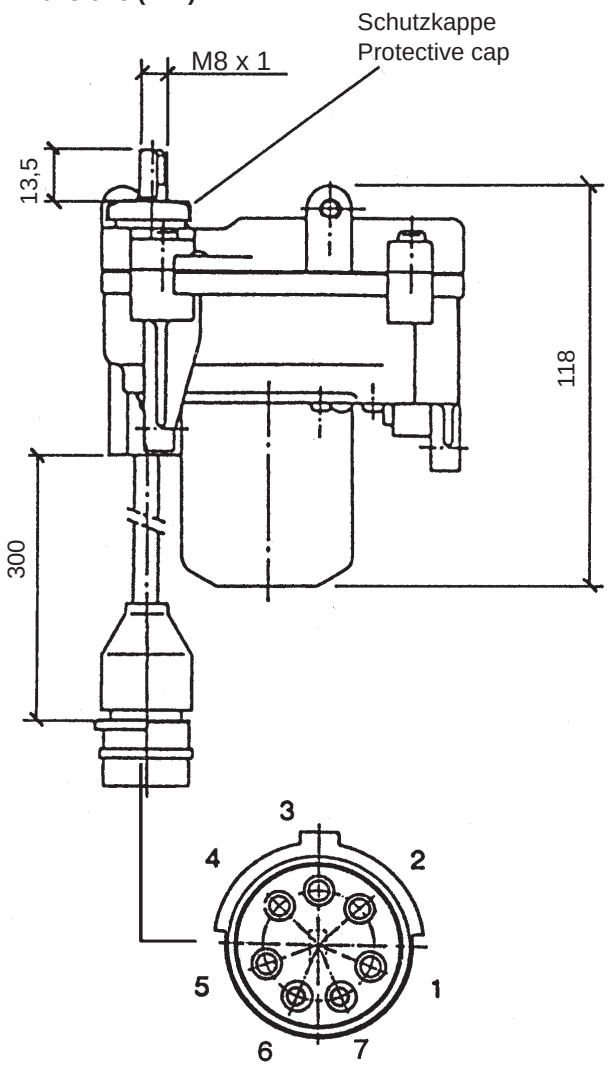
Electric Actuator

System component for E-Gas® compact

Abmaße (mm):



Dimensions (mm):



Anschlussbelegung:		Terminal Connection:	
1	Motor (–)	1	Actuator (–)
2	Potentiometer (IP–)	2	Potentiometer (IP–)
3	Potentiometer (IPS)	3	Potentiometer (IPS)
4	Potentiometer (IP+)	4	Potentiometer (IP+)
5	Kupplung	5	Clutch
6	Kupplung	6	Clutch
7	Motor (+)	7	Actuator (+)

Bestell-Nr. / Order No. 408-422-006-001P

(Weitere Dokumentation siehe “Technische Kunden-Unterlage” 408-422-006-001P. /
Further documentation see ‘Technical Customer Documentation’ 408-422-006-001P.)

Zubehör:	**Accessories:**	**Best.-Nr. / Order No.:**
Dämpfungselemente (Teilesatz)	Damping components (parts kit)	240-110-001-001P
Stellgliedhaltersatz (motorfeste Montage)	Actuator bracket kit (engine mounting)	X39-397-112-014

Overview of Chapter

Elektrisches Stellglied

Systemkomponente für E-Gas® II, E-Gas® compact

Beschreibung:

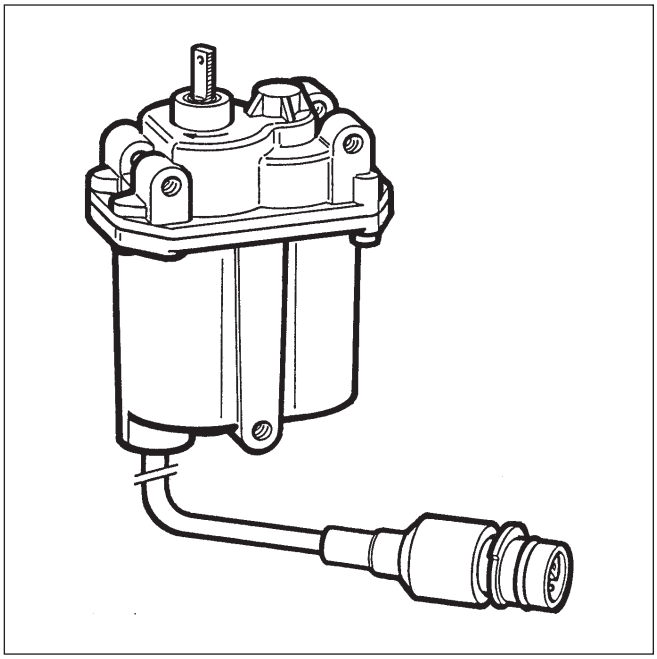
Das elektrische Stellglied wurde von VDO zur Betätigung des Einspritzpumpenhebels von Dieselmotoren in Zusammenhang mit elektronischen VDO Reglern konzipiert.
Die elektrische Ansteuerung des permanenterregten Gleichstrommotors erfolgt durch ein pulsweitenmoduliertes Signal.
Aufbau:
Wasserdichtes Alu-Druckgussgehäuse mit PTFE-Membrane zum Druckausgleich. Dreistufiges Getriebe, das in permanentem Eingriff zur Abtriebsachse steht.
Leitplastikpotentiometer zur Rückmeldung.
Sicherheitskontakt, der bei einer definierten Stellung der Abtriebsachse öffnet.
Anschlusskabel mit Stecker.

Description:

VDO has designed the electric actuator for actuating the injection-pump lever of diesel engines to be used with VDO electronic control systems.
A pulse width modulated (PWM) signal controls the electric motor (permanently activated direct-current motor).
Design:
Waterproof aluminium diecast housing with a PTFE membrane for pressure compensation. Three-speed gearbox in permanent connection with the output axle.
Conductive-plastic feedback potentiometer.
Safety contact opening at a defined position of the output axle.
Connecting cable with plug.

Electric Actuator

System component for E-Gas® II E-Gas® compact



Technische Daten:

Nennspannung:	24V
Nenndrehmoment:	180 Ncm (in Verbindung mit elektron. Regler)
Stellzeit:	< 250ms bei Nennspannung 100 bis 180 Ncm Stellmoment
Sicherheitskontakt-Schaltpunkt:	21° bis 12,5° (schließen in LL-Richtung)
Betriebstemperatur:	– 40°C bis + 120°C (+ 140°C max. 1x1 Std.)
Schutzart:	IP56 DIN 40050
Mechanischer Winkel:	120°
Max. Anzugsdrehmoment für die Antriebsachse:	10 Nm
Max. Anzugsdrehmoment für die Befestigungsschrauben:	8 + 4 Nm (bei 9mm Einschraubtiefe)
Anschlussstecker:	ITT Canon Sure Seal, 7polig

Technical Data:

Rated voltage:	24V
Rated torque:	180 Ncm (in union with electronic controller)
Actuating time:	< 250ms at rated voltage and 100 to 180 Ncm actuating torque
Safety contact-switching point:	21° to 12.5° (closed in idle speed direction)
Operating temperature:	– 40°C to + 120°C (+ 140°C max. 1x1 h)
Protection:	IP56 DIN 40050
Mechanical angle:	120°
Maximum tightening torque for the output shaft:	10 Nm
Maximum tightening torque for fastening screws:	8 + 4 Nm (relating to a screw depth of 9 mm)
Connecting plug:	ITT Canon Sure Seal, 7-pole

Overview of Chapter

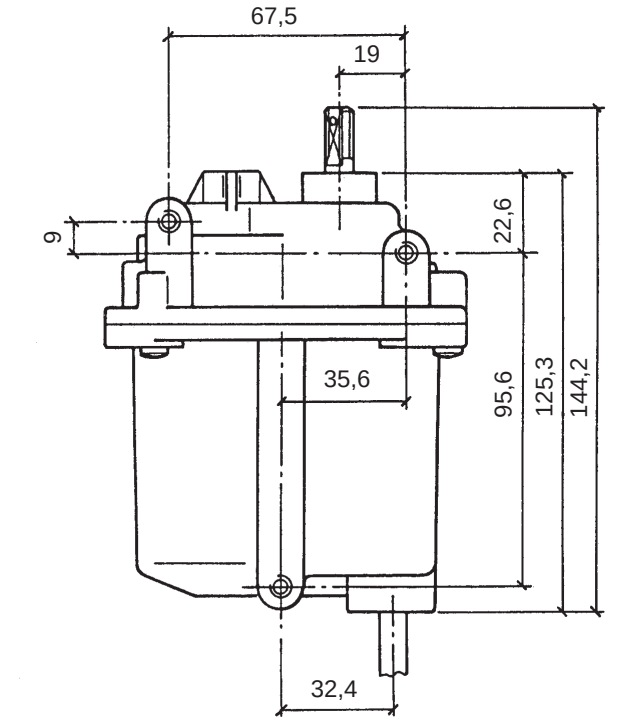
Elektrisches Stellglied

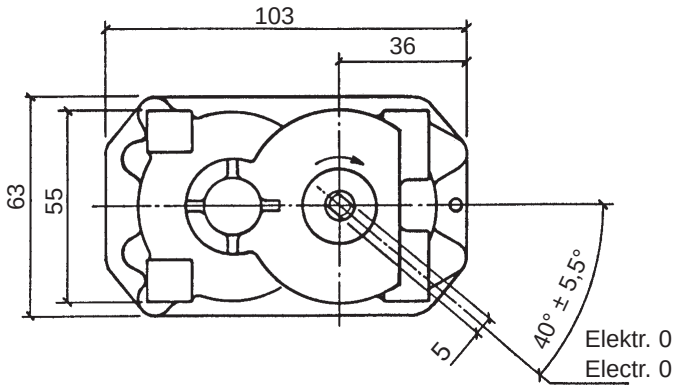
Systemkomponente für E-Gas® II, E-Gas® compact

Electric Actuator

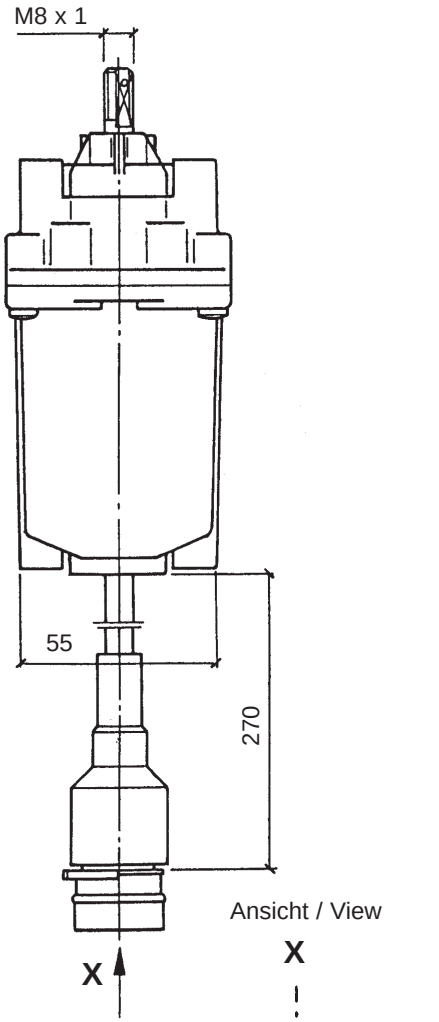
System component for E-Gas® II E-Gas® compact

Abmaße (mm):





Dimensions (mm):



Anschlussbelegung:

1	Motor (–)
2	Motor (+)
3	Sicherheitskontakt
4	Sicherheitskontakt
5	Potentiometer (IP–)
6	Potentiometer (IPS)
7	Potentiometer (IP+)

Teminal Connection:

1	Actuator (–)
2	Actuator (+)
3	Safety contact
4	Safety contact
5	Potentiometer (IP–)
6	Potentiometer (IPS)
7	Potentiometer (IP+)

Bestell-Nr. / Order No. 408-411-005-013P

(Weitere Dokumentation siehe “Technische Kunden-Unterlage” 408-411-005-013P. /
Further documentation see ‘Technical Customer Documentation’ 408-411-005-013P.)

Overview of Chapter

Zubehör:	**Accessories:**	**Best.-Nr. / Order No.:**
Dämpfungselemente (Teilesatz)	Damping components (parts kit)	240-110-001-001P
Hebel (abgewinkelt)	Lever (angled)	993-620-079-1143
Hebel (gerade)	Lever (straight)	993-620-082-1143

Elektrisches Stellglied

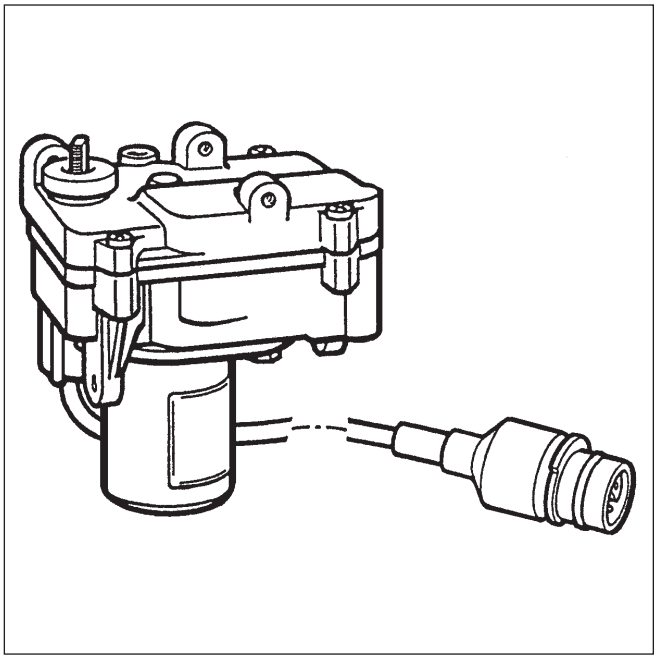
Systemkomponente für E-Gas® compact, AGB Komfort

Beschreibung:

Das elektrische Stellglied wurde von VDO zur Betätigung des Einspritzpumpenhebels von Dieselmotoren in Zusammenhang mit elektronischen VDO Reglern konzipiert.
Die elektrische Ansteuerung des permanenterregten Gleichstrommotors erfolgt durch ein pulsweitenmoduliertes Signal.
Aufbau:
Wasserdichtes Alu-Druckgussgehäuse mit PTFE-Membrane zum Druckausgleich. Dreistufiges Getriebe, das über eine elektromagnetische Kupplung den Kraftfluss zwischen Gleichstrommotor und Abtriebsachse herstellt.
Leitplastikpotentiometer zur Rückmeldung.
Anschlusskabel mit Stecker.

Electric Actuator

System component for E-Gas® compact, RSL Comfort



Description:

VDO has designed the electric actuator for actuating the injection-pump lever of diesel engines to be used with VDO electronic control systems.
A pulse width modulated (PWM) signal controls the electric motor (permanently activated direct-current motor)
Design:
Waterproof aluminium diecast housing with a PTFE membrane for pressure-compensation.
Via an electromagnetic clutch, the three-speed gearbox connects the direct-current motor with the output axle.
Conductive-plastic feedback potentiometer.
Connecting cable with plug.

Technische Daten:

Nennspannung:	12V
Nenndrehmoment:	400Ncm edul (AGB) 300Ncm mul (tempostat®)
Aufregelzeit:	≤ 2 Sek.
Isolationswiderstand:	≥ 500 KΩ
Durchschlagfestigkeit:	500V
Betriebstemperatur:	– 25°C bis + 90°C
Schutzart:	IP56 DIN 40050 Teil 9
Max. Anzugsdrehmoment für die Antriebsachse:	10 Nm
Max. Anzugsdrehmoment für die Befestigungsschrauben:	12 Nm (bei 9mm Einschraubtiefe)
Mechanischer Winkel:	103° ± 5°
Anschlussstecker:	ITT Canon Sure Seal, 7polig

Technical Data:

Rated voltage:	12V
Rated torque:	400Ncm ccw (RSL) 300Ncm cw (tempostat®)
Up-regulaton time:	< 2 Sek.
Insulating resistance:	> 500 KΩ
Dielectric strength:	500V
Operating temperature:	– 25°C to + 90°C
Protection:	IP56 DIN 40050 part 9
Maximum tightening toque for the output shaft:	10Nm
Maximum tightening toque for fastening screws:	12Nm (relating to a screw depth of 9mm)
Mechanical angle:	103° ± 5°
Connecting plug:	ITT Canon Sure Seal, 7-pole

Overview of Chapter

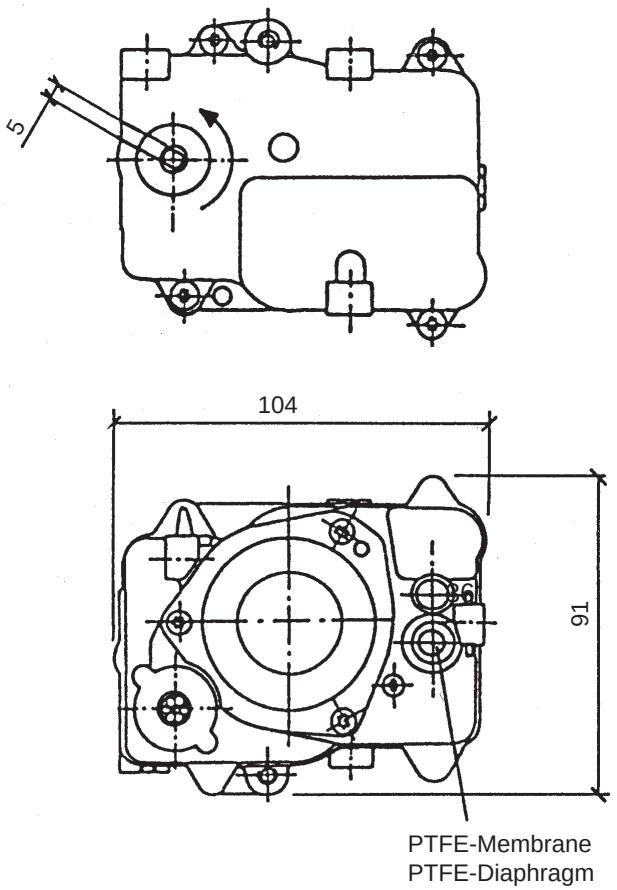
Elektrisches Stellglied

Systemkomponente für E-Gas® compact, AGB Komfort

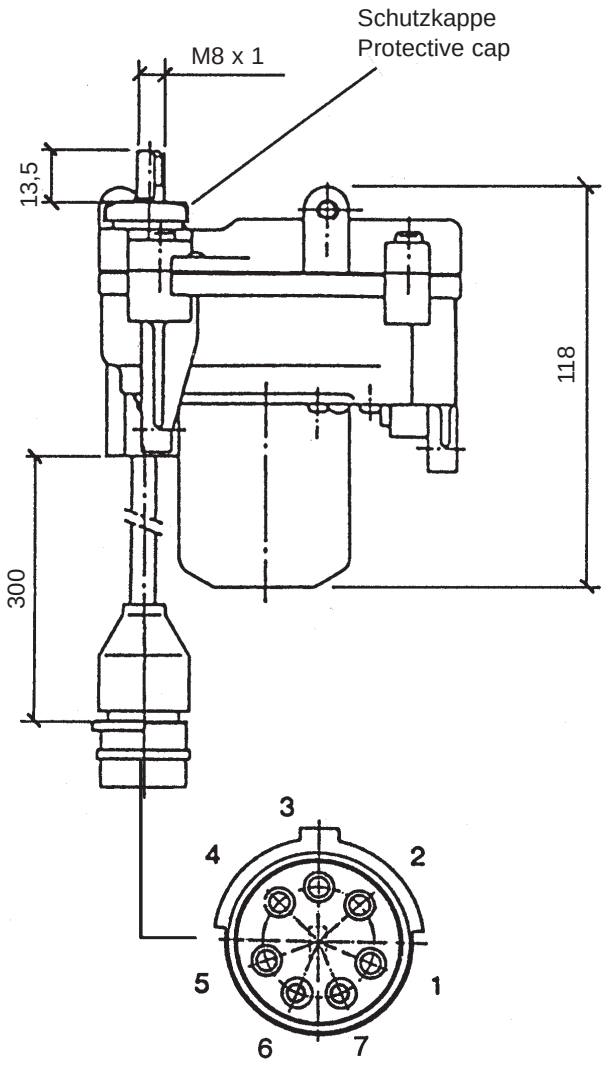
Electric Actuator

System component for E-Gas® compact, RSL Comfort

Abmaße (mm):



Dimensions (mm):



Anschlussbelegung:		Teminal Connection:	
1	Motor (–)	1	Actuator (–)
2	Potentiometer (IP–)	2	Potentiometer (IP–)
3	Potentiometer (IPS)	3	Potentiometer (IPS)
4	Potentiometer (IP+)	4	Potentiometer (IP+)
5	Kupplung	5	Clutch
6	Kupplung	6	Clutch
7	Motor (+)	7	Actuator (+)

Bestell-Nr. / Order No. 408-221-005-001P

Zubehör:	**Accessories:**	**Best.-Nr. / Order No.:**
Dämpfungselemente (Teilesatz)	Damping components (parts kit)	240-110-001-001P
Stellgliedhaltersatz (motorfeste Montage)	Actuator bracket kit (engine mounting)	X39-397-112-014

Overview of Chapter

Elektronischer Regler

Systemkomponente für E-Gas® compact

Beschreibung:

Der elektronische Regler wurde für den Einsatz in Spezialfahrzeugen (Off-Highway) konzipiert.
Er verstellt über ein Stellglied den Motorleistungshebel eines Verbrennungsmotors in Abhängigkeit unterschiedlicher Sollwertvorgaben. Ein integrierter 16-Bit-Prozessor verarbeitet sämtliche Eingangs,- und Ausgangssignale. Das Konzept erlaubt es, den Regler für die unterschiedlichsten Einsatzbedingungen zu programmieren wie z.B.

- Fahrpedalübertragung
- Drehzahlregelung und -begrenzung
- Geschwindigkeitsregelung und -begrenzung
- Stellungsbegrenzugen
- Vernetzung mit anderen Steuerungen

Über eine Diagnoseschnittstelle werden sämtliche Parametrierungen mit einer speziellen Software (PC) vorgenommen und der Fehlerspeicher bei Bedarf ausgelesen.
Der Regler entspricht folgenden Normen:

- EG RL 95/54 EMV in Kfz
- EG RL 92/24 Geschwindigkeitsbegrenzer
- DIN 40839 Störgrößen auf Versorgungsleitungen.

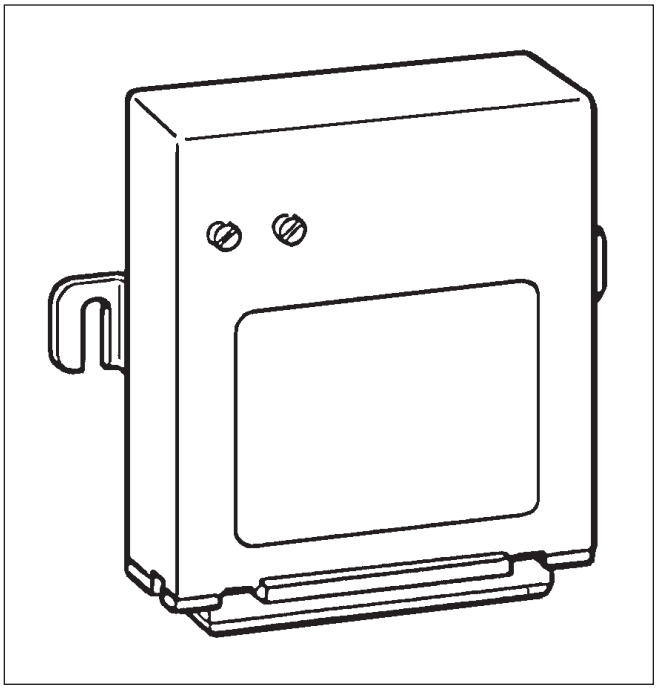
(Im Unterschied zum elektronischen Regler 412-413-011-001P kann das System nun grundsätzlich in allen Anwendungen erdgebundener Fahrzeuge und Maschinen eingesetzt werden).

Technische Daten:

Nennspannung:	12V oder 24V
Betriebsspannung:	9,5V bis 32V
Betriebstemperatur:	– 40°C bis + 70°C
Schutzart:	IP53 DIN 40050
Einbauort:	Innenraum
Einbaulage:	elektrischer Anschluss nach unten (mindestens 5°)
Steckanschluss:	25polig AMP

Electronic Controller

System component for E-Gas® compact



Description:

The electronic regulator has been designed for application in special vehicles (off-higway).
Via an electric actuator, it adjusts the engine output lever of a combustion engine depending on the corresponding rated values. An integrated 16-bit processor controls all input and output signals. This allows programming of the regulator for a variety of different applications such as:

- Pedal transmission
- RPM regulation + limiting
- Speed regulation + limiting
- Position limiting
- Connection with other controllers

A specific software (PC) linked to an interface allows parameterization and reading-out of the fault memory.
The electronic regulator complies with the following directives and standards:

- EU Directive 95/54 EMC in vehicles
- EU Directive 92/24 Road-Speed Limiter
- DIN 40839 Radiated disturbances on supply lines

(In contrast to the electronic controller 412-413-011-001P, this system can in principle be used for general application in earthbound vehicles and machines).

Technical Data:

Nennspannung:	12V oder 24V
Betriebsspannung:	9,5V bis 32V
Betriebstemperatur:	– 40°C bis + 70°C
Schutzart:	IP53 DIN 40050
Einbauort:	Innenraum
Einbaulage:	elektrischer Anschluss nach unten (mindestens 5°)
Steckanschluss:	25polig AMP

TU00-0782-5604620 I 0108 I

Overview of Chapter

Elektronischer Regler

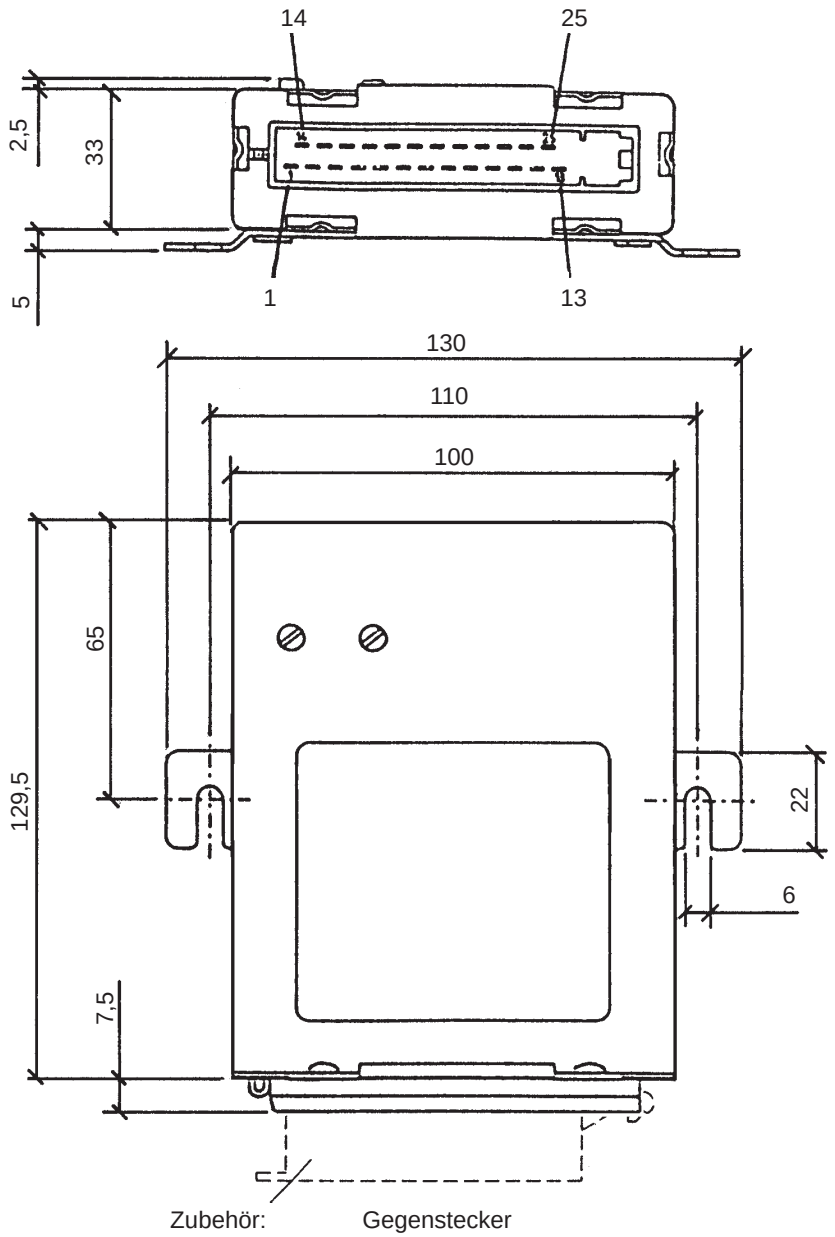
Systemkomponente für E-Gas® compact

Electronic Controller

System component for E-Gas® compact

Abmaße (mm):

Dimensions (mm):



Anschlussbelegung:

1 Klemme 15 (U_{Batt})
2 Motor –
3 Kupplungsschalter
4 Festdrehzahlregelung EIN
5 Pedaleinheit PWM 1
6 progr. Begrenzung
7 tempostat® memo
8 Bremssignal
9 Drehzahl
10 Stellerrückmeldung
11 Potianschluss +
12 Potianschluss –
13 Fehlerleuchte u. Taster
14 Klemme 31 (Masse)
15 Motor +
16 tempostat® off
17 Pedaleinheit PWM 2
18 Trennkupplung
19 tempostat® S - B
20 tempostat® S + B
21 Geschwindigkeitssignal
22 frei
23 Diagnose K-Leitung
24 Poti-Schleifer
25 Analogeingang

Terminal Assignment:

1 Terminal 15, Ignition-battery +
2 Actuator negative
3 Clutch switch
4 Preset engine speed regulation ON
5 Accelerator unit PWM 1
6 Programmable limit
7 tempostat® memo
8 Brake signal
9 Engine speed
10 Actuating return information
11 Potent. pos. contact
12 Potent. neg. contact
13 Fault light and touch switch
14 Terminal 31 (ground)
15 Actuator positive
16 tempostat® off
17 Accelerator unit PWM 2

Zubehör: Gegenstecker
Accessoriers: Receptacle shell

18 Separating clutch
19 tempostat® S - B
20 tempostat® S + B
21 Speed signal
22 —
23 Diagnostic K-line
24 Potent. sliding contact
25 Analog input

Bestell-Nr. / Order No.: 412-413-011-002P

Zubehör:		Accessories:		Best.-Nr. / Order No.:
Gegenstecker:	Steckerleiste, schwarz	Receptacle shell:	Terminal block cover, black	X11-397-109-003
	Steckerhülse		Female connector	X11-397-109-004

Overview of Chapter

Hängendes Pedal

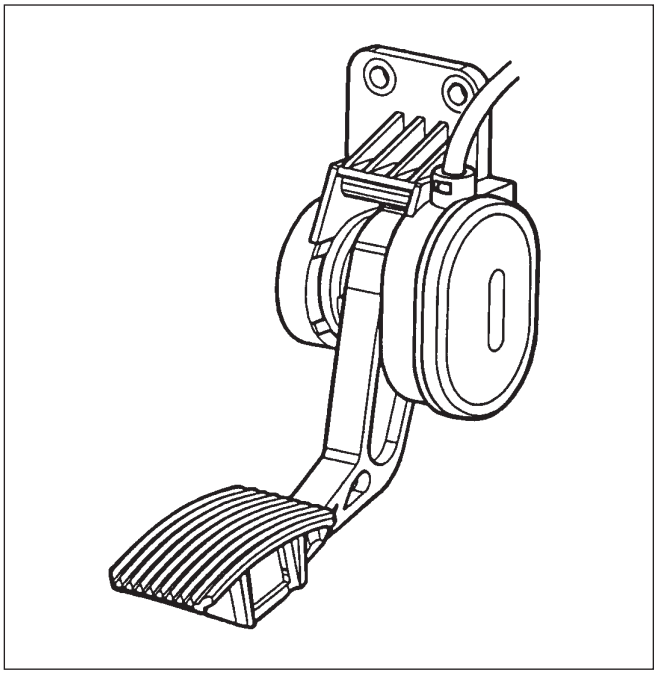
Systemkomponente für VDO E-Gas® compact

Beschreibung:

Die Pedaleinheit besteht aus einer im Fahrgastraum zu befestigenden Grundplatte mit einem fertig montierten Gaspedal. Für die Nachbildung der Gaspedalkräfte ist eine Rückstellfeder, sowie eine Friktionseinheit für eine wegabhängige Kraft-hysterese vorhanden.
Die Rückmeldung von zwei Potentionmetern wird von zwei internen Elektronikschaltungen in zwei PWM-Signale umgewandelt. Die ausgegebenen PWM-Signale entsprechen der aktuellen Gaspedalstellung.
Ein PWM-Signal liefert in Leerlaufstellung ein hohes Tastverhältnis, das bei Betätigung in Richtung Volllast geringer wird. Das zweite PWM-Signal liefert in Leerlaufstellung ein kleines Tastverhältnis, das bei Betätigung in Richtung Volllast ansteigt.
Der Gesamt-Signalfluss ist redundant.

Suspended pedal

System component for VDO E-Gas® compact



Description:

The pedal unit consists of a base plate and a pedal assembly to be mounted inside the passenger compartment.
A return spring plus a friction unit for distance-related force hysteresis serves the purpose of duplication the forces applied to the pedal.
Two internal circuits transform the linear feedback of two potentiometers into two pulse-width-modulated signals (PWM). The reported PWM-signals are invers against each other.
The complete signal transmission is redundant.

Technische Daten:

Spannungsversorgung durch elektronischen Regler		412-413-011-001P
Betriebstemperatur:		-40°C bis +80°C
Schutzart:		IP54 DIN 40050 Blatt 9
Einbauort:		Innenraum
Stellwinkel:		20°
Pedalkraft:	Aufregelung	Abregelung
Leerlauf	30 ± 5N	16,5 ± 5N
Endausschlag	44 ± 5N	30 ± 5N
Alle Ein- und Ausgänge sind kurzschlussfest, die Spannungsversorgung verpolsicher		

Technical Data:

Voltage supply by electronic controller		412-413-011-001P
Operating temperature:		-40°C to +80°C
Protection:		IP54 DIN 40050 page 9
Installation place:		interior
Angle of actuation:		20°
Pedal force:	Up-regulation	Down-regulation
Idling	30 ± 5N	16,5 ± 5N
Final position	44 ± 5N	30 ± 5N
All inputs and outputs are short-circuit-proof, the voltage supply is reverse-polarity protected		

TU00-0783-5104620 I 0108 I

Overview of Chapter

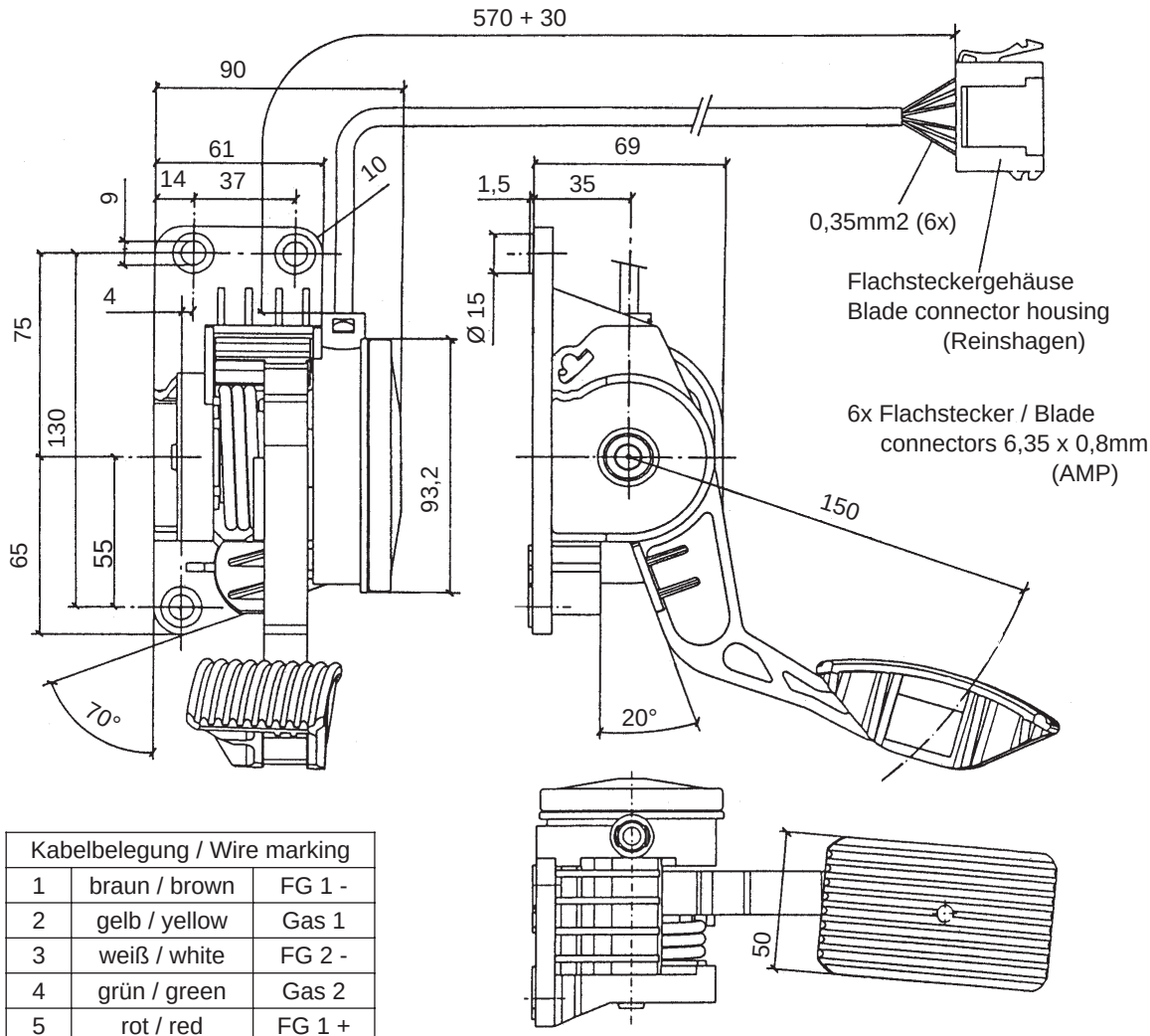
Hängendes Pedal

Systemkomponente für VDO E-Gas® compact

Suspended pedal

System component for VDO E-Gas® compact

Abmaße (mm): **Dimensions (mm):**



Kabelbelegung / Wire marking		
1	braun / brown	FG 1 -
2	gelb / yellow	Gas 1
3	weiß / white	FG 2 -
4	grün / green	Gas 2
5	rot / red	FG 1 +
6	lila / lilac	FG 2 +

Bestell-Nr. / Order No.: 445-803-005-001P

(Weitere Dokumentation siehe “Produktinformation” 445-803-005-001P.
Further documentation see ‘Product Information’ 445-803-005-001P.)

Overview of Chapter

Sollwertgeber

Systemkomponente für VDO E-Gas® II, VDO E-Gas® compact

Beschreibung:

Der Sollwertgeber wandelt mit einem Potentiometer die Fahrpedalstellung in ein elektrisches Signal um. Der Potentiometerschleifer ist über Potentiometer- und Antriebswelle formschlüssig mit dem Antriebshebel verbunden. Das Potentiometergehäuse ist kraftschlüssig mit dem Aluminiumgehäuse verbunden. Das Sollwertsignal ist ständig verfügbar.

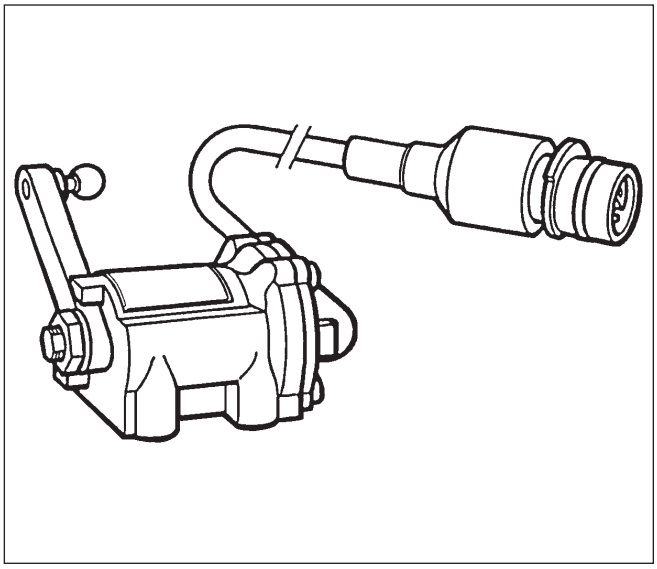
Innerhalb eines definierten Bereichs wird ein Sicherheitskontakt (SK) und ein Kick Down- Kontakt (KD) betätigt. Der Sicherheitskontakt (SK) steht in einer festen Beziehung zu einem Potentiometerwert. Der Betätigungsnocken ist formschlüssig mit der Antriebswelle verbunden. Bei Betätigung des Antriebshebel von Volllast nach Leerlauf wird der Sicherheitskontakt zwangsgeöffnet. Die Kontaktfeder ist dauerfest.

Technische Daten:

Spannungsversorgung durch elektronischen Regler	
Betriebstemperatur:	-40°C bis +80°C
Anfangsdrehmoment:	160 Ncm $^{+20\ Ncm}_{-30\ Ncm}$
Enddrehmoment:	280 Ncm ± 40 Ncm
Kick Down-Drehmoment:	550 Ncm ± 70 Ncm
Hysterese:	bei Leerlauf 50 Ncm ± 20 Ncm bei Volllast 50 Ncm ± 20 Ncm
Schutzart:	IP66 DIN 40050
Max. Anzugsmoment für Befestigungsschrauben: 8 Nm + 4 Nm (bei 9 mm Einschraubtiefe)	
Anschlussstecker:	ITT Canon Sure Seal, 7polig

Set-Point Sensor

System component for VDO E-Gas® II, VDO E-Gas® compact



Description:

The set-point sender converts the accelerator-pedal position into an electrical signal using a potentiometer. The potentiometer slider is linked to the drive lever via the potentiometer and drive shaft by means of a positive connection. The potentiometer casing is secured to the aluminium casing by means of a friction-type connection. The set-point signal is available at all times.

A switching contact is actuated within a defined range. The safety contact (SK) has a fixed relation to a potentiometer value. The actuation cam is connected to the drive shaft by means of a positive connection. When the drive lever is moved from full load to idling, the safety contact is forced open. The contact spring is designed to last for the full service life

Technical Data:

Voltage supply by electronic controller	
Operating temperature:	-40°C to +80°C
Initial torque:	160 Ncm $^{+20\ Ncm}_{-30\ Ncm}$
Final torque:	280 Ncm ± 40 Ncm
Kick Down torque:	550 Ncm ± 70 Ncm
Hysteresis:	at idle speed 50 Ncm ± 20 Ncm at full load 50 Ncm ± 20 Ncm
Protection:	IP66 DIN 40050
Tightening torque maximum for fastening screws: 8 Nm + 4 Nm (relating to a screw depth of 9mm)	
Connecting plug:	ITT Canon Sure Seal, 7-pole

TU00-0784-5104620 I 0108 I

Overview of Chapter

Sollwertgeber

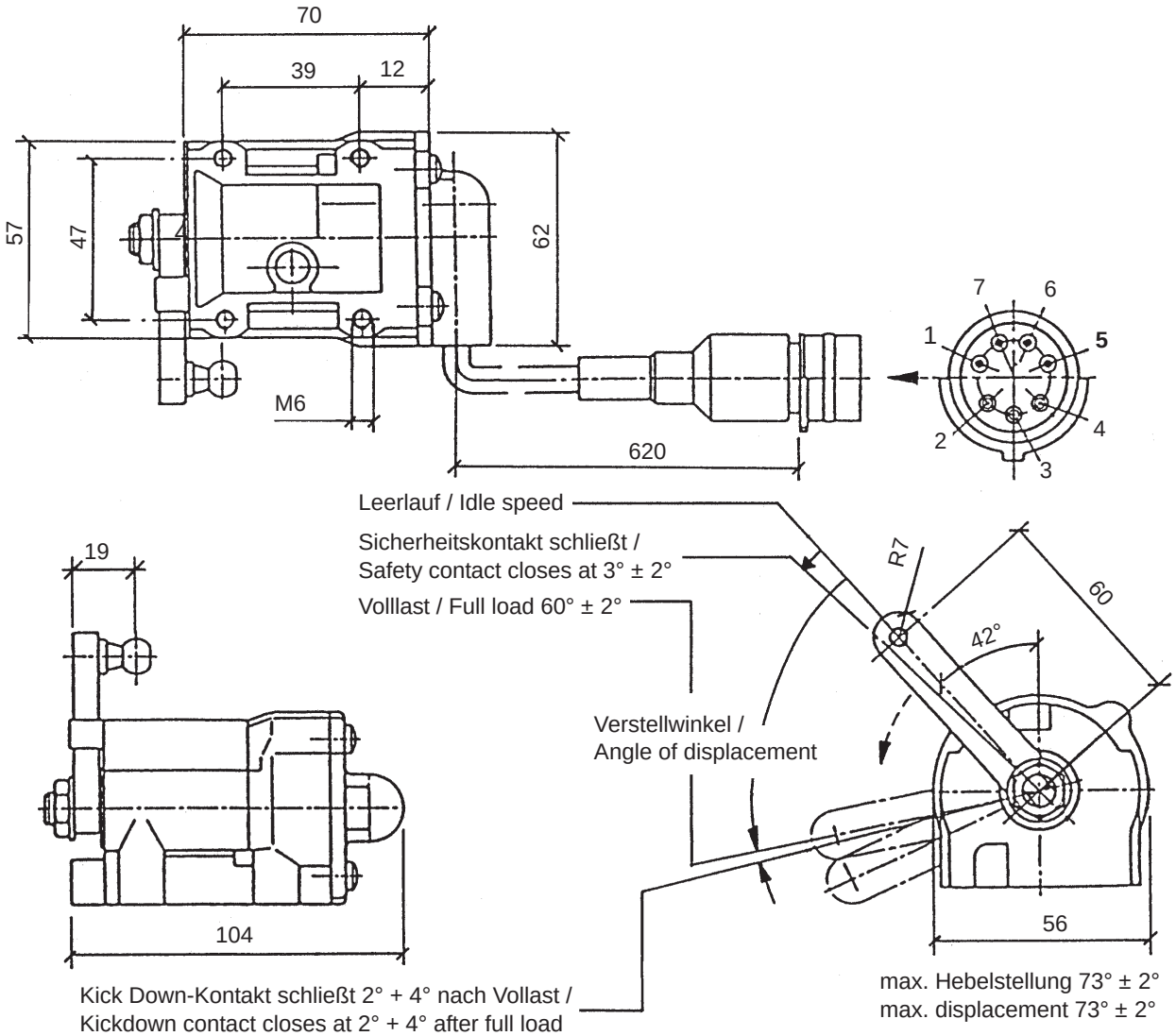
Systemkomponente für VDO E-Gas® II, VDO E-Gas® compact

Set-Point Sensor

System component for VDO E-Gas® II, VDO E-Gas® compact

Abmaße (mm):

Dimensions (mm):



Anschlussbelegung

1 • weiß, Sicherheitskontakt (SK), Stift
2 rot, Potentiometer (SP +), Buchse
3 gelb, Potentiometer (SPS), Buchse
4 • blau, Kick Down-Kontakt (KD), Buchse
5 braun, Potentiometer (SP -), Stift
6 • grün, Kick Down-Kontakt (KD) Stift
7 • schwarz, Sicherheitskontakt (SK), Stift

Leitung 0,5 mm²

• max. Schaltstrom 1 Amp. (nicht induktiv)

Terminal assignment:

1 • white, safety contact (SK), pin
2 red, potentiometer (SP +), socket
3 yellow, potentiometer (SPS), socket
4 • blue, kickdown contact (KD), socket
5 brown, potentiometer (SP -), pin
6 • green, kickdown contact (KD) pin
7 • black, safety contact (KD), pin

wire 0,5 mm2

• Current max. 1 Amp. (not inductive)

Bestell-Nr. / Order No.: 445-804-005-014P

(Weitere Dokumentation siehe “Technische Kunden-Unterlage” 445-804-005-014P.)
(Further documentation see ‘Technical Customer Documentation’ 445-804-005-014P.)

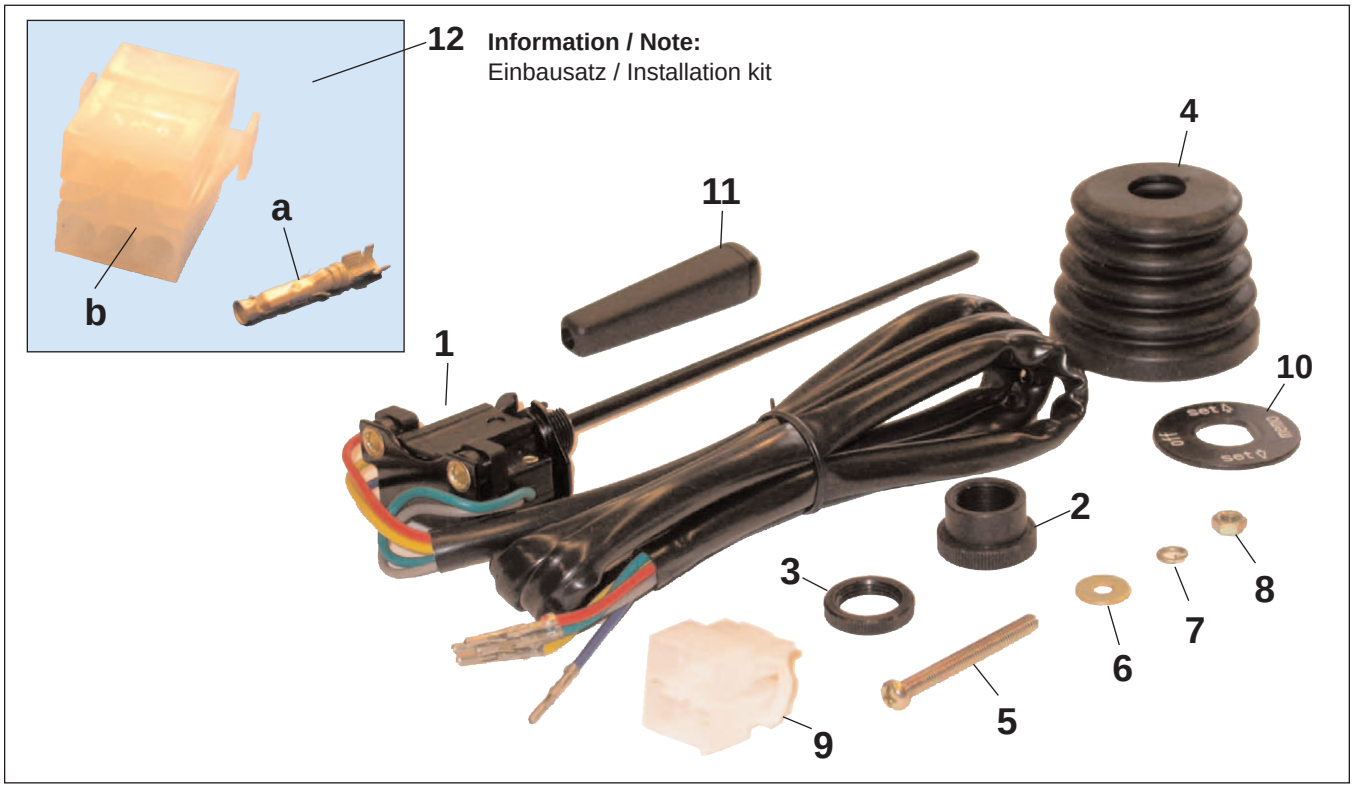
Overview of Chapter

Standard Bedienhebel

Systemkomponente für tempostat® 12V, AGB Komfort, E-Gas® II E-Gas® compact, Pedal Interface II

Standard control stalk

System component for tempostat® 12V, RSL Comfort, E-Gas® II E-Gas® compact, Pedal Interface II



Der Einbausatz besteht aus: **The installation kit is consisting of:**

Pos.	Benennung / Designation		
1	Bedienhebel / Control stalk	1x	
2	Gewindehülse / Threaded sleeve (M14 x 1)	1x	
3	Rändelmutter / Knurled nut (M14x1)	1x	
4	Faltenbalg / Bellows	1x	
5	Zylinderkopfschraube / Cheese hd. screw (M4x40 DIN 84)	2x	
6	Scheibe / Washer (4,2 DIN 9021)	2x	
7	Federring / Lock washer (4 DIN 127)	2x	
8	Sechskantmutter / Hex nut (M4 DIN 934)	2x	
9	Steckerstiftgehäuse, 6polig / Pin housing, 6-pole	1x	
10	Blende / Cover	1x	
11	Griff / Grip	1x	
12	**Information / Note:** Einbausatz Standard Bedienhebel / Installation kit standard stalk (Gehört nicht zum Lieferumfang, falls notwendig bitte separat bestellen / This is not part of the supply, if necessary please order separatly).		X39-737-300-010
a	Buchsenkontakt / Bush contact	6x	X11-708-002-023
b	Kupplungsgehäuse / Coupling housing	1x	X11-708-002-027

TU00-0785-5104620 I 0108 I

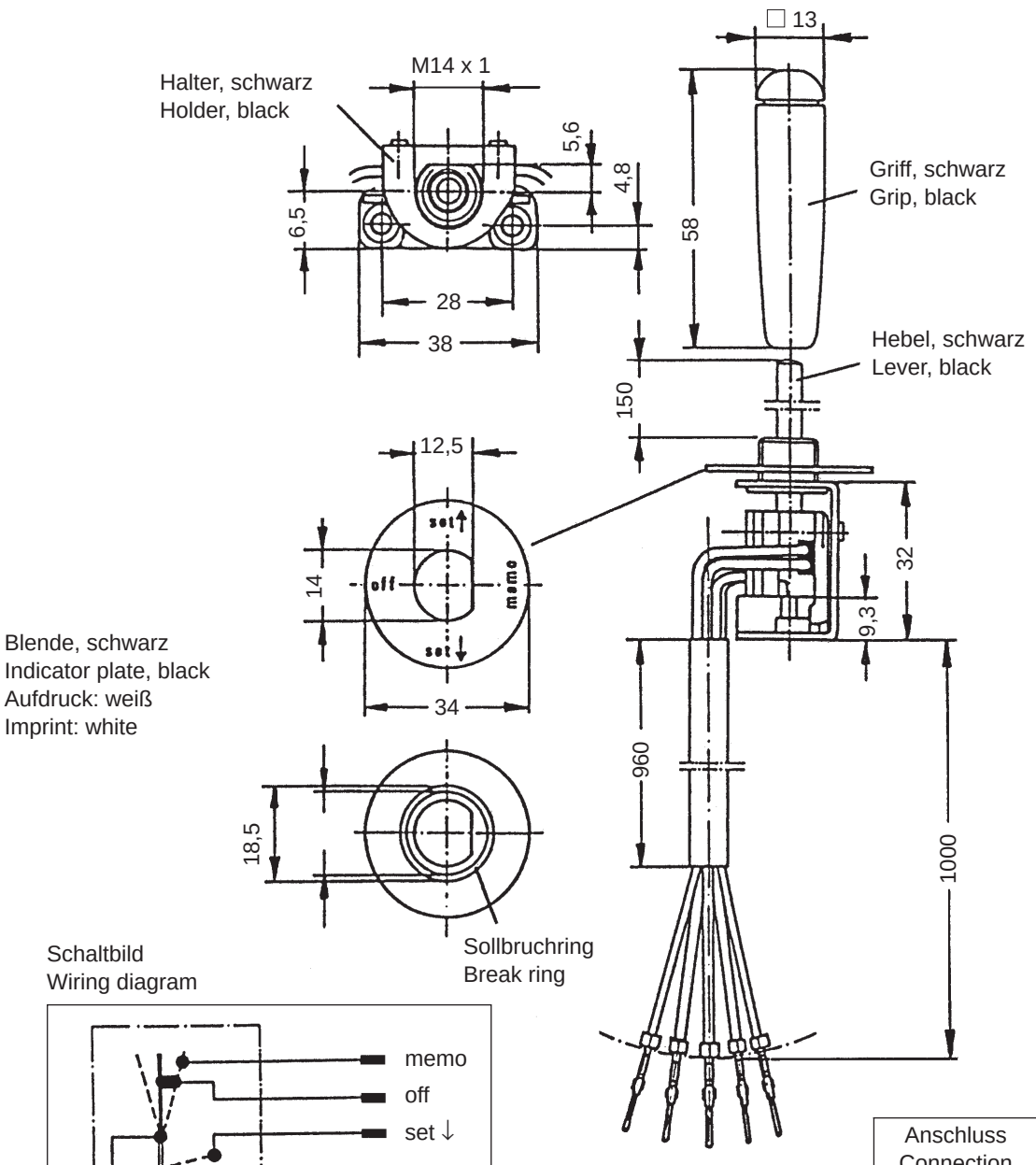
Standard Bedienhebel

Systemkomponente für tempostat® 12V, AGB Komfort, E-Gas® II E-Gas® compact, Pedal Interface II

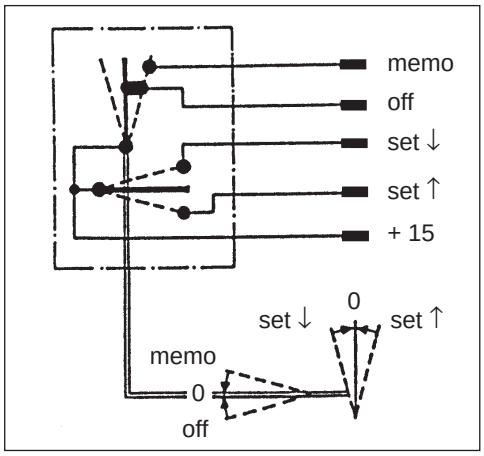
Standard control stalk

System component for tempostat® 12V, RSL Comfort, E-Gas® II E-Gas® compact, Pedal Interface II

Abmaße (mm): **Dimensions (mm):**



Schaltbild
Wiring diagram



Anschluss Connection	Kabelfarbe Colour coding
memo	blau / blue
set ↑	grün / green
set ↓	gelb / yellow
+ 15	rot / red
off	grau / grey

Betriebsspannung bis 24V
Operating voltage up to 24V

Bestell-Nr. / Order No.: X39-397-106-149

Overview of Chapter

8. Fault Analysis

Errors are indicated via a warning lamp and a error switch (see page 1-16/3-16) which are connected to an electronic controller.

Flashing light short: decade

Flashing light long: Units digits, indicated after operating of the error switch.
Flashing code „long/long/short“ is equivalent to error code no. „22“. After re- operating of the error switch possibly the next flashing code will be indicated. In case, there are no more errors, the reading process is going back to the start positon.

Error code reading is only possible when the vehicles is stationaried!

Fault table see pages 8-2, 8-3.

Deletion of the fault memory

a) Ignition off.
b) Press and hold on the fault switch.
c) Switch on ignition and hold on the fault switch for further 4 seconds.
d) Fault memory is deleted.

On vehicles with set point sensor, the accelerator pedal must be kept pressed (> ∡ 4°) during the whole procedure.

Deletion of the fault memory by the test software leads to a loss of the adjustment values of the set-point sensor or pedal unit.
If the fault memory is being deleted as mentioned above, the set-point sensor or the pedal unit have to be adjusted again (see pages 3-12, 3-13).

8. Fault Analysis

Fault table

Flashing code	Fault type	Possible cause	Reaction to fault
11	Fault lamp	Fault lamp or conductors defective	none
12	Clutch switch	Clutch switch or cable shorted to ground	Clutch switch is disregarded
13	tempostat® control lever	Control lever input signals not plausible, more than one input is active	tempostat®, var. v limitation and var. PTO not possible
14	Brake signal input	Brake light switch not detected or speed signal fault Deceleration > 2m/s^2.	tempostat® disabled. Enable only after ignition reset
15	Accelerator unit adjustment fault	Incorrect pedal adjustment	Adjust pedal per installation instructions
16	Accelerator unit signal fault PWM 1	Failure of one or both PWM signals	Continue on one PWM signal, no tempostat® function or idle position is set-point
17	Accelerator unit signal fault PWM 2	See fault 16	See fault 16
22	Vehicle speed signal	Short-circuit to ground or excessive line capacity	Depending on program, position limitation and road speed signal functions disabled
24	Vehicle speed signal	Short-circuit to Ubatt or wire breakage	See fault 22.
31	Actuator or set-point sensor potentiometer	Short-circuit or breakage of potentiometer or wire	Idle position is set-point or quick coupling opens
32	Engine speed signal	No RPM signal. Measure at road speed signal > 25km/h	No RPM functions
34	Control electronics	Faulty self-test of control electronics	Quick coupling opens

8. Fault Analysis

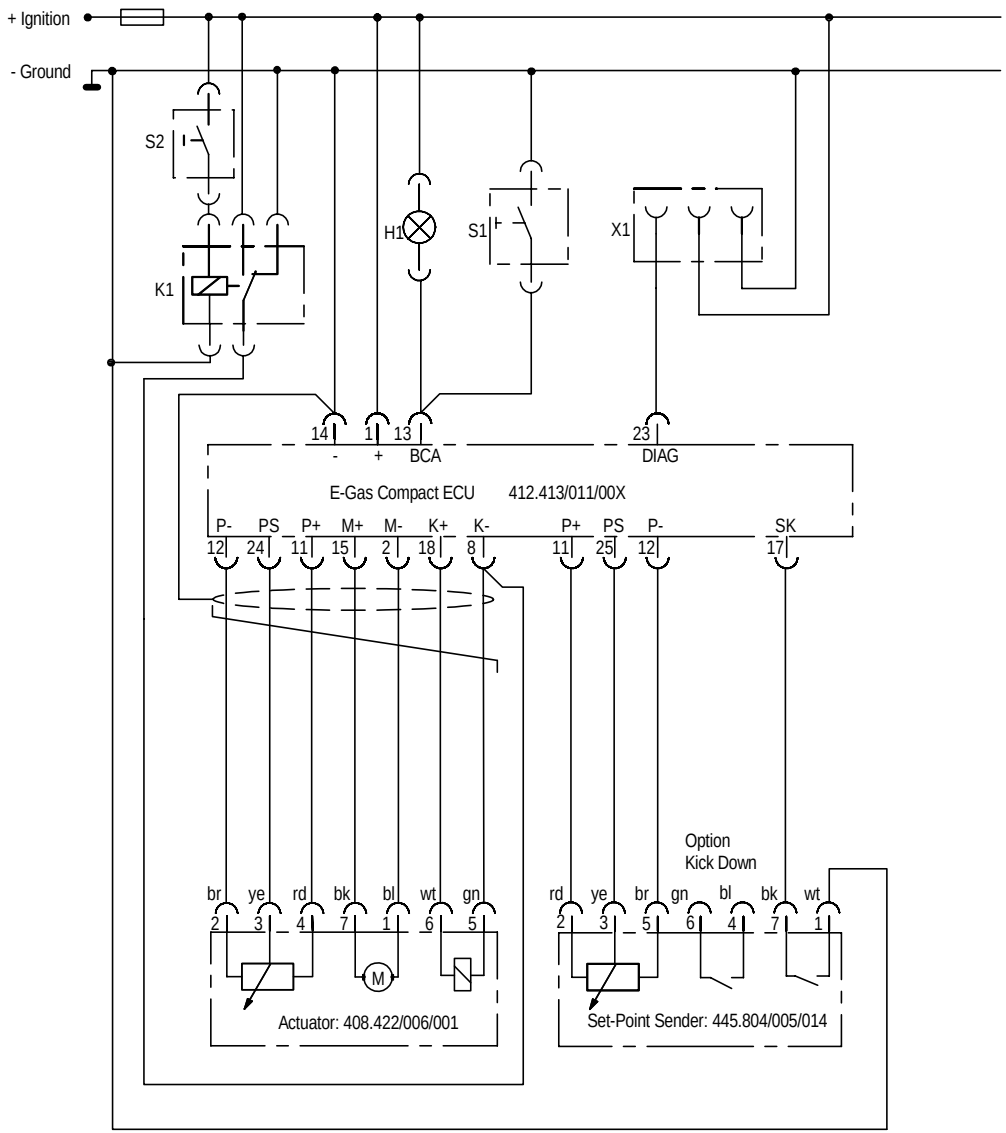
Fault table

Flashing code	Fault type	Possible cause	Reaction to fault
35	Programmed data fault	Controller has been programmed with wrong data	A default value is used or actuator goes to emergency position, depending on fault
36	Electronic controller	Defect of the 2nd watchdog	No limitation of function
41	Actuator	Motor line, short-circuit to Ubatt	Quick coupling opens idle position
42	Actuator	Motor line, short-circuit to ground	Quick coupling opens idle position
43	Actuator	Grouping of several actuator faults t < 500ms if pedal set-point < actuator position	Idle position is set-point
44	Actuator	Open motor line	Quick coupling opens idle position
45	Actuator linkage	Actuator does not attain specified position, injection pump lever is binding	Actual value < set-point value = control continues. Actual value > set-point quick coupling opens and closes in idle position
51	Actuator coupling	Short-circuit to Ubatt or to ground	Normal operation continues or idle position is specified
52	Set-point sensor	Input signal out of range	Idle position is specified

9. Wiring Diagrams

Enclosures

Compact wiring	Standard wiring (ECU & Compact actuator & set point sensor)
Compact engine speed control only	Fixed engine speed (switch n1 to n4)
Compact idle-full	Idle / full positon via pin 19 & 20
Compact variable PTO	Variable engine speed with tempostat switch
Compact with 2 ECU	2 ECU & 2 Compact actuators & 1 set point sensor
Compact with 2 fixed rpm & set point	Switch fixed rpm No. 1 / fixed rpm No. 2 & set point sensor
Compact with 2 fixed rpm	Switch fixed rpm No. 1 / fixed rpm No. 2
Compact with 2 pedal unit	Switch pedal unit No. 1 / pedal unit No. 2
Compact with 2 set point sender	Switch setpoint sender No. 1 / setpoint sender No. 2
Compact with E-Gas II actuator	Compact ECU & E-Gas II actuator
Compact with pedal unit	ECU & actuator & pedal unit
Compact with poti & ext. 0V-5V	Ext. Potentiometer 5k und option ext. 0V-5V



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

Description
H1 Fault Lamp
K1 Relay
S1 Fault-Push Button
S2 Brake Light Switch
X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Standard Connection

Customer:

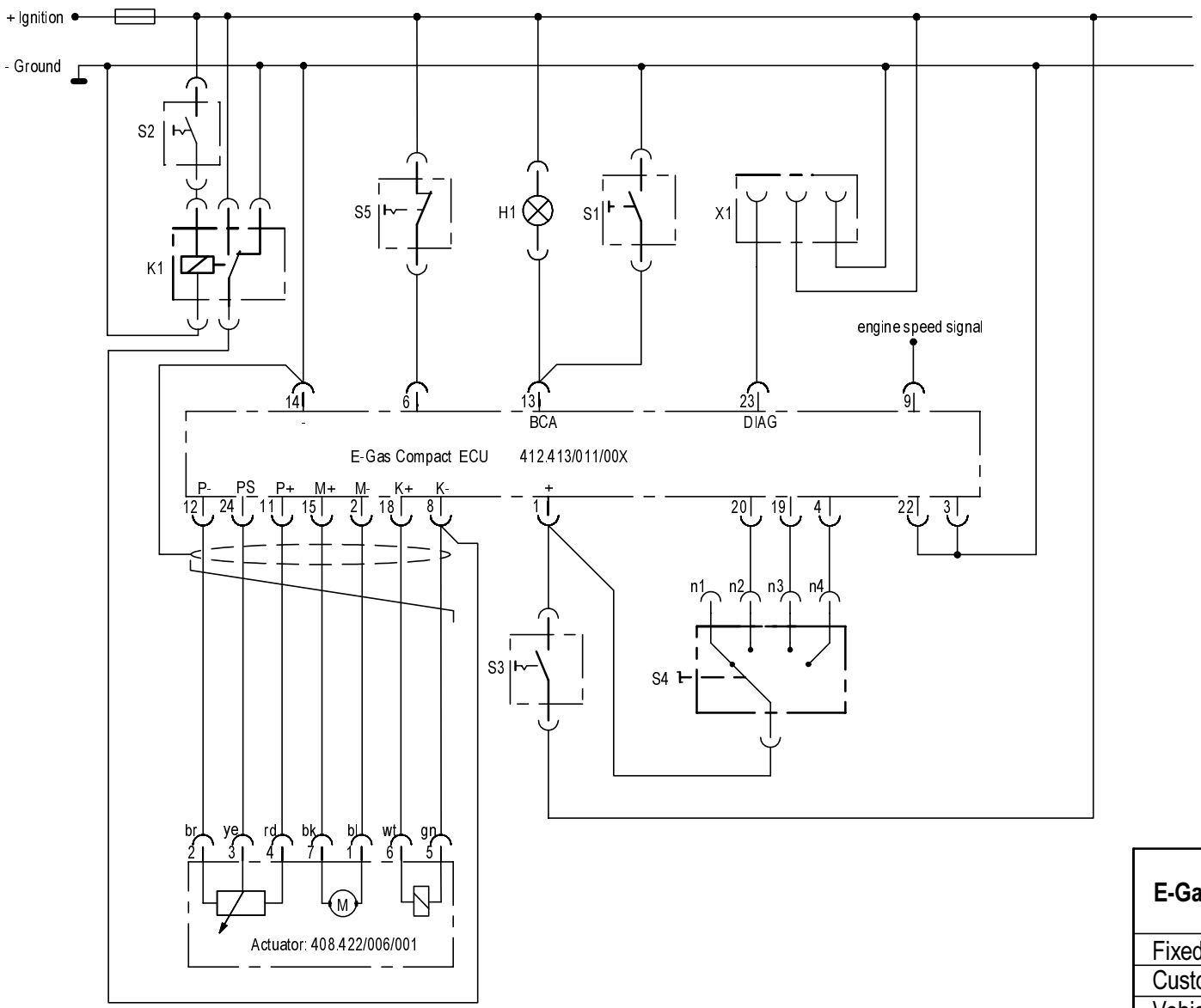
Vehicle:

Version: 1.00 (24V)

File: Compact-Wiring.igr

Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

ECU-Programming

ECU mode: Engine speed control only
Start position for engine speed function :XX% > RPM1
Maximum engine speed limit : XX rpm
Engine speed pulses : XX Imp/100U
Fixed engine speed 1 : XX rpm (RPM1)
Fixed engine speed 2 : XX rpm
Fixed engine speed 3 : XX rpm
Fixed engine speed 4 : XX rpm

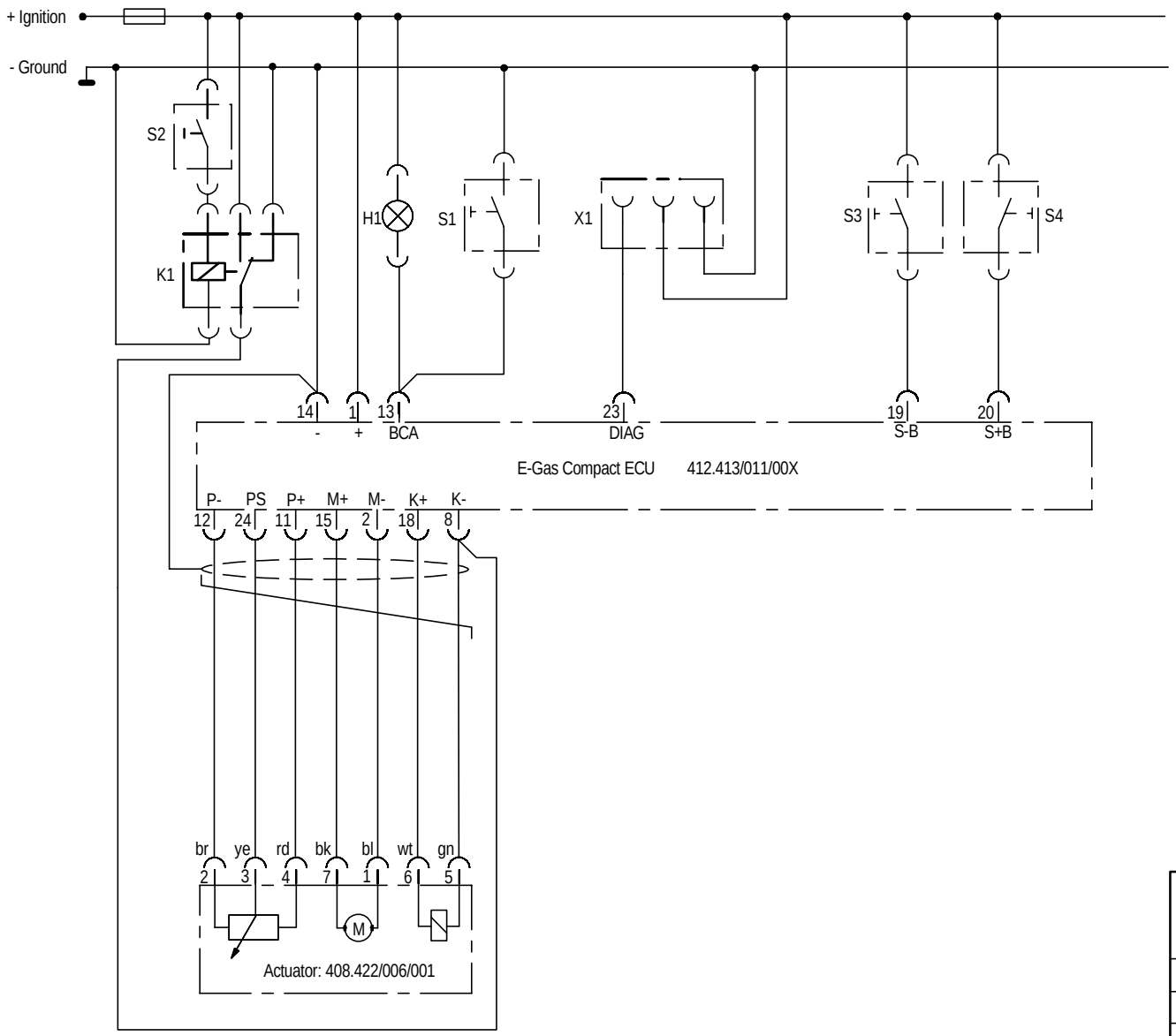
Description

H1 Fault Lamp
K1 Relay
S1 Fault-Push Button
S2 Brake Light
S3 Engine speed n1 and ECU on
S4 Rotary-Switch fixed engine speed
S5 Gain rate switchable
X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Fixed engine speed (switch n1 to n4)
Customer:
Vehicle:
Version: 2.00 (24V)
File: Compact engine speed control only.igr
Date: 23.03.2001 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

ECU Programming
Upper limit for idle increase :100% Response time idle increase : XX s Selection of rated value input : Ext. 0V- 5V

Description
H1 Fault Lamp K1 Relay S1 Fault-Push Button S2 Brake Light Switch S3 Switch Idle-Position S4 Switch Full-Position X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Idle / Full position via pin 19 & 20

Customer:

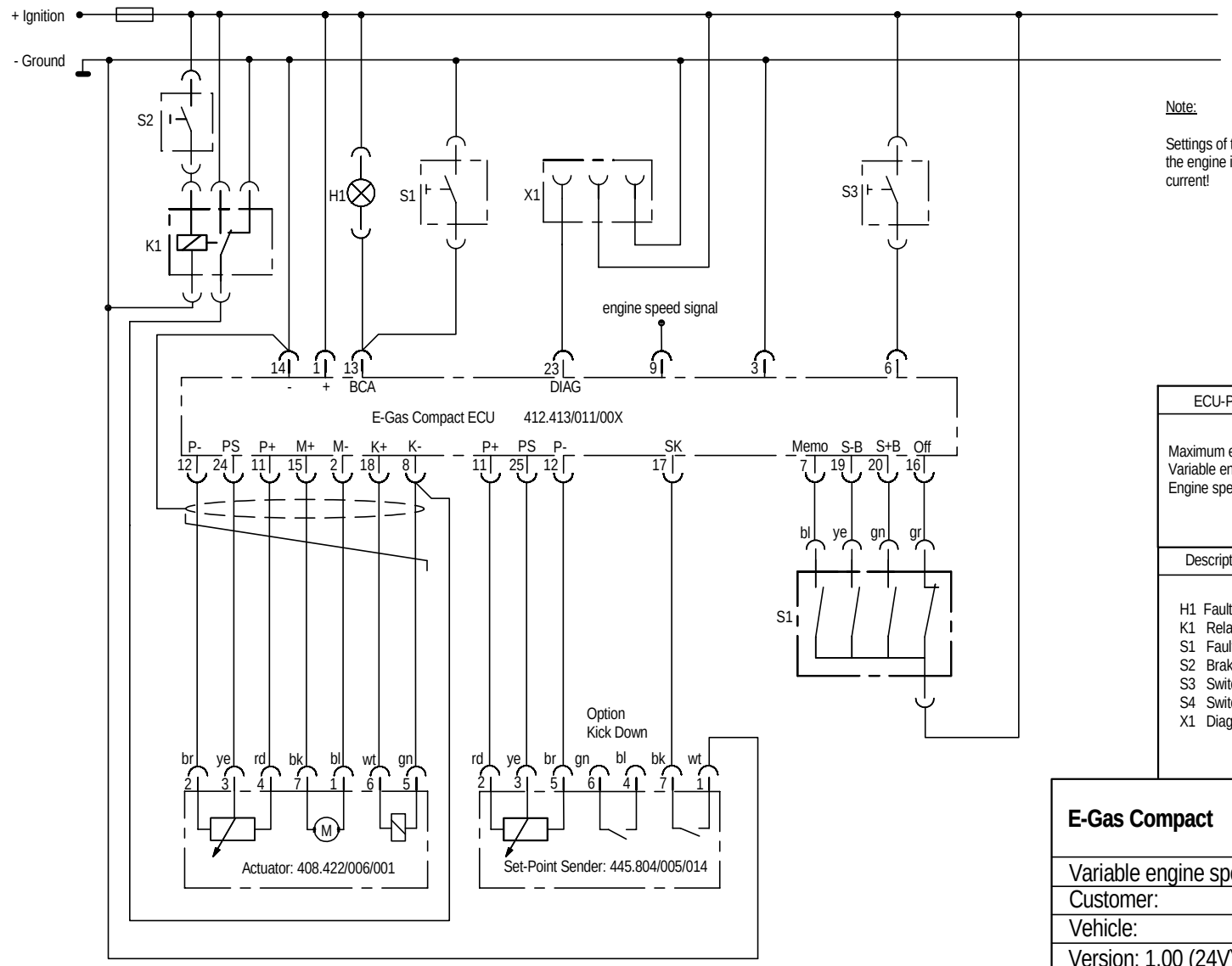
Vehicle:

Version: 1.00 (24V)

File: Compact Idle-Full.igr

Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

ECU-Programming

Maximum engine speed limit : XX rpm
Variable engine speed : XX rpm
Engine speed pulses : XX Imp/100U

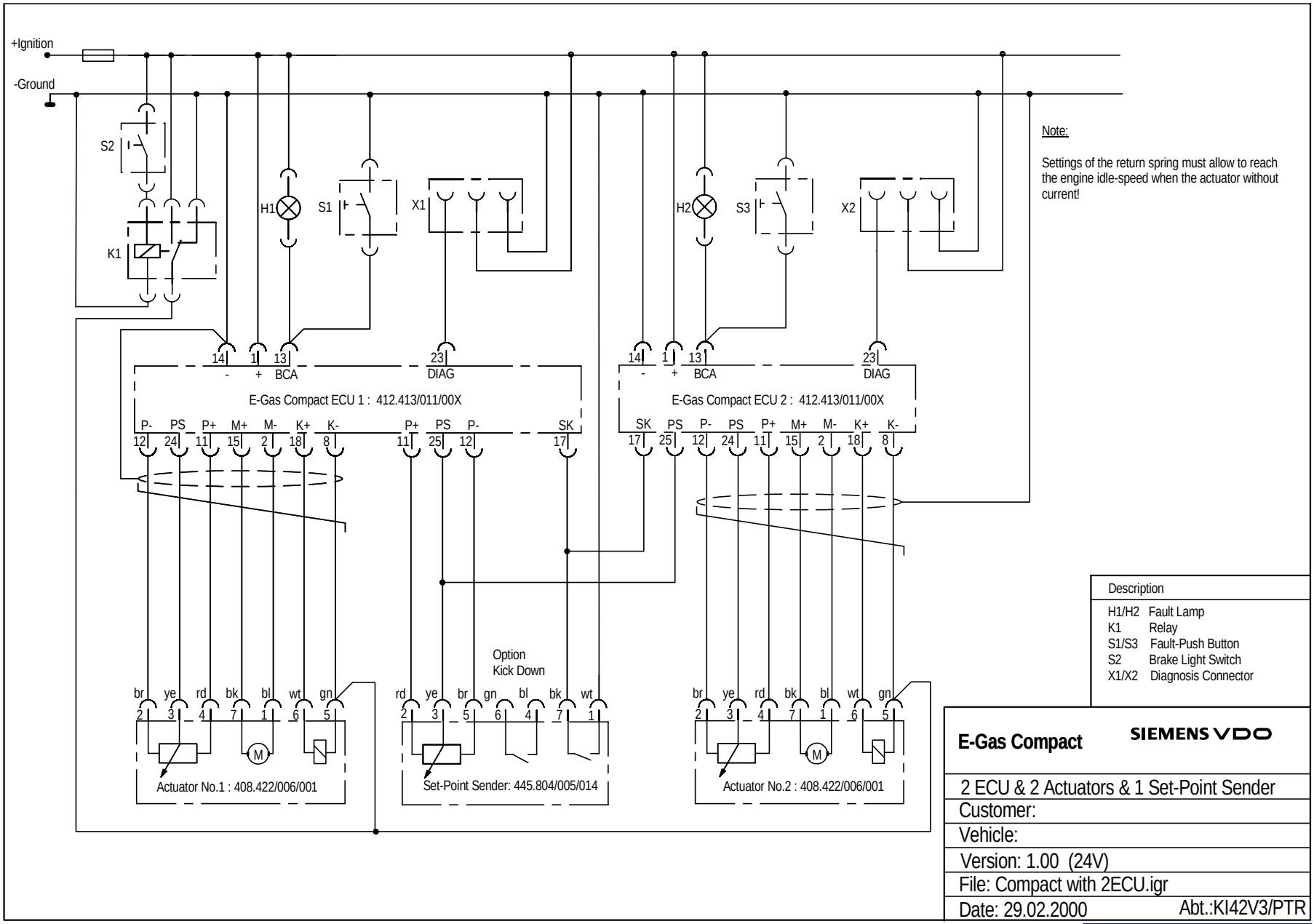
Description

H1 Fault Lamp
K1 Relay
S1 Fault-Push Button
S2 Brake Light
S3 Switch variable engine speed on/off
S4 Switch set variable engine speed
X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Variable engine speed with tempostat switch
Customer:
Vehicle:
Version: 1.00 (24V)
File: Compact variable PTO.igr
Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

Description	
H1/H2	Fault Lamp
K1	Relay
S1/S3	Fault-Push Button
S2	Brake Light Switch
X1/X2	Diagnosis Connector

E-Gas Compact SIEMENS VDO

2 ECU & 2 Actuators & 1 Set-Point Sender

Customer:

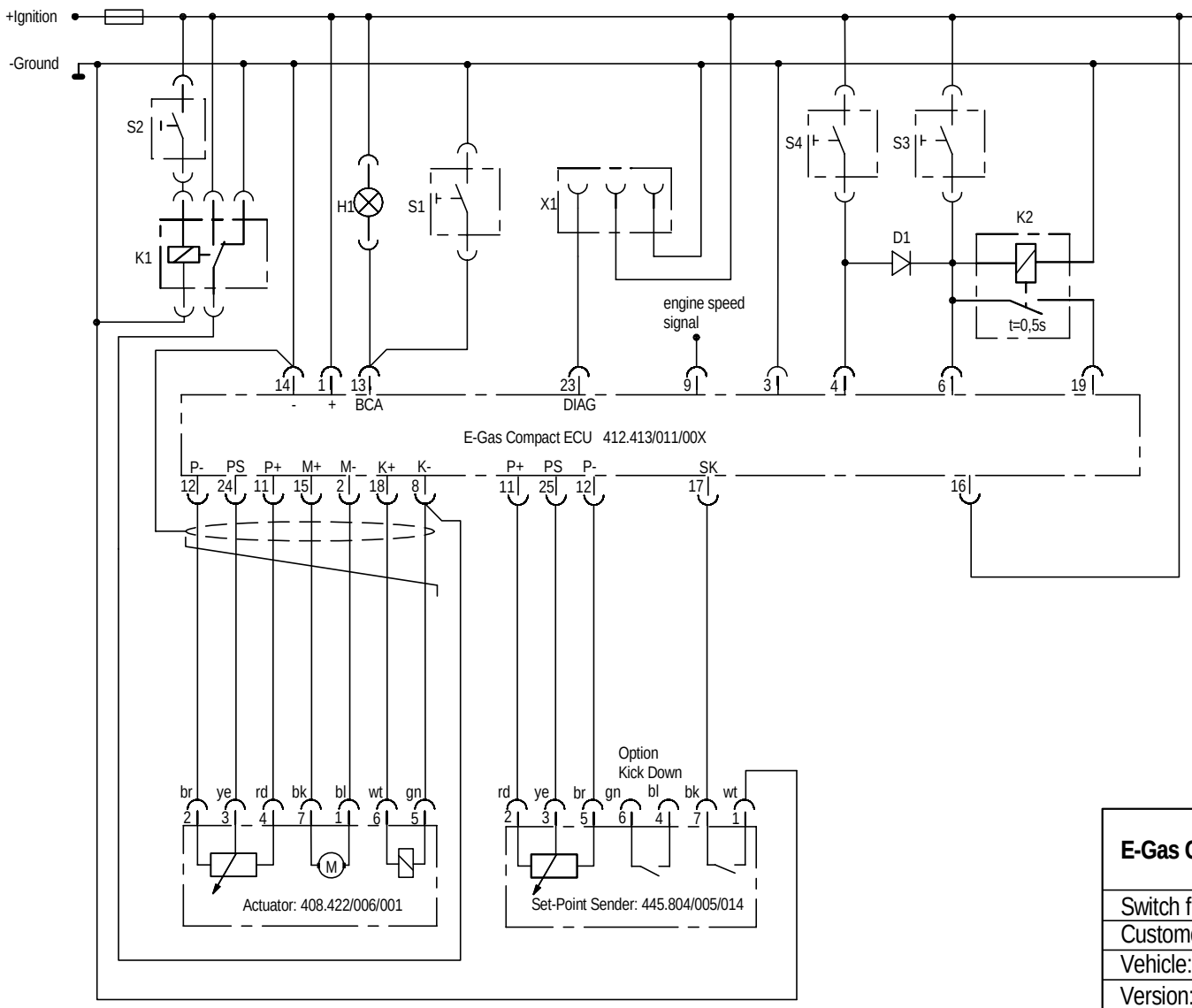
Vehicle:

Version: 1.00 (24V)

File: Compact with 2ECU.igr

Date: 29.02.2000 Abt.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

Relay K2 switch on with time-delay.

Fixed rpm No.1 = minimum engine speed for PTO

ECU Programming
Maximum engine speed limit : XX rpm Special engine speed limit : XX rpm Minimum engine speed for PTO : XX rpm Fixed engine speed : XX rpm Engine speed pulses : XX Imp/100U

Description
D1 Diode
H1 Fault Lamp
K1 Relay
K2 Time-delay relay
S1 Fault-Push Button
S2 Brake Light Switch
S3 Switch fixed rpm No.1
S4 Switch fixed rpm No.2
X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Switch fixed rpm No.1 / fixed rpm No.2

Customer:

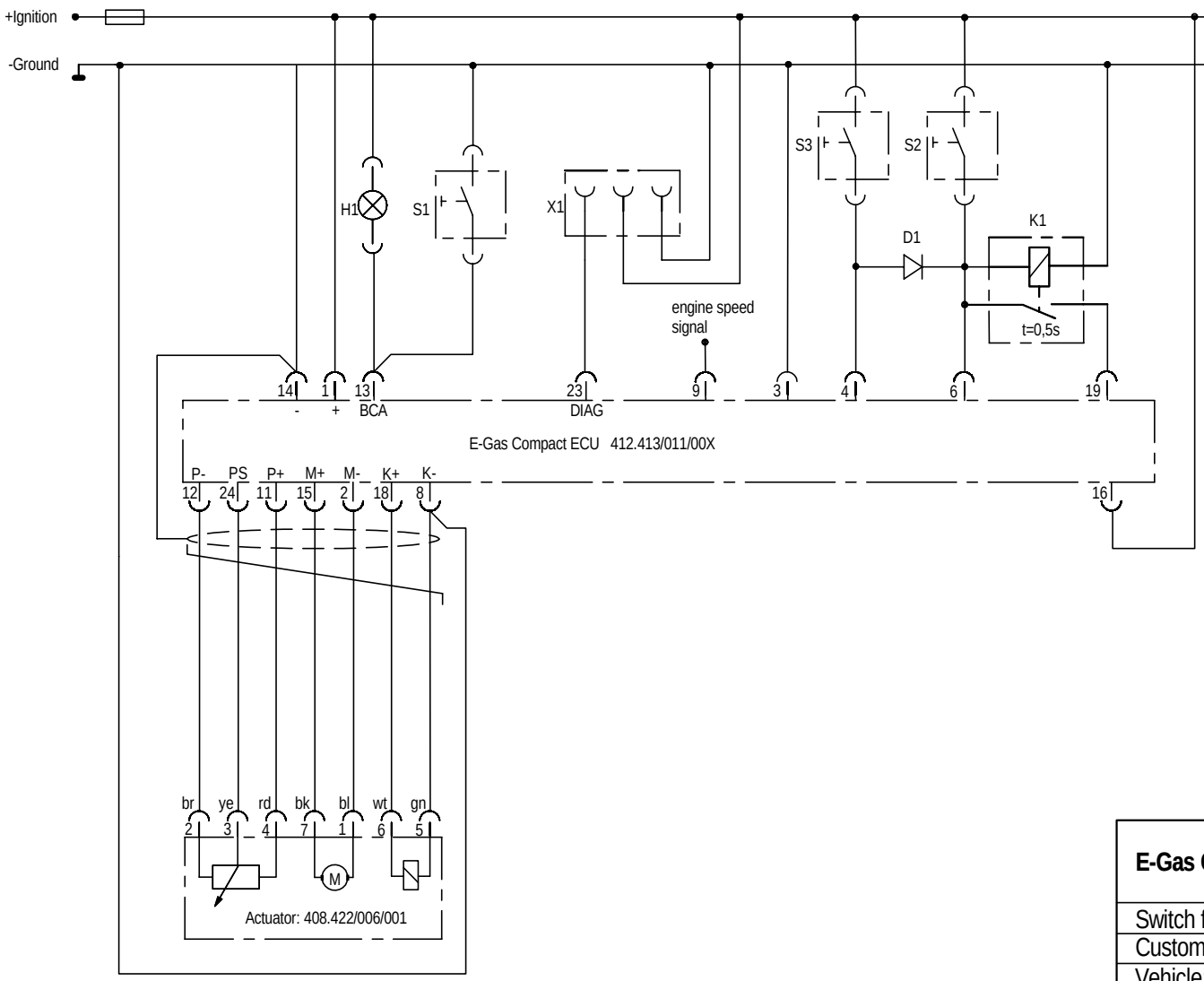
Vehicle:

Version: 1.00 (24V)

File: Compact with 2 fixed rpm & set point.igr

Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

Relay K1 switch on with time-delay.

Fixed rpm No.1 = minimum engine speed for PTO

ECU Programming
Maximum engine speed limit : XX rpm Special engine speed limit : XX rpm Minimum engine speed for PTO : XX rpm Fixed engine speed : XX rpm Engine speed pulses : XX Imp/100U Selection of rated value input: Ext. 0V-5V

Description
D1 Diode H1 Fault Lamp K1 Time-delay relay S1 Fault-Push Button S2 Switch fixed rpm No.1 S3 Switch fixed rpm No.2 X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Switch fixed rpm No.1 / fixed rpm No.2

Customer:

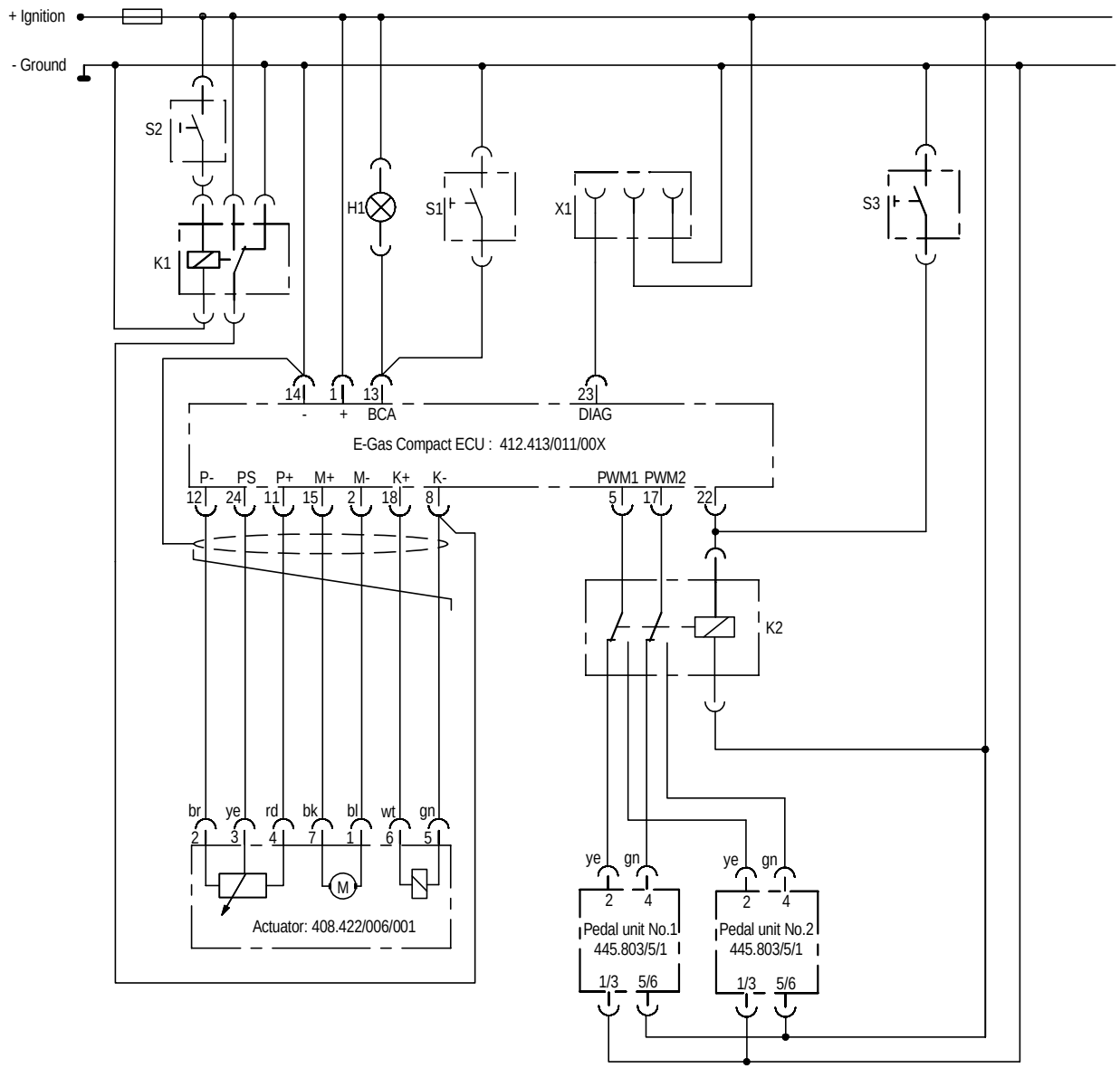
Vehicle:

Version: 1.00 (24V)

File: Compact with 2 fixed rpm.igr

Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

ECU Programming
Selection of rated value input : Pedal unit

Description
H1 Fault Lamp K1 Relay K2 Relay S1 Fault-Push Button S2 Brake Light Switch S3 Switch Pedal unit No.1/ Pedal unit No.2 X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Switch Pedal Unit No.1 / Pedal unit No.2

Customer:

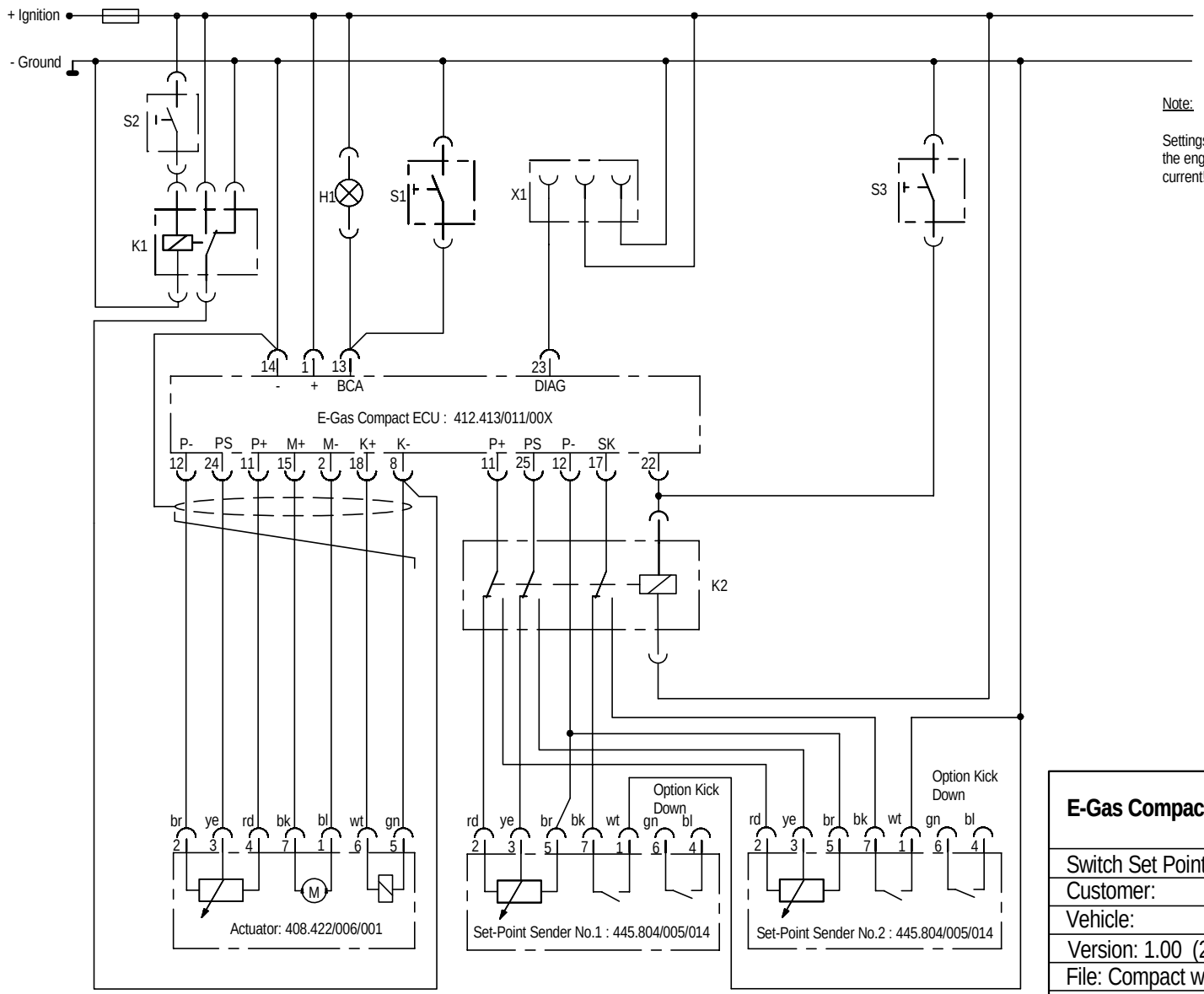
Vehicle:

Version: 1.00 (24V)

File: Compact with 2 pedal unit.igr

Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

Description
H1 Fault Lamp
K1 Relay
K2 Relay
S1 Fault-Push Button
S2 Brake Light Switch
S3 Switch Set Point Sender No.1/ No.2
X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Switch Set Point Sender No.1 / No.2

Customer:

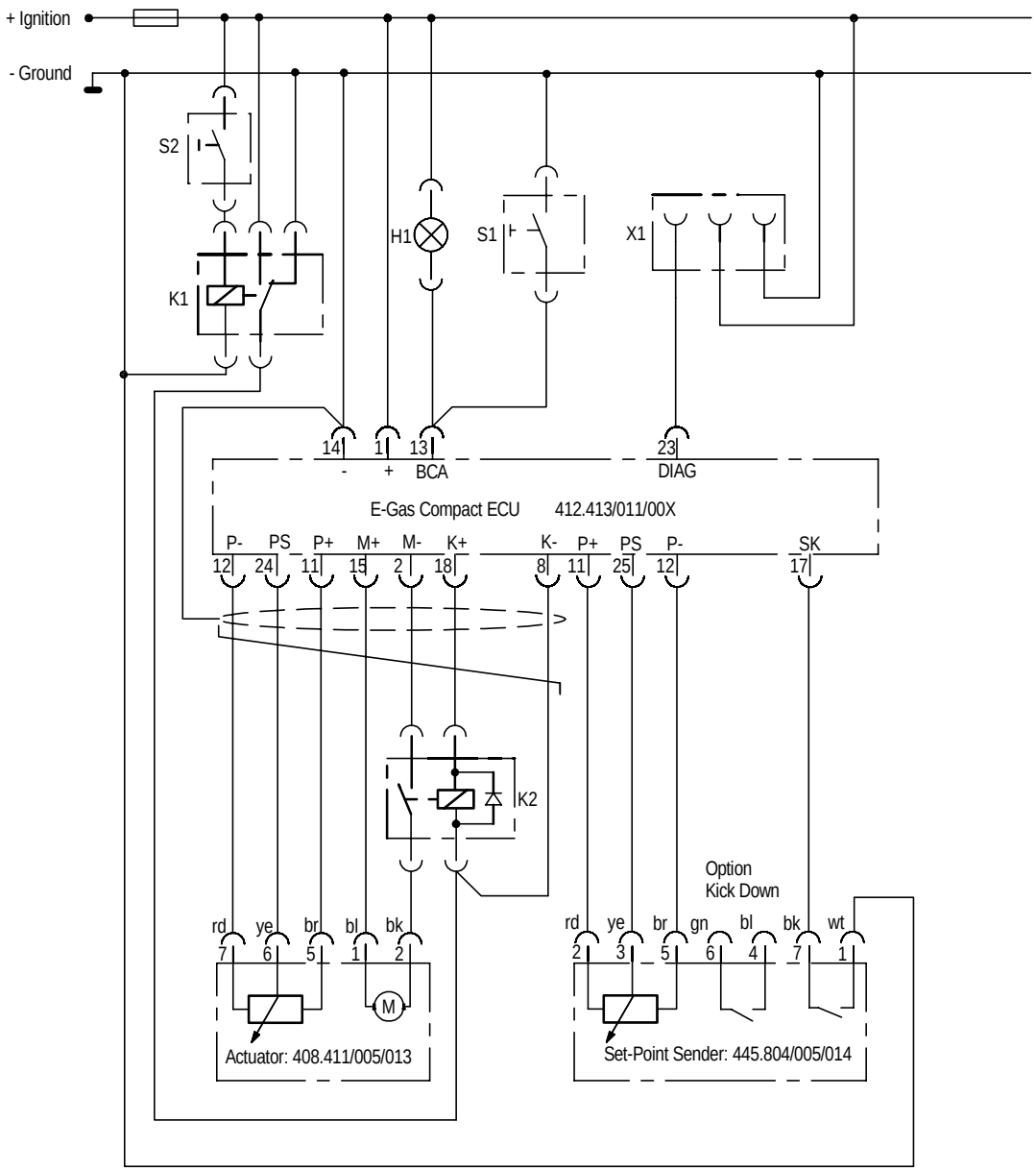
Vehicle:

Version: 1.00 (24V)

File: Compact with 2 Set Point Sender.igr

Date: 29.02.2000 Abt.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

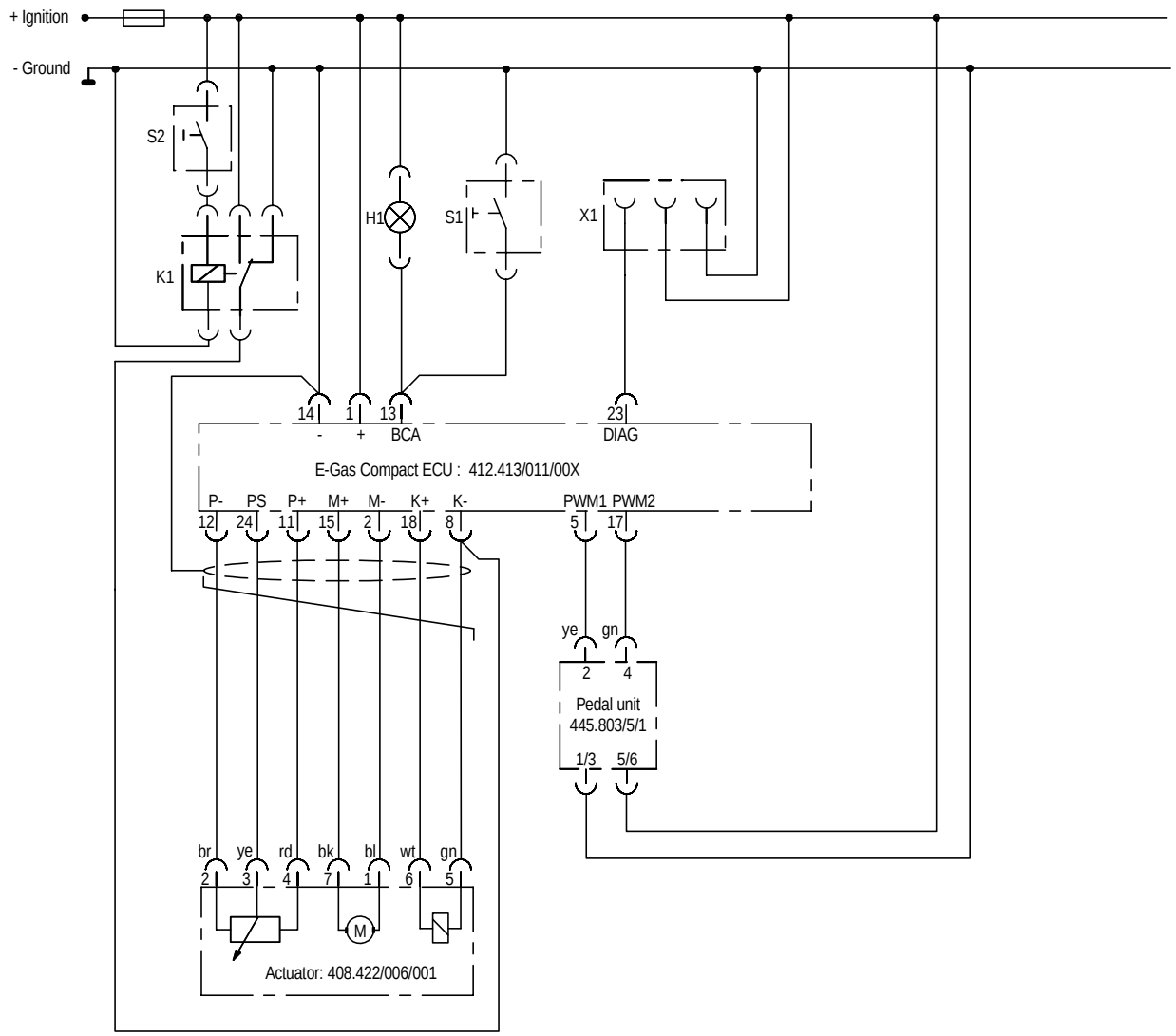
ECU Programming
Actuator type : E-Gas II 24V

Description
H1 Fault Lamp K1 Relay K2 Relay S1 Fault-Push Button S2 Brake Light Switch X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Compact ECU & E-Gas II Actuator
Customer:
Vehicle:
Version: 2.00 (24V)
File: Compact with E-Gas II actuator.igr
Date: 08.03.2001 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

ECU Programming
Selection of rated value input : Pedal unit

Description
H1 Fault Lamp K1 Relay S1 Fault-Push Button S2 Brake Light Switch X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

ECU & Actuator & Pedal Unit

Customer:

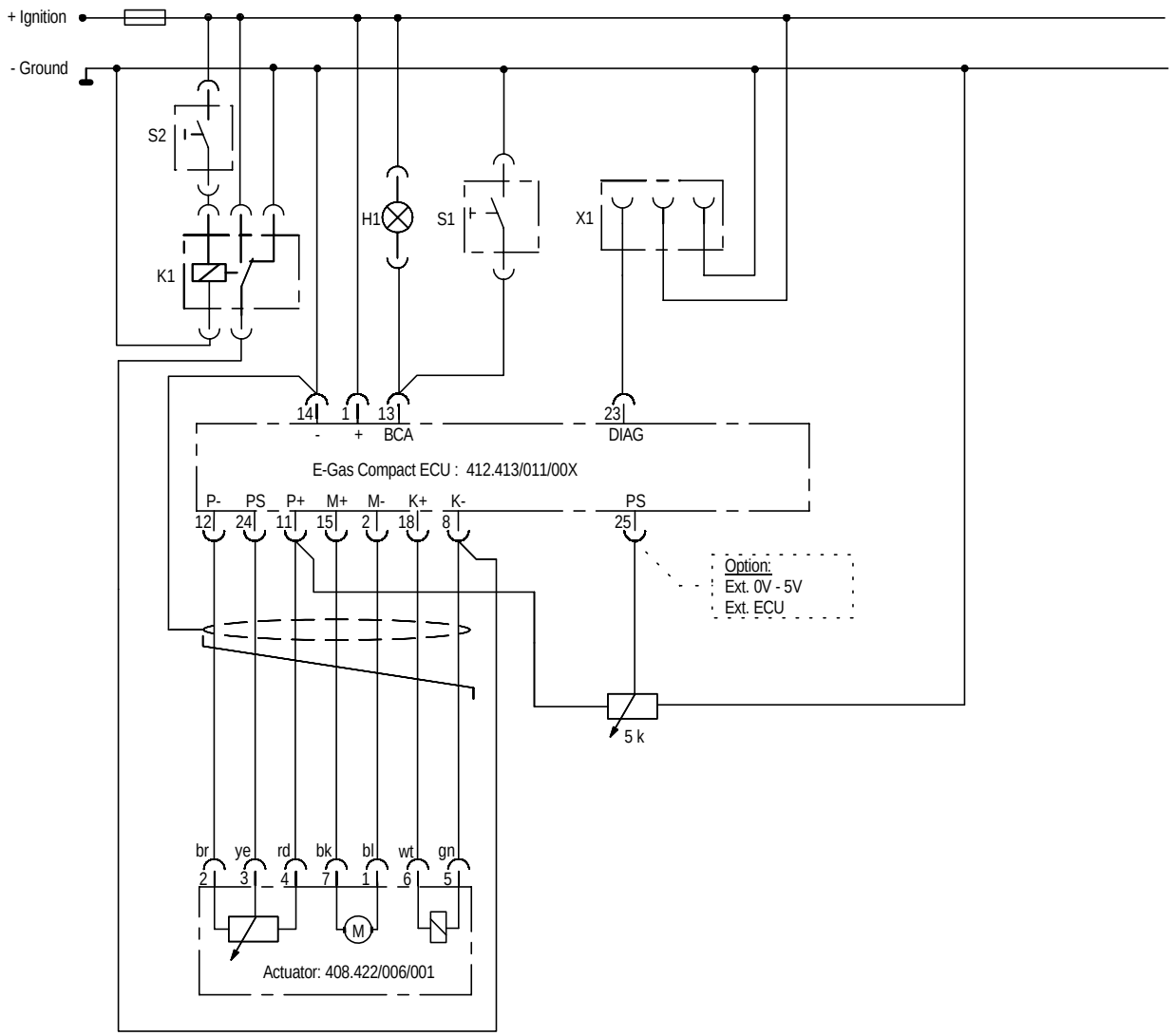
Vehicle:

Version: 1.00 (24V)

File: Compact with pedal unit.igr

Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter



Note:

Settings of the return spring must allow to reach the engine idle-speed when the actuator without current!

ECU Programming
Selection of rated value input : Ext. 0V - 5V

Description
H1 Fault Lamp K1 Relay S1 Fault-Push Button S2 Brake Light Switch X1 Diagnosis Connector

E-Gas Compact SIEMENS VDO

Ext. Potentiometer 5k & option ext. 0V - 5V
Customer:
Vehicle:
Version: 1.00 (24V)
File: Compact with Poti & ext. 0V-5V.igr
Date: 29.02.2000 Dep.:KI42V3/PTR

Overview of Chapter

Product Manual E-Gas® compact

Change Overview

Date	Chapter-Page	Comment
0100	0-2	Chapters 7,8 and 9 new, chapter 10 removed
	1-2 to 1-9	Text supplement
	1-12 to 1-14	new: pin 13 = page 8-1, 8-2
	3-4, 3-6, 3-12, 3-13, 3-16, 3-17	Text supplement
	4	Testing software VDO E-Gas® compact was: test equipment new: classification
	4-14	Text supplement
	5	new: classification
	6-2	new: = 37 (complete)
	6-5	new: pos.1, 5, 37
	7-1 + enclosures	Data Sheets was Technical Drawings new: data sheets from 7 components
	8	Chapter 8 was chapter 10, Text supplement
	9	complete new
0700	6-5	*new:* comment pos. 10
0900	7-1 + enclosures	new: dates 5 data sheets exchanged
1100	3-1	new: 3.3.3
	3-10	Figure 7 removed
	3-15	Text supplement, (page 3-18) was (page 3-10)
	3-18	complete new
	6-2	Pos. 24 new figure
0301	3-16	Connection actuator 408-411-005-013: black 2M- *was* 15M+, blue 15M+ *was* 2M-, red 12P- *was* 11P+, brown 11P+ *was* 12P-
1001	complete	Corporate Design changed
	1-12	Text supplement
	1-14	Pin 9: technical data supplement
	4-2	Version designation: 3.00
	8-1	Deletion of the fault memory: text
	9	Compact with E-Gas II actuator: wiring diagram
0605	3 - 10	Figure 7 added
0705	1 - 3, Chapter 9	CD changed
1006	complete	CD changed and Data Sheets
0908	complete	CD changed