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HEINZMANN®

Engine & Turbine Management

PHLOX II

IC-08, IC-08A, IC-08B
IC-12, IC-12A, IC-12B
IC-16, IC-16A, IC-16B

Ignition Control System

Warnings / Pictogramme de Danger

The appropriate manuals must be thoroughly studied be-fore installation, initial start-up and maintenance

All instructions pertaining to the system and safety must be followed in full. Non-observance of the instructions may lead to injury to persons and/or material damage.

HEINZMANN shall not be held liable for any damage caused through non-observance of instructions.
Independent tests and inspections are of particular im-portance for all applications in which a malfunction could result in in-jury to persons or material damage.

All examples and data, as well as all other information in this manual are there solely for the purpose of instruction and they may not be used for special application without the operator running independent tests and inspections before-hand.

HEINZMANN does not guarantee, neither expressly nor tac-itly, that the examples, data or other information in this manu-al is free from error, complies with industrial stand-ards or ful-fils the requirements of any special application.

Les manuels appropriés doivent être soigneusement étudiées avant l'installation, le démarrage initial et la maintenance.

Toutes les instructions relatives au système et à la sécurité doi-vent être respectées dans leur intégralité. Le non-respect de ces instructions peut entraîner des dommages aux personnes et / ou des dommages matériels.

HEINZMANN ne pourra être tenu responsable de tout dom-mage causé par le non-respect des instructions. Des essais et inspections indépendantes sont d'une importance particulière pour toutes les applications où un dysfonctionnement pourrait entraîner des dommages aux personnes ou des dommages ma-tériels.

Tous les exemples et les données, ainsi que toutes les autres in-formations contenues dans ce manuel sont là uniquement à des fins d'enseignement et ils ne peuvent être utilisés pour des ap-plications spéciales sans que l'opérateur conduise des tests et des inspections indépendantes auparavant.

HEINZMANN ne garantit ni expressément ni tacitement que les exemples, données ou autres informations contenues dans ce manuel sont exemptes d'erreur, conformes aux normes in-dustrielles ou remplissent les exigences de toute application particulière.

To avoid any injury to persons and damage to systems, the following monitoring and protective systems must be provided:

– Overspeed protection independent of the rpm controller HEINZMANN shall not be held liable for any damage caused through missing or insufficiently rated overspeed protection.

– Thermal overload protection

The following must also be provided for alternator systems:

– Overcurrent protection

– Protection against faulty synchronisation for excessively-large frequency, voltage or phase difference

– Directional contactor

The reasons for overspeeding may be:

– Failure of positioning device, control unit or its auxiliary devices

– Linkage sluggishness and jamming

Pour éviter tous dommages aux personnes et aux systèmes, les systèmes de surveillance et de protections suivantes doivent être fournis:

– Protection de survitesse indépendante du régulateur de vitesse HEINZMANN ne pourra être tenu responsable de tout dommage causé par une protection de survitesse manquante ou insuffisamment dimensionnée.

– Protection thermique

Les éléments suivants doivent également être fournis pour les systèmes avec alternateur:

– Protection de surintensité

– Protection contre erreur de synchronisation en raison d'une trop grande différence de fréquence, de tension ou de phase

– Contacteur directionnel

Les raisons d'une survitesse peuvent être:

– Un défaut du dispositif de positionnement, de l'unité de contrôle ou de ses dispositifs auxiliaires

– Un blocage ou l'inertie du levier de couplage

The following must be observed before an installation:

– Always disconnect the electrical mains supply before any interventions to the system.

– Only use cable screening and mains supply connections that correspond with the *European Union EMC Directive*

Check the function of all installed protection and monitoring systems

C**e qui suit doit être observée avant l'installation:**

– Toujours déconnecter l'alimentation électrique du secteur avant toute intervention sur le système.

– Utiliser uniquement le blindage du câble et des connecteurs de réseau qui correspondent à la directive CEM de l'Union européenne

Vérifier le fonctionnement de toutes les protections installées et des systèmes de surveillance

	HEINZMANN expressly rejects any implied guarantee pertaining to any marketability or suitability for a special purpose, including in the event that **HEINZMANN** was notified of such a special purpose or the manual contains a reference to such a special purpose.	**HEINZMANN** rejette expressément toute garantie implicite concernant toute commercialisation ou adaptation dans un but particulier, y compris dans le cas où **HEINZMANN** a été avisé d'un tel but particulier ou le manuel contient une référence à un tel but spécial.
	HEINZMANN shall not be held liable for any indirect and direct damage nor for any incidental and consequential damage that results from application of any of the examples, data or miscellaneous information as given in this manual.	**HEINZMANN** ne pourra être tenu responsable de tout dommage direct et indirect, ni pour tout dommage indirect ou consécutif qui résulte de l'application de l'un des exemples, des données ou des informations diverses comme indiqués dans ce manuel.
	HEINZMANN shall not provide any guarantee for the design and planning of the overall technical system. This is a matter of the operator its planners and its specialist engineers. They are also responsible for checking whether the performances of our devices match the intended purpose. The operator is also responsible for a correct initial start-up of the overall system.	**HEINZMANN** ne fournit aucune garantie en ce qui concerne la conception et la planification du système technique globale. Il en est de la responsabilité de l'opérateur, de ses planificateurs et de ses ingénieurs spécialisés. Ceux-ci sont également chargés de vérifier que les performances de nos appareils correspondent à l'usage prévu. L'opérateur est également responsable de la mise en service de l'ensemble du système.

	**Risk of fire** **Risk of fire and serious burns from flammable chemicals!** > Never clean engine with flammable cleaners	**Risque d'incendie** **Risque d'incendie et de brûlures graves dû à des produits chimiques inflammables!** > Ne jamais nettoyer le moteur avec des nettoyants inflammables !
	**Hot surface** **Housing of PHLOX-II gets hot when engine is running!** > Never touch PHLOX-II housing bare-handed when engine is running or has been switched of recently. > Use safety gloves or let cool down the unit before touching.	**Surface chaude** **Le boitier du PHLOX-II devient chaud lorsque le moteur tourne!** > Ne jamais toucher le boitier du PHLOX-II à mains nues lors que le moteur tourne ou a été arrêté récemment. > Utilisez des gants de protection ou laisser refroidir l'appareil avant de le toucher
NOTICE	In particular, the system may be operated only within the electrical and technical ranges indicated in the specification. All components should be checked regularly for signs of wear, damage**.** Repairs to **HEINZMANN** devices may only be carried out on the manufacturer's premises! The devices may in no case be opened by the customer!	En particulier, le système ne peut être utilisé que dans les gammes électriques et techniques indiquées dans le cahier des charges. Tous les composants doivent être contrôlés régulièrement pour repérer tout signe d'usure ou de dommage. Les réparations de dispositifs **HEINZMANN** ne peuvent être effectuées que dans les locaux du fabricant! Les dispositifs ne doivent en aucun cas être ouverts par le client!
	The **PHLOX II** system is designed so that it does not require maintenance or upkeep. Nevertheless, the state of all components such as cables, connectors, coils, leads, rails and sensors should be checked regularly for signs of damage or wear.	Le système **PHLOX II** est conçu de telle sorte qu'il ne nécessite pas de maintenance ou d'entretien. Néanmoins, l'état de tous les composants tels que câbles, connecteurs, bobines, fils de raccordements, rails et capteurs doit être vérifié régulièrement pour repérer tout signe de détérioration ou d'usure.

	**Explosion** **Risk of deflagration or explosion of unconsummated fuel gas!** > Before running engine ensure the fuel system is leak proof. > Bleeder valves are compulsory on intake side and exhaust side. > Intake and exhaust side have to be realized in adequate dimension.	**Explosion** **Risque de déflagration ou une explosion de gaz combustible non consommé!** > Avant de faire tourner le moteur s'assurer que le système de carburant est étanche. > Des soupapes de purges sont obligatoires côté admission et côté échappement. > Admission et échappement doivent être de dimension adéquate.
	**Mechanical dangers** **Risk of injury by falling or sharp-edged devices!** > During installation lose devices or tools might fall down. > Electric connectors and plugs might be sharp-edged. **Use some personal protective equipment!**	**Dangers mécaniques** **Risque de blessures par chute ou dispositifs tranchants!** > Lors de l'installation, des dispositifs ou des outils peuvent tomber. > Les connecteurs électriques peuvent être tranchants. **Utilisez un équipement de protection individuelle!**
	**Mechanical danger** **Risk of injury by rotating parts!** > The trigger disk be prevented from touch by an adequate cover when engine is running.	**Dangers mécaniques** **Risque de blessure par des pièces en rotation!** > Un couvercle adéquat doit protéger le disque de trigger de tout contact lorsque le moteur tourne
	**High-Voltage** **Risk of electric shock!** > High voltage devices have to be isolated adequately. Protection against accidental contact has to be established by the user. > Wirings for primary circuit must have a sufficient insulation for a voltage of at least 300V.	**Haute tension** **Risque de choc électrique!** > Les dispositifs à haute tension doivent être isolés de façon adéquate. Une protection contre les contacts accidentels doit être mise en place par l'opérateur. > Les câblages pour le circuit primaire doivent avoir une isolation suffisante pour une tension d'au moins 300V

Contents

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1 Safety Instructions and Related Symbols

This publication offers practical safety instructions to indicate the unavoidable residual risks involved when operating the machine. These residual risks involve hazards to

- Personnel
- Product and machine
- The environment

The primary aim of the safety instructions is to prevent personal injury!

The signal words used in this publication are specifically designed to direct your attention to possible damage extent!

DANGER ***DANGER indicates a hazardous situation which will lead to fatal or severe injuries if it is not prevented.***

WARNING ***WARNING indicates a hazardous situation which could lead to fatal injury or severe injuries if it is not prevented.***

CAUTION ***CAUTION indicates a hazardous situation which could lead to minor injuries if it is not prevented.***

NOTICE ***NOTICE indicates possible material damage.***

Safety instructions are not only denoted by a signal word but also by hazard warning triangles. Hazard warning triangles can contain different symbols to illustrate the danger. However, the symbol used is no substitute for the actual text of the safety instructions. The text must therefore always be read in full!

This symbol does not refer to any safety instructions but offers important notes for better understanding the functions that are being discussed. They should by all means be observed and practiced.

2 System Description

2.1 Proper and intended use

PHLOX II is a high-energy capacity spark ignition control system. It is to be used solely for ignition control application on spark-ignited combustion engines. It is intended for use in an industrial environment. When operated outdoors, additional protective measures against bad weather are also required.

Signals are exchanged via electrical signals or data bus system. Because transmission may be interfered with by external circumstances or influences, the user must provide additional safety devices to match the application type.

In individual cases, the following must be coordinated with the manufacturer, HEINZMANN:

Each use which deviates from the above mentioned:

- Modifications to the device
- Use in extreme ambient conditions that deviate from the specification (dust, temperature, wetness)
- Use under powerful electrical or electromagnetic fields
- Use in aggressive atmospheres or vapours
- Use in potentially explosive areas

A written statement from the manufacturer must always be obtained in the event of any uncertainty, queries or missing statements.

	**The PHLOX II – Ignition Control System must not be used for any safety function! Safety functions always have to be realised by alternative systems!**

2.2 Operational principle

PHLOX II is a highly flexible ignition control system. It is available in 3 versions of up to 8, 12 or 16 cylinders.

To achieve accurate timing control, the systems can process up to 2 Hall or inductive pick-ups. They support all usual engine pick-up configurations such as single pick-up on camshaft trigger disk or double pick-up on crankshaft (position) and camshaft (reference). 3 LEDs are provided to represent the actual status of the ignition unit visually and to allow quick diagnostics. A separate plug is available to connect HEINZMANN DcDESK 2000 software or a hand programmer to perform detailed configuration, monitoring or diagnostics.

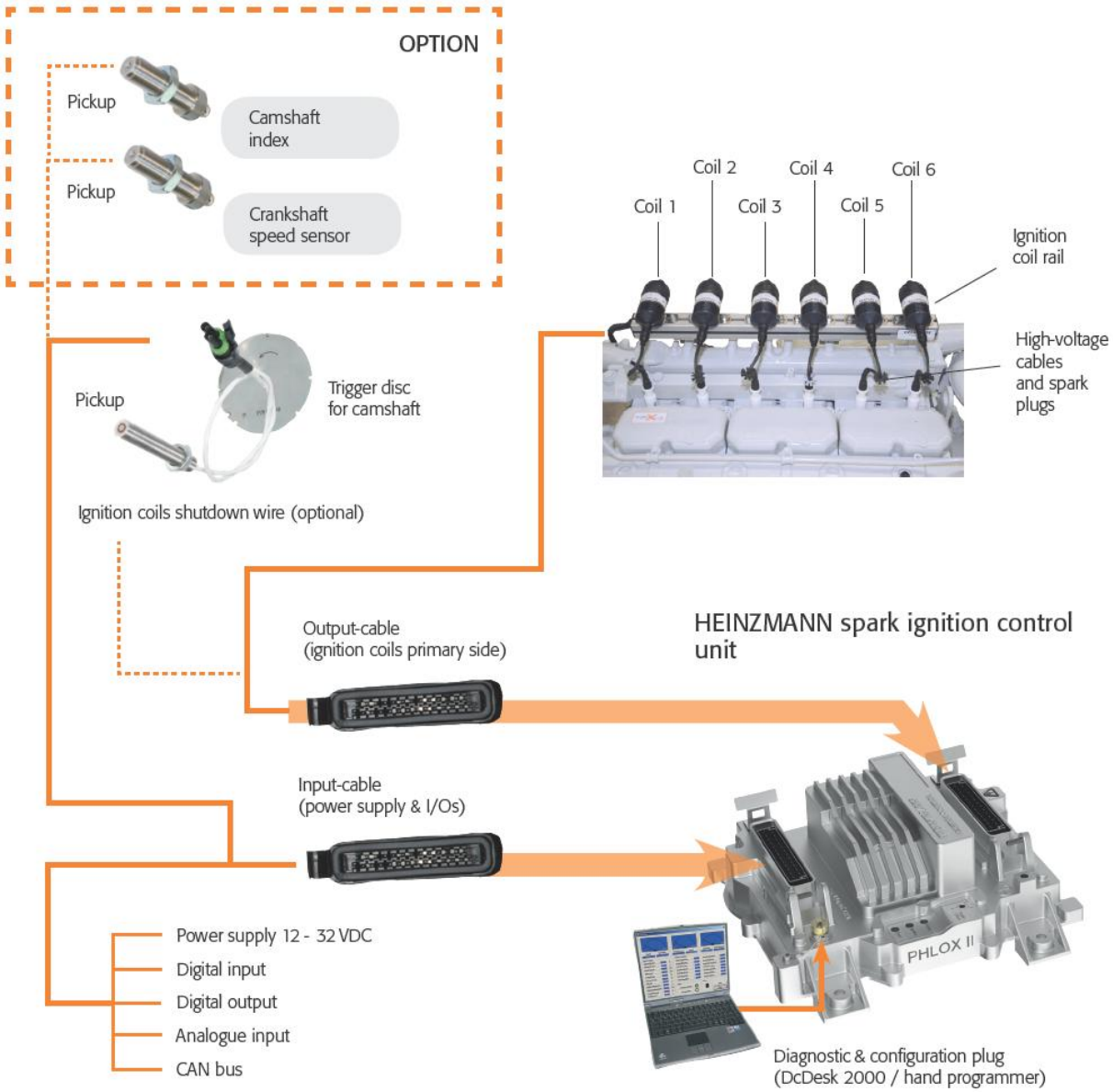


Figure 1: Example of configuration for 6-cylinder engine

In order to reduce spark plug wear, PHLOX II systems offer 32 levels of ignition energy in a range of 25 to 280 mJ. Depending on application, the energy level can be set or adjusted as a function of speed, load or on-board spark diagnostics. Optionally, and depending on pick-up configuration, the detected misfiring level can automatically adapt the energy level to needs of the engine and help extend usable spark plug life, while assuring optimum engine performance. Its flexibility and I/O possibilities allow easy integration into any gas engine management system and guarantee economical and tailored solutions for OEMs, packagers and retrofit customers.

2.3 System components

- PHLOX II control units IC series
- PHLOX II pick-ups
- PHLOX II coils
- Cable harnesses
- PHLOX II ignition leads
- PHLOX II trigger discs
- PHLOX II wiring rails
- PHLOX II spark plugs
- DcDesk 2000 configuration and visualisation tools

NOTICE

This system component may only be combined with control units that meet HEINZMANN specifications Consult HEINZMANN if a different control unit is to be used

2.4 System characteristics

- Complete ignition system
- Precise ignition timing
- Increased spark plug durability
- Easy integration via CAN
- On-board diagnostics
- Diagnostic of sparking process
- Up to 16 cylinders
- Complete system from one source
- Configurable solution
- High ignition capabilities
- Hall or inductive pick-ups to cover all engine configurations
- Variable energy level to reduce spark plug wear
- On-board diagnostics for safe operation
- I/Os and CAN bus available for simple integration
- Customised cable trees
- Variety of coils suitable for all applications and fuels

2.5 Applications

- Lean-burn engines
- Lambda 1 engines
- Stationary engines and vehicles
- Engines with fixed and variable speed
- Fuels: propane, natural gas, sewage gas, landfill gas, carburetted hydrogen vapour
- Fuels with variable gas quality

2.6 Additional functions

- Engine stop, switch off ignition
- Overspeed protection

  Overspeed may be set in a parameter. If this overspeed is exceeded the control unit sounds an alarm and switches off the ignition.
- Engine hours counter

  Displays the total number of hours during which the engine runs (speed is recognised). Additionally, the number of engine starts is registered.
- Error diagnosis and error messages

  In case of sensor error, an alarm is sounded and, if necessary, the system goes into emergency operation or closes the valve, thereby stopping the engine. Internal errors are also recognised and are stored in the same way as all other errors. All errors can be extracted with an external, handheld programmer or, if the communications software is installed and a cable available, read out to a PC / laptop computer.
- Communication

  Serial interface for the HEINZMANN communications programme DcDesk 2000 or for a handheld programmer (HEINZMANN communications cable required).

  A CAN interface is available for communication with other HEINZMANN control units and, if adequately configured, allows communication with external devices such as SPS. In this way, the system may be integrated flexibly into a comprehensive engine management solution.
- Optional misfire detection

  As an option, expanded software for misfire detection is available.

3 Operation, Maintenance and Service

	**Risk of fire** **Risk of fire and serious burns from flammabel chemicals!** > Never clean engine with flammable cleaners

	**Hot surface** **Housing of PHLOX-II gets hot when engine is runnings!** > Never touch PHLOX-II housing bare-handed when engine is running or has been switched of recently. > Use safety gloves or let cool down the unit before touching

NOTICE

The system must be operated in such a way to reliably pre damage of any type.

In particular, the system may be operated only within the electrical and technical ranges indicated in the specification.

All components should be checked regularly for signs of wear, damage and should be checked regularly.

Repairs to HEINZMANN devices may only be carried out on the manufacturer's premises!

The devices may in no case be opened by the customer!

The PHLOX II system is designed so that it does not require maintenance or upkeep. Nevertheless, the state of all components such as cables, connectors, coils, leads, rails and sensors should be checked regularly for signs of damage or wear.

4 PHLOX II control unit, technical data

4.1 General

Number of cylinders		
- by PHLOX II IC-08 , IC-08A or IC-08B	up to 8	
- by PHLOX II IC-12 , IC-12A or IC-12B	up to 12	
- by PHLOX II IC-16 , IC-16A or IC-16B	up to 16	
Power supply	nominal 24	V_{DC}
	range 18 … 32	V_{DC}
	temporarily allowed (≥ 0.5 s) 9 … 33	V_{DC}
Current consumption by 24V and 1800 rpm, maximal level of ignition energy		
- by PHLOX II IC-08 , IC-08A or IC-08B	up to 2,4	A (DC)
- by PHLOX II IC-12 , IC-12A or IC-12B	up to 3,5	A (DC)
- by PHLOX II IC-16 , IC-16A or IC-16B	up to 4,7	A (DC)
Current-pulse for ~ 5 ms by switching on power supply	up to 50	A
External fuse	10 AT / 32 V (DC)	C-type
Ambient temperature	-40 … +95	°C
Protection grade	IP 66	
Polution degree	2	
Engine speed	30 … 3000	rpm
Spark duration	200 … 600	µs
Energy level	32 levels, 25 … 280	mJ
Peak voltage of primary ignition circuit	max. 300	V

4.2 Dimensional drawing

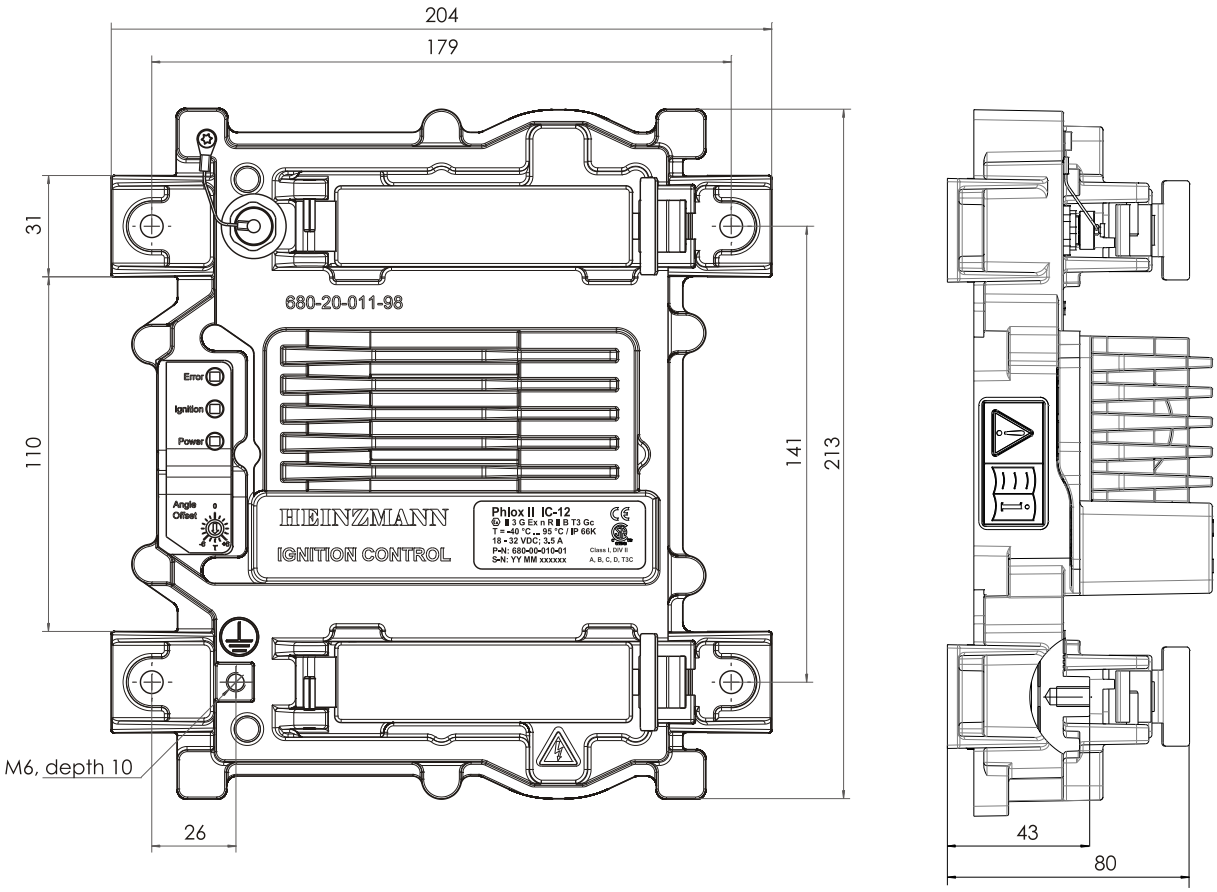
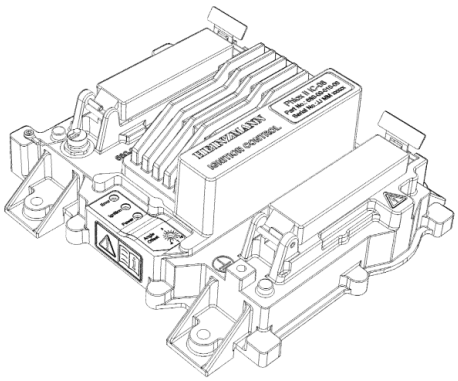


Figure 2: Dimensional drawing of PHLOX II control unit

The fastening element for top-hat-rail in the above drawing is available on request.



4.3 Communication ports

- CAN-1 communication-protocol CAN2.0B,
  protocol SAE J1939, CANopen, DeviceNet,
  HEINZMANN CAN

- CAN-2 / Modbus (isolated)

Included in devices PHLOX II IC08A or IC-12A or IC-16A as:
Communication/ protocol CAN2.0B,
protocol SAE J1939, CANopen, DeviceNet,
HEINZMANN CAN

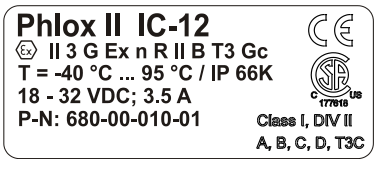
Included in devices PHLOX II IC08B or IC-12B or IC-16B as:
Modbus RTU or additional CAN interface

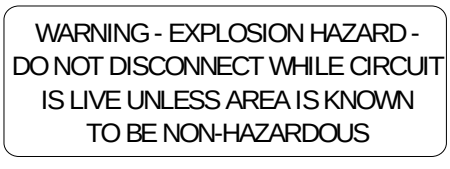
Configuration tool HZM DcDesk 2000, hand programmer

4.4 PHLOX-II ATEX Certification

All PHLOX ICS-12 /16 and derived systems described in the previous chapters are ATEX-certified according to EN 60079-0 and EN 60079-15 respectively restricted breathing protection type "nR".

HEINZMANN will attach the following information sign to the housing:





5 Sensors

5.1 Pick-up sensors in general

Pick-up terminals with power supply for sensors 2×

Each pick-up terminal is configurable for several types of pick-up sensor:

- inductive pick-up shaft position sensor
- Hall effect pick-up shaft position sensor, supply voltage 12 V;
- Hall effect pick-up shaft position sensor, supply voltage 5 V;
- discrete output or open contact

Analogue input with power supply for sensor 1×

Analogue input is configurable as:

- voltage-input (Rin < 300 kOm) for signal 0 … 5 V
- current-input (Rin < 220 Om) for signal 0 … 25 mA

Digital input/output, PWM compatible 2×

Each DIO-terminal is configurable as:

- low-side DI or low-side PWM-In, with or without internal pull-up
- high-side DI or high-side PWM-In, with or without internal pull-down
- switch-input “up / down“;
- low-side DO (up to 0,5A) or low-side PWM-Out, with or without internal pull-up

5.2 Magnetic speed pick-up IA…

5.2.1 Technical Data

Operating principle	inductive sensor	
Distance from measuring wheel	0.5 to 0.8	mm
Output	0.5 … 12	V (AC)
Signal type	sine (depending from tooth shape)	
Resistance	approx. 52	Ω
Temperature range housing	-8 … +120	°C
cable	-5 … +80	°C
Protection grade	IP 55	
Vibration	< 10g, 10 … 100	Hz
Shock	< 50g, 11 ms half sine	
Connector used	SV 6 - IA - 2K (EDV-No: 010-02-170-00)	

5.2.2 Distance of the speed pick-up

The distance between the speed pick-up and the top of the teeth should be approx. 0.5 to 0.8 mm. (the speed pick-up can be screwed onto the top of the tooth and screwed back approx. half a revolution.)

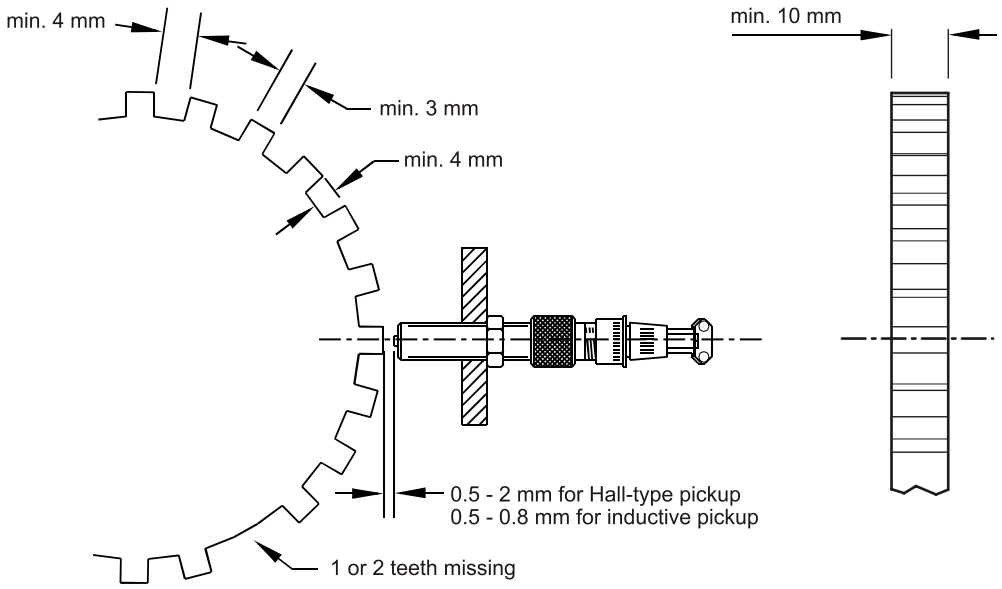


Figure 3: Distance of the speed pick-up

5.2.3 Dimensions and order information

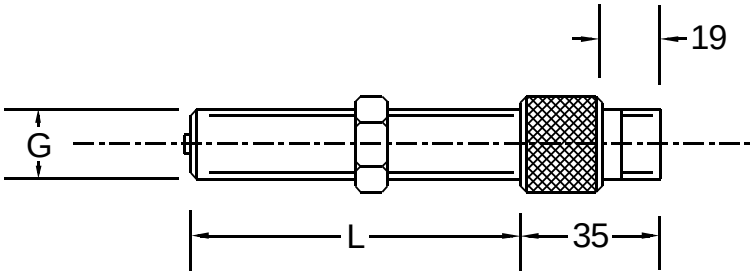


Figure 4: magnetic pick-up

Type	Position	Thread Length L / (mm)	Thread Size G	EDV-No.	Remarks
IA M12-76/160	camshaft	76	M12 × 1.5	600-00-111-00	standard
IA 01-38	crankshaft	38	M16 × 1.5	600-00-003-01	
IA 02-76	crankshaft	76	M16 × 1.5	600-00-006-01	
IA 03-102	crankshaft	102	M16 × 1.5	600-00-007-01	
IA 04-125	crankshaft	125	M16 × 1.5	600-00-010-01	

Table 1: Magnetic pick-ups

Corresponding plug: SV 6 - HIA - 3K (EDV- No.: 010-02-355-00)

5.3 Hall sensors

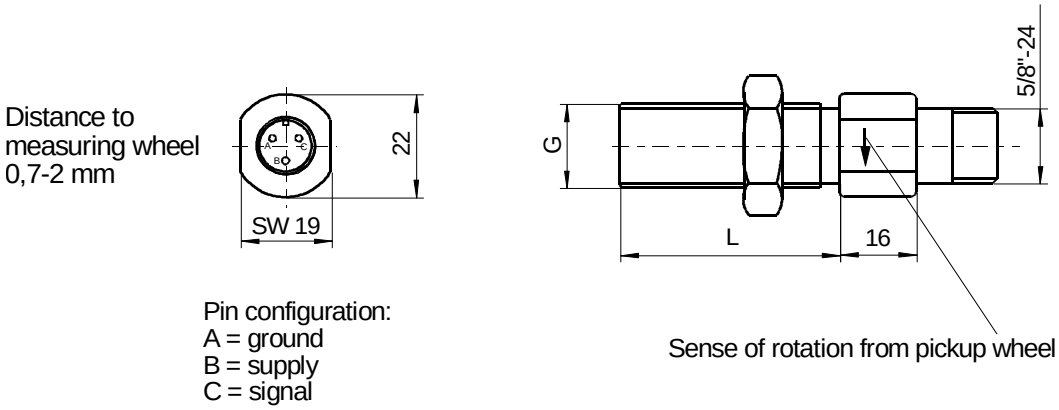


Figure 5: Hall sensors with contact plug

Type	Position	Thread length L / (mm)	Thread size G	EDV-No.	Remarks
HIA 32-46	crankshaft, camshaft	46	M 18 × 1	600-00-052-00	
HIA 32-76	crankshaft, camshaft	76	M 18 × 1	600-00-060-02	standard
HIA 32-102	crankshaft, camshaft	102	M 18 × 1	600-00-065-00	
Corresponding plug: SV 6 - HIA - 3K (EDV- No.: 010-02-355-00)					

Table 2: Hall sensors

5.4 Boost pressure sensor

Measuring range	0 … 2	bar,
	0 – 5	bar
Over pressure	4	bar
	10	bar
Supply voltage	12 … 36	V (DC)
Output signal	4 … 20	mA
	0 … 5	V (DC)
Storage temperature	-55 … +100	°C
Ambient temperature	-40 … +100	°C
Protection grade	IP 65	
Vibration	< 2 g, 5 – 500	Hz
Shock	< 50 g, 11 ms half-sine wave	
Connection	DIN 43650-A or terminal strip, 2-line system	

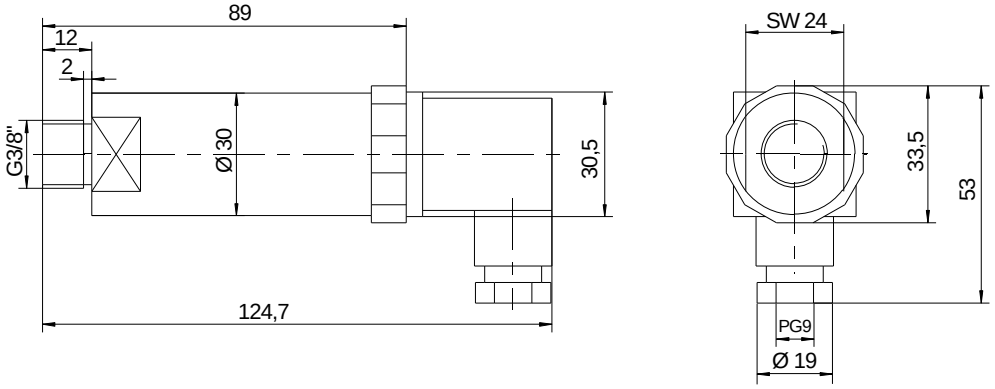


Figure 6: Boost pressure sensor with contact plug

The boost pressure sensors are also available in a version with terminal strip.

Type	Range		EDV-No.	Remarks
DSL 01-2	0.2 … 2 bar abs.	4 … 20 mA	600-00-057-00	
DSL 01-5	0.2 … 5 bar abs.	4 … 20 mA	600-00-057-01	
DSL	0.5 … 4.5 bar abs	0.5 … 4.5 V	600-00-095-00	standard

Table 3: Boost pressure sensors

5.5 Potentiometer

5.5.1 Setpoint Potentiometer SW 02 – 10m, (1 - turn)

Displacement angle	approx. 312°	
Resistance	5	kΩ
Temperature range	-55 … +120	°C
Protection grade	IP 00	
EDV-No.	010-15-001-01	

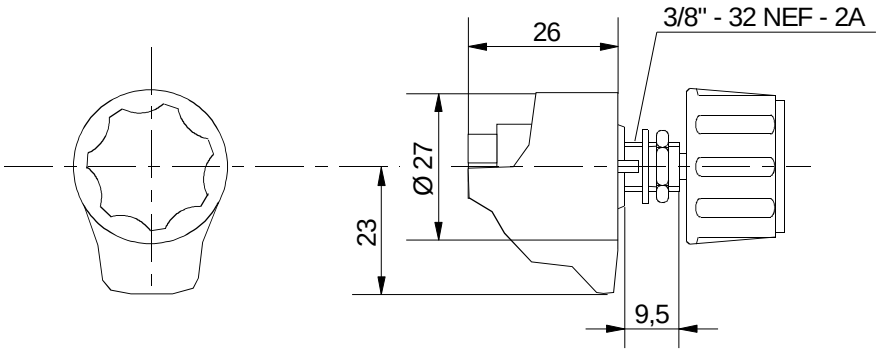


Figure 7: Potentiometer SW 02 - , 1- turn

5.5.2 Setpoint Potentiometer SW 02 - 10 – K, (10 - turn)

Resistance	5	kΩ
Temperature range	-55 … +120	°C
Protection grade	IP 00	
EDV-No.	010-15-001-02	

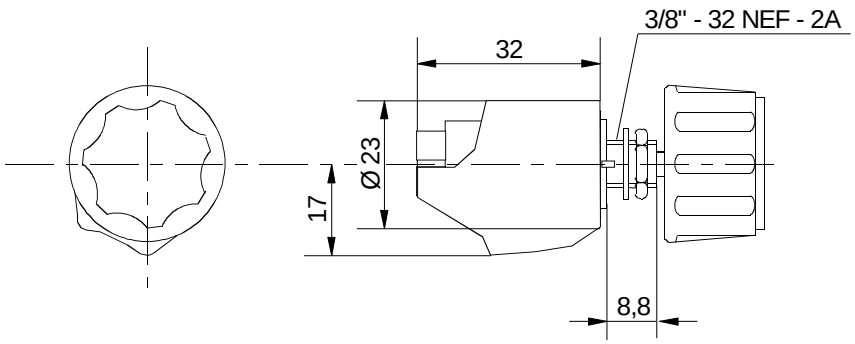


Figure 8: Potentiometer SW 02 - , 10-turn

6 Installation

6.1 Mounting the control unit

	**Explosion** **Risk of deflagration or explosion of unconsummated fuel gas!** > Before running engine ensure the fuel system is leak proof. > Bleeder valves are compulsory on intake side and exhaust side. > Intake and exhaust side have to be realized in adequate dimension.

	**Mechanical dangers** **Risk of injury by falling or sharp-edged devices!** > During installation lose device or tools might fall down. Electric connectors and plugs might be sharp-edged. Use some personal protective equipment.

	**Mechanical danger** **Risk of injury by rotating parts!** > The triggre disk be prevented from touch by an adequate cover when engine is running.

	**High-Voltage** **Risk of electric shock!** > To ensure protection against accidental contact with life wires PHLOX-II always has to be installed in a switch cabinet.

NOTICE

> Installation of the PHLOX II Control Unit can be carried out at any orientation of the device.

The control unit may be positioned at the engine or on the rack carrying the engine. However, this should be a position where it is subject to low vibration and low ambient temperatures.

Max allowed PHLOX II vibration profile:

10 ... 24Hz, +/- 2mm
24 ... 64Hz, 0.24 m/s
64 ... 2000Hz, 5g

Shock absorbing dampers can be used for installation on customers own account. Dampers are not scope of delivery. They have to be ordered separately.

> The permitted maximum cable lengths must also be observed. To avoid the occurrence of faults, the device must not be exposed to any powerful magnetic fields.

6.2 Pin assignment

6.2.1 PHLOX II - IC8/12/16 – Pin assignment Connector X1

Pin No.:	Signal Name	Application	Function
2	“+BAT“	"+" Power supply	Power supply 24V (DC)
15	“+BAT“		
1	“-BAT“	"-" Power supply	
14	“-BAT“		
16	“DIO1“	Digital / PWM input 1 (high- or low-side configurable) Digital / PWM output 1 (low-side up to 1A).	DIO1
3	“DIO2“	Digital / PWM input 2 (high- or low-side configurable) Digital / PWM output 2 (low-side up to 1A).	DIO2
4	“AI_POW(5VR/24V)“	Sensor supply (configurable 5V/ 24V)	AI (C/V): Differential analogue input, configurable: 0 ... 5 V or 0 ... 25 mA
17	“AI_SIG(C/V)“	Sensor signal (configurable 0 ... 25 mA / 0 ... 5 V)	
18	“AI_SIG_0V“	Signal ground (SIG_0V)	
5	“AI_POW_0V“	Sensor supply ground (POW_0V)	
6	“AI_SHILD“	Cable shield	
21	“CAN-H“	"CAN-High"	CAN- Interface ISO/DIS 11898 (CAN2.0B)
20	“CAN-L“	"CAN low"	
7	“CAN-GND“	CAN ground and CAN cable shield connection	
9	“CAN2-H / Modbus-A“	“CAN2-High / Modbus-A“	CAN2 / Modbus Interface (option) ISO/DIS 11898 (CAN2.0B) RS485 (Modbus)
8	“CAN2-L / Modbus-B“	„CAN2-Low / Modbus-B“	
19	“CAN2 / Modbus-GND“	CAN2 / Modbus ground and CAN2 / Modbus cable shield connection	

11	“SPEED_5/12V“	Hall Speed pick-up power supply	Speed_PickUp, magnetic or Hall
23	“SPEED_SIG“	Speed pick-up input signal	
22	“SPEED_0V“	Speed pick-up ground	
10	“SPEED_SHIELD“	Speed pick-up cable shield	
13	“INDEX_5/12V“	Hall index pick-up power supply	Index_PickUp, magnetic or Hall
25	“INDEX_SIG“	Index pick-up input signal	
24	“INDEX_0V“	Index pick-up ground	
12	“INDEX_SHIELD“	Index pick-up cable shield	

Table 4: Connector X1

6.2.2 PHLOX II - IC8/12/16 – Pin assignment Connector X2

Pin Nr.:	Signal Name	Application	
1	“CHANNEL_1“	“+“ Ignition coil Cyl. 1*	
2	“CHANNEL_2“	“+“ Ignition coil Cyl. 2*	
3	“CHANNEL_3“	“+“ Ignition coil Cyl. 3*	
6	“CHANNEL_4“	“+“ Ignition coil Cyl. 4*	
5	“CHANNEL_5“	“+“ Ignition coil Cyl. 5*	
4	“CHANNEL_6“	“+“ Ignition coil Cyl. 6*	
8	“CHANNEL_7“	“+“ Ignition coil Cyl. 7*	
7	“CHANNEL_8“	“+“ Ignition coil Cyl. 8*	
13	“CHANNEL_9“	“+“ Ignition coil Cyl. 9*	
12	“CHANNEL_10“	“+“ Ignition coil Cyl. 10*	
11	“CHANNEL_11“	“+“ Ignition coil Cyl. 11*	
10	“CHANNEL_12“	“+“ Ignition coil Cyl. 12*	
15	“CHANNEL_13“	“+“ Ignition coil Cyl. 13*	
14	“CHANNEL_14“	“+“ Ignition coil Cyl. 14*	
16	“CHANNEL_15“	“+“ Ignition coil Cyl. 15*	
17	“CHANNEL_16“	“+“ Ignition coil Cyl. 16*	
25	“JL“	“-“ Ignition coils rail Bank A / Motor ground	
24	“JL“		
23	“JL“		
22	“JR“	“-“ Ignition coils rail Bank B / Motor ground	
21	“JR“		
9	“JR“		
20	“J“	Motorground	Hardwired ignition stop
19	“G“	Shutdown-wire	
18	-	Not used	
(* Ignition order configurable by software			

Table 5: Connector X2

Mind order of pin assignment when connecting.
Pin number does not always correspond to channal number.

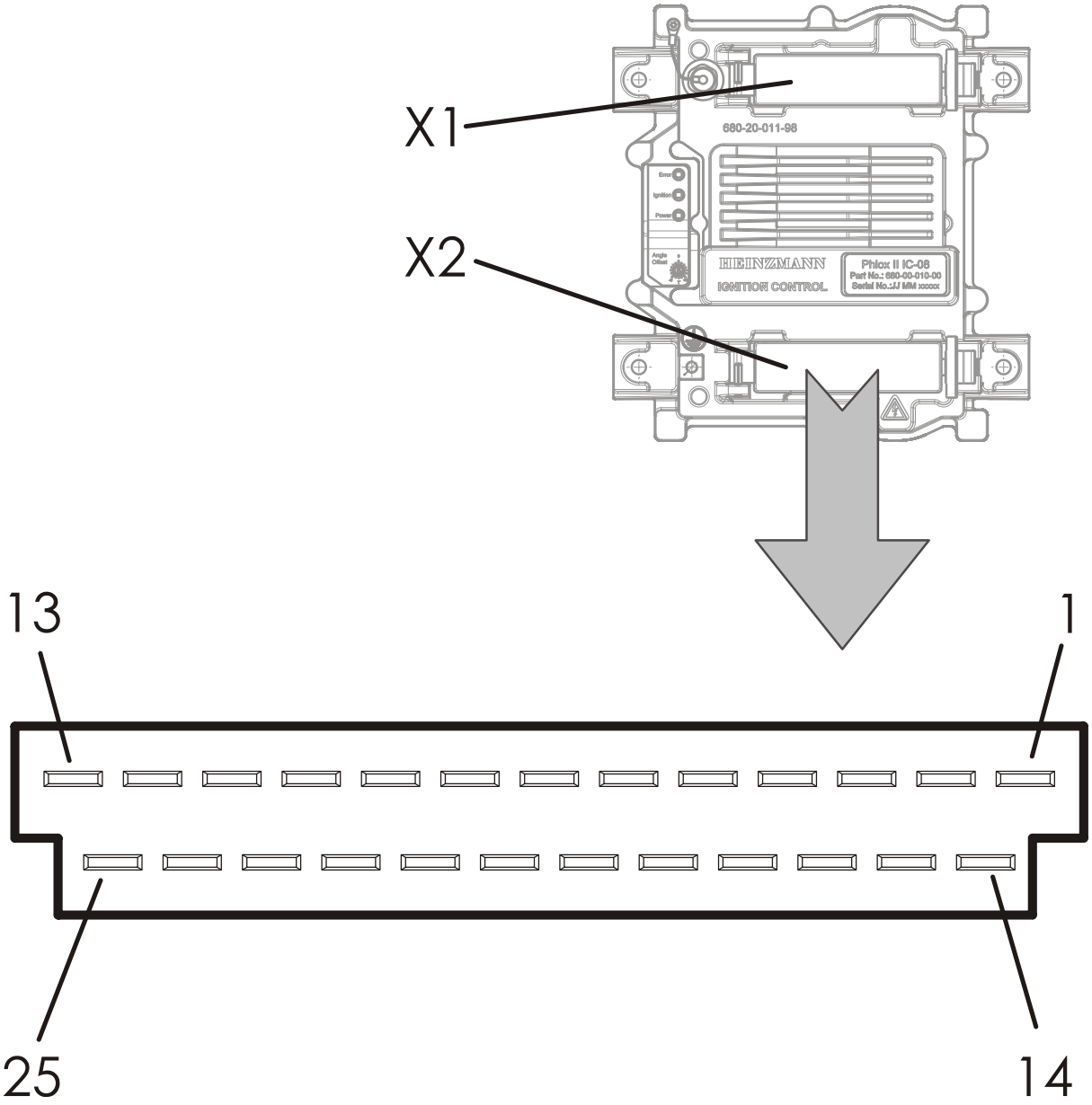


Figure 9: Connector X1 and X2

6.3 Electric connections and requirements for electric installation

High-Voltage

Risk of serious injury!

To ensure protection against accidental contact with life wires PHLOX II always has to be installed in a switch cabinet.

> All wiring must be carried out exclusively by trained personnel and conform with current standards and regulations.

> The electrics must be connected in accordance with the wiring diagrams provided by HEINZMANN and by the plant builder. Only specified cable types may be used for wiring. All indicated cable cross sections allways must be adhered.

> Always switch off power before carrying out maintenance work or demounting components of the system!

> PHLOX II housing must be connected to PE (protective earth) at its specific and indicated terminal!

> Keep away from high voltage device (output-connector, ignition-coils, high voltage wires, spark plug connectors etc.) and never touch it while system is switched on.

> High voltage devices have to be isolated adequately. Protection against accidental contact has to be established by user.

> The equipment does not have some insulation between high-voltage circuits and SELV circuits (safety extra low voltage)!

> Any measuring instruments for diagnosis of high voltage have to be isolated adequately.

6.3.1 General requirements for installation and use

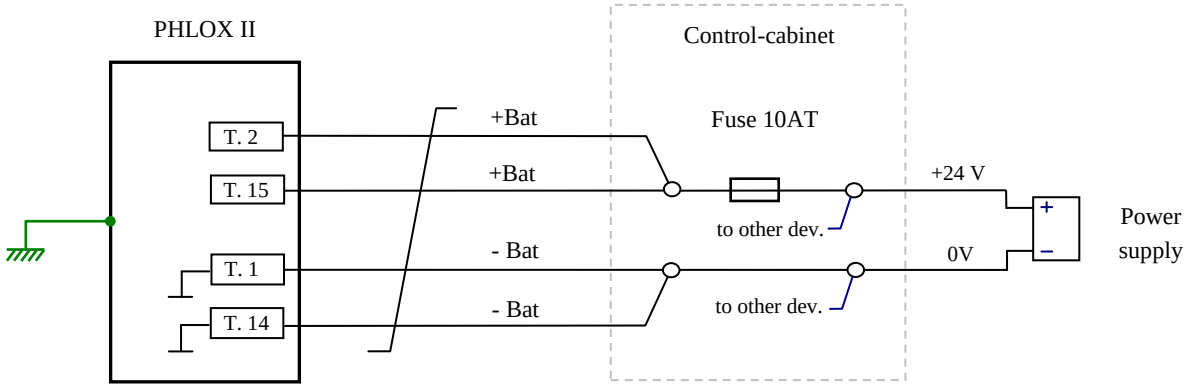
- PHLOX II is intended for built-in use. Mounting and installation might only be carried out by experienced and skilled personnel!

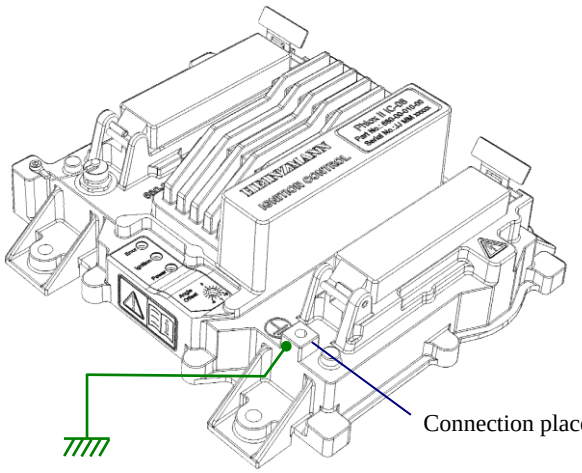
  For excess-current release an external fuse is compulsory!
  (for details see chp.6.3.2)

- Engine-block must be connected to PE!

6.3.2 DC power supply terminal end protoctive earth

Category	DC – direct current power input (incorporated in S3 –cable)
Designation	Wires for DC power supply input: terminals 1 / 14 (-Bat), terminals 2 / 15 (+Bat)
Function of terminal	Power supply
Range	12 … 32 V (DC) , max. 10 A
Connected to	PHLOX and control cabinet terminal block (power supply 24V (DC)
Type of cord used	Wire 1.5 ... 2.5 mm^2, unshielded
Max. length	< 200 m
Requirements	- Use 10 AT / 32 V (DC) C-type fuse or circuit-breaker - Connect PE (protective earth) to PE-wiring point at PHLOX II housing.
Note	Incorporated in the input cable harness of PHLOX II, cable to the control cabinet
Recommendation for test	See test arrangement





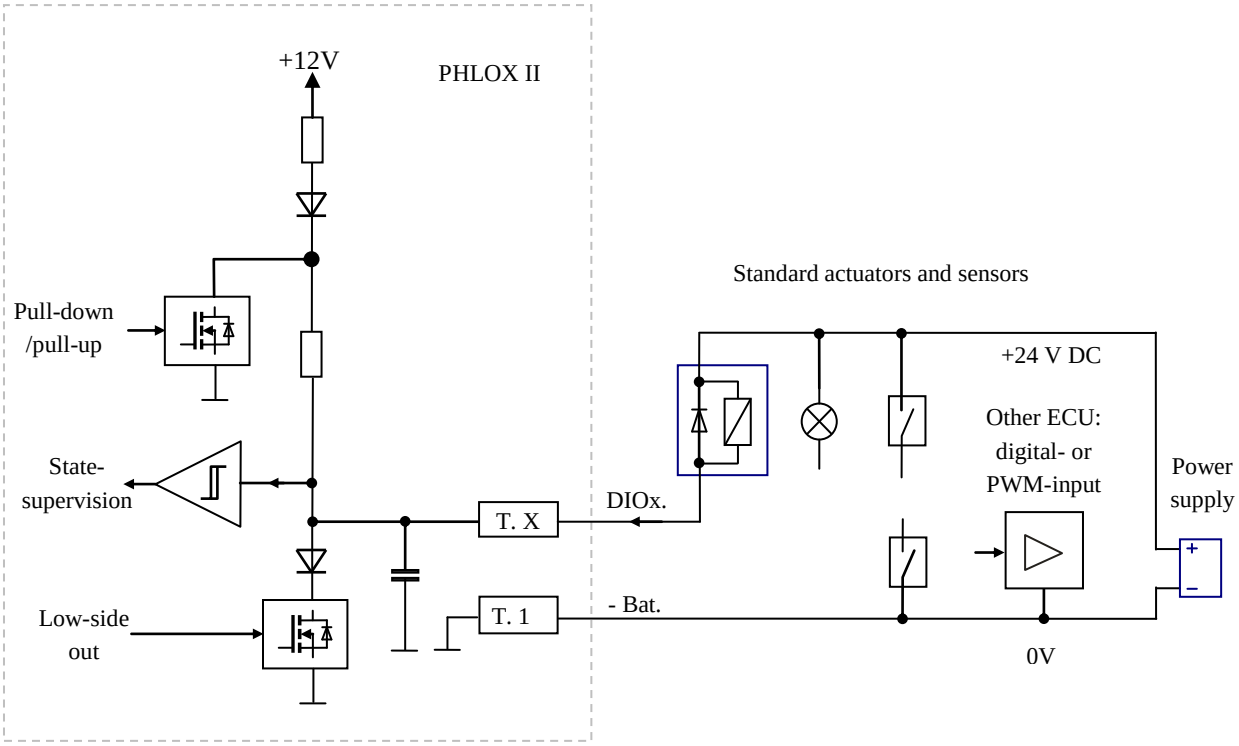
The PE-wire between PE-terminal and metal construction elements, connected to PE:

conductor 2,5mm^2, length 200mm max

6.3.3 Digital inputs and outputs

Category	S3++ – signal terminal
Designation	Wires for 2× independent digital indut/outputs: Terminal 16 (DIO1 - digital In/Out No. 1), terminal 3 (DIO2 - digital In/Out No. 2)
Function of terminals	2 universal terminals for discrete signals, configurable for operating elements such as switches, actuators, relays, lamps etc. Each DIOx is configurable as: - low-side DI, - high-side DI, - low-side DO, - low-side PWM-In, - low-side PWM-Out
Range	0 V ... +Bat. - Potential
Connected to	PHLOX wire-terminals in control cabinet and relays, lamps or other ECU.
Type of cord used	Wire 1.5 ... 2.5 mm^2, unshilded
Max. length	< 30 m
Note	Cable to the control cabinet is part of PHLOX II input cable harness
Recommendation for test	DIO1-terminal in PWM-output mode is translating PWM=50%; DIO2-terminal in PWM-input mode is reciving them. See test arrangement.

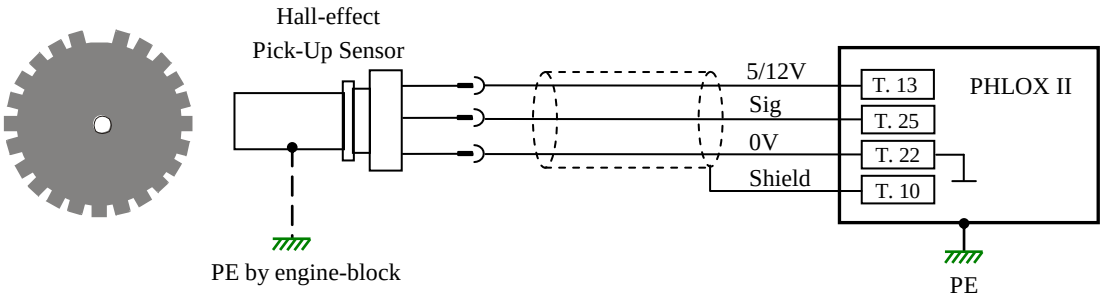
Example of a DIO



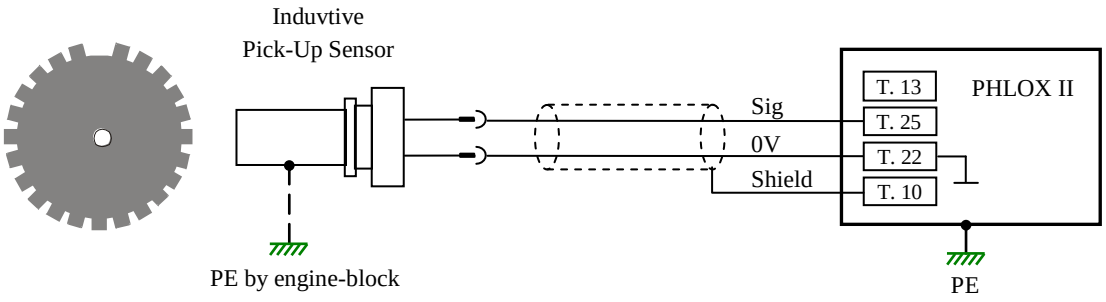
6.3.4 Terminals for shaft position pick-up sensors

Category	S1 and S2 – signal terminal
Designation	Sensor cables for: Pick-Up sensor terminal no. 1 - “Sped PickUp”: Terminal 22 (Speed_0V), Terminal 23 (Speed_Sig), Terminal l1 (Speed_5/12 V), Terminal 10 (Speed_Shield) Pick-Up sensor terminal no. 2 - “Index PickUp”: Terminal 24 (Index_0 V), Terminal 25 (Index_Sig), Termina 13 (Index_5/12 V), Terminal 12 (Index_Shield)
Function of terminals	Detecting of engine driving shaft position via crankshaft and/or camshaft of reciprocation combustion engine. 2× universal terminals for pick-up sensors, including protected sensor power supply. Each terminal is configurable by software for work with: - inductive shaft position sensor (magnetic coil with permanent magnet) - Hall effect shaft position sensor with discrete output With Hall effect sensors each terminal is configurable by software for 5 V or 12 V power supply.
Range	In inductive mode: 50 ... 5000 mVp-n, resistant in range -75 V ... +75 Vp-n; In Hall mode: 0 V ... to sensor supply voltage
Connected to	Standard: PHLOX and shaft position sensor (inductive or Hall effect) sensor Optional: wire-terminals in control cabinet, shaft position sensor (inductive or Hall effect) sensor or other isolated pick-up output (pick-up spliter device etc.)
Type of cord used	For inductive shaft position sensor: shielded 2-core cable, twisted For Hall effect shaft position sensor: shielded 3-core cable, twisted
Max. length	< 30 m
Requirements	Cable shielding should be terminated by PHLOX-terminal “Shield” only. For sensors the insolation between signals and metal case, PE or other external networks is compulsory
Note	Both camshaft sensor cables are part of PHLOX II input cable harness
Recommendation for test	15 m shielded cable to crancshaft Hall effect sensor (Heinzmann HIA 32-76) on the engine-simulator (the test-bench as well with electric motor-drive). 15 m shielded cable to camshaft inductive sensor (Heinzmann IA-M12-76/160) on the engine-simulator (the test-bench as well with electric motor-drive).

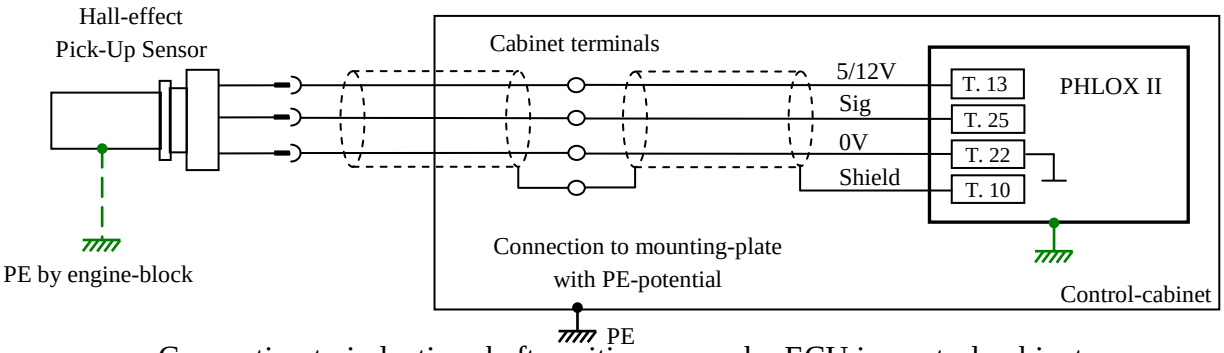
Connection to Hall effect shaft position sensor by ECU on the engine-block or other construction



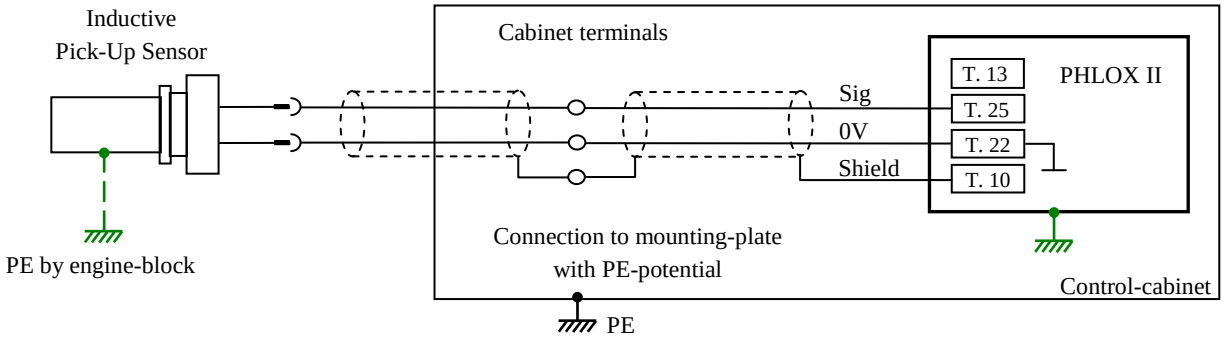
Connection to inductive shaft position sensor by ECU on the engine-block or other construction



Connection to Hall effect shaft position sensor by ECU in control-cabinet



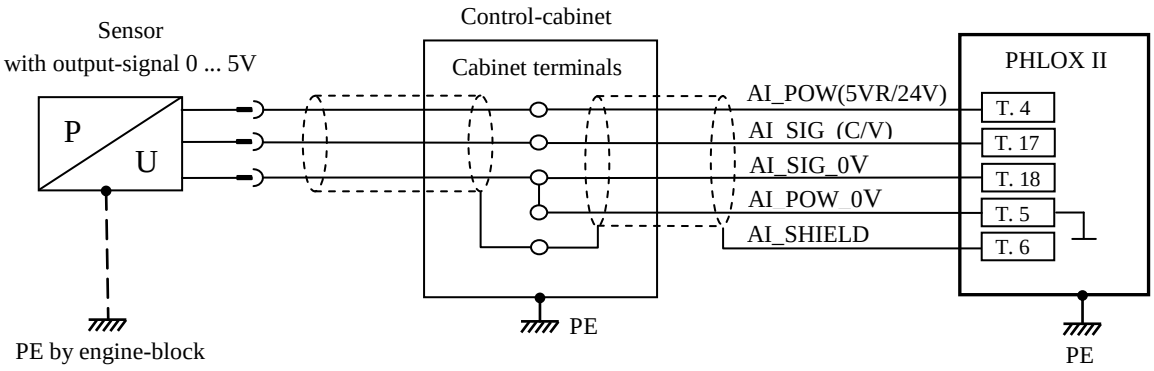
Connection to inductive shaft position sensor by ECU in control-cabinet



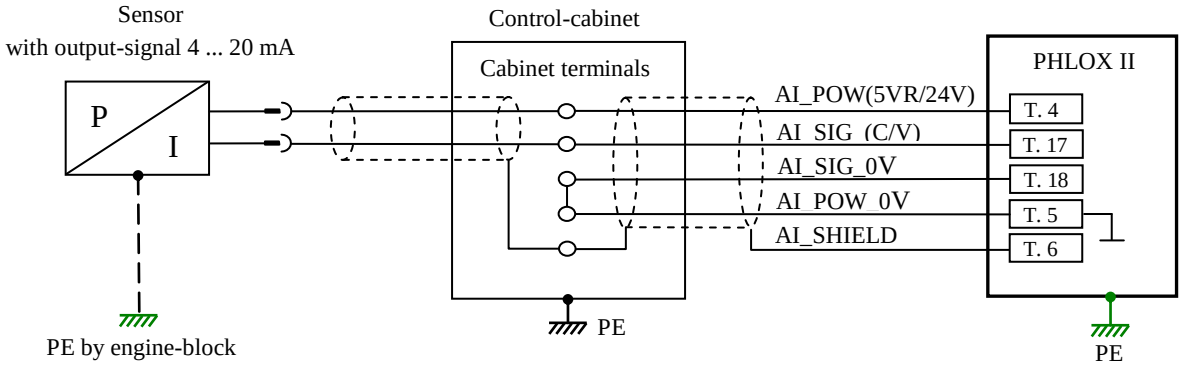
6.3.5 Analogue input

Category	S3++ – signal input
Designation	Sensor cables for: Analog input, configurable 0-5V or 4-20mA: Terminal 18 (AI_SIG_0V), Terminal 17 (AI_SIG(C/V)), Terminal 4 (AI_POW(5VR/24V)), Terminal 5 (AI_POW_0V), Terminal 6 (AI_SHIELD)
Function of terminals	Terminal of differential AI for sensors with analogue signal (setpoint-unit, pressure-sensor, temperature-sensor etc.) or from analogue output of other ECU. Protected power-supply for sensor is including. AI terminal is configurable by software for work with: analogue current signal 4 … 20 mA; analogue voltage signal 0.5 … 4.5 V. Configurable by software for support of sensor with power supply out: - 5 V (by use of potentiometer as settpoint-unit) or +Bat.
Range	Signal in voltage-mode 0.5 ... 4.5V, signal in current-mode 4 ... 20 mA
Connected to	PHLOX, wire-terminals in control cabinet and sensor or other ECU
Type of cord used	For sensor with voltage-signal: twisted 3 core shielded cable For sensor with current-signal: twisted 2 core shielded cable
Max. length	< 30 m
Requirements	Cable shielding should be terminated by PHLOX-Terminal “Shield” only. For sensor: Insulation required between signals and metal-case (or other external networks) of sensor. For customer ECU: DC-entcoupling between signals and PE (frame) by customer ECU is required.
Note	Part of PHLOX II input cable harness

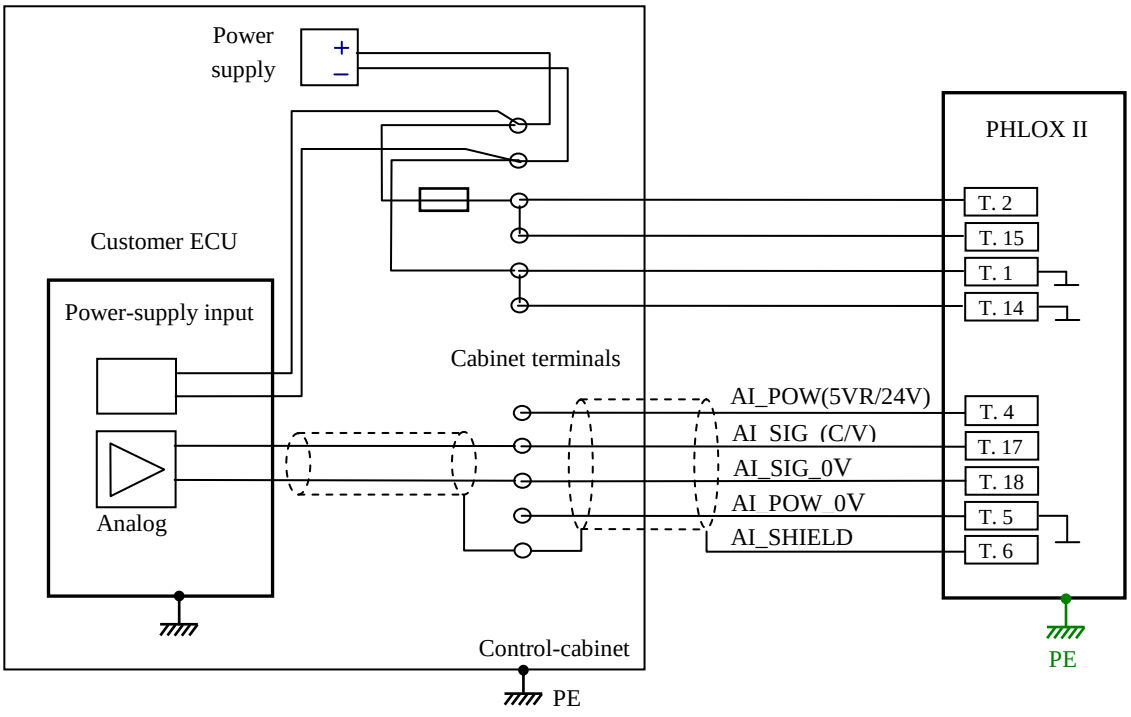
Connection to sensor with voltage-sygnal



Connection to sensor with current-signal



Connection to customer ECU inside control-cabinet and use of common power –supply.



6.3.6 CAN-1 and CAN-2 / Modbus communication ports

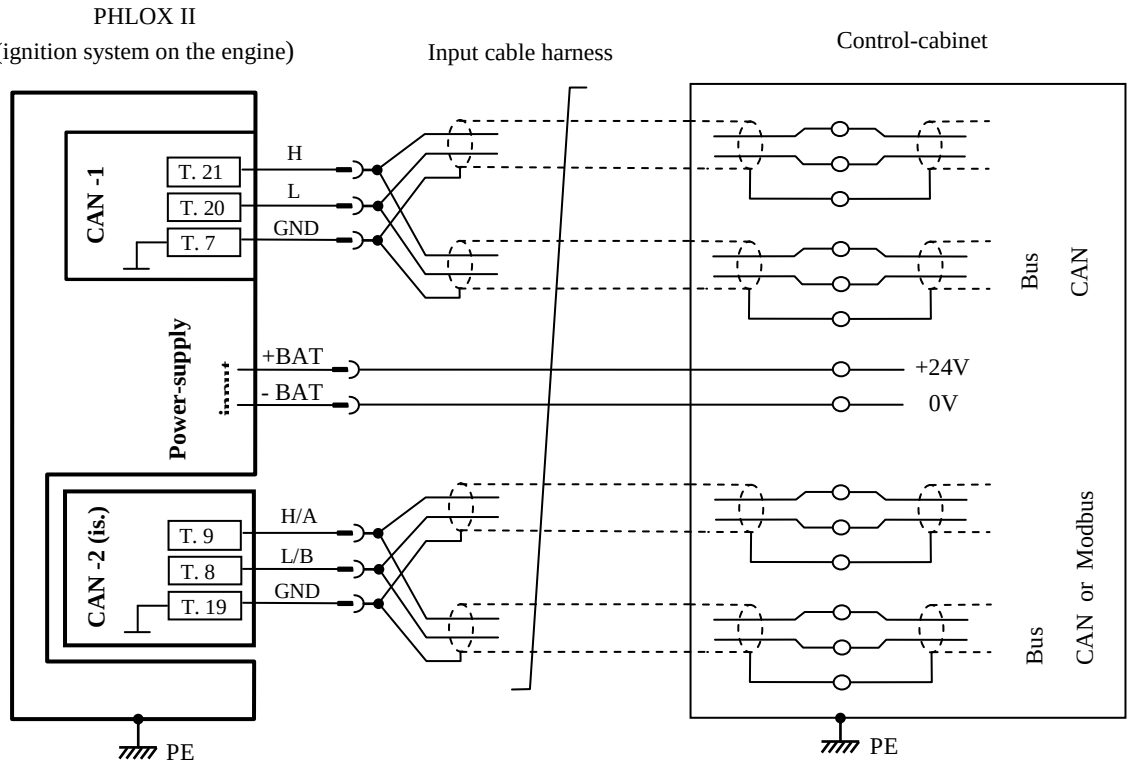
Communication port CAN-1

Category	S3++ – signal input
Designation	Terminal interface CAN-1: Terminal 7 (CAN-GND), Terminal 20 (CAN-L), Terminal 21 (CAN-H)
Function of terminals	Interface for communication bus CAN for application by devices inside control cabinet. Physical layer: ISO 11898-1, -2 and CAN-Specification 2.0B.
Connected to	PHLOX , cabinet terminals and other ECUs or CAN-repeater for insulation
Type of cord used	See requirements for establishing CAN bus communication
Total cable length	< 30 m
Note	Incorporated in the input cable harness for PHLOX II, cable to the control cabinet

Communication port CAN-2 / Modbus (isolated)

Category	S5 – signal input
Designation	Terminal configurable interface CAN-2 (isolated) or Modbus (isolated): Terminal 19 (CAN2 / Modbus-GND), Terminal 8 (CAN2-L / Modbus-B), Terminal 9 (CAN2-H / Modbus-A)
Function of terminals	Configurable interface, depends on the version of ECU: by PHLOX II IC-08, IC-12 or IC-16: not available. by PHLOX II IC-08A, IC-12A or IC-16A: Isolated interface for CAN-Communication to devices inside and/or outside control cabinet. Physical layer: ISO 11898-1, -2 and CAN-Specification 2.0B. by PHLOX II IC-08B, IC-12B or IC-16B: Isolated interface for Modbus-communication to devices inside and/or outside control cabinet. Physical layer: EIA/TIA RS485, 2-wire mode only.
Connected to	PHLOX, cabinet terminals and other ECUs
Type of cord used	- for CAN > see requirements for establishing CAN bus; - for Modbus > see requirements for establishing Modbus;
Total cable length	In CAN-2 (is.) mode - depending on baud rate of data transmission: 1 Gb/s max. 40 m 500 Mb/s max. 70 m 250 Mb/s max. 150 m 125 Mb/s max. 300 m In Modbus (is.) mode - depending on baud rate of data transmission: 9600 kb/s or 19200 kb/s max. 1500 m
Note	Incorporated in the input cable harness for PHLOX II, cable to the control cabinet

Universale solution for connection to communication-ports by PHLOX II

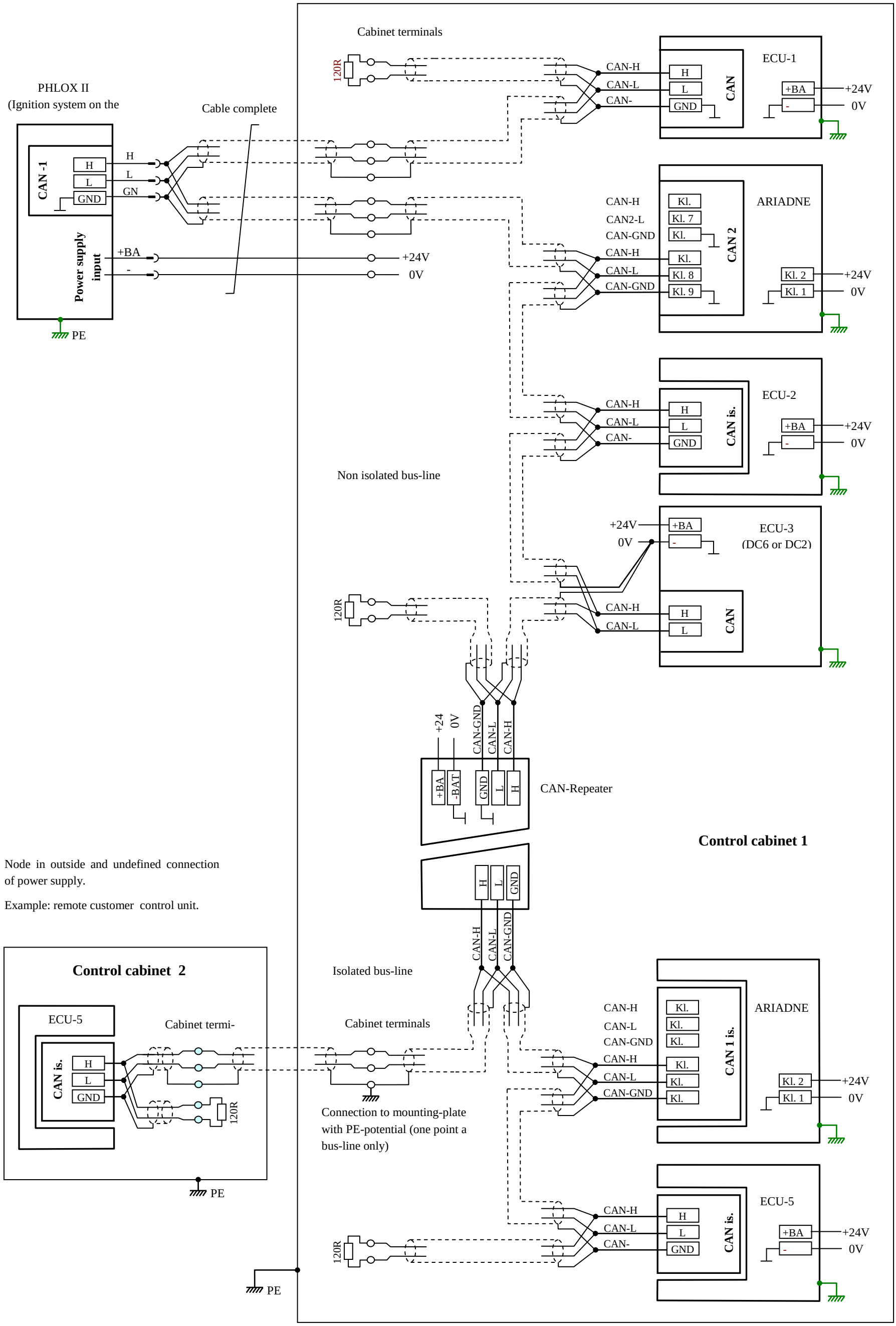


General Requirements for establishing CAN bus communication

Type of wire used	Outside and inside of control cabinet: CAN-cable (shielded twisted pair, wave-impedance 120Ω).
Electrical requirements for CAN bus (see picture next page)	1.) Organisation of electrical bus line: The CAN-H, CAN-L and shield (CAN-GND) must be looped through from node to node. CAN bus line must be organised according to line-structure (node-1, node-2 … node-N)., see picture. 2.) Termination of twisted pair in bus line: connect between CAN-H and CAN-L one resistor 120Ω on the begin of bus line and one resistor 120Ω on the end of bus line. 3.) Conditions by each node (CAN-Port by ECU) on the bus line: - shield must be connected to terminal "CAN-GND", signal lines CAN-H and CAN-L to signal terminals (the names are the same). - By removing of one node-device the CAN-communication between other nodes must work without interrupt (requirements acc. ISO 11898-2:2003). - DC-decoupling between CAN-port (CAN-GND, -H, -L) and PE (frame) is required. 4.) Type of bus line isolation and the application fields: There are generally two different types of bus lines: - isolated and non isolated. If one or more nodes on the line don't have galvanic isolation – this bus is called non isolated. Generally: - use isolated bus line for communication with external customer modules. - for communication, localised internally in one control cabinet only, it is allowed to use a non isolated bus line. 5.) Connection to PE by isolated bus line (see point-4): the shield of can-bus must be connected to PE (mounting plate) in one point only. If required, use a CAN-repeater for isolation. Consider time delay for signal conversion by CAN-repeaters and limit the cable length or reduce the data transmission baud rate

Inspection of CAN-H- and CAN-L-signals by oscilloscope refering to CAN-GND isrecommended for diagnostic of communication.

Example of CAN bus establishment

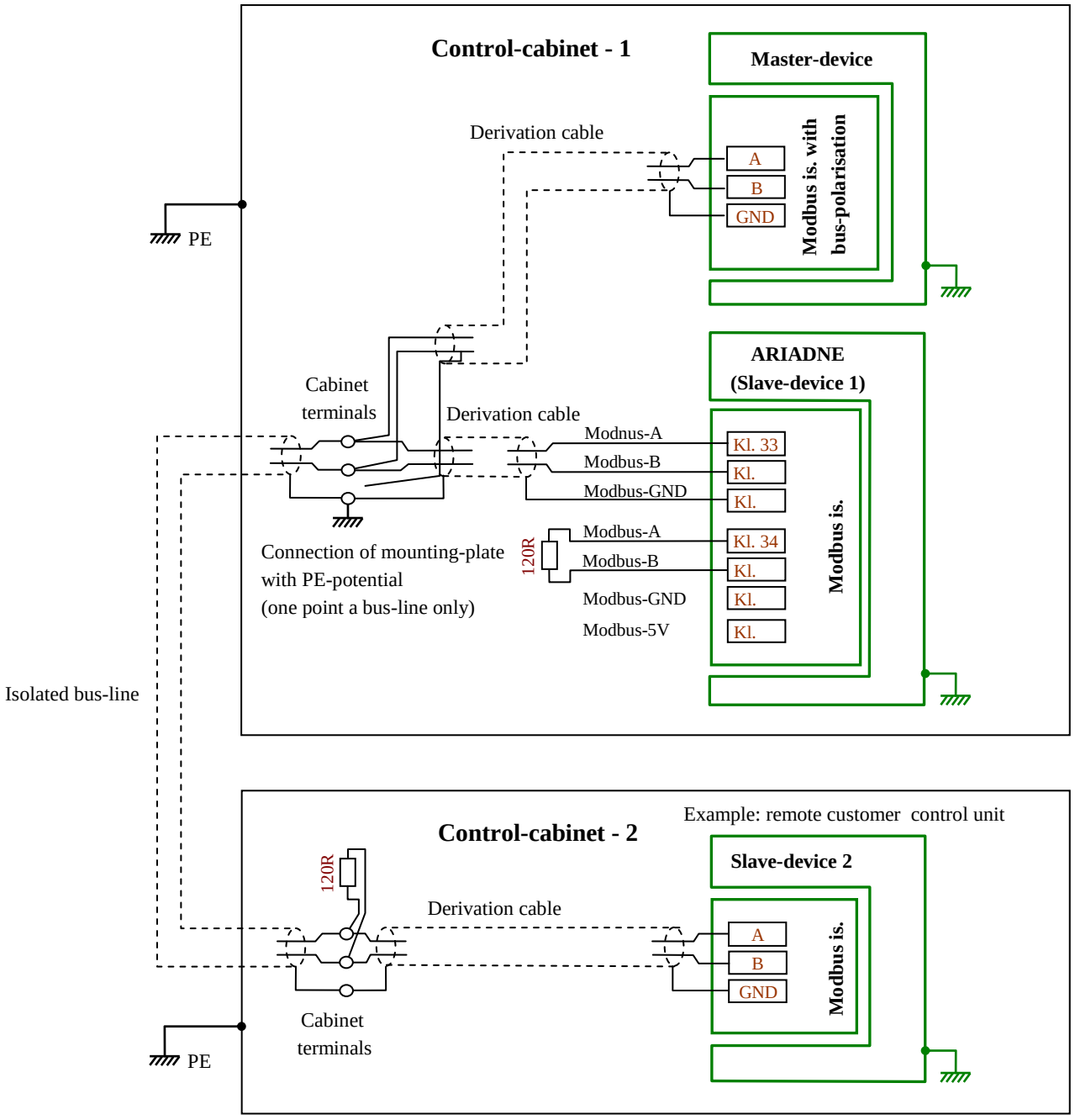


General requirements for establishing Modbus communication

Type of wire used	For bus line outside and inside of control cabinet: - Modbus-cable (shielded twisted pair, wave-impedance 150Ω). - Exception for short bus lines (up to 100m): some non standard Modbus-cable as shielded twisted pair with wave impedance 120Ω (see CAN-cable) is allowed to use. For derivation-cable between node and bus line (up to 20m): - shielded twisted pair
Electrical requirements for CAN bus (see picture next page)	1. Organisation of electrical bus line: The CAN-H, CAN-L and shield (CAN-GND) must be looped through from node to node. CAN bus line must be organised according to line-structure (node-1, node-2 … node-N).(see picture). 2. Termination of twisted pair in bus line: connect between CAN-H and CAN-L one resistor 120 Ω on the begin of bus line and one resistor 120 Ω on the end of bus line. 3. Conditions by each node (CAN-Port by ECU) on the bus line: - shield must be connected to terminal "CAN-GND", signal lines CAN-H and CAN-L to signal terminals (idenical designation). - By removing of one node-device the CAN-communication between other nodes must work without interrupt (requirements acc. ISO 11898-2:2003). - DC-decoupling between CAN-port (CAN-GND, -H, -L) and PE (frame) is required. 4. Type of bus line isolation and the application fields: In general there are two different types of bus lines. Isolated and non isolated. If one or more nodes on the line don't have galvanic isolation – this bus is called non isolated. In general: - use isolated bus line for communication with external customer modules. - for communication, localised internally in one control cabinet only, it is allowed to use a non isolated bus line. 5. Connection to PE by isolated bus line (see point-4): the shield of can-bus must be connected to PE (mounting plate) in one point only. 6. If required, use a CAN-repeater for isolation. Consider time delay for signal conversion by CAN-repeaters and limit the cable length or reduce the data transmission baud rate

For diagnosis of communication it is recommeded to inspect A- and B-L-signals refering to Modbus-GND with an oscilloscope.

Example of Modbus establishment



6.3.7 Ignition output for primary connection to ignition coils

Category	S4 – signal output
Designation	Communication cable harness for out for ignition rail up to 16 cylinders: For "+" ignition coil cylinder-1: Terminal 1 (Channel_1); For "+" ignition coil cylinder-2: Terminal 2 (Channel_2); For "+" ignition coil cylinder-3: Terminal 3 (Channel_3); For "+" ignition coil cylinder-4: Terminal 6 (Channel_4); For "+" ignition coil cylinder-5: Terminal 5 (Channel_5); For "+" ignition coil cylinder-6: Terminal 4 (Channel_6); For "+" ignition coil cylinder-7: Terminal 8 (Channel_7); For "+" ignition coil cylinder-8: Terminal 7 (Channel_8); For "+" ignition coil cylinder-9: Terminal 13 (Channel_9); For "+" ignition coil cylinder-10: Terminal 12 (Channel_10); For "+" ignition coil cylinder-11: Terminal 11 (Channel_11); For "+" ignition coil cylinder-12: Terminal 10 (Channel_12); For "+" ignition coil cylinder-13 Terminal 15 (Channel_13); For "+" ignition coil cylinder-14: Terminal 14 (Channel_14); For "+" ignition coil cylinder-15: Terminal 16 (Channel_15); For "+" ignition coil cylinder-16: Terminal 17 (Channel_16); *PHLOX II IC-08* *PHLOX II IC-12* *PHLOX II IC-16* For "-" ignition coils at cylinder-bank A (left), to connect to rail-constr. and engine ground: Terminals 23, 24, 25 (JL); For "-" ignition coils at cylinder-bank B (right), to connect to rail-constr. and engine ground: Terminal 9, 21, 22 (JR); For emergency shutdown input "Ignition Stop" (to switch "J" and "G"-wires by external relay-contact for stop of ignition): Terminal 20 (engine ground "J"), Terminal 20 (shutdown wire "G") Not used terminals: Terminal 17 (not connected).
Function of terminals	Terminals for output to ignition coils on the ignition rails to drive up to 16 cylinders by combustion engine. The function of diagnostics of sparking process by each cylinder and supervisoring of functionality are included: ● output connector (output cable harness) isn't connected → shutdown of ignition; ● opening of primary ignition circuit (failure of ECU, cable or coil); ● short circuit of primary ignition circuit (failure of ECU, cable or coil); ● opening of secondary ignition circuit (failure of coil, HV-wire, spark plug connector or spark plug); ● short circuit of secondary ignition circuit (failure of coil or spark plug); ● spark duration diagnostic: ► spark duration to long (failure of coil, HV-wire, spark plug connector or spark plug); ► spark duration to short (failure of coil, HV-wire, spark plug connector or spark plug); Additionally – one emergency shutdown input for activation by external relay-contact. Short circuit between wires "J" and "G" provide stop of ignition process (shutdown) and turn the ignition energy in store capacitor bank to zero. The time-out after shutdown before continue of ignition-process: 250ms.

Range	Ignition outputs refer to engine-ground: up to 280 V pick, up to 60 A pick.
Connected to	PHLOX, ignition rail A (left) and ignition rail B (right), optional wire-terminals in control cabinet or junction box.
Type of cord used	Wire 1.5 ... 2.5 mm^2, unshielded. See requirements for installation.
Total cable length	< 30 m
Note	Incorporated in the output cable harness for PHLOX II, cable to the control cabinet
Use by test	See test arrangement

6.3.8 Requirements for installation of HV-part of ignition system PHLOX II

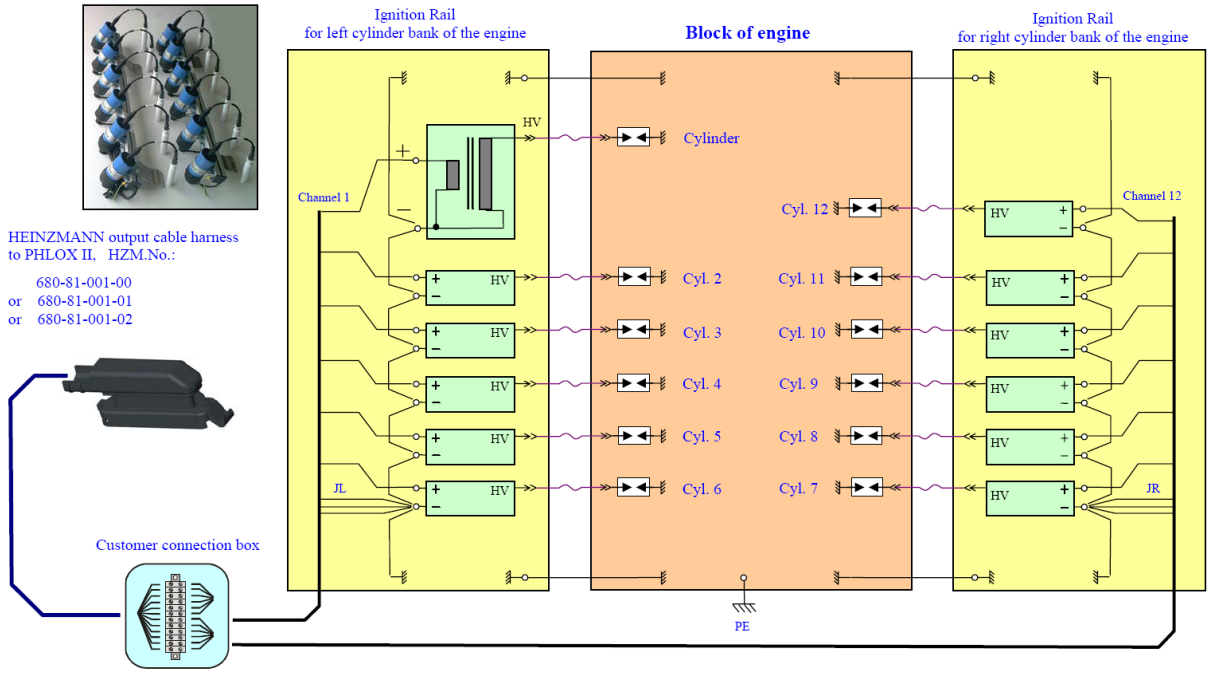
Grounding:

- The wires “JL” and “JR” must be connected to “-”-terminals of all ignition coils, Rail-construction and to engine-block;
- Engine-block must be connected to PE;
- Ignition sytem PHLOX II is designed for work with ignition coils, that have a common connection of primary- and secondary-winding at “-”-contact only.

Wire cross-sections:

Cable length	Minimal wire cross-section, minimum:	
	Wire section (+) for each channel 1 - 16	Wire section (Gnd) for the 6 common pins JL and JR group
Up to 5 m	1.5 mm²	2 × 1.5 mm² = 3 mm²
5 ... 10 m	2.5 mm²	3 × 1.5 mm² = 4.5 mm²
10 ... 20 m	4 mm²	3 × 2.5 mm² = 7.5 mm²
20 ... 30 m	2 × 2.5 mm² = 5 mm²	3 × 4 mm² = 12 mm²

Example of proper connection:



7 Sensor configuration

In all **HEINZMANN** control units there is a clear distinction between analogue or PWM inputs on the one hand and sensors on the other. This means that engine or application control is determined by the current values read by the sensors, but where those sensors take their values from is configured separately.

7.1 Sensor overview

Sensors are required to measure set values, pressures, etc., and to execute functions depending on these quantities. The following table provides an overview:

Parameter	Meaning	Usage
2900 *IgnitionTimingOffset*	Offset on the common base ignition timing	Ignition timing offset
2901 *Ignition Energy Offset*	Offset on the common ignition energy setpoint	Ignition energy setpoint offset
2912 ManifoldPressure	Manifold pressure	Calculation of the engine power based on the manifold pressure
2918 *MeasuredPower*	Measured power	Speed- and load-dependant ignition timing maps

Table 6: Sensors overview

7.2 Configuration of sensors

Sensors and setpoint adjusters supply an analogue signal (current or voltage) or a PWM signal. It is also possible to measure this signal somewhere else and have it transmitted to the control via CAN bus. The firmware determines which possibilities are available for selection. HZM-CAN customer module communication is integrated in the PHLOX II basis software. Other CAN protocols may only be implemented on request.

Selection and configuration of the sensors as analogue, PWM or "communication" sensors are carried out with the parameters starting from 4900 *ChanTyp...* where one of the following values must be entered, depending on the firmware variant used:

ChanTyp	Sensor source
0	analogue signal (current or voltage)
1	PWM signal
2	HZM-CAN periphery module
3	custom defined CAN protocol
4	CANopen protocol (CANopen slave)
5	DeviceNet-CAN protocol (slave)
6	Modbus protocol
7	SAE J1939-CAN-Protokoll
8	HZM-CAN customer module
9	HZM-CAN second control device of the same type (twin system)
10	WAGO module protocol (CANopen master)

Table 7: Sensors – Sources

Parameterising: example:

The signal for the ignition timing offset is received from an analogue potentiometer, and the ignition energy offset operates via a PWM signal. Manifold pressure is received from a HZM-CAN customer module via the HZM-CAN bus:

Number	Parameter	Value	Unit
4900	*ChanTypIgnTimOff*	*0*	
4901	*ChanTypIgnEgyOffs*	*1*	
4912	*ChanTypMnfldPress*	*8*	

7.3 Assigning inputs to sensors and setpoint adjusters

Assignment of inputs to sensors and setpoint adjusters is made by entering the desired channel number of the analogue or PWM input channels or the channel number of the communication module in the assigning parameters from 900 *AssignIn...* onwards. The channel numbers will run from 1 up to the maximum number, which depends on the type of control unit/communication module used.

Entering the number 0 in the assignment parameter signifies that the respective sensor has neither been connected nor activated. Consequently, the input will not be monitored. The assignment parameters of any sensors which are not required should therefore be set to 0. The sensor value during operation will then constantly be equal to the minimum value.

Double assignments will not be intercepted. But the HEINZMANN communications programme DcDesk 2000 reports such multiple configurations in its sensor window.

Parameterising Example:

The ignition timing offset adjuster (indication parameter 2900) is to be connected to the analogue input, the ignition energy offset adjuster (indication parameter 2901) to PWM input 1, and the manifold pressure sensor (indication parameter 2912) to HZM-CAN customer module input 3. For all other sensors which remain unused the value 0 is to be entered.

Number	Parameter	Value	Unit
900	*AssignIn_IgnTimOffs*	*1*	
901	*AssignIn_IgnEgyOffs*	*1*	
912	*AssignIn_MnfldPress*	*3*	
4900	*ChanTypIgnTimOffs*	*0*	
4901	*ChanTypIgnEgyOffs*	*1*	
4904	*ChanTypMnfldPress*	*8*	

7.4 Measuring ranges of sensors

In **HEINZMANN** controls, all sensor parameters and all relating values are provided with the maximum possible value range. For example manifold pressure covers a maximum range of 0 to 5 bar.
Since pressure sensors exist with different measuring ranges, the control unit must be informed of the particular value ranges which may differ from the maximum possible physical value range. These ranges are defined as the physical values corresponding to minimum and maximum input values such as 0.5 to 4.5 Volts or 4 to 20 mA for analogue inputs or 10 % and 90 % for PWM inputs.

Sensor	**Minimum measuring value**	**Maximum measuring value**
Ignition timing offset	950 *IgnTimOffsSensorLow*	951 *IgnTimOffsSensorHigh*
Ignition timing offset	952 *IgnEgyOffsSensorLow*	953 *IgnEgyOffsSensorHigh*
Manifold pressure	974 Mnfld*PressSensorLow*	975 *MnfldPressSensorHigh*

Table 8: Sensors – Measuring ranges

Parameterising Example:

A manifold pressure sensor with a measuring range from 0.5 to 3.5 bar is to be used.

Number	Parameter	Value	Unit
974	*MnfldPressSensorLow*	*0.5*	*bar*
975	*MnfldPressSensorHigh*	*3.5*	*bar*

7.5 Modifying reactions to sensor errors

The valid measuring ranges of setpoint adjusters and sensors are monitored. If they exceed these ranges in either direction, a sensor error is detected. If any error is detected, the appropriate response to this error can be modified by the correct configuration, which will allow adjustment of the control's behaviour to the specific application and mode of operation in case of failure.

Substitute values may be set for setpoint adjusters and sensors by means of the parameters 1000 *Subst…* This will permit the control to continue operation should the sensor in question fail. It is also possible to return to the last valid value before the error occurred rather than to maintain operation by resorting to a default value. The parameters 5000 *SubstOrLast...* are used to decide by which value the control is to continue operation in case the setpoint adjuster or the sensor is at fault. If the respective parameter is set to "1" the substitute value will be used as defined, if set to "0" the last valid value will be used. This method of error handling will in most cases be sufficient to sustain safe emergency operation of the installation.

The table below lists both the parameters where the substitute values are stored and the associated parameters for selecting operation by default value or by the last valid value.

Substitute value	**Selection of substitute value**	**Substitute value for**
1000 *SubstIgnTimOffs*	5000 *SubstOrLastIgnTimOff*	Ignition timing offset
1001 *SubstIgnEgyOffs*	5001 *SubstOrLastIgnEgyOff*	Ignition energy offset
1012 *SubstMnfldPressure*	5012 *SubstOrLastMnfldPres*	Manifold pressure
1018 *SubstMeasPower*	5018 *SubstOrLastMeasPower*	Measured power

Table 9: Sensor default values in case of error

With setpoint and sensor inputs, the parameters 5040 *HoldOrReset…* offer the option to decide how the control is to react if an error clears itself (e.g., loose contact in wiring). If the respective parameter is set to "1" the error will be regarded to be latching. Therefore, the control unit will not react if the sensor measurement falls back within the valid range.

If the parameter is set to "0" the error will be reset and operation continues using the signal coming from the sensor.

Parameter	Reaction to error at
5040 *HoldOrResetIgnTimOff*	Ignition timing offset
5041 *HoldOrResetIgnEgyOff*	Ignition energy offset
5052 *HoldOrResetMnfldPres*	Manifold pressure
5058 *HoldOrResetMeasPower*	Measured power

Table 10: Sensor error, latching

8 Switching functions

In **HEINZMANN** control units a strict distinction is made between external switches and internal switching functions. This means that engine or application control is determined by the current values read by switching functions but these values come from is configured separately.

Normally, they will be influenced by digital inputs, but in specific applications their values may be assigned by serial or CAN protocols. For this reason the switching functions need to be configured and the sources they are receiving their actual states from specified.

For each switching function there are up to four parameters which define the external source and the current value. The last three digits of the four parameter numbers are identical for any one specific switching function.

Parameter	Meaning
810 *Funct...*	Assigning a digital input number (own hardware or HZM-CAN periphery module)
2810 *Switch...*	Indication of current value of switching function
20810 *Comm...*	Assigning an input number of a communication module
24810 *ChanTyp...*	Assigning a channel type of the external source

Table 11: Switching functions parameters

If the firmware currently used does not use a communications module or only the HZM-CAN periphery module is used, the parameters starting from 20810 Comm... and 24810 ChanTyp... will not be available.

8.1 Complete overview of all switching functions

Switching functions may be defined as on-off switches or as selector switches. The name of a switching function will indicates its meaning. The name of a selector switch always includes the operator *Or*, where the expression preceding *Or* will be valid when the value of the switching function is 1 and where the expression following *Or* will be valid when the switching function has a value of 0. With on-off switches the name is equivalent to the label *On*. State “1” will always define *On* and state “0” *Off*.

For each of the switching functions there is a parameter to indicate whether the function is active.

A complete overview of all existing switching functions is given in the following ↑Table 12: Switching functions. For an explanation of each individual function and switch priority, please refer to the respective chapters.

Switching function	Meaning
2810 *SwitchIgnitionStop*	1 = Ignition stop
2811 *SwitchIgnTimOffsInc*	0→1 = Ignition Timing Offset Increase (at edge change) (if Par. 5917 = 1 and Par. 5918 = 1)
2812 *SwitchIgnTimOffsDec*	0→1 = Ignition Timing Offset Decrease (at edge change) (if Par. 5917 = 1 and Par. 5918 = 1)
2813 *SwitchIgnEgyOffsInc*	0→1 = Ignition Energy Offset Increase (at edge change) (if Par. 5947 = 1 and Par. 5948 = 1)
2814 *SwitchIgnEgyOffsDec*	0→1 = Ignition Energy Offset Decrease (at edge change) (if Par. 5947 = 1 and Par. 5948 = 1)
2828 *SwitchErrorReset*	0→1 = current errors are cleared (at edge change)
2848 *SwitchIgnTimMap2Or1*	0 = Ignition Timing Map 1 active (if Par. 5910 = 1) 1 = Ignition Timing Map 2 active (if Par. 5910 = 1)

Table 12: Switching functions

8.1.1 Ignition stop

For ignition stops, 4810 *StopImpulseOrSwitch* it can be determined whether the ignition stop is to remain active as long as the request itself also remains active, or whether a single switching pulse shall be sufficient to activate the ignition stop. In the latter case, the ignition stop request will only end when the engine has completely stopped, i.e. when speed 0 is recognized.

4810 *StopImpulseOrSwitch* = 0	ignition stop is active only as long as the stop command is coming in
4810 *StopImpulseOrSwitch* = 1	ignition stop is activated by a single switching pulse until the engine stops

8.2 Assignment of digital inputs

A digital input can be assigned to a switching function by entering the number of the digital input in the assignment parameter of the respective function, starting from 810 *Funct...*

The number of digital inputs always runs from 1 to the maximum number for that particular control device.

These assignment parameters are parallel to the indication parameters for switching functions that start from 2810 *Switch....*

Assignment of the value 0 means that the switching function in question has not been allocated to a digital input. Such a switching function will always have the value 0, except when it is received via a communications module.

The pin state, which activates the switching function, must be configured. There are 2 cases depending if a normal digital input or a tristate switch is used.

- Normal digital input

A normal digital input is configured by setting Par. 4802 / 4806 to 0. The digital inputs can be configured as high-active, i.e., active when the voltage at the corresponding pin is higher than 7V, or low-active, i.e., active when the voltage at the corresponding pin is lower than 6V. High-active inputs are designated by positive digital input numbers in the assignment parameters, low-active ones with negative digital input numbers.

- Tristate switch

A tristate switch is configured by setting Par. 4802 / 4806 to 1. Tristate switches have 3 different states (high, low and hi-z) thus a switching function can be activated at 6 different pin-states (high, low, high-z, not high, not low, not high-z). The pin-state considered for a particular switching function is configured by setting the corresponding pin-level parameter (Par. 5810 and following):

> 1 for high

> -1 for low

> 0 for high-z

> The assignment parameter itself indicates only which channel is to be used for the switching function. If, in addition the pin-state has to be negated to activate the switching function, the channel number shall also be negated.

One single switch may simultaneously activate or be changed over several functions. In this case, the functions involved will have to be assigned the same input number, possibly with the activity inverted (negative sign).

If a switching function is required that is permanently active (e.g. when the engine is running exclusively with Ignition Timing Map 2 which means 2848 SwitchIgnTimMap2Or1 *1*), any unused (disconnected) digital input may be utilised to activate this function by assigning the negative number of the digital input to the switching function.

Switching pulses must have a duration of at least 20 ms in order that the control electronics recognise them. Any switching function will remain active only as long as the switch input is active (with the exception of ↑ 8.1.1 Ignition stop).

Parameterising Example:

By closing the switch of input no. 1 you will stop the ignition. For the ignition timing offset, you should use a tristate switch on the input no. 2. When the switch is high the ignition timing offset increases. When the switch is low the ignition timing offset decreases. Hi-z state does not modify the ignition timing offset.

Number	Parameter	Value	Unit
810	*FunctIgnitionStop*	*1*	
811	*FunctIgnTimOffsInc*	*2*	
812	*FunctIgnTimOffsDec*	*2*	
4802	*DigCh1TriStatOrDigIn*	*0*	
4806	*DigCh2TriStatOrDigIn*	*1*	
5811	*IgnTimOffsIncLevel*	*1*	
5812	*IgnTimOffsDecLevel*	*-1*	

Indication:		Switch open	Switch closed
2810	*SwitchIgnTimOffsInc*	*0*	*1*

Indication:		Switch high	Switch low	Switch hi-z
2811	*SwitchIgnTimOffsInc*	*1*	*0*	*0*
2812	*SwitchIgnTimOffsDec*	*0*	*1*	*0*

8.2.1 HZM-CAN periphery module

The digital inputs of periphery modules connected with HZM-CAN protocol are considered extensions of the digital inputs to its own hardware. The digital inputs of the periphery module are therefore added to the digital inputs already available.

If the system includes several periphery modules the number of digital inputs increases by the same number as the number of digital inputs on all periphery modules, while the node types of the periphery modules are as set in parameters starting with 407 *CanPENodeType* determine the sequence. The maximum number is limited to 32.

If, for instance

404 *CanPENodeNumber*(0) = 1

405 *CanPENodeNumber*(1) = 2

406 *CanPENodeNumber*(2) = 0

407 *CanPENodeType*(0) = 1 type 1 (DC 6-07 with max. 5 digital inputs)

408 *CanPENodeType*(1) = 0 type 0 (PE 2-01 with max. 8 digital inputs)

two periphery modules are connected to a control unit of the type PHLOX II, the resulting number of available digital inputs is 15: numbers from 1 to 2 in its own hardware, with numbers 3 to 7 in the DC 6-07 periphery module and numbers and 8 to 15 in the PE 2-01. In this case it does not matter whether all possible ports of the periphery modules have actually been configured as digital inputs, the maximum number is always used.

8.3 Assignment of communication modules

A switching function may also receive its current value from a communication module, e.g., a CAN protocol such as DeviceNet or a serial protocol like Modbus.

The type of the communication module is indicated for each switching function in 24810 *ChanTyp...* These assignment parameters are parallel to the indication parameters for switching functions that start from 2810 *Switch....*

ChanTyp	Switching function source
0	no receipt from communications module
3	custom defined CAN protocol
4	CANopen protocol
5	DeviceNet CAN protocol
6	Modbus serial protocol
7	SAE J1939 CAN protocol
8	HZM-CAN Customer Module
9	HZM-CAN second control device of the same type (twin system)
10	WAGO module protocol (CANopen)

Table 13: Switching functions – Sources

Which switching functions are addressed by which bit of the communications telegram is determined by the manufacturer of the sending module and must be agreed with the manufacturer. The switching functions received from the communications module are then numbered from 1 onwards and the respective number is entered in the assignment parameters starting from 20810 *Comm...* These assignment parameters are parallel to the indication parameters for switching functions that start from 2810 *Switch....*

Assignment of a value of 0 to 20810 *Comm...* means that the respective switching function is not addressed by a communications module (but possibly by a digital input, see ↑*8.2* Assignment of digital inputs). For communication purposes, such a switching function always has a value of 0.

For safety reasons, a function must be activated deliberately via a communications module. For this reason, the switching functions addressed by communications modules can be only high-active, i.e. become active on receipt of a "1", as opposed to digital inputs (↑*8.2* Assignment of digital inputs). When the connection to the communication module is interrupted, the switching function automatically adopts a value of 0.

8.4 Value of a switching function

With on-off switches the name is equivalent to the label *On*. State “1” of the switching function will always define *On* and state “0” *Off*. The identifiers of change-over switches

or of parameters selecting between two functions always include the operator “Or”, where the expression preceding “Or” will is valid when the value of the switching function is “1” and where the expression following “Or” will be valid when the switching function has the value “0”.

If no communication module is enabled in the current firmware, the value of the switching function is determined exclusively by digital input. The parameters starting from 20810 *Comm...* and 24810 *ChanTyp...* do not exist.

If, on the other hand, a communication module must be taken into account, then each switching function can be addressed either by a digital input or by the communications module, or even by both.

1. Digital input only
   Parameter 20810 *Comm...* must be set to 0.
   When 810 *Funct...* = 0, then the switching function always has the value 0, otherwise it has the current value of the digital input (possibly with inverted activity).

2. Communication module only
   Parameter 810 *Funct...* must be set to 0 and 24810 *ChanTyp...* >= 3.
   If 20810 *Comm...* = 0, then the switching function always has the value 0, otherwise it has the current value of the received message. If the connection to the communication module is interrupted, the switching function automatically adopts the value 0.

3. Both digital input and communication module
   Parameter 810 *Funct...* is not equal 0, 20810 *Comm...* > 0 and 24810 *ChanTyp...* >= 3.
   The current value from the digital input (possibly inverted) and from the communications module are linked by OR. The switching function will therefore be = 0 only if both sources send the value 0; it will be = 1 if at least one source sends the value 1. When the connection to the communication module is interrupted, the switching function automatically adopts the value 0 for this transmission path. In this case, the digital input alone decides on the overall value.

For safety reasons HEINZMANN recommends connecting the ignition stop directly at all times, regardless of a possible additional transmission via a communication module. On the other hand, HEINZMANN advises that you never connect change-over switches that select between two functions (with “Or” in their identifier) with two signal paths.

9 Inputs and outputs

9.1 Selectable inputs/outputs

The PHLOX II control unit is equipped with 2 pick-up inputs, 1 analogue input and 2 selectable digital ports. These can function as input or output, digital or PWM.

Connection name	Terminal	Configuration parameters	Configuration
P1	16	4798 *DigChannel1_CamIxOut*	0 = Normal dig / PWM In/Out 1 = Cam index digital output
		4800 *DigChannel1OutOrIn*	If not Cam Ix Out (Par. 4798 = 0) 0 = Input 1 1 = Output 1
		4801 *DigChannel1PWMOrDIO*	0 = Digital input / output 1 = PWM input / output
		4802 *DigCh1TriStatOrDigIn*	If digital input (Par. 4798 = 0, Par. 4800 = 0, Par. 4801 = 0) 0 = Normal digital input 1 = Tristate switch
		4803 *DigIn1HighOrLowSide*	If digital / PWM input (Par. 4798 = 0, Par. 4800 = 0, Par. 4801 =1 or Par. 4802 = 0) 0 = Low side input (Pull-up activated) 1 = High side input (Pull-down activated)
P2	3	4799 *DigChannel2_CamIxOut*	0 = Normal dig / PWM In/Out 1 = Cam index digital output
		4804 *DigChannel2OutOrIn*	If not Cam Ix Out (Par. 4799 = 0) 0 = Input 2 1 = Output 2
		4805 *DigChannel2PWMOrDIO*	0 = Digital input / output 1 = PWM input / output

Connection name	Terminal	Configuration parameters	Configuration
		4806 *DigCh2TriStatOrDigIn*	If digital input (Par. 4799 = 0, Par. 4804 = 0, Par. 4805 = 0) 0 = Normal digital input 1 = Tristate switch
		4807 *DigIn2HighOrLowSide*	If digital / PWM input (Par. 4799 = 0, Par. 4804 = 0, Par. 4805 =1 or Par. 4806 = 0) 0 = Low side input (Pull-up activated) 1 = High side input (Pull-down activated)

Table 14: PHLOX II: selectable inputs / outputs

Parameterising Example:

Port 1 is used as cam index output (for example to transmit the pick-up signal to the Ariadne control unit). Port 2 is used as PWM input 2. The signal received is a high-side signal.

Number	Parameter	Value	Unit
4798	*DigChannel1_CamIxOut*	*1*	
4799	*DigChannel2_CamIxOut*	*0*	
4804	*DigChannel2OutOrIn*	*0*	
4805	*DigChannel2PWMOrDIO*	*1*	
4806	*DigCh2TriStatOrDigIn*	*0*	
4807	*DigIn2HighOrLowSide*	*1*	

9.2 Pick-up inputs

Depending on the firmware used, the PHLOX II control unit can make use of 1 or 2 pick-up inputs.

- Firmware with support for 2 pick-ups

Connection name	Terminal	Configuration parameters	Configuration
Speed	23	4002 *PickUpOn*	0 = pick-up deactivated 1 = pick-up activated
		4020 *PickUpInductivOrHall*	0 = Hall pick-up 1 = inductive pick-up
		4021 *MeasWheelBoreOrTeeth*	Indicates if the measuring wheel consists of holes or teeth 0 = Teeth 1 = Holes
		4022 *HallPUSupply5Vor12V*	Only Hall pick-ups (Par. 4020 = 0): selects the pick-up power supply on pin 11 0 = 12V 1 = 5V
		4023 *HallPUPolInvOrHzm*	Only Hall pick-ups (Par. 4020 = 0): indicates whether the pick-up polarity is similar to Heinzmann pick-ups or inverted 0 = Hzm standard (low over tooth) 1 = Inverted (low over gap)
		4024 *HallPUTrigInvOrHzm*	Only Hall pick-ups (Par. 4020 = 0): selects trigger flank used either as Heinzmann standard or inverse 0 = Hzm standard (the flank used is the one at the begin of tooth / hole) 1 = Inverse (the flank used is the one at the end of tooth / hole)
Index	25	4005 *CamIndexOn*	0 = pick-up deactivated 1 = pick-up activated
		4025 *CamIxInductivOrHall*	0 = Hall pick-up 1 = inductive pick-up
		4026 *CamIndexBoreOrTeeth*	Indicates if the cam index is a hole or a tooth 0 = Tooth 1 = Hole

Connection name	Terminal	Configuration parameters	Configuration
		4027 *HallCamSupply5Vor12V*	Only Hall pick-ups (Par. 4025 = 0): selects the pick-up power supply on pin 13 0 = 12V 1 = 5V
		4028 *HallCamPolInvOrHzm*	Only Hall pick-ups (Par. 4025 = 0): indicates whether the pick-up polarity is similar to Heinzmann pick-ups or inverted 0 = Hzm standard (low over tooth) 1 = Inverted (low over gap)
		4029 *HallCamTrigInvOrHzm*	Only Hall pick-ups (Par. 4025 = 0): selects trigger flank used either as Heinzmann standard or inverse 0 = Hzm standard (the flank used is the one at the begin of tooth / hole) 1 = Inverse (the flank used is the one at the end of tooth / hole)

Table 15: PHLOX II: pick-up inputs

- Firmware with support for only 1 pick-up (camshaft trigger disk)

Connection name	Terminal	Configuration parameters	Configuration
Index	25	4025 *PickUpInductivOrHall*	0 = Hall pick-up 1 = inductive pick-up
		4026 *TrigDiskBoreOrTeeth*	Indicates if the trigger disk consists of holes or teeth 0 = Teeth 1 = Holes
		4027 *HallPUSupply5Vor12V*	Selects the pick-up power supply on pin 13 0 = 12V 1 = 5V
		4028 *HallPUPolInvOrHzm*	Indicates whether the pick-up polarity is similar to Heinzmann pick-ups or inverted 0 = Hzm standard (low over tooth) 1 = Inverted (low over gap)
		4029 *HallPUTrigInvOrHzm*	Selects trigger flank used either as Heinzmann standard or inverse 0 = Hzm standard (the flank used is the one at the begin of tooth / hole) 1 = Inverse (the flank used is the one at the end of tooth / hole)

9.3 Analogue input

PHLOX II is equipped with 1 analogue input which can be configured for current or voltage

Connection name	Terminal	Configuration parameters	Configuration
AI	17	5510 *AIWithSensorSupply*	0 = deactivates control of sensor supply 1 = activates control of sensor supply
		5511 *AISupply24VOr5V*	Selects sensor supply used (pin 4) 0 = 5V 1 = 24V
		5512 *AIVoltOrCurrent*	Selects sensor type (voltage or current) 0 = Current (0 ... 25 mA) 1 = Voltage (0 ... 5 V)

9.4 PWM inputs

The PHLOX II control unit is equipped with two inputs that may be configured as PWM inputs, ↑*9.1* Selectable inputs/outputs.

Input	Designation	Terminal	Maximum frequency
PWM input 1*	P1	16	500 Hz
PWM input 2*	P2	3	500 Hz

Table 16: PHLOX II: PWM inputs

* Configurable as digital input/output or PWM input/output

9.5 Digital inputs

The PHLOX II control unit feature a maximum of two digital inputs, ↑*9.1* Selectable inputs/outputs.

Input	Designation	Terminal
Digital input 1*	P1	16
Digital input 2*	P2	3

Table 17: PHLOX II: Digital inputs

* Configurable as digital input/output or PWM input/output

9.6 PWM outputs

The PHLOX II control unit is equipped with two ports that may be configured as PWM outputs, ↑*9.1* Selectable inputs/outputs.

Input	Designation	Terminal	Frequency range	Type	Power (max.)
PWM output 1*	P1	16	50…500 Hz	low side	1 A
PWM output 2*	P2	3	50…500 Hz	low side	1 A

Table 18: PHLOX II: PWM outputs

* Configurable as digital input/output or PWM input/output

9.7 Digital outputs

The PHLOX II control unit feature a maximum of two digital outputs. The required parameter settings for the assignment are described in chapter ↑ *9.1* Selectable inputs/outputs.

Input	Designation	Terminal	Type	Power (max.)
Digital output 1*	P1	16	low side	1 A
Digital output 2*	P2	3	low side	1 A

Table 19: PHLOX II: Digital outputs

* Configurable as digital input/output or PWM input/output

10 Configuring the control's inputs and outputs

10.1 Digital inputs

Configuring of digital inputs is described in detail in chapter ↑*8* Switching functions.

10.2 Analogue inputs

10.2.1 Calibration of current/voltage inputs

Sensors convert physical quantities (e.g. pressure) to electric quantities (voltage, current). The PHLOX II control unit measures voltage/current and indicates them directly in V or mA. To enable the control to operate with the physical value transmitted by the sensor, it is necessary that the control be provided with two reference values informing it about the relation between the electrically measured values and the actual physical quantities. The two reference values are the sensor output values associated with the minimum and maximum measuring values as described in ↑*7.4* Measuring ranges of sensors. With this information, the control is capable of normalising the measured values and of displaying them specified in percent age terms of the sensor range or directly in terms of their physical values.

The PHLOX II voltage/current input is associated with a low reference value (parameter 1510 *AnalogIn1_RefLow*) and a high reference value (parameters 1511 *AnalogIn1_RefHigh*). If the sensor signal is inverted the low reference value absolutely may be higher than the high reference value.

Parameterising example:

A manifold pressure sensor has been connected to the analogue input. Its measuring range should be from 0.5 bar to 3.5 bar and is to be converted into a voltage ranging from 0.5 V to 4.5 V. The parameter 3510 *AnalogIn1* displays the voltage as measured and the parameter 2912 *ManifoldPressure* will read the converted measuring value by bar.

Number	Parameter	Value	Unit
912	*AssignIn_MnfldPress*	*1*	
974	*MnfldPressSensorLow*	*0.5*	*bar*
975	*MnfldPressSensorHigh*	*3.5*	*bar*
1510	*AnalogIn1_RefLow*	*0.5*	*V*
1511	*AnalogIn1_RefHigh*	*4.5*	*V*
4912	*ChanType_MnfldPress*	*0*	
5512	*AIVoltOrCurrent*	*1*	

10.2.2 Filtering of analogue inputs

The measured value of the analogue input can be filtered through a digital filter. The respective parameter is stored at number 1514 *AnalogIn1_Filter*.

In this parameter the time constant is entered in seconds. A value of 0.00 s corresponds to no filtering. For normally fast sensor changes, a filter value 0.10 s will be appropriate. For measuring quantities that change more slowly, such as temperatures, a filter value of about 1.00 s may be used. The filtering time constant should correspond approximately to the sensor's time constant.

Parameterising Example:

Number	Parameter	Value	Unit
1514	*AnalogIn1_Filter*	*0,10*	*s*

10.2.3 Error detection in analogue inputs

If a sensor fails (e.g., due to a short circuit or cable break), the control will read all voltages or currents lying outside the normal measuring range. These irregular measuring values can be used to define inadmissible operating ranges via which the control can recognize that the sensor is faulty.

For the analogue input, the error limits are entered in the relevant electric unit

The parameter 1512 *AnalogIn1_ErrorLow* defines the lower error limit.

The parameter 1513 *AnalogIn1_ErrorHigh* defines the upper error limit.

Parameterising Example:

The manifold pressure sensor connected to the analogue input and operating within a normal voltage range of 0.5 V to 4.5 V is assumed to supply a voltage of 5 V in case of cable break and a voltage of 0 V in case of a short circuit. The ranges below 0.3 V and above 4.7 V are defined as inadmissible by the following parameters:

Number	Parameter	Value	Unit
912	*AssignIn_MnfldPress*	*1*	
1510	*AnalogIn1_RefLow*	*0.50*	*V*
1511	*AnalogIn1_RefHigh*	*4.50*	*V*
1512	*AnalogIn1_ErrorLow*	*0.30*	*V*
1513	*AnalogIn1_ErrorHigh*	*4.70*	*V*

These error limits chosen should not be too close to the minimum and maximum values, in order to prevent natural fluctuations of the values measured by the sensors from being mistaken as errors. On the other hand, it must be ensured that short circuits or cable breaks are unambiguously recognized as such.

PHLOX II offers the possibility to supply the connected sensors and setpoint adjusters with a 5Vor a 24V voltage from the control unit. This must be communicated to the control with parameter

5510 *AIWithSensorSupply* = 1 sensor is powered with 5V / 24V by the control

5511 *AISupply24VOr5V* = 0/1 sensor is powered with 5V (0) or 24V (1)

When a sensor is connected to such a reference, the relevant reference voltage is monitored. The supplied voltage is measured back and displayed in parameter 3512 *SensorSupplyAI1*

Once an error is detected, the error parameter associated with the analogue input and with the relevant sensor is set. To learn more about what action to take in the event that any such error occurs, please refer to the chapter. If an analogue input is not used due to not being assigned to a sensor it will not be monitored for errors.

The following table provides an overview of possible errors:

Error	Meaning
0	**Signal short circuit to earth** - The measuring value of the relevant input value is below the lower error threshold. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor. • Check parameters for error thresholds.
1	**Signal short circuit to supply voltage** - The measuring value of the relevant input value is below the upper error threshold. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor. • Check parameters of error thresholds.
2	**Sensor supply voltage, cable break or short circuit to earth** - The measured value of the relevant reference voltage is below 4V (5V supply) or 20V (24V supply). - Monitoring active only if sensor referencing is active. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor.
3	**Sensor supply voltage, short circuit to supply voltage** - The measured value of the relevant reference voltage is greater than 6V

Error	Meaning
	(5V supply) or 26V (24V supply). - Monitoring active only if sensor referencing is active. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor.

Table 20: Error detection for analogue inputs

10.2.4 Overview of the parameters associated with the analogue input

For the analogue input the following parameters are provided:

Parameter	Meaning
1510 *AnalogIn1_RefLow*	lower reference value
1511 *AnalogIn1_RefHigh*	upper reference value
1512 *AnalogIn1_ErrorLow*	lower error limit
1513 *AnalogIn1_ErrorHigh*	upper error limit
1514 *AnalogIn1_Filter*	filtering constant
3510 *AnalogIn1*	current measuring value in %
3511 *AnalogIn1_Value*	current measuring value in electric unit
3512 *SensorSupplyAI1*	current measuring value of the sensor supply in electric unit

Table 21: Parameters for analogue inputs

10.3 PWM inputs

Transmission of the PWM signal typically uses a range from 5 % to 95 % PWM. To standardise the measuring range, the lower reference values must be entered in parameters 1500 / 1502 *PWMInx_RefLow* and the upper reference values in parameters 1501 / 1503 *PWMInx_RefHigh*. If the sensor signal is inverted the low reference value absolutely may be higher than the high reference value.

The measuring parameters 3500 / 3502 *PWMInx* will indicate the PWM ratio, and the measuring parameters starting from 3501 / 3503 *FrequencyInx* the PWM frequency.

Selection as a PWM sensor is to be made as described in chapter ↑*7.2* Configuration of sensors. Assignment to the sensors is to be conducted as explained in chapter ↑*7.3* Assigning inputs to sensors and setpoint adjusters.

Parameterising Example:

The ignition timing offset is to set speed by means of a PWM ratio of between 5% and 95%.

Number	Parameter	Value	Unit
900	*AssignIn_IgnTimOffs*	*1*	
1500	*PWMIn1_RefLow*	*5*	*%*
1501	*PWMIn1_RefHigh*	*95*	*%*
4900	*ChanTypIgnTimOffs*	*1*	

10.3.1 Error detection at PWM inputs

The following failure causes will be detected at the PWM input and indicated as errors of the assigned sensor:

- PWM signal is missing
- Frequency exceeds the maximum admissible frequency by 25% (500 Hz). In this case, the PWM input is switched off in order to minimize interrupt stress for the control.
- The PWM ratio lies outside the error limits that are equivalent to half the lower reference parameter (1500 / 1502 *PWMInx_RefLow)* and the average between the higher reference parameter (1501 / 1503 *PWMInx_RefHigh)* and 100%.

10.4 PWM outputs

The PHLOX II control unit features two PWM outputs that may be used to output different types of values. The characteristics of the PWM outputs and the admissible frequency range are described in chapter ↑*9.6* PWM outputs. As an example of parameter setting of a PWM output here output 1 is used: Parameterising of the other outputs follows the same procedure.

*The **HEINZMANN** PC programme DcDesk 2000 provides an easy and convenient utility to parameterise PWM outputs. All parameters required for configuration are displayed together is a dedicated window.*

10.4.1 PWM output frequency

PWM outputs can have different frequencies (refer to chapter ↑*9.6* PWM outputs). The frequency used on a particular PWM output is configurable using certain parameters:

1651 *PWMOut1_Frequency* output frequency for PWM output 1

1652 *PWMOut2_Frequency* output frequency for PWM output 2

10.4.2 Assignment of output parameters to PWM outputs

Every parameter of the control unit can be read out via PWM outputs. To this end, all that is necessary is to assign its parameter number to the desired output in 1600 / 1605 *PWMOutx_Assign.* This makes sense only for measurement or indication values with a value range greater than [0,1], but in the control itself no limitations are implemented.

Signal output can be inverted (e.g., small PWM ratio for high output values) by entering the parameter numbers negative in sign. The effect of the parameter number being entered with a negative sign will be that there is a long high-phase for small output values and a short high-phase for large ones.

Parameterising Example:

PWM output 1 is to be used to read out speed (indication parameter 2000 *Speed*), and output 2 to read out the active ignition timing (indication parameter 3910 *ActiveIgnitionTiming*).

Number	Parameter	Value	Unit
1600	*PWMOut1_Assign*	*2000*	
1605	*PWMOut2_Assign*	*3910*	

10.4.3 Value Range of output parameters

When values are to be read out, it will sometimes not be the entire range that is of interest but only a restricted one. Therefore, output via the PWM output can be adapted to the desired range by means of the 1603 / 1608 *PWMOutx_ValueMin* and 1604 / 1609 *PWMOutx_ValueMax*. As there are a great many different value ranges, these parameters are to be set to the required low and high output values specified in per cent of the value range of the respective output parameter.

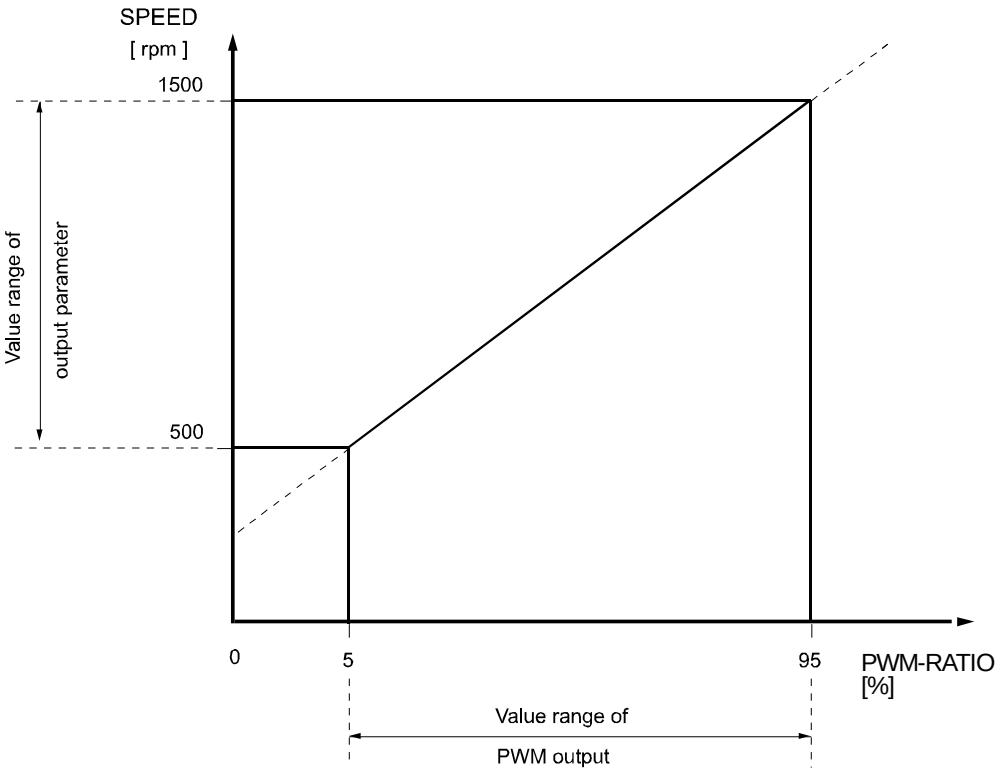


Figure 10: Reading out a parameter via a PWM output

If the entire value range is required, the minimum value should be set to 0 % and the maximum value to 100 %.

*The **HEINZMANN** PC programme DcDesk 2000 features a special window for PWM outputs, where the value ranges of the output parameters are listed with their physical values and the respective percentage values are calculated.*

Parameterising Example:

Actual speed 2000 *Speed* is to be read out via a PWM output but the range is to be restricted to 500 rpm - 1500 rpm, i.e., 500 rpm will correspond to 5 % and 1500 rpm to 95 %. As the values of this parameter have a range from 0 to 4000 rpm, the output will have to be adapted:

$$PWMOut1\_ValueMin = \frac{500}{4000} * 100\% = 12.5\%$$

$$PWMOut1\_ValueMax = \frac{1500}{4000} * 100\% = 37.5\%$$

Number	Parameter	Value	Unit
1600	*PWMOut1_Assign*	*2000*	
1603	*PWMOut1_ValueMin*	*12.5*	*%*
1604	*PWMOut1_ValueMax*	*37.5*	*%*

10.4.4 Value range of PWM outputs

Normally, only a PWM ratio between 5 % and 95 % is required.

To adapt the output range of the PWM output the parameters 1601 / 1606 *PWMOutx_RefLow* and 1602 / 1607 *PWMOutx_RefHigh* are to be used. The limit values may be specified directly in per cent PWM ratio.

Parameterising Example:

Actual speed 2000 *Speed* is to be read out via the PWM output 1 by a pulse-pause ratio of 5 % ... 95 %. The range is to be restricted to 500 rpm - 1500 rpm, i.e., 500 rpm will correspond to 5 % and 1500 rpm to 95 % PWM ratio.

Number	Parameter	Value	Unit
1600	*PWMOut1_Assign*	*2000*	
1601	*PWMOut1_RefLow*	*5*	*%*
1602	*PWMOut1_RefHigh*	*95*	*%*
1603	*PWMOut1_ValueMin*	*12.5*	*%*
1604	*PWMOut1_ValueMax*	*37.5*	*%*

10.4.5 Error monitoring of PWM outputs

PWM outputs are monitored during cable breaks, short circuits and overcurrents. Monitoring and parameterising of PWM outputs is heavily dependent on the electric characteristics of the connected load.

Monitoring of cable break, short circuit and overcurrent is activated with the parameters

51x0 *DOPWMx_SupviseOn* activates monitoring of output x

The error message may be delayed by means of the parameter

111x0 *DOPWMx_DelayTime* delay time until error message

This means that the error state must remain active for at least the time set in this parameter before an error message is generated.

Monitoring is possible only when both the high-phase and the low-phase of the PWM signal are greater than 137.5 µs. Delay time must be adjusted to

output frequency since at 50 Hz a period is 20 ms long and the delay time therefore must in any case be longer than this value.

The following table provides an overview of possible errors:

Error	Meaning
0	**Signal short circuit to earth** - Governor has detected a short circuit to earth. → only error message • Check wiring and connected loads.
1	**Short circuit to supply voltage** - Governor has detected a short circuit to supply voltage. → only error message • Check wiring and connected loads.

Table 22: Possible errors for PWM outputs

The parameter

51x1 *DOPWMx_HoldOrReset* hold or reset error message

allows the user to configure whether the error message is to be reset when the error state is no longer present. This applies comprehensively to all error messages during this output.

10.5 Digital outputs

A digital output may be assigned to each measurement or indication value with value range [0,1] in parameter list 2. In addition, for the output of error parameters it is possible to read out single errors of an error state. To achieve this, single bits of an error state are selected by means of a mask parameter to determine the specific errors. If more than one error bit is selected, the output becomes active as soon as at least one error bit is set.

Several values may be assigned to each digital output (so called multiple allocation).

The values currently output are displayed by parameter 2851 *DigitalOut1* and subsequent parameters.

The parameter settings described in the following sections – in particular multiple allocation – can be achieved in an easy and comfortable way using a dedicated window of DcDesk 2000.

10.5.1 Multiple allocation

Using multiple allocation, anything up to 8 output values may be assigned to each digital output. The maximum amount is defined in the firmware and cannot be augmented. It is, however, possible to use fewer values that the maximum.

This type of allocation makes sense whenever it is necessary to visualise a number of error parameters greater than the number of available digital outputs. The related parameter numbers must be entered in the parameter fields starting from 8800 *DigitalOut1:Param(0)..(7)*. If you wish to negate an allocation parameter, its parameter number must be entered with a minus sign.

The current values of these single output parameter now may either be linked by logic operator for output on the digital output or configured to produce different blinking codes. The preferred alternative may be chosen separately for each digital output.

To do this, indicate the logical link you wish to use or the value 80 Hex if your prefer a blinking code in the parameters starting from 4851 *DigitalOut1:Logic* Enter the value 0 if only one parameter was assigned to the output.

10.5.1.1 Logical operators

The value for the logical operation in 4851 *DigitalOut1:Logic* consists of single bits. Bit value 0 corresponds to the logic operator AND and bit value 1 to the logic operator OR. The lowest bit represents the operator between the allocation parameters 1 and 2, the following bit between assignment parameters 2 and 3 and so forth. With a maximum of eight allocation parameters this allows a maximum of seven operators, equivalent to a value between 0 and 7F Hex. The processing sequence is from the lowest to the highest allocation parameter. Bracketing is not possible.

10.5.1.2 Blinking signals

If, instead of a logical operation the value 80 Hex was entered in 4851 *DigitalOut1:Logic*, the digital output visualizes blinking signals. If the first allocation parameter is active, the output emits the following blinking signal:

2 short, 1* long, 2* short*

for the second allocation parameter

2 short, 2* long, 2* short*

for the third

2 short, 3* long, 2* short*

and so on. In between signals there is a pause to better distinguish the single errors. If, for instance, both the first and the third allocation parameters are active, the resulting blinking signal is as follows:

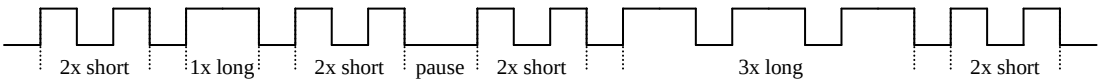


Figure 11: Blinking signal

By counting along with the long blinks it is possible to determine which parameter is active. The operator of the system must be informed about the meaning of the blink signals.

10.5.1.3 Flashing and continuous light

Operators frequently wish to display error messages in the form of flash signals, and to allocate a continuous light to one or more specific errors of particular importance. The parameters starting from 4880 *DigitalOut1:Prior* can be used for this purpose.

Each set bit means that the active state of the related parameter in 8800 *Digital-Out1:Param(0) ... (7)* is to generate a continuous light on the digital output. All other values with a value of 0 in the priority bit continue to generate flash signals – please note that these are visible only if no value of higher priority is active.

It is recommended to start the allocation of parameter numbers to the digital output from the blinking signals and to put the ones with high priority at the end of the field.

Parameterising Example:

The control unit allows indicating up to eight parameters for each digital output.
output 1 is to
blink 1x in case of error pick-up (3003 *ErrPickUp, all error bits*),
blink 2x in case of charge error (3909 *EngineIgnErrorState, bit 0*),
blink 3x in case of primary short (3909 *EngineIgnErrorState, bit 1*),
blink 4x in case of primary open (3909 *EngineIgnErrorState, bit 2*),
blink 5x in case of secondary short (3909 *EngineIgnErrorState, bit 3*),
blink 6x in case of secondary open (3909 *EngineIgnErrorState, bit 4*),
blink 7x in case of spark duration low (3909 *EngineIgnErrorState, bit 5*),
blink 8x in case of spark duration high (3909 *EngineIgnErrorState, bit 6*),

output 2 is to
blink 1x in case of common alarm (3801 *CommonAlarm*),
be lit continuously in case of emergency alarm (3800 *EmergencyAlarm)*

Number	Parameter	Value	Unit
4851	*DigitalOut1:Logic*	*80*	*Hex (blinking)*
4852	*DigitalOut2:Logic*	*80*	*Hex (blinking)*
4881	*DigitalOut2:Prior*	*02*	*Hex (2. par. continuous output)*
8800	*DigitalOut1:Param(0)*	*3003*	

8801	*DigitalOut1:Param(1)*	*3909*	
8802	*DigitalOut1:Param(2)*	*3909*	
8803	*DigitalOut1:Param(3)*	*3909*	
8804	*DigitalOut1:Param(4)*	*3909*	
8805	*DigitalOut1:Param(5)*	*3909*	
8806	*DigitalOut1:Param(6)*	*3909*	
8807	*DigitalOut1:Param(7)*	*3909*	
8810	*DigitalOut2:Param(0)*	*3801*	
8811	*DigitalOut2:Param(1)*	*3800*	
8960	*DigitalOut1:Mask(0)*	*FFFF*	*Hex*
8961	*DigitalOut1:Mask(1)*	*0001*	*Hex*
8962	*DigitalOut1:Mask(2)*	*0002*	*Hex*
8963	*DigitalOut1:Mask(3)*	*0004*	*Hex*
8964	*DigitalOut1:Mask(4)*	*0008*	*Hex*
8965	*DigitalOut1:Mask(5)*	*0010*	*Hex*
8966	*DigitalOut1:Mask(6)*	*0020*	*Hex*
8967	*DigitalOut1:Mask(7)*	*0040*	*Hex*

10.5.2 Error monitoring of digital outputs

Digital outputs are monitored with cable breaks, short circuits and overcurrents. Monitoring and parameterising of digital outputs is heavily dependent on the electric characteristics of the connected loads.

Monitoring is activated with the parameter

51x0 *DOPWMy_SupviseOn* monitoring of output

The electrical characteristics of the connected load require a short interruption of output monitoring whenever output level changes. This delay time is set with the following parameter:

111x0 *DOPWMy_DelayTime* delay time after edge change

The following table provides an overview of possible errors:

Error	Meaning
0	**Signal short circuit to earth** - Governor has detected a short circuit to earth. → error message appears alone • Check wiring and connected loads.
1	**Short circuit to supply voltage** - Governor has detected a short circuit to supply voltage. → error message appears alone • Check wiring and connected loads.

Table 23: Possible digital sensor errors

The parameter

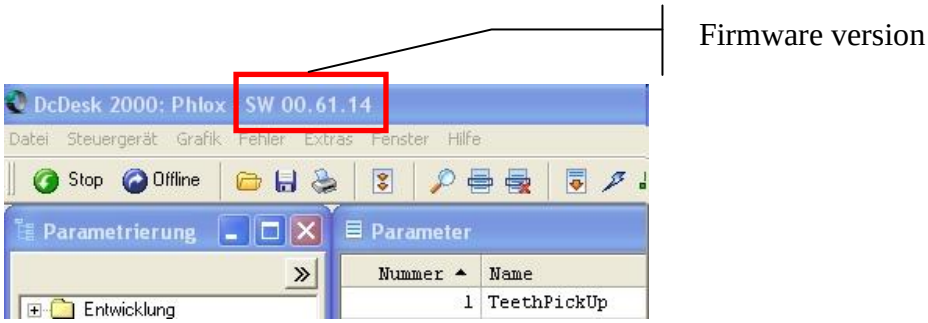
51x1 *DOPWMy_HoldOrReset* hold or reset error message

allows the user to configure whether the error message is to be reset when the error state is no longer present. This applies in common to all error messages.

11 Commissioning

11.1 Software versions

The PHLOX II control unit can be delivered with different firmware, the version of which is displayed at the top of the DcDesk window.



The structure of the firmware version designation is as follows:

SW **AAA**.**BC**.**DD** with

AAA: Customer number in case of customer specific modification or need for a limited DcDesk access to the PHLOX II control unit (00 means Heinzmann standard firmware)

BC: Firmware variant

- ➔ **B**: CAN or ModBus implementation
  - 6: ModBus, 8: CAN SAE J1939, 9: CANopen
- ➔ **C**: Pick-up configuration
  - 0: 1 pick-up on a camshaft trigger disc
  - 1:
    - 1 pick-up on a X-1 measuring wheel (single gap) on crankshaft and 1 pick-up as reference index on camshaft

    OR

    - 1 pick-up on a X-1 measuring wheel (single gap) on camshaft
  - 2:
    - 1 pick-up on a X-2 measuring wheel (double gap) on crankshaft and 1 pick-up as reference index on camshaft

    OR

    - 1 pick-up on a X-2 measuring wheel (double gap) on camshaft
  - 4: 2 redundant pick-ups on a X-1 measuring wheel (single gap) on camshaft

- 7: 1 pick-up on a X-1 measuring wheel (single gap) on crankshaft for 2-Strokes engines
- 8: 1 pick-up on a crankshaft trigger disc (wasted spark)

DD: Running index of the firmware version

11.2 Engine configuration

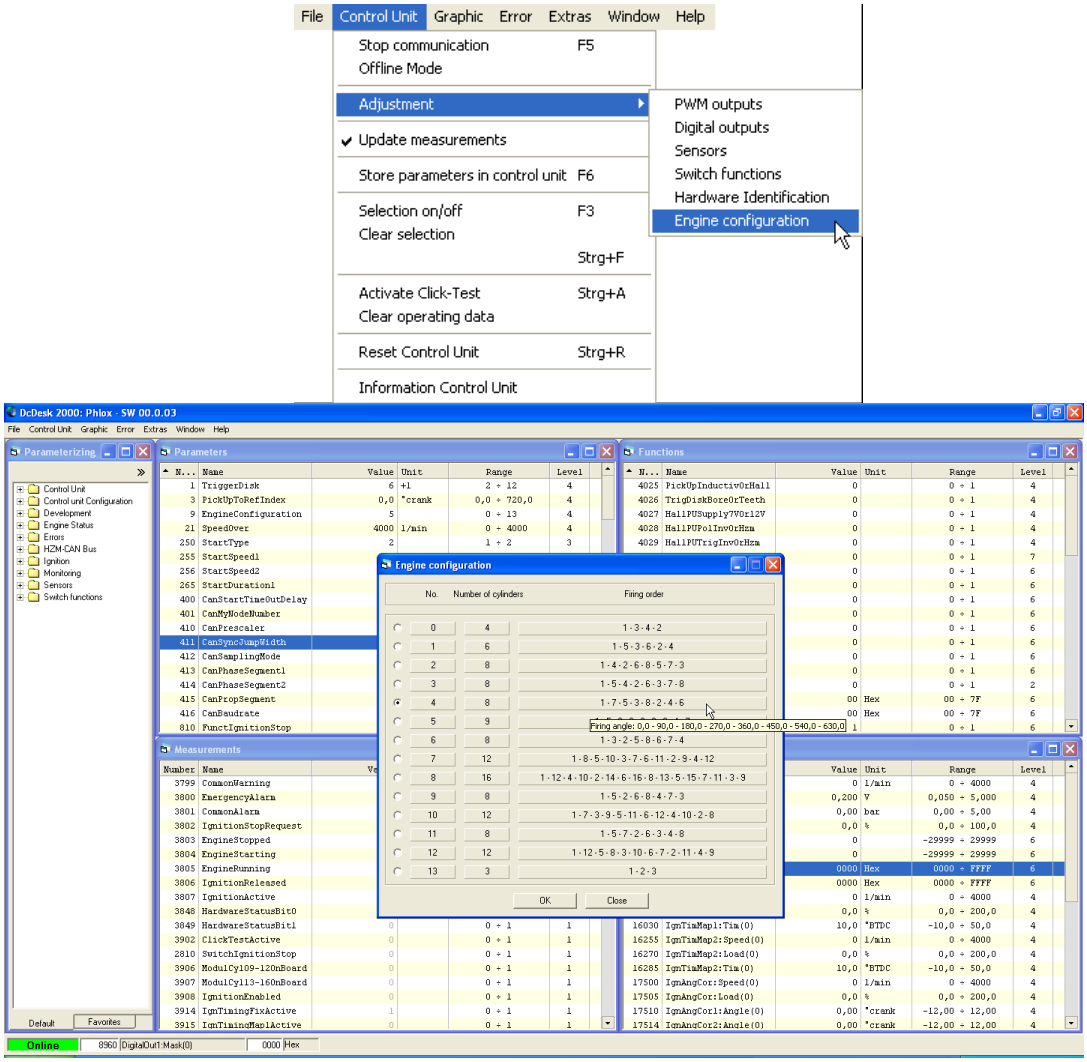
The selected engine configuration will only be activated after saving all parameters and resetting the control unit

11.2.1 Predefined engine configurations

To select a predefined engine firing order, Par. 4100 *EngCfgManOrFix* shall be set to 0. Open the menu Control Unit -> Adjustment -> Engine Configuration and select the correct engine configuration. Note: moving the mouse over the different configurations will display the TDC angles of all cylinders.

Example: Configuration for firing order 1-7-5-3-8-2-4-6 and TDC angles 0-90-180-270-360-450-540-630 deg crank

Number	Parameter	Value	Unit
4100	*EngCfgManOrFix*	*0*	



11.2.2 Manual engine configuration

If the needed firing order is not available in the predefined engine configurations, it can be configured manually using DcDesk2000:

> Set Par. 4100 *EngCfgManOrFix* to 1.

> Set the number of cylinders in Par. 100 *ManEngCfg_CylNr*.

> Setup the top dead centre of all cylinders in Par. 101 *ManEngCfg_TDCCyl1* to 116 *ManEngCfg_TDCCyl16.Per definition TDC of Cyl. 1 is 0° crank and cannot be modified.*

> Setup the Phlox channel number used for each cylinder in Par. 131 *ManEngCfg_OutNrCyl1* to 146 *ManEngCfg_OutNrCyl16* according to the engine wiring *↑6.2 Pin assignment*

Example: Configuration for firing order 1-7-5-3-8-2-4-6 and TDC angles 0-90-180-270-360-450-540-630 deg crank. Engine cylinder number and Phlox channel number is identical.

Number	Parameter	Value	Unit
4100	*EngCfgManOrFix*	*1*	
100	ManEngCfg_CylNr	*8*	
101	ManEngCfg_TDCCyl1	*0*	
102	ManEngCfg_TDCCyl2	*450*	*°crank*
103	ManEngCfg_TDCCyl3	*270*	*°crank*
104	ManEngCfg_TDCCyl4	*540*	*°crank*
105	ManEngCfg_TDCCyl5	*180*	*°crank*
106	ManEngCfg_TDCCyl6	*630*	*°crank*
107	ManEngCfg_TDCCyl7	*90*	*°crank*
108	ManEngCfg_TDCCyl8	*360*	*°crank*
131	ManEngCfg_OutNrCyl1	*1*	
132	ManEngCfg_OutNrCyl2	*2*	
133	ManEngCfg_OutNrCyl3	*3*	
134	ManEngCfg_OutNrCyl4	*4*	
135	ManEngCfg_OutNrCyl5	*5*	
136	ManEngCfg_OutNrCyl6	*6*	
137	ManEngCfg_OutNrCyl7	*7*	
138	ManEngCfg_OutNrCyl8	*8*	

In most cases, the engine cylinder numbers and the corresponding Phlox channel numbers used are identical. So cylinder 1 is wired to channel 1,…, cylinder 16 is wired to channel 16.

11.3 Pick-up Configuration

A pick-up / index configuration will only be activated after saving all parameters and resetting the control unit

- 3 main measuring methods are available

Measuring Method 1 Measuring Method 2 Measuring Method 3

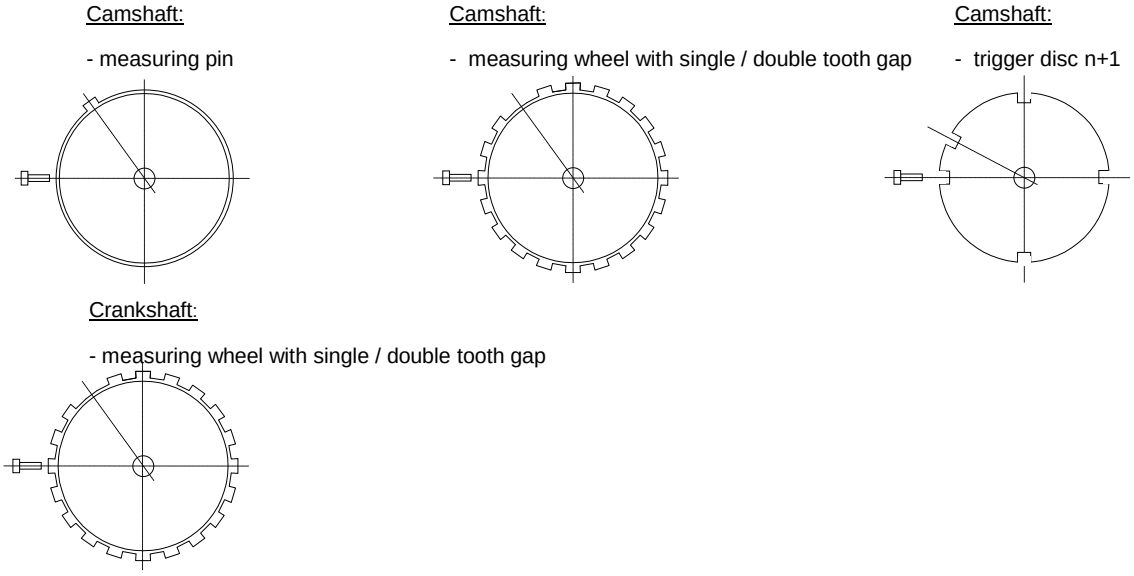


Figure 12: Pick-up configuration

These measuring methods are supported by the software versions AAA-B0/1/2-DDD

- Additional firmware versions have been released to fulfil special requirements but are not described in all details in the following.
    - **AAA-B4-DDD**
      2 redundant pick-ups on a measuring wheel with single / double tooth gap installed on engine camshaft. Note the first active pick-up is pick-up 1. If pick-up 1 fails, Phlox will use pick-up2 as backup. Time to switch over is very short but ignition will be stopped until pick-up2 is synchronized with the measuring wheel (gap detected).
        ➔ Very similar to measuring method 2 but with 2 pick-ups.
        ↑*11.3.2* Measuring Method 2 (Software Version AAA-B1/2-DDD)
    - **AAA-B7-DDD**
      1 pick-up on a measuring wheel with single / double tooth gap installed on a 2-strokes engine crankshaft. Range of TDC angles is 0-360° instead of 0-720°
        ➔ Very similar to measuring method 1 but without cam index.
        ↑*11.3.1* Measuring Method 1 (Software Versions AAA-B1/2-DDD)
    - **AAA-B8-DDD**
      1 pick-up on a trigger disk n+1 installed on the engine crankshaft. In that case,

each cylinder fires 2 times per cycle (wasted spark). Very often 2 cylinders are firing simultaneously. Consequently Phlox functions are limited: no cylinder individual ignition angle and energy offsets, no knock spark retards, secondary diagnostics (secondary open / short, spark duration low / high) only during ignition test possible and not while engine is running.

➔ Pick-up configuration very similar to measuring method 3.
↑*11.3.3* Measuring Method 3 (Software Version AAA-B0-DDD)

11.3.1 Measuring Method 1 (Software Versions AAA-B1/2-DDD)

If the measuring wheel has a single tooth gap firmware variant B1 must be used.
If the measuring wheel has a double tooth gap, firmware variant B2 must be used.
In both cases the setup of pick-up and measuring wheel still is exactly identical.

- Crankshaft pick-up setup

Activate Pick-up:

Par. 4001 = 0 (Pick-up is on crankshaft)

Par. 4002 = 1

Configure pick-up type according to used pick-up:

Par. 4020 = 0 for Hall Pick-ups.

Par. 4020 = 1 for inductive (magnetic) pick-up.

- Hall crankshaft pick-up setup

This paragraph concerns only Hall pick-ups

Configure pick-up power supply according to pick-up specification

Par. 4022 = 0 to setup a 12V pick-up power supply

Par. 4022 = 1 to setup a 5V pick-up power supply

Configure pick-up signal output according to pick-up specification:

Par. 4023 = 0 for Heinzmann standard pick-up signal output (signal low when pick-up over tooth, high when pick-up over gap)

Par. 4023 = 1 for inverted pick-up signal output (signal high when pick-up over tooth, low when pick-up over gap)

Configure trigger edge for best timing:

Depending on the pick-up used, the falling or the rising edge shall be the better choice for best ignition timing

Par. 4024 = 0 for Heinzmann standard trigger edge (begin of tooth / gap)

Par. 4024 = 1 for inverted trigger flank (end of tooth / gap)

- Inductive crankshaft pick-up setup

This paragraph concerns only inductive pick-ups

For inductive pick-ups, the trigger level is speed-dependent and can be setup with the help of a curve (Par. 7700-7704, 7710-7714 or via the menu Graphics->Curve->Trigger-Level Inductive Pick-Up 1). It is important to set this curve up properly according to the pick-up and measuring wheel properties, otherwise speed measuring and timing problems may occur. As a starting point following curve may be used:

Parameter number	Speed [rpm]	Parameter number	Trigger level [V]
7700	0	7710	0.150
7701	100	7711	0.150
7702	1000	7712	0.500
7703	2000	7713	1.000
7704	4000	7714	1.500

This curve needs to be corrected if speed measuring or timing problems occur. If this is case it is recommended that you measure the pick-voltage of the pick-up signal output at different speeds and to setup the trigger-levels for those speeds at half of the measured voltage. Generally, it is good practice as soon as speed increases to depart from the very low trigger levels (like 50 or 100mV), which make speed sensing quite sensitive to signal disturbances.

- Camshaft index setup

  Activate Index:

  Par. 4005 = 1

  Configure index pick-up type according to used pick-up:

  Par. 4025 = 0 for Hall Pick-ups.

  Par. 4025 = 1 for inductive (magnetic) pick-up.

- Hall camshaft index pick-up setup

  This paragraph concerns only Hall pick-ups

  Configure index pick-up power supply according to pick-up specification:

  Par. 4027 = 0 to setup a 12V pick-up power supply

  Par. 4027 = 1 to setup a 5V pick-up power supply

  Configure index pick-up signal output according to pick-up specification:

  Par. 4028 = 0 for Heinzmann standard pick-up signal output (signal low when pick-up over tooth, high when pick-up over gap)

  Par. 4028 = 1 for inverted pick-up signal output (signal high when pick-up over tooth, low when pick-up over gap)

  Configure trigger edge for best timing:

  The pick-up used determines whether the rising or falling edge should be used for optimum ignition timing.

  Par. 4029 = 0 for Heinzmann standard trigger edge (begin of tooth / gap)

  Par. 4029 = 1 for inverted trigger flank (end of tooth / gap)

- Inductive camshaft index pick-up setup

  This paragraph concerns inductive pick-ups only

  For inductive pick-ups, the trigger level is speed-dependent and can be setup with the help of a curve (Par. 7720-7724, 7720-7724 or via the menu Graphic->Curve->Trigger-Level Inductive Cam-Index). It is important to setup this curve properly according to the pick-up and measuring

wheel properties, otherwise speed measuring and timing problems can occur. As a starting point following curve might be used:

Parameter number	Speed [rpm]	Parameter number	Trigger level [V]
7720	0	7730	0.150
7721	100	7731	0.150
7722	1000	7732	0.500
7723	2000	7733	1.000
7724	4000	7734	1.500

This curve needs to be corrected if speed measuring or timing problems occur. In this case it measuring the pick-voltage of the pick-up signal output is recommended at different speeds and to setup the trigger-levels for those speeds at half of the measured voltage. Generally speaking, it is good practice depart from the very low trigger levels (such as 50 or 100mV), as soon as speed increases, which make speed detection sensitive to signal disturbances.

- Speed measuring wheel and index setup

  Configure the speed measuring wheel according to its physical properties:

  Par. 4021 = 0 for a wheel equipped with teeth

  Par. 4021 = 1 for a wheel equipped with holes

  Par. 1 = Number of teeth / holes.

  If the measuring wheel has a single tooth/hole gap (firmware variant B1), the gap is counted as 1 tooth / hole. For example a 120-1 teeth wheel Par. 1 = 120. If the measuring wheel has a double tooth/hole gap (firmware variant B2), the gap is counted as 2 teeth / holes. For example a 60-2 teeth wheel Par. 1 = 60

  Configure the index according to its physical properties:

  Par. 4026 = 0 for a single tooth index

  Par. 4026 = 1 for a single hole index

- Pick-up and index angle position setup

The position of the speed measuring wheel gap resp. of the index must be determined exactly. The ignition TDC of the cylinder selected first (cylinder A1, TDC is equivalent to 0° crankshaft angle) is used as a reference point. All distances (including that of the speed measuring wheel gap or of the index on the camshaft) are to be specified in degrees of crankshaft **angle before the compression TDC of cylinder A1**.

Procedure to determine the distance (see pictures following):

1. The crankshaft is rotated into a position where cylinder A1 is exactly at TDC (ignition TDC).

2. **For Hall Pick-ups**: The distance between the centre of the sensor and the **beginning or the end (depending on Par. 4024 and 4029)** of the first tooth after gap is measured by degrees of crankshaft starting from the sensor in direction of engine rotation.

3. **For Inductive Pick-ups**: The distance between the centre of the sensor and the **centre** of the first tooth after the gap is measured by degrees of crankshaft starting from the sensor, in the direction in which the engine rotates.

The following pictures make use of measuring wheel with single tooth gap. The setup is still exactly the same when a measuring wheel with double tooth gap is used.

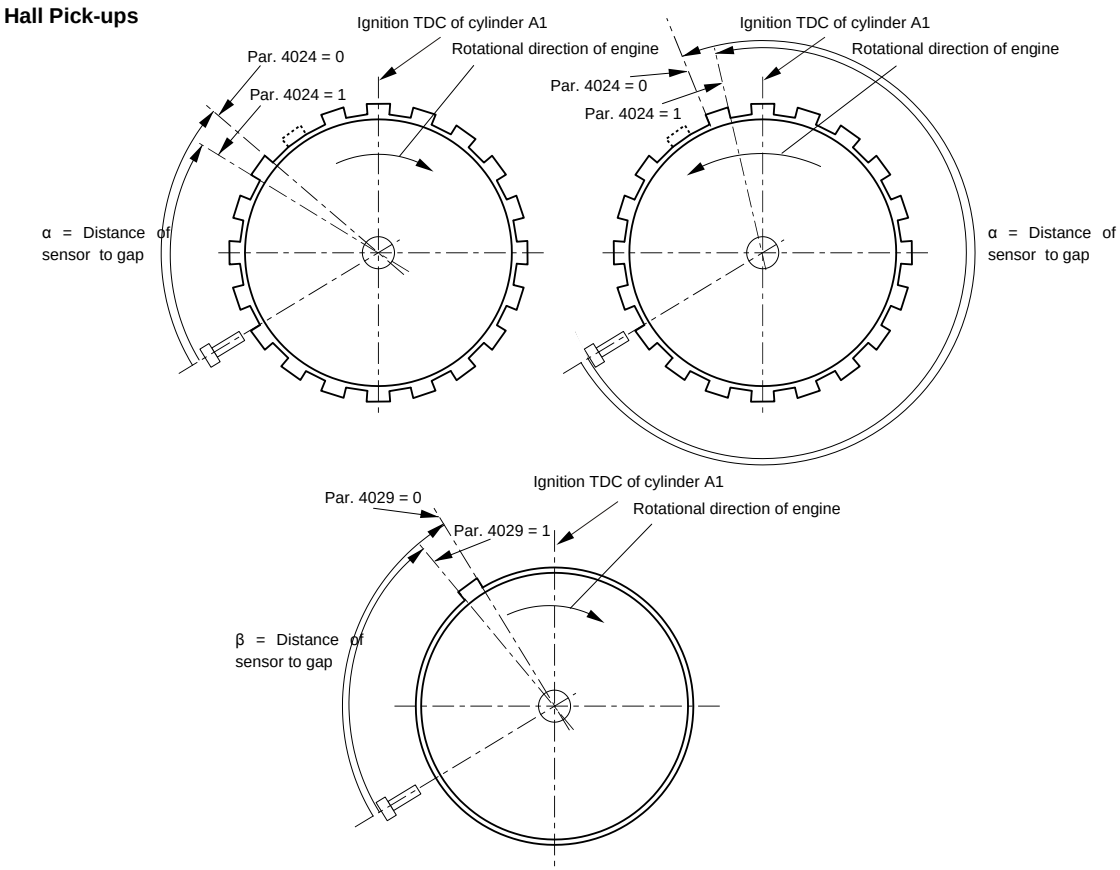


Figure 13: Hall pick-ups

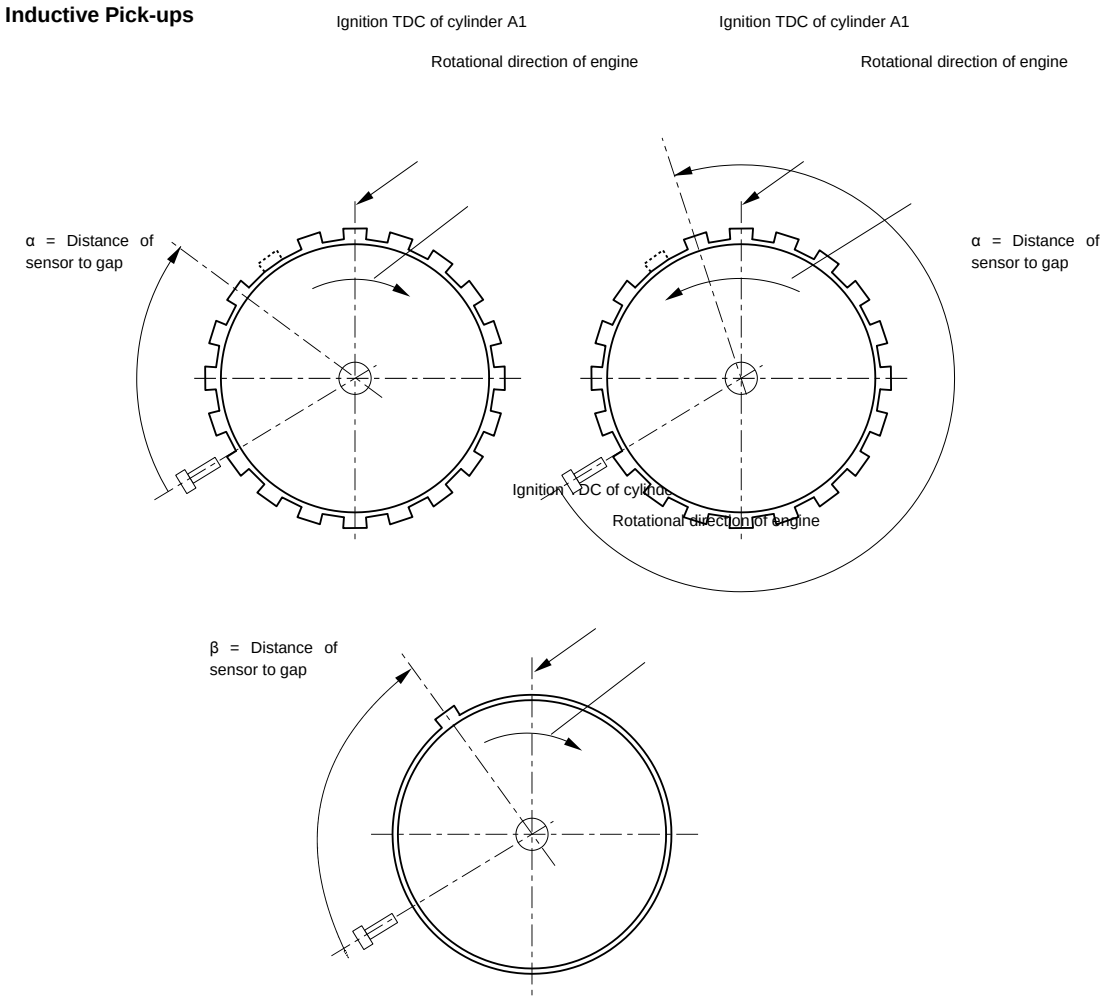


Figure 14: Inductive pick-ups

Configure the pick-up and index positions as following:

Par. 3 = α [°crank]

Par. 5 = β [°crank]

11.3.2 Measuring Method 2 (Software Version AAA-B1/2-DDD)

If the measuring wheel has a single tooth gap, firmware variant B1 must be used. If the measuring wheel has a double tooth gap, firmware variant B2 must be used. The pick-up and measuring wheel are set up in exactly the same way in both cases.

This method makes use of one pick-up and a measuring wheel with tooth gap placed on the camshaft. The setup is very similar to that in measuring method 1 but no cam index is used.

- Camshaft pick-up setup

Activate Pick-up:

Par. 4001 = 1 (Pick-up is on camshaft)

Par. 4002 = 1

Configure pick-up type according to used pick-up:

Par. 4020 = 0 for Hall Pick-ups.

Par. 4020 = 1 for inductive (magnetic) pick-up.

- Hall camshaft pick-up setup

This paragraph concerns only Hall pick-ups

Configure pick-up power supply according to pick-up specification

Par. 4022 = 0 to setup a 12V pick-up power supply

Par. 4022 = 1 to setup a 5V pick-up power supply

Configure pick-up signal output according to pick-up specification:

Par. 4023 = 0 for Heinzmann standard pick-up signal output (signal low when pick-up over tooth, high when pick-up over gap)

Par. 4023 = 1 for inverted pick-up signal output (signal high when pick-up over tooth, low when pick-up over gap)

Configure trigger edge for best timing:

The pick-up used determines whether the rising or falling edge should be used for optimum ignition timing.

Par. 4024 = 0 for Heinzmann standard trigger edge (begin of tooth / gap)

Par. 4024 = 1 for inverted trigger flank (end of tooth / gap)

- Inductive camshaft pick-up setup

This paragraph concerns only inductive pick-ups

For inductive pick-ups, the trigger level is dependent on the speed and can be setup with the help of a curve (Par. 7700-7704, 7710-7714 or via the menu Graphic->Curve->Trigger-Level Inductive Pick-Up 1). It is important to set up this curve properly according to the pick-up and measuring wheel properties, otherwise problems with speed measuring and timing can occur. As a starting point following curve might be used:

Parameter number	Speed [rpm]	Parameter number	Trigger level [V]
7700	0	7710	0.150
7701	100	7711	0.150
7702	1000	7712	0.500
7703	2000	7713	1.000
7704	4000	7714	1.500

This curve needs to be corrected if problems with speed measuring or timing occur. In this case it is recommended to measure the pick voltage of the pick-up signal output at different speeds and to set the trigger-levels for those speeds at half of the measured voltage. Generally speaking, it is good practice to depart from the very low trigger levels (e.g. 50 or 100mV) as soon as speed increases which make speed sensing quite sensitive to signal disturbances.

- Camshaft index setup

This measuring method does not require a cam index:

Par. 4005 = 0

- Speed measuring wheel setup

Configure the speed measuring wheel according to its physical properties:

Par. 4021 = 0 for a wheel equipped with teeth

Par. 4021 = 1 for a wheel equipped with holes

Par. 1 = Number of teeth / holes.

If the measuring wheel has a single tooth/hole gap (firmware variant B1), the gap is counted as 1 tooth / hole. For example a 120-1 teeth wheel Par. 1 = 120. If the measuring wheel has a double tooth/hole gap (firmware variant B2), the gap is counted as 2 teeth / holes. For example a 60-2 teeth wheel Par. 1 = 60

- Pick-up angle position setup

The position of the speed measuring wheel gap must be determined exactly. The ignition TDC of the cylinder selected first (cylinder A1, TDC is equivalent to 0° crankshaft angle) is to be used as a reference point. All distances (including that of the speed measuring wheel gap) are specified in **degrees of crankshaft angle before the compression TDC of cylinder A1**.

Procedure to determine the distance (see following images):

1. The crankshaft is rotated into a position where cylinder A1 is exactly at TDC (ignition TDC).

2. **For Hall Pick-ups**: The distance between the centre of the sensor and the **beginning or the end (depending on Par. 4024)** of the first tooth after gap is measured by degrees of crankshaft starting from the sensor in the direction in which the engine rotates.

For Inductive Pick-ups: The distance between the centre of the sensor and the **centre** of the first tooth after gap is measured by of degrees crankshaft starting from the sensor in the direction in which the engine rotates.

The following pictures make use of a measuring wheel with single tooth gap. The setup remains exactly the same of a measuring where a wheel with double tooth gap is used

*Attention: angles must be converted into **degrees of crankshaft**.*

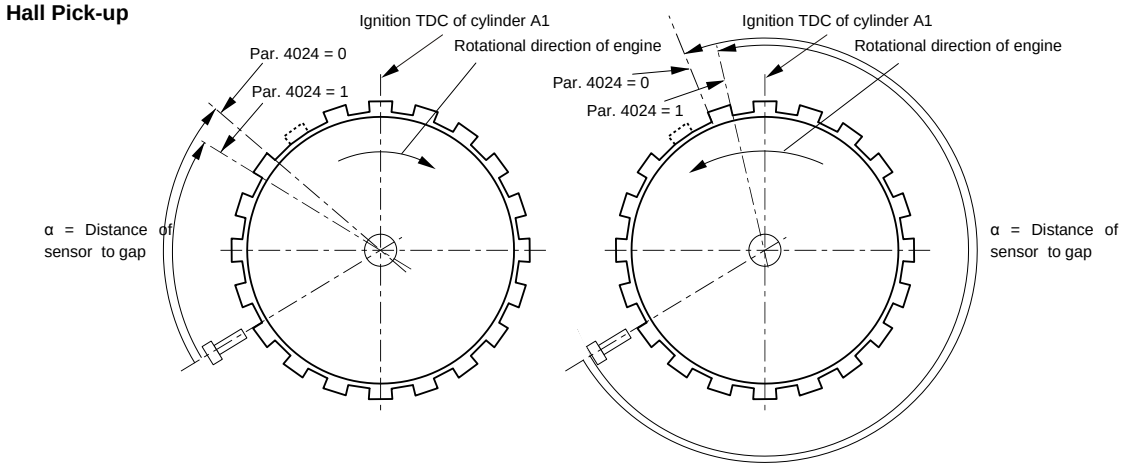


Figure 15: Crankshaft angle Hall pick-ups

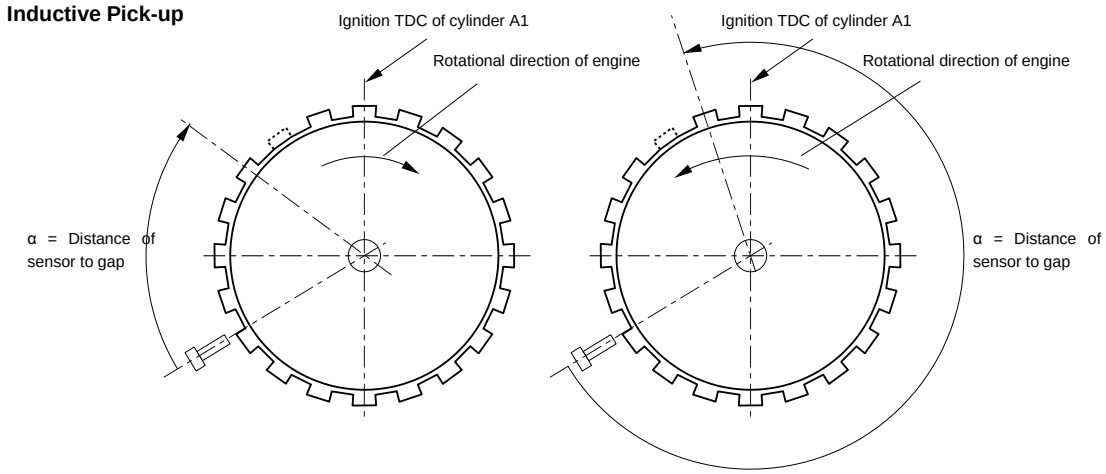


Figure 16: Crankshaft angle inductive pick-ups

Configure the pick-up position as following:

Par. 3 = α [°crank]

11.3.3 Measuring Method 3 (Software Version AAA-B0-DDD)

- Camshaft pick-up setup

Configure pick-up type according to pick-up used:

Par. 4025 = 0 for Hall Pick-ups.

Par. 4025 = 1 for inductive (magnetic) pick-up.

- Hall camshaft pick-up setup

This paragraph concerns only Hall pick-ups

Configure pick-up power supply according to pick-up specification (for Hall pick-ups only):

Par. 4027 = 0 to setup a 12V pick-up power supply

Par. 4027 = 1 to setup a 5V pick-up power supply

Configure pick-up signal output according to pick-up specification (for Hall pick-ups only):

Par. 4028 = 0 for Heinzmann standard pick-up signal output (signal low when pick-up over tooth, high when pick-up over gap)

Par. 4028 = 1 for inverted pick-up signal output (signal high when pick-up over tooth, low when pick-up over gap)

Configure trigger edge for optimum timing (for Hall pick-ups only):

The pick-up used determines whether the rising or falling edge should be used for optimum ignition timing.

Par. 4029 = 0 for Heinzmann standard trigger edge (begin of tooth / gap)

Par. 4029 = 1 for inverted trigger flank (end of tooth / gap)

- Inductive camshaft pick-up setup

This paragraph concerns only inductive pick-ups

For inductive pick-ups, the trigger level is dependent on the speed and can be set up using a curve (Par. 7720-7724, 7720-7724 or via the menu Graphic->Curve->Trigger-Level Inductive Cam-Index). It is important to set up this curve properly according to the pick-up

and measuring wheel properties, otherwise problems with speed measuring and timing may occur. As a starting point following curve might be used:

Parameter number	Speed [rpm]	Parameter number	Trigger level [V]
7720	0	7730	0.150
7721	100	7731	0.150
7722	1000	7732	0.500
7723	2000	7733	1.000
7724	4000	7734	1.500

This curve needs to be corrected if speed measuring or timing problems occur. In this case it measuring measure the pick-voltage of the pick-up signal output at different speeds and setting up the trigger-levels for those speeds at half of the measured voltage are recommended. Generally speaking, it is good practice to depart from the very low trigger levels (like 50 or 100mV), which make speed detection quite sensitive to signal disturbances, as soon as the speed increases.

- Trigger disk setup

Configure the trigger disk according to its physical properties:

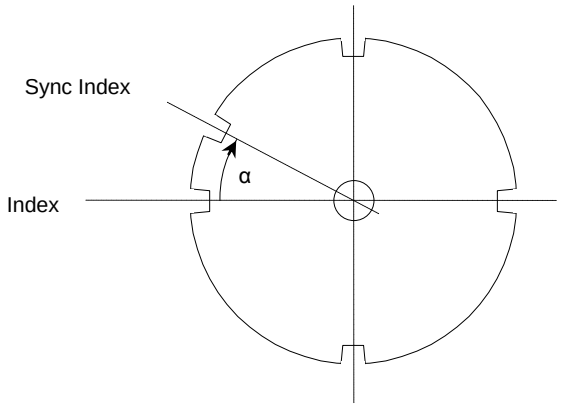
Par. 4026 = 0 for a trigger disk with teeth

Par. 4026 = 1 for a trigger disk with holes

Par. 1 = Number of teeth / holes (synchronisation index not counted). For example a 6+1 trigger disk Par. 1 = 6

- Pick-up angle position setup

Method 3 uses one pick-up on a timing trigger disc installed on the camshaft. The trigger disc has n equidistant indexes (teeth / holes) and one additional synchronization index used as phase reference.



Recommandation: 1/4 720° / n <= α <= 1/3 720° / n

To determine the TDC of all cylinders, the ignition TDC of the cylinder selected first (cylinder A1, TDC is equivalent to 0° crankshaft angle) is to be used as a reference point. Depending on the rotational direction of the disc, a reference index is defined as the index just after or just before the synchronisation index. The distance between the sensor and the reference index must be determined in **degrees of crankshaft**. The rotational direction of the disc is called "normal" when following angle sequence is detected by the pick-up: normal – small (α) – middle (720/n - α) – normal. In this case, the reference index is the one which follows the synchronisation index. The rotational direction of the disc is called "inverse" when following angle sequence is detected by the pick-up: normal – middle (720/n - α) – small (α) – normal. In this case the reference index is the one before the synchronisation index.

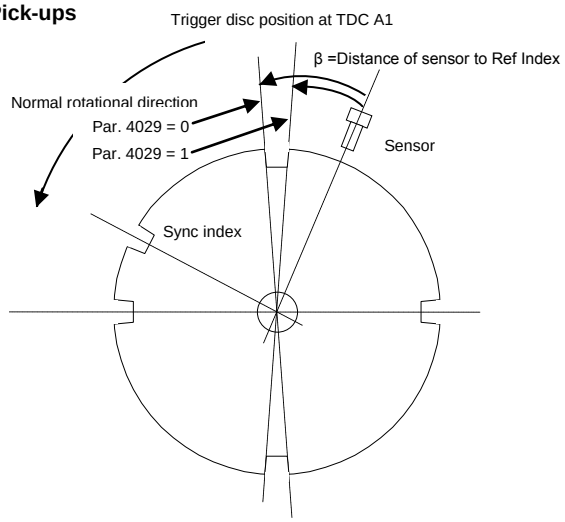
Procedure to determine the distance (see following images):

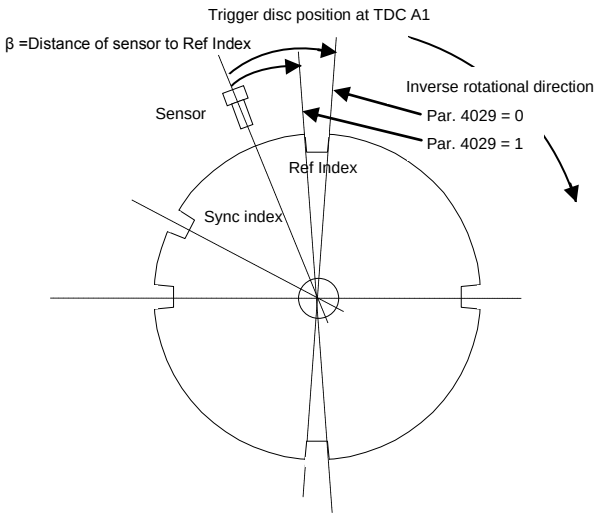
1. The crankshaft is rotated into a position where cylinder A1 is exactly at TDC (ignition TDC).

2 **For Hall Pick-ups**: The distance between the centre of the sensor and the **beginning or the end (depending on Par. 4029)** of the reference index is measured by degrees of crankshaft starting from the sensor in direction of engine rotation.

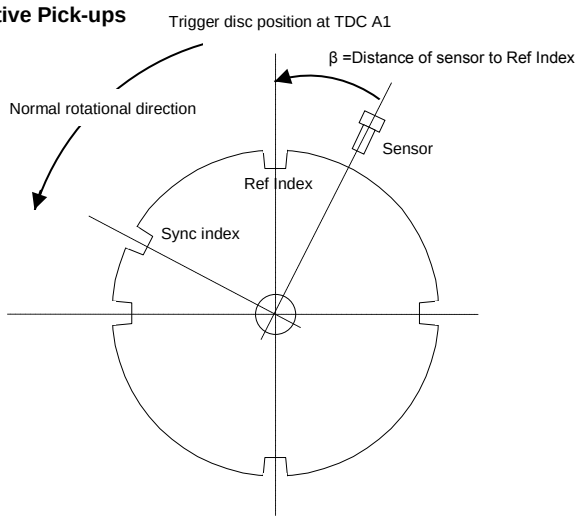
For Inductive Pick-ups: The distance between the centre of the sensor and the **centre** of the reference index is measured by degrees of crankshaft starting from the sensor in the direction in which the engine rotates.

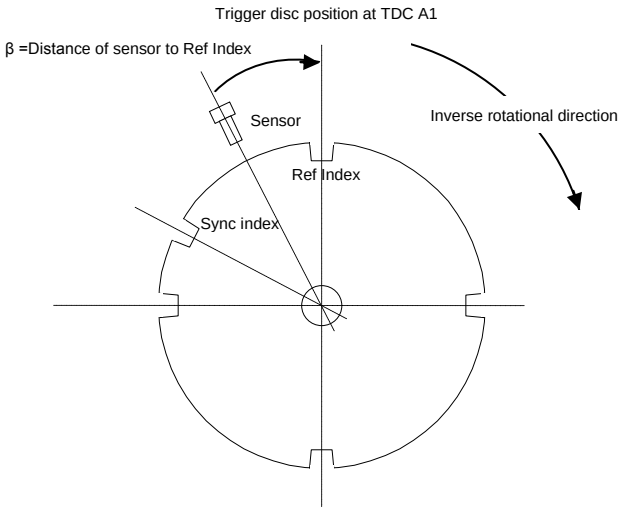
Hall Pick-ups





Inductive Pick-ups





Configure the rotational direction:

Par. 4009 = 0 for normal rotational direction

Par. 4009 = 1 for inverse rotational direction

Configure the pick-up position:

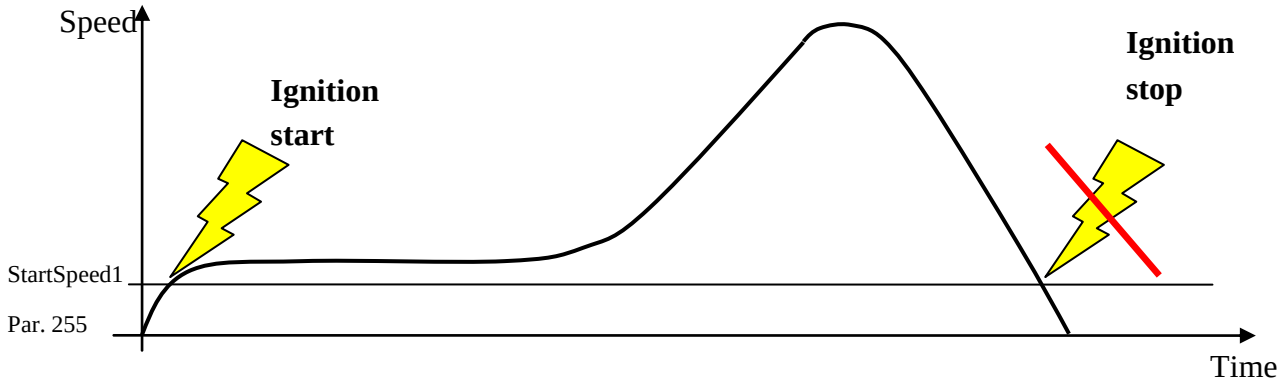
Par. 3 = β [° Crank]

11.4 Ignition start

When the engine is started, the ignition can be set up to start in 2 different ways:

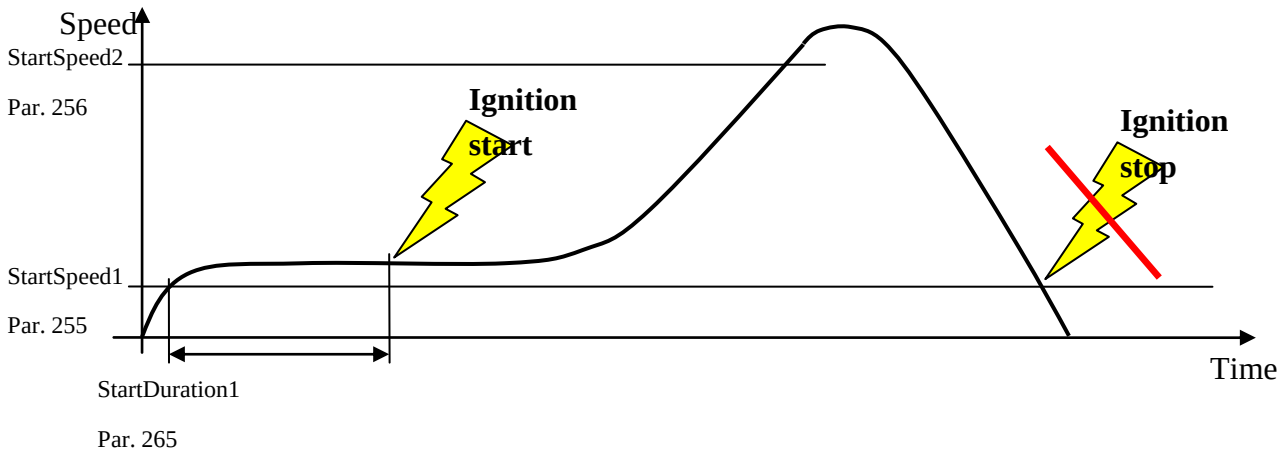
- Start-type 1 (Par. 250 = 1):

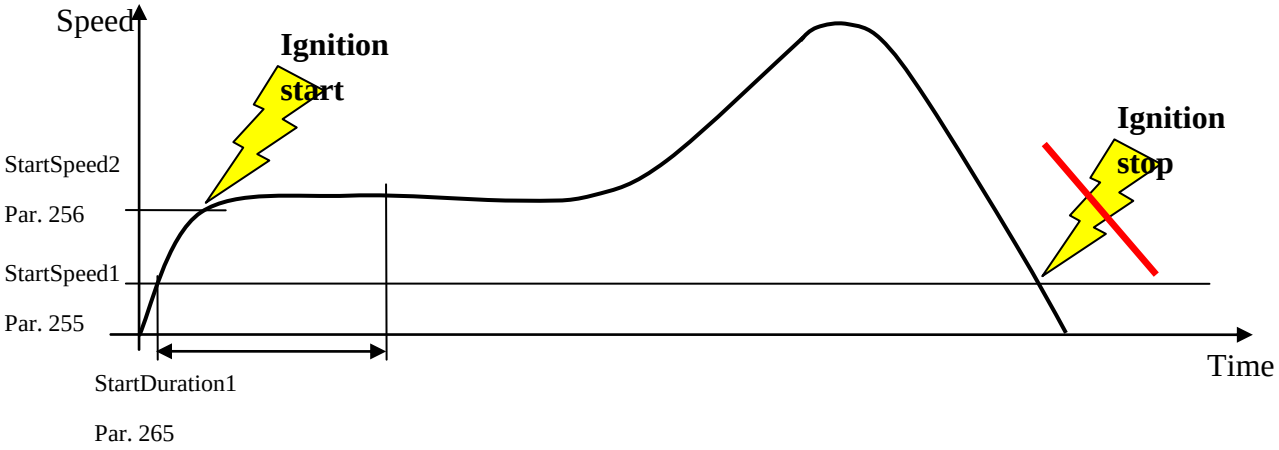
When configured as start-type 1, ignition begins as soon as speed (Par. 2000) exceeds StartSpeed1 (Par. 255).



- Start-type 2 (Par. 250 = 2):

When configured as start-type 2, ignition begins when speed (Par. 2000) exceeds StartSpeed1 (Par. 255) and after the StartDuration1 delay (Par. 265) or when speed exceeds StartSpeed2 (Par. 256) immediately.





11.5 Ignition stop

Ignition stops when speed falls below StartSpeed1 (Par. 255)

Additionally, a digital input can be configured as ignition stop command. If that is the case, depending on Par. 4810, the ignition will stop as soon as the stop command is applied [Par. 4810 = 0] or until the engine stops (speed=0) [Par. 4810 = 1].

11.6 Common ignition-based timing

General remark on ignition angles

Ignition angles of all cylinders (Par. 13550-13565) are worked out by the addition of 3 terms:

- the common ignition base timing (Par. 3911-3913) -> This paragraph
- the common ignition timing offsets (Par. 3917, Par. 3918) -> ↑*11.7* Common Ignition timing offsets
- the cylinder individual ignition angle offsets (Par. 13450-13515) -> ↑*11.8* Cylinder individual ignition angle offsets
  These angle offsets are internal configured values and external knock retards

Ignition angle [cyl] = **common base timing** + common timing offsets + cyl individual angle offsets [cyl]

Ignition angles and timings are always given in terms of [° crank] before TDC, so positive angles are before TDC, negative angles after TDC. The ignition angles are limited in 2 steps. First the common ignition timing (common base timing + common timing offsets) will be limited in a range of [-10; 90°] before TDC. Additionally the final ignition angles (common ignition timing + cyl. Individual angle offsets) will also be limited in a range of [-10; 90°] before TDC

The common ignition base timing can be:

- a fix value
- the result of up to 2 different speed- and load-dependant ignition timing maps

Which setpoint is currently active is displayed in parameters 3914-3916:

- Par. 3914 = 1 -> the fix common ignition base timing is active
- Par. 3915 = 1 -> the common ignition timing map 1 is active
- Par. 3916 = 1 -> the common ignition timing map 2 is active

11.6.1 Fix common ignition base timing

To setup fix common ignition base timing, perform following configuration:

Par. 5910 = 0

Par. 1910 = desired ignition timing [° crank before TDC], for example,

Par. 1910 = 15 ° crank

The active fix ignition timing is displayed in Par. 3911

11.6.2 Speed- and load-dependant common ignition base timing

2 speed- and load- dependant common ignition base timing maps are available. The active map can be selected by an hardwired digital input, which can be useful in case the engine is supplied with various gas qualities.

- Engine relative power

The common ignition base timing maps use engine speed and relative power as reference values. The relative power can be calculated in 2 ways:

– With a Measured Power sensor:

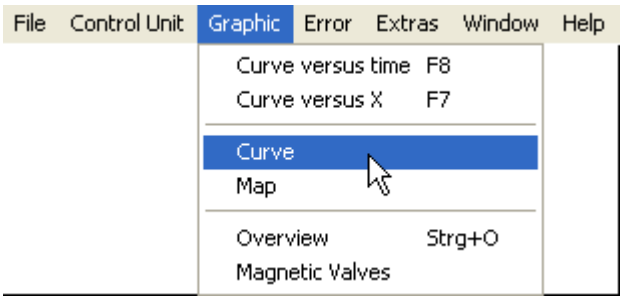
Par. 5231 = 0

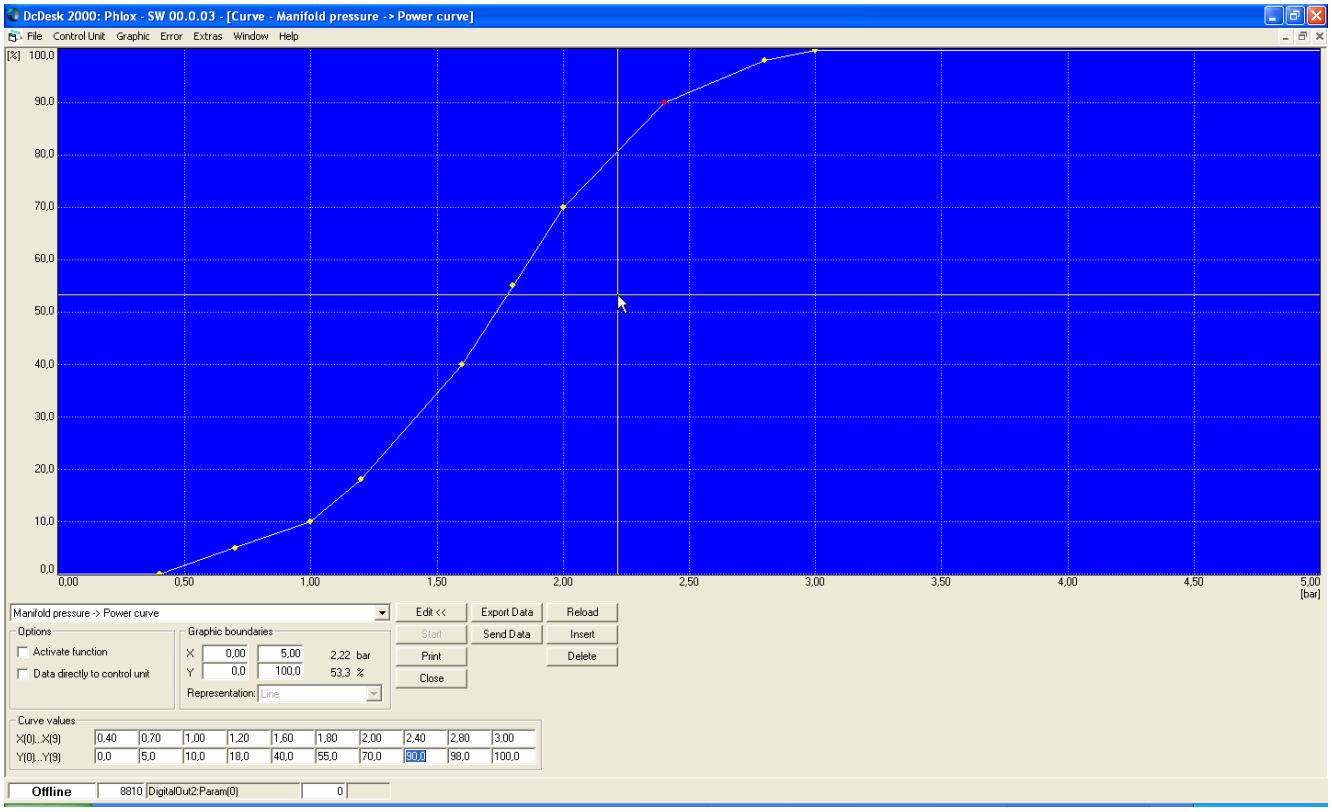
$$\text{RelativePower[Par.3232]} = \frac{\text{MeasuredPower[Par.2918]} \times 100}{\text{RatedPower[Par.1232]}}$$

– With a manifold pressure sensor:

Par. 5231 = 1

Configure the conversion curve Manifold pressure -> Power by using the Curve setting window



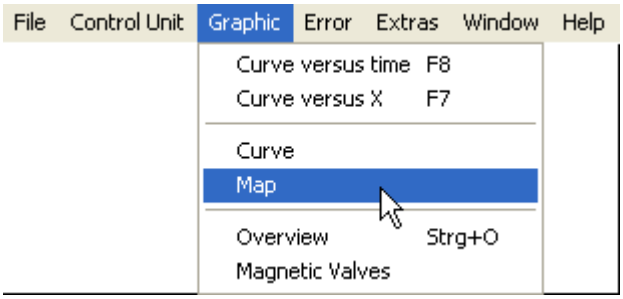


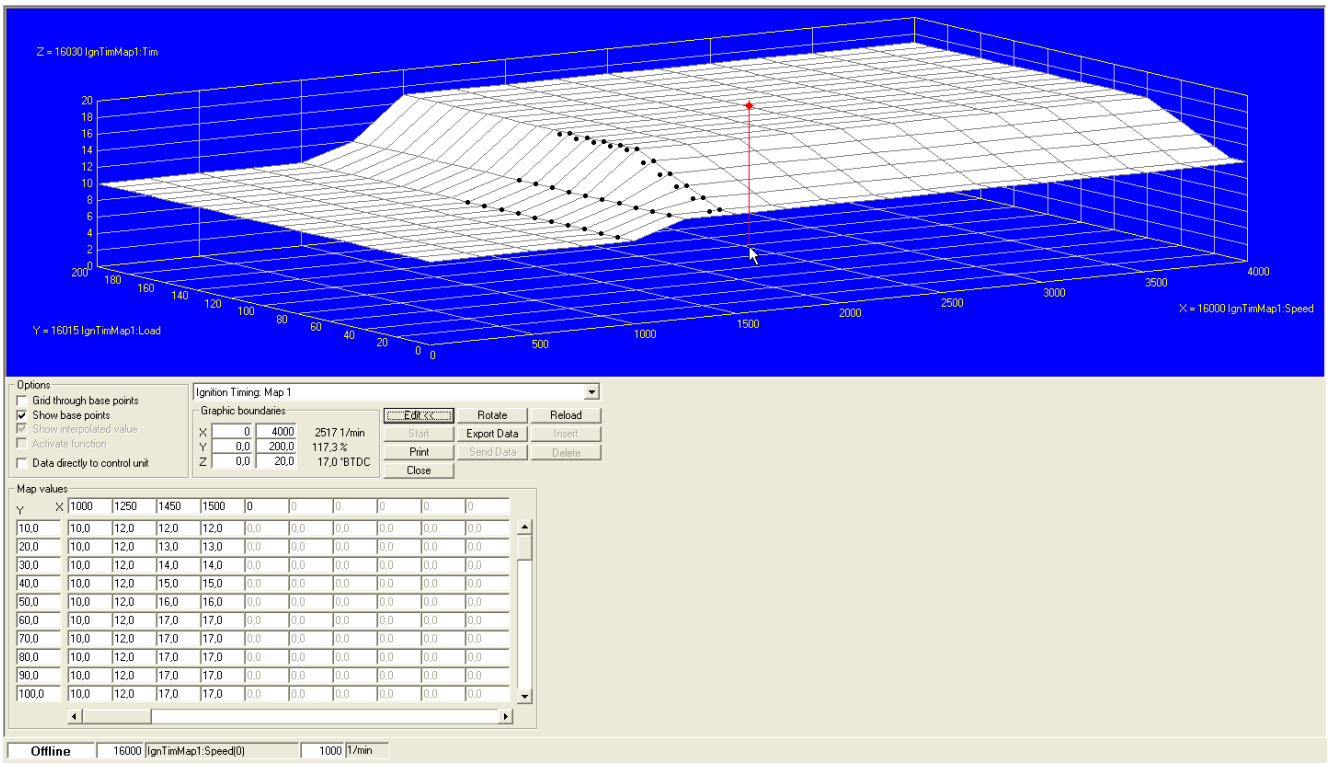
The measured power will be displayed in Par. 3231 and the relative power in Par. 3232 and calculated as:

$$\mathrm{RelativePower[Par.3232]} = \frac{\mathrm{MeasuredPowerByMnfldP[Par.3231]} \times 100}{\mathrm{RatedPower[Par.1232]}}$$

Engine relative power

Configure the ignition map 1 according to the engine specification:





If a second map is needed, configure the ignition map 2 in the same way.

The interpolated ignition timing setpoint of both maps are displayed on following parameters:

Par. 3912 = Ignition timing setpoint from map1

Par. 3913 = Ignition timing setpoint from map2

The selection between Map 1 and 2 is done by the switch function SwitchIgnTimMap2Or1 [Par. 2848]:

Par. 2848 = 0 -> Map 1 active -> Par. 3915 = 1, Par. 3916 = 0

Par. 2848 = 1 -> Map 2 active -> Par. 3916 = 1, Par. 3915 = 0

When configured, the ignition map(s) must be activated by:

Par. 5910 = 1

11.7 Common Ignition timing offsets

General remark on ignition angles

Ignition angles of all cylinders (Par. 13550-13565) are worked out by the addition of 3 terms:

- the common ignition base timing (Par. 3911-3913) -> ↑*11.6* Common ignition-based timing
- the common ignition timing offsets (Par. 3917, Par. 3918) -> This paragraph
- the cylinder individual ignition angle offsets (Par. 13450-13515) -> ↑*11.8* Cylinder individual ignition angle offsets
  These angle offsets are internal configured values and external knock retards

Ignition angle [cyl] = **common base timing** + common timing offsets + cyl individual angle offsets [cyl]

Ignition angles and timings are always given in [° crank] before TDC, so positive angles are before TDC, negative angles after TDC. The ignition angles are limited in 2 steps. First the common ignition timing (common base timing + common timing offsets) will be limited in a range of [-10; 90°] before TDC. Additionally the final ignition angles (common ignition timing + cyl. Individual angle offsets) will also be limited in a range of [-10; 90°] before TDC

The common ignition timing offset can be applied in 2 ways: internally by using the ignition timing rotary switch on the PHLOX II housing or externally by using an analog or digital input. If both methods are used, the applied timing offset will be the addition of the internal and the external offsets.

The current common ignition timing is displayed as the addition of the common ignition base timing and the common ignition timing offsets in Par. 3910.

11.7.1 Internal ignition timing offset

To setup the internal common ignition timing offset, follow following steps:

- Par. 5919 = 1
- Turn the rotary switch on the PHLOX II housing to the desired position. The offset can be setup between -6 and +6 ° crank in 1° steps. As the rotary switch has no end position and to avoid sudden big steps in the ignition angles, the transition between -6 and +6 ° crank is done in 3° steps. This area should be in normal cases avoided. The following table gives the rotary switch positions and the corresponding ignition offsets:

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Offset	0	1	2	3	4	5	6	3	0	-3	-6	-5	-4	-3	-2	-1

The active internal common ignition timing offset is displayed in Par. 3918 and the actual rotary switch position in Par. 3920

11.7.2 External ignition timing offset

The external timing offset can be applied in 2 ways:

– by an analog setpoint, using the 0-5V or 4-20mA analog input (for example a potentiometer)

– by a digital input used as tristate switch (3 positions: +, -, neutral)

Whatever the method used, the active external common ignition timing offset displayed in Par. 3917 is added to the active common ignition base timing [Par. 3911-3913] to build the common ignition timing [Par. 3910] limited in the range [-10; 90°] before TDC.

- Analog external common ignition timing offset

To setup an analog common ignition timing offset (provided for example by a knock control unit), perform following configuration:

- Setup the sensor IgnitionTimingOffset [Par. 2900].

- Par. 5917 = 1

- Par. 5918 = 0

- Digital external common ignition timing offset

To setup a digital common ignition timing offset, perform following configuration:

- Setup the switch functions SwitchIgnTimOffsInc [Par. 2811] and

SwitchIgnTimOffsDec [Par. 2812]. It is recommended to use a tristate switch

and only one digital input for this purpose

- Par. 5917 = 1

- Par. 5918 = 1

- Par. 1917 = minimal digital ignition timing offset

- Par. 1918 = maximal digital ignition timing offset

- Par. 1919 = ignition timing offset step for each Increase or Decrease impulse

The actual active digital ignition timing offset is stored in a non-volatile memory after each modification and will be used as initial offset value after, for example, a reset of the control unit.

11.8 Cylinder individual ignition angle offsets

General remark on ignition angles

Ignition angles of all cylinders (Par. 13550-13565) are worked out by the addition of 3 terms:

– the common ignition base timing (Par. 3911-3913) -> ↑*11.6* Common ignition-based timing

– the common ignition timing offsets (Par. 3917, Par. 3918) -> ↑*11.7* Common Ignition timing offsets

– the cylinder individual ignition angle offsets (Par. 13450-13515) -> This paragraph
These angle offsets are internal configured values and external knock retards

Ignition angle [cyl] = **common base timing** + common timing offsets + cyl individual angle offsets [cyl]

Ignition angles and timings are always given in terms of [° crank] before TDC, so positive angles are before TDC, negative angles after TDC. The ignition angles are limited in 2 steps. Firstly, the common ignition timing (common base timing + common timing offsets) will be limited in a range of [-10; 90°] before TDC. Additionally the final ignition angles (common ignition timing + cyl. Individual angle offsets) will also be limited in a range of [-10; 90°] before TDC

Cylinder specific ignition angle offsets can be applied in 2 ways:

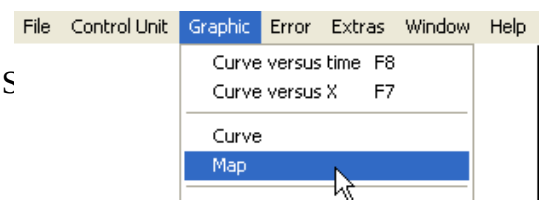
- Internally, cylinder individual speed- and load-dependent ignition angle correction maps can be used to modify the ignition angles of specific cylinders
- The PHLOX II control unit can be connected by CAN bus to the. Heinzmann Knock Control Unit (Ariadne). If such a connection is setup, the Ariadne will send cylinder specific ignition angle retards depending on the knock level measured on that cylinder.

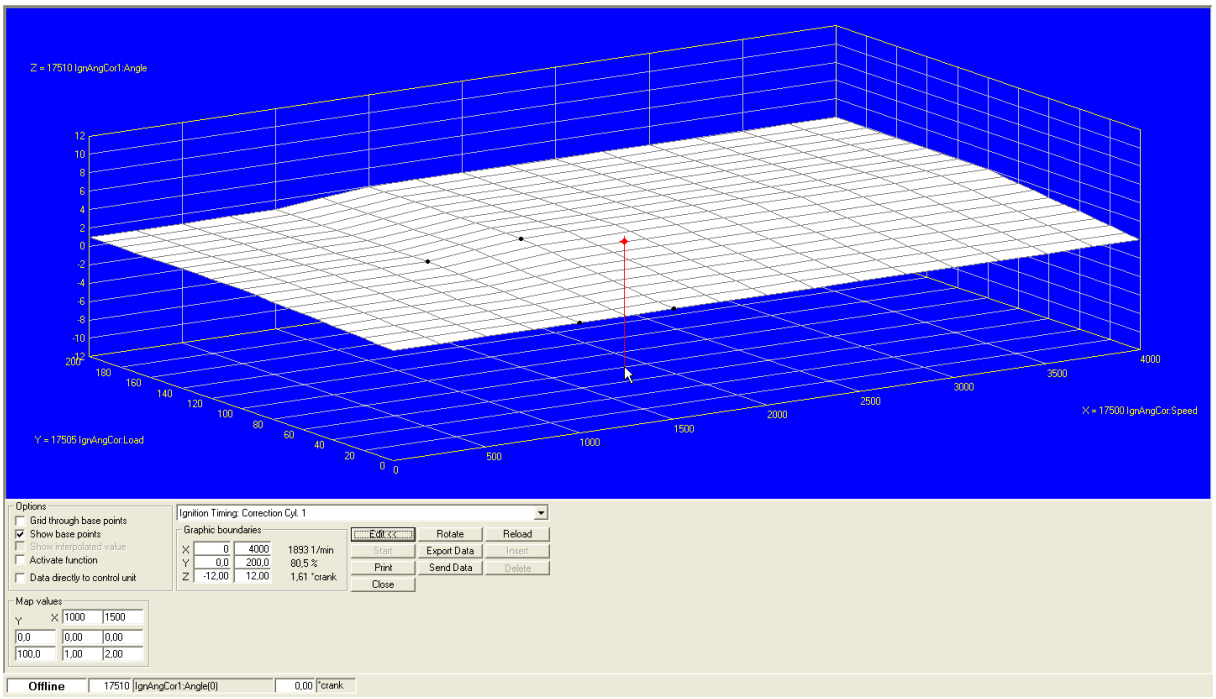
If both methods are used, the applied cylinder specific ignition angle offsets will be the addition of the internal cylinder specific ignition angle offsets and the external cylinder specific knock retards.

The active cylinder specific ignition angles are displayed in Par. 13550-13565

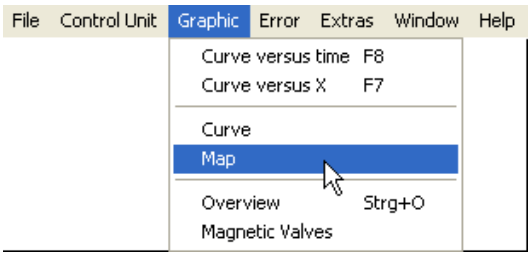
11.8.1 Internal cylinder individual ignition angle offsets

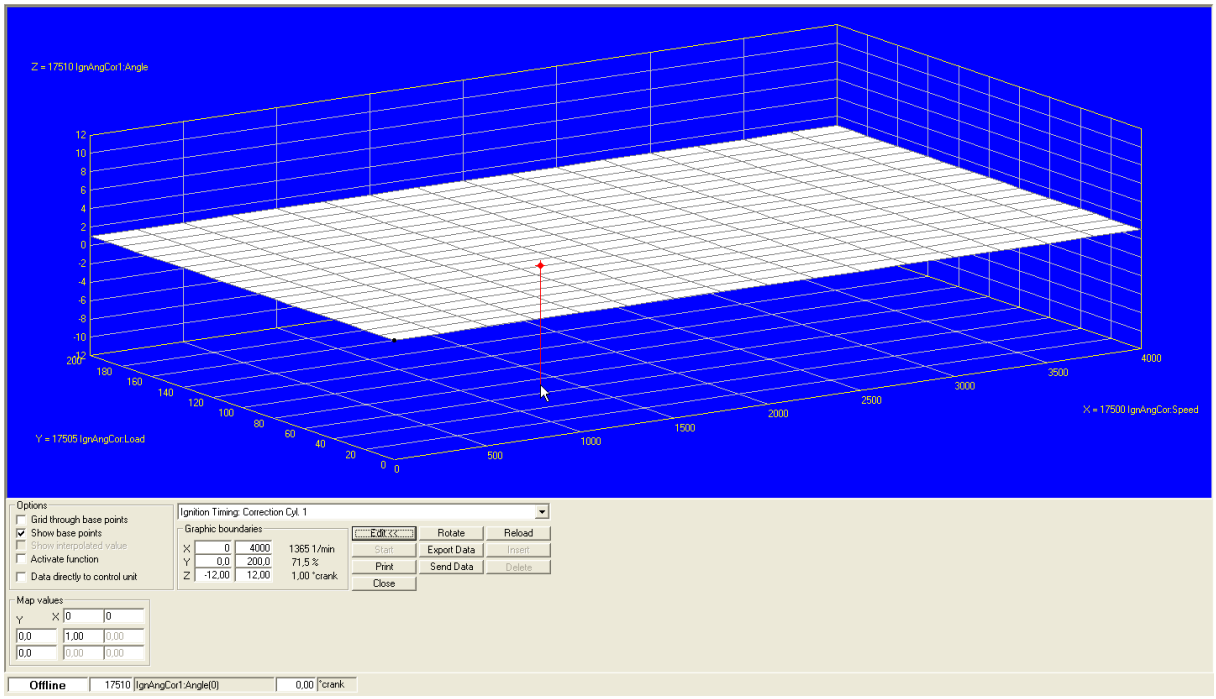
If necessary, the ignition angle of each cylinder can be modified by using cylinder individual speed- and load- ignition angle correction maps. To use this function, start by configuring all cylinder individual ignition angle correction maps:





It is, of course, possible to set up a fix cylinder individual ignition angle correction, which is independent of speed or load. To do this, delete the second column and the second diagram and setup the correction value in the upper left cell, as in the following example:





Once everything has been configured, the cylinder individual ignition angle correction maps must be activated by:

Par. 5920 = 1

11.8.2 External cylinder specific knock retards

If knock retards need to be used, the PHLOX II and Ariadne control units must be connected by CAN bus.

- CAN bus settings
  - To set up the baud rate of the CAN bus, perform following configuration

    PHLOX II and Ariadne:

    Par. 416 = baud rate [125, 250, 500, 1000 kBaud]

    Par. 4416 = 0

    Attention: the settings in both control units must be identical
  - To setup the CAN bus participant numbers of each control unit, perform following configuration:

    PHLOX II:

    Par. 401 = PHLOX CAN participant number

    Par. 430 = Ariadne CAN participant number

Ariadne:

Par. 401 = Ariadne CAN participant number

Par. 430 = PHLOX CAN participant number

Attention: settings must correspond to: Par 401 (PHLOX) = Par. 430 (Ariadne) and Par. 430 (PHLOX) = Par. 401 (Ariadne).

- To start the CAN bus communication, perform following configuration:

  PHLOX II and Ariadne:

  Par. 4405 = 1

- Knock retards settings

  Ariadne:

  Depending on the knock levels measured at each cylinder, the Ariadne control unit will send spark retard standardised values, in the range from 0 to 100%. The increase and decrease ramps for those retard values can be set using Par. 1920 and 1921

  PHLOX II:

  The standardised spark retard values sent by the Ariadne shall be converted into °crank. This is done using Par. 1916:

  Par. 1916 = Ignition angle offset [°Crank] corresponding to a spark retard of 100%

  As this is an ignition retard, this value must be negative.

- Activate knock retards

  To activate the knock retards, perform following configuration:

  Ariadne:

  Par. 5910 = 1 (activates knock control)

  Par. 5920 = 1 (activates spark retard)

  Par. 5921 = 1 (activates cylinder specific spark retards)

  PHLOX II:

  Par. 5916 = 1

  The knock retard values received from Ariadne are displayed in Par. 13400-13415

  The corresponding ignition angle offsets are displayed in Par. 13450-13465

  The active ignition angles are displayed in Par. 13550-13565

11.9 Ignition energy

The ignition energy in use can be set in a quite wide range. 32 different energy levels are available from app. 25 mJ (Ignition energy level 0) up to 280 mJ (Ignition energy level 31). The control unit continuously measures the energy stored in the ignition capacitor and gives feedback of the active ignition energy in Par. 13600-13615. The current setpoints are displayed for each cylinder in Par. 3950-3965

The ignition energy set points of all cylinders are found by the addition of 3 terms:

- The fix common ignition energy setpoint
- The external common ignition energy setpoint offset
- The cylinder specific ignition energy correction

The ignition energy set points are limited in 2 steps. First the common ignition energy set point (common energy set point + external common energy offset) will be limited in a range of [0; 31]. Additionally, the final ignition energy se points (common ignition energy set point + cyl. individual energy set point offsets) will again be limited in a range of [0; 31]

11.9.1 Fix common ignition energy set point

To setup the fix ignition energy set point, perform following configuration:

Par. 1940 = fix common ignition energy set point (from 0 for 25mJ to 31 for 280 mJ).

As a starting point, an ignition energy of 20 (ca. 180 mJ) would be recommendable.

11.9.2 External common ignition energy set point offset

The external common energy set point offset can be applied in 2 ways:

- using an analogue set point, using the 0-5V or 4-20mA analog input (for example a potentiometer)
- using a digital input as tristate switch (3 positions: +, -, neutral)

Whichever method is used, the external common ignition energy set point offset displayed in Par. 3947 is added to the fix common ignition energy set point [Par. 1940] calculate the common ignition energy set point [Par. 3940], limited to the range [0; 31].

- Analogue external common ignition energy set point offset

To setup an analogue common ignition energy set point offset, perform following configuration:

- Setup the sensor IgnitionEnergyOffset [Par. 2901].
- Par. 5947 = 1
- Par. 5948 = 0

- Digital external common ignition energy setpoint offset

To set up a digital common ignition energy set point offset, perform the following configuration:

- Set the switch functions SwitchIgnEgyOffsInc [Par. 2813] and SwitchIgnEgyOffsDec [Par. 2814]. Using recommended a tristate switch and only one digital input for this purpose are recommended
- Par. 5947 = 1
- Par. 5948 = 1
- Par. 1947 = minimal digital ignition energy setpoint offset
- Par. 1948 = maximal digital ignition energy setpoint offset

The actual active digital ignition energy set point offset is stored in a non-volatile memory after each modification and is used as the initial offset value after, for example, the control unit .

11.9.3 Cylinder specific ignition energy correction

To setup a cylinder specific correction of the ignition energy, perform following configuration:

- Set all the cylinder specific ignition energy corrections by configuring Par. 1950-1965. These terms will be added to the common ignition energy set point, and as a result may be positive or negative. In any case, the ignition energy set point of each cylinder will be between 0 and 31.
- Par. 5950 = 1

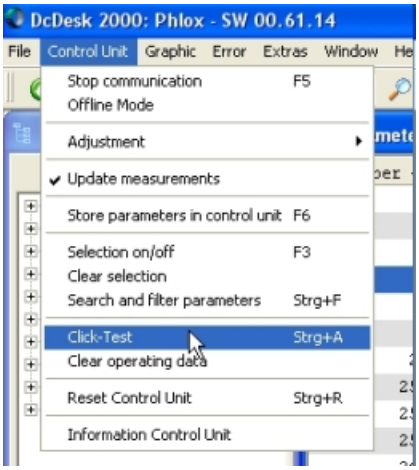
11.10 Ignition test

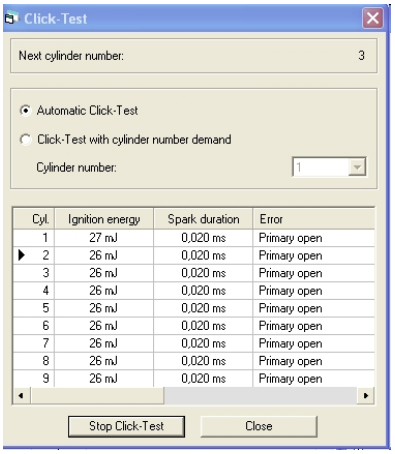
When the engine is stopped, a test mode can be found under the menu Control Unit -> Click-Test. The ignition test is started / stopped by using the relevant button in the ignition test window. During the test, ignition can be forced on one particular cylinder or on all cylinders alternatively. This test-mode is clearly indicated before the first time the engine starts up in order to verify that each PHLOX II output is connected to the right cylinder and that no problems occur with the primary and secondary circuits (for example short circuit in the primary cable, faulty sparkplug). To perform this test, high voltage cable(s) and sparkplug(s) must be disconnected from the engine and the spark plug ground connected to engine ground. All ignition diagnostics must be active while the test-mode is active.

High Voltage!

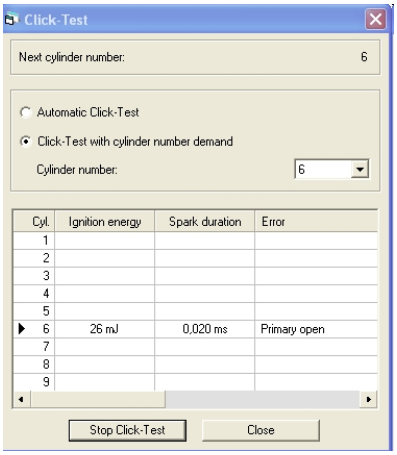
> Danger of serious injuries due to live currents!

> Do not touch any of the ignition components (spark plugs, high voltage cables, ignition coils) while the test is running





Ignition test on all cylinders alternatively



Ignition test on Cylinder Nr. 6

In the ignition test window, the measured ignition energy, the measured spark duration and the diagnostic messages will be displayed.

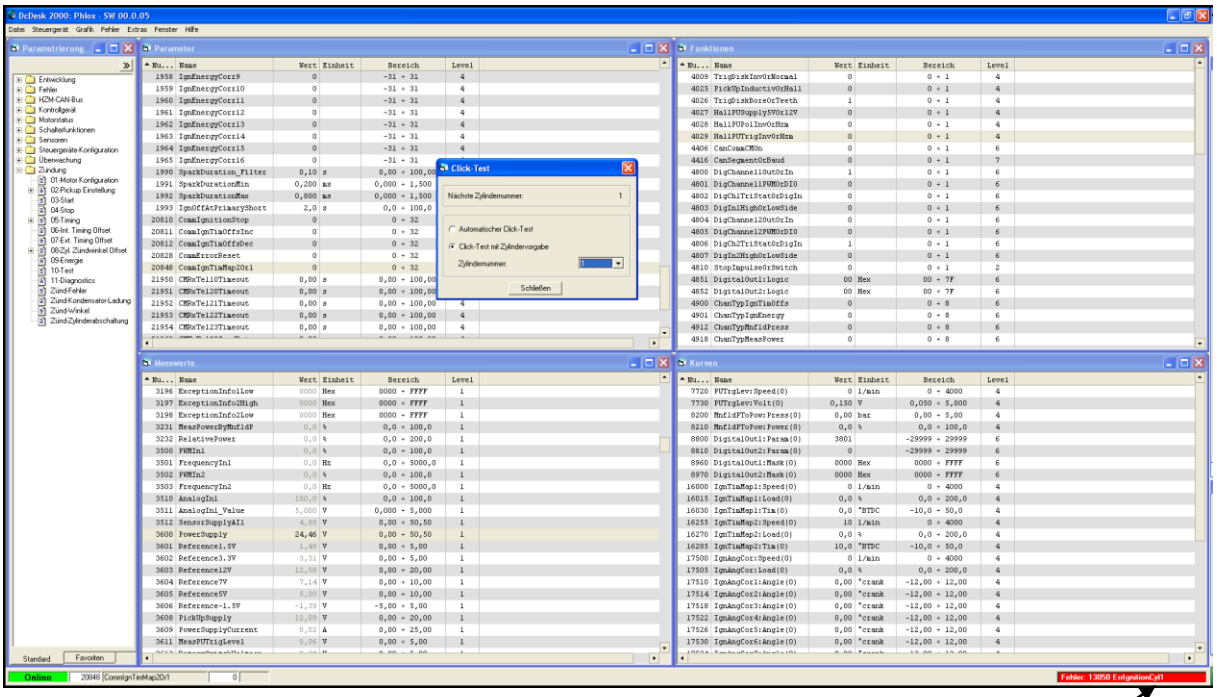
In addition to the test mode, it is recommended to first crank the engine without fuel and to verify the correct ignition angles of all cylinders using a stroboscope. If the measured ignition angle does not match with the setup (Par. 13550-13565), verify the engine firing order configuration (chapter 1) and the pick-up configuration (chapter 2). Note that modification on engine or pick-up configuration will only be active after saving all parameters and resetting the control unit.

11.11 Ignition diagnostics

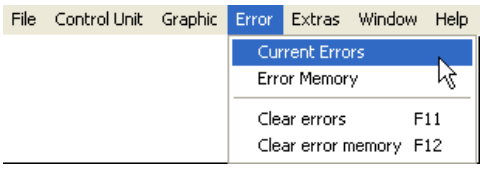
The ignition module continuously monitors the charge process of the integrated capacitor before ignition as well as the primary and secondary circuits during ignition. The following results are displayed for each cylinder:

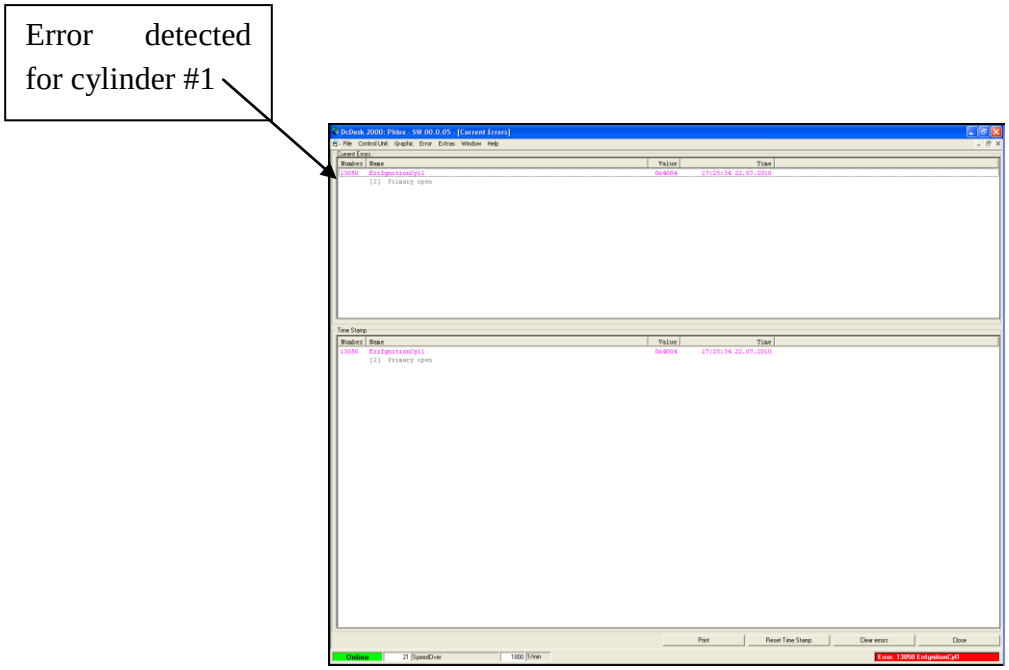
- Measurement of the energy stored in the capacitor before ignition [Par. 13600-13615]
- Duration of the charge process [Par. 13700-13715]
- Maximum available duration for the charge process [13750-13765]
- Spark duration [Par. 13650-13665]

Should an error occur, an error message [Par. 13050-13065] is displayed for the relevant cylinder. Details can be found in the current errors window. The different possible error types are listed below. Note: as the measured spark duration is taken as part of diagnostics, it is recommended that the filter is set to this measurement [Par. 1990], to a value higher than 1s to avoid false error messages. A delay can be applied on the secondary diagnostics (secondary open / short, spark duration low / high) by configuring Par. 1994.



Error detected for cylinder #1





- No charge

  This error is displayed if the energy level set point required has not been reached before ignition. In this case, the measured charge duration [Par. 13700-13715] should be higher than the maximum charge duration available [Par. 13750-13765].

  Possible causes:

  – Wrong pick-up configuration. Follow instructions given in paragraph 2

  – Unit power supply failure (for example empty battery). Check the measured power supply voltage [Par. 3600]. Note: the voltage may be correct at the engine stop but may fail when engine is running.

  – The min. and max. current settings for the charge process are inadequate [Par. 1950-1951]. Increase the max. current setting up to 20-25A.

  – Wrong cylinder individual ignition timing corrections (for example one cylinder with +12 deg BTDC, the next one with -12 deg BTFD).

- Primary Short

  This error is displayed if a short circuit is detected on the primary ignition coil circuit. In this case the spark duration [Par. 13650-13665] will be displayed as 0,010ms. As this kind of failure can overstress the unit, it is recommended that you turn off the ignition as soon

as possible to find and repair the cause of the failure. If needed the ignition can be turned off for a required time on the affected cylinder by setting Par. 1993 to a value higher than 0. The ignition circuit of this cylinder will be tested again once this interval has passed.

Possible causes:

- Cabling / connector failures
- Inversion of + and – on the ignition coil
- Ignition coil failure

- Primary open

This error is output if the primary circuit of the ignition coil is open. In this case the spark duration [Par. 13650-13665] will be displayed as 0,020ms.

Possible causes:

- Cabling / connector failures
- Ignition coil failure

- Secondary Short

This error is dispalyed when a short circuit condition is detected on the high voltage circuit. In this case the spark duration [Par. 13650-13665] will be displayed as a value higher than 1.300ms.

Possible causes:

- Spark plug failure (example: spark plug in need of exchange, short circuit between electrodes due to installation error …)
- Failure on the high voltage cable (bad isolation, flash over …)
- Ignition coil failure
- Energy set point too high (try to reduce the ignition energy level on this cylinder)

- Secondary Open

This error is displayed when an open circuit is detected on the high voltage circuit. In this case the spark duration [Par. 13650-13665] will be displayed 0,040 ms.

Possible causes:

- Spark plug failure
  (example: spark plug in need of exchange, no spark plug installed)
- Error in the high voltage cable

– Ignition coil error
– Energy set point too low (try to increase the ignition energy level of this cylinder)
– Cable between control unit and ignition coils too long or section of the cable too small.

- Spark Duration Low

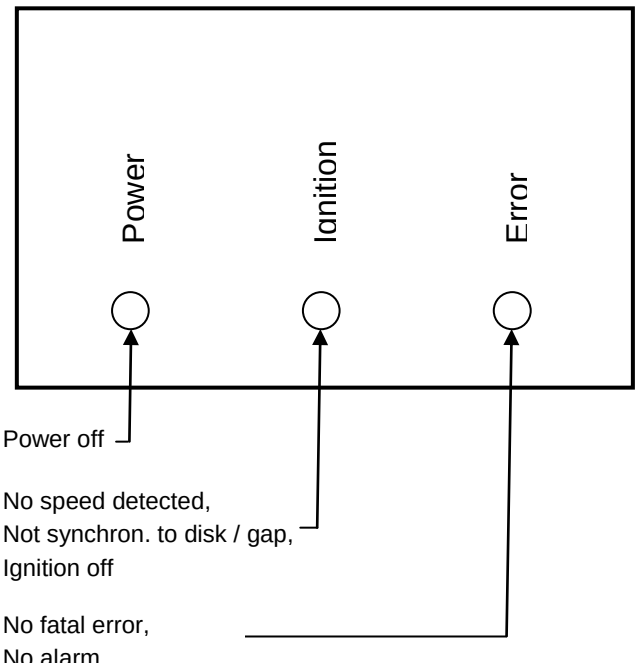
  This error is displayed when the measured spark duration [Par. 13650-13665] is below a configured limit [Par. 1991], for example 0,200ms.

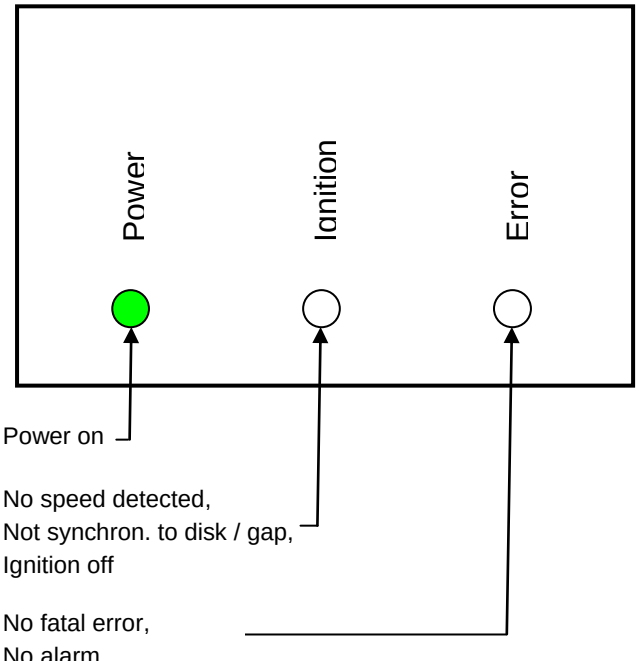
- Spark Duration High

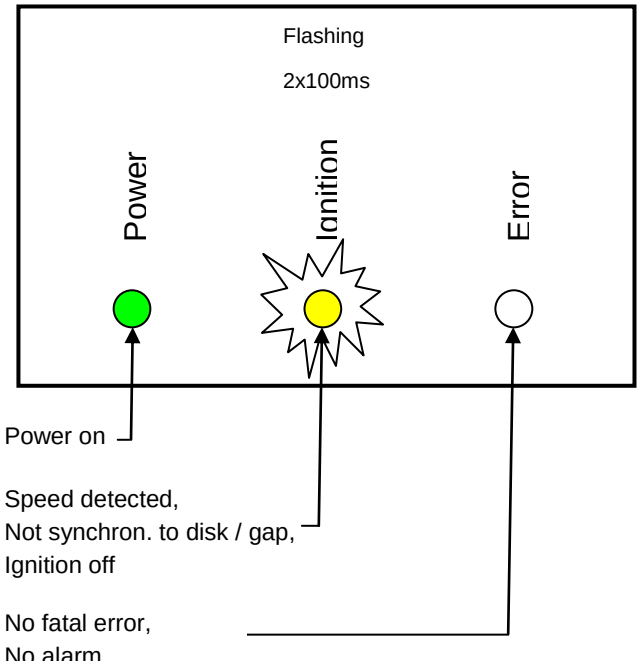
  This error is displayed when the measured spark duration [Par. 13650-13665] is higher than a configured limit [Par. 1992], for example 0,800ms.

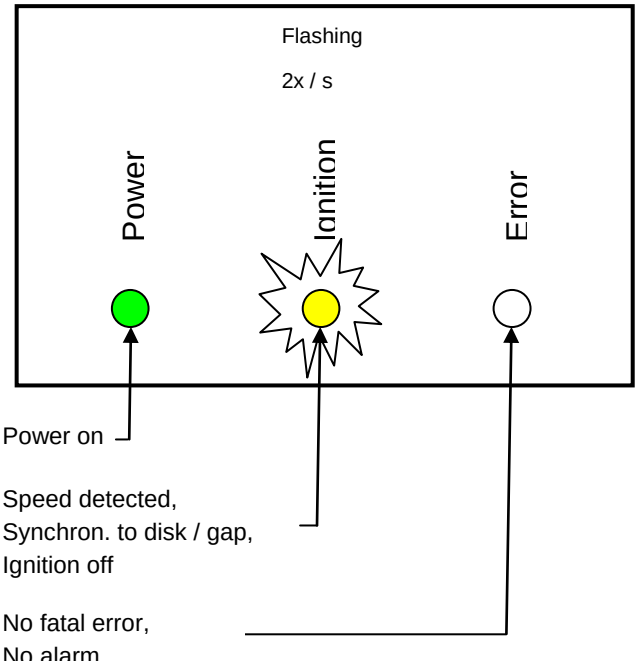
- Control unit LEDs

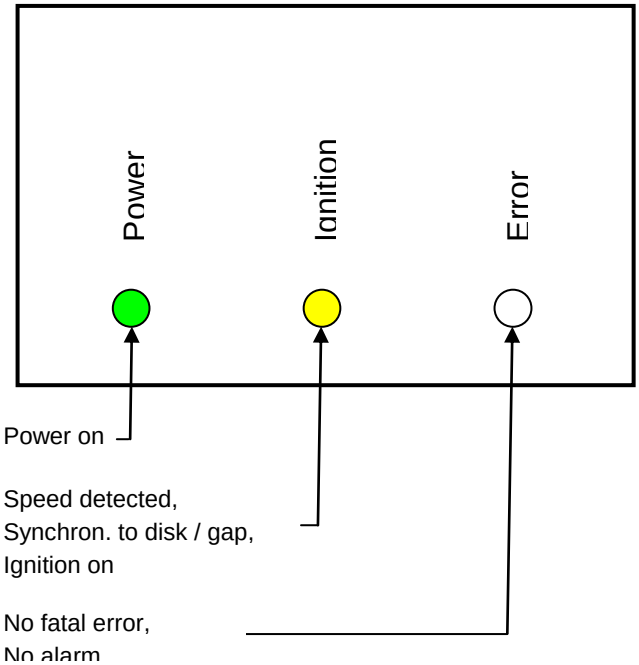
  This paragraph summarizes the different possible indication of the unit LEDs.

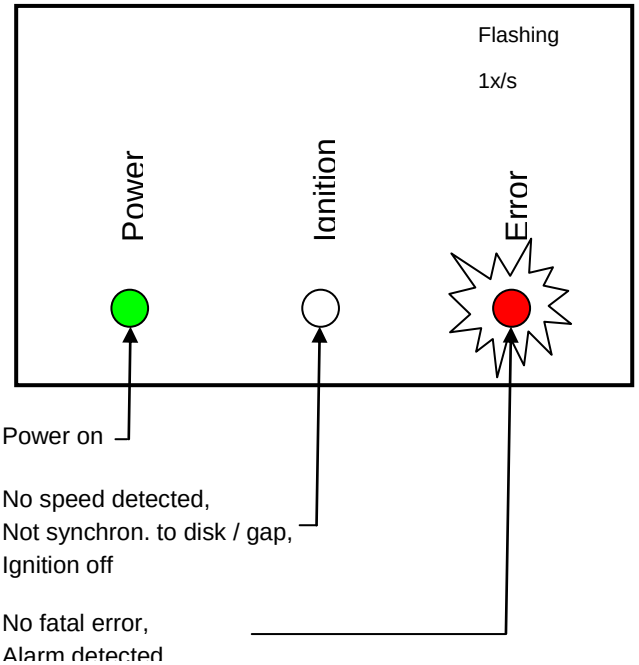


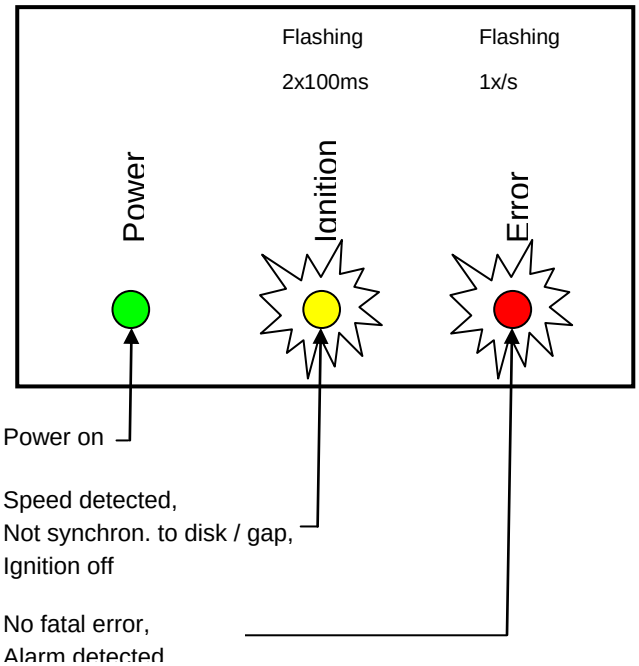


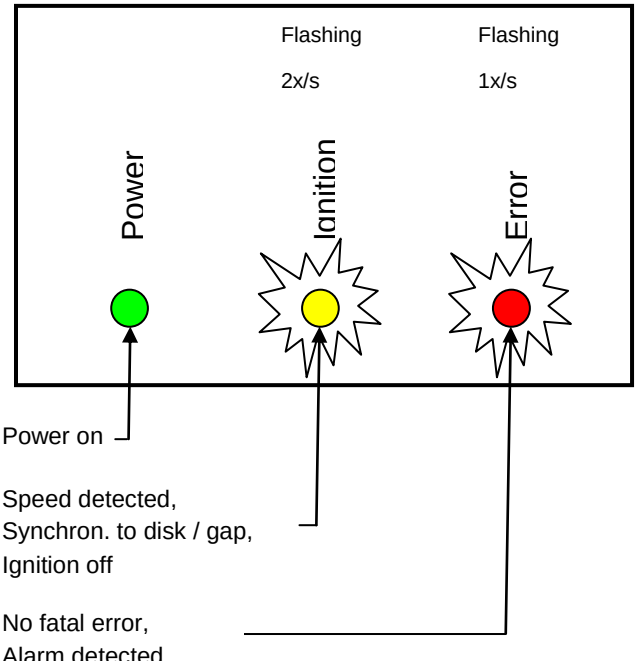

Flashing
2x100ms
Power
Ignition
Error
Power on
Speed detected,
Not synchron. to disk / gap,
Ignition off
No fatal error,
No alarm

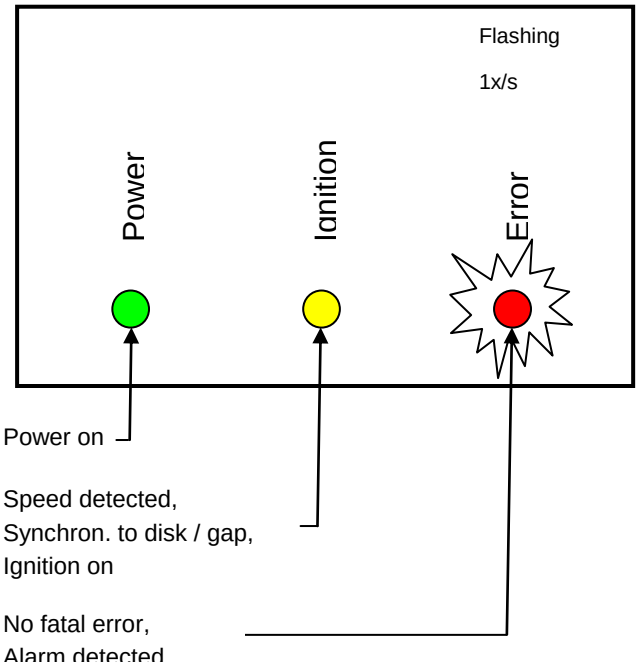

Flashing
2x / s
Power
Ignition
Error
Power on
Speed detected,
Synchron. to disk / gap,
Ignition off
No fatal error,
No alarm

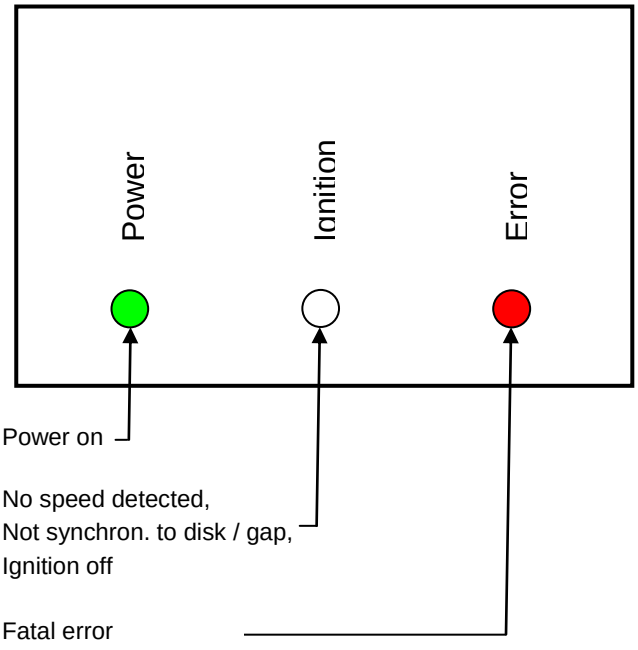

Power
Ignition
Error
Power on
Speed detected,
Synchron. to disk / gap,
Ignition on
No fatal error,
No alarm

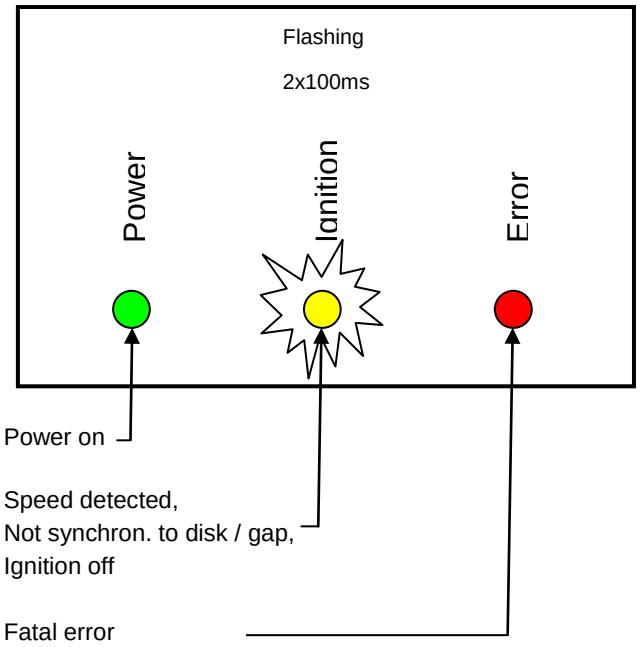

Flashing
1x/s
Power
Ignition
Error
Power on
No speed detected,
Not synchron. to disk / gap,
Ignition off
No fatal error,
Alarm detected

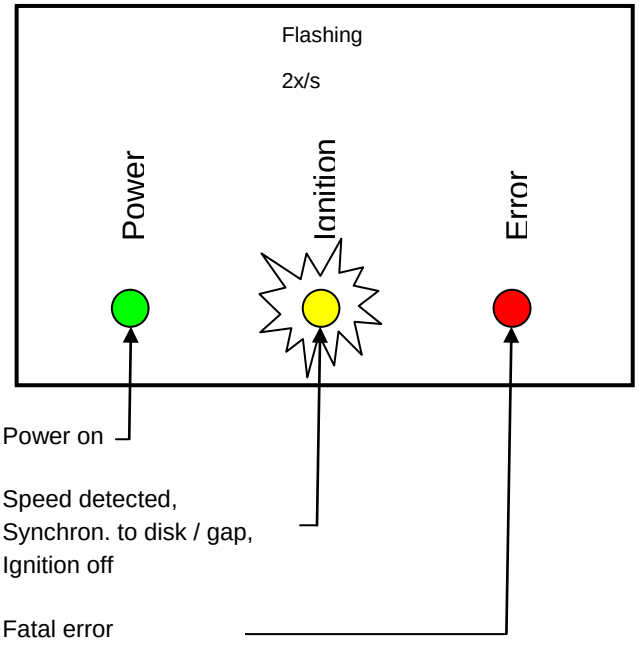

Flashing
2x100ms
Flashing
1x/s
Power
Ignition
Error
Power on
Speed detected,
Not synchron. to disk / gap,
Ignition off
No fatal error,
Alarm detected


Flashing
2x/s
Flashing
1x/s
Power
Ignition
Error
Power on
Speed detected,
Synchron. to disk / gap,
Ignition off
No fatal error,
Alarm detected


Flashing
1x/s
Power
Ignition
Error
Power on
Speed detected,
Synchron. to disk / gap,
Ignition on
No fatal error,
Alarm detected


Power
Ignition
Error
Power on
No speed detected,
Not synchron. to disk / gap,
Ignition off
Fatal error


Flashing
2x100ms
Power
Ignition
Error
Power on
Speed detected,
Not synchron. to disk / gap,
Ignition off
Fatal error


Flashing
2x/s
Power
Ignition
Error
Power on
Speed detected,
Synchron. to disk / gap,
Ignition off
Fatal error

12 Parameter Settings for PHLOX II Control Unit

The software for the HEINZMANN digital controllers is designed so that parameterising can be done either by the engine manufacturer or by the final customer, if the necessary instruments (communications tool) are available. Only a few basic parameters are pre-set in the HEINZMANN factory. This means that the digital governor usually gets its defining of data from a source outside HEINZMANN.

An exception is made for control units that are delivered in greater numbers. If HEINZMANN has been provided in advance with defining data, this can be transferred to the units in the factory.

Initial programming must always be conducted by experienced personnel and must be checked before the engine is first commissioned the.

How parameters are adjusted and their meaning is explained in detail in the manual "Basic information 2000".

The following sections describe the possibilities of parameterising the control unit:

12.1 Parameterisation with the Hand Held Programmer 3

All parameterisation can be done using the hand-held programmer ‘Programmer 3’. This handy device is particularly suited to development and series calibration as well as to servicing. This unit does not require external power supply.

12.2 Parameterisation with the PC / Laptop

Parameterisation can also be carried out using a PC and the convenient HEINZMANN communication software DcDesk 2000. Compared to the hand held programmer, it offers the great advantage of having various curves graphically represented on the screen and, at the same time at the same time being able to introduce changes as well as having time diagrams displayed without an oscilloscope when commissioning the control unit on the engine. Furthermore, the PC offers a better overview as the PC programme has a menu structure and allows having several parameters displayed simultaneously.

Additionally, the PC programme facilitates saving and downloading of operational data to and from data media. Furthermore the following useful application is available:

Once parameterisation has been completed for a specific engine type and its application, the data set can be saved to disk. The data sets can be downloaded and re-used with the new control units for future applications of similar type.

13 Parameter Description

13.1 Parameter Overview

Parameter		Measurements		Functions		Curves	
No.	Designation	No.	Designation	No.	Designation	No.	Designation
1	Number of Teeth/Speed	2000	Speed Pick-up/ Speed	4000	Speed Pick-up/ Speed	6000	
250	Ignition Start / Stop						
400	CAN bus	2400	CAN bus	4400	CAN bus		
800	Digital Switch Functions	2800	Digital Switch Functions	4798	Configuration of Digital Ports		
				4850	Digital outputs		
900	Sensors	2900	Sensors	4900	Sensors		
1000	Sensor Error Handling	3000	Actual Errors	5000	Sensor Error Handling		
				5110	Dig. / PWM outputs		
1500	PWM Inputs	3500	PWM Inputs				
1510	Analog Input	3510	Analog Input	5510	Configuration of Analogue Input		
1600	PWM Outputs	3600	Internal Measurements				
						7700	Magnetic Pick-ups Trigger Level
		3800	Status				
				5810	Configuration of Tristate Digital Inputs		
1900	Ignition Coil Outputs	3900	Ignition Coil Outputs	5900	Ignition Coil Outputs		
1910	Ignition	3910	Ignition	5910	Ignition		
						8200	Interpolation Manifold Pressure -> Engine Load
						8800	Digital Outputs
						16000	Ignition Timing Map 1
						16255	Ignition Timing Map 2
		13000	Actual Errors				
		13050	Actual Cylinder specific Ignition Errors				
11110	Dig. / PWM outputs						
		13400	Cylinder specific Knock spark retards				
		13450	Cylinder specific Knock Ignition angle Offsets				
		13500	Cylinder specific Ignition Angle Corrections			17500	Cylinder specific Ignition Angle Corrections
		13550	Ignition Angles				
		13600	Ignition Energy Measurements				
		13650	Ignition Spark Durations				
		13700	Ignition Charge Durations				
		13750	Ignition Charge Durations Max				
20810	Communication Switch Functions			24810	Communication Switch Functions		
		23720	Bit Collections				
21950	HZM-CAN Customer Module			25950	HZM-CAN Customer Module		
						29800	HZM-CAN Customer Module
						29900	Bit Collections

13.2 Parameters

1 TriggerDisk ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 2 ... 12 +1
Page(s):

Type of trigger disk installed on camshaft (x+1 indexes)

1 TeethPick-up ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 30 ... 255
Page(s):

Number of teeth on the measuring wheel

3 PickUpToRefIndex ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 720 °crank
Page(s):

Distance of pick-up sensor from the reference index on the trigger disk

3 SensorToGapPickUp ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 720 °crank
Page(s):

Distance of pick-up sensor from the reference mark on the crankshaft / camshaft wheel

5 SensorToCamIndex ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 720 °crank
Page(s):

Distance of camshaft index sensor from the reference mark on the camshaft wheel

6 GapRatio ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 1.10 ... 1.90
Page(s):

Ratio for determination of the synchronising mark – multiplier for the time between two teeth

7 GapToCamIndexMax ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 720 °crank
Page(s):

Allowed distance to camshaft index

9 EngineConfiguration

Level: 4
Range: 0 ... 13
Page(s):

Configuration of cylinder number and firing sequence

21 SpeedOver

Level: 4
Range: 0 ... 4000 1/min

Speed threshold for ignition stop in case of overspeed

100 ManEngCfg_CylNr

Level: 4
Range: 3 ... 20
Page(s):

Number of cylinders for manual firing order (Par. 4100 = 1)

101 ManEngCfg_TDCCyl1

Level: 4
Range: 0 ... 0
Page(s):

TDC angle of cylinder 1 for manual firing order (Par. 4100 = 1)

102 ManEngCfg_TDCCyl2

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 2 for manual firing order (Par. 4100 = 1)

103 ManEngCfg_TDCCyl3

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 3 for manual firing order (Par. 4100 = 1)

104 ManEngCfg_TDCCyl4

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 4 for manual firing order (Par. 4100 = 1)

105 ManEngCfg_TDCCyl5

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 5 for manual firing order (Par. 4100 = 1)

106 ManEngCfg_TDCCyl6

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 6 for manual firing order (Par. 4100 = 1)

107 ManEngCfg_TDCCyl7

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 7 for manual firing order (Par. 4100 = 1)

108 ManEngCfg_TDCCyl8

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 8 for manual firing order (Par. 4100 = 1)

109 ManEngCfg_TDCCyl9

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 9 for manual firing order (Par. 4100 = 1)

110 ManEngCfg_TDCCyl10

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 10 for manual firing order (Par. 4100 = 1)

111 ManEngCfg_TDCCyl11

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 11 for manual firing order (Par. 4100 = 1)

112 ManEngCfg_TDCCyl12

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 12 for manual firing order (Par. 4100 = 1)

113 ManEngCfg_TDCCyl13

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 13 for manual firing order (Par. 4100 = 1)

114 ManEngCfg_TDCCyl14

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 14 for manual firing order (Par. 4100 = 1)

115 ManEngCfg_TDCCyl15

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 15 for manual firing order (Par. 4100 = 1)

116 ManEngCfg_TDCCyl16

Level: 4
Range: 0 ... 720
Page(s):

TDC angle of cylinder 16 for manual firing order (Par. 4100 = 1)

131 ManEngCfg_OutNrCyl1

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 1 for manual firing order (Par. 4100 = 1)

132 ManEngCfg_OutNrCyl2

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 2 for manual firing order (Par. 4100 = 1)

133 ManEngCfg_OutNrCyl3

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 3 for manual firing order (Par. 4100 = 1)

134 ManEngCfg_OutNrCyl4

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 4 for manual firing order (Par. 4100 = 1)

135 ManEngCfg_OutNrCyl5

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 5 for manual firing order (Par. 4100 = 1)

136 ManEngCfg_OutNrCyl6

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 6 for manual firing order (Par. 4100 = 1)

137 ManEngCfg_OutNrCyl7

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 7 for manual firing order (Par. 4100 = 1)

138 ManEngCfg_OutNrCyl8

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 8 for manual firing order (Par. 4100 = 1)

139 ManEngCfg_OutNrCyl9

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 9 for manual firing order (Par. 4100 = 1)

140 ManEngCfg_OutNrCyl10

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 10 for manual firing order (Par. 4100 = 1)

141 ManEngCfg_OutNrCyl11

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 11 for manual firing order (Par. 4100 = 1)

142 ManEngCfg_OutNrCyl12

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 12 for manual firing order (Par. 4100 = 1)

143 ManEngCfg_OutNrCyl13

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 13 for manual firing order (Par. 4100 = 1)

144 ManEngCfg_OutNrCyl14

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 14 for manual firing order (Par. 4100 = 1)

145 ManEngCfg_OutNrCyl15

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 15 for manual firing order (Par. 4100 = 1)

146 ManEngCfg_OutNrCyl16

Level: 4
Range: 0 ... 16
Page(s):

Number of the Phlox output used for cylinder 16 for manual firing order (Par. 4100 = 1)

250 StartType

Level: 3
Range: 1 ... 2
Page(s):

Ignition start type

1: immediate start

2: delayed start

255 StartSpeed1

Level: 3
Range: 0 ... 4000 1/min
Page(s):

Minimum speed above which the engine is recognised as being cranked and ignition starts

256 StartSpeed2

Level: 3
Range: 0 ... 4000 1/min
Page(s):

Minimum speed above which engine is recognised to be running. If released but not yet started, ignition will start above that speed anyway.

265 StartDuration1

Level: 3
Range: 0 ... 100 s
Page(s):

Delay for ignition start if start type 2 is selected

400 CanStartTimeOutDelay

Level: 6
Range: 0 ... 100 s
Page(s):

Delay of HZM-CAN-connection monitoring after reset.

401 CanMyNodeNumber

Level: 6
Range: 1 ... 31
Page(s):

Own node numbers in HZM-CAN network

403 CanCMNodeNumber

Level: 6
Range: 1 ... 31
Page(s):

Node number of customer module in HZM-CAN network

416 CanBaudrate

Level: 6
Range: 125 ... 1000 kBaud
Page(s):

CAN baud rate

810 FunctIgnitionStop

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function “Ignition stop“

811 FunctIgnTimOffsInc

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function "Ignition Timing Offset Increase"

812 FunctIgnTimOffsDec

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function "Ignition Timing Offset Decrease"

813 FunctIgnEgyOffsInc

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function "Ignition Energy Offset Increase"

814 FunctIgnEgyOffsDec

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function "Ignition Energy Offset Decrease"

828 FunctErrorReset

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function "Ignition Error Reset"

848 FunctIgnTimMap2Or1

Level: 6
Range: -2 ... 2
Page(s):

Switch assignment to function "Ignition Timing Map 2 or 1"

900 AssignIn_IgnTimOffs

Level: 6
Range: 0 ... 16
Page(s):

Assignment of input channel to sensor "Ignition Timing Offset"

901 AssignIn_IgnEgyOffs

Level: 6
Range: 0 ... 16
Page(s):

Assignment of input channel to sensor "Ignition Energy Offset"

912 AssignIn_MnfldPress

Level: 6
Range: 0 ... 16
Page(s):

Assignment of input channel to sensor "Manifold Pressure"

918 AssignIn_MeasPower

Level: 6 Assignment of input channel to sensor "Measured Power"
Range: 0 ... 16
Page(s):

950 IgnTimOffsSensorLow

Level: 4 Minimum value of sensor "Ignition Timing Offset"
Range: -30 ... 30 °BTDC
Page(s):

951 IgnTimOffsSensorHigh

Level: 4 Maximum value of sensor "Ignition Timing Offset"
Range: -30 ... 30 °BTDC
Page(s):

952 IgnEgyOffsSensorLow

Level: 4 Minimum value of sensor "Ignition Energy Offset"
Range: 0 ... 31
Page(s):

953 IgnEgyOffsSensorHigh

Level: 4 Maximum value of sensor "Ignition Energy Offset"
Range: 0 ... 31
Page(s):

974 MnfldPressSensorLow

Level: 4 Minimum value of sensor "Manifold Pressure"
Range: 0 ... 5 bar
Page(s):

975 MnfldPressSensorHigh

Level: 4 Maximum value of sensor "Manifold Pressure"
Range: 0 ... 5 bar
Page(s):

1000 SubstIgnTimOffs

Level: 4 Substitute value of sensor "Ignition Timing Offset"
Range: -30 ... 30 °BTDC
Page(s):

1001 SubstIgnEgyOffs

Level: 4 Substitute value of sensor "Ignition Energy Offset"
Range: -31 ... 31
Page(s):

1012 SubstMnfldPress

Level: 4 Substitute value of sensor "Manifold Pressure"
Range: 0 ... 5 bar
Page(s):

1018 SubstMeasPower

Level: 4 Substitute value of sensor "Measured Power"
Range: 0 ... 100 %
Page(s):

1232 RatedPower

Level: 4 Rated power
Range: 0 ... 100 %
Page(s):

1500 PWMIn1_RefLow

Level: 4 Lower reference of PWM-Input 1
Range: 0 ... 100 %
Page(s):

1501 PWMIn1_RefHigh

Level: 4 Upper reference of PWM-Input 1
Range: 0 ... 100 %
Page(s):

1502 PWMIn2_RefLow

Level: 4 Lower reference of PWM-Input 2
Range: 0 ... 100 %
Page(s):

1503 PWMIn2_RefHigh

Level: 4 Upper reference of PWM-Input 2
Range: 0 ... 100 %
Page(s):

1510 AnalogIn1_RefLow

Level: 4 Lower reference value for analogue input
Range: 0 ... 5 V
Page(s):

1511 AnalogIn1_RefHigh

Level: 4 Upper reference value for analogue input
Range: 0 ... 5 V
Page(s):

1512 AnalogIn1_ErrorLow

Level: 4
Range: 0 ... 5 V
Page(s):

Lower error limit for analogue input

1513 AnalogIn1_ErrorHigh

Level: 4
Range: 0 ... 5 V
Page(s):

Upper error limit for analogue input

1514 AnalogIn1_Filter

Level: 4
Range: 0 ... 100 s
Page(s):

Filter value of analogue input

1600 PWMOut1_Assign

Level: 4
Range: -29999 ... 29999
Page(s):

Parameter assignment to PWM output 1

1601 PWMOut1_RefLow

Level: 4
Range: 0 ... 100 %
Page(s):

Minimum value of PWM output 1

1602 PWMOut1_RefHigh

Level: 4
Range: 0 ... 100 %
Page(s):

Maximum value of PWM output 1

1603 PWMOut1_ValueMin

Level: 4
Range: 0 ... 100 %
Page(s):

Minimum value of PWM output 1 in per cent of the value range of output parameter

1604 PWMOut1_ValueMax

Level: 4
Range: 0 ... 100 %
Page(s):

Maximum value of PWM output 1 in per cent of the value range of output parameter

1605 PWMOut2_Assign

Level: 4
Range: -29999 ... 29999
Page(s):

Parameter assignment to PWM output 2

1606 PWMOut2_RefLow

Level: 4
Range: 0 ... 100 %
Page(s):

Minimum value of PWM output 2

1607 PWMOut2_RefHigh

Level: 4
Range: 0 ... 100 %
Page(s):

Maximum value of PWM output 2

1608 PWMOut2_ValueMin

Level: 4
Range: 0 ... 100 %
Page(s):

Minimum value of PWM output 2 in per cent of the value range of output parameter

1609 PWMOut2_ValueMax

Level: 4
Range: 0 ... 100 %
Page(s):

Maximum value of PWM output 2 in per cent of the value range of output parameter

1651 PWMOut1_Frequency

Level: 4
Range: 50 ... 500 Hz
Page(s):

Frequency of PWM output 1

1652 PWMOut2_Frequency

Level: 4
Range: 50 ... 500 Hz
Page(s):

Frequency of PWM output 2

1800 Level

Level: 1
Range: 1 ... 7
Page(s):

User level

1876 ValueStep

Level: 2
Range: 0 ... 65535
Page(s):

Step width for value modifications (handheld programmer only)

1900 CylinderMask

Level: 6
Range: 0000 ... FFFF Hex
Page(s):

Mask on active cylinders

1905 ClickTestCylinder

Level: 2
Range: 0 ... 16
Page(s):

Selection of cylinder for click test

1910 IgnTimingFix

Level: 4
Range: -10 ... 90 °BTDC
Page(s):

Fix ignition base timing, common to all cylinders.

Active if Par. 5910 = 0

1916 IgnAngleKnockOffsMax

Level: 4
Range: -30 ... 0 °BTDC
Page(s):

Maximum knock ignition angle offset in °crank corresponding to a spark retard of 100%

1917 IgnTimingOffsDigMin

Level: 4
Range: -30 ... 30 °BTDC
Page(s):

Minimal digital ignition timing offset

1918 IgnTimingOffsDigMax

Level: 4
Range: -30 ... 30 °BTDC
Page(s):

Maximal digital ignition timing offset

1919 IgnTimingOffsStep

Level: 4
Range: 0 ... 12 °BTDC
Page(s):

Digital ignition timing offset step for each increase or decrease impulse

1939 MeasIgnEnergy_Filter

Level: 4
Range: 0 ... 100 s
Page(s):

Filter value for the ignition energy measurement

1940 IgnEnergySetpFix

Level: 4
Range: 0 ... 31 s
Page(s):

Fix ignition energy set point, common to all cylinders.

Active if Par. 5947 = 0

1947 IgnEgyOffsDigMin

Level: 4
Range: -31 ... 31 s
Page(s):

Minimum digital ignition energy offset

1948 IgnEgyOffsDigMax

Level: 4
Range: -31 ... 31 s
Page(s):

Maximum digital ignition energy offset

1950 IgnEnergyCorr1

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 1.

Active if Par. 5950 = 1

1951 IgnEnergyCorr2

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 2.

Active if Par. 5950 = 1

1952 IgnEnergyCorr3

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 3.

Active if Par. 5950 = 1

1953 IgnEnergyCorr4

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 4.

Active if Par. 5950 = 1

1954 IgnEnergyCorr5

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 5.

Active if Par. 5950 = 1

1955 IgnEnergyCorr6

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 6.

Active if Par. 5950 = 1

1956 IgnEnergyCorr7

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 7.

Active if Par. 5950 = 1

1957 IgnEnergyCorr8

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 8.

Active if Par. 5950 = 1

1958 IgnEnergyCorr9

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 9.

Active if Par. 5950 = 1

1959 IgnEnergyCorr10

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 10.

Active if Par. 5950 = 1

1960 IgnEnergyCorr11

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 11.

Active if Par. 5950 = 1

1961 IgnEnergyCorr12

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy setpoint offset for cylinder 12.

Active if Par. 5950 = 1

1962 IgnEnergyCorr13

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 13.

Active if Par. 5950 = 1

1963 IgnEnergyCorr14

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy setpoint offset for cylinder 14.

Active if Par. 5950 = 1

1964 IgnEnergyCorr15

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 15.

Active if Par. 5950 = 1

1965 IgnEnergyCorr16

Level: 4
Range: -31 ... 31
Page(s):

Cylinder specific Ignition energy set point offset for cylinder 16.

Active if Par. 5950 = 1

1990 SparkDuration_Filter

Level: 4
Range: 0 ... 100 s
Page(s):

Filter value for the ignition spark duration measurement

1991 SparkDurationMin

Level: 4
Range: 0 ... 1.5 ms
Page(s):

Lower error limit for spark duration

1992 SparkDurationMax

Level: 4
Range: 0 ... 1.5 ms
Page(s):

Upper error limit for spark duration

1993 IgnOffAtPrimaryShort

Level: 6
Range: 0 ... 100 s
Page(s):

Off-time while ignition is suspended on one cylinder if a primary short condition has been detected

1994 SpkDurationErrDelay

Level: 4
Range: 0 ... 100 s
Page(s):

Delay for secondary diagnostics (secondary short / open, spark duration too low / high)

11120 DOPWM2_DelayTime

Level: 6
Range: 0 ... 2.55 s
Page(s):

Delay for error report at digital / PWM output 2

20810 CommIgnitionStop

Level: 6
Range: 0 ... 32
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Switch assignment to function "Ignition stop" via communication modules

20811 CommIgnTimOffsInc

Level: 6
Range: 0 ... 32
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Switch assignment to function "Ignition Timing Offset Increase" via communication modules

20812 CommIgnTimOffsDec

HZM CAN Customer-Module Manual DG 05007-e

Level:			6	
Range:	0	...	32	Switch assignment to function "Ignition Timing Offset Decrease" via communication modules
Page(s):				

20813 CommIgnEgyOffsInc

HZM CAN Customer-Module Manual DG 05007-e

Level:			6	
Range:	0	...	32	Switch assignment to function "Ignition Energy Offset Increase" via communication modules
Page(s):				

20814 CommIgnEgyOffsDec

HZM CAN Customer-Module Manual DG 05007-e

Level:			6	
Range:	0	...	32	Switch assignment to function "Ignition Energy Offset Decrease" via communication modules
Page(s):				

20828 CommErrorReset

HZM CAN Customer-Module Manual DG 05007-e

Level:			6	
Range:	0	...	32	Switch assignment to function "Ignition Error Reset" via communication modules
Page(s):				

20848 CommIgnTimMap2Or1

HZM CAN Customer-Module Manual DG 05007-e

Level:			6	
Range:	0	...	32	Switch assignment to function "Ignition Timing Map 2 or 1" via communication modules
Page(s):				

21950 CMRxTel*XX*Timeout

up to 21954

HZM CAN Customer-Module Manual DG 05007-e

Level:			4	
Range:	0	... 100	s	Timeout on receiving telegram *XX*
Page(s):				

21960 CMTxTel*XX*SendRate

up to 21983

HZM CAN Customer-Module Manual DG 05007-e

Level:			4	
Range:	0	... 100	s	Sending rate of telegram *XX*
Page(s):				

13.3 Measurements

2000 Speed

Level: 1
Range: 0 ... 4000 1/min
Page(s):

Current speed

2003 SpeedPickUpValue ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 4000 1/min
Page(s):

Unfiltered speed as read by speed pick-up

2005 ActivePick-up ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 2
Page(s):

Active pick-up check

2006 PMMErrorCode ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error code relating to recognition of tooth gap

2007 SynchronToGap

Level: 1
Range: 0 ... 1
Page(s):

Message showing that trigger disk / tooth gap has been recognised

2008 TryToFindGap ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 1
Page(s):

Message indicating that tooth gap is being searched for (in case of lost camshaft index sensor signal)

2009 SpeedPickUpValue ***Firmware versions AAA.B0.DDD***

Level: 1
Range: 0 ... 4000 1/min
Page(s):

Unfiltered speed as read by speed pick-up

2009 SpeedCamIndex ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 4000 1/min
Page(s):

Current speed value from camshaft index sensor

2010 GapToCamIndex ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 720 °crank

Distance in degrees of crankshaft angle between synchronisation gap and camshaft index

2011 GapToCamIndexValue ***Firmware versions AAA.B1/2.DDD***

Level: 6
Range: 0 ... 720 °crank
Page(s):

Unfiltered distance in degrees of crankshaft angle between synchronisation gap and camshaft index

2250 EngineStartCounter

Level: 1
Range: 0 ... 65535
Page(s):

Number of engine starts since counter was cleared last

2401 CanTxBufferState

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

State of CAN source buffer

2402 CanRxBufferState

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

State of CAN destination buffer

2403 CanRxTimeout

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

State of CAN destination timeout monitoring

2404 CanTypeMismatch

Level: 1
Range: 0 ... 1
Page(s):

Message indicating a conflict of 2 devices of the same type and number on the HZM-CAN bus

2405 CanOnline

Level: 1
Range: 0 ... 1
Page(s):

Message indicating that the CAN-controller is active

2406 CanState

Level: 1
Range: 00 ... FF Hex
Page(s):

General state of CAN controller

2420 CanACNodeState31to16

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM-CAN:

Indication of activity for auxiliary controller with node number 16 ... 31

2421 CanACNodeState15to01

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM-CAN:
Indication of activity of auxiliary controller with node number 1 ... 15

2422 CanCMNodeState31to16

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM-CAN:
Indication of activity of customer module with node number 16 ... 31

2423 CanCMNodeState15to01

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM-CAN:
Indication of activity of customer module with node number 1 ... 15

2424 CanPCNodeState31to16

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM-CAN Dialog/Diagnose:
Indication of activity of PC with node number 16 ... 31

2425 CanPCNodeState15to01

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM-CAN Dialog/Diagnose:
Indication of activity of PC with node number 1 ... 15

2549 ACModulesMax

Level: 1
Range: 0 ... 1
Page(s):

HZM-CAN:
Amount of auxiliary controllers supported (all types)

2550 ACModulesMaxType(0)

Level: 1
Range: 0 ... 1
Page(s):

HZM-CAN:
Amount of auxiliary controllers of type PHLOX II supported

2551 ACModulesMaxType(1)

Level: 1
Range: 0 ... 1
Page(s):

HZM-CAN:
Amount of auxiliary controllers of type Ariadne supported

2552 ACModulesMaxType(2)

Level: 1
Range: 0 ... 1
Page(s):

HZM-CAN:
Amount of auxiliary controllers of type Elektra supported

2553 ACModulesMaxType(3)

Level: 1 HZM-CAN:
Range: 0 ... 1 Amount of auxiliary controllers of type Kronos 20 supported
Page(s):

2810 SwitchIgnitionStop

Level: 1 Switch position "Ignition stop"
Range: 0 ... 1
Page(s):

2811 SwitchIgnTimOffsInc

Level: 1 Switch position "Ignition Timing Offset Increase"
Range: 0 ... 1
Page(s):

2812 SwitchIgnTimOffsDec

Level: 1 Switch position "Ignition Timing Offset Decrease"
Range: 0 ... 1
Page(s):

2813 SwitchIgnEgyOffsInc

Level: 1 Switch position "Ignition Energy Offset Increase"
Range: 0 ... 1
Page(s):

2814 SwitchIgnEgyOffsDec

Level: 1 Switch position "Ignition Energy Offset Decrease"
Range: 0 ... 1
Page(s):

2828 SwitchErrorReset

Level: 1 Switch position "Error Reset"
Range: 0 ... 1
Page(s):

2848 SwitchIgnTimMap2Or1

Level: 1 Switch position "Ignition Timing Map 2 or 1"
Range: 0 ... 1
Page(s):

2851 DigitalOut1

Level: 1 State of digital output 1
Range: 0 ... 1
Page(s):

2852 DigitalOut2

Level: 1
Range: 0 ... 1
Page(s):

State of digital output 2

2855 AlarmLEDNormalState

Level: 1
Range: 0 ... 1
Page(s):

Red LED state on PHLOX II housing in normal operation mode

2856 AlarmLEDFlashState

Level: 1
Range: 0 ... 1
Page(s):

Red LED state on PHLOX II housing in extended operation mode

2857 IgnLEDNormalState

Level: 1
Range: 0 ... 1
Page(s):

Yellow LED state on PHLOX II housing in normal operation mode

2858 IgnLEDFlashState

Level: 1
Range: 0 ... 1
Page(s):

Yellow LED state on PHLOX II housing in extended operation mode

2900 IgnitionTimingOffset

Level: 1
Range: -30 ... 30 °BTDC
Page(s):

Current value of sensor "Ignition Timing Offset"

2901 IgnitionEnergyOffset

Level: 1
Range: -31 ... 31
Page(s):

Current value of sensor "Ignition Energy Offset"

2912 ManifoldPressure

Level: 1
Range: 0 ... 5 bar
Page(s):

Current value of sensor "Manifold Pressure"

2918 MeasuredPower

Level: 1
Range: 0 ... 100 %
Page(s):

Current value of sensor "Measured Power"

3000 ConfigurationError

Level: 1 Indication of configuration errors
Range: 0 ... 65535
Page(s):

3001 ErrPickUp ***Firmware versions AAA.B1/2.DDD***

Level: 1 Error message - speed pick-up
Range: 0000 ... FFFF Hex
Page(s):

3003 ErrPickUp ***Firmware versions AAA.B0.DDD***

Level: 1 Error report - speed pick-up
Range: 0000 ... FFFF Hex
Page(s):

3003 ErrPickUpIndex ***Firmware versions AAA.B1/2.DDD***

Level: 1 Error report - camshaft index pick-up
Range: 0000 ... FFFF Hex
Page(s):

3004 ErrOverSpeed

Level: 1 Error report - overspeed
Range: 0000 ... FFFF Hex
Page(s):

3005 ErrExtIgnTimingOffs

Level: 1 Error report - sensor "Ignition Timing Offset"
Range: 0000 ... FFFF Hex
Page(s):

3006 ErrExtIgnEnergyOffs

Level: 1 Error report - sensor "Ignition Energy Offset"
Range: 0000 ... FFFF Hex
Page(s):

3017 ErrMnfldPress

Level: 1 Error report - sensor "Manifold Pressure"
Range: 0000 ... FFFF Hex
Page(s):

3023 ErrMeasuredPower

Level: 1 Error report - sensor "Measured Power"
Range: 0000 ... FFFF Hex
Page(s):

3035 ErrIgnitionTiming

Level: 1 Error report - ignition timing overlapping
Range: 0000 ... FFFF Hex
Page(s):

3036 ErrSynchronisation

Level: 1 Error report - pick-up synchronisation with trigger disk
Range: 0000 ... FFFF Hex
Page(s):

3038 ErrIgnitionShutdown

Level: 1 Error report - hardwired ignition shutdown
Range: 0000 ... FFFF Hex
Page(s):

3070 ErrCanBus1

Level: 1 Error report - CAN bus 1
Range: 0000 ... FFFF Hex
Page(s):

3071 ErrCanComm1

Level: 1 Error report - CAN communication via CAN bus 1
Range: 0000 ... FFFF Hex
Page(s):

3075 ErrIntADRef

Level: 1 Error report - the AD converter internal reference channels
Range: 0000 ... FFFF Hex
Page(s):

3076 ErrRotarySwitch

Level: 1 Error report - the ignition timing offset rotary switch on the
Range: 0000 ... FFFF Hex PHLOX II housing
Page(s):

3077 ErrIntTempAddModul1

Level: 1 Error report - internal temperature measurement on the addi-
Range: 0000 ... FFFF Hex tional module 1 (sensor error / over temperature)
Page(s):

3078 ErrIntTempAddModul2

Level: 1 Error report - internal temperature measurement on the addi-
Range: 0000 ... FFFF Hex tional module 2 (sensor error / over temperature)
Page(s):

3079 ErrIntTempDCDCAir

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - internal air temperature measurement of DCDC converter (sensor error / over temperature)

3080 ErrIntTempDCDCMosfet

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - internal mosfet temperature measurement of DCDC converter (sensor error / over temperature)

3081 ErrIntTempDCDCTrafo

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - internal temperature measurement of DCDC converter (sensor error / over temperature)

3082 ErrIntTempCaseOutput

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - internal housing temperature at output connector (sensor error / over temperature)

3083 ErrIntTempCaseInput

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - internal housing temperature at input connector (sensor error / over temperature)

3084 ErrIntTempAirInput

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - internal air temperature at input connector (sensor error / over temperature)

3085 ErrPowerSupply

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - unit at 24V power supply

3086 ErrIntVoltSupply

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - the internal voltage references

3087 ErrEEPROM

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Error report - EEPROM

3092 ErrConfiguration

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Configuration error

3094 ErrIntern

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Internal error - control device

3190 ExceptionNumber

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: exception number

3191 ExceptionAddr1High

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: address 1 where exception has occurred (high)

3192 ExceptionAddr1Low

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: address 1 where exception has occurred (low)

3193 ExceptionAddr2High

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: address 2 where exception has occurred (high)

3194 ExceptionAddr2Low

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: address 2 where exception has occurred (low)

3195 ExceptionInfo1High

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: information 1 about the exception (high)

3196 ExceptionInfo1Low

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: information 1 about the exception (low)

3197 ExceptionInfo2High

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: information 2 about the exception (high)

3198 ExceptionInfo2Low

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Indication of the last saved exception error: information 2 about the exception (low)

3231 MeasPowerByMnfldP

Level: 1
Range: 0 ... 100 %
Page(s):

Measured power interpolated from manifold pressure sensor

3232 RelativePower

Level: 1
Range: 0 ... 200 %
Page(s):

Relative power as related to rated power

3500 PWMIn1

Level: 1
Range: 0 ... 100 %
Page(s):

Current value of PWM input 1

3501 FrequencyIn1

Level: 1
Range: 0 ... 5000 Hz
Page(s):

Current frequency of PWM input 1

3502 PWMIn2

Level: 1
Range: 0 ... 100 %
Page(s):

Current value of PWM input 2

3503 FrequencyIn2

Level: 1
Range: 0 ... 5000 Hz
Page(s):

Current frequency of PWM input 2

3510 AnalogIn1

Level: 1
Range: 0 ... 100 %
Page(s):

Normalised value of analogue input in % related to sensor range

3511 AnalogIn1_Value

Level: 1 Raw value of analogue input
Range: 0 ... 5 V
Page(s):

3512 SensorSupplyAI1

Level: 1 Current value of sensor power supply for analogue input
Range: 0 ... 50,5 V
Page(s):

3600 PowerSupply

Level: 1 Current value of power supply in control unit
Range: 0 ... 50,5 V
Page(s):

3601 Reference1.5V

Level: 1 Current value of internal 1.5V supply
Range: 0 ... 5 V
Page(s):

3602 Reference3.3V

Level: 1 Current value of internal 3.3V supply
Range: 0 ... 5 V
Page(s):

3603 Reference12V

Level: 1 Current value of internal 12V supply
Range: 0 ... 20 V
Page(s):

3604 Reference7V

Level: 1 Current value of internal 7V supply
Range: 0 ... 10 V
Page(s):

3605 Reference5V

Level: 1 Current value of internal 5V supply
Range: 0 ... 10 V
Page(s):

3606 Reference-1.5V

Level: 1 Current value of internal -1.5V supply
Range: -5 ... 5 V
Page(s):

3607 PickUpSupply ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 20 V
Page(s):

Current value of supply voltage for pick-up (Hall pick-up only)

3608 PickUpSupply ***Firmware versions AAA.B0.DDD***

Level: 1
Range: 0 ... 20 V
Page(s):

Current value of supply voltage for pick-up (Hall pick-up only)

3608 CamIxSupply ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 20 V
Page(s):

Current value of supply voltage for camshaft index pick-up (Hall pick-up only)

3609 PowerSupplyCurrent

Level: 1
Range: 0 ... 25 A
Page(s):

Current value of control unit current consumption

3610 MeasPUTrigLevel ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 5 V
Page(s):

Current value of pick-up signal trigger level (magnetic / inductive pick-up only)

3611 MeasPUTrigLevel ***Firmware versions AAA.B0.DDD***

Level: 1
Range: 0 ... 5 V
Page(s):

Current value of pick-up signal trigger level (magnetic / inductive pick-up only)

3611 MeasCamIxTrigLevel ***Firmware versions AAA.B1/2.DDD***

Level: 1
Range: 0 ... 5 V
Page(s):

Current value of camshaft index pick-up signal trigger level (magnetic / inductive pick-up only)

3612 RotarySwitchVoltage

Level: 1
Range: 0 ... 5 V
Page(s):

Current value of voltage measured from the ignition timing offset rotary switch on the PHLOX II housing

3615 DigChannel1PinState

Level: 1
Range: 0 ... 1
Page(s):

Current pin state of digital channel 1

3616 DigChannel2PinState

Level: 1
Range: 0 ... 1
Page(s):

Current pin state of digital channel 2

3620 InternTempAddModul1

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal temperature measurement at additional module 1

3621 InternTempAddModul2

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal temperature measurement at additional module 2

3622 InternTempDC/DC_Air

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal air temperature measurement of DCDC converter

3623 InternTempDCDCMosfet

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal mosfet temperature measurement of DCDC converter

3624 InternTempDCDC_Trafo

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal temperature measurement of DCDC converter

3625 InternTempCaseOutput

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal housing temperature at output connector

3626 InternTempCaseInput

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal housing temperature at input connector

3627 InternTempAirInput

Level: 1
Range: -100 ... 1000 °C
Page(s):

Current value of internal air temperature at input connector

3799 CommonWarning

Level: 1
Range: 0 ... 1
Page(s):
Message indicating that all errors present are only warnings

3800 EmergencyAlarm

Level: 1
Range: 0 ... 1
Page(s):
Message about emergency alarm (ignition is stopped)

3801 CommonAlarm

Level: 1
Range: 0 ... 1
Page(s):
Message about common alarm

3802 IgnitionStopRequest

Level: 1
Range: 0 ... 1
Page(s):
Message indicating that the ignition has been stopped via an internally or externally applied ignition stop command

3803 EngineStopped

Level: 1
Range: 0 ... 1
Page(s):
Message that engine has stopped

3804 EngineStarting

Level: 1
Range: 0 ... 1
Page(s):
Message that engine is starting

3805 EngineRunning

Level: 1
Range: 0 ... 1
Page(s):
Message that engine is running

3806 IgnitionReleased

Level: 1
Range: 0 ... 1
Page(s):
Message that ignition is released

3807 IgnitionActive

Level: 1
Range: 0 ... 1
Page(s):
Message that ignition is active

3830 Phase

Level: 1
Range: 0 ... 8
Page(s):

Current ignition control phase

3839 PhloxType

Level: 1
Range: 1 ... 2
Page(s):

Indicates the Phlox type (I or II)

3842 SoftwareVersion

Level: 1
Range: 00.0.00 ... 65.5.35
Page(s):

Software version number (Firmware)
2 places customer ID, 1 place variant, 2 places revision index

3843 BootSoftwareVersion

Level: 1
Range: 00.0.00 ... 65.5.35
Page(s):

Boot loader software version number

3844 SerialDate

Level: 1
Range: 0 ... 9912
Page(s):

Control device hardware serial date

3845 SerialNumber

Level: 1
Range: 0 ... 65535
Page(s):

Control device hardware serial number of

3846 HardwareStatus

Level: 1
Range: 0 ... 3
Page(s):

Control device hardware variant

3847 DownloadCounter

Level: 1
Range: 0 ... 65535
Page(s):

Number of control device firmware downloads,

3848 HardwareStatusBit0

Level: 1
Range: 0 ... 1
Page(s):

Hardware variant status bit 0 of control device hardware

3849 HardwareStatusBit1

Level: 1
Range: 0 ... 1
Page(s):

Control device hardware variant status bit 1

3850 Identifier

Level: 1
Range: 0 ... 65535
Page(s):

Identification number of PC programme\handheld device programme

3851 LastIdentifier

Level: 1
Range: 0 ... 65535
Page(s):

Identification number of PC programme\handheld device programme of last memorized parameter modification

3857 CompileTime

Level: 1
Range: 0 ... 2359
Page(s):

active firmware compile time message

3858 CompileDate

Level: 1
Range: 0 ... 3112
Page(s):

active firmware compile date message

3859 CompileYear

Level: 1
Range: 2000 ... 3000
Page(s):

active firmware compile year message

3865 CalculationTime

Level: 1
Range: 0 ... 29.127 ms
Page(s):

Calculation time required by main processor

3870 Timer

Level: 1
Range: 0 ... 65.535 s
Page(s):

Internal milliseconds timer

3871 OperatingHourMeter

Level: 1
Range: 0 ... 65535 h
Page(s):

Operating hour meter when engine is running

3872 OperatingSecondMeter

Level: 1
Range: 0 ... 3599 s
Page(s):

Operating seconds meter when engine is running until next full operating hour

3897 StackTestFreeBytes

Level: 6
Range: 0000 ... FFFF Hex
Page(s):

Message showing number of free bytes in stack

3900 CylinderNumber

Level: 1
Range: 0 ... 16
Page(s):

Number of cylinders in current engine configuration

3902 ClickTestActive

Level: 1
Range: 0 ... 1
Page(s):

Message when ignition test is active

3903 ActiveCylinder

Level: 6
Range: 0000 ... FFFF Hex
Page(s):

Cylinders currently active

3904 ActiveCylinderNumber

Level: 1
Range: 0 ... 16
Page(s):

Number of currently active cylinders

3905 AvailCylOutputsNr

Level: 1
Range: 0 ... 16
Page(s):

Number of ignition coil outputs available

3906 ModulCyl09-12OnBoard

Level: 1
Range: 0 ... 1
Page(s):

Message that the additional module 1 for cylinders 9-12 is onboard

3907 ModulCyl13-16OnBoard

Level: 1
Range: 0 ... 1
Page(s):

Message that the additional module 2 for cylinders 13-16 is onboard

3908 IgnitionEnabled

Level: 1
Range: 0 ... 1
Page(s):

Message that the control device hardware is ready for ignition

3909 EngineIgnErrorState

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

Ignition Error report for the engine (built as logical OR of Par. 13050-13065)

3910 ActiveIgnitionTiming

Level: 1
Range: -10 ... 90 °BTDC
Page(s):

Common ignition timing currently active

3911 IgnitionTimingFix

Level: 1
Range: -10 ... 90 °BTDC
Page(s):

Current value of the fix ignition timing

3912 IgnitionTimingMap1

Level: 1
Range: -10 ... 90 °BTDC
Page(s):

Current value of the ignition timing interpolated from ignition timing map 1

3913 IgnitionTimingMap2

Level: 1
Range: -10 ... 90 °BTDC
Page(s):

Current value of the ignition timing interpolated from ignition timing map 2

3914 IgnTimingFixActive

Level: 1
Range: 0 ... 1
Page(s):

Message that the fix ignition timing is active

3915 IgnTimingMap1Active

Level: 1
Range: 0 ... 1
Page(s):

Message that the ignition timing map 1 is active

3916 IgnTimingMap2Active

Level: 1
Range: 0 ... 1
Page(s):

Message that the ignition timing map 2 is active

3917 ExtIgnTimingOffs

Level: 1
Range: -30 ... 30 °BTDC
Page(s):

Currently active external ignition timing offset

3918 RotSwitchIgnTimOffs

Level: 1
Range: -30 ... 30 °BTDC
Page(s):

Currently active internal ignition timing offset from rotary switch on the PHLOX II housing

3920 RotarySwitchPosition

Level: 1
Range: 00 ... 0F Hex
Page(s):

Current position of ignition timing offset rotary switch on the PHLOX II housing

3936 MeasChargeCurrentMin

Level: 6
Range: 0 ... 25 A
Page(s):

Current value of minimal ignition capacitor charge current

3937 MeasChargeCurrentMax

Level: 6
Range: 0 ... 25 A
Page(s):

Current value of maximal ignition capacitor charge current

3940 CommonIgnEnergySetp

Level: 1
Range: 0 ... 31
Page(s):

Currently active common ignition energy set point

3947 ExtIgnEnergyOffs

Level: 1
Range: -31 ... 31
Page(s):

Currently active external ignition energy set point offset

3950 IgnEnergySetp1

Level: 1
Range: 0 ... 31
Page(s):

Energy set point - cylinder 1

3951 IgnEnergySetp2

Level: 1
Range: 0 ... 31
Page(s):

Energy set point - cylinder 2

3952 IgnEnergySetp3

Level: 1 Energy set point - cylinder 3
Range: 0 ... 31
Page(s):

3953 IgnEnergySetp4

Level: 1 Energy set point - cylinder 4
Range: 0 ... 31
Page(s):

3954 IgnEnergySetp5

Level: 1 Energy set point - cylinder 5
Range: 0 ... 31
Page(s):

3955 IgnEnergySetp6

Level: 1 Energy set point - cylinder 6
Range: 0 ... 31
Page(s):

3956 IgnEnergySetp7

Level: 1 Energy set point - cylinder 7
Range: 0 ... 31
Page(s):

3957 IgnEnergySetp8

Level: 1 Energy set point - cylinder 8
Range: 0 ... 31
Page(s):

3958 IgnEnergySetp9

Level: 1 Energy set point - cylinder 9
Range: 0 ... 31
Page(s):

3959 IgnEnergySetp10

Level: 1 Energy setpoint - cylinder 10
Range: 0 ... 31
Page(s):

3960 IgnEnergySetp11

Level: 1 Energy set point - cylinder 11
Range: 0 ... 31
Page(s):

3961 IgnEnergySetp12

Level: 1 Energy set point - cylinder 12
Range: 0 ... 31
Page(s):

3962 IgnEnergySetp13

Level: 1 Energy set point - cylinder 13
Range: 0 ... 31
Page(s):

3963 IgnEnergySetp14

Level: 1 Energy set point - cylinder 14
Range: 0 ... 31
Page(s):

3964 IgnEnergySetp15

Level: 1 Energy set point - cylinder 15
Range: 0 ... 31
Page(s):

3965 IgnEnergySetp16

Level: 1 Energy set point - cylinder 16
Range: 0 ... 31
Page(s):

13000 ErrDigitalOut1

Level: 1 Error in digital output 1
Range: 0000 ... FFFF Hex
Page(s):

13001 ErrDigitalOut2

Level: 1 Error in digital output 2
Range: 0000 ... FFFF Hex
Page(s):

13050 ErrIgnitionCyl1

Level: 1 Ignition error message - cylinder 1
Range: 0000 ... FFFF Hex
Page(s):

13051 ErrIgnitionCyl2

Level: 1 Ignition error report - cylinder 2
Range: 0000 ... FFFF Hex
Page(s):

13052 ErrIgnitionCyl3

Level: 1 Ignition error report - cylinder 3
Range: 0000 ... FFFF Hex
Page(s):

13053 ErrIgnitionCyl4

Level: 1 Ignition error report - cylinder 4
Range: 0000 ... FFFF Hex
Page(s):

13054 ErrIgnitionCyl5

Level: 1 Ignition error report - cylinder 5
Range: 0000 ... FFFF Hex
Page(s):

13055 ErrIgnitionCyl6

Level: 1 Ignition error report - cylinder 6
Range: 0000 ... FFFF Hex
Page(s):

13056 ErrIgnitionCyl7

Level: 1 Ignition Error report - cylinder 7
Range: 0000 ... FFFF Hex
Page(s):

13057 ErrIgnitionCyl8

Level: 1 Ignition error report - cylinder 8
Range: 0000 ... FFFF Hex
Page(s):

13058 ErrIgnitionCyl9

Level: 1 Ignition error report - cylinder 9
Range: 0000 ... FFFF Hex
Page(s):

13059 ErrIgnitionCyl10

Level: 1 Ignition error report - cylinder 10
Range: 0000 ... FFFF Hex
Page(s):

13060 ErrIgnitionCyl11

Level: 1 Ignition error report - cylinder 11
Range: 0000 ... FFFF Hex
Page(s):

13061 ErrIgnitionCyl12

Level: 1 Ignition error report - cylinder 12
Range: 0000 ... FFFF Hex
Page(s):

13062 ErrIgnitionCyl13

Level: 1 Ignition error report - cylinder 13
Range: 0000 ... FFFF Hex
Page(s):

13063 ErrIgnitionCyl14

Level: 1 Ignition error report - cylinder 14
Range: 0000 ... FFFF Hex
Page(s):

13064 ErrIgnitionCyl15

Level: 1 Ignition error report - cylinder 15
Range: 0000 ... FFFF Hex
Page(s):

13065 ErrIgnitionCyl16

Level: 1 Ignition error report - cylinder 16
Range: 0000 ... FFFF Hex
Page(s):

13400 KnockSparkRetard1

Level: 1 Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 1
Range: 0 ... 100 %
Page(s):

13401 KnockSparkRetard2

Level: 1 Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 2
Range: 0 ... 100 %
Page(s):

13402 KnockSparkRetard3

Level: 1 Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 3
Range: 0 ... 100 %
Page(s):

13403 KnockSparkRetard4

Level: 1 Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 4
Range: 0 ... 100 %
Page(s):

13404 KnockSparkRetard5

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 5

13405 KnockSparkRetard6

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 6

13406 KnockSparkRetard7

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 7

13407 KnockSparkRetard8

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 8

13408 KnockSparkRetard9

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 9

13409 KnockSparkRetard10

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 10

13410 KnockSparkRetard11

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 11

13411 KnockSparkRetard12

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 12

13412 KnockSparkRetard13

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 13

13413 KnockSparkRetard14

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 14

13414 KnockSparkRetard15

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 15

13415 KnockSparkRetard16

Level: 1
Range: 0 ... 100 %
Page(s):

Cylinder specific knock spark retard transmitted by the Ariadne control unit - cylinder 16

13450 KnockIgnAngleOffs1

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 1
(= Par. 13400 x Par. 1916)

13451 KnockIgnAngleOffs2

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 2
(= Par. 13401 x Par. 1916)

13452 KnockIgnAngleOffs3

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 3
(= Par. 13402 x Par. 1916)

13453 KnockIgnAngleOffs4

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 4
(= Par. 13403 x Par. 1916)

13454 KnockIgnAngleOffs5

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 5
(= Par. 13404 x Par. 1916)

13455 KnockIgnAngleOffs6

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 6
(= Par. 13405 x Par. 1916)

13456 KnockIgnAngleOffs7

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 7
(= Par. 13406 x Par. 1916)

13457 KnockIgnAngleOffs8

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 8
(= Par. 13407 x Par. 1916)

13458 KnockIgnAngleOffs9

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 9
(= Par. 13408 x Par. 1916)

13459 KnockIgnAngleOffs10

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 10
(= Par. 13409 x Par. 1916)

13460 KnockIgnAngleOffs11

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 11
(= Par. 13410 x Par. 1916)

13461 KnockIgnAngleOffs12

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 12
(= Par. 13411 x Par. 1916)

13462 KnockIgnAngleOffs13

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 13
(= Par. 13412 x Par. 1916)

13463 KnockIgnAngleOffs14

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 14
(= Par. 13413 x Par. 1916)

13464 KnockIgnAngleOffs15

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 15
(= Par. 13414 x Par. 1916)

13465 KnockIgnAngleOffs16

Level: 1
Range: -30 ... 0 °crank
Page(s):

Cylinder specific knock ignition angle offset - cylinder 16
(= Par. 13415 x Par. 1916)

13500 IgnAngleCorr1

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 1

13501 IgnAngleCorr2

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 2

13502 IgnAngleCorr3

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 3

13503 IgnAngleCorr4

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 4

13504 IgnAngleCorr5

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 5

13505 IgnAngleCorr6

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 6

13506 IgnAngleCorr7

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 7

13507 IgnAngleCorr8

Level: 1
Range: -12 ... 12 °crank
Page(s):

Cylinder specific ignition angle correction - cylinder 8

13508 IgnAngleCorr9

Level: 1 Cylinder specific ignition angle correction - cylinder 9
Range: -12 ... 12 °crank
Page(s):

13509 IgnAngleCorr10

Level: 1 Cylinder specific ignition angle correction - cylinder 10
Range: -12 ... 12 °crank
Page(s):

13510 IgnAngleCorr11

Level: 1 Cylinder specific ignition angle correction - cylinder 11
Range: -12 ... 12 °crank
Page(s):

13511 IgnAngleCorr12

Level: 1 Cylinder specific ignition angle correction - cylinder 12
Range: -12 ... 12 °crank
Page(s):

13512 IgnAngleCorr13

Level: 1 Cylinder specific ignition angle correction - cylinder 13
Range: -12 ... 12 °crank
Page(s):

13513 IgnAngleCorr14

Level: 1 Cylinder specific ignition angle correction - cylinder 14
Range: -12 ... 12 °crank
Page(s):

13514 IgnAngleCorr15

Level: 1 Cylinder specific ignition angle correction - cylinder 15
Range: -12 ... 12 °crank
Page(s):

13515 IgnAngleCorr16

Level: 1 Cylinder specific ignition angle correction - cylinder 16
Range: -12 ... 12 °crank
Page(s):

13550 IgnitionAngle1

Level: 1 Current value of ignition angle - cylinder 1
Range: -10 ... 50 °BTDC
Page(s):

13551 IgnitionAngle2

Level: 1 Current value of ignition angle - cylinder 2
Range: -10 ... 90 °BTDC
Page(s):

13552 IgnitionAngle3

Level: 1 Current value of ignition angle - cylinder 3
Range: -10 ... 90 °BTDC
Page(s):

13553 IgnitionAngle4

Level: 1 Current value of ignition angle - cylinder 4
Range: -10 ... 90 °BTDC
Page(s):

13554 IgnitionAngle5

Level: 1 Current value of ignition angle - cylinder 5
Range: -10 ... 90 °BTDC
Page(s):

13555 IgnitionAngle6

Level: 1 Current value of ignition angle - cylinder 6
Range: -10 ... 90 °BTDC
Page(s):

13556 IgnitionAngle7

Level: 1 Current value of ignition angle - cylinder 7
Range: -10 ... 90 °BTDC
Page(s):

13557 IgnitionAngle8

Level: 1 Current value of ignition angle - cylinder 8
Range: -10 ... 90 °BTDC
Page(s):

13558 IgnitionAngle9

Level: 1 Current value of ignition angle - cylinder 9
Range: -10 ... 90 °BTDC
Page(s):

13559 IgnitionAngle10

Level: 1 Current value of ignition angle - cylinder 10
Range: -10 ... 90 °BTDC
Page(s):

13560 IgnitionAngle11

Level: 1 Current value of ignition angle - cylinder 11
Range: -10 ... 90 °BTDC
Page(s):

13561 IgnitionAngle12

Level: 1 Current value of ignition angle - cylinder 12
Range: -10 ... 90 °BTDC
Page(s):

13562 IgnitionAngle13

Level: 1 Current value of ignition angle - cylinder 13
Range: -10 ... 90 °BTDC
Page(s):

13563 IgnitionAngle14

Level: 1 Current value of ignition angle - cylinder 14
Range: -10 ... 90 °BTDC
Page(s):

13564 IgnitionAngle15

Level: 1 Current value of ignition angle - cylinder 15
Range: -10 ... 90 °BTDC
Page(s):

13565 IgnitionAngle16

Level: 1 Current value of ignition angle - cylinder 16
Range: -10 ... 90 °BTDC
Page(s):

13600 MeasIgnEnergy1

Level: 1 Measured ignition energy - cylinder 1
Range: 0 ... 1000 mJ
Page(s):

13601 MeasIgnEnergy2

Level: 1 Measured ignition energy - cylinder 2
Range: 0 ... 1000 mJ
Page(s):

13602 MeasIgnEnergy3

Level: 1 Measured ignition energy - cylinder 3
Range: 0 ... 1000 mJ
Page(s):

13603 MeasIgnEnergy4

Level: 1 Measured ignition energy - cylinder 4
Range: 0 ... 1000 mJ
Page(s):

13604 MeasIgnEnergy5

Level: 1 Measured ignition energy - cylinder 5
Range: 0 ... 1000 mJ
Page(s):

13605 MeasIgnEnergy6

Level: 1 Measured ignition energy - cylinder 6
Range: 0 ... 1000 mJ
Page(s):

13606 MeasIgnEnergy7

Level: 1 Measured ignition energy - cylinder 7
Range: 0 ... 1000 mJ
Page(s):

13607 MeasIgnEnergy8

Level: 1 Measured ignition energy - cylinder 8
Range: 0 ... 1000 mJ
Page(s):

13608 MeasIgnEnergy9

Level: 1 Measured ignition energy - cylinder 9
Range: 0 ... 1000 mJ
Page(s):

13609 MeasIgnEnergy10

Level: 1 Measured ignition energy - cylinder 10
Range: 0 ... 1000 mJ
Page(s):

13610 MeasIgnEnergy11

Level: 1 Measured ignition energy - cylinder 11
Range: 0 ... 1000 mJ
Page(s):

13611 MeasIgnEnergy12

Level: 1 Measured ignition energy - cylinder 12
Range: 0 ... 1000 mJ
Page(s):

13612 MeasIgnEnergy13

Level: 1 Measured ignition energy - cylinder 13
Range: 0 ... 1000 mJ
Page(s):

13613 MeasIgnEnergy14

Level: 1 Measured ignition energy - cylinder 14
Range: 0 ... 1000 mJ
Page(s):

13614 MeasIgnEnergy15

Level: 1 Measured ignition energy - cylinder 15
Range: 0 ... 1000 mJ
Page(s):

13615 MeasIgnEnergy16

Level: 1 Measured ignition energy - cylinder 16
Range: 0 ... 1000 mJ
Page(s):

13650 SparkDuration1

Level: 1 Current spark duration - cylinder 1
Range: 0 ... 1.5 ms
Page(s):

13651 SparkDuration2

Level: 1 Current spark duration - cylinder 2
Range: 0 ... 1.5 ms
Page(s):

13652 SparkDuration3

Level: 1 Current spark duration - cylinder 3
Range: 0 ... 1.5 ms
Page(s):

13653 SparkDuration4

Level: 1 Current spark duration - cylinder 4
Range: 0 ... 1.5 ms
Page(s):

13654 SparkDuration5

Level: 1 Current spark duration - cylinder 5
Range: 0 ... 1.5 ms
Page(s):

13655 SparkDuration6

Level: 1 Current spark duration - cylinder 6
Range: 0 ... 1.5 ms
Page(s):

13656 SparkDuration7

Level: 1 Current spark duration - cylinder 7
Range: 0 ... 1.5 ms
Page(s):

13657 SparkDuration8

Level: 1 Current spark duration - cylinder 8
Range: 0 ... 1.5 ms
Page(s):

13658 SparkDuration9

Level: 1 Current spark duration - cylinder 9
Range: 0 ... 1.5 ms
Page(s):

13659 SparkDuration10

Level: 1 Current spark duration - cylinder 10
Range: 0 ... 1.5 ms
Page(s):

13660 SparkDuration11

Level: 1 Current spark duration - cylinder 11
Range: 0 ... 1.5 ms
Page(s):

13661 SparkDuration12

Level: 1 Current spark duration - cylinder 12
Range: 0 ... 1.5 ms
Page(s):

13662 SparkDuration13

Level: 1 Current spark duration - cylinder 13
Range: 0 ... 1.5 ms
Page(s):

13663 SparkDuration14

Level: 1 Current spark duration - cylinder 14
Range: 0 ... 1.5 ms
Page(s):

13664 SparkDuration15

Level: 1
Range: 0 ... 1.5 ms
Page(s):
Current spark duration - cylinder 15

13665 SparkDuration16

Level: 1
Range: 0 ... 1.5 ms
Page(s):
Current spark duration - cylinder 16

13700 ChargeDuration1

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 1

13701 ChargeDuration2

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 2

13702 ChargeDuration3

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 3

13703 ChargeDuration4

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 4

13704 ChargeDuration5

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 5

13705 ChargeDuration6

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 6

13706 ChargeDuration7

Level: 1
Range: 0 ... 4 ms
Page(s):
Current value of ignition capacitor charge duration time - cylinder 7

13707 ChargeDuration8

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 8

13708 ChargeDuration9

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 9

13709 ChargeDuration10

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 10

13710 ChargeDuration11

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 11

13711 ChargeDuration12

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 12

13712 ChargeDuration13

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 13

13713 ChargeDuration14

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 14

13714 ChargeDuration15

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 15

13715 ChargeDuration16

Level: 1
Range: 0 ... 4 ms
Page(s):

Current value of ignition capacitor charge duration time - cylinder 16

13750 ChargeDurationMax1

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 1

13751 ChargeDurationMax2

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 2

13752 ChargeDurationMax3

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 3

13753 ChargeDurationMax4

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 4

13754 ChargeDurationMax5

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 5

13755 ChargeDurationMax6

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 6

13756 ChargeDurationMax7

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 7

13757 ChargeDurationMax8

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 8

13758 ChargeDurationMax9

Level:
Range: 0 ... 4
Page(s):

1 ms

Maximum ignition capacitor charge duration time available - cylinder 9

13759 ChargeDurationMax10

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 10

13760 ChargeDurationMax11

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 11

13761 ChargeDurationMax12

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 12

13762 ChargeDurationMax13

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 13

13763 ChargeDurationMax14

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 14

13764 ChargeDurationMax15

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 15

13765 ChargeDurationMax16

Level: 1
Range: 0 ... 4 ms
Page(s):

Maximum ignition capacitor charge duration time available - cylinder 16

23720 BitCollection(0)

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Collection of bit states according to definition in 29900-29915 *BitCollParamSet(0-15)*

23721 BitCollection(1)

Level: 1
Range: 0000 ... FFFF Hex
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Collection of bit states according to definition in 29916-29931 *BitCollParamSet(16-31)*

13.4 Functions

4001 PickUpAtCamOrCrank ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Pick-up at camshaft or crankshaft

4002 PickUpOn ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Activation of pick-up

4005 CamIndexOn ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Activation of camshaft index pick-up

4007 CheckGapToIndexDistance ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Activation of monitoring of distance between crankshaft synchronizing mark and camshaft index sensor

4008 TryToFindGapOn ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Activation of test procedure in case of failure of camshaft index sensor

4009 TrigDiskInvOrNormal ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Indicates whether the rotational direction of the trigger disk is normal or inversed.

(0 = normal, 1 = inversed)

4020 PickUpInductivOrHall ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Type of pick-up used.

(0 = Hall, 1 = inductive / magnetic)

4021 MeasWheelBoreOrTeeth ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Indicates whether the measuring wheel is made of bores or teeth.

(0 = Teeth, 1= Bores)

4022 HallPUSupply5VOr12V ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection of the supply voltage for the pick-up to be either 5V or 12V (Hall pick-ups only).

(0 =: 12V (Heinzmann pick-up standard), 1 = 5V)

4023 HallPUPolInvOrHzm ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection of Hall Pick-up output.

0: signal low on tooth, high on bore (Heinzmann pick-up standard)

1: signal high on tooth, low on bore

4024 HallPUTrigInvOrHzm ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection whether speed / position sensing is making use of the signal flank at the beginning or at the end of teeth / bores.

(0 = Beginning (Heinzmann standard), 1 = End)

4025 PickUpInductivOrHall ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Type of pick-up used.

(0 = Hall, 1 = inductive / magnetic)

4025 CamIxInductiveOrHall ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Type of camshaft index pick-up used.

(0 = Hall, 1 = inductive / magnetic)

4026 TrigDiskBoreOrTeeth ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Indicates whether the trigger disk is made of bores or teeth.

(0 = Teeth, 1= Bores)

4026 CamIndexBoreOrTeeth ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Indicates whether the camshaft index is a bore or a tooth.

(0 = Tooth, 1= Bores)

4027 HallPUSupply5VOr12V ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection of the supply voltage for the pick-up to be either 5V or 12V (Hall pick-ups only).

(0 =: 12V (Heinzmann pick-up standard), 1 = 5V)

4027 HallCamSupply5VOr12V ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection of the supply voltage for the camshaft index pick-up to be either 5V or 12V (only Hall pick-ups).

(0 =: 12V (Heinzmann pick-up standard), 1 = 5V)

4028 HallPUPolInvOrHzm ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection of Hall pick-up output.

0: signal low on tooth, high on bore (Heinzmann pick-up standard)

1: signal high on tooth, low on bore

4028 HallCamPolInvOrHzm ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection of Hall camshaft index pick-up output.

0: signal low on tooth, high on bore (Heinzmann pick-up standard)

1: signal high on tooth, low on bore

4029 HallPUTrigInvOrHzm ***Firmware versions AAA.B0.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection whether speed / position sensing is making use of the signal flank at the beginning or at the end of teeth / bores.

(0 = Beginning (Heinzmann standard), 1 = End)

4029 HallCamTrigInvOrHzm ***Firmware versions AAA.B1/2.DDD***

Level: 4
Range: 0 ... 1
Page(s):

Selection whether speed / position sensing is making use of the signal flank at the beginning or at the end of teeth / bores.

(0 = Beginning (Heinzmann standard), 1 = End)

4100 EngCfgManOrFix

Level: 4
Range: 0 ... 1
Page(s):

Manual or predefined firing order
(0 = predefined, 1 = manual)

4330 AllSendSpeedOn

Level: 4
Range: 0 ... 1
Page(s):

HZM-CAN All: transmission of speed

4332 AllSendPowPercentOn

Level: 4
Range: 0 ... 1
Page(s):

HZM-CAN All: transmission of engine load

4334 AllSendErrorStatusOn

Level: 4 HZM-CAN All: transmission of the Phlox error status
Range: 0 ... 1
Page(s):

4335 AllSendStatusOn

Level: 4 HZM-CAN All: transmission of the Phlox status
Range: 0 ... 1
Page(s):

4340 AllSendAutoResetOn

Level: 4 HZM-CAN All: transmission of the control unit autoreset signal
Range: 0 ... 1
Page(s):

4341 AllSendErrorResetOn

Level: 4 HZM-CAN All: transmission of the error reset signal
Range: 0 ... 1
Page(s):

4377 ACAutoResetOn

Level: 4 HZM-CAN AC: transmission of the control unit autoreset signal
Range: 0 ... 1
Page(s):

4378 ACErrorResetOn

Level: 4 HZM-CAN AC: transmission of the error reset signal
Range: 0 ... 1
Page(s):

4405 CanCommACOn

Level: 6 HZM-CAN: activation of node type AC
Range: 0 ... 1
Page(s):

4406 CanCommCMOn

Level: 6 HZM-CAN: activation of node type CM
Range: 0 ... 1
Page(s):

4415 CanCommAllOn

Level: 6 HZM-CAN: activation of node type All
Range: 0 ... 1
Page(s):

4798 DigChannel1_CamIxOut

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 1 as cam index output

4799 DigChannel2_CamIxOut

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 2 as cam index output

4800 DigChannel1OutOrIn

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 1 as input or output

(0 = Input, 1 = Output)

4801 DigChannel1PWMOrDIO

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 1 as digital or PWM input / output

4802 DigCh1TriStatOrDigIn

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 1 as normal or tristate digital input (only if Par. 4800 = 0 and Par. 4801 = 0).

(0 = normal digital input, 1 = tristate digital input)

4803 DigIn1HighOrLowSide

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital input 1 as low- or high-side (only if Par. 4800 = 0, Par. 4801 = 0, Par. 4802 = 0).

(0 = low side input, 1 = high side input

4804 DigChannel2OutOrIn

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 2 as input or output

(0 = Input, 1 = Output)

4805 DigChannel2PWMOrDIO

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 2 as digital or PWM input / output

4806 DigCh2TriStatOrDigIn

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital port 2 as normal or tristate digital input (only if Par. 4804 = 0 and Par. 4805 = 0).

(0 = normal digital input, 1 = tristate digital input)

4807 DigIn2HighOrLowSide

Level: 6
Range: 0 ... 1
Page(s):

Selection of digital input 2 as low- or high-side (only if Par. 4804 = 0, Par. 4805 = 0, Par. 4806 = 0).

0: low side input

1: high side input

4810 StopImpulseOrSwitch

Level: 2
Range: 0 ... 1
Page(s):

Selection of type of ignition stop switch:

0 = Stop active only while stop command is applied

1 = Stop active by one single switch pulse until engine stops

4851 DigitalOut1:Logic

Level: 6
Range: 00 ... 80 Hex
Page(s): 69

Logical link for multiple assignment to digital output 1

4852 DigitalOut2:Logic

Level: 6
Range: 00 ... 80 Hex
Page(s):

Logical link for multiple assignment to digital output 2

4880 DigitalOut1:Prior

Level: 6
Range: 00 ... 80 Hex
Page(s):

Priority for multiple assignment to digital output 1

4881 DigitalOut2:Prior

Level: 6
Range: 00 ... 80 Hex
Page(s):

Priority for multiple assignment to digital output 2

4900 ChanTypIgnTimOffs

Level: 6
Range: 0 ... 8
Page(s):

Configuration of input channel type for sensor “Ignition Timing Offset”.

0: analogue input (0-5V / 4-20mA)
1: PWM input
6: ModBus
8: Hzm-CAN CM

4901 ChanTypIgnEgyOffs

Level: 6
Range: 0 ... 8
Page(s):

Configuration of input channel type for sensor “Ignition Energy Offset”.

0: analogue input (0-5V / 4-20mA)
1: PWM input
6: ModBus
8: Hzm-CAN CM

4912 ChanTypMnfldPress

Level: 6
Range: 0 ... 8
Page(s):

Configuration of input channel type for sensor “Manifold Pressure”.

0: analogue input (0-5V / 4-20mA)
1: PWM input
6: ModBus
8: Hzm-CAN CM

4918 ChanTypMeasPower

Level: 6
Range: 0 ... 8
Page(s):

Configuration of input channel type for sensor “Measured Power”.

0: analogue input (0-5V / 4-20mA)
1: PWM input
6: ModBus
8: Hzm-CAN CM

5000 SubstOrLastIgnTimOff

Level: 4
Range: 0 ... 1
Page(s):

Selects substitute value for sensor “Ignition Timing Offset” in case of error

(0 = last valid value, 1 = substitute value)

5001 SubstOrLastIgnEgyOff

Level: 4
Range: 0 ... 1
Page(s):

Selects substitute value for sensor “Ignition Energy Offset” in case of error

(0 = last valid value, 1 = substitute value)

5012 SubstOrLastMnfldPres

Level: 4
Range: 0 ... 1
Page(s):

Selects substitute value for sensor “Manifold Pressure” in case of error

(0 = last valid value, 1 = substitute value)

5018 SubstOrLastMeasPower

Level: 4
Range: 0 ... 1
Page(s):

Selects substitute value for sensor “Measured Power” in case of error

(0 = last valid value, 1 = substitute value)

5040 HoldOrResetIgnTimOff

Level: 4
Range: 0 ... 1
Page(s):

Selects whether error of sensor “Ignition Timing Offset” is to be held or automatically reset
(0 = automatic reset, 1 = error is held)

5041 HoldOrResetIgnEgyOff

Level: 4
Range: 0 ... 1
Page(s):

Selects whether error of sensor “Ignition Energy” is to be held or automatically reset
(0 = automatic reset, 1 = error is held)

5052 HoldOrResetMnfldPres

Level: 4
Range: 0 ... 1
Page(s):

Selects whether error of sensor “Manifold Pressure” is to be held or automatically reset
(0 = automatic reset, 1 = error is held)

5058 HoldOrResetMeasPower

Level: 4
Range: 0 ... 1
Page(s):

Selects whether error of sensor “Measured Power” is to be held or automatically reset
(0 = automatic reset, 1 = error is held)

5100 NoStoreSErrOn

Level: 6
Range: 0 ... 1
Page(s):

Error saving is disabled until next reset

5101 CommAlarmWarnFlashOn

Level: 2
Range: 0 ... 1
Page(s):

Selects whether common alarm flash activates there are only a warning

5102 CommonAlarmResetOn

Level: 2
Range: 0 ... 1
Page(s):

Selects whether the common alarm indicator is to be reset temporarily (edge change) if a further error occurs

5103 CommonAlarmResetBoth

Level: 2
Range: 0 ... 1
Page(s):

Selects whether slope is changed (5102 *CommonAlarmReseOn* = 1), even when an error is cleared (generally with any error)

5105 ExtendedLedFlashOn

Level: 2
Range: 0 ... 1
Page(s):

Switches the LEDs operation to extended mode (errors are output on the red LED, ignition angles on the yellow LED).

5110 DOPWM1_SupviseOn

Level: 6
Range: 0 ... 1
Page(s):

Enables the supervision of the Digital / PWM output 1.

5111 DOPWM1_HoldOrReset

Level: 6
Range: 0 ... 1
Page(s):

Selects whether an error of digital / PWM output 1 is to be held or automatically reset
(0 = automatic reset, 1 = error is held)

5120 DOPWM2_SupviseOn

Level: 6
Range: 0 ... 1
Page(s):

Enables the supervision of the Digital / PWM output 2.

5121 DOPWM2_HoldOrReset

Level: 6
Range: 0 ... 1
Page(s):

Selects whether an error of digital / PWM output 2 is to be held or automatically reset
(0 = automatic reset, 1 = error is held)

5231 MeasPowerByMnfldPOn

Level: 6
Range: 0 ... 1
Page(s):

Selects whether Measured Power shall be interpolated using the “Manifold Pressure” sensor and the “Manifold Pressure to Power” curve.

5232 MeasPowerOverCanOn

Level: 4
Range: 0 ... 1
Page(s):

Enables the reception of measured power by Hzm-CAN All protocol

5510 AIWithSensorSupply

Level: 6
Range: 0 ... 1
Page(s):

Selects whether the sensor connected to the analogue input shall be power supplied by PHLOX II

5511 AISupply24VOr5V

Level: 6
Range: 0 ... 1
Page(s):

Selection of the sensor power supply.
(0 = 5V, 1 = 24V)

5512 AIVoltOrCurrent

Level: 6
Range: 0 ... 1
Page(s):

Configuration of the analogue input as voltage or current input.
(0 = current, 1 = voltage)

5810 EngineStopLevel

Level: 4
Range: -1 ... 1
Page(s):

Selects the input state associated with function “Ignition Stop” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5811 IgnTimOffsIncLevel

Level: 4
Range: -1 ... 1
Page(s):

Selects the input state associated with function “Ignition Timing Offset Increase” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5812 IgnTimOffsDecLevel

Level: 4
Range: -1 ... 1
Page(s):

Selects the input state associated with function “Ignition Timing Offset Decrease” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5813 IgnEgyOffsIncLevel

Level: 4
Range: -1 ... 1
Page(s):

Selects the input state associated with function “Ignition Energy Offset Increase” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5814 IgnEgyOffsDecLevel

Level: 4
Range: -1 ... 1
Page(s):

Selects the input state associated with function “Ignition Energy Offset Decrease” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5828 ErrorResetLevel

Level: 4
Range: -1 ... 1
Page(s):

Selects of the input state associated with function “Error Reset” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5848 IgnTimMap2Or1Level

Level: 4
Range: -1 ... 1
Page(s):

Selects the input state associated with function “Ignition Timing Map 2 or 1” if this is assigned to a tristate digital input.

(-1 = low side, 0 = floating, 1 = high side)

5900 CylinderMaskOn

Level: 6
Range: 0 ... 1
Page(s):

Activates cylinder shutdown mask 1900 *CylinderMask* via PC

5905 ClickTestForceCylOn

Level: 2
Range: 0 ... 1
Page(s):

Selects cylinder for click test

5910 MapOrFixIgnTiming

Level: 4
Range: 0 ... 1
Page(s):

Selects the common ignition base timing.

0 : fix value (Par. 1910)

1 : use of speed / load dependant timing map 1 / 2

5916 KnockSparkRetardOn

Level: 4
Range: 0 ... 1
Page(s):

Activates the cylinder specific knock ignition angle offsets, if the PHLOX II is connected by CAN to the Ariadne control unit

5917 ExtIgnTimOffsetOn

Level: 4
Range: 0 ... 1
Page(s):

An external ignition timing offset is used, either analogue (sensor "Ignition Timing Offset") or digital (functions "Ignition Timing Offset Increase/Decrease")

5918 IgnTimOffsetDigOrAna

Level: 4
Range: 0 ... 1
Page(s):

Configures the external ignition timing offset.

(0 = analogue, 1 = digital)

5919 RotSwIgnTimOffsetOn

Level: 4
Range: 0 ... 1
Page(s):

Activates the ignition timing offset rotary switch on the PHLOX II housing (+/- 6°)

5920 IgnAngleCorrCylOn

Level: 4
Range: 0 ... 1
Page(s):

Activates cylinder specific ignition angle correction maps

5947 ExtIgnEgyOffsetOn

Level: 4
Range: 0 ... 1
Page(s):

An external ignition energy offset is used, either analogue (sensor "Ignition Energy Offset") or digital (functions "Ignition Energy Offset Increase/Decrease")

5948 IgnEgyOffsetDigOrAna

Level: 4
Range: 0 ... 1
Page(s):

Configures the external ignition energy offset.
(0 = analogue, 1 = digital)

5950 IgnEnergyCorrCylOn

Level: 4
Range: 0 ... 1
Page(s):

Activates cylinder specific ignition energy setpoint correction parameters (Par. 1950-1965)

24810 ChTypIgnitionStop

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e
Configures module type for switching function "Ignition stop" via communication modules

24811 ChTypIgnTimOffsInc

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e
Configures module type for switching function " Ignition Timing Offset Increase " via communication modules

24812 ChTypIgnTimOffsDec

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e
Configures module type for switching function " Ignition Timing Offset Decrease " via communication modules

24813 ChTypIgnEgyOffsInc

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e
Configures module type for switching function " Ignition Energy Offset Increase " via communication modules

24814 ChTypIgnEgyOffsDec

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e
Configures module type for switching function " Ignition Energy Offset Decrease " via communication modules

24828 ChTypErrorReset

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Configures module type for switching function "Error Reset" via communication modules

24848 ChTypTimMap2Or1

Level: 6
Range: 0 ... 8
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Configures module type for switching function "Ignition Timing Map 2 or 1" via communication modules

25960 CMTxTel*XX*On

up to 25983

Level: 4
Range: 0 ... 1
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Activation of send telegrams *XX*

13.5 Curves

7700 **PUTrgLev:Speed(x)** ***Firmware versions AAA.B1/2.DDD***

up to 7724 Level: 4
Range: 0 ... 4000 1/min
Page(s):
Speed-supporting points of pick-up trigger level curve (magnetic / inductive pick-ups only)

7710 **PUTrgLev:Volt(x)** ***Firmware versions AAA.B1/2.DDD***

up to 7734 Level: 4
Range: 0,050 ... 5.000 V
Page(s):
Speed-dependent trigger level values of pick-up trigger level curve (for magnetic /inductive pick-ups only)

7720 **PUTrgLev:Speed(x)** ***Firmware versions AAA.B0.DDD***

up to 7724 Level: 4
Range: 0 ... 4000 1/min
Page(s):
Speed-supporting points of pick-up trigger level curve (magnetic / inductive pick-ups only)

7730 **PUTrgLev:Volt(x)** ***Firmware versions AAA.B0.DDD***

up to 7734 Level: 4
Range: 0,050 ... 5.000 V
Page(s):
Speed-dependent trigger level values of pick-up trigger level curve (for magnetic /inductive pick-ups only)

7720 **CamIxTrgLev:Speed(x)** ***Firmware versions AAA.B1/2.DDD***

up to 7724 Level: 4
Range: 0 ... 4000 1/min
Page(s):
Speed-supporting points of camshaft index pick-up trigger level curve (magnetic / inductive pick-ups only)

7730 **CamIxTrgLev:Volt(x)** ***Firmware versions AAA.B1/2.DDD***

up to 7734 Level: 4
Range: 0,050 ... 5.000 V
Page(s):
Speed-dependent trigger level values of camshaft index pick-up trigger level curve (for magnetic /inductive pick-ups only)

8200 **MnfldPToPow:Press(x)**

up to 8209 Level: 4
Range: 0,00 ... 5.00 bar
Page(s):
Manifold pressure supporting points of manifold pressure to engine power interpolation curve

8210 **MnfldPToPow:Power(x)**

up to 8219 Level: 4
Range: 0,0 ... 100,0 %
Page(s):
Engine power values of manifold pressure to engine power interpolation curve

8800 **DigitalOut1:Param(x)**

up to 8807 Level: 6
Range: -29999 ... 29999
Function assignment for multiple assignment to digital output 1

8810 DigitalOut2:Param(x)

up to 8817 Level: 6 Range: -29999 ... 29999 Page(s):
Function assignment for multiple assignment to digital output 2

8960 DigitalOut1:Mask(x)

up to 8967 Level: 6 Range: 0000 ... FFFF Hex Page(s):
Masks for the selection of parameter value bits to assign to the digital output 1

8970 DigitalOut2:Mask(x)

up to 8977 Level: 6 Range: 0000 ... FFFF Hex Page(s):
Masks for the selection of parameter value bits to assign to the digital output 2

16000 IgnTimMap1:Speed(x)

up to 16014 Level: 4 Range: 0 ... 4000 1/min Page(s):
Speed-supporting points of speed / load-dependent ignition timing map 1

16015 IgnTimMap1:Load(x)

up to 16029 Level: 4 Range: 0,0 ... 200,0 % Page(s):
Load-supporting points of speed / load-dependent ignition timing map 1

16030 IgnTimMap1:Tim(x)

up to 16254 Level: 4 Range: -10,0 ... 50,0 °BTDC Page(s):
Ignition timing values of speed / load-dependent ignition timing map 1

16255 IgnTimMap2:Speed(x)

up to 16269 Level: 4 Range: 0 ... 4000 1/min Page(s):
Speed-supporting points of speed / load-dependent ignition timing map 2

16270 IgnTimMap2:Load(x)

up to 16284 Level: 4 Range: 0,0 ... 200,0 % Page(s):
Load-supporting points of speed / load-dependent ignition timing map 2

16285 IgnTimMap2:Tim(x)

up to 16509 Level: 4 Range: -10,0 ... 50,0 °BTDC Page(s):
Ignition timing values of speed / load-dependent ignition timing map 2

17500 IgnAngCor:Speed(x)

up to Level: 4
Speed-supporting points of cylinder specific speed / load-

17501 Range: 0 ... 4000 1/min dependent ignition angle correction map of cylinder 1-16
Page(s):

17505 IgnAngCor:Load(x)

up to 17506 Level: 4 Load-supporting points of cylinder specific speed / load dependent ignition angle correction map of cylinder 1-16
Range: 0,0 ... 200,0 %
Page(s):

17510 IgnAngCor1:Angle(x)

up to 17513 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 1
Range: -12.00 ... 12.00 °crank
Page(s):

17514 IgnAngCor2:Angle(x)

up to 17517 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 2
Range: -12.00 ... 12.00 °crank
Page(s):

17518 IgnAngCor3:Angle(x)

up to 17521 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 3
Range: -12.00 ... 12.00 °crank
Page(s):

17522 IgnAngCor4:Angle(x)

up to 17525 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 4
Range: -12.00 ... 12.00 °crank
Page(s):

17526 IgnAngCor5:Angle(x)

up to 17529 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 5
Range: -12.00 ... 12.00 °crank
Page(s):

17530 IgnAngCor6:Angle(x)

up to 17533 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 6
Range: -12.00 ... 12.00 °crank
Page(s):

17534 IgnAngCor7:Angle(x)

up to 17537 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinderr 7
Range: -12.00 ... 12.00 °crank
Page(s):

17538 IgnAngCor8:Angle(x)

up to 17541 Level: 4 Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 8
Range: -12.00 ... 12.00 °crank
Page(s):

17542 IgnAngCor9:Angle(x)

up to 17545 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 9

17546 IgnAngCor10:Angle(x)

up to 17549 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 10

17550 IgnAngCor11:Angle(x)

up to 17553 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 11

17554 IgnAngCor12:Angle(x)

up to 17557 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 12

17558 IgnAngCor13:Angle(x)

up to 17561 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 13

17562 IgnAngCor14:Angle(x)

up to 17565 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 14

17566 IgnAngCor15:Angle(x)

up to 17569 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 15

17570 IgnAngCor16:Angle(x)

up to 17573 Level: 4 Range: -12.00 ... 12.00 °crank Page(s): Ignition angle correction values of cylinder specific speed / load-dependent ignition angle correction map - cylinder 16

29800 CMTel50ParamSet(x)

up to 29803 Level: 4 Range: 0 ... 29999 Page(s): *HZM CAN Customer-Module Manual DG 05007-e*

Assignment of sending parameters to send telegram 50 of HZM-CAN Customer Module

29805 CMTel51ParamSet(x)

up to 29808

Level: 4
Range: 0 ... 29999
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Assignment of sending parameters to send telegram 51 of HZM-CAN Customer Module

29810 CMTel52ParamSet(x)

up to 29813

Level: 4
Range: 0 ... 29999
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Assignment of sending parameters to send telegram 52 of HZM-CAN Customer Module

29900 BitCollParamSet(x)

up to 29931

Level: 4
Range: -29999 ... 29999
Page(s):

HZM CAN Customer-Module Manual DG 05007-e

Assignment of bit parameters for compressed transmission through the respective communication module

14 Error Handling

14.1 General

The **HEINZMANN** control devices PHLOX II - ICxx include an integrated error monitoring system in which errors in sensors, speed pick-ups, etc., can be detected and reported. It is also possible to use digital outputs (↑*10.5* Digital outputs) for external indication of the errors by visual or audible signals or to send the error messages to a higher-level system by way of communication modules.

The various errors may be viewed at the parameters 3000 ... 3099, 13000 ... 13099 and 23000 ... 23099. A currently set error parameter will read the value "1", otherwise the value "0".

Generally, one can differentiate between the following types of error:

- Errors in configuring the control and adjusting the parameters of the control device

  These errors are caused by erroneous input on the part of the user and cannot be intercepted by either the PC or the handheld programmer. They do not occur in series-fabricated controls.

- Errors occurring during operation

  These errors are the most significant when using governors produced in series. Errors, such as errors in speed pick-ups, set point adjusters, pressure and temperature sensors, or logical errors such as excessive temperatures or low boost pressure are typical of this category.

- Internal computational errors of the control

  These errors may be due to defective components or other unsuitable operating conditions. Under normal circumstances, they are not likely to occur.

To rectify an error, its cause should first be eliminated before clearing any of the currently stored errors. Some errors are cleared automatically as soon as the cause has been eliminated (see also ↑*14.4* Error parameter list). Errors can be cleared by means of the PC, by the handheld programmer or, if configured accordingly, by a digital input. Fatal errors leading to an emergency shutdown can be cleared only once the engine has stopped. If the system continues to report the error, the cause must be searched for until it is found.

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

All errors can be subdivided into three categories. The first category consists of warnings, meaning that the control device has not recognised an actual error but, for example, a sensor value is out of its permitted range.

Additionally, there are errors which allow the engine to continue to run, albeit possibly with limited functionality (e.g., a sensor has failed).

The last category consists of what are called fatal errors that will lead to an emergency shutdown of the engine (e.g. overspeeding, failure of both speed pick-ups).

These error categories are signalled by the following three parameters:

3799	*CommonWarning*	warning only
3800	*EmergencyAlarm*	emergency alarm
3801	*CommonAlarm*	common alarm

Parameter 3799 *CommonWarning* is triggered only when there are only warnings. The parameter 3801 *CommonAlarm* is triggered by the occurrence of any error, 3800 *EmergencyAlarm* only if a fatal error occurs. Thus, 3799 *CommonWarning* and 3800 *EmergencyAlarm* will never occur on their own.

Normally, these two alarm parameters are assigned to ↑*10.5* Digital outputs in order to be able to signal the error status. The emergency alarm is usually output in inverted form (low-active) and interpreted as the signal *"Ignition control unit ready"* which would also signal a fatal error in case of missing power supply.

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

Status "Common alarm"	Status "Ignition control unit ready"	Meaning
not active	not active	no power supply
not active	active	no error
active	not active	emergency alarm
active	active	common alarm

Table 24: Alarms

The *"Ignition control unit ready"* output, i.e., the inverted emergency alarm signal, is usually used to activate engine shutdown.

With the common alarm, the option also exists of making the output blink at a frequency of 1 Hz to denote a warning. For this purpose, the parameter 5101 *CommAlarmWarnFlashOn* is to be set to "1". As soon as at least one true error (no warning) comes in, the common alarm will remain active.

The common alarm output can also be configured in such a way that the output is reset for 0.5 seconds on the occurrence of any new error. A PLC connected to the output will thus be able to detect the new error. For this configuration, the parameter 5102 *CommonAlarmResetOn* should be set to "1" and the above function disabled (5101 *CommAlarmWarnFlashOn* = 0). The output can also be reset if any of the errors present disappear. For this configuration, the parameter 5103 *CommonAlarmResetBoth* should be set to "1"

14.2 Configuration errors

If the configuration of the control device is faulty, this will be indicated in 3092 *ErrConfiguration*. A faulty configuration may result, for instance, if during parameter setting for inputs and outputs the channel type was not indicated.

In addition to 3092 *ErrConfiguration* an error code is output in 3000 *ConfigurationError*, which gives information about the type of error which has occurred. The message displayed in 3000 *ConfigurationError* changes every second and shows all configuration errors currently present.

The communication programme displays the error message for configuration errors in the window "Current errors".

A configuration error cannot simply be cleared with the command "clear error"; the cause of the error must be rectified first. Most configuration errors are checked only when the control device starts. Therefore, a reset will be necessary after the parameters have been changed and saved in the control device.

The following tables give an overview of the error codes and their meaning. It depends on the version of the control device software whether one or fewer of the mentioned communications protocols is supported. In other words, not all the errors mentioned here will occur in a specific control unit.

Configuration errors – switching functions allocation	
800	Channel type was assigned to a switching function not supported by the software
804	Channel number too high for customer protocol switching function
805	Channel number too high for CANopen switching function
806	Channel number too high for DeviceNet switching function
807	Channel number too high for Modbus switching function
808	Channel number too high for SAE J1939 sensor input.
809	Channel number too high for HZM-CAN customer module switching function
810	Channel number too high for HZM-CAN twin-module switching function
811	Channel number too high for WAGO switching function
854	Customer protocol inactive or not supportive of switching functions
855	CANOpen inactive or not supportive of switching functions
856	DeviceNet inactive or not supportive of switching functions
857	Modbus inactive or not supportive of switching functions

858	SAE J1939 switching input inactive or features no digital inputs
859	HZM-CAN customer module inactive or not supportive of switching functions
860	HZM-CAN twin-module inactive or not supportive of switching functions
861	WAGO inactive or not supportive of switching functions

Configuration errors - sensor allocation	
900	Channel type was assigned to sensor not supported by the software
901	Channel number too high for analogue sensor input
902	Channel number too high for PWM sensor input
903	Channel number too high for HZM-CAN-PE module sensor input
904	Channel number too high for customer protocol sensor input
905	Channel number too high for CANopen sensor input
906	Channel number too high for DeviceNet sensor input
907	Channel number too high for Modbus sensor input
908	Channel number too high for SAE J1939 sensor input.
909	Channel number too high for HZM-CAN customer module sensor input
910	Channel number too high for HZM-CAN twin-module sensor input
911	Channel number too high for WAGO

Configuration error – speed range	
1000	Frequency resulting from teeth number and maximum required speed is too high.

Communication protocol WAGO CANopen	
21700	WAGO-CANopen not active, but values from it have been requested

Communication protocol CANopen	
21750	CANopen not active, but values from it have been requested

Communication protocol Modbus	
21800	Modbus not active, but values from it have been requested

Communication protocol DeviceNet	
21850	DeviceNet not active, but values from it have been requested
21851	A DeviceNet sensor that is not transmitted was allocated

Communication protocol SAE J1939	
21900	SAE J1939 not active, but values from it have been requested

Communication protocol HZM-CAN CM	
21950	HZM-CAN CM not active, but values from it have been requested

Table 25: Configuration errors

14.3 Error memories

When the control unit is powered down it loses any existing information on actual errors. In order to be able to check which errors have occurred, a permanent error memory has been incorporated in the control. Any errors that have occurred at least once are stored there.

For each error registered since the error memory was last cleared, an error count and the time of first and last occurrence are registered. The times are indicated in form of operating hours of the engine, i.e. the hours the engine has been running. The error count is increased only if the engine operating hours counter has changed by at least one second since the last occurrence of the error.

In addition, for each error up to five data about the circumstances of its occurrence may be registered, e.g., speed, power supply, internal temperature at the last occurrence. The relevant environment information is defined via DcDesk 2000.

The values stored in the error memory are treated by the control merely as monitor values and of which no further account is taken. In other words, it is only the errors occurring during operation that the control will respond to.

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

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

14.4 Error parameter list

The error parameter list of the main program listed below contains descriptions of the causes of each single error and of the control unit's response. Furthermore, it lists the appropriate actions to be taken to eliminate the error in question.

Errors are grouped in ascending order with the numbers 3001 ... 3099, 13000 ... 13099, 23000 ... 23099 Each number corresponds to a group of errors of up to 14 single error states and two additional pieces of information. Error states are structured in bits. If several errors belonging to the same group are set at the same time, the relevant combination of error bits is shown in hexadecimal format. In DcDesk 2000 there is a special window indicating the current errors, in which each individual error status and a short description are displayed.

At least one of the errors from 0 to 13 (0x0001 ... 0x2000) of each error group has a meaning, which is described in the following section.

Error 14 is set (0x4000) when all other active errors of this error group are warnings only.

Error 15 means that at least one of the errors 0…13 of this error group has led to an emergency shutdown (0x8000).

Errors which have not been used are not described.

The following table shows an overview of the individual errors of an error group, together with the respective code and a description of the errors 14 and 15, which are present in in each error group. The errors 14 and 15 are not included in the following description of the individual error groups.

Error	Code	Meaning
0	0x0001	
1	0x0002	
2	0x0004	
3	0x0008	
4	0x0010	
5	0x0020	
6	0x0040	
7	0x0080	
8	0x0100	
9	0x0200	
10	0x0400	
11	0x0800	
12	0x1000	
13	0x2000	
14	0x4000	**Warning** - At least one error in this group has triggered off a warning. → indication only
15	0x8000	**Emergency shutdown** - At least one error in this group has triggered off an emergency shutdown. → The engine is stopped / cannot be started.

Table 26: General error status

14.4.1 Speed sensors

3001 *ErrPickUp1* **3002 *ErrPickUp2***

Error	Meaning
0	**Speed pick-up has failed or cable of speed pick-up is faulty** - For a certain interval no signal is measured (monitoring only when 2000 *Speed* > 256 *StartSpeed2).* - The camshaft index sensor has measured a revolution and the speed pick-up does not transmit a signal. - The emergency operation camshaft index sensor is already synchronised and the speed pick-up does not transmit a signal. → The speed pick-up is disabled and its tasks are taken over by a redundant pick-up (if available). • Check the distance between speed pick-up and gear rim. • Check cable to pick-up. • Check pick-up, replace if necessary.
1	**Speed pick-up does not start or is too far away from gear rim** - The speed pick-up does not deliver a signal although the redundant pick-up already registers a speed. Applies to redundant speed pick-ups 1 and 2 only. → The speed pick-up is disabled and its tasks are taken over by a redundant pick-up (if available). • Check distance between speed pick-up and gear rim. • Check cable to pick-up. • Check pick-up, replace if necessary.
3	**Speed pick-up transmits a frequency which is too high** - The interrupt difference over several periods is shorter than 500 µs, meaning that the input frequency is too high. → The speed pick-up is disabled and its tasks are taken over by a redundant pick-up (if available). • Check pick-up, replace if necessary.
4	**Speed pick-up has been mounted in wrong direction of magnetization** - Monitored only if function 4015 *CheckPickUpDirection* is active → Only error message • Check preferred direction of speed pick-up. • Check configuration of preferred direction.
5	**Pick-up power supply short circuit to earth** - The measured pick-up power supply voltage is below the lower error threshold → Only error message

Error	Meaning
	• Check cable to pick-up
6	**Pick-up power supply short circuit to supply voltage** - The measured pick-up power supply voltage is greater the high error threshold → Only error message • Check cable to pick-up

Table 27: Possible errors speed pick-ups

↑*11.3* Pick-up Configuration

14.4.2 Camshaft index sensor

3003 *ErrPickUp / ErrPickUpIndex*

Error	Meaning
0	**Camshaft index sensor has failed or cable to camshaft index sensor is faulty** - For a certain interval no signal is measured (monitoring only when 2000 *Speed* > 256 *StartSpeed2).* - Crankshaft gap has been detected but camshaft index sensor does not transmit a signal. → On engine start: emergency shutdown, if test procedure is not allowed, otherwise attempt to synchronise. → With running engine: only error message • Check distance between camshaft index sensor and gear rim. • Check cable to camshaft index sensor. • Check camshaft index sensor, replace if necessary.
4	**Camshaft index sensor has been mounted in wrong direction of magnetization** - Monitored only if function 4016 *CheckPickUpDirection* is active. → error message only • Check preferred direction of camshaft index sensor. • Check configuration of preferred direction.
5	**Camshaftindex power supply short circuit to earth** - The measured camshaftindex power supply voltage is below the lower error threshold → Only error message

Error	Meaning
	• Check cable to camshaft index
6	**Camshaftindex power supply short circuit to supply voltage** - The measured camshaftindex power supply voltage is greater the high error threshold → Only error message • Check cable to camshaftindex

Table 28: Possible errors: Camshaft index sensor

↑*11.3* Pick-up Configuration

14.4.3 Overspeed

3004 *ErrOverSpeed*

Error	Meaning
0	**Overspeed pick-up 1** - Engine speed as registered by pick-up 1 was/is exceeding overspeed. - A combination between teeth number of pick-up 1 and maximum speed/overspeed results in a measuring frequency higher than allowed. → Emergency shutdown • Check overspeed parameter (21 *SpeedOver*). • Check adjustment of set speed. • Check PID adjustment. • Check whether overspeeding was due to thrust operation.
1	**Overspeed pick-up 2** - Engine speed as registered by pick-up 2 was/is exceeding overspeed. - A combination between teeth number of pick-up 2 and maximum speed/overspeed results in a measuring frequency higher than allowed. → Emergency shutdown • Check overspeed parameter (21 *SpeedOver*). • Check adjustment of set speed. • Check PID adjustment. • Check whether overspeed was due to thrust operation.
2	**Overspeed camshaft index sensor** - Speed of camshaft index sensor was/is exceeding overspeed. →Emergency camshaft wheel: emergency shutdown → Camshaft measuring pin: error message only • Check overspeed parameter (21 *SpeedOver*). • Check adjustment of set speed. • Check PID adjustment. • Check whether overspeeding was due to thrust operation.

Table 29: Possible errors: Overspeed

14.4.4 Setpoint adjusters and sensors

3005 *ErrExtIgnTimingOffs*
3006 *ErrExtIgnEnergyOffs*
3017 *ErrMnfldPress*
3023 *ErrMeasuredPower*

Error	Meaning
0	**Signal short circuit to earth** - The measuring value of the respective input value is below the lower error threshold. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor. • Check parameters for error thresholds.
1	**Signal short circuit to supply voltage** - The measuring value of the respective input value is greater the upper error threshold. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor. • Check parameters for error thresholds.
2	**Sensor supply voltage, cable break or short circuit to earth** - The measured value of the respective reference voltage is below 4V (5V supply) or 20V (24V supply). - Monitoring active only if sensor referencing is active. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor.
3	**Sensor supply voltage, short circuit to supply voltage** - The measured value of the respective reference voltage is greater than 6V (5V supply) or 26V (24V supply). - Monitoring active only if sensor referencing is active. → Reaction according to the configuration of sensor error handling. • Check sensor cable. • Check sensor.
4	**Error via communication module** - The connection to the communication module has dropped. - The communication module delivers an erroneous sensor value. → Reaction according to the configuration of sensor error handling.

Error	Meaning
	• Check the connection to the communication module. • Check sensor cable. • Check sensor.
5	**Threshold 1 surpassed in excess or in default** - The sensor value is higher or lower than the threshold value 1 and the relevant delay time has expired. → Warning message or emergency shutdown, depending on the configuration of monitoring.
6	**Threshold 2 surpassed in excess or in default** - The sensor value is higher or lower than the threshold value 2 and the respective delay time has expired. → Warning message or emergency shutdown, depending on the configuration of monitoring.

Table 30: Possible errors: Setpoint adjusters and sensors

14.4.5 Ignition

3035 *ErrIgnitionTiming*

Error	Meaning
0	
1	**Overlapping of ignition** - the ignition for the current cylinder starts **before** the end of ignition of cylinder before. → Emergency shutdown. • Check cylinder individual ignition angle offsets

Table 31: Possible errors: Ignition timing

14.4.6 Synchronisation

3036 *ErrSynchronisation*

Error	Meaning
0	**Synchronising lost with running engine** - Monitoring only as long as 2000 *Speed* > 256 *StartSpeed2* → ignition is turned off, attempt at renewed synchronisation • Check distance of pick-up from sensing wheel. • Check sensing wheel. • Check speed pick-up • Check parameter 6 *GapRatio*.
1	**Distance between gap and index sensor is too great** - Monitoring only during engine start. - Monitored only if function 4007 *CheckGapToIndexDist* is active. → error message only • Check configuration of sensor positions.
2	**Wrong number of teeth on active crankshaft impulse transmitter** - The number of measured teeth between two gaps following one after the other does not correspond to the pre-set number of teeth. → Ignition is turned off, attempt at renewed synchronisation • Check distance of pick-up from sensing wheel. • Check sensing wheel. • Check speed pick-up. • Check parameter 6 *GapRatio*.
3	**Synchronization not possible** - Synchronization was not successful within 10 seconds after attempted en-

Error	Meaning
	gine start. → only error message • Check distance of pick-up from sensing wheel. • Check sensing wheel. • Check speed pick-up • Check parameter 6 *GapRatio*.

Table 32: Possible errors: Synchronization

14.4.7 Ignition Shutdown

3038 *ErrIgnitionShutdown*

Error	Meaning
1	**Ignition hardwired emergency shutdown** - The shutdown wire (Connector X2 Pin 19) is connected to ground → Emergency shutdown • Check wiring of PHLOX II connector X2 pin 19

Table 33: Possible errors: Ignition shutdown

14.4.8 CAN bus

3070 *ErrCanBus1* **3072 *ErrCanBus2***

Error	Meaning
0	**BusOff was reported** - The CAN controller reports BusOff. → CAN telegrams can no longer be sent or received. • Check CAN cabling. • Check CAN terminator. • Check baud rate.

Table 34: Possible errors: CAN bus

14.4.9 CAN communication

3071 *ErrCanComm1* **3072 *ErrCanComm2***

Error	Meaning
0	**Receipt time was exceeded** - Parameter 2403 *CanRxTimeout* shows with what device type the timeout has occurred. → Reaction depends on device type.
1	**Overflow of receipt buffer** - The receipt buffer has overflown. Some messages could not be received. Parameter 2402 *CanRxBufferState* shows on what device type the receipt buffer has overflown. → only error message
2	**Overflow of send buffer** - The send buffer has overflown. Some messages could not be sent. Parameter 2401 *CanTxBufferState* shows on what device type the send buffer has overflown. → error message only
3	**Erroneous device configuration** - Two devices with the same device number and of the same device type are connected to the CAN network. CAN communication is disabled. → No CAN telegrams are sent or received. • Assign a unique device number in the respective parameter.

Ignition shutdown

Table 35: Possible errors: CAN communication

Supplementary Information

14.4.10 Internal voltage measurement

3075 *ErrIntADRef*

Error	Meaning
1	**AD0 – 75% reference too low** - Internal 75% voltage reference for AD converter 0 is lower than 73% → warning
2	**AD0 – 75% reference too high** - Internal 75% voltage reference for AD converter 0 is higher than 77% → warning
3	**AD0 – 25% reference too low** - Internal 25% voltage reference for AD converter 0 is lower than 23% → warning
4	**AD0 – 25% reference too high** - Internal 25% voltage reference for AD converter 0 is higher than 27% → warning
5	**AD1 – 75% reference too low** - Internal 75% voltage reference for AD converter 1 is lower than 73% → warning
6	**AD1 – 75% reference too high** - Internal 75% voltage reference for AD converter 1 is higher than 77% → warning
7	**AD1 – 25% reference too low** - Internal 25% voltage reference for AD converter 1 is lower than 23% → warning
8	**AD1 – 25% reference too high** - Internal 25% voltage reference for AD converter 1 is higher than 27% → warning

Table 36: Possible errors: Internal AD Reference voltage

3076 *ErrRotarySwitch*

Error	Meaning
1	**Signal short circuit to earth** - The measuring value of rotary switch voltage is below the lower error threshold. → The last valid rotary switch position and corresponding ignition timing offset are used

Error	Meaning
2	**Signal short circuit to supply voltage** - The measuring value of rotary switch voltage is greater than the high error threshold. → The last valid rotary switch position and corresponding ignition timing offset are used
3	**No stable position detected** - No stable rotary switch position has been detected during the last 10s. → The last valid rotary switch position and corresponding ignition timing offset are used
4	**Voltage drift** - a discrepancy between normal and measured voltage of the rotary switch has been detected. → Error message

Table 37: Possible errors: Rotary switch

3085 *ErrPowerSupply*

Error	Meaning
0	**Supply voltage too low** - Supply voltage for the control device has been lower than 8 V or lower than 12V for longer than 0,5s → Emergency shutdown • Check supply voltage.
1	**Supply voltage is too high** - Supply voltage for the control device has been higher than 33 V for longer than 0,5s → Emergency shutdown • Check supply voltage.
2	**Current too high** - the measured supplied current for the control device is higher than 10A • → Warning

Table 38: Possible errors: Power Supply

3086 *ErrIntVoltSupply*

Error	Meaning
0	**Error of 1.5V reference Voltage too low** - Internal 1.5V reference voltage is too low. → only error message
1	**Error of 1.5V reference Voltage too high** - Internal 1.5V reference voltage is too high. → only error message
2	**Error of 3.3V reference Voltage too low** - Internal 3.3V reference voltage is too low. → only error message
3	**Error of 3.3V reference Voltage too high** - Internal 3.3V reference voltage is too high. → only error message
4	**Error of 12V reference Voltage too low** - Internal 12V reference voltage is too low. → only error message
5	**Error of 12V reference Voltage too high** - Internal 12V reference voltage is too high. → only error message
6	**Error of 7V reference Voltage too low** - Internal 7V reference voltage is too low. → only error message
7	**Error of 7V reference Voltage too high** - Internal 7V reference voltage is too high. → only error message
8	**Error of 5V reference Voltage too low** - Internal 5V reference voltage is too low. → only error message
9	**Error of 5V reference Voltage too high** - Internal 5V reference voltage is too high. → only error message
10	**Error of -1.5V reference Voltage too low** - Internal -1.5V reference voltage is too low. → only error message

Error	Meaning
11	**Error of -1.5V reference Voltage too high** - Internal -1.5V reference voltage is too high. → only error message

Table 39: Possible errors: Supply voltage

14.4.11 Internal temperature measurement

3077 ***ErrIntTempAddModul1***
3078 ***ErrIntTempAddModul2***
3079 ***ErrIntTempDCDCAir***
3082 ***ErrIntTempCaseOutput***
3084 ***ErrIntTempAirOutput***

Error	Meaning
0	**Signal short circuit to earth** - The measuring value of the respective input value is below the lower error threshold. • → Error message.
1	**Signal short circuit to supply voltage** - The measuring value of the respective input value is greater the upper error threshold. • → Error message
5	**Internal temperature is too high** - Internal temperature is higher that 120 °C for more than 1 second. → Warning
6	**Internal temperature is extremely high** - Internal temperature is higher that 135 °C for more than 1 second. → Emergency shutdown

Table 40: Possible errors: Internal temperature measurement

3080 ***ErrIntTempDCDCMosfet***
3081 ***ErrIntTempDCDCTrafo***

Error	Meaning
0	**Signal short circuit to earth** - The measuring value of the respective input value is below the lower error threshold. • → Error message.
1	**Signal short circuit to supply voltage** - The measuring value of the respective input value is greater the upper error threshold. • → Error message
5	**Internal temperature is too high** - Internal temperature is higher that 135 °C for more than 1 second. → Warning
6	**Internal temperature is extremely high** - Internal temperature is higher that 145 °C for more than 1 second. → Emergency shutdown

Table 41: Possible errors: Internal temperature measurement

14.4.12 Data memory

3087 *ErrEEPROM*

Error	Meaning
0	**Error during EEPROM access** - Data could not be read or written. → Reading error: emergency shutdown, standard program parameters are used (this error can only occur during control device start-up). → Writing error: error message only, data cannot be saved.
1	**Parameter memory is faulty** - The data sectors reserved for memorizing parameters are faulty. (this error can only occur during control device start-up) → emergency shutdown, standard program parameters are used
2	**Parameter memory not valid** - EEPROM is unreadable (see error 0). (this error can only occur during control device start-up) - First control device start-up after program download. → Emergency shutdown, standard program parameters are used instead.

Error	Meaning
3	**ECU page is faulty** - The data sectors reserved for control device identification are faulty. → Error message only, data used on.
4	**NMI page is faulty** - The data sectors reserved for NMI data (e.g., seconds of operation) is faulty. → Error message only, data used on.
5	**Work data page is faulty** - The data sectors reserved for operational data are faulty. → Error memory is cleared, other data is used on.

Table 42: Possible errors: Data memory

14.4.13 Configuration

3092 *ErrConfiguration*

Error	Meaning
0	**Configuration error** - At least one configuration of the control device is faulty. → Error message only • The configuration error is shown in parameter 3000 *ConfigurationError.* • Check and correct faulty configuration.

Table 43: Possible errors: Configuration

14.4.14 Internal computing error

3094 *ErrIntern*

Error	Meaning
0	**Stack overflow** - The memory reserved for the stack is full. → Emergency shutdown • Write down parameters 3191 to 3199. • Restart governor by a reset and inform **HEINZMANN.**

Error	Meaning
1	**Exception error** - The control device reports an internal computing error. → Emergency shutdown. • Write down parameters 3191 to 3199. • Restart governor by a reset and inform **HEINZMANN**.
2	**Error in cyclical program test** - Checksum calculated by the program does not correspond to the memorized checksum. → Emergency shutdown. • Write down parameters 3191 to 3199. • Restart governor via a reset .and inform **HEINZMANN**.
3	**Error in cyclical RAM test** - The cyclical RAM test reports an error. → Emergency shutdown. • Write down parameters 3191 to 3199. • Restart governor via a reset and inform **HEINZMANN**.
4	**Overflow of error memory** - The memory space reserved for errors is full. → Error message only → New errors are no longer memorized in the error memory. • The error memory must be cleared.
5	**Error index too great** - Attempt to set an error whose parameter does not exist. → Error message only • Restart governor by a reset and inform **HEINZMANN**.

Table 44: Possible errors: Internal computing error

14.4.15 Digital and PWM outputs

13000 ***ErrDigitalOut1***
13001 ***ErrDigitalOut2***

Error	Meaning
0	**Signal short circuit to earth** **Cable broken (only for low-side outputs)** - Governor has detected a short circuit to earth or a broken cable. → Error message only • Check wiring and connected loads.

Error	Meaning
1	**Short circuit to supply voltage** **Cable broken (only for high-side outputs)** - Governor has detected a short circuit to supply voltage or a broken cable. → Error message only • Check wiring and connected loads.

Table 45: Possible errors: Digital and PWM outputs

14.4.16 Ignition errors

13050 ***ErrIgnitionCyl1*** **13051** ***ErrIgnitionCyl2***
13052 ***ErrIgnitionCyl3*** **13053** ***ErrIgnitionCyl4***
13054 ***ErrIgnitionCyl5*** **13055** ***ErrIgnitionCyl6***
13056 ***ErrIgnitionCyl7*** **13057** ***ErrIgnitionCyl8***
13058 ***ErrIgnitionCyl9*** **13059** ***ErrIgnitionCyl10***
13060 ***ErrIgnitionCyl11*** **13061** ***ErrIgnitionCyl12***
13062 ***ErrIgnitionCyl13*** **13063** ***ErrIgnitionCyl14***
13064 ***ErrIgnitionCyl15*** **13065** ***ErrIgnitionCyl16***

Error	Meaning
0	**Ignition capacitor charge error** - The energy level set point has not been reached before ignition → Error message only • Check pick-up configuration • Check control unit power supply • Check min. and max. charge current settings (Par.1950, 1951) • Check cylinder individual timing offsets
1	**Primary short** - Short circuit detected on the primary ignition coil circuit → Error message only • Check wiring and connected coils • Check coil polarity (inversion + / -)
2	**Primary open** - Open circuit detected on the primary ignition coil circuit → Error message only • Check wiring and connected coils
3	**Secondary short** - Short circuit detected on the secondary ignition coil circuit → Error message only • Check spark plug • Check high voltage cable • Check ignition coil • Try reduce energy set point
4	**Secondary open** - Open circuit detected on the secondary ignition coil circuit → Error message only • Check spark plug

Error	Meaning
	• Check high voltage cable • Check ignition coil • Try to increase energy set point
5	**Spark duration low** - The measured spark duration is lower than the configured threshold → Error message only • Check spark plug • Check high voltage cable • Check ignition coil • Try to increase energy setpoint
6	**Spark duration high** - The measured spark duration is higher than the configured threshold → Error message only • Check spark plug • Check high voltage cable • Check ignition coil • Try reduce energy setpoint

Table 46: Possible errors: Common rail high-pressure pumps outputs

Supplementary Information

↑8.10 Ignition Diagnostics

14.5 Boot loader

The **HEINZMANN** digital controls include what is known as a boot loader. This program section is stored at a specific location of the read-only memory and, once programmed at the factory; the boot loader cannot be erased.

Upon starting the control program by powering it up or a reset, the boot loader programme is the first thing to be executed This program performs various relevant tests which indicate whether the actual control programme is operable or not. Based on these tests the boot loader decides whether the control program can carry out the execution or whether execution must remain confined to the boot loader to remove any risk of personal injury or damage to the engine. As long as the program is in boot loader mode the engine cannot be started.

All boot loader tests and the subsequent initialisation of the main programme will take about. 150-200 ms.

14.5.1 Boot loader start tests

The following section describes which tests are performed by the boot loader and which measures may have to be taken. There is no communication with the device as long as these tests are running, especially when the program is caught in an infinite loop due to a fatal error.

- Test of internal watchdog

  This is to check whether the watchdog integrated into the processor is operable. This is to ensure that in case of some undefined program execution, that the control program goes into a safe state after a pre-defined time.

  If the test is not interrupted by the internal watchdog, the error message 3012 ErrBootloader (*MissingInternWatchdog)* is triggered.

  If both watchdog tests yield a negative result (internal and external watchdog → double fault), the boot loader program remains in an endless loop for safety reasons and no communication with DcDesk 2000 is possible.

- Test of external watchdog

  This test checks whether the external watchdog situated on the printed circuit board is functional. This is to ensure that in case of any undefined program execution the control program goes into a safe state after a pre-defined time.

  If the test is not interrupted by the external watchdog, the error message 3012 ErrBootloader (*MissingExternWatchdog)* is triggered.

  If both watchdog tests yield a negative result (internal and external watchdog → double fault), the boot loader program remains in an endless loop for safety reasons and no communication with DcDesk 2000 is possible.

- RAM test

  During this test, various binary patterns are written into the internal processor RAM memory and read out again. If at least one cell does not contain the expected code it is checked whether this RAM sector is used by the boot loader program itself. If so, the boot loader program enters an endless loop and no communication with DcDesk 2000 is possible. If not, the communication to DcDesk 2000 becomes active and the faulty RAM cell is indicated.

- EEPROM test

  This test checks existence of an EEPROM. If EEPROM could not be detected DcDesk reports error 3011 ErrEEPROM and any further access to EEPROM will be blocked.

- Boot loader programme test

  During this test, a check sum is calculated for the memory area containing the boot loader program and compared with the check sum that pre-programmed at the factory. If the sums do not match, the boot loader programme will remain in an endless loop, and no communication with DcDesk 2000 is possible.

- Main program test

  During this test, a check-sum is calculated over the memory area containing the main programme and compared with the check sum pre-programmed at the factory. If the sums do not match, the boot loader will go into a state which is indicated by the error 3012 ErrBootloader (MainCheckSum) via DcDesk 2000.

- Watchdog triggering while main program is running

  The boot loader passes into a state which is indicated in DcDesk 2000 as 3012 ErrBootloader (*ExternWatchdog* or *InternWatchdog)*, as the case may be.

14.5.2 Boot loader communication with DcDesk 2000

Whenever the boot loader recognizes a situation that does not allow the main program to start – either because there is no main program available or because a hardware memory error has occurred – it is possible to establish a connection from DcDesk 2000 and to read out the cause of the error. The only exceptions are when neither the internal nor the external watchdog respond (that would be a double fault), when the RAM required by the boot loader is faulty or when the boot loader program itself is inconsistent (fails checksum test). In this case the program stays in an endless loop and a connection is not possible. The following table shows the meaning of each indicated value:

The following parameters are not visible in the main program, only in the boot loader.

PHLOX II - ICxx	
Indicated value	**Meaning**
3010 *ErrIntern*	An exception error has occurred, it is shown in 3190 *ExceptionNumber* to 3198 *ExceptionInfo2Low*
3011 *ErrEEPROM*	EEPROM not available or bootpage unreadable or bootpage inconsistent or error in EEPROM programming cycle.
3012 *ErrBootloader*	An error has occurred during boot loader start tests
- *MissingExtWatchdog*	Test of external watchdog has failed.
- *MissingIntWatchdog*	Test of internal watchdog has failed.
- *RAMTest*	RAM is faulty outside that which required by the boot loader, the address containing the error and its content are indicated in 3200 *ErrRAMAddressHigh* to 3205 *ErrRAMValueLow*
- *MainCheckSum*	Main program is inconsistent. Check sum over program in flash does not correspond to checksum memorized in bootpage.
- *MainEmpty*	no main program available entry address in Flash has been deleted or program length or program check sum in EEPROM boot page have been deleted.
- *ExternWatchdog*	Reset by external watchdog monitoring.
- *InternWatchdog*	Reset by internal watchdog monitoring.
- *ResetSource*	Unknown reset origin: Neither Power On nor Auto reset nor external / internal watchdog.
3013 *ErrFlash*	Error while clearing, writing or checking the flash memory
3014 *ErrCanBus*	Bus off reported
3015 *ErrCanComm*	CAN bus communication error
3190 *ExceptionNumber*	Exception code
3191 *ExceptionAddr1High*	Address 1 where exception has occurred, high part.
3192 *ExceptionAddr1Low*	Address 1 where exception has occurred, low part.
3193 *ExceptionAddr2High*	Address 2 where exception has occurred, high part.

PHLOX II - ICxx	
Indicated value	**Meaning**
3194 *ExceptionAddr2Low*	Address 2 where exception has occurred, low part.
3195 *ExceptionInfo1High*	Information 1 about exception, high part.
3196 *ExceptionInfo1Low*	Information 1 about exception, low part.
3197 *ExceptionInfo2High*	Information 2 about exception, high part.
3198 *ExceptionInfo2Low*	Information 2 about exception, low part.
3200 *ErrRAMAddressHigh*	Faulty address in SRAM, high part.
3201 *ErrRAMAddressLow*	Faulty address in SRAM, low part.
3202 *ErrRAMTestValHigh*	SRAM test value, high part
3203 *ErrRAMTestValLow*	SRAM test value, low part
3204 *ErrRAMValueHigh*	SRAM value, high part
3205 *ErrRAMValueLow*	SRAM value, low part
3300 *ResetSource*	Content of Reset Status Register
3840 *HardwareVersion*	Hardware version of boot loader
3841 *AddHardwareVersion*	Additional hardware version of boot loader
3842 *SoftwareVersion*	Software version of boot loader
3843 *BootSoftwareVersion*	Developer version of boot loader software.
3847 *DownloadCounter*	Number of main program downloads.
3850 *Identifier*	Identifier of DcDesk 2000 dongle.
3857 *CompileTime* 3858 *CompileDate* 3859 *CompileYear*	Information about when the boot loader software was created
3870 *Timer*	Incremental timer
3890 *ProcessorType* 3891 *ProcessorRevision*	Information about the onboard processor

Table 47: Parameters of boot loader PHLOX II - ICxx