

USER MANUAL

for

GDMS-PCN09[®]

**Gear and Diesel engine Monitoring System
Propulsion Condition Navy**

Part No.: 1 900 00 0000

Release: 100412
(revision 110901)



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Declaration of Conformity
EMC-Directive: 2004 / 108 / EC

We

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declare on our own responsibility, that the products

Kind of equipment:

**Gear and Diesel engine Monitoring System
Propulsion Condition Navy**

Type - designation:

GDMS - PCN09

are in compliance with following norms:

**EN 55011, EN 55022,
EN 61000-4-2, EN 61000-4-3,
EN 61000-4-4, EN 61000-4-5, EN 61000-4-6**



It is recommended to read this instruction manual before commencing the repair, assembly or commissioning of the bearing condition monitoring system!

Caution: The manufacturer's warranty will become void if these instructions are not followed!

Unless notified to the contrary, these operation instructions are applicable for:

GDMS-PCN09

In case a GDMS-PCN09 alarm, the operator should shut down the engine to avoid serious damages of the engine or its components.

Contents

1. System Description.....	1.1
2. Installation	2.1
3. Commissioning	3.1
4. Performance / Maintenance Tests	4.1
5. Troubleshooting	5.1
6. Repair	6.1
7. Spare Parts.....	7.1
8. Attachments.....	8.1
9. Notes	9.1



Contents

1. System Description.....	1.1
1.1. Components.....	1.1
1.1.1. GDMS-PCN09 - Principle	1.1
1.1.2. GDMS-PCN09 - Delivered Items (Overview).....	1.3
1.1.3. GDMS-PCN09 - System Components.....	1.5
1.1.3.1. GDMS-PCN09 Evaluator	1.5
1.1.3.2. Connectors and pin-out of the GDMS-PCN09 Evaluator.....	1.8
1.1.3.3. GDMS-PCN09 Slip Ring Transmitter (SRT)	1.9
1.1.3.4. Technical Data of GDMS-PCN09 Slip Ring Transmitter and Evaluator.....	1.10
1.1.5. Editions of GDMS-PCN09 System.....	1.11
1.1.6. Intended Purpose of the Monitoring Software (opt.)	1.12
2. Installation	2.1
2.1. General	2.1
2.2. Installation Position	2.2
2.3. SRT Mechanical Adjustments	2.3
2.4. Wiring Diagram	2.4
2.5. Software Installation (optional).....	2.5
2.6. PC Requirements (optional).....	2.6
3. Commissioning	3.1
3.1. Pre-Commissioning Checks.....	3.1
3.2. Synchronization of the PCN09 Sensor with the firing TDC of the first cylinder	3.2
3.3. Data Sampling.....	3.3
3.4. Alarm Setting and Triggering.....	3.4
3.4.1. Alarm Resetting.....	3.6
3.5. Settings & Parameters / Using the Evaluator	3.7
3.5.1. Basic Usage of the Evaluator.....	3.7
3.5.2. How to change a value	3.8
3.5.3. Menu Screen Overview.....	3.11
3.6. GDMS-PCN09 Logger measurement data storage and management (optional)	3.30
3.6.1. Compressing Data Files.....	3.31
3.6.2. Capturing the Graphic Screens.....	3.33
3.6.3. Archiving the Compressed Files	3.34
3.6.4. Manual Data Analysis for Compartment Localization	3.35
4. Performance / Maintenance Tests	4.1
4.1. Function Test.....	4.1
5. Troubleshooting	5.1
5.1. During Software Installation	5.1
5.2. During Software Use	5.2



5.3. Missing Control Signal	5.3
5.4. Very low / strong signal on polar diagram	5.4
5.5. Error code and Error description	5.5
6. Repair	6.1
7. Spare Parts.....	7.1
7.1. Main Spare Parts	7.1
7.2. Accessories	7.2
8. Attachments.....	8.1
8.1. Connection Assembly Instructions	8.1
8.1.1. Preparing the Cable	8.1
8.1.2. Connecting the RS-485 converter.....	8.2
8.1.3. Assembling the plug.....	8.3
8.1.4. Connection Cable - RS485 PCI Card to Evaluator	8.4
8.2. Wiring Diagrams.....	8.6
9. Notes	9.1

1. System Description

1.1. Components

1.1.1. GDMS-PCN09 - Principle

GDMS-PCN09, developed by MSS AG, is one of the most advanced and revolutionary monitoring systems available on the market.

Applicable to diesel engines, pumps, turbines and other machines where it is possible to measure electrical signals between a rotating shaft and its bearings, GDMS-PCN09 is able to monitor the condition of sliding bearings and sliding surfaces. Thus, it helps to diagnose failures in those moving parts at early stages, preventing the engine from serious damages.

Application to diesel engines:

The basic principle of the system is to measure the thermo voltage produced by a steel crankshaft when it slides on the metal surface of its bearing shells.

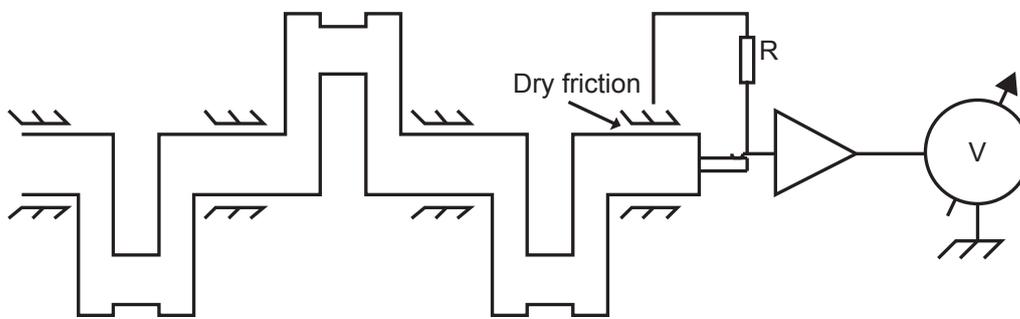


Fig 1.1.

Such thermo voltage signal is usually low during engine's normal operation (less than 1 mV) because lubricating oil film provides electrical isolation. Should the oil film between sliding parts be broken at any moment, e.g. due to metal particles within the bearing clearance, low oil pressure, overheated oil, etc., the Slip Ring Transmitter (SRT) will register higher thermo voltage signals.

GDMS-PCN09 is also capable of failure localisation. The cylinder firing sequence of the engine is stored in the configuration parameters of GDMS-PCN09. The SRT also observes the engine's rotation speed and the direction of rotation with the help of an incremental encoder.

High pressure during cylinder firing will generate significant thermo voltage signal at faulty parts, which, together with information from incremental encoder and firing sequence, helps to determine the location of failing oil film.

This information proved to be essential in engine diagnostics, and this is why GDMS-PCN09 is a very successful tool in reducing engine maintenance costs.

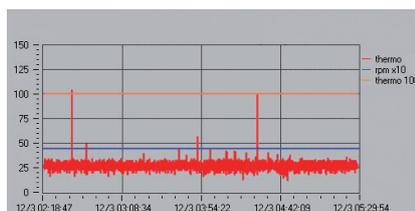


Fig 1.2. Logger graph showing a thermo signal

Thermo voltage signals and engine's rotation speed are displayed at a control device called Evaluator, and optionally can be monitored on a PC. This allows a trained operator to detect malfunctioning and failures in the crankshaft-bearing area of the engine at early stage, and to take immediate action to eliminate the fault. Optionally, the GDMS-PCN09 can be connected with alarm devices or can be used to automatically shut down the engine in order to prevent more serious engine damage. This can reduce the repair costs and the repair time drastically, usually leading to only minor repairs and maintenance works after early fault diagnostics.

The physical effect of thermo voltage spikes takes place for a few seconds at each start of the engine when the crankshaft still makes contact with the bearing shell while the oil film is building up. As soon as the oil film is fully created, it electrically isolates both metallic parts of the crankshaft bearing and the thermo voltage will disappear.

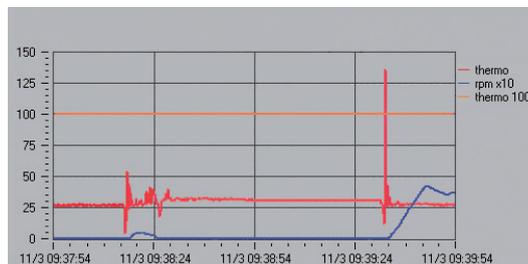


Fig 1.3. Start of an engine shows a high signal

The same effect can be also observed during engine's shutdown process. The thermo voltage will still be registered even after the engine is fully stopped until the temperatures of the contact points of the crankshaft and the bearing shells have been equalized.

1.1.2. GDMS-PCN09 - Delivered Items (Overview)

GDMS-PCN09[®] connected to engine

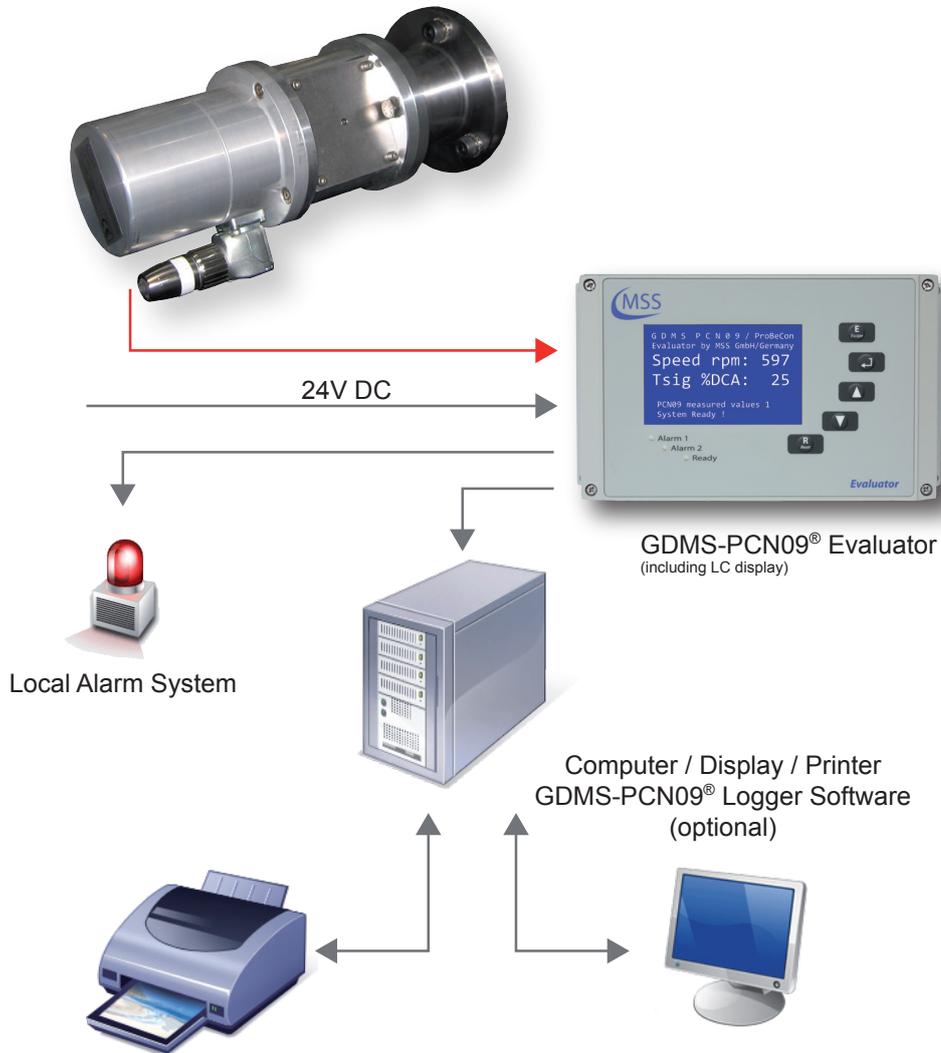


Fig 1.4.

- One Slip Ring Transmitter (SRT) installed on the housing on a free end of the crankshaft.
The rotating shaft of the SRT is mechanically attached to the free end of the crankshaft, usually with a vibration damper
- One GDMS-PCN09 Evaluator as the Local Control Panel where the measured values are displayed and the signal evaluation is performed. These values can also be displayed on a computer in the engine control room via RS485 communication cable with the help of GDMS PCN09 Logger software which provides online visualization and storage of the signals transmitted by the Evaluator. Furthermore, stored measurement data can be viewed and analysed by GDMS Data Display and ECPA software



- One set of mechanical mounting/join adapters which includes shaft adapter and cover, adapter housing with bearing, interface housing and cover
- This manual; optionally, a backup CD with commissioning data
- Optional PC with PCN09 Logger software; a CD with Logger installation and a soft copy of this manual



GDMS-PCN09 installation and commissioning are performed by MSS AG personnel or by its authorized partners.

Installation procedure includes training for technical staff at the engine site.

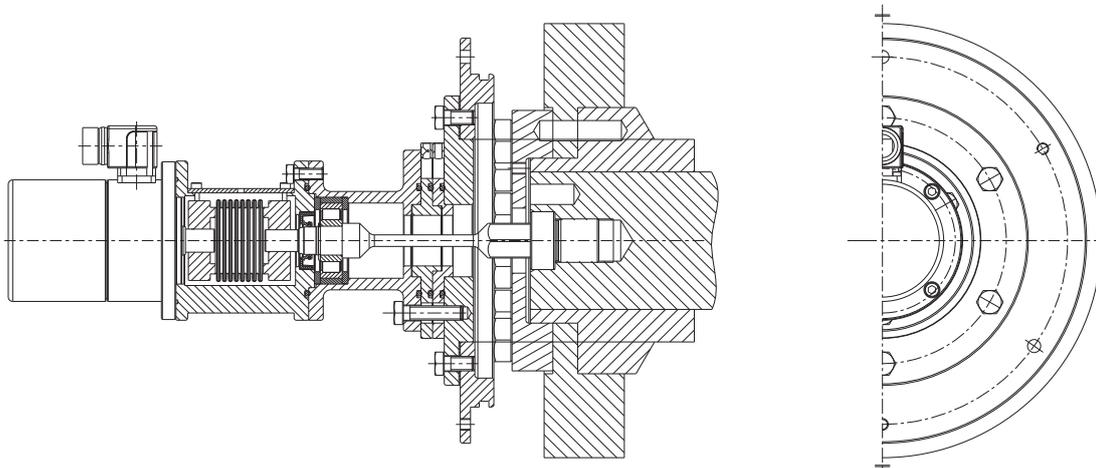


Fig. 1.5. Cut out Model of a sample GDMS-PCN09 installation

1.1.3. GDMS-PCN09 - System Components

1.1.3.1. GDMS-PCN09 Evaluator

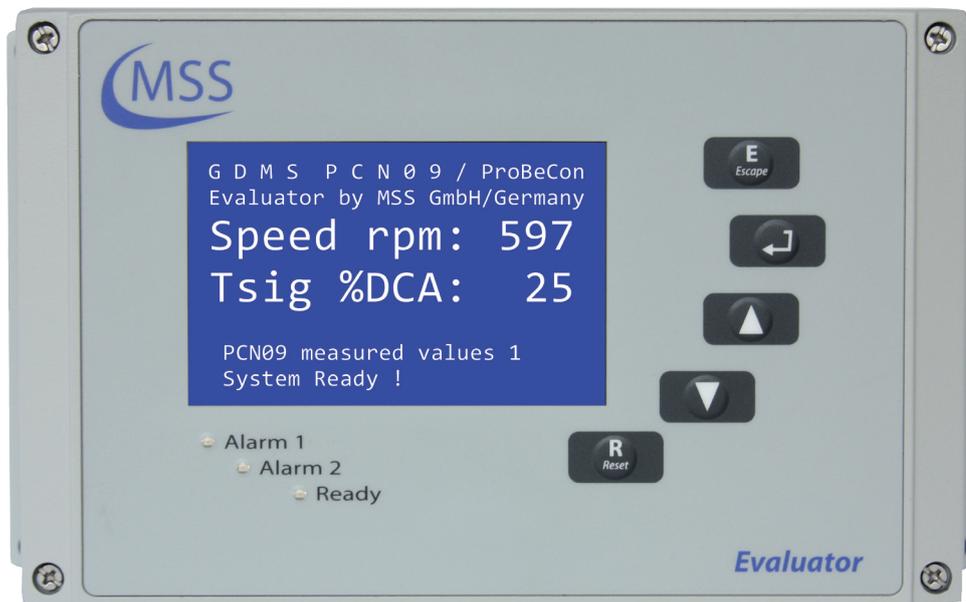


Fig 1.6.

The visible part of the Evaluator consists of a metallic case, a liquid crystal display (LCD), three LEDs (Alarm1, Alarm2 and Ready), four control keys ( ,  ,  , ) and one reset button  .

The electronics and the display of the GDMS-PCN09 Evaluator are installed in a closed, shock-proofed, water, dust and EMC resistant Aluminium case, protection class IP 67.

The Evaluator is provided for mounting close to the engine or in the engine control room. The Evaluator operates reliably at temperatures between 0°C to 70°C and at relative humidity up to 80%.

The installation of the Evaluator is performed via 2 assembly rigs. If required, the Evaluator can be mounted vibration-free. In each case you have to pay attention that the connection cable is passed loose in a loop and without traction to the plug-in connections.

The Evaluator is able to display the measurement values and PCN09 parameter values on its LCD display. It also provides some test procedures that can be performed for GDMS-PCN09 diagnostics.

The control keys of the Evaluator are made as film-press buttons. During operation, please be careful and do not press them with spiky or sharp items, instruments like knives, screw-drivers or ball-pens. Just touch the buttons with a slight pressure by a fingertip.





If needed, the keypad can be wiped with a mild cleaning agent. Please never use a solvent!

After successful installation and testing by service technicians of MSS AG or authorized service technicians, the settings of the Evaluator should not be changed any more. The Evaluator runs maintenance-free.



Info: There are firmware updates available for the Evaluator which may only be applied to your system by MSS AG technicians or authorized service technicians. These updates are not free of charge, so please contact MSS AG or its authorized representatives for a recent price list and further information.

1.1.3.2. Connectors and pin-out of the GDMS-PCN09 Evaluator

Connection at the Connectors of the Evaluator						
Pin	1	2	3	4	5	6
	Power Supply	Relays	Serial Data Link	Reserved	Reserved	SRT
1	+24V	1st Alarm No	TxD / 232			SRT-1
2	0V	1st Alarm COM	RxD / 232			SRT-2
3		1st Alarm NC	CAN-H			SRT-3
4		2nd Alarm No	CAN-L			SRT-4
5		2nd Alarm COM	RS485 +			SRT-5
6		2nd Alarm NC	RS485 -			SRT-6
7		Ready No	RxD + RS485			SRT-7
8		Ready COM	RxD - RS485			SRT-8
9			MODBUS + optional			SRT-9
10			MODBUS - optional			SRT-10
11		Pre Alarm COM	GND			SRT-11
12		Pre Alarm NC	GND			SRT-12
Cable Part. No.	2xAWG 20 9200020000	12xAWG 20 9200120000	12xAWG 20 9200120000			12xAWG 20 9200120000
Connector Set	9300061000	9300122000	9300124000			9300122000

(for further information like wire colors, please refer to pages 8.6 - 8.9)

Table 1.1.

1.1.3.3. GDMS-PCN09 Slip Ring Transmitter (SRT)



Fig 1.8.

The Connector-Set for the socket at the SRT: Art. No. 9300121000 has the wiring assignment as listed on Table 1.1. on page 1.8 for the Connector-Set with the Art. No. 9300122000

The Slip Ring Transmitter is shaped as a cylinder. It is fixed to a mounting board with a flange and 4 cylinder-head screws. The SRT is identical for all engines. In each individual case the mounting flange and the transmission shaft to the crankshaft of the engine are adapted individually for each engine type. If necessary, SRT can be dismantled for maintenance.

Info: The shaft and the mounting flange are determined, designed and manufactured by MSS AG or by its authorized partners for each engine type. Only in this case correct operation and trouble-free transmission of measurement signals are guaranteed.

The Slip Ring Transmitter contains a special slip ring with redundant carbon brushes which receives the thermo-voltage signal from the crankshaft-engine system, and an incremental encoder for measuring speed and rotating direction.

The SRT is designed to work in typical environment conditions of diesel engines. Please also refer to the technical data on page 1.10



1.1.3.4. Technical Data of GDMS-PCN09 Slip Ring Transmitter and Evaluator

Power Supply:	24V DC +30/-25%
	Operating Current: max. 1.5 A
Sensitivity:	Adjustable in 5 steps
Relay-Outputs:	Contact load for all relays: max. 60VAC, 1A, 60VA / max. 60VDC, 1A, 60W
	Alarm 1: 1 relay with 2 ground-free switch-over contacts, usually configured as main alarm.
	Alarm 2: 1 relay normally closed, usually configured to open if pre- alarm condition arises
	Ready: 1 relay, closes if system is fault-free, opens otherwise
	Wire break protection with 33 kOhm resistors (standard)
Interface:	Serial Interface: • RS485 for standardized industrial, bidirectional communication
	Communication Protocol: • Modbus (optional) • CAN Bus (optional)
User interface:	LCD Display 240*128 dots 1 LED green "Ready" 1 LED red "Alarm 1" (usually set up as main alarm) 1 LED orange "Alarm 2" (usually set up as pre-alarm)
Connection cable:	for example: • Huber + Suhner Radox MFHS-EMC (GL approved) • Metrofunk 12 AWG 20UC-L
Environment Conditions:	Ambient temperature in service: 0°C - 70°C for GDMS-PCN09 Evaluator and SRT Ambient temperature in storage: -25°C - 85°C Protection: IP65
	(GL-environment category D, EMC 2)

1.1.5. Editions of GDMS-PCN09 System

Delivered Part(s)	GDMS-PCN09 Professional	GDMS-PCN09 Advanced	GDMS-PCN09 Basic
Hardware			
Slip Ring Transmitter (SRT)	x	x	x
GDMS-PCN09 Evaluator	x	x	x
Mechanical Parts	x	x	x
Monitoring PC	x	x	-
Logger Software			
Displays RPM	x	x	-
Displays Thermosignal in %	x	x	-
Displays Relais Status	x	x	-
Displays adjusted DC alarmlevel	x	x	-
Status window with plain text information	x	x	-
Displays set parameters	x	x	-
Displays thermosignal and engine speed in one y-t graph	x	x	-
Minimized polar diagram in the main window	x	-	-
Detailed representation of engine geometry and detected signal	x	-	-
Cylinder Speed Difference Diagram for Evaluation of each single Cylinder	x	-	-
Cylinder Thermosignal Difference Diagram	x	-	-
Storing Standard Data in Daily Log File	-	x	-
Storing Enhanced Data in Daily Log File	x	-	-
Data Display Software			
Status window with plain text information	x	x	-
Displays thermosignal and engine speed in one y-t graph	x	x	-
Minimized polar diagram in the main window	x	-	-
Detailed representation of engine geometry and detected signal	x	-	-
Cylinder Speed Difference Diagram for Combustion Analysis	x	-	-
Cylinder Thermosignal Difference Diagram	x	-	-

x = scope of delivery
- = not included



1.1.6. Intended Purpose of the Monitoring Software (opt.)

Attention: This chapter only applies if you are running a **GDMS-PCN09 Advanced** or **GDMS-PCN09 Professional** system! Otherwise, the following information can be ignored.

The PCN09
Logger software
handles up to six
GDMS-PCN09
systems

The purpose of the GDMS-PCN09 Monitoring Software is:

- to allow the measurements of a GDMS-PCN09 to be monitored by means of a computer
- to store the recorded data in daily log-files
- to display measured signals to allow trained engine operator to localize the damaged part(s)

The PCN09
Logger software
does not replace
functions of the
safety system



The Monitoring Software does not replace the interconnection of the GDMS-PCN09 Evaluator with the engine safety and alarm system

The use of a computer with the GDMS-PCN09 is only permitted when it is installed and configured by MSS AG or by its authorized representatives.

MSS AG can only provide technical support if MSS AG approved equipment, i.e. interface converter, plugs, etc., is used.



The purpose of this manual is to instruct the operator how to make the best use of the software and to alert of safety issues that may arise.

To be handled
only by
appropriately
trained
personnel

All products mentioned in this manual are to be handled only by personnel with appropriate electrical and computer knowledge, such as international ISO standards and Microsoft Windows Operating systems.

Any damages, either human or material, caused by the use of the products described in this manual for any purpose other than that intended, is solely the responsibility of the user and not of the manufacturer.

2. Installation

2.1. General

Installation and commissioning of GDMS-PCN09 is conducted or supervised by personnel from MSS AG or its authorized representatives.

The installation procedure includes training for the site operation personnel. The commissioning data will be stored on the backup CD for later reference.

The wiring diagram and schematic given here are guidelines only. The actual wiring will be adapted to the existing alarm and monitoring system on site.



2.2. Installation Position



Fig 2.1.

The GDMS-PCN09 Slip Ring Transmitter is installed at the end of the crankshaft of the combustion engine. The evaluator can be installed in the engine room near the engine or, alternatively, in the engine control room. The length of signal cables should not exceed 200 m.

2.3. SRT Mechanical Adjustments

The Slip Ring Transmitter is centered during installation, and it is not necessary to do it afterwards. Replacing the SRT can be performed without re-centering.

During the GDMS-PCN09 installation, the SRT has to be synchronized with the engine's crankshaft. This has to be done only once!

This involves positioning the engine at TDC at No. 1 cylinder and finding incremental encoder impulse offset.

This is especially important at four-stroke engines (inlet and outlet valves are closed).

The GDMS-PCN09 SRT may only be replaced by personnel of MSS AG or by its authorized representatives.





2.4. Wiring Diagram

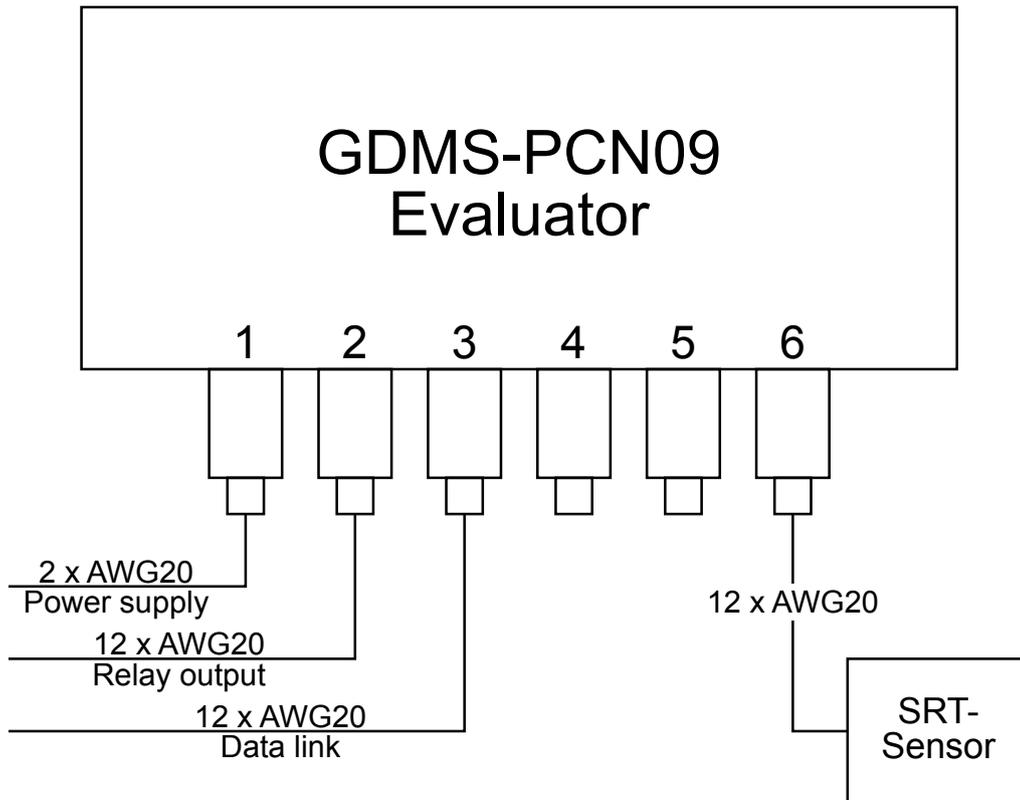


Fig 2.2. Principle Connection

The cable types for power supply, relay output, data link and connection of the SRT sensor are shown in „Fig 2.2. Principle Connection“. For connector details please refer to chapters 1.1.3.2. on page 1.8 and 8.2. on page 8.6.

2.5. Software Installation (optional)

Attention: This chapter only applies if you are running a **GDMS-PCN09 Advanced** or **GDMS-PCN09 Professional** system! Otherwise, the following information can be ignored.

The GDMS-PCN09 Logger and GDMS-PCN09 Data Display software is pre-installed on the hard disk of the supplied computer. The programmes must be configured correctly according to the system specific configuration on site after GDMS-PCN09 commissioning. Please refer to PCN09 Logger and PCN09 Data_Display manual for information.

Upon request, a backup CD with

- 1) a softcopy of this manual
- 2) the GDMS-PCN09 Logger and Data Display setup programs
- 3) the commissioning data

can be shipped by MSS AG.

Note:

PCN09 Logger and Data Display installation steps are not described in this manual to avoid any unauthorized attempt to reinstall it. If necessary, please contact MSS AG or its authorized representatives for further information.





2.6. PC Requirements (optional)

Attention: This chapter only applies if you are running a **GDMS-PCN09 Advanced** or **GDMS-PCN09 Professional** system! Otherwise, the following information can be ignored.

The monitoring computer should have the following minimum requirements:

- Intel Core2Duo Processor
- 2.66GHz or higher **
- CD-Rom drive, recommended CD-R/W drive
- min. 2GB DDR2 RAM **
- Hard Disk with a capacity of min. 160 GB for recording data (approx. 80MB per day per GDMS-PCN09 set, see chapter 3.4. on page 3.4 for more info) **
- supports Windows XP, Windows Vista, Windows 7
- mouse, keyboard
- at least 3 PCI slots **,
- Display resolution 1280 x 1024 or higher **

**) depending on how many GDMS-PCN09-applications running parallel on the same PC

As a personal computer is usually not equipped with a RS485 interface, MSS AG provides optionally either the necessary converter, incl. power supply equipment, to convert the RS485 signal of the GDMS-PCN09 Evaluator into the required RS232 PC-signal (see Fig. 7.11 & Fig 7.12, page 7.5) or a PCI card installed in the computer (see Fig. 7.13, page 7.6).

The RS485 cable length must not exceed 200 m.

3. Commissioning

3.1. Pre-Commissioning Checks

Check for the following:

1. correct wiring as given in chapter 1.1.3.2. and Chapter 2.3.
2. correct power supply on GDMS-PCN09 Evaluator
3. GDMS-PCN09 Evaluator display is on

- 4a. correct power supply on RS-485 converter
- 5a. green power light on
- 6a. the RS-485 converter rate setting is correct

- 4b. PCI card is built into the PC correctly
- 5b. PCI card driver for the corresponding OS is correctly installed

7. COM-Port of the computer is correctly assigned

Note: Steps 4a – 6a are required if a RS-485 converter is used; steps 4b – 5b are for the case when a PCI card is built into the PC.

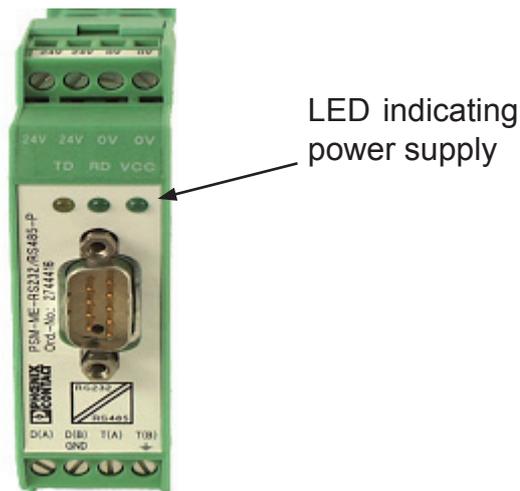


Fig. 3.1. RS485-Converter, LED indicating power supply



3.2. Synchronization of the PCN09 Sensor with the firing TDC of the first cylinder

At the installation of the GDMS-PCN09 sensor an one time calibration of the incremental encoder has to be performed. The adjustment is done to calibrate the neutral point of the incremental encoder with the setting firing Top Dead Center for cylinder 1. The setting firing TDC has to be observed especially at four-stroke engines (inlet and outlet valves are closed).

The following procedure may only be executed by authorized personnel:

- Turn engine to firing TDC of first cylinder (number 1 at inline engine, A1 at v-type engine), all valves must be closed!
- Go to Screen 1.6.1.10 - IS Impuls Offset (page 3.23) at the Evaluator
- Start Impuls Offset detection in the Evaluator
- Turn engine in normal rotation direction until Impuls Offset detection is finished
- Leaving Screen 1.6.1.10 - IS Impuls Offset (page 3.23), the offset will be stored in the Evaluator's EEPROM
- Restart evaluator
- The synchronization procedure is done



Attention: Synchronization must be repeated after all works that required the mechanical connection between crankshaft and SRT sensor to be opened!

3.3. Data Sampling

As soon as GDMS-PCN09-Evaluator is powered up, it starts the initial self check procedure and shows the READY status if all pre-set conditions are fulfilled. This self check procedure is carried out in a certain cycle.

Regardless of the GREEN READY LED status of the GDMS-PCN09 Evaluator, if a working GDMS-PCN09 Slip Ring Transmitter is connected to it, the GDMS-PCN09 Evaluator samples the signals from the GDMS-PCN09 SRT at a certain sampling rate. After that, the Evaluator converts them into digital signals, analyzes, evaluates and displays them on its LCD-display.

These data including detected events are continuously made available through the RS485 interface to the installed PC with PCN09 Logger software for remote monitoring and further processing. It is also possible to set up some PCN09 Evaluator parameters from the PC using standard Windows HyperTerminal application.

Depending on the configuration, the GDMS-PCN09 Logger software can manage up to 6 GDMS-PCN09 systems on a single computer. The measured values and events will be monitored and displayed continuously on the computer, and stored in a distinct directory on the hard disk for each connected GDMS-PCN09 system.



3.4. Alarm Setting and Triggering

There are 3 alarm relays integrated in the GDMS-PCN09 Evaluator:

- 1st Alarm relay: always assigned to main alarm, additionally programmable as pre-alarm or over speed alarm
- 2nd Alarm relay: programmable as main alarm or pre-alarm or both and/or over-speed alarm
- 1 Ready relay: indicates the system status

The GDMS-PCN09 has a self check procedure which is carried out in a certain cycle. If any one of the conditions for System Ready status is not detected the GDMS-PCN09 Evaluator switches off the GREEN READY LED and the Ready relay opens. Error code and text error message are shown on the LCD display of the Evaluator and also in the event window of PCN09 Logger on the monitoring computer.

GDMS-PCN09 enables to set different alarm sensitivity levels by defining different thermo voltage signal thresholds as alarm condition. Thermo signal alarm levels are encoded as numbers from 1 to 5 (the higher the number is the less sensitive is the system).

Over-speed alarm level is given in RPM.

Alarm sensitivity levels must be set at the GDMS-PCN09 Evaluator. If alarm conditions are fulfilled, the firmware of the GDMS-PCN09 Evaluator triggers the corresponding alarm.

The GDMS-PCN09 monitoring software on the computer does **only registering, recording, displaying and storing data!**

For example, the following set of conditions should be met in GDMS-PCN09 in order to trigger Main Alarm:

- 1) The GREEN READY LED has to be on.
- 2) The measured thermo voltage signals should be higher than the pre-set alarm level over a certain period of time.
- 3) The increase of these measured signals over time should be higher than a certain value.
- 4) The engine rotation speed should be higher than pre-set minimal value.

If GDMS-PCN09 Evaluator triggers Main Alarm it does not mean that the affected parts have been damaged irreparably.

Depending on the pre-set alarm level and on wiring to the engine site alarm devices, Main Alarm alerts the operator that the tolerated level has been exceeded, indicating that further investigation of GDMS-PCN09 signals is needed, and may initiate an engine shutdown.

By selecting the appropriate sensitivity level, the operator defines up to which extend he would allow moving parts to be affected by friction.

With this information of fault on early stage, the operator is aware of the progressing problem and has enough time for making decisions on engine maintenance and repair.

In case of an alarm triggering, it is shown:

- by the LED indicators on the GDMS-PCN09 Evaluator
- by the PCN09 Logger software on the monitoring computer
- by alarm indicators of the engine alarm devices, depending on wiring



3.4.1. Alarm Resetting

- In case of a System Not Ready status:

Only if all conditions for System Ready status are re-established (e.g. the problem indicated on the LC-Display of GDMS-PCN09 Evaluator is fixed by the operator), the System Ready status will be reactivated automatically by the system.

- In case of a Pre-Alarm triggered:

If the conditions for a Pre-alarm are not confirmed after pre-set time period, the Pre-Alarm will be reset automatically by the system.

- In case of a Main-Alarm triggered:

The Main Alarm will not be reset automatically by the system even after the conditions that led to it are not met any more. Main Alarm can only be reset manually at the GDMS-PCN09 Evaluator by pressing the RESET button for 3 seconds.

- In case if Over-speed Alarm triggered:

Over-speed Alarm is not being reset automatically by the system either! It must be reset by pressing the RESET button at the Evaluator for 3 seconds



Attention: Main-Alarm cannot be reset through the PCN09 Logger software, but only at the GDMS-PCN09 Evaluator by pressing the RESET-Button for 3 seconds.

3.5. Settings & Parameters / Using the Evaluator

3.5.1. Basic Usage of the Evaluator

Using the Evaluator is very simple. It has got one large 240x128 LCD, four navigation buttons (, , , ), one reset button  and three LEDs indicating the system status.

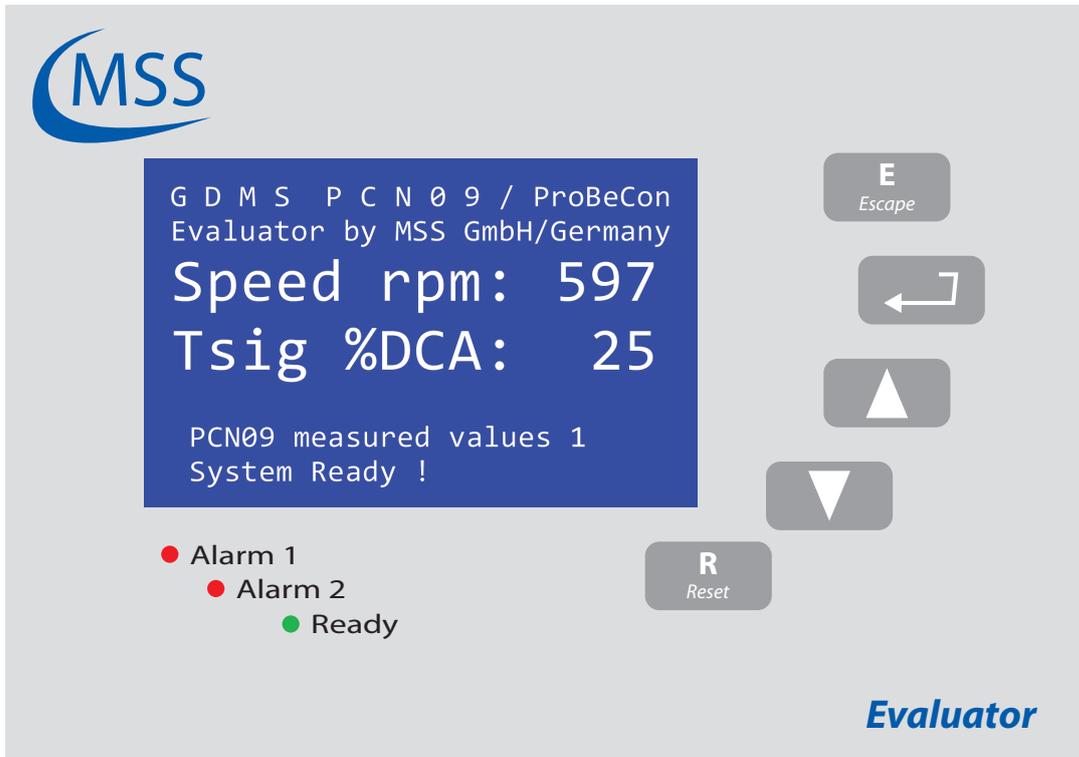


Fig. 3.2. View of the Evaluator with the default screen

On this sample picture you see the Evaluator displaying Screen 1.1 (page 3.13) which is the default screen while the system is running. On the following pages, each screen is described and the possible actions are given.

Please have a short look at the description of Screen 1.1 (page 3.13). On the given table, you can see that

- pushing the button  will display Screen 1.2
- pushing the button  will display Screen 1.6
- pushing the button  will not do anything
- pushing the button  will display Screen 1.7

Note: The button  is only needed to reset an alarm!

On the next page, an example for changing a value is given.

3.5.2. How to change a value

In this example the change of the value “LCD brightness” is described.

The screen we need to get to is Screen 1.6.2.1 - LCD brightness.

1. Beginning with the default screen Screen 1.1 - Speed rpm / Tsig %DCA you have to go to Screen 1.6 - Parameter setup by pushing  once **or** by pushing  five times.
2. Then, you have to push  to get to the next menu level.
3. Screen 1.6.1 - Setup PCN-09 will be displayed.
4. Since the target screen is at level Screen 1.6.2 - Setup CPU you need to push  once and after that .

```
G D M S P C N 0 9 / ProBeCon
Evaluator by MSS GmbH/Germany

-- Setup CPU -----
LCD brightness : 30
up/down=next, ret=select
Press ESC to leave !
Change of parameters
System Ready !
```

Fig. 3.3. Screen 1.6.2.1 as of step 5

5. Screen 1.6.2.1 - LCD brightness will be displayed:
6. Now, we can change the value by pressing the  button first.

```
G D M S P C N 0 9 / ProBeCon
Evaluator by MSS GmbH/Germany

-- Setup CPU -----
LCD brightness : 30
up/down=next, ret=select
Press ESC to leave !
Change of parameters
System Ready !
```

Fig. 3.4. Screen 1.6.2.1 as of step 6

The screen will now look like this:

7. The value is highlighted now which indicates that it may be changed.
8. To change the value use the button  to increase the value and the button  to decrease the value.
9. If you reached the new value, for example “50”, press . The screen will look like that:

```
G D M S P C N 0 9 / ProBeCon
Evaluator by MSS GmbH/Germany

-- Setup CPU -----
LCD brightness : 50
up/down=next, ret=select
Press ESC to leave !
Change of parameters
System Ready !
```

Fig. 3.5. Screen 1.6.2.1 as of step 9

10. By pushing  twice, the Evaluator will restart and the default screen Screen 1.1 - Speed rpm / Tsig %DCA will be shown.

Note: If you do not want to change the value while you are in step 8, press the button  and the old value will return.

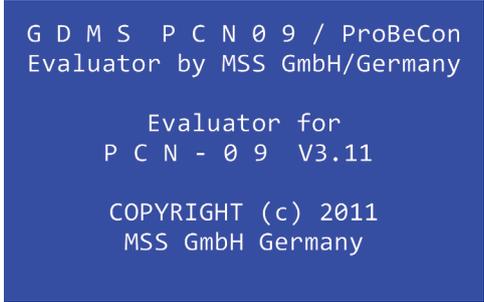


3.5.3. Menu Screen Overview

Screen 0.1 - Startup Screen	3.12
Screen 0.2 - Startup Navigation Information	3.12
Screen 1.1 - Speed rpm / Tsig %DCA	3.13
Screen 1.2 - Teff %DCA / Teff %ACA.....	3.13
Screen 1.3 - Voltage Tabs [mV]	3.13
Screen 1.4 - Graphic overview	3.14
Screen 1.4.1 - Graphic overview displaying	3.16
Screen 1.5 - Extended Infos	3.14
Screen 1.5.1 - TS1	3.17
Screen 1.5.2 - TS2	3.17
Screen 1.5.3 - ISa.....	3.17
Screen 1.5.4 - ISb.....	3.18
Screen 1.5.5 - ISs.....	3.18
Screen 1.5.6 - TDC.....	3.18
Screen 1.6 - Parameter setup	3.14
Screen 1.6.1 - Setup PCN-09.....	3.19
Screen 1.6.1.1 - TS Alm-Level DC	3.20
Screen 1.6.1.2 - TS PreAlm-Level.....	3.20
Screen 1.6.1.3 - RPM Alarm-Level	3.20
Screen 1.6.1.4 - TS Alm-Level1 AC.....	3.21
Screen 1.6.1.5 - TS Alm-Level2 AC.....	3.21
Screen 1.6.1.6 - RPM for Level2	3.21
Screen 1.6.1.7 - Start Alminhibit	3.22
Screen 1.6.1.8 - TS Test Time	3.22
Screen 1.6.1.9 - TS Test Len	3.22
Screen 1.6.1.10 - IS Impuls Offset	3.23
Screen 1.6.1.11 - PIN Impuls Offs.....	3.23
Screen 1.6.1.12 - TSeff ena for DC	3.23
Screen 1.6.1.13 - Values for TSeff.....	3.24
Screen 1.6.2 - Setup CPU	3.19
Screen 1.6.2.1 - LCD brightness	3.25
Screen 1.6.2.2 - RS485 fullduplex.....	3.25
Screen 1.6.2.3 - Modbus enable	3.25
Screen 1.6.2.4 - Modbus adress	3.26
Screen 1.6.2.5 - PIN for Setup	3.26
Screen 1.6.2.6 - Software Info.....	3.26
Screen 1.6.2.6.1 - Software Info displaying.....	3.27
Screen 1.6.3 - Test Features	3.19
Screen 1.6.3.1 - Ready Relay	3.28
Screen 1.6.3.2 - Alarm Relay.....	3.28
Screen 1.6.3.3 - Alm2/Pre Relay	3.28
Screen 1.6.3.4 - Testsignal A.....	3.29
Screen 1.6.3.5 - Testsignal B.....	3.29
Screen 1.7 - Do you really want restart?	3.15

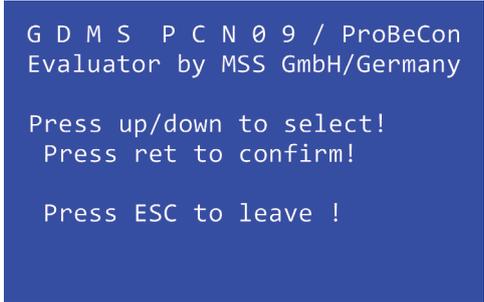


Screen 0.1 - Startup Screen

		No action
		No action
		No action
		No action
		No action

This screen is displayed right after powering up the Evaluator. It shows the product name, the firmware version and the copyright information.
This screen is shown for ca. 3 seconds and will automatically jump to screen Screen 0.2

Screen 0.2 - Startup Navigation Information

		No action
		No action
		No action
		No action
		No action

This screen shows some basic navigation information. Detailed information for each screen is given on the next pages.
This screen is shown for ca. 3 seconds and will automatically jump to screen Screen 1.1

Screen 1.1 - Speed rpm / Tsig %DCA

<div style="background-color: #003366; color: white; padding: 10px;"> <p>G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>Speed rpm: 597</p> <p>Tsig %DCA: 25</p> <p>PCN09 measured values 1 System Ready !</p> </div>		Screen 1.2 will be shown
		Screen 1.6 will be shown
		No action
		Screen 1.7 will be shown
		No action

This screen shows the current motor speed in RPM (revolutions per minute) and the current thermo signal relating to the DC alarm level in %. Main alarm will be triggered if this value reaches 100%.

Screen 1.2 - Teff %DCA / Teff %ACA

<div style="background-color: #003366; color: white; padding: 10px;"> <p>G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>Teff %DCA: 25</p> <p>Teff %ACA: 16</p> <p>PCN09 measured values 2 System Ready !</p> </div>		Screen 1.3 will be shown
		Screen 1.1 will be shown
		No action
		No action
		No action

This screen shows the root mean square value of the DC part of the thermo signal in % (Teff %DCA) relating to the DC alarm level and the root mean square value of the AC part of the thermo signal in % (Teff %ACA) relating to the AC alarm level. Main alarm will be triggered if any of these values reaches 100%.

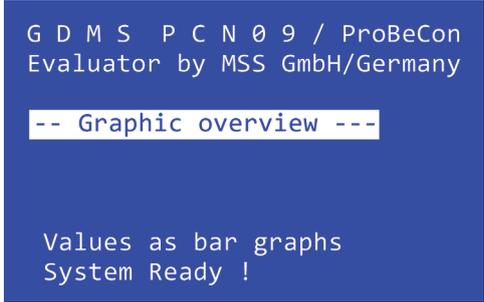
Screen 1.3 - Voltage Tabs [mV]

<div style="background-color: #003366; color: white; padding: 10px;"> <p>G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>Voltage</p> <p>Tabs [mV]: 0.1</p> <p>PCN09 measured values 3 System Ready !</p> </div>		Screen 1.4 will be shown
		Screen 1.2 will be shown
		No action
		No action
		No action

This screen shows the current absolute thermo signal in mV (millivolts).

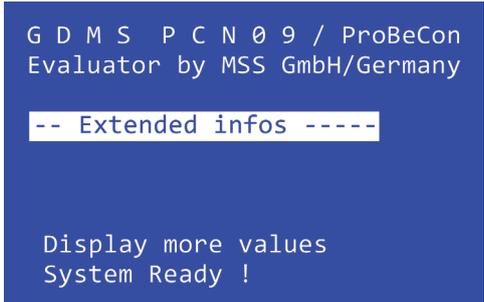


Screen 1.4 - Graphic overview

		Screen 1.5 will be shown
		Screen 1.3 will be shown
		Screen 1.4.1 (page 3.16) will be shown
		No action
		No action

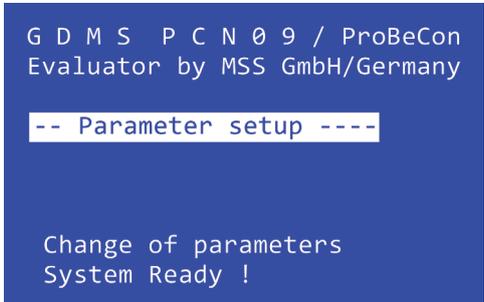
Via this screen you can access the bar graph visualization of the different measured values: RPM, Teff %ACA, Teff %DCA, Tsig %DCA

Screen 1.5 - Extended Infos

		Screen 1.6 will be shown
		Screen 1.4 will be shown
		Screen 1.5.1 (page 3.17) will be shown
		No action
		No action

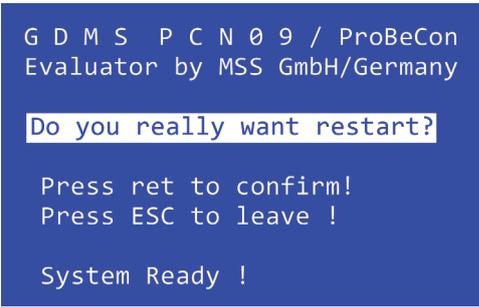
Via this screen you can access the detailed information level.

Screen 1.6 - Parameter setup

		Screen 1.1 will be shown
		Screen 1.5 will be shown
		Screen 1.6.1 (page 3.19) will be shown
		No action
		No action

Via this screen you can access the parameter setup level.

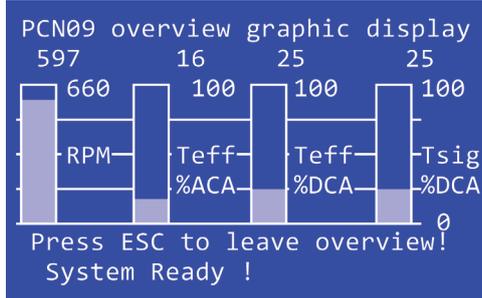
Screen 1.7 - Do you really want restart?

		No action
		No action
		Evaluator will restart and Screen 0.1 will be shown
		Screen 1.1 will be shown
		No action

This screen is a confirmation prompt which requires you to verify if the system really should restart.



Screen 1.4.1 - Graphic overview displaying



	No action
	No action
	No action
	Screen 1.1 will be shown
	No action

This screen shows the current measured data as bar graphs. Above each bar graph the measured value is displayed as text.

Screen 1.5.1 - TS1

 <p>GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>TS1: 409</p> <p>PCN-09 thermo sig.1 System Ready !</p>		Screen 1.5.2 will be shown
		Screen 1.5.6 will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the value returned by the analog/digital converter of the first thermo voltage measurement channel.</p>		

Screen 1.5.2 - TS2

 <p>GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>TS2: 545</p> <p>PCN-09 thermo sig.2 System Ready !</p>		Screen 1.5.3 will be shown
		Screen 1.5.1 will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the value returned by the analog/digital converter of the second thermo voltage measurement channel.</p>		

Screen 1.5.3 - ISa

 <p>GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>ISa: 1</p> <p>PCN-09 increment. a System Ready !</p>		Screen 1.5.4 will be shown
		Screen 1.5.2 will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the current pulse value of the incremental encoder of channel A. The value may be 1 or 0. The motor speed and rotational direction is determined by the values ISa and ISb.</p>		



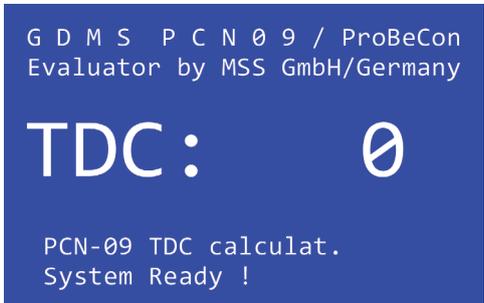
Screen 1.5.4 - ISb

 <p>GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>ISb: 1</p> <p>PCN-09 increment. b System Ready !</p>		Screen 1.5.5 will be shown
		Screen 1.5.3 will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the current pulse value of the incremental encoder of channel B. The value may be 1 or 0. The motor speed and rotational direction is determined by the values ISa and ISb.</p>		

Screen 1.5.5 - ISs

 <p>GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>ISs: 0</p> <p>PCN-09 increment. s System Ready !</p>		Screen 1.5.6 will be shown
		Screen 1.5.4 will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the zero pulse of the incremental encoder.</p>		

Screen 1.5.6 - TDC

 <p>GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany</p> <p>TDC: 0</p> <p>PCN-09 TDC calculat. System Ready !</p>		Screen 1.5.1 will be shown
		Screen 1.5.5 will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the signal of the calculated Top Dead Centre (TDC) of the engine of cylinder 1 with a value of 0 or 1.</p>		



If you have entered either Screen 1.6.1, Screen 1.6.2 or Screen 1.6.3, pushing  will make the Evaluator reboot and continue with Screen 0.1!

Screen 1.6.1 - Setup PCN-09

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2 will be shown
		Screen 1.6.3 will be shown
		Screen 1.6.1.1 (page 3.20) will be shown
		Screen 1.1 will be shown
		No action

Via this screen you can access the parameters concerning the main GDMS-PCN09 monitoring.

Screen 1.6.2 - Setup CPU

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.3 will be shown
		Screen 1.6.1 will be shown
		Screen 1.6.2.1 (page 3.25) will be shown
		Screen 1.1 will be shown
		No action

Via this screen you can access the parameters concerning communications and the display. You will also find the software version information and the PIN input mask.

Screen 1.6.3 - Test Features

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Test Features ----- up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1 will be shown
		Screen 1.6.2 will be shown
		Screen 1.6.3.1 (page 3.28) will be shown
		Screen 1.1 will be shown
		No action

Via this screen you can access the testing features of the Evaluator.

 **Attention:** You need to enter the PIN to be able to access this level!

Screen 1.6.1.1 - TS Alm-Level DC

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TS Alm-Level DC : 3 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.2 will be shown
		Screen 1.6.1.13 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>Setting of DC main alarm level in the range from 0 - 5.</p> <p>Value "0" means alarm disabled.</p>		

Screen 1.6.1.2 - TS PreAlm-Level

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TS PreAlm-Level : 70 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.3 will be shown
		Screen 1.6.1.1 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>Setting of GDMS-PCN09 pre-alarm level (in % main alarm) in the range from 40 - 100.</p>		

Screen 1.6.1.3 - RPM Alarm-Level

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- RPM Alarm-Level : 660 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.4 will be shown
		Screen 1.6.1.2 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>Setting of overspeed alarm in RPM (revolutions per minute) in the range of 0 - 3000 in steps of 50.</p> <p>Value "0" means overspeed alarm disabled.</p>		

Screen 1.6.1.4 - TS Alm-Level1 AC

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TS Alm-Level1 AC: 3 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.5 will be shown
		Screen 1.6.1.3 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action

Setting of AC main alarm level in RPM zone 1 in the range from 0 - 5.

Value “0” means alarm disabled.

Screen 1.6.1.5 - TS Alm-Level2 AC

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TS Alm-Level2 AC: 3 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.6 will be shown
		Screen 1.6.1.4 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action

Setting of AC main alarm level in RPM zone 2 in the range from 0 - 5.

Value “0” means alarm disabled.

Screen 1.6.1.6 - RPM for Level2

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- RPM for Level2 :1500 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.7 will be shown
		Screen 1.6.1.5 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action

Value of RPM to switch from RPM zone 1 to RPM zone 2.

i The system has the possibility to define two RPM ranges with 2 different AC alarm levels.



Screen 1.6.1.7 - Start Alminhibit

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- Start Alminhibit:Off up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.8 will be shown
		Screen 1.6.1.6 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>With this setting the alarm can be inhibited up to 5 hours after the start of the engine.</p>		

Screen 1.6.1.8 - TS Test Time

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TS Test Time : 1 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.9 will be shown
		Screen 1.6.1.7 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>Setting of time interval in minutes between test pulses, which test the operation of the sensor, in the range of 1 - 10 min.</p>		

Screen 1.6.1.9 - TS Test Len

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TS Test Len : 1 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.10 will be shown
		Screen 1.6.1.8 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>Length of test pulse in seconds in the range of 1 - 15 sec.</p>		

Screen 1.6.1.10 - IS Impuls Offset

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- IS Impuls Offset: 123 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.11 will be shown
		Screen 1.6.1.9 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.1.11.
		Screen 1.6.1 (page 3.19) will be shown
		No action

Determination of the impulse offsets between the zero pulse of the sensor and the Top Dead Center (T.D.C.) of cylinder 1 of the engine.

⚠ You need to enter the PIN in Screen 1.6.1.11 before you may change this value!

Screen 1.6.1.11 - PIN Impuls Offs.

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- PIN Impuls Offs.: *** up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.12 will be shown
		Screen 1.6.1.10 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action

Here, authorized personnel can enter the PIN to unlock Screen 1.6.1.10.

Screen 1.6.1.12 - TSeff ena for DC

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- TSeff ena for DC: 1 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.13 will be shown
		Screen 1.6.1.11 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action

This setting enables/disables the usage of the calculated DC Teff value for DC alarm triggering.

Possible values: Off = disabled / 1 = enabled



Screen 1.6.1.13 - Values for TSeff

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup PCN-09 ----- Values for TSeff: 90 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.1.1 will be shown
		Screen 1.6.1.12 will be shown
		You may change the value if you have entered the PIN at Screen 1.6.2.5 (page 3.26).
		Screen 1.6.1 (page 3.19) will be shown
		No action
<p>Number of values used for TSeff calculation in the range of 1 - 2000.</p>		

Screen 1.6.2.1 - LCD brightness

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- LCD brightness : 30 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2.2 will be shown
		Screen 1.6.2.6 will be shown
		You may change the value.
		Screen 1.6.2 (page 3.19) will be shown
		No action

Setting of display brightness in the range of 5 to 100. (5 = dark, 100 = bright)

Screen 1.6.2.2 - RS485 fullduplex

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- RS485 fullduplex :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2.3 will be shown
		Screen 1.6.2.1 will be shown
		You may change the value.
		Screen 1.6.2 (page 3.19) will be shown
		No action

Setting of RS485 transmission method:
 OFF means two-wire transmission data reversal, sending and receiving is not possible simultaneously.
 ON means four-wire transmission fullduplex, sending and receiving is possible simultaneously.

Screen 1.6.2.3 - Modbus enable

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- Modbus enable :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2.4 will be shown
		Screen 1.6.2.2 will be shown
		You may change the value.
		Screen 1.6.2 (page 3.19) will be shown
		No action

Setting of Modbus interface, ON means enabled, OFF disabled.



Screen 1.6.2.4 - Modbus adress

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- Modbus address : 3 up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2.5 will be shown
		Screen 1.6.2.3 will be shown
		You may change the value.
		Screen 1.6.2 (page 3.19) will be shown
		No action
<p>Setting of Modbus address in the range of 0-99.</p>		

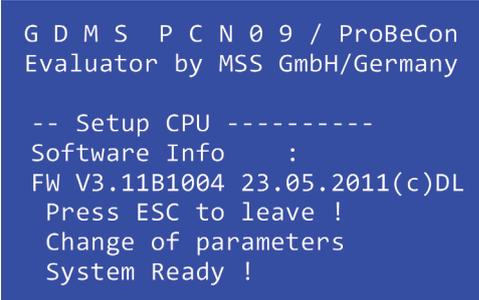
Screen 1.6.2.5 - PIN for Setup

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- PIN for Setup :*** up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2.6 will be shown
		Screen 1.6.2.4 will be shown
		You may change the value.
		Screen 1.6.2 (page 3.19) will be shown
		No action
<p>The write access to the “Setup PCN-09” parameters and all “Test Feature” operations require this PIN to be entered. It is only known by authorized personnel!</p>		

Screen 1.6.2.6 - Software Info

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Setup CPU ----- Software Info : up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.2.1 will be shown
		Screen 1.6.2.5 will be shown
		Screen 1.6.2.6.1 will be shown
		Screen 1.6.2 (page 3.19) will be shown
		No action
<p>Entering this screen will show you the software version of the firmware installed in the Evaluator.</p>		

Screen 1.6.2.6.1 - Software Info displaying

		No action
		No action
		No action
		Screen 1.6.2.6 will be shown
		No action
<p>This screen shows the current firmware version installed in the Evaluator.</p>		



Screen 1.6.3.1 - Ready Relay

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Test Features ----- Ready Relay :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.3.2 will be shown
		Screen 1.6.3.5 will be shown
		You may change the value.
		Screen 1.6.3 (page 3.19) will be shown
		No action
<p>The ready relay can be switched on and off manually for testing purposes.</p>		

Screen 1.6.3.2 - Alarm Relay

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Test Features ----- Alarm Relay :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.3.3 will be shown
		Screen 1.6.3.1 will be shown
		You may change the value.
		Screen 1.6.3 (page 3.19) will be shown
		No action
<p>The alarm 1 relay can be switched on and off manually for testing purposes.</p>		

Screen 1.6.3.3 - Alm2/Pre Relay

<pre> G D M S P C N 0 9 / ProBeCon Evaluator by MSS GmbH/Germany -- Test Features ----- Alm2/Pre Relay :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.3.4 will be shown
		Screen 1.6.3.2 will be shown
		You may change the value.
		Screen 1.6.3 (page 3.19) will be shown
		No action
<p>The alarm 2 (usually pre-alarm) relay can be switched on and off manually for testing purposes.</p>		

Screen 1.6.3.4 - Testsignal A

<pre> GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany TS1: 413 TS2: 417 -- Test Features ----- Testsignal A :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.3.5 will be shown
		Screen 1.6.3.3 will be shown
		You may change the value.
		Screen 1.6.3 (page 3.19) will be shown
		No action

The test signal A can be switched on and off manually for testing purposes.

The measurement values of TS1 and TS2 are displayed, too.

Screen 1.6.3.5 - Testsignal B

<pre> GDMS PCN09 / ProBeCon Evaluator by MSS GmbH/Germany TS1: 541 TS2: 545 -- Test Features ----- Testsignal B :OFF up/down=next, ret=select Press ESC to leave ! Change of parameters System Ready ! </pre>		Screen 1.6.3.1 will be shown
		Screen 1.6.3.4 will be shown
		You may change the value.
		Screen 1.6.3 (page 3.19) will be shown
		No action

The test signal B can be switched on and off manually for testing purposes.

The measurement values of TS1 and TS2 are displayed, too.



3.6. GDMS-PCN09 Logger measurement data storage and management (optional)

GDMS PCN09 Logger is a PC program for displaying and storing the measured data.



Info: For detailed information on PCN09 Logger software please refer to PCN09 Logger user manual.

GDMS PCN09 Data Display software is used for reading and analysing the PCN09 data files. For further information please refer to GDMS-PCN09 Data Display user manual.

The daily data files created by PCN09 Logger have an approximate size of 80MB per GDMS-PCN09 set. To save hard disk space, older files can be deleted, compressed and/or archived on CD. By compressing a daily log-file with WinRAR, WinZip or other suitable software, the size of the file can be reduced to approx. 8MB.

WinRAR shareware is usually pre-installed on the monitoring PC.

3.6.1. Compressing Data Files

To compress daily data files with the file extension *.log to *.rar

* symbolizes the name of the data file, which is usually given systematically as follows:

YYYYMMDD_EngineXXX, i.e. 20050331_EngineXXX,

whereas

YYYY: year, i.e. 2005

MM: month, i.e. 03

DD: day, i.e. 31

of the GDMS-PCN09 set on the Engine XXX

using “WinRAR” follow these instructions:

- 1) Click on the desired data file which is to be compressed with the right button of the mouse. A menu should pop up (refer to Fig 3.6.).
- 2) Click on the option “Add to Archive” from the option list.
- 3) Click “OK” (refer to Fig 3.7.) and the data file *.log will be automatically compressed and a new file *.rar with the same prefix-file name will be created.
- 4) Each log file can be compressed into a single file by repeating the steps 1&2 by selecting the log files *.log one by one.
- 5) If multiple log files are to be compressed into a single rar-file, repeat the above steps 1&2 by selecting all desired log files at once.

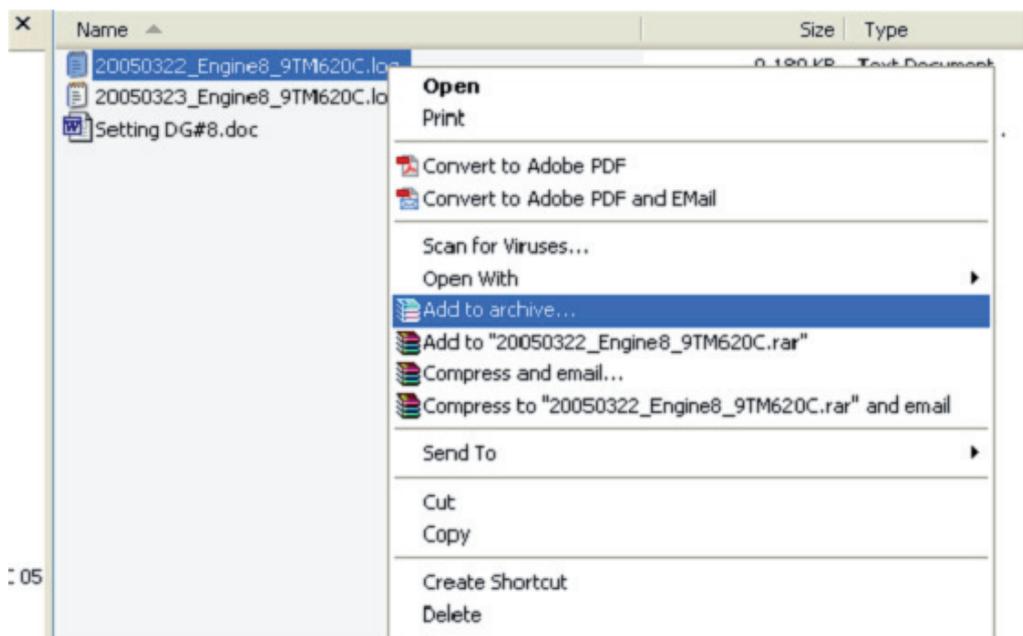


Fig 3.6.

Remarks:

Standard settings of the application software “WinRAR” to compress the data files may not be modified:

- 1) Archive format: RAR
- 2) Update mode: Add and update files
- 3) Archiving option: no tag selected
- 4) Compression method: best
- 5) Volume size: not limited
- 6) The original of the data files, which have been compressed, will not be deleted automatically.

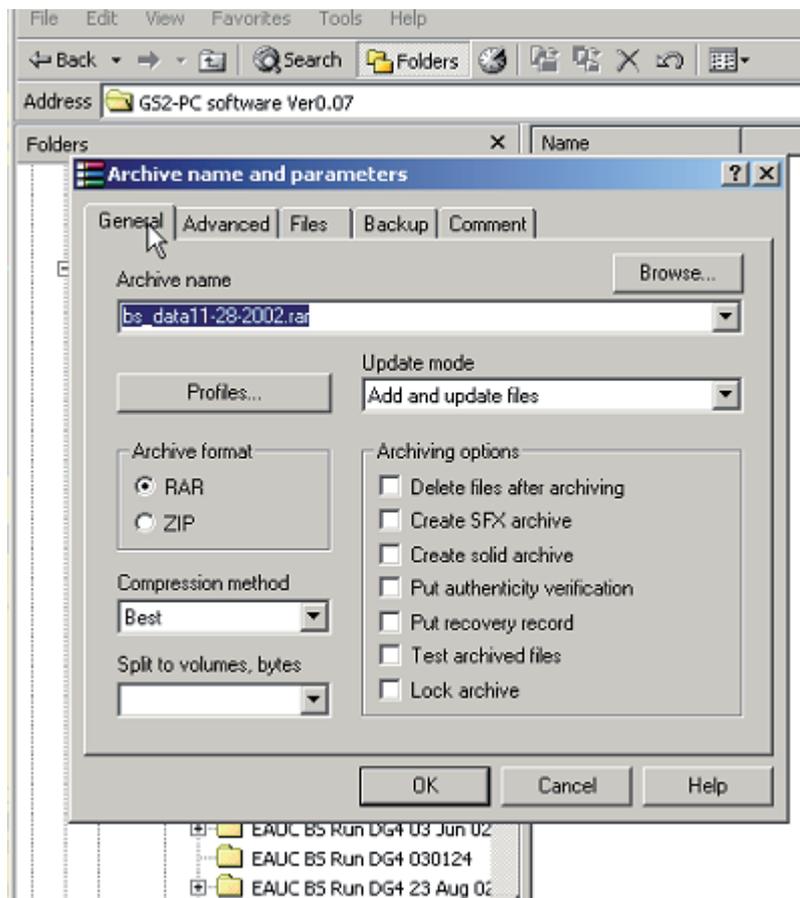


Fig 3.7.

3.6.2. Capturing the Graphic Screens

To capture and archive the window screens with the graphical trends of the GDMS-PCN09 signals in daily graphic files with the file extension *.doc using “MS-Word” proceed as follows:

- A) Preparing/creating a new daily screen file with the file extension *.doc
- * symbolizes the name of the daily screen file to be chosen, which should be normally named systematically as follows:
YYYYMMDD_EngineXXX, i.e. 20050331_EngineXXX, whereas
MM: month, i.e. 03
DD: day, i.e. 31
YYYY: year, i.e. 2005
- 1) Please click “start” with the left button of the mouse
 - 2) and go to “Documents” and
 - 3) click “my document” with the left button of the mouse
 - 4) Select “Blank template for graphic screens” by clicking it with the left button of the mouse twice!
 - 5) Go to “File” in the menu bar and then click “save as”
 - 6) Please type the name “D:\Archive_monthly_data YY.MM\YYYYMMDD_EngineXXX”, whereas “D:\Archive_monthly_data YY.MM” is the monthly archive directory and “YYYYMMDD_EngineXXX” as described above; and click “save”.
- B) Then please minimize all other software applications except GDMS-PCN09 monitoring application. (so that you can get a clear screen without unnecessary windows at the back ground of GDMS-PCN09 monitoring application).
- C) Select the part of the diagram you want to save as described in chapter 3.6.6.
- D) Press the “Print Scrn”-button of the keyboard once.
- E) Then Click the MS-work *.doc file icon in the bottom menu bar, so the YYYYMMDD_EngineXXX.doc will open.
- F) Point to the position you want to insert the captured screen.
- G) Click the right button of the mouse and click “Paste” from the menu by clicking the left button of the mouse.
- H) Then the captured screen will be inserted in the doc-file, please resize it according to your need and if necessary please add remarks to the just inserted graphic clips.
- I) Please repeat the steps B to H until you have saved all the graphic parts you want (Hints: It is better to keep the graphic curves parts in chronological sequence).
- J) Then save and close the YYYYMMDD_EngineXXX.doc

To reduce the file size; the YYYYMMDD_EngineXXX.doc files can also be compressed using the same method described in chapter “3.6.3. Archiving the Compressed Files” on page 3.34.



3.6.3. Archiving the Compressed Files

To move the compressed data-files *.rar from the daily directory to the monthly archive directory or other storage media (D:\Archive_monthly_data YY.MM, whereas MM: month, i.e. 03; YY: year, i.e. 05,) proceed as follows:

- 1) Select all the data-files *.rar to be moved by marking the first data-files *.rar by
 - a. pointing to the first data-file *.rar to be moved and
 - b. pressing the left button of the mouse once and then press the “Shift-button” of the keyboard, hold it and move the mouse pointer to the last data-files *.rar to be moved and
 - c. press the left button of the mouse once again and release the “Shift-button”. All the selected data-files *.rar change the colour.
- 2) Then click the right button of the mouse.
- 3) Select (by pointing and click the left button) the option “cut” from the pop-up option list.
- 4) Move the pointer to the monthly archive directory (D:\Archive_monthly_data YY.MM) and select it by clicking the left button of the mouse once.
- 5) Then click the right button of the mouse.
- 6) Select (by pointing and click the left button) the option “paste” from the pop-up option list.
- 7) All the selected data-files *.rar will be moved to the monthly archive directory.

3.6.4. Manual Data Analysis for Compartment Localization

Since the conditions which cause the measured thermo voltage are very complex, no automatic compartment localization is possible!

Thus, a very well trained person has to perform further localization manually. To do so, please use the data stored in the daily data file.

As described in chapter “1.1.1. GDMS-PCN09 - Principle” on page 1.1, the faulty parts will produce higher thermo voltage signal due to high pressure during firing in the affected cylinders. GDMS-PCN09 Logger software displays these signals in the positions corresponding to those cylinders in the detailed display of polar diagram.

When analysing these signals in consideration of the known engine geometry, a trained engine operator is able to identify whether the high thermo signals are caused:

- by friction against the rotating crankshaft. If this is the case, he can further identify:
 - the compartment where the fault occurred or
 - the exact faulty parts in case of a bearing failure
- by other moving parts not related to the rotating crankshaft, and furthermore:
 - (based on experience) which parts exactly are affected

Attention

A general description cannot be given at this point, because the form of thermo voltage signals in GDMS-PCN09 varies depending on the type of engine and application.

In the training session after the commissioning, the engine operators will be trained intensively to perform the localization of faulty compartment and parts specifically to their engines.

If no such trained person is available, or if he or she was not able to find the problem, please contact Asia Monitoring and Safety (AMS) Pte Ltd or MSS AG for further analysis of your measurement data.

Attention: Please do not send the log file immediately in your first email to us. You will get further information after contacting us.



4. Performance / Maintenance Tests

4.1. Function Test

During operation GDMS-PCN09 transmits test signals to the crankshaft at regular intervals. These signals are displayed depending on the operating state:

1. if the engine runs its crankshaft is electrically isolated from bearings with the lubrication oil film. Test signals are visible among measurement data.
2. on the stopped engine the crankshaft makes electrical contact with the bearing. Test signals are not visible.

The test signals will not be visible either, if the test signal option in the Logger software is disabled. If this option is disabled, the test signal will not be displayed nor stored to the daily log file. This means, that you cannot activate the display of the test signal in Data_Display later.



5. Troubleshooting

CAUTION

The manufacturer's warranty will become void if

- the GDMS-PCN09 Evaluator was modified without permission or
- the GDMS-PCN09 Slip Ring Transmitter was opened!



5.1. During Software Installation

The GDMS-PCN09 Logger and Data_Display software is designed and tested to run under the following Microsoft operating systems:

- Windows XP
- Windows Vista
- Windows 7

Please refer to chapter 2.6. on page 2.6 for requirements to the personal computer needed for the software.

If a “Not connected” message appears in the event window after you have started “PCN09 Logger”, the following steps may fix the problem in case the RS-485 converter is used:

- Is the RS-485 converter's green power-LED on? Check the power supply.
- Is the wiring of the RS-485 interface reversed (connection A and B).
This is the most common cause of error!
- Is the RS-485 converter connected to the correct COM port? If connected correctly, the transmit LED (TX) (Fig. 5.1) should blink after measurement start to indicate that computer is sending data.
- If the connection is established, this is confirmed by a “Connected” message in the event window. (Fig. 5.2)

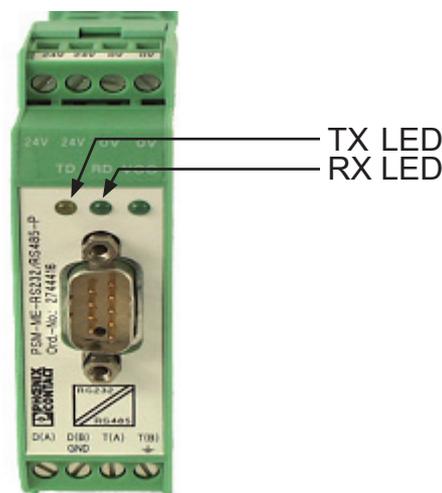


Fig. 5.1. RS-485 Converter



5.2. During Software Use

The error messages displayed in PCN09 Logger are self-explaining, i.e. a communication problem with the GDMS-PCN09 Evaluator is depicted in Fig. 5.2. below.

The operators should use the technical acceptable standards to trace the cause of the errors reported and skillfully fix the problem. If the problem cannot be solved, please contact MSS AG's authorized representatives.

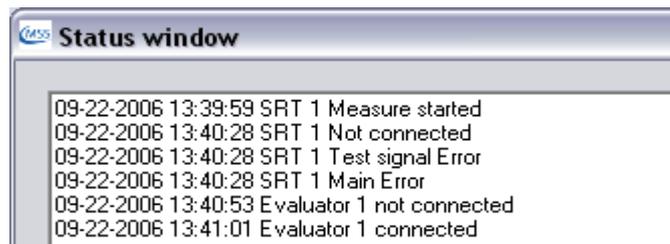


Fig 5.2. Example of messages displayed in the event window / status window

5.3. Missing Control Signal

1. If the green READY LED of the GDMS-PCN09 Evaluator is off, and the thermo voltage signal and/or RPM are displayed as zero or unstable on the LCD-display of the Evaluator (and in PCN09 Logger) at a running engine, then please conduct the following steps:
 - 1) Check if cable connectors at the cable connecting SRT and the Evaluator are loose, if necessary, fix them
 - 2) If this can not solve the problem, check the error message reported and contact MSS AG or its authorized representatives.

2. If the green READY LED of the GDMS-PCN09 Evaluator is on, but only the thermo signal and no RPM is displayed on the LCD-display of the Evaluator (and in PCN09 Logger) at a running engine, then please conduct the following steps:
 - 1) Remove the interface housing cover.
 - 2) Check whether the metal coupling inside is turning with the engine
 - 3) If it is not turning, retighten it with the necessary torque of 40Nm.
 - 4) If the coupling is turning, check if cable connectors at the cable connecting SRT and the Evaluator are loose, and if necessary, fix them.
 - 5) If you could not solve the problem, please check the error message reported and contact MSS AG or its authorized representatives.

Attention: If you have retightened the metal coupling the synchronization steps in chapter 2.3. SRT Mechanical Adjustments on page 2.3 have to be done!





5.4. Very low / strong signal on polar diagram

The bearing monitoring by a GDMS-PCN09 sensor is a relative measurement. The recording and interpretation of the signals over a longer period is important. Changes of the signal could be evaluated based on the previous recorded data.

Based on these results suitable measures for engine operation, lubricating oil care or others will derive.

5.5. Error code and Error description

The following messages displayed on the LCD screen of the GDMS-PCN09 Evaluator are possible.

System Ready!

Standard message indicating that the system works and all measured values are in the permitted range.

GDMS-PCN09 - Error 04

First pulse sequence of incremental encoder - not connected

GDMS-PCN09 - Error 08

Second pulse sequence of incremental encoder - not connected

GDMS-PCN09 - Error 16

Synchronization signal of the incremental encoder - not connected

GDMS-PCN09 - Error 32

GDMS-PCN09 test-signal dead, check all connections

The error codes may be summed up! For example, error code 20 means that the error codes 04 and 16 appeared together.

Possible combined codes are shown on the table on the next page.

GDMS-PCN09 - Error 99

SRT-Sensor not connected

CPU Error xxx

A CPU error means an error from the EEPROM. This error appears also due to incorrect or incomplete parametrization. Should this error not be fixed after correcting the parameters and restarting please contact the manufacturer or the maintenance service, providing the error code.

01 xx Check parameters of CPU (...)

02 xx Check parameters of GDMS-PCN09 (...)



		Single codes			
		32	16	8	4
Summed up codes	12	-	-	X	X
	20	-	X	-	X
	24	-	X	X	-
	28	-	X	X	X
	36	X	-	-	X
	40	X	-	X	-
	44	X	-	X	X
	48	X	X	-	-
	52	X	X	-	X
	56	X	X	X	-
	60	X	X	X	X

Table 5.1. Code combinations

6. Repair

Before any attempts to repair or dismount the GDMS-PCN09 devices because of an assumed defect or failure you should contact MSS AG or its authorized partners.

Based on experience, many failures can be cleared easily by fault diagnostics on site. In most cases a repair is not necessary.

Dismounting may only be performed on demand by MSS AG or its authorized service representatives.

A repair of GDMS-PCN09 components is done exclusively by MSS AG. Defective parts should be sent to MSS AG including detailed failure description.

Please get in contact with the headquarter of MSS AG for further assistance.



7. Spare Parts

⚠ Only the original parts supplied and approved by MSS AG should be used; otherwise a proper working system could not be assured.

7.1. Main Spare Parts



Part No.
3 010 00 0000

Fig. 7.1. Slip Ring Transmitter



Part No.
3 020 00 0000

Fig. 7.2. GDMS-PCN09 Evaluator



7.2. Accessories

Part No.
9 100 20 0000

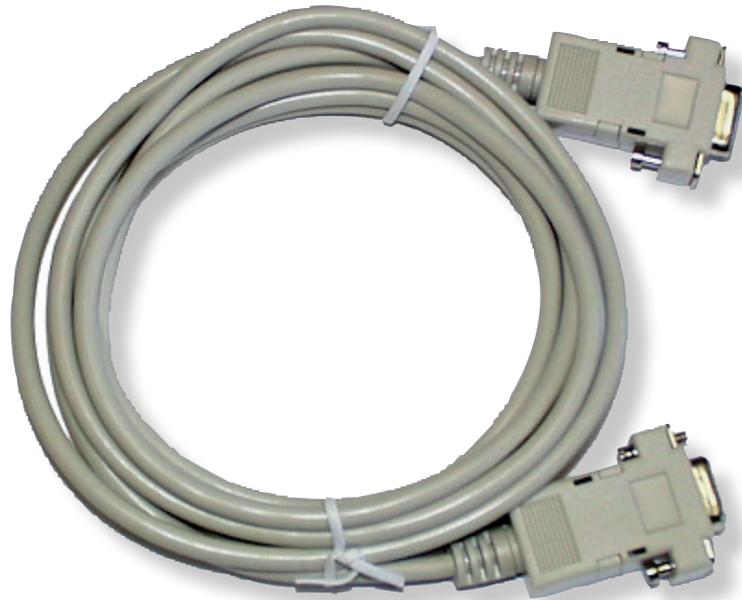


Fig. 7.3. RS-232 Connection cable for PC to external RS-485 converter

Part No.
9 200 04 2200



Fig. 7.4. 2 x 2 twisted pair communication cable



Fig. 7.5. 2 core power cable

Part No.
9 200 02 0000



Fig. 7.6. 12 core communication cable

Part No.
9 200 12 0000



Fig. 7.7. Sub-D9 connector

Part No.
9 301 09 1000



Part No.
9 300 06 1000

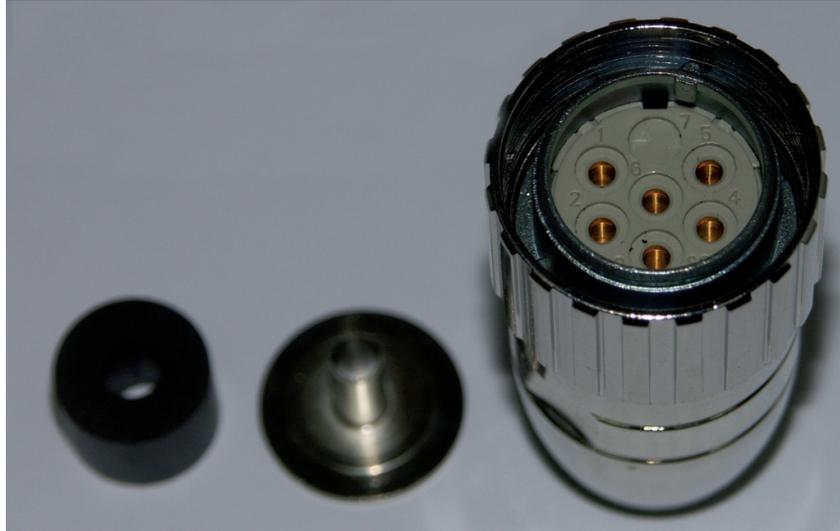


Fig. 7.8. 6-pol. female connector

Part No.
9 300 12 2000

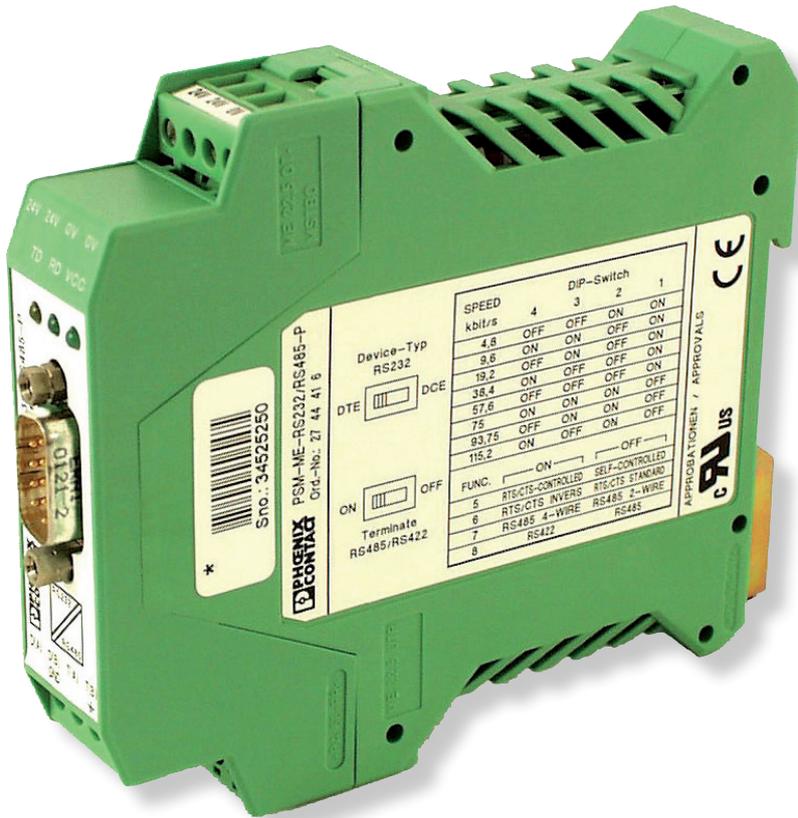


Fig. 7.9. 12-pol. male connector

Part No.
9 300 12 1000



Fig. 7.10. 12-pol. female connector



Part No.
9 100 30 0000

Fig. 7.11. RS-485 Converter



Part No.
9 110 04 0000

Fig. 7.12. Power supply unit 24V/15W



Part No.
9 100 40 0000

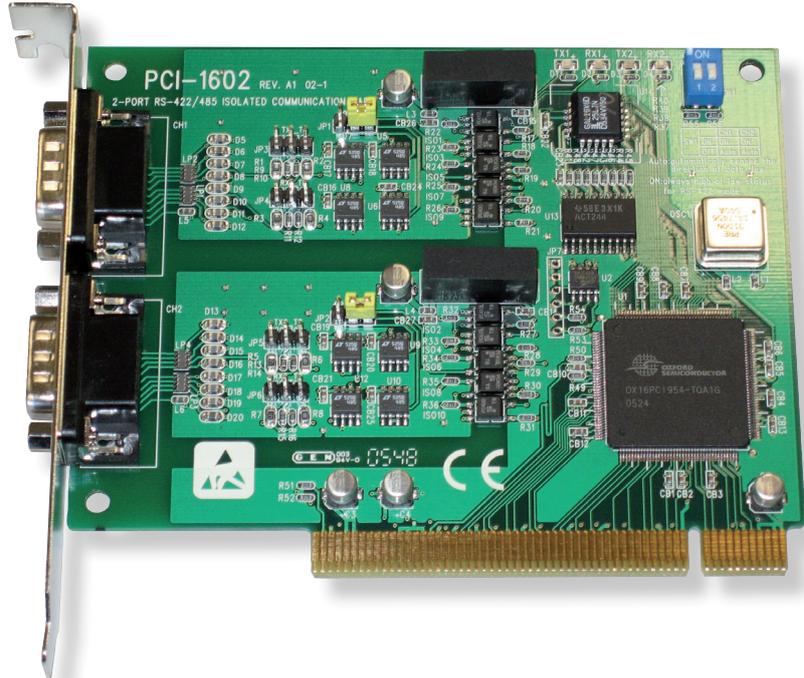


Fig. 7.13. RS 485 Converter PCI Card for mounting inside PC

8. Attachments

8.1. Connection Assembly Instructions

8.1.1. Preparing the Cable

For RS485-Converter
(Part No. 9 200 04 2200)

As an example of using 2 X 2 wire twisted cores (Fig 8.1):

- Signal cable: Use a shielded cable, consisting of 2 X 2 wire twisted pair stranded cores, with each core having a nominal section area of 0.25mm² and overall cable diameter of 8 to 12mm.
- The recommended cable is Metrofunk 2 X 2 AWG 22, (MSS AG Part No. 9200042200) this is used as an example to show how the connection is made. This cable has 2 twisted pairs of black/brown and black/red.
- Cut away the outer insulation approx. 25mm from the end of the cable and pull back the braided shield.
- Cut the braided shield 10mm from the end as shown in Fig. 8.1.
- In this example: Select a twisted pair black/brown and the red wire of the other twisted pair black/red, and cut away the insulation approx. 5 mm from the end of these 3 wires and solder them to the pins of the plug (as shown in Fig. 8.3, Pos. 6)
- Cut off the unused wires (in this example, the black wire)

Pay attention to the assembly instructions, especially the cable shielding to avoid electromagnetic interference!

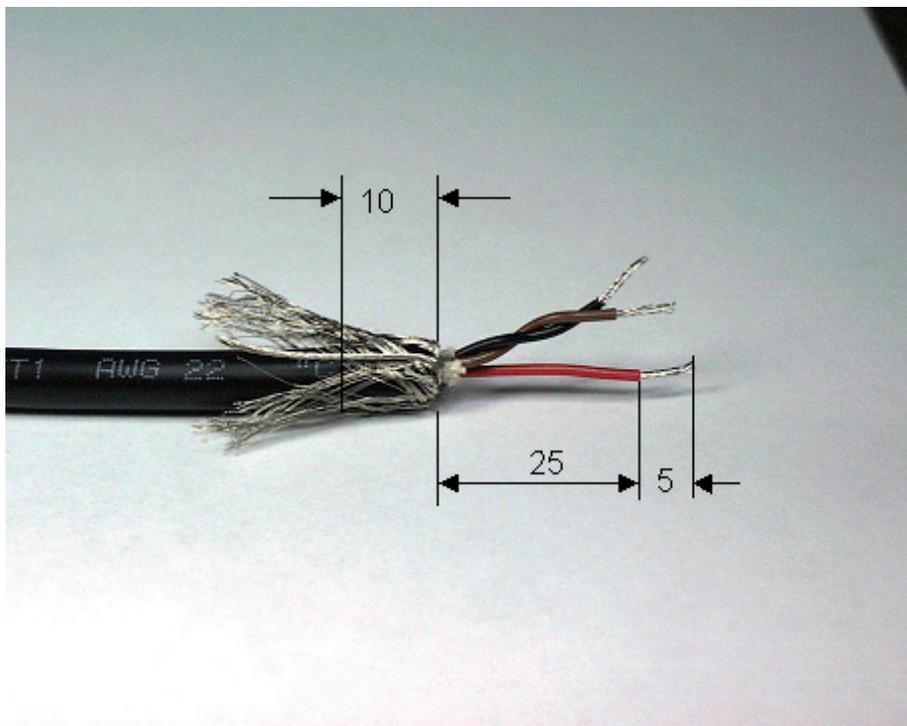


Fig. 8.1. Preparing the cable

8.1.2. Connecting the RS-485 converter

(Part. No. 9 100 30 0000)

Preparing and Connecting the Cable to the Converter (Fig. 8.2):

- At the free end of the signal cable, the same wires of the twisted pair black/brown and a red wire of the other twisted pair black/red, should be used. Please refer to the Section “Preparing the Cable”, page 8.1.
- Cut away the outer insulation approx. 40mm from the end of the cable and pull back the braided shield (as shown in Fig. 8.1).
- Cut the braided shield 10mm from the end (see Fig. 8.1)
- Cut away the insulation approx. 5mm from the end of these 3 wires.
- Connect the 3 wires to the terminals on the RS-485/RS-232 converter (as shown in Fig. 8.2).

RS 485 B: brown wire from the black/brown twisted pair to terminal D(B).

RS 485 GND: red wire from the black/red twisted pair to Ground terminal.

RS 485 A: black wire from the black/brown twisted pair to terminal D(A).

Note: If and only if a connection between the PC and OMD could not be established, please swap the signal cables between D(A) and D(B).

- Cut off the unused wires (black wire).

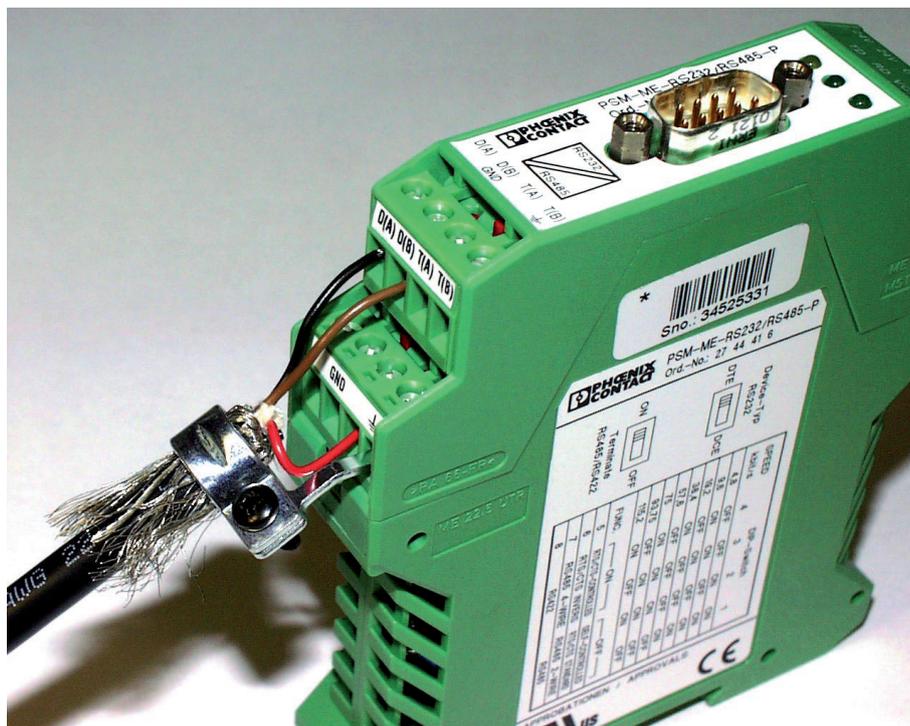


Fig. 8.2. Connecting the RS485-converter

8.1.3. Assembling the plug

(Part. No. 9 300 12 1000 and 9 300 12 2000)

- Push the components over the cable starting with the adapter (Pos. 1), coupling nut (Pos. 2) and the seal/strain relief element (Pos. 3),
- Cut away the outer insulation approx. 23mm from the end of the cable.
- Push back the braided shield.
- Push the shielding disc (Pos. 4) over the wires and press it against the braided shield.
- Cut back excess of braided shield close to the shielding disc.
- Cut away the plastic foil, filling material and inner insulation.
- Cut away insulation of wires approx. 3.5mm from the end and twist them.
- Solder brown wire of brown/black pair into pin No. 2 on plug.
- Solder red wire of red/black pair into pin No. 3 on plug.
- Solder black wire of brown/black pair into plug's Pin No. 4.
- Cut off black wire of red/black pair.
- Add the distance ring (Pos. 5) between the shielding disc (Pos. 4) and insert ring (Pos. 6).
- Push taper sleeve (Pos. 7) over the insert ring (Pos. 6) and distance ring (Pos. 5). **Make sure the Coding rib is on the right position!**
- Push in cable with shielding disc (Pos. 4) and seal and strain relief element (Pos. 3).

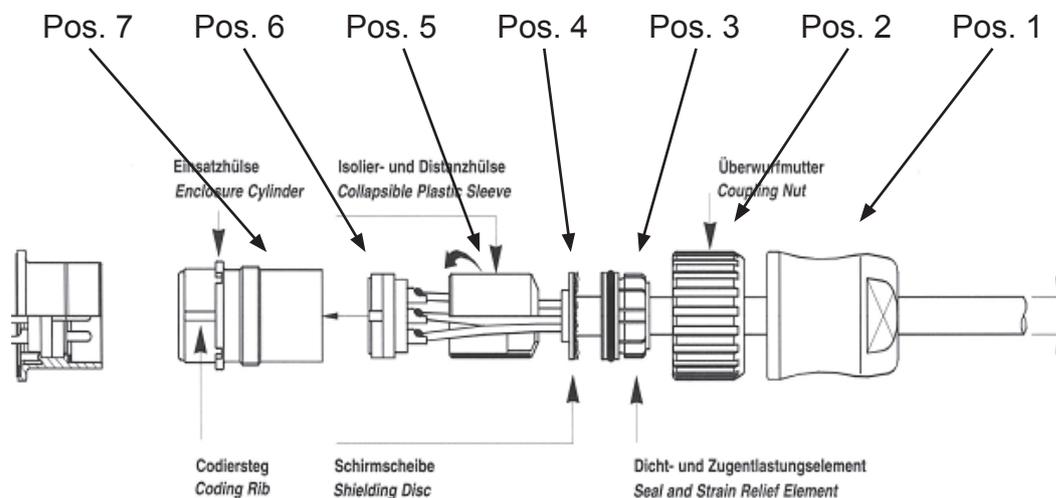
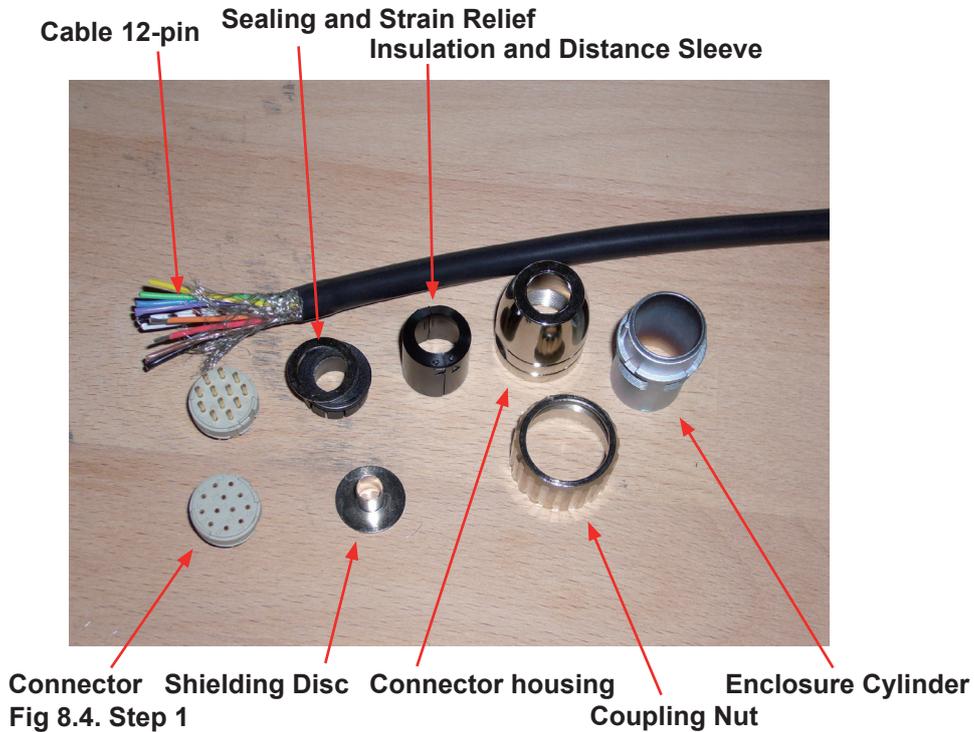


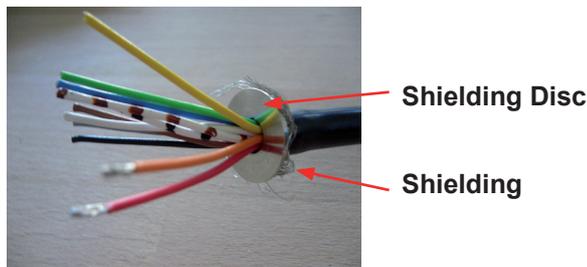
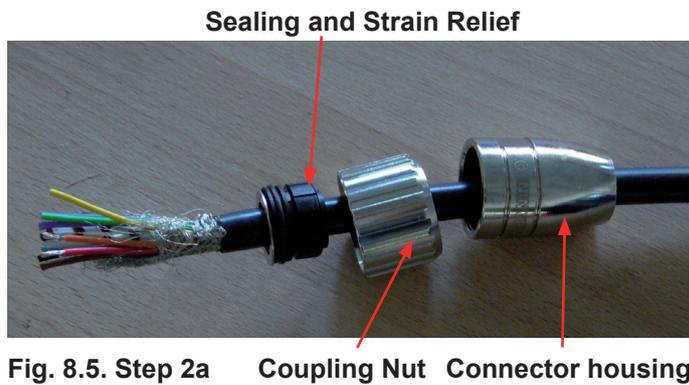
Fig. 8.3. Mounting the plug part. no. 9 300 12 1000 and 9 300 12 2000

8.1.4. Connection Cable - RS485 PCI Card to Evaluator

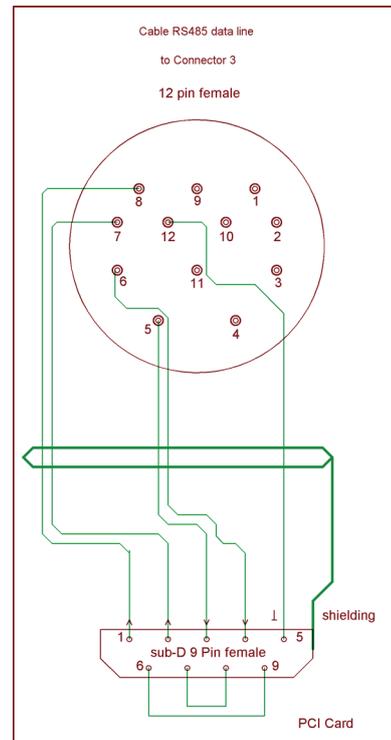
- Cut away the outer insulation approx. 23mm from the end of the cable

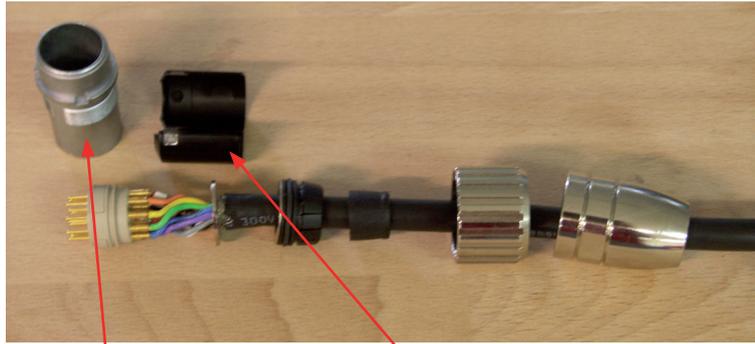


- Push back the braided shield
- Push the sealings over the wires



- Solder wires as shown in Fig 8.7.

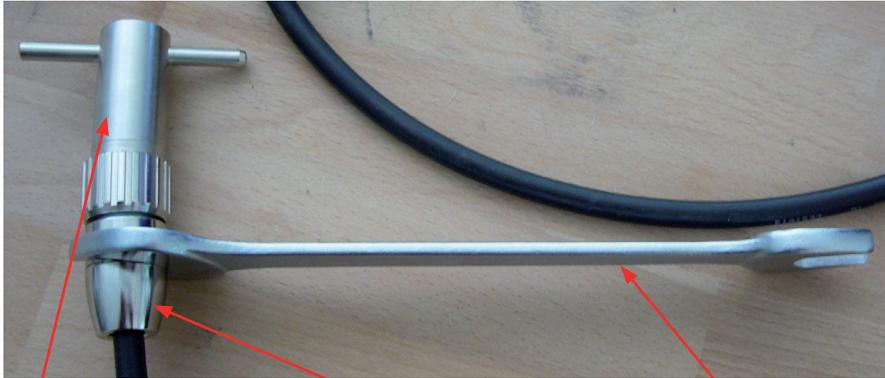




Enclosure Cylinder Insulation and Distance Sleeve
Fig 8.8. Step 4

- After soldering, pull the insulation and distance relief over the wires
- Pull the enclosure cylinder over the soldered wires

- Finally, seize the connector housing by using the installation wrench and a flat wrench No. 22



Installation Wrench Connectour Housing Flat Wrench No. 22
Fig 8.9. Step 5

Assemble the Sub-D9 connector on the other side of the cable. (Fig 8.7.) Below, you've got two pictures of the connector before and after assembly.

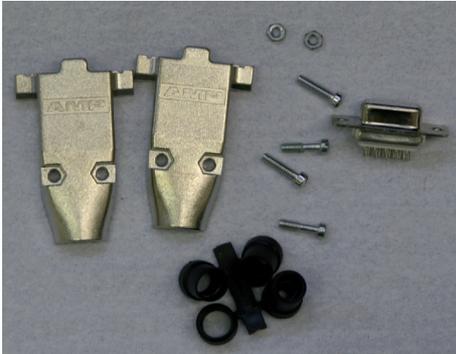
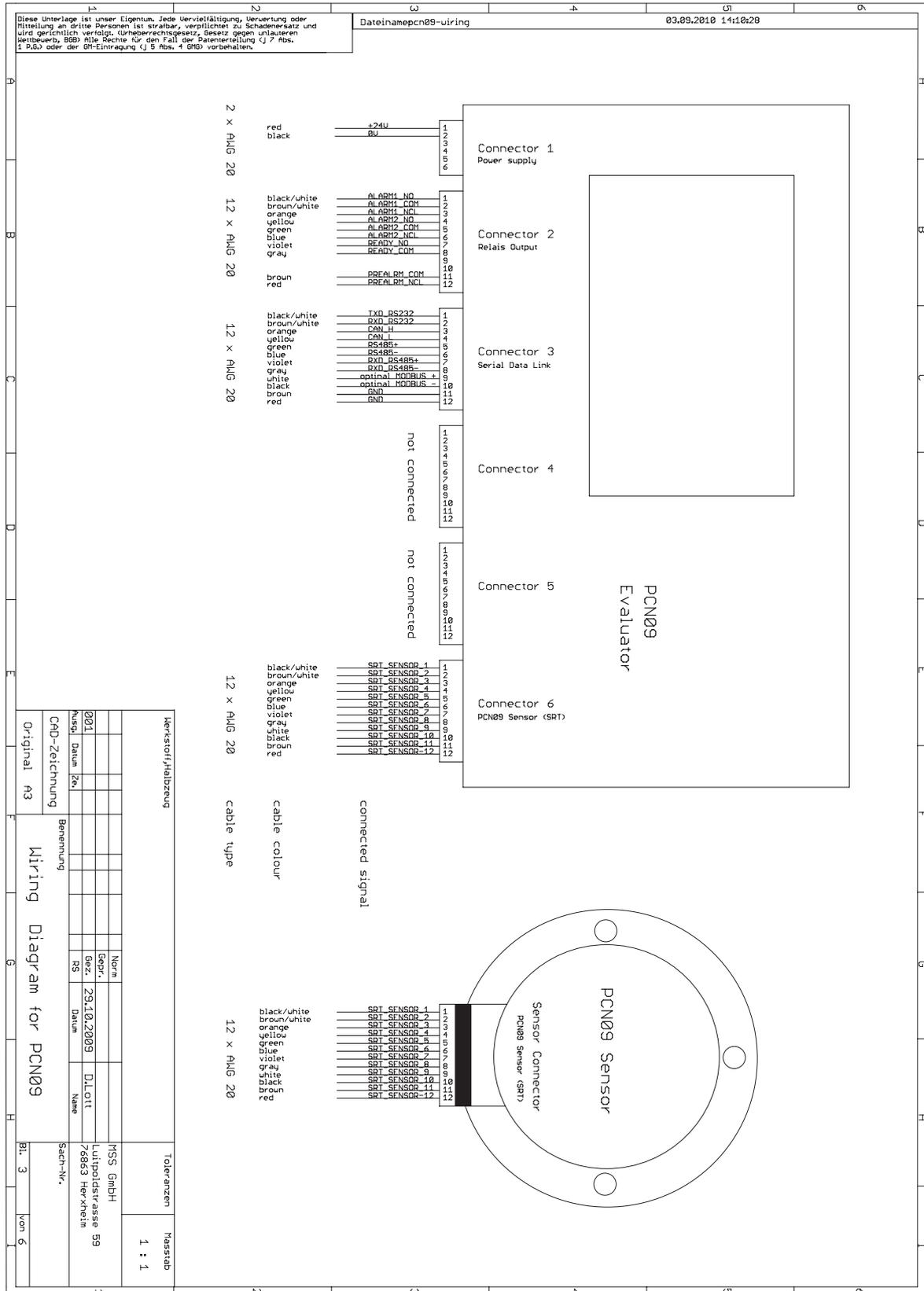


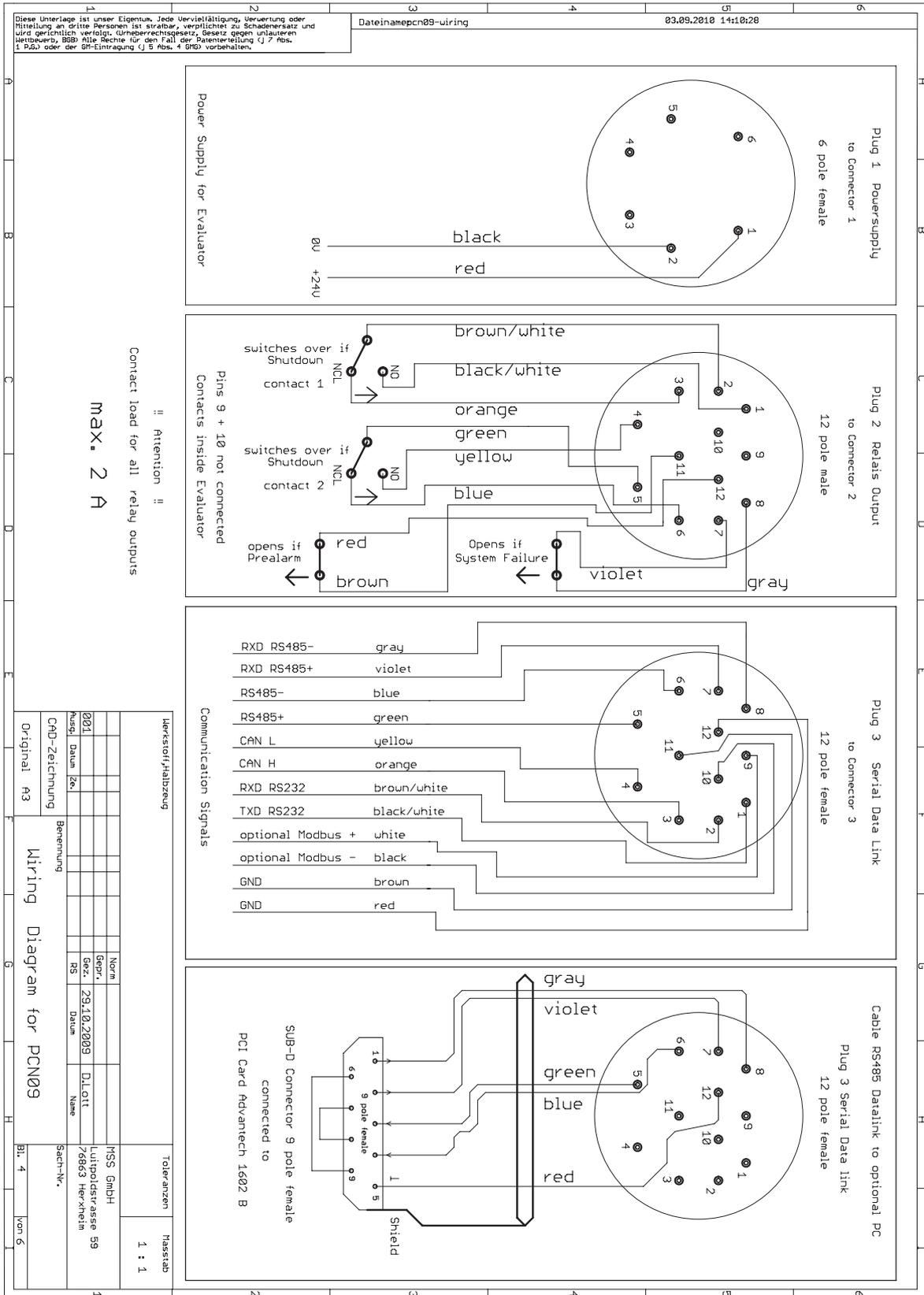
Fig 8.10. Sub D9 connector before assembly

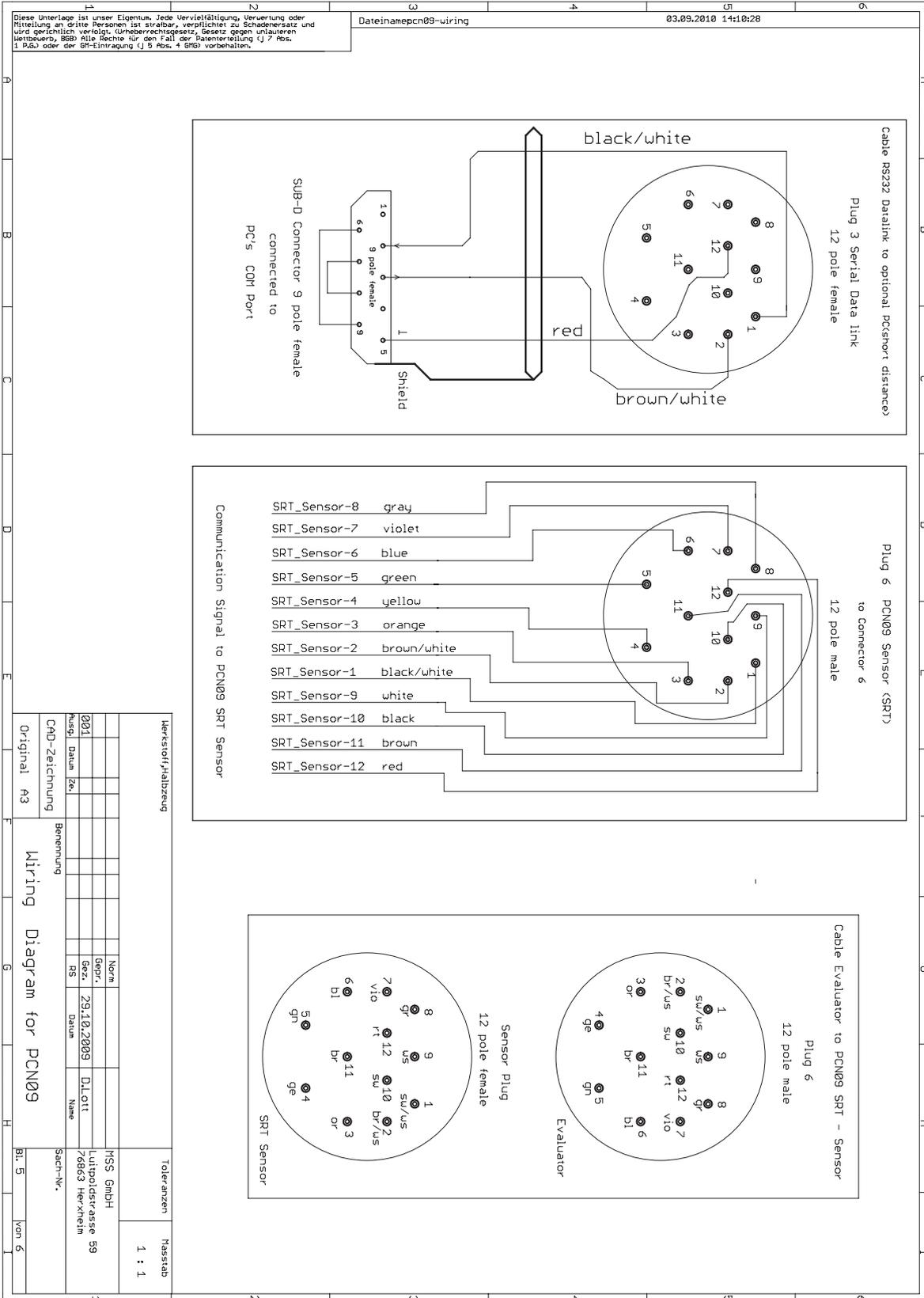


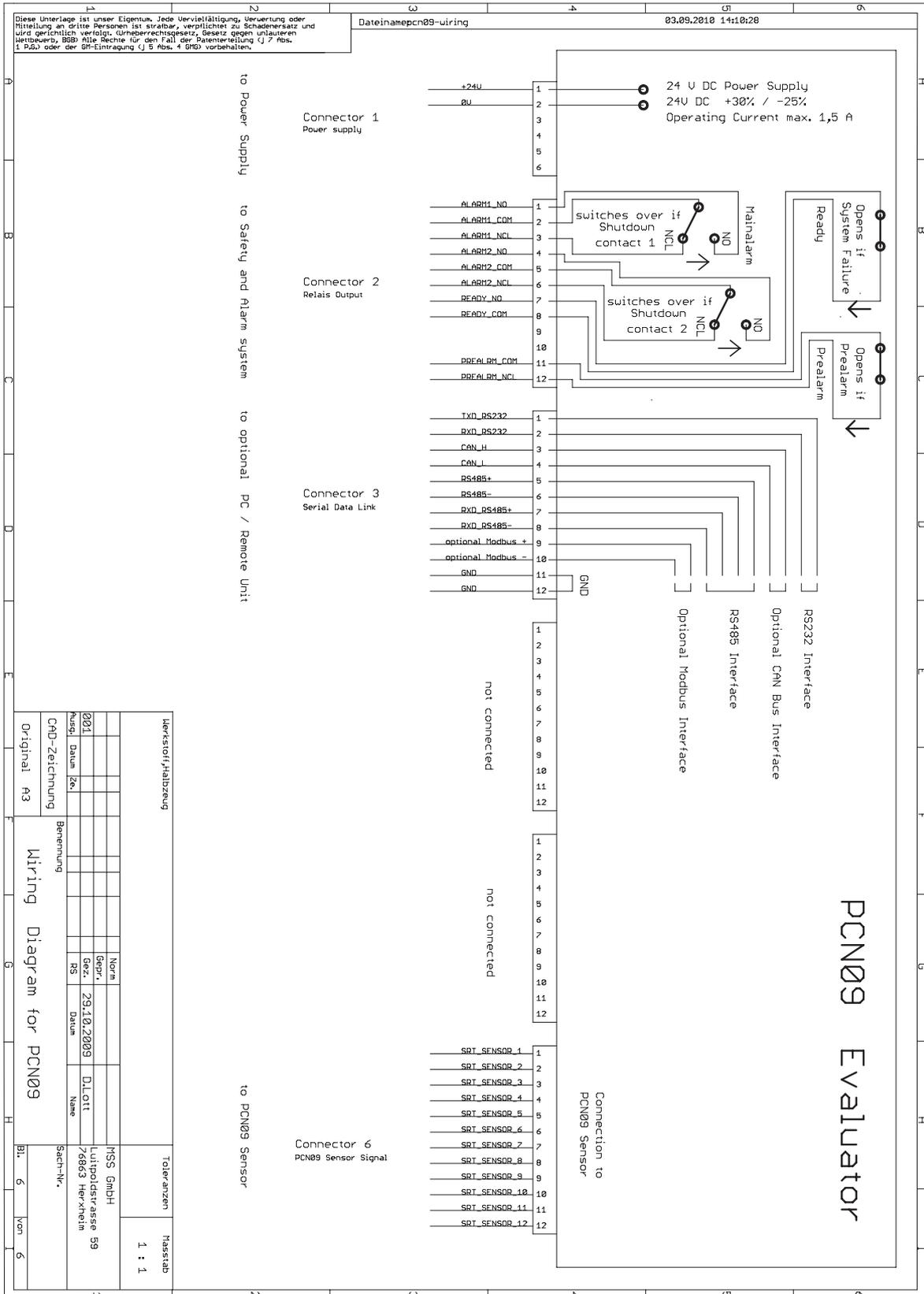
Fig 8.11. Sub D9 connector after assembly

8.2. Wiring Diagrams











9. Notes