

Temposonics®

- Electronic module with Profibus-DP interface for displacement sensors
- Suitable for evaluation of 4 Temposonics absolute position sensors with Start/Stop output



Profibus-DP Module EB 342 - 0101



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Technical alterations reserved

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1. Safety Instructions

Preface

The general safety instructions given below are intended to ensure the personnel safety and to avoid damage. TEMPOSONICS are state-of-the-art position measurement systems built in accordance with the standard safety regulations. Nevertheless, hazards to the life and health of the user or other persons, or impairments of the sensor or other objects may arise in conjunction with the use of TEMPOSONICS Sensors.

Application

1. The position measurement systems of all series TEMPOSONICS may be used only for the purposes for which they were designed, i.e. they may be used exclusively for measurement tasks in industrial, commercial and laboratory applications. E.g. positions, displacements and speeds can be measured (more detailed information is given in the relevant product documentation).

The position sensors are accessories of an installation and must be connected to a suitable evaluating unit as included in a PLC, IPC, indicator or other electronic control unit. Correct use for the intended purpose implies that all instructions given in the product documentation are followed. Using sensor Temposonics beyond these limits is incorrect. MTS Sensor Technologie refuse any liability for damage resulting from incorrect use.

2. The displacement sensors may be used only in safe condition. In order to maintain this condition and to ensure safe operation, installation, connection and service work may be done only by trained and qualified personnel *), whereby the relevant instructions for accident prevention and safety as well as the information given in the product documentation must be followed.

Functional trouble

Hazards to the safety of persons or risks of damage to operating facilities due to sensor failure or malfunction must be avoided by additional safety measures such as plausibility checks, limit switches, emergency off systems, protective devices, etc. In case of trouble, the sensor must be shut down and protected against accidental operation.

Repair

Repair of the sensor may be done only by MTS or an explicitly authorized organization.

Installation and operation

To ensure perfect functioning, following the information given below is indispensable

1. Protect the sensors against mechanical damage during installation and operation.
2. Do not open or dismantle the sensors.
3. Connect the sensors with utmost care related to polarity of connections, supply voltage as well as type and duration of control pulses.
4. Use only approved power supplies.
5. Meeting the permissible sensor limit values e.g. for supply voltage, environmental conditions etc. specified in the product documentation is indispensable.
6. Check the correct function of the position sensors at regular intervals and provide test documentation.
7. Before switching on the installation, ensure that the starting machine does not threaten the safety and health of persons.

*) *Trained personnel means persons who*

- *related to projecting, are familiar with the safety concepts of automation,*
- *are informed of the electromagnetic compatibility,*
- *have received a special training for commissioning and servicing,*
- *are familiar with the operation of the unit and informed of the specifications for correct operation given in the product documentation.*

2. Device Description

The EB 342-0101 Profibus-DP module is a part of an absolute digital length measurement system (Fig. 2) which operates on the magnetostrictive measuring principle developed by MTS.

The module, which is accommodated in a series-produced Phoenix electronics housing, is designed for mounting on a standard rail.

It is used for connection of max. 4 Temposonics position sensors with Start/Stop output (see separate data sheet of the relevant position sensor).

The module generates the start pulses, determines the length measurement position values from the time differences to the stop pulses formed by the sensor and transmits them to Profibus system.

The 24 V DC sensor operating voltage is taken via the EB 342 and protected against overcurrent.

The module interface is suitable for direct connection to the fieldbus and designed according to the Profibus-DP specification EN 50170. Protocol architecture is oriented to OSI model (ISO 7498). These fieldbus module provides functions for diag-nostics and monitoring, which are loaded into the bus via a configuration tool (3.5" disk) at installation.

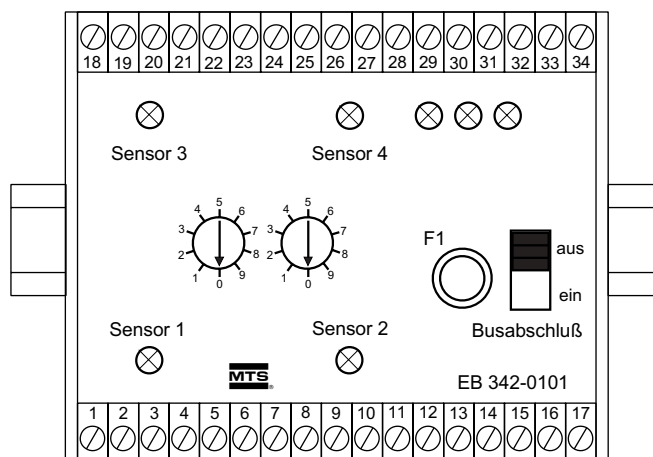
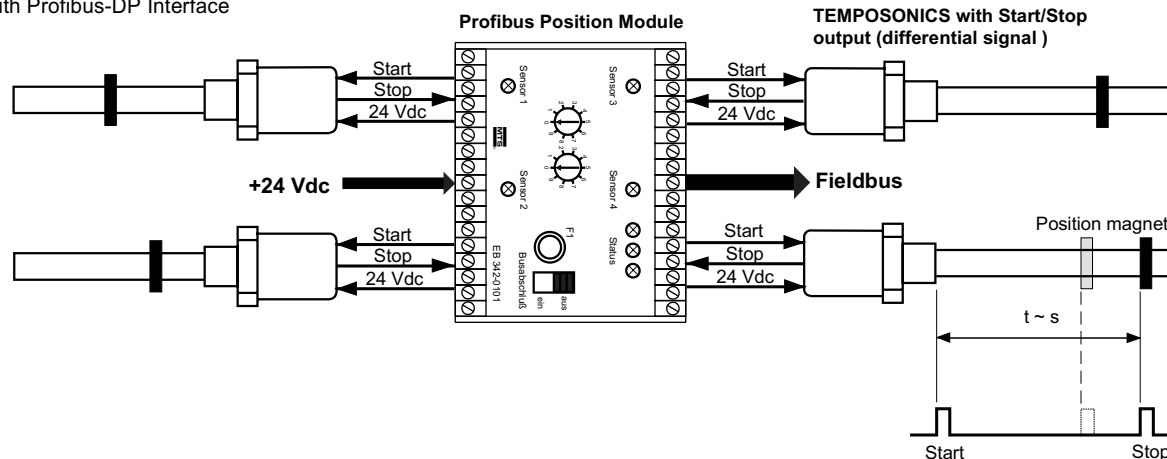


Fig. 1
Electronics housing: Type Phoenix EG 90.../TSB for standard rail mounting, 90 mm wide, 34 pin screw termination

Fig. 2
Fieldbus structure of Temposonics displacement measuring system with Profibus-DP Interface



2.1 Order information

Description	Part No.
Profibus-Module for 4 Sensors Start/Stop	EB 342-0101
<u>Scope of delivery</u>	
Profibus-Module	
Installation guide + 3.5" GDS disk (Electronic Data Sheet with standardized Device Data Base File)	

2.2 Technical Data

Electronic housing	Dimensions: 90 x 75 x 107 mm (width x height x length), Phoenix EG 90.../TSB type for standard mounting rails (EN 50 022) with plug-in screw terminals 2,5 mm ² , 2 strips with 17 terminals each
Housing material	ABS
Ingress protection	Housing IP 40, terminals IP 20
Operating temperature	0 ... +75° C
Electrical connection	Sensor and power supply with screw terminals,
Input	4 sensors Temposonics with Start/Stop output (4 x Start/Stop-Signal RS 422), max. 120 m cable, short circuit-proof qualified
Output	RS 485, Profibus-DP Protocol EN50170 (DIN 19245)
Addresses	Set-up with hardware switches, addresses 03 - 99, Default set-up: 99 1 address per Profibus Module
Baud rate	9600 up to 12.000 kBit/s
Position data	24 bit per position value (Intel or Motorola format), max. measuring range 7600 mm
Status information	1 bit per sensor (Indication: no response message, e.g. no position magnet)
Configuration tool	GSD Software
Resolution	Selectable, minimum 0,005 mm
Input voltage	+ 24 Vdc (+20 % / -15 %)
- Ripple	< 1 % S-S
- Current consumption	< 150 mA w/o Sensor + 100 mA typical per connected sensor
Fuse	4 A/125 V, style TR3/UL 198 G (fuse L1)
Update frequency	Cycle time between 2 measurements will be changed (max. measuring range dependent):

<u>Measuring range up to</u>	<u>Cycle time</u>
400	0,75
1500	1,00
3100	1,50
4300	2,00
5700	2,50
6900	3,00
>6900 mm	3,50 ms

During cycle time the position values of 1 - 4 sensors will be measured at the same time.

3. Installation

Mount the Profibusmoduls EB 342 on standard mounting rail. Pls. note the specified protection class (Mounting into cabinet if neccessary).

4. Electrical Connections

Sensor connection to the module plug-in screw terminals (2 connector strips with 17 terminals each) is via its cable connector. The required power supply for each position sensor is connected additionally.

Connect the screenings of the sensor cables to functional earth (machine ground) near the EB 342 interface module.

For electromagnetic compatibility (EMC) reasons, further connection to machine ground in the area of the control cabinet entry gland may be necessary.

Unless separate machine parts are provided with sufficient common ground, additional potential compensation may also be required.

For bus network installation pls. notice the corresponding Profibus standards.

Termination	Signal	
1	Start +	Sensor 1
2	Start -	
3	Stop +	
4	Stop -	
5	+ 24 VDC	} 1)
6	DC Ground (0V)	
7	Start +	Sensor 2
8	Start -	
9	Stop +	
10	Stop -	
11	+ 24 VDC	} 1)
12	DC Ground (0V)	
13	+24 VDC	Power supply output (looped through)
14	DC Ground (0V)	
15	DC Ground (0V)	Power supply Input
16	+24 VDC	
17		

18	Start +	Sensor 3
19	Start -	
20	Stop +	
21	Stop -	
22	+ 24 VDC	} 1)
23	DC Ground (0V)	
24	Start +	Sensor 4
25	Start -	
26	Stop +	
27	Stop -	
28	+ 24 VDC	} 1)
29	DC Ground (0V)	
30	VP +5V,	
31	DGND	
32	RxD / TxD-N	
33	RxD / TxD -P	
34		

1) Secured over the internal fuse

5. System Operation

Module EB 342 is designed as an intelligent Profibus-DP Slave. Configuration and diagnostics is done by the Profibus Master. Using the configuration tool on a 3,5" disk (on delivery) based on GSD files, integration of the sensor system is very simple.

The module digitized the measured positions and permits at parameterization additional the selection of:

- Numbers of sensors (4 sensors maximum)
- Resolution (common for all sensors)
- Measuring direction (each sensor)
- Offset setup (each sensor)
- Error messages

Profibus interface is built up with Siemens ASIC SPC3.

That allows baud-rates from 9600 baud to 12 Mbaud with an automatic search of transfer rate and a very fast system response time.

System Connections

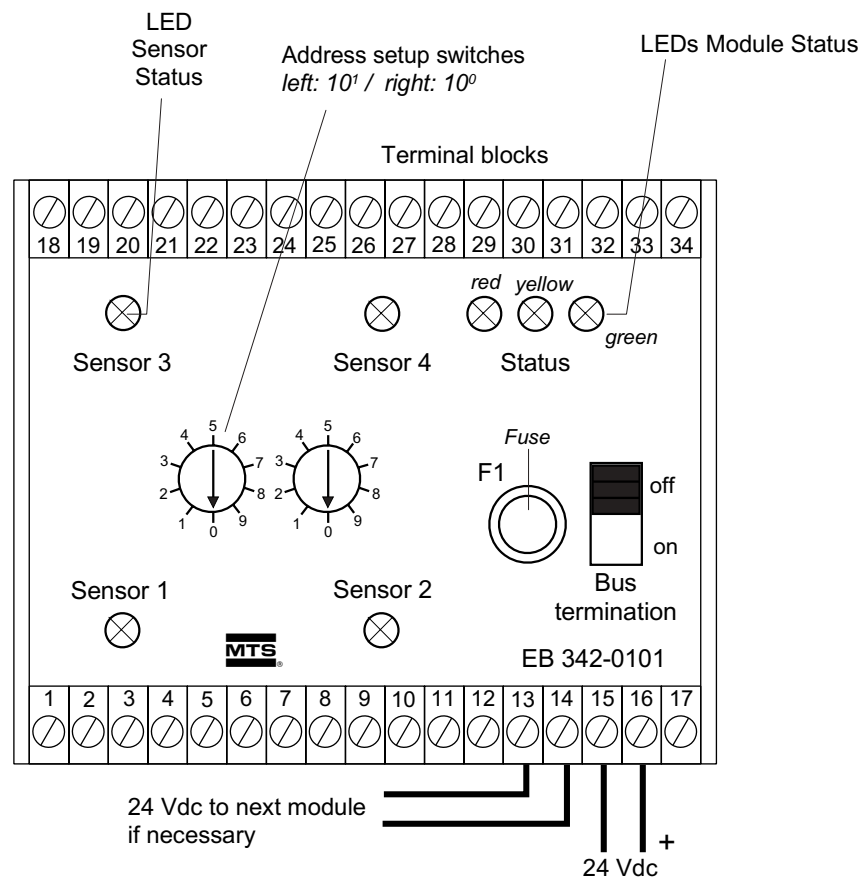
For operation, the sensors have to be connected to the box (see page 6).

The module requires a 24 Vdc power supply connection, the data transfer is via RS485 standard to the bus.

The Bus connection, the integrated evaluation electronics and the start/stop sensor interface are electrically isolated.

The needed bus-termination can be switched on by the slide switch in front panel (Fig. 3).

Fig. 3
Front view Profibus Module



6. System configuration

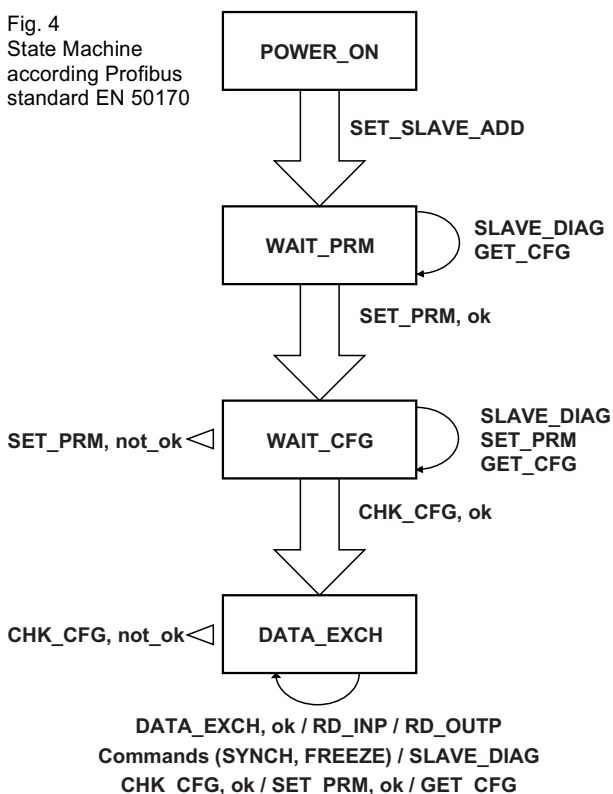
6.1 Address setting

For operation the Profibus module needs a unique slave address. The setup of slave address is done by the integrated switches in the module front panel (Fig. 3). The slave address is selectable between 3 and 99 according to the Profibus standards. An address < 3 will automatically be changed into 3 by the busmodule.

6.2 LED status displays

The status of sensors and the busmodule with its internal *state machine* (logic operation of parameterization and configuration) is indicated by LEDs on the module.

Fig. 4
State Machine
according Profibus
standard EN 50170



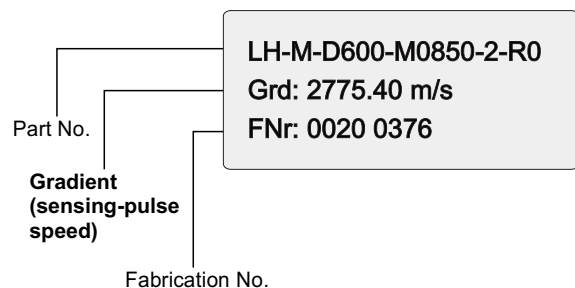
6.3 GSD file

The GSD file which is delivered together with the module allows to connect the measurement system to the Profibus-DP. These files provide a clear and comprehensive description of the sensor system characteristics in a precisely defined format.

The GSD features for the Profibus module are e.g. number of displacement sensors, sensor resolution, measuring direction and magnet offset.

The sensor tolerances in the module are compensated by entry of a correction factor for the sensing-pulse speed (Grd = gradient) printed on the sensor type label. This allows a high-accuracy measurement.

Fig. 5
Example sensor type label



The Approval No. of this Profibus-DP interface module, granted by the PNO (Profibus User Organisation) is hexadecimal 0539. The GSD-File is MTSG0539.GSD.

LED functions

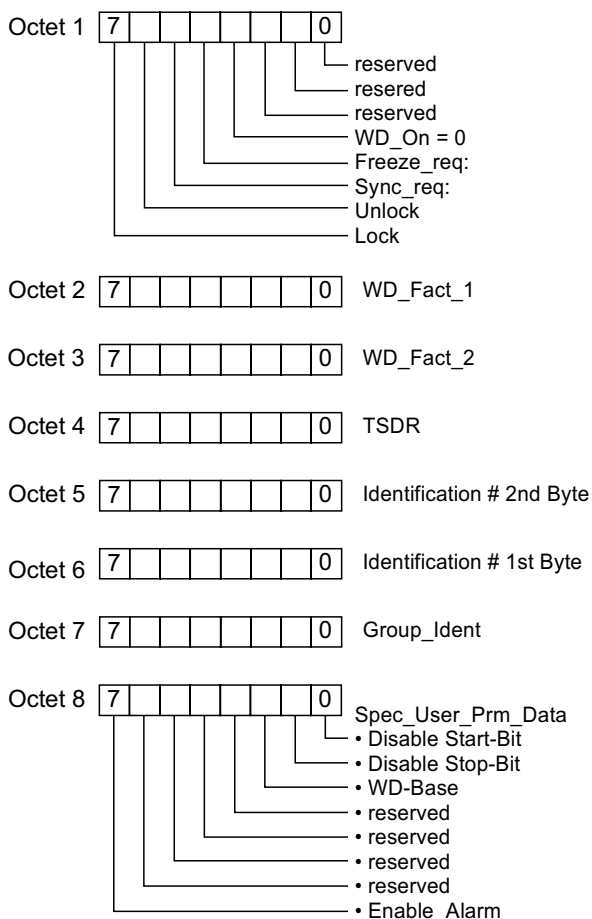
LED description	LED color	Comment
1. Module status	red yellow green yellow and green (flashes)	After switching on module waits for parameterizing Parameterization active Data communication to Master Hardware malfunction in bus communication or configuration fault
2. Sensor 1 - 4 status	green green (flashes)	Standard operations Malfunction

6.4 Parameter adjustment

The parameterization of the MTS Profibus-DP module follows the Profibus standard EN 50170 (DIN 19245-3). The first 7 Bytes are defined by the Profibus standard. Byte 8 contains the specific information for the Profibus controller SPC3 and also the information for the Profibus-DP extensions for the acyclic data exchange (DPV 1).

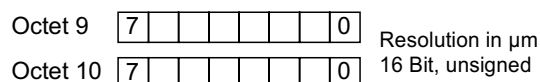
These extensions are not supported by the MTS module. The MTS specific parameter adjustments start at Byte 9. The adjustments are preset by the Device Data Base Files (*.GSD) as **User_Prm_Data**, but they are changeable during the configuration. The bytes descriptions for parameterizing is shown as follows:

6.4.1. Parameters (Profibus-DP Protocol)

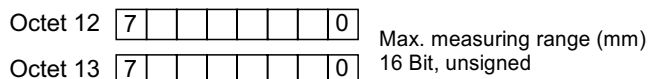
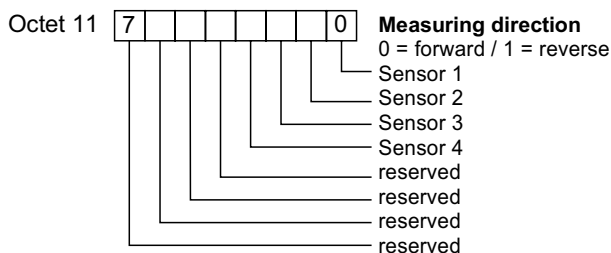


Setup of reserved Bits and Bytes = 0 !

6.4.2. MTS Profile (General sensor parameters)

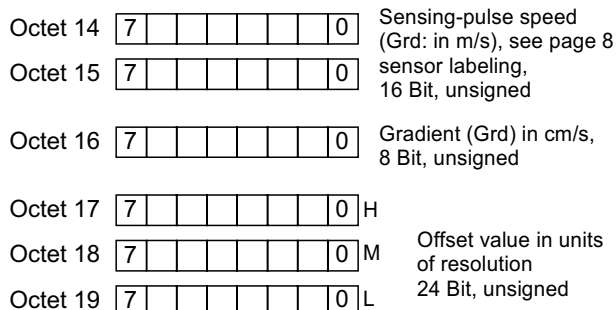


The resolution shown above shall prevail for all sensors. If the resolution is e.g. 20 μm the change of the input data from module into the control system by 1 Bit means a change of position by 20 μm .



In order to avoid conflicts the measuring length of the longest connected sensor has to be #entered above.

6.4.3. MTS Profile (Sensor parameter per sensor)



These parameters are existing for each sensor, i.e.

Sensor-No.	Gradient (Octet)	Offset (Octet)
1	14-16	17-19
2	20-22	23-25
3	26-28	29-31
4	32-34	35-37

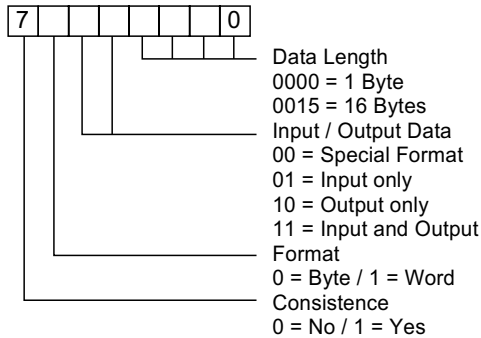
Attention ! All Bits will be set as:
1 = Functional selection / 0 = Reserved

After the module has checked the parameters, its changes into the state **Wait_Cfg**. Here it waits for the transmission of the configuration data. If the parameters are not allowed, it sends a diagnostic message to the master and stays in the state **Wait_Prm** until it gets the right parameters.

6.5 Configuration

After the successful parameterization, the sensor needs the configuration data. The configuration describes mainly the length of the input and output data, that are transferred during the data exchange mode.

Built-up of Configuration Byte:



The MTS Profibus module has a modular data structure. During the configuration 1 configuration byte has to be added for each sensor into the configuration data. To shorten data transfer rates, only input data will be transmitted. Additional 1 configuration-byte is always necessary for status information of all connected sensors.

For each sensor the length of input data in the data exchange mode is 4 byte (1 byte status information and 3 bytes position data).

After the module has checked the configuration data, it enters the data exchange mode **Data_Exch** and the sensor transmits the position values permanently.

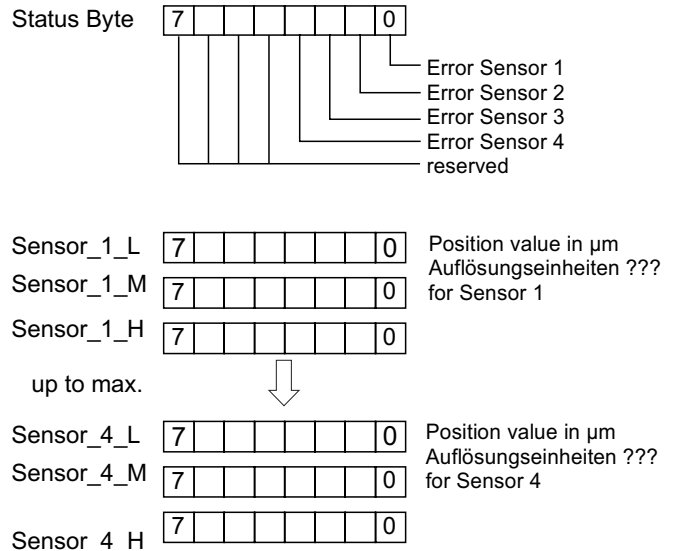
If the configuration is not valid, it sends a diagnostic message to the master and waits in the configuration state **Wait_Cfg**, until it receives the right configuration data.

The parameterization and configuration is usually handled by the project engineering software. Under normal circumstances the position and function of the data mentioned above is not necessary if using the GSD-File (MTSG0539.GSD).

6.6 Data exchange

Selection of following described operation modes is done by the GSD file and configuration software.

6.6.1. Intel-Format operation mode

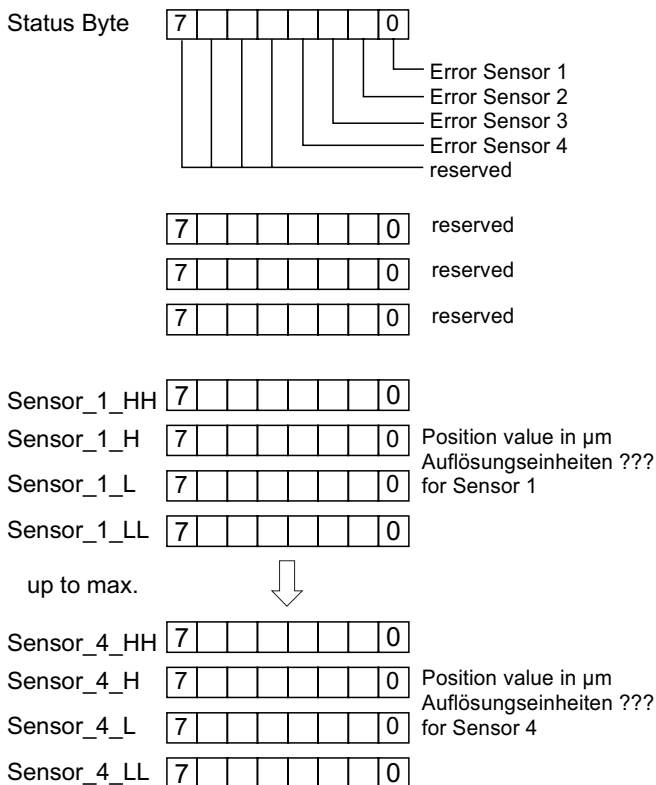


With **Intel-Format**, the position information is transmitted in ascending byte order with 3 bytes per sensor after a status byte.

If the inverse output action was selected, the position data are complemented. An offset value is added subsequently.

With sensor errors, the relevant bytes in the status byte are set and reset with the next correct measurement.

6.6.2. Motorola-Format operation mode



With **Motorola-Format**, the position information is transmitted in descending byte order with 4 bytes per sensor after 1 status byte and 3 reserved bytes.

If the inverse output action was selected, the position data are complemented. An offset value is added subsequently.

The Interface module uses an internal data width of 24 bits. With output in Motorola format, the most significant byte is a copy of the most significant bit of the 24-bit value.

With sensor errors, the relevant bits in the status byte are set, and reset with the next correct measurement.

6.7 Diagnostic

Profibus-module EB 342-0101 supports only the standard diagnostic function according to the profibus norm. Extended diagnostic functions are not assigned at present.

