502 082 01

ANALOG INTERFACE MODULE

PD 3250

Manual

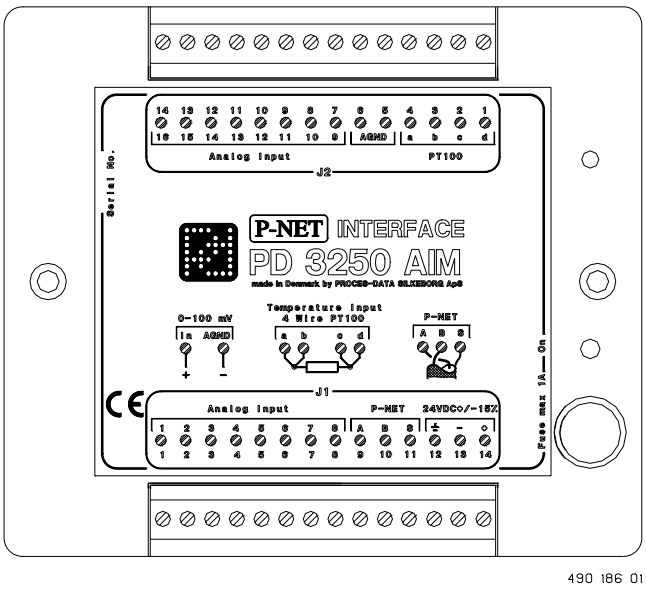
GB *September 1996*

PROCES-DATA A/S, Navervej 8, 8600 Silkeborg, Denmark, phone +45-87 200 300, fax +45-87 200 301

Contents

1 General information

The PD 3250 Analog Interface Module is a member of **PROCES-DATA**'s module series 3000.



490 186 01

The PD 3250 module is an intelligent measurement module, provided with 16 analog input channels for thermocouple transducers or voltage signals 0-100mV. Furthermore, it has a Pt-100 reference input and an interface to P-NET®. It provides a versatile interface between Thermocouple transducers generating analogue voltage signals, and distributed master control computers.

Configuration of the module for the functions required, and communication between the module and control computers, is carried out via the P-NET Fieldbus.

PD 3250 Analog Interface Module (AIM) provides internal conversion of measurement into an engineering unit representing the analog process being monitored and controlled, for direct interrogation by central control or any master unit connected to the P-NET Fieldbus system.

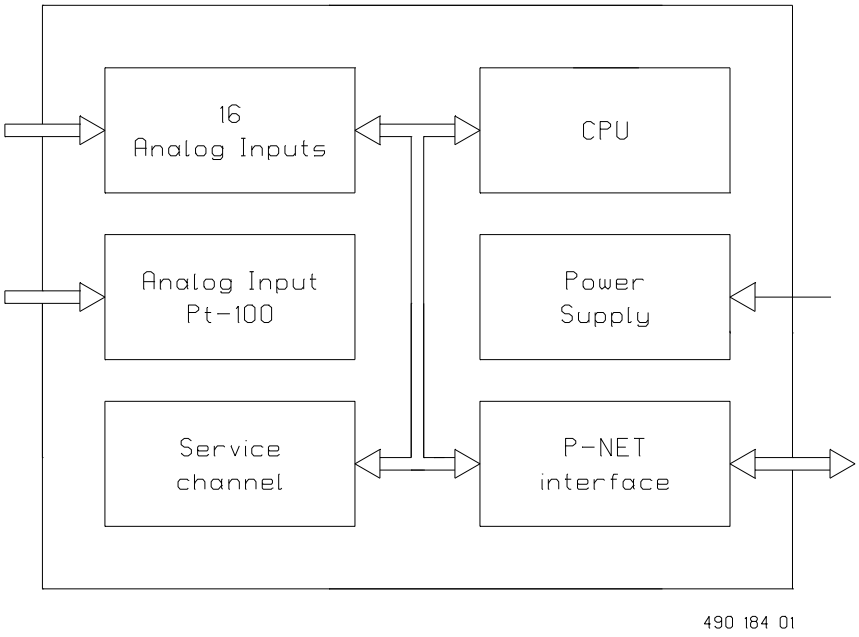
The compact design and the outstanding environmental specifications for the Analog Interface Module, makes it an ideal process component in industrial as well as other environments.

1.1 Features

- 1 high resolution (15 bit) analog input channel for Pt-100 signal.
- 16 high resolution (15 bit) analog input channels.
- Thermocouple transducer or Voltage input (0-100 mV).
- Linearization for Thermocouple transducers, type R, S, B, J, T, E, K and N.
- Filtered input signals
- Suppression of 50 and 60 Hz interference
- High and Low level limit switch for each channel
- Advanced self testing facility
- Overload protection
- P-NET Fieldbus communication
- Watchdog Timer
- Rail mounting module (DIN / EN)
- EMC approved (89/336/EEC)

1.2 Channel/registers

The PD 3250 module contains:



1 Service channel	(channel 0)
16 Analog inputs	(channel 1-$10)
1 Pt-100 input	(channel $11)

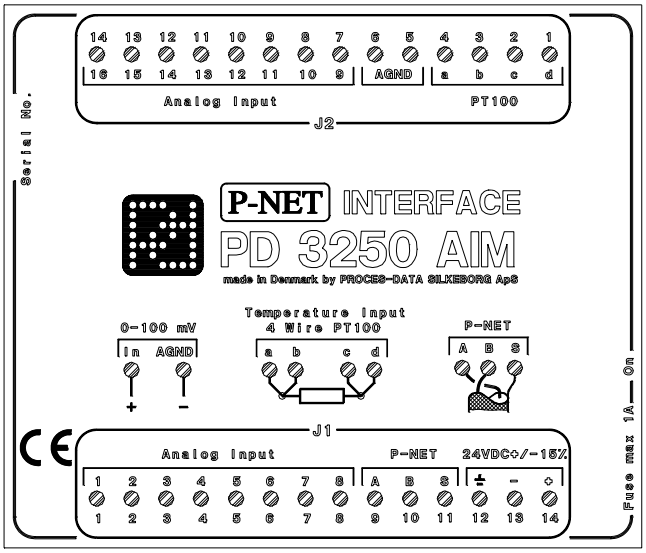
A set of 16 variables, numbered from 0 - $F, is associated with each channel. To address a variable within a particular channel, a logical address called a SoftWire Number (SWNo), is used. The SWNo is calculated as:(channel number ∗ $10 + variable number within the channel).

Example: Variable 9 on channel 3 needs to be addressed.
The SWNo will therefore be $39.

Throughout the manual the variables are depicted as tables. The variable names are standard identifiers, as defined in Process-Pascal.

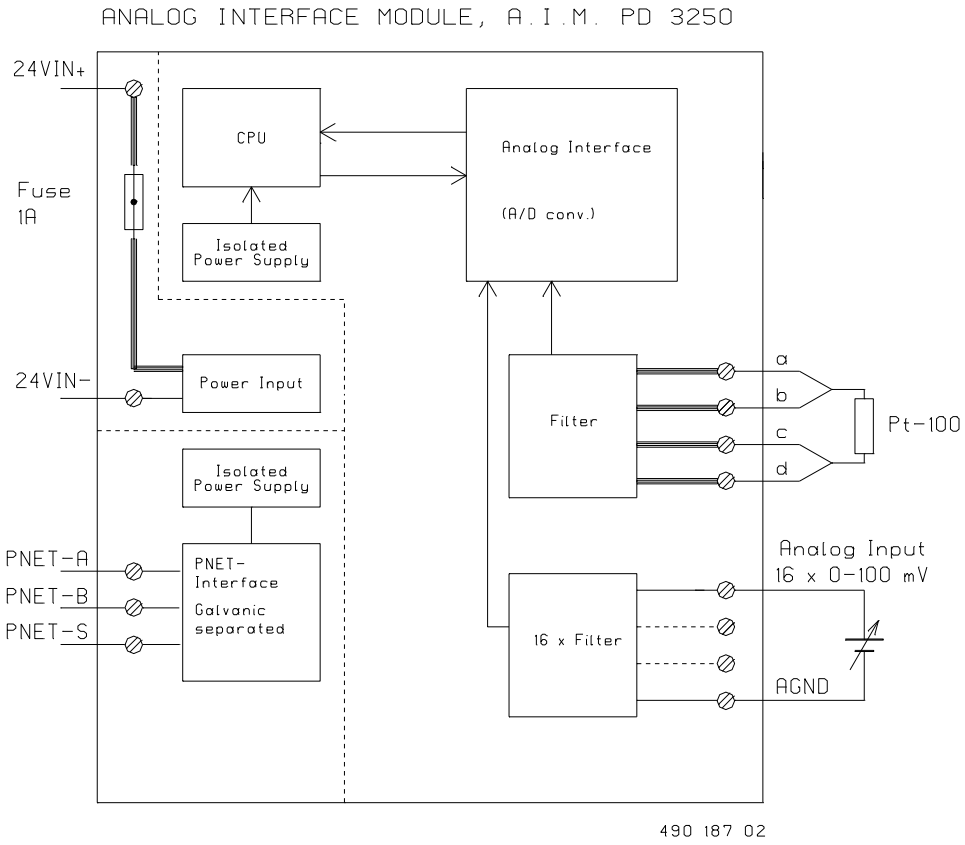
1.3 Connections

The PD 3250 is physically designed as a black box, having two 14 pin connectors for screw terminals. The connectors are removable and equipped with a key pin, to avoid reversed connections. The module has a built in fuse, which is used to protect the module, and externally connected wiring and equipment.
Connection identities are printed on the top of the module.



490 185 01

Hardware diagram, principle.



490 187 02

1.4 Memory types

The PD 3250 stores data in different types of memory, depending on the value of a control variable following a reset or a power failure, and the state of write protection.

Some variables are stored in both non volatile memory and in volatile memory. The state of the module's WriteEnable register determines whether the contents are changed in both types of memory or only in the volatile type.

The following memory types are listed in the channel definition tables.

Read Only

PROM ReadOnly
: The PROM is always write protected and can never be changed.

RAM ReadOnly
: The variable is stored in RAM and is only accessible for Reading.

Read, Protected Write

EEPROM RPW (Read, Protected Write)
: The EEPROM is always write protected directly following a reset. By setting WriteEnable to TRUE, the contents of the EEPROM can be changed. The contents of the EEPROM will remain unchanged during and after a power failure.

Read Write

RAM ReadWrite
: The variable can be changed instantly. After reset or a power failure, it's value is set to zero.

Read Write, Protected BackUp Write

RAM InitEEPROM
: The variable is stored in both RAM and EEPROM. After a reset, the variable is copied from EEPROM into RAM. When the variable is changed via P-NET, the value is changed in RAM. If WriteEnable is TRUE, the value is changed in both RAM and EEPROM when the variable is changed via P-NET.

2 Service Channel

PD 3250 contains a service channel containing variables and functions common to the entire module.

Variables on Service channel (channel 0). Channel identifier: **Service**

SWNo	Identifier	Memory type	Read out	Type
0	NumberOfSWNo	PROM Read Only		Integer
1	DeviceID	PROM Read Only	- - - - - - - -	Record
2				
3	Reset	RAM Read Write	Hex	Byte
4	PnetSerialNo	Special function	- - - - - - - -	Record
5				
6				
7	FreeRunTimer	RAM Read Only	Decimal	LongInteger
8	WDTimer	RAM Read Write	Decimal	Real
9	ModuleConfig	EEPROM RPW	- - - - - - - -	Record
A	WDPreset	EEPROM RPW	Decimal	Real
B				
C				
D	WriteEnable	RAM Read Write	Binary	Boolean
E	ChType	PROM Read Only	- - - - - - - -	Record
F	CommonError	RAM Read Write	- - - - - - - -	Record

SWNo 0: NumberOfSWNo
This variable holds the highest SWNo in the module.

SWNo 1: DeviceID
The purpose of this record is to be able to identify the device. The record includes a registered manufacturer number, the type number of the module and a string, identifying the manufacturer.

The record is of the following type:

```
Record
    DeviceNumber: Word;          (* Offset = 0 *)
    ProgramVersion: Word;        (* Offset = 2 *)
    ManufacturerNo: Word;        (* Offset = 4 *)
    Manufacturer: String[20];    (* Offset = 6 *)
end
```

An example of the field values in the DeviceID record is shown below:

DeviceNumber = 3250
ProgramVersion= 100 (the first version)
ManufacturerNo = 1
Manufacturer = Proces-Data DK

SWNo 3: Reset
By writing $FF to SWNo 3, the module performs a reset, and ExternalReset in CommonError SWNo $F is set TRUE.

SWNo 4: PnetSerialNo
This Variable is a record of the following type:

```
Record
    PnetNo: Byte; (* Node address *)     (* Offset = 0 *)
    SerialNO: String[20];                (* Offset = 2 *)
end
```

The serial number is used for service purposes and as a 'key' to setting the module's P-NET Node address.

A special function is included for identifying a module connected to a network containing many other modules, having the same or unknown node addresses, and to enable a change of the node address via the P-NET.

Setting a new node address via the P-NET is performed by writing the required node address, together with the serial number of the module in question, into the PnetSerialNo at node address $7E (calling all modules). All modules on the P-NET will receive the message, but only the module with the transmitted serial number will store the P-NET node address.
An attempt to write data to node address $7E will give no reply. Consequently the calling master must disable the generation of a transmission error when addressing this node.

In the module, the SerialNo = "XXXXXXXXPD", is set by **PROCES-DATA**, and cannot be changed. The eight X`s indicate the serialnumber, and PD is the initials of PROCES-DATA.

SWNo 7: FreeRunTimer
FreeRunTimer is a timer, to which internal events are synchronized. The timer is of type LongInteger in 1 /256 Second.

P-NET Watchdog function
PD 3250 Analog Interface module is equipped with a P-NET Watchdog. The P-NET Watchdog uses SWNo 8 and SWNo $A.

SWNo 8: WDTimer [s]
WDTimer is automatically preset with the value from WDPreset (SWNo $A), either each time the module is called via P-NET, or following a power-up or module reset. If the WDTimer reaches zero before it is preset again, the PnetWDRunOut flag will be set. The timer contains a value in seconds.

SWNo 9: ModuleConfig
The variable is a record of the following type:

```
Record
    Enablebit   : Bit8;          (* Offset = 0 *)
    Functions   : BYTE;          (* Offset = 1 *)
    Ref_A       : BYTE;          (* Offset = 2 *)
    Ref_B       : BYTE;          (* Offset = 3 *)
end
```

The EnableBit field is not utilised in the module.

The Watchdog facility may be switched on and off by means of the field variable Functions as shown below.

ModuleConfig.Functions = 0	Watchdog
ModuleConfig.Functions = $10	No Watchdog

The Ref_A and Ref_B fields are not utilised in the module.

SWNo $A: WDPreset [s]
The maximum allowable time between two calls for the module, before the Watchdog is activated, is defined in seconds, in this register.

SWNo $D: WriteEnable
Write protected variables can only be changed when WriteEnable is TRUE. After a reset, WriteEnable is set to FALSE.

After modifying the contents of module EEPROM, WriteEnable should be set FALSE. An EEPROM sum check is calculated each time WriteEnable is changed from "TRUE" to "FALSE". This sum check calculation period is approximately 0.25 second. Consequently, the module should not be reset during this period, otherwise an EEPROM error could occur (see SWNo $F: CommonError).

NB: Writing to EEPROM is limited to 10,000 cycles for each byte, including the sum check bytes.

SWNo $E: ChType

Each channel within an interface module is described in an individual ChType variable. This is a Record, consisting of a unique number for the channel type, and a TRUE boolean value for each of the registers which are represented within a channel. The register number in a channel, corresponds to the index number in the boolean array. In addition to these fields, various other fields may be found in the record, depending on the channel type.

The record for the service channel has the following structure:

```
Record
    ChannelType: WORD;          (* Offset = 0 *)
    Exist: Bit16;               (* Offset = 2 *)
    Functions: Bit16;           (* Offset = 4 *)
end
```

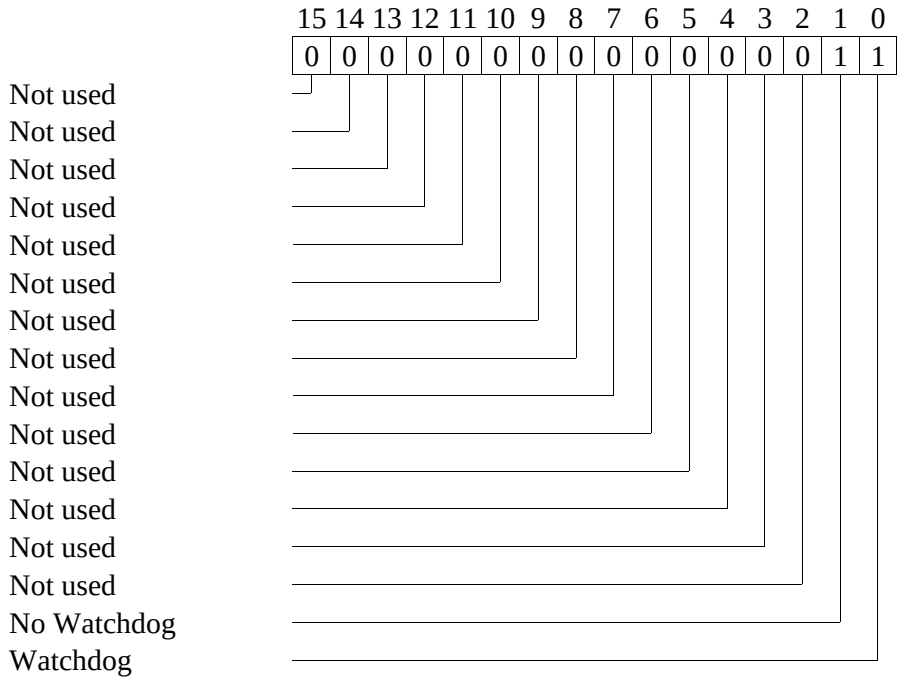
For the service channel, ChType has the following value:

ChannelType = 1

Exist =

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

Functions =

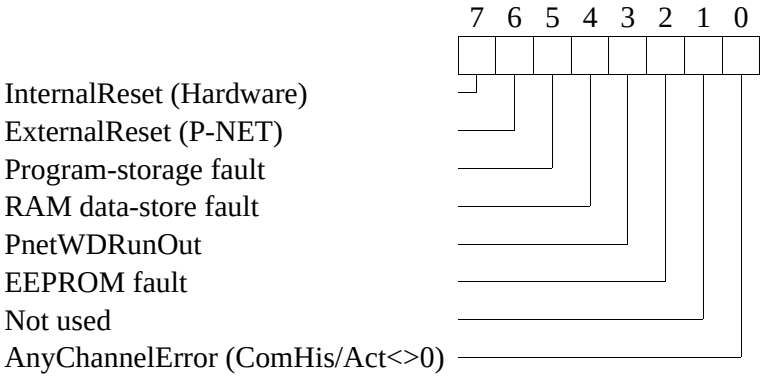


SWNo $F: CommonError

The CommonError variable holds error information on all Channels.
This variable is a record of the following type:

```
Record
    ChError: Record
                His:Array[0..7] of Boolean;     (* Offset = 0 *)
                Act:Array[0..7] of Boolean;     (* Offset = 2 *)
            End;
    ComHis24:Array [0..$17] of Boolean;         (* Offset = 4 *)
    ComAct24:Array [0..$17] of Boolean;         (* Offset = 8 *)
End
```

The 8 bits in ChError.His and ChError.Act have the following meaning:



Bit 7 InternalReset is set TRUE if a reset is caused by a power failure, or if the power has been disconnected.

Bit 6 ExternalReset is set TRUE if a reset is caused by writing $FF to SWNo 3, Reset, via P-NET.

Bit 5 Program-storage fault is set TRUE if the self test finds an error in the program memory (PROM).

Bit 4 RAM data-store fault is set TRUE if the self test finds an error in the data memory (RAM).

Bit 3 PnetWDRunOut is set TRUE if the WDTimer reaches zero and the Watchdog function is switched ON.

Bit 2 EEPROM fault is set to TRUE if the self test finds an error in the data memory (EEPROM). The error may be corrected by setting and resetting WriteEnable.

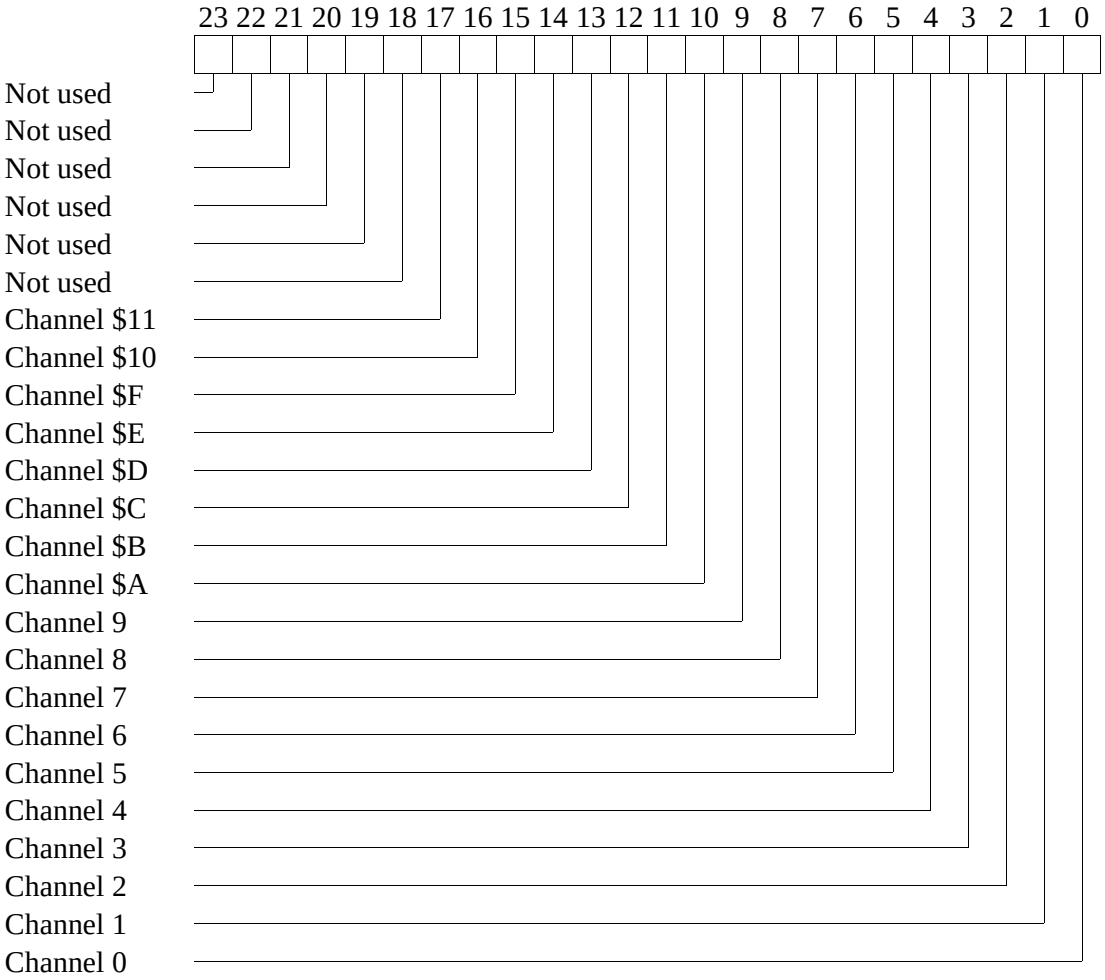
Bit 0 AnyChannelError = 1 means that an error or an unknowledged error exists, in one or more channels.

The following function of ChError.His and ChError.Act is analogous in all Channels:

1 When an error occurs, the corresponding bits in ChError.Act and ChError.His are set.
2 When the error disappears, the corresponding bit is reset in ChError.Act.
3 After reading ChError.His, ChError.Act is copied to ChError.His.
4 Transmission responses from a module will include the Actual Data Error bit (DataError) set TRUE if ChError.Act <> 0.

5 The Historical Data Error bit (GeneralError) will be set TRUE in all responses from the module if ChError.His <> 0.

ComHis and ComAct are unique fields in the service channel, and hold an error status relating to all channels, where the bit number corresponds to the channel number. Each Channel has an error register, ChError. If ChError.His in a particular channel is<>0, the corresponding bit is set in ComHis. If ChError.Act in a particular channel is<>0, the corresponding bit is set in ComAct in the service channel. If the error disappears (ChError. Act = 0), the corresponding bit in ComAct is automatically cleared.
If the channels become error free, individual bits in ComHis will be cleared when reading ChError in each of the channels.
ComHis:=0 performs a special function, equivalent to reading all ChErrors.His in all channels.



3 Analog input channel (channel 1-$10)

16 analog input signals may be connected to the PD 3250. The signals can be a standard Thermocouple transducer or a voltage (0-100 mV). The Thermocouple transducer type etc. is selected individually for each channel, by means of a channel configuration (ChConfig). A Thermocouple transducer measures a relative temperature. To obtain the absolute temperature, an offset must be added. The offset can be a fixed value, simulating the ambient temperature, or it can be an absolute temperature measurement from the Pt-100 Channel. The input signals are filtered, and suppressed against 50 and 60 Hz interference.

Variables on analog input channel x. Channel identifier: **Analog_In_x**

SWNo	Identifier	Memory type	Read out	Type	SI Unit
x0	AnalogIn	RAM Read Write	Decimal	Real	*
x1					
x2					
x3					
x4					
x5					
x6					
x7	HighLevel	RAM Init EEPROM	Decimal	Real	*
x8	LowLevel	RAM Init EEPROM	Decimal	Real	*
x9	ChConfig	EEPROM RPW	- - - - - -	Record	
xA					
xB	FullScale	EEPROM RPW	Decimal	Real	*
xC	ZeroPoint	EEPROM RPW	Decimal	Real	*
xD	Maintenance	EEPROM RPW	- - - - - -	Record	
xE	ChType	PROM Read Only	- - - - - -	Record	
xF	ChError	RAM Read Only	Binary	Record	

* SI unit depends on the connected process component.

SWNo x0: AnalogIn

This variable holds a value, which is either derived from the sum of the measurement from the Thermocouple transducer and a reference value (selected in ChConfig.Ref_A), or from the value of the input voltage. The reference value could be selected as the common reference temperature available from the Pt-100 input (channel $11), or it could be an AnalogIn value from any of the other measurement channels, or it can be zero. To store the resultant measurement as a scaled value in SI units, a calculation is performed, using either the contents of ZeroPoint and the upper range for the Thermocouple transducer, or from the contents of FullScale for voltage input measurements. If the value of this result exceeds the specified upper limit of the particular thermocouple transducer type, or 110% of FullScale in the case of voltage inputs, the contents of this register will be held at this value, and the module will generate an error code (see ChError). A similar situation will occur if the input signal falls to -5% of the specified minimum.

SWNo x7: HighLevel

HighLevel is a "limitswitch" with the following function:

```
IF AnalogIn > HighLevel and ChConfig.Enablebit[4] THEN
  HighAlarm:=true
ELSE
  HighAlarm:=false.
```

SWNo x8: LowLevel

LowLevel is a "limitswitch" with the following function:

```
IF AnalogIn < LowLevel and ChConfig.Enablebit[3] Then
  LowAlarm:=true
ELSE
  LowAlarm:=false.
```

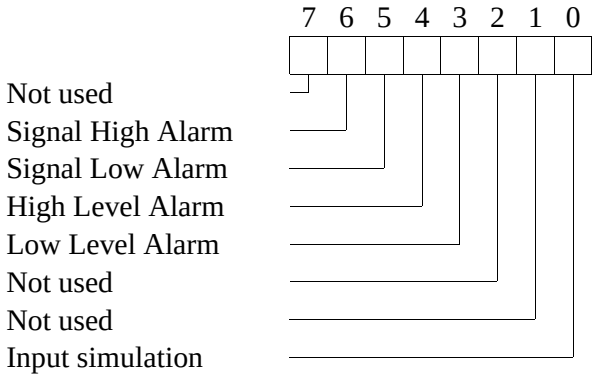
SWNo x9: ChConfig

The channel configuration for an analog input channel is stored in a record variable of the following type:

```
Record
    Enablebit   : Bit8;          (* Offset = 0 *)
    Functions   : BYTE;          (* Offset = 1 *)
    Ref_A       : BYTE;          (* Offset = 2 *)
    Ref_B       : BYTE;          (* Offset = 3 *)
end
```

where each field has the following interpretation:

Enablebit :



Functions :

The Functions field holds a 2 digit hexadecimal value, where the most significant digit is used to specify the input signal type, and the least significant digit is used to select a time constant for the input filter. The filter time constant defines that for a stepped change at the input terminals, the measured value (AnalogIn), will have only changed by 63 % of it's target value, at the end of the specified time period.

Input signal specification:

Functions = $0x => Channel disabled
Functions = $4x => Voltage 0-100 mV
Functions = $5x => Thermocouple transducer

Filter constant specification:

Functions = $x0 => No filter
Functions = $xA => Time constant = 1 sec.
Functions = $xB => Time constant = 2 sec.
Functions = $xC => Time constant = 5 sec.
Functions = $xD => Time constant = 10 sec.

Ref_A :
The Ref_A field is only used when the input signal is Thermocouple transducer. Ref_A holds the Channel No. for a reference value. If “$11" is selected, the common Pt-100 measurement is used as reference temperature. If "00" is selected, no reference value is used.

Ref_B :
The Ref_B field holds a value used to specify the type of Thermocouple transducer.
Thermocouple transducer type:

Ref_A = 0 => Platinum-13% Rhodium/Platinum (type R)
-50 °C to 1768 °C
Ref_A = 1 => Platinum-10% Rhodium/Platinum (type S)
-50 °C to 1768 °C
Ref_A = 2 => Platinum-30% Rhodium/Platinum-6% Rhodium (type B)
0 °C to 1820 °C
Ref_A = 3 => Iron/Copper-Nickel (type J)
-109,1 °C to 1200 °C
Ref_A = 4 => Copper/Copper-Nickel (type T)
-166,5 °C to 400 °C
Ref_A = 5 => Nickel-Chromium/Copper-Nickel (type E)
-94,8 °C to1000 °C
Ref_A = 6 => Nickel-Chromium/Nickel-Aluminium (type K)
-153,7 °C to 1372 °C
Ref_A = 7 => Nickel-Chromium-Silicon/Nickel-Silicon (type N)
-270 °C to 1300 °C

The Thermocouple types are described in the IEC standard publication 584-1.

Note: If a channel is not in use, "00" should be written in ChConfig.Functions, ("channel disable"), otherwise errors can occur.
When the channel is configured for input simulation mode, (ChConfig.Enablebit[0] = TRUE), no measurement value will be calculated, and enables the user to insert any value in AnalogIn.

SWNo x$B: FullScale
The resultant measurement value expected in AnalogIn, when the input signal is at it's 100mV maximum, should be placed in the FullScale variable. The value is inserted using the same SI units as those required to appear in AnalogIn. FullScale is not used for Thermocouple signals.

SWNo x$C: ZeroPoint
The resultant measured value expected in AnalogIn when the input signal is at it's 0 mV minimum, should be placed in the ZeroPoint variable. The value is inserted using the same SI units as those required to appear in AnalogIn. If the channel has been configured as a Thermocouple input, ZeroPoint is used as an offset adjustment for the temperature detector.

SWNo x$D: Maintenance
The Maintenance variable is used for service management and maintenance purposes, and holds the last date of service and indicates the type of service.

Maintenance is a Record of the following type:

```
Record
    Date        : BYTE;
    Month       : BYTE;
    Year        : BYTE;
    Category    : BYTE;
End
```

SWNo x$E: ChType
For the analog input channels, ChType is of the following type:

```
Record
    ChannelType: WORD;          (* Offset = 0 *)
    Exist: Bit16;               (* Offset = 2 *)
    Functions: Bit16;           (* Offset = 4 *)
    FilterConstant: Bit16;      (* Offset = 6 *)
end
```

ChType has the following value:

ChannelType = 4

Exist =

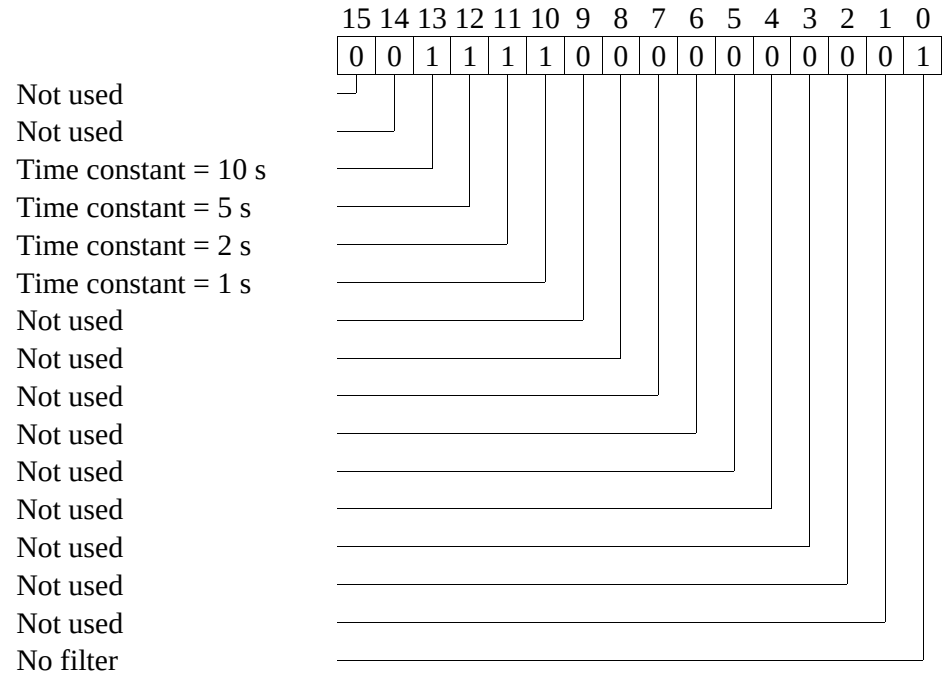
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	1

Functions =

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

Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Thermocouple transducer
Voltage 0-100 mV
Not used
Not used
Not used
Channel can be disabled

FilterConstant =

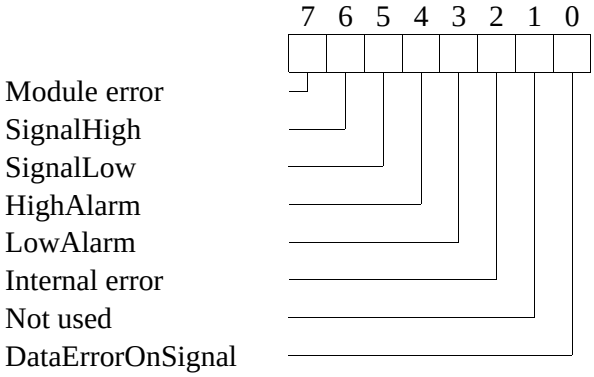


SWNo x$F: CHError

This variable holds error information relating to the analog input channel. The variable is a record of the following type:

```
ChError: Record
            His:Array[0..7] of Boolean;     (* Offset = 0 *)
            Act:Array[0..7] of Boolean;     (* Offset = 2 *)
        End;
```

When an error occurs, the corresponding bit is set in both ChError.His and ChError.Act, and when the error disappears, the bit is cleared in ChError.Act. The 8 bits in ChError.His and ChError.Act have the following meaning:



Bit 7 Module error. If this bit is set, the rest of the bits are insignificant, because a module error can lead to random error codes on individual channels (also see "Service channel").

Bit 6 SignalHigh indicates different kinds of errors, depending on the channel configuration for the Input signal:

0-100mV: SignalHigh is set if the input signal exceeds the maximum value (100mV) by more than 10% and ChConfig.Enablebit [6] = TRUE.

Thermocouple: SignalHigh is set if the input signal exceeds the maximum value of the selected thermocouple type (see ChConfig) and ChConfig.Enablebit[6] = TRUE.

Bit 5 SignalLow indicates different kinds of errors, depending on the channel configuration for the Input signal:

0-100mV: SignalLow is set if the input signal falls below the minimum value (0mV) by more than 5% and ChConfig.Enablebit[5] = TRUE.

Thermocouple: SignalLow is set if the input signal falls below the minimum value of the selected thermocouple type (see ChConfig) and ChConfig.Enablebit[5] = TRUE.

Bit 4 HighAlarm is set if AnalogIn > HighLevel and ChConfig.Enablebit[4] = TRUE.

Bit 3 LowAlarm is set if AnalogIn < LowLevel and ChConfig.Enablebit[3] = TRUE.

Bit 2 An internal error is indicated. If the module continues to indicate an internal error after a reset, the module is likely to require repair.

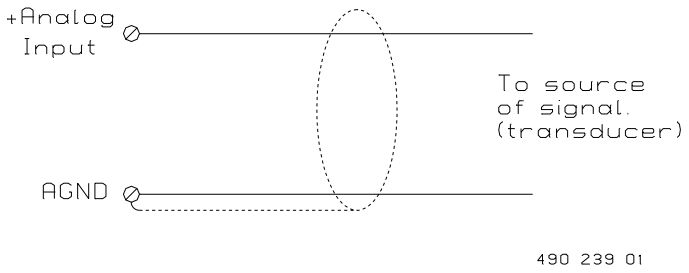
Bit 1 Not used.

Bit 0 DataErrorOnSignal is set when the signal selected for reference temperature has an ChError.Act <> 0.

3.1 Connection to analog input channels

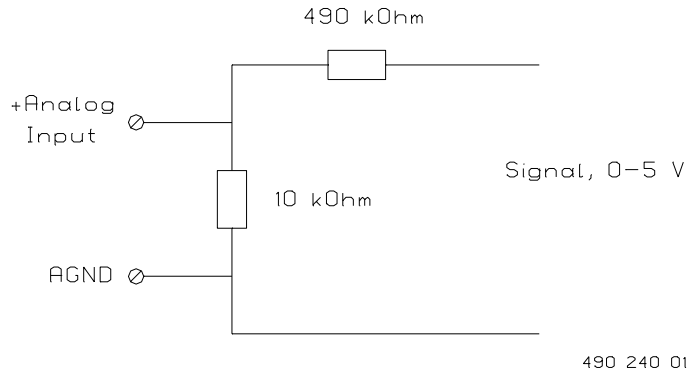
The PD 3250 module has terminals for connection of the analog input signals. The connection for each signal is determined by the analog input transmitter type, and the processing of each signal is determined the the channel configuration setting.

Analog voltage signals having a 0-100 mV characteristic can be directly connected to the PD 3250 module.



The input impedance of an analog channel is so high, that conventional voltage division using two resistors can be applied, if the signal to be measured is higher than 100 mV.

Example: Input signal 0-5 V.



4 Analog input channel (channel $11)

One Pt-100 device may be connected to the PD 3250 for temperature measurement. This channel may be used as a reference temperature for the Thermocouple transducers connected to the Channels 1 to $10.

Variables on Analog Input Channel $11. Channel identifier: **Analog_In_11**

SWNo	Identifier	Memory type	Read out	Type	SI Unit
110	AnalogIn	RAM Read Write	Decimal	Real	°C
111					
112					
113					
114					
115					
116					
117	HighLevel	RAM Init EEPROM	Decimal	Real	°C
118	LowLevel	RAM Init EEPROM	Decimal	Real	°C
119	ChConfig	EEPROM RPW	- - - - - -	Record	
11A					
11B	FullScale	EEPROM RPW	Decimal	Real	
11C	ZeroPoint	EEPROM RPW	Decimal	Real	°C
11D	Maintenance	EEPROM RPW	- - - - - -	Record	
11E	ChType	PROM Read Only	- - - - - -	Record	
11F	ChError	RAM Read Only	Binary	Record	

SWNo $110: AnalogIn

This variable holds the measurement result of the Pt-100 input, scaled as a value in °C and added to the contents of ZeroPoint. If the value should exceed 220 °C, the contents of this register will be held at 220 °C and the module will generate an error code (see ChError). A similar situation will occur if the input signal drops below -105 °C.

SWNo $117: HighLevel

HighLevel is a "limitswitch" with the following function:

```
IF AnalogIn > HighLevel and ChConfig.Enablebit[4] THEN
  HighAlarm:=true
ELSE
  HighAlarm:=false.
```

SWNo $118: LowLevel

LowLevel is a "limitswitch" with the following function:

```
IF AnalogIn < LowLevel and ChConfig.Enablebit[3] Then
  LowAlarm:=true
ELSE
  LowAlarm:=false.
```

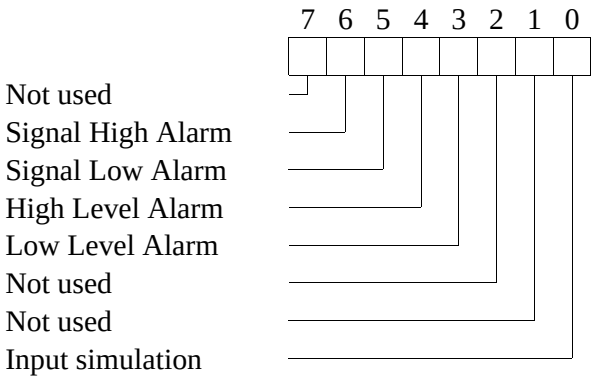
SWNo $119: ChConfig

The channel configuration for the analog input channel is stored in a record variable of the following type:

```
Record
    Enablebit   : Bit8;          (* Offset = 0 *)
    Functions   : BYTE;          (* Offset = 1 *)
    Ref_A       : BYTE;          (* Offset = 2 *)
    Ref_B       : BYTE;          (* Offset = 3 *)
end
```

where each field has the following interpretation:

Enablebit :



Functions :

The Functions field holds a 2 digit hexadecimal value, where the most significant digit is used to specify the input signal type, and the least significant digit is used to select a time constant for the input filter. The filter time constant defines that for a stepped change at the input terminals, the measured value (AnalogIn), will have only changed by 63 % of it's target value, at the end of the specified time period.

Input signal specification:

Functions = $0x => Channel disabled
Functions = $1x => Temperature Pt-100

Filter constant specification:

Functions = $x0 => No filter
Functions = $xC => Time constant = 5 sec.
Functions = $xD => Time constant = 10 sec.
Functions = $xE => Time constant = 20 sec.
Functions = $xF => Time constant = 50 sec.

Ref_A : Not used

Ref_B : Not used

Note: If the channel is not in use, "00" should be written in ChConfig.Functions, ("channel disable"), otherwise errors can occur.

When the channel is configured for input simulation mode (ChConfig.Enablebit[0] = TRUE), no measurement value will be calculated, and the user can insert any value in AnalogIn.

SWNo $11B: FullScale
This variable is not used.

SWNo $11C: ZeroPoint
Zeropoint is used as an offset adjustment for the temperature detector. The value is inserted in °C, which corresponds to the units used in AnalogIn.

SWNo $11D: Maintenance
The Maintenance variable is used for service management and maintenance purposes, and holds the last date of service and indicates the type of service.

Maintenance is a Record of the following type:

```
Record
    Date      : BYTE;
    Month     : BYTE;
    Year      : BYTE;
    Category  : BYTE;
End
```

SWNo $11E: ChType

For the analog input channels, ChType is of the following type:

```
Record
    ChannelType: WORD;          (* Offset = 0 *)
    Exist: Bit16;               (* Offset = 2 *)
    Functions: Bit16;           (* Offset = 4 *)
    FilterConstant: Bit16;      (* Offset = 6 *)
end
```

ChType has the following value:

ChannelType = 4

Exist =

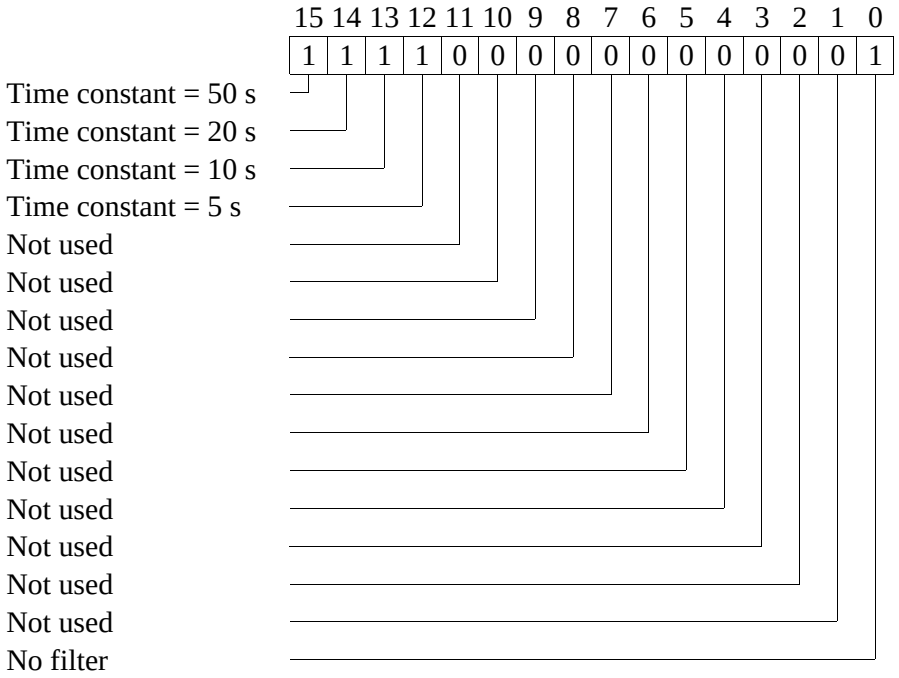
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	1

Functions =

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

Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Not used
Temperature Pt-100
Channel can be disabled

FilterConstant =

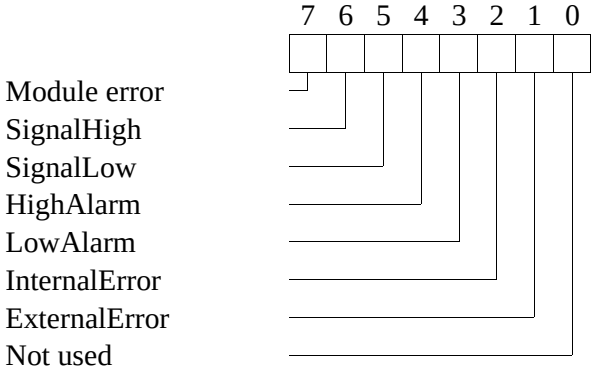


SWNo $11F: CHError

This variable holds error information relating to the analog input channel. The variable is a record of the following type:

```
ChError: Record
            His:Array[0..7] of Boolean;     (* Offset = 0 *)
            Act:Array[0..7] of Boolean;     (* Offset = 2 *)
        End;
```

When an error occurs, the corresponding bit is set in both ChError.His and ChError.Act. When the error disappears, the bit is cleared in ChError.Act. The 8 bits in ChError.His and ChError.Act have the following meaning:



Bit 7 Module error. If this bit is set, the rest of the bits are insignificant, because a module error can lead to random error codes on individual channels (also see "Service channel").

Bit 6 SignalHigh is set if the input signal exceeds the maximum value (200°C) by more than 10% and ChConfig.Enablebit[6] = TRUE.

Bit 5 SignalLow is set if the input signal falls below the minimum value (-100°C) by more than 5% and ChConfig.Enablebit[5] = TRUE.

Bit 4 HighAlarm is set if AnalogIn > HighLevel and ChConfig.Enablebit[4] = TRUE.

Bit 3 LowAlarm is set if AnalogIn < LowLevel and ChConfig.Enablebit[3] = TRUE.

Bit 2 An internal error is indicated. If the module continues to indicate an internal error after a reset, the module is likely to require repair.

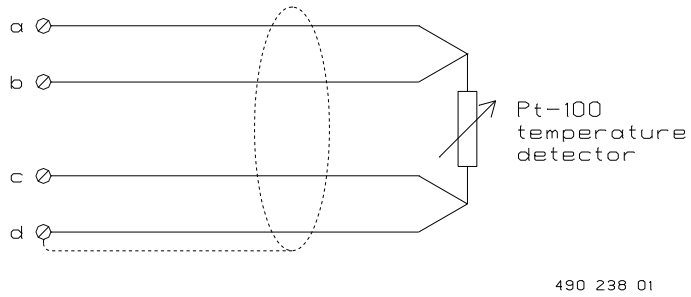
Bit 1 External error is set if the current in the Pt-100 sensor is outside a legal range for measurement, due to disconnection or a broken wire. This error can not be disabled.

Bit 0 Not used.

4.1 Connection to Pt-100 input channel

The PD 3250 module has terminals used for connection of analog input signals. The connection for each signal is determined by the analog input transmitter type, and each signal is processed depending on the channel configuration.

Temperature detectors of the Pt-100 type can be connected to the PD 3250 module. A detector is connected to a set of terminals marked “a-b-c-d”. If dual twisted pair is used for a four wire connection, then terminal connections b and c should be used for one pair, and terminals a and d for the other pair.



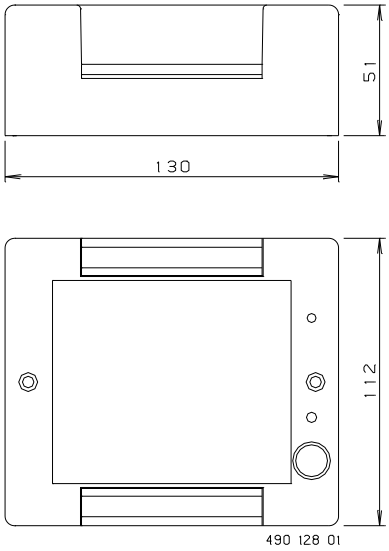
5 Construction, Mechanical

The PD 3250 module is housed in a black plastic case. The case measures W x H x D = 130.0 x 112.0 x 50.9 mm (tolerance to DIN 16901).

The module is designed for plugging directly on to a mounting rail (EN 50 022 / DIN 46277). The module incorporates two snap connectors, which provide terminals for field connection, power and communications.

The module may be DIN rail mounted for a panel mounted configuration, or contained in a sealed box designed for the plant environment. It may be removed for service, without interfering with operational activities on the rest of the network.

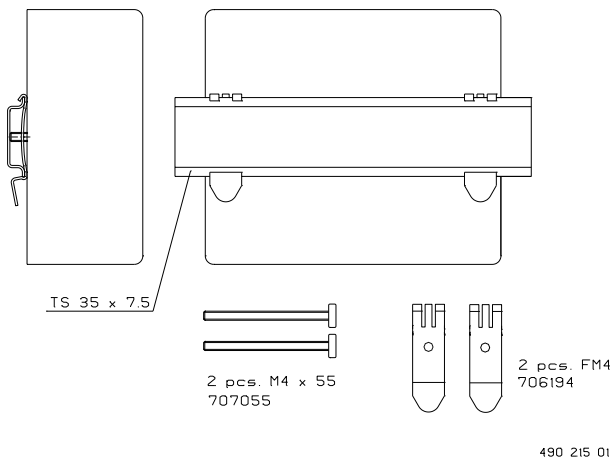
Scale drawing (in mm):



Materials

Case	: Black NORYL GFN (injection moulded)
Front foil	: Polycarbonate.
Back plate	: Black anodized aluminium.
Weight	: 400 gram.

Rail mounting:



6 Specifications

All electrical characteristics are valid at an ambient temperature -25 °C - 70 °C, unless otherwise stated.

All specifications are valid within the range of approved EMI conditions. EMC test specifications for PD 3250 are available in a separate document, PD no. **506 026**.

6.1 Power supply

Power supply DC:	nom.	24.0 V
	min.	20.0 V
	max.	28.0 V
Ripple :	max.	5 %
Power consumption :	max.	1.3 W
Current at power up :	max.	250 mA

Fuse 1 A (time lag).

6.2 Analog input

Voltage input channel 1 to channel 16 (0-100 mV):

Measurement error:		
@ 0°C to +50°C:	max.	± 0.1 % of actual voltage ± 10 µV
@ -25°C to +70°C:	max.	± 0.3 % of actual voltage ± 10 µV
Resolution :		5 µV
Repeatability :		± 10 µV
Input impedance :	min.	5.0 MΩ
Voltage input measurement update time (channel 1 - 4 enabled):		0.6 s
Voltage input measurement update time (channel 1 - 8 enabled):		0.9 s
Voltage input measurement update time (channel 1 - 12 enabled):		1.2 s
Voltage input measurement update time (channel 1 - 16 enabled):		1.5 s

Thermocouple types for use with input channels $01 to channel $10 are described below. The thermocouple types are defined in the IEC standard publication 584-1:

Platinum-13% Rhodium/Platinum (type R):	-50 °C - 1768 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 1°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 1°C
Resolution :	0,5°C
Repeatability :	± 1°C

Platinum-10% Rhodium/Platinum (type S):	-50 °C - 1768 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 1,1°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 1,1°C
Resolution :	0,6°C
Repeatability :	± 1,2°C

Platinum-30% Rhodium/Platinum-6% Rhodium (type B):	0 °C - 1820 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 1,4°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 1,4°C
Resolution :	0,77°C
Repeatability :	± 1,54°C

Iron/Copper-Nickel (type J):	-109,1 °C - 1200 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 0,23°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 0,23°C
Resolution :	0,1°C
Repeatability :	± 0,2°C

Copper/Copper-Nickel (type T):	-166,5 °C - 400 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 0,37°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 0,37°C
Resolution :	0,13°C
Repeatability :	±0,26°C

Nickel-Chromium/Copper-Nickel (type E):	-94,8 °C - 1000 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 0,27°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 0,27°C
Resolution :	0,08°C
Repeatability :	± 0,16°C

Nickel-Chromium/Nickel-Aluminium (type K):	-153,7 °C - 1372 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 0,36°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 0,36°C
Resolution :	0,15°C
Repeatability :	± 0,3°C

Nickel-Chromium-Silicon/Nickel-Silicon (type N):	-270 °C - 1300 °C
Measurement error @ 0°C to +50°C:	max. ± 0,1 % of actual temperature ± 0,36°C
Measurement error @ -25°C to +70°C:	max. ± 0,3 % of actual temperature ± 0,36°C
Resolution :	0,18°C
Repeatability :	± 0,36°C

Temperature input with Pt-100 sensor channel $11 (IEC 751). Specifications exclude the accuracy of the Pt-100 sensor.

Accuracy @ -100 °C :	max. ± 0.19 °C
Accuracy @ 20 °C :	max. ± 0.29 °C
Accuracy @ 200 °C :	max. ± 0.51 °C
Resolution :	0.05 °C
Repeatability :	± 0.1 °C
Temperature range :	-100 °C to +200 °C
Temperature input measurement update time (channel 1 - 4 enabled):	1.8 s
Temperature input measurement update time (channel 1 - 8 enabled):	2.7 s
Temperature input measurement update time (channel 1 - 12 enabled):	3.6 s
Temperature input measurement update time (channel 1 - 16 enabled):	4.5 s
Power dissipation in temperature detector :	max. 0.05 mW

6.3 Ambient Temperature

Operating temperature :	-25 °C to +70 °C
Storage temperature :	-40 °C to +85 °C

6.4 Humidity

Relative humidity :	max. 95 %

6.5 Approvals

Compliance with EMC-directive no.:	89/336/EEC
Generic standards for emission:	
Residental, commercial and light industry	EN 50081-1
Industry	EN 50081-2
Generic standards for immunity:	
Residental, commercial and light industry	EN 50082-1
Industry	EN 50082-2
Vibration (sinusoidal):	IEC 68-2-6 Test Fc

7 Survey of variables in the PD 3250 module

SWNo	**Service** 0	**Analog_In_x** 1 - $11
x0	NumberOfSWNo	AnalogIn
x1	DeviceID	
x2		
x3	Reset	
x4	PnetSerialNo	
x5		
x6		
x7	FreeRunTimer	HighLevel
x8	WDTimer	LowLevel
x9	ModuleConfig	ChConfig
xA	WDPreset	
xB		FullScale
xC		ZeroPoint
xD	WriteEnable	Maintenance
xE	ChType	ChType
xF	CommonError	ChError

Contents

Page