



**Isolation** Galvanic isolators for analogue and digital signals as well as HART® signals. A wide product range with both loop-powered and universal isolators featuring linearisation, inversion, and scaling of output signals.



**Displays** Programmable displays with a wide selection of inputs and outputs for display of temperature, volume, weight, etc. Feature linearisation, scaling, and difference measurement functions for programming via PReset software.



**Ex barriers** Interfaces for analogue and digital signals as well as HART® signals between sensors / I/P converters / frequency signals and control systems in Ex zone 0, 1 & 2. Feature options such as mathematical functions and 2 wire transmitter interfaces.



**Temperature** A wide selection of transmitters for DIN form B mounting and DIN rail modules with analogue and digital bus communication ranging from application-specific to universal transmitters.



**Backplane** Flexible motherboard solutions for system 5000 modules. Our backplane range features flexible 8 and 16 module solutions with configuration via PReplan 8470 – a PC program with drop-down menus.



- DK Side 1
- UK Page 13
- FR Page 25
- DE Seite 37



**5 3 3 1**

**2-Wire Programmable Transmitter**

No.5331V109-IN (0540)  
From ser. no. 010455001



**SIGNALS THE BEST**

# 2-TRÅDS PROGRAMMERBAR TRANSMITTER

**PRetop 5331**

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## Sikkerhedsinstruktion

### Ex-installation:

For sikker installation af 5331B, C og D i eksplosionsfarligt område skal følgende overholdes. Installation må kun foretages af kvalificeret personale, der er bekendt med de nationale og internationale love, direktiver og standarder, der gælder for området.

Produktionsår fremgår af de to første cifre i serienummeret.

For installationsanvisninger og Ex-data henvises til ATEX-certifikat.

## OVERENSSTEMMELSESERKLÆRING

Som producent erklærer

**PR electronics A/S**

**Lerbakken 10**

**DK-8410 Rønde**

hermed at følgende produkt:

**Type: 5331**

**Navn: 2-Tråds programmerbar transmitter**

er i overensstemmelse med følgende direktiver og standarder:

EMC-direktivet 2004/108/EF og senere tilføjelser

**EN 61326**

Denne erklæring er udgivet i overensstemmelse med EMC-direktivets paragraf 10, stk. 1. For specifikation af det acceptable EMC-niveau henvises til modulets elektriske specifikationer.

ATEX-direktivet 94/9/EF og senere tilføjelser

**EN 50014 og EN 50020**

**ATEX-certifikat: DEMKO 99ATEX126962**

Bemyndiget organ for CENELEC / ATEX: **UL International Demko A/S 0539**



Rønde, 6. okt. 2005

Peter Rasmussen  
Producentens underskrift

## 2-TRÅDS PROGRAMMERBAR TRANSMITTER PRetop 5331

- Indgang for RTD, TC, Ohm eller mV
- Ekstrem målenøjagtighed
- 1,5 kVAC galvanisk isolation
- Programmerbar følerfejlsværdi
- Kan monteres i DIN form B følerhoved

### Anvendelse:

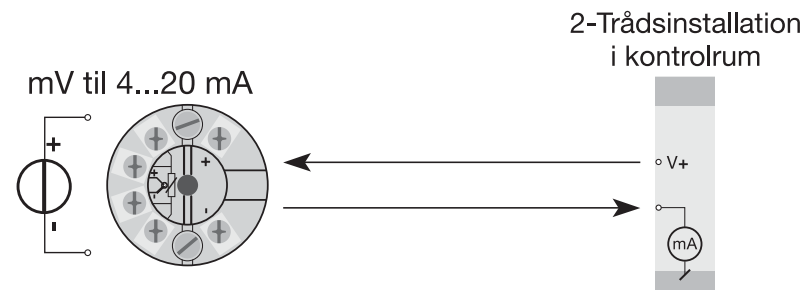
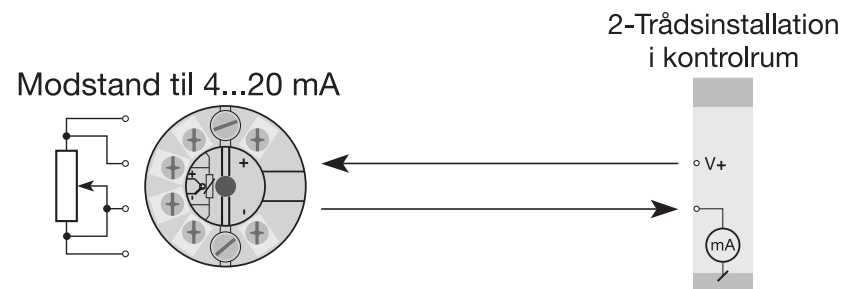
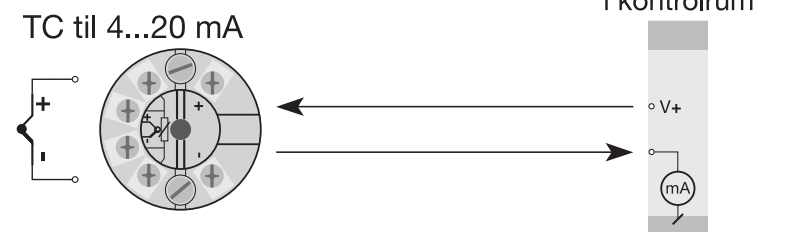
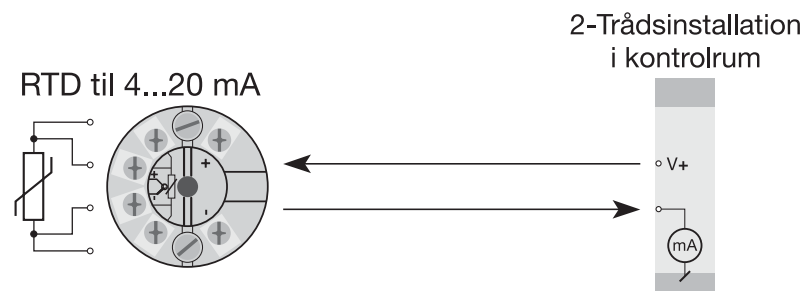
- Temperaturlineariseret måling med Pt100...Pt1000, Ni100...Ni1000 eller termoelementføler.
- Omsætning af lineær modstandsændring til standard analogt strømsignal, f.eks. fra ventiler eller ohmske niveaustave.
- Forstærkning af bipolært mV-signal til et standard 4...20 mA strømsignal.

### Teknisk karakteristik:

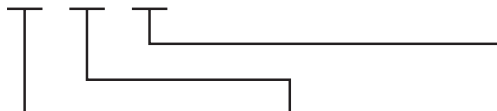
- PR5331 kan af brugeren i løbet af få sekunder programmeres til at måle inden for alle normerede temperaturområder.
- RTD og modstandsindgangen har kabelkompensering for 2-, 3- og 4-leder tilslutning.
- Der er løbende sikkerhedscheck af gemte data.

### Montage / installation:

- Kan monteres i DIN form B følerhoved. I ikke-eksplosionsfarlige områder kan 5331 monteres på en DIN-skinne med et specielt beslag.
- **NB:** Som Ex-barriere for 5331B anbefaler vi 5104B, 5114B eller 5116B.



## Bestillingsskema: 5331



Type	Version	Omgivelses-temperatur	Galvanisk isolation
5331	Standard : A	-40°C...+85°C : 3	1500 VAC : B
	ATEX : B		
	FM og ATEX : C		
	CSA, FM og ATEX : D		

### Elektriske specifikationer:

#### Specifikationsområde:

-40°C til +85°C

#### Fælles specifikationer:

##### Forsyningsspænding DC

Standard, 5331A .....	7,2...35 V
ATEX, FM og CSA, 5331B, C og D.....	7,2...28 VDC
Egetforbrug .....	25 mW...0,8 W
Spændingsdrop.....	7,2 VDC
Isolationsspænding, test / drift .....	1,5 kVAC / 50 VAC
Opvarmningstid.....	5 min.
Kommunikationsinterface.....	Loop Link
Signal- / støjforhold.....	Min. 60 dB
Reaktionstid (programmerbar) .....	1...60 s
EEPROM fejlcheck .....	< 3,5 s
Signaldynamik, indgang.....	20 bit
Signaldynamik, udgang.....	16 bit
Kalibreringstemperatur.....	20...28°C

Nøjagtighed, størst af generelle og basisværdier:

Generelle værdier		
Indgangstype	Absolut nøjagtighed	Temperaturkoefficient
Alle	$\leq \pm 0,05\%$ af span	$\leq \pm 0,01\%$ af span / °C

Basisværdier		
Indgangstype	Basis nøjagtighed	Temperaturkoefficient
RTD	$\leq \pm 0,2^\circ\text{C}$	$\leq \pm 0,01^\circ\text{C}/^\circ\text{C}$
Lin.R	$\leq \pm 0,1 \Omega$	$\leq \pm 10 \text{ m}\Omega/^\circ\text{C}$
Volt	$\leq \pm 10 \mu\text{V}$	$\leq \pm 1 \mu\text{V}/^\circ\text{C}$
TC-type: E, J, K, L, N, T, U	$\leq \pm 1^\circ\text{C}$	$\leq \pm 0,05^\circ\text{C}/^\circ\text{C}$
TC-type: B, R, S, W3, W5, LR	$\leq \pm 2^\circ\text{C}$	$\leq \pm 0,2^\circ\text{C}/^\circ\text{C}$

EMC-immunitetspårvirkning.....	< $\pm 0,5\%$ af span
Udvidet EMC-immunitet:	
NAMUR NE 21, A kriterium, gniststøj .....	< $\pm 1\%$ af span

#### Virkning af forsyningsspændings-

ændring .....	< 0,005% af span / VDC
Vibration .....	IEC 60068-2-6 Test FC
Lloyd's specifikation nr. 1 .....	4 g / 2...100 Hz
Max. ledningskvadrat .....	1 x 1,5 mm <sup>2</sup> flerkoret ledning
Luffugtighed .....	< 95% RH (ikke kond.)
Mål .....	Ø 44 x 20,2 mm
Tæthedsgrad (hus / klemme) .....	IP68 / IP00
Vægt.....	50 g

### Elektriske specifikationer indgang:

#### RTD- og lineær modstandsindgang:

RTD-type	Min. værdi	Max. værdi	Min. span
Pt100	-200°C	+850°C	25°C
Ni100	-60°C	+250°C	25°C
Lin.R	0 $\Omega$	5000 $\Omega$	30 $\Omega$

Max. nulpunktsforskydning (offset).....	50% af valgt max. værdi
Kabelmodstand pr. leder (max.).....	5 $\Omega$
Følerstrøm .....	Nom. 0,2 mA

Virkning af følerkabelmodstand

(3- / 4-leder) ..... < 0,002 Ω/Ω

Følerfejlsdetektering ..... Ja

**TC-indgang:**

Type	Min. temperatur	Max. temperatur	Min. span	Norm
B	+400°C	+1820°C	200°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-100°C	+900°C	50°C	DIN 43710
N	-180°C	+1300°C	100°C	IEC584
R	-50°C	+1760°C	200°C	IEC584
S	-50°C	+1760°C	200°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	75°C	DIN 43710
W3	0°C	+2300°C	200°C	ASTM E988-90
W5	0°C	+2300°C	200°C	ASTM E988-90
LR	-200°C	+800°C	50°C	GOST 3044-84

Max. nulpunktsforskydning (offset) ..... 50% af valgt max. værdi

Koldt loddestedskomp. (CJC) ..... < ±1,0°C

Følerfejlsdetektering ..... ja

Følerfejlsstrøm:

under detektering ..... nom. 33 mA

ellers ..... 0 mA

**Spændingsindgang:**

Måleområde ..... -12...800 mV

Min. måleområde (span) ..... 5 mV

Max. nulpunktsforskydning (offset) ..... 50% af valgt max. værdi

Indgangsmodstand ..... 10 MΩ

**Udgang:**

**Strømodgang:**

Signalområde ..... 4...20 mA

Min. signalområde ..... 16 mA

Opdateringstid ..... 440 ms

Udgangssignal ved EEpromfejl ..... ≤ 3,5 mA

Belastningsmodstand ..... ≤ (V<sub>forsyn.</sub> - 7,2) / 0,023 [Ω]

Belastningsstabilitet ..... < ±0,01% af span / 100 Ω

**Følerfejlsdetektering:**

Programmerbar ..... 3,5...23 mA

NAMUR NE43 Upscale ..... 23 mA

NAMUR NE43 Downscale ..... 3,5 mA

**Ex- / I.S.-data:**

U<sub>i</sub> ..... : 28 VDC


I<sub>i</sub> ..... : 120 mADC

P<sub>i</sub> ..... : 0,84 W

L<sub>i</sub> ..... : 10 μH

C<sub>i</sub> ..... : 1 nF

**EEx- / I.S.-godkendelse:**

DEMKO 99ATEX126962 .....  II 1 G

EEx ia IIC T1...T6

Max. omgivelsestemp. for T1...T4 ..... 85°C

Max. omgivelsestemp. for T5 og T6 ..... 60°C

ATEX, må anvendes i zone ..... 0, 1 eller 2

FM, må anvendes i ..... IS, Class I, DIV. 1, Group A, B, C, D

IS, Class I, Zone 0, AEx ia IIC

Entity, FM Installation Drawing No. .... 5300Q502

CSA, må anvendes i ..... Class I, Zone 0, AEx ia IIC

Installation Drawing No. .... 533XQC03

**Marine-godkendelse:**

Det Norske Veritas, Ships & Offshore ..... Standard for Certification No. 2.4

**Overholdte myndighedskrav:**

**Standard:**

EMC 2004/108/EF

Emission og immunitet ..... EN 61326

ATEX 94/9/EF ..... EN 50014 og EN 50020

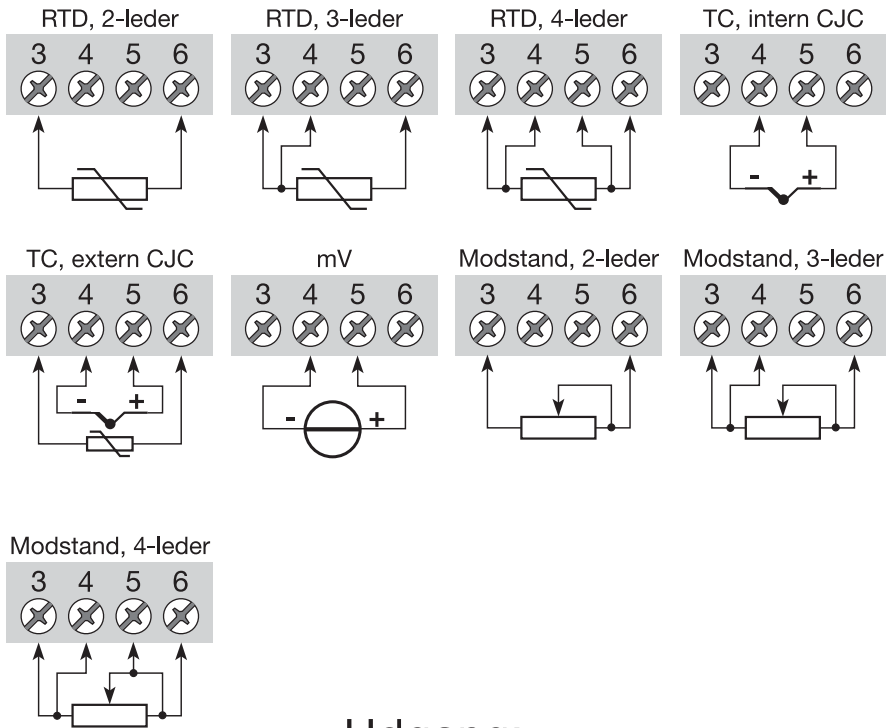
FM, ASCN ..... 3600, 3611, 3610

CSA, CAN / CSA ..... C22.2 No. 157, E60079-11, UL 913

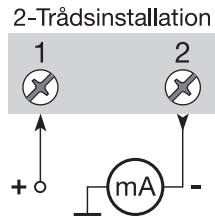
Af span = Af det aktuelt valgte område

# Tilslutninger:

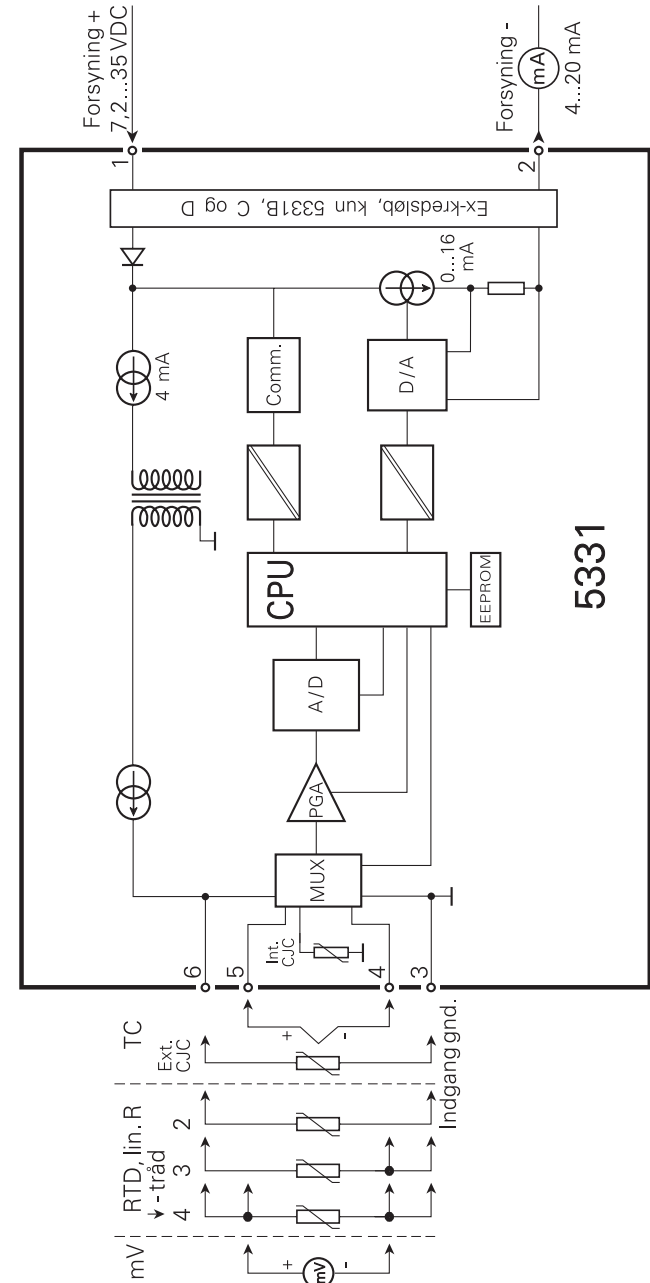
## Indgang:



## Udgang:



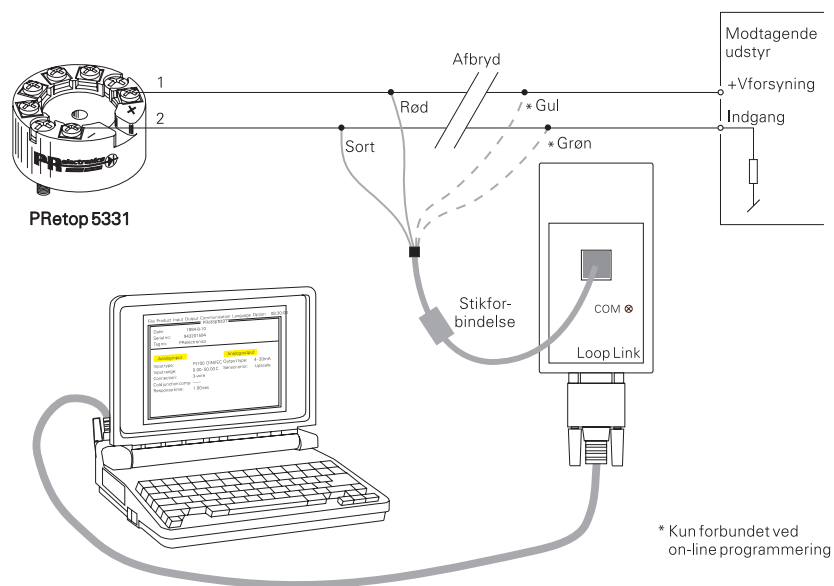
# BLOKDIAGRAM:



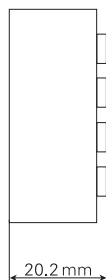
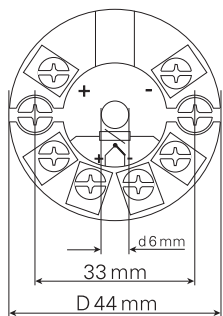
## Programmering:

- Loop Link er et batteridrevet kommunikationsinterface, der er nødvendigt for programmering af PRetop 5331.
- Ved programmering henvises til tegningen nedenfor og hjælpefunktionen i PReset programmet.
- Loop Link må ikke benyttes til kommunikation med moduler installeret i Ex-område

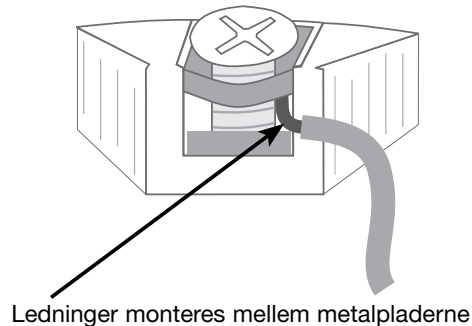
### Bestilling: Loop Link



### Mekaniske specifikationer:



### Montering af følerledninger:



## 2-WIRE PROGRAMMABLE TRANSMITTER

### PRetop 5331

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## Safety instructions

### Ex installation:

For a safe installation of 5331B, C and D in hazardous area the following must be observed. The module must only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area.

Year of manufacture can be taken from the first two digits in the serial number.

For installation requirements and Ex data see ATEX certificate.

## DECLARATION OF CONFORMITY

As manufacturer

**PR electronics A/S**

**Lerbakken 10**

**DK-8410 Rønede**

hereby declares that the following product:

**Type: 5331**

**Name: 2-Wire programmable transmitter**

is in conformity with the following directives and standards:

EMC directive 2004/108/EC and later amendments

**EN 61326**

This declaration is issued in compliance with article 10, subclause 1 of the EMC directive. For specification of the acceptable EMC performance level, refer to the electrical specifications for the module.

The ATEX directive 94/9/EC and later amendments

**EN 50 014 and EN 50 020**

**ATEX certificate: DEMKO 99ATEX126962**

Notified body for CENELEC/ATEX: UL International Demko A/S 0539

Rønede, 6 Oct. 2005



Peter Rasmussen  
Manufacturer's signature

## 2-WIRE PROGRAMMABLE TRANSMITTER PRetop 5331

- *RTD, TC, Ohm, or mV input*
- *Extremely high measurement accuracy*
- *1.5 kVAC galvanic isolation*
- *Programmable sensor error value*
- *For DIN form B sensor head mounting*

### Application:

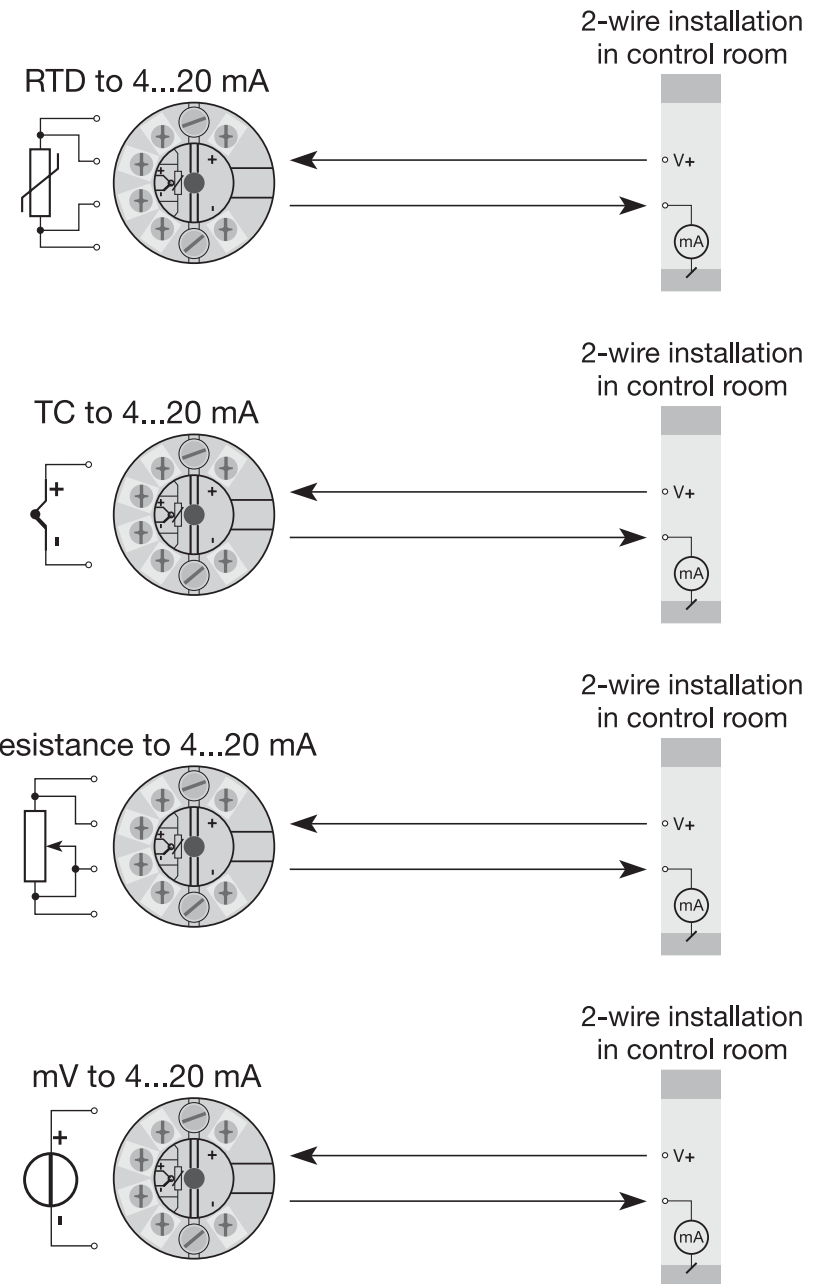
- Linearised temperature measurement with Pt100...Pt1000, Ni100...Ni1000, or TC sensor.
- Conversion of linear resistance variation to a standard analogue current signal, for instance from valves or Ohmic level sensors.
- Amplification of a bipolar mV signal to a standard 4...20 mA current signal.

### Technical characteristics:

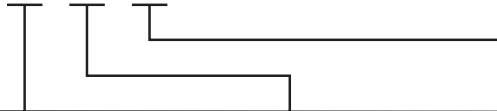
- Within a few seconds the user can program PR5331 to measure temperatures within all ranges defined by the norms.
- The RTD and resistance inputs have cable compensation for 2-, 3- and 4-wire connection.
- Continuous check of vital stored data for safety reasons.

### Mounting / installation:

- For DIN form B sensor head mounting. In non-hazardous areas the 5331 can be mounted on a DIN rail with a special fitting.
- **NB:** As Ex barrier for 5331B we recommend 5401B, 5114B, or 5116B.



Order: 5331



Type	Version	Ambient temperature	Galvanic isolation
5331	Standard : A	-40°C...+85°C : 3	1500 VAC : B
	ATEX : B		
	FM and ATEX : C		
	CSA, FM and ATEX : D		

**Electrical specifications:**

**Specifications range:**

-40°C to +85°C

**Common specifications:**

- Supply voltage, DC
  - Standard, 5331A ..... 7.2...35 V
  - ATEX, FM and CSA, 5331B, C and D.. 7.2...28 VDC
- Internal consumption ..... 25 mW...0.8 W
- Voltage drop ..... 7.2 VDC
- Isolation voltage, test / operation ..... 1.5 kVAC / 50 VAC
- Warm-up time..... 5 min.
- Communications interface ..... Loop Link
- Signal / noise ratio ..... Min. 60 dB
- Response time (programmable)..... 1...60 s
- EEProm error check ..... < 3.5 s
- Signal dynamics, input..... 20 bit
- Signal dynamics, output ..... 16 bit
- Calibration temperature ..... 20...28°C

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	≤ ±0.05% of span	≤ ±0.01% of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
RTD	≤ ±0.2°C	≤ ±0.01°C/°C
Lin.R	≤ ±0.1 Ω	≤ ±10 mΩ/°C
Volt	≤ ±10 μV	≤ ±1 μV/°C
TC type: E, J, K, L, N, T, U	≤ ±1°C	≤ ±0.05°C/°C
TC type: B, R, S, W3, W5, LR	≤ ±2°C	≤ ±0.2°C/°C

EMC immunity influence .....	< ±0.5% of span
Extended EMC immunity: NAMUR NE 21, A criterion, burst .....	< ±1% of span

- Effect of supply voltage variation..... < 0.005% of span / VDC
- Vibration ..... IEC 60068-2-6 Test FC
- Lloyd's specification no. 1 ..... 4 g / 2...100 Hz
- Max. wire size..... 1 x 1.5 mm<sup>2</sup> stranded wire
- Humidity ..... < 95% RH (non-cond.)
- Dimensions..... Ø 44 x 20.2 mm
- Tightness (enclosure / terminal) ..... IP68 / IP00
- Weight ..... 50 g

**Electrical specifications, input:**

**RTD and linear resistance input:**

RTD type	Min. value	Max. value	Min. span
Pt100	-200°C	+850°C	25°C
Ni100	-60°C	+250°C	25°C
Lin.R	0 Ω	5000 Ω	30 Ω

- Max. offset ..... 50% of selec. max. value
- Cable resistance per wire (max.)..... 5 Ω
- Sensor current..... Nom. 0.2 mA
- Effect of sensor cable resistance  
(3- / 4-wire)..... < 0.002 Ω/Ω
- Sensor error detection ..... Yes

**TC input:**

Type	Min. temperature	Max. temperature	Min. span	Norm
B	+400°C	+1820°C	200°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-100°C	+900°C	50°C	DIN 43710
N	-180°C	+1300°C	100°C	IEC584
R	-50°C	+1760°C	200°C	IEC584
S	-50°C	+1760°C	200°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	75°C	DIN 43710
W3	0°C	+2300°C	200°C	ASTM E988-90
W5	0°C	+2300°C	200°C	ASTM E988-90
LR	-200°C	+800°C	50°C	GOST 3044-84

Max. offset .....	50% of selec. max. value
Cold junction compensation .....	< ±1.0°C
Sensor error detection .....	Yes
Sensor error current:	
When detecting .....	Nom. 33 mA
Else .....	0 mA

**Voltage input:**

Measurement range .....	-12...800 mV
Min. span.....	5 mV
Max. offset .....	50% of selec. max. value
Input resistance.....	10 MΩ

**Output:****Current output:**

Signal range .....	4...20 mA
Min. signal range.....	16 mA
Updating time.....	440 ms
Output signal at EEprom error .....	≤ 3.5 mA
Load resistance.....	≤ (V <sub>supply</sub> - 7.2) / 0.023 [Ω]
Load stability .....	< ±0.01% of span / 100 Ω


**Sensor error detection:**

Programmable.....	3.5...23 mA
Namur NE43 Upscale.....	23 mA
Namur NE43 Downscale.....	3.5 mA

**Ex / I.S. data:**

U <sub>i</sub> .....	: 28 VDC
I <sub>i</sub> .....	: 120 mADC
P <sub>i</sub> .....	: 0.84 W
L <sub>i</sub> .....	: 10 μH
C <sub>i</sub> .....	: 1 nF

**EEx / I.S. approval:**

DEMKO 99ATEX126962.....	 II 1 G
	EEx ia IIC T1...T6
Max. omgivelsestemp. for T1...T4 .....	85°C
Max. omgivelsestemp. for T5 og T6 .....	60°C
ATEX, applicable in zone.....	0, 1 or 2
FM, applicable in.....	IS, Class I, Div. 1, Group A, B, C, D
	IS, Class I, Zone 0, AEx ia IIC
Entity, FM Installation Drawing No.....	5300Q502
CSA, applicable in.....	Class I, Zone 0, AEx ia IIC
Installation Drawing No. ....	533XQC03

**Marine approval:**

Det Norske Veritas, Ships & Offshore .....	Standard for Certification No. 2.4
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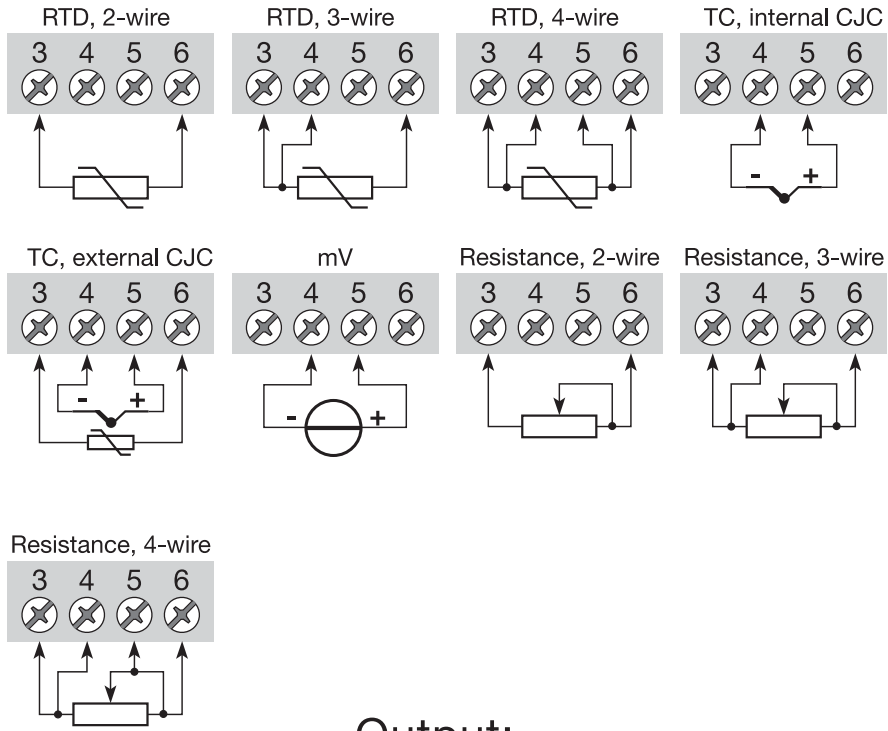
**Observed authority requirements:**

EMC 2004/108/EC	<b>Standard:</b>
Emission and immunity .....	EN 61326
ATEX 94/9/EC.....	EN 50014 and EN 50020
FM, ASCN .....	3600, 3611, 3610
CSA, CAN / CSA.....	C22.2 No. 157, E60079-11, UL 913

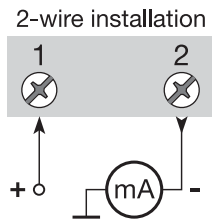
Of span = Of the presently selected range

# Connections:

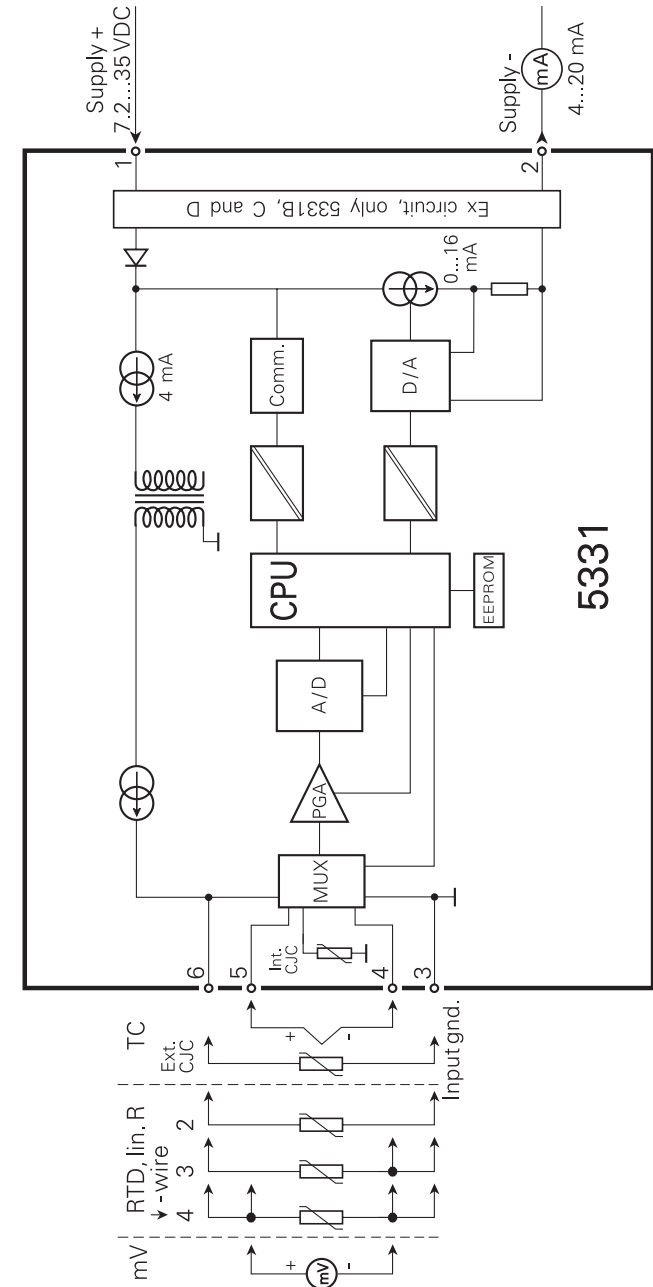
## Input:



## Output:



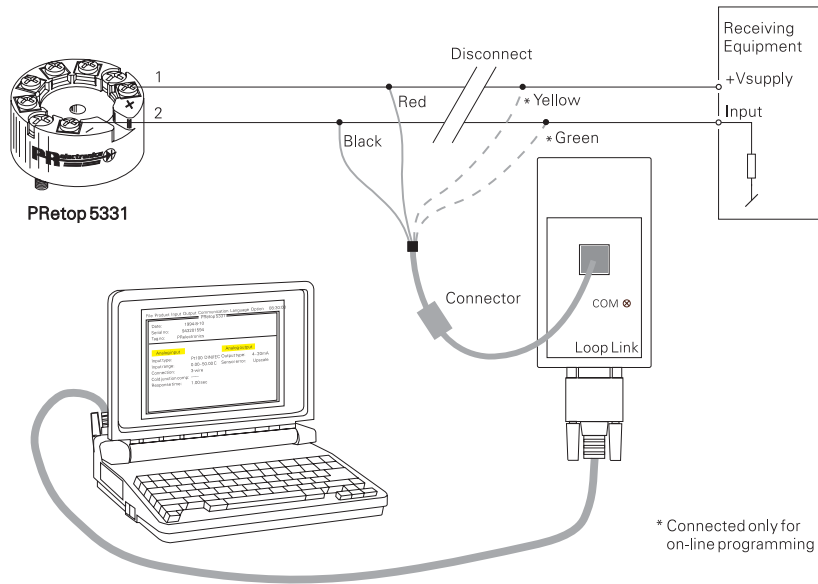
# BLOCK DIAGRAM:



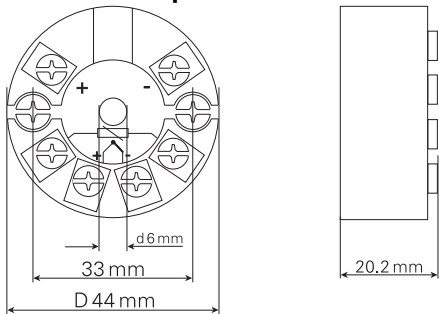
## Programming:

- Loop Link is a communications interface that is needed for programming PRetop 5331.
- For programming please refer to the drawing below and the help functions in PReset.
- Loop link is not approved for communication with modules installed in hazardous (Ex) areas

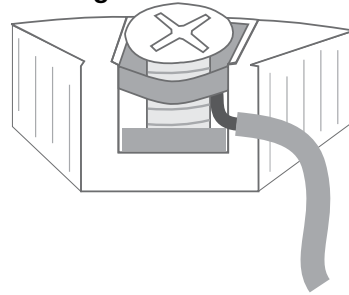
### Order: Loop Link



### Mechanical specifications:



### Mounting of sensor wires



Wires must be mounted between the metal plates.

## TRANSMETTEUR 2-FILS UNIVERSEL (Pt100/TC)

### PRetop 5331

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## Consigne de sécurité

### Installation S.I. :

Pour l'installation de 5331B, C et D dans les zones dangereuses, conformez-vous aux consignes de sécurité suivantes : l'installation ne doit être réalisée que par du personnel qualifié connaissant la législation nationale et internationale ainsi que les directives et standards régissant ce domaine.

L'année de production ressort des deux premiers chiffres du numéro de série.

Pour les conditions d'installation et les données de sécurité intrinsèque, voir le certificat ATEX.

## DECLARATION DE CONFORMITE

En tant que fabricant

**PR electronics A/S**

**Lerbakken 10**

**DK-8410 Rønne**

déclare que le produit suivant :

**Type : 5331**

**Nom : Transmetteur 2-fils universel**

correspond aux directives et normes suivantes :

La directive CEM (EMC) 2004/108/CE et les modifications subséquentes

**EN 61326**

Cette déclaration est délivrée en correspondance à l'article 10, alinéa 1 de la directive CEM. Pour une spécification du niveau de rendement acceptable CEM (EMC) renvoyer aux spécifications électriques du module.

La directive ATEX 94/9/EC et les modifications subséquentes

**EN 50014 et EN 50020**

**Certificat ATEX : DEMKO 99ATEX126962**

Organisme notifié pour CENELEC/ATEX : **UL International Demko A/S 0539**

Rønne, le 6 octobre 2005



Peter Rasmussen  
Signature du fabricant

# TRANSMETTEUR 2-FILS UNIVERSEL (Pt100/TC) PRetop 5331

- *Entrée RTD, TC, Ohm ou mV*
- *Très grande précision de mesure*
- *Isolation galvanique de 1,5 kVAC*
- *Sécurité programmable*
- *Pour tête de sonde DIN B*

## Application :

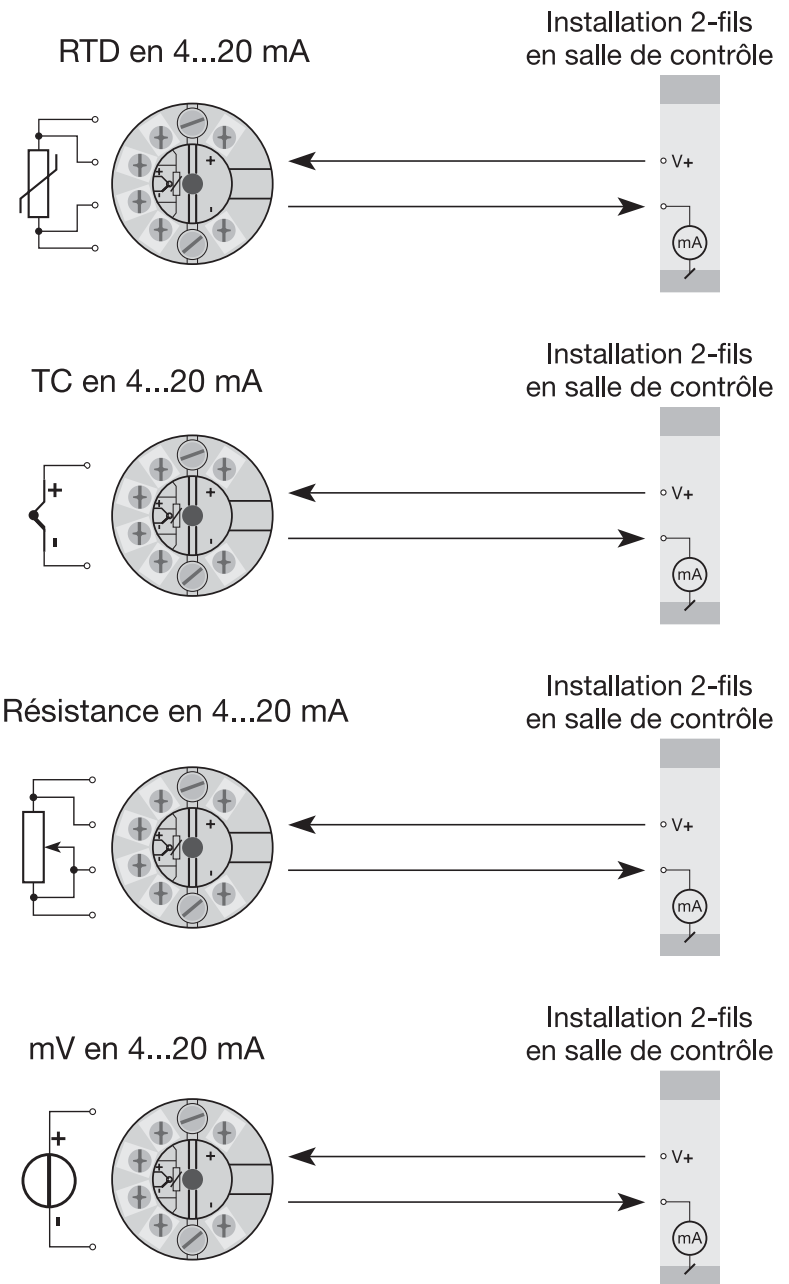
- Mesure linéarisée de la température avec un capteur Pt100...Pt1000, Ni100...Ni1000 ou de thermocouples.
- Conversion d'une résistance linéaire en un signal courant standard analogique pour mesurer par exemple le niveau ou la position d'une vanne.
- Amplification d'un signal mV bipolaire en un signal courant standard de 4...20 mA.

## Caractéristiques techniques :

- Le PR5331 peut être programmé de manière simple et rapide.
- Compensation de ligne pour des entrées RTD et résistance avec un raccordement à 2, 3 et 4 fils.
- Vérification continue des données sauvegardées.

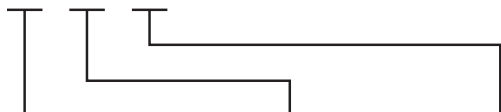
## Montage / installation :

- Pour tête de sonde DIN B. En zone non-dangereuse le 5331 peut être monté sur rail DIN avec un support spécifique.
- **N.B.** : Comme barrière S.I. pour le 5331B nous recommandons le PR5104B, 5114B ou 5116B.





Référence : 5331



Type	Version	Température ambiante	Isolation galvanique
5331	Standard : A	-40°C...+85°C : 3	1500 Vca : B
	ATEX : B		
	FM et ATEX : C		
	CSA, FM et ATEX : D		

**Spécifications électriques :**

**Plage des spécifications :**

-40°C à +85°C

**Spécifications communes :**

Tension d'alimentation, cc

Standard, 5331A ..... 7,2...35 V

ATEX, FM et CSA, 5331B, C et D ..... 7,2...28 Vcc

Consommation interne ..... 25 mW...0,8 W

Chute de tension ..... 7,2 Vcc

Tension d'isolation, test / opération ..... 1,5 kVca / 50 Vca

Temps de chauffe ..... 5 min.

Kit de programmation ..... Loop Link

Rapport signal / bruit ..... Min. 60 dB

Temps de réponse (programmable) ..... 1...60 s

Vérification de l'EEPROM ..... < 3,5 s

Dynamique du signal d'entrée ..... 20 bit

Dynamique du signal de sortie ..... 16 bit

Température d'étalonnage ..... 20...28°C

Précision, la plus grande des valeurs générales et de base :

Valeurs générales		
Type d'entrée	Précision absolue	Coefficient de température
Tous	≤ ±0,05% de l'EC	≤ ±0,01% de l'EC / °C

Valeurs de base		
Type d'entrée	Précision de base	Coefficient de température
RTD	≤ ±0,2°C	≤ ±0,01°C/°C
R. Lin.	≤ ±0,1 Ω	≤ ±10 mΩ/°C
Volt	≤ ±10 μV	≤ ±1 μV/°C
Type TC : E, J, K, L, N, T, U	≤ ±1°C	≤ ±0,05°C/°C
Type TC : B, R, S, W3, W5, LR	≤ ±2°C	≤ ±0,2°C/°C

Immunité CEM.....	< ±0,5% de l'EC
Immunité CEM améliorée :	
NAMUR NE 21, critère A, burst.....	< ±1% de l'EC

Effet d'une variation de

la tension d'alimentation ..... < 0,005% de l'EC / Vcc

Vibration ..... IEC 60068-2-6 Test FC

Lloyd, spécification no 1 ..... 4 g / 2...100 Hz

Taille max. des fils ..... 1 x 1,5 mm<sup>2</sup> fil multibrins

Humidité ..... < 95% HR (sans cond.)

Dimensions ..... Ø 44 x 20,2 mm

Étanchéité (boîtier / bornier) ..... IP68 / IP00

Poids ..... 50 g

**Spécifications électriques, entrée :**

**Entrée RTD et entrée résistance linéaire :**

Type RTD	Valeur min.	Valeur max.	Plage min.
Pt100	-200°C	+850°C	25°C
Ni100	-60°C	+250°C	25°C
R. Lin.	0 Ω	5000 Ω	30 Ω

Décalage max. .... 50% de la valeur max. sélec.

Résistance de ligne max. par fils ..... 5 Ω

Courant de sonde ..... Nom. 0,2 mA

Effet de la résistance de ligne (3 / 4 fils) ..... < 0,002 Ω/Ω

Détection de rupture sonde ..... Oui

**Entrée TC :**

Type	Température min.	Température max.	Plage min.	Norme
B	+400°C	+1820°C	200°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-100°C	+900°C	50°C	DIN 43710
N	-180°C	+1300°C	100°C	IEC584
R	-50°C	+1760°C	200°C	IEC584
S	-50°C	+1760°C	200°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	75°C	DIN 43710
W3	0°C	+2300°C	200°C	ASTM E988-90
W5	0°C	+2300°C	200°C	ASTM E988-90
LR	-200°C	+800°C	50°C	GOST 3044-84

Décalage max. .... 50% de la valeur max. sélec.  
 Compensation de soudure froide ..... < ±1,0°C  
 Détection de rupture de sonde ..... Oui  
 Courant de sonde :  
 Pendant la détection..... Nom. 33 mA  
 Si non ..... 0 mA

**Entrée tension :**

Gamme de mesure..... -12...800 mV  
 Plage de mesure min. .... 5 mV  
 Décalage max. .... 50% de la valeur max. sélec.  
 Résistance d'entrée ..... 10 MΩ

**Sortie :****Sortie courant :**

Gamme de mesure..... 4...20 mA  
 Plage de mesure min. .... 16 mA  
 Temps de scrutation..... 440 ms  
 Sortie en cas de corruption de l'EEPROM.... ≤ 3,5 mA  
 Résistance de charge..... ≤ (V<sub>alim.</sub> - 7,2) / 0,023 [Ω]  
 Stabilité de charge ..... < ±0,01% de l'EC / 100 Ω


**Détection de rupture de sonde :**

Programmable..... 3,5...23 mA  
 NAMUR NE43 Haut d'échelle ..... 23 mA  
 NAMUR NE43 Bas d'échelle..... 3,5 mA

**Caractéristiques S.I. :**

U<sub>i</sub>..... : 28 Vcc  
 I<sub>i</sub>..... : 120 mAcc  
 P<sub>i</sub>..... : 0,84 W  
 L<sub>i</sub>..... : 10 μH  
 C<sub>i</sub>..... : 1 nF

**Approbation EEx / S.I. :**

DEMKO 99ATEX126962.....  II 1 G  
 EEx ia IIC T1...T6  
 Température amb. max. (T1...T4) ..... 85°C  
 Température amb. max. (T5 et T6)..... 60°C  
 ATEX, applicable en zone..... 0, 1 ou 2  
 FM, applicable en ..... IS, Class I, Div. 1, Group A, B, C, D  
 IS, Class I, Zone 0, AEx ia IIC  
 Entity, FM Installation Drawing No..... 5300Q502  
 CSA, applicable en..... Class I, Zone 0, AEx ia IIC  
 Installation Drawing No. .... 533XQC03

**Approbation marine:**

Det Norske Veritas, Ships & Offshore ..... Standard for Certification No. 2.4

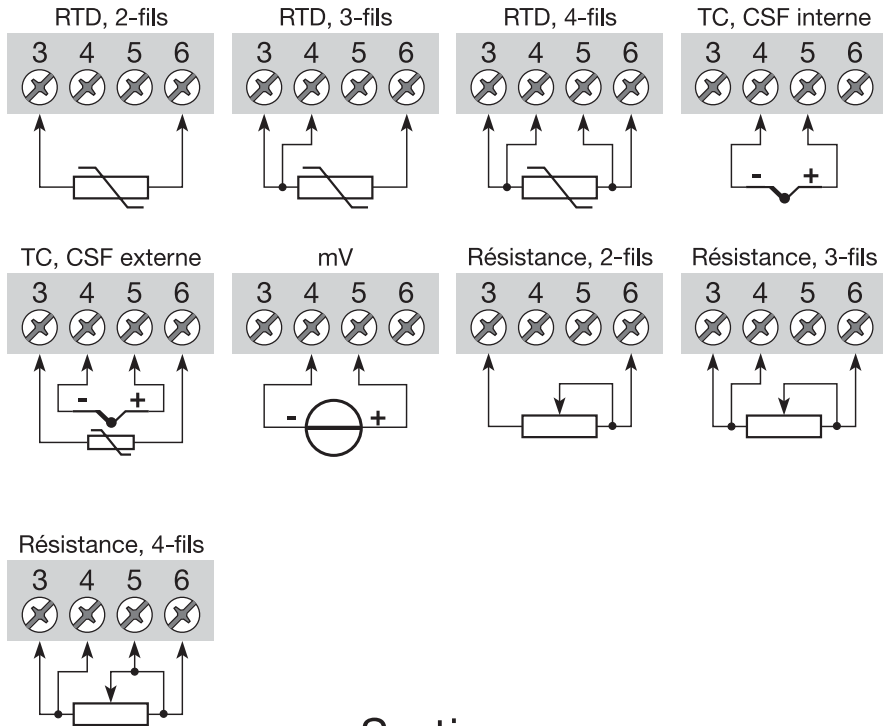
**Agréments et homologations :****Standard :**

EMC 2004/108/CE  
 Emission et immunité..... EN 61326  
 ATEX 94/9/CE..... EN 50014 et EN 50020  
 FM, ASCN ..... 3600, 3611, 3610  
 CSA, CAN / CSA..... C22.2 No. 157, E60079-11, UL 913

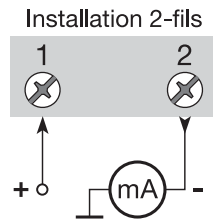
**EC** = Echelle configurée

# Connexions :

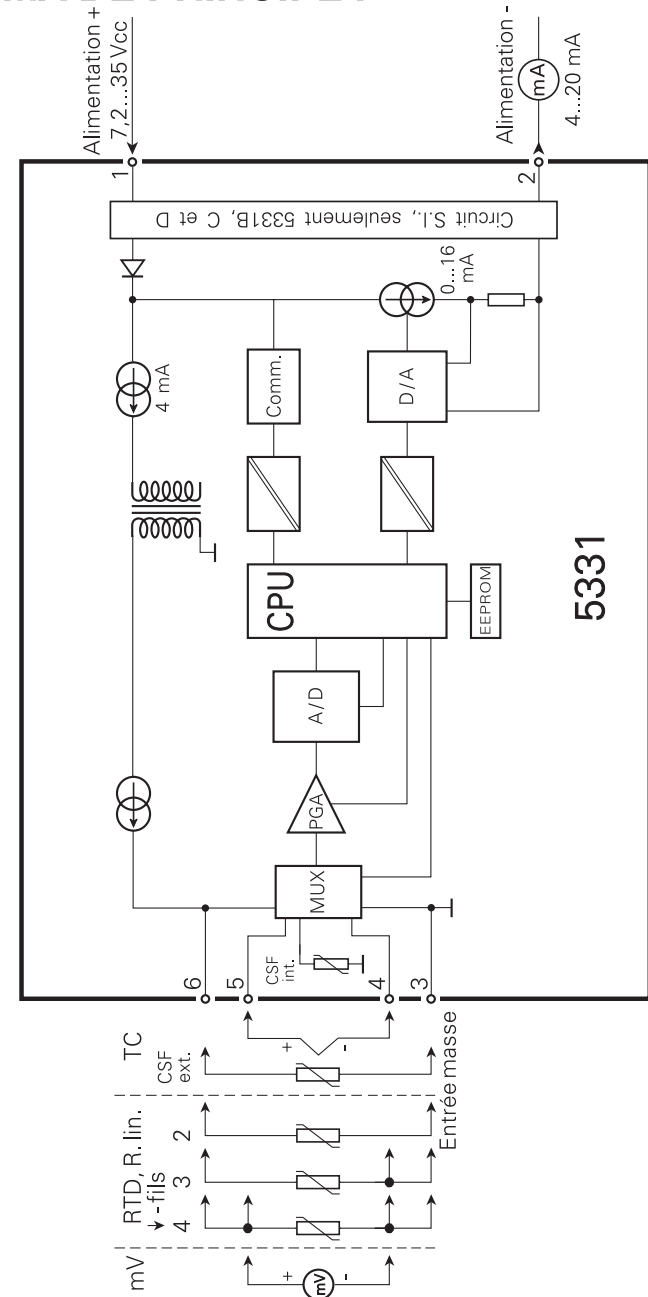
## Entrée :



## Sortie :



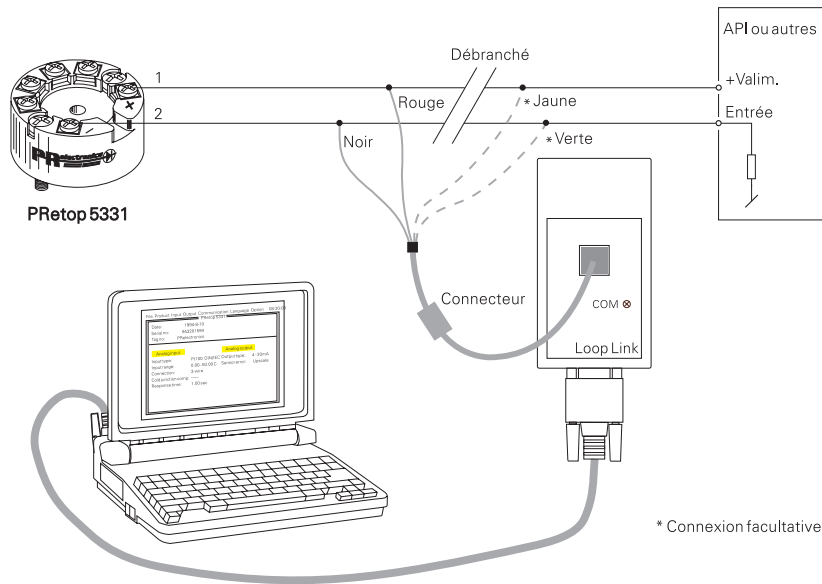
# SCHEMA DE PRINCIPE :



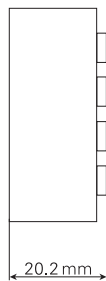
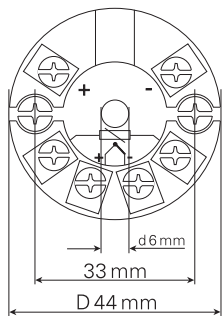
## Programmation :

- Loop Link est un kit de programmation permettant de programmer le PRetop 5331.
- Pour le raccordement du Loop Link, veuillez vous reporter au schéma ci-dessous et à l'aide en ligne du logiciel PReset.
- Loop Link ne doit pas être utilisé pour communication avec des modules installés en zone dangereuse.

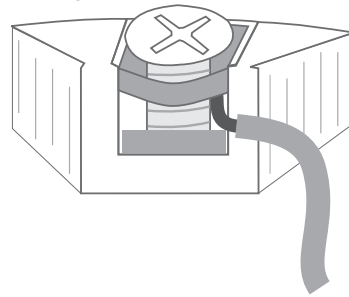
Numéro de référence : Loop Link



Dimensions mécaniques :



Montage des fils du capteur



Les fils doivent être montés entre les plaques métalliques.

## 2-DRAHT UNIVERSALMESSUMFORMER

### PRetop 5331

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## Sicherheitsinstruktion

### Ex-Installation:

Für sichere Installation von 5331B, C und D in explosionsgefährdeter Umgebung muss folgendes beobachtet werden. Die Installation muss nur von qualifizierten Personen, die mit den nationalen und internationalen Gesetze, Direktiven und Standards des Gebiets bekannt sind, vorgenommen werden.

Die ersten beiden Ziffern der Seriennummer geben das Produktionsjahr an.

Für Einbauvorschriften und Ex-Daten siehe das ATEX-Zertifikat.

## KONFORMITÄTSERKLÄRUNG

Als Hersteller bescheinigt

**PR electronics A/S**

**Lerbakken 10**

**DK-8410 Rønde**

hiermit für das folgende Produkt:

**Typ: 5331**

**Name: 2-Draht Universal Messumformer**

die Konformität mit folgenden Richtlinien und Normen:

EMV Richtlinien 2004/108/EG und nachfolgende Änderungen

**EN 61326**

Diese Erklärung ist in Übereinstimmung mit Artikel 10, Unterklausel 1 der EMV Richtlinie ausgestellt. Zur Spezifikation des zulässigen Erfüllungsgrades, siehe die Elektrische Daten des Moduls.

Die ATEX Richtlinien 94/9/EC und nachfolgende Änderungen

**EN 50014 und EN 50020**

**ATEX-Zertifikat: DEMKO 99ATEX126962**

Zulassungsstelle für CENELEC/ATEX: **UL International Demko A/S 0539**

Rønde, 6. Okt. 2005



Peter Rasmussen  
Unterschrift des Herstellers

## 2-DRAHT UNIVERSALMESSUMFORMER PReTop 5331

- Eingang für WTH, TE,  $\Omega$  oder mV
- Extreme Messgenauigkeit
- 1,5 kVAC mit galvanische Trennung
- Programmierbare Sensorfehlanzeige
- Für Einbau in Anschlusskopf DIN Form B

### Verwendung:

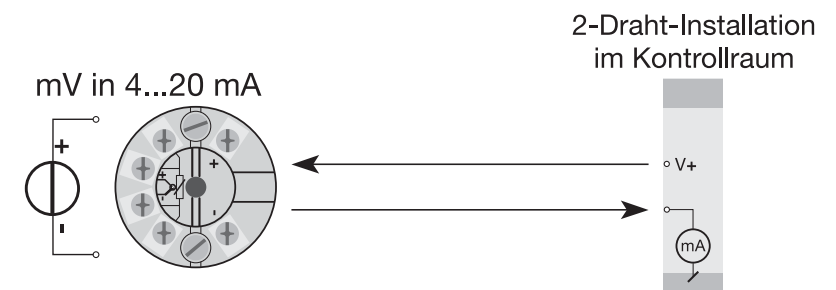
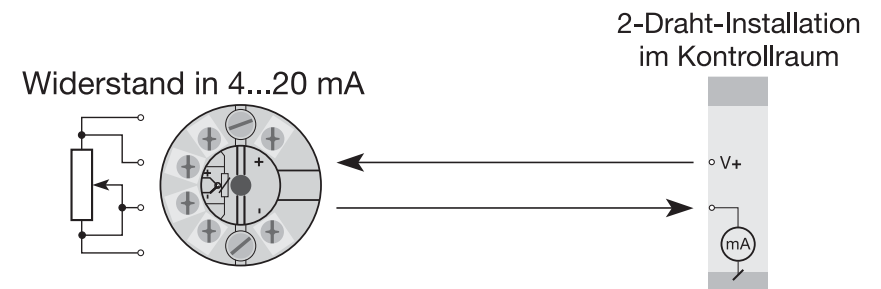
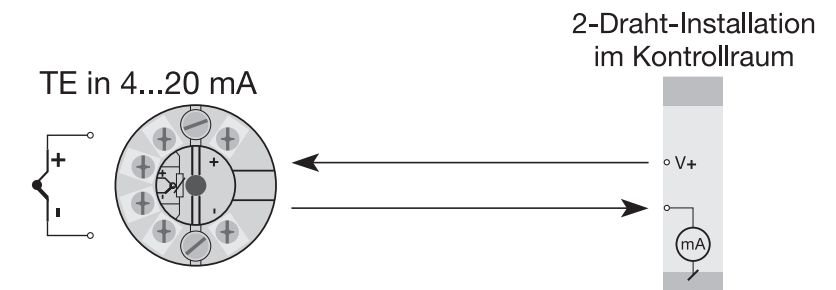
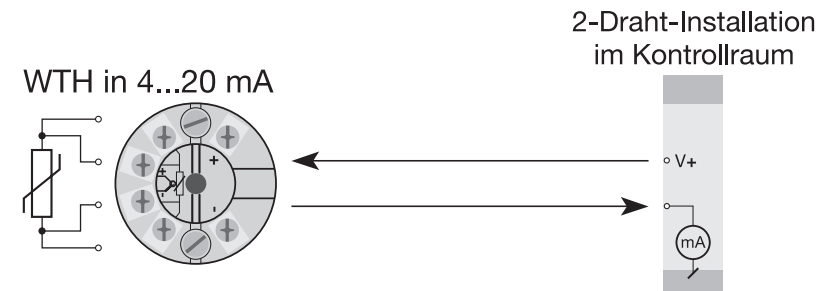
- Linearisierte Temperaturmessung mit Pt100...Pt1000, Ni100...Ni1000 oder Thermoelementsensoren.
- Umwandlung von linearer Widerstandsänderung in ein analoges Standard-Stromsignal, z.B. von Ventilen oder Niveau-Messwertgeber.
- Verstärkung von bipolaren mV-Signalen zu einem Standard 4...20 mA Stromsignal.

### Technische Merkmale:

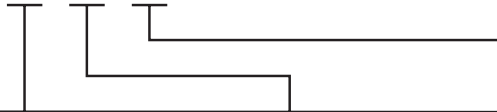
- PR5331 kann vom Benutzer innerhalb von wenigen Sekunden zur Messung in allen genormten Temperaturbereiche programmiert werden.
- Der WTH- und Widerstandseingang haben Leitungskompensation bei 2-, 3- oder 4-Leiter-Anschluss.
- Die gespeicherten Daten werden laufend kontrolliert.

### Montage / Installation:

- Für DIN Form B Sensorkopf Montage. Im sicheren Bereich kann der 5331 auf einer DIN-Schiene mittels einer spezieller Armatur montiert werden.
- **NB:** Als Ex-Sicherheitsbarriere für 5331B empfehlen wir 5104B, 5114B oder 5116B.



**Bestellangaben: 5331**



Typ	Version	Umgebungs-temperatur	Galvanische Trennung
5331	Standard : A	-40°C...+85°C : 3	1500 VAC : B
	ATEX : B		
	FM und ATEX : C		
	CSA, FM und ATEX : D		

**Elektrische Daten:**

**Spezifikationsbereich:**

-40°C bis +85°C

**Allgemeine Daten:**

Versorgungsspannung, DC

Standard, 5331A .....	7,2...35 V
ATEX, FM und CSA, 5331B, C und D..	7,2...28 VDC
Eigenverbrauch .....	25 mW...0,8 W
Spannungsabfall.....	7,2 VDC
Isolationsspannung, Test / Betrieb.....	1,5 kVAC / 50 VAC
Aufwärmzeit.....	5 Min.
Kommunikationsschnittstelle .....	Loop Link
Signal- / Rauschverhältnis .....	Min. 60 dB
Ansprechzeit (programmierbar).....	1...60 s
EEProm Fehlerkontrolle.....	< 3,5 s
Signalaufösung, Eingang.....	20 bit
Signalaufösung, Ausgang.....	16 bit
Kalibrierungstemperatur.....	20...28 °C

Genauigkeit, höherer Wert von allgemeinen und Grundwerten:

Allgemeine Werte		
Eingangsart	Absolute Genauigkeit	Temperaturkoeffizient
Alle	≤ ±0,05% d. Messsp.	≤ ±0,01% d. Messsp./°C

Grundwerte		
Eingangsart	Grund-Genauigkeit	Temperaturkoeffizient
WTH	≤ ±0,2°C	≤ ±0,01°C/°C
Lin. R	≤ ±0,1 Ω	≤ ±10 mΩ/°C
Volt	≤ ±10 μV	≤ ±1 μV/°C
TE-Typ: E, J, K, L, N, T, U	≤ ±1°C	≤ ±0,05°C/°C
TE-Typ: B, R, S, W3, W5, LR	≤ ±2°C	≤ ±0,2°C/°C

EMV-Immunitätswirkung .....	< ±0,5% d. Messsp.
Erweiterte EMV-Immunität: NAMUR NE 21, A Kriterium, Burst.....	< ±1% d. Messsp.

Einfluss von Änderung der

Versorgungsspannung.....	< 0,005% d. Messsp. / VDC
Vibration .....	IEC 60068-2-6 Test FC
Lloyd's Spezifikation Nr. 1 .....	4 g / 2...100 Hz
Max. Leitungsquerschnitt.....	1 x 1,5 mm <sup>2</sup> Litzendraht
Luftfeuchtigkeit.....	< 95% RH (nicht kond.)
Maß .....	Ø 44 x 20,2 mm
Schutzart (Gehäuse / Anschluss).....	IP68 / IP00
Gewicht .....	50 g

**Elektrische Daten, Eingang:**

**WTH- und Linearer Widerstandseingang:**

WTH-Typ	Min. Wert	Max. Wert	Min. Spanne
Pt100	-200°C	+850°C	25°C
Ni100	-60°C	+250°C	25°C
Lin. R	0 Ω	5000 Ω	30 Ω

Max. Nullpunktverschiebung (Offset) .....	50% des gewählten Maximalwertes
Leitungswiderstand pro Leiter (max.).....	5 Ω
Sensorstrom .....	Nom. 0,2 mA

Wirkung des Fühlerkabelwiderstandes

(3- / 4-Leiter) ..... < 0,002 Ω/ Ω

Fühlerfehlererkennung..... Ja

**TE-Eingang:**

Typ	Min. Temperatur	Max. Temperatur	Min. Spanne	Norm
B	+400°C	+1820°C	200°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-100°C	+900°C	50°C	DIN 43710
N	-180°C	+1300°C	100°C	IEC584
R	-50°C	+1760°C	200°C	IEC584
S	-50°C	+1760°C	200°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	75°C	DIN 43710
W3	0°C	+2300°C	200°C	ASTM E988-90
W5	0°C	+2300°C	200°C	ASTM E988-90
LR	-200°C	+800°C	50°C	GOST 3044-84

Max. Nullpunktverschiebung (Offset)..... 50% des gewählten Maximalwertes

Vergleichstellenkompensation (CJC)..... < ±1,0°C

Fühlerfehlererkennung..... Ja

Fühlerfehlerstrom:

Bei Erkennung ..... Nom. 33 mA

Sonst ..... 0 mA

**Spannungseingang:**

Messbereich ..... -12...800 mV

Min. Messbereich (Spanne)..... 5 mV

Max. Nullpunktverschiebung (Offset)..... 50% des gewählten Maximalwertes

Eingangswiderstand ..... 10 MΩ

**Ausgang:**

**Stromausgang:**

Signalbereich ..... 4...20 mA

Min. Signalbereich ..... 16 mA

Aktualisierungszeit ..... 440 ms

Ausgangssignal bei EEpromfehler ..... ≤ 3,5 mA

Belastungswiderstand ..... ≤ (U<sub>Versorg.</sub> - 7,2) / 0,023 [Ω]

Belastungsstabilität ..... < ±0,01% d. Messsp. / 100 Ω

**Sensorfehlanzeige:**

Programmierbar ..... 3,5...23 mA

NAMUR NE43 aufsteuernd ..... 23 mA

NAMUR NE43 zusteuernd ..... 3,5 mA

**Ex- / I.S.-Daten:**

U<sub>i</sub> ..... : 28 VDC


I<sub>i</sub> ..... : 120 mADC

P<sub>i</sub> ..... : 0,84 W

L<sub>i</sub> ..... : 10 μH

C<sub>i</sub> ..... : 1 nF

**EEx- / I.S.-Zulassung:**

DEMKO 99ATEX126962 .....  II 1 G

EEx ia IIC T1...T6

Max. Umgebungstemp. für T1...T4 ..... 85°C

Max. Umgebungstemp. für T5 und T6 ..... 60°C

ATEX, für Anwendung in Zone ..... 0, 1 oder 2

FM, für Anwendung in ..... IS, Class I, Div. 1, Group A, B, C, D

IS, Class I, Zone 0, AEx ia IIC

Entity, FM Installation Drawing No. .... 5300Q502

CSA, für Anwendung in ..... Class I, Zone 0, AEx ia IIC

Installation Drawing No. .... 533XQC03

**Marine-Zulassung:**

Det Norske Veritas, Ships & Offshore ..... Standard for Certification No. 2.4

**Eingehaltene Behördenvorschriften: Norm:**

EMV 2004/108/EG

Emission und Immunität ..... EN 61326

ATEX 94/9/EG ..... EN 50014 und EN 50020

FM, ASCN ..... 3600, 3611, 3610

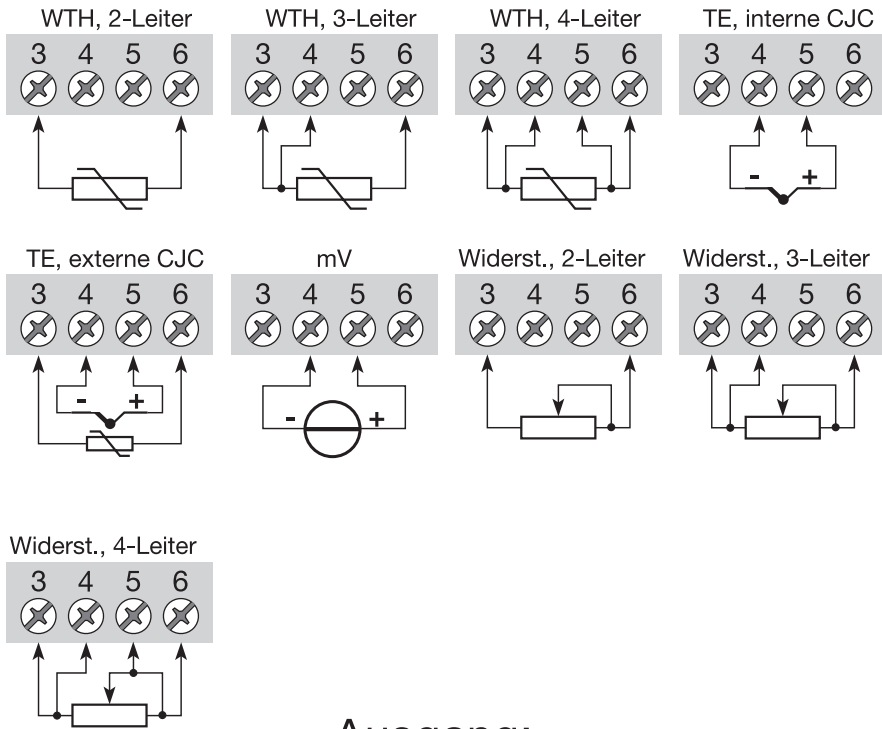
CSA, CAN / CSA ..... C22.2 No. 157, E60079-11, UL 913

**d. Messspanne** = der gewählten Messspanne

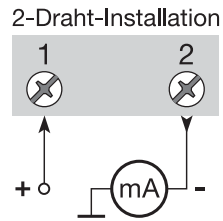


# Anschlüsse:

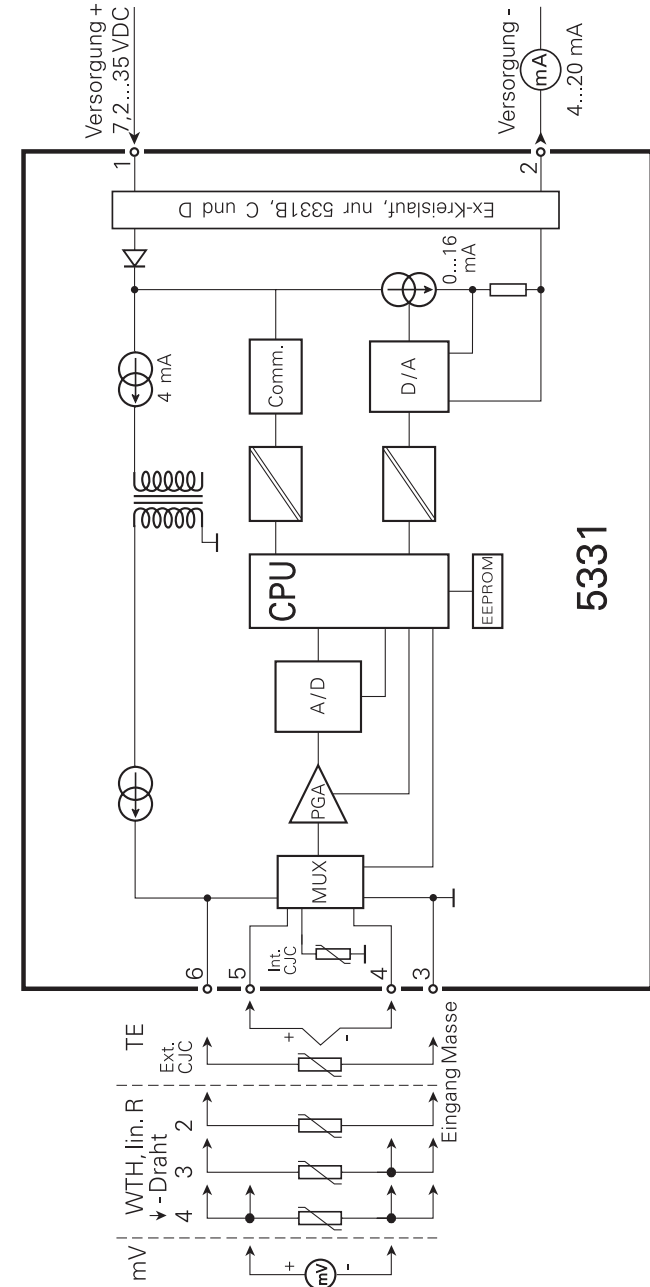
## Eingang:



## Ausgang:



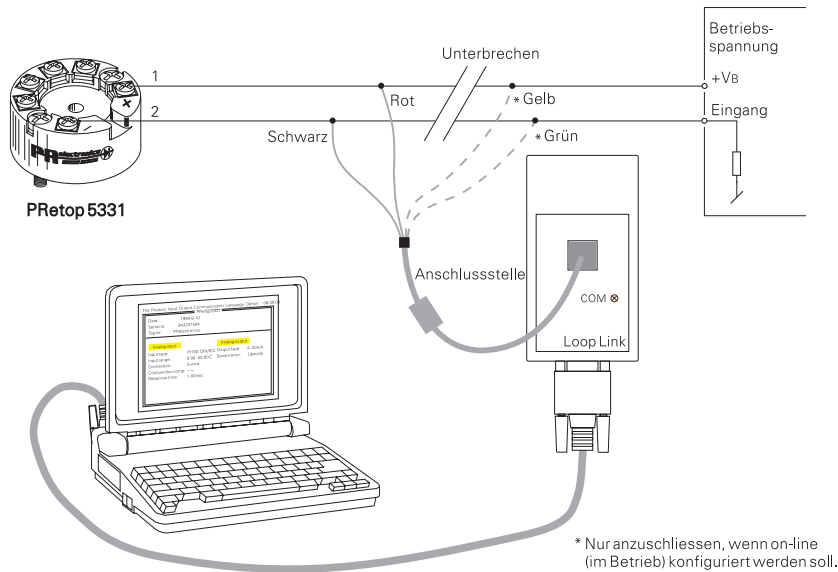
# BLOCKDIAGRAMM:



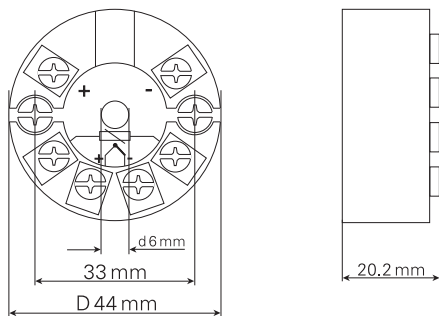
## Programmierung:

- Loop Link ist eine batteriegespeiste Schnittstelle zur Programmierung des PRetop 5331.
- Bezüglich Programmierung verweisen wir auf die nachfolgende Zeichnung und die "Hilfe"-Funktion im PReset-Programm.
- Loop Link darf nicht zur Kommunikation mit Modulen, die in Ex-gefährdeten Bereichen installiert sind, benutzt werden.

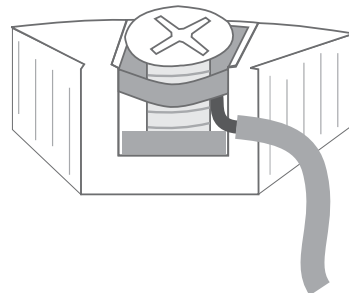
### Bestellangabe: Loop Link



### Abmessungen:



### Montage von Fühlerleitungen:



Die Leitungen müssen zwischen den Metallplatten montiert werden.

# APPENDIX

FM Installation Drawing No. 5300Q502

CSA Installation Drawing No. 533XQC03

# Installation Drawing 5300Q502.

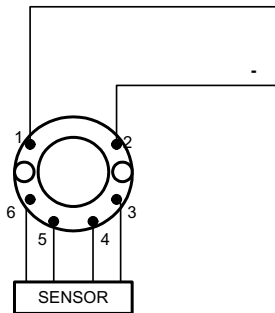
## Model 5331C, 5331D, 5333C and 5333D Hazardous (Classified) Location

Class I, Division 1, Groups A, B, C, D  
Class II Division 1 Groups E, F, G or  
Class I, Zone 0, IIC

Ambient temperature limits  
T4: -40 to +85 deg. Celcius  
T6: -40 to +60 deg. Celcius

Terminal 1, 2  
V<sub>max</sub> or U<sub>i</sub>: 28 V  
I<sub>max</sub> or I<sub>i</sub>: 120 mA  
P<sub>max</sub> or P<sub>i</sub>: 0.84 W  
C<sub>i</sub>: 1 nF  
L<sub>i</sub>: 10 uH

Terminal 3, 4, 5, 6  
Only passive, or non-energy  
storing devices such as RTD's  
and Thermocouples may be  
connected.



## 5333D Non Hazardous Location

Associated Apparatus  
or Barrier  
with  
entity Parameters:

$UM \leq 250V$   
 $V_{oc} \text{ or } U_o \leq V_{max} \text{ or } U_i$   
 $I_{sc} \text{ or } I_o \leq I_{max} \text{ or } I_i$   
 $P_o \leq P_i$   
 $C_a \text{ or } C_o \geq C_i + C_{cable}$   
 $L_a \text{ or } L_o \geq L_i + L_{cable}$

This device must not be  
connected to any associated  
apparatus which uses or  
generates more than 250 VRMS

## Model 5335C, 5335D.

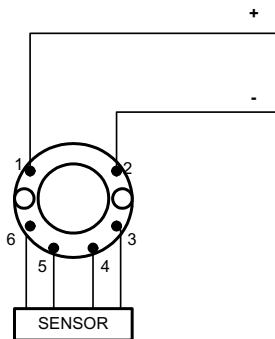
### Hazardous (Classified) Location

Class I, Division 1, Groups A, B, C, D  
Class II Division 1 Groups E, F, G or  
Class I, Zone 0, IIC

Ambient temperature limits  
T4: -40 to +85 deg. Celcius  
T6: -40 to +60 deg. Celcius

Terminal 1, 2  
V<sub>max</sub> or U<sub>i</sub>: 28 V  
I<sub>max</sub> or I<sub>i</sub>: 120 mA  
P<sub>max</sub> or P<sub>i</sub>: 0.84 W  
C<sub>i</sub>: 1 nF  
L<sub>i</sub>: 10 uH

Terminal 3, 4, 5, 6  
V<sub>t</sub> or U<sub>o</sub>: 9.6 V  
I<sub>t</sub> or I<sub>o</sub>: 28 mA  
P<sub>t</sub> or P<sub>o</sub>: 67.2 mW  
C<sub>a</sub> or C<sub>o</sub>: 3.5 uF  
L<sub>a</sub> or L<sub>o</sub>: 35 mH



### Non Hazardous Location

Associated Apparatus  
or Barrier  
with  
entity Parameters:

$UM \leq 250V$   
 $V_{oc} \text{ or } U_o \leq V_{max} \text{ or } U_i$   
 $I_{sc} \text{ or } I_o \leq I_{max} \text{ or } I_i$   
 $P_o \leq P_i$   
 $C_a \text{ or } C_o \geq C_i + C_{cable}$   
 $L_a \text{ or } L_o \geq L_i + L_{cable}$

This device must not be  
connected to any associated  
apparatus which uses or  
generates more than 250 VRMS

## The entity concept.

The Transmitter must be installed according to National Electrical Code (ANSI-NFPA 70).

When installed in Class II locations the Transmitter shall be installed in an enclosure with a specified ingress protections of IP6X according to IEC60529 and Dust-tight conduit seals must be used.

Equipment that is FM-approved for intrinsic safety may be connected to barriers based on the ENTITY CONCEPT. This concept permits interconnection of approved transmitters, meters and other devices in combinations which have not been specifically examined by FM, provided that the agency's criteria are met. The combination is then intrinsically safe, if the entity concept is acceptable to the authority having jurisdiction over the installation.

The entity concept criteria are as follows:

The intrinsically safe devices, other than barriers, must not be a source of power. The maximum voltage U<sub>i</sub>(V<sub>MAX</sub>) and current I<sub>i</sub>(I<sub>MAX</sub>), and maximum power P<sub>i</sub>(P<sub>max</sub>), which the device can receive and remain intrinsically safe, must be equal to or greater than the voltage (U<sub>o</sub> or V<sub>oc</sub> or V<sub>t</sub>) and current (I<sub>o</sub> or I<sub>sc</sub> or I<sub>t</sub>) and the power P<sub>o</sub> which can be delivered by the barrier.

The sum of the maximum unprotected capacitance (C<sub>i</sub>) for each intrinsically device and the interconnecting wiring must be less than the capacitance (C<sub>a</sub>) which can be safely connected to the barrier.

The sum of the maximum unprotected inductance (L<sub>i</sub>) for each intrinsically device and the interconnecting wiring must be less than the inductance (L<sub>a</sub>) which can be safely connected to the barrier.

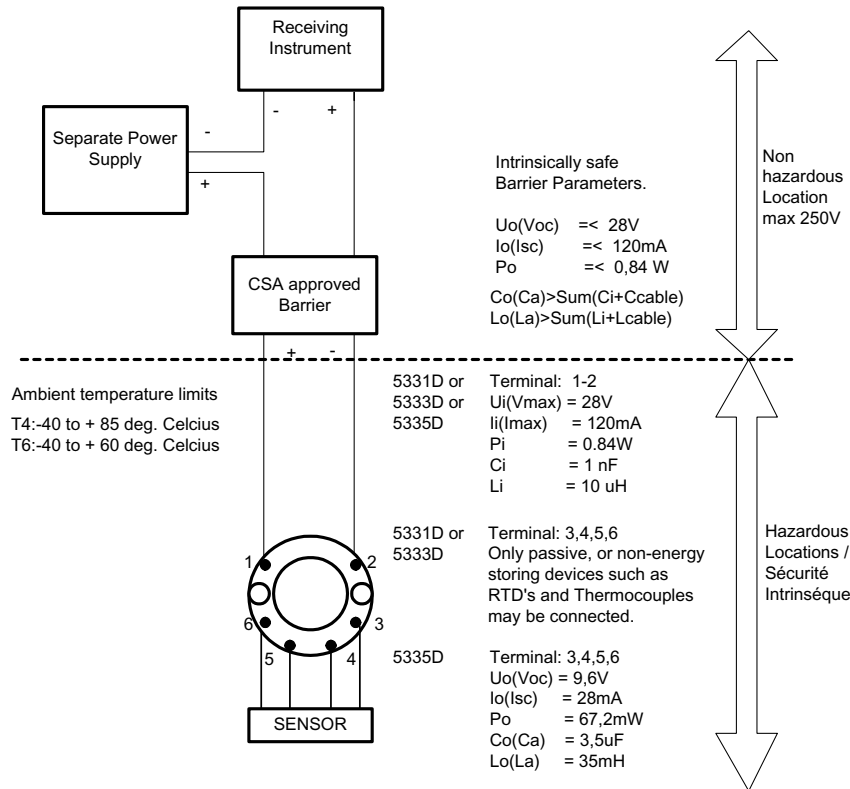
The entity parameters U<sub>o</sub>, V<sub>oc</sub> or V<sub>t</sub> and I<sub>o</sub>, I<sub>sc</sub> or I<sub>t</sub>, and C<sub>a</sub> and L<sub>a</sub> for barriers are provided by the barrier manufacturer.

# CSA Intrinsic Safety Installation Drawing.

5331D, 5333D and 5335D transmitters are approved as intrinsically safe in Zone 0 Group IIC or Class I, Division 1, Group A, B, C, D when installed according to Installation Drawing.

## 1. Connections with separate power supply and receiver.

Output: Standard 4 - 20mA loop



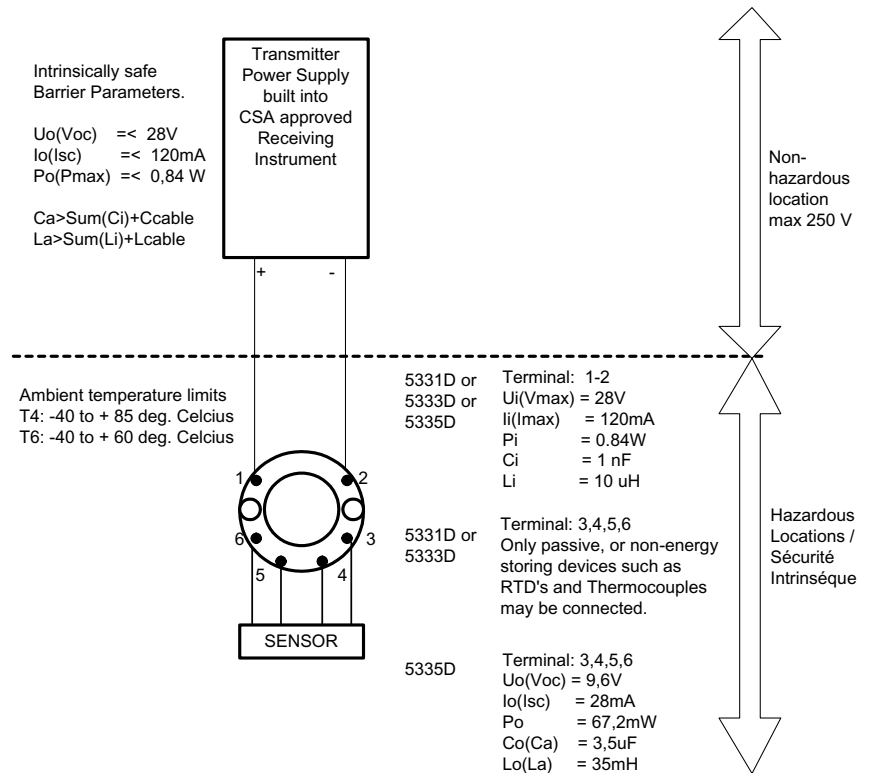
### Warning:

Substitution of components may impair intrinsic safety.

The transmitters must be installed in a suitable enclosure to meet installation codes stipulated in the Canadian Electrical Code (CEC).

## 2. Connection with power supply and barrier built into receiver.

Output: Standard 4 - 20mA loop



### Warning:

Substitution of components may impair intrinsic safety.

The Transmitters must be installed in a suitable enclosure to meet installation codes stipulated in the Canadian Electrical Code (CEC).

**DK** ▶ PR electronics A/S tilbyder et bredt program af analoge og digitale signalbehandlingsmoduler til industriel automation. Vores kompetenceområder omfatter: Isolation, Displays, Ex-barrierer, Temperatur samt Backplanes. Alle produkter opfylder de strengeste internationale standarder, og størstedelen integrerer den patenterede STREAM-SHIELD teknologi, der sikrer driftssikkerhed i selv de værste omgivelser. Vores motto »Signals the Best« er indbegrebet af denne filosofi – og din garanti for kvalitet.

**UK** ▶ PR electronics A/S offers a wide range of analogue and digital signal conditioning modules for industrial automation. Our areas of competence include: Isolation, Displays, Ex barriers, Temperature, and Backplanes. All products comply with the most exacting international standards and the majority feature our patented STREAM-SHIELD technology ensuring reliability in even the worst of conditions. »Signals the Best« is the epitome of our philosophy – and your guarantee for quality.

**FR** ▶ PR electronics A/S offre une large gamme de produits pour le traitement des signaux analogiques et numériques dans tous les domaines industriels. Nos compétences s'étendent des transmetteurs de température aux afficheurs, des isolateurs aux barrières SI, jusqu'aux platines de montage. Tous nos produits sont conformes aux normes internationales les plus strictes et la majorité d'entre eux répondent même à la technologie brevetée STREAM-SHIELD qui garantit un fonctionnement fiable sous les conditions les plus défavorables. Notre devise »SIGNALS the BEST« c'est notre ligne de conduite - et pour vous l'assurance de la meilleure qualité.

**DE** ▶ PR electronics A/S verfügt über ein breites Produktprogramm an analogen und digitalen Signalverarbeitungsmodulen für die industrielle Automatisierung. Unsere Kompetenzbereiche umfassen: Displays, Temperaturtransmitter, Ex- und galvanische Signaltrenner. Alle Produkte von PR electronics werden in Übereinstimmung mit den strengsten internationalen Normen produziert. Für die Mehrzahl aller Produkte garantiert die patentierte STREAM-SHIELD Technologie höchste Zuverlässigkeit auch unter schwierigsten Einsatzbedingungen. »Signals the Best« ist Ihre Garantie für Qualität!

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