

Rub-Block with ½ NPT Conduit Entry included a PT100 sensor, type RB100DN

Belt off-tracking WARNING device, for use in hazardous areas

Installation guide



ACCURATE

FAIL-SAFE



Contents

The Rub-Block with PT100 resistance temperature sensor is designed to report the misalignment of an elevator belt or a conveyor belt. The Rub-Block offers the advantage that it will emit a real time continuous output signal to the PLC - SKADA system

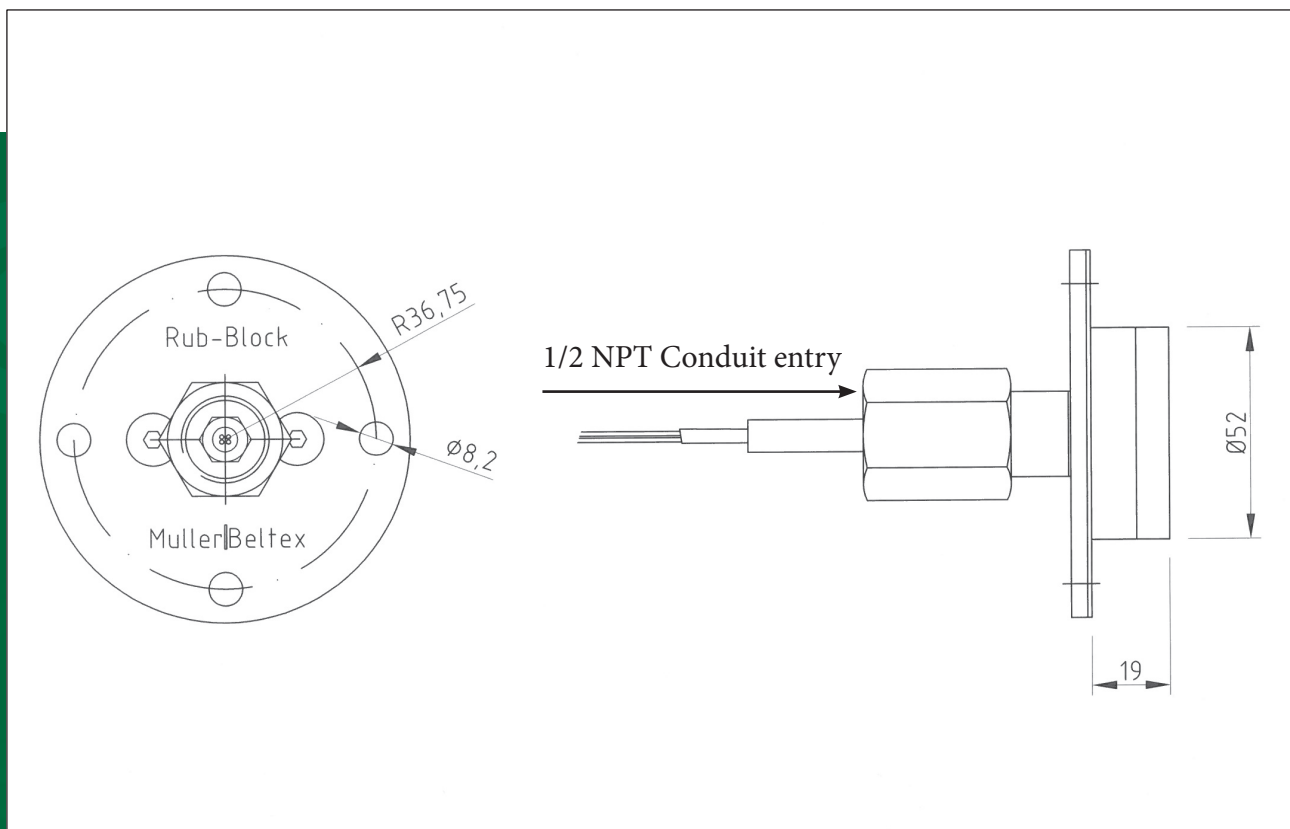
If an output signal is absent, an alarm will be generated, the reason must be investigated. If found faulty, the PT100 sensor needs to be replaced and must be correctly fitted back into the Rub-Block.

When the belt is contacting the brass friction plate from the Rub-block during a belt misalignment the temperature will be rising. Off-tracking belts running into the side of conveyor equipment will cause friction, which may cause damage to the belt and the casing and may generate heat, what can result in a possible dust explosion or an fire.

Prior to fitting the Rub Block it is of great importance to ensure that:

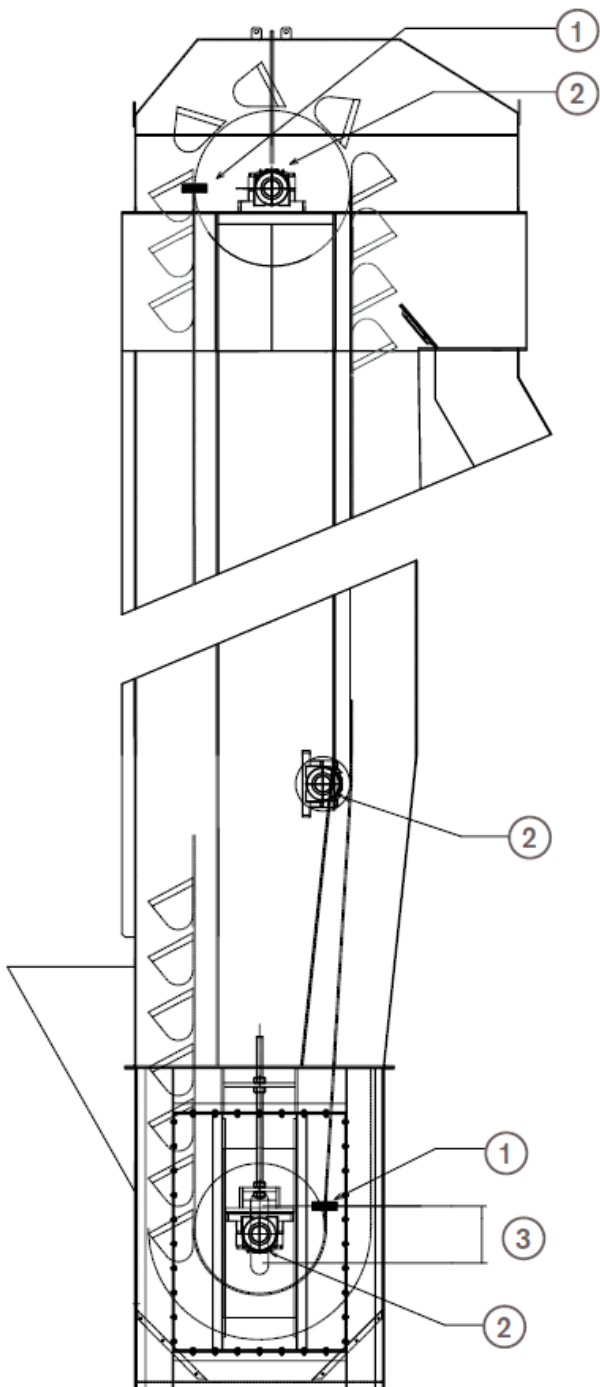
- Fitting is implemented by qualified personnel only.
- Proper and safe work conditions are provided.
- Pulleys have a correct design and are in good condition.
- The belt clamp should be appr. 20 mm inside the belt width! When its outside the belt width it will damaged the Rub-Block.
- The spot where the Rub-Block is to be mounted is clean and free of dust.
- A good earth wire is available to ensure precise reading.
- If the supply leads are terminated in a hazardous area, the termination arrangement must comply with the Zone/Category/EPL of the hazardous area that it is to be installed.

Mounting details RB100DN



Mounting location

1. Rub-Block RB100DN or RB200DN belt misalignment monitoring location (both sides)
2. Bearing temperature sensor monitoring PT100 location (both sides)
3. Speed monitoring
4. Junction box small or large



Mounting Rub-Block

Before the Rub-Block is mounted, it is important that the following issues be taken into account:

First of all, the electrical signal for the Rub-Block PT100 sensors has to be operational. If this is not the case, use temporarily coverplate (not included with the Rub-Block supply) in order to temporarily close the holes already drilled till the electrical signal is operational in the PLC. The Rub-block requires a clean earthing to eliminate any inductive voltage fields and to check whether the PT100 sensor is installed in the Rub-Block. For cabling in the field we recommend using shielded cable in order to avoid any electrical interference.

Locate the correct mounting spot for the Rub-Block according to drawing 1:

1. **Bucket elevator return pulley:** The preferred position near the return pulleys is on the side of the descending leg (opposite the intake) of the elevator. In the vertical sense the Rub-Block must be positioned level with the centre of the belt tensioning device. In the horizontal sense the Rub-Block should be positioned so that the belt edge passes the "eye", the hole in the Rub-Block contact plate in which the PT100 sensor is mounted.
2. **Bucket elevator drive pulley:** The preferred position near the drive pulleys is on the side of the ascending leg (opposite the intake) of the elevator. In the vertical sense the Rub-Block must be positioned level with the centre of the drive pulley shaft. Should this not be possible due to a division of the hood, we recommend to fit the Rub-Block immediately above this partition in the removable hood. In the horizontal sense the Rub-Block should be positioned so that the belt edge passes the "eye", the hole in the Rub-Block contact plate in which the PT100 sensor is mounted.
3. **Wall thickness:** To allow proper fitting, the thickness of the casing of the elevator should measure minimum 2,5 mm and maximum 10 mm. If the plating measures less than 2,5 mm a metal filler plate should be installed (see drawing 1.1).
4. **Rub-Block depth:** If the distance from the inside of the casing to the pulley rim is less than 22 mm, NBR-rubber gaskets must be used (two gaskets 1 mm thick are supplied with the Rub-Block for this purpose). If the distance from the inside of the casing to the pulley rim is greater than 36 mm, a recessed mounting unit must be installed. We recommend placing the brass (or stainless steel) contact plate a minimum of 6 mm inward from the inside of the casing plate in order to create a failsafe principle. The maximum distance between the Rub-Block contact plate and the rim of the pulley, or belt edges, depends on the individually permitted tolerance for the belt misalignment.

Marking off the correct holes for the Rub-Block as per drawing 2:

1. Use the corresponding template to correctly mark off the pattern of holes

Realising the holes for correct positioning of the Rub-Block as per drawing 3:

1. Drill four holes with a 4.8 mm drill and tap these holes with an M6 thread. (at a later stage, the Rub-Block will be secured to these four holes using M6 bolts).
2. Using a Ø 53 mm hole saw to drill out a round piece as per drawing. **Please avoid cutting the belt!**
3. Continue above-mentioned steps 1 and 2 for the other Rub-Block sensors to be installed.
Use minimum 4 Rub-Block sensors, two in the bottom and two in the top of the elevator.
For an conveyor it is recommended to use two stainless steel Rub-Block sensors, type RB200DN every 50 meters.

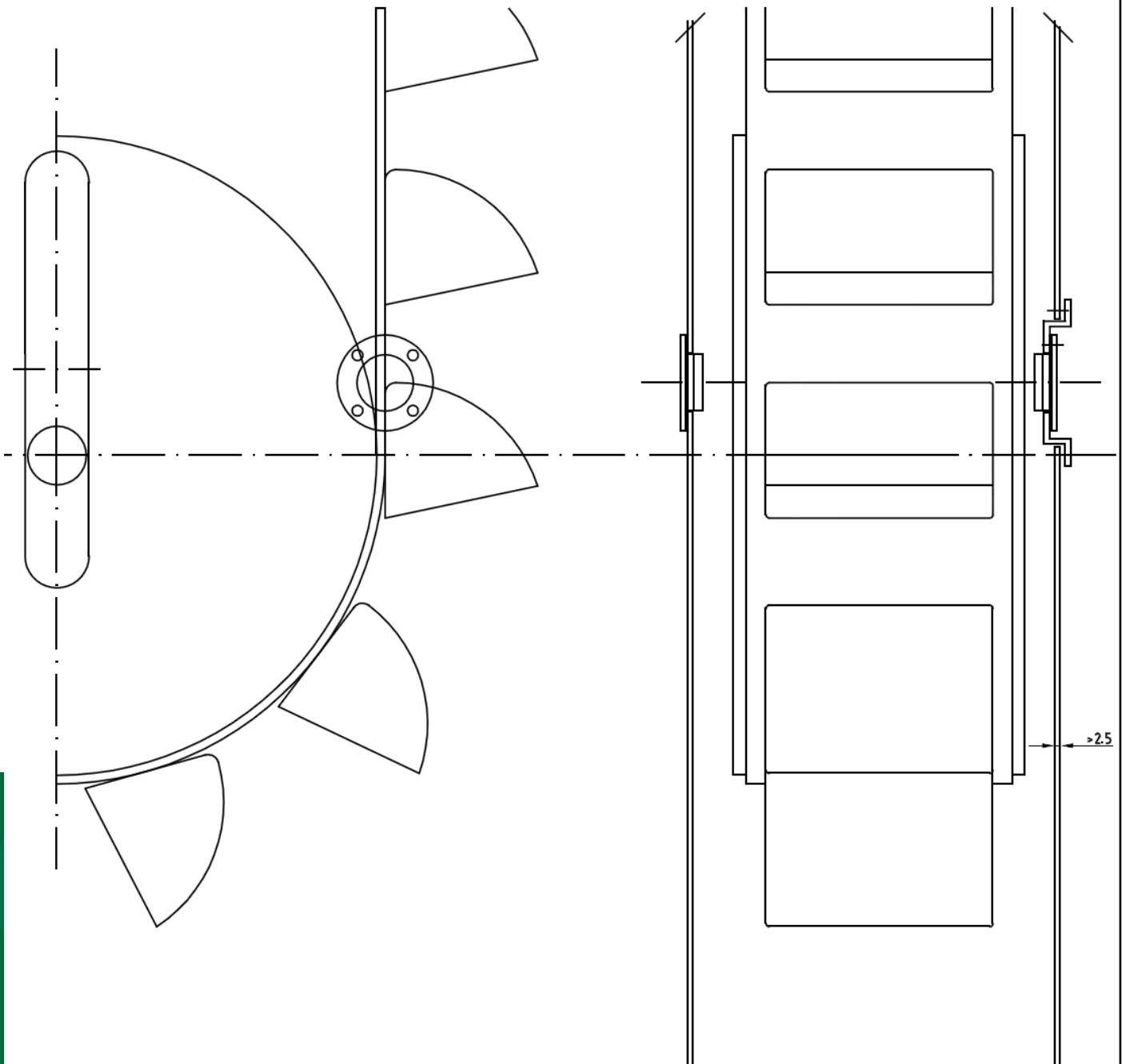
Mounting of the Rub-Block sensors as per drawing 4:

1. The PT100 sensor must be fitted into the Rub-Block all the way till the probe-tip of the PT100 sensor reaches the surface of the brass friction plate. The PT100 sensor must be secured in this position by following the **instructions in step 1-5 further on in this installation guide.**
If this is not done properly, no exact measurement can be taken and the risk that the sensor will break is very high.
2. Mount the Rub-Block and secure it with M6 bolts with an Teflon® O-ring. Also use PTFE tape on the thread from the bolt to ensure that the IP 67 class will be prevented.
3. Correctly connect the earthing on the Rub-Block to avoid any electrical interference.
4. After mounting the Rub-Block, the conduit system can be installed correctly.

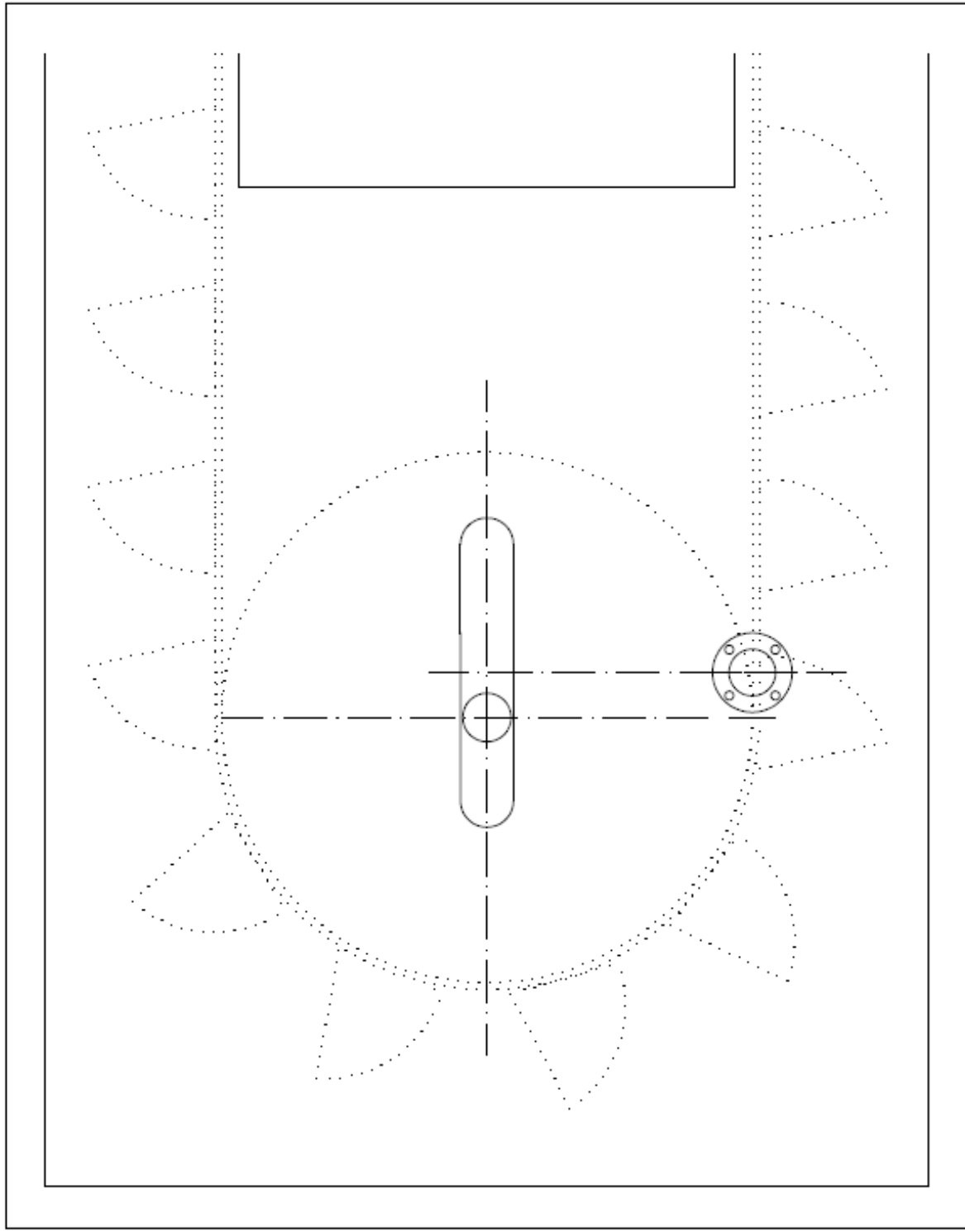
Attention!! The Rub-Block may only be installed once the PT100 signal is ready integrated in the process PLC.!!

Installation drawing 1

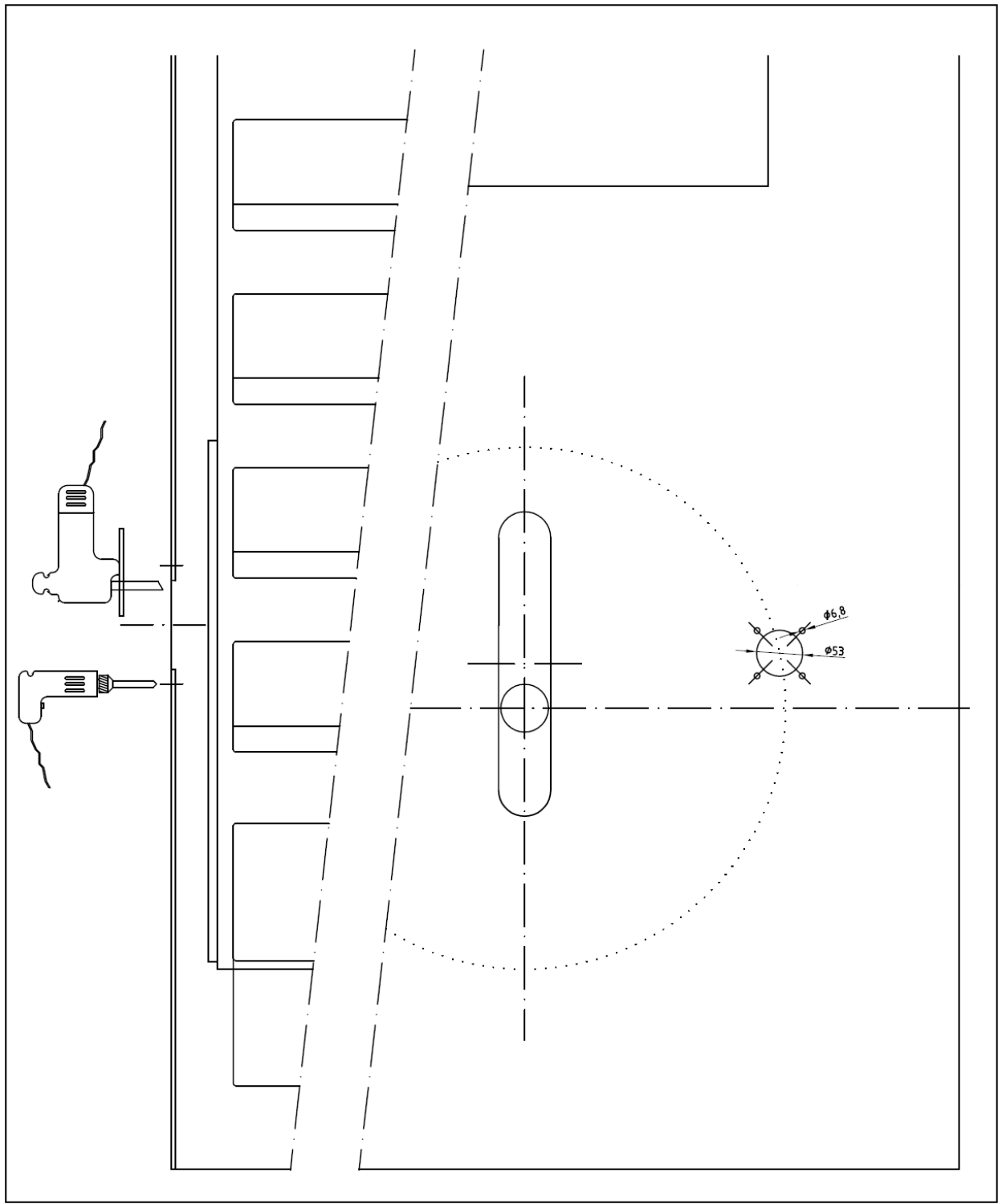
For the Rub-Block type RB100DN a Recessed mounting plate type FP100 is available (**but not included in supply**)



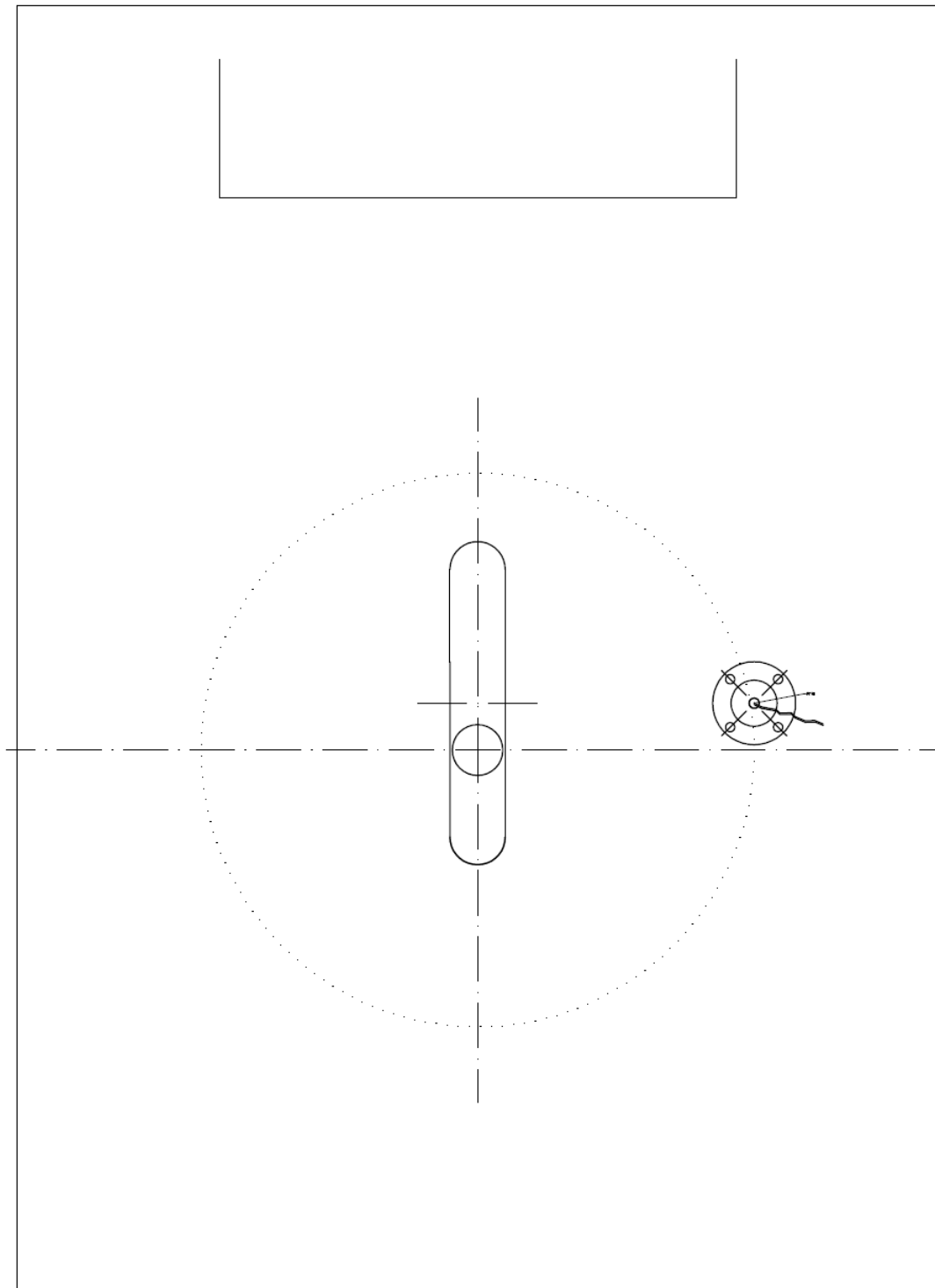
Installation drawing 2



Installation drawing 3



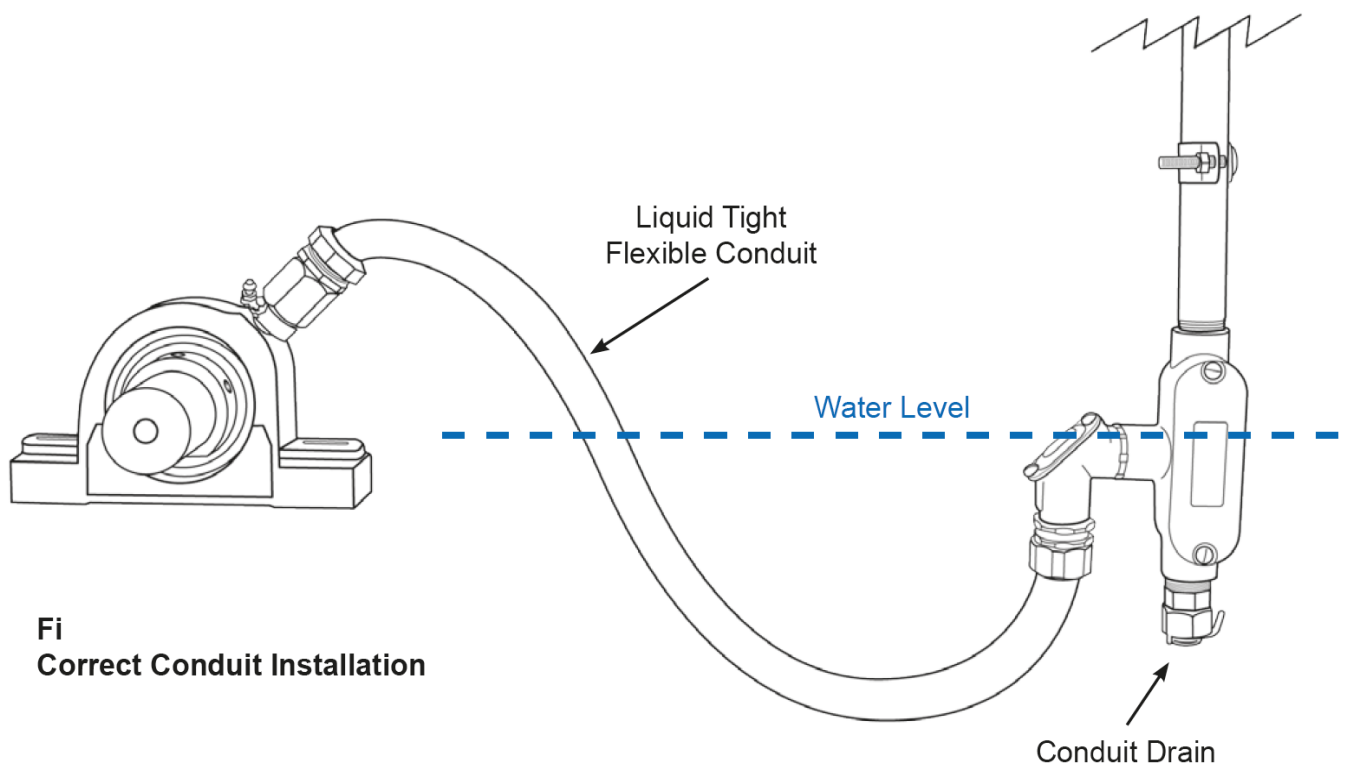
Installation drawing 4



Liquid tight flexible conduit installation

Conduit systems can channel water directly to sensors from incorrectly sealed fittings and condensation. Over time, water will adversely affect sensor performance. To prevent this type of damage, it is important to properly install conduit and low point conduit drains. Use rigid metal conduit to protect the cables from the sensors to the control unit.

Figure illustrates the correct installation of liquid tight flexible conduit. Notice that the bearing sensor is above the conduit drain and the water level.



Intrinsically safe connection, Ex "i" Protection

The equipment used in areas with an explosion hazard only contains intrinsically safe circuits. A circuit is intrinsically safe if, both in normal operation and in the event of a fault, a short-circuit in the circuit does not produce a spark capable of causing ignition, and the current flowing through the equipment does not heat any part of the surface above the level specified for the temperature class (see also EN 60079-11).

In order for a circuit to be designated as intrinsically safe, every individual device included in the circuit must be designed to be intrinsically safe. Furthermore, it is necessary to test that the complete circuit of the (individually) intrinsically safe devices forms, as a whole, an intrinsically safe circuit.

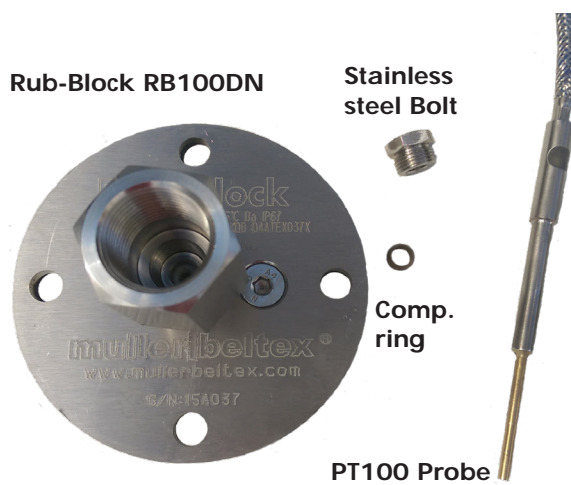
The fact that a circuit is assembled from devices that are (individually) intrinsically safe, does not guarantee that the circuit as a whole is intrinsically safe.

For a RTD temperature probe the measuring current (or in case of malfunction the residual current) flows through the sensor element. The result is self-heating of the element and ultimately temperature increase on the surface area of the protection fitting. It is essential to ensure that the limit of the defined temperature class is not exceeded.

Mounting the PT100 sensor

Please read this fitting installation instruction carefully before beginning the installation.

For the correct torque on the bolt/nut during the fitting of the PT100 on the Rub-Block please follow the steps and instruction very carefully.



Step 1: Start with above three components.

Step 2: Put the PT100 probe in the stainless steel body



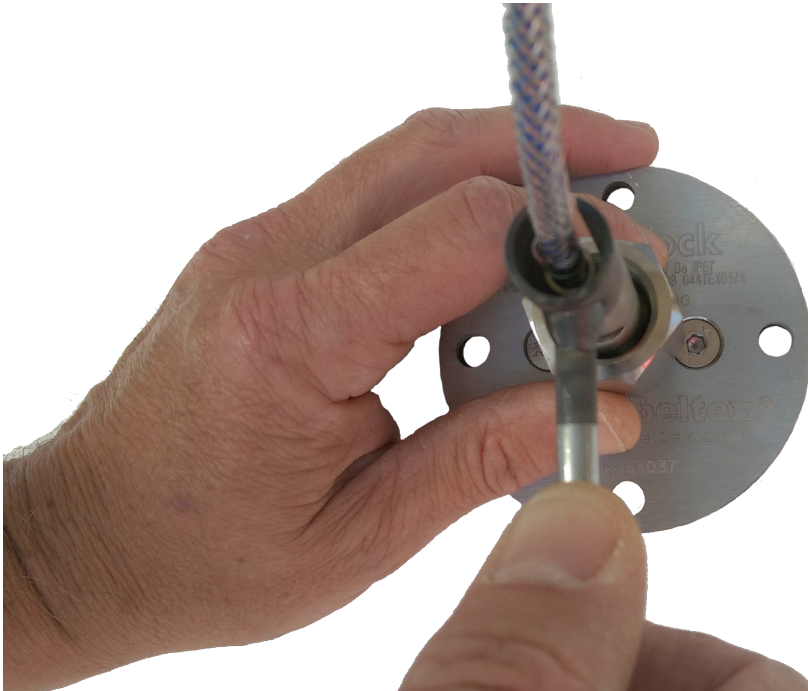
Step 3: Use the recommended pipe wrench (PTDN13)



Step 4: Tighten the bolt onto the stainless steel body hand-tight.

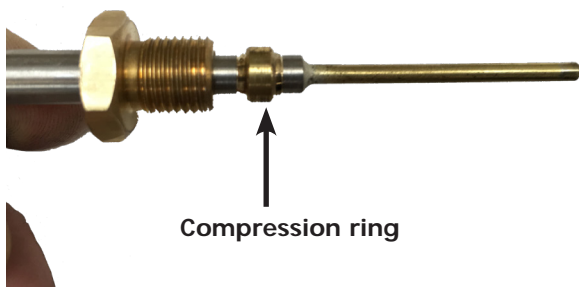
Fitting the PT100 sensor

Hold the lower part of the stainless steel body tight with the adjustable spanner or with the hand.



Step 5: Turn the pipe wrench (PTDN13) clockwise 1½ **PLEASE DO NOT OVER-TIGHTEN.**

When this is done correctly as above described the PT100 sensor is tightened and secured by the compression ring (olive) inside the stainless steel body.



Extra information before mounting the Rub-Block plate:



Before mounting the Rub-Block with M6 bolts please make sure you will use an Teflon® O-ring and use PTFE tape on the thread from the bolt to ensure that the IP 67 class will be achieved.

When loosening or disconnecting a fitting, remove the old tape and re-wrap it with a fresh piece.

PT100 signal

Measuring

The PT100 produces a standard analogue output signal. It is easy to implement this signal in a PLC system, for example a SIEMENS PLC S7 (SIL2). If it is not possible to implement an analogue signal, an analogue card is required or a HEAD transmitter with an analogue output signal of 4-20mA can be used. Software for the visualisation can be programmed by a qualified software engineer.

PT100 connections

- PT100 connected directly to an RTD I/O card by using a shielded cable in order to avoid any electrical interference
- Local transmitter 4..20mA
- Indicator
- Converter/Barrier

The transmitter can be either 4..20mA or bus technology (e.g. Profibus PA, Foundation Fieldbus, Modbus, ect.)

Required functional specification for the transmitter, 4..20mA version:

- Output 4-20mA
- Calibration Range 4mA = -25°C, 20mA = 125°C
- Fail – Low signal (<4mA) on internal failure
- Electrical approvals – Hazardous approval according to local zoning

Bus Technology:

- Broken wire detection
- Fail detection on internal failure
- Electrical approvals – Hazardous approval according to local zoning

Transmitter Failsafe Configuration:

Power loss failure configuration: The transmitter range shall have a high value at 4mA. This assures broken wire alarming in case of a broken wire between the transmitter and the I/O card and/or transmitter power loss. The analog input card shall detect a fault on the analog input, and go to "error".

Internal instrument failure configuration: The failure mode alarm shall be set to low or below 4mA either via Hart handheld programmer or internal hardware switch.

In case of a broken cable in the connection between the PT100 and the transmitter, the transmitter will read the maximum resistance, giving max temperature value on the analog output. The PLC will generate alarm.

Alarm configuration PLC

Best maximum delay for the sum of the timer and the filter is 5 seconds.

The following alarm points are recommended in a ATEX environment:

- Absolute temperature PRE-ALARM : 60 °C
- Absolute temperature STOP-ALARM : 80 °C

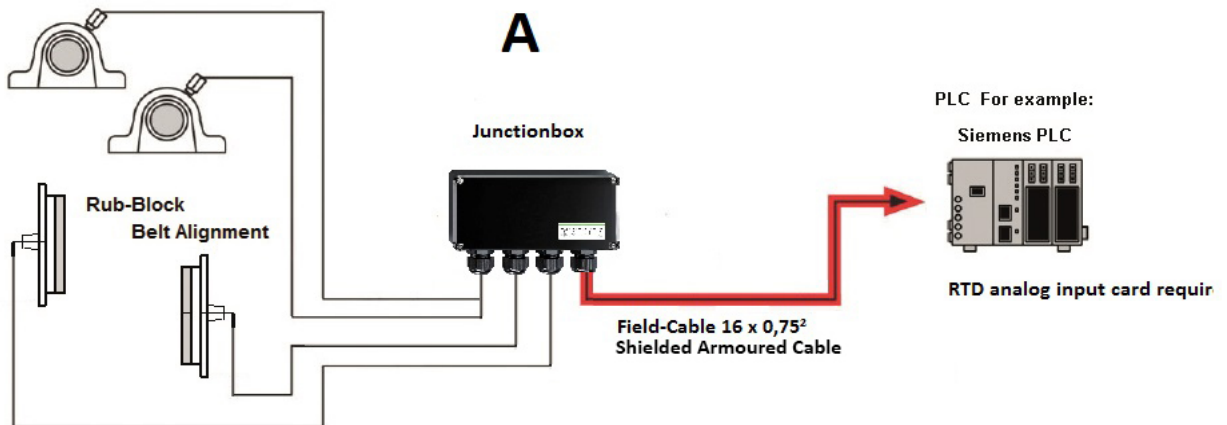
The electrical conductivity of metal (i.e. platinum) is based on the mobility of free electrons. With increasing temperatures the atoms in the metal lattice will vibrate more vigorously and thus impede the free flow of electrons towards the positive pole of a voltage source. This impedance causes a resistance in linear proportion to the temperature.

The resistance value is in conformance with the European standard: $PT100 = 100 + 0.385\ 055 \times T$.

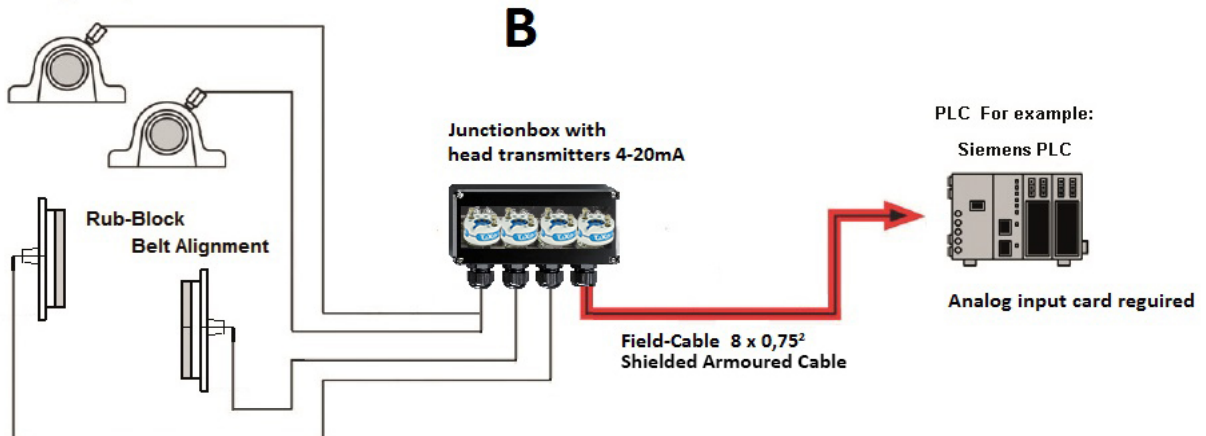
The positive temperature coefficient of a PT100 is 0.385 055 Ohms per Kelvin.

Installation diagram Rub-Block and PT100 bearing sensor

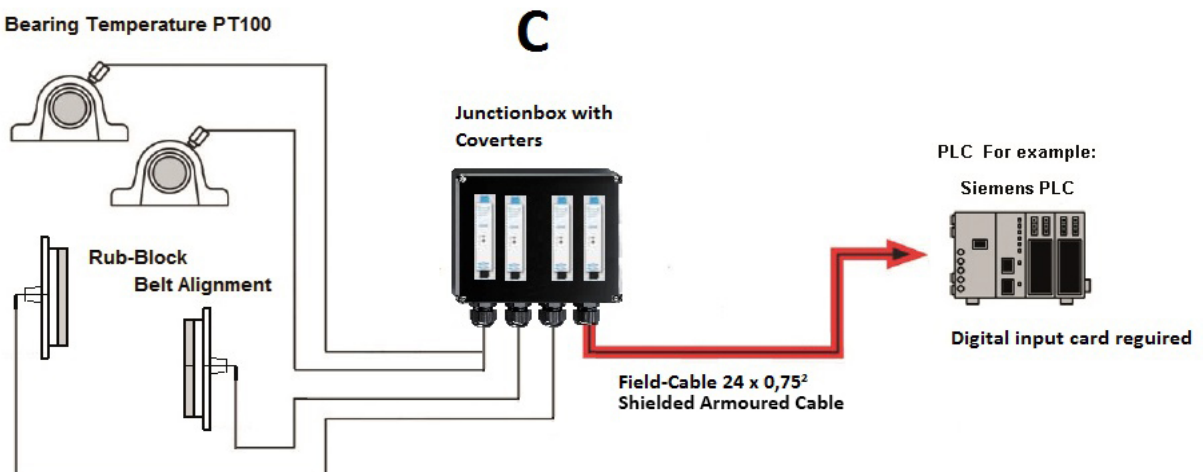
Bearing Temperature PT100



Bearing Temperature PT100



Bearing Temperature PT100



Technical Data

Rub-Block RB100DN with PT100 technical data

PT100 sensor

Sensor type:	: R7-63527320-0090/050.S01 with 1 x 4L connection wires
Protection type connection head:	: IP 67
Tolerance class:	: Class A DIN IEC751
Cable type:	: PFA-PFA-V2A Cn 4 x 0,22 mm ²
Ambient temperature limit for cable:	: - 40°C to + 185°C
Cable Length:	: 5 meter, (several cable lengths available)
Measuring temperature limit:	: - 40°C to + 280°C
Measuring current:	: 1mA
Output signal:	: Analogue
Probe length:	: 75 mm
Probe Diameter:	: Stainless Steel 5 mm
Probe-tip Diameter:	: Brass 3 mm

Electrical Data PT100

Measuring voltage	: U _i 30 V
Maximum current input	: I _i 101 mA
Maximum total output	: P 750 mW

Brass body

Housing sensorbody	: Stainless steel
Diameter screw connection head	: M12 fine

Material Rub-Block

Mounting plate round	: Stainless steel Ø 90 mm x 4 mm
NBR-Gasket	: 1 mm thick
Insulation material round	: PTFE high-heat plastic FDA-approved Ø 52 mm x 12 mm
Friction Plate round	: Brass Ø 52 mm x 8 mm

Hazardous area classification

ATEX Class (Ex-i)	: Ex II 1D Ex iaD T85°C / Ex II 1G IIC T6
Certificate number	: IBE _U 13ATEX1079X
IECEx Class (Ex-i)	: Ex II 1D Ex iaD T85°C Da, Ex II 1/2 G Ex ia IIC T6* Ga/GB TAMB -40°C to 185°C
Certificate number	: IECEx IBE 15.0014X
Gost R (Ex-i)	: Ex II 1D Ex iaD T85°C / Ex II 1G IIC T6
Certificate number	: POCC PL.AF.H00052
CSA	: Class II, Division 1
Measuring voltage	: U _i 5 V
Maximum current input	: I _i 40 mA

Operational maintenance

Test Procedure

The RTD temperature tester has been designed to test adjustable depth bearing temperature sensors in the field. This hand held test unit features an integrated heating block specifically designed to have a RTD probe sensor directly inserted. With integral controls and temperature display, the unit heats the sensor to the desired trip point, and allows quick and easy real life testing of the sensor and temperature monitoring system.

Method of operation: During planned maintenance or periodic testing, the RTD Sensor Tester can be used as a diagnostic tool to verify that the alarm and shutdown sequences of the control unit are functioning as expected. To test, the heater block should be set above the control units alarm operating temperature. Remove the PT100 sensor probe from the housing and insert it into the heater block. As the heater block reaches the alarm temperature, the PT100 sensor will relay this data to the SCADA system, allowing you to verify that the alarm and shutdown sequences run as expected.

Inspection of the Rub-Block

The Rub-block needs to be inspected for wear regularly (recommendation: yearly) and after a trip for wearing. For this purpose, the Rub-Block must be extracted from the conveyor.



 Compression ring

Picture: Pipe wrench 13mm is not included. This part can easily be ordered under the product name “PTDN13”

Rub-Block covers

Sunlight does not have an impact on the measurements, the PT100 is protected with several insulating layers, different temperatures on two sides of the casing have no effect. Problems in hot climate have not occurred.

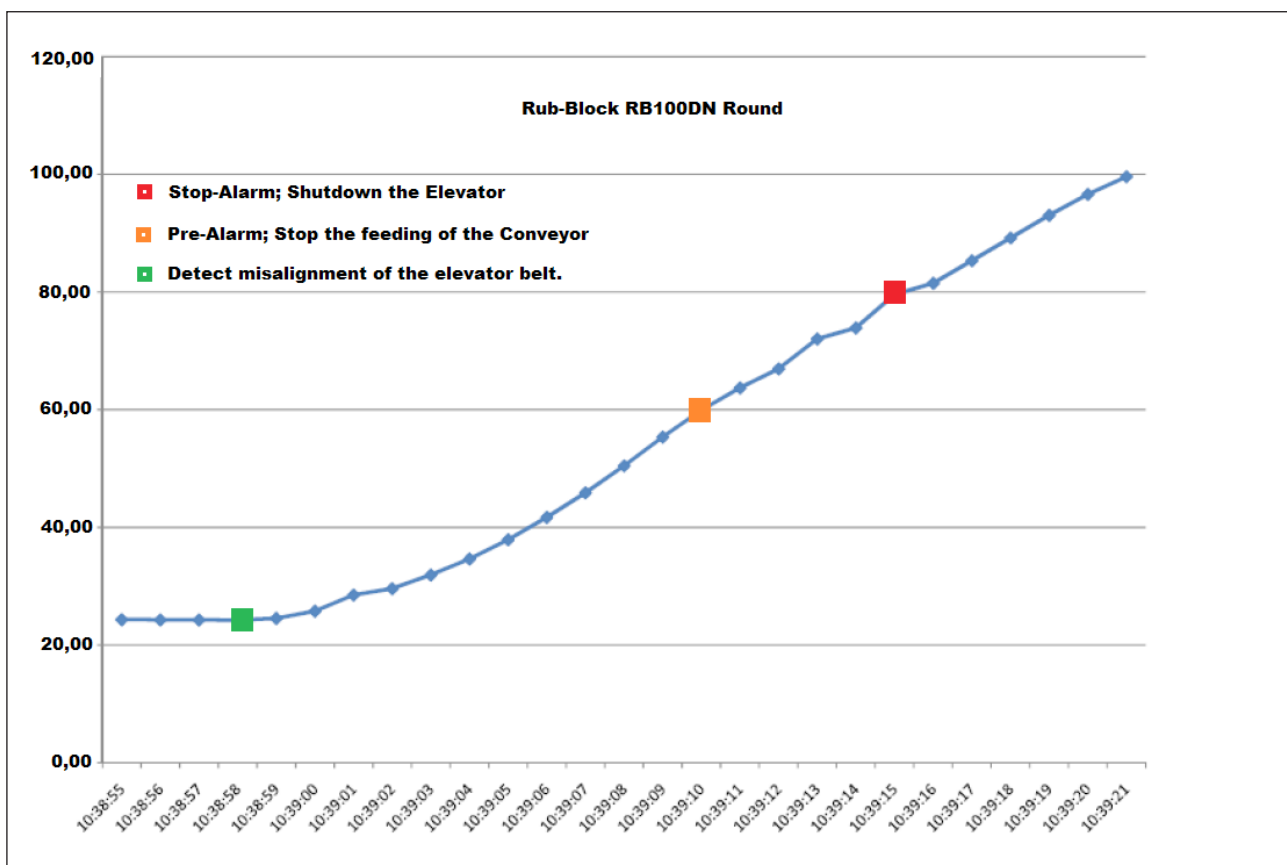
Maintenance

The valid European and national regulations must be observed for maintenance, servicing and testing. In particular, all parts on which explosion protection depends must be checked yearly during maintenance.

RB100DN measurement data

This measuring was done on an elevator with a height of 50 meters and an elevator belt with a thickness of 13 mm. The elevator belt runs at a speed of 3 meters per second.

Diagram (°C) Time (min.)



Ambient temperature of 25°C

Duration contact of elevator belt and Rub-Block **RB100DN** because of belt off-tracking: 60 sec.

Duration temperature rise to 100°C **PT100**: **Approximately 23 sec.**

Additional Notes: for temperature line monitoring

We recommend to use an trending software module. As soon as a difference in temperature occurs within a certain time, there is a slight belt misalignment. It prevents unnecessary wear of the brass plate from the Rub-Block and you will be informed for a threatening belt misalignment.

- Temperature rise rate STOP-ALARM : 2,5°C /min, max allowed 10°C /min
- Temperature rise rate STOP-ALARM : 1°C /5sec, max allowed 5°C /5sec
- Temperature rise rate PRE-ALARM : 0,2°C /min, max allowed 10°C /min
- Temperature rise rate PRE-ALARM : 0,7°C /5sec, max allowed 5°C /5sec



Safety notice to our customers

- A. In order to maximize efficiency and safety, selecting the right equipment for each operation is vital. The correct installation of this equipment, as well as regular maintenance and inspection, are equally important to proper operation and safety of the product. The correct installation and maintenance of the products are the responsibility of the user.
- B. All installation and wiring must conform to governing local and national electrical codes and other standards applicable to specific industries. The installation of the wiring should be undertaken by an experienced and qualified professional electrician. Failure to correctly wire the product to any machinery may result in the product or machine failing to operate as intended.
- C. Periodic inspection by a qualified person will help assure that this product performs properly. It is recommended that a documented inspection is carried out at least annually or more frequently in case that the product has been subjected to intensive use.

Customer safety responsibilities

- 1. Read all literature provided with the product. Read all user instructions and safety manuals to ensure that the product operation is understood and can be used safely and effectively use this product.
- 2. Select a qualified and competent installer; Correct installation of the product is important for safety and performance. It is critical for the safety of your operation and of those who may work with your equipment that a qualified and competent electrical installer is selected to undertake the installation of this product. The product must be installed properly to perform to its designed functions. The installer should be qualified, trained, and competent to perform the installation in accordance with local and National Electrical Codes, all relevant OSHA Regulations, as well as any of the user's own standards and preventive maintenance requirements, and other product installation information supplied with the product. The installer should be provided with all necessary installation information to assist in the installation.

Warnings and symbols in this operation manual

-  This symbol indicates safety measures that definitely must be taken into account in order to prevent personal injury.
-  This symbol indicates ATEX Certified components with a certain zoning designation.

The flat sealing surfaces and seals must not be damaged!

Warning! Installation and commissioning must be performed by qualified personnel. Read the instructions carefully before starting up. The supplier is not liable for personal injury or property damage incurred by incorrect use.

It is required to check the latest product information on Muller Beltex' website, before installing this product. Failure to do so, could result in to product failure or damage.

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