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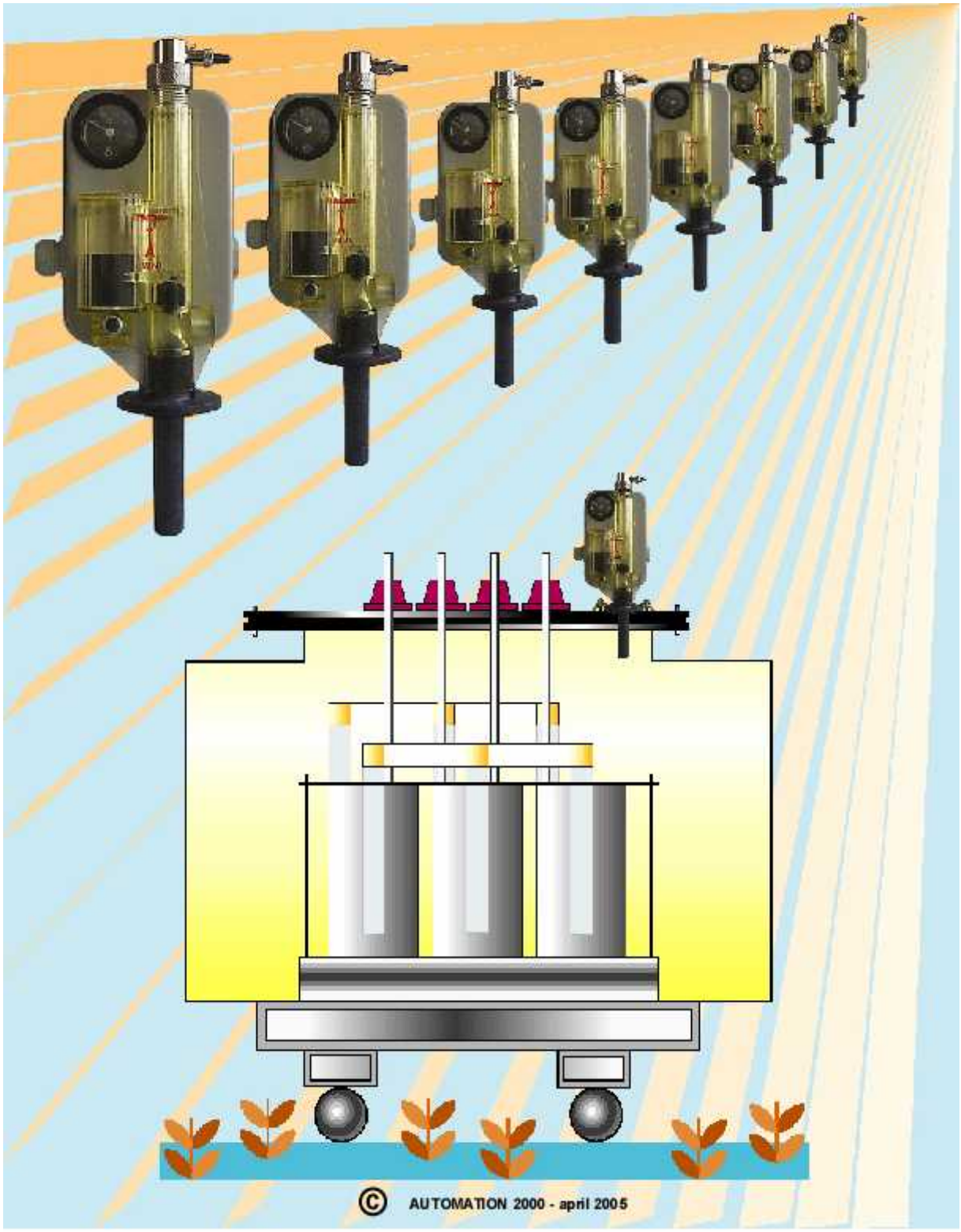
TECHNICAL INSTRUCTIONS
STANDARD DGPT2



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Hello!

First of all, we would like to thank you for the interest you have shown in our products.

These instructions are the fruit of more than 30 years of experience in the field of transformer protection.

Let us present our company to you…

A little bit of history…

At the end of 1973, French manufacturers of electrical distribution transformers expressed the need for their new type of equipment to be protected. This protective device should be capable of checking the various dielectric related parameters continuously.

In 1974, Automation 2000 released its first device.

Since then, production has continued to rise and new types of device appeared (with the help of customer partnerships).

How to contact us ?

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Yours contacts:

M^R CROITORIU **MANAGING DIRECTOR**
M^RS PARTAIX **CUSTOMER RELATIONS**

1 – ROLE AND FUNCTIONS OF THE STANDARD DGPT2

Reminder from the "General" technical instructions

1-1 Role

Transformers are very important links in the electrical distribution network. They act as the interface between the electricity supplier and the consumer, generally an industrial company.

Therefore:

- The transformer needs to be protected on the "primary" side, and by doing so, this protects the installation after it. This also avoids supplying a major fault.
- It must be possible to cut off the transformer on the "secondary" side when it is used beyond its capacities or if a fault occurs which creates a significant rise in temperature.

The standard DGPT2 has been designed to carry out these functions.

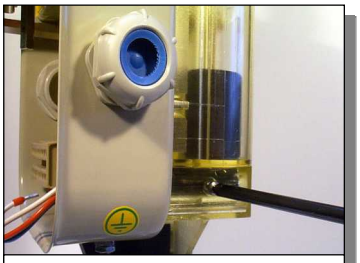
How does the device monitor ?

In three ways:

1-1-1 Discharge of gases or significant drop in level

Gases are discharged due to dielectric pyrolysis. This is generally due to small discharges caused by ruptured insulation.

A significant drop in the level is generally due to a leak on the transformer (drain tap not closed correctly for example).



Float and reed contact

SLOW PHENOMENON IN TIME (IN COMPARISON TO EXCESS TANK PRESSURE)

1-1-2 Tank pressure

In the event of an outright short circuit in the transformer, the electric arc formed causes an instantaneous shock wave.

The excess pressure in the tank then becomes very high and deforms it (sometimes causing an explosion).

MOST IMPORTANT PHENOMENON FOR SAFETY AND EXTREMELY RAPID

1-1-3 Dielectric temperature

The temperature can rise for a number of reasons:

- an internal defect causing overheating
- the nominal power rating of the transformer being exceeded (large amount of heat dissipated due to the Joule effect)

THIS IS ALSO RELATIVELY SLOW PHENOMENON

1-2 Functions

*In the transformer, the following functions are **monitored** :*

- *the **D**ischarge of **G**ases.....**DG***
- *the tank **P**ressure.....**P***
- *the **T**emperature.....**T2** (2 thresholds)*

*which is why the device is called: **DGPT2***

FOR FURTHER DETAILS ON THESE FUNCTIONS, REFER TO THE GENERAL TECHNICAL INSTRUCTIONS T/NOT-0088

Front view

Rear view

2 - CHARACTERISTICS

2-1 Treatments and materials

2-1-1 Treatments

- Painting of the metal housings

Surface preparation

- Degreasing
- Phosphating
- Chemical passivation
- Rinsing in demineralised water
- Drying

Anti-corrosion primer

- This is an epoxy resin based thermosetting powder that is rich in zinc, to protect the ferrous metals against rust.
- Thickness of the coat: **55** to **66** µm

Paint

- Epoxy powder finishing paint
- Colour **RAL 7032**
- Thickness of the coat: 70 ±5 µm

Required results

The housings must withstand the salt spray defined in **NF X 41002** without any of the following occurring:

- Rust (NF T 30071): Ri 0
- Bubbling (NF T 30071): none
- Adhesion (NF T 30038): Cot 0

- Nickel plating of the brass parts

- Degreasing (ultrasonic, electrolytic)
- Rinsing
- Copper plating (**3** to **4** µm)
- Rinsing
- Depassivation (acid water)
- Rinsing
- Nickel bath at **4.5** V. Thickness deposited: **8** to **10** µm
- Rinsing
- Drying

2-1-2 Main materials

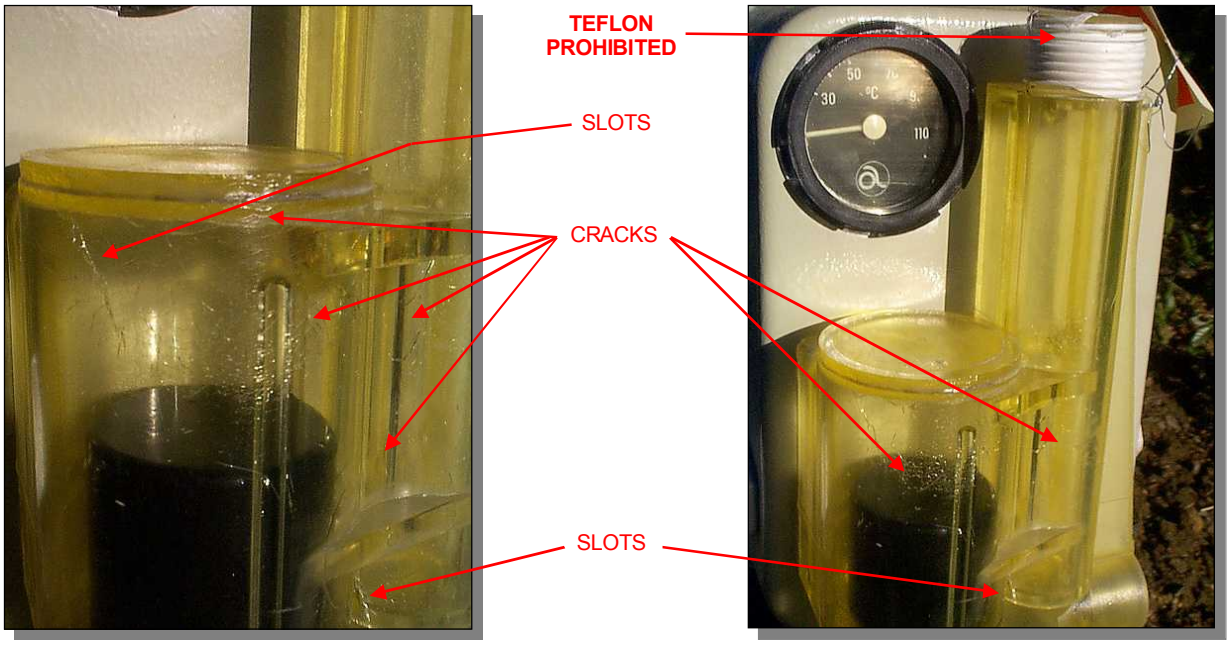
- Housing
XES steel, 0.8 mm thick

- Transparent body
Permanently transparent amorphous polyamide, UV resistant

Name: **Trogamid T anti-UV**
Main characteristics:

- High shock resistance
- Shore D hardness: 86
- Normal operating range: -50 to +120°C
- Maximum temperature: 140°C
- Impervious to ultraviolet light
- Dielectric rigidity (DIN/VDE 0303): K20/P50 = 24
- Electrolytic corrosion: A1
- Excellent chemical resistance to all known dielectrics

TROGAMID T IS NOT RESISTANT TO ALCOHOLS OR HOT WATER (≥70°C)
DO NOT USE PRODUCTS CONTAINING EVEN TRACES OF ALCOHOL ON THE BODY.



WARNING: some leak-detector products in aerosols (ARDROX 9D1B especially) contain alcohol (up to 30% propanol: C_3H_8O) and 70% acetone (surface damage only).

Polyamide flange:

- Trogamid T loaded with carbon fibres

- The seals

The moulded-on seals and the flange and tap seals are made of FPM (Viton from Du Pont de Nemours).

Main characteristics:

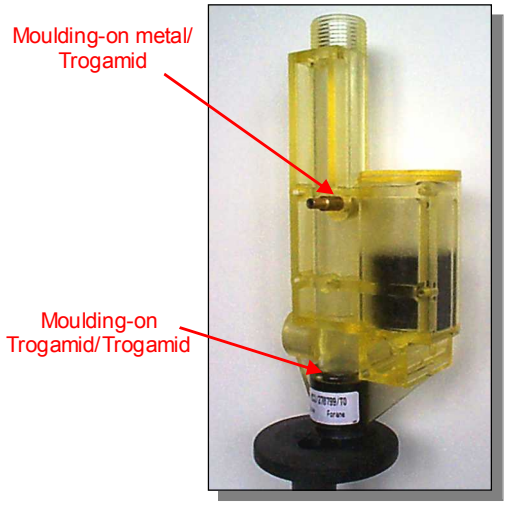
- Heat resistance: 250°C continuously, 300°C peak
- Impervious to oils and hydrocarbons
- Very good resistance to chemical products, especially concentrated oxidising acids. Very good fire resistance.
- Excellent impermeability to gases
- Ozone inert
- Fragile below -25°C

2-2 Specific production aspects

2-2-1 Moulding-on

- Metal / transparent Trogamid

In order to limit the problem of leaks in time as much as possible, the body of the device is moulded in one piece.
The metal part of the body is therefore moulded-on for this reason, at a pressure of 600 bar / 300°C.
The compensation of the **difference in expansion** between the Trogamid and the metal insert is ensured by fitting FPM O rings to it before moulding.
They are thus held in position and stretch slightly during expansion.

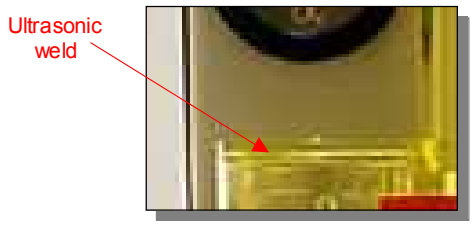


- Reinforced Trogamid / transparent Trogamid

In this case, the insert is heated to 120°C then placed in the mould. After moulding, as the material of the insert and body is the same, the two parts penetrate one another (homogenous weld) thus eliminating the need for any expansion compensation seals.

2-2-2 Ultrasonic welding

After fitting the large gas detection float, the body is blocked by a transparent Trogamid cover, welded ultrasonically.
This system ensures a tight homogenous weld, by pressurised localised heating.



2-3 Standards

2-3-1 Design standards

THE NF EN 60439-1 STANDARD

"Low voltage device assemblies - Part 1: Standard assemblies and assemblies derived from standard assemblies"

- **Paragraph 7.1.3.3**
  "The space available for connection must permit external conductors to be connected correctly and multi-core cables not to be constrained. The conductors must not be subjected to constraints which reduce their nominal working life…"

  The plate has been designed to provide the maximum amount of space possible to external connections, without constraining the cables.
  The internal wiring of the device respects the minimum curve radii recommended by this standard.

- **Paragraph 7.2.2**
  "In the case of an assembly which is to be installed outdoors and an assembly under a cover for indoor installation in places where there is a high level of humidity, and the temperature varies greatly, suitable measures (ventilation and/or heating indoors, drain holes, etc.) should be taken to prevent condensation which could damage the inside of the assembly. However, the degree of protection specified must also be maintained at the same time."

  The housing is equipped with three holes at the bottom.

- **Paragraph 8.1.2**
  Individual tests
  "The individual tests include:
  A) The inspection of the assembly, including the wiring and an electrical operation test.
  B) A dielectric test
  C) A check of the protection measures and the electrical conduction of the protection circuit.

  These tests can be carried out in any order.

  Note: the fact that individual tests are carried out in the manufacturer's workshops does not mean that the party installing the device is freed from the obligation of checking it after transport and installation."

  The settings of pressure switches and thermostats can be altered to actuate the contacts and then reset precisely by the user, without any special equipment being required.

For details, refer to section 5, page 28

THE NF C 17-300

Conditions of use of liquid dielectrics: first part Fire risks.
This standard explains in which case and why **the used of a protective system for transformer is obligatory or not**. To read this standard, it is necessary to read the **NF C 27-300** standard "***Classification of liquid dielectrics according to their fire behavious***" before.

2-3-2 Production standards

THE NF EN 60950 STANDARD

This standard concerns the safety of equipment required to obtain the CE brand, but does not concern the DGPT2 directly.

- **Paragraph 1.1.3**
  "…this standard does not apply:
  - to passive equipment… and devices which operate without any electrical power sources."
  Which is our case.

However, if the user of our device wishes to include it in an assembly which may be subject to CE approval, this should be possible.
For this reason, we have followed this standard as closely as possible.

- **Purpose of this standard**
  "Dangers
  The purpose of applying this standard is to forewarn against accidents or damage arising from the following dangers:

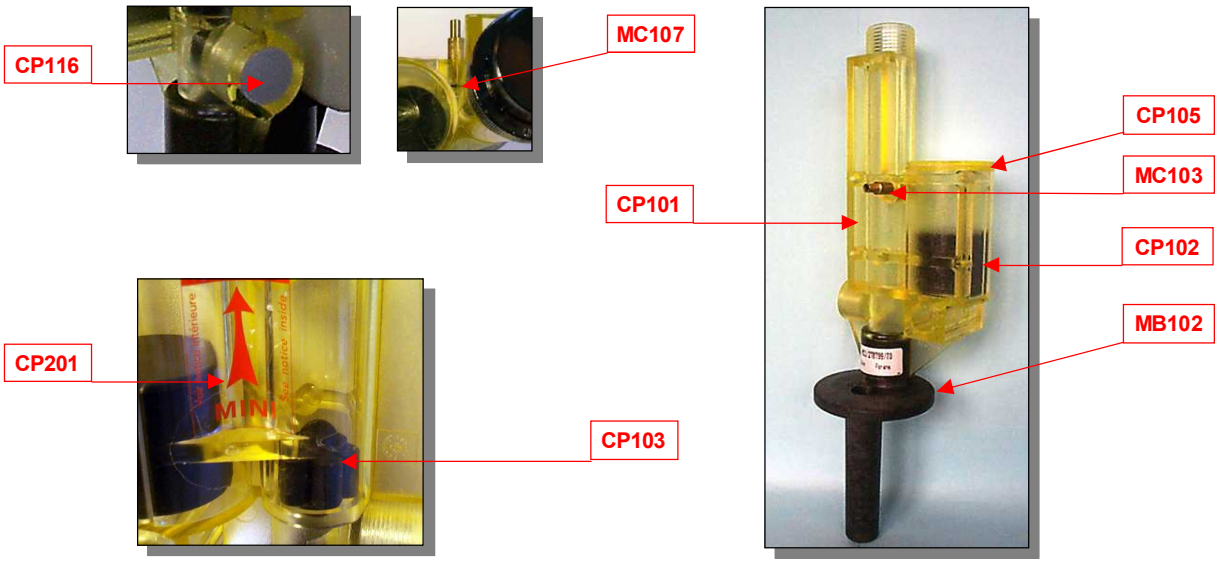
- electrical shock	→	**The DGPT is concerned**
- risks of energy transfer	→	Not concerned
- fire	→	**The DGPT is concerned**
- mechanical and thermal risks	→	Not concerned
- radiation risks	→	Not concerned
- chemical risks"	→	Not concerned

- **Paragraphs 2.1 to 3.3.9**
  "Electrical shock"
  - the device is equipped with two earth connections with conduction of the earth.
  - labels inside providing all of the information required on operating voltages, degrees of insulation and dielectric rigidity.

- **Paragraphs 4.4 to 4.4.5**
  "Fire"
  - Use of metal for the external covers. The housing of the DGPT2 is made of metal and allows fire to be contained.
  *- All plastics inside the housing are of the "non-fire spreading" or "self-extinguishing" type (*in compliance with the CENELEC HD 21-55 standard*).*

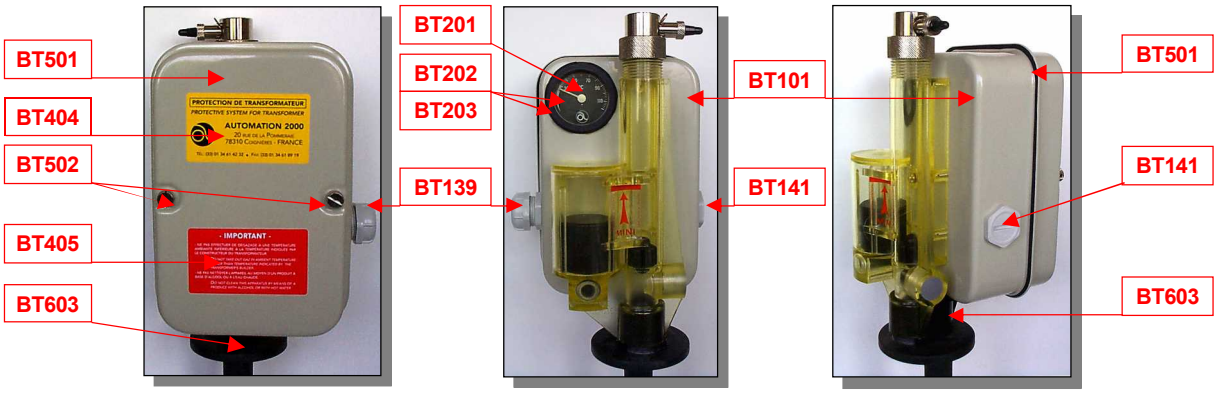
2-4 List of the main components

2-4-1 The body



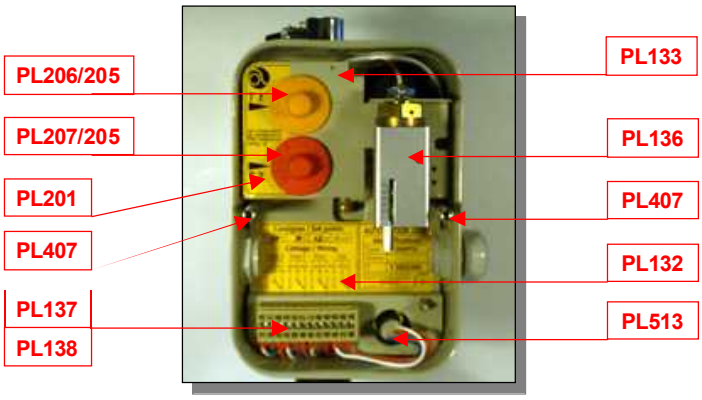
ITEM	DESCRIPTION	MATERIAL	QT.	COMMENTS
CP101	Complete transparent body with moulded-on parts	UV resistant Trogamid T	1	One piece
CP102	Large black float (gas detection)	Nitrile ebonite	1	One piece (closed micro-cells)
CP103	Small black float (level gauge)	Nitrile ebonite	1	One piece (closed micro-cells)
CP105	Body cover	UV resistant Trogamid T	1	
CP116	Thread protection	PVC	1	For Buccholtz adaptation
CP201	"Level limit" label	Dry transfer	1	Supplied on request
MB102	Attachment flange onto transformer	Loaded Trogamid	1	Load: carbon fibres
MC103	Pressure connection insert	Brass	1	
MC107	R4 O ring	FPM	1	

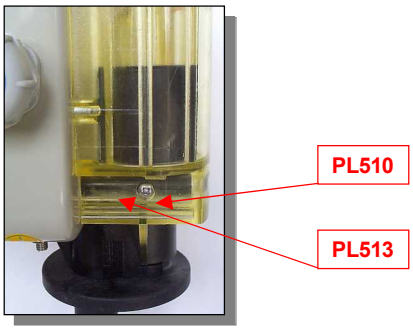
2-4-2 The electrical housing



ITEM	DESCRIPTION	MATERIAL	QT.	COMMENTS
BT101	DGPT2 type housing	XES 8/10 steel	1	Anti-corrosion treatment Epoxy paint Class: IP567
BT139/140	M25 (ISO) stuffing gland with nut	Polyamide (PEP)	1	Capacity: 13 to 18 mm
BT141/140	M25 (ISO) closing with nut	Polyamide (PEP)	1	
BT201	Thermometer		1	57 mm Ø Scale: 30 to 120°C Accuracy: ±2 % full scale Temperature compensated
BT202/203	Thermometer support (2 pieces)	UV resistant Trogamid T Polyamide (PEP)	1	Physical and UV protection
BT404	"Transformer protection" label	Polyester	1	French/English bilingual
BT405	"IMPORTANT" label	Polyester	1	French/English bilingual
BT501	DGPT2 type housing cover	XES 8/10 steel EPDM seal (-40 to +120°C)	1	Anti-corrosion treatment Epoxy paint Class: IP567
BT502	Cover attachment screw	Nickel plated brass	2	Copper and nickel plated
BT603	Capillary tube protection	Black polyamide 6	1	Capillary protection

2-4-3 The electrical component plate



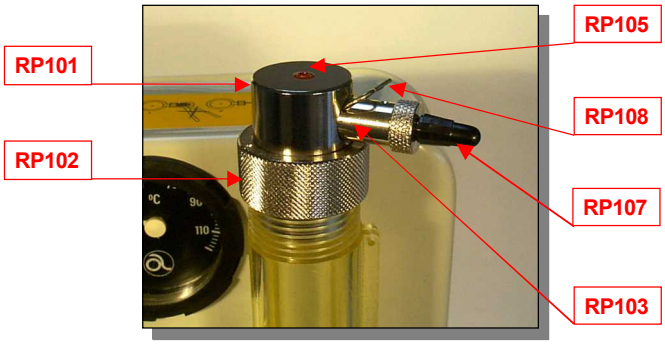


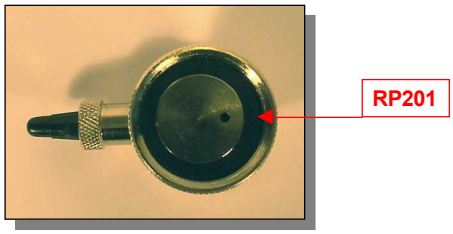
ITEM	DESCRIPTION	MATERIAL	QT.	COMMENTS
PL132	Identification and connection plate	Matt polyester	1	
PL133	Electrical component plate	12/10 steel plate	1	Epoxy paint
PL136	Pressure switch		1	Scale: 0 to 0.5 bar Accuracy: ±2% full scale Accuracy of display: ±0,05 bar Response time: 5 ms
PL137/138	Industrial terminals with cheek	Polyamide (PA)	12, 1	Test points Clamping capacity: 2.5 mm²
PL201	Thermostat label	Polyester	1	
PL205	T1 and T2 thermostats with bulb and capillary tube		2	Scale: 30 to 120°C Accuracy of display: ±2.5 °C Temperature compensated
PL206	T1 thermostat button	Polyamide 6, yellow	1	Graduated in steps of 5°C
PL207	T2 thermostat button	Polyamide 6, red	1	Graduated in steps of 5°C

Table continued…

ITEM	DESCRIPTION	MATERIAL	QT.	COMMENTS
PL407	Component plate/cover attachment spacer	Nickel plated brass	2	
PL510	Bulb attachment screw	Stainless steel	1	M3.5
PL513	Gas detection magnetic bulb, complete		1	Can easily be replaced by the user.

2-4-4 The drain tap (*part* RP109)



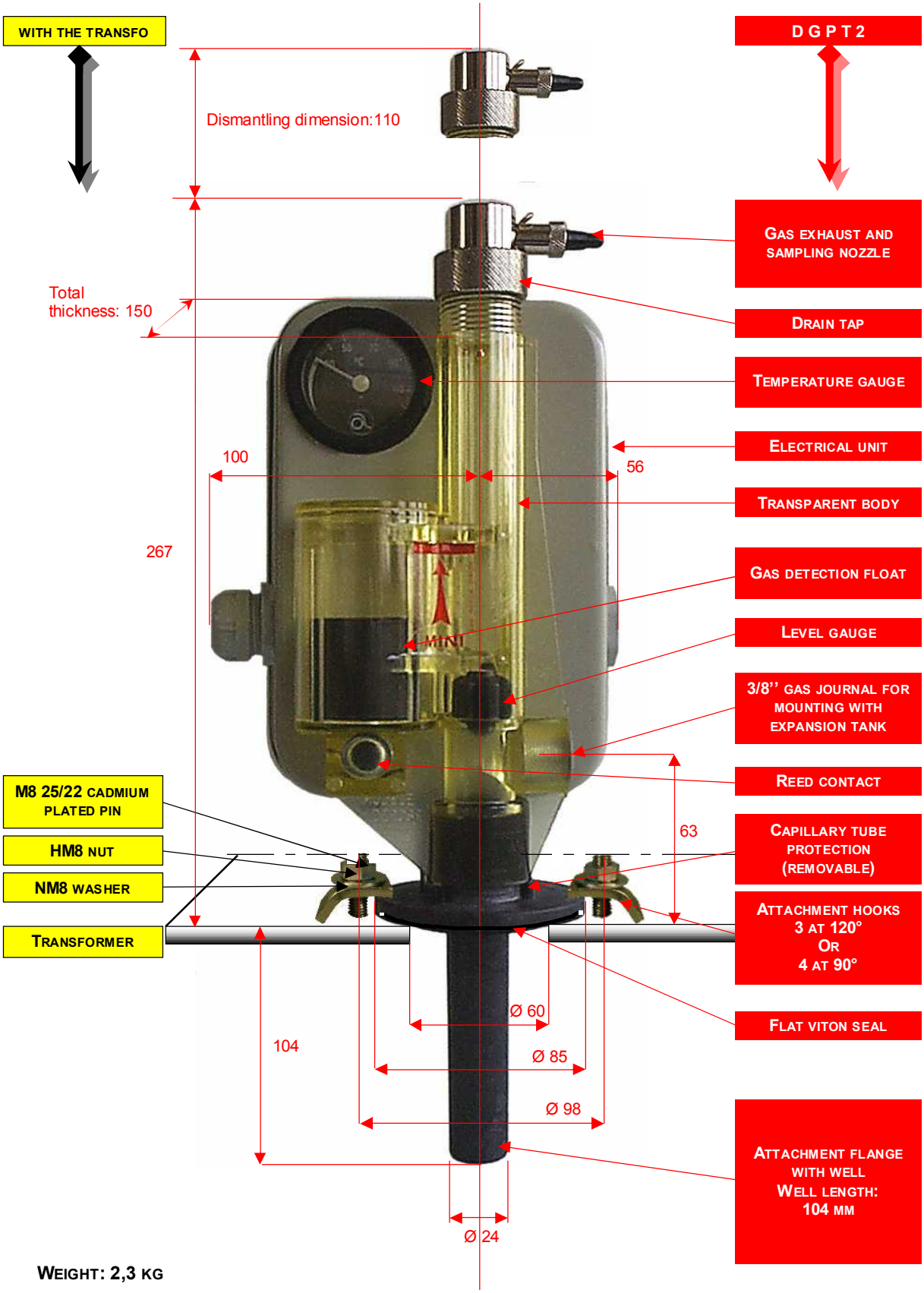


ITEM	DESCRIPTION	MATERIAL	QT.	COMMENTS
RP101	Tap body	Brass	1	Copper + nickel plating
RP102	Tap collar	Brass	1	Copper + nickel plating
RP103	Actuating tap	Brass	1	Copper + nickel plating
RP105	Translation movement lock screw	Stainless steel	1	With thread lock
RP107	Tap plug	PVC	1	
RP108	Actuation lock pin	Stainless steel	1	Can replace lead sealing
RP201	Tap/body interface seal	Viton	1	End sealing. **WARNING** We strongly recommend that **TEFLON** is not used to seal the threads, as it prevents the seal being tightened correctly and causes leaks...

2-4-5 The accessories

ITEM	DESCRIPTION	MATERIAL	QT.	COMMENTS
AC101	Body/transformer attachment flange seal **(supplied with DGPT2)**	Viton	1	Flat seal: ext. Ø 78 mm int. Ø 67 mm Thickness: 6 mm
AC102	Flange attachment hooks **(supplied with DGPT2)**	Steel or 316 stainless steel	4	Bichromated
AC201	Anti-magnetism shielding **(supplied on request)**	XC	1	Anti-corrosion treatment Epoxy paint

2-5 Dimensioned drawing



WEIGHT: 2,3 KG

2-6 The options

As the DGPT is of an open modular design, there are many options available which allow it to be adapted to the various customer specifications.
In particular, the solutions proposed for a safety update of an old transformer are numerous and simple (to avoid emptying the transformer tank).

If the options do not satisfy your requirement, or if the device has to be adapted, feel free to contact us (see page 6 for our address, telephone number, etc.).

List of options (the following list is not exhaustive)

DGPT2	DESCRIPTION	OPTION
☑	THERMOMETER WITH MAXIMUM NEEDLE	**AM**
	WITH THERMOMETER	**AT**
☑	FOR ASKAREL DIELECTRIC	**AS**
☑	WITH EXTERNAL METAL CONNECTOR	**CE**
☑	4 MM^2 INDUSTRIAL TERMINALS	**CQ**
☑	THERMOMETER ON COVER FRONT FACE	**FA**
	TRHE TYPE FLANGE	**HE**
☑	BUCCHOLTZ TYPE MOUNTING ADAPTER	**IB**
☑	WITH ANCHORING MARINE TYPE STUFFING GLAND	**PA**
	FLANGELESS	**SB**
☑	WITH SAFETY VALVE	**SO**
☑	PRECISION THERMOMETER ±1°C	**TS**
☑	LOCKING THERMOSTATS	**TV**
☑	PRESSURE SWITCH WITH 2 SIMULTANEOUS CONTACTS	**2P**
☑	GASEOUS DISCHARGE WITH 2 SIMULTANEOUS CONTACTS	**2G**
☑	2 GAS CONTACTS AND 2 PRESSURE CONTACTS, NON-INVERTING	**2GPNI**
☑	REMOTE PROBE (PT100) FOR TEMPERATURE RELAY	**PT**
☑	**2** GAS CHANGE-OVER CONTACTS WITH OFFSET THRESHOLDS	**2GD**
☑	**2** PRESSURE CHANGE-OVER CONTACTS WITH OFFSET THRESHOLDS	**2PD**
☑	DEVICE FOR CORROSIVE ATMOSPHERE	**X**

For further details, refer to the GENERAL technical instructions ***T/NOT-0088***

3 – MOUNTING THE DEVICE

3-1 Preparation

IF YOUR TRANSFORMER IS STILL UNDER GUARANTEE, CONTACT THE MANUFACTURER BEFORE CARRYING OUT ANY WORK.

THE METHODS DESCRIBED BELOW ARE GIVEN FOR INFORMATION ONLY, AND THE USER IS ENTIRELY RESPONSIBLE FOR CARRYING THEM OUT. THEY ONLY CONCERN THE UPDATING OF THE TRANSFORMER (THE MANUFACTURERS HAVE THEIR OWN FACTORY INSTALLATION PROCEDURES).

The two most common cases are:
(1) The transformer doesn't have a drain tap.
(2) The transformer has a drain tap.

Methods will be recommended for these two situations.

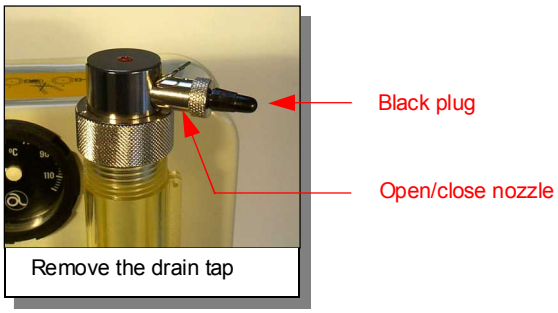
Preamble:

- The power supply to the transformer must be switched off.
- The procedure must be carried out when the equipment is not hot (ideal ambient temperature of 20°C).
- The dielectric level in the transformer should be slightly below the transformer cover.
- The orifice the device is to be mounted on should be open.

3-2 Mounting

3-2-1) The transformer doesn't have a drain tap

- Before mounting the device:



Remove the drain tap

Remove the small float

This allows rapid filling.

3-2-2 With and without drain tap

- Fit the transformer/protection sealing system:
  - flat Viton seal supplied with the device. *Part* **AC101**
- Mount and attach the device:
  - either with the metal hooks supplied with the device.
    Part **AC102** *(4 off)*
- Carefully check that the hooks grip correctly and the flat seal is in the correct position.

Tightening precautions of the HM8 nuts on the attachment hooks:

- Make sure not to tighten the hooks to hard (maximum tighten coupling: 3 m.kg).
- The flange **MUST NOT** be in contact with the top of the transformer tank. The flat Viton seal must stay visible.
- Make sure to tighten each attachment hook one after the other, clockwise. **DO NOT** tighten each hook completely before you proceed to the next. Tighten the first hook a little and proceed to the next. Repeat until all hooks are completely tightened.

3-3 Filling

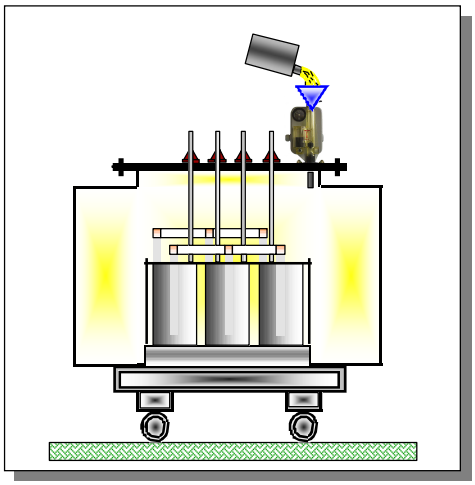
FOR THE FILLING OPERATION, IT IS VERY IMPORTANT:
- TO USE EXACTLY THE SAME DIELECTRIC
- THAT THE DIELECTRIC IS NEW AND HAS BEEN STORED IN A SEALED CONTAINER IN ORDER TO AVOID IT BECOMING DAMP, WICH COULD DAMAGE THE TRANSFORMER.

Before starting, protect the device from any possible accidental spillage of dielectric, especially between the electrical housing and the transparent body.

3-3-1 The transformer doesn't have a drain tap

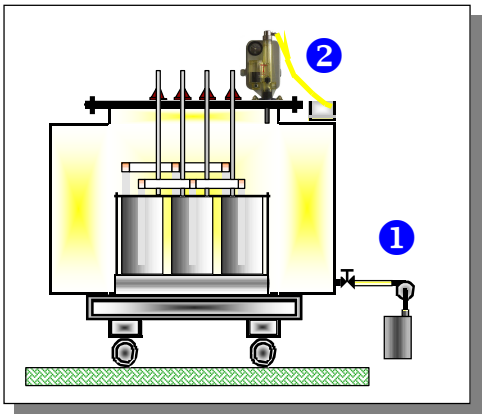
- Using a funnel, fill the protective unit **slowly** to the top.
- Fit the small float.
- Screw in the drain tap.

Note:
We recommend pouring the dielectric in slowly to avoid introducing too much air into it and the transformer by circulation.

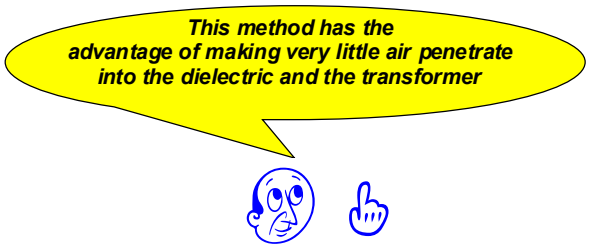


IF THE DEVICE NEEDS TO BE CLEANED AFTER SPILLAGE OR OVERFLOW, DO NOT USE PRODUCTS CONTAINING ALCOHOLS, EVEN IN VERY LOW QUANTITIES (E.G. GLASS CLEANING PRODUCTS).
OTHERWISE THE TROGAMID BODY WILL LOSE ITS TRANSPARENCY, THEN IT WILL CRACK AND EVENTUALLY SPLIT, CAUSING LEAKS.

3-3-2 The transformer has a drain tap



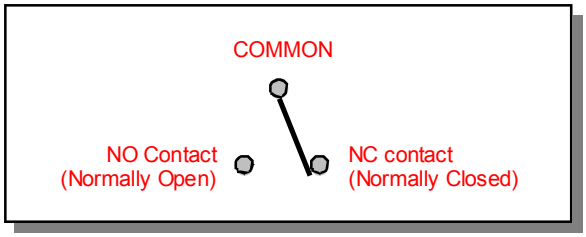
- Fit a pump onto the drain tap (**1**).
- Remove the black plug from the drain tap of the protective unit.
- Open the tap by turning the nozzle in an **anticlockwise direction** (it will screw into the tap body).
- Fit a vinyl tube onto the end of the nozzle. Place the other end of the tube in a recipient, so as to collect any drops during filling (**2**).
- Open the drain tap on the transformer.
- Switch on the pump so as to fill the protective unit slowly then the expansion tank.
- As soon as the dielectric starts running out of the nozzle of the drain tap, close it by turning the nozzle in a **clockwise direction**.
- Stop the pump as soon as the DGPT2 is filled up to its tap.
- Close the transformer drain tap.
- Remove the pump, tube and recipient. Put the black plug onto the tap nozzle.



4 – ELECTRICAL OPERATION

4-1 Preamble

The contacts of the various functions of the DGPT2 are of the "changeover" type. They therefore have a "common" point, a "Normally Closed" contact and a "Normally Open" contact.



They therefore provide the user with the possibility of choosing between "absent" or "emission" operation.

- ***Absent operation*** (also called "*negative safety*")
In this case, the normally closed NC contact of the changeover should be used. It will open when the fault occurs.
In the device, the output from this contact is always cabled with the blue (common) and red (NC) wires.

- ***Emission operation*** (also called "*positive safety*")
In this case, the normally open NO contact of the changeover should be used. It will close when the fault occurs.
In the device, the output from this contact is always cabled with the blue (common) and white (NC) wires.

IN THE FOLLOWING DIAGRAMS, THE CONTACTS ARE SHOWN NOT POWERED AND AT REST, WHICH IS TO SAY NOT UNDER THE INFLUENCE OF THE FAULT SHOWN.

4-2 Operating diagrams

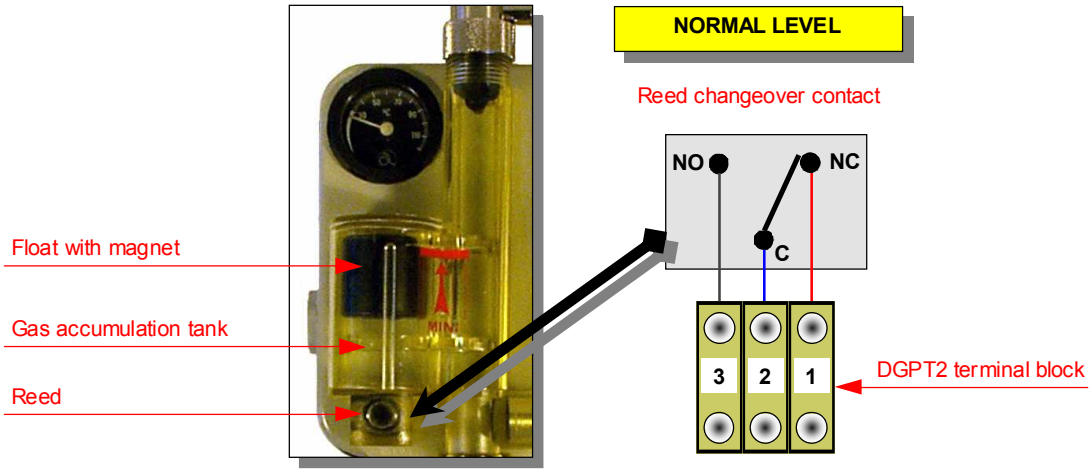
4-2-1 Discharge of gases

- The volume of gas which actuates the contact is determined by its construction. By analogy with the Buccholtz (110 cm^3), the volume varies between 100 and 140 cm^3, depending on the type of dielectric used:

  dielectric density < 1 = volume < 110 cm^3
  dielectric density > 1 = volume > 110 cm^3

- In the case of gases being discharged, the gas takes the place of the dielectric in the DGPT2 tank, causing the level to drop.

- **Option 2GD**: with a dielectric density of ± 0.8, the first contact actuates between 90 and 95 cm^3, the second contact between 130 and 140 cm^3.



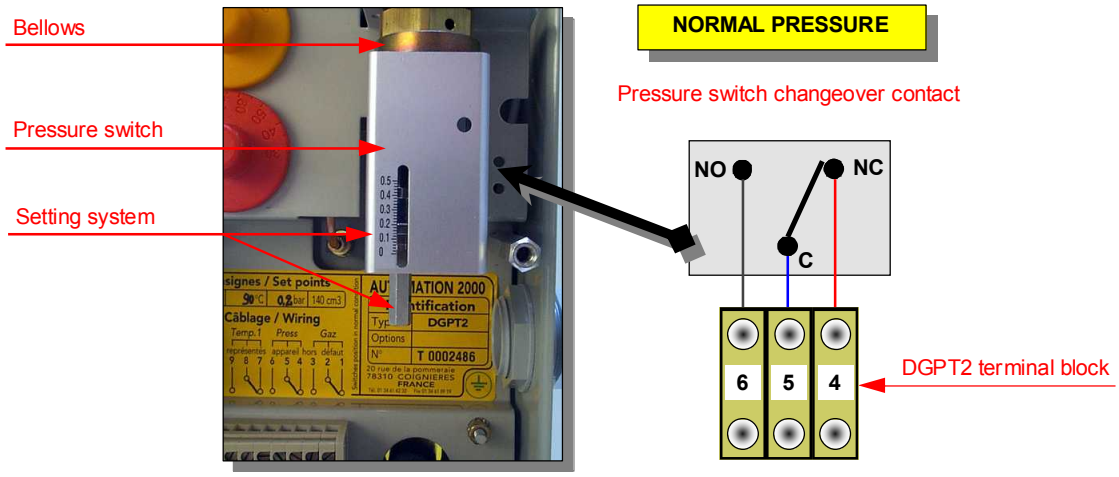
- When the float is between **3** and **5** mm above the bottom of the tank, the magnet moves the reed contact from **NC** to **NO** by magnetism (**open** between **1** and **2**, **closed** between **2** and **3**).

Remark :
It should be noted that this is **not a permanent contact**. If the level rises in the tank (after bleeding for example), the reed contact will return to its initial position.

4-2-2 Tank pressure

- **Excess tank pressure may be due to:**
  - the transformer being overfilled
  - the dielectric expanding too much
  - a clear short circuit, and the electrical arc formed causes an instantaneous shock wave.
- excess pressure is detected by a **direct action bellows pressure switch**. It is linked to the pressure in the transformer tank by means of a capillary tube welded into the **pressure insert** (**MC103**).
- the tank excess pressure set point **is not defined by Automation 2000 but by the transformer manufacturer**. A "customer" technical specification provides this value.
- when a transformer is updated by adding a **DGPT2** to it, it is supplied with a **standard setting of 0.2 bar**, unless requested otherwise.
- **Reminder of the characteristics of the pressure switch:**
  - very short response time: **5 milliseconds**
  - **linear** system
  - fidelity and repeatability
  - due to its linearity and accuracy, the **set point can be set or reset by the user without any special tools being required.**
  - the setting system can be lead sealed.
  - display accuracy: **± 0.05 bar**
  - accuracy: **± 2 %** of the full scale (**0.01 bar**)
  - scale: **0 - 0.5 bar**

IN ALL CASES, WE RECOMMEND THAT YOU CONTACT THE MANUFACTURER OF THE TRANSFORMER FOR THE EXACT VALUE OF THE EXCESS PRESSURE SET POINT (DEPENDENT ON THE ELASTICITY OF THE TANK).



- When the tank pressure reaches the reference value displayed (±0.01 bar), the pressure switch contact moves from the **NC** to the **NO** position (**open** between **4** and **5**, **closed** between **5** and **6**).

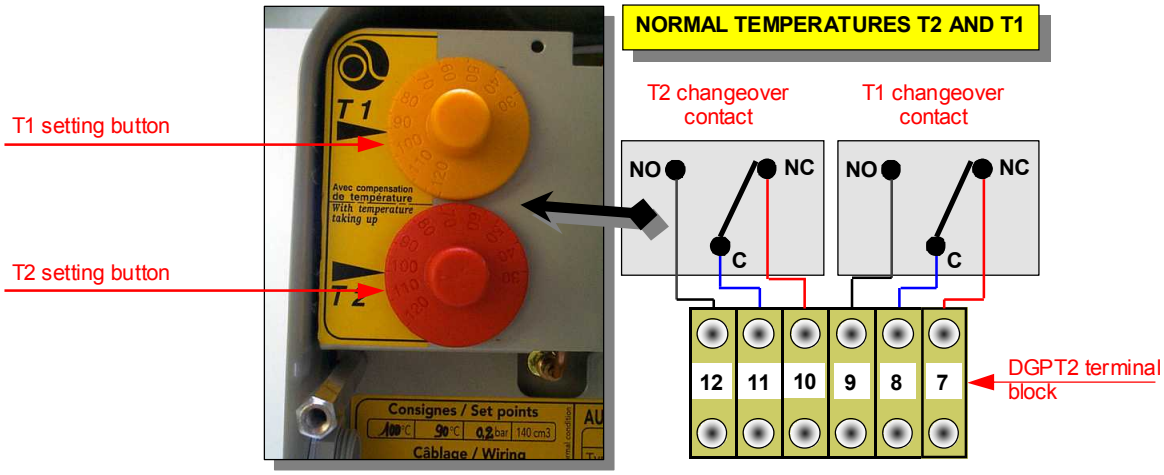
  Remark :
  This is ***not a permanent contact***. When the excess pressure disappears (after bleeding or when the dielectric cools down for example), the contact returns to its initial position.

4-2-3 Dielectric temperature

- **The increase in temperature may be due to:**
  - an electrical fault causing localised heating
  - intensive use of the transformer (above the service conditions recommended by the manufacturer).
- The temperature is monitored by 2 independent bulb/capillary and liquid expansion type thermostats, with **temperature compensation**.
- The bulbs are housed in the well of the attachment flange, which is permanently immersed in the dielectric.
- The temperature set points **are not defined by Automation 2000 but by the transformer manufacturer**. A customer technical specification defines these values.
- When the transformer is updated by adding a **DGPT2**, it is supplied with the following **standard settings**:

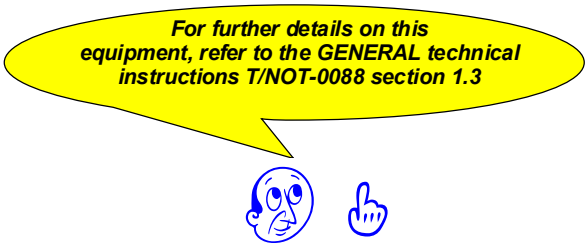
  90 °C for T1
  100 °C for T2

IN ALL CASES, WE RECOMMEND THAT YOU CONTACT THE MANUFACTURER OF THE TRANSFORMER FOR THE EXACT VALUE OF THE TEMPERATURE SET POINT.



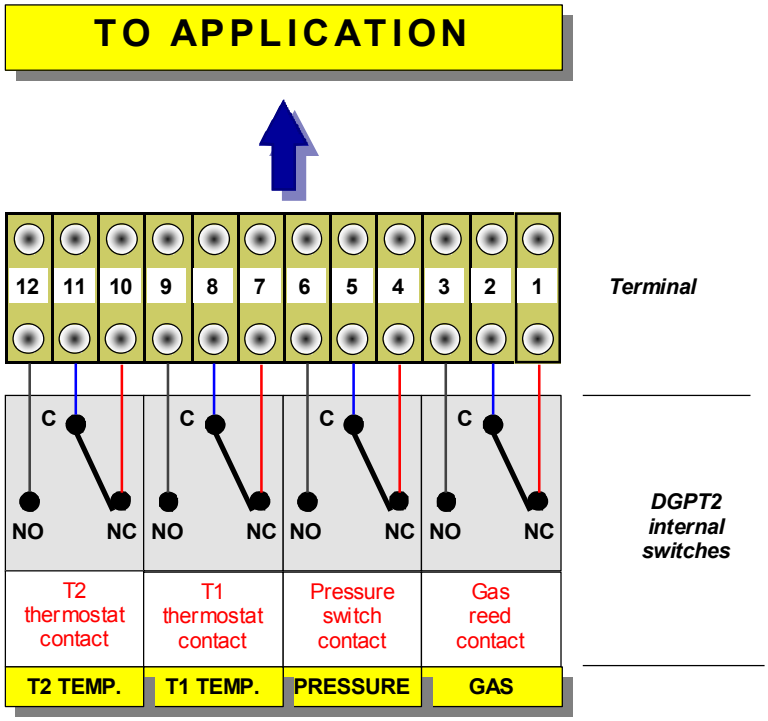
- When the dielectric temperature reaches the set point displayed (±2.5°C), the **T1** thermostat contact moves from the **NC** to the **NO** position (**open** between **7** and **8**, **closed** between **8** and **9**).
- When the dielectric temperature reaches the set point displayed (±2.5 °C), the **T2** thermostat contact moves from the **NC** to the **NO** position (**open** between **10** and **11**, **closed** between **11** and **12**).

Remark:
This is **not a permanent contact** for T1 or T2. When the excess temperature disappears (when the dielectric cools down for example), the contact returns to its initial position.



4-3 Connection diagram

IN THIS DIAGRAM, THE CONTACTS ARE SHOWN NOT POWERED AND AT REST, WHICH IS TO SAY NOT UNDER THE INFLUENCE OF THE FAULT SHOWN.



4-4 Sectioning capacity

FUNCTIONS	CURRENT (ON RESISTIVE LOAD)				
	ALTERNATING	DIRECT			
	250V-50HZ MAX.	24V	48V	110V	220V
DISCHARGE OF GASES	0,25A	1A	1A	0,2A	0,1A
EXCESS PRESSURE	5A	2A	3A	0,5A	0,25A
TEMPERATURES	8A	4A	4A	1A	0,5A

4-5 Attributions of the contacts

This section can also be found in the **GENERAL** technical instructions **T/NOT-0088**.

Our device provides you with non-polarised dry electrical contacts, whose function is attributed by yourself to protect and monitor your transformer, in compliance with the standards and decrees in force.

WARNING !
AS WE HAVE NO INFORMATION ON THE ENVIRONMENT BEFORE OR AFTER THE TRANSFORMER, IT IS IMPOSSIBLE FOR US TO DEFINE A STANDARD USE FOR THE THREE DGPT2 FUNCTIONS PREVIOUSLY DESCRIBED, EITHER AS AN ALARM OR TO TRIGGER.

However…
We can provide, **simple logical advices** as to the possible attribution of the functions.

4-5-1 Discharge of gases

In general, this is a slow phenomenon. An alarm would therefore appear to be sufficient in order to check the transformer on site (if possible) and carry out work if required.
In the case of a very violent discharge, the excess tank pressure will act before it.
However, the NF C 13-100 and NF C 13-200 standards provide for it as a trigger, referring to the Buccholtz, which has no excess tank pressure contacts. (Furthermore, these standards refer to transformers with expansion tanks and completely filled transformers).

4-5-2 Excess tank pressure

A very large and rapid phenomenon, it may be advisable to use it as a trigger.

Which triggers ?

As this phenomenon generally occurs in the case of serious damage, it would seem logical to isolate the transformer so that the fault is no longer powered.

Which level ?

- The standard recommends that a transformer should not be cut off when under load, so therefore the secondary then the primary should be cut off (**NF C 13-100 and NF C 13-200**).
- If either (or both) of the circuits is not equipped with controlled isolating devices, the user must use the equipment as best as possible, or make the required modifications to the automated system.
- In all cases, a high sectioning capacity fast-blow fuse is obligatory (**NF C 13-200, section 551**).
- In the case of automatic cut off of the secondary winding and on a back-up system, it must be ensured that the secondary winding of the transformer cannot be powered again by a transformer in parallel.

4-5-3 Temperatures

T1: the first temperature threshold can be used as an alarm in order to warn the user that the transformer is operating close to its nominal power rating (**guarantee level**).

T2: the second threshold has to protect the transformer against use beyond the maximum temperature defined by the manufacturer.
In general, it will be used as a trigger on the consumption side (there is no thing to prevent it being used to cut off the primary winding supply as well).

REMINDER :
THE SOLUTIONS CHOSEN AND ADOPTED BY THE CUSTOMER OR ITS SUB-CONTRACTOR COMMITS THEIR RESPONSABILITY.
UNDER NO CIRCUMSTANCES CAN AUTOMATION 2000 BE HELD RESPONSIBLE IN THE CASE OF PROBLEMS, BEYOND THE DEVICE'S DRY CONTACT OUTLET TERMINALS.

5 - TESTS

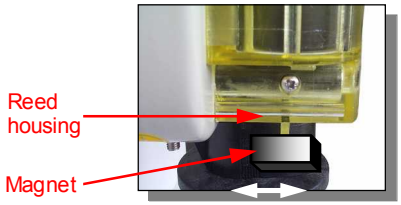
AS RECOMMENDED BY THE STANDARD, FUNCTIONAL AND ELECTRICAL TESTS MUST BE CARRIED OUT BEFORE FINAL COMMISSIONING.
(REFER TO SECTION 2-3, PAGE 11)

BEFORE CARRYING OUT THE TESTS:

- Ensure that the power supply to the transformer is switched off.
- Check the cabling carefully.
- Check that the servo units are powered so that the loops can be tested up to the final element (LED, etc. for alarm function, and the various actuators for trigger function).

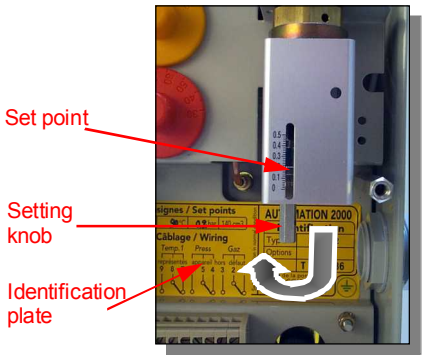
5-1 Discharge of gases

Element concerned: **reed contact PL513**
Moving a magnet under the reed housing will change the position of the changeover contact.
Check that the loop is operating correctly.



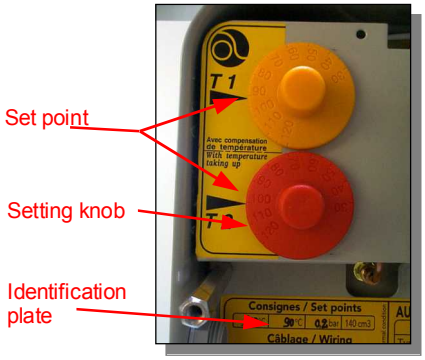
5-2 Excess tank pressure

Element concerned: **pressure switch PL136**
Using a spanner, turn the setting knob in the direction shown by the arrow to bring the reference value to zero.
The changeover contact changes position.
After checking that the servo loop is operating correctly, reset the set point to the value marked on the identification and connection plate **PL132**.
***Warning*: this test is completely impossible to do with the PM1 or PM2 options.**



5-3 T1 temperature

Element concerned: **thermostat PL205**
Turn the setting knob **PL206** to below the 30°C graduation.
The changeover contact changes position.
After checking that the servo loop is operating correctly, reset the set point to the value marked on the identification and connection plate **PL132**.



5-4 T2 temperature

Element concerned: **thermostat PL205**
Same comments as for "T1 temperature".

6 – TROUBLESHOOTING

BEFORE CARRYING OUT ANY WORK ON YOUR TRANSFORMER:
CONTACT THE MANUFACTURER
- BY OBLIGATION, IF IT IS STILL UNDER GUARANTEE
- BY PRUDENCE, IF IT IS NO LONGER UNDER GARANTEE

6-1 Problem area: discharge of gases

6-1-1 Question #1

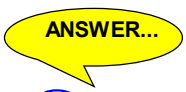
Every time the transformer is switched on, the "gas discharge" contact moves to the fault position then returns to its normal position.
In addition, no gas is observed in the body of the device (the large float is at the top of its tank).

On certain transformers, the magnetic losses when switching on (especially under no or little load) can be sufficient to actuate the reed of the DGPT2.
In general, this change of position does not last longer than 10 ms, which is to say the time of one half cycle in 50 Hz, which often makes the problem difficult to pinpoint.

Solution:
*- Fit **anti-magnetism shielding** (item **AC201**. see section 2-4-5, page 15).*
Fitting it does not require any modification to the DGPT2 or special tooling and it is totally effective.
To fit it, refer to the technical instructions T/NOT-0085 appended to this document.

6-1-2 Question #2

When testing the DGPT2 and the associated servo systems, the "gas discharge" contact switches to its fault position and stays there.
No gas is observed in the body of the device (the large float is at the top of its tank).
Following this anomaly, the actuation of the contact is tested again using a magnet, as described on page 28 (section 5-1).
It is observed that the contact does not change position any more and remains closed in the fault position.



When testing, voltage or current surges can occur, most often caused by defective equipment, or cabling or relay errors.
Long cables can also caused current surges if switching takes place.
Routing low voltage servo cables with power cables (motor power supply, transformer power, etc.) often leads to significant interference by electrical and electromagnetic induction.
These different phenomena lead to the contacts of the reed sticking or being welded.

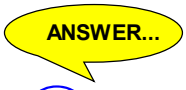
Solution:
- Firstly check the cabling, the servo systems associated to the DGPT2 and the cable routing if necessary.
- If the contact is simply stuck together, simply testing the reed with a magnet will free them.
*- If the contact is welded, the **PL513** reed contact must be changed.*

*The reed can be changed quickly and easily by the user. (Refer to the technical instructions **T/NOT-0085**).*

To change the reed:
- Contact us so that we an send you a new reed. The fitting instructions are enclosed with it.

6-1-3 Question #3

The gas discharge contact shows a fault.
The presence of gas in the tank can be observed in the body of the DGPT2 (the large float is at the bottom of its tank).



The device has operated correctly !
Now it is just a question of determining whether the gas is caused by decomposition or simply air.

Solution:
- Inform the transformer manufacturer.
- Depending on the reply received, take a sample of the gas and have it analysed.
- send the manufacturer the results and follow the manufacturer's advice.

***If it is just air**, and you are authorised to do so, you can bleed the device and thus cause the level in the body to rise again.*
If the level does not rise (cold ambient temperature and low transformer load), the level can be raised without adding dielectric by creating a slight negative pressure inside the DGPT2 using a bicycle pump with an inverted membrane.

Moving the tap
The DGPT2 tap can be used to bleed it and take samples.

1 - Remove the black plug and the lock pin (see parts list). **2** - On the threaded journal of the tap, mount your sampling system if required. **3** - Open the tap by turning it in an **anti-clockwise direction. 4** - It must be screwed into the body of the tap. Sample as required then close the tap by turning it in a **clockwise direction**. Wipe, fit the pin and screw on the black plug.

1

3

4

6-2 Problem area: excess tank pressure

6-2-1 Question #4

The excess tank pressure contact shows a fault.
The phenomenon occurs frequently, as soon as the transformer reaches its operating temperature.
The contact returns to normal when the transformer cools down.

There may be two causes to this problem:

1 - The transformer the device is mounted on has a rigid tank and is not suitable for complete filling.
The expansion of the dielectric therefore causes excessive pressure in the tank.
It is essential that the transformer is not used in these conditions.
The transformer needs to be modified in order to be used.
Solution:
*- Contact the transformer manufacturer and read the **General** technical instructions **T-NOT-0088** carefully.*

2 - Dielectric has been added when not required, in incorrect conditions.
The expansion of the dielectric therefore causes excessive pressure in the tank.
Solution:
- Contact the transformer manufacturer.

6-3 Miscellaneous

6-3-1 Question #5

The body of the device has become matt or opaque in certain areas. In addition, fine cracks can be seen on the surface of the Trogamid.
No deposits of products which could damage the transparency of the body are observe. Is the device UV resistant ?

*As explained in section 2-1-2, page 9, **Trogamid T is impervious to UV light.***
*However, it is rapidly degraded by **alcohols**. Even an **atmosphere heavy with alcohol vapours** will create a similar result.*
First of all, the surface attacked becomes opaque, then fine cracks appear which in turn lead to increasingly deeper splits and finally by the rupture of the material.
Dielectric leaks then occur.
***Note:** the symptoms described of matt or opaque appearance do not occur everytime and depend above all on the type of alcohol used. (For example, isopropyl alcohol only causes cracks and splits).*
(Refer to section 2-1-2, page 9).

Solution:
Unfortunately, the only solution is to change the device, if the damage is already done.
*If this is caused by a deposit, when cleaning, **ensure that the product used is completely free from any type of alcohol whatsoever.***

7 - MAINTENANCE

USUALLY THE DGPT2 DOES NOT REQUIRE ANY SPECIAL MAINTENANCE.

7-1 The transparent body

In very polluted or intensive agricultural atmospheres, successive layers of deposits can make the body of the device less transparent.
If this is the case, clean it carefully with a product which is totally free from any alcohol whatsoever (***refer to 6-3-1 Question #5, answer***).

7-2 The dielectric level in the body

The level can fluctuate according to the ambient temperature and the operating temperature of the transformer.
The fluctuations are of low amplitude and **there is no need to add dielectric as soon as the level drops.**
However, if the level drops far enough to cause a "gas discharge" fault, inform the transformer manufacturer (***refer to 6-1-3 Question #3, answer***).

7-3 Annual check

If your automated systems and safety devices need to be checked once a year, we inform you that **there is no problem in testing** the DGPT2 contacts and the set points, which **can easily be reset by the user** (***refer to section 5, page 28***).

8 - GUARANTEE AND AFTER-SALES SERVICE

8-1 Guarantee

This equipment has a three year parts and labour guarantee, parts must be delivered to our workshops.

8-2 After-Sales Service

No work is carried out by Automation 2000 on transformers on site.
A telephone help line is at your service from 9 a.m. to 5 p.m. for all technical or sales enquiries.

9 - APPENDIX

T/NOT-0085 **Changing the reed contact**

T/NOT-0100 **Fitting the anti-magnetism shielding**

AUTOMATION 2000
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CHANGING THE REED CONTACT
(December 1996 model)
ITEM NUMBER: **PL513**

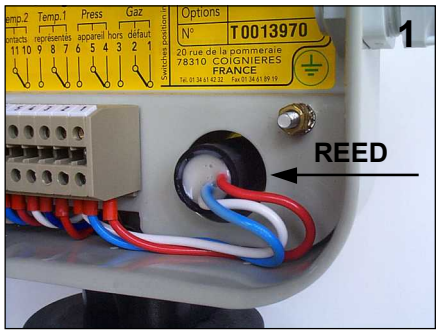
Caution

Before carrying out any work in the electrical unit of the DGP or the DGPT2, ensure that the power supply to the contacts of the device has been switched off.
Any work carried out when the device is powered could cause an electrical shock which is dangerous for the user.

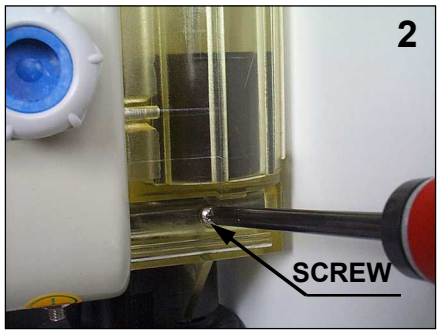
Warning

If the cause of the destruction of the reed has not been determined:
firstly, carefully check the circuit to which the bulb is connected to avoid the new reed being destroyed.

PROCEDURE



After removing the cover, disconnect the reed wires

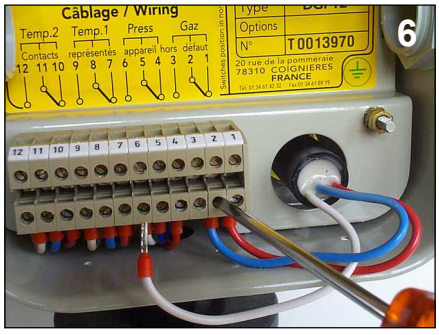


Using a Phillips screwdriver, loosen off the lock-screw until the reed holder tube is

Remove the reed by pulling it towards you from the inside of the housing.

Fit the new reed in the housing and push it right in.

Fit the lock-screw and tighten until the reed is held securely in its housing and does not move.



Wire the reed as follows:
red wire : terminal 1
blue wire : terminal 2
white wire : terminal 3

Put the wires inside the housing and fit the cover.

The operation of the reed is checked by moving a magnet underneath the reed housing (approximately where the lock-screw is situated). If switching does not occur, check that the reed is fitted in the correct position (pushed at the bottom of its housing).

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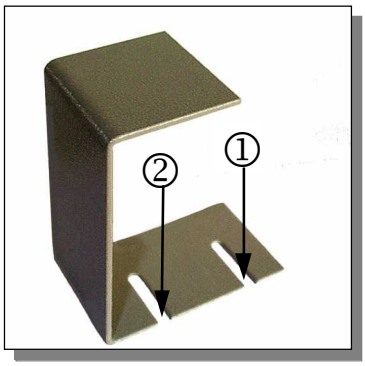
FITTING THE ANTI-MAGNETISM SHIELDING
ITEM NUMBER: **AC201**

What is the role of the anti-magnetism shielding ?



It is possible that when powered up, in exceptional cases, with the transformer under load or not, that an alarm or unexpected triggering occurs due to the gas discharge reed.

This temporary phenomenon (flicker of the reed) is caused by the magnetic field emitted by the transformer.

It can be easily eliminated by fitting anti-magnetism shielding (see photo opposite) to the protection unit.

This operation does not require any modifications to be made to the device or special tooling.

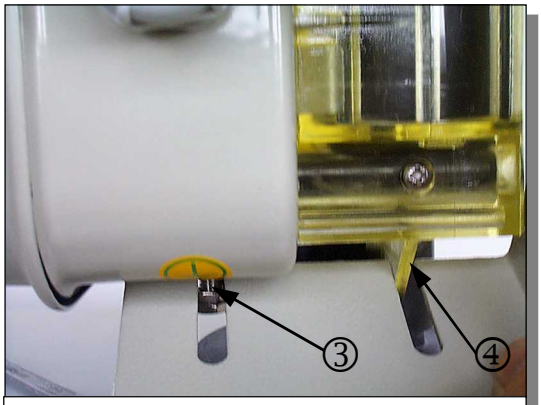
The anti-magnetism shielding is available on request from Automation 2000.

PROCEDURE

❶

Unscrew the two nuts on the earth screw of the housing by approximately 5 mm.

❷

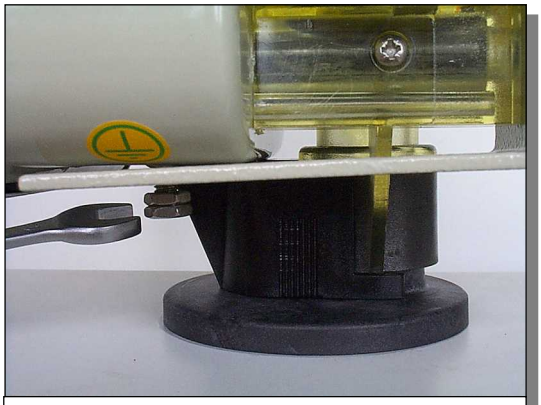


Position the shielding:
- slot 1 should be aligned with the earth screw (**3**)
- slot 2 should be aligned with the rib on the body of the device (**4**)

❸

Insert the shielding as shown.
Ensure that the top of the shielding touches the top of the cylindrical body.

❹



Finish by tightening the two nuts on the earth screw.

TESTS ON THE SPOT

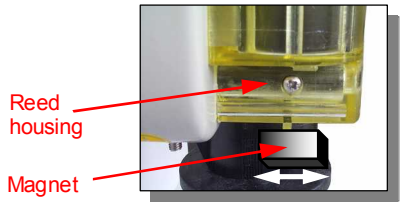
AS RECOMMENDED BY THE STANDARD, FUNCTIONAL AND ELECTRICAL TESTS MUST BE CARRIED OUT BEFORE FINAL COMMISSIONING.
(REFER TO SECTION 2-3, PAGE 11)

BEFORE CARRYING OUT THE TESTS:

- Ensure that the power supply to the transformer is switched off.
- Check the cabling carefully.
- Check that the servo units are powered so that the loops can be tested up to the final element (LED, etc. for alarm function, and the various actuators for trigger function).

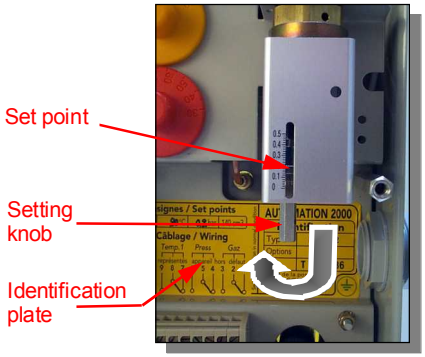
Discharge of gases

Element concerned: **reed contact PL513**
Moving a magnet under the reed housing will change the position of the changeover contact.
Check that the loop is operating correctly.



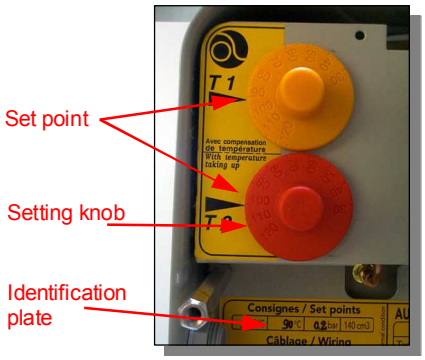
Excess tank pressure

Element concerned: **pressure switch PL136**
Using a spanner, turn the setting knob in the direction shown by the arrow to bring the reference value to zero.
The changeover contact changes position.
After checking that the servo loop is operating correctly, reset the set point to the value marked on the identification and connection plate **PL132**.
Warning: **this test is completely impossible to do with the PM1 or PM2 options.**



T1 temperature

Element concerned: **thermostat PL205**
Turn the setting knob **PL206** to below the 30°C graduation.
The changeover contact changes position.
After checking that the servo loop is operating correctly, reset the set point to the value marked on the identification and connection plate **PL132**.



T2 temperature

Element concerned: **thermostat PL205**
Same comments as for "T1 temperature".

WARNING…

WHEN YOU MAKE TESTS BY SHUNTING THE TERMINALS, YOU ARE TESTING THE CABLE AND NOT THE DGPT2 !