D.M.C.R. Protection Relay for Oil Transformer

DMCR - Detection, Measurement and Control Relay for Hermetically Sealed Oil Transformer

Content

Introduction to D.M.C.R.

The ***DMCR*** is a protection relay designed for the ***hermetically sealed oil immersed transformers*** without gas cushion. This device enables complete control of the tank's internal parameters, i.e. ***pressure***, ***temperature***, ***oil level*** and ***gas detection***.

Fitted directly to the transformer cover, this relay ensures ***protection against internal faults***, prolonged overvoltages and fire risks associated with the use of inflammable dielectric fluids.

The accessory continuously monitors:

1. Dielectric fluid level,
2. Tank internal pressure,
3. Dielectric fluid temperature at two different thresholds.

To operate properly, the protection relay mustbe ***fully filled with fluid*** (*level higher than the float visible in the transparent section of the unit*). If this is not the case, check the instructions which appear inside each casing.

To ensure optimum protection, the following action and adjustments are recommended:

Finding	Recommended adjustment	Fault detected	Action to be taken
Gas emitted or drop in level	Large float at the top	Serious fault	De-energize unit
Pressure switch	0.20 bar	Serious fault	De-energize unit
Thermostat threshold 1	90°C	Overvoltages	Activate alarm
Thermostat threshold 2	100°C	Overvoltages	De-energize unit

There are two types of transformers:

1. The air-cooled transformer, also called dry transformer
2. The oil immersed transformer. The transformer is immersed in an oil-filled tank.

The ***DMCR*** is a protection relay designed for the hermetically sealed oil immersed transformers without gas cushion. This device enables complete control of the tank's internal parameters, i.e. ***pressure***, ***temperature***, ***oil level*** and ***gas detection***.

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Faults detected on live transformer unit

1. Dielectric fluid level is detected as low

The protection relay is empty and the large float is at the bottom.

May be due to:

1.1 Air entering

There must be a dielectric fluid leak and thus oily stains should be visible on the ground. Accurately localise the fault, carry out repair, then recheck the level with the body of fluid at a temperature of 20°C, before switching the unit live again.

1.2 Internal gas emission

Gas should be ***sampled using a syringe*** and then analysed.

Whilst awaiting results, under no circumstances should the transformer be switched live again because a risk of total destruction exists.

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2. Overheating is detected

This may be due to:

1. Improper cooling of the transformer (insufficient air flow around unit or plan-troom ventilation),
2. Continuous overvoltage.

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3. Excess pressure is detected

This may be due to:

1. Overheating
2. Internal gas emission
3. Topping up of dielectric fluid with the body of fluid below 20°C; drain the over-flow with the transformer de-energised and the dielectric fluid at 20°C.

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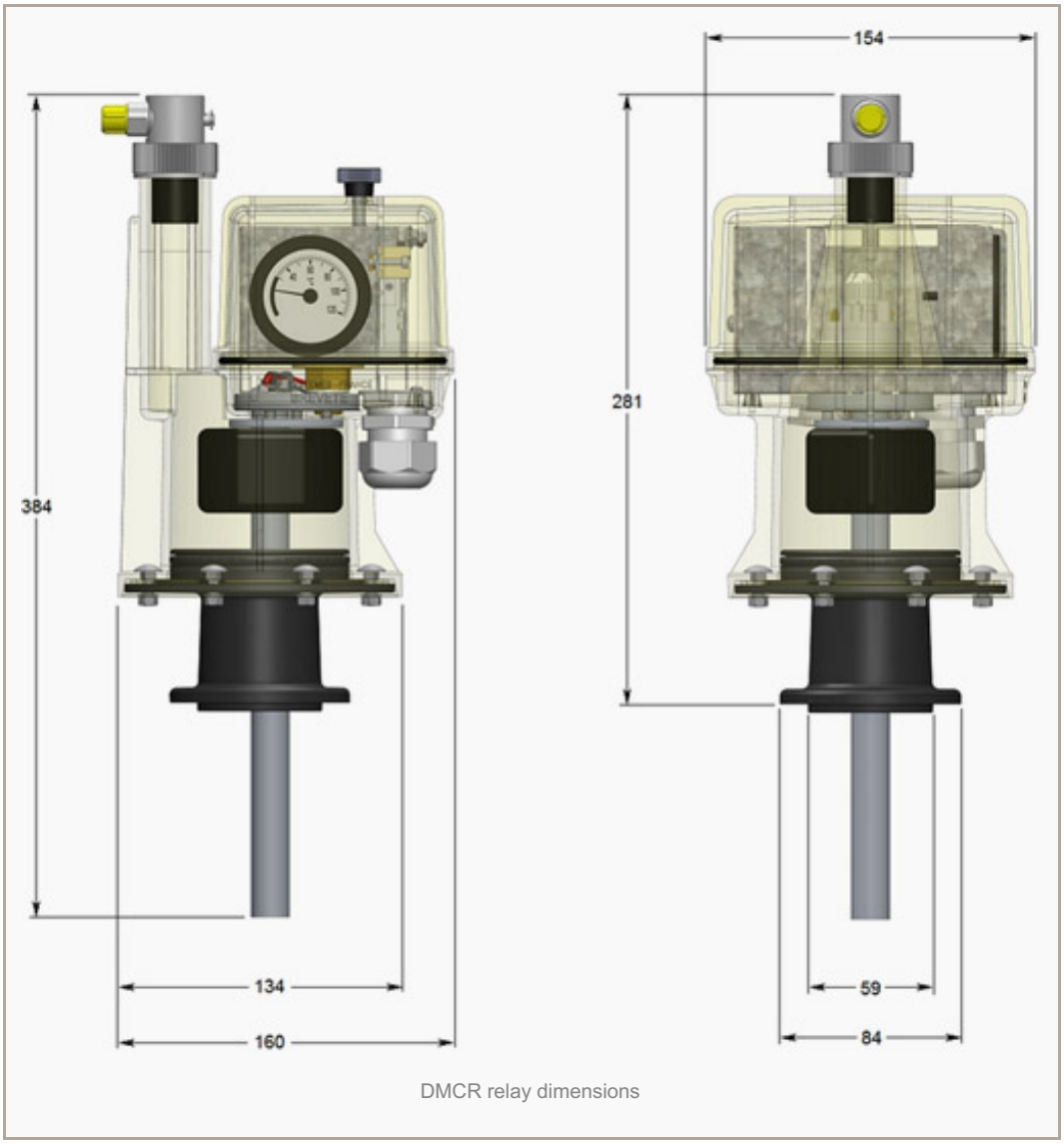
Standards

This protection relay has been designed according to the European standard ***EN 50216-3***, specification which came into action on the 5th of June 2002.

This standard applies to protection relays for hermetically sealed oil immersed transformers, (*in accordance with the EN 60076 standard*) and induction coils (*in accordance with the EN 60289 standard*) without gas cushion for an indoor or outdoor use.

The DMCR relay is an IDEF Systemes design, made in France. It has two French and one European patents.



DMCR relay dimensions

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Possibilities of D.M.C.R.

1. Oil level control and gas detection

The DMCR enables to control both the oil level and the presence of gas inside the transformer's tank. The DMCR body is a small see-through tank fitted ontothe transformer's tank.

Should gas form inside the transformer, it will then accumulate inside the DMCR and cause the oil level to drop.

Visual information

The level drop is first visible through the lowering of the small red float inside the upper part of the DMCR, followed by the lowering of the main red float.

The ***360 degree visibility*** is a specifically designed and patented system.

Electrical information

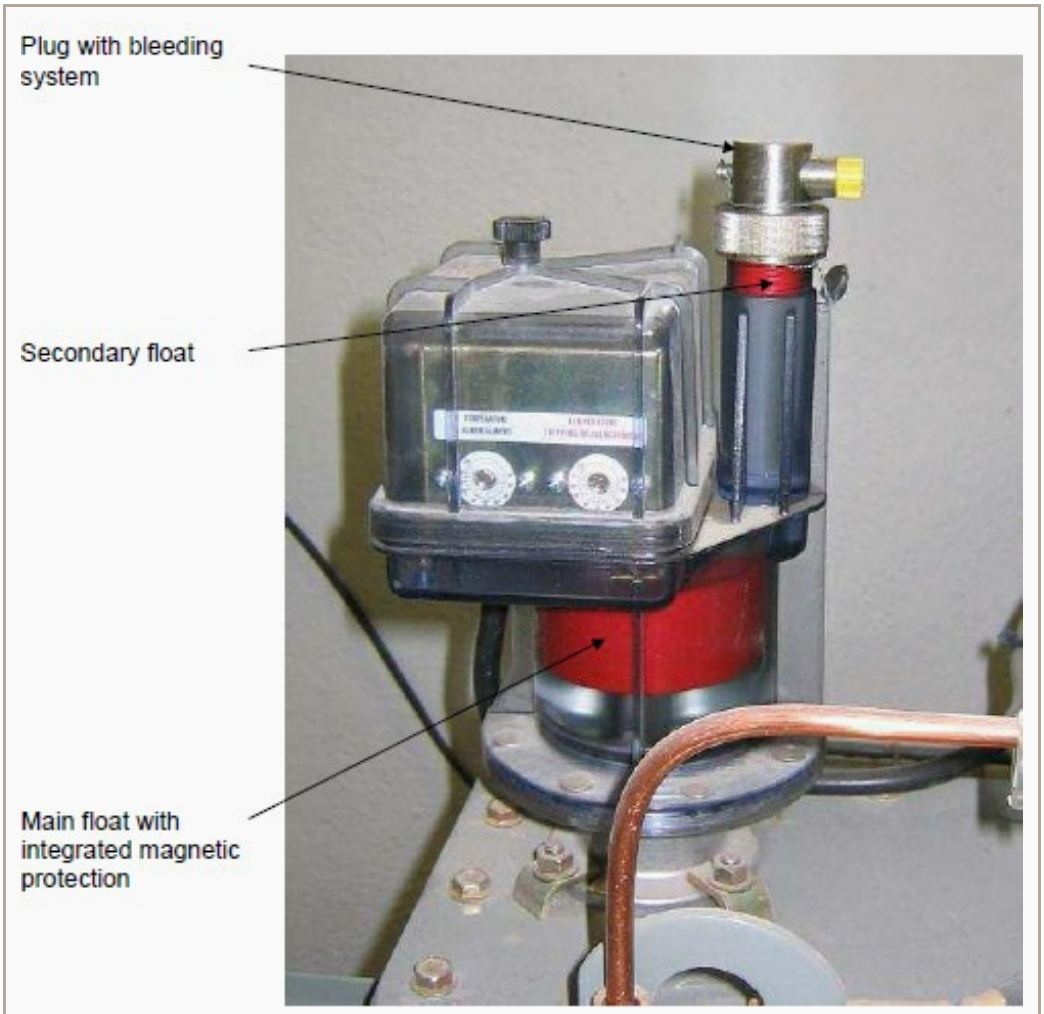
A circular magnet is fitted in the main float and it acts upon a ***magnetic changeover contact*** (*REED switch*) sitting inside the brass tube that runs through the float. The lowering of the float triggers the activation of an electrical contact, through the magnet's motion.

A bleeding system facilitates gas collection inside the relay so that one can analyze it and understand the reason for its presence. The bleeding system has a male G1/8'' thread, accordingto the standard.

For the oil level and gas detection control, the contacts have been chosen in order to use the REED switch's working contact when the float is in a high position. This means that, in such a position, i.e. with a normal oil level and therefore normal conditions of use, the contact has already switched.

This is a positive safety system. With this method, any potential damage to the switch is immediately spotted.

The DMCR below is filled in with oil: the main float and the secondary float are both in high position.



The DMCR - Oil level control and gas detection

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2. Pressure control

Pressure inside a transformer's tank can increase significantly when:

1. There is a temperature rise due to the transformer charge: oil expands and pressure increases
2. An internal short-circuit occurs and provokes an oil temperature rise.

An adjustable pressure captor detects ***overpressure in the transformer's tank***. It features a changeover contact actuated by a soft membrane which deforms under pressure.

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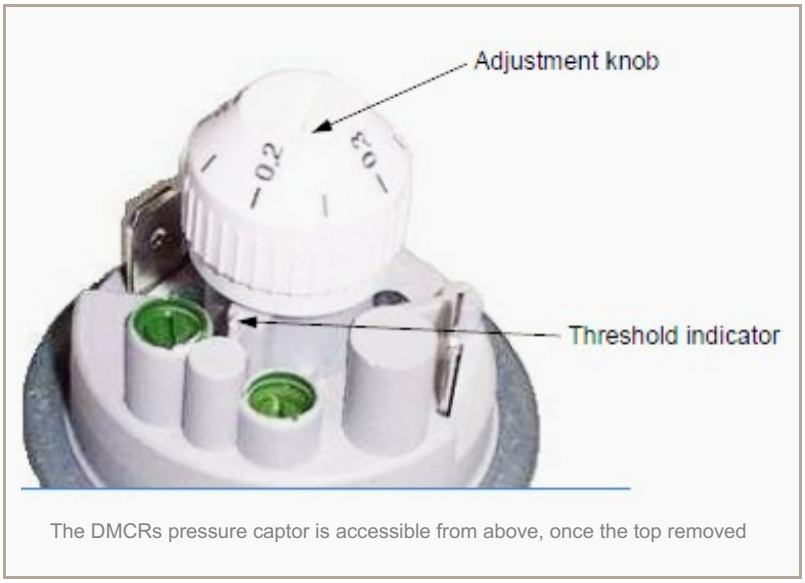
3. Temperature control

Visual check:

A needle thermometer indicates the temperature inside the transformer.

Electrical check

Two identical ***adjustable thermostats*** detect potential over-heating inside the transformer.

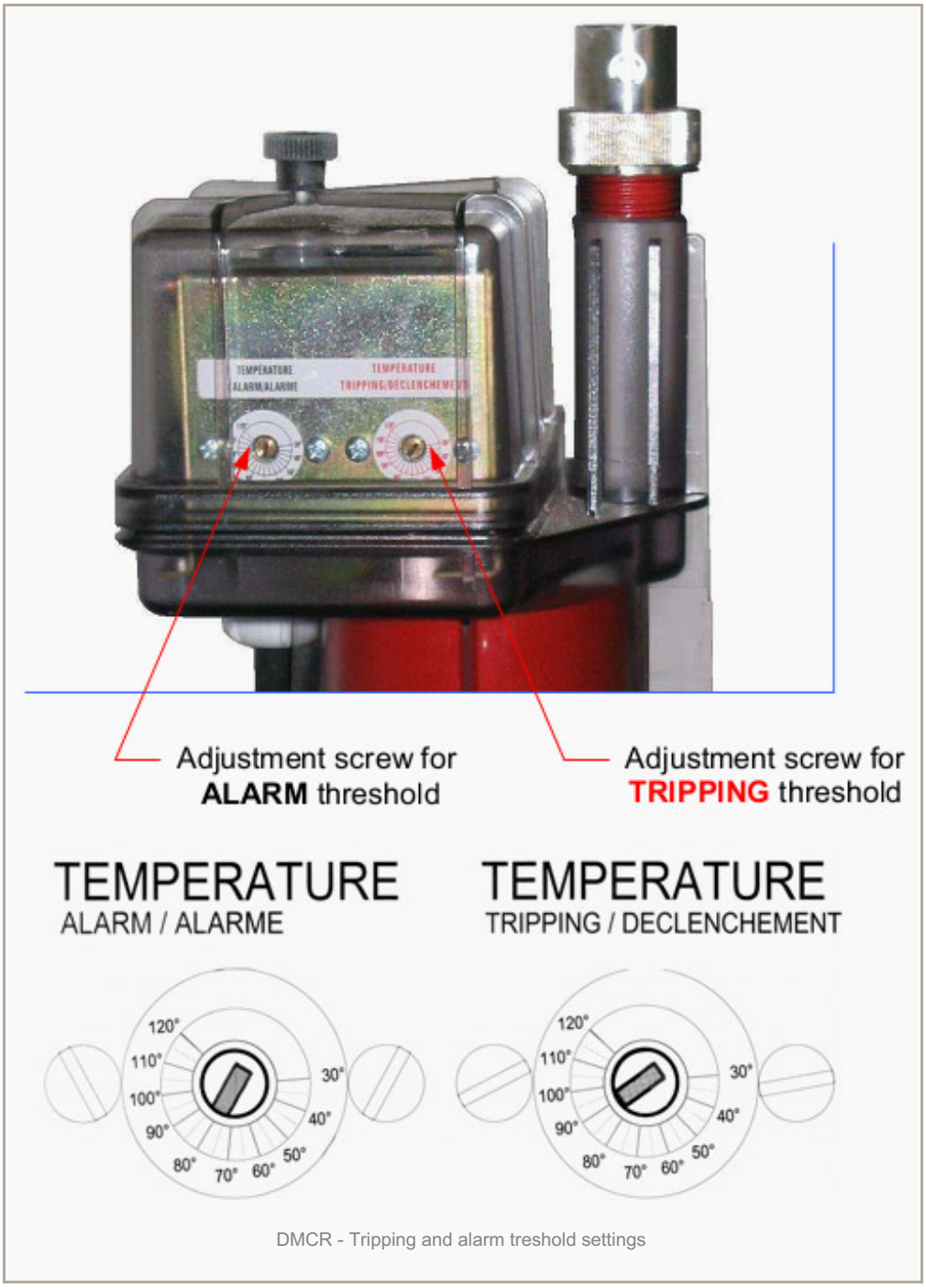


The DMCRs pressure captor is accessible from above, once the top removed

The thermostats feature a changeover contact actuated bya diaphragm linked by a capillary tube to a temperature probe sitting deep inside the central brass tube, which is immersed in the transformer's tank. The capillary tube and probe are filled in with a liquid which expands proportionally to the temperature surrounding the probe.

The ***ALARM*** thermostat detects a primary temperature threshold.

The ***TRIPPING*** thermostat detects a secondary temperature threshold, superior to the first.



DMCR - Tripping and alarm treshold settings

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Resources:

- *MINERA Transformer Installation guide – Schneider Electric*
- *DMCR relay – IDEF Systems*

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About Author //

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Edvard - Electrical engineer, programmer and founder of EEP. Highly specialized for design of LV high power busbar trunking (<6300A) in power substations, buildings and industry fascilities. Designing of LV/MV switchgears. Professional in AutoCAD programming and web-design. Present on

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3 Comments

1. *Teguh Santoso*

   Oct 20, 2014

   DCMR is the same as DGPT, right?

   (reply)

2. *The most common accessories you can find on oil filled transformer | EEP*

   May 16, 2014

   […] an absence of transformer protection relay. I have written about it few times about a year ago (read here and here). Oil conservator is considered as a standard part of transformer, so not an […]

   (reply)

3. *Olarotimi*

   Jan 29, 2014

   Thanks

   (reply)

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+ 4 = ten