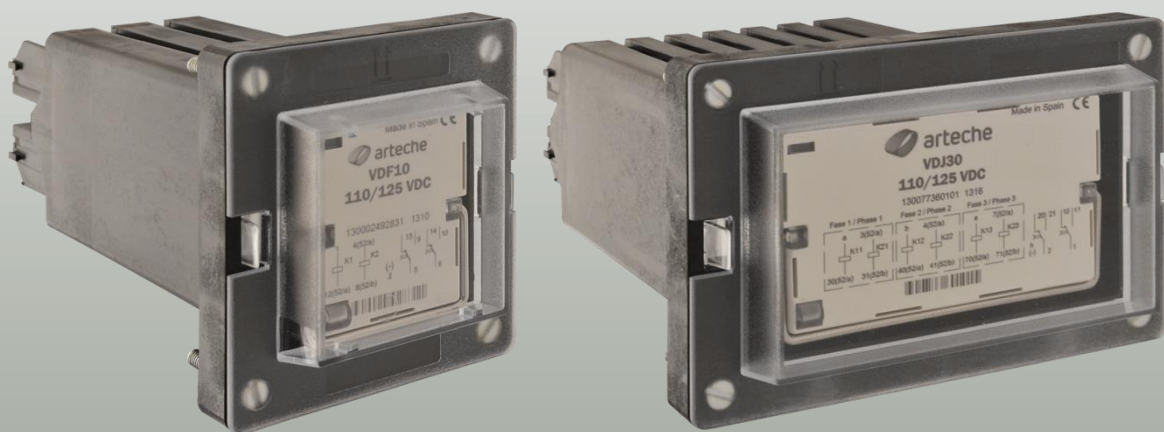


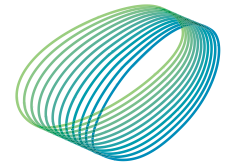
arteche

Circuit Breaker Supervision Relay

VDF-10 / VDJ-30

User's Handbook (General Model)





arteche

651.601.429

Rev: 1.1

Int. Ref.: V 3.0

Date: 03/09/2013

© Electrotécnica Arteche Smart Grid, S.L.

This document, including texts, photos, graphics and any other content, is protected from unauthorized use under international copyright law. Any unauthorized copying, downloading, republication, or other use of the referenced materias, without the prior written authorization of ARTECHE, is strictly prohibited.

The information in this document is subject to change without notice and should not be considered as a commitment by ARTECHE.

Chapter 1. Object.....	4
Chapter 2. Range.....	4
Chapter 3. Operating principles	4
3.1. Circuit breakers and their applications	5
Chapter 4. Reception & Storage.....	5
Chapter 5. Operational characteristics.....	6
5.1. Supervision Functions.....	6
5.2. Relay indicators	7
Chapter 6. Functional diagram.....	8
Chapter 7. Operation.....	8
7.1. Supervision with the CB closed.....	8
7.2. Supervision during Trip	11
7.3. Supervision with CB open and protection trip contact closed	12
7.4. Supervision with CB open	13
Chapter 8. Technical characteristics	14
Chapter 9. Tests	15
9.1. EMC Tests.....	15
9.2. Climate & Electrical Safety Tests	17
Chapter 10. External connections diagram.....	18
10.1. Single-pole supervision relay VDF-10 OP	18
10.2. Three poles supervision relay VDJ-30 OP	18
Chapter 11. Dimensions and types of sockets	19
11.1. Relay VDF-10 OP dimensions.	19
11.2. Relay VDJ-30 OP dimensions.....	19
11.3. Sockets.....	20
Appendix A. Differences with the old VDF-10.....	21

Chapter 1. Object

This manual is intended to help users to operate the **VDF-10 OP** and **VDJ-30 OP** relays which supervise the breaker's tripping and closing circuits.

Chapter 2. Range

The new family of circuit breaker supervision relays is represented with an **OP** and comprises the following models:

- **VDF-10 OP**: Supervision relay of **1** tripping or closing circuit.
- **VDJ-30 OP**: Supervision relay of **3** tripping and/or closing circuits.

Chapter 3. Operating principles

- The **VDF-10 OP** relay is designed to supervise the electrical continuity of **1** circuit (tripping or closing) of a breaker.
- The **VDJ-30 OP** relay supervises individually **3** different coil circuits at the same time. Note that **VDJ-30 OP** guarantees galvanic isolation between the **3** supervised circuits.

The relay supervises the whole tripping or closing circuit regardless of the status of the breaker (open or closed). The circuit(s) wiring is supervised from the positive supply to the negative supply whilst the circuit breaker is open or closed.

*NOTE: All the information in this document referring to the **VDF-10 OP** model may be applied to the **VDJ-30 OP**, except when it is specified the opposite.*

3.1. Circuit breakers and their applications

Single-pole circuit breaker: it usually operates with two tripping coils and one closing coil. Each bay contains 3 single-pole breakers, one per phase. When a single-phase fault occurs, a single-pole breaker opens the affected phase separately, without needing to open all the phases and enabling a single-phase reclosing.

→ **Possible application:** supervision of **3** circuits (one per phase) by **VDJ-30 OP** relay.

Three-pole circuit breaker: it usually operates with two tripping coils and one closing coil. When a fault occurs, the three-pole breaker opens the three phases at the same time.

→ **Possible applications:** supervision of **1** circuit (tripping or closing) by **VDF-10 OP** relay. Another option is the use of **VDJ-30 OP** relay in order to supervise the **3** circuits (two tripping and one closing) of the three-pole breaker.

Chapter 4. Reception & Storage

The **VDF-10 OP**, (**VDJ-30 OP**) supervision relay is supplied with packaging capable of protecting it during normal handling for equipment of this type.

If it is not to be installed immediately, it should be kept in the packaging, properly closed and in indoor conditions, protected from rain, dust, vibration, etc.

If the packaging is damaged or it is believed that the unit may have been incorrectly handled in transit, the carrier, the relevant insurance company and the manufacturing plant should be informed forthwith.

Check also that the data on the ID plate matches the order data.

Chapter 5. Operational characteristics

5.1. Supervision Functions

The **VDF-10 OP** relay features the following functions:

- VDF-10 OP relay monitors the supply and correct state of fuses or miniature circuit breakers of the circuit. An alarm will be initiated if the supply falls below the assigned drop-out voltage (see table on page 8).
- With the CB (circuit breaker) in the open and closed position, the VDF-10 OP relay supervises:
 - The tripping/closing circuit wiring
 - The CB's tripping/closing coil
 - The CB's 52a and 52b auxiliary contacts (See diagrams in section 6)

The supervision is carried out with a small current that flows through the supervision-circuit in series with the coil of the circuit breaker. **The supervision current is always lower than 1.4 mA.** This makes the **VDF-10 OP** relay suitable for the supervision of circuit breakers with low power consumptions, down to 4.5 W. **Therefore, external current limiting resistors are not required because those resistors are already considered internally in the VDF-10 OP relay scheme.**

- Indicates if the tripping/closing coil fails to respond to a tripping/closing command.
- **The operation time of the circuit breaker must be lower than 500 ms.** If it is higher, the **VDF-10 OP** relay will drop off and indicate a circuit failure.
- **In normal conditions the VDF-10 OP cannot produce misoperations due to the high impedance of its supervision circuit. Measures are taken to avoid a short-circuit in the supervision module by integrating a fuse which melts avoiding an unwanted operation.**
- The **VDF-10 OP** allows a latched protection trip contact (trip contact from a lock-out relay). (See condition 7.3.; section 7).

5.2. Relay indicators

Correct operation of the **VDF-10 OP** is shown via:

- An illuminated green LED. Check different LED indicator configuration available for VDF-10 supervision relay.
- Two potential-free change-over contacts (5-9-and 6-10).

Both contacts and the LED are connected in series and therefore synchronized.

LED configuration options for one phase relay VDF-10 OP.

- VDF-10 OP. --- Correct operation is shown via an illuminated green LED in the bottom left.

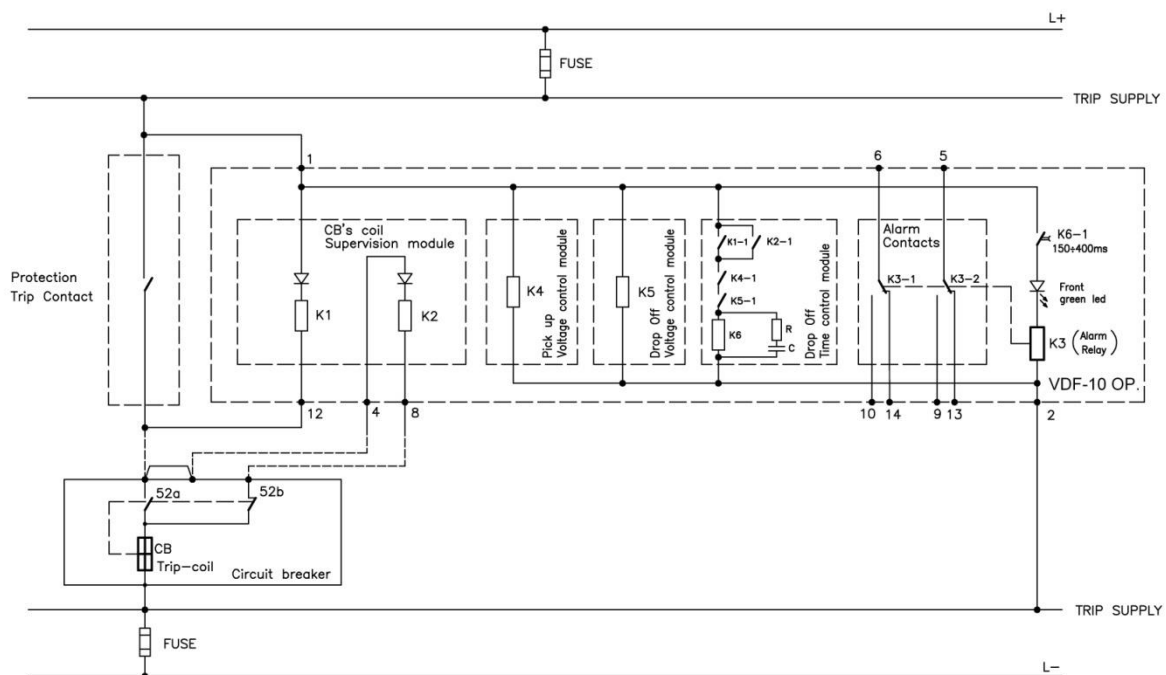


Fig. 1. Green LED shows the VDF-10 OP2 correct operation, the red LED shows a loss of continuity.

- VDF-10 OP1. Correct operation is shown via an illuminated red LED in the bottom left.
- VDF-10 OP2. ---Correct operation is shown via an illuminated green LED in the bottom left. In case of loss of continuity, after 500ms, a red LED is illuminated in the upper left as an alarm.

Chapter 6. Functional diagram

The connection diagram below shows the **VDF-10 OP** with the complete trip circuit up to the trip coil of the circuit breaker.



The contacts in the diagram above are shown without an auxiliary supply.

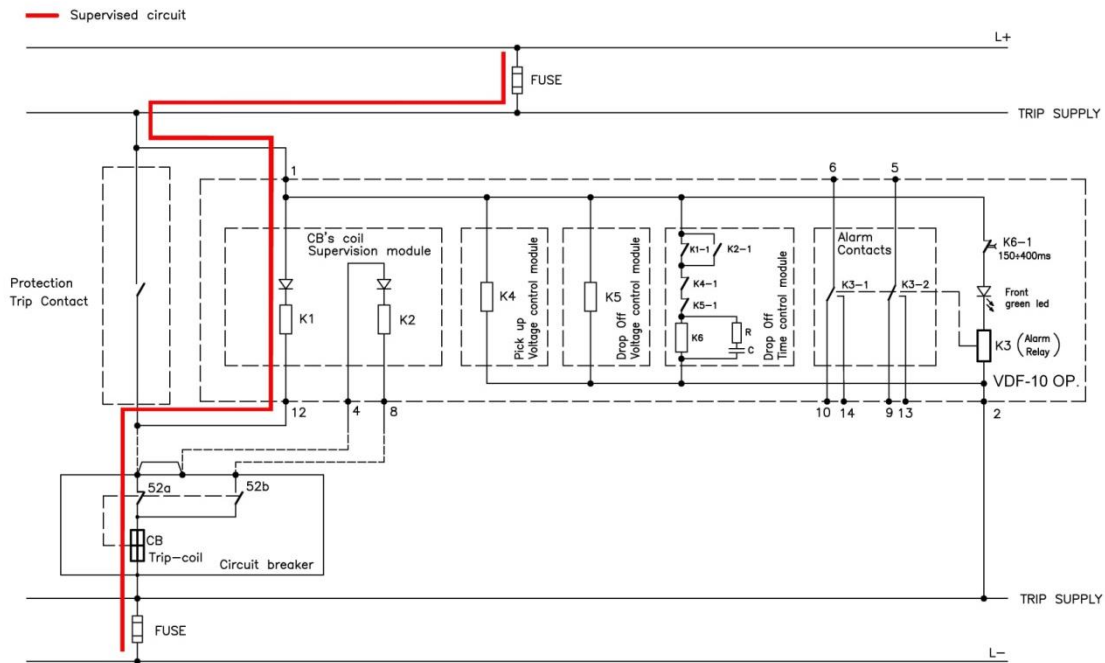
Chapter 7. Operation

The LED is on and both contacts are in close position (terminal 5-9 and 6-10) whenever the trip circuit is healthy.

The supervision is performed under the 4 possible conditions described in the following pages.

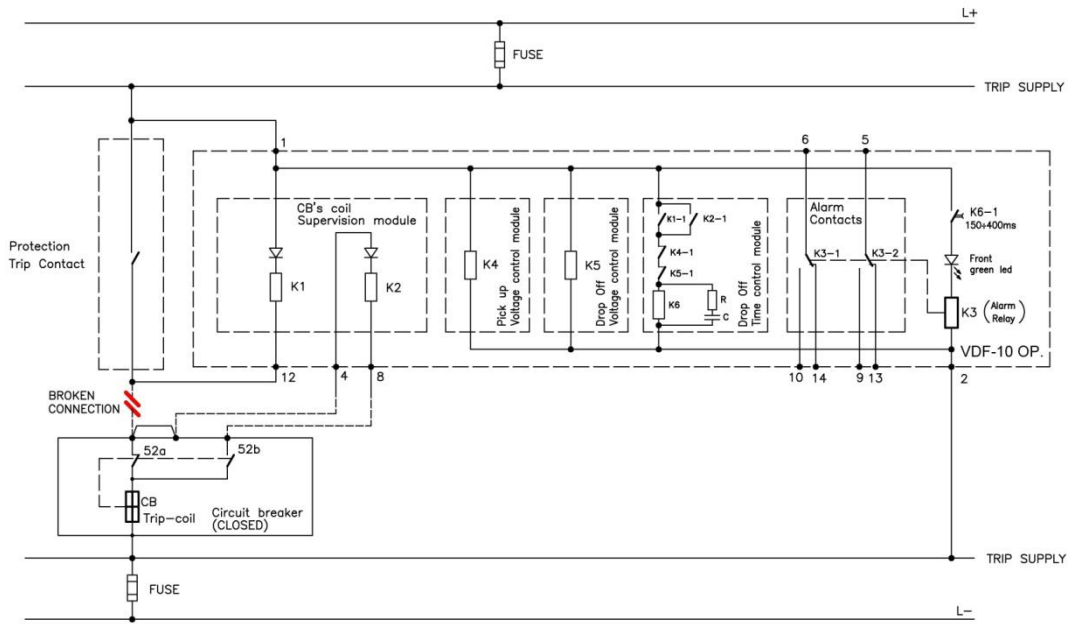
7.1. Supervision with the CB closed

The supervision circuit is indicated (via K1, 52a and the CB coil). K2 is not energized.



Different situations that can occur:

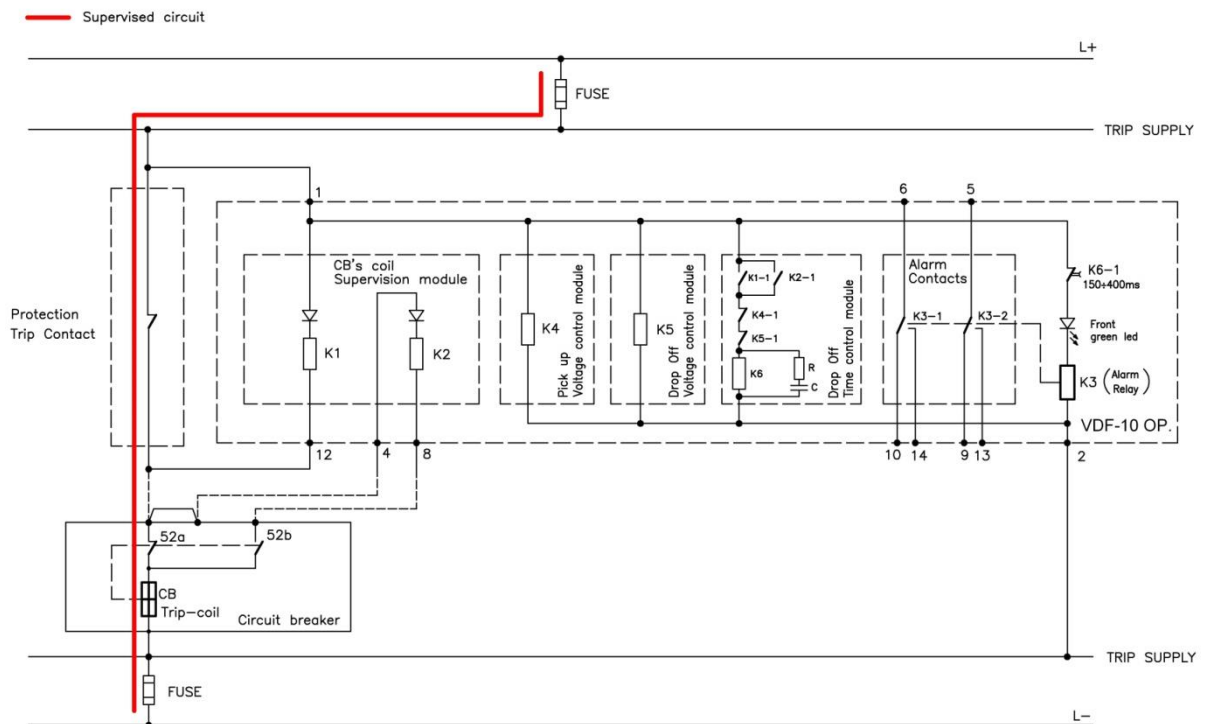
1. If the trip supply falls below the assigned drop-off voltage, the drop-off voltage control module, will detect it. Therefore K5 will drop-off and this will lead to the de-energization of K6 and K3 after 500 ms. This will result in a trip circuit supervision alarm.
2. In case of a broken connection in the supervision circuit, K1 will drop off and this will lead to the de-energization of K6 and K3 after 500 ms. This will result in a trip circuit supervision alarm.



7.2. Supervision during Trip

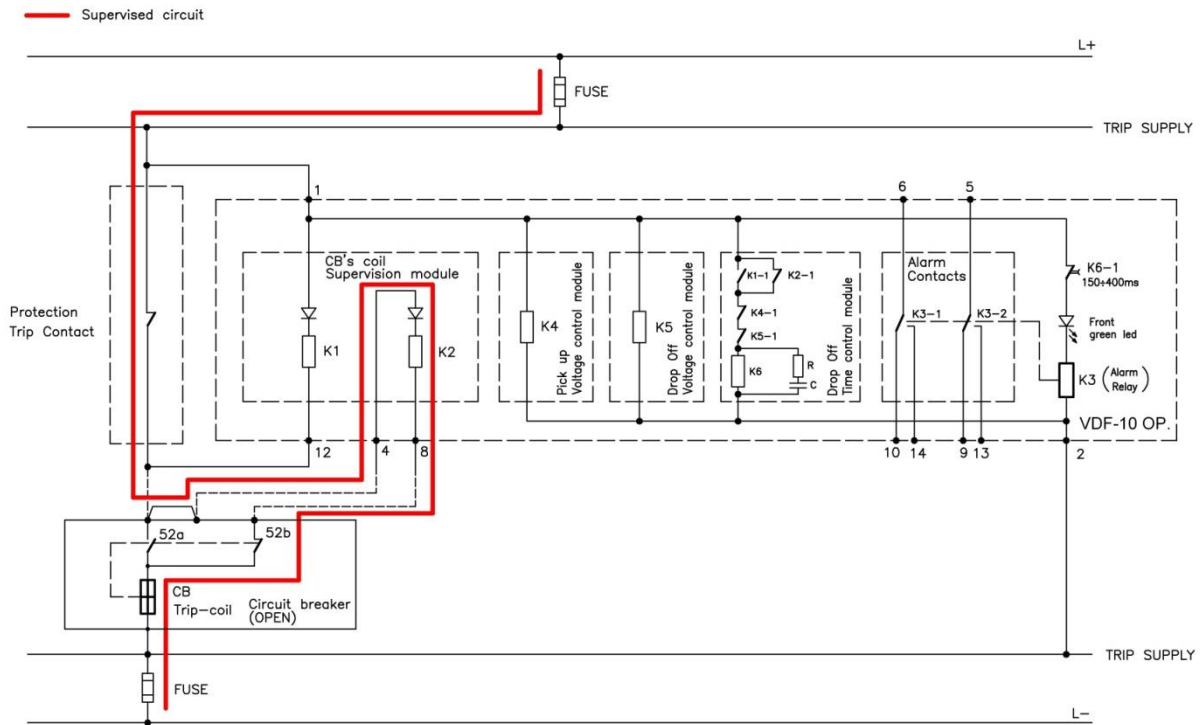
In this situation the trip contact of the protection relay and the circuit breaker are closed. The supervision circuit is indicated (via 52a and the CB coil). K1 and K2 are not energized.

The operation time of the CB must be less than 500 ms, in order to avoid the drop off of the relay. K6 is kept energized with an internal capacitor and therefore also the LED and K3 remain energized. This will avoid an unwanted alarm during operation.



7.3. Supervision with CB open and protection trip contact closed

Trip contact is still closed in this situation although the CB has already opened. The supervision circuit is indicated (via K2, 52b and the CB coil). K1 is not energized.

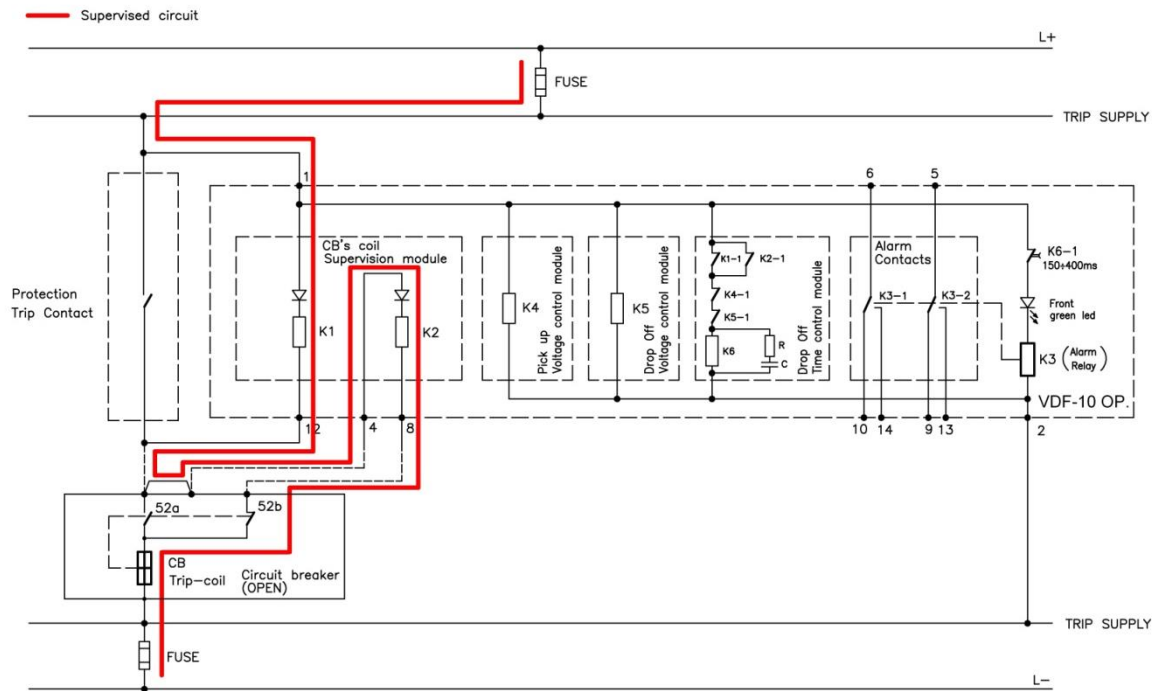


In this situation the trip contact can remain closed, e.g. if the protection relay trip contact belongs to a lock-out relay.

In this case, the trip contact remains closed until the trip was recognized and the lock-out relay would be reset.

7.4. Supervision with CB open

In this situation the trip contact of the protection relay and the circuit breaker are open. The supervision circuit is indicated. K1 and K2 are energized.



The following table resumes the four situations explained before (The situation of K1 y K2 would be in the trip circuit normal working conditions):

Situation	Trip Contact	CB Status	K1	K2
7.1.	O	C	H	L
7.2.	C	C	L	L
7.3.	C	O	L	H
7.4.	O	O	H	H

- C: CLOSED
- O: OPENED
- H: Energized
- L: De-Energized

Chapter 8. Technical characteristics

→ Standard voltages and consumption:

U_N [Vdc]	Voltage range [Vdc]	Consumption	Impedance per phase (kOhms)	Pick up • Drop out voltage [Vdc]
24/30	18-33	32 mA	20	between 12 and 18V
60	42-66	18 mA	44	between 36 and 42V
110/125	77-138	18 mA	94	between 66 and 77V
220	154-242	13 mA	200	between 132 and 154V

→ Drop-out time: between 200 ms and 400 ms

→ Contacts:

→ Permanent current: 8A

→ Instantaneous current: 15A

→ Making capacity: 15A/4 s

→ Breaking capacity: 0,3A/110 Vdc

→ U_{max} , opened contact: 250 Vdc/400 Vac

→ Mechanical life: 10^7 operations

→ Operating temperature: -10°C +55°C

→ Storage temperature: -30°C +70°C

→ Operating humidity: 93%/40°C

Chapter 9. Tests

9.1. EMC Tests

→ High frequency 1MHz burst disturbance test:	EN 60255-22-1
	1 MHz, 400 imp/s, 2 s
→ Common mode:	2,5 kV
→ Dif. mode:	1 kV
→ Electrical Fast transient burst	EN 61000-4-4
	4 kV / 2,5 kHz, 1min
	2 kV / 5 kHz, 1min
→ Impulse test voltage (surge)	EN 61000-4-5
	1,2/50 μ s.(voltage)
	8/20 μ s.(current)
	1,2/50 μ s.(voltage)
→ Common mode	2 kV
→ Differential mode	1 kV
→ Radiated electromagnetic field	EN 61000-4-3
	80-1000 MHz, 10V/m,
	80% AM (1 kHz)
→ Radiated electromagnetic field from digital radio-telephones	EN 61000-4-3
	900 MHz \pm 5 MHz, 10 V/m,
	50%(200 MHz)
	1.89 GHz \pm 10 MHz, 10V/m,
	50%(200 MHz)

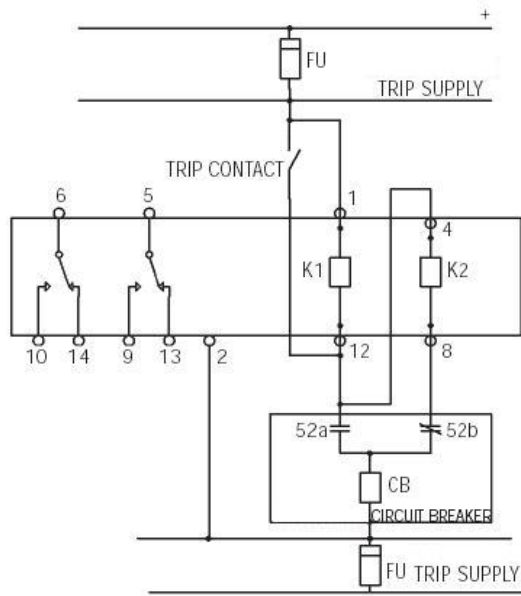
→ Conducted disturbances induced by Radio-frequency fields	EN 61000-4-6 0,15-80 MHz 80% AM (1kHz) 10 V
→ Electrostatic discharges	EN-61000-4-2
→ Contact	±15 kV
→ Air mode	±15 kV
→ Power frequency magnetic field	EN 61000-4-8
→ During 1min	100 A/m
→ During 1 s	1000 A/m
→ Emissivity test	EN 55011 / A Class
Cover:	30-230 MHz, 40dB(μV/m) (quasi peak)-10m 230-1000 MHz, 47dB(μV/m) (quasi peak)-10m
Power supply:	0,15-0,5 MHz, 79dB(μV)(peak)/66dB med. value 0,5-5 MHz, 73dB(μV) (peak)/60dB med. value 5-30 MHz, 73dB(μV) (peak)/60dB med. Value

9.2. Climate & Electrical Safety Tests

→ Electrical tests:	IEC 60255-5
→ Dielectric test	2 kV / 50 Hz / 1 min
→ Surge withstand	5 kV / 1,2 / 50 μ s
→ Insulation	> 2000 M Ω / 500 Vcc
→ Inflammability tests:	IEC 60692-2-1
→ Plastic materials	UL94: VO
→ Cover protection degree:	IEC 60529, EN 60529: IP 40
→ Climate tests:	IEC 60068-2
→ Cold temperature	-10° C
→ Dry heat test	+55° C
→ Heat shock	-25° C, +70° C

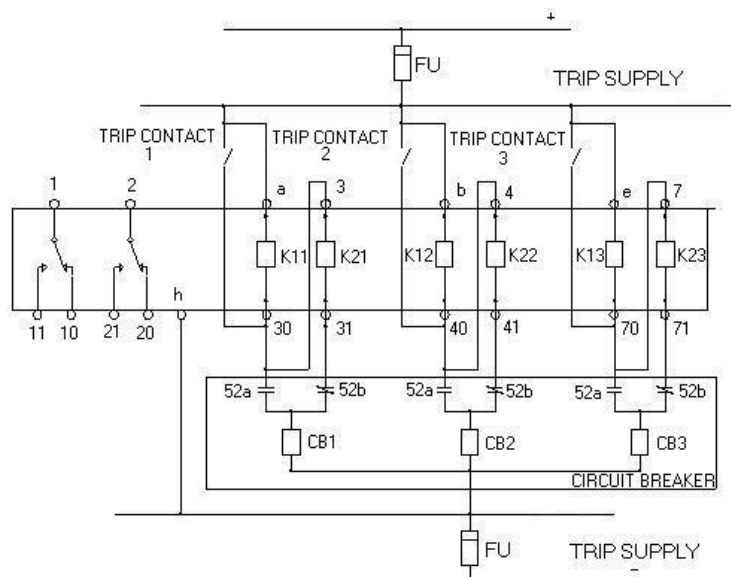
Chapter 10. External connections diagram

10.1. Single-pole supervision relay VDF-10 OP



Note: Contacts are represented without auxiliary supply in the relay

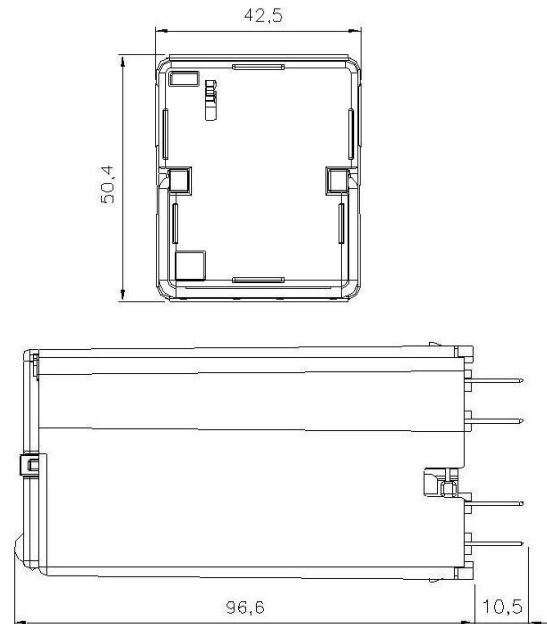
10.2. Three poles supervision relay VDJ-30 OP



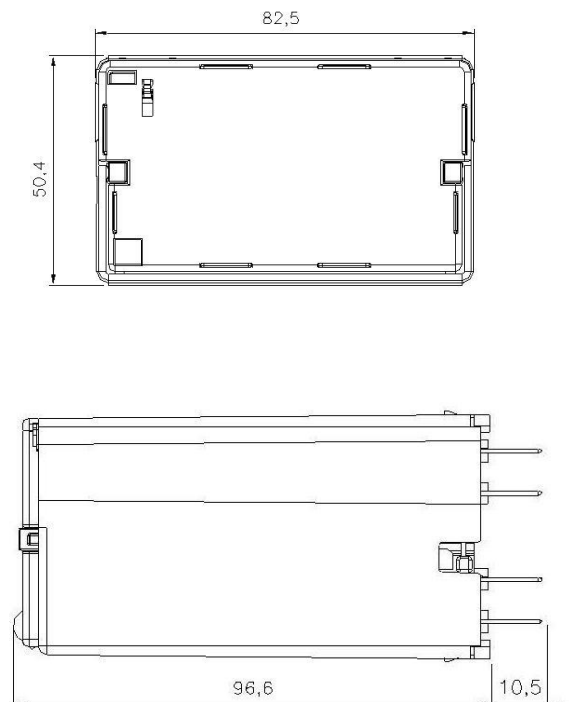
Note: Contacts are represented without auxiliary supply in the relay

Chapter 11. Dimensions and types of sockets

11.1. Relay VDF-10 OP dimensions.



11.2. Relay VDJ-30 OP dimensions

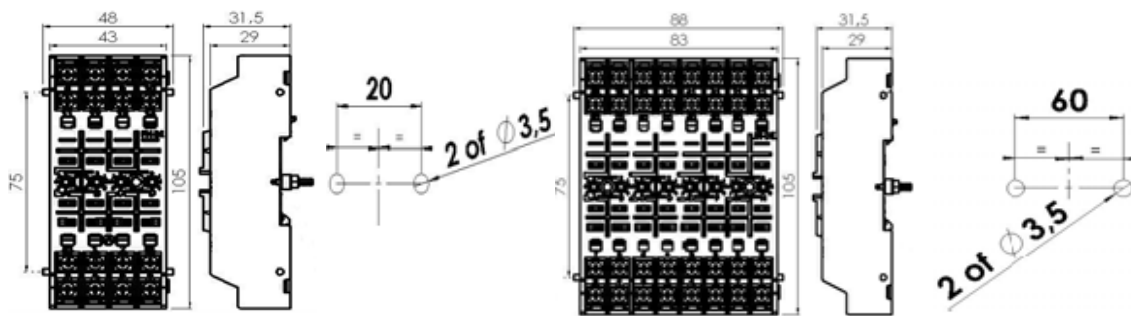


11.3. Sockets

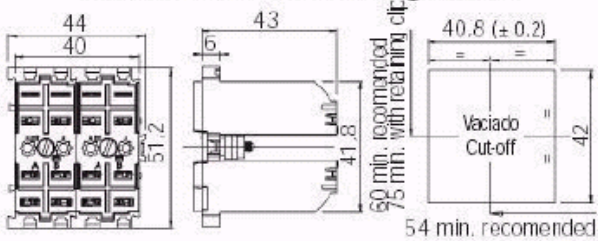
	VDF-10 OP		VDJ-30 OP	
	Screw	Double Faston	Screw	Double Faston
Front connection	FN-DE IP10	FN-DE2C IP10	JN-DE IP10	JN-DE2C IP10
Rear connection	F-TR OP	FN-TR2C OP	JN-TR OP	JN-TR2C OP
Flush mounting	F-EMP OP	F-EMP2C OP	J-EMP OP	J-EMP2C OP

FN-DE IP10/FN-DE2C IP10

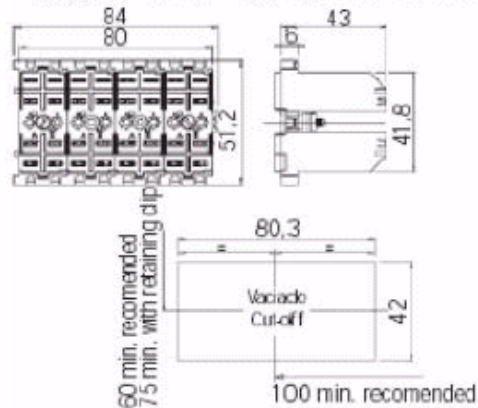
JN-DE IP10/JN-DE2C IP10



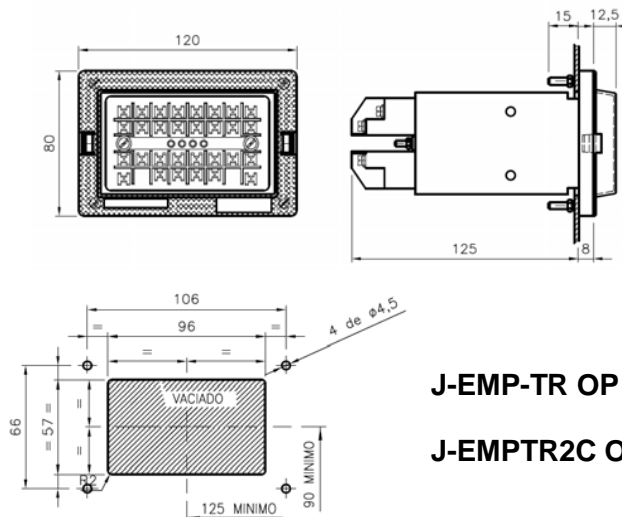
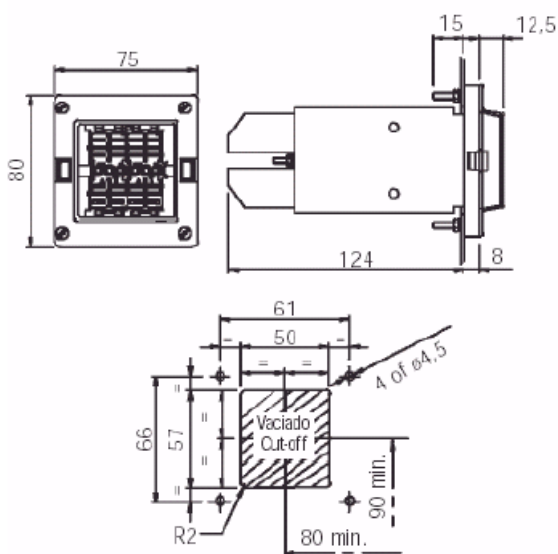
Base FN-TR OP • FN-TR2C OP Socket



Base JN-TR OP • JN-TR2C OP Socket



Base F-EMP OP • F-EMP2C OP Socket



J-EMP-TR OP

J-EMPTR2C OP

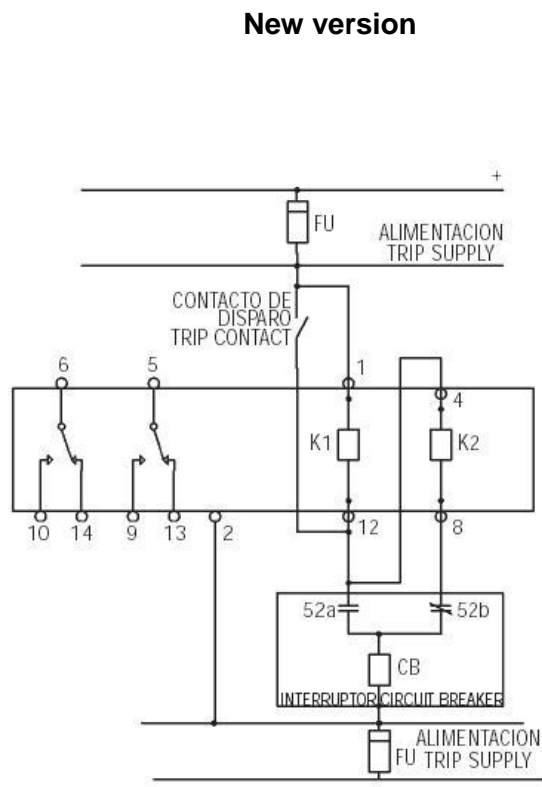
Appendix A. Differences with the old VDF-10

Novelties:

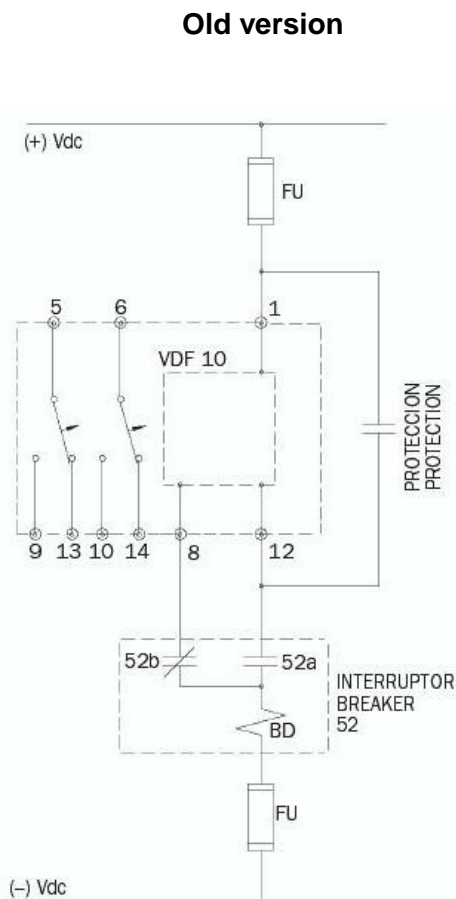
- The new VDF-10, can be used with low-consumption circuit breakers. (down to 4,5 W)
- Supervises the complete trip circuit in open position of the circuit breaker.

Differences:

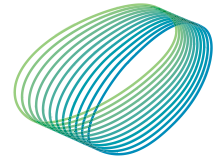
In case of replacing an old VDF-10 with one new VDF-10, it must be taken into account the two additional connections: 2 and 4. See the differences between the old and new VDF-10 connections on the following diagrams.



Contactos representados con relé sin tensión
Contacts represented without auxiliary supply in the relay.



- Contactos representados con relé sin tensión.
- Contacts represented without auxiliary supply in the relay.



arteche

Moving together

651601429_MU_RELES_VDF-10_VDJ-30_EN