

# VD4/R

Medium Voltage vacuum circuit-breakers  
for secondary distribution



**ABB**



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### General information

The VD4 series of medium voltage vacuum circuit-breakers for indoor installation are constructed using the separate pole technique.

Each pole has a vacuum interrupter inside it which, thanks to a special production process, is incorporated in the resin directly during the cylinder moulding stage.

This construction technique ensures protection of the vacuum interrupter against impact, dust and condensation phenomena.

The operating mechanism is the EL type with stored energy and free release, with opening and closing operations independent of the operator. The EL operating mechanism is already widely used in all the VD4 series circuit-breakers with front operating mechanism.

Remote control of the circuit-breaker is possible by means of applying special electrical accessories (geared motor, shunt opening and shunt closing release, etc.).

The operating mechanism, the three poles and the current sensors (if provided) are mounted on a metallic frame without wheels. Construction is particularly compact, sturdy and of limited weight.

The circuit-breakers in the VD4/R series with lateral operating mechanism are "sealed for life" pressure systems (IEC 62271-100 and CEI 17-1 Standards).

### Versions available

VD4 circuit-breakers with lateral operating mechanism are available in the following versions:

- fixed with right lateral operating mechanism and 230 mm pole centre distance
- fixed with left lateral operating mechanism and 230 mm pole centre distance
- fixed with right lateral operating mechanism and 300 mm pole centre distance
- fixed with left lateral operating mechanism and 300 mm pole centre distance
- plug-in with right lateral operating mechanism, version for UniSwitch switchgear, 210 mm pole centre distance
- plug-in with right lateral operating mechanism, version for UniMix, switchgear, 230 mm pole centre distance
- plug-in with right lateral operating mechanism, version for UniAir, switchgear, 300 mm pole centre distance.

On request and according to the version, they can be fitted with two or three current sensors and with the PR521 series overcurrent protection device.

### Fields of application

The VD4 series circuit-breakers with lateral operating mechanism are used in all applications

- Interchangeable with VD4 and HD4 circuit-breakers with ESH lateral operating mechanism (\*)
- Mechanical operating mechanism with stored energy able to carry out a complete O-C-O cycle without spring recharging
- EL type operating mechanism common to all the VD4 series with front operating mechanism
- High number of operations and long electrical and mechanical life
- Suitable for installation in prefabricated substations and switchgear
- Simple personalisation thanks to the complete range of accessories
- Vacuum interrupters incorporated in the pole cylinders to ensure resistance to impact, condensation and polluted environments
- Maintenance-free
- Application (on request) of the current sensors and PR521 self-supplied protection device (suitable for installation in unmanned plants)

(\*) Except version for internal arc proof UniAir switchgear

for medium voltage secondary distribution and in MV/LV transformer substations in factories, workshops in the industrial sector in general, and in the service sector.

Thanks to application (on request) of the PR521 self-supplied electronic overcurrent release, VD4 circuit-breakers with lateral operating mechanism are suitable for use in unmanned MV/LV transformer substations and without auxiliary power supply.

### PR521 Protection device

The VD4 series circuit-breakers with lateral operating mechanism, with rated voltage up to 24 kV can, on request, be fitted with self-supplied PR521 type electronic overcurrent protection device, available in the following types:

- **PR521 (50-51):** provides the protection function against overload (51) and against instantaneous and delayed short-circuit (50);
- **PR521 (50-51-51N):** provides the protection function against overload (51), against instantaneous and delayed short-circuit (50) and against earth fault (51N).

The current sensors are available in four rated current values and cover all the circuit-breaker fields of application (for the protection fields, please see chap. 3).

Other important characteristics of the PR521 devices are:

- trip precision
- wide setting ranges
- operation guaranteed even with single-phase power supply
- constancy of characteristics and operating reliability even in highly polluted environments
- single and simultaneous adjustment of all three phases
- no limit to the rated breaking capacity (thanks to the current sensors) and to the short-time withstand current of the circuit-breaker.

For further information, please consult chapter 3.

### PR521/DK protection device

The PR521/DK protection device with its own current sensors conforms to the Enel DK5600 rev. V June 2006 specification.

The PR521/DK protection device carries out the following functions:

- overcurrent protection with fixed time (51);
- overcurrent protection with adjustable delay (50);
- overcurrent and earth fault protection with adjustable delay (51N) (external vectorial sum with external toroid).

For the general characteristics, please consult chapter 3.



PR521 protection device.



PR521/DK protection device.

### Standards and approvals

The VD4 circuit-breakers with lateral operating mechanism comply with the IEC 62271-100, CEI 17-1 file 1375, and those of the major industrialised countries. They have undergone the tests indicated below and ensure service safety and reliability of the apparatus in all installations.

- **Type tests:** heating, withstand insulation at power frequency and lightning impulse, short-time and peak withstand current, mechanical life, making and breaking capacity of short-circuit currents.
- **Individual tests:** insulation with voltage at power frequency in the main circuits, insulation of the auxiliary and control circuits, measurement of the main circuit resistance and mechanical and electrical operation.



### Service Safety

Thanks to the complete range of mechanical and electrical locks (on request), safe distribution switchgear can be constructed with the VD4 circuit-breakers with lateral operating mechanism.

The locking devices have been studied to prevent incorrect operations and carry out inspection of the installations whilst guaranteeing maximum operator safety.

All the operating, control and signalling devices are located on the front of the circuit-breaker.

The anti-pumping device is always provided on the actuator.

### Accessories

The VD4 circuit-breakers with lateral operating mechanism have a complete range of accessories which means all installation requirements can be satisfied.

The operating mechanism is of the same type for the whole series and has a standardised range of accessories and spare parts which are easy to identify and order. Use and service of the apparatus are simple and require limited use of resources.

### EL operating mechanism

- One type for the whole series.
- The same accessories for all the types of circuit-breaker.
- Fixed reference points to simplify assembly and replacement of the accessories.
- Accessory cabling with socket and plug.
- Suitable for the rapid 0-0,3s-CO-15s-CO re-closing cycle

### Technical documentation

To go into technical and application aspects of the VD4/R circuit-breakers in depth, please ask us for the following publications:

- UniAir switchgear
- UniMix switchgear
- REF 542*plus* unit
- UniSwitch switchgear

Cat. 1VCP000065

Cat. 1VCP000008

Cat. 1VTA00001

Cat. UNIS5



Current sensors (on request), easily replaced.



Electrical accessories with simplified assembly.



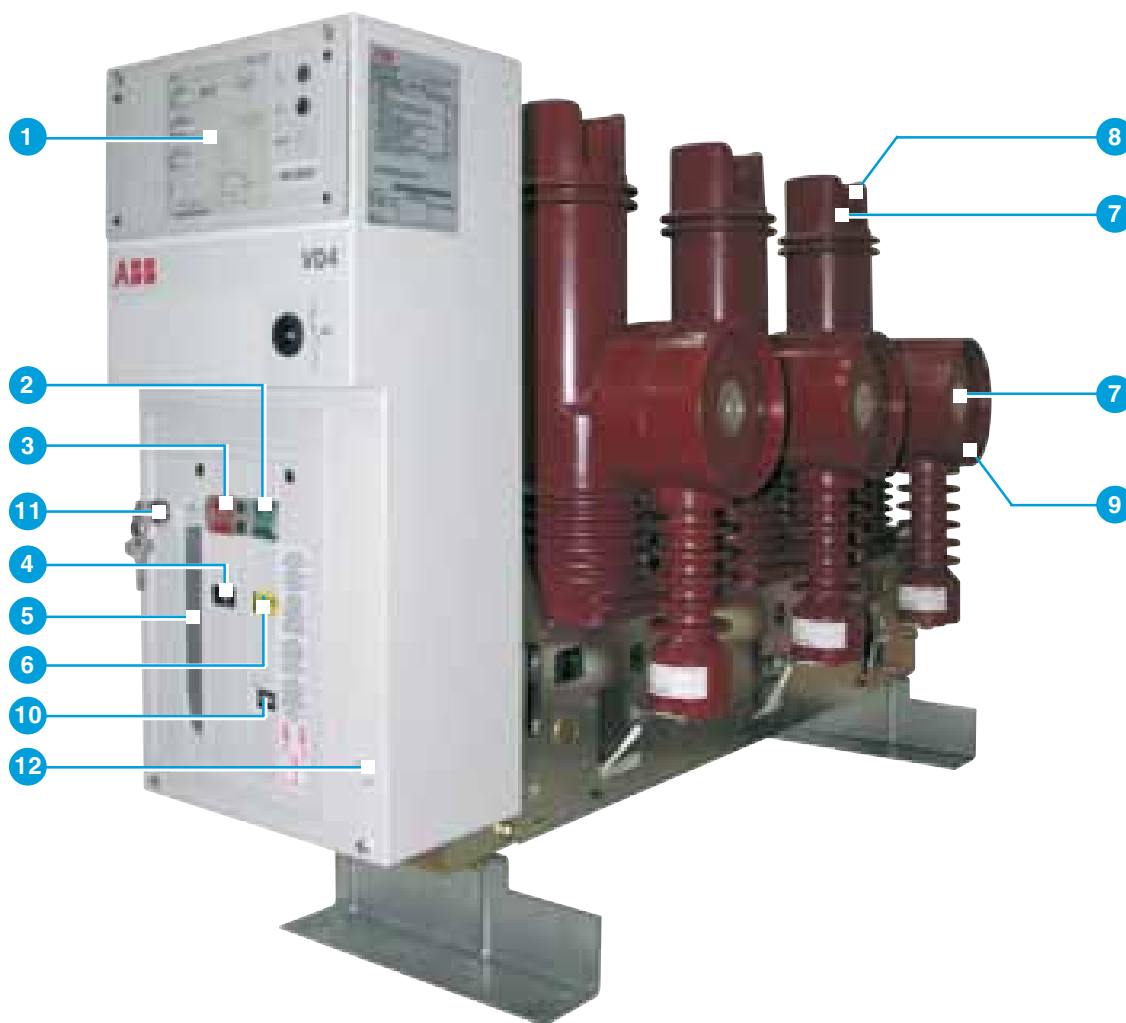
Circuit-breaker characteristics nameplate on the side of the operating mechanism casing.



Self-supplied PR521 release (on request) and coordination with the circuit-breaker and with the current sensors.



Mechanical anti-pumping device.



- 1 PR521 protection device (on request)
- 2 Closing pushbutton
- 3 Opening pushbutton
- 4 Signalling device for circuit-breaker open/closed
- 5 Incorporated lever for manual closing spring charging
- 6 Signalling device for closing springs charged (yellow) and discharged (white)
- 7 Medium voltage terminals
- 8 Circuit-breaker pole
- 9 Current sensor (for PR521 protection device – if provided)
- 10 Operation counter
- 11 Key lock
- 12 Seat of the undervoltage release mechanical override

### Quality Assurance System

Certified by an external independent organization as complying with ISO 9001 Standards.

### Environmental Management System

Certified by an external independent organization as complying with ISO 14001 Standards.

### Health and Safety Management System

Certified by an external independent organization as complying with OHSAS 18001 Standards.

### Test laboratory

Accredited by an external independent organization as complying with UNI CEI EN ISO/IEC 17025 Standards.

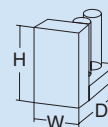
### Electrical characteristics

Circuit-breaker		VD4/R 12	VD4/R 17	VD4/R 24
Rated voltage	[kV]	12	17.5	24
Rated normal current	[A]	630/800/1250	630/800/1250	630/800/1250
Rated breaking capacity	[kA]	12.5 ... 25	12.5 ... 25	12.5 ... 20

### General characteristics of fixed circuit-breakers with right lateral operating mechanism (12 – 17.5 – 24 kV)



Circuit-breaker	
Standards	IEC 62271-100 CEI 17-1 (file 1375)
Rated voltage	Ur [kV]
Rated insulation voltage	Us [kV]
Withstand voltage at 50 Hz	Ud (1 min) [kV]
Impulse withstand voltage	Up [kV]
Rated frequency	fr [Hz]
Rated normal current (40°C)	Ir [A]
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]
Rated short-time withstand current (3 s)	Ik [kA]
Making capacity	Ip [kA]
Operation sequence	[O - 0.3s - CO - 15s - CO]
Opening time	[ms]
Arcing time	[ms]
Total breaking time	[ms]
Closing time	[ms]
Overall dimensions (maximum)	H [mm] W [mm] D [mm]
Pole centre distance	I [mm]
Weight <sup>(3)</sup>	[kg]
Application of PR521 protection device	In [A]
Application of PR521/DK protection device	
Table of standardised dimensions	
Electric circuit diagram	
Operating temperature	[°C]
Tropicalization	IEC: 60068-2-30, 60721-2-1
Electromagnetic compatibility	IEC 60694



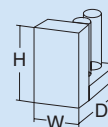
- (1) Pole centre distance 230 mm
- (2) Pole centre distance 300 mm
- (3) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg
- (4) Rated current of the current sensors (the PR521 device and the current sensors are optional)
- (5) DK type phase current sensors on board the circuit-breaker and toroidal CT for DK type homopolar protection not on board (the PR521/DK device and the DK sensors are optional)



	VD4/R 12			VD4/R 17			VD4/R 24		
	■			■			■		
	■			■			■		
	12			17.5			24		
	12			17.5			24		
	28			38			50		
	75			95			125		
	50-60			50-60			50-60		
	630	800	1250	630	800	1250	630	800	1250
	12.5	—	—	12.5	—	—	12.5	—	—
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	25	25	25	—	—	—
	12.5	—	—	12.5	—	—	12.5	—	—
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	25	25	25	—	—	—
	31.5	—	—	31.5	—	—	31.5	—	—
	40	40	40	40	40	40	40	40	40
	50	50	50	50	50	50	50	50	50
	63	63	63	63	63	63	—	—	—
	■			■			■		
	40...60			40...60			40...60		
	10...15			10...15			10...15		
	50...75			50...75			50...75		
	50...70			50...70			50...70		
	785			785			785		
	317			317			317		
	1029 <sup>(1)</sup> / 1170 <sup>(2)</sup>			1029 <sup>(1)</sup> / 1170 <sup>(2)</sup>			1029 <sup>(1)</sup> / 1170 <sup>(2)</sup>		
	230 / 300			230 / 300			230 / 300		
	65 <sup>(1)</sup> - 67 <sup>(2)</sup>			65 <sup>(1)</sup> - 67 <sup>(2)</sup>			65 <sup>(1)</sup> - 67 <sup>(2)</sup>		
	40 - 80 - 250 - 1250 <sup>(4)</sup>			40 - 80 - 250 - 1250 <sup>(4)</sup>			40 - 80 - 250 - 1250 <sup>(4)</sup>		
	■ <sup>(5)</sup>			■ <sup>(5)</sup>			■ <sup>(5)</sup>		
	1VCD000100 <sup>(1)</sup>			1VCD000100 <sup>(1)</sup>			1VCD000100 <sup>(1)</sup>		
	1VCD000101 <sup>(2)</sup>			1VCD000101 <sup>(2)</sup>			1VCD000101 <sup>(2)</sup>		
	1VCD400097			1VCD400097			1VCD400097		
	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40		
	■			■			■		
	■			■			■		

### General characteristics of fixed circuit-breakers with left lateral operating mechanism (12 – 17.5 – 24 kV)

Circuit-breaker	
Standards	IEC 62271-100 CEI 17-1 (file 1375)
Rated voltage	Ur [kV]
Rated insulation voltage	Us [kV]
Withstand voltage at 50 Hz	Ud (1 min) [kV]
Impulse withstand voltage	Up [kV]
Rated frequency	fr [Hz]
Rated normal current (40°C)	Ir [A]
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]
Rated short-time withstand current (3 s)	Ik [kA]
Making capacity	Ip [kA]
Operation sequence	[O - 0.3s - CO - 15s - CO]
Opening time	[ms]
Arcing time	[ms]
Total breaking time	[ms]
Closing time	[ms]
Overall dimensions (maximum)	H [mm] W [mm] D [mm]
Pole centre distance	I [mm]
Weight <sup>(3)</sup>	[kg]
Application of PR521 protection device	In [A]
Application of PR521/DK protection device	
Table of standardised dimensions	
Electric circuit diagram	
Operating temperature	[°C]
Tropicalization	IEC: 60068-2-30, 60721-2-1
Electromagnetic compatibility	IEC 60694

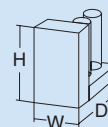


- (1) Pole centre distance 230 mm
- (2) Pole centre distance 300 mm
- (3) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg
- (4) Rated current of the current sensors (the PR521 device and the current sensors are optional)
- (5) DK type phase current sensors on board the circuit-breaker and toroidal CT for DK type homopolar protection not on board (the PR521/DK device and the DK sensors are optional)

	VD4/L 12			VD4/L 17			VD4/L 24		
	■			■			■		
	■			■			■		
	12			17.5			24		
	12			17.5			24		
	28			38			50		
	75			95			125		
	50-60			50-60			50-60		
	630	800	1250	630	800	1250	630	800	1250
	12.5	—	—	12.5	—	—	12.5	—	—
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	25	25	25	—	—	—
	12.5	—	—	12.5	—	—	12.5	—	—
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	25	25	25	—	—	—
	31.5	—	—	31.5	—	—	31.5	—	—
	40	40	40	40	40	40	40	40	40
	50	50	50	50	50	50	50	50	50
	63	63	63	63	63	63	—	—	—
	■			■			■		
	40...60			40...60			40...60		
	10...15			10...15			10...15		
	50...75			50...75			50...75		
	50...70			50...70			50...70		
	785			785			785		
	317			317			317		
	1029 <sup>(1)</sup> / 1170 <sup>(2)</sup>			1029 <sup>(1)</sup> / 1170 <sup>(2)</sup>			1029 <sup>(1)</sup> / 1170 <sup>(2)</sup>		
	230 / 300			230 / 300			230 / 300		
	65 <sup>(1)</sup> - 67 <sup>(2)</sup>			65 <sup>(1)</sup> - 67 <sup>(2)</sup>			65 <sup>(1)</sup> - 67 <sup>(2)</sup>		
	40 - 80 - 250 - 1250 <sup>(4)</sup>			40 - 80 - 250 - 1250 <sup>(4)</sup>			40 - 80 - 250 - 1250 <sup>(4)</sup>		
	■ <sup>(5)</sup>			■ <sup>(5)</sup>			■ <sup>(5)</sup>		
	1VCD003453 <sup>(1)</sup>			1VCD003453 <sup>(1)</sup>			1VCD003453 <sup>(1)</sup>		
	1VCD003454 <sup>(2)</sup>			1VCD003454 <sup>(2)</sup>			1VCD003454 <sup>(2)</sup>		
	1VCD400097			1VCD400097			1VCD400097		
	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40		
	■			■			■		
	■			■			■		

**General characteristics of fixed circuit-breakers with right lateral operating mechanism for ABB UnitSwitch type switchgear (12 – 17.5 – 24 kV)**

Circuit-breaker	
Standards	<b>IEC 62271-100</b> <b>CEI 17-1</b> (file 1375)
Rated voltage	<b>Ur</b> [kV]
Rated insulation voltage	<b>Us</b> [kV]
Withstand voltage at 50 Hz	<b>Ud</b> (1 min) [kV]
Impulse withstand voltage	<b>Up</b> [kV]
Rated frequency	<b>fr</b> [Hz]
Rated normal current (40°C)	<b>Ir</b> [A]
Rated breaking capacity (rated symmetrical short-circuit current)	<b>Isc</b> [kA]
Rated short-time withstand current (3 s)	<b>Ik</b> [kA]
Making capacity	<b>Ip</b> [kA]
Operation sequence	[O - 0.3s - CO - 15s - CO]
Opening time	[ms]
Arcing time	[ms]
Total breaking time	[ms]
Closing time	[ms]
Overall dimensions (maximum)	<b>H</b> [mm] <b>W</b> [mm] <b>D</b> [mm]
Pole centre distance	<b>I</b> [mm]
Weight <sup>(3)</sup>	[kg]
Application of PR521 protection device	<b>In</b> [A]
Application of PR521/DK protection device	
Table of standardised dimensions	
Electric circuit diagram	
Operating temperature	[°C]
Tropicalization	<b>IEC:</b> 60068-2-30, 60721-2-1
Electromagnetic compatibility	<b>IEC</b> 60694

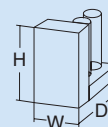


- (1) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg
- (2) Rated current of the current sensors (the PR521 device and the current sensors are optional)
- (3) Special version with “ $\beta = 1$ ” or “ $\beta = 1, RI$ ” curves for the Belgian market: please ask ABB for availability and delivery times

	VD4/S 12			VD4/S 17			VD4/S 24		
	■			■			■		
	■			■			■		
	12			17.5			24		
	12			17.5			24		
	28			38			50		
	75			95			125		
	50-60			50-60			50-60		
	630	800	1250	630	800	1250	630	800	1250
	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	—	—	—	—	—	—
	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	—	—	—	—	—	—
	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
	40	40	40	40	40	40	40	40	40
	50	50	50	50	50	50	50	50	50
	63	63	63	—	—	—	—	—	—
	■			■			■		
	40...60			40...60			40...60		
	10...15			10...15			10...15		
	50...75			50...75			50...75		
	50...70			50...70			50...70		
	730			730			730		
	282			282			282		
	990			990			990		
	210			210			210		
	67			67			67		
	40 - 80 - 250 - 1250 <sup>(2)</sup>			40 - 80 - 250 - 1250 <sup>(2)</sup>			40 - 80 - 250 - 1250 <sup>(2)</sup>		
	vedi nota <sup>(3)</sup>			vedi nota <sup>(3)</sup>			vedi nota <sup>(3)</sup>		
	1VCD000098			1VCD000098			1VCD000098		
	1VCD400098			1VCD400098			1VCD400098		
	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40		
	■			■			■		
	■			■			■		

### General characteristics of fixed circuit-breakers with right lateral operating mechanism for UniMix type switchgear (12 – 17.5 – 24 kV)

Circuit-breaker	
Standards	IEC 62271-100 CEI 17-1 (file 1375)
Rated voltage	Ur [kV]
Rated insulation voltage	Us [kV]
Withstand voltage at 50 Hz	Ud (1 min) [kV]
Impulse withstand voltage	Up [kV]
Rated frequency	fr [Hz]
Rated normal current (40°C)	Ir [A]
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]
Rated short-time withstand current (3 s)	Ik [kA]
Making capacity	Ip [kA]
Operation sequence	[O - 0.3s - CO - 15s - CO]
Opening time	[ms]
Arcing time	[ms]
Total breaking time	[ms]
Closing time	[ms]
Overall dimensions (maximum)	H [mm] W [mm] D [mm]
Pole centre distance	I [mm]
Weight <sup>(3)</sup>	[kg]
Application of PR521 protection device	In [A]
Application of PR521/DK protection device	
Table of standardised dimensions	
Electric circuit diagram	
Operating temperature	[°C]
Tropicalization	IEC: 60068-2-30, 60721-2-1
Electromagnetic compatibility	IEC 60694



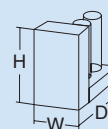
- (1) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg
- (2) Rated current of the current sensors (the PR521 device and the current sensors are optional)
- (3) DK type phase current sensors on board the circuit-breaker and DK type toroidal CT not on board (the PR521/DK device and the DK sensors are optional)
- (4) VD4/UniMix-F for P1/F Unit (fixed circuit-breaker without wheels and cabled to terminal box)
- (5) VD4/UniMix-R for P1/F Unit (fixed circuit-breaker with wheels and power cord with plug)

	VD4/UniMix 12	VD4/UniMix 17	VD4/UniMix 24
	■	■	■
	■	■	■
	12	17.5	24
	12	17.5	24
	28	38	50
	75	95	125
	50-60	50-60	50-60
	630	630	630
	12.5	12.5	12.5
	16	16	16
	20	20	20
	25	25	—
	12.5	12.5	12.5
	16	16	16
	20	20	20
	25	25	—
	31.5	31.5	31.5
	40	40	40
	50	50	50
	63	63	—
	■	■	■
	40...60	40...60	40...60
	10...15	10...15	10...15
	50...75	50...75	50...75
	50...70	50...70	50...70
	700 <sup>(4)</sup> - 734 <sup>(5)</sup> 382 (IP30) - 393 (A.I.) 1030 230	700 <sup>(4)</sup> - 734 <sup>(5)</sup> 382 (IP30) - 393 (A.I.) 1030 230	700 <sup>(4)</sup> - 734 <sup>(5)</sup> 382 (IP30) - 393 (A.I.) 1030 230
	65	65	65
	40 - 80 - 250 - 1250 <sup>(2)</sup>	40 - 80 - 250 - 1250 <sup>(2)</sup>	40 - 80 - 250 - 1250 <sup>(2)</sup>
	■ <sup>(3)</sup>	■ <sup>(3)</sup>	■ <sup>(3)</sup>
	1VCD000106 <sup>(4)</sup> 1VCD000107 <sup>(5)</sup>	1VCD000106 <sup>(4)</sup> 1VCD000107 <sup>(5)</sup>	1VCD000106 <sup>(4)</sup> 1VCD000107 <sup>(5)</sup>
	1VCD400097 <sup>(4)</sup> 1VCD400098 <sup>(5)</sup>	1VCD400097 <sup>(4)</sup> 1VCD400098 <sup>(5)</sup>	1VCD400097 <sup>(4)</sup> 1VCD400098 <sup>(5)</sup>
	- 5 ... + 40	- 5 ... + 40	- 5 ... + 40
	■	■	■
	■	■	■

**General characteristics of fixed circuit-breakers with right lateral operating mechanism for IP30 UniAir type switchgear (12 – 17.5 – 24 kV)**

Circuit-breaker	
Standards	IEC 62271-100 CEI 17-1 (file 1375)
Rated voltage	Ur [kV]
Rated insulation voltage	Us [kV]
Withstand voltage at 50 Hz	Ud (1 min) [kV]
Impulse withstand voltage	Up [kV]
Rated frequency	fr [Hz]
Rated normal current (40°C)	Ir [A]
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]
Rated short-time withstand current (3 s)	Ik [kA]
Making capacity	Ip [kA]
Operation sequence	[O - 0.3s - CO - 15s - CO]
Opening time	[ms]
Arcing time	[ms]
Total breaking time	[ms]
Closing time	[ms]
Overall dimensions (maximum)	H [mm] W [mm] D [mm]
Pole centre distance	I [mm]
Weight <sup>(3)</sup>	[kg]
Application of PR521 protection device	In [A]
Application of PR521/DK protection device	
Table of standardised dimensions	
Electric circuit diagram	
Operating temperature	[°C]
Tropicalization	IEC: 60068-2-30, 60721-2-1
Electromagnetic compatibility	IEC 60694

- (1) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg
- (2) Rated current of the current sensors (the PR521 device and the current sensors are optional)
- (3) DK type phase current sensors on board the circuit-breaker and toroidal CT for DK type homopolar protection not on board (the PR521/DK device and the DK sensors are optional)
- (4) VD4/UniAir for P1/E Unit IP30 version (unit with plug-in circuit-breaker); **the circuit-breaker for the same Arc Proof version unit is not available**
- (5) VD4/UniAir-2R for P1E/2R Unit IP30 version (unit with withdrawable circuit-breaker on supply and load side); **the circuit-breaker for the same Arc Proof version unit is not available**
- (6) VD4/UniAir-A for P1/A Unit IP30 version (unit with fixed "upside-down" circuit-breaker); **the circuit-breaker for the same Arc Proof version unit is not available**
- (7) VD4/UniAir-F for P1/F Unit IP30 version (unit with fixed circuit-breaker without wheels and cabled to terminal box); **the circuit-breaker for the same Arc Proof version unit is not available**





	VD4/UniAir 12			VD4/UniAir 17			VD4/UniAir 24		
	■			■			■		
	■			■			■		
	12			17.5			24		
	12			17.5			24		
	28			38			50		
	75			95			125		
	50-60			50-60			50-60		
	630	800	1250	630	800	1250	630	800	1250
	12.5	—	—	12.5	—	—	12.5	—	—
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	25	—	—	—	—	—
	12.5	—	—	12.5	—	—	12.5	—	—
	16	16	16	16	16	16	16	16	16
	20	20	20	20	20	20	20	20	20
	25	25	25	25	—	—	—	—	—
	31.5	—	—	31.5	—	—	31.5	—	—
	40	40	40	40	40	40	40	40	40
	50	50	50	50	50	50	50	50	50
	63	63	63	63	—	—	—	—	—
	■			■			■		
	40...60			40...60			40...60		
	10...15			10...15			10...15		
	50...75			50...75			50...75		
	50...70			50...70			50...70		
	734,5 <sup>(4) (5) (6)</sup> - 725 <sup>(7)</sup>			734,5 <sup>(4) (5) (6)</sup> - 725 <sup>(7)</sup>			734,5 <sup>(4) (5) (6)</sup> - 725 <sup>(7)</sup>		
	374 <sup>(4) (5) (6)</sup> - 282 <sup>(7)</sup>			374 <sup>(4) (5) (6)</sup> - 282 <sup>(7)</sup>			374 <sup>(4) (5) (6)</sup> - 282 <sup>(7)</sup>		
	1170 <sup>(4) (5) (6) (7)</sup>			1170 <sup>(4) (5) (6) (7)</sup>			1170 <sup>(4) (5) (6) (7)</sup>		
	300			300			300		
	70 <sup>(4) (5) (6)</sup> - 67 <sup>(7)</sup>			70 <sup>(4) (5) (6)</sup> - 67 <sup>(7)</sup>			70 <sup>(4) (5) (6)</sup> - 67 <sup>(7)</sup>		
	40 - 80 - 250 - 1250 <sup>(2)</sup>			40 - 80 - 250 - 1250 <sup>(2)</sup>			40 - 80 - 250 - 1250 <sup>(2)</sup>		
	■ <sup>(3)</sup>			■ <sup>(3)</sup>			■ <sup>(3)</sup>		
	1VCD000102 <sup>(4)</sup>			1VCD000102 <sup>(4)</sup>			1VCD000102 <sup>(4)</sup>		
	1VCD000103 <sup>(5)</sup>			1VCD000103 <sup>(5)</sup>			1VCD000103 <sup>(5)</sup>		
	1VCD000104 <sup>(6)</sup>			1VCD000104 <sup>(6)</sup>			1VCD000104 <sup>(6)</sup>		
	1VCD000105 <sup>(7)</sup>			1VCD000105 <sup>(7)</sup>			1VCD000105 <sup>(7)</sup>		
	1VCD400098 <sup>(4) (5) (6)</sup>			1VCD400098 <sup>(4) (5) (6)</sup>			1VCD400098 <sup>(4) (5) (6)</sup>		
	1VCD400097 <sup>(7)</sup>			1VCD400097 <sup>(7)</sup>			1VCD400097 <sup>(7)</sup>		
	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40		
	■			■			■		
	■			■			■		

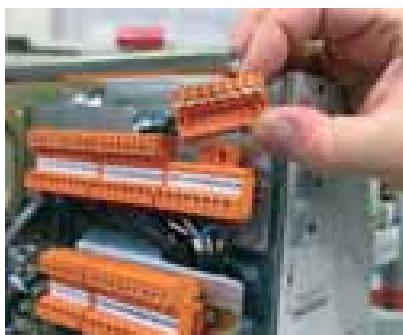


### Versions available

VD4 circuit-breakers with lateral operating mechanism are available in the following versions:

- fixed with right lateral operating mechanism and 230 mm pole centre distance
- fixed with left lateral operating mechanism and 230 mm pole centre distance
- fixed with right lateral operating mechanism and 300 mm pole centre distance
- fixed with left lateral operating mechanism and 300 mm pole centre distance
- fixed with right lateral operating mechanism, version for UniSwitch switchgear, 210 mm pole centre distance
- fixed with right lateral operating mechanism, version for UniMix, switchgear, 230 mm pole centre distance
- fixed with right lateral operating mechanism, version for UniAir, switchgear, 300 mm pole centre distance.

On request and according to the version, they can be fitted with two or three current sensors and with the PR521 series overcurrent protection device.



### Standard fittings

1. VD4/R fixed circuit-breakers with right lateral operating mechanism (230 or 300 mm centre distance) and VD4/L fixed circuit-breakers with left lateral operating mechanism (230 or 300 mm centre distance)

The basic coded version of the fixed circuit-breakers is always three-pole and is fitted with:

- 1 opening pushbutton
- 2 closing pushbutton
- 3 operation counter
- 4 mechanical signalling device for circuit-breaker open/closed
- 5 lever for manual spring charging (incorporated in the operating mechanism)
- 6 mechanical signalling device for closing springs charged/discharged.

The basic cabling ends at a terminal box. The terminal box is fitted with a removable part which allows the customer to make a disconnectable power cord (see images at the side).

The basic version also includes the following **accessories to be specified at the time of ordering**:

(see Kits 1, 2, 3 described on page “24-25”):

**Kit 1** set of five open/closed auxiliary contacts or, alternatively and on payment, ten or fifteen auxiliary contacts. Each shunt opening release uses one NO auxiliary contact after having opened the circuit-breaker, therefore there is one NO auxiliary contact less for each shunt opening release installed

**Kit 2** shunt opening release

**Kit 3** key lock.

## **2. Circuit-breakers for UniSwitch switchgear with right operating mechanism (centre distance 210 mm)**

The basic coded version of the **VD4/S** circuit-breakers for UniSwitch switchgear is the same as that of the fixed circuit-breakers with the following exceptions and specific fittings:

- base fitted with wheels to facilitate handling and racking the UniSwitch switchgear into the compartment
- top and bottom terminals prepared for connection to the busbars of the UniSwitch switchgear
- insulating caps to be installed on the upper part of the poles (after having connected the busbars to the top terminals)
- special connector (male 58-pole socket) fixed onto the right side of the operating mechanism casing. The connector is fitted with a lock which does not allow manual operation unless the plug fitted with the special insulating release pin is inserted
- insulating release pin to be inserted in the plug (female with 58 poles) to disable the lock which does not allow manual operation unless the plug is inserted in the socket on the operating mechanism.

On request and on payment, a set of 12 auxiliary contacts is available, alternatively to the group of 5 open/closed auxiliary contacts. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed.

## **3. Circuit-breakers for switchgear UniMix with right operating mechanism (centre distance 230 mm)**

The basic coded version of the circuit-breakers for UniSwitch switchgear is the same as that of the fixed circuit-breakers. The operating mechanism casing is fitted with a side frame specific to the

UniMix unit which the circuit-breaker must be racked into. In particular:

- type **VD4/UniMix-F** has the top and bottom terminals prepared for connection to the busbars of the UniMix switchgear P1/F unit. Alternatively and on payment, 10 or 15 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed
- type **VD4/UniMix-R** has a base fitted with wheels to facilitate handling and racking the UniSwitch switchgear into the compartment, a power cord with 58-pole plug for the auxiliary circuits. The top and bottom terminals are prepared for connection to the busbars of the UniMix switchgear P1/F unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed.

## **4. Circuit-breakers for switchgear UniAir with right operating mechanism (centre distance 300 mm)**

The basic coded version of the circuit-breakers for UniAir switchgear is the same as the one for the fixed circuit-breakers. The operating mechanism casing is fitted with a side frame specific to the UniAir unit which the circuit-breaker must be racked into. In particular:

- type **VD4/UniAir** has the base fitted with wheels to facilitate handling and racking the switchgear into the compartment, a power cord with 58-pole plug for the auxiliary circuits. The top and bottom terminals are prepared with pliers for connection to the isolator on the supply side and to the busbars (or DIN CT) on the load side of the UniAir switchgear P1/E unit, and there is the release lever which keeps the circuit-breaker locked in the unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed
- type **VD4/UniAir-2R** has the base fitted with wheels to facilitate handling and racking the switchgear into the compartment, a power cord with 58-pole plug for the auxiliary circuits.

The top and bottom terminals are prepared with pliers for connection to the isolator on the supply and load side of the UniAir switchgear P1E/2R unit, and there is the release lever which keeps the circuit-breaker locked in the unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed

- type **VD4/UniAir-A** has the base fitted with wheels to facilitate handling and racking the switchgear into the compartment, a power cord with 58-pole plug for the auxiliary circuits. The top fixed terminals and the bottom terminals are prepared with pliers for connection to the busbars/CT on the supply side and to the isolator on the load side of the UniAir switchgear P1/A unit, and there is the release lever which

keeps the circuit-breaker locked in the unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed

- type **VD4/UniAir-F** is without wheels and power cord and only has the top terminals prepared with pliers for connection to the isolator on the supply side, whereas the bottom fixed terminals are prepared for connection to the busbars/CT on the load side of the UniAir switchgear P1/F unit. Alternatively and on payment, 10 or 15 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact for de-energise after having carried out circuit-breaker opening, therefore there is a NO auxiliary contact unavailable for each shunt opening release installed.

#### VD4/R 12-17-24 (right lateral operating mechanism)

				Pole centre distance		Technical documentation	
U [kV]	In [A]	Isc [kA]	Description	230 mm	300 mm	Dimensions	Electric diagram
12	630	12.5	VD4/R 12.06.12	•	•	1VCD000100 (230 mm)	1VCD400097
		16	VD4/R 12.06.16	•	•		
		20	VD4/R 12.06.20	•	•		
		25	VD4/R 12.06.25	•	•		
	800	16	VD4/R 12.08.16	•	•	1VCD000101 (300 mm)	
		20	VD4/R 12.08.20	•	•		
		25	VD4/R 12.08.25	•	•		
	1250	16	VD4/R 12.12.16	•	•		
		20	VD4/R 12.12.20	•	•		
		25	VD4/R 12.12.25	•	•		
17.5	630	12.5	VD4/R 17.06.12	•	•	1VCD000100 (230 mm)	1VCD400097
		16	VD4/R 17.06.16	•	•		
		20	VD4/R 17.06.20	•	•		
		25	VD4/R 17.06.25	•	•		
	800	16	VD4/R 17.08.16	•	•	1VCD000101 (300 mm)	
		20	VD4/R 17.08.20	•	•		
		25	VD4/R 17.08.25	•	•		
	1250	16	VD4/R 17.12.16	•	•		
		20	VD4/R 17.12.20	•	•		
		25	VD4/R 17.12.25	•	•		
24	630	12.5	VD4/R 24.06.12	•	•	1VCD000100 (230 mm)	1VCD400097
		16	VD4/R 24.06.16	•	•		
		20	VD4/R 24.06.20	•	•		
	800	16	VD4/R 24.08.16	•	•	1VCD000101 (300 mm)	
		20	VD4/R 24.08.20	•	•		
	1250	16	VD4/R 24.12.16	•	•		
		20	VD4/R 24.12.20	•	•		

# VD4/L 12-17-24 (left lateral operating mechanism)

				Pole centre distance		Technical documentation	
U [kV]	In [A]	Isc [kA]	Description	230 mm	300 mm	Dimensions	Electric diagram
12	630	12.5	VD4/L 12.06.12	•	•	1VCD003453 (230 mm)	1VCD400097
		16	VD4/L 12.06.16	•	•		
		20	VD4/L 12.06.20	•	•		
		25	VD4/L 12.06.25	•	•		
	800	16	VD4/L 12.08.16	•	•	1VCD003454 (300 mm)	
		20	VD4/L 12.08.20	•	•		
		25	VD4/L 12.08.25	•	•		
	1250	16	VD4/L 12.12.16	•	•		
		20	VD4/L 12.12.20	•	•		
		25	VD4/L 12.12.25	•	•		
17.5	630	12.5	VD4/L 17.06.12	•	•	1VCD003453 (230 mm)	1VCD400097
		16	VD4/L 17.06.16	•	•		
		20	VD4/L 17.06.20	•	•		
		25	VD4/L 17.06.25	•	•		
	800	16	VD4/L 17.08.16	•	•	1VCD003454 (300 mm)	
		20	VD4/L 17.08.20	•	•		
		25	VD4/L 17.08.25	•	•		
	1250	16	VD4/L 17.12.16	•	•		
		20	VD4/L 17.12.20	•	•		
		25	VD4/L 17.12.25	•	•		
24	630	12.5	VD4/L 24.06.12	•	•	1VCD003453 (230 mm)	1VCD400097
		16	VD4/L 24.06.16	•	•		
		20	VD4/L 24.06.20	•	•		
	800	16	VD4/L 24.08.16	•	•	1VCD003454 (300 mm)	
		20	VD4/L 24.08.20	•	•		
	1250	16	VD4/L 24.12.16	•	•		
		20	VD4/L 24.12.20	•	•		

**VD4/S 12-17-24 (right lateral operating mechanism; version for UniSwitch switchgear)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				210 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/S 12.06.12	•	1VCD000098	1VCD400098
		16	VD4/S 12.06.16	•		
		20	VD4/S 12.06.20	•		
		25	VD4/S 12.06.25	•		
	800	12.5	VD4/S 12.08.12	•		
		16	VD4/S 12.08.16	•		
		20	VD4/S 12.08.20	•		
		25	VD4/S 12.08.25	•		
	1250	12.5	VD4/S 12.12.12	•		
		16	VD4/S 12.12.16	•		
		20	VD4/S 12.12.20	•		
		25	VD4/S 12.12.25	•		
17.5	630	12.5	VD4/S 17.06.12	•	1VCD000098	1VCD400098
		16	VD4/S 17.06.16	•		
		20	VD4/S 17.06.20	•		
	800	12.5	VD4/S 17.08.12	•		
		16	VD4/S 17.08.16	•		
		20	VD4/S 17.08.20	•		
	1250	12.5	VD4/S 17.12.12	•		
		16	VD4/S 17.12.16	•		
24	630	12.5	VD4/S 24.06.12	•	1VCD000098	1VCD400098
		16	VD4/S 24.06.16	•		
		20	VD4/S 24.06.20	•		
	800	12.5	VD4/S 24.08.12	•		
		16	VD4/S 24.08.16	•		
		20	VD4/S 24.08.20	•		
	1250	12.5	VD4/S 24.12.12	•		
		16	VD4/S 24.12.16	•		
24	630	12.5	VD4/S 24.06.12	•	1VCD000098	1VCD400098
		16	VD4/S 24.06.16	•		
		20	VD4/S 24.06.20	•		
	800	12.5	VD4/S 24.08.12	•		
		16	VD4/S 24.08.16	•		
		20	VD4/S 24.08.20	•		
	1250	12.5	VD4/S 24.12.12	•		
		16	VD4/S 24.12.16	•		

**VD4/UniMix-F 12-17-24 (right lateral operating mechanism; version for UniMix switchgear P1/F unit both IP30, and Arc-proof; circuit-breaker without wheels and cabled to terminal box)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				230 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniMix-F 12.06.12	•	1VCD000106	1VCD400097
		16	VD4/UniMix-F 12.06.16	•		
		20	VD4/UniMix-F 12.06.20	•		
		25	VD4/UniMix-F 12.06.25	•		
17.5	630	12.5	VD4/UniMix-F 17.06.12	•	1VCD000106	1VCD400097
		16	VD4/UniMix-F 17.06.16	•		
		20	VD4/UniMix-F 17.06.20	•		
		25	VD4/UniMix-F 17.06.25	•		
24	630	12.5	VD4/UniMix-F 24.06.12	•	1VCD000106	1VCD400097
		16	VD4/UniMix-F 24.06.16	•		
		20	VD4/UniMix-F 24.06.20	•		

**VD4/UniMix-R 12-17-24 (right lateral operating mechanism; version for UniMix switchgear P1/F unit both IP30, and Arc-proof; circuit-breaker with wheels and fitted with power cord with 58-pole plug)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				230 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniMix-R 12.06.12	•	1VCD000107	1VCD400098
		16	VD4/UniMix-R 12.06.16	•		
		20	VD4/UniMix-R 12.06.20	•		
		25	VD4/UniMix-R 12.06.25	•		
17.5	630	12.5	VD4/UniMix-R 17.06.12	•	1VCD000107	1VCD400098
		16	VD4/UniMix-R 17.06.16	•		
		20	VD4/UniMix-R 17.06.20	•		
		25	VD4/UniMix-R 17.06.25	•		
24	630	12.5	VD4/UniMix-R 24.06.12	•	1VCD000107	1VCD400098
		16	VD4/UniMix-R 24.06.16	•		
		20	VD4/UniMix-R 24.06.20	•		

**VD4/UniAir 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/E unit - IP30 version – unit with circuit-breaker withdrawable on the supply side)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir 12.06.12	•	1VCD000102	1VCD400098
		16	VD4/UniAir 12.06.16	•		
		20	VD4/UniAir 12.06.20	•		
		25	VD4/UniAir 12.06.25	•		
	800	16	VD4/UniAir 12.08.16	•		
		20	VD4/UniAir 12.08.20	•		
		25	VD4/UniAir 12.08.25	•		
	1250	16	VD4/UniAir 12.12.16	•		
		20	VD4/UniAir 12.12.20	•		
		25	VD4/UniAir 12.12.25	•		
17.5	630	12.5	VD4/UniAir 17.06.12	•	1VCD000102	1VCD400098
		16	VD4/UniAir 17.06.16	•		
		20	VD4/UniAir 17.06.20	•		
	800	16	VD4/UniAir 17.08.16	•		
		20	VD4/UniAir 17.08.20	•		
	1250	16	VD4/UniAir 17.12.16	•		
24	630	20	VD4/UniAir 17.12.20	•	1VCD000102	1VCD400098
		12.5	VD4/UniAir 24.06.12	•		
		16	VD4/UniAir 24.06.16	•		
	800	20	VD4/UniAir 24.06.20	•		
		16	VD4/UniAir 24.08.16	•		
		20	VD4/UniAir 24.08.20	•		
	1250	16	VD4/UniAir 24.12.16	•		
		20	VD4/UniAir 24.12.20	•		

**VD4/UniAir-2R 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/E 2R unit - IP30 version – unit with circuit-breaker withdrawable on the supply and load side)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir-2R 12.06.12	•	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 12.06.16	•		
		20	VD4/UniAir-2R 12.06.20	•		
		25	VD4/UniAir-2R 12.06.25	•		
	800	16	VD4/UniAir-2R 12.08.16	•		
		20	VD4/UniAir-2R 12.08.20	•		
		25	VD4/UniAir-2R 12.08.25	•		
	1250	16	VD4/UniAir-2R 12.12.16	•		
		20	VD4/UniAir-2R 12.12.20	•		
		25	VD4/UniAir-2R 12.12.25	•		
17.5	630	12.5	VD4/UniAir-2R 17.06.12	•	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 17.06.16	•		
		20	VD4/UniAir-2R 17.06.20	•		
	800	16	VD4/UniAir-2R 17.08.16	•		
		20	VD4/UniAir-2R 17.08.20	•		
	1250	16	VD4/UniAir-2R 17.12.16	•		
24	630	12.5	VD4/UniAir-2R 24.06.12	•	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 24.06.16	•		
		20	VD4/UniAir-2R 24.06.20	•		
	800	16	VD4/UniAir-2R 24.08.16	•		
		20	VD4/UniAir-2R 24.08.20	•		
	1250	16	VD4/UniAir-2R 24.12.16	•		
24	630	12.5	VD4/UniAir-2R 24.12.20	•	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 24.12.20	•		
		20	VD4/UniAir-2R 24.12.20	•		
	800	16	VD4/UniAir-2R 24.12.20	•		
		20	VD4/UniAir-2R 24.12.20	•		
	1250	16	VD4/UniAir-2R 24.12.20	•		

**VD4/UniAir-A 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/A unit - IP30 version – unit “upside-down” with circuit-breaker withdrawable on the load side)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir-A 12.06.12	•	1VCD000104	1VCD400098
		16	VD4/UniAir-A 12.06.16	•		
		20	VD4/UniAir-A 12.06.20	•		
		25	VD4/UniAir-A 12.06.25	•		
	800	16	VD4/UniAir-A 12.08.16	•		
		20	VD4/UniAir-A 12.08.20	•		
		25	VD4/UniAir-A 12.08.25	•		
	1250	16	VD4/UniAir-A 12.12.16	•		
		20	VD4/UniAir-A 12.12.20	•		
		25	VD4/UniAir-A 12.12.25	•		
17.5	630	12.5	VD4/UniAir-A 17.06.12	•	1VCD000104	1VCD400098
		16	VD4/UniAir-A 17.06.16	•		
		20	VD4/UniAir-A 17.06.20	•		
	800	16	VD4/UniAir-A 17.08.16	•		
		20	VD4/UniAir-A 17.08.20	•		
	1250	16	VD4/UniAir-A 17.12.16	•		
24	630	12.5	VD4/UniAir-A 17.12.20	•	1VCD000104	1VCD400098
		16	VD4/UniAir-A 17.12.20	•		
		20	VD4/UniAir-A 17.12.20	•		
	800	16	VD4/UniAir-A 24.08.16	•		
		20	VD4/UniAir-A 24.08.20	•		
	1250	16	VD4/UniAir-A 24.12.16	•		
24	630	12.5	VD4/UniAir-A 24.12.20	•	1VCD000104	1VCD400098
		16	VD4/UniAir-A 24.12.20	•		
		20	VD4/UniAir-A 24.12.20	•		
	800	16	VD4/UniAir-A 24.12.20	•		
		20	VD4/UniAir-A 24.12.20	•		
	1250	16	VD4/UniAir-A 24.12.20	•		



**VD4/UniAir-F 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/F unit - IP30 version – unit with fixed circuit-breaker without wheels and cabled to terminal box)**

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir-F 12.06.12	•	1VCD000105	1VCD400097
		16	VD4/UniAir-F 12.06.16	•		
		20	VD4/UniAir-F 12.06.20	•		
		25	VD4/UniAir-F 12.06.25	•		
	800	16	VD4/UniAir-F 12.08.16	•		
		20	VD4/UniAir-F 12.08.20	•		
		25	VD4/UniAir-F 12.08.25	•		
	1250	16	VD4/UniAir-F 12.12.16	•		
		20	VD4/UniAir-F 12.12.20	•		
		25	VD4/UniAir-F 12.12.25	•		
17.5	630	12.5	VD4/UniAir-F 17.06.12	•	1VCD000105	1VCD400097
		16	VD4/UniAir-F 17.06.16	•		
		20	VD4/UniAir-F 17.06.20	•		
	800	16	VD4/UniAir-F 17.08.16	•		
		20	VD4/UniAir-F 17.08.20	•		
	1250	16	VD4/UniAir-F 17.12.16	•		
24	630	12.5	VD4/UniAir-F 24.06.12	•	1VCD000105	1VCD400097
		16	VD4/UniAir-F 24.06.16	•		
		20	VD4/UniAir-F 24.06.20	•		
	800	16	VD4/UniAir-F 24.08.16	•		
		20	VD4/UniAir-F 24.08.20	•		
	1250	16	VD4/UniAir-F 24.12.16	•		
		20	VD4/UniAir-F 24.12.20	•		

## Accessories included in the standard fittings

**KIT1 - Open/closed signalling contacts (-BB1)**

The standard fitting provides a set of five auxiliary contacts. On request and at extra cost, other additional sets of auxiliary contacts are available, whose number depends on the version of the apparatus. Please see the summary of the total number which can be supplied.

**Kit Description**

- 1A Set of 5 auxiliary contacts (Standard fitting for all versions)
- 1B Set of 10 auxiliary contacts (VD4/R, VD4/L, VD4/UniMix-F and VD4/UniAir-F versions)
- 1C Set of 12 auxiliary contacts (VD4/S, VD4/UniMix-R, VD4/UniAir, VD4/UniAir-2R and VD4/UniAir-A versions)
- 1D Set of 15 auxiliary contacts (versions VD4/R, VD4/L, VD4/UniMix-F and VD4/UniAir-F versions)

**Summary of the total number of auxiliary contacts available (\*)**

Total number	5 auxiliary contacts (-BB1)	10 auxiliary contacts (-BB1, -BB2)	12 auxiliary contacts (-BB1, -BB2, -BB3)	15 auxiliary contacts (-BB1, -BB2, -BB3)
VD4/R p230 VD4/R p300 VD4/L p230 VD4/L p300	Standard fitting	Alternative available on request. It is the minimum compulsory number if -M02 (the additional shunt opening release) is also requested	Alternative not available	Alternative available on request
VD4/UniMix-F p230	Standard fitting	As above	As above	As above
VD4/UniAir-F p230	Standard fitting	As above	As above	As above
VD4/S p210	Standard fitting	As above	Alternative available on request. It is the minimum compulsory number if -M02 (the additional shunt opening release) is also requested	Alternative not available
VD4/UniMix-R p230	Standard fitting	As above	As above	As above
VD4/UniAir VD4/UniAir-2R VD4/UniAir-A p300	Standard fitting	As above	As above	As above

(\*) Each shunt opening release requested uses an auxiliary contact to de-energise after opening the circuit-breaker, therefore the number of auxiliary contacts actually available is reduced by the same number of shunt opening releases installed.

**Characteristics**

Un:	24 ... 250 V AC-DC			
Rated current:	I <sub>th2</sub> = 10 A			
Insulation voltage:	2500 V 50 Hz (for 1 min)			
Electrical resistance:	3 mOhm			
Rated current and breaking capacity in category AC11 and DC11:				
Un	Cosφ	T	I <sub>n</sub>	I <sub>cu</sub>
220 V ~	0.7	–	2.5 A	25 A
24 V –	–	15 ms	10 A	12 A
60 V –	–	15 ms	6 A	8 A
110 V –	–	15 ms	4 A	5 A
220 V –	–	15 ms	1 A	2 A

## KIT 2 - Shunt opening release (-M01)

This allows remote opening control of the apparatus.

The release can operate both in direct and alternating current and is suitable both for instantaneous and permanent service. In any case, an auxiliary contact is provided to de-energise the shunt opening release after opening the circuit-breaker.

To guarantee tripping, the minimum current impulse time must be 100 ms.

Control of functionality and continuity is only possible with the STU device (accessory on request 23).

On request, a special version of the shunt opening release is available, which can operate combined with devices for control of continuity (CCC) or opening circuit supervision (TCS).

## KIT 3 - Key lock in open position

Specify the type of lock required:

**3A** Lock with different keys

**3B** Lock with the same keys

### Characteristics

Un:	24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–
Un:	24 - 48 - 60 - 110 - 120...127 - 220...240 - V ~ 50 Hz
Un:	110 - 120 - 127 - 220 - 240 - V ~ 60 Hz
Operating limits:	70 ... 110 % Un
Inrush power (Ps):	DC 200 W; AC = 200 VA
Inrush time:	about 100 ms
Continuous power (Pc):	DC = 5 W; AC = 5 VA
Opening time:	40...60 ms
Closing time:	40...80 ms
Insulation voltage:	2500 V 50 Hz (for 1 min)

## Optional accessories

### 1. Spring charging geared motor (-MS)

This carries out automatic charging of the circuit-breaker operating mechanism closing spring. After circuit-breaker closing, the geared motor immediately sees to recharging the closing spring. When there is no power supply or during maintenance work, the closing spring can in any case be charged manually (by means of the special lever incorporated in the operating mechanism).

**N.B. The 24 V d.c. geared motor is always supplied with the thermomagnetic protection circuit-breaker (accessory 2).**

### Characteristics

Un:	24...30 - 48...60 - 110...130 - 220...250 V–
Un:	100...130 - 220...250 V ~ 50/60 Hz
Operating limits:	85 ... 110 % Un
Inrush power (Ps):	DC=500 W; AC=500 VA
Rated power (Pn):	DC=200 W; AC=200 VA
Inrush time:	0.2 s
Charging time:	4-5 s
Insulation voltage:	2500 V 50 Hz (for 1 min)





## 2. Geared motor thermomagnetic protection circuit-breaker (-FB1)

This protects the spring charging motor in the case of an overload and is always provided with a signalling contact.

It is available in two versions:

**2A** Protection circuit-breaker with contact signalling circuit-breaker closed

**2B** Protection circuit-breaker with contact signalling circuit-breaker open.

(specify the spring charging motor power supply voltage in the order).



## 3. Additional shunt opening release (-M02)

Like the -M01 shunt opening release, this allows remote opening control of the apparatus and can be supplied by a circuit completely separate from the -M01 release. The release can operate both in direct and alternating current and is suitable both for instantaneous and permanent service. In any case, an auxiliary contact is provided to de-energise the shunt opening release after opening the circuit-breaker. To guarantee tripping, the minimum current impulse time must be 100 ms.

Control of functionality and continuity is only possible with the STU device (accessory on request 23).

On request, a special version of the shunt opening release is available, which can operate combined with devices for control of continuity (CCC) or opening circuit supervision (TCS).

### Characteristics

Un: 24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–

Un: 24 - 48 - 60 - 110 - 120...127 - 220...240 - V ~ 50 Hz

Un: 110 - 120 - 127 - 220 - 240 - V ~ 60 Hz

Operating limits: 70 ... 110 % Un

Inrush power (Ps): DC 200 W; AC = 200 VA

Inrush time: about 100 ms

Continuous power (Pc): DC = 5 W; AC = 5 VA

Opening time: 40...60 ms

Closing time: 40...80 ms

Insulation voltage: 2500 V 50 Hz (for 1 min)



## 4. Opening solenoid (-M03)

The opening solenoid -M03 is a release with demagnetisation, which is supplied as standard when the PR521 series of overcurrent protection devices is requested.

The demagnetisation release is an accessory which is not alternative to the -M01 and -M02 releases. Use of this release with overcurrent protection devices other than the PR521 series must be verified previously.

## 5. Undervoltage release (-MU)

The undervoltage release opens the circuit-breaker when the relative power supply drops notably or is cut off.

It can be used for remote tripping (by means of a normally closed pushbutton), for a lock on closing or for controlling the voltage in the auxiliary circuits. Circuit-breaker closing is only allowed with the release supplied (the lock on closing is carried out mechanically). The release can operate both in direct and alternating current.

### Characteristics

Un: 24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–

Un: 24 - 48 - 60 - 110 - 120 - 127 - 220...240 V ~ 50 Hz

Un: 110 - 120...127 - 220...240 V ~ 60 Hz

Operating limits:

- circuit-breaker opening: 35-70% Un
- circuit-breaker closing: 85-110% Un

Inrush power (Ps): DC 200 W; AC = 200 VA

Inrush time: about 100 ms

Continuous power (Pc): DC = 5 W; AC = 5 VA

Opening time: 30 ms

Insulation voltage: 2500 V 50 Hz (for 1 min)



## 6. Electronic time delay device (-KT)

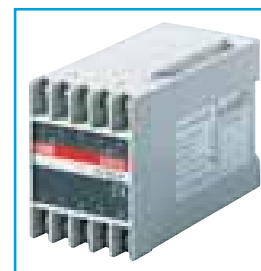
This device allows the undervoltage release trip to be delayed with fixed and adjustable times.

The electronic time delay device must be mounted outside the circuit-breaker.

Using the undervoltage release combined with the electronic time delay device -KT prevents tripping when the power supply of the release is cut off or if there are short voltage drops.

When it is not supplied, circuit-breaker closing is prevented.

The time delay device must be combined with an undervoltage release with the same voltage as the delay device.



### Characteristics of the time delay device

Un: 24...30 - 48 - 60 - 110...127 - 220...250 V–

Un: 48 - 60 - 110...127 - 220...240 - V ~ 50/60 Hz

Adjustable opening time (release + time delay device): 0.5-1-1.5-2-3 s

## 7. Electrical signalling of undervoltage release trip (-BB5)

The undervoltage release can be fitted with a contact (at choice, normally closed or open) for signalling undervoltage release energised or de-energised and for remote signalling of the state of the release.

Specify the type of signalling required:

**7A** signalling of undervoltage release energised

**7B** signalling of undervoltage release de-energised.





### 8. Shunt closing release (-MC)

The shunt closing release (-MC) allows remote closing control of the apparatus. The release can operate both in direct and alternating current and is suitable for both instantaneous and continuous service. When permanently supplied, the release carries out the electrical anti-pumping function. In the case of instantaneous service, the minimum current impulse time must be 100 ms. The shunt closing release (-MC) is supplied as compulsory on the VD4/UniAir, VD4/UniAir-2R and VD4/UniAir-A versions not provided with a PR521 release.

#### Characteristics

Un: 24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–	
Un: 24 - 48 - 60 - 110 - 120...127 - 220...240 - V ~ 50 Hz	
Un: 110 - 120 - 127 - 220 - 240 - V ~ 60 Hz	
Operating limits:	70 ... 110 % Un
Inrush power (Ps):	DC 200 W; AC = 200 VA
Inrush time:	about 100 ms
Continuous power (Pc):	DC = 5 W; AC = 5 VA
Opening time:	40...60 ms
Closing time:	40...80 ms
Insulation voltage:	2500 V 50 Hz (for 1 min)



### 9. Signalling contacts for closing springs charged and discharged (-BS2)

Two pairs of contacts (one open and the other closed) allow remote signalling of the state of the circuit-breaker operating mechanism closing spring. This means remote signalling of both spring charged and spring discharged is available.



### 10. Mechanical override of undervoltage release

This is a mechanical device which allows the undervoltage release function to be disabled. This means it is possible to close the circuit-breaker even when the undervoltage release is not supplied with power. Enabling / disabling the undervoltage release is carried out by means of the special knob located on the front of the circuit-breaker operating mechanism. The undervoltage override is always fitted with electrical signalling of undervoltage release disabled (-BB6).



### 11. Opening pushbutton protection

The protection only allows the opening pushbutton to be operated with a special tool.

## 12. Closing pushbutton protection

The protection only allows the closing pushbutton to be operated with a special tool.



## 13. Opening and closing pushbutton protection

The protection only allows the opening and closing pushbuttons to be operated with a special tool.



## 14. Padlock on opening and closing pushbuttons

The device allows the opening and closing pushbuttons to be locked with a maximum of three 4 mm diameter padlocks (not provided). The padlock is not supplied.

This lock is available in two versions:

- 14A** padlockable equally for both pushbuttons
- 14B** padlockable separately for the opening and/or closing pushbutton



## 15. PR521 protection device (-BR51)

This causes out circuit-breaker tripping due to:

- overload (51)
- short-circuit (50)
- earth fault (51N).

It is available in the following versions::

- 15A** PR 521 self-supplied with protection 51-50
- 15B** PR 521 self-supplied with protection 51-50-51N.
- 15C** PR521/DK version specific for the Italian market conforming to DK5600 ENEL which requires an auxiliary power supply (can only be supplied with VD4/R, VD4/L, in VD4/UniMix and VD4/UniAir versions)

For the technical and trip characteristics and for the adjustable threshold values, please see chapter 3.

### Notes

- The transparent anti-tampering protection is always supplied with the PR521 protection device.
- For operation of the release, the circuit-breaker must be fitted with the opening solenoid - MO3 (accessory 4) and with two or three current sensors -BL/L1 ... L3 (accessory 16).

Three current sensors are necessary to carry out function 51N for vectorial summation of the phase currents. Should function 51N be carried out with an external toroidal current transformer, only two current sensors can be installed. The PR521/DK version is only supplied with its own DK sensors and with DK series external toroidal transformer for the homopolar protection..

**In the 24 kV versions with 230 mm pole centre distance, only two current sensors can be mounted (on the lateral poles).**





### 16. Current sensors for PR521 protection device (-BC1 ... -BC3)

The current sensors transmit the current signal to be processed to the release and supply the power to supply the release and the opening solenoid in the case of tripping.

Types of sensors available for PR 521

Kit	Number	Rated current
16A	No. 2 sensors	In = 40 A
16B	No. 3 sensors	In = 40 A
16C	No. 2 sensors	In = 80 A
16D	No. 3 sensors	In = 80 A
16E	No. 2 sensors	In = 250 A
16F	No. 3 sensors	In = 250 A
16G	No. 2 sensors	In = 1250 A
16H	No. 3 sensors	In = 1250 A
16I	No. 2 sensors version for DK 5600	
16L	No. 3 sensors version for DK 5600	

Maximum number of current sensors for PR521 release which can be installed on board the circuit-breaker according to the version and to the rated insulation voltage

Service voltage (kV)			12 - 17,5	24
Pole centre distance (mm)				
VD4/R	VD4/L	230	2 or 3	2 or 3
VD4/R	VD4/L	300	2 or 3	2 or 3
VD4/S		210	2 or 3	--- (*)
VD4/UniMix-F	VD4/UniMix-R	230	2 or 3	2 or 3
VD4/UniAir	VD4/UniAir-2R	300	2 or 3	2 or 3
VD4/UniAir-A	VD4/UniAir-F			

(\*) in this case, the circuit-breaker can be combined with the PR512 switchgear protection supplied by BT toroidal transformers for mounting on medium voltage insulated cables (see accessory 24).



### 17. External toroidal transformer (-BN)

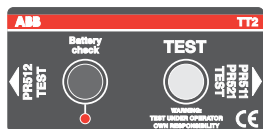
The external toroidal transformer is indispensable for detecting earth fault currents when the circuit-breaker is only fitted with two current sensors. It also allows earth fault currents below about ten Amperes to be detected.

It is available in the following versions (with transformation relation  $I_n = 50/1$  A):

**17A** with closed core with 110 mm internal diameter (in photo)

**17B** with openable core with 110 mm internal diameter.

**17C** with closed core with 110 mm internal diameter, version for DK 5600



### 18. TT2 test unit

This is a portable device which allows the PR521 "release chain" and opening solenoid (-MO3) functionality to be checked



### 19. Wheels

This kit consists of the set of front and rear wheels to be mounted in replacement of the fixing brackets of the VD4/R and VD4/L version circuit-breaker.

**N.B.** Assembly is to be carried out by the customer.

**Attention!** The wheels are part of the standard fittings for the VD4/S, VD4/UniMix-R, VD4/UniAir, VD4/UniAir-2R and VD4/UniAir-A circuit-breakers.



## 20. Socket and plug

The kit consists of a 58-pole male (mobile plug) and female (fixed socket) connector, and the pins needed for cabling.

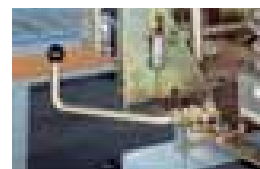
**N.B.** The cables, sheath and assembly are to be carried out by the customer.



## 21. Release lever for VD4/R and VD4/L

On request, the lever is available to allow the circuit-breaker to be hooked up and locked in the unit to prevent translation of the circuit-breaker.

**N.B.** Activation of the lever does not carry out automatic opening of the circuit-breaker. This lever is part of the standard fittings for the VD4/UniAir, VD4/UniAir-2R, VD4/UniAir-A types and is only compatible with the VD4/R and VD4/L versions.



## 22. Connection terminals

Some terminals for connection to the fixed circuit-breaker power circuit are available for the VD4/R and VD4/L versions (on request). The set includes the set of three top and bottom terminals available in the following versions:

**22A** Set of 630 A terminals

**22B** Set of 1250 A terminals.



## 23. Device for controlling functionality and continuity of the shunt opening/closing releases (STU Shunt Test Unit)

Because of the particular construction of these releases, checking the functionality of the shunt closing (-MC) and opening (-MO1, -MO2) releases is not possible with dedicated relays (e.g. TCS Test Control Supervision, CCC Control Coil Continuity) or with the REF control and protection unit. The only device able to carry out control of the functionality is the STU device. Should you want to carry out this check using devices other than the STU, please contact us. The STU device can be combined with the shunt opening release (-MO1; -MO2) or with the shunt closing release (-MC) to check its functionality and continuity (one device for each release to be controlled).

The Shunt Test control/monitoring Unit allows the continuity of releases with a rated service voltage between 24 V and 250 V (AC and DC), as well as the functionality of the electronic circuit of the release to be checked.

The continuity check is carried out cyclically with an interval of 20 seconds between one test and the next.

The unit has optical signals by means of LEDs on the front. In particular, the following information is indicated:

- POWER ON: presence of power supply
- -M0/-MC TESTING: test being carried out
- TEST FAILED: signal following a failed test or signal for absence of auxiliary power supply
- ALARM: signal following three consecutive failed tests.

Two changeover relays are also available on board the unit, which signal the following two events remotely:

- failure of one test (resetting takes place automatically when the alarm ceases)
- failure of three tests (resetting only takes place by means of the manual - RESET – from the front of the unit).

There is also a manual - RESET – button on the front of the unit.

### Characteristics

Un: 24 ... 250 V AC/DC

Maximum current interrupted: 6 A

Maximum voltage interrupted: 250 V AC





#### 24. PR512 switchgear release

Please refer to the specific catalogue 1VCP000055 for the characteristics of the PR512 release.

#### 25. LV Toroidal current transformers for PR512 release only suitable for assembly on MV insulated cable

The following toroidal transformers with fixed core with 55 mm internal diameter are available:

Type	Rated current
25A	40/1 A
25B	80/1 A
25C	250/1 A
25D	1250/1 A

#### 26. Special accessories for the VD4/S circuit-breaker

A special cord with 1.5 m standard length, with cabled socket is provided (on request) for the VD4/S circuit-breaker.

Should this cord not be ordered, the customer can make it using a 58-pole socket. This socket must be completed with the striker pin supplied with the accessories the circuit-breaker is fitted with. Omission of this pin will not allow operation of the circuit-breaker even with the plug correctly inserted in the socket.

#### PR521/DK device

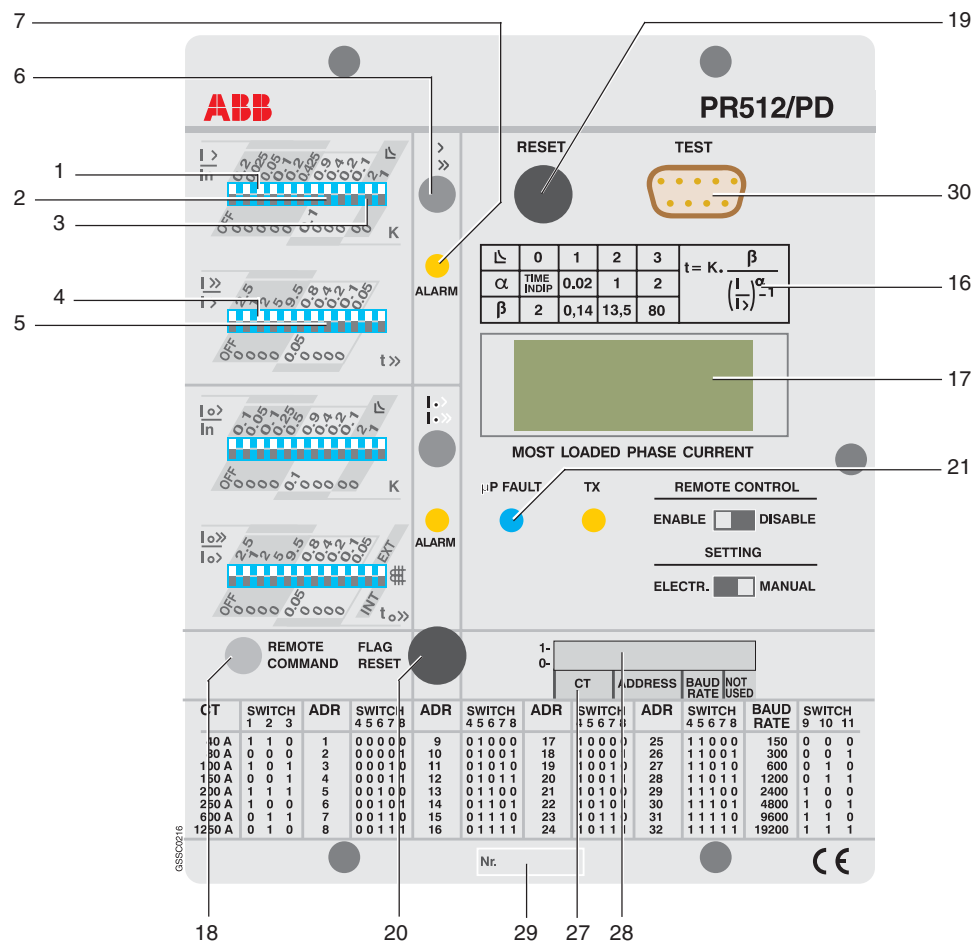
The PR521/DK unit is incorporated on board the VD4/R, VD4/L, VD4/UniAir and VD4/UniMix series circuit-breakers and is a protection device against overcurrent specifically for the Italian market. In fact, it was designed to meet the requirements of the ENEL DK 5600 ed. V June 2006 specification.

The General Protection Device DG, according to DK5600, consists of the PR521/DK release, of two or three phase current sensors, of a toroidal homopolar current sensor for PR521/DK (to be mounted outside the circuit-breaker) and of the demagnetisation release (–MO3) which is integrated and acts directly on the EL operating mechanism to carry out opening of the apparatus.

N.B. All the DK type of current sensors like the DK type of toroidal homopolar current sensor are only to be combined with the PR521/DK release (therefore they cannot be combined with other releases in the PR521 family).

PR521/DK is fitted with “universal” 24 ... 130 V AC/DC auxiliary power supply to ensure correct operation of the protection function against earth fault regardless of the phase current. In any case, the unit is able to operate in self-supply mode and guarantees correct operation of the protection function in presence of a current higher or equal to 50 A circulating on at least one phase fitted with a current sensor.

Please refer to the 1VCD600228 manual for the specific characteristics of the device.



### Caption

- 1 Dip-switch setting trip threshold of protection I>
- 2 Dip-switch setting timing K of protection I>
- 3 Dip-switch setting type of curve (DT, NI, VI, EI) of protection I>
- 4 Dip-switch setting trip threshold of protection I>>
- 5 Dip-switch setting trip time t>> protection I>>
- 6 Bistable magnetic flag signalling protection I> or I>> tripped
- 7 LED signalling timing in progress of protections I> or I>>
- 16 Time-current relationship according to IEC 255-4
- 17 Display showing the most loaded phase current
- 18 Bistable magnetic flag signalling remote opening of the circuit-breaker has taken place
- 19 RESET pushbutton of the microprocessor and of the bistable relays signalling SRE and ¼P FAULT
- 20 Pushbutton for resetting the bistable magnetic flags (ref. 6, 18)
- 21 LED signalling microprocessor fault (¼P FAULT)
- 27 Dip-switch setting size of current transformers
- 28 Dip-switch cover cap and "In" plate for CT size
- 29 Unit serial No.
- 30 TEST connector

### Resistance to vibrations

The VD4 circuit-breakers with lateral EL operating mechanism are unaffected by mechanical vibrations or those due to electromagnetic effect.

### Electromagnetic compatibility

The VD4 circuit-breakers with lateral EL operating mechanism fitted with PR521 electronic protection devices ensure operation free of unwarranted trips, even in the presence of interference caused by electronic apparatus, by atmospheric disturbances or by electrical discharges. Furthermore, the apparatus does not generate interference with other electronic equipment in the vicinity of the installation. The above is in compliance with the EN 50081-2, 50082-2 and 60694 Standards, as well as with the European EEC 89/336 and subsequent Directives regarding electromagnetic compatibility (EMC), and the releases are CE marked as complying with these.

### Tropicalization

The VD4 circuit-breakers with lateral EL operating mechanism are manufactured in compliance with the strictest regulations for use in hot-humid-saline climates.



All the most important metal components are treated against corrosive factors according to the environment and to UNI 12500 Standards. Galvanisation is carried out in accordance with UNI ISO 2081 Standards, classification code Fe/Zn 12, with a thickness of  $12 \times 10^{-6}$  m, protected by a conversion layer mainly consisting of chromates in compliance with the UNI ISO 4520 Standards. These construction characteristics mean the VD4 series of circuit-breakers with lateral EL operating mechanism comply with climate graph 8 of the IEC 60721-2-1 and IEC 60068-2-2 (Test B: Dry Heat) and IEC 60068-2-30 (Test Db: Damp Heat, cyclic) Standards.

### Altitude

It is a known fact that the insulating property of air decreases as the altitude increases. This phenomenon must therefore always be taken into account during the design stage of the insulating components of apparatus to be installed over 1000 m above sea level. In this case a correction coefficient must be considered, which can be taken from the following graph, drawn up on the basis of the indications in the IEC 62271-100 Standards. The following example is a clear interpretation of the indications given above.

Graph for determining the Ka correction factor according to the altitude

**H** = altitude in metres;  
**m** = value referred to industrial frequency and to atmospheric impulse and between phase withstand voltages.

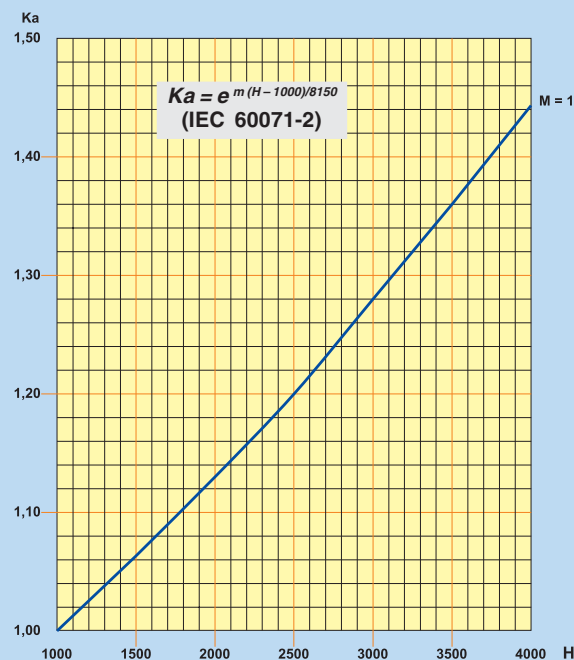
#### Example

- Installation altitude: 2000 m
- Rated service voltage of 12 kV
- Industrial frequency withstand voltage: 28 kV rms
- Impulse withstand voltage: 75 kVp
- Ka factor, which can be taken from the graph = 1.13.

Considering the above parameters, the apparatus must withstand (on test at zero altitude, i.e. at sea level):

- power frequency withstand voltage equal to:  $28 \times 1.13 = 31.6$  kVrms
- impulse withstand voltage equal to:  $75 \times 1.13 = 84.7$  kVp.

From the above, it can be deduced that for installations at an altitude of 2000 m above sea level, with 12 kV service voltage, apparatus must be provided with 17.5 kV rated voltage, characterised by insulation levels at industrial frequency of 38 kVrms with 95 kVp impulse withstand voltage.



## Environmental protection programme

The VD4 circuit-breakers with lateral EL operating mechanism are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management). The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. Assessment of the environmental impact of the life cycle of the product (LCA - Life Cycle Assessment), obtained by minimising energy consumption and overall raw materials of the product, became a concrete matter during the design stage by means of targeted selection of the materials, processes and packing. Production techniques which prepare the products for simple dismantling and separation of the components are used to manufacture the circuit-breakers. This is to allow maximum recycling at the end of the useful life cycle of the apparatus. The Environmental Management System of the medium voltage apparatus production facility is certified by an external independent organisation.

## Anti-pumping device

The EL type of operating mechanism of the VD4 circuit-breakers (in all versions) is fitted with a mechanical anti-pumping device which prevents re-closing due to either electrical or mechanical commands.

Should both the closing command and any one of the opening commands be active at the same time, there would be a continuous succession of opening and closing operations.

The anti-pumping device avoids this situation, ensuring that each closing operation is only followed by a single opening operation and that there is no other closing operation after this. To obtain a further closing operation, the closing command must be released and then re-launched.

Furthermore, the anti-pumping device only allows circuit-breaker closure if the following conditions are present at the same time:

- operating mechanism springs fully charged
- opening pushbutton and/or shunt opening release -MO1/-MO2) not enabled
- circuit-breaker open.

## Spare parts

- Opening spring (\*)
- Closing spring (\*)
- Complete pole (\*)
- Operating mechanism base (\*)
- Geared motor
- Shunt opening release
- Additional shunt opening release
- Shunt closing release
- Key lock
- Geared motor limit contact
- Opening pushbutton
- Closing pushbutton
- Set of VD4 / UniAir / 2R/A pliers (specify the rated current)
- Terminals for VD4/R and VD4/L (specify the rated current)

**Ordering:** for availability and ordering of spare parts, please contact our Service, specifying the circuit-breaker serial number.

(\*) Replacement can only be carried out by trained personnel and/or in our workshops.



### PR521 protection device

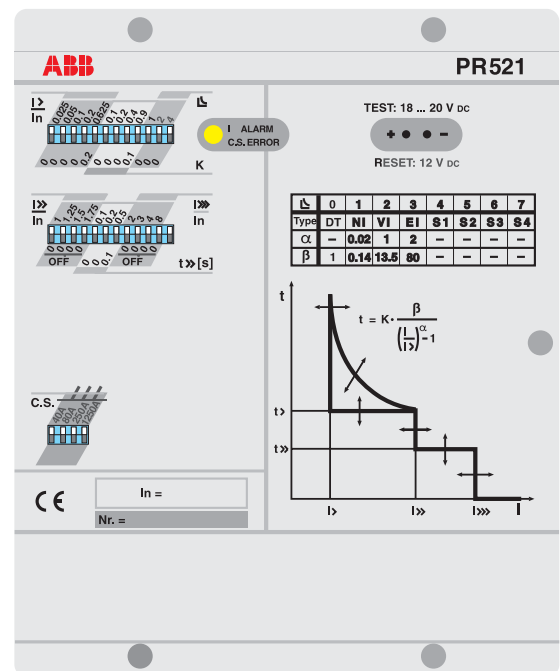
The PR521 unit carries out the following functions:

- **PR521 - LSI:** overcurrent protection (code ANSI 50-51), two-phase or three-phase according to the whether it is connected to two or three current sensors;
- **PR521 - LSIG:** ike PR521-LSI plus earth fault protection (code ANSI 51N) (by means of vectorial summation inside the three phase sensors or by means of an external earth fault toroid and two or three current sensors).

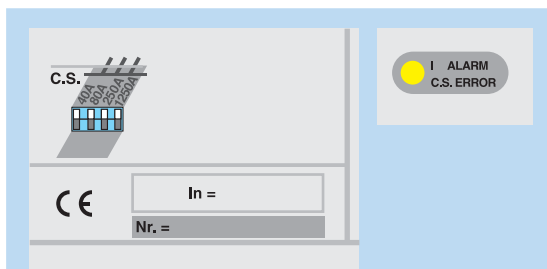
Apart from supplying the current signal, the current sensors also provide the energy required for operation of the unit. The unit is self-supplied and its correct operation is guaranteed in the presence of a current higher than or equal to 20% of the rated value on at least one of the phases fitted with current sensors ( $0.2 \times I_n$ ).

Microprocessor-based digital technology is used in its construction.

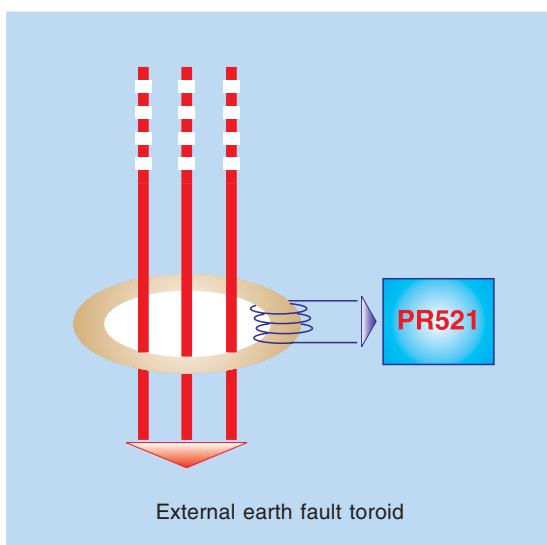
The unit causes the circuit-breaker, in which it is integrated, to open, by means of an opening solenoid (-MO3 – see accessory kit no. 4), which acts directly on the operating mechanism of the apparatus.



PR521 with LSI protection functions.



Selection of the primary current of the current sensors



External earth fault toroid

### Current sensors (C.S.)

The PR521 unit can be used with current sensors supplied by ABB with the following characteristics:

Rated primary current	$I_n = 40 \text{ A}$
	$I_n = 80 \text{ A}$
	$I_n = 250 \text{ A}$
	$I_n = 1250 \text{ A}$
Rated secondary current	$I_n = 1 \text{ A}$

To select the sensor, enable the corresponding dipswitch. If, by chance, several sensors are selected, the alarm LED flashes to provide an error signal.

### External earth fault toroid

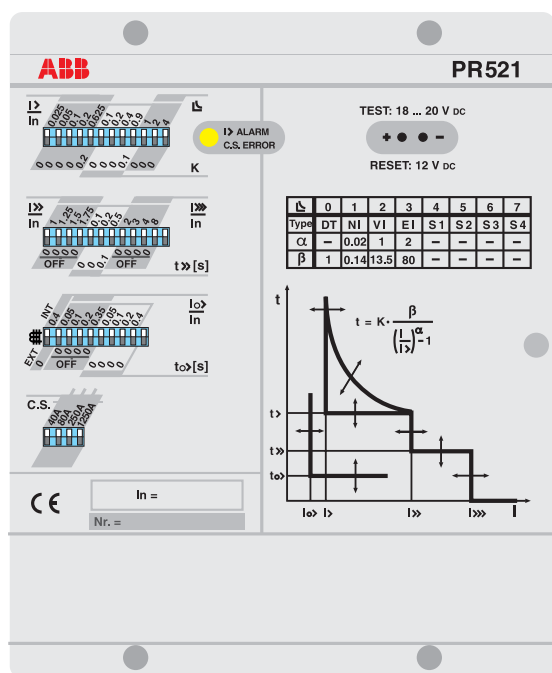
The PR521 unit can be used with any external toroid to determine the earth fault current as long as it has the following characteristics:

Rated primary current	any
Rated secondary current	1 A
Performance	1 VA
Class of precision, ultimate precision factor	Cl. 3 or higher

Use of the external toroid for determining the earth fault current is recommended when very low setting values of the 51N threshold are required (less than 0.45 times the rated current -  $I_n$  - of the current sensors).

### Release actuator

The PR521 release unit carries out release of the operating mechanism in the case of the protection functions tripping, by means of an opening solenoid (-MO3 - see accessories chap. 2).



PR521 with LSIG protection functions.

### Self-supply

Operation of the PR521 unit is guaranteed by the self-supply circuit. The minimum value of phase current needed for operation is  $0.2 \times I_n$ .

This circuit is able to withstand:

- overload:  $1.5 \times I_n$  continuous
- overload:  $6 \times I_n$  for 200 sec.
- overload: 25 kA for 1 sec. (short-time withstand overcurrent of the circuit-breaker).

### MTBF

An MTBF of 15 years at an operating temperature of  $40^\circ\text{C}$  is expected.

### Ambient conditions

Ambient temperature	$-5^\circ\text{C} \dots +40^\circ\text{C}$
Storage temperature	$-40^\circ\text{C} \dots +90^\circ\text{C}$
Relative humidity without condensation	90%
Degree of protection (mounted on the circuit-breaker and with front protection)	IP42

### Operating frequency

From 45 Hz to 66 Hz.

## Inputs

### Inanalogue inputs

- Inputs for current sensors.  
The current sensors which supply the signals proportional to the current circulating in the phases and the energy required for self-supply of the apparatus are connected to the PR521 unit by means of these three inputs.
- Input for external earth fault toroid.  
The external earth fault toroid whose signal is directly proportional to the earth fault current is connected to the PR521 unit by means of this input. This transformer does not supply the energy for self-supplied operation of the release. This input must be made using a braided screened telephone cable whose braiding must be earthed on the metallic box of the PR521 (please refer to the wiring diagram enclosed with the circuit-breaker).  
Because of EMC problems, the earthing connection of the braiding must be as solid and short as possible.

### Binary input for control function

- Input for circuit-breaker remote opening.  
This input makes it possible to open the circuit-breaker remotely, exploiting the energy, if available, supplied by the current sensors.  
This input must be made using a screened telephone cable whose braiding must be earthed on the metallic box of the PR521 (please refer to the wiring diagram enclosed with the circuit-breaker).  
By connecting an external contact without potential (e.g. the contact of a Buchholz relay) to the special input connector, it is possible to control circuit-breaker opening remotely through the PR521 release when the primary current exceeds the value of  $0.2 \times I_n$  on at least one phase fitted with a current sensor.



## Outputs

### Power output

This output controls the specific opening solenoid for PR521 (-MO3 - see chapter 2).

### Signalling output by means of closing contact

An output made by means of a bistable relay is available (it keeps the state even with a power cut and until the RESET operation), with closing contacts without potential, through which the relay trip signal is supplied. After protection trip and circuit-breaker opening, this contact can be reset in two different ways:

- with phase current higher than  $0.2 \times I_n$ , automatic resetting takes place when the circuit-breaker closes again;
- with phase current lower than  $0.2 \times I_n$  and the protection unit off (even with the circuit-breaker open), by means of the front bushing for RESET as defined in the “Test and reset function”.

**N.B.** This signalling contact is not enabled if a remote circuit-breaker opening command is given or for the Test operation of release functionality.

Function	Protection tripped
Type	Bistable
Maximum changeover power	150 W / 1250 VA (resistive load)
Maximum changeover voltage	220 V– / 250 V ~
Maximum changeover current	5 A
Breaking capacity (UL/CSA):	
– at 30 Vdc (resistive load)	5 A
– at 250 Vac (resistive load)	5 A
– at 250 Vac ( $\cos\phi = 1.0$ )	5 A
– at 250 Vac ( $\cos\phi = 0.4$ )	3 A
Mechanical life (at 180 operations/minute)	$5 \times 10^7$
Electrical life	$1 \times 10^5$
Insulation:	
– between open contacts	1000 Veff (50 Hz / 1 min)
– between contact and coil	3000 Veff (50 Hz / 1 min)

## Protection functions

The PR521 unit carries out the following protections:

- **PR521 - LSI:** phase overcurrent protection (instantaneous, with adjustable delay, with definite and fixed time)
- **PR521 - LSIG:** like PR521-LSI plus earth fault overcurrent protection (with adjustable delay).

The thresholds and trip times can be selected directly by setting some Dip-switches on the front of the unit.

For fixed time protection, the trip time is given by the following relationship:

$$t = K \times \beta$$

For definite time protection, the relationship between trip time and overcurrent is given by the following formula:

$$t = K \times \frac{\beta}{\left[ \frac{I}{I>} \right]^{\alpha} - 1}$$

### Caption

**t** = trip time

**K** = parameter which can be set by the user to select the required trip curve

**$\alpha, \beta$**  = pair of parameters depending on the type of protection which can be selected by the user

**I** = fault current

**I>** = trip threshold which can be selected by the user.



## Overcurrent protection with fixed time

A family of protection curves is available, defined as “Fixed time with adjustable delay DT” (in accordance with the IEC 60255-3 Standards).

The following settings are possible:

### • 32 current threshold values ( $I>$ ) (1)

0.200	0.225	0.250	0.275
0.300	0.325	0.350	0.375
0.400	0.425	0.450	0.475
0.500	0.525	0.550	0.575
—	0.625	0.650	0.675
0.700	0.725	0.750	0.775
0.800	0.825	0.850	0.875
0.900	0.925	0.950	0.975
1.000	—	—	—
$x I_n$			

### • 16 trip times ( $t>$ ), (with $b = 1$ , $K = 0.1...1.6$ with steps of 0.1) (2)

0.1	0.2	0.3	0.4	0.5	—
0.6	0.7	0.8	0.9	1.0	—
1.1	1.2	1.3	1.4	1.5	1.6 s

The protection **cannot be excluded**.

The  $I>$  protection for the DT curve processes the peak value over the whole interval  $0.2 \dots 20 x I_n$ .

## Overcurrent protection with definite time

Three different families of protection curves are available (in accordance with the IEC 60255-3 Standards), defined as follows:

- Normally inverse time NI
- Very inverse time VI
- Extremely inverse time EI.

The following settings are possible:

### • 32 current threshold values ( $I>$ ) (1)

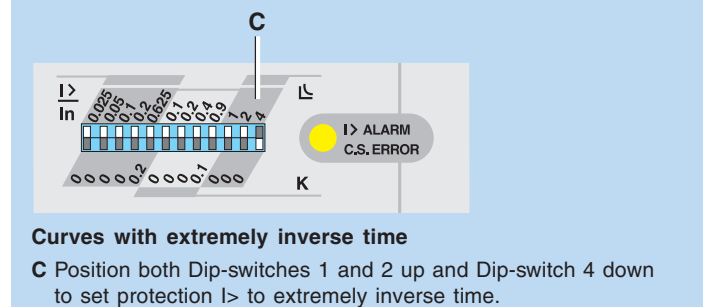
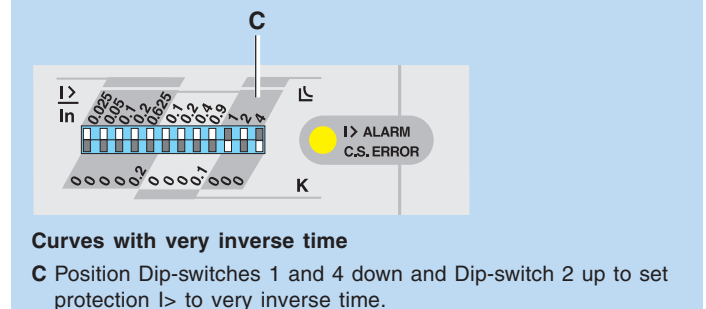
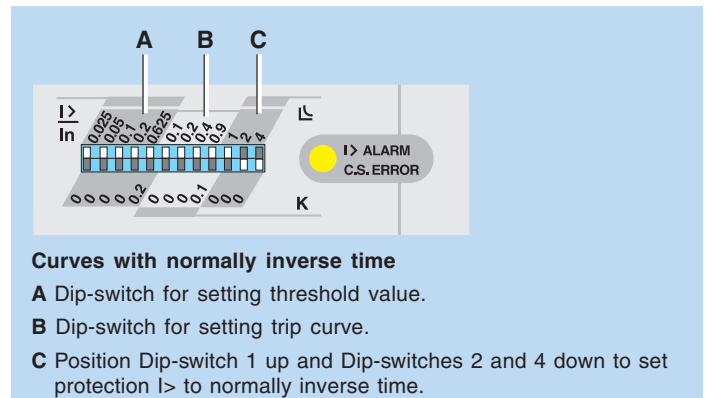
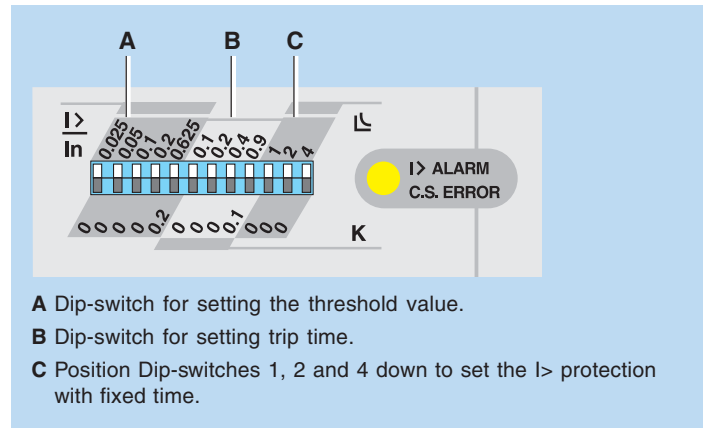
0.200	0.225	0.250	0.275
0.300	0.325	0.350	0.375
0.400	0.425	0.450	0.475
0.500	0.525	0.550	0.575
—	0.625	0.650	0.675
0.700	0.725	0.750	0.775
0.800	0.825	0.850	0.875
0.900	0.925	0.950	0.975
1.000	—	—	—
$x I_n$			

### • 16 trip curves for each family, defined as follows (3)

- Curves with normally inverse time (with  $\alpha = 0.02$ ,  $\beta = 0.14$ ,  $K = 0.1...1.6$  with steps of 0.1)
- Curves with very inverse time (with  $\alpha = 1$ ,  $\beta = 13.5$ ,  $K = 0.1...1.6$  with steps of 0.1)
- Curves with extremely inverse time (with  $\alpha = 2$ ,  $\beta = 80$ ,  $K = 0.1...1.6$  with steps of 0.1)

The protection **cannot be excluded**. The trip curves move as the current thresholds change.

The  $I>$  protection for the NI, VI, EI curves processes the true effective value of the phase current.



- (1) The unit guarantees that it does not enter the threshold for currents under  $1.05 x I>$  set to guarantee threshold entry for currents higher than  $1.30 x I>$  set.
- (2) The tolerance over the trip times with three-phase power supply is  $\pm 15\%$  or  $\pm 30$  ms.
- (3) The tolerance over the trip times is  $\pm 20\%$  or  $\pm 150$  ms.

### Overcurrent protection with adjustable delay

The following settings are possible:

• **14 current threshold values ( $I_{>>}$ ) (1)**

1.00	1.25	1.50	1.75
—	2.25	2.50	2.75
3.00	3.25	—	3.75
4.00	4.25	4.50	—
—	—	5.50	—
<b>x <math>I_n</math></b>			

• **8 trip times ( $t_{>>}$ ) (2)**

0.10	0.20	0.30	0.40
0.50	0.60	0.70	0.80 s

The protection **can be excluded**.

The  $I_{>>}$  protection processes the peak value over the whole interval 1 ... 20 x  $I_n$ .

- (1) The tolerance over the threshold values is  $\pm 10\%$ .  
 (2) The tolerance over the trip times is  $\pm 15\%$  or  $\pm 30$  ms.

### Instantaneous overcurrent protection

The following settings are possible:

• **15 current threshold values ( $I_{>>>}$ ) (1)**

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17 x  $I_n$

• **Instantaneous trip time not adjustable (curve with intentional delay nil added)**

The protection **can be excluded**.

The  $I_{>>>}$  protection processes the peak value over the whole interval 2 ... 20 x  $I_n$ .

- (1) The tolerance over the threshold values is  $\pm 10\%$ .  
 (2) The tolerance over the trip times is  $\pm 15\%$  or  $\pm 30$  ms.

### Earth fault overcurrent protection with adjustable delay (internal vectorial sum)

The earth fault current is calculated as the vectorial sum of the three phase currents. The apparatus must therefore be fitted with three current sensors.

This sum is made by means of an internal toroid (which processes the secondary phase currents of the current sensors). Selection of this method is carried out by means of the front Dip-switches.

The following settings are possible:

• **14 current threshold values ( $I_{o>}$ ) (1)**

0.65	0.70	0.75	0.80
0.85	0.90	0.95	1.00
1.05	1.10	<b>x <math>I_n</math></b>	

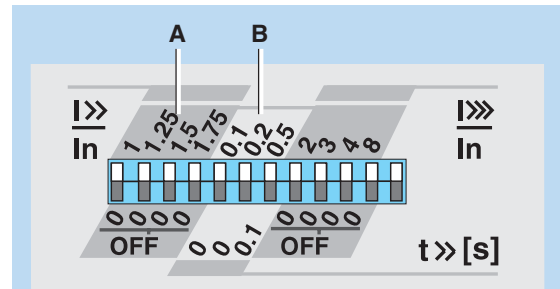
• **16 trip times ( $t_{o>}$ ) (2)**

0.00 (3)	0.05	0.10	0.15
0.20	0.25	0.30	0.35
0.40	0.45	0.50	0.55
0.60	0.65	0.70	0.75 s

The protection **can be excluded**.

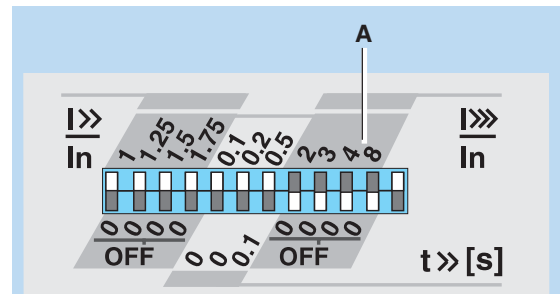
The  $I_{o>}$  protection processes the peak value of the earth fault current over the whole interval 0 ... 2.5 x  $I_n$ .

- (1) The tolerance over the threshold values is  $\pm 20\%$ .  
 (2) The tolerance over the trip times is  $\pm 20\%$  or  $\pm 30$  ms.  
 (3) Curve with additional intentional delay nil.

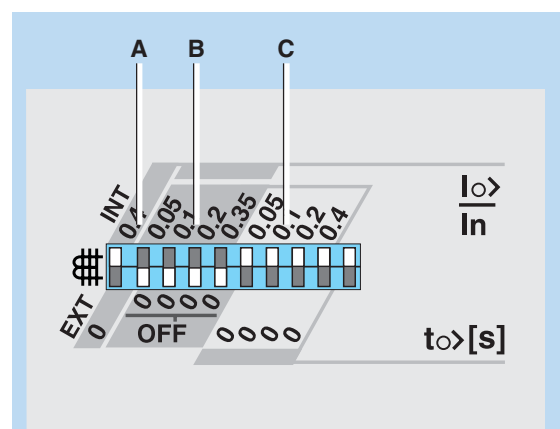


**A** Position all the Dip-switches down to exclude the protection. The trip threshold is set by positioning the Dip-switches appropriately.

**B** Dip-switch for setting the trip time.



**A** Position all the Dip-switches down to exclude the protection. The trip threshold is set by positioning the Dip-switches appropriately.



**A** Position all the Dip-switches up to select the internal toroid. This setting defines the trip threshold equal to 0.4 + the threshold set (see note B).

**B** Position all the Dip-switches down to exclude the protection. The trip threshold is set by positioning the Dip-switches appropriately.

**C** Dip-switch for setting the trip time.

**N.B.** The  $I_{o>}$  protection function is activated if the current exceeds the value of 0.2 x  $I_n$  on at least two phases or the value of 0.4 x  $I_n$  in single phase, whereas it is automatically excluded when the phase overcurrent exceeds the value of 2.5 x  $I_n$ .

## Earth fault overcurrent protection with adjustable delay (External Toroid)

The earth fault current is calculated as the vectorial sum of the three primary phase currents.

This sum is made by means of an external toroid (which processes the primary phase currents) installed directly on the power cables and therefore, it is only possible to mount two current sensors on board the apparatus (with network with insulated neutral). Selection of this method is carried out by means of front Dip-switches. The following settings are possible:

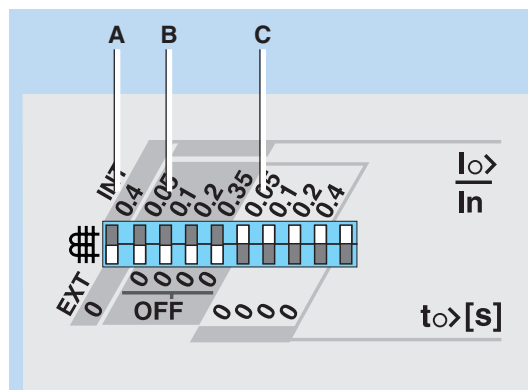
### • 14 current threshold values ( $I_{o>}$ ) (1)

0.05	0.10	0.15	0.20
0.25	0.30	0.35	0.40
0.45	0.50	0.55	0.60
0.65	0.70	$x I_n$	

### • 16 trip times ( $t_{o>}$ ) (2)

0.00 (3)	0.05	0.10	0.15
0.20	0.25	0.30	0.35
0.40	0.45	0.50	0.55
0.60	0.65	0.70	0.75
$s$			

The protection **can be excluded**. The  $I_{o>}$  protection processes the peak value of the earth fault current over the whole operating interval.



**A** Position the Dip-switch down to select the external toroid.

This setting defines the trip threshold equal to 0 + the threshold set (see note B).

**B** Position all the Dip-switches down to exclude the protection.

The trip threshold is set by positioning the Dip-switches appropriately.

**C** Dip-switch for setting the trip time.

**N.B.** The  $I_{o>}$  protection function is activated if the current exceeds the value of  $0.2 \times I_n$  on at least two phases or the value of  $0.4 \times I_n$  in single phase.

- (1) The tolerance over the threshold values is  $\pm 15\%$ .
- (2) The tolerance over the trip times is  $\pm 20\%$  or  $\pm 30$  ms.
- (3) Curve with additional intentional delay nil.

## Self-protection curve with fixed time

A self-protection curve of the electronic relay is available which intervenes at  $20 \times I_n$  with a fixed time of 1 sec. The self-protection processes the peak value of the phase current.

No type of adjustment is possible and the protection **cannot be excluded**. This means that self-protection of the unit is carried out for phase currents over  $20 \times I_n$  without limiting the circuit-breaker breaking capacity (short-time withstand current of 1 s).

### Rated setting currents

Current sensor	Protection function				
$I_n$ [A]	$I_{>}$ (0.2...1x $I_n$ ) [A]	$I_{>>}$ (1...5.5x $I_n$ ) [A]	$I_{>>>}$ (2...17x $I_n$ ) [A]	$I_{o>}$ (0.05...0.7x $I_n$ ) [A] External toroid (*)	$I_{o>}$ (0.45...1.1x $I_n$ ) [A] Internal toroid
40	8 ... 40	40 ... 220	80 ... 680	2.5 ... 35	18 ... 44
80	16 ... 80	80 ... 440	160 ... 1360	2.5 ... 35	36 ... 88
250	50 ... 250	250 ... 1375	500 ... 4250	2.5 ... 35	112.5 ... 275
1250	250 ... 1250	1250 ... 6875	2500 ... 21250	2.5 ... 35	562.5 ... 1375

$I_n$  = rated current of the current sensor  
 $I_{>}$  = overload current setting value (51)  
 $I_{>>}$  = short-circuit current setting value (50)

$I_{>>>}$  = instantaneous short-circuit current setting value (50)  
 $I_{o>}$  = earth fault current setting value (51N)  
 (\*) = If an external toroid is used (kit no. 16) with  $I_n = 50/1$  A.

### LED optical signalling function

The release has an optical indicator on the front (operating from 0.22 x  $I_n$  of phase), able to signal the events shown in the table.

Current sensor setting ERROR	Protection I <sub>&gt;</sub> under timing	LED
No	No	Off
No	Yes	On
Yes	No	Flashes
Yes	Yes	Flashes

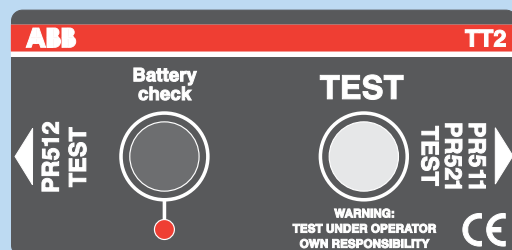
**N.B.** An error in current sensor setting is made when 2 or more sizes are selected simultaneously.

### TEST and RESET function

By means of the TT2 accessory (Test Unit which can be supplied on request), it is possible to carry out the overall TEST of relay release operation (electronic part and -MO3 opening solenoid) as well as RESET of the “release tripped due to overcurrent signalling contact”. The latter function is only enabled when the protection unit is completely off.

### Auto-reset

The auto-reset function (automatic reset) for release tripped signalling takes place on re-closing of the circuit-breaker with primary current equal to or higher than 0.2 x  $I_n$  on at least one phase fitted with a current sensor.



Front view of the TT2 Test Unit.

PR512 TEST	1	2	3	4	PR511 PR521 TEST	1	2	3	4	
OFF	B	--	--	--	OFF	B	--	--	--	
TRIP TEST	A	A	B	B	TRIP TEST	A	A	B	--	
DEF. TIME I <sub>&gt;</sub> I <sub>&gt;&gt;</sub> TRIP	A	B	A	B	RESET	A	B	A	--	
DEF. TIME I <sub>&gt;</sub> I <sub>&gt;&gt;</sub> TEST	A	B	A	A						

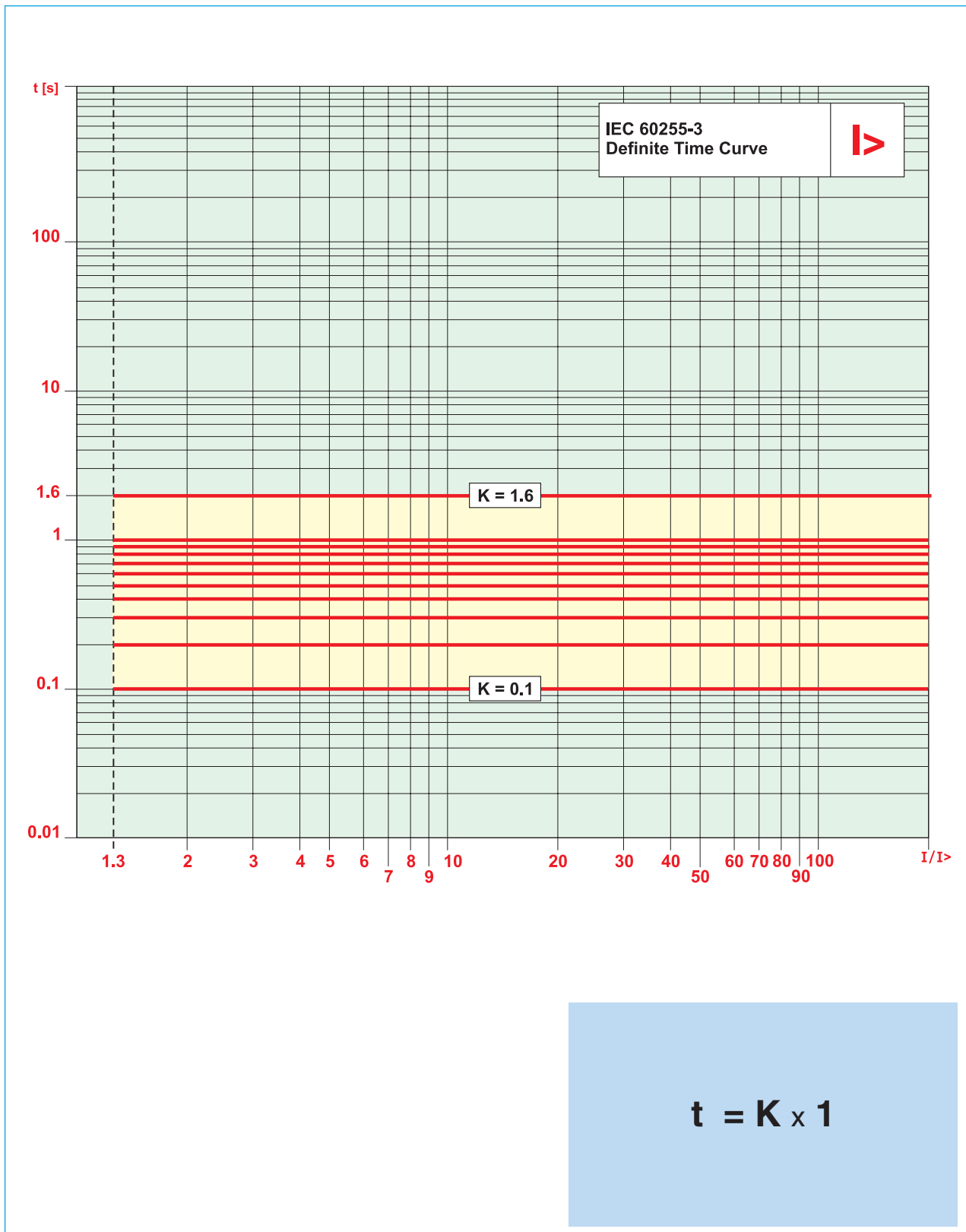
Battery: 9V IEC SIZE: 6F22

**OPERATION MODE**  
 1) Set the Dip-Switch  
 2) Insert the plug  
 3) Press TEST pushbutton until the end of check

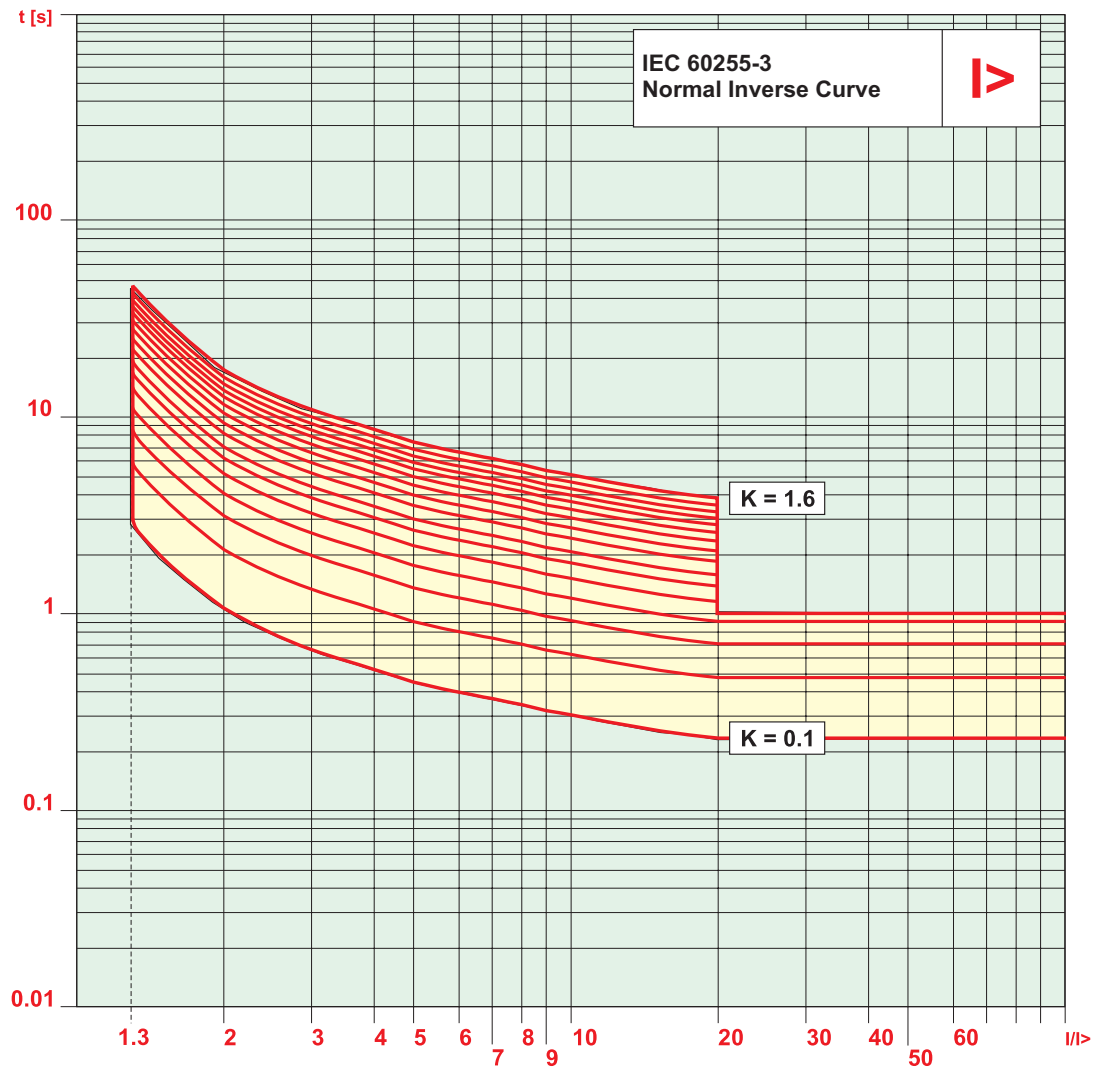
Rear view of the TT2 Test Unit.

- By positioning Dip-switch 1 in position A, the TT2 unit is active (the Battery Check can be carried out).
- By positioning Dip-switches 1 and 2 in position A and 3 in B, the TT2 unit carries out the circuit-breaker opening test by means of the YO3 opening solenoid.
- By positioning Dip-switches 1 and 3 in position A and 2 in B, the TT2 unit resets the alarm (internal signalling relay).

## Trip curve with fixed time (DT) for overcurrent protection

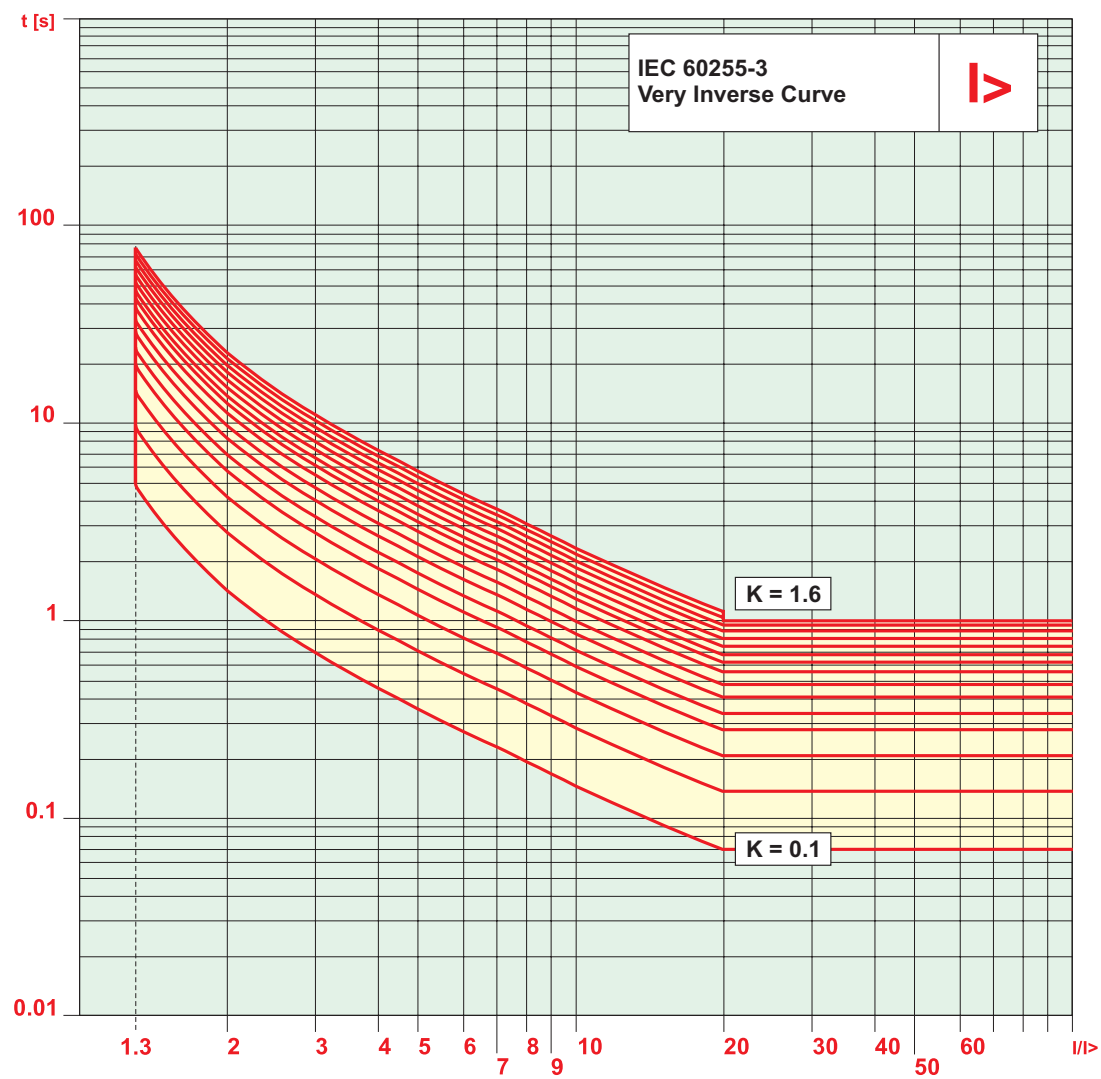


## Trip curve with normally inverse time (NI) for overcurrent protection



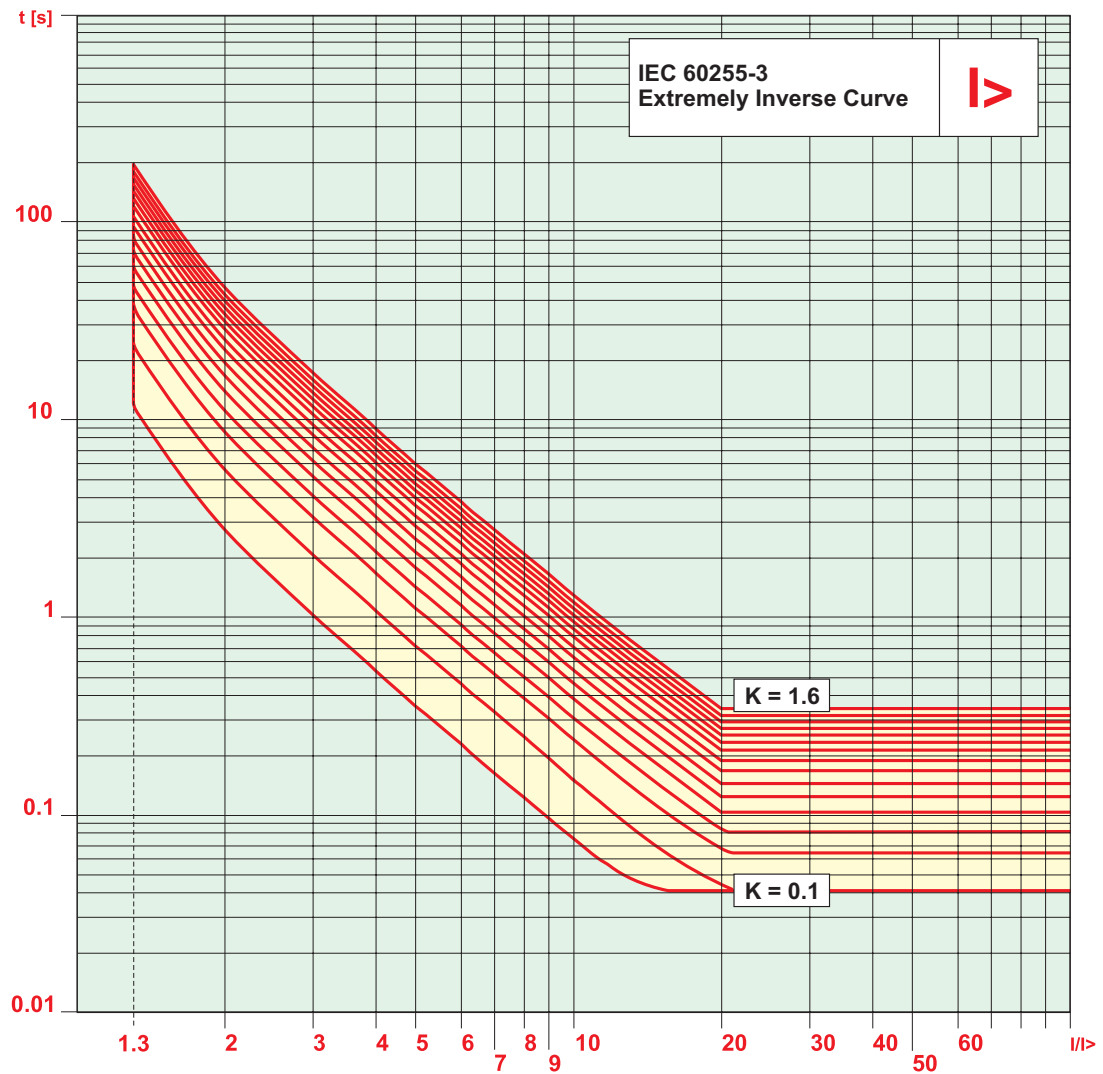
$$t = K \times \frac{0.14}{\left[ \frac{I}{I_{>}} \right]^{0.02} - 1}$$

## Trip curve with very inverse time (VI) for overcurrent protection



$$t = K \times \frac{13.5}{\left[ \frac{I}{I_{>}} \right] - 1}$$

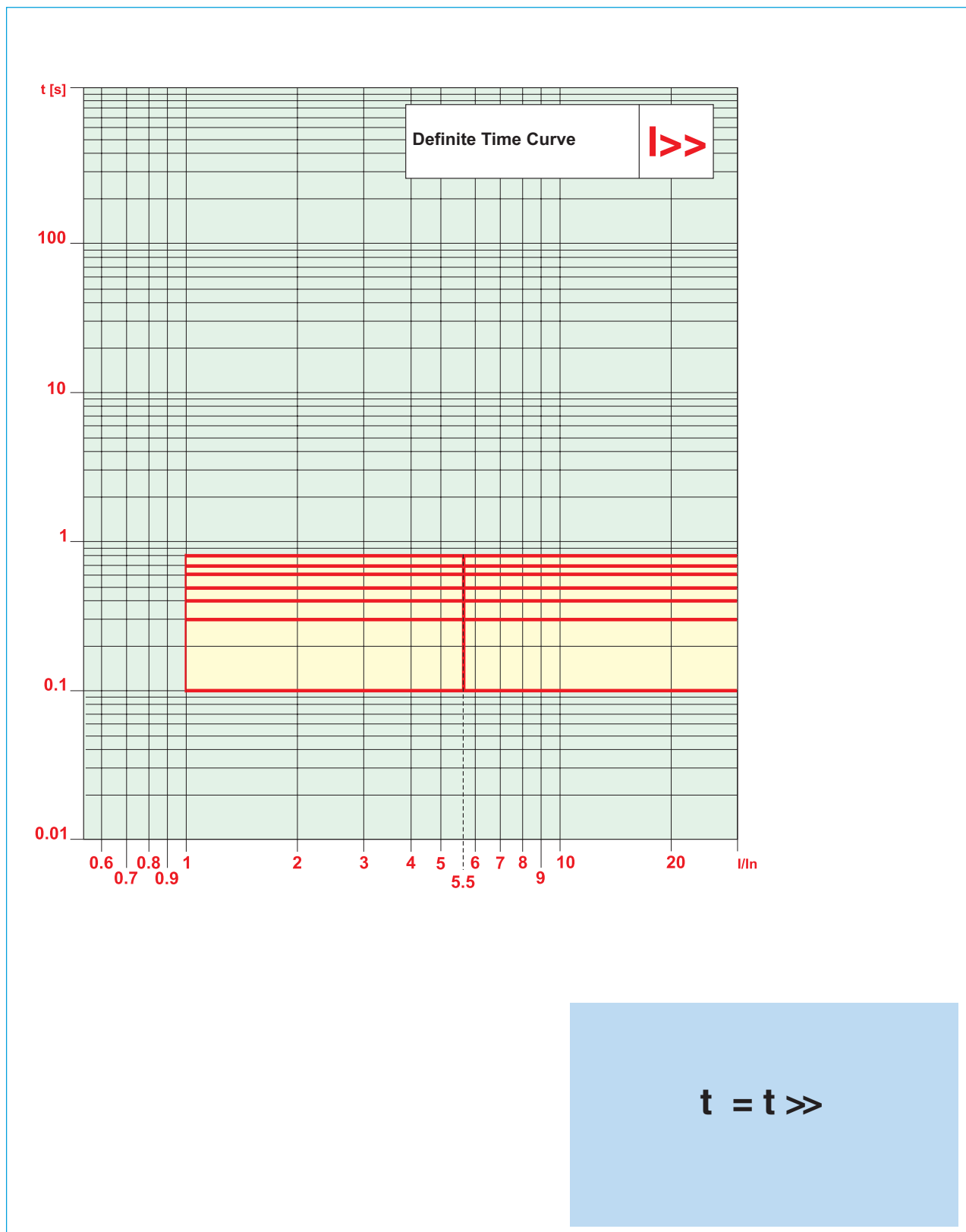
## Trip curve with extremely inverse time (EI) for overcurrent protection



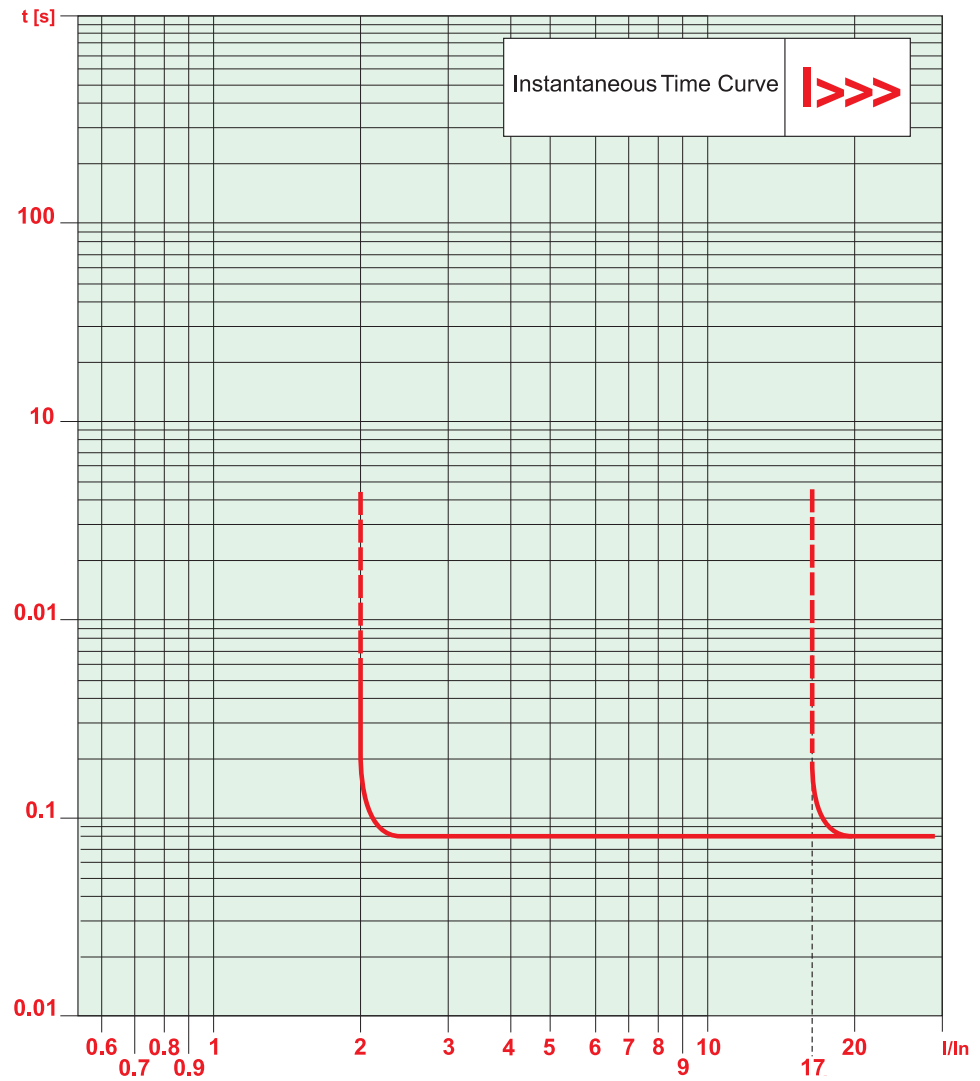
$$t = K \times \frac{80}{\left[ \frac{I}{I_{>}} \right]^2 - 1}$$



## Trip curve with fixed time for short-circuit protection with adjustable delay

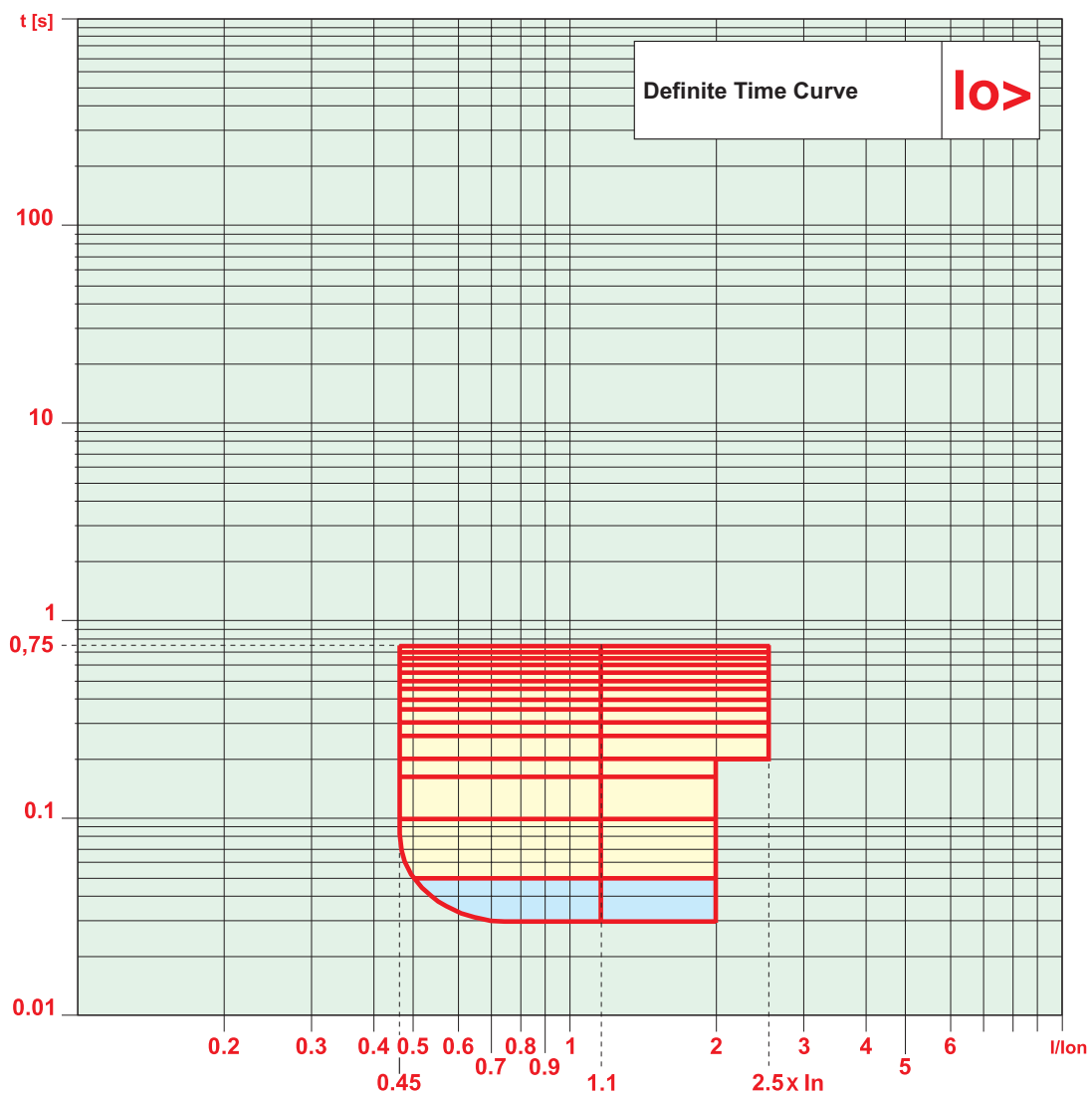


## Trip curve for short-circuit protection with instantaneous trip time



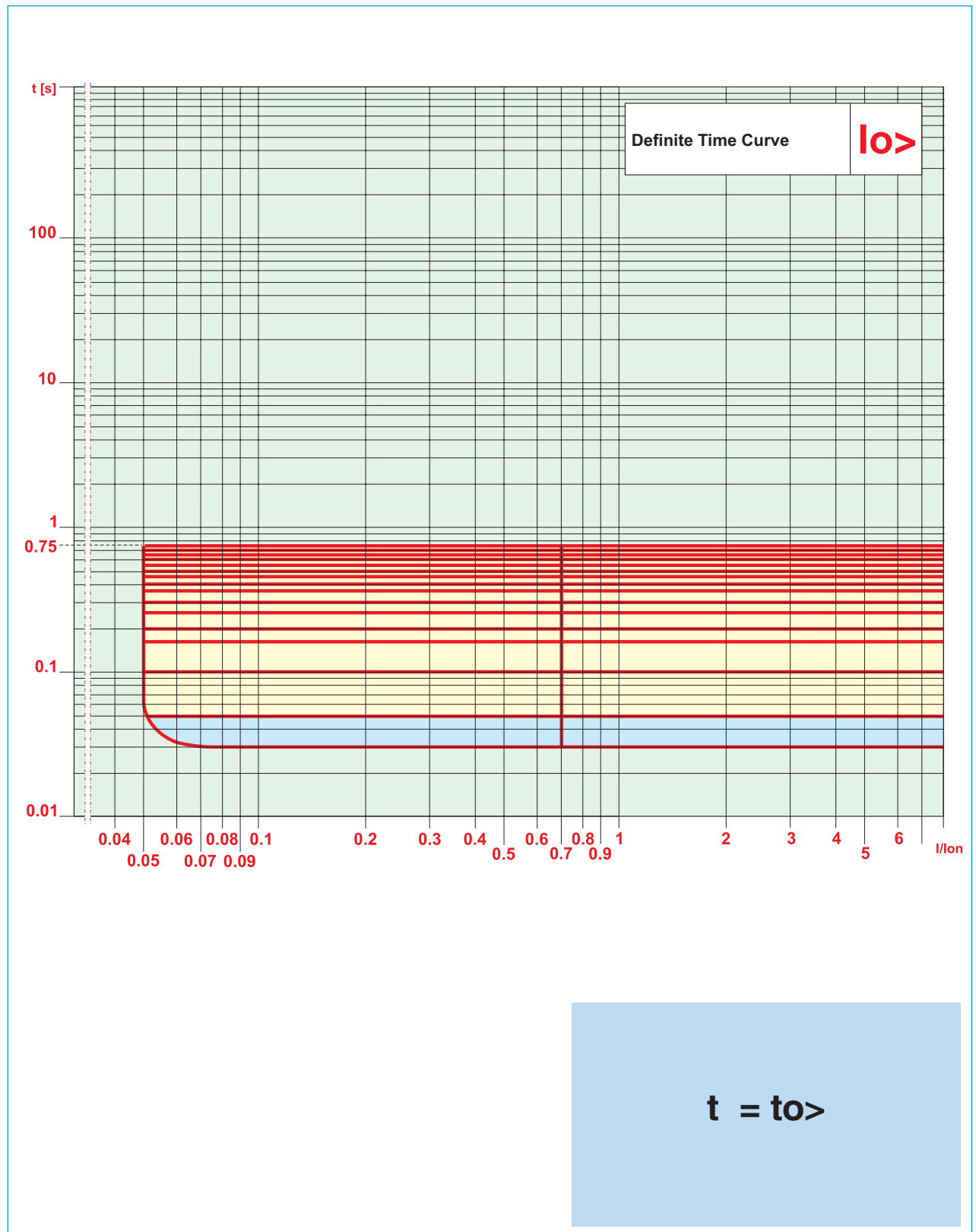
$$t = t >>>$$

# Trip curve with fixed time for earth fault protection by means of internal toroid

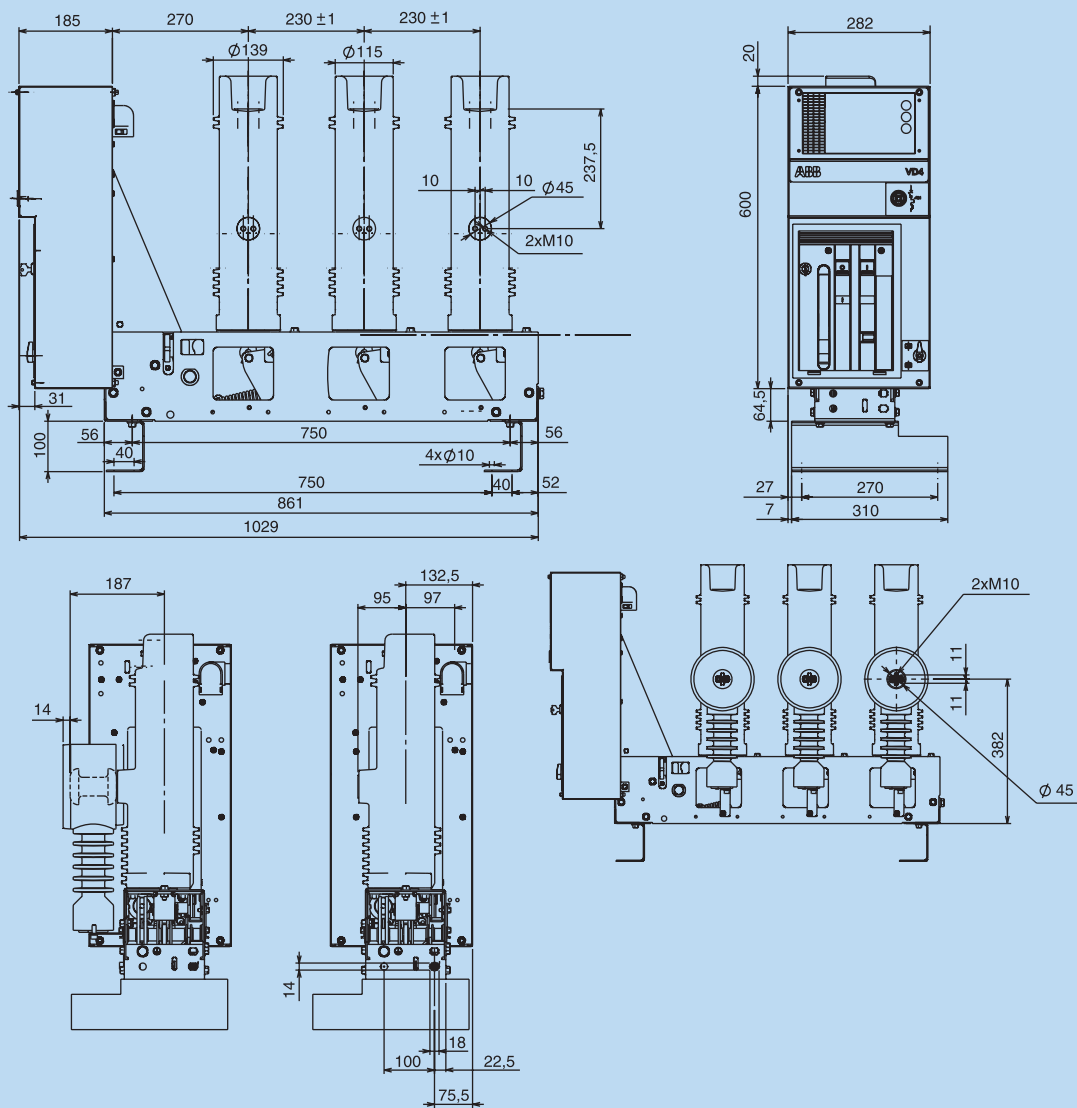


$$t = t_0 >$$

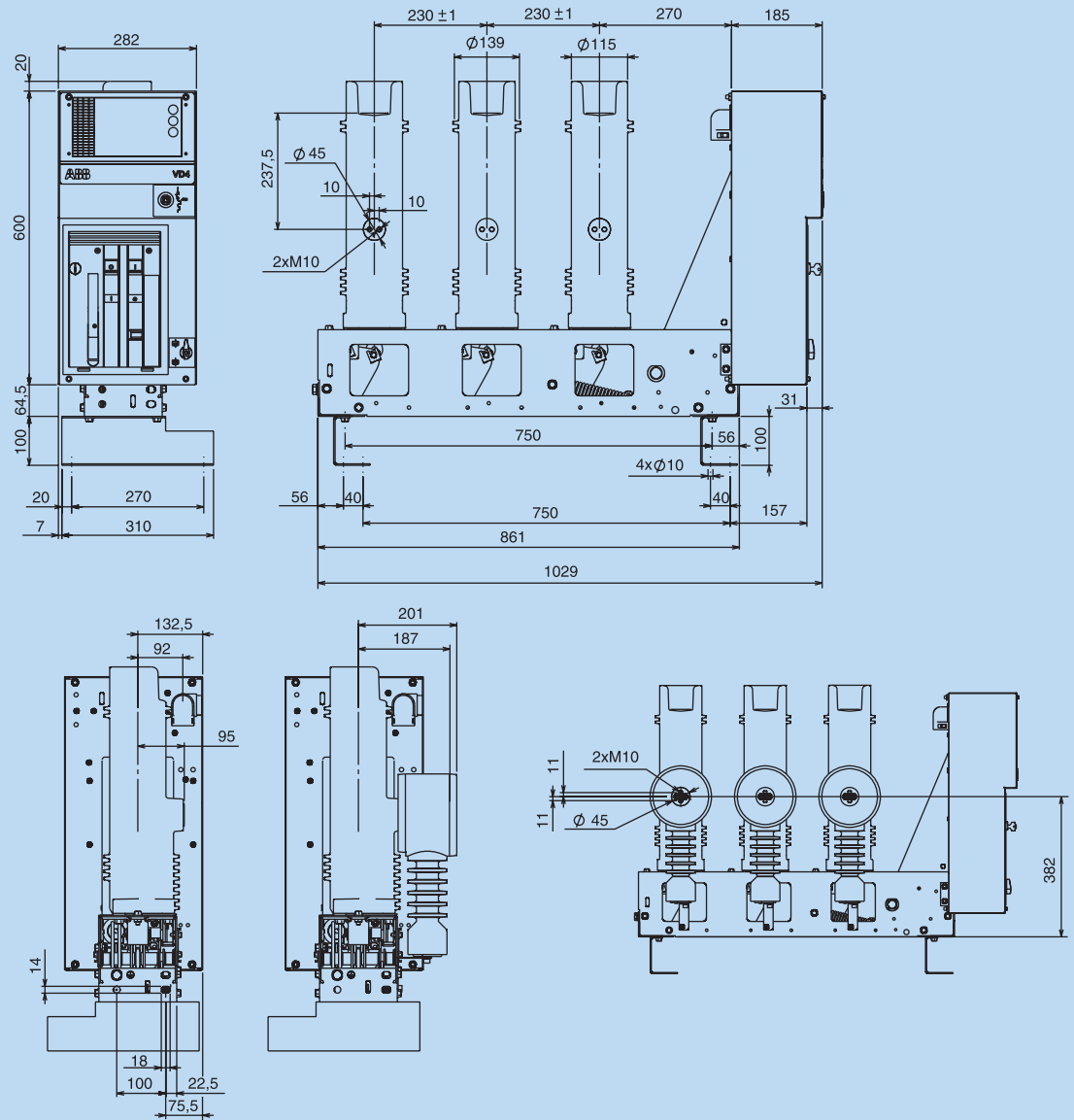
## Trip curve with fixed time for earth fault protection by means of external toroid



**Fixed circuit-breaker - right lateral operating mechanism - 12-17.5-24 kV - pole centre distance P = 230 mm**



**Fixed circuit-breaker - left lateral operating mechanism - 12-17.5-24 kV - pole centre distance P = 230 mm**

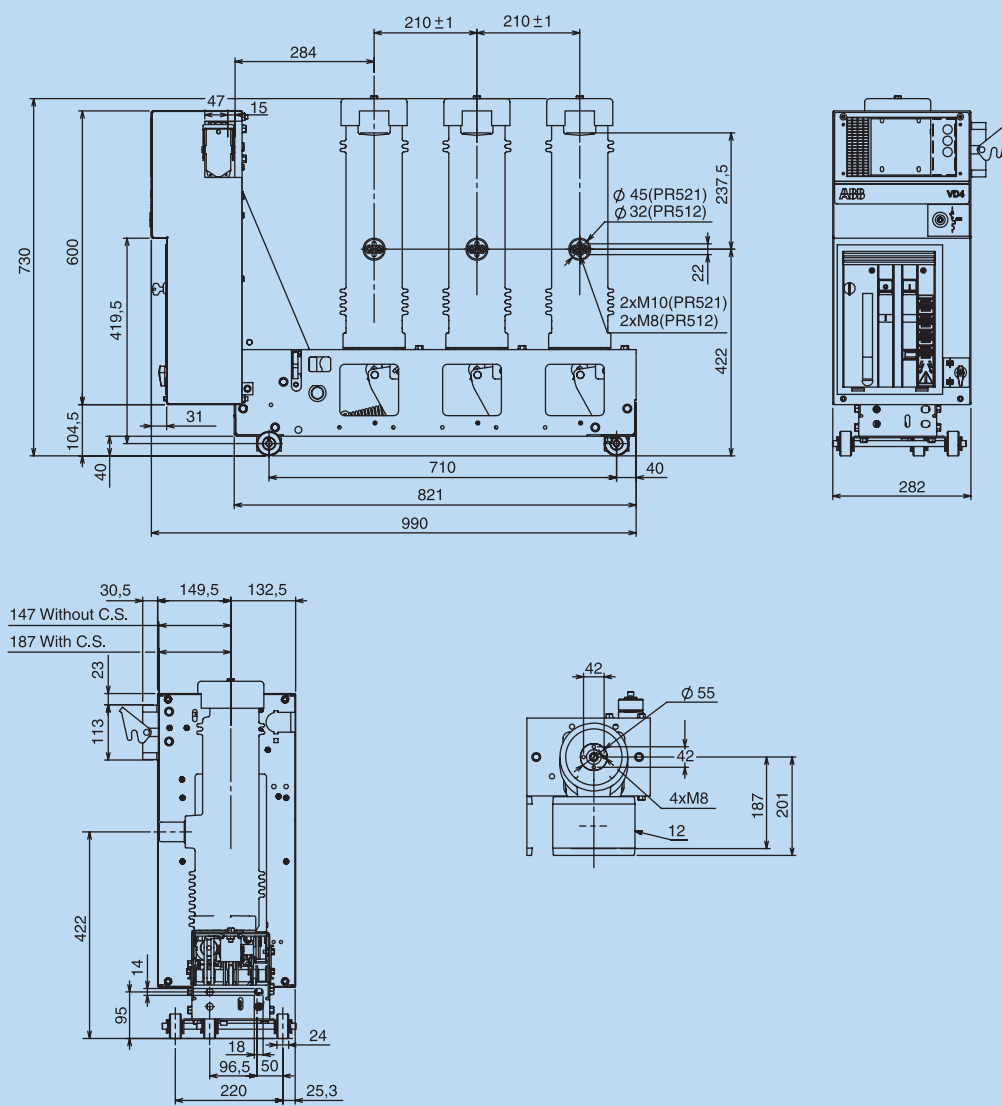






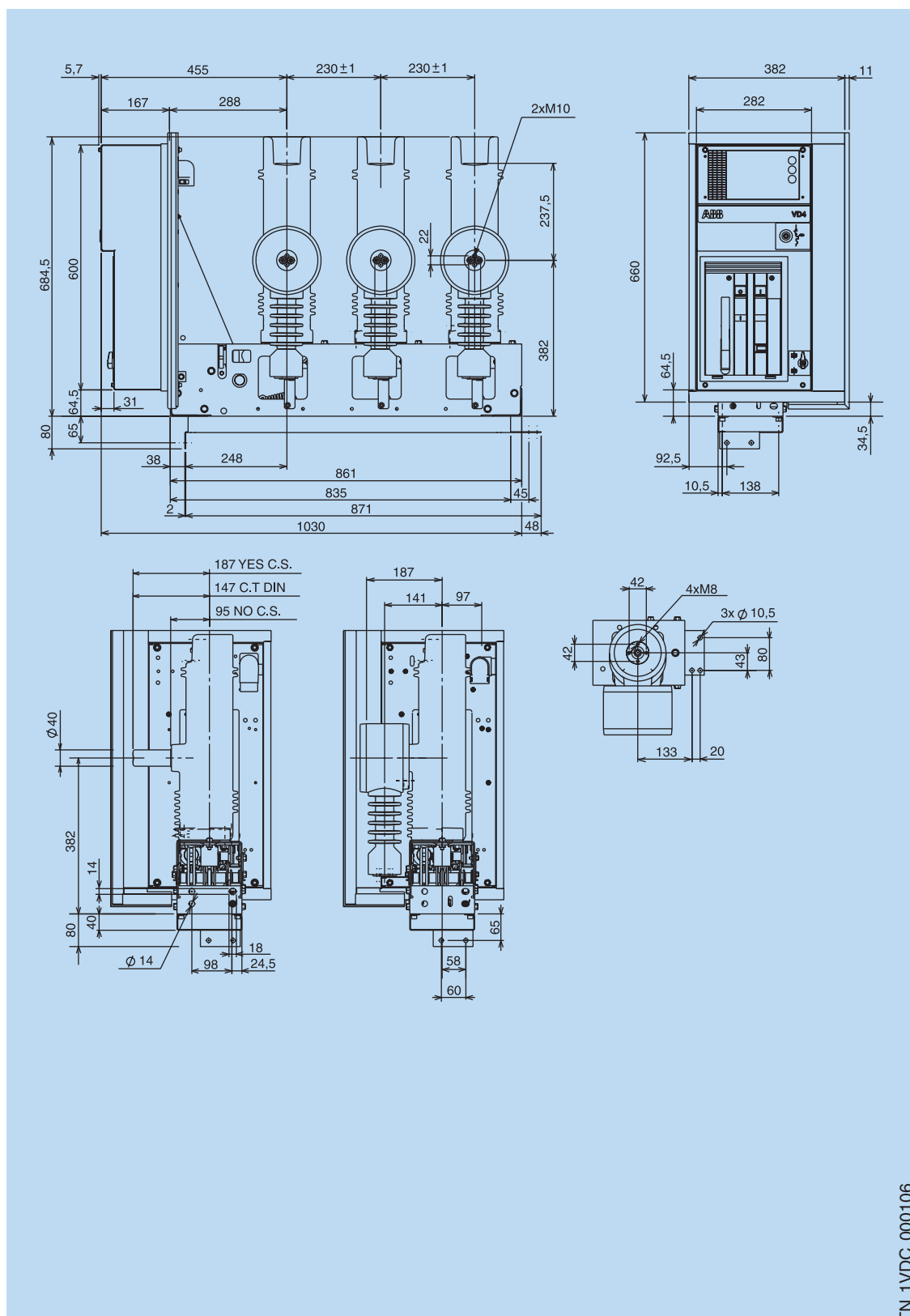


**Fixed circuit-breaker for UniSwitch switchgear – right lateral operating mechanism - 12-17.5-24 kV pole centre distance P = 210 mm**

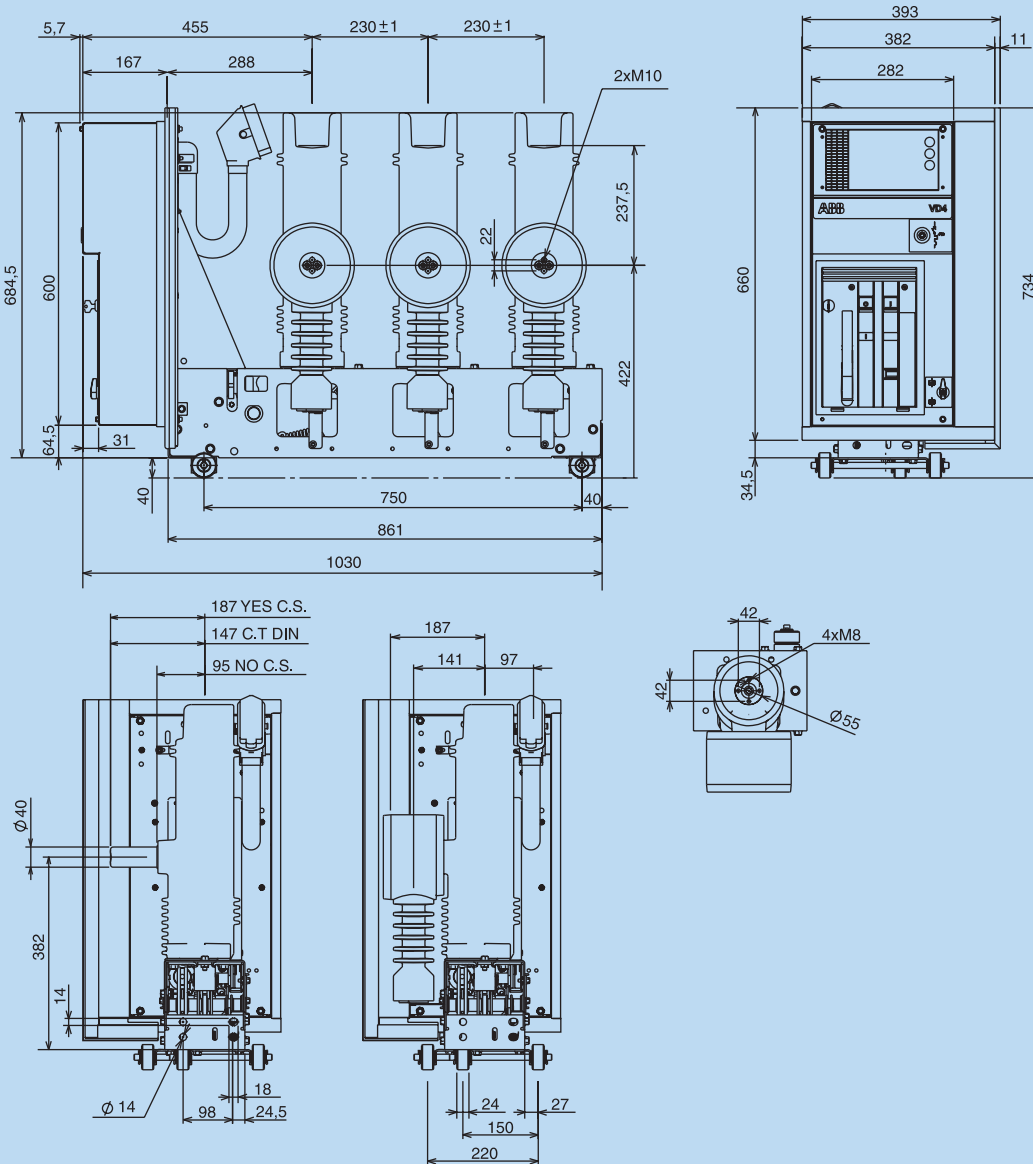


TN 1VDC 000098

**Fixed circuit-breaker for UniMix-F switchgear – right lateral operating mechanism - 12-17.5-24 kV pole centre distance P = 230 mm**

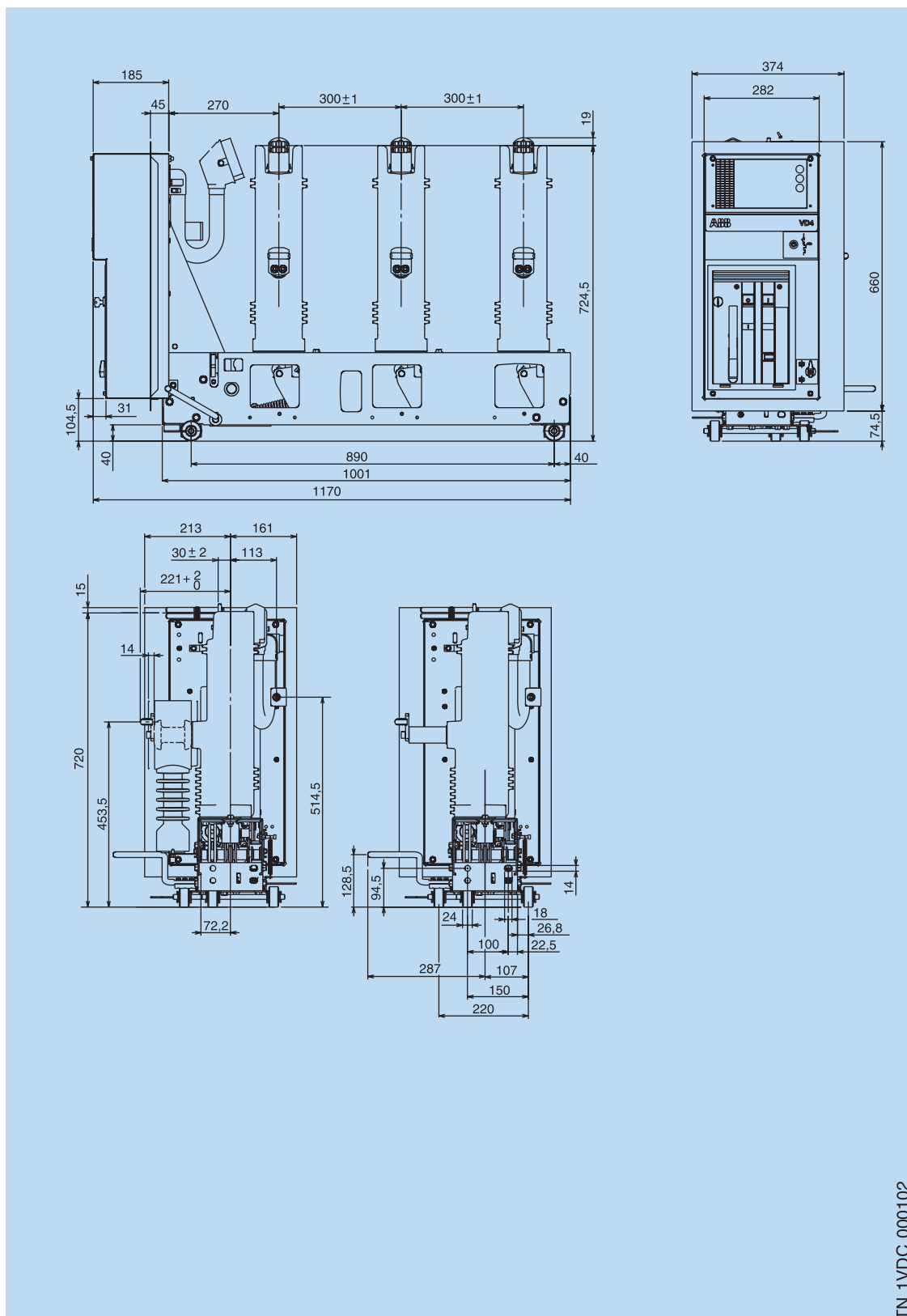


**Fixed circuit-breaker for UniMix-R switchgear – right lateral operating mechanism -  
12-17.5-24 kV pole centre distance P = 230 mm**

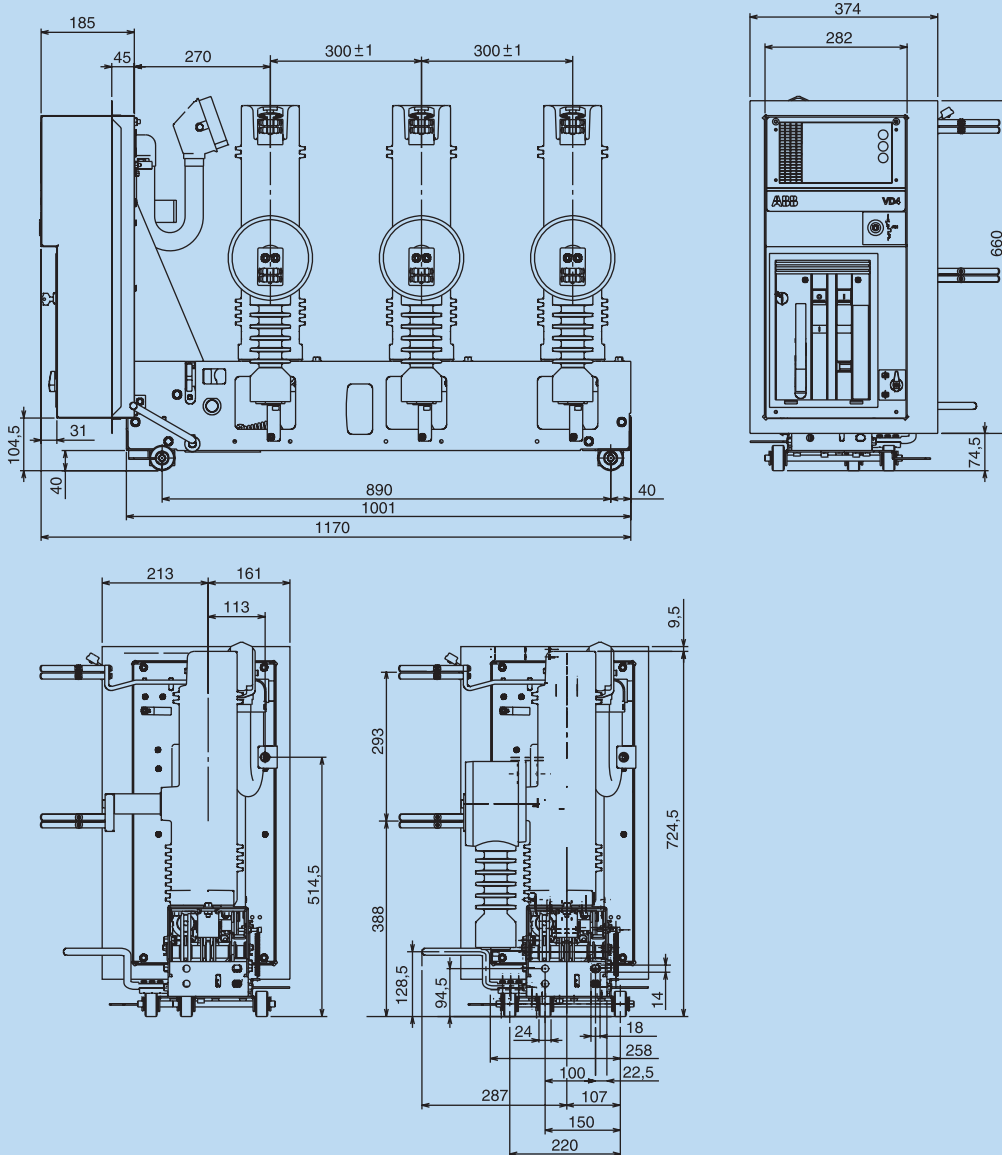


TN 1VDC 000107

**Fixed circuit-breaker for UniAir switchgear – right lateral operating mechanism -  
12-17.5-24 kV pole centre distance  $P = 300$  mm**

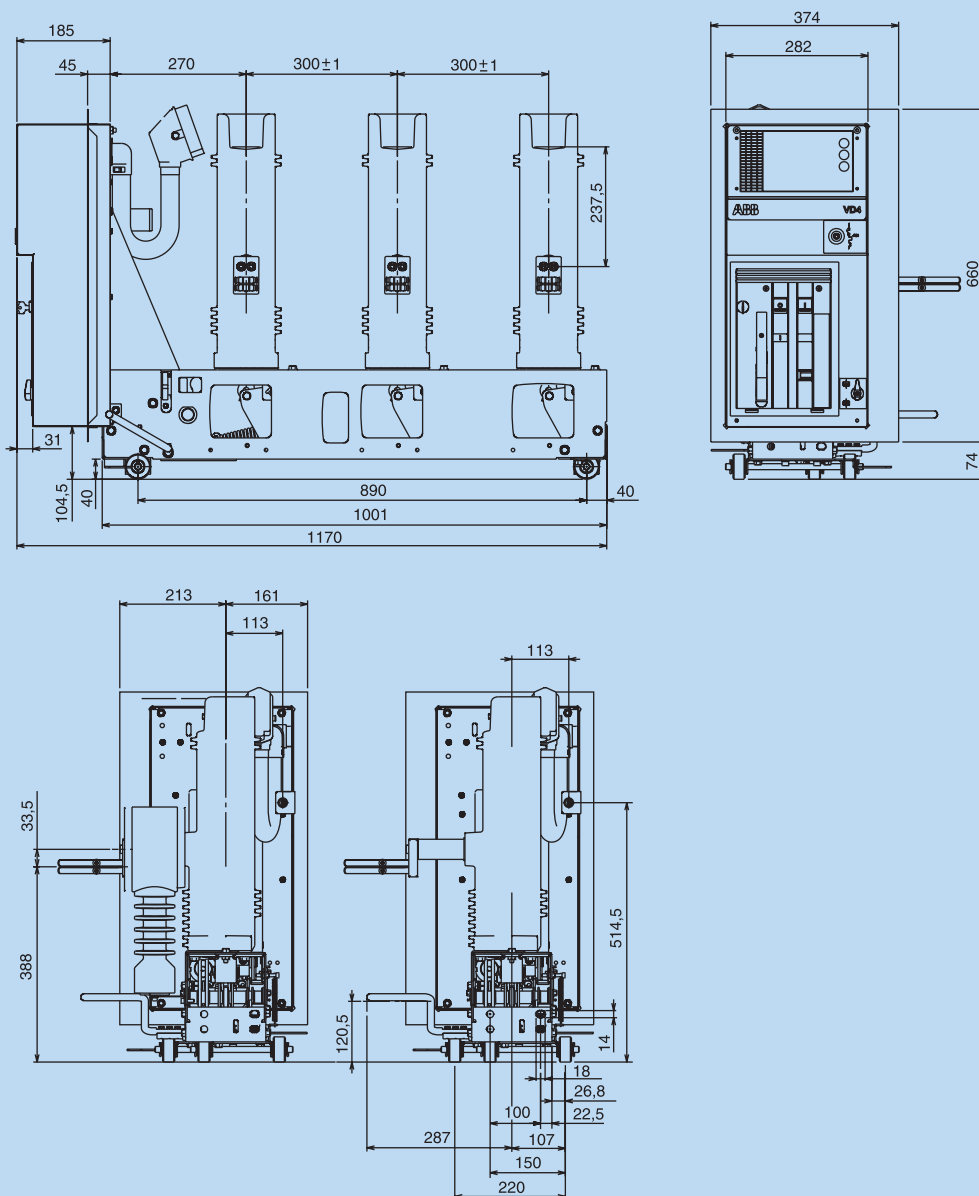


**Fixed circuit-breaker for UniAir-2R switchgear – right lateral operating mechanism - 12-17.5-24 kV pole centre distance P = 300 mm**

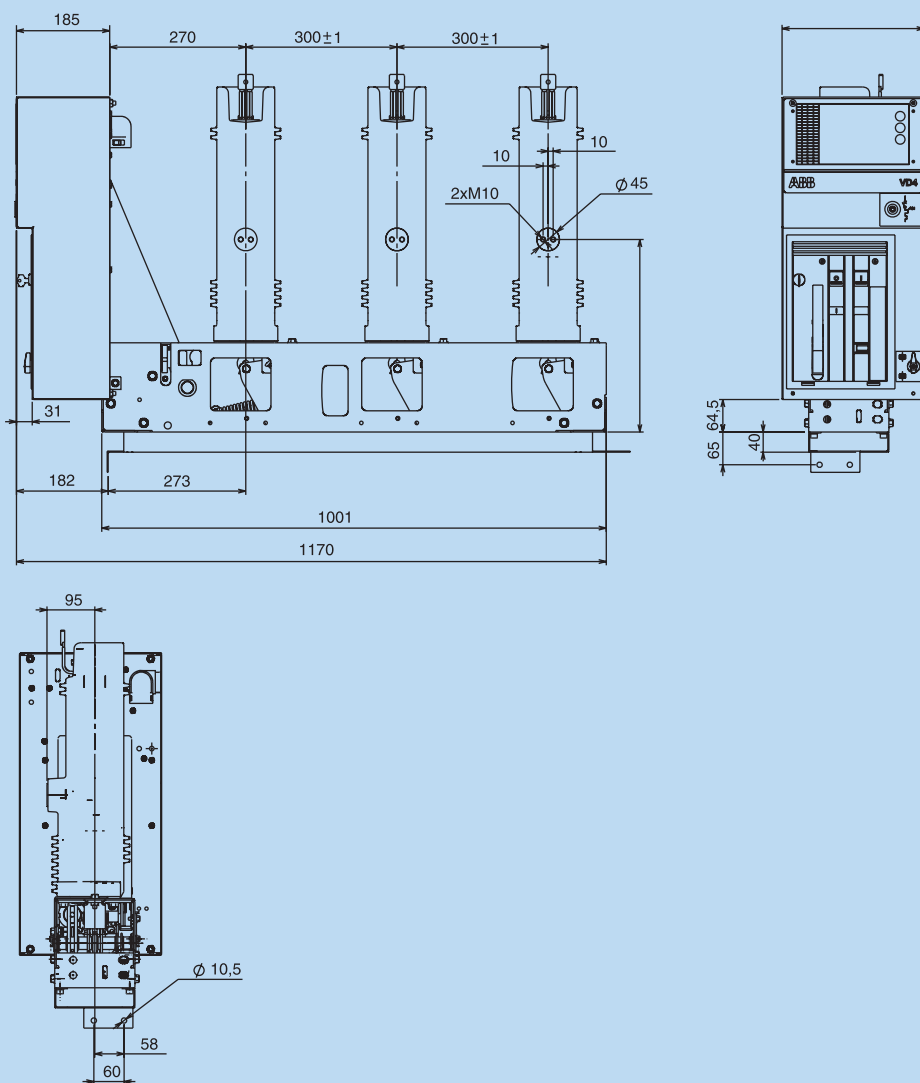


TN 1VDC 000103

**Fixed circuit-breaker for UniAir-A switchgear – right lateral operating mechanism - 12-17.5-24 kV pole centre distance P = 300 mm**



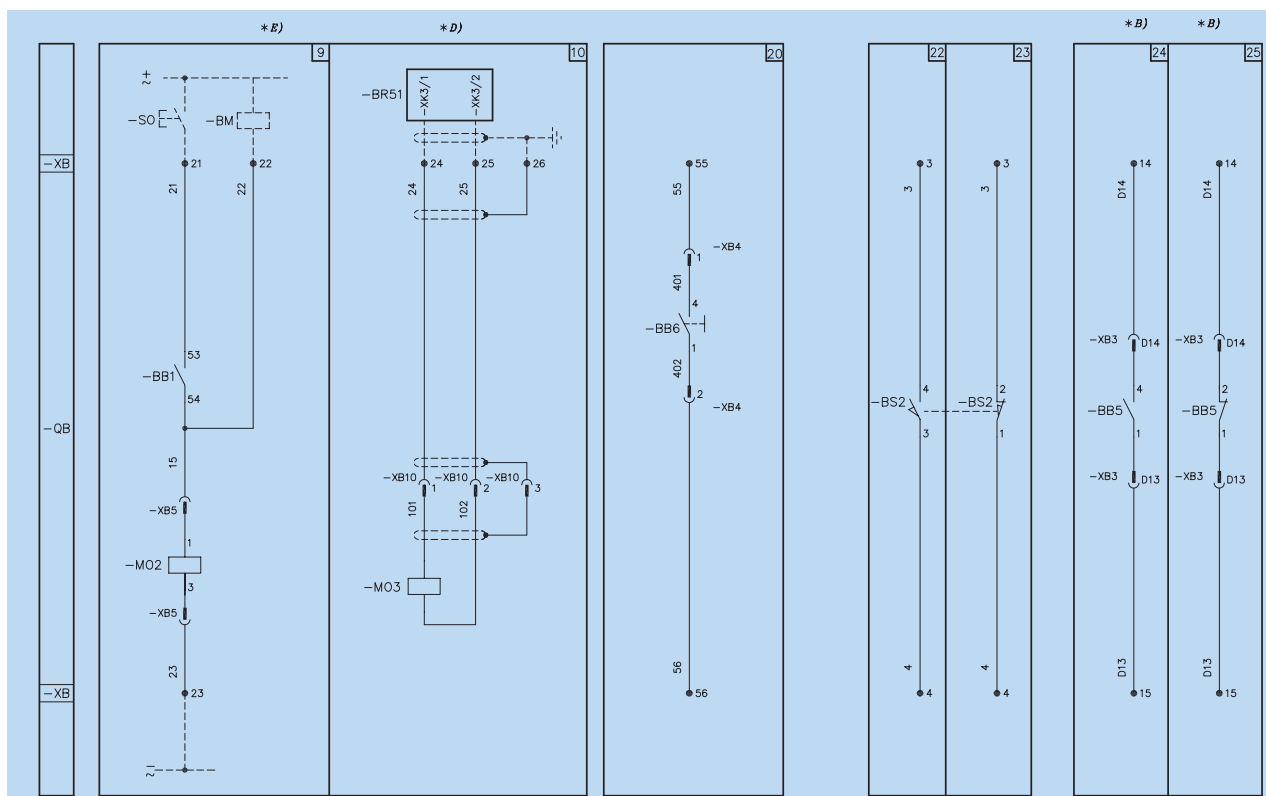
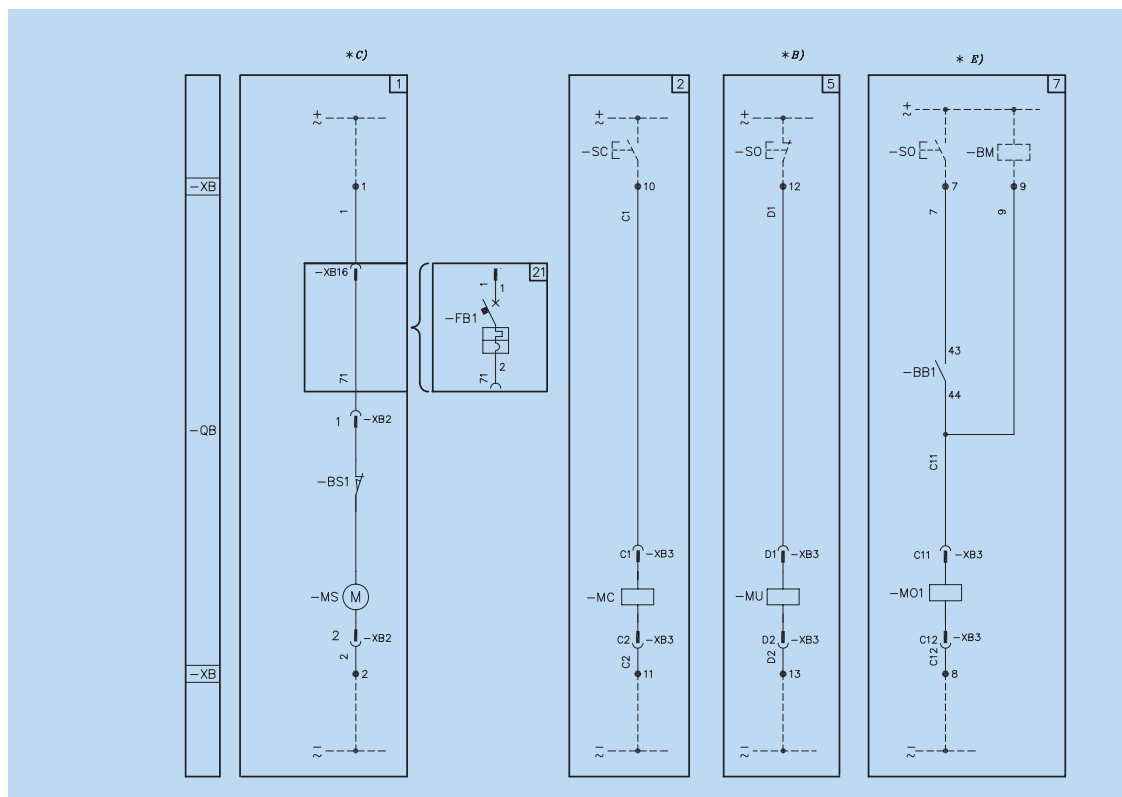
**Fixed circuit-breaker for UniAir-F switchgear – right lateral operating mechanism -  
12-17.5-24 kV pole centre distance P = 300 mm**



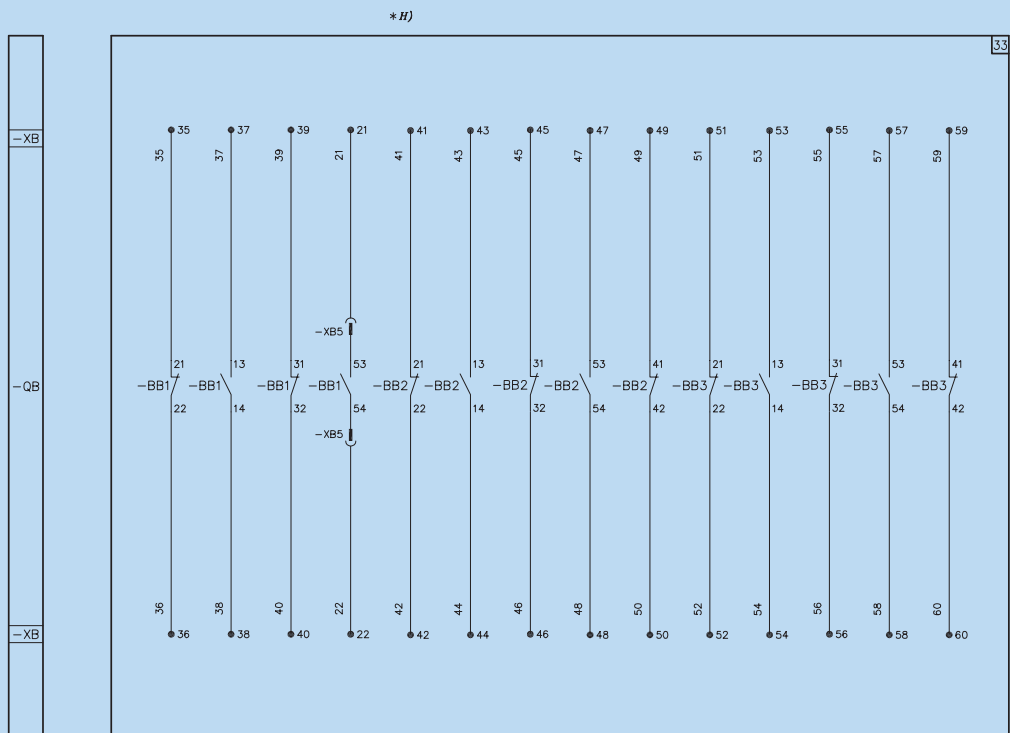
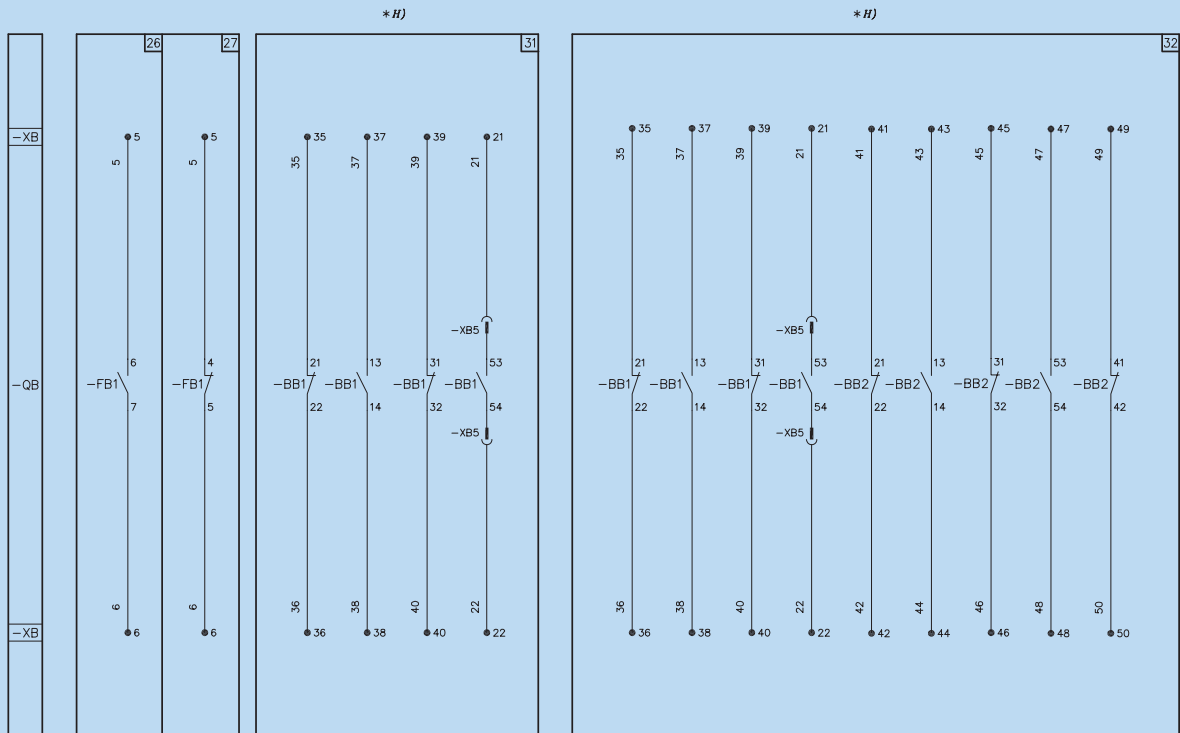
TN 1VDC 000105

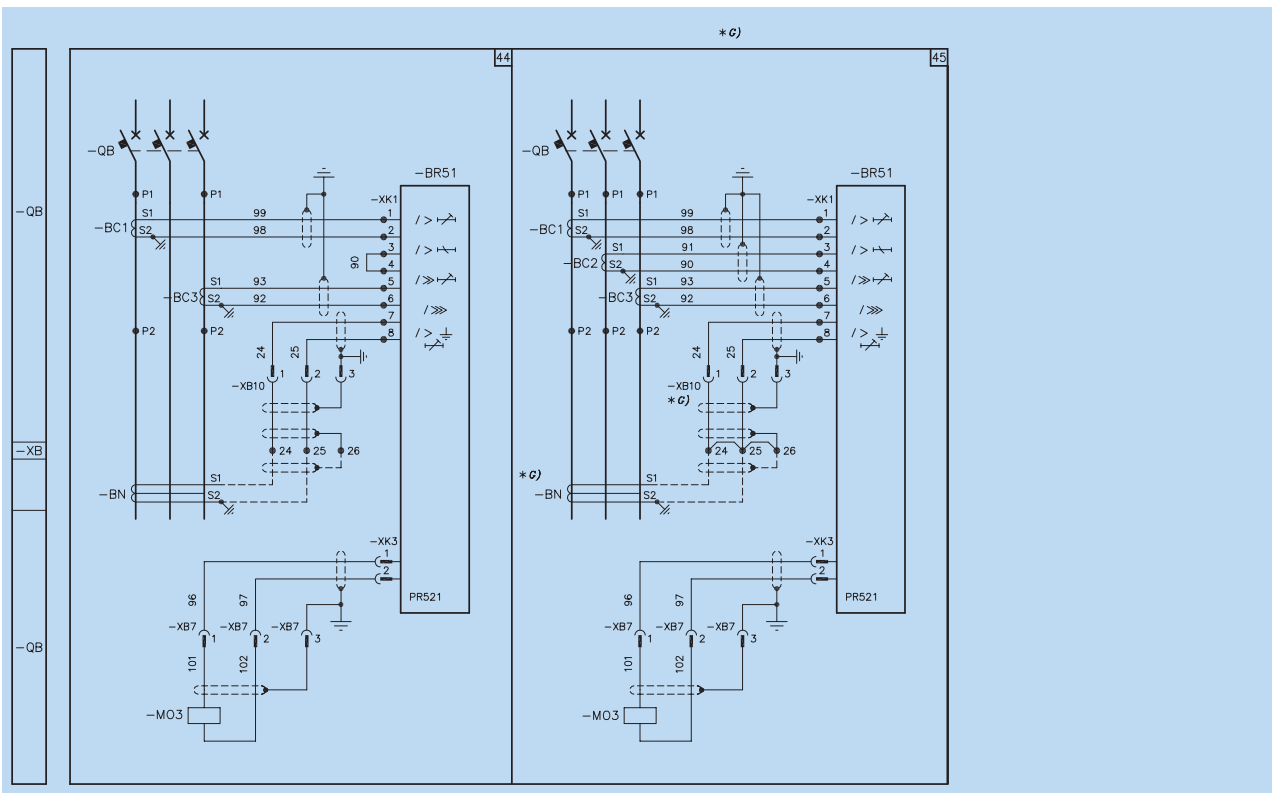
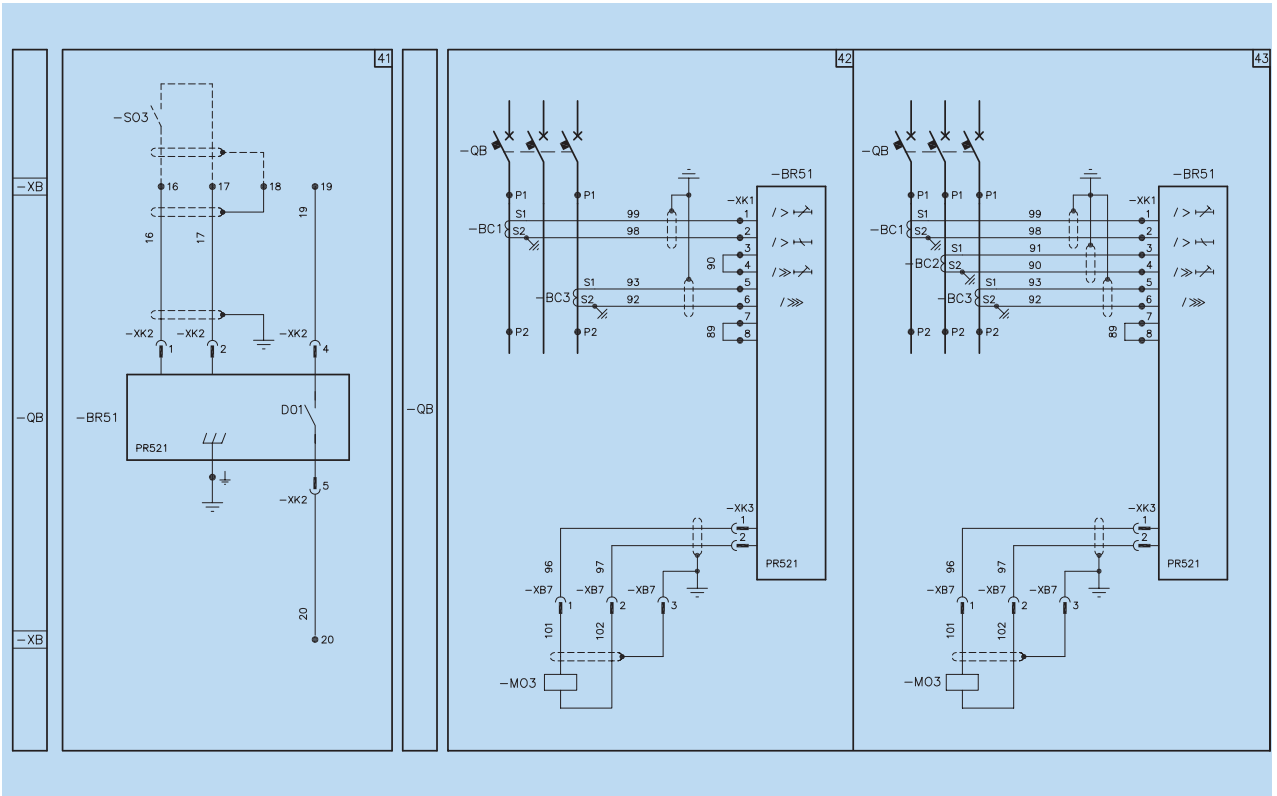
### Diagrams of the applications

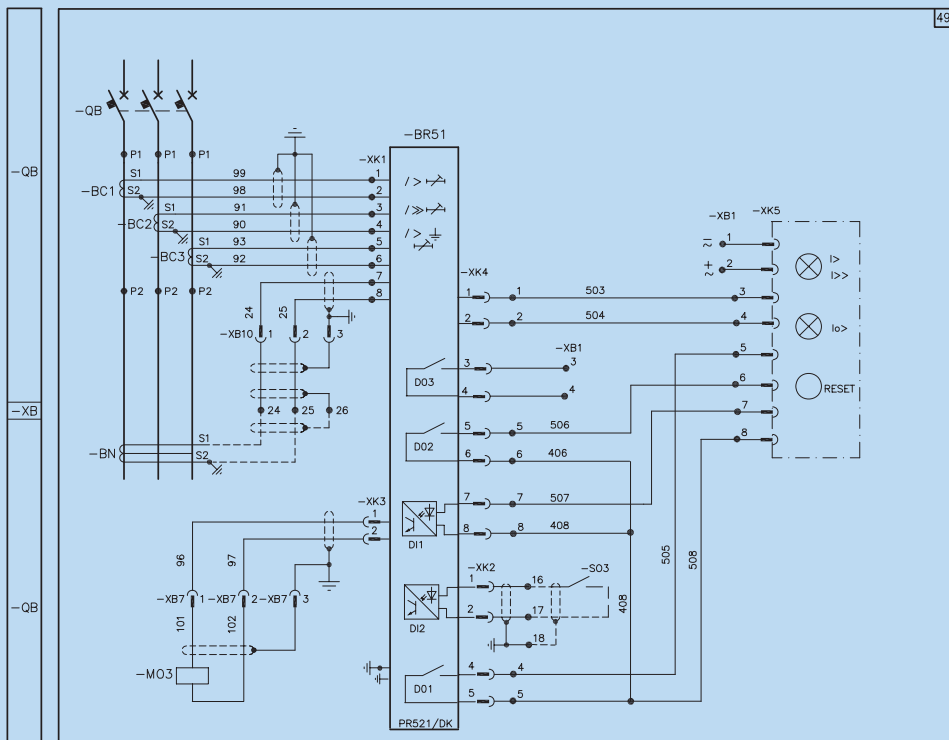
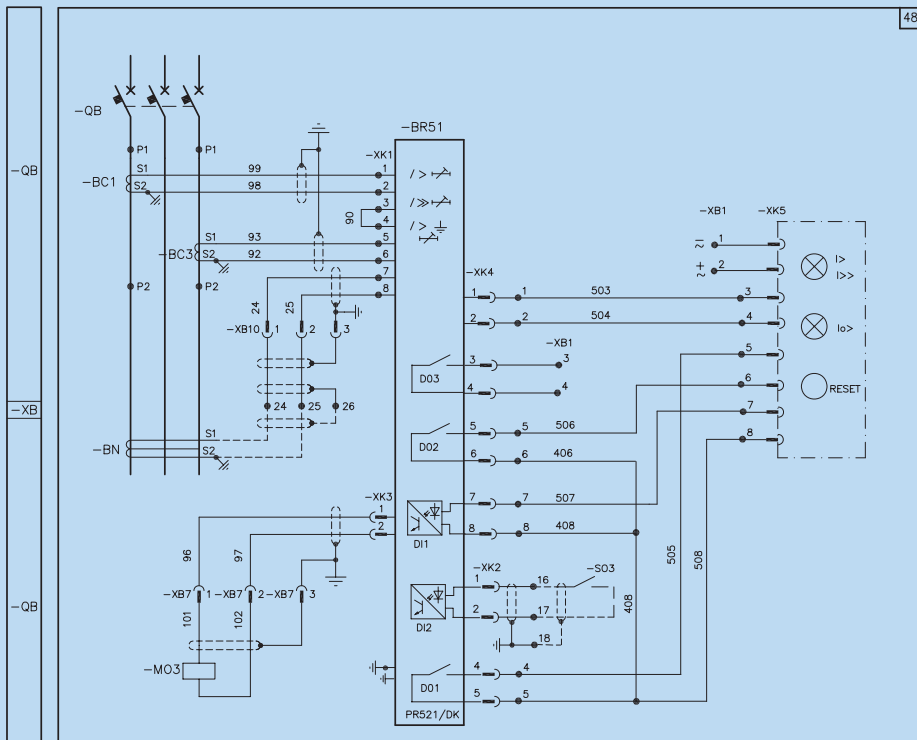
The following diagrams show the fixed circuit-breaker circuits, delivered to the customer by means of the "XB" terminal box (Ref. 1VCD400097). However, to take into account product development, it is always necessary to refer to the circuit diagram supplied with each circuit-breaker.












**State of operation shown**

The diagram is shown under the following conditions:

- circuit-breaker open
- circuits de-energized
- closing springs discharged
- releases not tripped
- undervoltage release activated.

**Caption**

	= Number of diagram figure	DI2	= (only for PR521/DK electronic release) :digital input for contact -SO3
*	= See note indicated by the letter	-MS	= Closing spring charging motor (see note C)
-BM	= Device for control of shunt opening release coil continuity (see note E)	-QB	= Main circuit-breaker
-B51	= Electronic type PR512 overcurrent release with the following protection functions (for PR512 release outside the circuit-breaker - see note D):	-BB1,...-BB3	= Circuit-breaker auxiliary contacts
	–against overload with long definite, inverse, very inverse or extremely inverse trip time-delay	-BB5	= Contact for electrical signalling of undervoltage release energised/de-energised
	–against short-circuit with short definite trip time-delay	-BB6	= Contact for electrical signalling of undervoltage release disabled
	–against short-circuit with instantaneous trip time	FB1	= Thermomagnetic circuit-breaker for protection of the spring charging motor (see note F)
	–against earth fault with short definite trip time-delay (on request)	-BS1,-BS2	= Spring charging motor limit contacts
-BR51	= Electronic type PR521/DK overcurrent release (according to ENEL DK5600 ed. IV – specification of March 2004) with the following protection functions:	-SC	= Pushbutton or contact for circuit-breaker closing
	–against overload with definite time	-SO	= Pushbutton or contact for circuit-breaker opening
	–against short-circuit with definite time	-SO3	= Contact for circuit-breaker opening by means of the -MO3 solenoid
	–against earth fault with definite time	-BC1,...-BC3	= Current sensors located on phases L1-L2-L3 for power supply of the PR521 or PR521/DK electronic release
D01	= –for PR521 electronic release : contact for electrical signalling of solenoid -M03 tripped for overcurrent ( $I > I_o$ or $I >> I_o$ or $I >>> I_o$ .)	-BN	= Homopolar current transformer, outside the circuit-breaker and with connections to be made by the customer, for the PR521 electronic release (see note G) or for PR521/DK
	–for PR521/DK electronic release : contact for electrical signalling of solenoid -M03 tripped for overcurrent ( $I > I_o$ or $I >> I_o$ .)	-TR1,-TR2	= Rectifiers for the -MO1 and -MO2 releases
D02	= (only for PR521/DK electronic release), contact for electrical signalling of solenoid -M03 tripped for homopolar overcurrent ( $I_o$ .)	-XB	= Delivery terminal box of circuit-breaker circuits
D03	= (only for PR521/DK electronic release), contact for electrical signalling of control and activation control circuits ready. The following conditions are verified :	XB2,-XB..	= Connectors of the accessories
	- availability of activation power -MO3	-XK1	= PR521 electronic release current circuit terminal box
	- electronic system operative	-XK2,-XK3	= PR521 electronic release auxiliary circuit connectors
	- auxiliary power supply	-XK4	= PR521/DK electronic release terminal box
DI1	= (only for PR521/DK electronic release) :digital input for resetting signalling contacts D01, D02 and D03	-XK5	= PR521/DK electronic release luminous signalling terminal box
		-MC	= Shunt closing release
		-MO1	= First shunt opening release (see note E)
		-MO2	= Second shunt opening release (see note E)
		-MO3	= PR512 electronic release opening solenoid
		-MU	= Instantaneous undervoltage release or with pneumatic time-delay device (see note B)
		-VF	= Filter (only provided with 220 V d.c. power supply voltage)

## Description of figures

- Fig. 1 = Closing spring charging motor circuit (see note C).
- Fig. 2 = Shunt closing release (anti-pumping is mechanical).
- Fig. 5 = Instantaneous undervoltage release or with time-delay device (see note B).
- Fig. 7 = First shunt opening release circuit with possibility of continuous control of the winding (see note E).
- Fig. 9 = Second shunt opening release circuit with possibility of continuous control of the winding (see note E).
- Fig. 10 = Opening solenoid for PR512 electronic release.
- Fig. 20 = Contact for electric signalling of undervoltage release disabled
- Fig. 21 = Thermomagnetic spring charging motor protection circuit-breaker (see note F).
- Fig. 22 = Contact for electrical signalling of springs charged.
- Fig. 23 = Contact for electrical signalling of springs discharged.
- Fig. 24 = Contact for electrical signalling of undervoltage release energised (see note B).
- Fig. 25 = Contact for electrical signalling of undervoltage release de-energised (see note B).
- Fig. 26 = Contact for electrical signalling of motor protection circuit-breaker closed.
- Fig. 27 = Contact for electrical signalling of motor protection circuit-breaker open.
- Fig. 31 = Circuit-breaker auxiliary contacts available.
- Fig. 33 = Circuit-breaker auxiliary contacts available.
- Fig. 41 = PR521 electronic release auxiliary circuits.
- Fig. 42 = PR521 electronic release current circuits without protection against earth fault, supplied by two current sensors (can only be used with networks with insulated neutral and negligible earth fault currents).
- Fig. 43 = PR521 electronic release current circuits without protection against earth fault, supplied by three current transformers.
- Fig. 44 = PR521 electronic release current circuits with protection against earth fault, supplied by two current sensors and by a homopolar current sensor.
- Fig. 45 = PR521 electronic release current circuits with protection against earth fault, supplied by three current transformers and (if provided, by the customer) by a homopolar current sensor (see note G).
- Fig. 48 = PR521/DK electronic release current circuits (conforming to ENEL DK5600 specification) with protection against earth fault, supplied by two DK type current sensors and with luminous signalling of trip of the PR521/DK electronic release.

- Fig. 49 = PR521/DK electronic release current circuits (conforming to ENEL DK5600 specification) with protection against earth fault, supplied by three DK type current sensors and by a DK type homopolar current sensor and with luminous signalling of trip of the PR521/DK electronic release.

## Incompatibility

The combinations of circuits given in the figures below are not possible on the same circuit-breaker:

10-41	22-23	26-27	31-32-33	24-25
9-10-42-43-44-45-48-49			09-31	

## Notes

- A) The circuit-breaker is only fitted with the accessories listed in the order acknowledgement. To make out the order please consult the catalogue of the apparatus.
- B) The undervoltage release can be supplied in the version for power supply with voltage branched on the supply side of the circuit-breaker or from an independent source. The use of both the instantaneous and electronic time-delay device undervoltage release is allowed (outside the circuit-breaker). Circuit-breaker closing is only allowed with the release energised (the lock on closing is achieved mechanically).  
On request, the contact in fig. 24 or the one in fig. 25 is available (signalling is permanent). Should there be the same power supply for the shunt closing and undervoltage releases and automatic circuit-breaker closing on return of the auxiliary voltage is required, it is necessary to introduce a delay of 50 ms between the moment of undervoltage release consent and energization of the shunt closing release. This can be done by means of a circuit outside the circuit-breaker including a permanent closing contact, the contact indicated in fig. 24 and a time-delay relay.
- C) Check the power available on the auxiliary circuit to verify the possibility of starting several motors for charging the closing springs at the same time. To avoid excessive absorption, it is necessary to charge the springs manually before supplying the auxiliary circuit with voltage.
- E) The circuit for controlling continuity of the shunt opening release winding must only be used for this function. Checking the shunt opening release functionality for instantaneous service is possible with the device called CCC "Control Coil Continuity", and for electronically controlled releases use the "STU" device
- G) When the homopolar current sensor -BN is not used, connect terminals -XB1/41 and -XB1/42 to earth, or, if the terminal box -XB1 is not provided, connect conductors E9 and D2 (i.e. the conductors connected to poles E9 and D2 of connector -XB) to earth.
- H) When fig. 9 is required, the contact to terminals 53-54 of pack -BB1 is not available for figs. 31-32-33. When fig. 20 is required, the contacts of pack -BB3, to terminals 31-32 are no longer available for fig. 33.

## Graphic symbols for electric diagrams

	Thermal effect		Capacitor (general symbol)		Power circuit-breaker with automatic opening
	Electromagnetic effect		Motor (general symbol)		Control coil (general symbol)
	Pushbutton control		Current transformer		Overcurrent relay with adjustable long time delay characteristic
	Earth (general symbol)		Current transformer with wound secondary and primary consisting of three bushing conductors		Overcurrent relay with inverse long time delay characteristic
	Mass, frame		Rectifier with two half-waves		Overcurrent relay with adjustable short time delay characteristic
	Conductors in shielded cable (e.g. two conductors)		Break contact		Instantaneous overcurrent relay
	Conductor connections		Make contact		Earth fault overcurrent relay with long adjustable time delay characteristic
	Terminal or clamp		Insulated binary digital input		Lamp (general symbol)
	Socket and plug (female and male)		Closing position contact (limit switch)		
	Resistor (general symbol)		Opening position contact (limit switch)		





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The data and illustrations are not binding. We reserve the right to make changes in the course of technical development of the product.  
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