Instantaneous current and voltage relays type RRIL and RREL

- For use in short-circuit protections, earth-fault protections etc. frequently in combination with time-lag relays
- Are electromagnetic with high overload capacity
- Are of plug-in design RR – occupy two relay seats
- Low power consumption – easily adapted to various types of measuring transformers
- Series/parallel connection of the two relay coils provides an extensive scale range for current relays
- Great accuracy – providing accurate monitoring for protected zones
- Are designed for severe service conditions – modern, non-hygroscopic insulating material used
- Serve as replacements for the previous instantaneous current and voltage relays type RMJ and RRMJ

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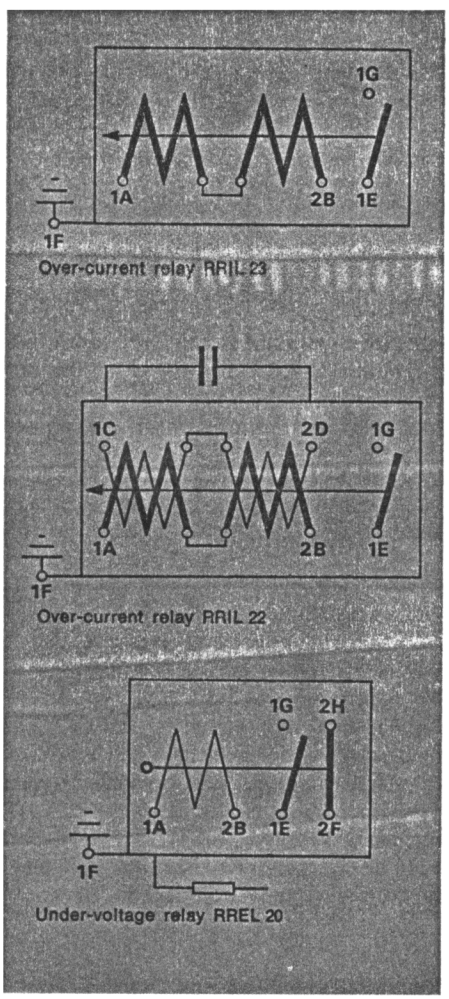

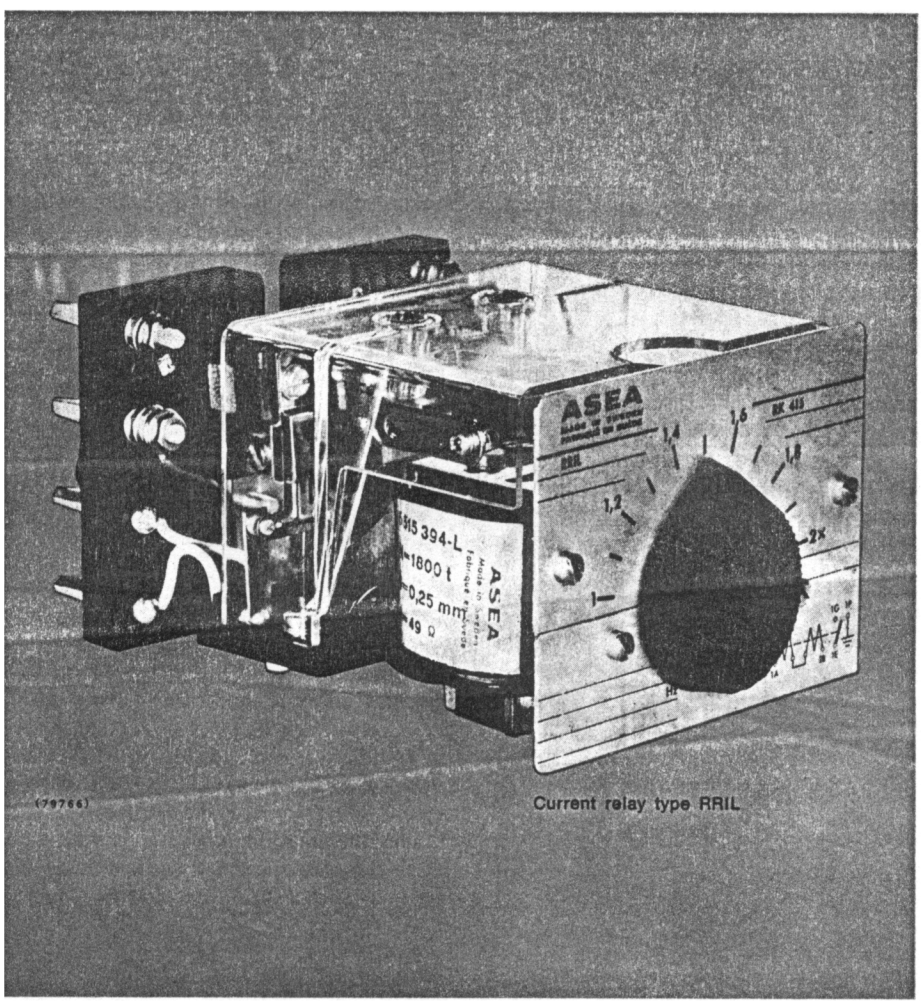

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Instantaneous current and voltage relays

General

RRIL and RREL are electromagnetic relays and are manufactured as over-current or over-voltage and under-current or under-voltage relays for d.c. or a.c. supplies. They are intended to accurately measure current or voltage and have low power consumption and a large overload capacity. These relays are manufactured in different versions for individual types of application.

If special low power consumption or high resetting ratios are required, the static current and voltage relays type RRIG and RREG can be used. These relays which are described in Catalogue RK 41–1 E are even better suited to heavy duty than RRIL and RREL. RRIG is completely insensitive to the d.c. component whilst RRIL is influenced to a certain degree by this component. For this reason type RRIG is more suitable for use when the over-current relays RRIL would be influenced far too much.

The current relays can be combined with a special short-circuiting device type RTNK. This short-circuiting device operates in such a manner that the measuring circuit is short-circuited when the relay is removed.

The maximum permitted voltage between lines for the relays is 500 V for the a.c. versions and 600 V for the d.c. versions. Other technical data and Cat. Nos. are to be found in the tables on pages 5–11.

The RRIL current relay and the RREL voltage relay belong to the type RR plug-in system and replace the older types of relay RMJ and RRMJ. Table 1 on page 4 specifies the relays that are to be substituted for (R)RMJ and RRIL–RREL.

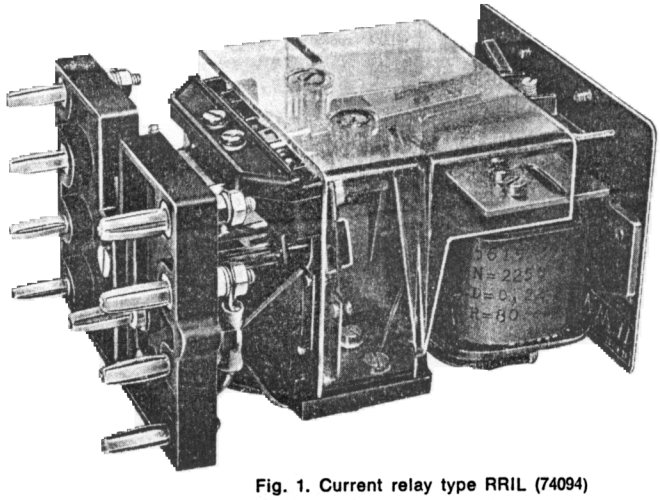


Fig. 1. Current relay type RRIL (74094)

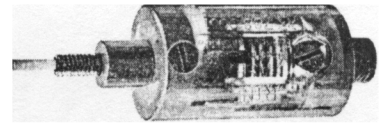


Fig. 2. Short-circuiting device RTNK

Design and mode of operation

The relays are of the electromagnetic type. The magnetic system has two coils and one armature mounted on a balance arm, which is provided at one end with the moving contact members, and pole shoes at the other end. In these different versions of relay the pole shoes are of different geometries. They are produced from soft magnetic material and must not be subjected to mechanical forces when the relays are manually tested. See under **Routine testing** on p. 4.

The relays are rationally constructed and comprise few parts. In the design, modern non-hygroscopic insulating materials have been used. The frame of the relay is of aluminium alloy whilst contact bridges, coil bobbins etc. are produced from glass-fibre filled poly-carbonate which has excellent electrical and mechanical properties.

The relays are plug-in components provided with a multi-pin terminal base. The balance arm is spring loaded and the operating value is set by means of a knob at the front of the relay. This knob varies the tractive force of the spring via an eccentric cam. The over-current or over-voltage relay operates (the armature picks up) when the energizing quantity reaches the set operating value. The under-current or under-voltage relay operates (the armature drops out) when the energizing quantity decreases to the set operating value.

The relays are provided with a transparent cover which protects the contacts and armatures against damage and accidental contact, such as when relays are inserted and removed from the relay case.

Versions

The relays are manufactured for d.c. and a.c., 50 and 60 Hz. The scales are graduated from 1–2, and this figure multiplied with the constant stated on the plate provides the correct operating value. As the tables on pages 6–11 show, the relays are manufactured in many different versions one of these is RRIL 22 which is provided with a capacitor winding, this relay thus becoming insensitive to harmonics. Relays for shunt connection can also be supplied.

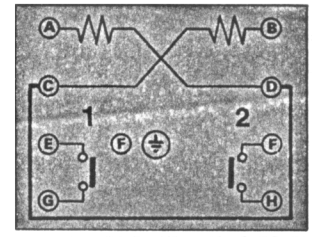
Current relays

The coils of the current relays can be connected either in series or parallel except on type RRIL 22. Parallel connection doubles the measurement range compared with series connection. The connection is simple to carry out, as is shown in the adjacent diagrams. The lower half of the relay plate which accommodates the symbol and scale constant is double-sided, one side applying for series connection and the other side for parallel connection. Thus the plate must be reversed when reconnecting the coils. The coils of the relays are normally connected in series when delivered.

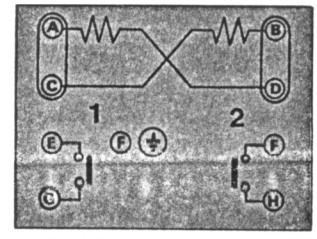
Reconnection of the relay is carried out on the front of the relay terminal base. Two connecting links are supplied with those relays delivered with the coils connected in series, these links being used if parallel connection is carried out.

For relays which are delivered connected in parallel, a conductor is supplied for use in series connection. See Fig. 3.

Fig. 3. Reconnecting coils on RRIL 23 and 24



Series connection:
Circuit between terminals 1C–2D. (On the front of the relay terminal base).
Normal connection when delivered.



Parallel connection:
The connecting links between terminals 1A–1C and 2B–2D (normally on the relay base.)
Conductor 1C–2D is removed.
Links are supplied mounted on the transparent cover of the relay. (See p. 1)

Voltage relays

Series resistors are supplied with the voltage relays which make the relays less dependent on temperature etc.

The relays are tested before delivery with the relative series resistor. Other information on the series resistors is to be found under **Mounting.**

Contacts

The relays are provided with either one or two contacts, as is shown by the symbols in the ordering tables on pages 6–11. These contacts make and break precisely, i.e. without creeping even if the supply is altered slowly. Contact bounce is minimal, and this ensures reliable operation in combination with time-lag relays. The contacts used are of the bridge type with silver contact elements. Data for contacts is to be found in Table 3 on page 5.

Earthing

The terminal 1F is connected to the frame of the relay and other non-current-carrying metal parts. This enables earthing.

Mounting

RRIL and RREL are included in the ASEA plug-in system RR and are designed for insertion in plug-in relay cases. The relays occupy two relay seats (approx. 80×55 mm). The ASEA plug-in system RR for relays is described in Catalogue RK 92–1 E.

A short-circuiting device type RTNK is available for current relays RRIL (see Fig. 2 on page 2) this device being more fully described in Catalogue RK 78–2 E. By using this device, the measuring circuit (i.e. CT secondary) is automatically short-circuited when a relay is removed from the case.

Type RTNK is a stud-type device and is designed for screwing into one of the relay coil terminals at the rear of the case, the connections then being arranged as shown in Fig. 4. See in addition instruction 5609 159 Y which is supplied with the short-circuiting device. A certain distance at point A must be kept in order to obtain correct breaking. This is effected by means of the spacers supplied.

Please note that the voltage relays type RREL have separate series resistors which are mounted on one or two steatite blocks. These have been tested together with the relay and marked together so that confusion will not occur. The dimensions of steatite blocks and resistors and the various connections are shown in the dimension drawing on page 12. A description of the steatite block and the resistors is to be found in Catalogue RK 78–2 E.

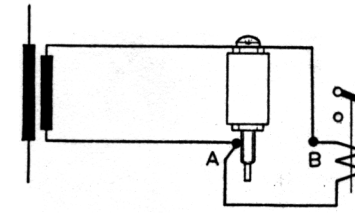


Fig. 4. Connections when connecting short-circuiting device RTNK.
The spacers that are supplied are put on at A in order to obtain the correct breaking distance.

Routine testing

In general, the relays in protective relay schemes are not required to operate very often and should therefore be routine tested every year or every other year – the frequency depending on how important the function is. By comparing operating values at different time points it is possible to see if any alterations have occurred in the operating values and thus an indication of whether complete maintenance is needed or not can be obtained. The greatest care must be taken if the armature is locked when testing or commissioning, as the operating values will become incorrect if the adjustment is altered. The armature must not be locked by inserting tools or the like in the air gap.

Maintenance

The relays must be protected from mechanical or chemical damage, grime or abnormal quantities of dust. It is therefore important that the covers should be kept on, or doors closed. It is also advisable, before opening doors or removing covers to dust off in such good time that disturbed dust has time to settle thus preventing it from entering relays.
Lubrication is not required. The bearings can be cleaned with a mixture of 50 % perchloro ethylene and 50 % methylated spirit when carrying out inspection, this mixture being best applied with a brush. In addition, the surfaces of the armature stops should also be cleaned during maintenance in order to prevent sticking.
Dirty, damaged or uneven contact surfaces should be dressed carefully with a diamond file or very fine file. Emery cloth or similar products are unsuitable for dressing contacts, because insulating grains from the abrasive material can be deposited on contact surfaces and cause malfunction. The contacts can also be cleaned with the fluid mentioned above in order to avoid sticking, but the contacts should be dressed afterwards with a file.

Table 1: Substitution table

Current relays

Old type	Design	Supply	New type
RMJ 1	over-current relay	a.c.	RRIL 23
RMJ 2		a.c./d.c.	RRIL 24
RMJ 12		a.c.	RRIL 22
	under-current relay		
		a.c.	
		a.c./d.c.	
		a.c.	

Voltage relays

Old type	Design	Supply	New type
RMJ 1	over-voltage relay	a.c.	RREL 23
RMJ 2		a.c./d.c.	RREL 24
RMJ 12		a.c.	RREL 22

Table 2: Specification table

Current relays

Type	Design	Supply	Contacts [1]
RRIL 24–10·		d.c.	
RRIL 24–20·			
RRIL 23–15·	over-current relay	a.c., 50–60 Hz	
RRIL 24–15·			
RRIL 24–25·			n.c.
RRIL 22–15·	over-current relay [2]	a.c., 50 Hz	
RRIL 22–16·		a.c., 60 Hz	
RRIL 20–10·	under-current relay	d.c.	
RRIL 20–20·			
RRIL 20–15·	under-current relay	a.c., 50–60 Hz	
RRIL 20–25·			

[1] n.o. = normally open (make contact), closes when relay picks up
n.c. = normally closed (break contact), opens when relay picks up
It is to be observed that the under-current and under-voltage relays are fed when normal conditions prevail.
[2] The relay is provided with a capacitor winding and has a separate one-seat plug-in capacitor unit (RRTCA 1).

Voltage relays

Type	Design	Supply	Contacts [1]
RREL 24–10··	over-voltage relay	d.c.	
RREL 24–20··			
RREL 23–15·	over-voltage relay	a.c., 50–60 Hz	1 n.o.
RREL 24–15·			2 n.o.
RREL 24–25·			1 n.o. + 1 n.c.
RREL 22–15··	over-voltage relay [2]	a.c., 50 Hz	1 n.o.
RREL 22–16··		d.c., 60 Hz	1 n.o.
RREL 20–10·	under-voltage relay	d.c.	2 n.c.
RREL 20–20·			1 n.o. + 1 n.c.
RREL 20–15·	under-voltage relay	a.c. 50–60 Hz	2 n.c.
RREL 20–25·			1 n.o. + 1 n.c.

Table 3: Contact data Maximum permitted voltage between lines: 600 V d.c. and 500 V a.c.

Relay type	Contact [1]	Contact load capacity A	Making capacity A	Breaking capacity, A, at a.c., P.F. ≥ 0.1 max. 220 V	d.c., L/R ≤ 40 ms 55 V	110 V	220 V
RR(I,E)L 20		3	6	6			
		3	6	6			
RR(I,E)L 22, 23	n.o.	3	4	4	2	0.8	0.3
RR(I,E)L 24	n.o.	3	6	6	4	1.4	0.5
	n.c.	3	4	4	2	0.8	0.3

[1]) n.o. = normally open (make contact), closes when relay picks up
n.c. = normally closed (break contact), opens when relay picks up

Table 4: Operating times in ms (± 10 %)

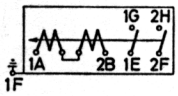
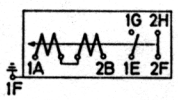
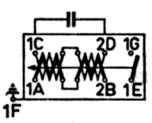
Type RR·L	Type of current	Contact that when armature picks up	Scale setting l = lowest h = highest	Pick-up time on instantaneous increase from 0 to n × the pick-up value: n= 1.1	1.5	2.5	5	10	Drop-out time on instantaneous decrease from 110 % of pick-up value to p % of the set value: p= 80 %	60 %	40 %	20 %	0 %
Under-current and under-voltage relay													
20	d.c.	makes	l	85	40	30	–	–	60	40	33	30	30
			h	60	30	25	–	–	30	23	20	20	20
		breaks					–	–					
			h				–	–					
	a.c.	makes					–	–					
			h	75	32	24	–	–					
		breaks					–	–					
							–	–					
Over-current and over-voltage relay													
22	a.c.	makes	l	125	65	40	35	33	–	75	50	45	45
			h	80	50	35	30	28	–	50	35	32	30
23	a.c.	makes							–				
			h						–				
24	d.c.	makes							–				
			h						–				
		breaks							–				
			h						–				
	a.c.	makes							–				
			h	90	57	54	52	50	–				
		breaks							–				
									–				

Ordering particulars

1. Cat. No.
2. Type designation (not obligatory)
4. To be ordered separately:
   - A. Case as in Catalogue RK 92–1 E
   - B. Short-circuiting device type RTNK as in Catalogue RK 78–2 E
   - C. Flush-mounting frame, as in Catalogue RK 93 E
   - D. Front terminals instead of rear, as in Catalogue RK 93 E
   - E. Extension bolts as in Catalogue RK 93 E
   - F. Special mounting bolts as in Catalogue RK 90 E
   - G. Position label as in Catalogue RK 90 E
5. For special versions the type of current, rated frequency and scale etc. must be given.

Table 5: Over-current relay type RRIL

Maximum permitted voltage between lines: 600 V d.c. and 500 V a.c.
Dispersion in operating values: approximately ±2 %
Graduation and setting errors: approximately ±3 %
Mechanical life: 100 000 operations
Net weight: 0.5 kg

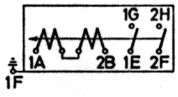
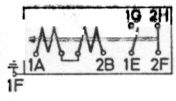
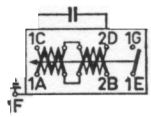
Type designation RRIL	Symbol for de-energized relay	Scale [1] A	Load capacity series/parallel continuous [2] A	Load capacity series/parallel 1 s A	Power consumption at lowest setting d.c. appr. W	Power consumption at lowest setting a.c. open relay armature approx. VA	Power consumption at lowest setting a.c. closed relay armature approx. VA	Resetting ratio as % of set value	Cat. No.
D.C.									
24–1011		0.01–0.02/0.02–0.04	0.07/0.14	2/4	0.1			≥ 78	RK 415 0011
–1012		0.025–0.05/0.05–0.1	0.17/0.34	5.5/11	0.1				0012
–1013		0.05–0.1/0.1–0.2	0.35/0.7	12/24	0.1				0013
–1014		0.1–0.2/0.2–0.4	0.75/1.5	27/54	0.1				0014
–1015		0.25–0.5/0.5–1	2/4	75/150	0.1				0015
–1016		0.5–1/1–2	4/8	140/280	0.1				0016
–1017		1–2/2–4	8/15(16)	300/500	0.1				0017
–1018		2.5–5/5–10	15/15(30)	470/500	0.13				0018
–1019		5–10/10–20	15/15(30)	470/500	0.23				0019
–1020		10–20/20–40	15/15(30)	470/500	0.4				0020
–1021		25–50/50–100	15/15(30)	470/500	1.25				0021
24–1010		To order From 0.005–0.01/0.01–0.02 to 25–50/50–100						≥ 78	RK 415 0099
24–2011		0.01–0.02/0.02–0.04	0.07/0.14	2/4	0.1			≥ 78	0111
–2012		0.025–0.05/0.05–0.1	0.17/0.34	5.5/11	0.1				0112
–2013		0.05–0.1/0.1–0.2	0.35/0.7	12/24	0.1				0113
–2014		0.1–0.2/0.2–0.4	0.75/1.5	27/54	0.1				0114
–2015		0.25–0.5/0.5–1	2/4	75/150	0.1				0115
–2016		0.5–1/1–2	4/8	140/280	0.1				0116
–2017		1–2/2–4	8/15(16)	300/500	0.1				0117
–2018		2.5–5/5–10	15/15(30)	470/500	0.13				0118
–2019		5–10/10–20	15/15(30)	470/500	0.23				0119
–2020		10–20/20–40	15/15(30)	470/500	0.4				0120
–2021		25–50/50–100	15/15(30)	470/500	1.25				0121
24–2010		To order From 0.005–0.01/0.01–0.02 to 25–50/50–100						≥ 78	RK 415 0199
A.C. 50 Hz									
22–1531		0.01–0.02	0.13	4.5				≥ 75	RK 415 0311
–1532		0.02–0.04	0.23	9					0312
–1533		0.025–0.05	0.29	12					0313
–1534		0.05–0.1	0.6	27					0314
–1535		0.1–0.2	1.3	55					0315
–1536		0.2–0.4	2.5	100					0316
–1537	[3]	0.25–0.5	3.5	140		0.1	0.16		0317
–1538		0.5–1	5.5	200					0318
–1539		1–2	11.5	470					0319
–1540		2–4	15	470					0320
–1541		2.5–5	15	470					0321
–1542		5–10	15	470					0322
22–1530		To order From 0.005–0.01 to 5–10						≥ 75	RK 415 0399

[1] When the coils are connected in parallel, the values are double those for series connection, e.g. in series 0.01–0.02 A and in parallel 0.02–0.04 A. This is indicated in the table with scale 0.01–0.02/0.02–0.04 A. The relays are delivered with series-connected coils if not otherwise requested when ordered.
The connecting links (see Fig. 3) are supplied with the relay but may be ordered separately **RK 415 0001.**
If the relays are supplied with coils connected in parallel a conductor **RK 415 0002** is supplied for series connection (1C–2D).
Scales of a.c. relays for 50–60 Hz are graduated for 50 Hz and have operating values approximately 1 % higher at 60 Hz.
Relays with scales graduated at 60 Hz (plate engraved 60 Hz) are available, **Cat. No. RK 415 0003.**

[2] With parallel connection, the higher values in brackets can be permitted if links are provided also at the rear of the case.

[3] Capacitor 4 µF, RTCK 33–4 (RK 789 1430) in a separate plug-in unit RRTCA 1, (one-seat). The entire unit is included in the relay Cat. No. and is marked together with the relay.

Table 5: continued

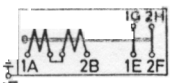
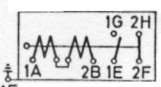
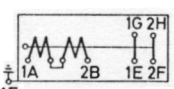
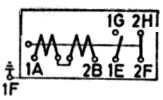
Type designation RRIL	Symbol for de-energized relay	Scale [1] A	Load capacity series/parallel: continuous [2] A	Load capacity series/parallel: 1 s A	Power consumption at lowest setting: d.c. appr. W	Power consumption at lowest setting: a.c. open relay armature approx. VA	Power consumption at lowest setting: a.c. closed relay armature approx. VA	Resetting ratio as % of set value	Cat. No.
		0.0025–0.005/0.005–0.01	0.035/0.07	1.4/2.8				≥ 80	RK 415 0511
		0.005–0.01/0.01–0.02	0.075/0.15	3/6					0512
		0.01–0.02/0.02–0.04	0.14/0.28	5.5/11		50 Hz	50 Hz		0513
		0.03–0.06/0.06–0.12	0.45/0.90	20/40		0.1	0.19		0514
		0.05–0.1/0.1–0.2	0.75/1.5	35/70					0515
		0.15–0.3/0.3–0.6	2.5/5	110/220		60 Hz	60 Hz		0516
		0.5–1/1–2	8/15(16)	380/500		0.13	0.23		0517
		1–2/2–4	14/15(28)	470/500					0518
		2.5–5/5–10	15/15(30)	470/500					0519
		5–10/10–20	15/15(30)	470/500					0520
		To order From 0.0025–0.005/0.005–0.01 to 5–10/10–20						≥ 80	RK 415 0599
24–1511		0.01–0.02/0.02–0.04	0.09/0.18	3/6				≥ 83	RK 415 0611
–1512		0.025–0.05/0.05–0.1	0.22/0.44	7/14					0612
–1513		0.05–0.1/0.1–0.2	0.45/0.9	17/34					0613
–1514		0.1–0.2/0.2–0.4	0.9/1.8	35/70		50 Hz	50 Hz		0614
–1515		0.25–0.5/0.5–1	2.5/5	95/190		0.40	0.53		0615
–1516		0.5–1/1–2	5/10	200/400					0616
–1517		1–2/2–4	10/15(20)	380/500		60 Hz	60 Hz		0617
–1518		2.5–5/5–10	15/15(30)	470/500		0.47	0.65		0618
–1519		5–10/10–20	15/15(30)	470/500					0619
–1520		10–20/20–40	15/15(30)	470/500					0620
–1521		25–50/50–100	15/15(30)	400/500					0621
24–1510		To order From 0.01–0.02/0.02–0.04 to 25–50/50–100						≥ 83	RK 415 0699
24–2511		0.01–0.02/0.02–0.04	0.09/0.18	3/6				≥ 83	RK 415 0711
–2512		0.025–0.05/0.05–0.1	0.22/0.44	7/14					0712
–2513		0.05–0.1/0.1–0.2	0.45/0.9	17/34					0713
–2514		0.1–0.2/0.2–0.4	0.9/1.8	35/70		50 Hz	50 Hz		0714
–2515		0.25–0.5/0.5–1	2.5/5	95/190		0.40	0.53		0715
–2516		0.5–1/1–2	5/10	200/400					0716
–2517		1–2/2–4	10/15(20)	380/500		60 Hz	60 Hz		0717
–2518		2.5–5/5–10	15/15(30)	470/500		0.47	0.65		0718
–2519		5–10/10–20	15/15(30)	470/500					0719
–2520		10–20/20–40	15/15(30)	470/500					0720
–2521		25–50/50–100	15/15(30)	470/500					0721
24–2510		To order From 0.01–0.02/0.02–0.04 to 25–50/50–100						≥ 83	RK 415 0799
A.C. 60 Hz									
		0.01–0.02	0.13	4.5				≥ 75	RK 415 0911
		0.02–0.04	0.23	9					0912
		0.025–0.05	0.29	12					0913
		0.05–0.1	0.6	27					0914
		0.1–0.2	1.3	55					0915
		0.2–0.4	2.5	100		0.13	0.22		0916
		0.25–0.5	3.5	140					0917
		0.5–1	5.5	200					0918
	[3]	1–2	11.5	470					0919
		2–4	15	470					0920
		2.5–5	15	470					0921
		5–10	15	470					0922
		To order From 0.005–0.01 to 5–10						≥ 75	RK 415 0999

[1] [2] See page 6

[3] Capacitor 3.2 µF, RTCK 33–3.2 (RK 789 1410) in a separate plug-in unit RRTCA 1, (one-seat).
The entire unit is included in the relay Cat. No. and is marked together with the relay.

Table 6: Under-current relay type RRIL

Maximum permitted voltage between lines: 600 V d.c. and 500 V a.c.
Dispersion in operating values: approximately ±2 %
Graduation and setting errors: approximately ±3 %
Mechanical life: 100 000 operations
Net weight: 0.5 kg

Type designation RRIL	Symbol for de-energized relay	Scale [1] A	Load capacity series/parallel: continuous [2] A	Load capacity series/parallel: 1 s A	Power consumption at lowest setting: d.c. appr. W	Power consumption at lowest setting: a.c. open relay armature approx. VA	a.c. closed relay armature approx. VA	Resetting ratio as % of set value	Cat. No.
D.C.									
20–1011		0.01–0.02/0.02–0.04	0.09/0.18	3/6	0.06			≤ 130	RK 415 1611
–1012		0.025–0.05/0.05–0.1	0.23/0.46	7/14	0.06				1612
–1013		0.05–0.1/0.1–0.2	0.5/1	17/34	0.06				1613
–1014		0.1–0.2/0.2–0.4	1/2	35/70	0.06				1614
–1015		0.25–0.5/0.5–1	2.6/5.2	95/190	0.06				1615
–1016		0.5–1/1–2	5.4/10.8	200/400	0.06				1616
–1017		1–2/2–4	10.6/15(21)	380/500	0.06				1617
–1018		2.5–5/5–10	15/15(30)	470/500	0.08				1618
–1019		5–10/10–20	15/15(30)	470/500	0.15				1619
20–1010		To order From 0.005–0.01/0.01–0.02 to 5–10/10–20						≥ 130	
20–2011		0.01–0.02/0.02–0.04	0.09/0.18	3/6	0.06			≥ 130	RK 415 1711
–2012		0.025–0.05/0.05–0.1	0.23/0.46	7/14	0.06				1712
–2013		0.05–0.1/0.1–0.2	0.5/1	17/34	0.06				1713
–2014		0.1–0.2/0.2–0.4	1/2	35/70	0.06				1714
–2015		0.25–0.5/0.5–1	2.6/5.2	95/190	0.06				1715
–2016		0.5–1/1–2	5.4/10.8	200/400	0.06				1716
–2017		1–2/2–4	10.6/15(21)	380/500	0.06				1717
–2018		2.5–5/5–10	15/15(30)	470/500	0.08				1718
–2019		5–10/10–20	15/15(30)	470/500	0.15				1719
20–2010		To order From 0.005–0.01/0.01–0.02 to 5–10/10–20						≥ 130	
A.C. 50–60 Hz									
20–1511		0.01–0.02/0.02–0.04	0.08/0.17	3/6				≤ 125	RK 415 2011
–1512		0.025–0.05/0.05–0.1	0.21/0.42	7/14					2012
–1513		0.05–0.1/0.1–0.2	0.45/0.90	17/34		50 Hz	50 Hz		2013
–1514		0.1–0.2/0.2–0.4	0.95/1.9	35/70		0.43	0.52		2014
–1515		0.25–0.5/0.5–1	2.5/5	95/190					2015
–1516		0.5–1/1–2	5/10	200/400		60 Hz	60 Hz		2016
–1517		1–2/2–4	10/15(20)	380/500		0.54	0.63		2017
–1518		2.5–5/5–10	15/15(30)	470/500					2018
–1519		5–10/10–20	15/15(30)	470/500					2019
20–1510		To order From 0.01–0.02/0.02–0.04 to 5–10/10–20						≥ 125	RK 415 2099
20–2511		0.01–0.02/0.02–0.04	0.08/0.17	3/6				≤ 125	RK 415 2111
–2512		0.025–0.05/0.05–0.1	0.21/0.42	7/14					2112
–2513		0.05–0.1/0.1–0.2	0.45/0.90	17/34		50 Hz	50 Hz		2113
–2514		0.1–0.2/0.2–0.4	0.95/1.9	35/70		0.43	0.52		2114
–2515		0.25–0.5/0.5–1	2.5/5	95/190					2115
–2516		0.5–1/1–2	5/10	200/400		60 Hz	60 Hz		2116
–2517		1–2/2–4	10/15(20)	380/500		0.54	0.63		2117
–2518		2.5–5/5–10	15/15(30)	470/500					2118
–2519		5–10/10–20	15/15(30)	470/500					2119
20–2510		To order From 0.01–0.02/0.02–0.04 to 5–10/10–20						≥ 125	

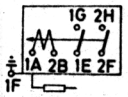
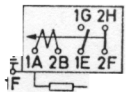
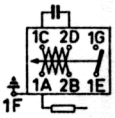
[1]) When the coils are connected in parallel, the values are double those for series connection, e.g. in series 0.01–0.02 A and in parallel 0.02–0.04 A. This is indicated in the table with scale 0.01–0.02/0.02–0.04 A. The relays are delivered with series-connected coils if not otherwise requested when ordered.
The connecting links (see Fig. 3) are supplied with the relay but may be ordered separately **RK 415 0001.**
If the relays are supplied with coils connected in parallel a conductor **RK 415 0002** is supplied for series connection (1C–2D).

Scales of a.c. relays for 50–60 Hz are graduated for 50 Hz and have operating values approximately 1 % higher at 60 Hz.
Relays with scales graduated at 60 Hz (plate engraved 60 Hz) are available, **Cat. No. RK 415 0003.**

[2]) With parallel connection, the higher values in brackets can be permitted if links are also provided at the rear of the case.

Table 7: Over-voltage relay type RREL

Maximum permitted voltage between lines: 600 V d.c. and 500 V a.c.
Dispersion in operating values: approximately ±2 %
Graduation and setting errors: approximately ±3 %
Mechanical life: 100 000 operations
Net weight: 0.5 kg

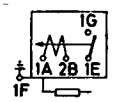
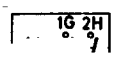
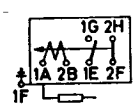
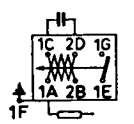
Type RREL	Symbol for de-energized relay	Scale V	Maximum permitted voltage continuously across relay + resistor V [1]	Power consumption across relay + resistor at lowest setting – d.c. appr. W	a.c. appr. VA	Resetting ratio as % of set value	Series resistors [2] Type MSB	Quantity	Total resistance Ω	Cat. No. [3]
D.C.										
24–1011		5–10	35	0.25		≥ 78	54–40+20	1+1	60	RK 415 2911
–1012		10–20	70	0.25			54–125+100	1+1	225	2912
–1013		15–30	100	0.40			124–200	2	400	2913
–1014		25–50	175	0.35			124–630	2	1260	2914
–1015		40–80	275	0.40			124–1600+1250	1+1	2850	2915
–1016		60–120	400	0.60			124–2500	2	5000	2916
–1017		100–200	600	0.65			124–6300	2	12600	2917
–1018		150–300	600	1.0			124–10000	2	20000	2918
–1019		250–500	600	1.65			54–10000+5000	3+1	35000	2919
24–1010		To order From 5–10 to 250–500				≥ 78				RK 415 2999
24–2011		5–10	35	0.25		≥ 78	54–40+20	1+1	60	RK 415 3011
–2012		10–20	70	0.25			54–125+100	1+1	225	3012
–2013		15–30	100	0.40			124–200	2	400	3013
–2014		25–50	175	0.35			124–630	2	1260	3014
–2015		40–80	275	0.40			124–1600+1250	1+1	2850	3015
–2016		60–120	400	0.60			124–2500	2	5000	3016
–2017		100–200	600	0.65			124–6300	2	12600	3017
–2018		150–300	600	1.0			124–10000	2	20000	3018
–2019		250–500	600	1.65			54–10000+5000	3+1	35000	3019
24–2010		To order From 5–10 to 250–500				≥ 78				RK 415 3099
A.C. 50 Hz										
22–1511		5–10	50			≥ 75	124–20+10	3+1	70	RK 415 3211
–1512		10–20	100				124–80+40	3+1	280	3212
–1513		15–30	150		0.32		124–160	4	640	3213
–1514		20–40	200				124–315+250	2+2	1130	3214
–1515		25–50	250				124–500+400	1+3	1700	3215
–1516	[4]	40–80	400				124–1250+1000	2+2	4500	3216
		To order From 5–10 to 250–500				≥ 75				RK 415 3299

[1] Limited by maximum permitted voltage between lines for this relay.

[2] The series resistors are supplied with the relay and are mounted on a steatite block, thus allowing any position in proximity to the relay. The type numbers represent size and ohmic values of the resistors, e.g. MSB 54–40+20 means two type MSB 54 of 40 and 20 ohms respectively (quantity according to column headed Quantity). Dimensions and connection are shown on page 12.
Cat. Nos. for resistors are to be found in Catalogue RK 78–2 E.
If no separately mounted resistors are wanted, relay type RREG acc. to Cat. RK 41–1 E must be selected.

[3] Series resistors are included under the Cat. No. and are marked together with the relay with relative number.

[4] Capacitor 4 µF, RTCK 33–4 (RK 789 1430), in a separate plug-in unit RRTCA 1, (one-seat). The entire unit is included under the Cat. No. of the relay and is marked together with the relay (relative number).

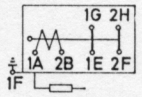
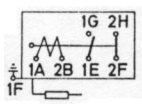
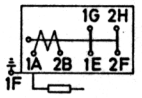
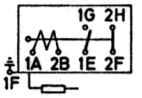
Type RREL	Symbol for de-energized relay	Scale V [1]	Maximum permitted voltage continuously across relay + resistor V [2]	Power consumption across relay + resistor at lowest setting d.c. appr. W	Power consumption across relay + resistor at lowest setting a.c. appr. VA	Resetting ratio as % of set value	Series resistors [3] Type MSB	Series resistors [3] Quantity	Series resistors [3] Total resistance Ω	
A.C. 50–60 Hz										
23–1511		5–10			0.3	≥ 80	124–10+6.3	5+3	69	RK 415 3311
–1512		10–20			0.35		124–63	4	252	3312
–1513		15–30			0.3		124–315	2	630	3313
–1514		25–50			0.35		124–400	4	1600	3314
–1515		40–80			0.35		124–1000	4	4000	3315
–1516		60–120			0.25		124–6300+5000	1+1	11300	3316
–1517		100–200			0.3		124–16000+12500	1+1	28500	3317
–1518		150–300			0.4		124–12500	4	50000	3318
–1519		250–500			0.7		124–16000+12500	3+3	85500	3319
23–1510		To order From 5–10 to 250–500								RK 415 3399
24–1511		5–10	40		1	≥ 83	124–4+2.5	4+2	21	RK 415 3411
–1512		10–20	70		1		124–20	4	80	3412
–1513		15–30	110		1		124–50	4	200	3413
–1514		25–50	150		1		124–160+125	1+3	535	3414
–1515		40–80	250		1		124–315	4	1260	3415
–1516		60–120	250		1.2		124–1250	2	2500	3416
–1517		100–200	400		1.45		124–3150	2	6300	3417
–1518		150–300	500		1.45		124–8000+6300	1+1	14300	3418
–1519		250–500	500		1.45		124–20000	2	40000	3419
24–1510		To order From 5–10 to 250–500				≥ 83				RK 415 3499
24–2511		5–10	40		1	≥ 83	124–4+2.5	4+2	21	
–2512		10–20	70		1		124–20	4	80	
–2513		15–30	110		1		124–50	4	200	
–2514		25–50	150		1		124–160+125	1+3	535	
–2515		40–80	250		1		124–315	4	1260	
–2516		60–120	250		1.2		124–1250	2	2500	
–2517		100–200	400		1.45		124–3150	2	6300	
–2518		150–300	500		1.45		124–8000+6300	1+1	14300	
–2519		250–500	500		1.45		124–20000	2	40000	
24–2510		To order From 5–10 to 250–500				≥ 83				RK 415 3599
A.C. 60 Hz										
22–1611	 [5]	5–10	50		0.32	≥ 75	124–20+10	3+1	70	RK 415 3711
–1612		10–20	100				124–80+40	3+1	280	3712
–1613		15–30	150				124–160	4	640	3713
–1614		20–40	200				124–315+250	2+2	1130	3714
–1615		25–50	250				124–500+400	1+3	1700	3715
–1616		40–80	400				124–1250+1000	2+2	4500	3716
22–1610		To order From 5–10 to 250–500				≥ 75				RK 415 3799

[4] Series resistors are included under the Cat. No. and are marked together with the relay with relative number.

[5] Capacitor 3.2 μF, RTCK 33–3.2 (RK 789 1410), in separate plug-in unit RRTCA 1, (one-seat). The entire unit is included under the Cat. No. of the relay and is marked together with the relay (relative number).

Table 8: Under-voltage relay type RREL

Maximum permitted voltage between lines: 600 V d.c. and 500 V a.c.
Dispersion in operating values: approximately ±2 %
Graduation and setting errors: approximately ±3 %
Mechanical life: 100 000 operations
Net weight: 0.5 kg

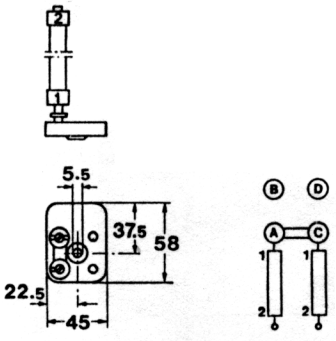
Type RREL	Symbol for de-energized relay	Scale V [1]	Maximum permitted voltage continuously across relay + resistor V [2]	Power consumption across relay + resistor at lowest setting d.c. appr. W	Power consumption across relay + resistor at lowest setting a.c. appr. VA	Resetting ratio as % of set value	Series resistors [3] Type MSB	Series resistors [3] Quantity	Series resistors [3] Total resistance Ω	Cat. No. [4]
D.C.										
20–1011		10–20	90	0.15		≤ 130	54–200	2	400	RK 415 4311
–1012		15–30	120	0.2			54–400	2	800	4312
–1013		25–50	200	0.35			124–800	2	1600	4313
–1014		40–80	240	0.35			54–2000	2	4000	4314
–1015		60–120	280	0.5			54–3150	2	6300	4315
–1016		100–200	500	0.85			124–6300+5000	1+1	11300	4316
–1017		150–300	600	1.1			124–12500+6300	1+1	18800	4317
–1018		250–500	600	1.5			124–20000	2	40000	4318
20–1010		To order From 5–10 to 250–500				≤ 130				
20–2011		10–20	90	0.15		≤ 130	54–200	2	400	RK 415 4411
–2012		15–30	120	0.2			54–400	2	800	4412
–2013		25–50	200	0.35			124–800	2	1600	4413
–2014		40–80	240	0.35			54–2000	2	4000	4414
–2015		60–120	280	0.5			54–3150	2	6300	4415
–2016		100–200	500	0.85			124–6300+5000	1+1	11300	4416
–2017		150–300	600	1.1			124–12500+6300	1+1	18800	4417
–2018		250–500	600	1.5			124–20000	2	40000	4418
20–2010		To order From 5–10 to 250–500				≤ 130				RK 415 4499
A.C. 50–60 Hz [1]										
20–1511		10–20	65			≤ 125	124–10	6	60	RK 415 4711
–1512		15–30	90				124–25+20	2+4	130	4712
–1513		25–50	125				124–100+80	2+2	360	4713
–1514		40–80	225				124–160+100	4+2	840	4714
–1515		60–120	275		5–2		124–500+400	2+2	1800	4715
–1516		100–200	300				124–2500+2000	1+1	4500	4716
–1517		150–300	500				124–8000+5000	1+1	13000	4717
–1518		250–500	500				124–20000+16000	1+1	36000	4718
20–1510		To order From 5–10 to 250–500				≤ 125				
20–2511		10–20	65			≤ 125	124–10	6	60	RK 415 4811
–2512		15–30	90				124–25+20	2+4	130	4812
–2513		25–50	125				124–100+80	2+2	360	4813
–2514		40–80	225				124–160+100	4+2	840	4814
–2515		60–120	275		1.5–2		124–500+400	2+2	1800	4815
–2516		100–200	300				124–2500+2000	1+1	4500	4816
–2517		150–300	500				124–8000+5000	1+1	13000	4817
–2518		250–500	500				124–20000+16000	1+1	36000	4818
20–2510		To order From 5–10 to 250–500				≤ 125				RK 415 4899

[1]) The a.c. relays for 50–60 Hz are graduated at 50 Hz and have operating values that are approximately 4 % higher at 60 Hz.
Graduation at 60 Hz (plate engraved 60 Hz) is available; Cat. No. **RK 415 0003.**

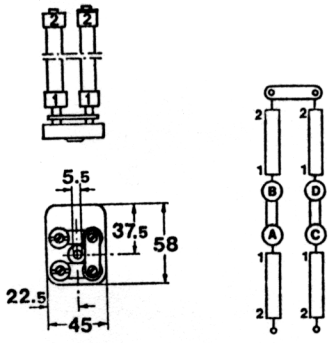
[2]) Limited by maximum permitted voltage between lines for this relay.

[3]) The series resistors are supplied with the relay and are mounted on a steatite block, and can be positioned in any position in proximity to the relay. The type figures represent size and ohmic values of the resistors for example, MSB 54–40+20 means two type MSB 54 with 40 and 20 ohms (quantity of each as given in the column headed Quantity). Dimensions and connection are shown on page 12.
Cat. Nos. for the resistors are to be found in Catalogue RK 78–2 E. If no separately mounted resistors are wanted, relay type RREG acc. to Cat. RK 41–1 E must be selected.

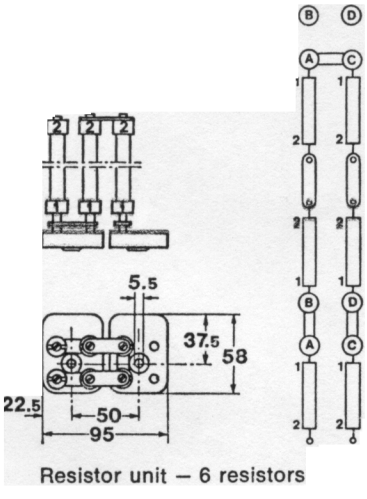
[4]) Series resistors are included under the Cat. No. and are marked together with the relay.



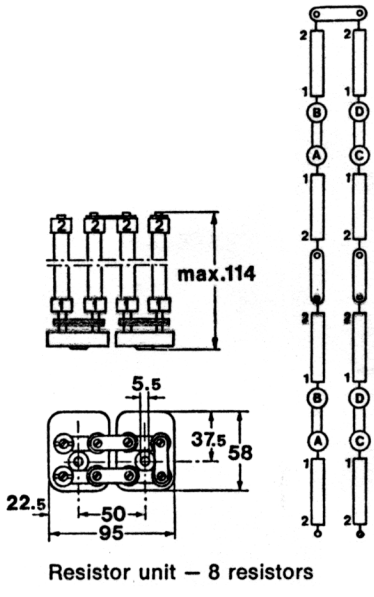
Resistor unit – 2 resistors



Resistor unit – 4 resistors



Resistor unit – 6 resistors



Resistor unit – 8 resistors

Type	Found on pages
RRIL	6–8
RREL	9–11

Cat. No.	Found on pages
RK 415 0001–0003	
0011–0399	
0511–0999	
1611–2199	8
2911–3299	9
3311–3799	10
4311–4899	11

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