

Miniature Circuit Breakers

MEM 250v miniature circuit breakers (MCB's) are manufactured to - **BSEN 60898**. They have a maximum breaking capacity of 6kA and are available in a selection of current ratings from 6A to 63A. The maximum cable capacity being 25mm².

The MCB is suitable for 240V, AC, 50/60Hz systems and is calibrated at 40°C. All of the MCB ratings available are single module width.

Characteristics and Applications for MCB Types

- TYPE B:** suitable for domestic and commercial installations having little or no switching surges.
- TYPE C:** general use in commercial/industrial installations where the use of fluorescent lighting, small motors etc. can produce switching surges.
- TYPE D:** for use with equipment such as transformers, some fluorescent lighting, X-ray machines, industrial welding equipment and similar applications where very high inrush currents are experienced.

OPERATING CHARACTERISTICS FOR MEM MCB'S

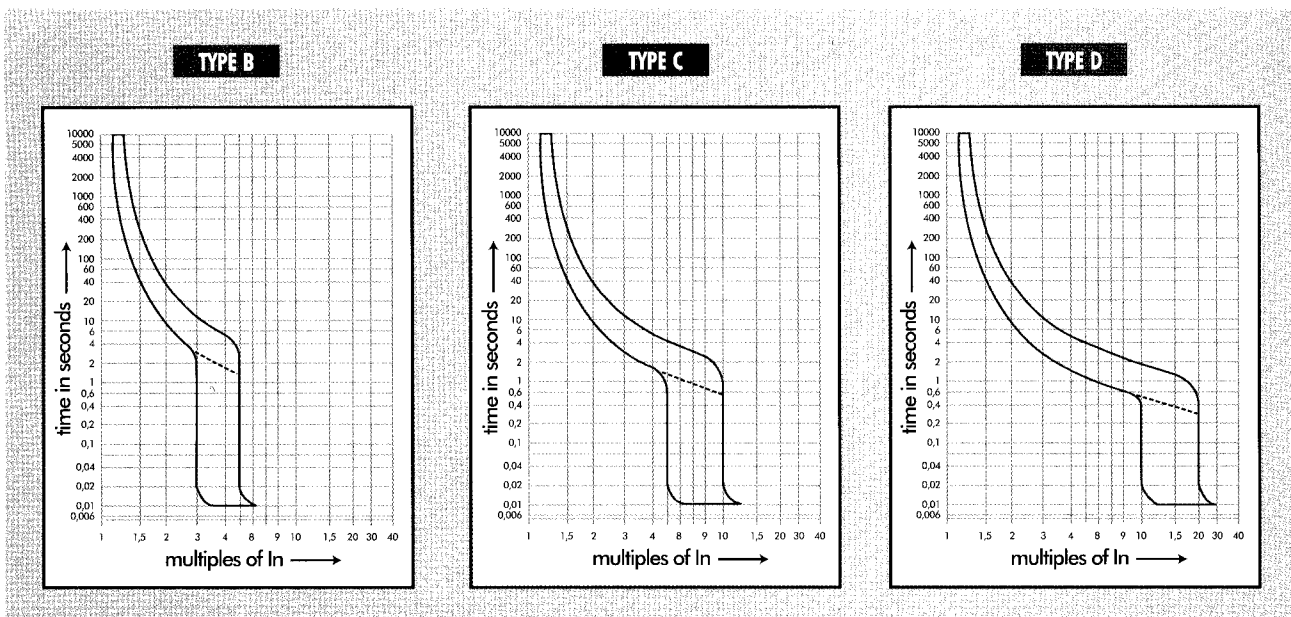
BS EN 60898 TYPE	Instantaneous Trip Current Range (xI _n)	Typical Application	MEM MCB Prefix
B	3 to 5	Domestic	ALB
C	5 to 10	Commercial Light Industrial	ALC
D	10 to 20	General Industrial	ALD

Note: IEC 898 permits the upper limit for type D to extend to 50 x I_n.

BS 7671: 1992 requirements for Electrical installations (16th Edition of the IEE Wiring regulations) specifically identifies Type B & Type C. Lower earth fault loop impedance's (Z_s) are generally necessary for Type D to achieve the operating times required by regulation 413-02-08. (Maximum Z_s is calculated using the formula in the regulations and the characteristics of the circuit breaker.)

Where the requirement cannot be achieved, use of the circuit breakers as overcurrent protective devices is not precluded, but the use of residual current circuit breakers (RCCB's) to provide protection against indirect earth fault condition is implied. Establishment of the value of the earth fault loop impedance (Z_s) at the design stage of installation will determine which type of the circuit breakers should be used.

MCB OPERATING CHARACTERISTICS



Switchgear Technical Data

Earth fault loop impedance's (Zs) to give compliance with BS 7671 regulation 413-02-08 at 240V

Maximum Earth fault loop impedance in ohms for circuits supplying socket outlets (also fixed bathroom equipment).

RATINGS

Device	BS	5/6A	15/16A	20A	30/32A	45A
House Fuse	BS 1361	10.9	3.43	1.78	1.2	0.6
Type B MCB	BS EN 60898	8.0	3.0	2.4	1.5	1.07
Type C MCB	BS EN 60898	4.0	1.5	1.2	0.75	0.53

HIGH RUPTURING CAPACITY (HRC) FUSE MODULES To BS 1361:1971 CARTRIDGE FUSE TO BS1361 AND BS 88

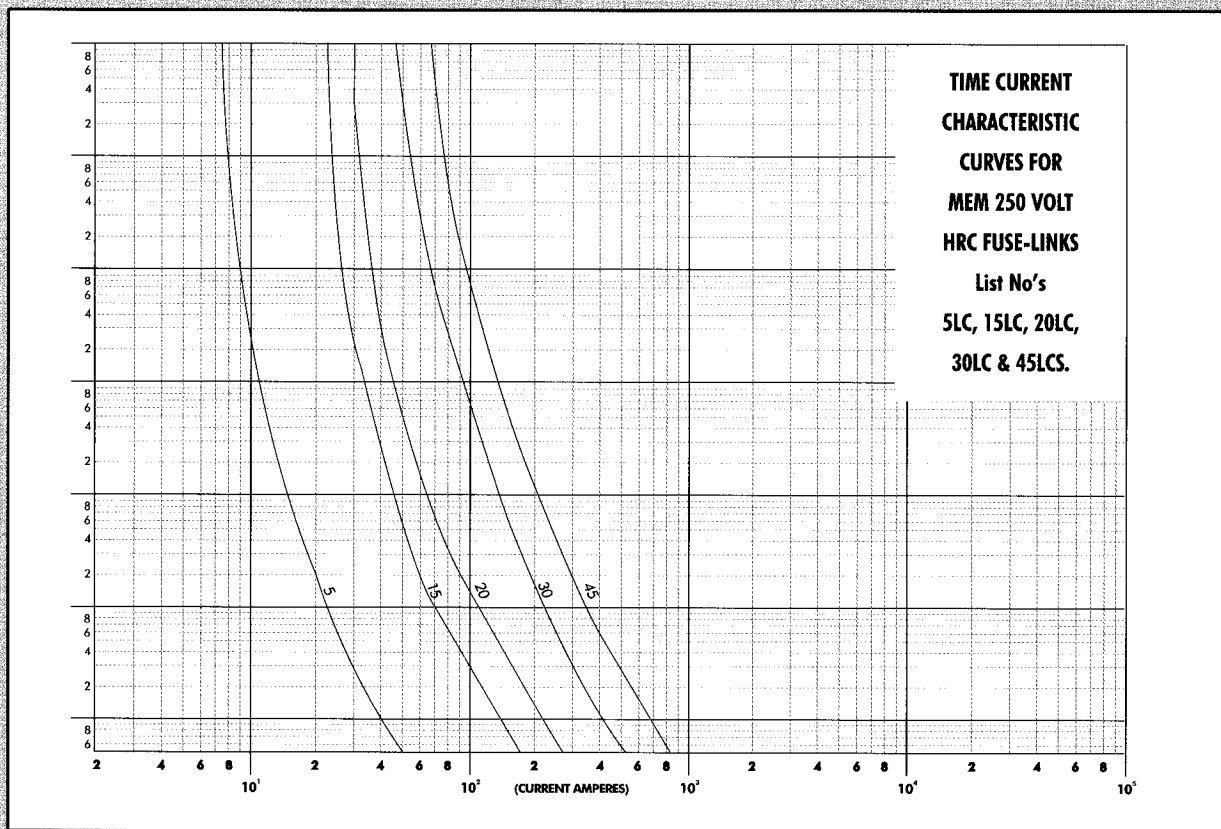
Reference No.	Rating (A)	Spare Fuse	Module Width	Fuse Standard
AC5	5	5LC	1	BS 1361
AC10	10	1510LC	1	BS 88
AC15	15	15LC	1	BS 1361
AC20	20	20LC	1	BS 1361
AC30	30	30LC	1	BS 1361
AC35	35	35LC	2	BS 88
AC40	40	40LC	2	BS 88
AC45	45	45LCS	2	BS 1361

RENARD SERIES OF RATINGS

Device	BS	6A	10A	16A	20A	32A	40A	50A	63A
HRC Fuse	BS 88	8.89	5.33	2.82	1.85	1.09	0.86	0.63	-
Type B MCB	BS EN 60898	8.0	4.8	3.0	2.4	1.5	1.2	0.96	0.76
Type C MCB	BS EN 60898	4.0	2.4	1.5	1.2	0.75	0.6	0.48	0.38

At these levels of loop impedance, fuses/MCB's will provide disconnection times in accordance with BS 7671

HRC FUSE OPERATING CHARACTERISTICS



Residual current circuit breakers (RCCB)

Explanation of abbreviations used

R.C.D. : Residual Current Device is the generic term covering the range of devices incorporating sensing of residual currents and includes within it's scope R.C.C.B. and R.C.B.O. type products.

R.C.C.B.: Residual Current Circuit Breaker is an RCD which will cause disconnection of electrical supply should a residual current passing through the device exceed a specified load.

R.C.B.O.: Residual Current Circuit Breaker with overload protection is an RCD which will cause disconnection of electrical supply due to residual current exceeding specified limits together with integral overload, overcurrent and short circuit protection associated with a miniature circuit breaker.

When must an RCCB be used

- i) TT supply
- ii) Sockets to supply portable equipment outside the equipotential zone
- iii) Supply to caravan

BS 7671 (16th Edition IEE regs.)

(471-08-06)

(471-16-01)

(608-13-05)

Current operated RCD's provide a high degree of protection against electrocution and fire risk due to electrical faults.

(RCCB) selection chart

To BS 4293. IEC 61008 also BS EN 61008. AC22B Duty. For mounting in suitable enclosures.

RATING(A)	Trip Current (mA)				
	10	30	100	300	300 TIME DELAY
2 Pole 2 Module					
16	A16UE	A16HE			
25		A25HE	A25ME		
32		A32HE	A32ME		
40		A40HE			
63		A63HE	A63ME		
80		A80HE	A80ME		
100		A100HE	A100ME	A100LE	A100LET
4 Pole-4 Module					
25		A25H4			
40		A40H4	A40M4		
63		A63H4			

Trip current selection

10mA providing a high degree of protection against electric shock in hazardous environments where supplementary protection against shock from accidental direct contact is required.

This rating should only be used to supply final circuits where a high risk exists.

30mA providing a high degree of protection against electric shock due to direct contact. The device must be able to trip within 40 milliseconds when a fault current of 150mA is detected.

This will also satisfy the IEE/BS condition of sockets feeding portable equipment outside the equipotential zone.

100mA to give a degree of protection against electric shock due to indirect contact situation. Generally this rating should be used to protect groups of circuits and provide overall protection against fire risk. If lower rated RCD devices are employed downstream then a time delayed 100mA RCD can be employed to ensure discrimination between same.

300mA gives overall protection against risk of fire from electrical faults in wiring etc. only where sufficient current (typically less than 500mA) may cause incandescence of metal parts.

When is it advisable to install an RCD?

- For protection against risk of fire due to live to earth where fault current is insufficient to cause over-current protection device to operate.
- For protection against risk of shock from indirect contact with equipment suffering a live to earth fault.
- For protection against shock in potentially hazardous environment.
- As supplementary protection against shock from directly touching 'Live'.

RCD operation

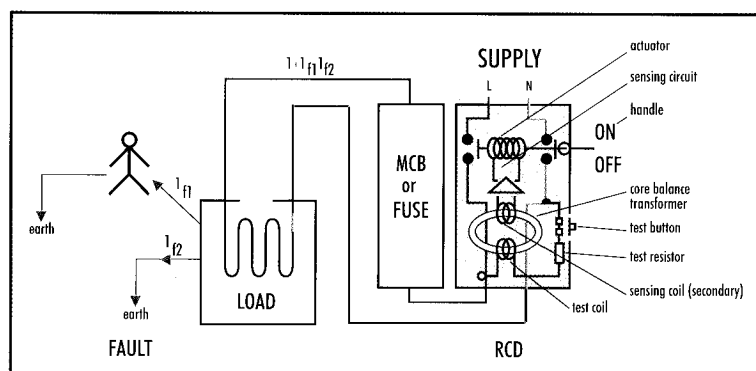
When a load is connected to the circuit supplied through an RCD current flows from the supply through the RCD whereby both phase and neutral form the primaries of a core balance transformer arrangement. The secondary of its arrangement is used as a sensing coil to detect any out of balance between the current flowing through the live and neutral conductors in the circuit.

A test circuit also incorporated whereby connection is made from load phase to supply neutral via a test coil and resistor and activated by the test button.

If a fault occurs on the load side of the RCD whereby a fault current (I_{fn}) flows between Live and Earth. The Load demands a current return through neutral of the RCD of I amps, whilst the current flow through the Live becomes $I + I_{fn}$ and from this imbalance a corresponding current will be induced in the sensing coil which if of sufficient magnitude and duration will cause the actuator to function and trip and RCD thereby disconnect supply.

However it should be noted that other disturbances that may cause the imbalance between phase and neutral can emanate from the upstream and / or down stream sources to give rise the effect of unwanted tripping as identified in 'RCD TROUBLE - SHOOTING'

SCHEMATIC DIAGRAM OF RCD



Schematic diagram of RCD connected to earth fault showing principle parts of installation.

Residual current circuit breaker with overload protection (R.C.B.O.)

Combined MCB/RCD.

The functionality of a standard MCB is maintained but with the added flexibility of residual current protection. MEM 250V's RCBO's all comply to the latest standard **BS EN 61009-1**.

The RCD 'pod' device can be fitted in situ to any single pole **BS EN 60898** MCB from MEM 250V.

RATING(A)	Trip Current (mA)	
	30	100
16	ALB161H30	ALB161AM100
32	ALB321H30	ALB321AM100
Pod Only	AH30	AM100

Loss of Supply Neutral

Under loss of supply neutral conditions, the R.C. element of the device will continue to provide earth leakage protection. With these conditions and upon detection of an earth leakage current the RCBO will operate within its normal characteristics.

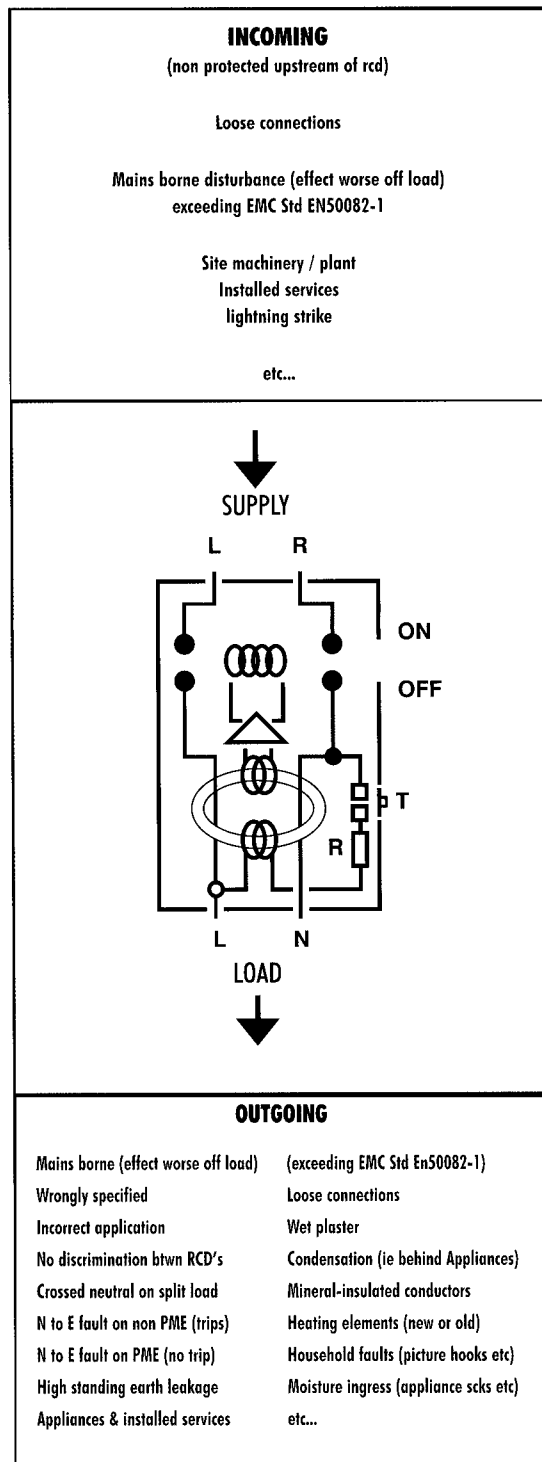
D.C. Components in the Load

The RCBO is capable of responding to the superimposed DC current in compliance with **BS EN 61009**.
eg. fault condition on equipment using rectified voltages.

Surge/Transient Suppression

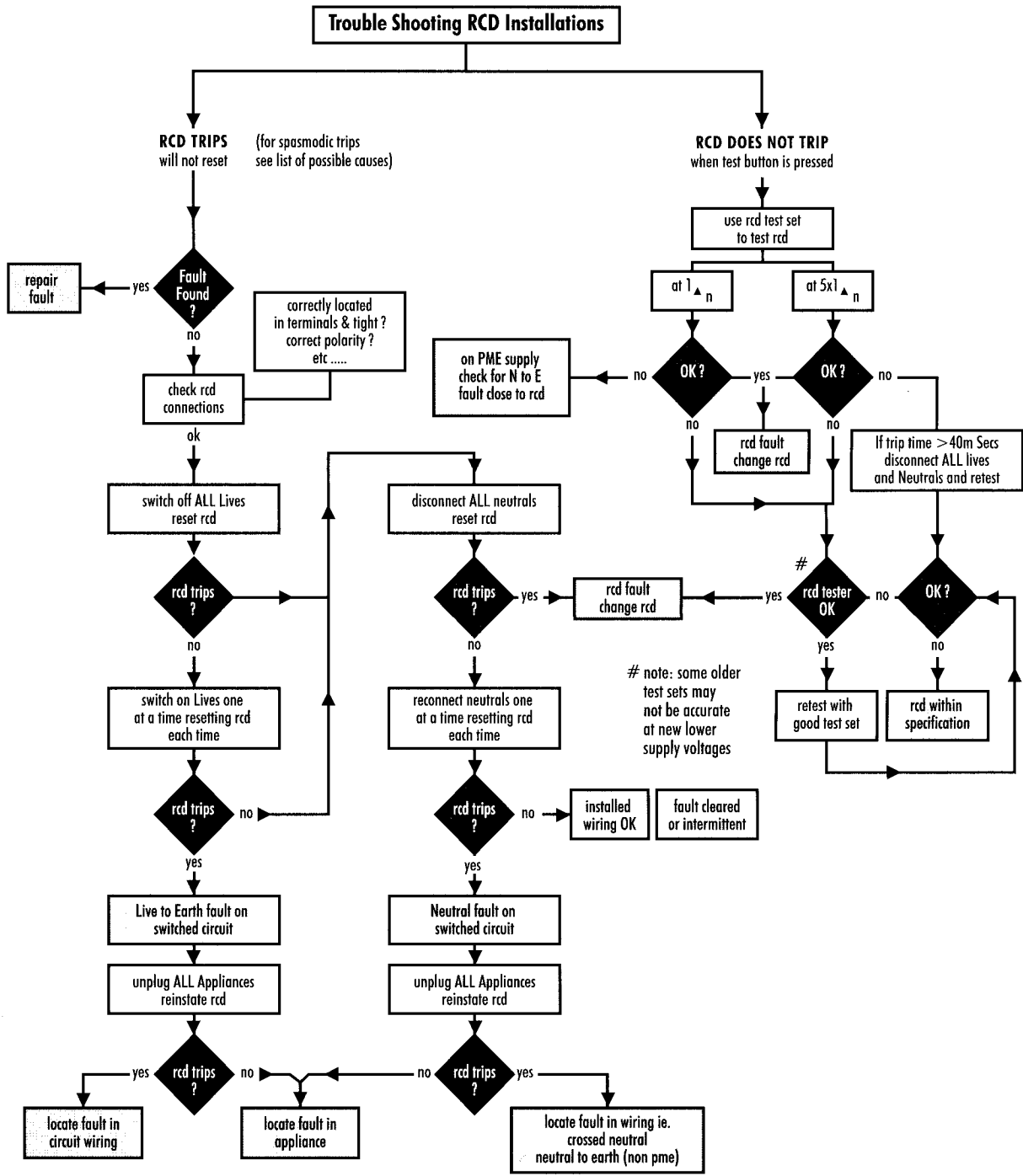
Surge/Transient suppression is incorporated within the unit and is therefore suitable for use with supply equipment susceptible to such mains borne transients. (Within EMC tolerances)

SCHEMATIC DIAGRAM OF RCD INCLUDING CAUSES OF SPASMODIC TRIPPING



Switchgear Technical Data

RCD troubleshooting diagram

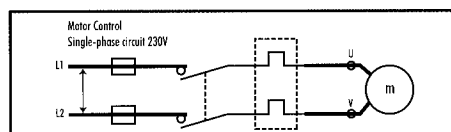
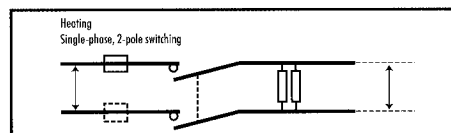


WARNING: Due to the requirement of working in close proximity to live parts these procedures should be carried out by persons who may be considered to be competent 'Electricians'

Technical information - modular contractor range for selection for heating and motor control circuits

Maximum Power in kW according to electrical durability

Electrical durability in opening cycles	Heating Circuits					contractor rating	230v single-phase capacitor motor (2 pole)
	100x10	150x10	200x10	500x10	10		
Single Phase	3.5	3	2.2	1	0.8	16A	0.55
Switching	5.4	4.6	3.5	1.6	1.2	25A	1.1
230V	8.6	7.4	3.5	1.6	1.2	40A	2.2
(2 pole)	13.6	11.6	8.8	4	3	63A	4



Reference	Impulse Relay					Contactor					
	AA161RA	AA161RB	AA161	AA262	AA203	AA204	AA402	AA403	AA404	AA633	AA634
Contact Configuration	1N/O	1N/O, 1N/C	1N/O, 1N/C	2N/O	3N/O	4N/O	2N/O	3N/O	4N/O	3N/O 1 AUX N/C	4N/O
Rating Operating Voltage	V	240	240	240	240/415	240/415	240/415	240/415	240/415	240/415	240/415
Rating Operating Current (AC1)	A	16	16	16	20	20	20	40	40	40	63
Cabling No. of Conductors		2	2	2	2	2	2	1	1	1	1
Cable C.S.A.	mm ²	1.4	1.4	1.4	1.4	1.4	1.4	4-25	4-25	4-25	4-25
CONTROL CIRCUIT CHARACTERISTICS											
Control Circuit Voltage	V	230/240	230/240	230/240	230/240	230/240	230/240	230/240	230/240	230/240	230/240
Average Consumption Inrush At Uc	VA	15	15	2.5	8	32	32	55	55	55	55
POWER DISSIPATED											
Dissipated by Coil	W	1	1	1	1	1.3	1.3	1.7	1.7	1.7	1.7
Dissipated by Pole	W	1.2	1.2	1.2	1.8	1.6	1.6	3.2	3.2	3.2	4
Impedance Per Pole	M	4.5	4.5	4.5	4.5	4	2	2	2	2	1
WIDTH											
Number of 18mm Modules		1	1	1	1	2	2	3	3	3	3

Technical information - modular time switch range

Reference	Electromechanical					Digital			Time Delay	
	AT11SD	AT11SD	AT1QD	AT1SW	AT1QD	AT1P	AT1P	AT2P	AA7	
Supply Voltage	240V a.c. 50Hz	220-240V a.c. 50Hz	220-240V a.c. 50Hz	240V a.c. 50Hz	220-240V a.c. 50Hz	220-240V a.c. 50Hz	220-240V a.c. 50Hz	220-240V a.c. 50Hz	240V a.c. 50Hz	
Maximum Power Consumption	1VA	1VA	1VA	1VA	1VA	5VA	5VA	5VA	-	
SWITCHING CAPACITY PER CHANNEL										
Resistive	16A	16A	16A	16A	16A	16A	16A	16A	16A	
Inductive	3A	4A (Cos 0.6)	3A	3A	3A	2.5A (Cos 0.6)	2.5A (Cos 0.6)	2.5A (Cos 0.6)	2A (Cos 0.6)	
Fluorescent	2.5A	1350W	2.5A	2.5A	2.5A	1000W	1000W	1000W	3500W	
Switching Arrangement	1 x c/o	1 x n/o	1 x c/o	1 x c/o	1 x c/o	1 x c/o	1 x c/o	1 x c/o	1 x n/o	
No. of Switching Commands	48	48	48	56	56	20	42	42	-	
Programme Options	-	-	-	-	-	-	r/h	r/h	-	
Minimum Programme Time	30 mins	30 mins	30 mins	3 hrs	3 hrs	1 min	1 min	1 min	30 secs	
Operating Temperature Range	-25 to +55C	-25 to +55C	-20 to +55C	-25 to +55C	-25 to +55C	-10 to +55C	-10 to +55C	-10 to +55C	-15 to +40C	
Operating Accuracy @ 20 C	-	-	-	-	-	2.5sec/day	2.5sec/day	2.5sec/day	-	
Summer / Winter Changeover	-	-	-	-	-	Yes	Yes	Yes	-	
Running Reserve	-	-	150 hrs	-	150 hrs	150 hrs	150 hrs	150 hrs	-	
Width of Unit (in 18mm modules)	3	1	3	3	3	2	1	2	1	
Terminal Capacity	2 x 2.5mm	2 x 4mm	2 x 2.5mm	2 x 2.5mm	2 x 2.5mm	2 x 2.5mm	2 x 4mm	2 x 2.5mm	2 x 2.5mm	
OR	4 x 1.5mm	-	4 x 1.5mm	4 x 1.5mm	4 x 1.5mm	4 x 1.5mm	-	4 x 1.5mm	-	

c/o = Changeover Switch
n/o = Normally Open Contact
r/h = Random Holiday

Other modular devices

BELL TRANSFORMER Ref:	AA2BT	ISOLATORS Ref:	AS100	AD100	ASN100
Primary Voltage	240v, 50/60Hz	Voltage Range	240V	240V/415V	240V
Secondary Voltage	4, 8V - 1.00A 12V - 0.67A	No. of Poles	1	2 Live	1 Live 1 Neutral
Modular Width	36mm (2 Modules)	No. of Modules	1	2	2

All solenoids 6x4, 100A, 50/60Hz comply to **BS EN60947-3**, Terminal Capacity 10-50mm².

Switchgear Technical Data

Technical information - modular contactor range

FLUORESCENT LAMPS WITH STARTER - SINGLE FITTING non-corrected (with parallel correction. In brackets)

P in W	20	40	50	80	110	Contactor rating
I In A	0.39 (0.19)	0.43 (0.29)	0.70 (0.46)	0.80 (0.57)	1.2 (0.79)	-
C In F	-, (5)	-, (5)	-, (7)	-, (7)	-, (16)	-
Maximum number of lamps	22 (15)	20 (15)	13 (10)	10 (10)	7 (5)	16A
	30 (20)	28 (20)	17 (15)	15 (15)	10 (7)	25A
	70 (40)	60 (40)	35 (30)	30 (30)	20 (14)	40A
	100 (60)	90 (60)	56 (43)	48 (43)	32 (20)	63A

Contactor rating

FLUORESCENT LAMPS WITH STARTER - TWIN FITTING non-corrected (with parallel correction. In brackets)

	2 x 18	2 x 36	2 x 58	2 x 80	2 x 14	Contactor rating
I In A	0.44 (0.26)	0.82 (0.48)	1.34 (0.78)	1.64 (0.96)	2.2 (1.3)	-
C In F	-, (3.5)	-, (4.5)	-, (7)	-, (9)	-, (18)	-
Maximum number of lamps	20 (30)	30 (30)	7 (10)	5 (9)	4 (6)	16A
	30 (46)	16 (25)	10 (16)	8 (13)	6 (10)	25A
	50 (80)	26 (43)	16 (27)	13 (22)	10 (16)	40A
	75 (123)	42 (67)	25 (42)	21 (34)	16 (25)	63A

Contactor rating

LOW PRESSURE SODIUM VAPOUR LAMPS non-corrected (with parallel correction. In brackets)

P in W	18	35	55	90	135	180	Contactor rating
IB In A	0.35 (0.35)	1.4 (0.6)	1.4 (0.6)	2.1 (0.9)	3.1 (0.9)	3.1 (0.9)	-
C In F	-, (5)	-, (20)	-, (20)	-, (26)	-, (45)	-, (40)	-
Maximum number of lamps	18 (14)	4 (3)	5 (3)	3 (2)	2 (1)	2 (1)	16A
	34 (21)	21 (9)	9 (5)	6 (4)	4 (2)	4 (2)	25A
	57 (40)	14 (10)	14 (10)	9 (8)	6 (4)	6 (5)	40A
	91 (60)	24 (15)	24 (15)	19 (10)	10 (6)	10 (7)	63A

Contactor rating

HIGH PRESSURE SODIUM VAPOUR LAMPS non-corrected (with parallel correction. In brackets)

	70	150	250	400	1000	Contactor rating
I In A	1 (0.6)	1.8 (0.7)	3 (1.25)	4.4 (2.5)	10.3 (6)	-
C In F	-, (12)	-, (12)	-, (32)	-, (25)	-, (45)	-
Maximum number of lamps	8 (6)	4 (6)	2 (2)	1 (2)	-, (1)	16A
	12 (9)	7 (9)	4 (3)	3 (4)	1 (2)	25A
	20 (18)	13 (418)	8 (6)	5 (8)	2 (4)	40A
	32 (25)	18 (25)	11 (9)	8 (12)	3 (6)	63A

Contactor rating

HIGH PRESSURE MERCURY VAPOUR LAMPS non-corrected (with parallel correction. In brackets)

P in W	50	80	125	250	400	700	1000	Contactor rating
IB In A	0.6 (0.35)	0.8 (0.5)	1.15 (0.7)	2.15 (1.5)	3.25 (2.4)	5.4 (4)	-, (5.7)	-
C In F	-, (7)	-, (8)	-, (10)	-, (18)	-, (25)	-, (40)	-, (60)	-
Maximum number of lamps	15 (10)	10 (9)	8 (9)	4 (4)	2 (3)	2 (1)	-	16A
	20 (15)	15 (13)	10 (10)	6 (6)	4 (2)	4 (2)	1	25A
	34 (28)	27 (25)	20 (20)	10 (11)	6 (4)	6 (5)	3	40A
	53 (43)	40 (38)	28 (30)	15 (17)	10 (6)	10 (7)	5	63A

Contactor rating

HALOGEN LAMPS USED WITH TRANSFORMER non-corrected (with parallel correction. In brackets)

	60	80	105	150	Contactor rating
I In A	0.26	0.35	0.45	0.65	-
C In F	-	-	-	-	-
Maximum number of lamps	9	8	6	4	16A
	14	12	9	6	25A
	27	23	18	13	40A
	40	35	27	19	63A

Contactor rating

METAL IODINE OR HALOGEN VAPOUR LAMPS non-corrected (with parallel correction. In brackets)

P in W	35	70	150	250	400	1000	2000	Contactor rating
IB In A	0.3 (0.3)	0.5 (0.5)	1.0 (1.0)	1.5 (1.5)	2.5 (2.5)	6 (6)	-, (5.5)	-
C In F	-, (6)	-, (12)	-, (20)	-, (32)	-, (45)	-, (85)	-, (60)	-
Maximum number of lamps	27 (12)	16 (6)	8 (4)	5 (3)	3 (2)	1 (-)	1	16A
	40 (18)	24 (9)	12 (6)	8 (4)	5 (3)	2 (1)	2	25A
	68 (31)	42 (16)	20 (10)	14 (7)	8 (5)	4 (3)	3	40A
	106 (50)	64 (25)	32 (15)	21 (10)	13 (7)	5 (4)	5	63A

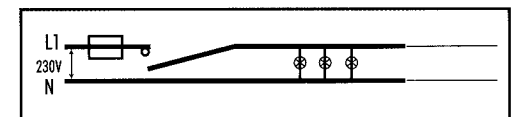
Contactor rating

INCANDESCENT AND HALOGEN LAMPS non-corrected (with parallel correction. In brackets)

P in W	60	75	100	150	200	300	500	1000	Contactor rating
IB In A	0.26	0.32	0.44	0.65	0.87	1.3	2.17	4.4	-
Maximum number of lamps	30	25	19	12	10	7	4	2	16A
	45	38	28	18	14	10	6	3	25A
	85	70	50	35	26	18	10	6	40A
	125	100	73	50	37	25	15	8	63A

Contactor rating

Presentation of Single Phase circuit



IB : Value of current drawn by each lamp at its rated operational voltage

C : Unit capacitance for each lamp

IB and C : Correspond to values normally quoted by lamp manufacturers

Memera 2000 AD and Memera 2000

TERMINAL CAPACITIES	Cable size (mm ²)	Type of termination
Isolator	2.5 - 50	Box clamp with gripper ribs
MCB	1 - 25	Box clamp with gripper ribs
RCBO	1 - 25	Box clamp with gripper ribs
HRC module	1 - 25	Box clamp with gripper ribs
RCD 100A DP	2.5 - 50	Box clamp with gripper ribs
RCD 25, 40 and 63A & 4P	2.5 - 25	Pinching screw
Earth/neutral bars (all holes)	1 - 16	Pinching screw

CABLE ENTRY FACILITIES Memera 2000 Moulded consumer units to BS 5486 Pt 13

Enclosure dimensions code	No. of entry positions Top/bottom*
a	3/2
b	3
c	5
d	5
e	7
f	5

CABLE ENTRY FACILITIES Memera 2000 AD Moulded consumer units to BSEN 60439-3

Enclosure dimensions code	No. of entry positions Top/bottom*
t	3
w	3
x	4/5
y	6/7

* Top and bottom cut outs are provided to accept either 16 x 25mm, 25 x 40mm or 40 x 40mm surface plastic trunking. 16 x 25mm side cut outs are provided. Arrple back entry cut outs are provided to offer full cable access.

* Each position has breakout provision for surface cable up to 25mm²; 25 x 16mm and 25 x 40mm surface plastic trunking. Additionally centre breakout provision top and bottom will accept 40 x 40mm surface plastic trunking.

Back entry provisions are provided by a series of elongated breakouts in unit backplate.

Memera 2000 Metalclad consumer units to BS 5486 Pt 13

Cable entry knockouts (mm)

Enclosure dimensions code	Top/bottom (round)	Sides (round)	Back (elongated 32 x 64mm)
g	2 x 25 with blind bushes	-	-
h	1 x 32, 4 x 20	2 x 32	1
j	1 x 32, 5 x 20	2 x 32	1
k	1 x 32, 6 x 20	2 x 32	2
l	1 x 32, 9 x 20	2 x 32	3
m	1 x 32, 10 x 20	2 x 32	3
n	1 x 32, 6 x 20	2 x 32	4
p	1 x 32, 5 x 20	2 x 32	2

Note:

If an AP4 unit is to be fitted with HRC fuse modules ≥ 30 amp normal diversity factors should be applied.

SUPPLEMENTARY SWITCHGEAR

Enclosure/Switch dimensions, cable entries

List No.	Cable entry knockouts (mm)		Dimensions (mm)			IP Rating
	Top	Bottom	H	W	D	
AN2	-	-	135	40	65	IP40
AN25	-	-	145	50	65	IP40
A2SL	-	-	165	65	88	IP55
AN4	-	-	135	110	88**	IP40
3QEL	-	-	134	174	97	IP55
4QEL	-	-	170	105	112	IP55
6QEL	-	-	170	135	112	IP55
4ELE	2 x 11 by 15.5	-	153	89	60*	IP40
A2SLE	1 x 25	1 x 25	170	62	82	IP55