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## INDU-ELECTRIC

Mobile power distribution box

# OPERATION MANUAL

PREPARED FOR

CATERPILLAR

CREATED

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## 1 General Information

INDU-ELECTRIC mobile power distribution boxes have been designed for use on construction sites, industrial environments, stage, broadcast, motion picture, outdoor events as well as a broad range of entertainment related applications.

Depending on the individual rating and design INDU-ELECTRIC power distributions boxes (PDU) are rated for use during high ambient temperatures, rain or mechanical stress.

Please inquire about the individual rating of your system before exposing it to demanding environmental conditions.

### 1.1 Safety Practices & Precautions

Before taking the product into operation conduct a visual inspection in order to ensure the integrity of the enclosure and the components. Carefully inspect the circuit breaker covers for physical damage in order to prevent moisture or water exposure.

Do not use damaged sockets/receptacles and service the unit immediately in order to replace damaged socket/receptacles.

The distribution box is intended for use within a TN-C-S earthing system. Check compatibility with the available mains supply before use.

The power distribution unit is designed for upright use only. It must not be tilted to any side.

Before each use, make sure that the MCCBs are set in conformance with the applicable regulations. In particular, the MCCBs may be adjusted for use at higher temperatures than exist at the place of operation. In that case, readjust them according to the MCCB table below.

Before connecting the unit to a three-phase system, make sure that the phase sequence is correct. For some distribution boxes input power is supplied by Powerlock single-core connectors. Observe the warning instructions applied on the distribution box side about connecting these connectors.

The input plugs must be connected in the following sequence:

First the earth conductor, then neutral, then the phases. Disconnect the plugs in exactly the reverse sequence. Unused Powerlock sockets must be fitted with protective caps. The cable cross-section for incoming and outgoing lines must be matched to the connectors' rated current. Do not use conductors with a smaller cross-section. Observe also the maximum permissible cable lengths. For the required cable crosssections and maximum cable lengths see the wiring codes for the respective countries.

Once the distribution box is under live power, check the function of the RCDs by pressing the button marked TEST on each RCD/GFCI (residual-current device/ground fault circuit interrupter). When the TEST button is pressed, the corresponding, marked protective element must trip. If the element does not trip, do not take the distribution box into operation.

Replace any faulty fuses, miniature circuit-breakers, under voltage relays, residual-current circuit-breakers or insulation monitors only with equivalent items of the same quality. Pay special attention to the rated current, tripping characteristics and rated operational voltage of the replacement product.

### 1.2 Applications of the power distribution box.

The distribution boxes are designed and manufactured in conformance with the safety requirements of European standard **EN 60439-1** and – because of the arduous duty associated with their field of application – also with reference to **EN 60439-4**.

The distribution box has a CE mark printed on the nameplate.

The CEE socket, MCBs, MCCBs, RCBOs, etc. and the installation material used conform to the European directives, standards and legal requirements applicable in each case at the time of manufacture.

### 1.3 Enclosure Material - THERMOLENE®

INDU-ELECTRIC enclosures are made out of THERMOLENE®.

THERMOLENE® is non-conductive, UL94 V0 rated, UV resistant and virtually indestructible.

THERMOLENE® is designed to tolerate extreme mechanical strain at low and high temperatures. Unlike rubber THERMOLENE® has an extremely low heat transfer resistance which ensures optimal heat dissipation. The enclosure dissipates about 250W per square meter surface at a temperature difference between outside and distribution box inner of 40 °C.

THERMOLENE® enclosures won't break, lose color or shape as easily as other materials do, even when exposed to direct sunlight for many years.

Although THERMOLENE® stands for exceptional ruggedness, it melts on contact with glowing parts (like all thermoplastics). Contact with red-hot components or parts with a surface temperature over 200°C must therefore be prevented. Its low thermal resistance means that THERMOLENE® has ideal heat dissipation properties, ensuring fully rated operation from -40 to +30 degrees Celsius. For higher operating temperatures de-rating does apply. Please read the appropriate section [Ambient temperature] of this user manual.

### 1.4 Ambient temperature

The distribution box rated for an ambient temperature of 40 °C. Do not operate the distribution box in direct sunlight.

Note that ambient temperatures above 30°C affect the miniature circuit-breakers' tripping characteristics and will result in de-rating of the circuit breakers.

(See section MCCBs for further information.)

Unlike the MCCBs, the RCBOs can not be adjusted to an outside temperature above 30°C.

Ambient temperature above 40°C de-rate the maximum rated current by 30%. Make sure that the fans built into the distribution box are working correctly at higher ambient temperatures.

The high infrared component of sunlight causes the outer surface of the distribution box to heat up significantly. This could cause the internal temperature of the distribution box to increase to the extent that its electronic components can no longer function correctly.

The distribution box is weather- and splashproof and can be used in outdoor applications. Make sure that plugs are dry when inserting in the sockets. Water entering from a wet plug can not run off and could cause corrosive damage. When using the distribution box in the rain, make sure that all protective caps are correctly fitted and their knurled screws fully tightened. If any water enters the distribution box – for example because of a missing

or loosely fitted cover – it must be opened and the water removed as the electronic components could otherwise corrode.

If using the distribution box in snow, make sure that it is placed on firm ground: The distribution box generates heat during operation, causing any snow it rests on to melt.

1.5 Transportation

For transportation, the distribution boxes can be stacked. Make sure, however, that the protective covers of the built-in electrical protection devices, the covers of the fitted earth contacts and CEE sockets and any sockets for control units are not damaged.

The castors are secured with four screws and locknuts. Check that they are secure at least twice a year. Lift the distribution box over any hurdle of more than 3 cm height. Pushing a distribution box against or over hurdles such as thresholds or pavements/sidewalks too quickly may damage the castor fixings. In rain, transport the distribution boxes only standing upright on their front. If it is necessary to wheel the distribution box on its castors in rain, cover the socket side with a watertight covering.

The distribution boxes are each fitted with four castors that cannot be locked. Take special care, therefore, when wheeling them on inclined surfaces.

Castors cannot be used in deep snow. Melting snow can freeze and destroy the ball-bearing of the castors.

1.6 Storage

For transportation and storage the distribution boxes can be stacked. Make sure that the protective covers of the built-in electrical protection devices and the covers of the built-in sockets do not become damaged. Like every synthetic material, THERMOLENE® exhibits a certain amount of cold flow, i.e. the material deforms on prolonged pressure at the same point.

1.7 Servicing and testing

Repair work must be carried out by electricians or under supervision and instruction of an electrician. After completion of any repair work, the electrical safety of the distribution box must be verified according to the applicable standards.

Perform additional periodic tests.

The test intervals should be specified so that any likely faults can be identified on time. The required intervals and technical regulations are laid down by the responsible Health and Safety Organization.

1.8 Sockets

The distribution box is designed so that all sockets can be operated at full rated load at an outside temperature of up to 40°C. This assumes, however, that the consumer power cables connected to the sockets have the minimum cross-sectional area specified by law.

Sockets				
Single phase:	16A = 2.5mm²	32A = 6mm²	63A = 16mm²	125A = 35mm²
Three-phase	16A = 2.5mm²	32A = 6mm²	63A = 16mm²	125A = 35mm²

Smaller cross-sections than given above may cause considerable damage to the distribution box, such as: Charring of the contacts and the incoming supply cable, welding of the contact carriers, or damage of the protective element. When you replace the 125A sockets, connect them with cables of at least 50mm² cross-section.

The Powerlock sockets are rated for a maximum current of 400A. At this current, the cross-section of the incoming supply cable must be at least 185mm². According to the electrical IEC regulations, a cross-section of 120mm² can carry up to 315A, and a cross-section of 150mm² up to 350A.

Make sure that plugs are always inserted fully into the socket. Make sure that sufficient strain relief is provided for the connected power supply cable. On the 16 and 32A sockets, strain relief is provided by a hook that engages in a lug on the plug. On the 63 and 125A sockets, the ring on the socket must be firmly screwed onto the plug.

1.9 Maintenance

Check all screw connections in the distribution box every six months or at least once a year. Although all screws are firmly tightened during assembly, they can work loose over time.

The copper conductors of the mains cables are subject to a certain amount of cold flow: copper flows away from the loaded point even when cold. It is therefore vital to regularly check all screw connections of the distribution box to ensure its safety and reliability.

Within the European Union the screw connections of all mobile electrical devices must be checked every six months. Before taking the equipment into operation, perform a visual inspection for damage, paying special attention to damaged safety covers of the MCCBs and RCDs, and the housing. Before connecting a distribution box to three-phase mains, make sure that the phase sequence is correct. Replace any faulty fuses, miniature circuit-breakers, undervoltage releases or residual-current circuit-breakers only with equivalent items of the same quality. Pay special attention to the rated current, tripping characteristics and rated operational voltage of the replacement product. Before you connect a mobile distribution box, check its compatibility with the mains configuration. Any existing residual-current devices must be tested for correct functioning by pressing

the test button before each use. If a distribution box has been stored for a longer time, the tripping times of the residual-current devices must be checked with a suitable test device before taking it into operation.

Repair work must be carried out only by or under supervision and instruction of a qualified electrician. After a completed repair, check the electrical safety of the distribution box according to the applicable standards. In your own interest, replace faulty parts immediately. Missing covers on the sockets, for example, can cause corrosion of the contacts, resulting in overheating of the contacts and consequently fusing of the insert. Perform additional periodic tests. Specify this inspection interval so that any potential faults can be identified and remedied on time. During testing, observe the relevant electrical rules and guidelines. Note that the statutory regulations also stipulate other tests, for example of dielectric strength. When testing dielectric strength, all electronic consumers and indicator lamps must be disconnected.

1.10 Troubleshooting:

**The 63A and 125A MCCBs trip and can not be switched on even though there is no short-circuit present.**  
Check whether an Orion RCDM has tripped due to excessive earth leakage current. The RCDM manual contains details about determining this value.  
If an excessive leakage current is present, let an electrician determine the cause.

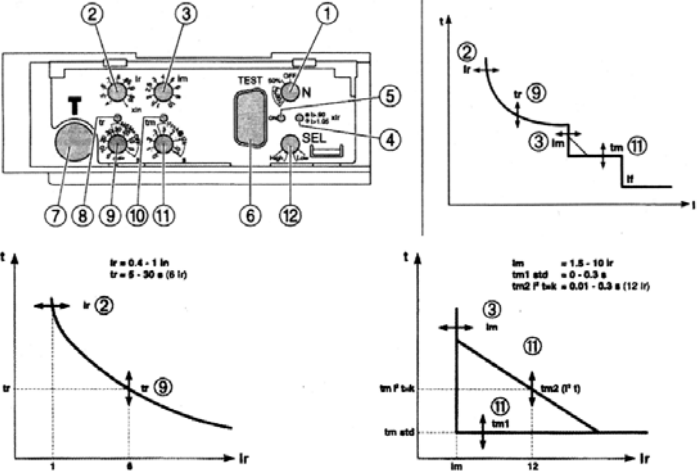
**The 63A and 125A MCCBs trip and can not be switched on again, even though there is no short-circuit present and no trip due to excessive earth leakage current has taken place.**  
The MCCB's shunt may be faulty. Replace the shunt.

INDU-ELECTRIC has a world-wide spare parts service. In Europe, please contact INDU-ELECTRIC Gerber GmbH, and in North and South America and the Pacific, INDU-ELECTRIC North-America. You can find the addresses and contact numbers on the cover sheet.

For further information and technical specifications of the used components, contact the respective component manufacturers, which are listed – together with the part numbers – on the parts lists

2 MCCBs

The 63A and 125A sockets of the distribution box are protected with MCCBs (moulded-case circuitbreakers) with electronic trip. The MCCBs' tripping characteristics can be adapted to requirements by an electrician. A separate manual is included for the MCCBs.  
Transparent hinged covers protect the MCCBs from dust, water and physical damage. Make sure that these covers are always correctly closed. Replace any defective actuation levers immediately.  
If a leakage current above a set value occurs, the RCDM issues a command to the shunt built into the MCCB, which then trips the MCCB. If the shunt is faulty, it can be replaced. To access it, unscrew and remove the front cover of the MCCB. Use only original replacement parts.



- Key**
- Ln Rated current
  - Ir Long-term protection (overload cut-out).
  - Tr Long-term protection delay or without thermal memory.
  - Im Short-term protection (short circuit).
  - Tm Short-term protection delay (standard or with constant I²t).
  - Lf Cut-out at fixed threshold (5KA).
  - ① Neutral pole protection switches (four-pole only).
  - ② Long-term protection setting.
  - ③ Short-term protection setting.
  - ④ RED LED, pre-alarm Comes on when  $I \geq 0.9 I_r$ , flashing when  $I \geq 1.051 I_r$
  - ⑤ GREEN LED, overcurrent release normal operation. Comes on when  $I \geq 2 I_n$ .
  - ⑥ Diagnostic socket
  - ⑦ Mechanical test button.
  - ⑧ ⑩ RED LEDs, .indicating tripped.
  - ⑨ Long-term protection delay.
  - ⑪ Short-term protection delay
  - ⑫ Dynamic selectivity.

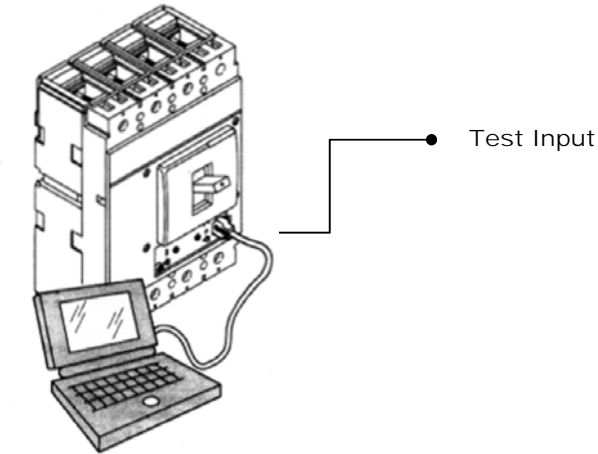
**N.B.:** Settings are protected by a transparent sealable cover.

THERMAL PROTECTION	
Internal temperature	
> 75°C	LEDs ④ and ⑤ flashing
≥ 90°C	Automatic release

2.1 Current Setting Range

In(A)	Lr (A)								
	1	0,95	0,9	0,85	0,8	0,7	0,6	0,5	0,4
160	160	152	144	136	128	112	96	80	64
250	250	237,5	225	212,5	200	175	150	120	100
400	400	380	360	340	320	280	240	200	160
630	630	598,5	567	535,5	504	441	378	315	252

2.2 Overcurrent electronic release test



2.3 Upstream Breaker / Selectivity

POSITION LOW

The upstream breaker is not delayed.<<

The cables protection is optimal.

POSITION HIGH

The upstream breaker is delayed.

The selectivity is maximum.

2.4 Logic Selectivity

10	Tx	Serial communication port
9	Rx	
8		Logic selectivity output
7		
6		Logic selectivity input
5		
4		Overload pre-alarm
3		
2	+	12 dc extern power supply for LEDs ③ and ⑩
1	-	

Different Levels of selectivity

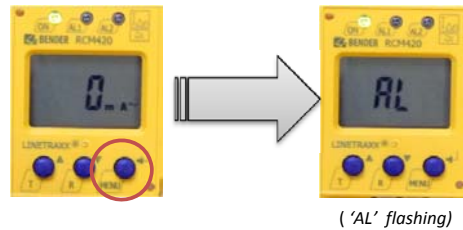
### 3 Bender RCDM

The RCDM protects the 32A, 63A and 125A 3-phase sockets from earth leakage currents. For details about setting the RCDM, see the supplied operator manual. Check the function of the RCDM every time the distribution box is switched on and at least once a day by pressing the Test button. The RCDM can be disabled with a keyswitch. Note that deactivation of the earth leakage protection is prohibited by law in some countries. The keyswitch must be operated only by qualified persons who are familiar with the applicable legal regulations.

#### 3.1 Set Ground Fault Trip Level

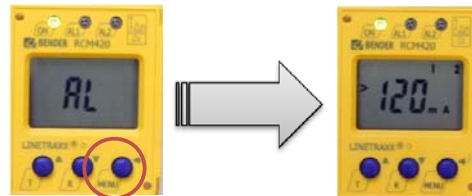
##### 1.Step

Press and Hold [MENU] until the display shows 'AL'



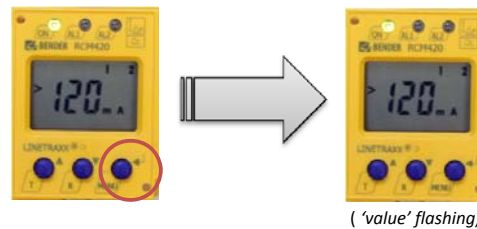
##### 2.Step

Press 1x [MENU]  
The display shows the set value of RCD.  
Here for example '120 mA'



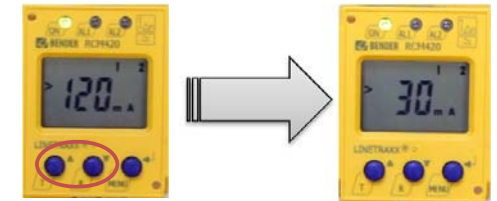
##### 3.Step

Press 1 x [MENU]  
to change the set value.  
Set 'set value' will flash.



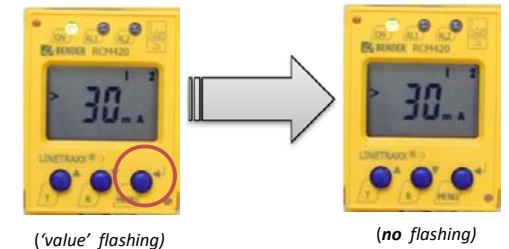
##### 4. Step

Use arrow keys [▲▼]  
to adjust RCD to desired value.  
(here for example 30mA)



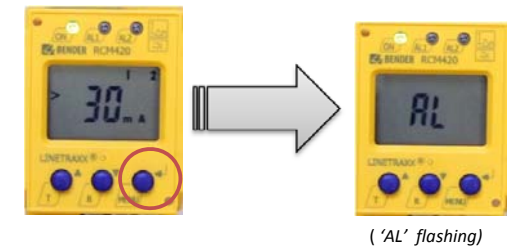
##### 5.Step

Press 1x [MENU]  
Display flashes will stop flashing.



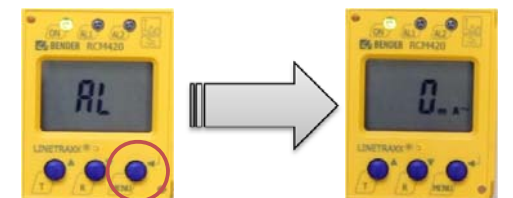
##### 6.Step

Press and Hold [MENU]  
until the display shows 'AL'



##### 7.Step

Press and Hold [MENU]  
until display showing '0 mA'

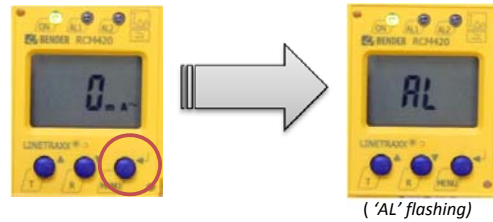




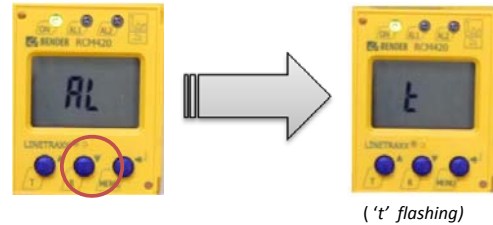
### 3.2 Setting of Trip Time delay

Bender RCD modules are all set to 0 seconds by factory settings.

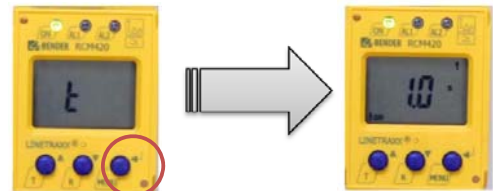
**1. Step**  
Press and Hold [MENU]  
until the display shows 'AL'



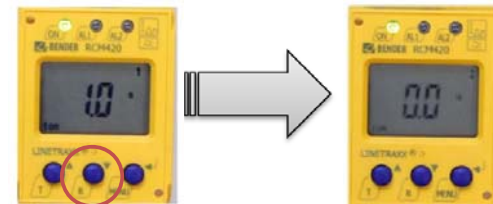
**2. Step**  
Press 2 x [▼]  
Display flashes showing 't'



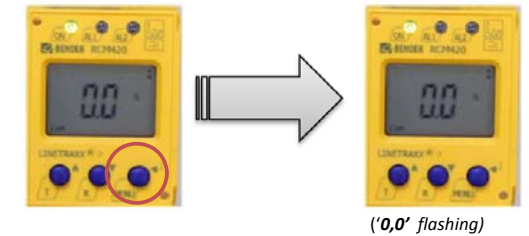
**3. Step**  
Press 2 x [MENU]  
Display showing '1.0 s'



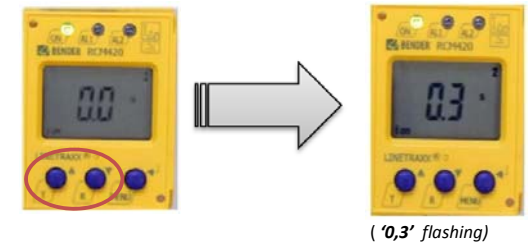
**4. Step**  
Press 1x ▼  
until the display shows '0.0s'



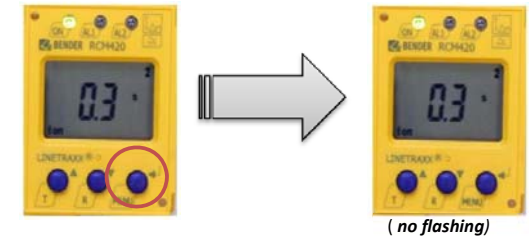
**5. Step**  
Press 1x [MENU]  
Display flashes showing 't'



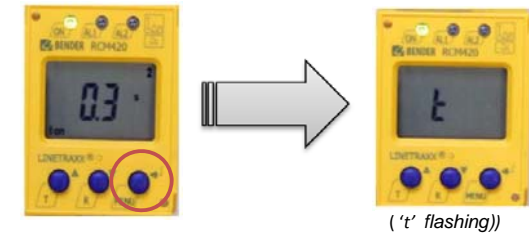
**6. Step**  
User Arrow Keys [▲▼]  
To adjust RCD to desired value  
(here for example '0.3s')



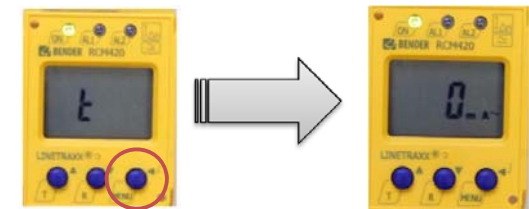
**7. Step**  
Press 2 x [MENU]  
The set value will stop flashing



**8. Step**  
Press and Hold [MENU]  
Until display showing flashing 't'



**9. Step**  
[Press and Hold [MENU]  
Until display shows 0mA



## 4 RCBOs

The CEE 16A and 32A single-phase sockets are protected from earth leakage currents over 30mA by RCBOs. Check the function of the RCBO's Test button every time the distribution box is switched on and at least once a day.

## 5 Warranty conditions

The mobile distribution boxes are manufactured according to the applicable directives, standards and regulations.

As part of final inspection and testing, the required inspections and tests are performed on all distribution boxes and recorded in a log. This procedure ensures a constant, high quality.

Should a supplied product not meet safety or quality requirements, we will repair or replace it free of charge under the legally applicable warranty conditions. Any fault must be reported immediately and no later than three days from receipt of the product.

Any warranty applies only if the product is used for its intended purpose and under the specified operational conditions.

Damage resulting from technical changes or the replacement of original parts with components that are not authorized by INDU-ELECTRIC are not covered by the general warranty conditions.

The CE mark also becomes invalid in these cases and must be immediately removed from the nameplate.

In particular, any damage resulting from the use of incomer and power cables of insufficient cross-section (see section Sockets) is not covered under the warranty.

The power distribution box must be operated by qualified persons. For this reason, this manual does not contain generally applicable rules of conduct for handling electrical equipment, which all electricians should be familiar with.

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