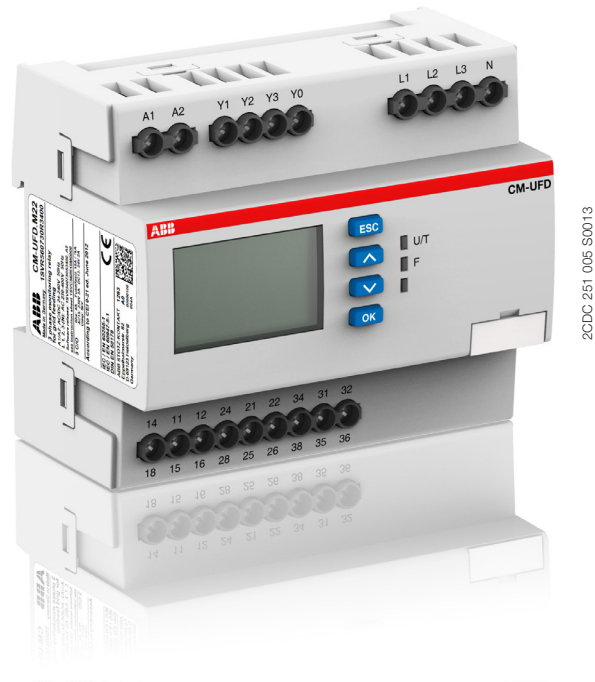


# Grid feeding monitoring according to DEWA DRRG standard

## CM-UFD.M34

The CM-UFD.M34 is a multifunctional grid feeding monitoring relay. It provides different monitoring functions in accordance with DRRG standard of DEWA to detect over- and undervoltage (10-minutes average value, voltage increase and decrease protection) as well as any changes in grid frequency (frequency increase and decrease protection).

The device is connected between the distributed generation and the public grid in order to disconnect the distributed generation in case of problems (e.g. unstable grid), faults or maintenance on the grid. Additionally monitoring of ROCOF (rate of change of frequency) can be configured.



### Characteristics

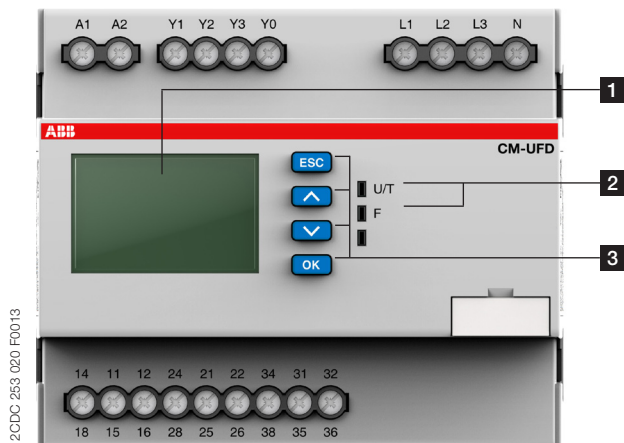
- Monitoring of voltage and frequency in single- and three-phase mains (2-wire, 3-wire or 4-wire AC systems)
- Type tested according to DEWA DRRG standard
- Over- and undervoltage, 10-minutes average value as well as over- and underfrequency monitoring
- Two-level threshold settings for over-/undervoltage and over-/underfrequency
- ROCOF (rate of change of frequency) monitoring and vector shift detection configurable
- Interrupted neutral detection
- Default setting according to DRRG standard of DEWA
- True RMS measuring principle
- All threshold values and tripping delays adjustable
- Error memory for up to 99 entries (incl. cause of error, measured value, relative timestamp)
- Autotest function
- Password setting protection
- 3 control inputs, e.g. for feedback signal, remote trip
- 3 c/o (SPDT) contacts
- Multiline, backlit LCD display

### Order data

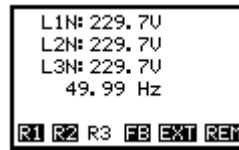
Type	Rated control supply voltage	Measuring range	Order code
CM-UFD.M34	24-240 V AC/DC	L-L: 0-540 V AC / L-N: 0-312 V AC	1SVR 560 730 R3403

## Functions

### Operating controls



#### 1 Display



R1 R2 R3 - relay status; in this case R3 is de-energized  
FB - status feedback loop Y1-Y0; in this case FB is closed  
EXT - status input external signal; in this case input is closed  
REM - status remote trip input; in this case input is closed

#### 2 Indication of operational states

U/T: green LED - Control supply voltage applied  
 Timing  
F: red LED - Fault message

#### 3 Keypad

ESC: escape / return to previous menu  
^: up / value increase  
v: down / value decrease  
OK: enter / confirm selection

### Application

The CM-UFD.M34 is a grid feeding monitoring relay (IP), which is connected between the public grid and the renewable resource generating plant (RRGP) such as photovoltaic systems, wind turbines, block-type thermal power stations. It monitors the voltage and the frequency in the grid and will disconnect the RRGP whenever the measured values are not within the range of the adjusted thresholds. The fault is indicated by LED and the corresponding plain text message is shown on the display.

In conformity with DRRG standard of DEWA, the CM-UFD.M34 relay can be used in all low voltage plants and in medium voltage power plants. The IP relay is mandatory in all low voltage generation plants with power > 10 kW.

### Operating mode

The CM-UFD.M34 can be set up to monitor single- and three-phase mains (2-wire, 3-wire as well as 4-wire AC systems). The unit is configurable by front-face push-buttons. A display with the corresponding menu enables the selection of pre-settings as well as the precise adjustment of the different threshold values and corresponding time delays. Furthermore, the display visualizes the measured values clearly. Together with the front-face LEDs, it shows all information about operational states of output relays and control inputs.

The CM-UFD.M34 provides 3 output relays and 3 control inputs. The first output relay R1 (11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub>) is required for disconnection of a distributed generation from the public grid (1st switching unit). The corresponding feedback signal from the external contact is monitored via the first control input Y1-Y0 by the internal logic. The second output relay R2 (21<sub>25</sub>-22<sub>26</sub>/24<sub>28</sub>) is redundant to the first one and only activated if output relay R1 has de-energized, but no changed state of the feedback from the external contact has been recognized within the adjusted time delay. In case a feedback signal is present, the redundancy relay does not trip. Once the feedback loop did not change its status after the first output changed the status and the 1st switching unit should disconnect, the CM-UFD.M34 detects this as a failure (e.g. welded contacts of the contactor) and trips the 2nd switching unit.

The third output relay R3 (31<sub>35</sub>-32<sub>36</sub>/34<sub>38</sub>) can be used for the closing command of a motor drive for circuit breaker. In case output relay R1 energizes, the adjusted ON-delay starts. When the ON-delay is complete, output relay R3 will be activated for the duration of the ON-time or until R1 de-energizes. In this last case the ON-time is inactive. It is also adjustable to synchronize tripping relay R3 with relay R1.

The operating principle of the relays R2 and R3 is configurable as normally energized (closed-circuit principle) or normally de-energized (open-circuit principle). For safety reasons, the operating principle of R1 is fixed as normally energized (closed-circuit principle).

Two additional control inputs allow to switch from remote between two sets of frequency threshold settings via Y2-Y0 or to trip the grid feeding monitoring relay via the control input Y3-Y0 (remote trip).

## Protective functions

If control supply voltage is applied and all phases are present with voltage and frequency values within their permissible range, output relay R1 energizes after the adjusted start-up delay and output relay R2 energizes or de-energizes, depending on the configuration, after a fixed delay of 1 s. Using the default factory setting, both output relays R1 and R2 will be activated synchronously. The green LED U/T flashes while timing and turns steady when the start-up delay is complete.

If a measured value exceeds or falls below the set threshold value, output relay R1 de-energizes after the adjusted delay. The fault is indicated by the red LED F and the type of fault is shown on the display as a plain text message. The event that has caused tripping of the relay is recorded in the event list. The green LED U/T flashes while timing and turns steady when the delay is complete.

As soon as the measured value returns to the tolerance range, taking into account a fixed hysteresis, the red LED F turns off and output relay R1 re-energizes after the adjusted re-start delay. The green LED U/T flashes while timing and turns steady when the delay is complete.

Protective function 34 S1 (10-minutes average value):

The CM-UFD.M34 calculates the sliding average value of the 3 phases over a period of 10 minutes. The voltage values are updated every 3 seconds. If the 10-minutes average value exceeds the threshold value, the output relays trip.

## Redundancy functions

The redundancy relay R2 (2nd switching unit) is activated if relay R1 (1st switching unit) has de-energized and if no feedback from the external contact has been recognized by the internal logic via the first control input Y1-Y0 within the adjustable time delay. In case a feedback signal is present, the redundancy relay does not trip.

## Output relay R3 (31<sub>35</sub>-32<sub>36</sub>/34<sub>38</sub>)

Output relay R3 can be used for the closing command of a breaker motor. In case output relay R1 energizes, the adjusted ON-delay starts. When timing is complete, output relay R3 will be activated for the duration of the ON-time or until relay R1 de-energizes. In this last case the ON-time is inactive. The operating principle of relay R3 is configurable as closed-circuit, open-circuit principle, disabled or synchronous with relay 1.

## ROCOF (Rate of change of frequency df/dt)

This function monitors the rate of change of frequency within a very short time and detects an imminent loss of mains (islanding).

The ROCOF function will detect zero crossings of the grid voltage. It measures the time between the zero crossings and calculates a new frequency after each zero crossing. In case the frequency changes too much since the last zero crossing, the relay will trip. After the adjusted error time the relay de-energizes automatically.

The ROCOF monitoring function is deactivated per default. It can be activated in the menu.

## Vector shift detection

This function is another possibility of detecting a loss of mains (islanding).

The vector shift detection is disabled by default and can be manually enabled in the menu. Through zero crossings the device detects the vector shift of mains voltage and de-energizes output relays R1 immediately if the shift exceeds the adjusted threshold value, e.g. 10 °. Only after the set error time the switch-on conditions will be evaluated in order to start an auto reconnection.

## Interrupted neutral detection

Interrupted neutral detection is always active when phase-neutral measuring principle is selected in the menu "Nominal voltage". The interruption of the neutral conductor will result in an immediate tripping of output relay R1.

## Error memory

The CM-UFD.M34 records and logs the last 99 events that caused tripping of the grid feeding monitoring relay as well as any interruption of the control supply voltage. The type of error as well as the current value of the operation counter is recorded into the internal error list, accessible via the menu "Error memory". The list is stored internally in a non-volatile memory which can be reset by the user.

## Local command and external signal

Activation of S1 or S2 thresholds is made by the corresponding combination of the external signal Y2-Y0 and the local command (see tables below).

Working principle	Input state	Control input
normally open	open	0
normally open	closed	1
normally closed	open	1
normally closed	closed	0

Table 1: Truth table for control inputs External Signal Y2-Y0 and Remote trip Y3-Y0

External signal	Local command	Active thresholds
0	disabled	only S2
1	disabled	only S2
0	enabled	only S2
1	enabled	S1 and S2

Table 2: Truth table for frequency thresholds

## Remote trip

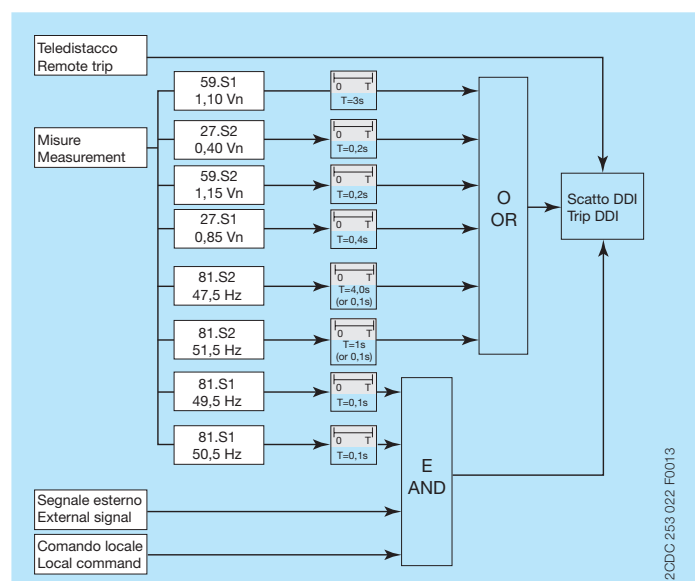
Control input Y3-Y0 allows tripping of the grid feeding monitoring relay from remote. The remote trip input can be configured as normally open or normally closed. If normally closed is configured, the relay trips if Y3-Y0 is opened. If normally open is configured, the relay trips if Y3-Y0 is closed. The output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> is tripped by the remote trip within less than 20 ms. When the remote trip input is deactivated, the output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> energizes again.

## Autotest

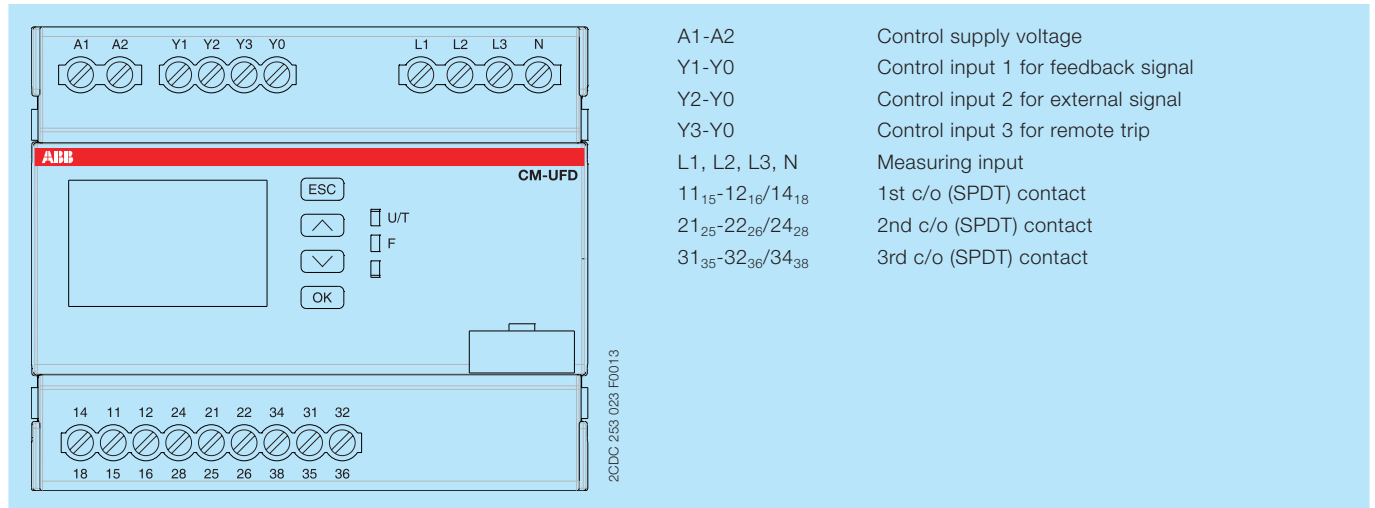
The autotest function allows the verification of the protective functions by increasing the lowest threshold and decreasing the highest threshold respectively, until the measured value for input voltage or frequency equals the threshold. Confirming the start of the autotest routine initiates the threshold sweep with the objective of tripping the relay. For each threshold the device displays the measured switching time up from tripping the output relay till the feedback signal from the external contact of the switching device. If the autotest fails, the cause of error has to be analysed and the test needs to be repeated. Output relay 11<sub>15</sub>-12<sub>16</sub>/14<sub>18</sub> remains de-energized as long as the test has not been passed successfully.

Note: The autotest will cause the CM-UFD.M34 to trip four times within a short time. This may lead to voltage fluctuations in the public grid. Therefore, we recommend to disconnect the generating plant manually from the grid before executing the auto test procedure.

## Operating principle



## Electrical connection

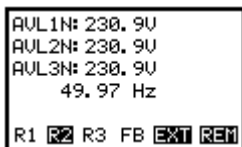
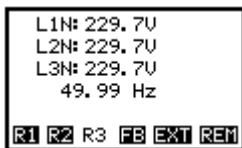


## Configuration

The relay is delivered with default settings in accordance to DRRG standard of DEWA. The menu structure starts with the main page that shows the real time measured values. Use the arrow keys to switch between the real time voltages and the 10-minutes average voltages.

## Display menu structure, navigation and possible configurations

### Main page



### Menu navigation

- With a dark display, press any button to light it up
- Press OK button to enter the menu
- Press arrow buttons to move between functions and parameters
- Press OK button to enter the chosen page
- Press arrow buttons to modify the values of the parameters
- Press OK button to confirm the value and proceed
- Press ESC button to return to the previous menu
- Press arrow buttons more than 1 s to scroll through the menu or password menu

Changes of parameters can be cancelled by pressing the ESC button.

## Password protection

Every CM-UFD.M34 relay is delivered with the same default password [0000] for protection of its settings and local command. The installer is responsible for the verification of the parameter values and the change of the password with a personal one in order to avoid unwanted modifications.

Visualization of the parameters is always possible, modification only after having entered the password. While entering the password, the password protection is temporarily disabled until the menu is exited.

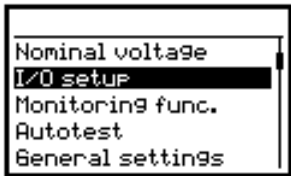
Only the parameters 'autotest', 'language', 'display switch-off delay' and 'contrast' are not password protected.

Indication of operational states

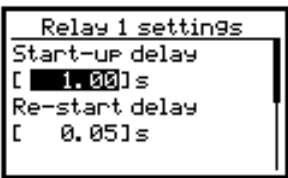
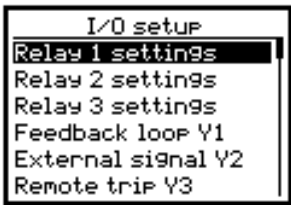
LED	Status information
U/T: green LED ON	Control supply voltage applied
U/T: green LED flashing	Timing
F: red LED ON	Failure

Menu structure

Main menu displays



Submenus displays



✓ down
 up ^
 ✓ down
 up ^

Main menu displays	Submenus displays	Options	Configuration possibilities	Step size	DEWA LV	DEWA MV
Nominal voltage	Meas. principle		[3L-N], [3L-L], [1L-N]		3L-N	3L-L
	Nominal voltage		[57.7] - [230.9] V L-N / [99.9] - [400.0] V L-L	0.1 V	230 V L-N	100 V L-L
I/O setup	Relay 1 settings	Start-up delay	[1.00] - [600.00] s	0.05 s	1 s	1 s
		Restart delay	[0.04] - [600.00] s	0.01 s	0.05 s	0.04 s
	Relay 2 settings	Working principle	[closed-circuit], [open-circuit]		closed-circuit	closed-circuit
	Relay 3 settings	Working principle	[closed-circuit], [open-circuit], [disabled], [sync. with relay 1]		sync. with relay 1	sync. with relay 1
		ON-delay	[0.00] - [10.00] s	0.05 s	0 s	0 s
		ON-time	[0.05] - [10.00] s	0.05 s	0.5 s	0.5 s
	Feedback loop Y1	Working principle	[normally closed], [normally open], [auto detection]		normally closed	normally closed
		Trip window	[0.05] - [0.50] s	0.05 s	0.5 s	0.5 s
		Release window	[0.50] - [600.00] s	0.05 s	0.5 s	0.5 s
	External signal Y2	Working principle	[normally closed], [normally open]		normally closed	normally closed
Monitoring functions	Remote trip Y3	Working principle	[normally closed], [normally open]		normally open	normally open
	Overvoltage >S1	Threshold value	[1.00] - [1.20] * Un	0.01 xUn	1.1 xUn	1.1 xUn
	Overvoltage >S2	Threshold value	[1.00] - [1.30] * Un	0.01 xUn	1.15 xUn	1.2 xUn
		Tripping delay	[0.05] - [600.00] s	0.05 s	0.2 s	0.6 s
	Undervoltage <S1	Threshold value	[0.20] - [1.00] * Un	0.01 xUn	0.85 xUn	0.85 xUn
		Tripping delay	[0.05] - [600.00] s	0.05 s	0.4 s	1.5 s
	Undervoltage <S2	Threshold value	[0.05] - [1.00] * Un	0.01 xUn	0.4 xUn	0.3 xUn
		Tripping delay	[0.05] - [600.00] s	0.05 s	0.2 s	0.2 s
	Overfrequency >S1	Threshold value	[50.0] - [54.0] Hz	0.1 Hz	52.5 Hz	52.5 Hz
		Tripping delay	[0.05] - [600.00] s	0.05 s	0.1 s	0.1 s
	Overfrequency >S2	Threshold value	[50.0] - [54.0] Hz	0.1 Hz	54.0 Hz	54.0 Hz
		Tripping delay	[0.05] - [600.00] s	0.05 s	10.0 s	10.0 s
	Underfrequency <S1	Threshold value	[46.0] - [50.0] Hz	0.1 Hz	47.5 Hz	47.5 Hz
		Tripping delay	[0.05] - [600.00] s	0.05 s	4.0 s	4.0 s
	Underfrequency <S2	Threshold value	[46.0] - [50.0] Hz	0.1 Hz/s	46.0 Hz	46.0 Hz
		Tripping delay	[0.05] - [600.00] s	0.05 s	10.0 s	10.0 s
	ROCOF	Monitoring	[disabled], [enabled]		disabled	disabled
		Threshold value	[0.100] - [5.000] Hz/s	0.005 Hz/s	2 Hz/s	2 Hz/s
		Number of cycles	[4] - [50]	1	20	20
		Tripping delay	[0.00] - [600.00] s	0.01 s	0.1 s	0.1 s
		Error-time	[0.05] - [600.00] s	0.01 s	1 s	1 s
	Vector Shift VS	Monitoring	[disabled], [enabled]		disabled	disabled
		Threshold value	[1.0] - [50.0] °	0.1 °	10 °	10 °
		Error time	[0.05] - [600.00] s	0.01 s	1 s	1 s
Autotest						
General settings	Local command	Local command	[disabled], [enabled]		enabled <sup>1)</sup>	
		Change LC password	[****]			
	Language	Language	[English], [Italiano]		English <sup>1)</sup>	
	Display	Switch-off delay	[10] - [600] s	1 s	10 s <sup>1)</sup>	
		Contrast	[0] - [9]	1	5 <sup>1)</sup>	
	Password	Protection	[disabled], [enabled]		disabled <sup>1)</sup>	
		Change password	[****]		0000 <sup>1)</sup>	
	Load settings	"Setting name"				
Error memory	Save settings	"Setting name"				
	Information					
	Error list					
	Error recording	Remote trip	[disabled], [enabled]		enabled <sup>1)</sup>	
		Power OFF	[disabled], [enabled]		enabled <sup>1)</sup>	
	Reset error memory					
	Operating counter					
	Cumulated OFF-time					

<sup>1)</sup> Device defaults, not affected by loading a setting

## Display and failure messages

```

L1N: 184.4V <UoN
L2N: 184.7V <UoN
L3N: 184.1V <U1
  49.99 Hz
R1 R2 R3 Y1 Y2 V3

```

The threshold for vector shift detection was exceeded.

```

L1N: 199.9V
L2N: 200.1V
L3N: 199.7V
  49.99 Hz ROCOF
R1 R2 R3 FB EXT REM

```

Error, ROCOF

```

L1N: 260.2V >S1
L2N: 260.3V >S1
L3N: 260.0V >S1
  49.99 Hz
R1 R2 R3 FB EXT REM

```

Error overvoltage S1 in all three phases detected.

If overvoltage occurs in one phase only, >S1 indicates the phase with overvoltage.

```

L1N: 199.9V
L2N: 200.1V
L3N: 199.7V
  49.61 Hz VS
R1 R2 R3 FB EXT REM

```

Error, Vector Shift

```

L1N: 264.6V >S2
L2N: 264.9V >S2
L3N: 264.6V >S2
  49.99 Hz
R1 R2 R3 FB EXT REM

```

Error overvoltage S2 in all three phases detected.

If overvoltage occurs in one phase only, >S2 indicates the phase with overvoltage.

```

Neutral conductor
is not connected!
R1 R2 R3 FB EXT REM

```

4-wire connection

The neutral conductor is disconnected or interrupted.

Please check wiring.

```

L1N: 190.3V <S1
L2N: 190.5V <S1
L3N: 190.1V <S1
  49.99 Hz
R1 R2 R3 FB EXT TSC

```

Error undervoltage S1 in all three phases detected.

If undervoltage occurs in one phase only, <S1 indicates the phase with undervoltage.

```

L1N: 230.4V
L2N: 230.6V
L3N: 230.3V
  49.99 Hz
R1-FB Press ESC!
R1 R2 R3 FB EXT REM

```

Failure in the feedback loop FB. E.g. wiring failure, configuration failure, welded feedback contact in DDI.

Please check configuration and installation for failures. After failure removal, press ESC to restart/reset.

```

L1N: 90.2V <S2
L2N: 90.3V <S2
L3N: 90.2V <S2
  49.99 Hz
R1 R2 R3 FB EXT REM

```

Error undervoltage S2 in all three phases detected.

If undervoltage occurs in one phase only, <S2 indicates the phase with undervoltage.

```

L1N: 220.5V
L2N: 220.6V
L3N: 220.4V
  49.99 Hz
R1-FB check loop!
R1 R2 R3 FB EXT REM

```

Permanent failure in the feedback loop FB. E.g. wiring failure, configuration failure, welded feedback contact in DDI.

Failure in configuration or installation must be removed before the failure can be receipted with ESC.

```

L1N: 230.4V
L2N: 230.5V
L3N: 230.2V
  51.00 Hz >S1
R1 R2 R3 FB EXT TSC

```

Error overfrequency S1 detected

```

L1N: 229.9V
L2N: 229.2V
L3N: 229.1V
  49.99 Hz
Internal error
R1 R2 R3 FB EXT REM

```

Failure within the logic or hardware of the device. Remove supply and restart. If failure still occurs, there is a permanent failure in the device.

```

L1N: 230.3V
L2N: 230.5V
L3N: 230.1V
  51.99 Hz >S2
R1 R2 R3 FB EXT TSC

```

Error overfrequency S2 detected

```

Autotest
U> 230.2V 16ms
Autotest failed

```

Feedback of DDI interrupted or failure.

```

L1N: 230.5V
L2N: 230.7V
L3N: 230.3V
  49.00 Hz <S1
R1 R2 R3 FB EXT TSC

```

Error underfrequency S1 detected

```

L1N: 229.9V
L2N: 230.2V
L3N: 229.9V
  49.99 Hz
Autotest failed
R1 R2 R3 FB EXT REM

```

Main display / start display after autotest failure. Restart autotest

```

L1N: 230.6V
L2N: 230.7V
L3N: 230.5V
  47.00 Hz <S2
R1 R2 R3 FB EXT TSC

```

Error underfrequency S2 detected

```

L1N: 230.0V
L2N: 230.3V
L3N: 229.7V
  49.61 Hz
Remote trip
R1 R2 R3 Y1 Y2 Y3

```

Remote trip shows that the remote trip is activated and output relay R1 is de-energized.



## Error memory

As soon as one of the above errors occurs, subsequent error codes with the corresponding time stamp will be stored in the error memory:

Storage position in the error list

Error code

Time stamp

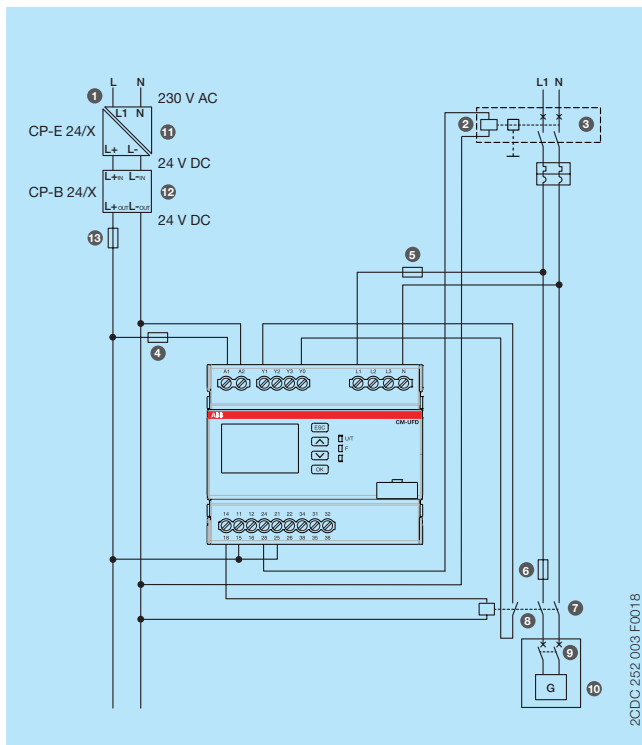
In this case the error occurred  
8 hours, 3 minutes and 15  
seconds after commissioning

Error list	
Number:	1
Code:	POWER
Time:	00Y000D08H03M15S

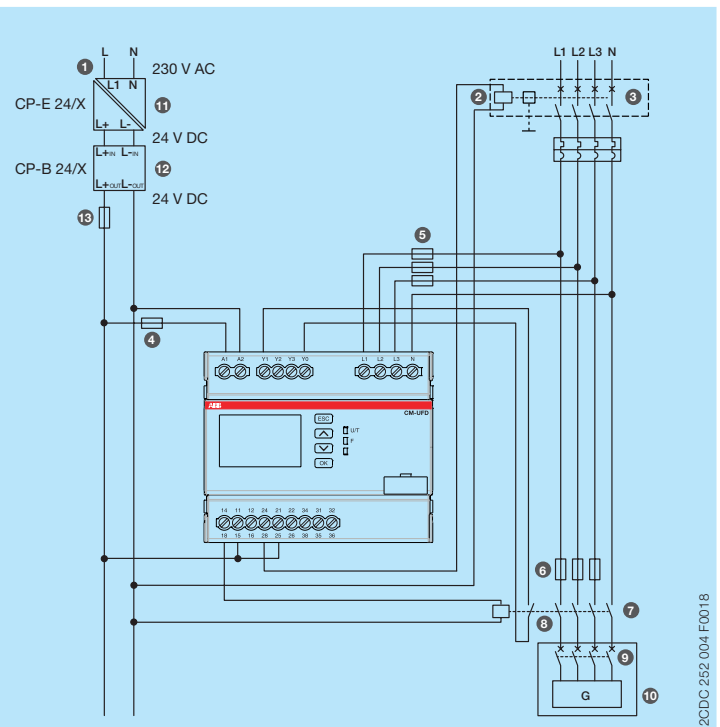
Error code	Explanation	
L1N>S1 or L2N>S1 or L3N>S1	Error, overvoltage S1	10-minutes average value
L1N>S2 or L2N>S2 or L3N>S2	Error, overvoltage S2	
L1N<S1 or L2N<S1 or L3N<S1	Error, undervoltage S1	
L1N<S2 or L2N<S2 or L3N<S2	Error, undervoltage S2	
L12>S1 or L23>S1 or L31>S1	Error, overvoltage S1	10-minutes average value
L12>S2 or L23>S2 or L31>S2	Error, overvoltage S2	
L12<S1 or L23<S1 or L31<S1	Error, undervoltage S1	
L12<S2 or L23<S2 or L31<S2	Error, undervoltage S2	
F>S1	Error, overfrequency S1	
F>S2	Error, overfrequency S2	
F<S1	Error, underfrequency S1	
F<S2	Error, underfrequency S2	
ROCOF	Error, ROCOF	
AUTO	Error, autotest	Failure during the autotest routine
REMOTE	Error, remote trip	
DDI-FB	Error, DDI feedback	Malfunction of the DDI
POWER	Error, power	Supply voltage is disconnected or too low
NEUTRAL	Error, interrupted neutral detection	
Exxx (e.g. E123)	Internal error	Failure within the logic or hardware of the device

## Connection and wiring

### Example of single-phase application



### Example of three-phase application



## Legend

1. Main circuit breaker DG or DGL
2. 2nd switching unit: Automatic circuit breaker or contactor equipped with low voltage coil and motor for automatic closure
3. Auxiliary contact of 2nd switching unit, necessary for realizing the feedback function (compulsory for CM-UFD.M34)
4. Short-circuit protection
5. Generator and/or inverter
6. Generator (DDG)
7. Protection fuse for the measuring circuit of the CM-UFD.M34 (optional)
8. Shunt trip coil for feedback function ( $P > 20$  kW). This coil can control DG/DGL or DDG devices
9. Control supply voltage for CM-UFD.M34 (IP) and tripping device (1st switching unit)
10. Device protection fuse for the CM-UFD.M34
11. Primary switch mode power supply unit CP-E (230 V AC / 24 V DC) for the buffer module CP-B
12. Ultra-capacitor based buffer module CP-B (24 V DC in/out)
13. Wire protection fuse for the output of the buffer module CP-B

## Technical data

Data at  $T_a = 25\text{ °C}$  and rated values, unless otherwise indicated

### Input circuits

Supply circuit		A1-A2
Rated control supply voltage $U_s$		24-240 V AC/DC
Rated control supply voltage $U_s$ tolerance		-15...+10 %
Control supply voltage range		20.4-264 V AC/DC
Rated frequency		DC or 50 Hz
Frequency range AC		40-60 Hz
Typical current / power consumption	24 V DC	64 mA / 1.5 W
	230 V AC	6.4 mA / 1.5 VA
Power failure buffering time		200 ms, according to LVFRT (Low Voltage Fault Ride Through)
Measuring circuits		L1, L2, L3, N
Monitoring functions acc. to DRRG standard of DEWA		overvoltage av. (59 S1) overvoltage (59 S2) undervoltage (27 S1) undervoltage (27 S2) overfrequency (81>S1) underfrequency (81<S1) overfrequency (81>S2) underfrequency (81<S2) Vector shift. configurable ROCOF, configurable neutral, activated if L-N
Measuring ranges	voltage (4-wire system L1, L2, L3-N)	0-312 V AC
	voltage (3-wire system L1, L2, L3)	0-540 V AC
	voltage (2-wire system L-N)	0-312 V AC
	frequency	40-60 Hz
Accuracy of measurements	voltage	$\leq 2\text{ %}$
	frequency	$\pm 20\text{ mHz}$
	delay times	$\leq 3\text{ %} \pm 20\text{ ms}$
Accuracy within the temperature range		$\Delta U \leq 0.02\text{ %/°C}$
Threshold values	overvoltage av. (59 S1)	adjustable, $1.00-1.20 \cdot U_n$ in $0.01 \cdot U_n$ steps
	overvoltage (59 S2)	adjustable, $1.00-1.30 \cdot U_n$ in $0.01 \cdot U_n$ steps
	undervoltage (27 S1)	adjustable, $0.20-1.00 \cdot U_n$ in $0.01 \cdot U_n$ steps
	undervoltage (27 S2)	adjustable, $0.05-1.00 \cdot U_n$ in $0.01 \cdot U_n$ steps
	overfrequency (81>S1)	adjustable, 50.0-54.0 Hz in 0.1 Hz steps
	underfrequency (81<S1)	adjustable, 46.0-50.0 Hz in 0.1 Hz steps
	overfrequency (81>S2)	adjustable, 50.0-54.0 Hz in 0.1 Hz steps
	underfrequency (81<S2)	adjustable, 46.0-50.0 Hz in 0.1 Hz steps
	ROCOF	adjustable, 0.100-5.000 Hz/s, in 0.005 Hz/s steps
	Vector Shift	adjustable, 1.0-50.0 °, in 0.1 ° steps
Hysteresis related to the threshold values	overvoltage	$0.95-0.97 \cdot U_n$
	undervoltage	$1.03-1.05 \cdot U_n$
	overfrequency	$0.997-0.999 \cdot f_n$
	underfrequency	$1.001-1.003 \cdot f_n$
Rated frequency of the measuring signal		50 Hz
Frequency range of the measuring signal		40-60 Hz
Accuracy within the temperature range		$\Delta U \leq 0.02\text{ %/°C}$

Measuring circuits		L1, L2, L3, N
Reaction time acc. DRRG standards chapter D.1.4 and D.2.4	overvoltage 1	adjustable, 0.05-600.00 s in 0.05 s steps, $\pm 3\%$ $\pm 20$ ms
	undervoltage 1	
	undervoltage 2	
	overfrequency 1	
	overfrequency 2	
	underfrequency 1	
	underfrequency 2	
Reaction time neutral interruption		< 150 ms
Measuring cycle at 50 Hz	ROCOF	adjustable, 4 - 50 cycles

Control circuits		Y0, Y1, Y2, Y3
Number		3
Type of triggering		volt-free triggering, signal source Y0
Function of the control inputs	Y1-Y0 control input 1	DDI feedback, trip and release monitoring times adjustable
	Y2-Y0 control input 2	external signal
	Y3-Y0 control input 3	remote trip
Electrical isolation	from the supply voltage	yes
	from the measuring circuit	no
	from the relay outputs	yes
Maximum switching current in the control circuit		6 mA
No-load voltage at the control inputs (V0-V1, V2, V3)		22-26 V DC
Minimum control pulse length		20 ms
Maximum cable length at the control inputs (unshielded)		10 m

## Timing functions

Start-up delay R1 (prior to first grid connection or re-connection after interruption)	adjustable, 1.00-600.00 s in 0.05 s steps
Restart delay R1	adjustable, 0.05-600.00 s in 0.05 s steps
Start-up delay R2 (prior to first grid connection or re-connection after interruption)	1 s, fixed
ON-delay R3	adjustable, 0.00-10.00 s in 0.05 s steps
ON-time R3	adjustable, 0.05-10.00 s in 0.05 s steps
Trip window, feedback loop Y1	adjustable, 0.05-0.50 s in 0.05 s steps
Release window, feedback loop Y1	adjustable, 0.50-600.00 s in 0.05 s steps
Tripping delays	adjustable, 0.05-600.00 s in 0.05 s steps
ROCOF tripping delay	adjustable, 0.00-600.00 s in 0.05 s steps
ROCOF error time	adjustable, 0.05-600.00 s in 0.05 s steps
Vector Shift error time	adjustable, 0.05-600.00 s in 0.01 s steps

## User interface

Indication of operational states		
Control supply voltage applied / tripping delay relay 1 active	U/T	LED green on / flashing
Fault message	F	LED red on
The operational states are additionally displayed through text on the LCD, details see table 'Indication of operational states'		

Display		
Backlight	on	press any button
	off	switch-off delay adjustable, 10-600 s (default 10 s)
Operating temperature range of the display	clearly visible	-20...+60 °C
Resolution		112 x 64 pixel
Display size		36 x 22 mm

Operating controls	
4 push-buttons for menu navigation, setting and entering	

## Output circuits

Kind of outputs	11-12/14 (15-16/18)	1st c/o (SPDT) contact, tripping relay for DDI
	21-22/24 (25-26/28)	2nd c/o (SPDT) contact, redundancy relay for DG
	31-32/34 (35-36/38)	3rd c/o (SPDT) contact, closing command for breaker motor, also sync. with relay 1
Operating principle	11-12/14	closed-circuit principle <sup>1)</sup>
	21-22/24	open- or closed-circuit principle <sup>1)</sup> configurable
	31-32/34	open- or closed-circuit principle <sup>1)</sup> configurable
Contact material		AgNi alloy, Cd free
Rated operational voltage $U_o$		250 V AC
Minimum switching voltage / minimum switching current		24 V / 10 mA
Maximum switching voltage / maximum switching current		see 'Load limit curves'
Rated operating current $I_o$	AC-12 (resistive) at 230 V	4 A
	AC-15 (inductive) at 230 V	3 A
	DC-12 (resistive) at 24 V	4 A
	DC-13 (inductive) at 24 V	2 A
Mechanical lifetime		30 x 10 <sup>6</sup> switching cycles
Electrical lifetime	at AC-12, 230 V AC, 4 A	50 x 10 <sup>3</sup> switching cycles
Maximum fuse rating to achieve short-circuit protection	n/c contact	10 A fast-acting
	n/o contact	10 A fast-acting
Conventional thermal current $I_{th}$		5 A

1) Closed-circuit principle: Output relay de-energizes if a fault is occurring  
Open-circuit principle: Output relay energizes if a fault is occurring

## General data

MTBF		on request
Repeat accuracy (constant parameters)		< ± 0.5 %
Duty time		100 %
Dimensions		see 'Dimensional drawing'
Weight		0.306 kg (0.675 lb)
Material of housing		PA666FR
Mounting		DIN rail (IEC/EN 60715) TH 35-7.5 and TH 35-15, snap-on mounting without any tool
Mounting position		any
Minimum distance to other units	horizontal / vertical	not necessary
Degree of protection	housing / terminals	IP20

## Electrical connection

Connecting capacity	fine-strand with wire end ferrule	1 x 0.25-4 mm <sup>2</sup> (1 x 24-12 AWG) 2 x 0.25-0.75 mm <sup>2</sup> (2 x 24-18 AWG)
	fine-strand without wire end ferrule	1 x 0.2-4 mm <sup>2</sup> (1 x 24-12 AWG) 2 x 0.2-1.5 mm <sup>2</sup> (2 x 24-16 AWG)
	rigid	1 x 0.2-6 mm <sup>2</sup> (1 x 24-10 AWG) 2 x 0.2-1.5 mm <sup>2</sup> (2 x 24-16 AWG)
Stripping length		8 mm (0.315 in)
Tightening torque		0.5-0.6 Nm (4.4-5.3 lb.in)

## Environmental data

Ambient temperature ranges	operation	-20 °C...+60 °C (-4...+140 °F)
	storage	-20 °C...+80 °C (-4...+176 °F)
Damp heat, cyclic	IEC/EN 60068-2-30	6 x 24 h cycle, 55 °C, 95 % RH
Climatic class	IEC/EN 60721-3-3	3K5 (no condensation, no ice formation)
Vibration, sinusoidal		Class 2
Shock		Class 2

## Isolation data

Rated insulation voltage $U_i$	supply / measuring / output circuits	600 V
	output 1 / output 2 / output 3	300 V
Rated impulse withstand voltage $U_{imp}$	supply / measuring / output circuits	6 kV; 1.2/50 $\mu$ s
	output 1 / output 2 / output 3	4 kV; 1.2/50 $\mu$ s
Basic insulation	supply / measuring / output circuits	600 V AC
	output 1 / output 2 / output 3	300 V AC
Protective separation (IEC/EN 61140)	supply / measuring / output circuits	250 V
	output 1 / output 2 / output 3	250 V
Pollution degree		3
Overvoltage category		III

## Standards / Directives

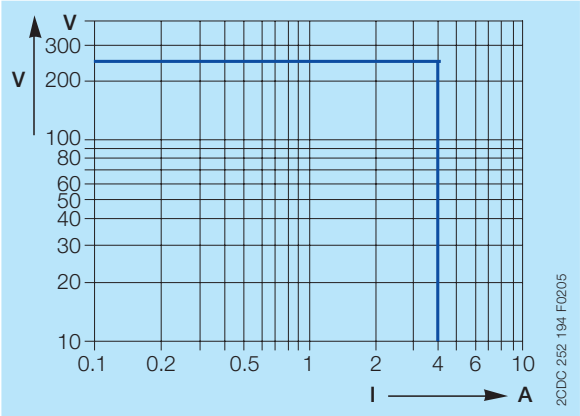
Standards	IEC/EN 60255-27, EN 50178, DRRG
Low Voltage Directive	2014/35/EU
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

## Electromagnetic compatibility

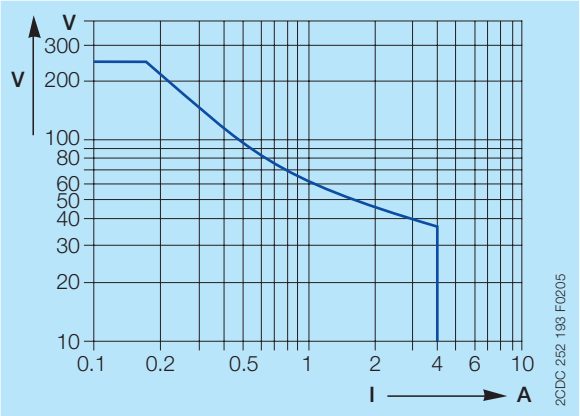
Interference immunity to		IEC/EN 61000-6-2
electrostatic discharge	IEC/EN 61000-4-2	Level 3, 6 kV contact discharge, 8 kV air discharge
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3	Level 3, 10 V/m
electrical fast transient / burst	IEC/EN 61000-4-4	Level 3, 2 kV / 5 kHz
surge	IEC/EN 61000-4-5	Level 3, installation class 3, supply circuit and measuring circuit 1 kV L-L, 2 kV L-N
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	Level 3, 10 V
voltage dips, short interruptions and voltage variations	IEC/EN 61000-4-11	Class 3
harmonics and interharmonics	IEC/EN 61000-4-13	Class 3
Interference emission		IEC/EN 61000-6-3
high-frequency radiated	IEC/CISPR 22, EN 55022	Class B
high-frequency conducted	IEC/CISPR 22, EN 55022	Class B

Technical diagrams

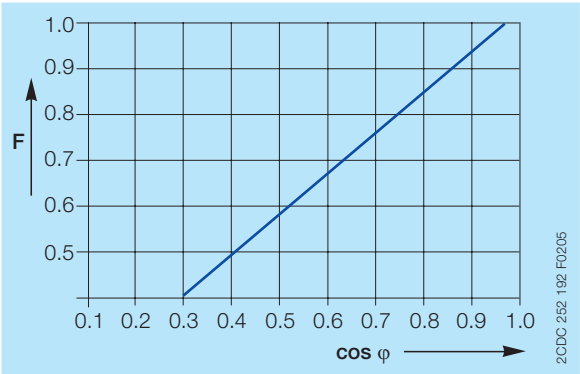
Load limits curves



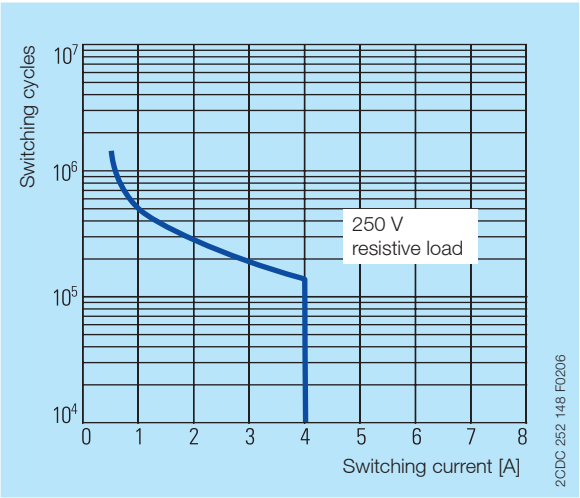
AC load (resistive)



DC load (resistive)



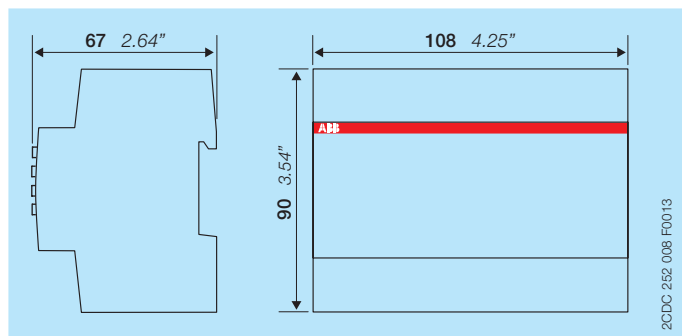
Derating factor F at inductive AC load



Contact lifetime

## Dimensions

in **mm** and inches



## Further documentation

Document title	Document type	Document number
Electronic relays and controls	Catalog	2CDC 110 004 C02xx
CM-UFD.M34 Grid feeding monitoring relay	Instruction sheet	1SVC 560 513 M0000

You can find the documentation on the internet at [www.abb.com/lowvoltage](http://www.abb.com/lowvoltage)

-> Automation, control and protection -> Electronic relays and controls -> Measuring and monitoring relays.

## CAD system files

You can find the CAD files for CAD systems at <http://abb-control-products.partcommunity.com>

-> Low Voltage Products & Systems -> Control Products -> Electronic Relays and Controls.



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