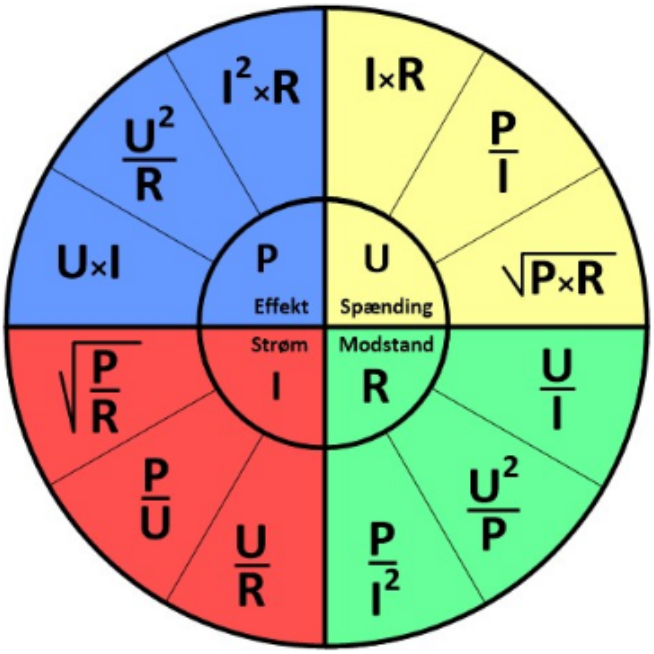
Tabel med præfikser

Præfiks	Symbol	Potenstal	Værdi
Tera	T	10^{12}	1 000 000 000 000
Giga	G	10^{9}	1 000 000 000
Mega	M	10^{6}	1 000 000
Kilo	k	10^{3}	1 000
		10^{0}	1
Milli	m	10^{-3}	0,001
Mikro	µ	10^{-6}	0,000 001
Nano	n	10^{-9}	0,000 000 001
Pico	p	10^{-12}	0,000 000 000 001

Ohms Regnecirkel

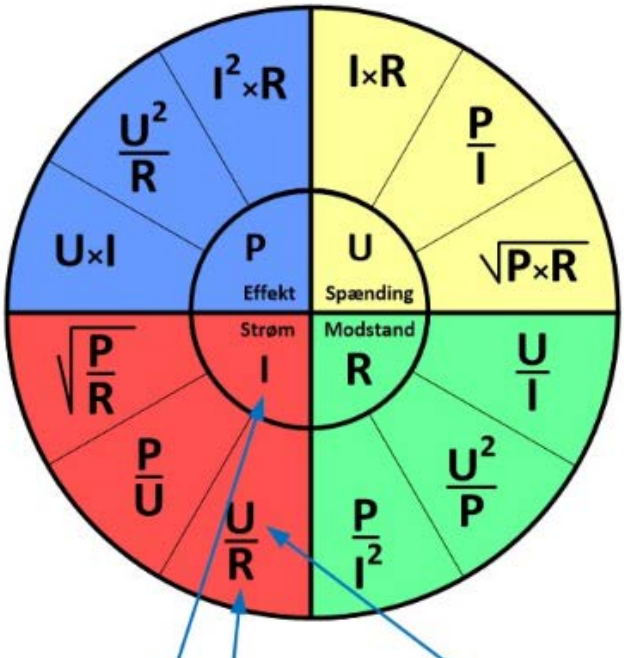
For at lettere at kunne udregne forskellige kombinationer af Ohms lov, findes der et redskab, der kaldes Ohms Regnecirkel.



Ohms Regnecirkel anvendes på følgende måde:

I de 4 inderste cirkelstykker findes den **ukendte værdi**, der skal beregnes: P_{EFFEKT} , $U_{SPÆNDING}$, $I_{STRØM}$, og $R_{MODSTAND}$

I de 12 yderste cirkelstykker vælges formlen ud fra de **2 kendte værdier**, hvorudfra den **ukendte værdi** udregnes.



Eksempel: Find strømme **I**, når **R = 2Ω** og spændingen **U = 10V**.

Formlen der skal anvendes er $I = \frac{U}{R}$

Når det indsættes i formlen bliver det til $I = \frac{10}{2}$

I bliver derfor **5A**

Formler til udregning af forskellige værdier i serie- og parallelkoblinger

Seriel forbindelse

Serielle kredsløb kan genkendes ved at sige, at modstandene sidder som "perler på en snor"

I en serieforbindelse er den samlede strøm(ampere) I ens i hele kredsløbet
$$I = I_{R1}=I_{R2}=I_{R3}= osv.$$

Den totale spænding(volt) U_T, der påtrykkes kredsløbet, er lig den samlede spændingsfald over de enkelte modstande
$$U_T = U_{R1}+U_{R2}+U_{R3}+osv.$$

For at regne den samlede modstand(ohm) R ud i kredsløbet lægger man modstandene sammen
$$R_T = R1+R2+R3+osv.$$

Parallel forbindelse

I en parallel forbindelse er spændingen(Volt) U fælles over de enkelte modstande

$$U` = U_{R1}=U_{R2}=U_{R3}=osv.$$

Den totale strøm(ampere) I_T er summen af de enkelte strømme
$$I_T = I_{R1}+I_{R2}+I_{R3}+osv.$$

For at regne den samlede modstand(ohm) R ud i kredsløbet kan man lægge modstandene sammen ved hjælp af den reciprokke formel:
$$1/R_T = 1/R1+1/R2+1/R3+osv.$$
Eller ved hjælp af ohms lov:
$$\sum R_T = U/I_T$$

Den samlede modstand i en parallel-forbindelse er altid mindre end den mindste modstand i parallel-forbindelsen

Udregning på lommeregner af parallel-modstanden ved brug af tasten X^{-1} eller 1/X

$$R1X^{-1}+R2X^{-1}+R3X^{-1}=X^{-1}=Resultat$$

Farvekode for modstande

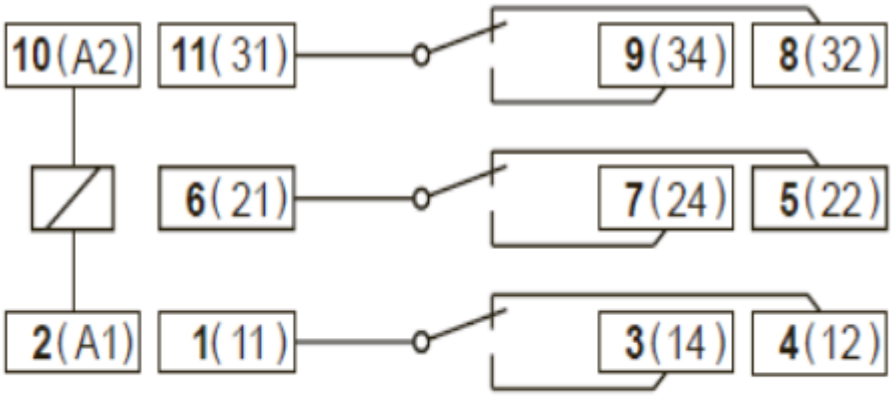
Når værdien angives med farveringe,
skal den aflæses på denne måde:

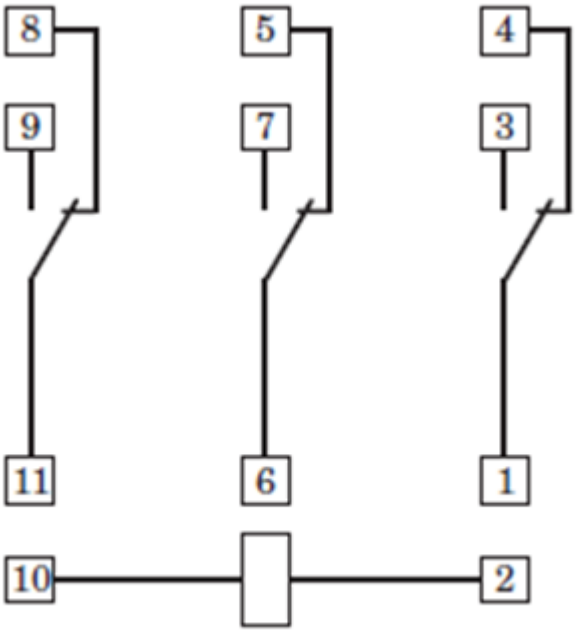
1. TAL
2. TAL
TOLERANCE
MULTIPLIKATOR

Farve	Tal	Multiplikator
Sølv		0,01
Guld		0,1
Sort	0	1
Brun	1	10
Rød	2	100
Orange	3	1.000
Gul	4	10.000
Grøn	5	100.000
Blå	6	1.000.000
Violet	7	10.000.000
Grå	8	100.000.000
Hvid	9	1.000.000.000

Tolerance	
Guld	5%
Sølv	10%
Ingen ring	20%

Herunder er vist forbindelserne i et 11 polet relæ.





Datablad for Carlo Gavazzi Multi Function Timer

Timers
Multifunction
Types DMB01, PMB01

CARLO GAVAZZI


DMB 01


PMB 01

- Time range 0.1 s to 100 h
- 7 knob selectable functions:
  - Op - delay on operate
  - In - interval
  - Io - interval on trigger open
  - Id - double interval
  - Dr - delay on release
  - R - symmetrical recycler ON first
  - Rb - symmetrical recycler OFF first
- Knob selection of time range
- Knob-adjustable time setting
- Automatic or manual start
- Repeatability: ≤ 0.2%
- Output: 8 A SPDT or 8 A DPDT relay
- For mounting on DIN-rail in accordance with DIN/EN 50 022 or Plug-in
- 22.5 mm Euronorm or 36 mm Plug-in module housing
- Combined AC and DC power supply
- LED indication for relay status and power supply ON

Product Description

Multi-voltage timer with 7 knob selectable functions and 7 knob selectable time ranges within 0.1s and 100h. For mounting on DIN-rail (DMB01) or Plug-in (PMB01).

Ordering Key

DMB 01 C M24

- Housing
- Function
- Type
- Item number
- Output
- Power supply

Type Selection

Mounting	Output	Housing	Supply: 24 VDC and 24 to 240 VAC	Supply: 24 to 240 VAC/DC
DIN-rail	SPDT	D-Housing	**DMB 01 C M24**	
	DPDT			**DMB 01 D M24**
Plug-in	SPDT	P-Housing	**PMB 01 C M24**	
	DPDT			**PMB 01 D M24**

Time Specifications

Time ranges	
Knob Selectable	0.1 to 1 s 1 to 10 s 6 to 60 s 60 to 600 s 0.1 to 1 h 1 to 10 h 10 to 100h
Setting accuracy	≤ 5%
Repeatability	≤ 0.2%
Time variation	
Within rated power supply	≤ 0.05%/V
Within ambient temperature	≤ 0.2%/°C
Reset	
Manual reset of time and/or relay	Close the trigger contact between pins A1 and Y1 or 2 and 5
Pulse duration	≥ 100 ms
Power supply interruption	≥ 200 ms
Automatic start	Connect pins A1 and Y1 or 2 and 5

Output Specifications

Output		SPDT or DPDT relay
Rated insulation voltage		250 VAC (rms)
Contact Ratings ($AgSnO_2$)		μ
Resistive loads	AC 1	8 A @ 250 VAC
	DC 12	5 A @ 24 VDC
Small inductive loads	AC 15	2.5 A @ 250 VAC
	DC 13	2.5 A @ 24 VDC
Mechanical life		≥ 30 x 10^6 operations
Electrical life		≥ 10^5 operations (at 8 A, 250 V, cos φ = 1)
Operating frequency		< 7200 operations/h
Dielectric strength		
Dielectric voltage		2 kVAC (rms)
Rated impulse withstand volt.		4 kV (1.2/50 μs)

CARLO GAVAZZI

Supply Specifications

Power supply	Overvoltage cat. III (IEC 60664, IEC 60038)
Rated operational voltage through terminals:	
(DMB01C) A1, A2	24 VDC ±15% and
(PMB01C) 2, 10	24 to 240 VAC +10%/-15%, 45 to 65 Hz
(DMB01D) A1, A2	24 to 240 VAC/DC
(PMB01D) 2, 10	+10%/-15%, 45 to 65 Hz
Voltage interruption	≤ 10 ms
Rated operational power	
AC supply	4 VA
DC supply	1.5 W

Function and Time Setting

Upper knob:
Setting of function:
- Op - delay on operate
- In - interval
- Io - interval on trigger open
- Id - double interval
- Dr - delay on release
- R - symmetrical recycler (ON first)
- Rb - symmetrical recycler (OFF first)

Centre knob:
Time setting on relative scale: 1 to 10 with respect to the chosen range.

Lower knob:
Setting of time range.

General Specifications

Power ON delay		≤ 100 ms
Indication for		
Power supply ON		LED, green
Output relays ON		LED, yellow (flashing when timing)
Environment		(EN 60529)
Degree of protection		IP 20
Pollution degree		3 (DMB01), 2 (PMB01) (IEC 60664)
Operating temperature		-20 to 60°C, R.H. < 95%
Storage temperature		-30 to 80°C, R.H. < 95%
Housing		
Dimensions	DMB01	22.5 x 80 x 99.5 mm
	PMB01	36 x 80 x 94 mm
Weight		Approx. 130 g
Screw terminals		
Tightening torque		Max. 0.5 Nm according to IEC EN 60947
Approvals		UL, CSA RINA (DMB01 only)
CE Marking		Yes
EMC		Electromagnetic Compatibility
Immunity		According to EN 61000-6-2
Emission		According to EN 61000-6-3
Timer Specifications		According to EN 61812-1

Mode of Operation

Function Op
Delay on operate
The time period begins as soon as the trigger contact is closed.
At the end of the set delay time the relay operates and doesn't release until the trigger contact is closed again or the power supply is disconnected. If the trigger contact is closed before the end of the delay time, the device resets and a new time period starts.

Function In
Interval
The relay operates and the time period begins as soon as the trigger contact is closed. The relay releases at the end of this period or when the power supply is disconnected. The relay operates again when the trigger contact is closed again. If the trigger contact is closed before the end of the delay time, the relay keeps ON and a new time period starts.

Function Io
Interval on trigger open
The relay operates and the time period begins as soon as the trigger contact is opened. At the end of the set delay or when the power supply is disconnected the relay releases. The relay operates again when the trigger contact is opened again. If the trigger contact is opened before the end of the delay time the relay keeps ON and a new time period begins.

Function Id
Double interval
The relay operates and the time period begins as soon as the trigger contact is closed. The relay releases at the end of this period or when the power supply is disconnected. When the trigger contact is opened the relay operates again for the set delay period. If the trigger contact is opened before the end of the first time period the second one begins; if the trigger contact is closed before the end of the second time period the relay keeps ON and the first time period begins again.

Function Dr
Delay on release
The relay operates as soon as the trigger contact is closed. The time period begins when the trigger contact is opened. The relay releases at the end of the set delay time or when the power supply is disconnected. The relay operates again when the input contact is closed again. If it is closed before the end of the delay time the relay keeps ON, a new time period begins as soon as the contact is opened again.

Function R
Symmetrical recycler, ON-time period first
The relay operates and the time period begins as soon as the input contact is closed. After the set delay period the relay releases for the same time period. This sequence continues with equal ON- and OFF-time periods until the power supply is interrupted.

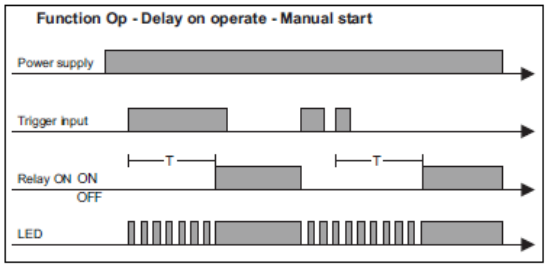
Function Rb
Symmetrical recycler, OFF-time period first
The time period begins as soon as the input contact is closed. The relay is OFF during the set delay period, after this time it operates for the same time period. This sequence continues with equal OFF- and ON-time periods until power supply is interrupted.

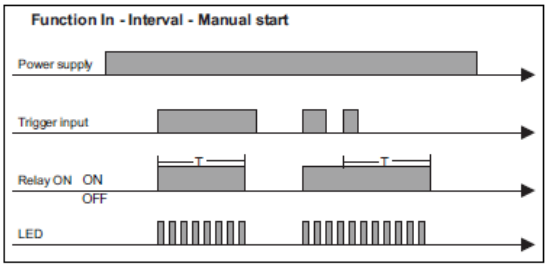
Mode of Operation (cont.)

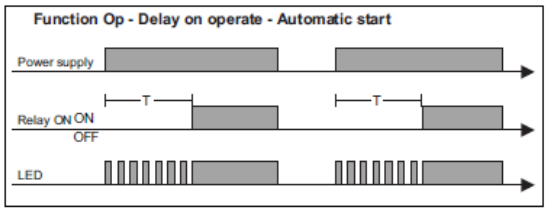
Additional Load
It's possible to wire an additional load (i.e. a relay) between pins Y1 and A2, or 5 and 10, driven by the trigger contact without damaging the device (see wiring diagram).

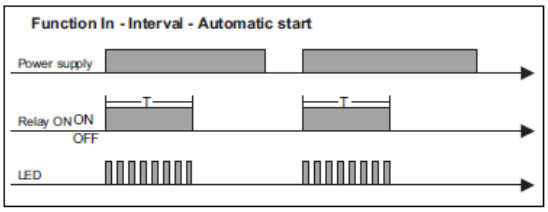
Yellow LED working mode
Timing: Slow blinking
Relay ON: See operation diagrams
Incorrect knobs position: Fast blinking

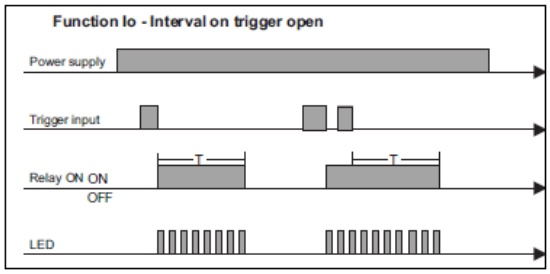
Operation Diagrams

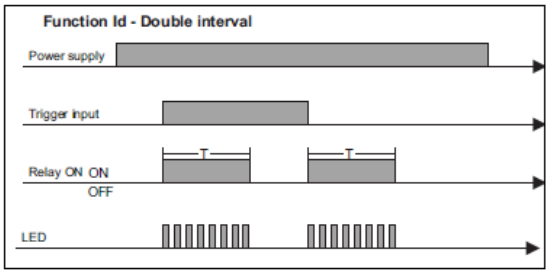


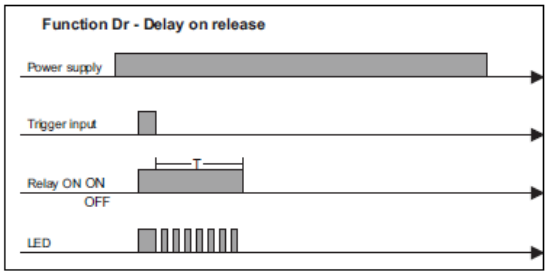


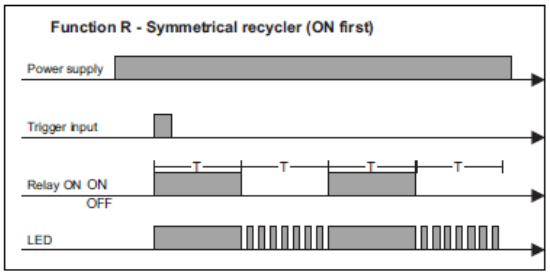




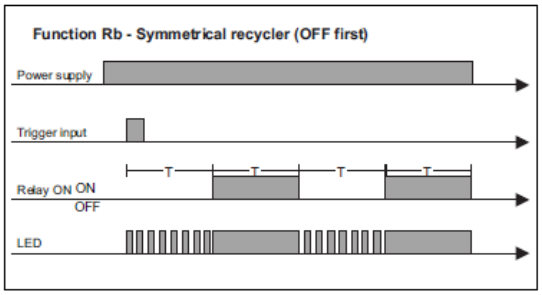






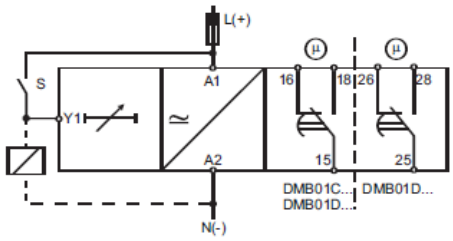


Operation Diagrams (cont.)

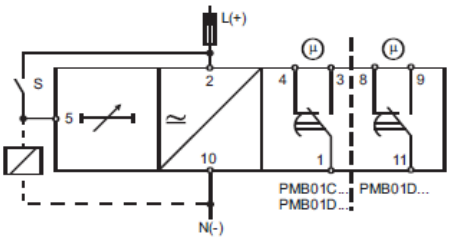


Wiring Diagrams

DMB 01

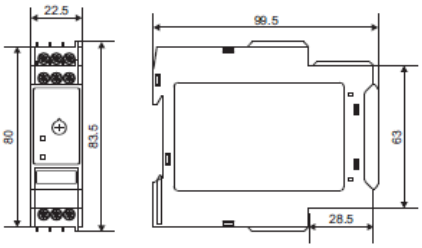


PMB 01



Dimensions

DIN-rail



Plug-in