5. Operating modes

5.1 Minimum-/Maximum set point (Window function)

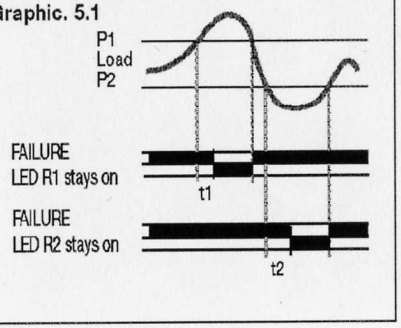
Function programing dip switch **P2 MAX in »OFF« position.**

Effect

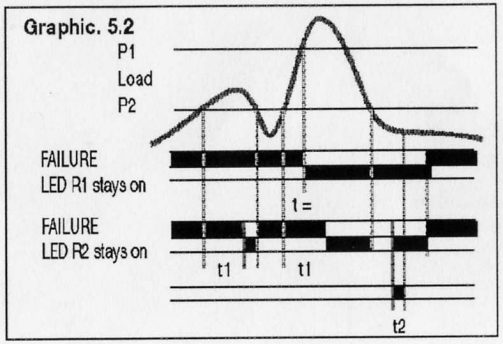
If the set point P1 is exeeded, the relay R1 switches to »FAILURE« position with a delay t1. LED in R1 flashes
If the set point P2 is not attained, the relay R2 switches to »FAILURE« position with a delay t2. LED in R2 flashes.

Note: If MEM1 and MEM 2 are active, the remaining set point is ignored.

Graphic. 5.1



Graphic. 5.2



5.2 Two independent maximum set points

Function programing dip switch **P2 MAX in »ON« position**

Effect:

If the set point P1 is exeeded, the relay R1 switches to »FAILURE« position with a delay t1. LED in R1 flashes
If the set point P2 is not attained, the relay R2 switches to »FAILURE« position with a delay t2. LED in R2 flashes. (In general: P2 can be set as maximum set point as well!)

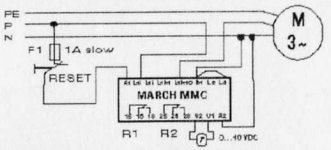
6. Function programing DIP switches

DIP-switch	OFF position	ON position
P2MAX Function selection	"window function" active: Output relay R1 switches to failure position if the max. set point in P1 is exeeded. (LED indicates FAILURE through flashing) Output relay R2 switches to failure position if the min. set point in P2 is not attained. (LED indicates FAILURE through flashing)	"2-maximum function" active: Output relay R2 switches to failure position if the first set point in P2 is exeeded. (LED indicates FAILURE through flashing) Output relay R1 switches to failure position if the second set point in P1 is exeeded. (LED indicates FAILURE through flashing)
R1 / R2 Relays	The relays R1 and R2 are dropped out during normal operation. During FAILURE they are activated.	The relays R1 and R2 are activated during normal operation. During FAILURE they are dropped out.
I = 0	Interruption of the current flow does not indicate FAILURE (e.g. when the motor is switched off)	If the current in phase L1 falls below 5% of the nominal value of the chosen current range, relays R1 and R2 are switching to the failure position. All LEDs are flashing.
MEM1 / MEM 2	Relays will switch automatically to normal position when the measured value is within the set limits.	Manuel resetting is required. Press reset key (or interrupt auxiliary supply).

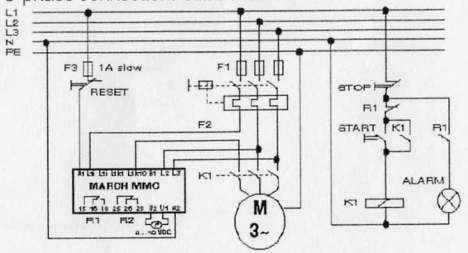
DIP switch time ranges:	LOW position	HI position
Switching delays for set points **t1 / t 2**	0,1 ... 5 sec	1 ... 5 0 sec
Time range for start-up bridging **START**	1... 10 sec	10...100 sec

7. Wiring diagrams (examples)

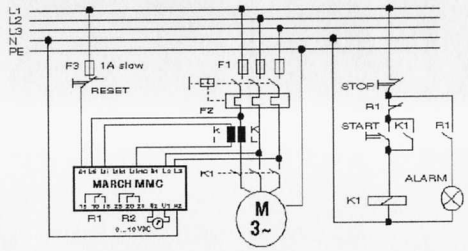
1-phase connection



3-phase connection: current on L1 < 10A



3-phase connection: with current transformer on L1



8. Technical data:

MMC 400 (values in parantheses apply to MMC 500V only)
Monitored power (without transformer): 23 ... 6930 W
Supply voltages:
12/24/42/48/110/127/230/400/440/500 VAC
Only transformer modules Typ TR3 .....V- are accepted!
Permissible variation of auxiliary voltage: +10% .. -15% U_N
Nominal power consumption: 4VA
Frequency range: 48...63Hz
Duty cycle: 100% IEC Klasse 1c

Environmental conditions
Ambient temperature range: -25°C bis +55°C
Class of application HVF according to DIN 40040

Accuracy
Repetition under constant conditions: ± 1% (± 2%)
Set points (in % of nominal load): ± 2% (± 5%)
Influence of temperature : ± 0.3‰ / °C
Frequency range.: ± 1,5%
(30 - 400Hz sin)
Time delays: ± 20%
Reset after failure of supply voltage ≥ 20ms
Ready after failure of supply voltage ≤ 1 sec.

Dimensions and standards
75 x 55 x 117 mm (H x B x T)
Railmounting according to DIN 46277/3 resp. EN 50 022)

MARCH MASTER CONTROL MMC 400V MMC 500V

External Electronic Load Monitoring

Use Instructions

MARCH PUMPEN GmbH
ADVANCED SOLUTIONS IN LEAK FREE PUMPTECHNOLOGY

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Protection class IP 40 accordingto VDE 0106 and VBG4
Screw terminals up to 4 mm²
Protection class of connecting terminals shrouted to human contact IP 20
Designation and arrangement accord. to DIN 46 199

Output 1 analog output 0 ...10VDC/1mA max.
2 x 1 separated change over: 250V~
Max. switching voltage: 440V... / 250V-
Max. continuous current: 5A
Switching capacity: 1200 VA
Mechanical life: ≥ 3 x 107 operations
Electrical life: ≤ 3 x 105 operations
(230V AC,5A,cos φ =1)
Contact material: silver- nickel thin film gold plated
Winding resistance L1K1:0 - 180W ± 15%
Winding resistance L1K10:0 - 18W ± 15%

Monitoring range (refer to chapter 2." Electr. conn....")
Load: 0 bis 99% of nominal load
Current / load: 0,1... 1 A steps from 0,1 A / < 130mΩ
1 ....10 A steps from1,0 A / < 20mΩ
I = 0 detection active below app. < 5% of nominal rage
Impedance correction: 0 ... 180 Ω / current 0,1 - 1,0A
0 ... 18 Ω / current 1,0 -10,0A

Time delays
Start up delays: 1 ... 100 sec
Error message: 0,1 ... 50 sec

1. Function:

The MMC 400V and MMC 500V determine the accepted electrical real power from the phases L1, L2 and L3 as well as from the current in L1 of symmetrical loads. Reactive power compontents caused by phase displacements between the current and voltage and fluctuations in supply voltage are considered. In addition, the internal resistance of the motor can be compensated. Failure is indicated through LED's. Two (2) independent maximum points can be selected and monitored. An analog output of 0 - 10V can be utilized.

2. Electrical connections:

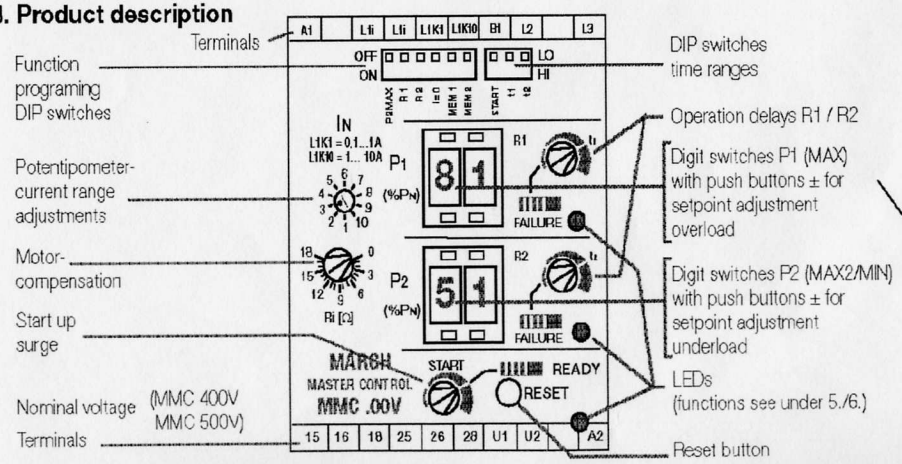
Caution ! Never install or dismantle the load monitor under voltage.

(Use only Pozidrive screw driver for the terminals)

Terminals	Application	Nominal rating 400V	Nominal rating 500V	Acceptable range 400V	Acceptable range 500V
A1 - A2 Auxiliary Supply	use only trafo modules TR3 ... V~	12... 440V~ 48 ... 63Hz	12 ...500V~ 48 ... 63Hz	+10% ... -15% according to printing on module	+10% ... -15%
L1i	Current phase L1; connected to line. Both L1 -terminals are internally connected				
L1k1	Current phase L1 connected to load	0,1... 1A ~	0,1... 1A ~	max. max. continuos current: 1,2A~	max.
L1k10	Current phase L1 connected to load	1... 10A ~	1... 10A ~	max. max. continuos current: 1,2A~	max.
L2...L3	phase voltage in 3-phase wiring	nom. Volt: 3... 400V	nom. Volt.: 3... 500V	measured Volt.: 3...100...415V	measured Volt.: 3...120...500V
B1	neutral (N) line in single phase wiring; not connected in 3-phase wiring	nom. Volt: 230V~	nom. Volt: 289V~	measured Volt.: 100...240 V~	measured Volt.: 120...289V~
15 16 ... 18	relay contacts (R1) for setpoint (P1)	μ - 250V~ / 8A resistive selective line-/operating voltage			
25 26 ... 28	relay contacts (R2) for setpoint (P2)	μ - 250V~ / 8A resistive selective line-/operating voltage			

Terminals	Application	Nominal rating
U1...U2	Analog output	0...10V / 1mA maximum, galvanically separated

3. Product description



4. Selection of operation parameters

4.1 Internal resistance of motor winding Ri: If the internal cooper looses of the motor are to be compensated, the internal resistance of the motor winding has to be measured and adjusted. Depending on the connection of the motor the potentiometer will be set as follows:

Connection (motor)	Measurement range	Effect
Delta-connected	10 A (terminal K 10)	measured value
Delta-connected	1 A (terminal K 1)	measured value / 10
Star-connected	10 A (terminal K 10)	measured value x 3
Star-connected	1 A (terminal K 1)	measured value / 3.3
One-phase	10 A (terminal K 10)	measured value x 3
One-phase	1 A (terminal K 11)	measured value / 3.3

If no compensation is wanted, the potentiometer Ri is turned to 0. The correct setting of the internal resistance improves the accuracy of the underload set point.

4.2 The current range is selected by choosing the terminals L1K1 bzw. L1K10

Current in phase L1 ≤ 1 A terminal L1K1 (MMC 400V only terminal L1K may be selected)

Current in phase L1K ≥ 10 A terminal L1K10

The with the switch - I_N - selected current range may be exceeded by max. 10%, without measurement errors occuring.

Load type	Current range	max. Overload	Effect
$I_N \leq +10\%$ continuing	depending on selection	1,1 x I_N	correct measurement
I_{MAX} continuing	terminal K1 terminal K10	1,2A 12 A	no correct measurement no damage to machine
I_{MAX} briefly	terminal K1 terminal K10	4 A 40 A	no correct measurement **if load exceeds1 sec – machine damage will occur!**

Start-up bridging:

The start-up bridging ignores the increased start-up current for a set duration when the auxiliary voltage of the monitor is switched on at the same time as the load. If the start-up is also to be monitored, the start-up current must be considered accordingly for the selection of the current range.

Example: 4-pole, 3-phases, acynchronous motor with measurement power.
Shaft power = 1,1kW • nominal current $I_N \triangleq 2.8A$ (= 3 A) • nominal voltage U_N = 3 ~ 380V
• phase displacement cos φ = 0,8
On the MCC 400V or MVCC 500V choose 3A for the selection of the current range => 3

4.3 Determining the set points

Select the current range according to the given data in 4.2. The max. or min. set points (%) are adjusted by using the push buttons () of the decade switches P1 and P2. The calculation of the correct values is shown in 4.4.

Important: Before the set points are adjusted, please check that the correct current range has been selected on the potentiometer (I_N).

4.4 Selecting the set points Max.- and Min. MMC 400V ... MMC 500V (see also 4.2)

(For nominal data please refer to instructions or type plate of the motor/machine.)

How to find the correct set points - computing example:

1.) Nominal power range of the motor I_N = 2,8A, U_N = 380V, cos φ = 0,8

$P_N = \sqrt{3} \times I_N(A) \times U_N(V) \times \cos\varphi$
$= \sqrt{3} \times 2{,}8 \times 380 \times 0{,}8$
$= 1.474\ W$ = adjustment ≙ 100%

2.) => $\frac{1474\ W}{100} = 14{,}74W \triangleq$ 1 scale intervall

3.) Required monitoring range MIN. = ... => MIN. = 750W / MAX. = 1200W

Calculated scale interval, Max. (1200W) = $\frac{1200}{14{,}74} = 81{,}41 \approx \boxed{81}$ = set point overload (P1 - MAX)

Calculated scale interval, Min. (750W) = $\frac{750}{14{,}74} = 50{,}88 \approx \boxed{51}$ = set point underload (P2 - MIN)

Stand 26.02.97 Korrektur