M400

MOTOR PROTECTION &

MANAGEMENT RELAY

VERSION 3.5

NINGI SERVICES (PTY) LTD

TOLL FREE 0800 000 400
082 556 7682

Presenting the ***M400*** Motor Manager

The M400 performs the functions of up to seven individual units.

BACKGROUND

The M400 Motor manager was designed to control and protect pumps and related units such as motors. Through effective management systems, the unit saves lives and electricity. The motor will only operate when necessary thus also saving on wear and tear.

Impressive examples of saving on repairs and downtime, increased reliability and safety enhancements are available from all our satisfied customers.

Why is the M400 unique?

The M400 is based on the M300, an earlier model, which has a proven track record through extensive exposure during the last couple of years. Improvements from the M300 include the stopping and starting of either the motor or pump with Infrared remote control.

With this new remote function, with the on-board infrared receiver, parameters can be set and changed by the customer according to his own individual needs. Data can now readily be downloaded or retrieved. This data represents a history printout directly to a printer. An earth leakage protection facility makes the M400 a worldwide leader in pump and motor protection.

Safety

The M400 saves LIVES as it can be operated during healthy working conditions, with full remote control functionality. (No physical contact to operate).

A Safety start, Press-release action, is available and changeable via the remote control for pumps working from level control switches. A customer specified Earth Leakage threshold limit.

Protection offeredby the M400.

- Phase loss detection
- Phase sequence detection
- Dry run/Under current (Selectable level and time)
- Pump blockage/Over current protection (Selectable level)
- Over voltage protection (Fixed level and time)
- Under voltage protection (Fixed level and time)
- No load detection/CT open circuit
- Single phase protection between motor and contactor
- Motor short circuit protection (Fixed curve)
- Earth leakage protection (Fixed level)

System Management offered by the M400.

The M400 manages systems by means of:

- An auto start function after all faults are clear (Adjustable)
- A manual safety start feature
- An auto start after a Dry run
- A connection to a PLC. or Telemetry system (Optional)
- 2 x On board hour meters
- On screen display of the history data

Brief description of the operation of the M400.

The M400 checks the three phases, CT, Core balance, Stop and Start switches. When all is OK and AUTO start is programmed, the M400 will start the motor/pump after the preset time. When the motor exceeds the load limits the M400 will stop the motor and restart (if programmed) the motor/pump after the set time. Any other faults such as Earth fault or Phase loss will stop the motor immediately.

Features of the M400.

- Self test facility, including Circuit test
- Alpha numeric display to indicate state of pump/circuit
- Timer functions to start/re-start the motor
- Remote Stop/Start
- Remote adjustments u/c, o/c, timers etc
- Number of minutes between starts
- Data logging (Hour meters & History)
- On board hour meters
- Run low/high indications
- Auto start off or count down
- Auto stop after preset time
- Dry run count down
- Over current count down
- All parameters adjustable via infrared remote control
- Toll free technical support line 0800 000 400

Advantages of the M400.

- Protects the equipment, saving on down time, and therefore increases reliability
- The system is installed inside the starter panel of the equipment and fits onto a standard “Din Rail” mounting
- 11 Pin plug in unit
- Easy installation and initial set-up, there- after no further operation adjustments required
- Easy calibration/Check calibration
- Low voltage on the Stop and Start button
- Added safety offered is the auto start and Earth leakage protection
- Start button activates when released
- Auto start after fault detection, even after total power loss
- Difficult to bypass unit
- User friendly

Typical applications of the M400.

The M400 is suitable for a wide range of applications, these include the mining, agriculture, food, chemical, and shipping industries, and more specifically the following:

- Pumps located in remote areas
- Mining dewatering pumps
- Irrigation pumps
- Pump control for pipe line systems
- Crude oil and fuel pumps
- Sewerage and sludge pumps
- Compressor pumps
- Air conditioning and cold room pumps
- Conveyor belt drive systems
- Fan motors

M400 Quality means

- Five year limited warranty
- State of the art surface mount technology
- Highest quality components available in the world
- Vibration resistant printed circuit boards
- Self diagnostic software
- High speed RISC type micro controller

M400 Remote control settings.

The M400 is programmable by means of a preset remote control that allows total flexibility and complete personalization of each and every unit.

M400 Accessories

- M400 Auxiliary contacts
- DL77 data logger and printer for the downloading of data
- Current transformer
- Core balance (30mA, 100mA, 250mA or 375mA)
- Din rail mounting of CT regulator and voltage converter

Quick Starting the M400.

1. Connect the M400 as per drawing
2. After power up, the display should read Auto/Off or Auto/60. (If not refer to faultfinding)
3. Push the start button and release after 1 second. The M400 will now start the motor.
4. Press and hold the start button.The reading on the display should read 100%. If the load is less than 100% turn the CT regulator clockwise until the load is 100%. If the CT regulator reaches it's limit before 100% of the load is reached, increase the number of turns through the CT.
5. If the load is more then 100% turn the CT regulator anti-clockwise until the reading is 100%. If the CT regulator reaches it's limit before 100% of the load is reached,decrease the number of turns trough the CT.Should the motor trip before the setting is obtained, push the STOP button, or switch the power off and on, then restart the motor as in 3.

M400 Adjustment.

1. While the motor is running and the START button (Manual or remote) is pressed, the M400 will display the load.
2. Timers for various functions are available.

Fault Finding on the M400.

No display on the M400.
-Check the supply voltage,M400 connections 2 and 3.
Phase loss line
-Check the Three incoming phases, M400 connection 9,10 and 11

Phase rotation
-Incoming phases in the wrong direction

CT open circuit
-Check the wiring from the CT; check the CT.M400 connection 4 and 5

Core balance open circuit
-Check the wiring from the Trans core; check the Trans core, M400 connection 4 and 6

Stop
-Stop switch open circuit or pressed.

Auto or Off latched
-Start switch closed or pressed

Phase loss load after start
-Excessive or no current drawn by motor

M 400 Remote control settings

Button definition

Button	*Function*
CH+	Enter menu, move up in menu
CH-	Move down in menu
V+	Increase the value
	Data playback
V-	Decrease the value
	Reset the REST time
	Clear the data.
Enter	Save the altered information
Start	Start the M400
	Display the load
Stop	Stop the M400

How to enter the Menu

Press CH+ on the remote control to enter the program

Which TYPE to use

Type	40	Limited access to program
Type	29	Advanced settings
Type	44	Show “RUN” on screen
Type	46	Show “%” on screen
Type	63	Lock out after over current
Type	255	Default the M400

Use V+ or V- to move to the required TYPE then press CH+ to move up in the program.

M400 Menu structure description.

AUTO: M400 Relay closes motor contact automatically after set time has lapsed.
PRIM: Time from start-up of motor to the condition where the load current is between the setable limits of OCP and UCP (Graph 1)
AOFF: M400 Relay opens the motor contact automatically after the set time has lapsed.
DRY1: M400 Relay restarts the motor automatically by closing the motor contact after the first under current condition.
DRY2: M400 Relay restarts the motor automatically by closing the motor contact after the second under current condition.
UCDT: Timer to delay under current trip condition.
SUDT: Setable time for start-up of the motor until the start current level reduce to a level less than 255% of load current.(Graph 2)
OCC: Number of restarts allowed after the M400 relay tripped due to over current condition..(Type 63 to block function)
OCWT: Setable value in minutes for the M400 relay to wait before restarting the motor after an over current trip.
UCP: Setable level for under current level. (Full load current of motor =100%)
OCP: Setable level for over current conditions of motor. (Full load current of motor =100%) (Graph 3)
MPS: Setable value in minutes to allow the motor to rest between starts.
SAFE: When the setting is "on" the start push button must be pushed and released before the motor will start.
When the setting is "off" the start button need not be held in.

PHSE: When the setting is "on" the M400 relay needs all three phases to operate.
When the setting is "off" the M400 relay does not need any phases to operate. (Single phase motors)
AUX: For use with external relay. (Version 4.5,4.6,)
CODE: Access to internal operations. Not to be used by client except:
A:) Code 30 to multiply the leakage current level by two during start up condition. This function will automatically reset once the PRIM time has lapsed after start-up..
B:) Code 6 to block all protection functions for two minutes to set up relay.

This is what you can set on TYPE 40

Menu Structure	*Setting*	*Unit*	*Description*
TYPE	0-255		
AUTO	Off-255	Minutes	Auto start timer
PRIM	2-255	Seconds	Allow pump to prime
AOFF	Off-255	Minutes	Auto off timer
DRY1	Off-255	Minutes	Restart after first dry run
DRY2	Off –255	Minutes	Restart after second dry run

This is what you can set on TYPE 29

Menu Structure	*Setting*	*Unit*	*Description*
TYPE	0-255		
AUTO	Off-255	Minutes	Auto start timer
PRIM	2-255	Seconds	Allow pump to prime
AOFF	Off-255	Minutes	Auto off timer
DRY1	Off-255	Minutes	Restart after first dry run
DRY2	Off –255	Minutes	Restart after second dry run
UCDT	1-15	Seconds	Under current delay timer
SUDT	.1-5.0	Seconds	Start up delay timer
OCC	1-5	Starts	Restart after over current trip
OCWT	Off- 255	Minutes	Wait time after over current trip
UCP	10-100	Percent	(Under current trip 100%= Full load)
OCP	100-255	Percent	Over current trip 100%= Full load)
MPS	Off-255	Minutes	Minutes between start
SAFE	ON-OFF		Safe start on/off
PHSE	ON-OFF		Phase detection on/off
AUX	0-255	Number	Use with external relay
CODE	Level3 access to internal operation.		

M400 History Record

ID NUMBER	BBGH	
TOTAL HOUR	207:58	HOURS
LAST HOUR	16:15	HOURS

TOTALS		
DRY RUN TOTAL	18	EVENTS
OVER CURRNET	7	EVENTS
CT FAIL	2	EVENTS
EARTH FAULT	2	EVENTS
PHASE LOSS LINE	3	EVENTS
TOTAL STARTS	9641	

LAST TRIP FIRST	**RUN TIME BEFORE TRIP**	**LOAD AT TRIP**
Dry run 2	0:05	58%
Dry run 1	5:16	58%
Phase loss line	12:34	100%
Dry run 1	58:02	45%
Earth fault	45:45	102%
Earth fault	38:12	97%
Over current	12:09	156%

Current Settings

TYPE	40	
AUTO	1	MIN
PRIM	3	SEC
AOFF	OFF	MIN
DRY1	15	MIN
DRY2	60	MIN
UCDT	3	SEC
SUDT	0.8	SEC
OCC	3	TIMES
OCWT	5	MIN
UCP	60	%
OCP	120	%
MPS	4	MIN
SAFE	OFF	
PHASE	OFF	Phase Detection
AUX	18	Auxiliary Contacts

M400 Electrical Specifications

Control voltage	110v/220vAC
Power dissipation	2.8va
Phase voltage input	220v/380v/525v/1000v
Motor load size	0.25W-5MW
Relay output	10A@250vAC
Current Transformer	200:1 (0-50Amps)
Case Material	ABS Plastic
Operating temperature	-10°C to 65°
Earth Leakage protection	30mA/100mA/250mA
Size	41x76x90 (WxHxD mm)

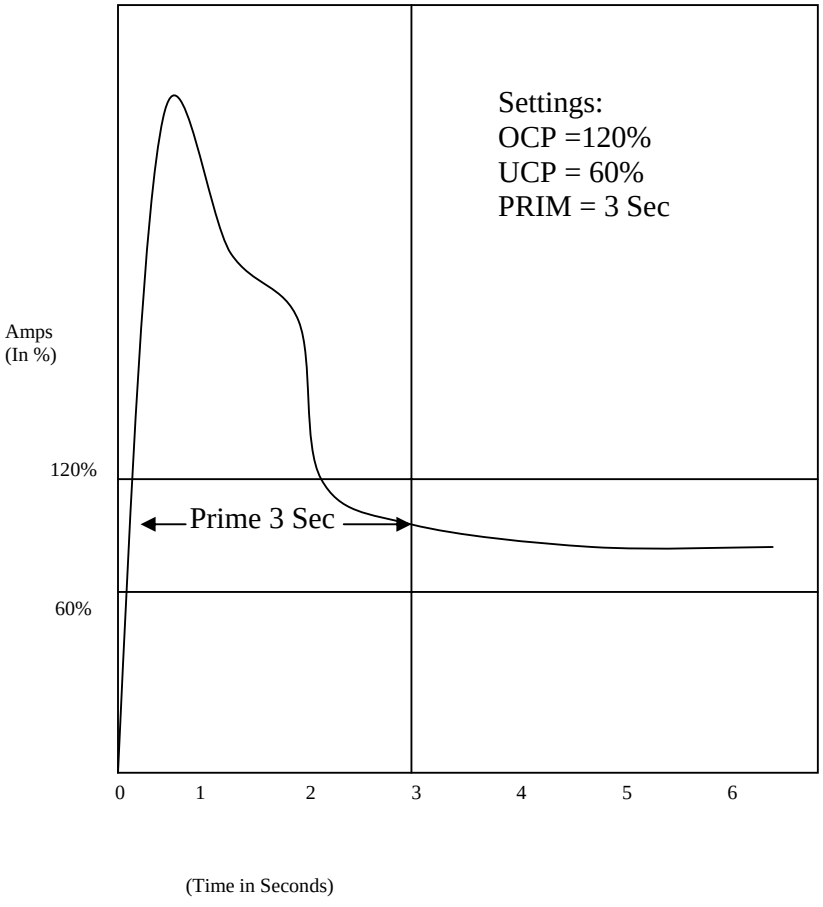
M400 Start-up

When starting the M400 relay the following will be displayed.

Display	**Meaning**
^	SUDT Time
ON	Prime time
RUN	Motor runs between set limits
RUN LOW	Motor runs close to Under Current limit
RUN HIGH	Motor runs close to Over Current limit

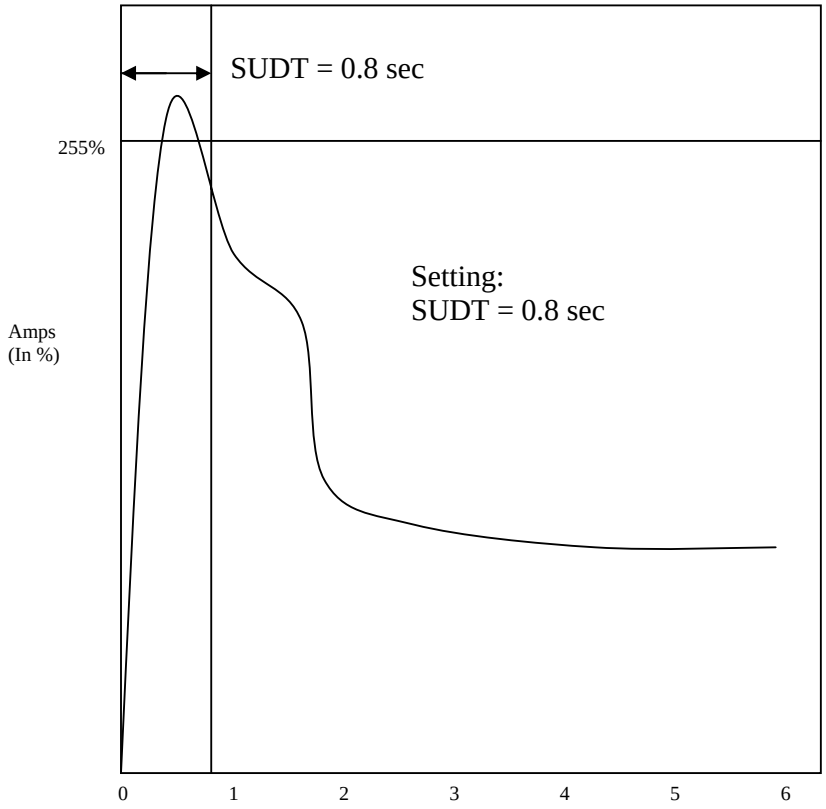
Graph 1

Start-up Curve

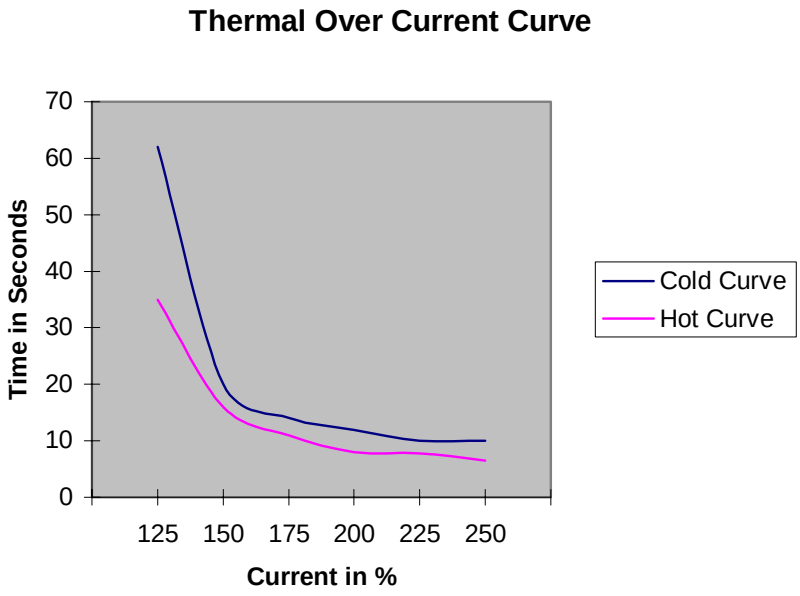


Graph 2

Start-up Curve



Graph 3



Setting: Prim = 3 Seconds

Cold Curve: Time from start-up to trip. When PRIM = 5 add 2 seconds to operating time. When PRIM = 11 add 8 seconds to operating time.

Hot Curve: Hot curve only activates 4 minutes after start-up