

UNIVERSAL GAS VALVES

MT4000 Series

SERVO MOTORS FOR AIR DAMPERS AND BUTTERFLY VALVES

PRODUCT HANDBOOK



APPLICATION

The MT4000, MT4001, MT4002 and MT4003 are servo motors to control and govern air lock of gaseous and liqued fuels.

The servo motors are suitable for burners with small to medium capacity.

Contents

General	
Device functions	2
Features	3
Technical	
Specifications	4
Dimensional drawings	5
Installation and operation	
Installation and final checkout	6
Electrical connections	7-8
MT4000 servo motors for general applications	9
MT4000 Servo motors combinations with various ignition controllers	10-19
Example Working Principles	20-22
Various	
Standards and approvals	23 -25
Ordering information	26
Replacement parts and accessories	27

DEVICE FUNCTIONS

MT4000A/B series

The MT4000 series are for general use on combustion air dampers and VF5000 butterfly valves. The A version is used with separate power lines to drive the motor to high fire or low fire position. The B version is used in combination with a relay to allow the motor to drive to high fire when the relay is energized and drive to low fire when the relay is de-energized. There are 2 micro switches for auxiliary use.

MT4001A series

The MT4001A series can be used with full featured ignition controllers and 3 wire thermostats. This type of motor has three switches for fixed positions of the motor: OFF, low fire and high fire. There is an additional, single pole double throw switch available, which can for example be used for two stage operation of a burner.

Optional: push button to allow independent movement of the motor to adjust the low fire position of the damper during installation.

MT4001B series

This type of motor can be used with full featured ignition controllers, where the ignition controller is providing the burner sequence including the drive to high fire during pre-purge. The motor has three switches for three fixed positions of the motor: OFF, low fire and high fire. There is an additional, single pole double throw switch available, which for example can be used for two stage operation of a burner.

The motor can be used with the following ignition controllers:

gas/oil: Honeywell: 7800 SERIES Controllers
Landis & Gyr: LFL, LGK and LAL.

Optional: push button to allow independent movement of the motor to adjust the low fire position of the damper during installation.

MT4001C series

This type of motor can be used with Satronic TMG740. The ignition controller is providing the burner sequence including the drive to high fire during pre-purge. The motor

has four switches which enables the motor to drive to the following three fixed positions: OFF, low fire and high fire. Additional there is a Single Pole Double Throw (SPDT) switch available, which can for example can be used for two stage operation of a burner.

Optional: push button to allow independent movement of the motor to adjust the low fire position of the damper during installation.

MT4002B series

The MT4002B series can be used in application, where it is allowed to have pre-purge on low fire. This type provides the pre-purge on low fire during the start up sequence.

The motor can be used with the following ignition controllers:

oil: Landis & Gyr LOA
Brahma GF2
Satronic TF832

Optional: push button to allow independent movement of the motor to adjust the low fire position of the damper during installation.

MT4003C series

The MT4003C series can be used with standard ignition controllers and provides internally the burner sequence to drive to high fire during pre-purge. A fail safe pre-purge timer provides pre-purge during 20 seconds on the high fire position. The motor can be used with the following ignition controllers:

gas: Landis & Gyr LGB21
Brahma MF2
Satronic MMG811

Optional: push button to allow independent movement of the motor to adjust the low fire position of the damper during installation.

Table 1. Cross Reference Matrix.

Ignition Controller		MT4001A	MT4001B	MT4001C	MT4002B	MT4003C
Honeywell	gas	-	EC7800 SERIES	-	-	-
	oil	-	EC7800 SERIES	-	-	-
Landis & Gyr	gas	LFL1-	LFL1-	-	-	LGB21
	oil	LAL2-	LAL2-	-	LOA-	-
Satronic	gas	-	-	TMG-740	-	MMI810-811 MMG810-811
	oil	-	-	-	TF832	
Brahma	gas	-	-	-	-	MF2
	oil	-	-	-	GF2	

FEATURES

- Synchronous reduction gear unit motor.
- Camshaft with maximum 5 cams and maximum 5 micro switches.
- Fail safe pre-purge timer (MT4003C only)
- Low fire adjustment switch to allow independent movement of the motor (optional, except for MT4000A/B).
- Cam adjustment in steps of 2 degrees.
- Actuator shaft, round with flat surface.
- Position indicator of the motor.
- Available in left and right handed rotation.
- Cam adjustment tool included in the housing.

SPECIFICATIONS

Models

MT4000A series for combustion air dampers and VF5000 butterfly valves. External signals for modulation required.

MT4000B series for combustion air dampers and VF5000 butterfly valves. Including relay for one external modulation input.

MT4001A series for air dampers in gas burners. To be used with full featured ignition controllers and 3 wire thermostats.

MT4001B series for air dampers in gas burners. To be used with full featured ignition controllers and 2 wire thermostats.

MT4001C series, special model, *only* for use with Satronic TMG740 ignition controller. The ignition controller is providing the burner sequence including the drive to high fire during pre-purge.

MT4002B series for air dampers in oil burners. Including relay for 2 wire thermostat connection.

MT4003C series can be used with standard low featured ON/OFF ignition controllers, where the pre-purge is provided by the servomotor. Including relays for 2 wire thermostat connection, low fire adjustment switch and fail safe pre-purge timer.

Dimensions

Height: 92 mm
 Width: 80 mm
 Depth: 135.5 mm

See also Fig. 1.

Supply voltage

Line voltage: 220 ... 240 Vac, 50/60 Hz
 110 Vac, 50/60 Hz

Maximum voltage

Current of micro switches: 250 Vac, 10A (ac) and 2A(dc)

Ambient temperature range

-15 ... 60 °C

Relative humidity: 0 – 90% at 40 °C (non-condensing)

Rated torque value

Maximum torque at 6s rotation time over 90 degrees: 1.5 Nm

Maximum torque at 12s rotation time over 90 degrees: 1.5 Nm

Maximum torque at 24s rotation time over 90 degrees: 3.0 Nm

Maximum diagonal force

300N, when mounted with 4 screws

Stroke timing over 90 degrees

6, 12, 24 and 30 s at 50 Hz

At 60 Hz, the timing is reduced with approximately 20%

Maximum adjustable stroke

0 to 160 degrees

Enclosure

IP40

Mounting and orientation

There are no restrictions in the mounting angle of the motor.

The motor can be assembled by 4 screws. For mounting hole dimensions, see installation drawing.

Minimum camshaft step

2 degrees (including mechanical tolerances).

Wiring

Two PG9 wiring conduits are provided in the housing.

NOTE: The PG9 wiring conduits do not provide strain-relief according to EN60730-1 and EN60335-1.

Finish

The servo motor is mounted in a black housing with transparent plastic cover, which can be removed by loosening 2 screws.

Pre-purge timer (MT40003C only)

25 seconds nominal, tolerance -5 s, +5 s.

Design life

Model	Number of Cycles
All models MT4000 Series	250.000

DIMENSIONAL DRAWING

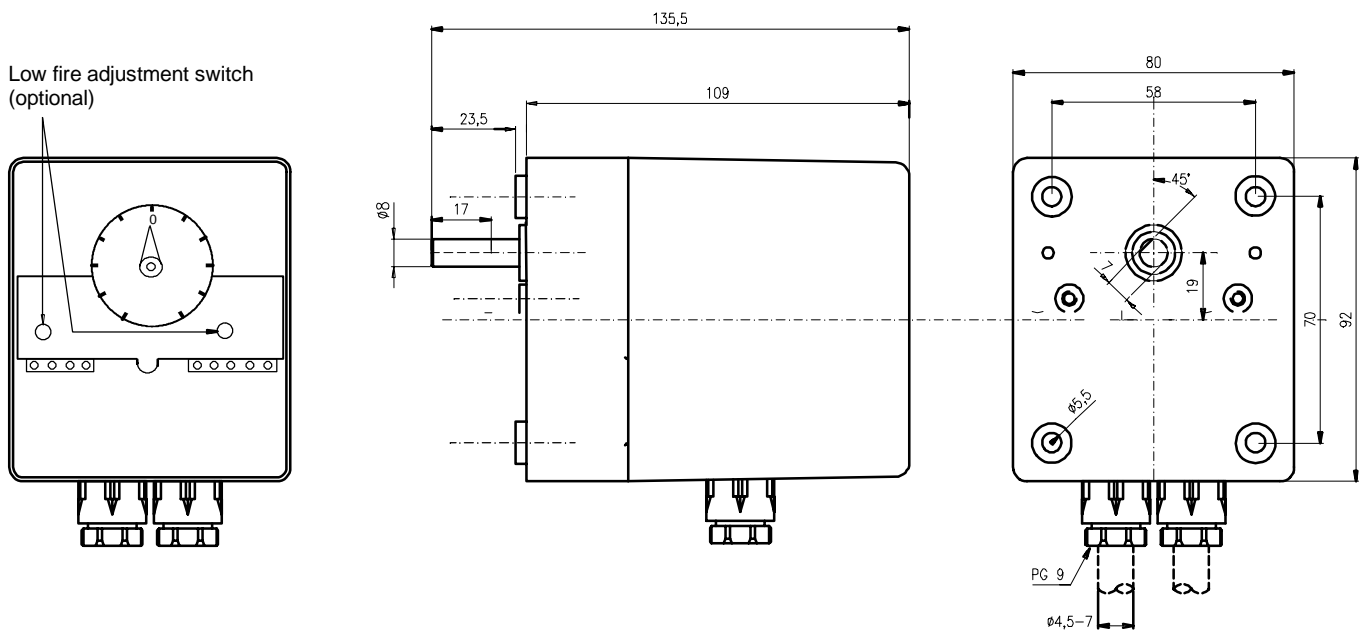


Fig. 1. Installation drawing

INSTALLATION AND ADJUSTMENTS

IMPORTANT

1. Installer must be a trained experienced service man.
2. Disconnect power supply to prevent electrical shock and/or equipment damage.
3. When the MT4000 is used in stand alone applications, use a proper strain-relief.
4. The appliance manufacturer's instructions should be followed when provided.
5. Carry out thorough checkout when installation is completed.

Functions of cams:

MT 4000 A/B series		MT4001 A/B/C, MT4002B & MT4003C series	
cam		cam	
I	high fire position of air damper motor	I	high fire position of air damper motor
II	closed position of air damper motor	II	closed position of air damper motor
III	auxiliary switches	III	low fire position of air damper motor
IV	auxiliary switches	IV	low fire position of air damper motor
		V	switches the second stage operation of the gas valves

Cam adjustment for servo motors with right hand rotation

MT4000A/B series	
cam	
I/III & IV	Rotate the cam clockwise to increase the opening position of the air damper Rotate the cam counter-clockwise to decrease the opening position of the air damper
II	Factory set at 0 degrees, to start air damper in closed position
MT4001A/B/C, MT4002B & MT4003C series	
cam	
I	Rotate the cam clockwise to increase the high fire position of the air damper Rotate the cam counter-clockwise to decrease the low fire position of the air damper
II	Factory set at 0 degrees, to start the air damper in closed position
III/IV	Rotate cam clockwise to increase the low fire position of air damper Rotate cam counter-clockwise to decrease the low fire position of the air damper
V	Rotate the cam clockwise, to delay the switching of the second stage gas valve Rotate the cam counter-clockwise, to advance the switching of the second stage of the gas valve



WARNING

- Adjustment should be made by qualified personnel only.
- If the appliance manufacturer supplies checkout and/or service and maintenance instructions, carefully follow them.
- All adjustments on the cams should be done *after* disconnecting the power supply.

Adjustment for cams

Disconnect the power supply and remove the cover. Use adjustment tool inside the cover to adjust the cams. Place the tool in one of the cam grooves to turn the cam in steps of approximately 2 degrees.

Factory set "zero position"

All motors are factory set with zero position corresponding with 45 degrees angle of flat surface on actuator shaft (see Figure 1. When field re-adjustment of zero position is necessary, rotate cam II (clock or counter-clockwise) to zero position and re-adjust arrow on scale manually.

Low fire adjustment switch (optional)

A push button switch, to activate electrically movement of the cam assembly, independent from the flame relay signals, is optional on MT4001B, MT4001C, MT4002B and MT4003C type of servo motors. Use the push button switch to move the cam assembly forward during (re)adjustment of the low fire position of the damper. When this push button is pressed down, the motor will drive to high fire position. When the push button is released, the motor will drive to low fire position. Depending on type, it is positioned either on left or right side of the front plate.

Cam adjustment for servo motors with left hand rotation

MT4000A/B series	
cam	
I/ III & IV	Rotate the cam counter-clockwise to increase the opening position of the air damper Rotate the cam clockwise to decrease the opening position of the air damper
II	Factory set at 0 degrees, to start air damper in closed position
MT4001A/B/C, MT4002B & MT4003C series	
cam	
I	Rotate the cam counter-clockwise to increase the high fire position of the air damper Rotate the cam clockwise to decrease the low fire position of the air damper
II	Factory set at 0 degrees, to start the air damper in closed position
III/IV	Rotate cam counter-clockwise to increase the low fire position of air damper Rotate cam clockwise to decrease the low fire position of the air damper
V	Rotate the cam counter-clockwise, to delay the switching of the second stage gas valve Rotate the cam clockwise, to advance the switching of the second stage of the gas valve

ELECTRICAL CONNECTIONS

IMPORTANT

Protective earth wires of external connected devices etc. should be connected to the MT4000 earth terminal according to the manufacturer's instructions (max. 2 devices)

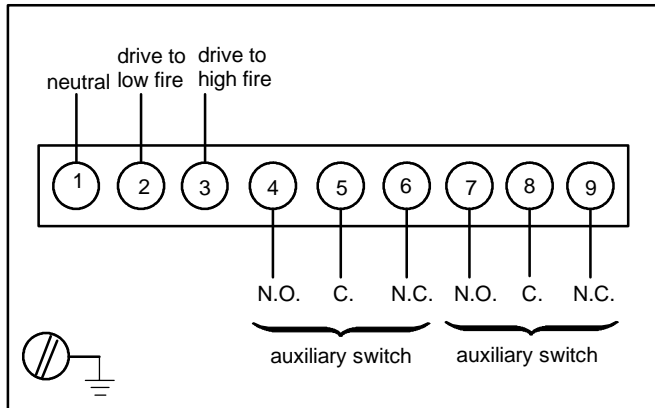


Fig. 2. Wiring diagram MT4000A

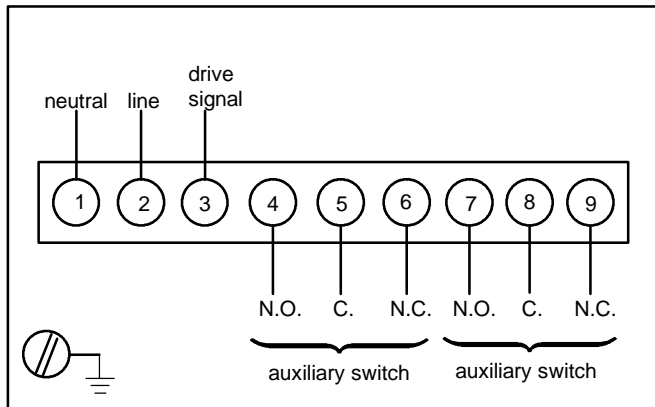


Fig. 3. Wiring diagram MT4000B

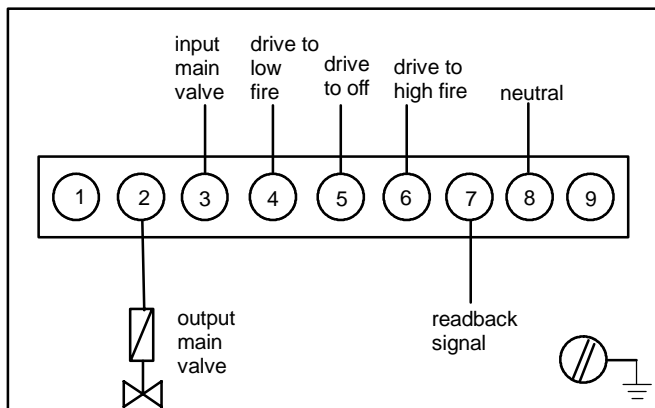


Fig. 4. Wiring diagram MT4001A

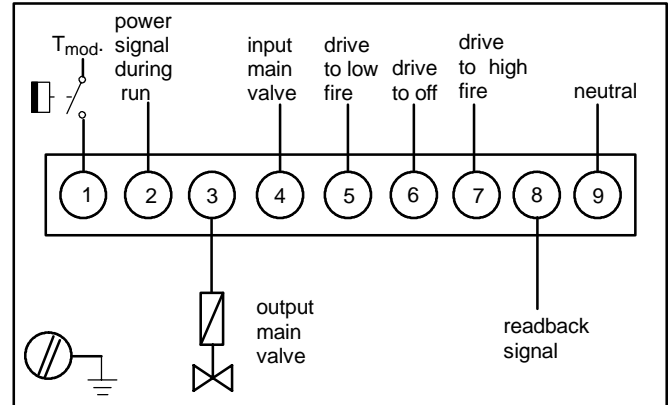


Fig. 5. Wiring diagram MT4001B

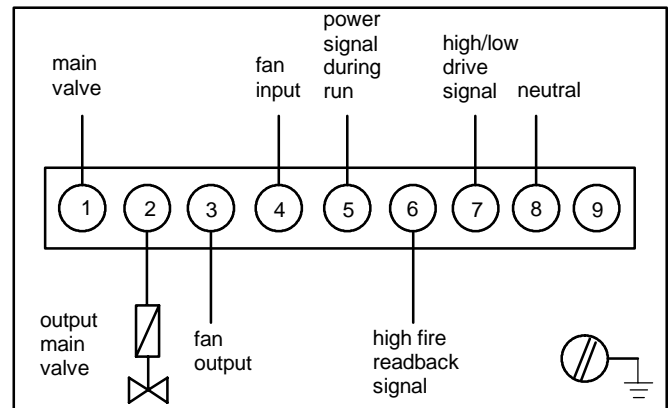


Fig. 6. Wiring diagram MT4001C

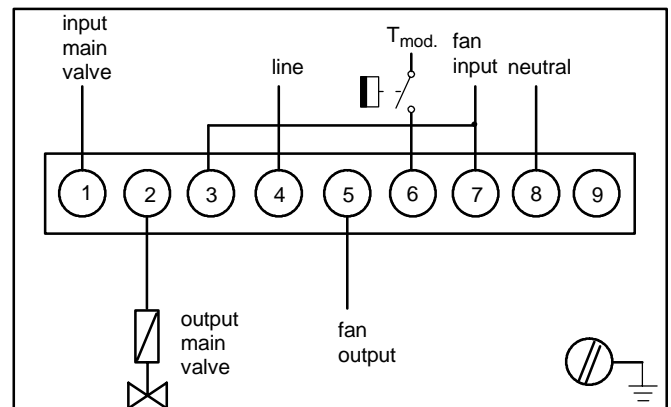


Fig. 7. Wiring diagram MT4002B

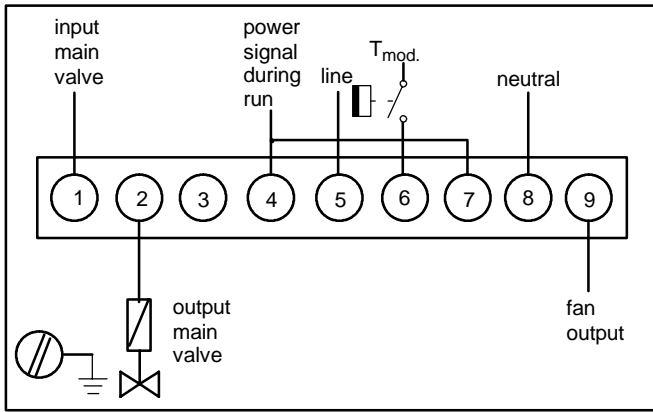


Fig. 8. Wiring diagram MT4003C

MT4000 SERVO MOTORS for general applications

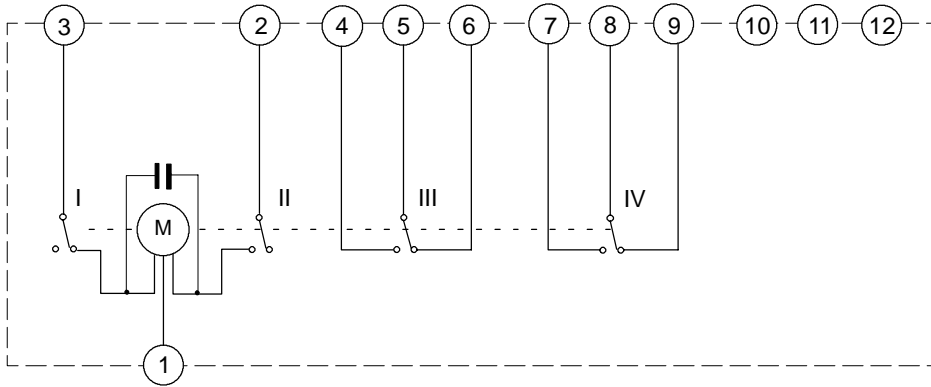


Fig. 9. Wiring diagram MT4000A

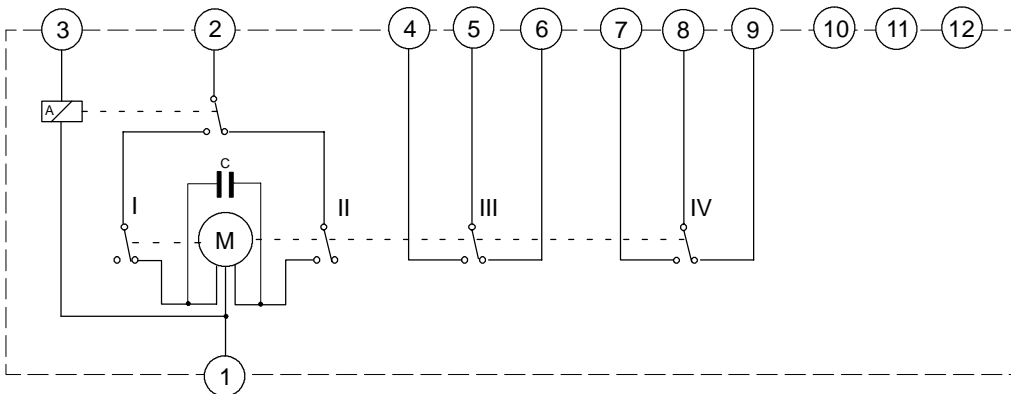


Fig. 10. Wiring diagram MT4000B

MT4000 SERVO MOTORS COMBINATIONS

with Various Ignition Controllers

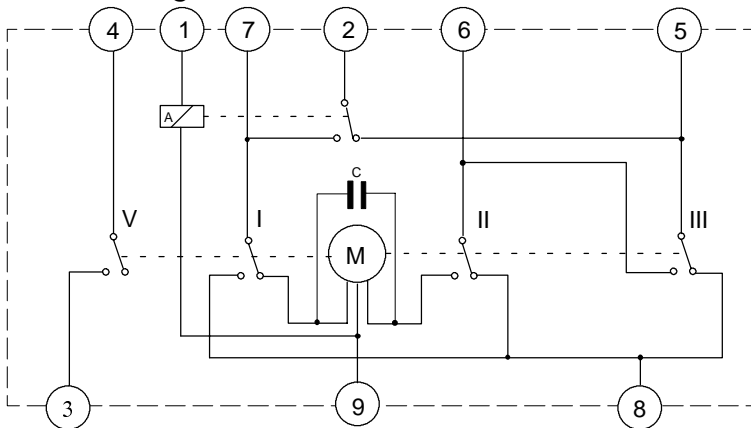


Fig. 11. Wiring diagram MT4001B

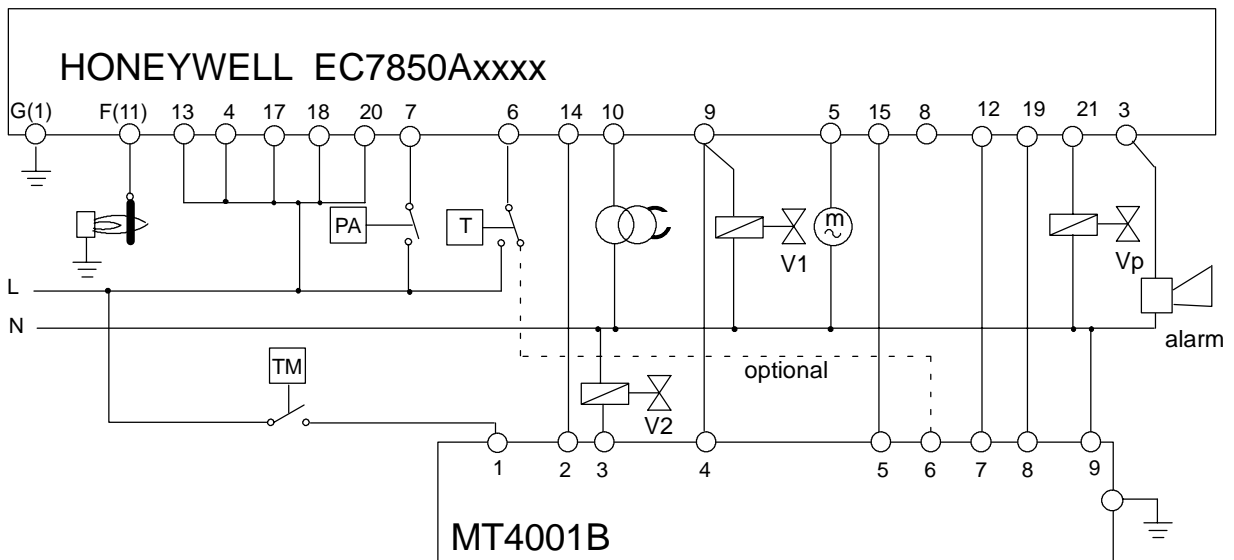


Fig. 12. Connection diagram Honeywell EC7850A - MT4001B

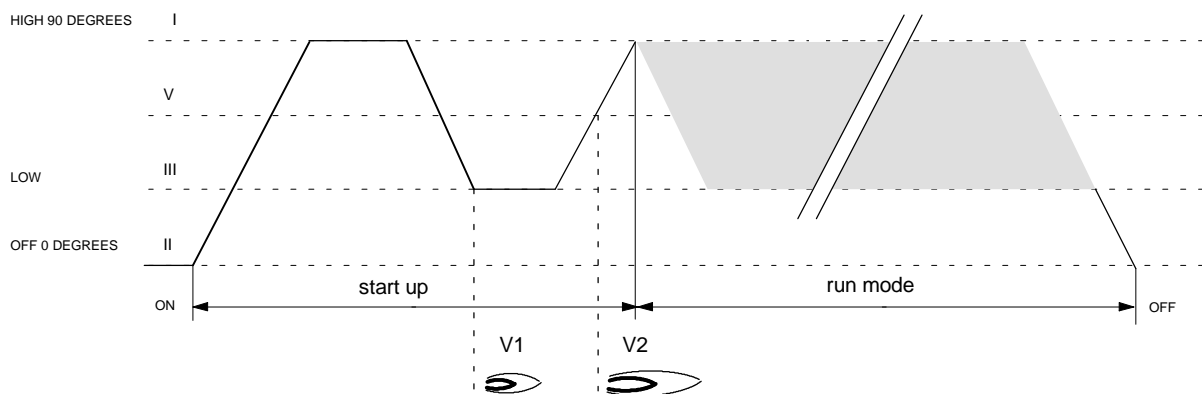


Fig. 13. Sequence diagram MT4001B

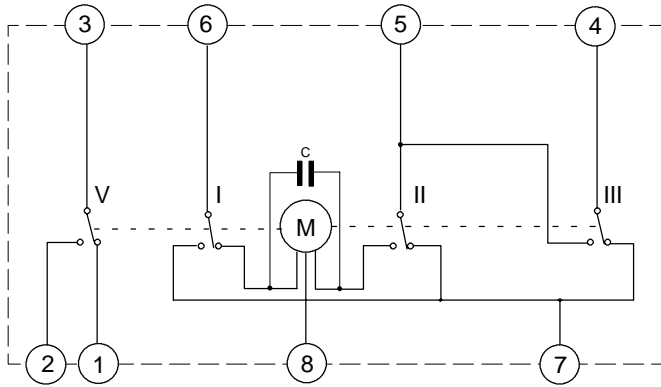


Fig. 14. Wiring diagram MT4001A

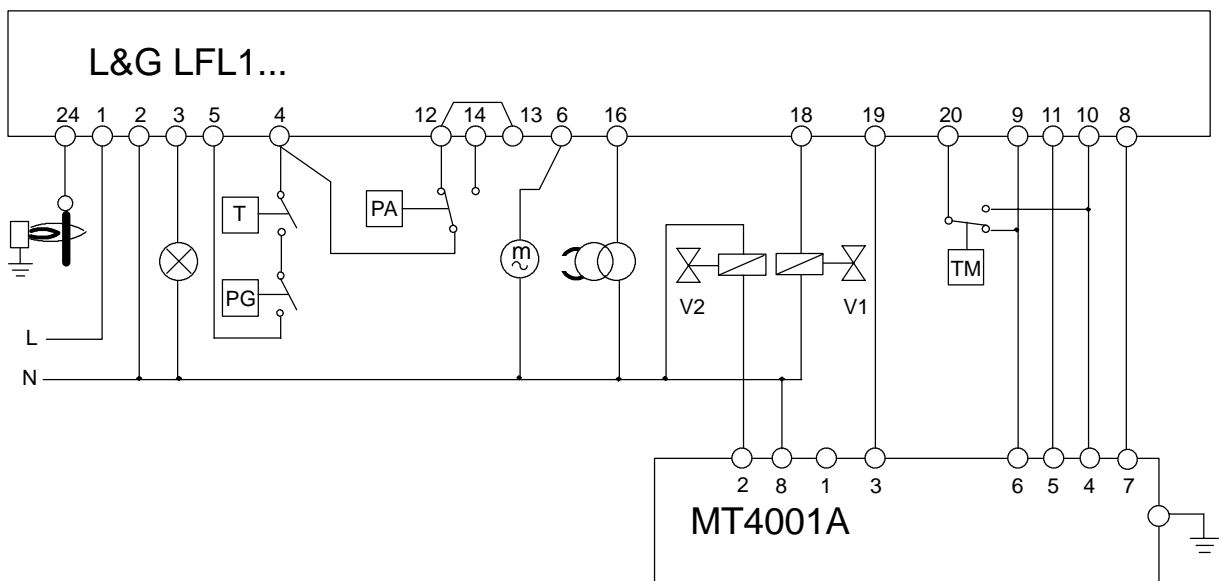


Fig. 15. Connection diagram L&G LFL1 - MT4001A

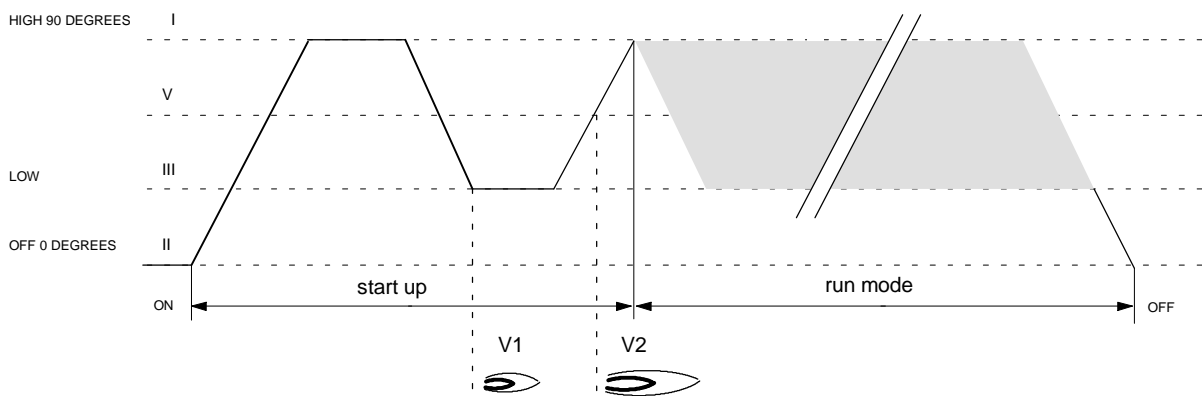


Fig. 16. Sequence diagram MT4001A

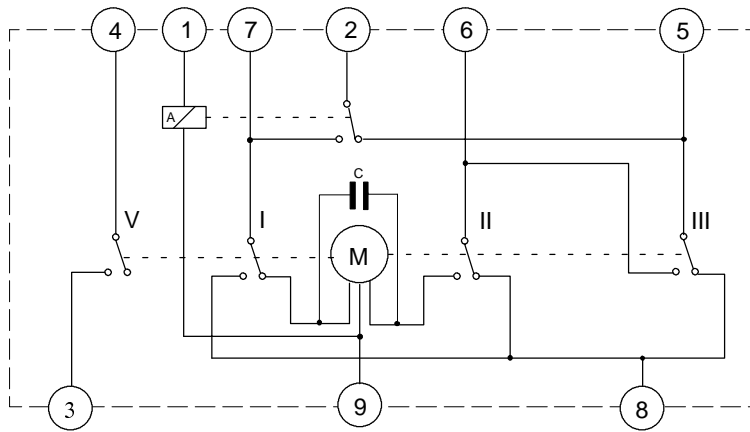


Fig. 18. Wiring diagram MT4001B

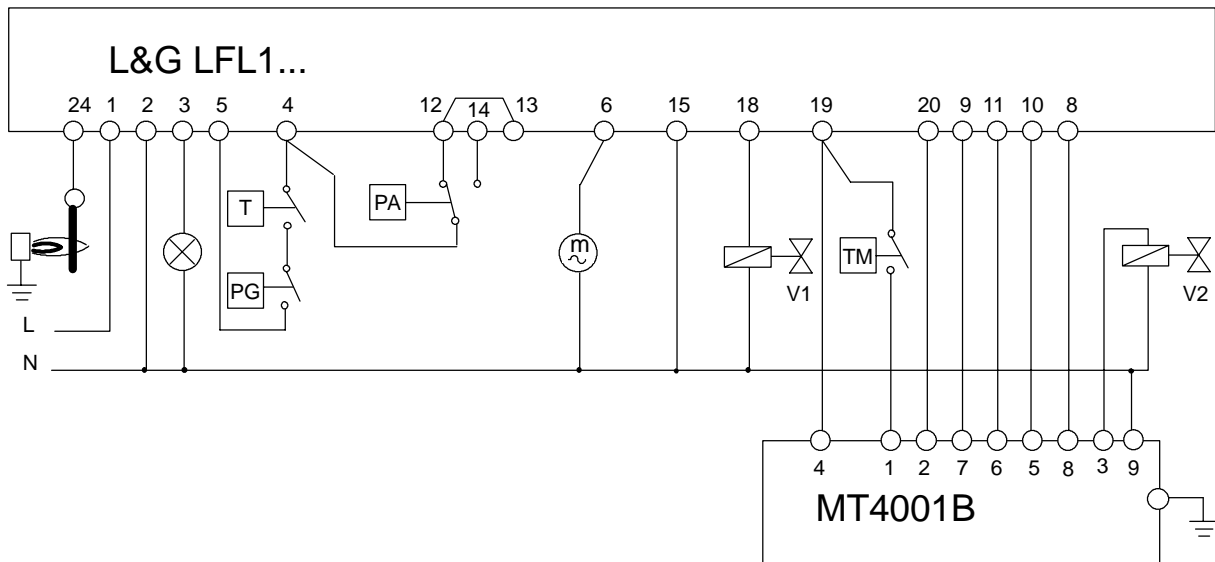


Fig. 17. Connection Diagram L&G LFL1 - MT4001B

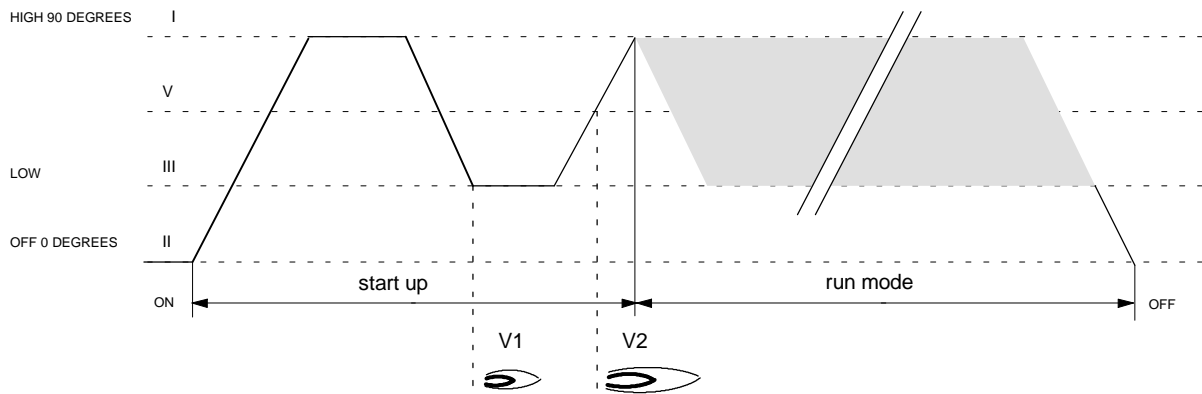


Fig. 19. Sequence Diagram MT4001B

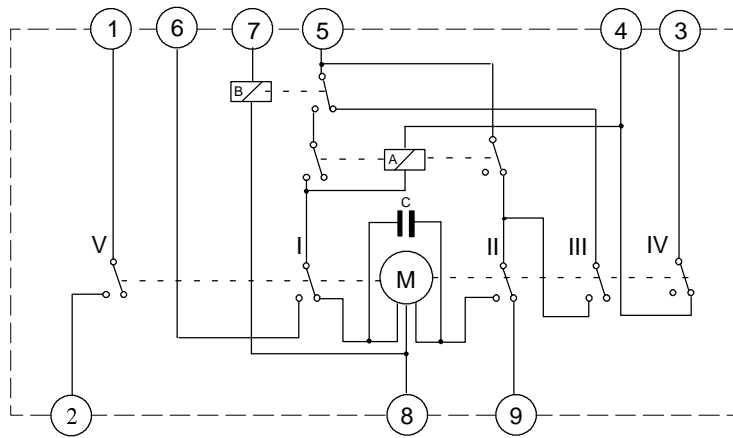


Fig. 20. Wiring diagram MT4001C

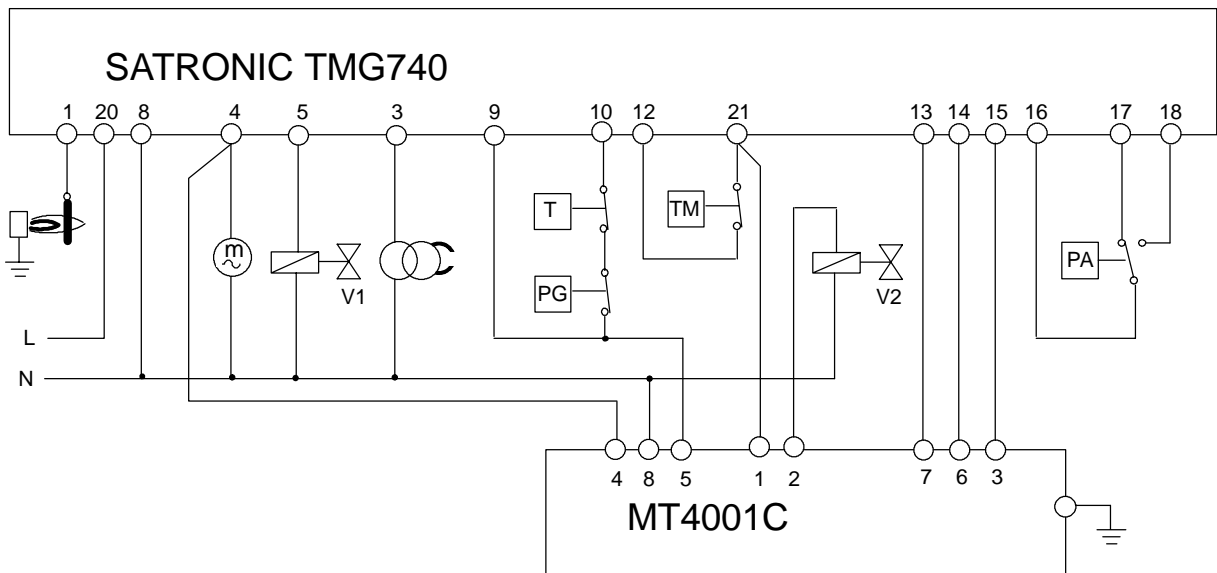


Fig. 21. Connection diagram Satronic TMG740 – MT4001C

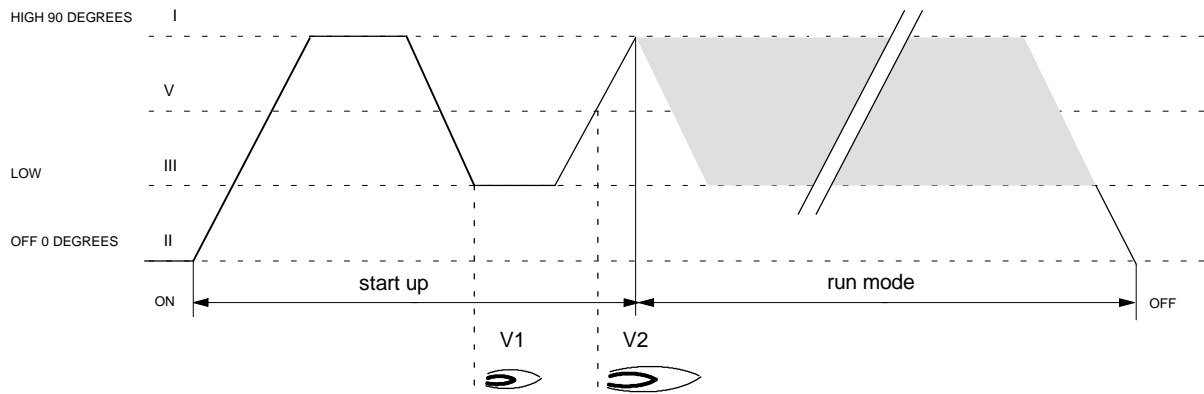


Fig. 22. Sequence diagram MT4001C

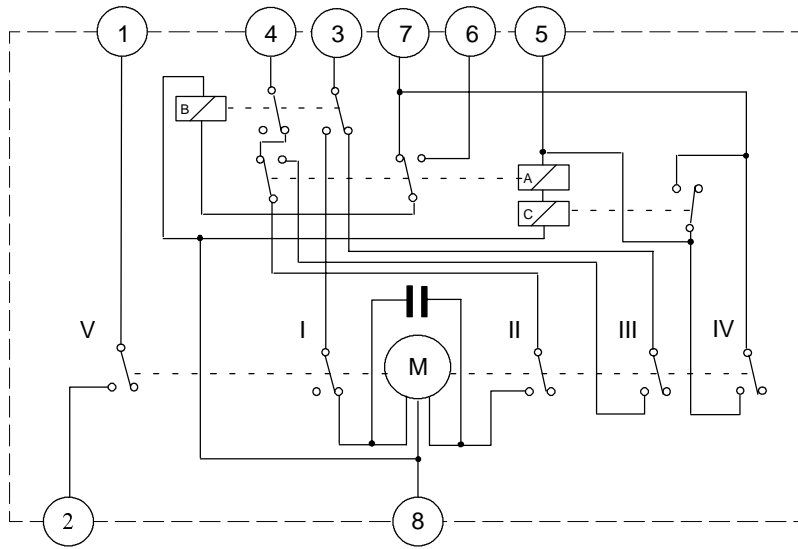


Fig. 23. Wiring diagram MT4002B

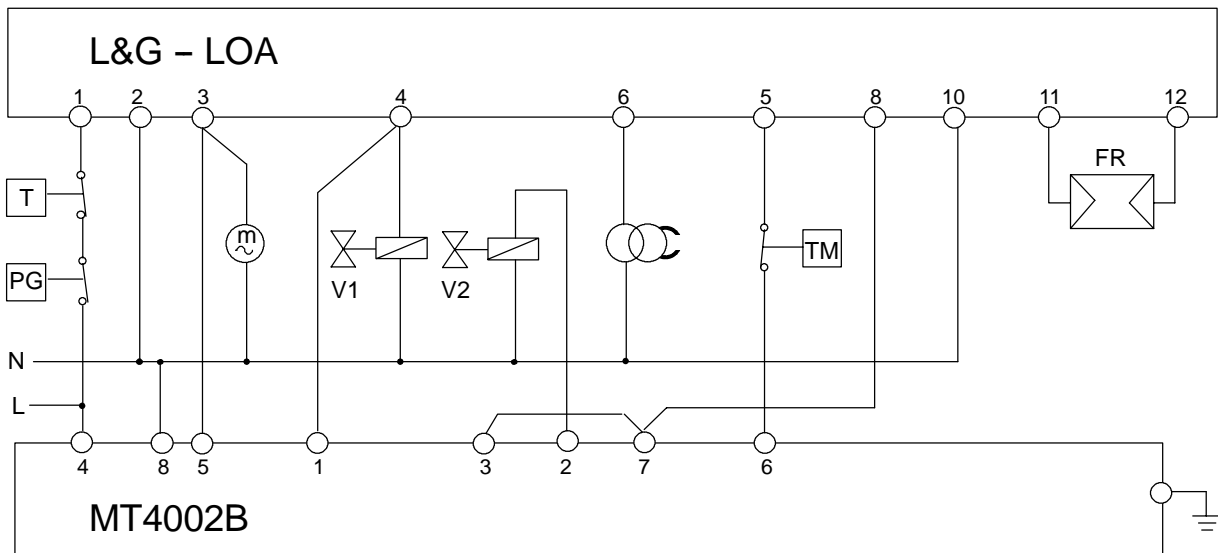


Fig. 24. Connection diagram L&G - MT4002B

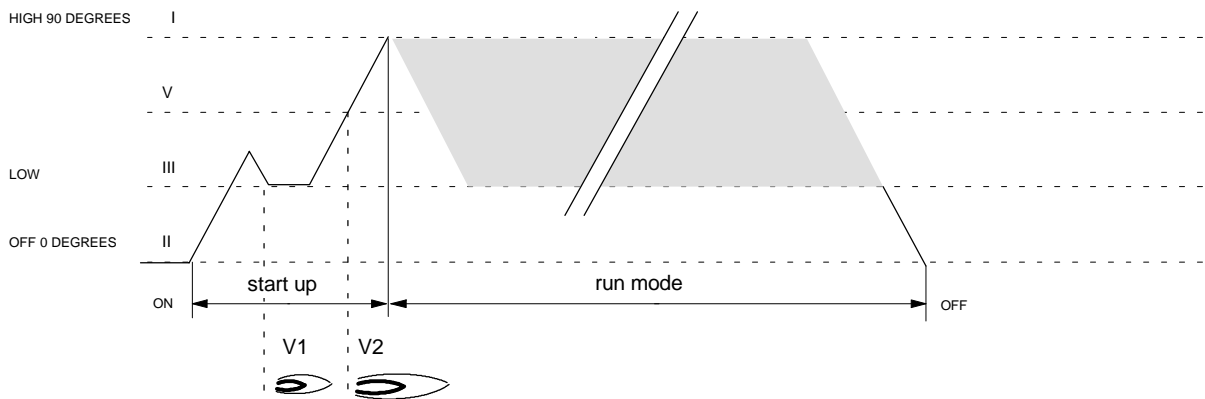


Fig. 25. Sequence diagram MT4002B

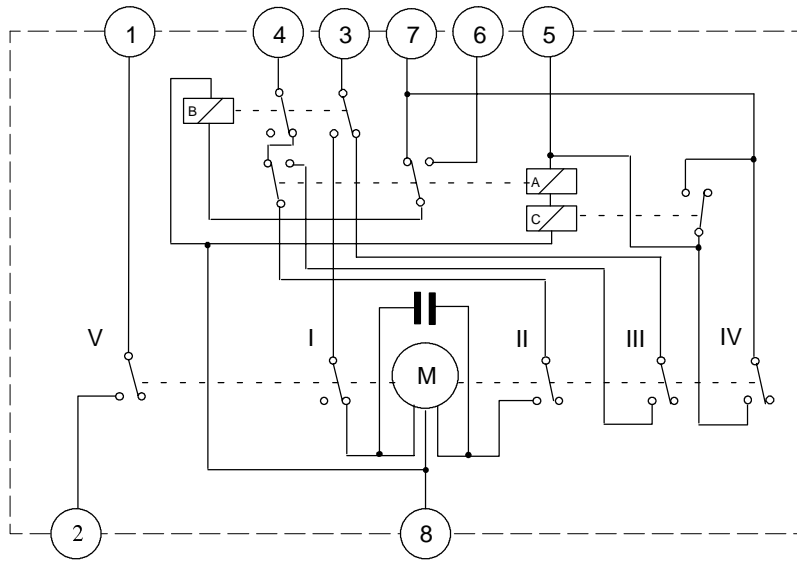


Fig. 26. Wiring diagram MT4002B

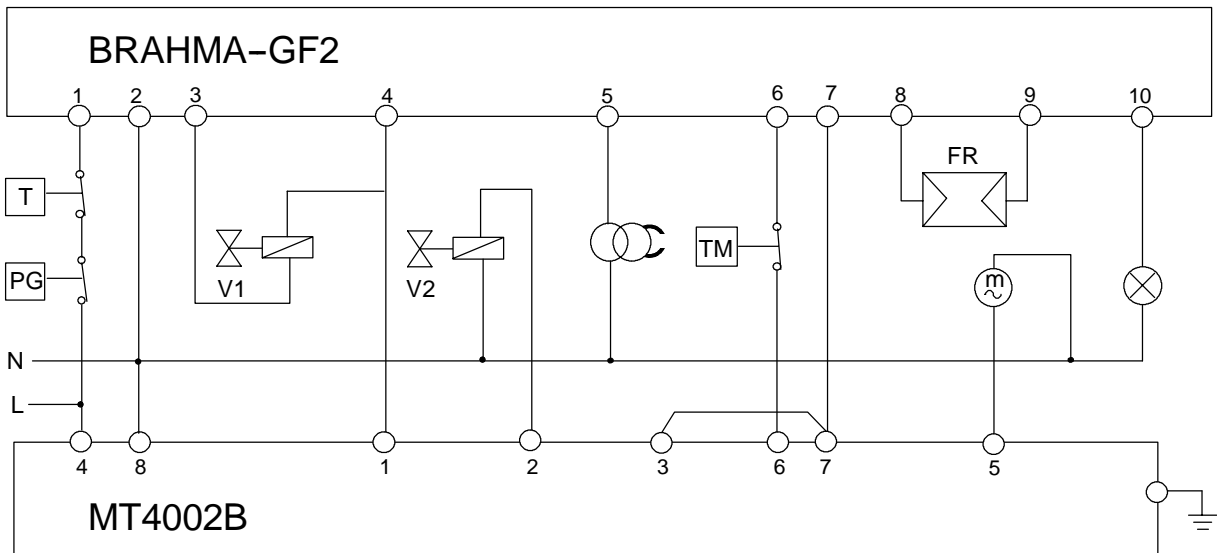


Fig. 27. Connection diagram Brahma-GF2 - MT4002B

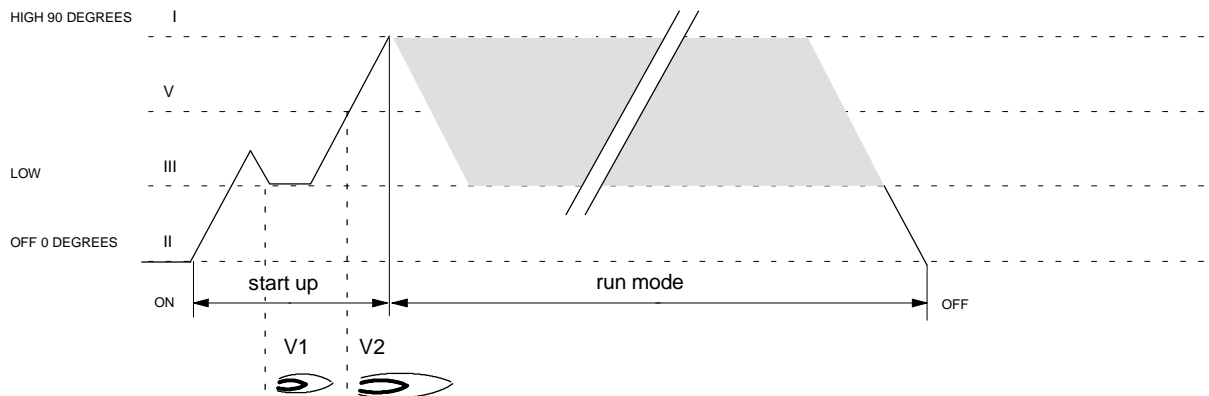


Fig. 28. Sequence diagram MT4002B

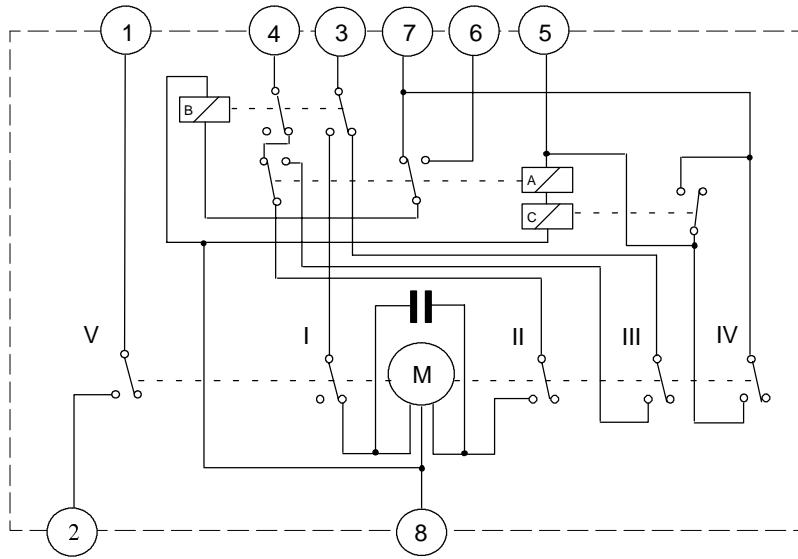


Fig. 29. Wiring diagram MT4002B

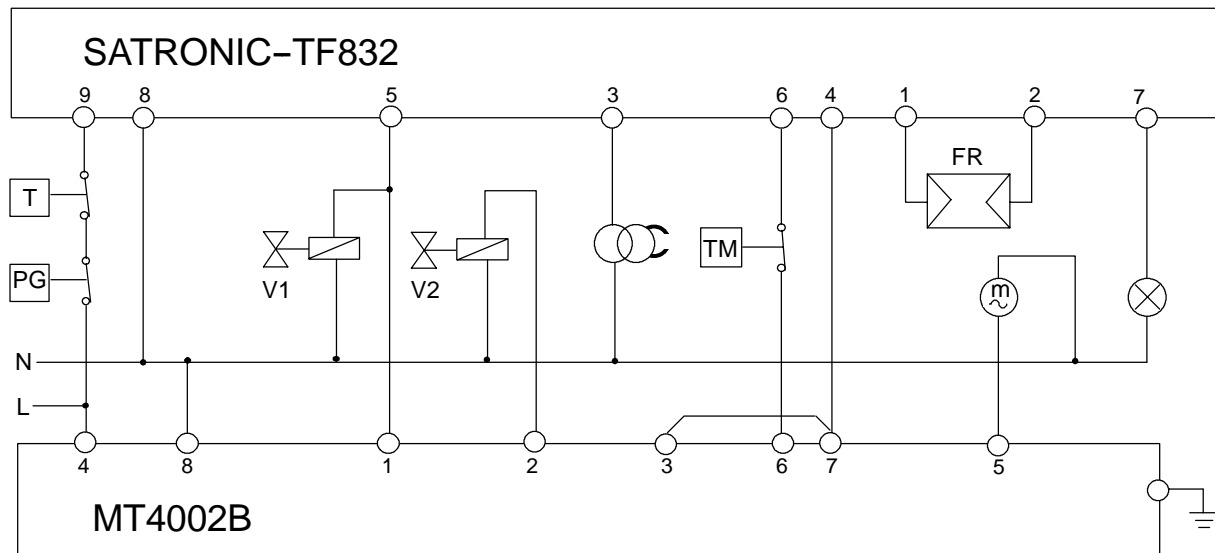


Fig. 30. Connection diagram Satronic-TF832 - MT4002B

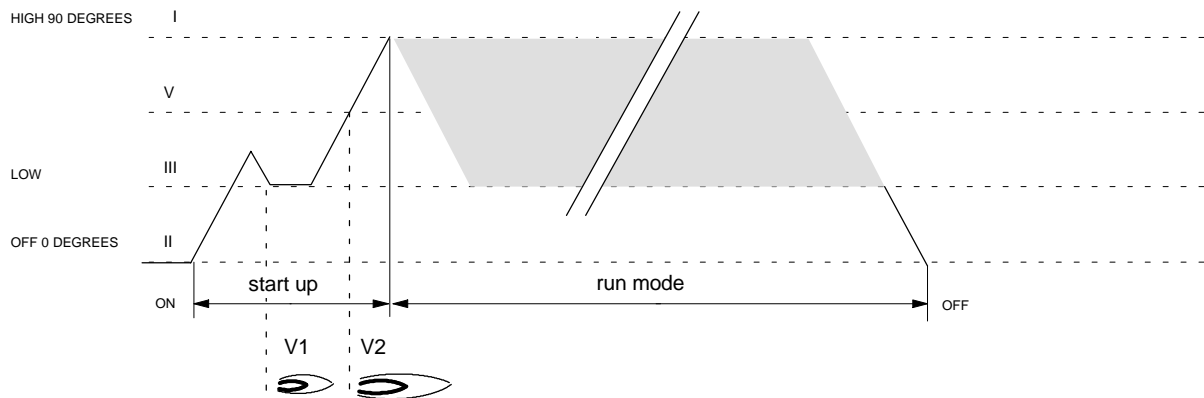


Fig. 31. Sequence diagram MT4002B

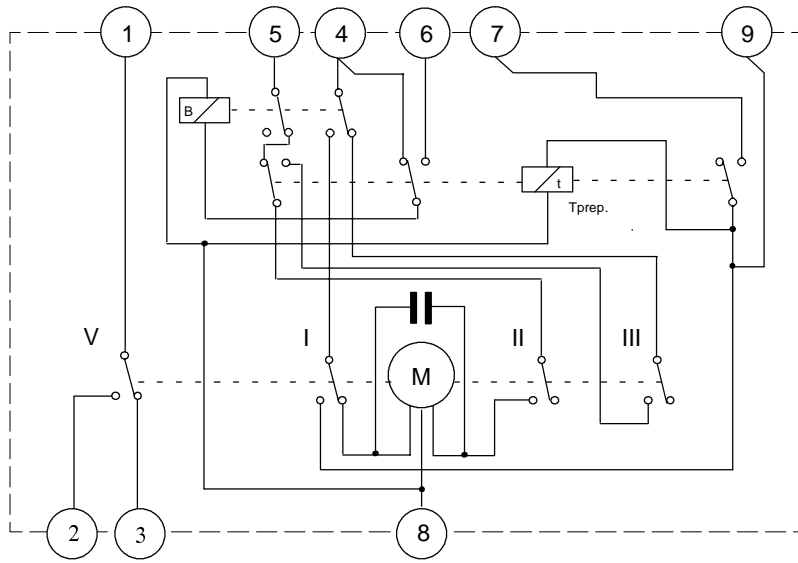


Fig. 32. Wiring diagram MT4003C

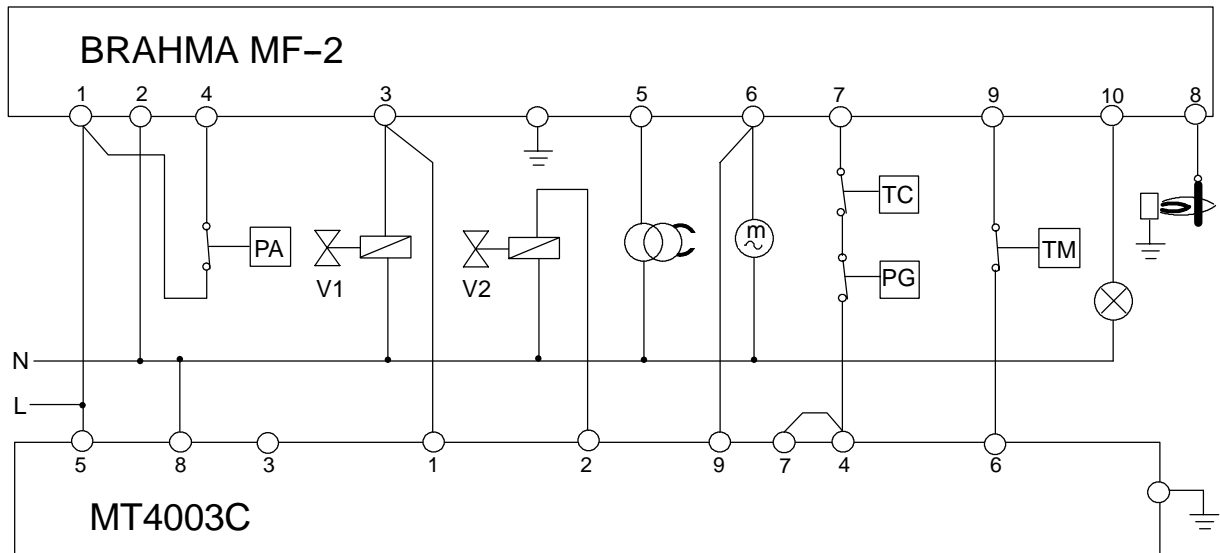


Fig. 33. Connection diagram BRAHMA MF-2 – MT4003C

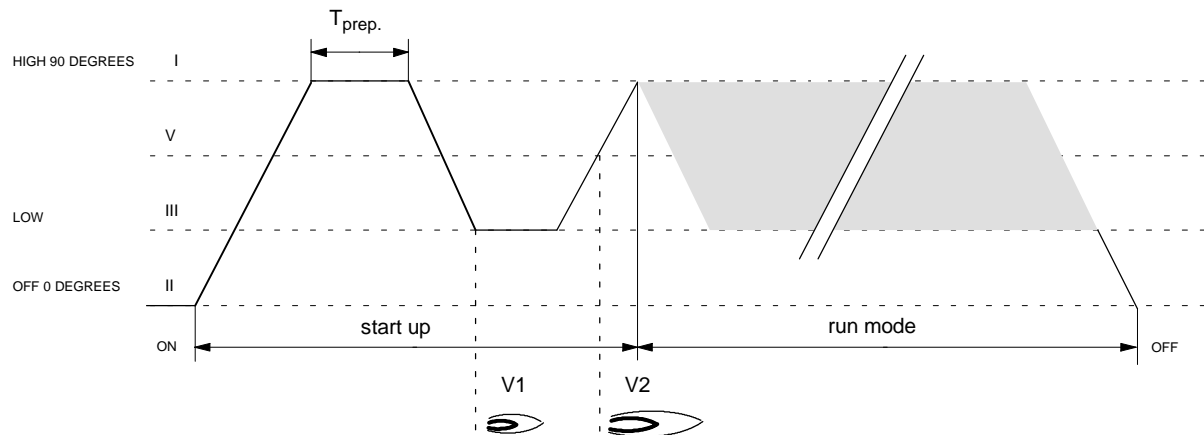


Fig. 34. Sequence diagram MT4003C, T_{prep} . provided by MT4003C

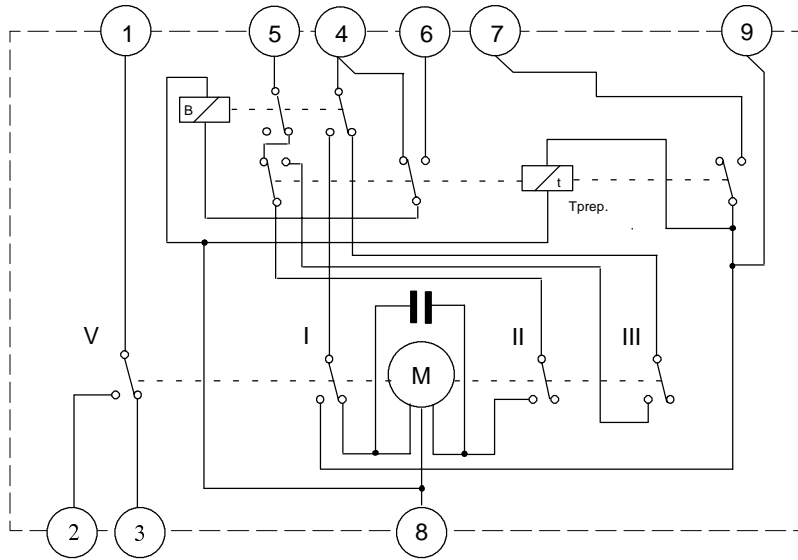


Fig. 35. Wiring diagram MT4003C

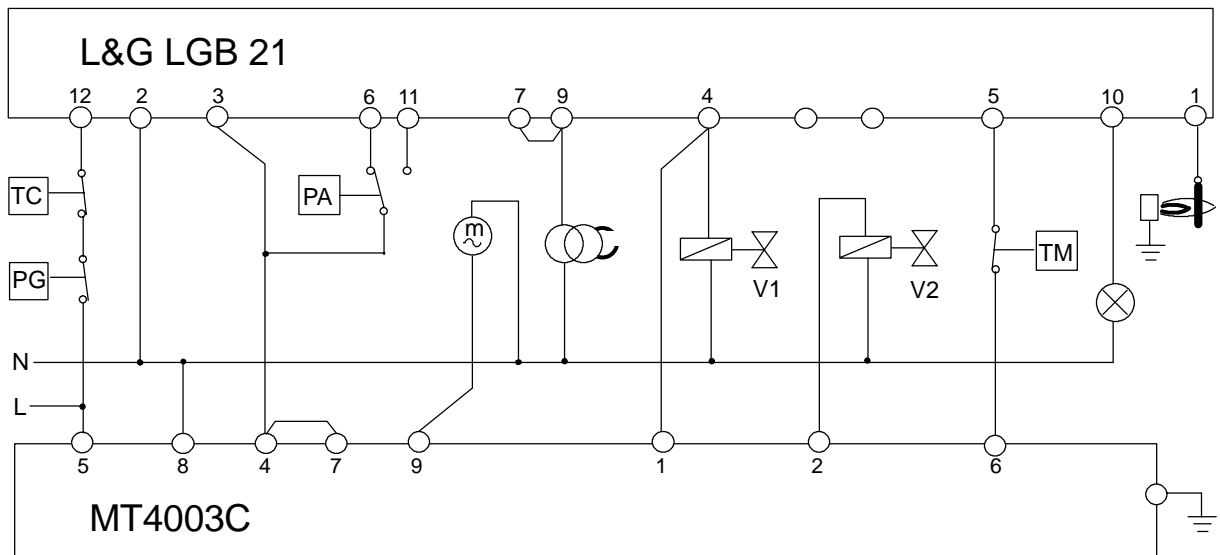


Fig. 36. Connection diagram L&G LGB 21 - MT4003C

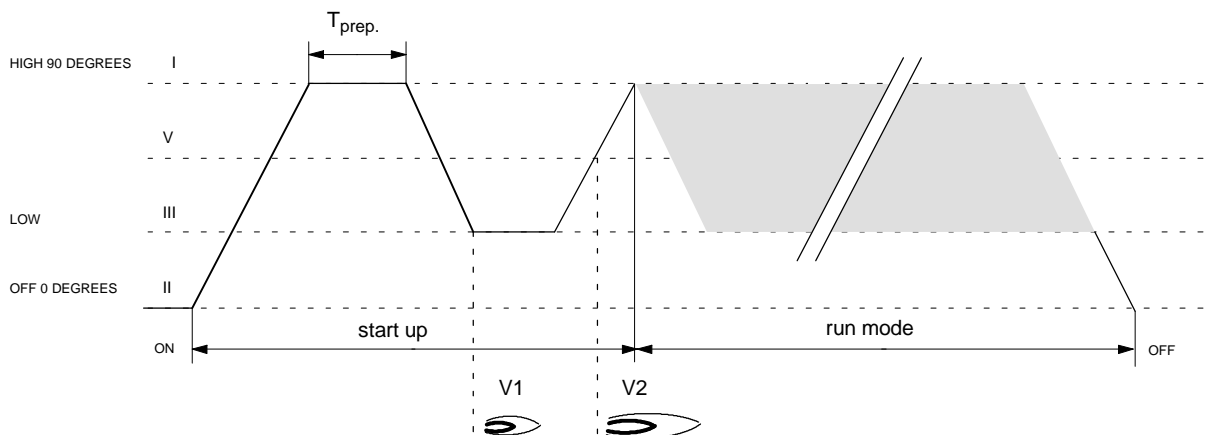


Fig. 37. Sequence diagram MT4003C, T_{prep}. provided by MT4003C

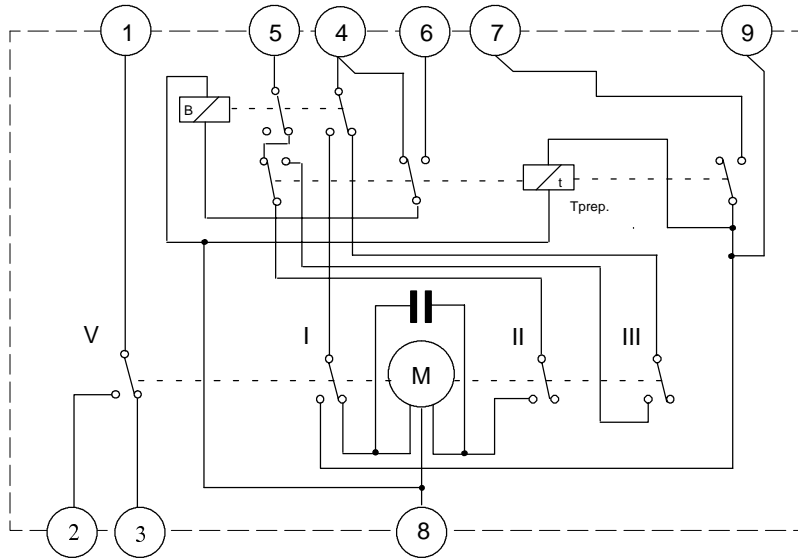


Fig. 38. Wiring diagram MT4003C

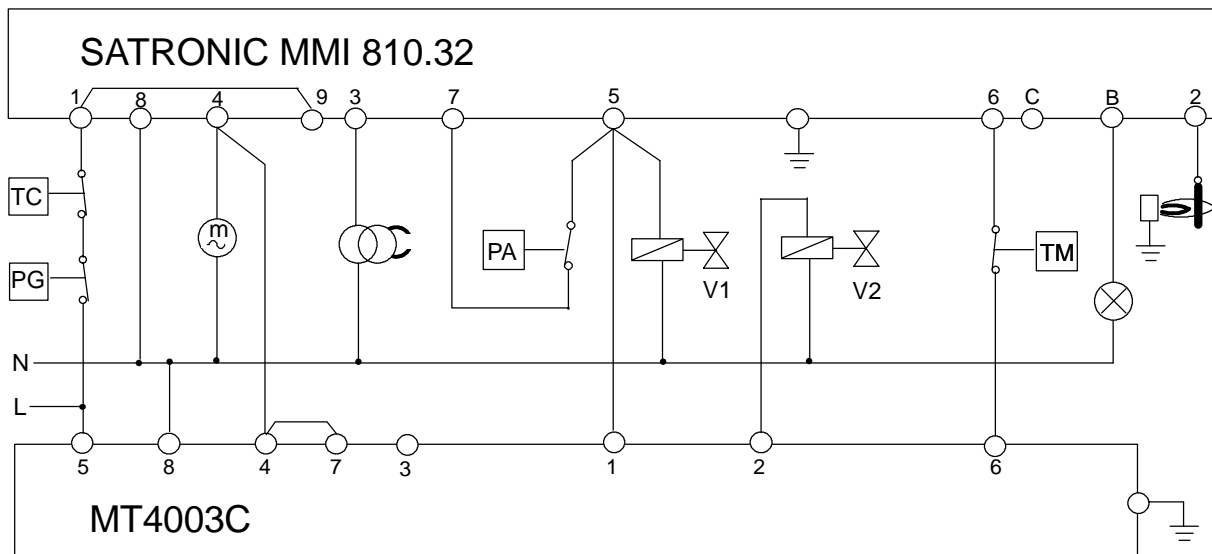


Fig. 39. Connection diagram Satronic MMI 810.32 – MT4003C

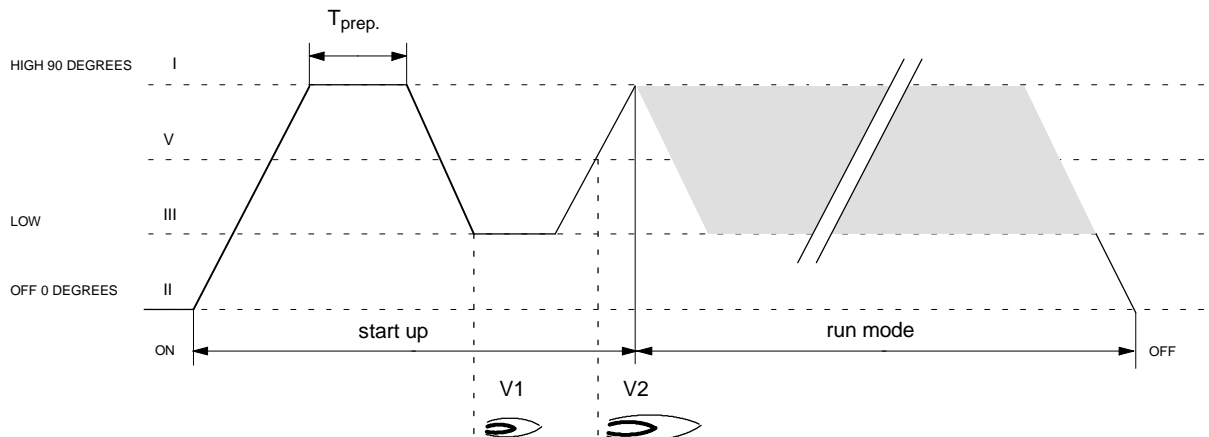


Fig. 40. Sequence diagram MT4003C, T_{prep}, provided by MT4003C

EXAMPLE WORKING PRINCIPLES

Introduction

To gain a better understanding of the typical functionality and operation sequence of the MT4000 Series servo motor, the sequence and functions of the MT4001B (in combination with an EC7850 burner controller and modulating thermostat) for a

complete ON/OFF cycle have been explained (see also Fig. 11. and Fig. 12. on page 10). The schematics below, show the steps in the cycle and the current carrying contacts/wires at specific moments in the motor cycle.

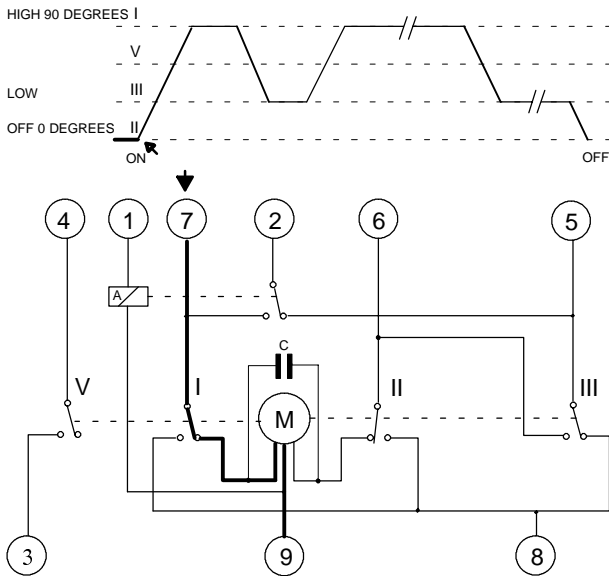


Fig.41.a Terminal 7 (drive to high fire) is energized, the servo motor starts.

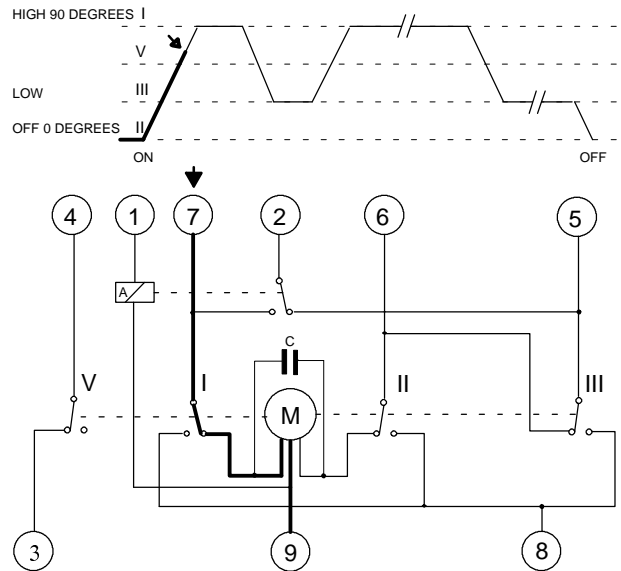


Fig.41.b Servo motor drives to high fire position.

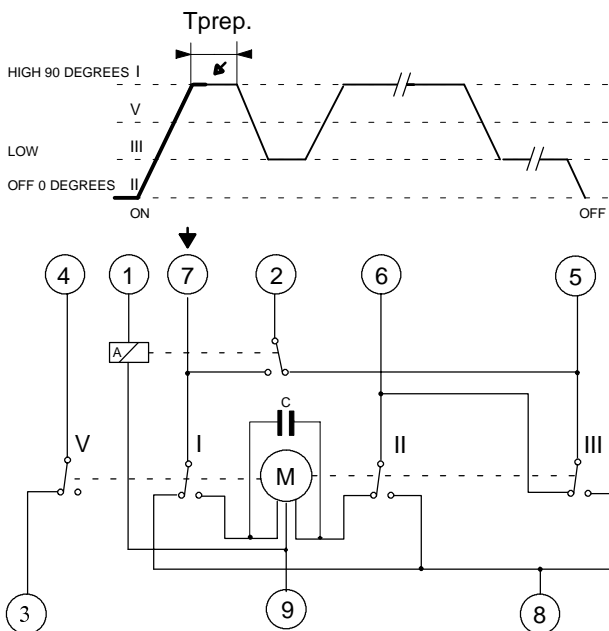


Fig.41.c Servo motor is stopped by switch I (high fire position is reached). Start of the pre purge time, provided by the burner controller.

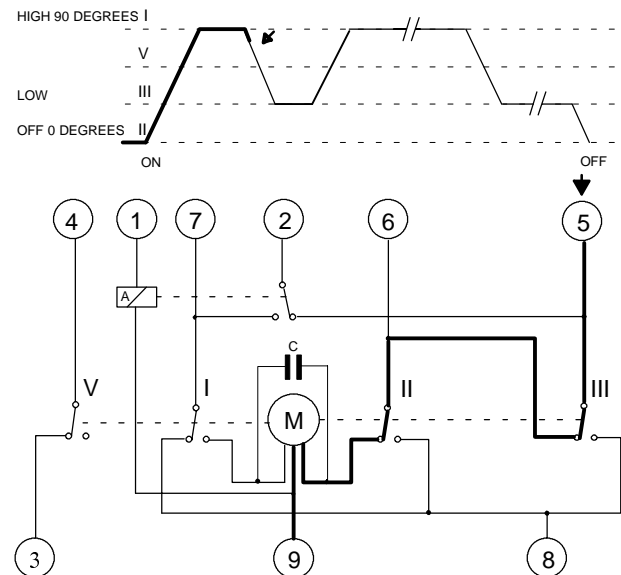


Fig.41.d Pre purge time elapsed, terminal 5 is energized. Servo motor drives back to low fire position (start position).

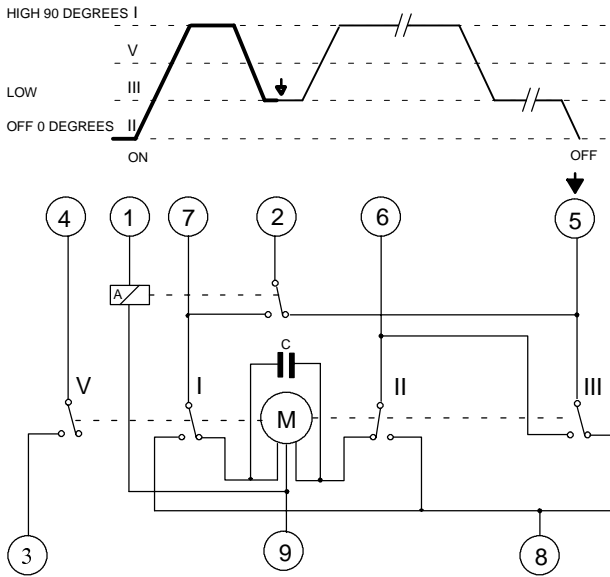


Fig.41.e Servo motor is stopped on low fire position by switch III. The Burner Controller will start the burner.

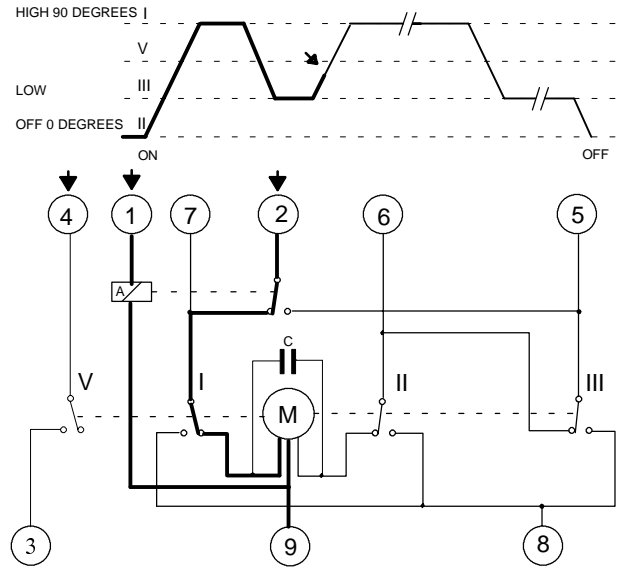


Fig.41.f When flame is proven and there is a demand for high fire, terminal 1, 4 and 2 are energized and the MT4001B will drive to high fire position.

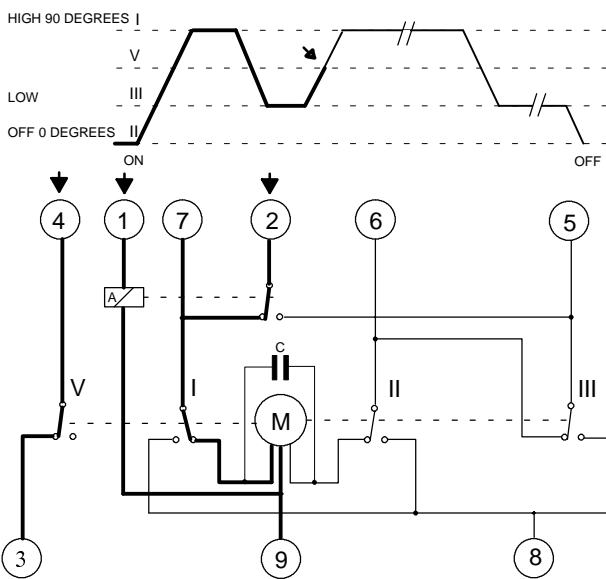


Fig.41.g The servo motor drives to high fire position, cam V switches and energizes the second stage valve.

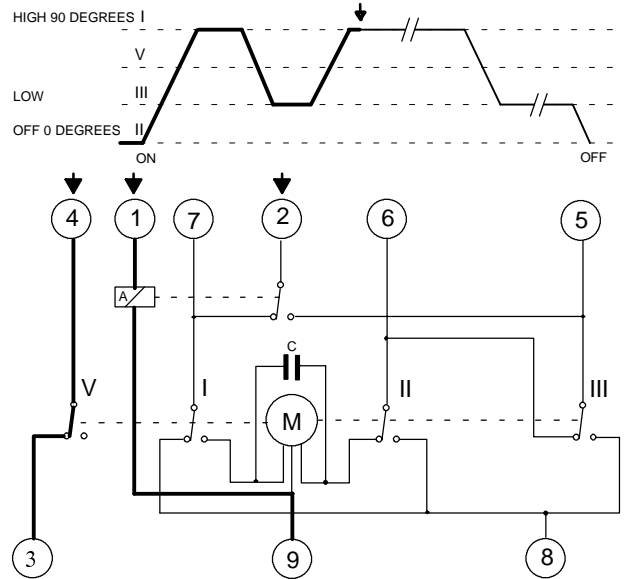


Fig.41.h Servomotor is stopped by switch I (high fire position is reached)

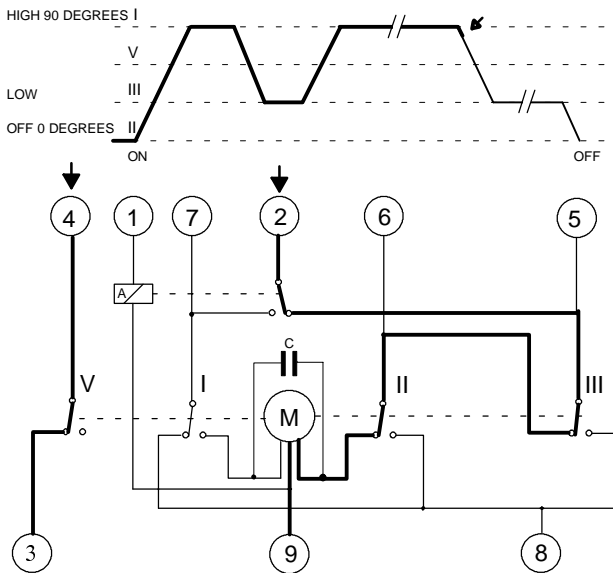


Fig.41.i There is no demand for high fire. Terminal 1 is de-energized, the servo motor drives back to low fire position.

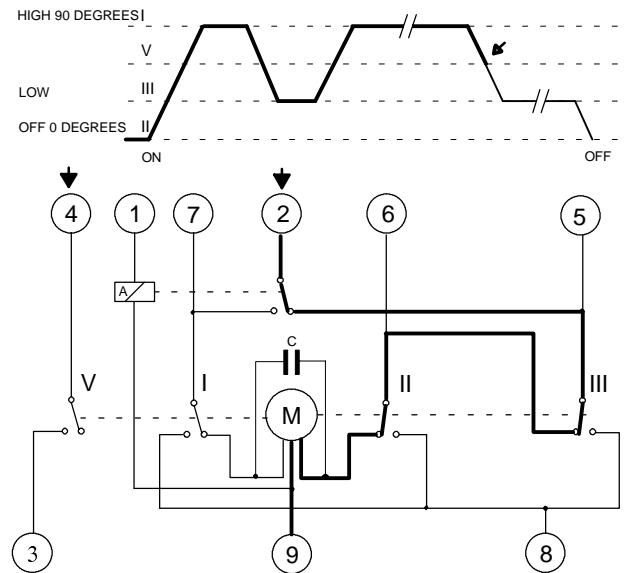


Fig.41.j Second stage valve is de-energized by switch V.

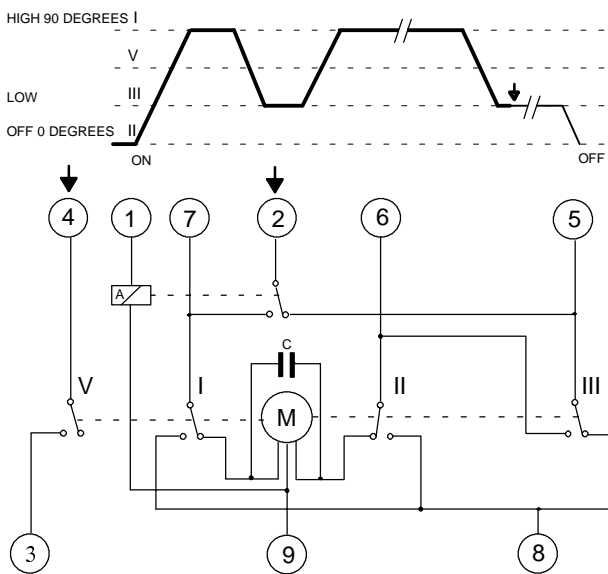


Fig.41.k Low fire position is reached, servo motor is stopped by switch III.

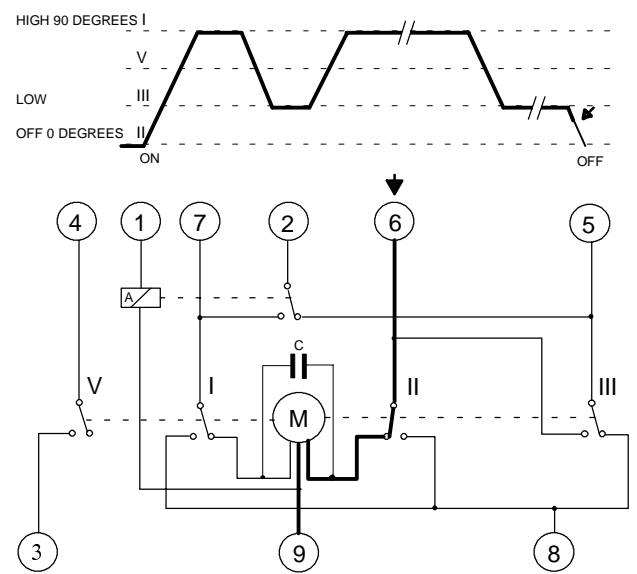


Fig.41.l Terminal 6 (drive to OFF) is energized and drives servo motor to OFF position, servo motor will be stopped by switch II, this is the end of the cycle.

STANDARDS AND APPROVALS

Standards

Regarding electrical safety, the MT4000 Series servo motors have been designed to meet European Standard EN60730-1 and International Standard IEC730-2-14 and can be used in applications according to EN60335 series and EN50165 and industrial applications.

Regarding Electro Magnetic Compatibility, the MT4000 Series servo motors have been designed to meet European Standards EN55011 class B regarding emission and EN50082-2 regarding immunity and covers non-industrial and industrial applications.


The MT4000 Series servo motors have been designed to meet European Standards EN298 regarding the fail safe pre-purge timer and can be used in non-industrial and industrial applications.

Approvals

The MT4000 Series meet the following European directives:

- Low Voltage Directive (73/23/EEC)
- Electro Magnetic Compatibility Directive (89/336/EEC)
- Gas Appliance Directive (90/396/EEC) for MT4003C only
PIN: 0063AR1582

See further Declarations of Conformity and Certificates below.

DECLARATION OF CONFORMITY 

Number **L110**

We,

Honeywell B.V.
Combustion Controls Center Europe
Philias Eggstraat 7
7821 AJ Emmen
The Netherlands

declare under our sole responsibility that the following products:

MT4000, 4001, 4002, 4003, VF4...


to which this declaration relates are in conformity with the following standard:


EN 60730-1
IEC 730-2-14

following the provisions of the **Low Voltage Directive 73/23/EEC**

This declaration is based on GASTEC report 119582, dated August 1996.

Emmen, 27 August, 1996


J.P. Dammer
Standards and Approvals Manager

DECLARATION OF CONFORMITY 

Number **E102**

We,

Honeywell B.V.
Combustion Controls Center Europe
Philias Eggstraat 7
7821 AJ Emmen
The Netherlands

declare under our sole responsibility that the following products:

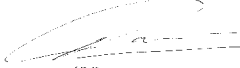
MT4000, 4001, 4002, 4003, VF4...

to which this declaration relates are in conformity with the following standard:
EN55011 CLASS B REGARDING EMISSION
EN50082-2 INDUSTRIAL LEVEL REGARDING IMMUNITY

following the provisions of the **EMC DIRECTIVE 89/336/EEC**

This Declaration regarding immunity is based on GASTEC report: 119582, dated August 1996

Emmen, 27 August, 1996


J.P. Dammer
Standards and Approvals Manager



DECLARATION

DECLARATION

File number: **AR1582**

GASTEC NV, hereby declares

that the **Honeywell B.V. servo-motor systems**

types **MT 4000A, MT 4000B, MT 4001A,
MT 4001B, MT 4001C, MT 4002B
and MT 4003C.**

made by **Honeywell - Universal Gas Valves S.r.L.,
Cascine-Vice Rivoli,
Torino, Italy.**

comply with the essential requirements of:

EN 60730-1 Automatic electrical controls for household
and similar use - Part 1: General
requirements (February 1995)
inclusive amendments A11 + A12
(February 1996)

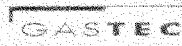
Report number: 119582, dated August 1996.

This declaration can be used as a reference document for the
manufacturers declaration of conformity for the Low Voltage
Directive (73/23/EEC, inclusive modifications described in
93/68/EEC).

Apeldoorn, **27 August 1996**


Ing. F. Mutter
Vice-President,
Certification

Centre of Gas Technology



GASTEC NV
P.O. Box 137
7300 AC Apeldoorn
The Netherlands
Wilhelmina 50
7327 AC Apeldoorn

EC TYPE-EXAMINATION CERTIFICATE



GASTEC NV, notified body **0063** hereby declares

that the **servo motor systems**
series **MT 4003C xxxx**
made by **Honeywell-Universal Gas Valves S.r.L.,
Cascine-Vice Rivoli,
Torino, Italy.**

comply with the essential requirements of the
Gas Appliances Directive (90/396/EEC).

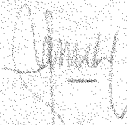
The compliance is based on examination to:
EN 298 (Oct. 1993)

PIN : 0063AR1582
Report number : 119582
Manufacturer file number : E3075

The products have been approved for:

Austria	Belgium	Denmark
Finland	France	Germany
Greece	Iceland	Ireland
Italy	Luxemburg	Norway
Portugal	Spain	Sweden
Switzerland	The Netherlands	United Kingdom

Apeldoorn, **1 September 1996**


dr. L. Noordzij,
president.

Centre of Gas Technology

GASTEC

GASTEC NV
P.O. Box 137
7300 AC, Apeldoorn
The Netherlands
Wimexstor 50
7327 AC Apeldoorn

CERTIFICATE

ORDERING INFORMATION

When ordering specify:

- Complete O.S. number of MT400_ Series.
- For type number and suffix letter, see table 2.; considering applications and possible combinations with ignition controllers.
- Order number of replacement parts and accessories, see Replacement Parts and Accessories and Cross Reference List.

NOTE: Left or right rotation: When series number (last 4 digits of the O.S. number) starts with 1, the motor runs counter-clockwise (left rotation). When the number starts with 2, the motor runs clockwise (right rotation).

Table 2. Ordering Information MT4000 Series servo motors

MT4000 series	Servo motors for combustion air dampers. Also used with VF butterfly valve.
MT4000A	General use, external signals for modulation required.
MT4000B	General use, including relay for one external modulation input.
MT4001 series	Servo motors for air dampers in gas burners. To be used with full featured ignition controllers such as: Honeywell EC7800 SERIES, L&G LFK/LGK, Satronic and Brahma.
MT4001A	Unit for 3 wire thermostat connections.
MT4001B	Unit for 2 wire thermostat connections.
MT4001C	Special model, <i>only</i> for use with TMG-740 ignition controller.
MT4002 series	Servo motors for air dampers in oil burners. To be used with many types ignition controllers such as: Honeywell, L&G, Satronic and Brahma.
MT4002B	Including relay for 2 wire thermostat connection.
MT4003 series	Intelligent servo motor for air dampers in gas burners. To be used with low featured ON/OFF ignition controllers, where the pre-purge is provided by the servo motor.
MT4003C	Includes relays for 2 wire thermostat connection, low fire adjustment switch and fail-safe pre-purge timer.

Cross reference list

Table 3. Cross Reference List Honeywell – UGV

Honeywell	UGV
MT 4000A	MT4..015
MT4000B	MT4..016
MT4001A	MT4..006
MT4001B	MT4..007
MT4001C	MT4..009
MT4002B	MT4..008
MT4003C	MT4..010A / 010

REPLACEMENT PARTS AND ACCESSORIES

Table 4. PCB Boards for 220 ... 240 Vac versions

Model	Without low fire adjustment switch	With low fire adjustment switch
MT4000A	CSMT0151	-
MT4000B	CSMT0161	-
MT4001A	CSMT0061	CSMTP061
MT4001B	CSMT0071	CSMTP071
MT4001C	CSMT0091	CSMTP091
MT4002B	CSMT0081	CSMTP081
MT4003C	CSMT0111	CSMTP111

Table 5. PCB Boards for 110 Vac versions

Model	Without low fire adjustment switch	With low fire adjustment switch
MT4000A	CSMT0152	-
MT4000B	CSMT0162	-