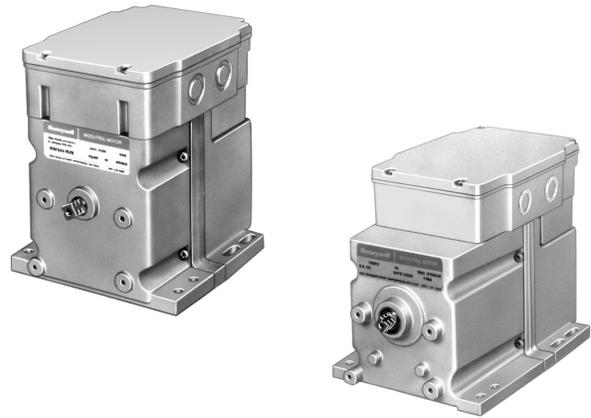


M7261, M7272, M7274, M7281, M7282, M7284, M7285, M7286, M7294 Modutrol IV Motors

The M72XX series Modutrol IV Motors are used to control dampers and valves. The motors accept a current or voltage signal from an electronic controller to position a damper or valve at any point between open and closed.



- Replaces M744S,T,Y and M745S,T,Y Motors.
- M7261, M7274, M7281, M7284, and M7294 are non-spring return motors; M7272, M7282, M7285, and M7286 are spring return motors.
- Oil immersed motor and gear train for reliable performance and long life.
- Wiring box provides NEMA 3 weather protection.
- Actuator motor and circuitry operate from 24 Vac. Models available with factory installed transformer or an internal transformer can be field added.
- Quick connect terminals standard—screw terminal adapter available.
- Adapter bracket for matching shaft height of older motors is standard with replacement motors.
- Nominal timing of 30 seconds for 90° stroke and 60 seconds for 160° stroke.
- Valve and damper linkages, explosion proof housing, and auxiliary switches available as accessories.
- Spring return motors are rated for 25 lb.-in. and 60 lb.-in torque.
- Non-spring return motors are rated for 35 lb.-in., 75 lb.-in., 150 lb.-in., and 300 lb.-in. torque.
- Models available with adjustable start (zero) and span.
- Models available with 4 to 20 mA input signal.
- Models available with 2 to 10 Vdc input signal.
- Die-cast magnesium housing.

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Specifications

MODELS:

M7261A
M7272A
M7274A,G
M7281A,C,Q
M7282A
M7284A,C,G,Q
M7285A,C,Q
M7286G
M7294A,G,Q

Control Type

72 is electronic with 4 to 20 mA or 2 to 10 Vdc

Torque Designation

6 is low torque (35 lb-in.)
7 is medium torque (75 lb-in.), non-spring return; 25 lb-in. spring return.
8 is high torque (150 lb-in.), non-spring return; 60 lb-in. spring return.
9 is extra-high torque (300 lb-in.), non-spring return

Output Drive

1 is single-ended shaft, non-spring return.
2 is single-ended shaft, spring return, normally closed mechanically.
4 is dual-ended shaft, non spring return.
5 is dual-ended shaft, spring return, normally closed mechanically.
6 is dual-ended shaft, spring return, normally open mechanically.

Suffix Letter

A: Fixed stroke (90° or 160°), no auxiliary switches, electrically normally closed.
C: Fixed stroke (90° or 160°), 2 auxiliary switches, electrically normally closed.
G: Fixed stroke (90° or 160°), no auxiliary switches, electrically normally open.
Q: Fixed stroke (90° or 160°), 2 auxiliary switches, with adjustable start (zero) and span, electrically normally closed.

IMPORTANT: *The specifications given in this publication do not include normal manufacturing tolerances. Therefore, an individual unit may not exactly match the listed specifications. Also, this product is tested and calibrated under closely controlled conditions and some minor differences in performance can be expected if those conditions are changed.*

CONTROLLER: These motors can be used with any electronic controller that provides a stable noise-free proportional current output as specified in Input Range below.

MOTOR ROTATION:

Closed: The limit of counterclockwise rotation as viewed from the power end of the motor.

Open: The limit of clockwise rotation as viewed from the power end of the motor.

Mechanically Normally Closed: Spring return, normally closed motors rotate to the closed position on loss of power.

Mechanically Normally Open: Spring return, normally open motors rotate to the open position on loss of power.

Electrically Normally Closed: Both spring return and non-spring motors return to the closed position on minimum signal.

Electrically Normally Open: Both spring return and non-spring return motors return to the open position on minimum signal.

STROKE: Fixed 90° or 160° models available. Other models available with field adjustable strokes from 90° to 160°. Stroke adjusted by means of cams located in the wiring compartment.

TIMING: Nominal 30 seconds for 90° stroke and 60 seconds for 160° stroke.

DEAD WEIGHT LOAD ON SHAFT: 200 lb [90.8 kg] on power or auxiliary end of motor; maximum combined load of 300 lb. [134.6 kg].

AMBIENT TEMPERATURE RATINGS: -40° F to +150° F [-40° C to +66° C].

SHAFT: 3/8 in. [9.5 mm] square.

DIMENSIONS: See Fig. 1.

Ordering Information

When purchasing replacement and modernization products from your wholesaler or distributor, refer to the price sheets for complete ordering number, or specify—

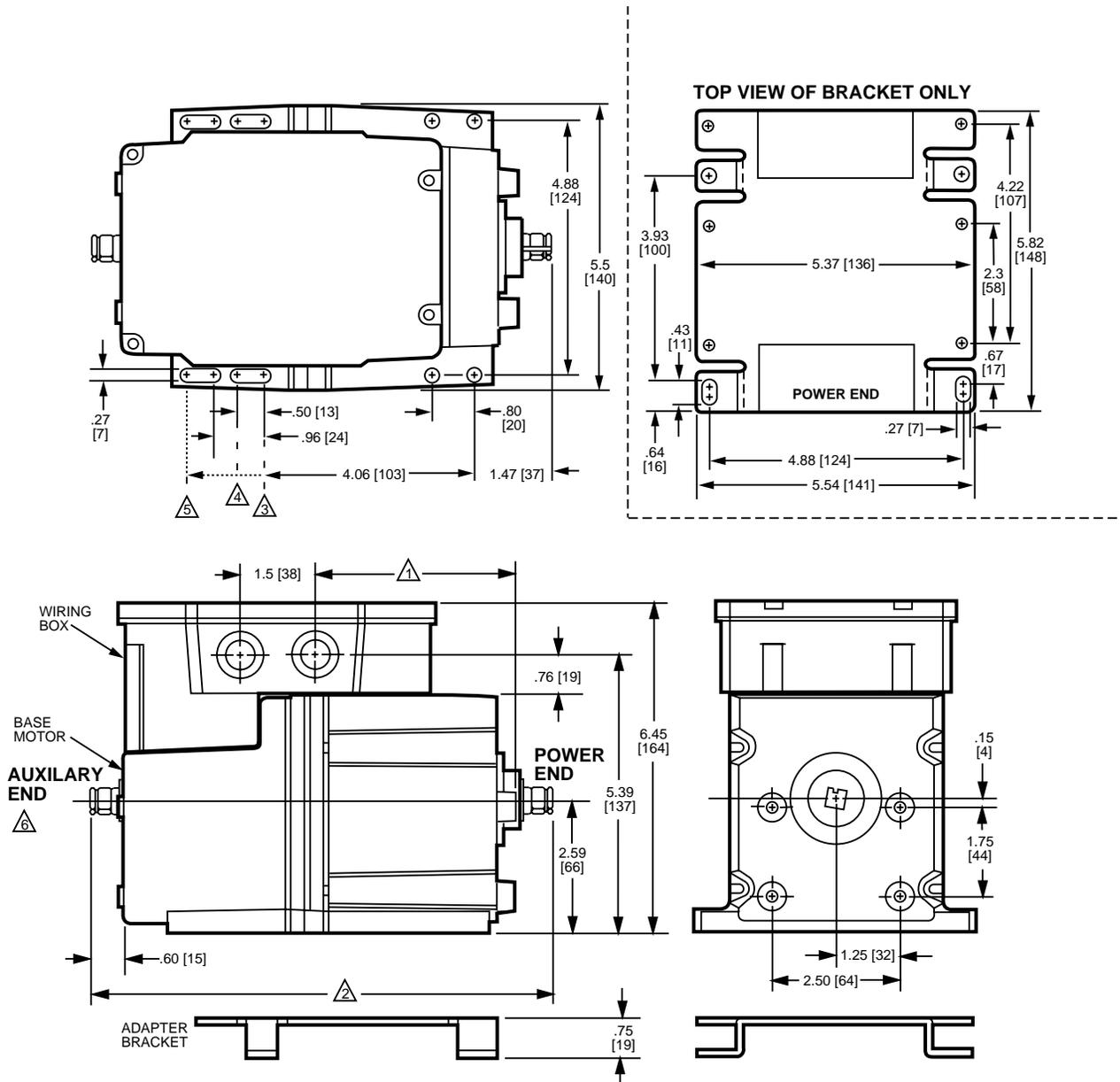
1. Order number

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Home and Building Control Sales Office (check white pages of your phone directory).
2. Home and Building Control Customer Satisfaction
 Honeywell Inc., 1885 Douglas Drive North
 Minneapolis, Minnesota 55422-4386 (612) 951-1000

In Canada—Honeywell Limited/Limitée, 740 Ellesmere Road, Scarborough, Ontario M1P 2V9. International Sales and Service offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Fig. 1—Dimensions of M7261, M7272, N7274, M7281, M7282, M7284, M7285, M7286, M7294 Modutrol IV Motors in in. [mm].



SPRING RETURN MODEL SHOWN

- △ FOR HIGH TORQUE (60 LB-IN.) SPRING RETURN MODELS 3.9 [98]; FOR LOW TORQUE (25 LB-IN.) SPRING RETURN MODELS 3.4 [85.5]; FOR NON-SPRING RETURN MODELS 2.4 [61].
- △ FOR HIGH TORQUE (60 LB-IN.) SPRING RETURN MODELS 8.76 [222.5]; FOR LOW TORQUE (25 LB-IN.) SPRING RETURN MODELS 8.26 [209.8]; NON-SPRING RETURN MODELS 7.3 [185].
- △ FOR HIGH TORQUE (60 LB-IN.) SPRING RETURN MODELS.
- △ FOR LOW TORQUE (25 LB-IN.) SPRING RETURN MODELS.
- △ FOR NON-SPRING RETURN MODELS.
- △ M72X1, M72X2 MODELS DO NOT HAVE AUXILIARY SHAFT. ALL OTHER DIMENSIONS ARE THE SAME.

M5507A

ELECTRICAL RATINGS:

Voltage and Frequency: 120 Vac, 50/60 Hz.

M7261: 19W, 0.20A	M7282: 28W, 0.28A
M7272: 26W, 0.26A	M7284: 23W, 0.24A
M7274: 15W, 0.71A	M7285: 28W, 0.28A
M7281: 23W, 0.24A	M7286: 23W, 1.00A
M7294: 23W, 0.24A	

INPUT RANGE:

Current, Nonadjustable: 4 to 20 mA nominal, 25 mA maximum.

Current, Adjustable: 4 to 20 mA adjustable, 50 mA maximum.

Zero/Null (Motor Closed): 0.08 to 18 mA.

Span: 1.8 to 18 mA.

Voltage, Nonadjustable: 2 to 10 Vdc.

INPUT IMPEDANCE:

4 to 20 mA Input: 100 ohms.

2 to 10 Vdc Input: 400 kohms.

AUXILIARY SWITCH RATINGS (Amperes):

One Contact Rating ^a	120V	240V
Full Load	7.2	3.6
Locked Rotor	43.2	21.6

^a 40 VA pilot duty, 120/240 Vac on opposite contact.

UNDERWRITERS LABORATORIES INC. LISTED: File No. E4436; Guide No. XAPX.

CANADIAN STANDARDS ASSOCIATION CERTIFIED:

General listed File No. LR1620; Guide No. 400-E.

ACCESSORIES:

ES650117 Explosion-proof Housing; encloses motor for use in explosive atmospheres. Not for use with Q601, Q618, and Q455 Linkages. Order separately

from Nelson Electric Co. Requires Honeywell 7616DM Coupling.

Q607 External Auxiliary Switch; controls auxiliary equipment as a function of motor position.

Q605 Damper Linkage; connects motor to damper; includes motor crank arm.

Q618 Linkage; connects Modutrol IV Motor to water or steam valve.

Q601 Bracket and Linkage Assembly; connects Modutrol IV Motor to water or steam valve.

Q100 Linkage; connects Modutrol IV Motor to butterfly valve.

221455A Motor Crank Arm; infinitely adjustable crank arm, can rotate through the downward position and clear the base of motor without requiring the use of an adapter bracket. Approximately 0.75 in. [19 mm] shorter than the 4074ELY Crank Arm.

7617ADW Motor Crank Arm; can rotate through the downward position and clear the base of the motor without requiring the use of an adapter bracket. Approximately 0.75 in. [19 mm] shorter than the 7616BR Crank Arm.

220741A Screw Terminal Adapter; converts the standard quick-connect terminals to screw terminals.

Transformers: Mounted internally, provide 24 Vac power to the motor:

198162JA 24 Vac, 50/60 Hz (for electrical isolation).

198162EA 120 Vac, 50/60 Hz.

198162GA 220 Vac, 50/60 Hz.

198162AA 120/208/240 Vac, 50/60 Hz.

4074ERU Weatherproofing Kit; provides NEMA 3 rating when Modutrol IV Motor is mounted in other than upright position.

Installation

WHEN INSTALLING THIS PRODUCT...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings and description given on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

**CAUTION**

1. Disconnect power before installation to prevent electrical shock or equipment damage.
2. Never turn the motor shaft by hand or with a wrench to prevent damage to the motor.
3. Always conduct a thorough checkout when installation is complete.

LOCATION

Install the Modutrol IV Motor in any location except where acid fumes or other deteriorating vapors might attack the metal parts, or in atmospheres of escaping gas or explosive vapors. Motors are rated for ambient temperatures between -40° F and +150° F [-40° C and +66° C].

In excessive salt environments, mounting base and screws should be zinc or cadmium plated, not stainless steel or brass. Use the 220738A Adapter Bracket for mounting on these surfaces.

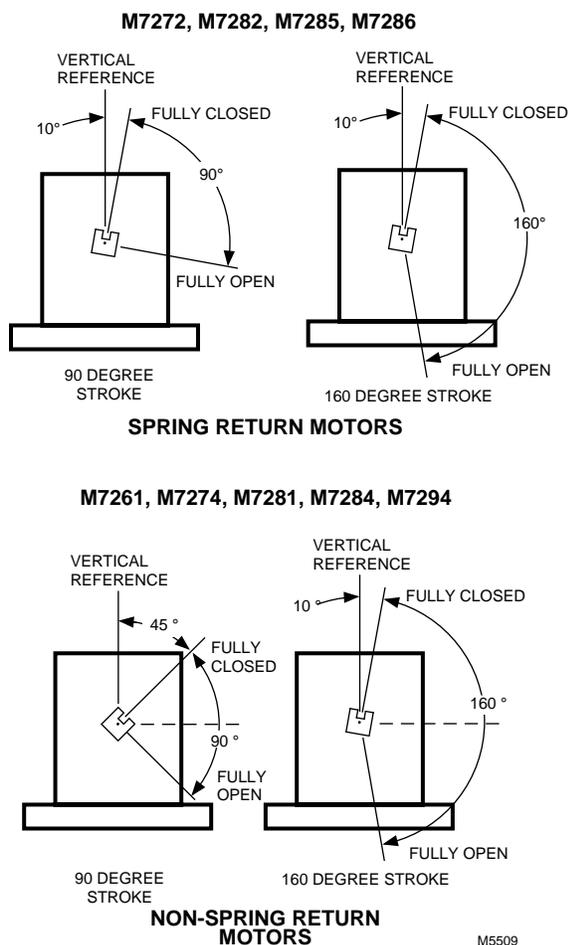
Allow enough clearance for installing accessories and servicing the motor when selecting a location (see Fig. 1). When located outdoors, mount motor upright and use liquid-tight conduit connectors and wiring box to provide NEMA 3 weather protection. When mounted outdoors in a position other than upright, install 4074ERU Weatherproofing Kit and liquid-tight conduit connectors to provide NEMA 3 weather protection.

MOUNTING

Always mount the motor with the shaft in a horizontal position. Mounting flanges extending from the bottom of the motor housing are drilled for 1/4 in. [6 mm] machine screws or bolts.

The Modutrol IV Motors are shipped in the closed position. The closed position is the limit of counterclockwise rotation as viewed from the power end of the motor. See Fig. 2. Motors with a “G” suffix letter, or normally open, spring return, are shipped in the open position (at the limit of clockwise rotation as viewed from the power end).

Fig. 2—Motor shaft position at limit of rotation as viewed from power end of motor.



ADAPTER BRACKET

The 220738A Adapter Bracket, positioned between the motor and the equipment, raises the motor shaft height by 0.75 in. [19 mm] to match that of the former Modutrol Motor. This is required on all valve linkage applications, Q607 External Auxiliary Switch applications, and on some damper linkage applications (either to provide clearance for the crankarm to rotate through the downward position, or to allow the damper linkage to reach the motor shaft).

To mount the motor with the bracket:

1. Mount the bracket to the equipment with existing or standard bolts.
2. Mount the motor to the bracket using the bolts provided. See Fig. 3.

For valve linkage applications, first mount the bracket to the linkage. The bracket then provides a convenient base on which the motor can be positioned. After the motor shaft is aligned with the linkage, attach the motor to the bracket with the four bolts provided. For the M7281 and M7284, put the bolts through the outer set of back slots of the motor flange and into the threaded holes of the bracket. See Fig. 4. For the M7282 and M7285, put the bolts through the outer set of back slots of the motor flange and into the outer threaded holes of the bracket.

LINKAGES

Use of the 220738A Adapter Bracket (packed with the motor) is optional for many damper applications. Use the bracket in damper applications requiring the crank arm to rotate through the bottom plane of the motor. If you do not use the bracket, you will have to adjust the damper linkage to the new shaft location.

The 220738A Adapter Bracket must be used with the Q100, Q601 and Q618 Valve Linkages in all valve applications. See Fig. 4.

The motor comes without a crank arm. The motor crank arm is included in the Q605 Linkage or may be ordered separately. (See Accessories.)

For detailed instructions on the assembly of specific linkages, refer to the instruction sheet packed with the linkage. In general, check the following points of operation when installing a motor and linkage:

1. Linkages for valves and louver-type dampers should be adjusted so that the damper or valve moves through only the maximum required distance while the motor moves through its full stroke.
2. With modulating control, maximum damper opening should be no more than 60 degrees. Little additional airflow is provided beyond this point.
3. The motor must be stopped at the end of its stroke by its internal limit switch and must not be stalled by the damper or valve. The motor will be damaged if it is not permitted to complete its full stroke.
4. Do not exceed the load and torque ratings in any application.
5. Do not turn the motor shaft manually or with a wrench because this will damage the motor.

Fig. 3—Mounting the motor with an adapter bracket.

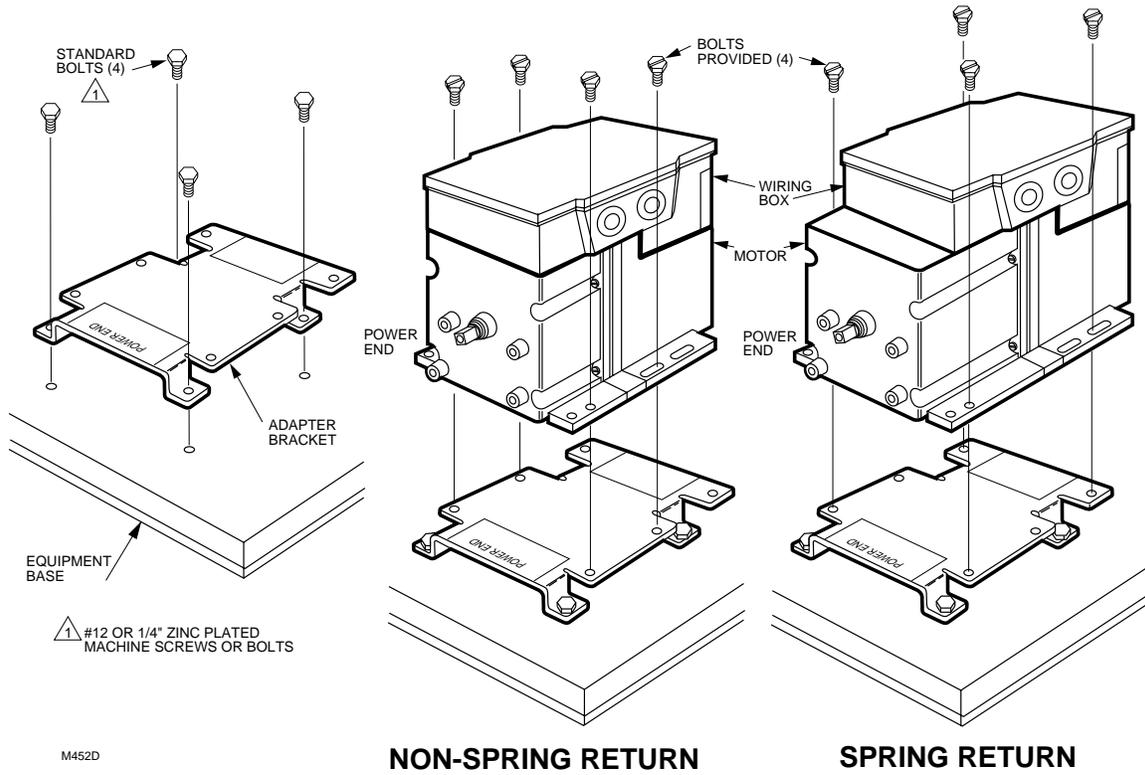
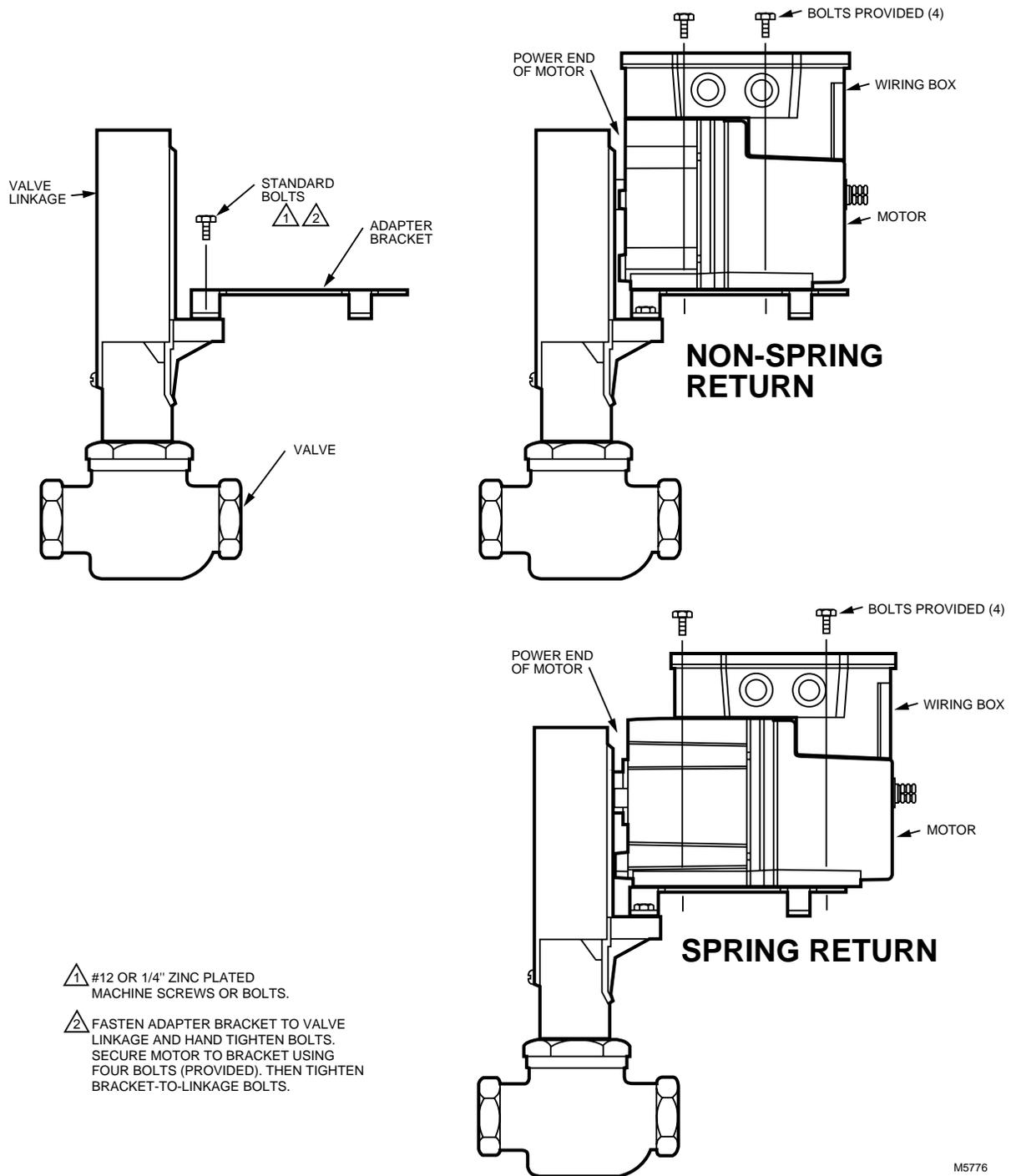


Fig. 4—Mounting Modutrol IV Motor on Q618 Valve Linkage.



M5776

WIRING

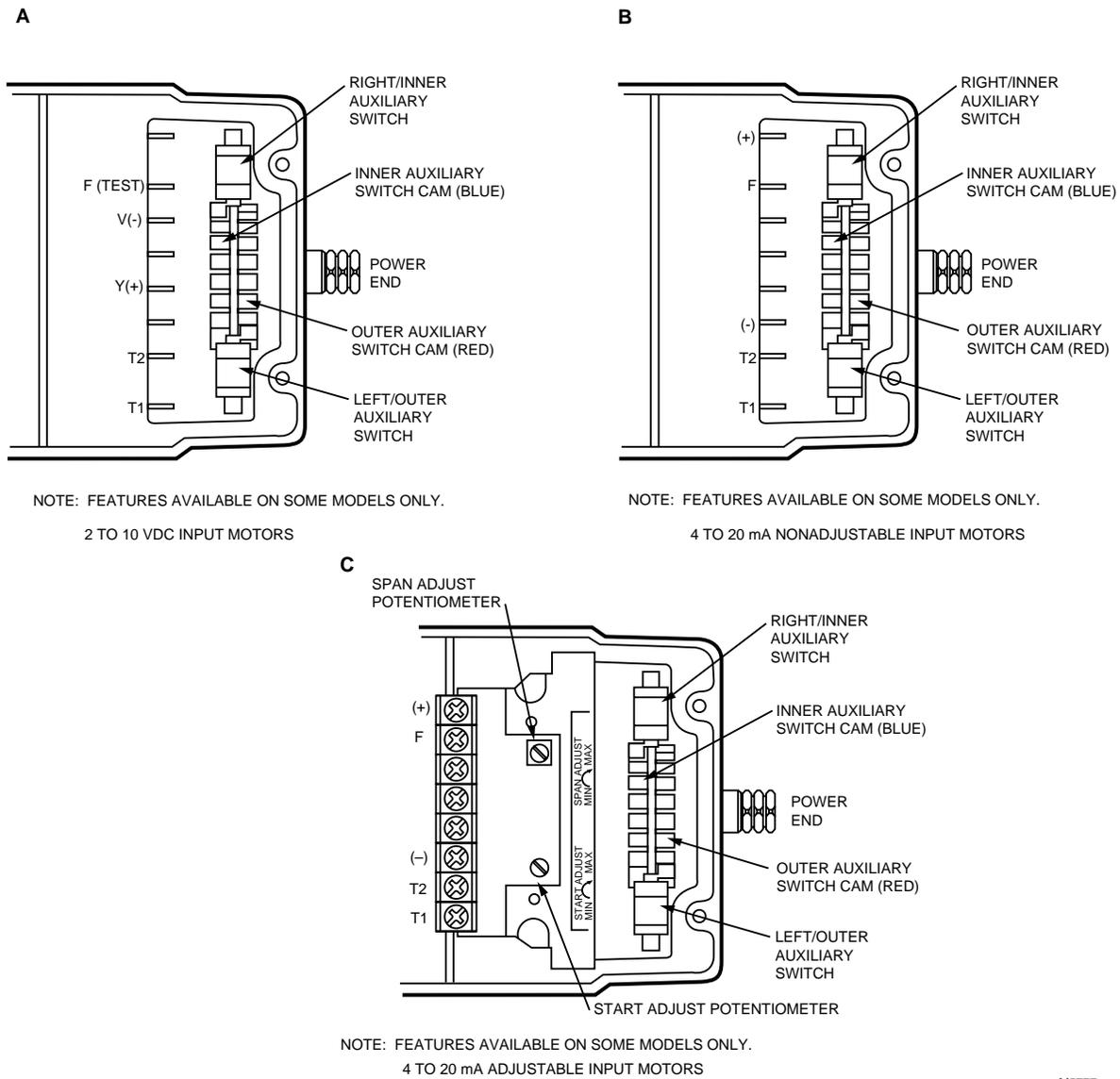
Disconnect power supply before beginning wiring to prevent electrical shock or equipment damage. All wiring must comply with applicable local codes, ordinances, and regulations.

Make sure that the voltage and frequency stamped on the motor correspond to the characteristics of the power supply. When several motors are to be connected in parallel, make sure that the power supply VA rating is large enough to provide power to all the motors to be used without overloading. An integral transformer is used to

supply 24 Vac power to the motor. Make sure that the power requirements stamped on the motor correspond to the characteristics of the power supply.

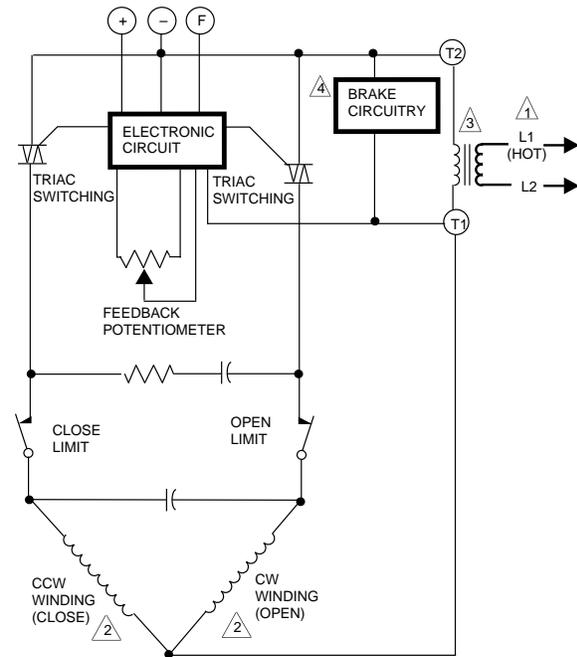
The motor terminals are quick-connects located on top of the printed circuit wiring board inside the wiring compartment. Access to the wiring compartment is gained by removing the four screws on the top of the wiring box and lifting off the cover. See Fig. 5 for terminal locations. See Fig. 6 for the internal schematic. Fig. 7 shows connections for typical system applications. Fig. 8 shows parallel motor connections.

Fig. 5—Terminals and adjustments.



M5777

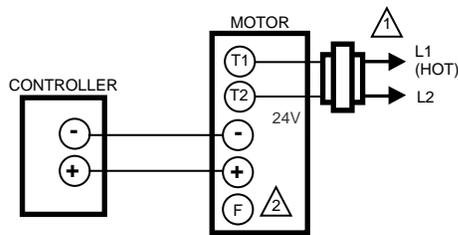
Fig. 6—Internal schematic of Series 72 Motors.



- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 DIRECTION OF MOTOR TRAVEL AS VIEWED FROM POWER END.
- 3 INTERNALLY MOUNTED TRANSFORMER. DO NOT CONNECT POWER SUPPLY TO T1 AND T2.
- 4 BRAKE CIRCUITRY ONLY ON SPRING RETURN MODELS.

M5511

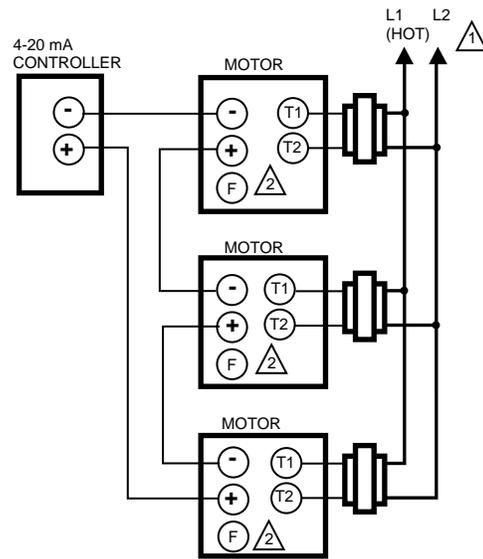
Fig. 7—Typical system wiring.



- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 CONNECTING F TO - WILL DRIVE MOTOR TO FULLY OPEN.

M5778

Fig. 8—Driving up to six motors from one 4 to 20 mA controller.



- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 CONNECTING F TO - WILL DRIVE MOTOR TO FULLY OPEN.

M5774

When used with liquid-tight conduit connectors, the wiring box provides NEMA 3 weather resistance for the motor. The wiring box, standard with replacement motors, also provides knockouts for wiring conduits and encloses terminals. The wiring box is required for housing an internal transformer or internal auxiliary switches.

Wire the motor as follows:

1. Remove the wiring box cover by removing the four screws holding the cover to the motor.
2. Wire motor to system using quick-connect terminals in wiring box.
3. Replace wiring box cover.

AUXILIARY SWITCH

The auxiliary switches are actuated by adjustable cams. These cams can be set to actuate the switches at any angle within the stroke of the motor. Also, switch differentials of 1° or 10° can be selected.

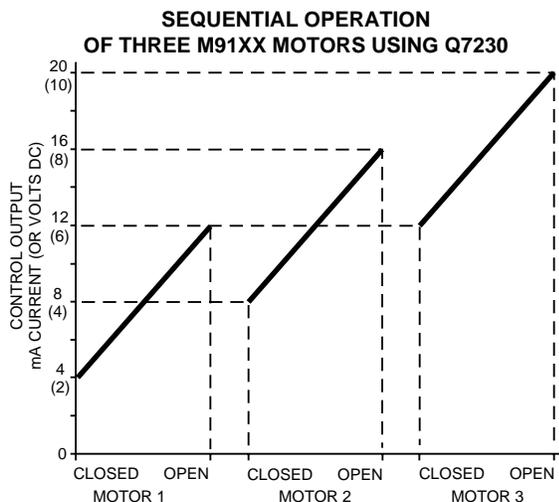
Motors with factory added auxiliary switches are shipped in the closed position (fully counterclockwise ↺, as viewed from the power end of the motor) with auxiliary cams set to actuate switches 30° from the closed position and to provide 1° degree differential. With the motor in the closed (fully counterclockwise ↺) position, the auxiliary switch breaks contacts R-B. See Fig. 10 for auxiliary switch wiring.

Settings and Adjustments

ZERO AND SPAN ADJUSTMENT FOR M7284Q AND M7285Q MOTORS (See Fig. 5.)

1. Adjust the start potentiometer fully clockwise (maximum zero) and the span potentiometer fully counterclockwise (minimum span).
2. Set the controller current to the value required to drive the motor to the closed position.
3. Turn the start potentiometer slowly counterclockwise until the motor begins to open. This is defined as the start or zero setting.
4. Set the controller current to the value required to drive the motor to the fully open position. The motor will open.
5. Turn the span potentiometer clockwise until the motor starts to close. The difference between the fully open span position current and the zero position current is defined as the operating span.
6. Recheck the start and readjust the span potentiometer P1 if necessary. Turn the start potentiometer clockwise to increase the zero position.
7. Recheck the span and readjust the span potentiometer if necessary. Turn it clockwise to increase the full span position.
8. For sequential operation, as shown in Fig. 9, repeat the above steps for each motor.

Fig. 9—Sequential operation of motors.



- 1. MOTOR 1 PROPORTIONS BETWEEN 4 AND 12 mA; FULLY CLOSED AT 4 mA, FULLY OPENED AT 12 mA.
- MOTOR 2 PROPORTIONS BETWEEN 8 AND 16 mA; FULLY CLOSED AT 8 mA, FULLY OPENED AT 16 mA.
- MOTOR 3 PROPORTIONS BETWEEN 12 AND 20 mA SIGNAL; FULLY CLOSED AT 12 mA, FULLY OPENED AT 20 mA.
- 2. UP TO 6 MOTORS CAN BE DRIVEN SEQUENTIALY OR IN UNISON FROM ONE CONTROLLER.
- 3. ADJUST ZERO ADJUST AND SPAN ADJUST POTENTIOMETERS TO ACHIEVE DESIRED SEQUENCE.

M2893

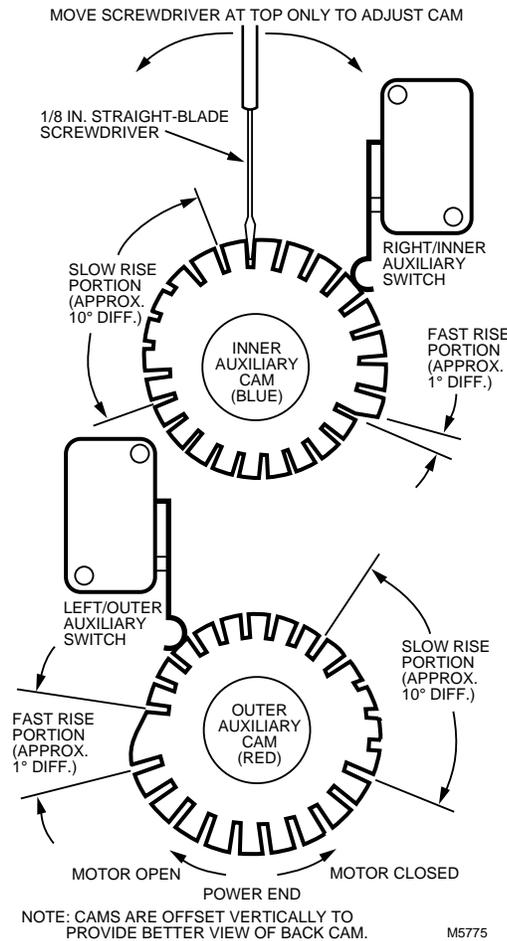
AUXILIARY SWITCH SETTING PROCEDURE (See Fig. 10)



1. Live circuits are exposed during the auxiliary switch adjustment procedure. Always turn off the power before adjusting switch cams.
 2. Do not turn motor shaft by hand or with a wrench because damage to the motor can result.
1. Remove the top cover from the wiring box to gain access to motor terminals and auxiliary switch cams.
 2. Disconnect the controller from the motor and connect a current source to the positive (+) and negative (-) terminals.
 3. Increase or decrease the current to drive the motor to the position where auxiliary equipment is to be switched.
 4. For a switch differential of 1°, check the continuity of auxiliary switch R-B contacts and rotate the cam as follows:
 - a. If contacts are open, rotate cam clockwise until R-B contacts close.
 - b. If contacts are closed, rotate cam counterclockwise until R-B contacts open.
 5. For switch differential of 10°, rotate cam approximately 180° so that the slow-rise portion of the cam actuates the switch; then check continuity of auxiliary R-B contacts and rotate cam as follows:
 - a. If contacts are open, rotate cam counterclockwise until R-B contacts close.
 - b. If contacts are closed, rotate cam clockwise until R-B contacts open.
 - c. Make final adjustment in the proper direction to obtain contact make or break at desired position.
 6. Check for proper differential and switching of auxiliary equipment by driving motor through full stroke in both directions.
 7. Disconnect power, remove current source, reconnect controller and replace the top cover on the motor wiring box.
 8. Restore power to the equipment.

NOTE: If differential is changed from 1° to 10°, the switching action is reversed. Switch contacts R-B make and R-W break on a counterclockwise (closed) rotation.

Fig. 10—Auxiliary switch and adjustable cams.



Operation and Checkout

OPERATION

The motor feedback potentiometer and control current input circuit form a bridge circuit. As long as the final control element remains at the position proportional to the input current from the controller, the circuit is balanced, and the motor does not run. When the value of the controlled medium changes, the current from the controller changes, and unbalance is amplified to energize the Triac switching to run the motor in the proper direction to correct the change in the temperature or the pressure. The motor turns the feedback potentiometer to rebalance the circuit and stop the motor.

CHECKOUT

After installation and linkage adjustment, operate the motor through the controller. Make sure that:

- The motor properly operates the damper or valve.
- The motor responds properly as the input is varied.

- The auxiliary switch, if used, operates at the desired point of motor rotation.

Inspect the motor, linkage, and valve or damper to see that all mechanical connections are correct and secure. In damper installations, the pushrod should not extend more than a few inches past the ball joints. Check to see that there is adequate clearance for the linkage to move through its stroke without binding or striking other objects. See controller or system instructions for additional checkout procedures.

Motor Operation Checkout

Check motor operation as follows:

1. To close the motor, open terminals +, -, and F.
2. To open the motor, connect terminal F to the negative (-) motor terminal.

Honeywell

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