LF24-ECON-R03(-R10) US

Proportional, Spring Return, 24 V, for Stand-Alone Economizer Damper Control Using 3 kΩ or 10 kΩ Mixed Air Sensor, Built-in Minimum Position Adjustment

BELIMO

- **Torque min. 35 in-lb, for control of air dampers**
- **Built-in adjustable min-position**
- **Integrated mixed air PI-control**

Application

For proportional control of mixed air setpoint on economizer dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft from 3/8" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. For shafts up to 3/4" use K6-1 accessory. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

The actuator operates in response to 3 kΩ or 10 kΩ thermistor, which allows the LF24-ECON... to retrofit or replace Honeywell® M7415 actuators.

Operation

The LF series actuators provide true spring return operation for reliable fail-safe application and positive close-off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator.

The LF series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 90°.
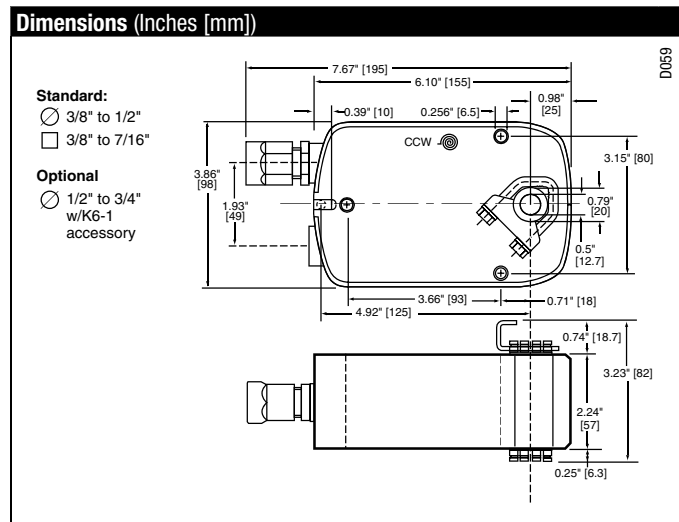
The LF24-ECON-R03 (-R10) US uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

See wiring diagrams for LF24-ECON-R03 US for more details on 3-position control.

Installation

Refer to LF Section of the Standard Actuation and Accessories, Product Documentation.

Honeywell® is a trademark of Honeywell Inc.

Technical Data		LF24-ECON-R03(-R10) US
Power supply		24 VAC ± 20% 50/60 Hz
		24 VDC ± 10%
Power consumption	running	2.5 W
	holding	1 W
Transformer sizing		5 VA (class 2 power source)
Electrical connection		3 ft, plenum rated cable
		1/2" conduit connector
Overload protection		electronic throughout 0 to 95° rotation
Control signal, Y1 (LF24-ECON-R03 US)		3 kΩ NTC Type 10 thermistor, 3 kΩ @ 77°F (25°C) MA setpoint = 55°F
Input impedance		100 kΩ
Feedback output U		2 to 10 VDC (max. 0.7 mA) for 95°
Angle of rotation		max. 95°, adjust. with mechanical stop
Torque		35 in-lb [4 Nm]
Override function		See override control table on opposite page
Direction of rotation	spring	reversible with cw/ccw mounting
	motor	reversible with built-in switch
Position indication		Visual indicator, 0° to 95° scaled as 0 to 1 (0° is spring return position)
Running time	motor	95 sec constant, independent of load
	spring	< 25 sec @-4°F to 122°F [-20°C to 50°C]
		< 60 sec @-22°F [-30°C]
Humidity		5 to 95% RH non-condensing
Ambient temperature		-22°F to 122°F [-30°C to 50°C]
Storage temperature		-40°F to 176°F [-40°C to 80°C]
Housing		NEMA type 2 /IP54
Housing material		zinc coated metal
Agency listings		cULus acc. to UL 873 and CAN/CSA C22.2 No. 24-93
Noise level (max)	running	< 30 db (A)
	spring return	62 dB (A)
Servicing		maintenance free
Quality standard		ISO 9001
Weight		3.2 lbs (1.45 kg)

LF24-ECON-R10 US	
Control Signal, Y1	10 kΩ NTC Type 7 thermistor, 10 kΩ @ 77°F (25°C) MA setpoint = 55°F

Dimensions (Inches [mm])

Standard:
⌀ 3/8" to 1/2"
□ 3/8" to 7/16"

Optional
⌀ 1/2" to 3/4" w/K6-1 accessory

7.67" [195]
6.10" [155]
0.98" [25]
0.39" [10]
0.256" [6.5]
CCW
3.15" [80]
3.86" [98]
1.93" [49]
0.79" [20]
0.5" [12.7]
3.66" [93]
0.71" [18]
4.92" [125]
0.74" [18.7]
3.23" [82]
2.24" [57]
0.25" [6.3]

Accessories

AV 10-18	Shaft extension (K6-1 is required)
IND-LF	Damper position indicator
K6-1	Universal clamp for up to 3/4" diameter shafts
KH-LF	Crank arm for up to 1/2" round shaft
Tool-06	8mm and 10 mm wrench
ZG-LF2	Crank arm adaptor kit for LF
ZG-112	Mounting bracket for replacing Honeywell Mod IV, M7415 type actuators, and new installations
ZG-LF112	Crank arm adaptor kit for replacing Honeywell Mod IV, M7415 type actuators, and new installations
20477-00001	Mounting bracket for Honeywell W7459 logic module
ZG-ECON1	Mounting bracket kit for Honeywell M7415 economizer actuator retrofit and new installations
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)

NOTE: When using LF24-ECON-R03 (R10) US actuators, use accessories listed on this page.

Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 3/4" diameter and center a 1/2" shaft. Actuator shall deliver a minimum output torque of 35 in-lbs. The actuator must provide proportional damper control in response to a 3 kΩ or 10 kΩ NTC thermistor, 55°F setpoint. Actuator must have a built-in minimum position potentiometer. Actuator must have minimum position override via 0 to 10VDC on wire 4. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be independent of torque load. A 2 to 10VDC feedback signal shall be provided for position feedback or master-slave applications. The actuator must be designed so that they may be used for either clock-wise or counterclockwise fail safe operation. Actuators shall be cULus listed, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo

Wiring Diagrams

⚒ *INSTALLATION NOTES*

1. Provide overload protection and disconnect as required.

2. Min-position is adjustable from 0 to 100% with a potentiometer on the actuator cover.

3. Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

4. CW (default) indicates that motor drive starts at zero position.

5. A relay or switch can spring return the actuator when the RTU fan de-energizes, or if low ambient temperature is sensed.

6. A standard relay can be used to close the sensor circuit to engage economizer mode, e.g. outside air changeover device like a dry bulb or enthalpy limit switch. Honeywell® logic module W7459A and enthalpy sensor C7400 also provide terminals for this switching.

7. A remote CO2 sensor or DDC controller with a 0 to 10 VDC output can change the standard relay or can be used to open and close the sensor circuit. This device can be a relay or a dry bulb/enthalpy limit switch.

8. Override control for Y2 only accepts 0 to 10 VDC override control.

⚠ WARNING *Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
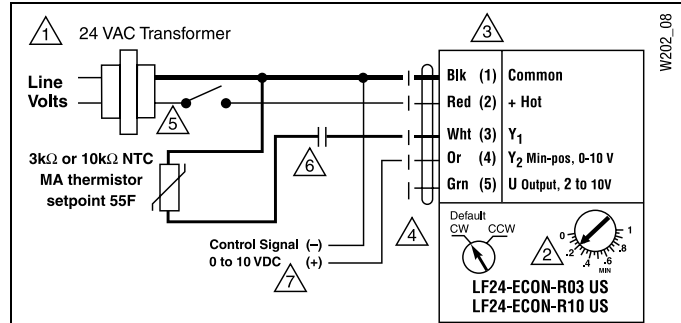
Standard Economizer Mode Wiring
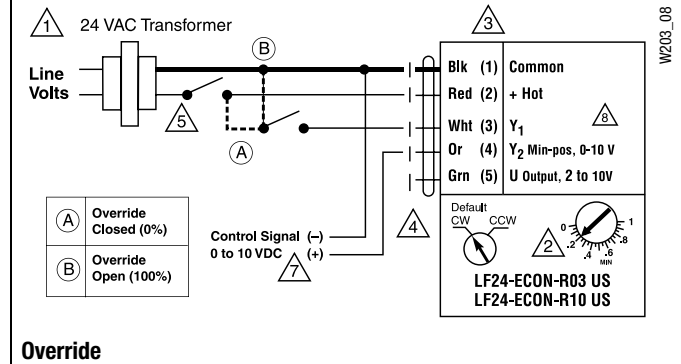
Override

Override Control

Wire	Input Signal	LF24-ECON... Position	Application
Y1	24 VAC	Drive closed (0%)	Morning warm-up cycle
Y1	Common	Drive open (100%)	Smoke Purge
Y1	Open wire	Drive to min position	Mechanical cooling in use, RTU thermostat calls for heat
Y2	0 VDC to 10 VDC	Min position of 0% to 100%	Override potentiometer via a remote CO2 sensor/controller or DDC controller

Operation LF24-ECON-R03(-R10) US

The LF24-ECON-R03(-R10) US provides a direct coupling solution for RoofTop Unit(RTU) economizer dampers.

Control of Mixed Air in Typical Economizer Dampers

Occupied - Economizer Mode

The LF24-ECON-R03 (-R10) US enters Economizer Mode when either an external relay or controller (e.g. Honeywell® W7459A) completes the circuit between the actuator wire 3(Y1) and MA sensor.   In this mode, the actuator moves proportionally to maintain a MA set-point of 55°F(fixed). A proportional band of 6°F modulates the actuator between 53 and 58°F. Also, a +/-1°F dead band eliminates hunting of the actuator, while maintaining suitable temperatures in the RTU mixed air chamber.

Occupied – Mechanical CH (Cooling or Heating) Mode

The LF24-ECON-R03(-R10) US enters Mechanical CH Mode when either an external relay or controller (e.g. Honeywell® W7459A) breaks the circuit between the actuator wire 3(Y1) and MA sensor.   In this mode, the actuator drives to minimum position. Minimum position can be set on built-in potentiometer, or set remotely by sending a 0 to 10 VDC signal to wire 4(Y2) via a SGA24 or DDC controller.
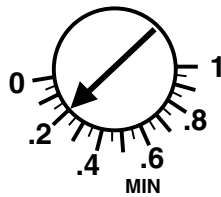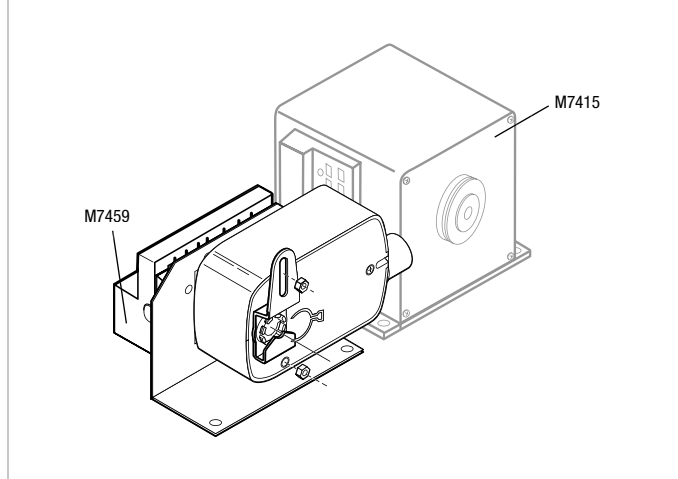
Unoccupied

RTU Economizer damper actuators typically interlock actuator supply power with RTU fan motor starter/relay. This set-up ensures that the actuator spring returns the economizer damper closed during periods when the ventilation air is not required.

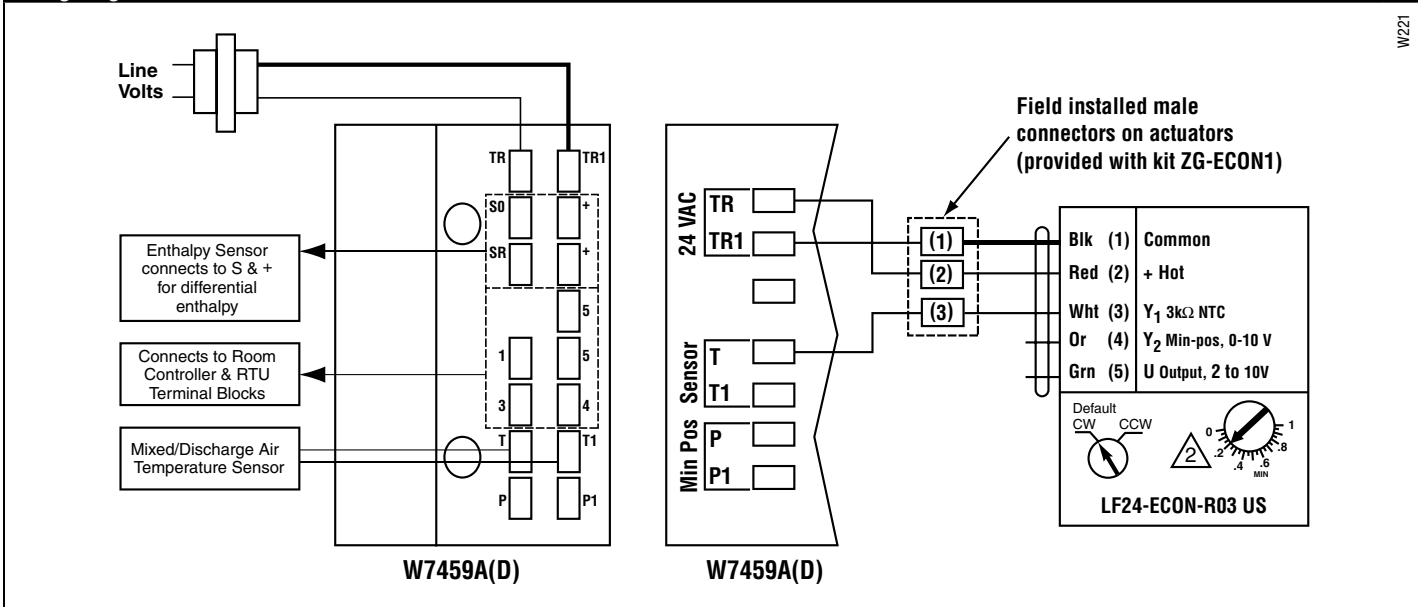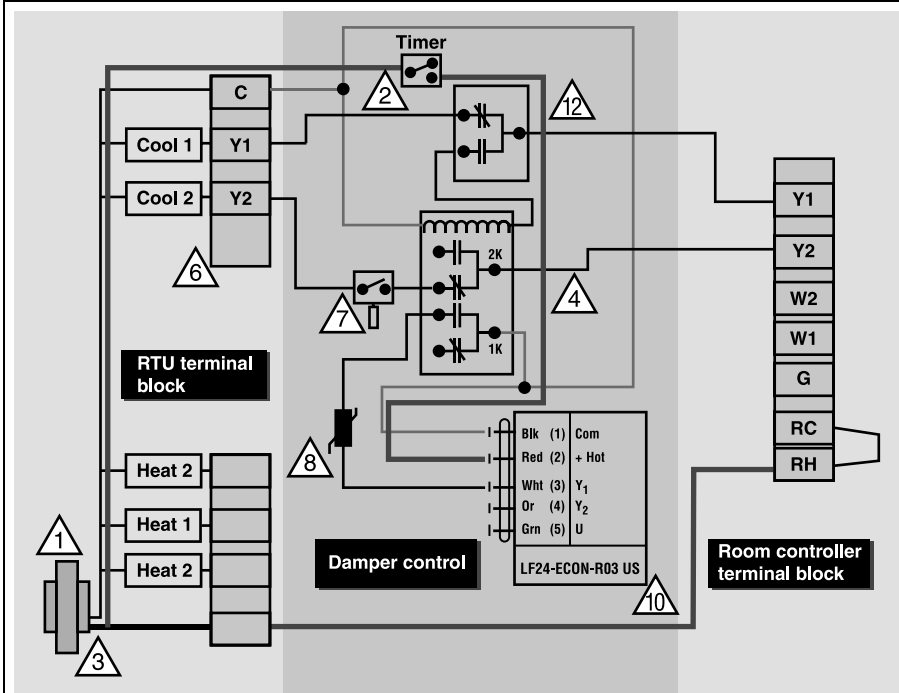| MA Dry Bulb Temperature	LF24-ECON... Position
< 53°F	Min. position
53°F < MAT < 58°F	Modulates between Min. Position and 100% open
> 58°F	100% open

Mounting

Logic Module Bracket

KH-LF Crank arm

ZG-112
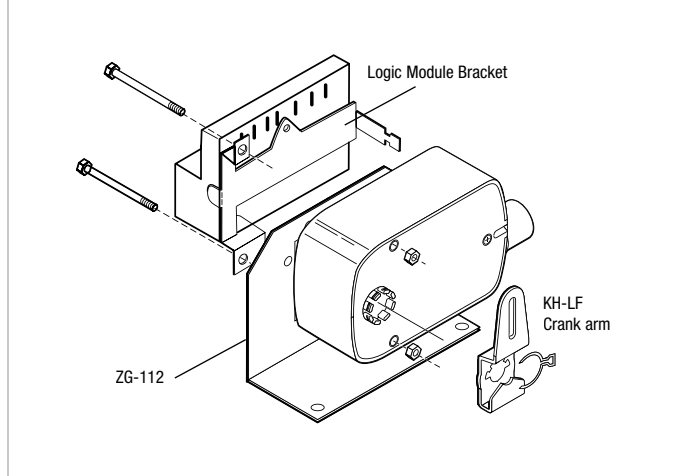
Replacing an Honeywell® M7415 actuator

M7415

M7459

Wiring Diagram for Installation of the LF24-ECON-R03 US

W221

Line Volts

TR   TR1

S0   +

SR   +

Enthalpy Sensor connects to S & + for differential enthalpy

Connects to Room Controller & RTU Terminal Blocks

Mixed/Discharge Air Temperature Sensor

1   5

3   4

T   T1

P   P1

W7459A(D)

24 VAC
TR
TR1

Min Pos Sensor
T
T1
P
P1

W7459A(D)

Field installed male connectors on actuators (provided with kit ZG-ECON1)

(1)
(2)
(3)

Blk (1) Common
Red (2) + Hot
Wht (3) Y₁ 3kΩ NTC
Or (4) Y₂ Min-pos, 0-10 V
Grn (5) U Output, 2 to 10V

Default
CW   CCW

0 1 .8 .6 MIN .4 .2

LF24-ECON-R03 US

BELIMO®

LF24-ECON-R03 US used with W7459A(D) / C7400 in two-stage cooling system with single enthalpy changeover
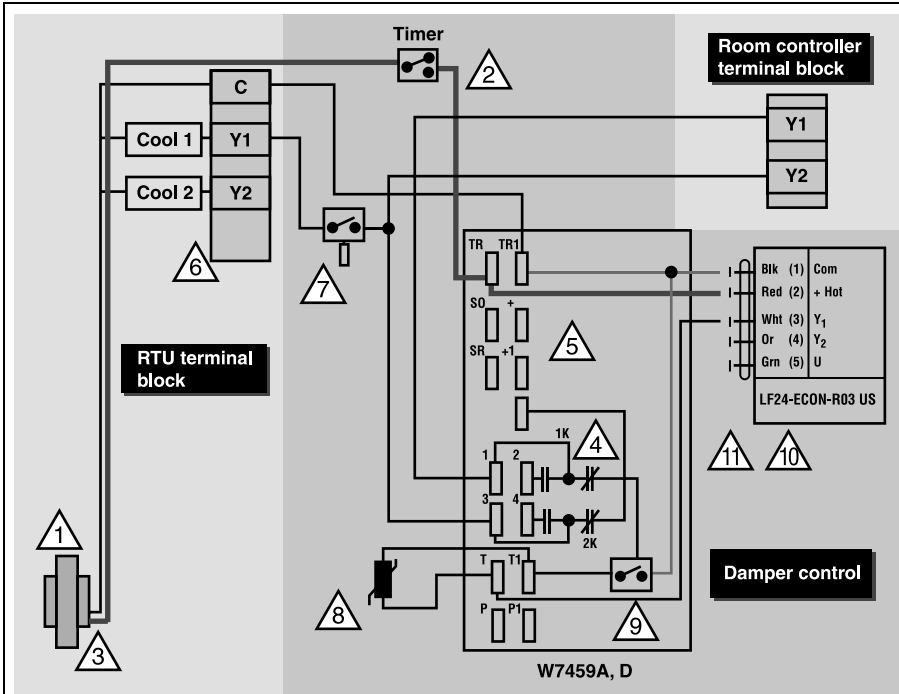
LF24-ECON-R03 US used with W7459A(D) / C7400 in one-stage cooling system with differential enthalpy changeover

Wiring Diagrams

⚒ INSTALLATION NOTES

1. Power supply is 24VAC transformer. Provide overload protection and disconnect as required.

2. A fan delay relay should be interlocked with bothfan and actuator power to ensure the actuator spring returns when the RTU fan de-energizes. A time clock for occupied or unoccupied mode is shown. The actuator spring returns in unoccupied mode.

3. Be sure the transformer is sized to accommodate the actuator, control module and other devices for economizer control.

4. Relays 1K and 2K actuate when the enthalpy sensed by the C7400 is higher than theenthalpy setpoint A-D..

5. Factory installed 620 OHM, 1 Watt 5% Resistor should be removed only if a C7400 enthalpy sen-sor is added to SR and + for differential enthalpy.

6. The heating, fan and power terminals of the RTU and room thermostat are not shown to simplify the wiring diagram. Typically there is a direct wiring connection between terminals W1, W2, G and R on both terminal strips. In addition the R terminal from the RTU connects to the RC or RH terminal on the thermostat. RH and RC are jumpered on the thermostat to ensure power gets to both the cooling and heating relays.

7. The ambient lockout controller sets a low limit of 50 degrees F. This set-up ensures the compressors for mechanical cooling remain off at lower temperatures.

8. Mixed/Discharge air temperature sensor is usedto regulate discharge air temperature by changing damper position of the LF24-ECON-R03(-R10) US.

9. This switch contacts when 24V power is applied from the relays in note 4.

10. The LF24-ECON-R03(-R10) US provides a 2 to 10 VDC output indicating position.

11. A remote CO2 sensor or DDC controller with a 0 to 10 VDC output can change the standard relay or can be used to open and close the sensor circuit. This device can be a relay or a dry bulb/enthalpy limit switch.

12. When conditions are met the dry bulb or enthalpy limit switch changes over the economizer from mechanical cooling to 100% outside air free cooling. This switch completes the circuit between the thermistor and the Y1 input on the actuator.

⚠ WARNING *Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical compo-nents. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

M40024 - 05/10 - Subject to change. © Belimo Aircontrols (USA), Inc.