





Technical Data	
Power Supply	24 VAC±20%, 50/60Hz, 24 VDC+20%/-10%
Power Consumption Running	3.5 W
Power Consumption Holding	2.5 W
Transformer Sizing	6 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	(2) 3 ft, 18 GA appliance cables with 1/2" conduit connectors
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range Y	2 to 10 VDC, 4 to 20 mA (w/ 500 Ω, 1/2 W resistor) ZG-R01
Input Impedance	100 k $\Omega$ for 2 to 10 VDC (0.1 mA), 500 $\Omega$ for 4 to 20 mA
Feedback Output U	2 to 10 VDC, 0.5 mA max
Angle of Rotation	95° (adjustable with mechanical end stop, 35° to 95°)
Torque (US unit)	90 in-lbs [10 Nm] minimum
Direction of Rotation (Motor)	reversible with built-in switch
Direction of Rotation (Fail-Safe)	reversible with CW/CCW mounting
Position Indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual Override	5 mm hex crank (3/16" Allen), supplied
Running Time (Motor)	95 sec
Running Time (Fail-Safe)	<20 sec @ -4°F to 122°F [-20°C to 50°C], < 60 sec @ -22°F [-30°C]
Humidity	max. 95% RH non-condensing
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 2, IP54, UL enclosure type 2
Housing Material	zinc coated metal and plastic casing
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	≤40 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	4.4 lbs [2.0 kg]
Auxiliary Switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at +10°, one adjustable 10° to 90°

Torque min. 90 in-lb, for control of air dampers.

## Application

For fail-safe, modulating control of 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 up to 1.05" in diameter by means of its universal clamp. 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 a 2 to 10 VDC or, with the addition of a 500 $\Omega$  resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

## Operation

The NF.24-SR-S 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 NF.24-SR-S series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The NF.24-SR-S 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 fail-safe 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. The NF.24-SR-S versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at +10°, the other switch function is adjustable between +10° to +90°. The NF.24-SR-S actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.



†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.



NFB24-SR-S - Damper Actuator Modulating, Spring Return, 24 V, for 2 to 10 VDC or 4 to 20 mA Control Signal

AH-P   Anti-rotation bracket AF/Nr.     AV8-25   9.8" shaft extension for 5/16" to 1" diameter shafts.     IND-AFB   AFB(X)/NFB(X) position indicator.     K7-2   Standard AFB(X)/NFB(X) clamp (1/2" to 1.05").     KG10A   Ball joint for 3/8" diameter rod, zinc plated.     KG8   Ball joint for 3/8" diameter rod, 90°, galvanized steel.     KH10   Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.     KH12   Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.     KH4   Univ. crankarm, slot 21/64" w, for 3/4" diameter).     SH10   Push rod for KG10A ball joint (36" L, 3/8" diameter).     SH10   Push rod for KG10A ball joint (36" L, 3/8" diameter).     TOOL-06   8 mm and 10 mm wrench.     Z-4F   Classic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.     ZG-100   Univ. right angle bracket (17" H x 11-1/8" W x 6" base).     ZG-110   Stand-off bracket for ZS-260.     ZG-110   Stand-off bracket for ZS-260.     ZG-118   AFB(X)/NFB(X) crankarm adaptor kit.     ZG-AFB118   AFB(X)/NFB(X) crankarm adaptor kit.     ZG-AFB AFS/X)/NFB(X) crankarm adaptor kit.   ZG-AFB AFS/X)/NFB(X) crankarm adaptor kit.     ZG-AFS A1   " diameter jackshaft adaptor (11" L). </th <th>Accessories</th> <th></th>	Accessories	
IND-AFBAFB(X)/NFB(X) position indicator.K7-2Standard AFB(X)/NFB(X) clamp (1/2" to 1.05").KG10ABall joint for 3/8" diameter rod, 30°, galvanized steel.KH10Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH12Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.KH18Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.KH19Push rod for KG10A ball joint (36" L, 3/8" diameter).SH10Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).T00L-068 mm and 10 mm wrench.Z-AFClassic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.ZG-100Univ. right angle bracket (17" H x 11-1/8" W x 6" base).ZG-101Right angle bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-120Jackshaft mounting bracket.ZG-AFBBAFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 6" width.ZG-DC2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-41.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-41.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (	AF-P	Anti-rotation bracket AF/NF.
K7-2Standard AFB(X)/NFB(X) clamp (1/2" to 1.05").KG10ABall joint for 3/8" diameter rod, 2inc plated.KG8Ball joint for 5/16" diameter rod, 90°, galvanized steel.KH10Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH12Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH4Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH4Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH4Huiv. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH4FB (X)/NFB(X) crankarm (with 3/4" dia. shaft pass through).SH10Push rod for KG10A ball joint (36" L, 3/8" diameter).SH2Classic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.ZG-100Univ. right angle bracket (17" H x 11-1/8" W x 6" base).ZG-101Univ. right angle bracket (13" H x 11" W x 7-7/16" base).ZG-103Stand-off bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB AFB(X)/NFB(X) crankarm adaptor kit.ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).		
KG10ABall joint for 3/8" diameter rod, zinc plated.KG8Ball joint for 5/16" diameter rod, 90°, galvanized steel.KH10Univ. crankarm, slot 21/64" w, for 3/6" to 1" dia. shafts.KH12Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.KH8Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.KH4FB(X)/NFB(X) crankarm (with 3/4" dia. shaft pass through).SH10Push rod for KG10A ball joint (36" L, 3/8" diameter).SH8Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).TOOL-068 mm and 10 mm wrench.Z-AFClassic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.ZG-101Univ. right angle bracket (17" H x 11-1/8" W x 6" base).ZG-103Kight angle bracket for ZS-260.ZG-104Jackshaft mounting bracket.ZG-105Stand-off bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-121Jackshaft mounting bracket.ZG-22Jackshaft mounting bracket.ZG-34AFB(X)/NFB(X) crankarm adaptor kit.ZG-35A-21-5/16" diameter jackshaft adaptor (11" L).ZG-35A-31.05" diameter jackshaft adaptor (12" L).ZS-300Weather shield - PC w/ foam seal (16"		
KG8Ball joint for 5/16" diameter rod, 90°, galvanized steel.KH10Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH12Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.KH8Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.KH8Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.KH8Push rod for KG10A ball joint (36" L, 3/8" diameter).SH10Push rod for KG10A ball joint (36" L, 3/8" diameter).TOOL-068 mm and 10 mm wrench.Z-AFClassic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.ZG-100Univ. right angle bracket (17" H x 11-1/8" W x 6" base).ZG-101Univ. right angle bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-3 <td< td=""><td></td><td></td></td<>		
KH10   Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.     KH12   Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.     KH4   Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.     KH-AFB   AFB(X)/NFB(X) crankarm (with 3/4" dia. shaft pass through).     SH10   Push rod for KG10A ball joint (36" L, 3/8" diameter).     SH8   Push rod for KG6 & KG8 ball joint (36" L, 5/16" diameter).     TOOL-06   8 mm and 10 mm wrench.     Z-AF   Classic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.     ZG-100   Univ. right angle bracket for ZS-260.     ZG-110   Stand-off bracket for ZS-260.     ZG-110   Stand-off bracket for ZS-260.     ZG-110   Stand-off bracket for ZS-260.     ZG-110   Jackshaft mounting bracket.     ZG-6101   Jackshaft mounting bracket.     ZG-6112   Jackshaft mounting bracket.     ZG-6120   Jackshaft mounting bracket.     ZG-6120   Jackshaft mounting bracket.     ZG-6120   Damper clip for damper blade, 6" width.     ZG-52   Damper clip for damper blade, 6" width.     ZG-54-1   1" diameter jackshaft adaptor (12" L).     ZG-54-3   1.05" diameter jackshaft adaptor (12" L).		
KH12   Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.     KH8   Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.     KH-AFB   AFB(X)/NFB(X) crankarm (with 3/4" dia. shaft pass through).     SH10   Push rod for KG10A ball joint (36" L, 3/8" diameter).     SH8   Push rod for KG10A ball joints (36" L, 5/16" diameter).     TOOL-06   8 mm and 10 mm wrench.     Z-AF   Classic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.     ZG-100   Univ. right angle bracket (17" H x 11-1/8" W x 6" base).     ZG-101   Univ. right angle bracket for ZS-260.     ZG-110   Stand-off bracket for ZS-260.     ZG-110   Jackshaft mounting bracket.     ZG-110   Jackshaft mounting bracket.     ZG-120   Jackshaft mounting bracket.     ZG-131   AFB(X)/NFB(X) U rankarm adaptor kit.     ZG-AFB   AFB(X)/NFB(X) crankarm adaptor kit.     ZG-AFB118   AFB(X)/NFB(X) crankarm daptor (11" L).     ZG-JSA-1   1" diameter jackshaft adaptor (12" L).     ZG-JSA-3   1.05" diame		
KH8   Univ. crankarm,slot 21/64" w,for 3/8" to 11/16" dia. shafts.     KH-AFB   AFB(X)/NFB(X) crankarm (with 3/4" dia. shaft pass through).     SH10   Push rod for KG10A ball joint (36" L, 3/8" diameter).     SH8   Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).     TOOL-06   8 mm and 10 mm wrench.     Z-AF   Classic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.     ZG-101   Univ. right angle bracket (17" H x 11-1/8" W x 6" base).     ZG-103   Right angle bracket for ZS-260.     ZG-110   Stand-off bracket for ZS-260.     ZG-120   Jackshaft mounting bracket.     ZG-120   Jackshaft mounting bracket.     ZG-46   AFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).     ZG-120   Jackshaft mounting bracket.     ZG-47B   AFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).     ZG-120   Jackshaft mounting bracket.     ZG-47B   AFB(X)/NFB(X) V crankarm adaptor kit.     ZG-47B   AFB(X)/NFB(X) Crankarm adaptor kit.     ZG-54A   1.05" diameter jackshaft adaptor (12" L).     ZG-JSA-1   1" diameter jackshaft adaptor (12" L).     ZG-JSA-3   1.05" diameter jackshaft adaptor (12" L).     ZG-JSA-3   1.05" diamet		
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TOOL-068 mm and 10 mm wrench.Z-AFClassic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.ZG-100Univ. right angle bracket (17" H x 11-1/8" W x 6" base).ZG-101Univ. right angle bracket (13" H x 11" W x 7-7/16" base).ZG-109Right angle bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-112Jackshaft mounting bracket.ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSCJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-C11/2" shaft adaptor for ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300Analog to digital switch for modulating actuators.RS-100Analog to digital switch for modulating actua		
Z-AFClassic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.ZG-100Univ. right angle bracket (17" H x 11-1/8" W x 6" base).ZG-101Univ. right angle bracket (13" H x 11" W x 7-7/16" base).ZG-109Right angle bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300NEMA 4X, 316L stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-51"/2" shaft adaptor for ZS-300(-5).ZS-300-51"/2" shaft adaptor for ZS-300(-5).ZS-300-52.4" shaft adaptor for ZS-300(-5).ZS-300-51" shaft adaptor for ZS-300(-5).ZS-300-51"/2" shaft adaptor for ZS-300(-5).ZS-300-51"/2" shaft adaptor for ZS-300(-5).ZS-300-52.5ZG-3021" shaft adaptor for ZS-300(-5).ZS-3001"/2" shaft adaptor for ZS-300(-5).ZS-300Analog to	SH8	
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ZG-101Univ. right angle bracket (13" H x 11" W x 7-7/16" base).ZG-109Right angle bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-118AFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-AFD1Damper clip for damper blade, 3.5" width.ZG-SD2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (12" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter or ZS-100.ZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-623/4" shaft adaptor for ZS-300(-5).ZS-300-631" shaft adaptor for ZS-300(-5).ZS-300-631" shaft adaptor for ZS-300(-5).ZS-300-631" shaft adaptor for ZS-300(-5).ZS-300-64Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.IRM-100Input rescaling module for modulating actuators.SGA24Positioner control for modulating actuators (flu	Z-AF	
ZG-109Right angle bracket for ZS-260.ZG-110Stand-off bracket for ZS-260.ZG-118AFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-U2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300NEMA 4X, 316 L stainless steel enclosure.ZS-300-11/2" shaft adaptor for ZS-300(-5).ZS-300-23/4" shaft adaptor for ZS-300(-5).ZS-300-3" shaft adaptor for ZS-300(-5).ZS-300-31" shaft adaptor for ZS-300(-5).ZS-300-31.05IRM-100Input rescaling module for modulating actuators.I	ZG-100	
ZG-110Stand-off bracket for ZS-260.ZG-118AFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-102Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-SNEMA 4X, 316L stainless steel enclosure.ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).<	ZG-101	
ZG-118AFB(X)/NFB(X) U bracket (5-7/8" H x 5-1/2" W x 2-19/32" D).ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-DC2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300NEMA 4X, 316L stainless steel enclosure.ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-3001" shaft adaptor for ZS-300(-5).ZS-3002.5 P piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.IRM-100Input rescaling module for modulating actuators.SGA24Positioner control for modulating actuators (surface mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, $50\Omega_1$ , 1/4 W resistor w 6" pigtail wires.ZG-SGFMounting plate for SGF.	ZG-109	Right angle bracket for ZS-260.
ZG-120Jackshaft mounting bracket.ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-DC2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-105Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-C11/2" shaft adaptor for ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-100Actuator power supply and control simulator.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (surface mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, $1/2"$ .ZG-R014 to 20 mA adaptor, $500\Omega$ , $1/4$ W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-R044 to 20 mA adaptor, 500Ω, $1/4$ W resistor w 6" pigtail wires.		
ZG-AFBAFB(X)/NFB(X) crankarm adaptor kit.ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-DC2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-C11/2" shaft adaptor for ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-3002 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.FS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (surface mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-SGFMounting plate for SGF.	ZG-118	
ZG-AFB118AFB(X)/NFB(X) crankarm adaptor kit.ZG-DC1Damper clip for damper blade, 3.5" width.ZG-DC2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-3002 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.FS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (surface mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-SGFMounting plate for SGF.	ZG-120	
ZG-DC1Damper clip for damper blade, $3.5"$ width.ZG-DC2Damper clip for damper blade, $6"$ width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-2 $1-5/16"$ diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for $1/2"$ to $1.05"$ shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-105Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C2 $3/4"$ shaft adaptor for ZS-300(-5).ZS-300-C2 $3/4"$ shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).SF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, $1/2"$ .ZG-R014 to 20 mA adaptor, $500\Omega$ , $1/4$ W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-AFB	
ZG-DC2Damper clip for damper blade, 6" width.ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor for ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).SF-20Cable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
ZG-JSA-11" diameter jackshaft adaptor (11" L).ZG-JSA-2 $1-5/16"$ diameter jackshaft adaptor (12" L).ZG-JSA-3 $1.05"$ diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to $1.05"$ shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C1 $1/2"$ shaft adaptor for ZS-300(-5).ZS-300-C2 $3/4"$ shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-520 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, $1/2"$ .ZG-R014 to 20 mA adaptor, $500\Omega$ , $1/4$ W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-JSA-21-5/16" diameter jackshaft adaptor (12" L).ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor, standard wtih ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-DC2	Damper clip for damper blade, 6" width.
ZG-JSA-31.05" diameter jackshaft adaptor (12" L).ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor, standard wtih ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-50020 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).SF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-JSA-1	1" diameter jackshaft adaptor (11" L).
ZG-JSLJackshaft linkage for ½" to 1.05" shaftsZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor, standard wtih ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGR24Positioner control for modulating actuators (flush mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-JSA-2	
ZS-100Weather shield - galvaneal (13" L x 8" W x 6" D).ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor, standard wtih ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (surface mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-JSA-3	
ZS-101Base plate for ZS-100.ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor, standard wtih ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (flush mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZG-JSL	
ZS-150Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).ZS-260Explosion proof housing.ZS-300NEMA 4X, 304 stainless steel enclosure.ZS-300-5NEMA 4X, 316L stainless steel enclosure.ZS-300-C11/2" shaft adaptor, standard wtih ZS-300(-5).ZS-300-C23/4" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-300-C31" shaft adaptor for ZS-300(-5).ZS-5F20 piece Z-AF kit.ADS-100Analog to digital switch for modulating actuators.IRM-100Input rescaling module for modulating actuators.PS-100Actuator power supply and control simulator.PTA-250Pulse width modulation interface for modulating actuators.SGA24Positioner control for modulating actuators (surface mount).SGF24Positioner control for modulating actuators (flush mount).TF-CC USCable conduit connector, 1/2".ZG-R014 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.ZG-R0250% voltage divider kit (resistors with wires).ZG-SGFMounting plate for SGF.	ZS-100	
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ZG-SGF Mounting plate for SGF.	ZG-R01	
	ZG-R02	
ZG-X40 120 to 24 VAC, 40 VA transformer.	ZG-SGF	
	ZG-X40	120 to 24 VAC, 40 VA transformer.



# 2 to 10 VDC / 4 to 20 mA Control



# Date created, 03/07/2016 - Subject to change. © Belimo Aircontrols (USA), Inc.

# NFB24-SR-S - Damper Actuator Modulating, Spring Return, 24 V, for 2 to 10 VDC or 4 to 20 mA Control Signal



## **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 jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500 $\Omega$  resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. 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 constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

## Wiring Diagrams

# ∧ 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.



Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.



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Actuators with appliance cables are numbered.

Provide overload protection and disconnect as required.

Actuators may also be powered by 24 VDC.

Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.

Only connect common to negative (-) leg of control circuits.

A 500  $\Omega$  resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.

Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.