

CN7505, CN7510 SERIES

NON-SPRING RETURN DIRECT-COUPLED DAMPER ACTUATORS FOR MODULATING AND FLOATING / 2-POSITION CONTROL

PRODUCT DATA



GENERAL

These direct-coupled damper actuators provide modulating control and floating/2-position control for:

- air dampers,
- VAV units,
- air handling units,
- ventilation flaps,
- louvers,
- reliable control for air damper applications with up to 10 sq.ft. / 44 lb-in (5 Nm) and 20 sq. ft. / 88 lb-in (10 Nm) (seal-less dampers; air friction-dependent).

FEATURES

- **Declutch for manual adjustment**
- **Adjustable mechanical end limits**
- **Removable access cover for direct wiring**
- **Mountable in any orientation**
- **Function selection switch for selecting modulating or floating/2 position control**

SPECIFICATIONS

Supply voltage	24 Vac/dc -15%/+20%,50/60 Hz;
Nominal voltage	24 Vac/dc, 50/60 Hz;

All values stated hereinafter apply to operation under nominal voltage conditions.

Power consumption

CN7505	5VA / 2 W
CN7510	5VA / 2 W

Control signal

Modulating	(0)2...10 Vdc
Floating/2-position	24Vac/dc

Ambient limits

Ambient operating limits	-20...+60 °C (-5...+140 °F)
Ambient storage limits	-40...+80 °C (-40...+175 °F)
Relative humidity	5...95%, non-condensing

Safety

Protection standard	IP54 as per EN 60529 (Type 1 Enclosure)
Overvoltage category	II
Pollution degree	II
Action Type	1
Protection against	
electric shock class	Class III
Electronic control	
software class	Class A

Lifetime

Full stroke cycle	60000
Repositions	1.5 million

Mounting

Round damper shaft	3/8 in 5/8 in.
Square damper shaft	1/4 in 1/2 in.; 45° steps
Shaft length	min. 1-5/8 in.

End switch (when included)

Rating	Class II
Triggering points	5°/85°

Torque rating

CN7505	5 Nm (44 lb-in)
CN7510	10 Nm (88 lb-in)
Runtime for 90°	90s (dc/60Hz ac), 110s (50Hz ac)
Rotation stroke	95° ±3°

Dimensions

see "Dimensions" on page 8

Weight (without cables)

1 lbs.

Noise rating

35 dB(A) max. at 1 m

Certification

CE&UL



PRODUCT IDENTIFICATION SYSTEM

C-Electrical Motor
N-Fail Safe Function (Non-Spring Return)
61-24V Floating Control
75-24V Modulating Control
05-44 lb-in. (5 Nm)
10-88 lb-in. (10 Nm)
A-Standard Model
1-No Feedback
2-Voltage Feedback Signal
0-No Internal Auxiliary Switches
2-Two Internal Auxiliary Switches
XX-System Controlled Numbers

C	N	75	10	A	2	0	XX
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Model #	Description
CN7505A2001	5Nm, 24Vac/Vdc, Modulating control, Non-Spring return, Voltage Feedback Signal and without aux. Switch
CN7510A2001	10Nm, 24Vac/Vdc, Modulating control, Non-Spring return, Voltage Feedback Signal and without aux. Switch
CN7510A2209	10Nm, 24Vac/Vdc, Modulating control, Non-Spring return, Voltage Feedback Signal and with aux. Switch

BASIC FEATURES

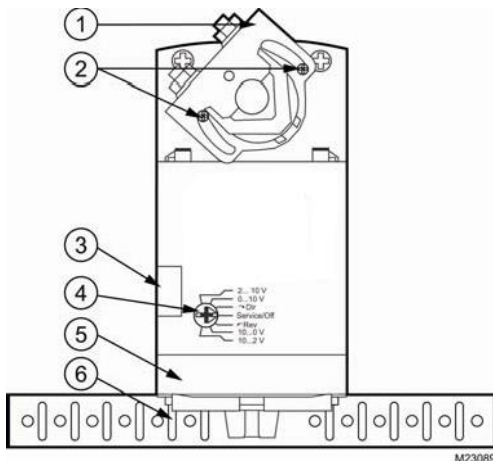


Fig. 1. units and control elements Setting

Legend for Fig. 1:

- 1) Universal shaft adapter
- 2) Mechanical end limits (manually adjustable)
- 3) Declutch button
- 4) Function selection switch
- 5) Removable access cover
- 6) Anti-rotation bracket

Contents of Package

The delivery package includes the actuator, parts 1 through 6 (see Fig. 1), plus two cable grommets and a spare cable grommet.

RUN MODES

The function selection switch (see Fig. 2) can be used to place the actuator into any one of two different modes:

- Service/Off; or
- the floating/2-position run mode ("Dir" for CCW-closing dampers or "Rev" for CW-closing dampers).
- the modulating run mode.

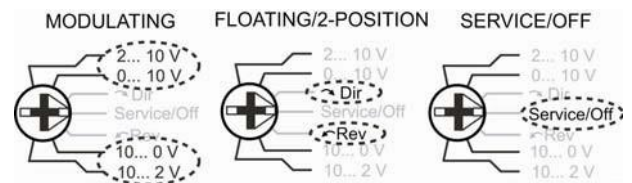


Fig. 2. Function selection switch

Power-Off Behavior

If power is removed, the shaft adapter remains in position.

Service/Off

If the function selection switch is set to the "Service/Off" position, then all rotary movement is cancelled, and all control signals are ignored, thus allowing the actuator to be manually operated safely.

Floating/2-Position Run Mode

Without Feedback Signal

If, however, the function selection switch has been set to one of the two floating/2-position control settings - but the actuator has not been wired for a feedback signal (see Fig. 12 and Fig. 13) - then as soon as operating power is applied, the shaft adapter will run according to the control signals applied.

With Feedback Signal

If the function selection switch has been set to one of the two floating/2-position control settings - and if the actuator has been wired for a feedback signal (see Fig. 12 and Fig. 13) - then as soon as operating power is applied, the shaft adapter will likewise run first completely counterclockwise and then completely clockwise (see also section "Adaption"), after which it will run according to the control signals applied.

Modulating Run Mode

If the function selection switch has been set to one of the four modulating control settings - and if the actuator is wired correspondingly (see Fig. 10) - then as soon as operating power is applied, the shaft adapter will run first completely counterclockwise and then completely clockwise (see also section "Adaption"), after which it will run according to the control signals applied.

Table 1 describes, for the floating mode, the shaft adapter behavior ("stops," rotates "CCW," or rotates "CW") in dependence upon the control signals applied to terminals 3 and 4 and upon the function selection switch setting.

Table 2 describes, for the 2-position mode, the shaft adapter behavior ("stops," rotates "CCW," or rotates "CW") in dependence upon the control signals applied to terminals 3 and 4 and upon the function selection switch setting.

Table 3 describes, for the modulating mode, the shaft adapter behavior ("stops," rotates "totally CCW," rotates "totally CW," runs to "proportional" position, or runs to "50%" of max. stroke) in dependence upon the control signals applied to terminals 3 and 4 and upon the function selection switch setting.

Table 1. Shaft adapter behavior in the floating mode

control signal at		switch settings				
terminal 3	terminal 4	0[2]...10V	Dir	Service/Off	Rev	10...0[2] V
open	open	--	stops	stops	stops	--
open	24 Vac/dc	--	CCW	stops	CW	--
24 Vac	open	--	CW	stops	CCW	--

Table 2. Shaft adapter behavior in the 2-position mode

control signal at		switch settings				
terminal 3	terminal 4	0[2]...10V	Dir	Service/Off	Rev	10...0[2] V
24 Vac	open	--	CW	stops	CCW	--
24 Vac	24 Vac/dc	--	CCW	stops	CW	--

Table 3. Shaft adapter behavior in the modulating mode

control signal at		switch settings				
terminal 3	terminal 4	0[2]...10V	Dir	Service/Off	Rev	10...0[2] V
open	open	totally CCW	--	stop	--	totally CCW
	24 Vac/dc	50%	--	stop	--	50%
< min control signal plus 0.24 V	open	totally CCW	--	stop	--	totally CW
	24 Vac/dc	50%	--	stop	--	50%
between min. control signal plus 0.24 V and max. control signal minus 0.24	open	proportional	--	stop	--	proportional
	24 Vac/dc	50%	--	stop	--	50%
> max. control signal minus 0.24 V	open	totally CW	--	stop	--	totally CCW
	24 Vac/dc	50%	--	stop	--	50%

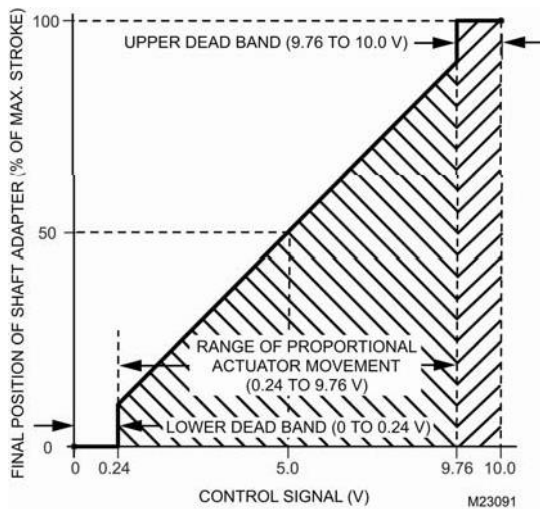


Fig 3. Final shaft adapter position in dependence upon control signal (example function selection switch setting of 0...10 V)

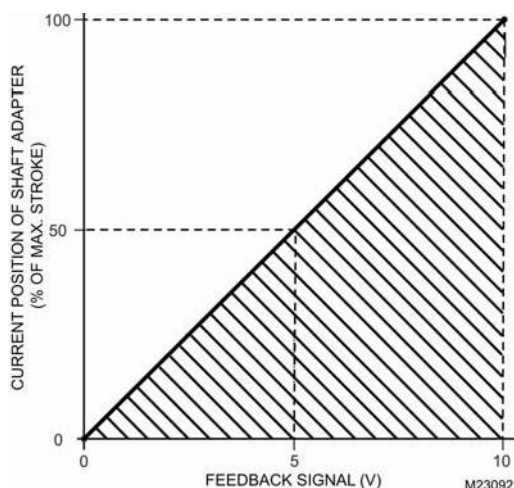


Fig 4. Feedback signal in dependence upon current position of shaft adapter (example function selection switch setting of 0...10 V)

Adaption

Adaption is a function in which the actuator re-maps its feedback signal and control signal in accordance with repositioned mechanical end limits (see also Fig. 6) and thus recognizes their new positions

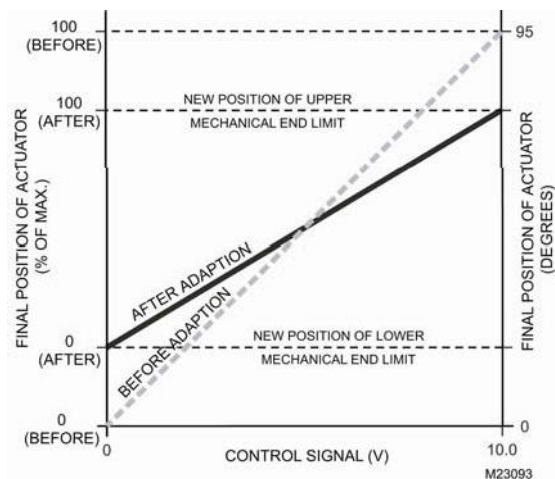


Fig 5. Adaption (function selection switch set to 0...10 V)

Adaption will be carried out whenever the actuator is in the modulating mode or the floating plus feedback mode or the 2-position plus feedback mode and

- the user powers up (from a totally powerless condition) the actuator; or
- the user sets the function selection switch to the "Service/Off" setting for at least 2 seconds and then back to its previous setting; or
- the control signal's value rises up into the upper dead band (i.e. to more than the max. control signal minus 0.24 V) or drops down into the lower dead band (i.e. to less than the min. control signal plus 0.24 V), after which the shaft adapter must then remain at the respective (upper or lower) mechanical end limit for at least 3 seconds. However, in this case, the actuator will then recognize the position of only the respective (upper or lower) mechanical end limit.

Overriding

An override is a condition in which a 24 V signal is applied to terminal 4 of an actuator in the modulating mode, thus causing the actuator to ignore the control signal at terminal 3, whereupon it will instead move to a position of 50% of its maximum stroke (see Table 3).

Feedback

If correspondingly wired (see Fig. 10, Fig. 11 and Fig. 12), the actuator provides, via terminal 5, a feedback signal proportional to the actual position of the shaft adapter.

MANUAL ADJUSTMENT

IMPORTANT

To prevent equipment damage, you must remove power or set the function selection switch to the "Service/Off" position before manual adjustment.

After removing power or setting the function selection switch to the "Service/Off" position, the gear train can be disengaged using the declutch button, permitting the shaft adapter to be manually rotated to any position. If you have wired the actuator for feedback signal, then, after adaption, the feedback signal will follow the new position.

Limitation of Rotation Stroke

Two adjustable mechanical end limits are provided to limit the angle of rotation as desired (see Fig. 6). The mechanical end limits must be securely fastened in place.

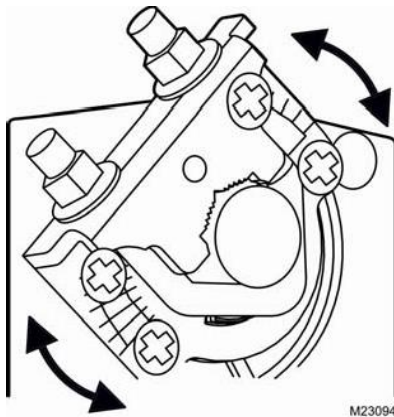


Fig 6. Mechanical end limits

To ensure tight closing of the dampers, the shaft adapter has a total rotation stroke of 95°.

After adjusting the mechanical end limits, the user should trigger adaption (see section "Adaption").

INTERNAL END SWITCHES

The internal end switches "A" and "B" are changeover switches which are activated when the shaft adapter moves past a position of 5° and 85°, respectively (see also Table 5).

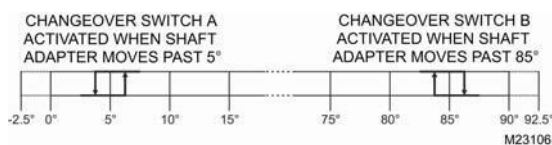


Fig 7. Internal end switch triggering points

INSTALLATION



To avoid personal injury (electrical shock) and to prevent equipment damage, before installation, you must remove power.

These actuators are designed for single-point mounting.

Mounting Instructions

All information and steps are included in the Installation Instructions (Product Literature No. 62-0224) supplied with each actuator.

Mounting Position

The actuators can be mounted in any position (IP54 is dependent upon orientation; see Fig. 8). Choose a mounting position permitting easy access to cables and controls.

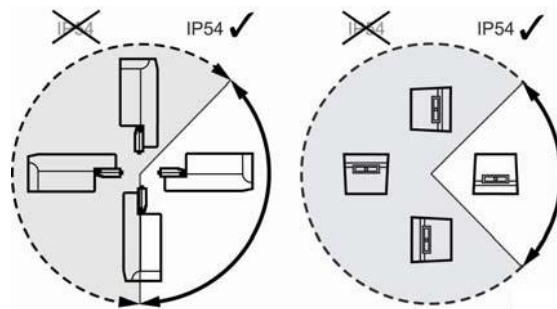


Fig 8. Mounting for IP54

NOTE: Further, in order to guarantee IP54, only original Honeywell grommets may be used.

Anti-Rotation Bracket and Screws

If the actuator is to be mounted directly on a damper shaft, use the anti-rotation bracket and screws included in the delivery package. The min. distance between the center of the damper shaft and the middle of the anti-rotation bracket is 3.35 in.; a max. of 4.25 in. is allowed (see also Fig 14).

Depending upon the specifics of your mounting site, the actuator may shift in position slightly while tightening the screws at the top of the shaft adapter. The anti-rotation bracket features a T-piece with a 5-mm-long shank to accommodate for this movement. It is important to ensure that this play is not impeded.

Universal Shaft Adapter

The universal shaft adapter can be used for shafts of various diameters and shapes (round: 3/8...5/8 in. and square: 1/4...1/2 in.).

WIRING

⚠ CAUTION

To avoid personal injury (electrical shock) and to prevent equipment damage, before wiring, you must remove power.

Access Cover

IMPORTANT

Once the access cover has been removed, please take care to avoid damaging any of the parts now accessible.

The access cover can be unscrewed and removed in order to gain access to the terminal block(s) and perform wiring.

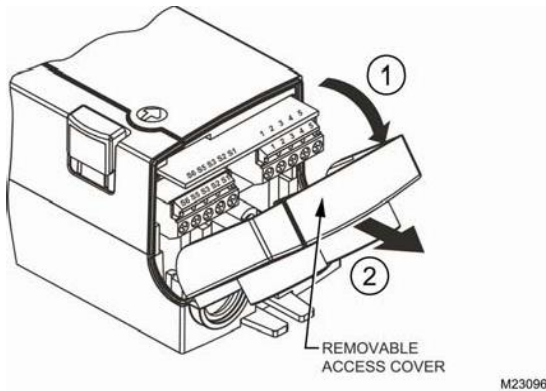


Fig 9. Access Cover

Wiring Diagrams

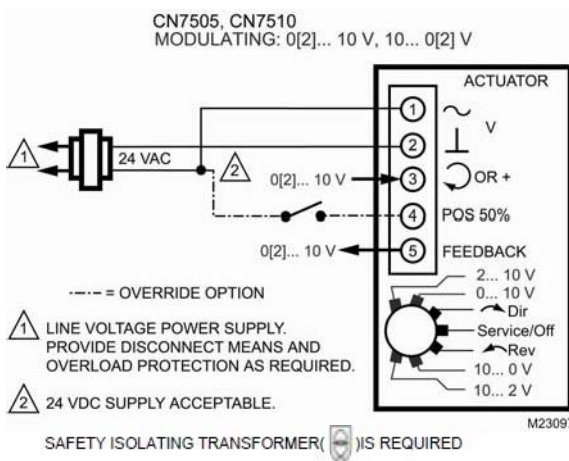


Fig 10. CN7505/CN7510 (modulating mode)

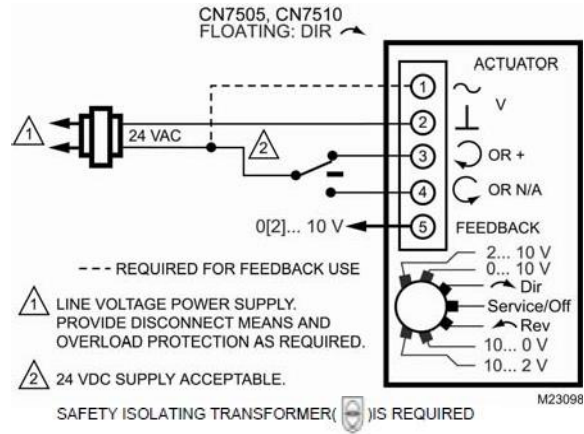


Fig 11. CN7505/CN7510 (floating mode)

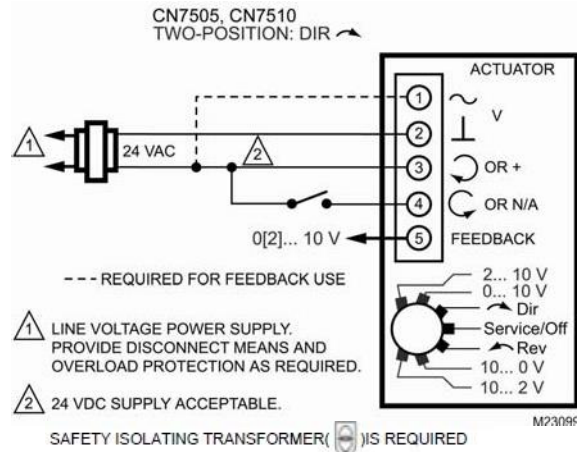


Fig 12. CN7505/CN7510 (2-position mode)

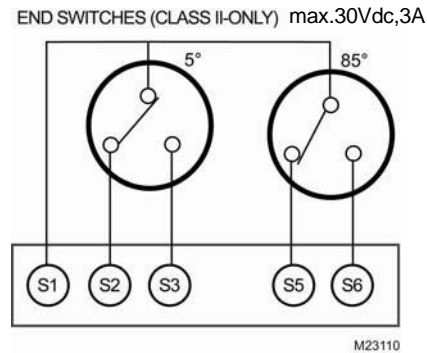


Fig 13. End switches

NOTE: Both of the internal end switches must be connected to the same power source.

Table 4 and Table 5 summarize the information presented in the preceding wiring diagrams.

Table 4. Signals at terminals

terminal	mode		
	modulating	floating	2-position
1	24 V ~/+ (power)	unused or (with feedback) 24 V ~/+ (power)	unused or (with feedback) 24 V ~/+ (power)
2	common ~/-	common ~/-	common ~/-
3	0[2]...10 V (control)	24 V ~/+ (control signal)	24 V ~/+ (control signal)
4	24 V ~/+ (override)	24 V ~/+ (control signal)	24 V ~/+ (control signal)
5	0[2]...10 V (feedback)	unused or (with feedback) 0...10 V	unused or (with feedback) 0...10 V
NOTE: All cables connected to these terminals must be equipped with spark suppression.			

Table 5. Internal end switches

terminal	type of switch
S1	common lead for switches A and B
S2, S3	change-over switch A (S1/S2 opens and S1/S3 closes when shaft adapter moves CW past 5°; reverts to original state when shaft adapter moves CCW past 5°).
S5, S6	change-over switch B (S1/S5 opens and S1/S6 closes when shaft adapter moves CW past 85°; reverts to original state when shaft adapter moves CCW past 85°).

Wiring Requirements: 20~16AWG, Cu, Str/Sol with Torque 4.5lb-in.

DIMENSIONS

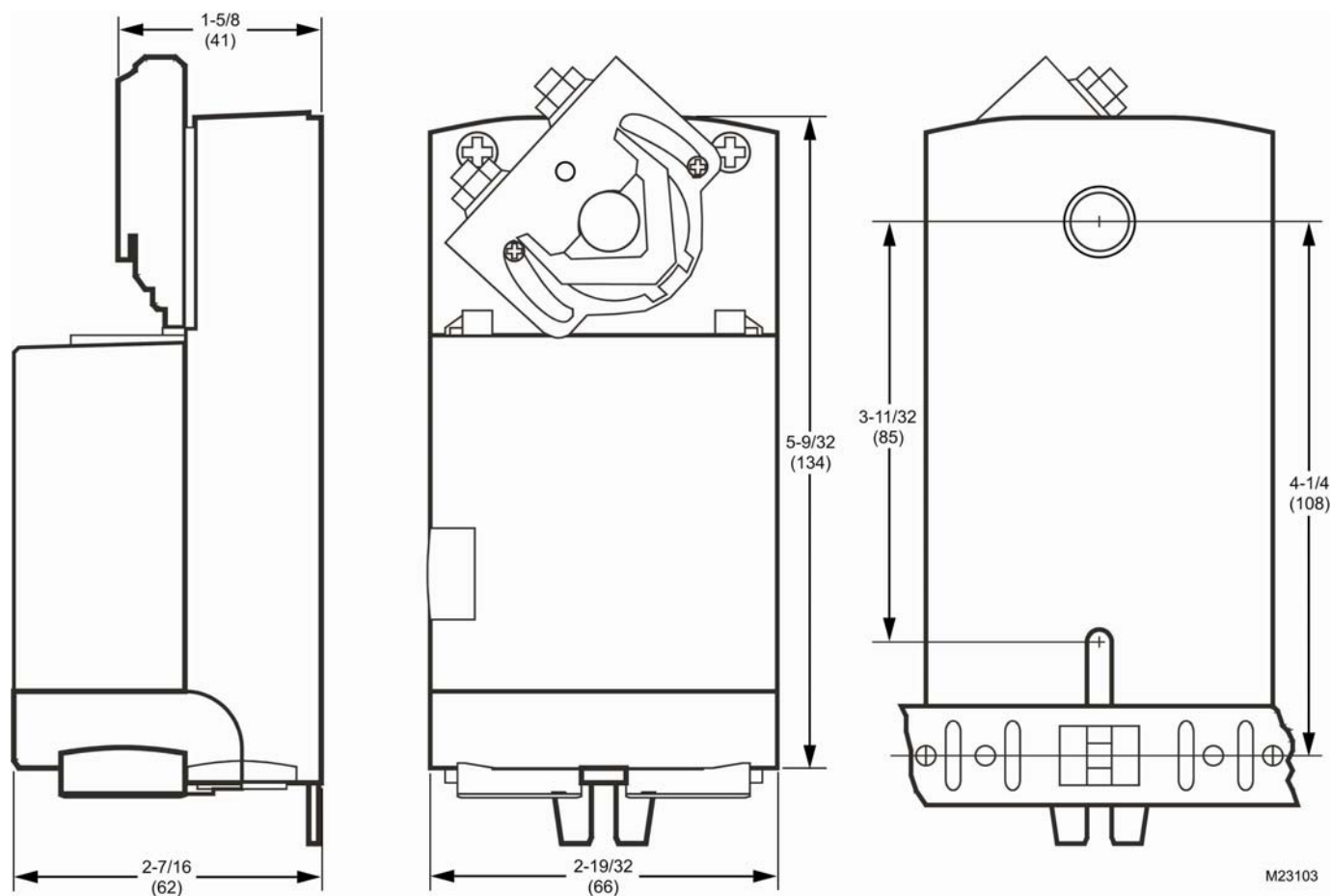


Fig 14. Dimensions (in in.)

CN05, CN10 SERIES

NON-SPRING RETURN DIRECT-COUPLED DAMPER ACTUATORS FOR FLOATING AND TWO-POSITION CONTROL

PRODUCT DATA



GENERAL

This non-spring return direct-coupled damper actuator provides floating and two-position control for:

- air dampers,
- VAV units,
- air handlers,
- ventilation flaps,
- louvers, and
- reliable control for air damper applications with up to 10 sq ft / 44 lb-in. (5 Nm) and 20 sq ft / 88 lb-in. (10 Nm) (seal-less damper blades; air friction-dependent).

FEATURES

- **Declutch for manual adjustment**
- **Adjustable mechanical end limits**
- **Removable access cover for direct wiring**
- **Mountable in any orientation**
- **Rotation direction and service/OFF switch**

SPECIFICATIONS

Supply voltage

CN6105/CN6110	24 Vac/dc -15%/+20%, 50/60 Hz
CN4605/CN4610	230 Vac -15%/+20%, 50/60 Hz

Nominal voltage

CN6105/CN6110	24 Vac/dc, 50/60 Hz
CN4605/CN4610	230Vac, 50/60 Hz

All values stated hereinafter apply to operation under nominal voltage conditions.

Power consumption

CN6105/CN6110	5 VA / 2 W
CN4605	22 VA / 2 W at 50 Hz
CN4610	25 VA / 2 W at 60 Hz

Ambient limits

Ambient operating limits	-5...+140 °F (20...+60 °C)
Ambient storage limits	-22...+176 °F (-30...+80 °C)
Relative humidity	5...95%, non-condensing

Safety

Protection standard	IP54
Protection class	II as per EN 60730-1
Overvoltage category	II

Lifetime

Full strokes	60000
Repositions	1.5 million

Mounting

Round damper shaft	3/8 in...5/8 in.
Square damper shaft	1/4 in...1/2 in.; 45° steps
Shaft length	min. 1-5/8 in.

End switches (when included)

Rating	Class II
Triggering points	5° / 85°
Torque rating	44 lb-in. (5Nm) / 88 lb-in. (10 Nm)

Runtime for 90°

CN6105	90 sec (dc / 60 Hz ac)
CN6110	90 sec (dc / 50 Hz ac)
CN4605	65...110 s (60/50 Hz)
CN4610	65...140 s (60/50 Hz)

Rotation stroke

95° ± 3°

Dimensions

see "Dimensions" on page 6

Weight (without cables)

1 lbs.

Noise rating

35 dB(A) max. at 1 m
40 dB(A) for 230 Vac at
65 sec runtime

Certification

CN6105/CN6110	CE & UL
CN4605/CN4610	CE

PRODUCT IDENTIFICATION SYSTEM

C-Electrical Motor									
N-Fail Safe Function (Non-Spring Return)									
61-24V Floating Control + ON/OFF									
75-24V Modulating Control + Floating + ON/OFF									
46-230V ON/OFF									
05-44 lb-in. (5 Nm)									
10-88 lb-in. (10 Nm)									
A-Standard Model									
1-No Feedback									
2-Voltage Feedback Signal									
0-No Internal Auxiliary Switches									
2-Two Internal Auxiliary Switches									
XX-System Controlled Numbers									

C	N	75	10	A	2	0	XX
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Model	Description
CN6105A1011	5Nm, 24Vac/Vdc, floating control, non-spring return, no feedback and without aux. Switch
CN4605A1001	5Nm, 230Vac, floating control, non-spring return, no feedback and without aux. Switch
CN6110A1003	10Nm, 24Vac/Vdc, floating control, non-spring return, no feedback and without aux. Switch
CN6110A1201	10Nm, 24Vac/Vdc, floating control, non-spring return, no feedback and with aux. Switch
CN4610A1001	10Nm, 230Vac, floating control, non-spring return, no feedback and without aux. Switch

BASIC FEATURES

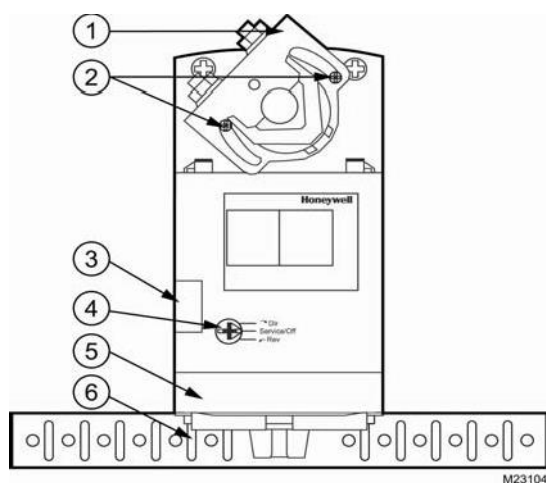


Fig. 1. Setting units and control elements

Legend for Fig. 1:

- 1) Universal shaft adapter
- 2) Mechanical end limits (manually adjustable)
- 3) Declutch button
- 4) Function selection switch
- 5) Removable access cover
- 6) Anti-rotation bracket

Contents of Package

The delivery package includes the actuator, parts 1 through 6 (see Fig. 1), plus two cable grommets and a spare cable grommet.

RUN MODES

The function selection switch (see Fig. 2) can be used to place the actuator into any one of two different modes:

- Service/Off; or
- the floating/2-position run mode ("Dir" for CCW-closing dampers or "Rev" for CW-closing dampers).

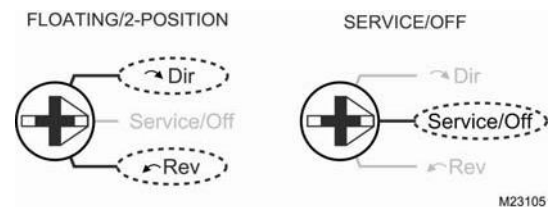


Fig. 2. Function selection switch

Power-Off Behavior

If power is removed, the shaft adapter remains in position.

Service/Off

If the function selection switch is set to the "Service/Off" position, then all rotary movement is cancelled, and all control signals are ignored, thus allowing the actuator to be manually operated safely.

Floating/2-Position Run Mode

If the function selection switch has been set to one of the two floating/2-position control settings—and if the actuator is wired correspondingly (see Fig. 7, Fig. 8, and Fig. 9)—then as soon as operating power is applied, the shaft adapter will run according to the control signals applied.

Table 1 describes the behavior (“stops,” rotates “CCW,” or rotates “CW”) of the CN6105/CN6110 in dependence upon the control signals (switch “open” or “24 Vac/dc”) applied to terminals 3 and 4, the function selection switch setting, and the manner in which the actuator is wired (either for floating mode: see Fig. 7; or for 2-position mode: see Fig. 8).

Table 1. Behavior of CN6105/CN6110

wiring	control signal at		switch setting		
	term 3	term 4	Dir	Service/ Off	Rev
float.	open	open	stops	stops	stops
	open	24Vac/dc	CCW	stops	CW
	24Vac/dc	open	CW	stops	CCW
2-pos.	24Vac/dc	open	CW	stops	CCW
	24Vac/dc	24Vac/dc	CCW	stops	CW

Table 2 describes the behavior (“stops,” rotates “CCW,” or rotates “CW”) of the CN4605/CN4610 in dependence upon the control signals (switch “open” or “230 Vac”) applied to terminals 1 and 3 and the function selection switch setting: only one manner of wiring is permitted (see Fig. 9).

Table 2. Behavior of CN4605/CN4610

control signal at		switch setting		
term 1	term 3	Dir	Service/ Off	Rev
open	open	stops	stops	stops
open	230 Vac	stops	stops	stops
230 Vac	open	CW	stops	CCW
230 Vac	230 Vac	CCW	stops	CW

MANUAL ADJUSTMENT

IMPORTANT

To prevent equipment damage, before manual adjustment, you must remove power or set the function selection switch to the “Service/Off” position.

After removing power or setting the function selection switch to the “Service/Off” position, the gear train can be disengaged using the declutch button, permitting the shaft adapter to be manually rotated to any position.

Limitation of Rotation Stroke

Two adjustable mechanical end limits are provided to limit the angle of rotation as desired (see Fig. 3). The mechanical end limits must be securely fastened in place.

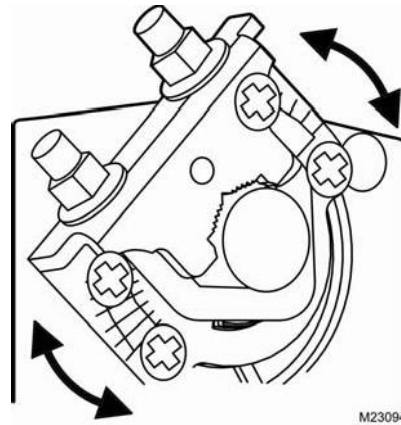


Fig.3. Mechanical end limits

To ensure tight closing of the dampers, the shaft adapter has a total rotation stroke of 95°.

INTERNAL END SWITCHES

The internal end switches “A” and “B” are changeover switches which are activated when the shaft adapter moves past a position of 5° and 85°, respectively (see also Table 5).

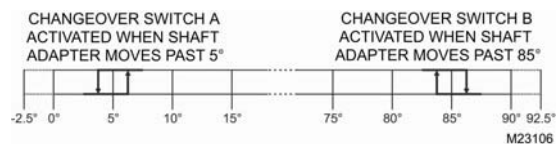


Fig.4. Internal end switch triggering points

INSTALLATION

To avoid personal injury (electrical shock) and to prevent equipment damage, before installation, you must remove power.

These actuators are designed for single-point mounting.

Mounting Instructions

All information and steps are included in the Installation Instructions supplied with each actuator.

Mounting Position

The actuators can be mounted in any position (IP54 is dependent upon orientation; see Fig. 5). Choose a mounting position permitting easy access to cables and controls.

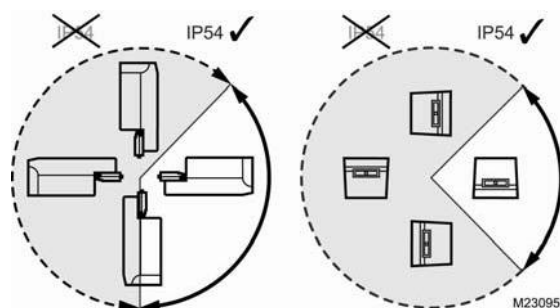


Fig. 5. Mounting for IP54

NOTE: Further, in order to guarantee IP54, only original Honeywell grommets may be used.

Anti-Rotation Bracket and Screws

If the actuator is to be mounted directly on a damper shaft, use the anti-rotation bracket and screws included in the delivery package. The min. distance between the center of the damper shaft and the middle of the anti-rotation bracket is 3.35 in.; a max. of 4.25 in. is allowed (see also Fig 11).

Depending upon the specifics of your mounting site, the actuator may shift in position slightly while tightening the screws at the top of the shaft adapter. The anti-rotation bracket features a T-piece with a 5-mm-long shank to accommodate for this movement. It is important to ensure that this play is not impeded.

Universal Shaft Adapter

The universal shaft adapter can be used for shafts of various diameters and shapes (round: 3/8...5/8 in. and square: 1/4...1/2 in.).

WIRING

CAUTION

To avoid personal injury (electrical shock) and to prevent equipment damage, before wiring, you must remove power.

Access Cover

IMPORTANT

Once the access cover has been removed, please take care to avoid damaging any of the parts now accessible.

The access cover can be unscrewed and removed in order to gain access to the terminal block(s) and perform wiring.

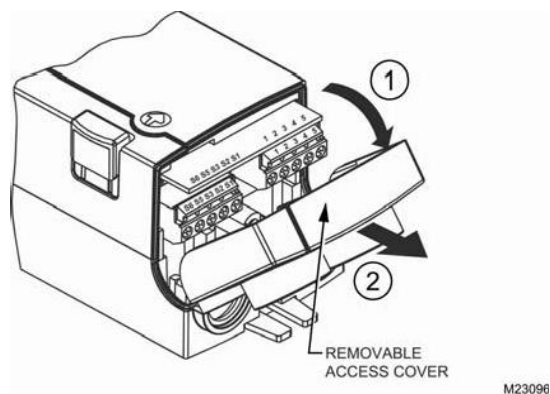


Fig. 6. Access Cover

Wiring Diagrams

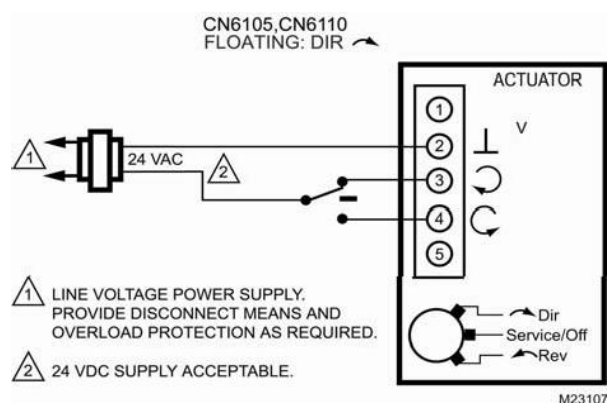


Fig. 7. CN6105/CN6110 (floating mode)

CN05,CN10 SERIES DAMPER ACTUATORS FOR FLOATING/2-POSITON CONTROL

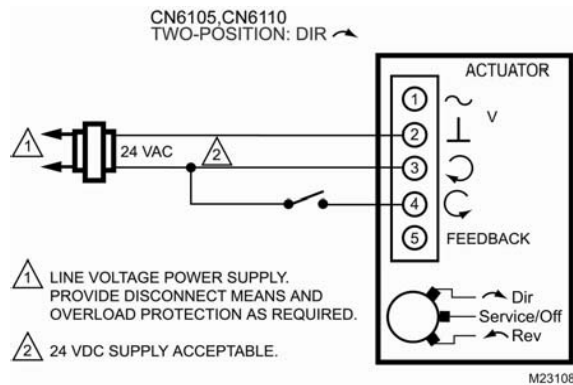


Fig. 8. CN6105/CN6110 (2-position mode)

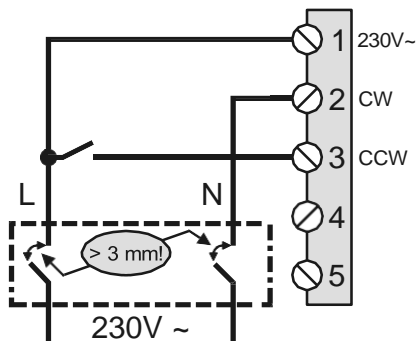


Fig. 9. CN4605/CN4610 (2-position mode)

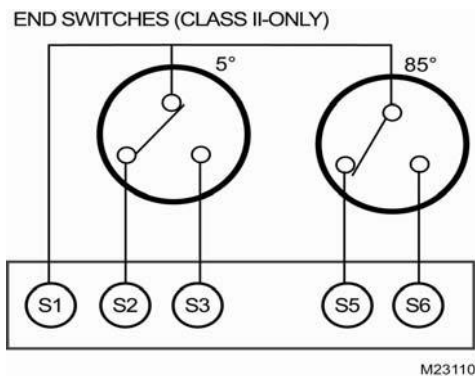


Fig. 10. End switches

NOTE: Both internal end switches must be connected to the same power source.

Tables 3,4 and 5 summarize the information presented in the preceding wiring diagrams.

Table 3. Signals at terminals for CN6105/CN6110

terminal	signal in floating	signal in 2-pos. mode
2	common ~/-	common ~/-
3	24 V ~/+ (control signal)	24 V ~/+ (control/ power signal)
4	24 V ~/+ (control signal)	24 V ~/+ (control signal/power)

NOTE: All cables connected to these terminals must be equipped with spark suppression.

Table 4. Signals at terminals for CN4605/CN4610

terminal	signal
1	L (230 V ~)
2	N (230 V ~)
3	control signal

NOTE: All cables connected to these terminals must be equipped with spark suppression.

Table 5. Internal end switches (SSW2)

terminal	type of switch
S1	common lead for switches A and B
S2 / S3	change-over switch A (S1/S2 opens and S1/S3 closes when shaft adapter moves CW past 5°; reverts to original state when shaft adapter moves CCW past 5°).
S5 / S6	change-over switch B (S1/S5 opens and S1/S6 closes when shaft adapter moves CW past 85°; reverts to original state when shaft adapter moves CCW past 85°).

DIMENSIONS

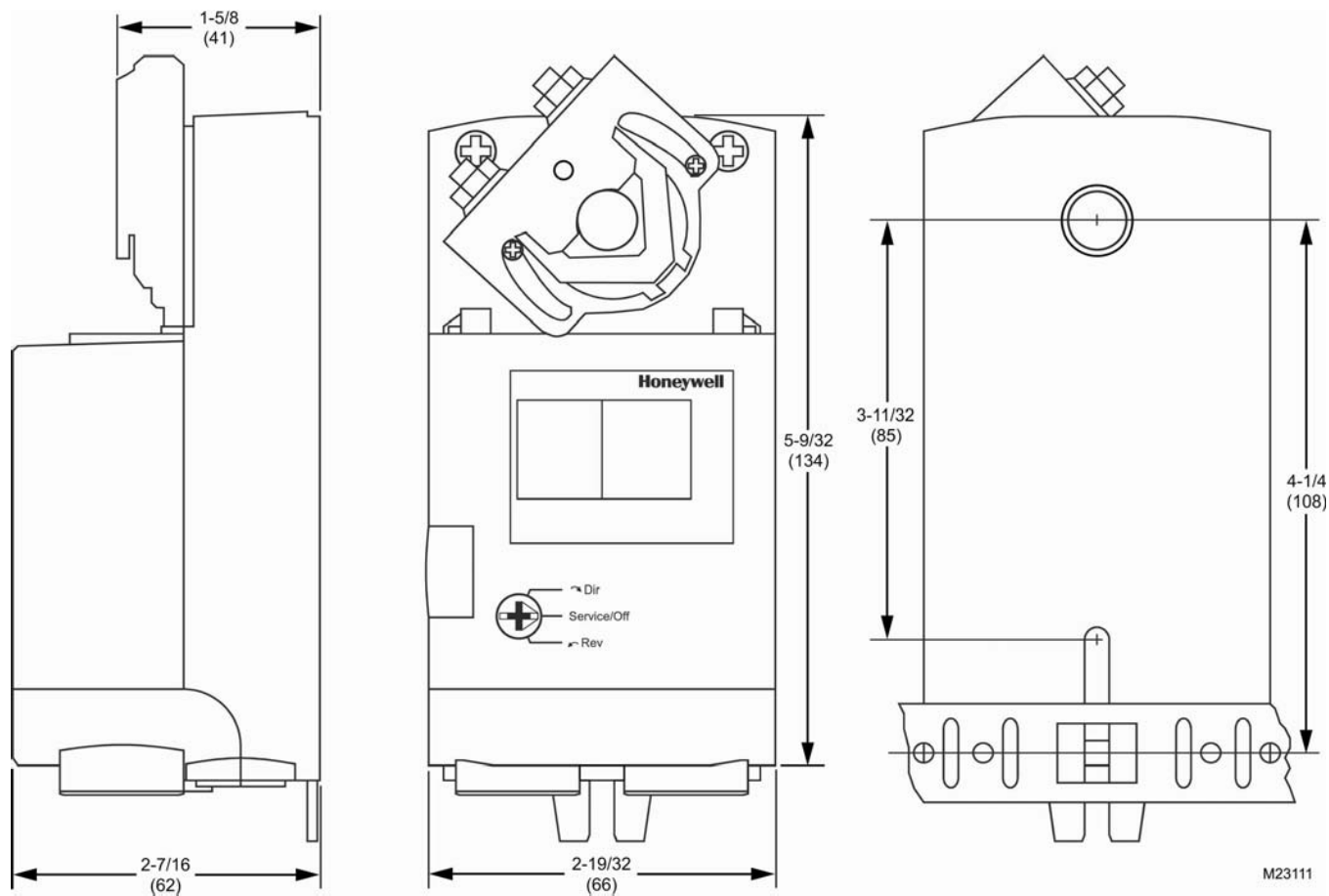


Fig. 11. Dimensions (in in.)

CN20, CN34 SERIES

NON-SPRING RETURN DIRECT-COUPLED DAMPER ACTUATORS FOR MODULATING AND FLOATING / 2-POSITION CONTROL

PRODUCT DATA



GENERAL

These direct-coupled damper actuators provide modulating control for:

- air dampers,
- VAV units,
- air handling units,
- ventilation flaps,
- louvers, and
- reliable control for air damper applications with up to 4.6 m² / 50 sq.ft. (20 Nm / 177 lb-in) or 7.8 m² / 85 sq. ft. (34 Nm / 300 lb-in) (seal-less dampers; air friction-dependent).

FEATURES

- Self-centering shaft adapter
- Access cover to facilitate connectivity
- Service/off for safe & easy servicing
- Rotation direction selectable by switch
- Declutch for manual adjustment
- Mechanical end limits
- Field-installable auxiliary switches
- Mountable in any orientation (no IP54 if upside down)
- Mechanical position indicator
- CE and UL certified

SPECIFICATIONS

Supply voltage	24 Vac/dc $\pm 15\%$, 50/60 Hz;
Nominal voltage	24 Vac/dc, 50/60 Hz;
All values stated hereinafter apply to operation under nominal voltage conditions.	
Power consumption	
CN7220A2007	6 VA / 3 W
CN7234A2008	6 VA / 3 W
Ambient limits	
Ambient operating limits	-20...+60 °C (-5...+140 °F)
Ambient storage limits	-40...+80 °C (-40...+175 °F)
Relative humidity	5...95%, non-condensing
Safety	
Protection standard	IP54 as per EN 60529
Protection class	II as per EN 60730-1
Overvoltage category	II
Lifetime	
Full strokes	60000
Repositions	1.5 million
Mounting	
Round damper shaft	10. 27 mm (3/8...1-1/16")
Square damper shaft	10...18 mm (3/8. 11/16"); 45° steps
Shaft length	min. 22 mm (7/8")
Control signal	0(2). 10 Vdc 0(4). 20 mA
Input impedance	>100 k Ω [0. 10 V] 500 Ω [0. 20 mA]
Feedback signal	
Limits	± 1 mA at 0.....V
End switches (when included)	
Rating	5 A (resistive) / 3 A (inductive)
Triggering points	5° / 85°
Torque rating	
CN7220A2007	20 Nm (177 lb-in)
CN7234A2008	34 Nm (300 lb-in)
Runtime	95 sec (60 Hz) / 110 sec (50 Hz or DC supply)
Rotation stroke	95° \pm 3°
Dimensions	see "Dimensions" on page 8
Weight (without cables)	1.35 kg (3 lbs.)
Noise rating	40 dB(A) max. at 1 m
Certification	CE & UL

MODELS

Model #	Description
CN7220A2007	20Nm, 24Vac/Vdc, Modulating and floating/2-position control, Non-Spring return, Voltage Feedback Signal and without aux. Switch
CN7234A2008	34Nm, 24Vac/Vdc, Modulating and floating/2-position control, Non-Spring return, Voltage Feedback Signal and without aux. Switch

PRODUCT IDENTIFICATION SYSTEM

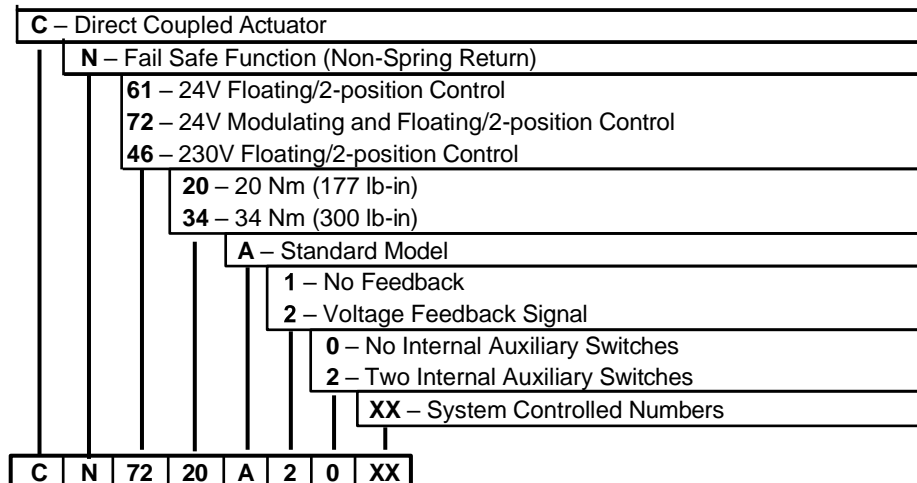


Fig.1. Product Identification System

OPERATION / FUNCTIONS

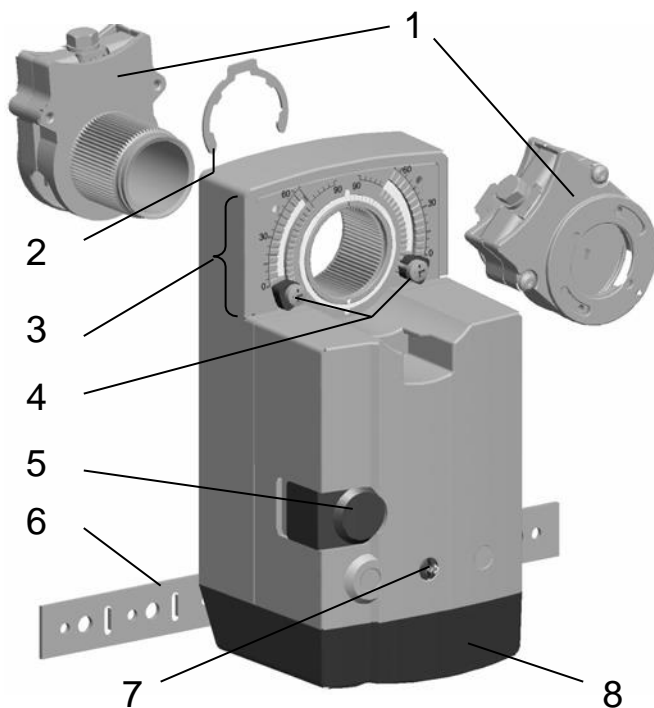


Fig. 2. Setting units and control elements

Legend for Fig.2:

- 1 Self-centering shaft adapter
- 2 Retainer clip
- 3 Rotational angle scales (0...90° / 90...0°)
- 4 Mechanical end limits
- 5 Declutch button
- 6 Anti-rotation bracket
- 7 Function Selection Switch
- 8 Access cover

Contents of Package

The delivery package includes the actuator itself, parts 1 through 8 (see Fig.2), the anti-rotation bracket screws, and installation instruction.

RUN MODES

The function selection switch (see Fig 3) is used to place the actuator into any one of five different modes:

- 2-10V, modulating control; floating/2-position control, cw run
- 0-10V/Dir, modulating control; floating/2-position control, cw run
- Service/Off, actuator stop running
- 10-0V/Rev, modulating control; floating/2-position control, ccw run

- 10-2V, modulating control; floating/2-position control, ccw run



Fig.3. Function selection switch

Power-Off Behavior

If power is removed, the actuator retains its position.

Service/Off

If the function selection switch is set to the "Service/Off" position, all rotary movement is cancelled, and all control signals are ignored, thus allowing the actuator to be safely manually operated.

Floating/2-Position Run Mode

If the function selection switch has been set to one of the four positions (2-10V, 0-10V/Dir, 10-0V/Rev, 10-2V) – and the actuator is wired as Floating/2-position mode (see A2 and A3) – then as soon as operating power is applied, the actuator will run clockwise or counterclockwise.

Modulating Run Mode

If the function selection switch has been set to one of the four positions (2-10V, 0-10V/Dir, 10-0V/Rev, 10-2V) – and the actuator is wired as modulating mode (see A1) – as soon as operating power is applied, the actuator will run according to the control signals applied. If terminal 5 is also wired, the actuator will output the voltage feedback signal(0/2-10V) proportional to actuator's actual position. Alternatively, if terminal 4 is wired and powered on, actuator will override the control signal and immediately come to a position of 0% of max. stroke.

Table 1 describes the actuator behavior (stops, rotates CCW, or rotates CW) for the floating mode in relation to the control signals applied to terminals 3 and 4 and to the function selection switch setting.

Table 2 describes the actuator behavior (stops, rotates CCW, or rotates CW) for the 2-position mode in relation to the control signals applied to terminals 3 and 4 and to the function selection switch setting.

Table 3 describes the actuator behavior (stops, rotates CCW, rotates CW, runs in proportional position, or runs to 0% of max. stroke) for the modulating mode in relation to the control signals applied to terminals 3 and 4 and to the function selection switch setting.

Table 1. Shaft adapter behavior in the floating mode

Control signal at		Function selection switch settings				
Terminal 3	Terminal 4	2...10V	0...10V /Dir	Service / Off	10...0V /Rev	10...2 V
open	open	stops	stops	stops	stops	stops
open	24 Vac/dc	CCW	CCW	stops	CW	CW
24 Vac/dc	open	CW	CW	stops	CCW	CCW

Table 2. Shaft adapter behavior in the 2-position mode

Control signal at		Function selection switch settings				
Terminal 3	Terminal 4	2...10V	0...10V /Dir	Service / Off	10...0V /Rev	10...2 V
24 Vac/dc	open	CW	CW	stops	CCW	CCW
24 Vac/dc	24 Vac/dc	CCW	CCW	stops	CW	CW

Table 3. Shaft adapter behavior in the modulating mode

Control signal at		Function selection switch settings				
Terminal 3	Terminal 4	2...10V	0...10V /Dir	Service / Off	0...10V /Rev	10...2 V
Open	open	--	--	stop	--	--
	24 Vac/dc	0% (most left)	0% (most left)	stop	0%(most right)	0% (most right)
< min. control signal plus 0.24V	open	--	--	stop	--	--
	24 Vac/dc	0% (most left)	0% (most left)	stop	0%(most right)	0% (most right)
between min. control signal plus 0.24V and max. control signal minus 0.24V	open	proportional	proportional	stop	proportional	proportional
	24 Vac/dc	0% (most left)	0% (most left)	stop	0%(most right)	0% (most right)
> max. control signal minus 0.24V	open	--	--	stop	--	--
	24 Vac/dc	0% (most left)	0% (most left)	stop	0%(most right)	0% (most right)

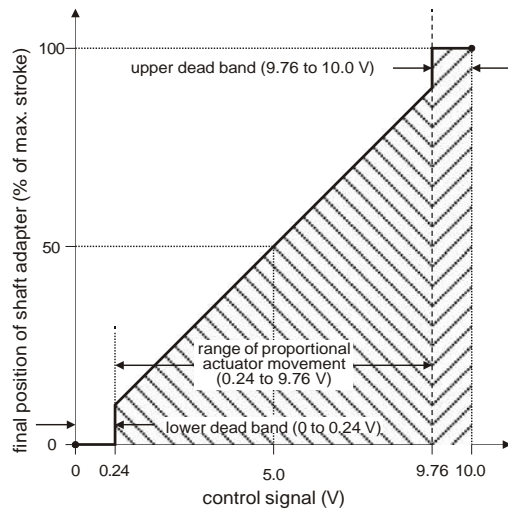


Fig.4. Final actuator position in dependence upon control signal (example selection setting of 0...10 V)

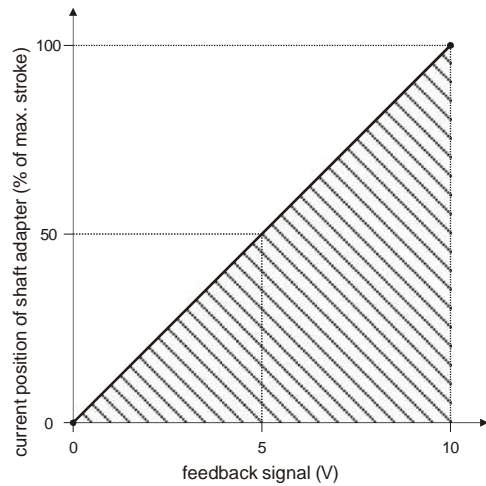


Fig.5. Feedback signal in dependence upon current position of actuator (example selection switch setting of 0...10 V)

Adaption

Adaption is a function in which the actuator re-maps its feedback signal and control signal in accordance with repositioned mechanical end limits (see Fig.6) and thus recognizes their new positions.

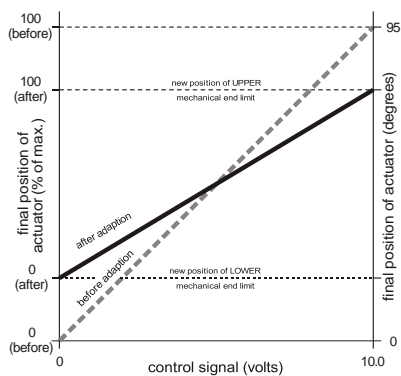


Fig.6. Adaption (selection switch set to "0...10 V")

Adaption will be carried out only when:

- Modulating models only, such as CN7220A2007, CN7234A2008, etc,
- actuator is wired in modulating mode (see Fig. A1)
- the control signal's value rises up into the upper dead band (i.e to more than the max. control signal minus 0.14V) or drops down into the lower dead band (i.e to less than the min. control signal plus 0.14V), and if the shaft adapter can remain at the respective (upper or lower) mechanical end limit at least 3 seconds, the actuator will recognize the new position automatically, and auto-adaption is happened (see Fig. 4).

Sleep Mode

When actuator reaches end stop or any obstacles blocking its running, it will fall into sleep mode automatically. Actuator will periodically start up and try to resume running, which will save energy significantly through whole service life.

Overriding

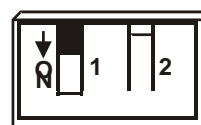
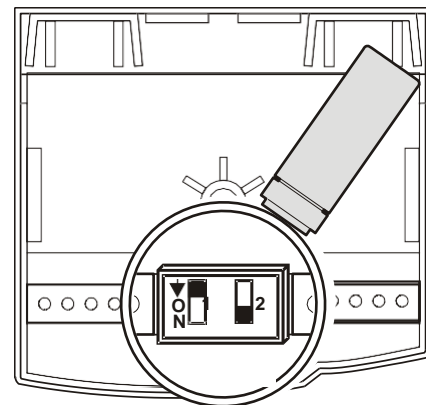
An override is a condition in which a 24 V signal is applied to terminal 4 of an actuator in the modulating mode, thus causing the actuator to ignore the control signal at terminal 3, whereupon it will instead move to a position of 0% of its maximum stroke. It would be the most left side [0/2~10V mode] or most right side [10~0/2 V mode] (see Table 3).

Feedback

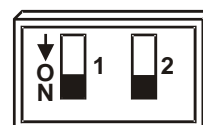
If correspondingly wired (see A1), the actuator provides, via terminal 5, a feedback signal(0/2~10V) proportional to the actual position of the actuator (see Fig. 5).

Dip Switches

The actuator is equipped with two dip switches (only switch 1 selectable) accessible after removing the access cover (see Fig. 7).



1: (U) VOLTAGE CONTROL
2: RESERVED



1: (mA) CURRENT
2: RESERVED

Fig.7. Dip switches (view with PCB at bottom)

Voltage/Current Control Signal Selection Dip Switch

In its default snapping position, the voltage/current control signal dip switch (see Fig. 7) is set to **OFF** (= voltage control), as shown in Fig. 7. Setting it to ON results in current control 4...20mA.

Position Indication

The hub adapter indicates the rotation angle position by means of the rotational angle scales (0...90° / 90...0°).

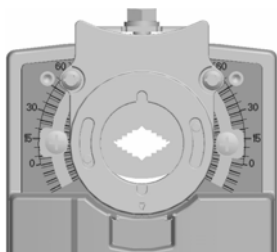


Fig.8. Position indication

Manual Adjustment

! IMPORTANT

In order to prevent equipment damage, you must remove power set the rotation direction switch to the "Service/Off" position before manual adjustment.

After removing power or setting the rotation direction switch to the "Service/Off" position, the gear train can be disengaged using the declutch button, permitting the actuator shaft to be manually rotated to any position. The feedback signal will then follow the new position.

Limitation of Rotation Stroke

Two mechanical end limits (adjustable in 5° increments) are provided to limit the angle of rotation as desired (see Fig.9).



Fig.9. Mechanical end limits

The mechanical end limits must be securely fastened in place. It is important that they properly mesh with the rotational angle scales when the screws are tightened.

Internal End Switches

NOTE: Applicable to models with internal switches only.

The internal end switches are set to change from "common" to "normally open" at angles of 5° and 85°, respectively, from the totally counterclockwise position.

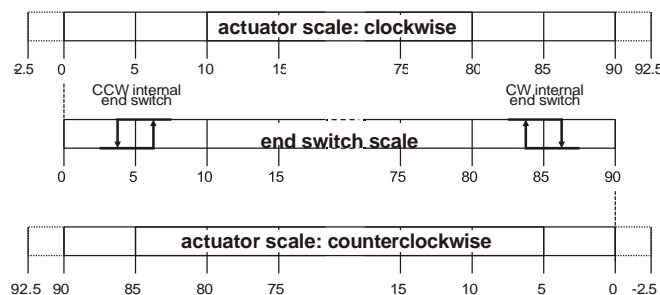


Fig. 10. Internal end switches

INSTALLATION

These actuators are designed for single-point mounting.

! IMPORTANT

In order to prevent equipment damage, you must remove power or set the rotation direction switch to the "Service/Off" position before manual operation.

Mounting Instructions

All information and steps are included in the installation instructions supplied with the actuator.

Mounting Position

The actuators can be mounted in any desired orientation (no IP54 if mounted upside down; see Fig.11). Choose an orientation permitting easy access to the actuator's cables and controls.

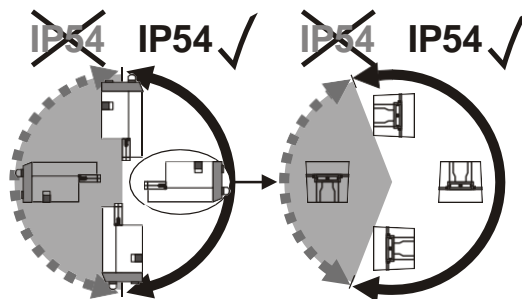


Fig. 11. Mounting for IP54

Mounting Bracket and Screws

If the actuator is to be mounted directly on a damper shaft, use the mounting bracket and screws included in the delivery package.

Self-Centering Shaft Adapter

The self-centering shaft adapter can be used for shafts having various diameters (10...27 mm [3/8...1-1/16"]) and shapes (square or round).

In the case of short shafts, the shaft adapter may be reversed and mounted on the duct side.

Stroke Limitation with Mechanical End Limits

The mechanical end limits enable the stroke to be limited from 0...90° in increments of 5°.

Wiring

Connecting to the Power Supply

In order to comply with protection class II, the power source of 24 V actuators must be reliably separated from the network power supply circuits as per DIN VDE 0106, part 101.

Access cover

To facilitate wiring the actuator to the controller, the access cover can be detached from the actuator.

! IMPORTANT

Remove power before detaching the access cover. Once the access cover has been removed, please take care to avoid damaging any of the parts now accessible.



Fig. 12. Access cover(models with internal switches)

Depending upon the model, the access cover may have one or two terminal strips, including a layout with a description for each of the terminals.

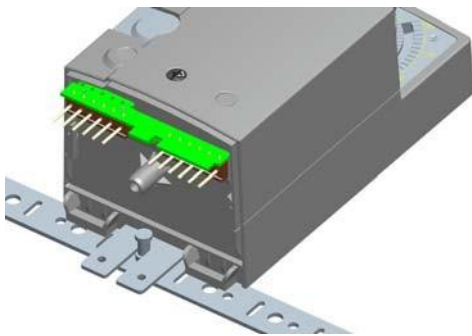


Fig. 13. Actuator with access cover removed

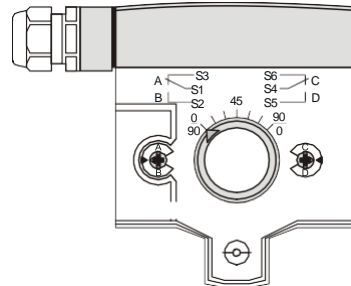
(models with internal switches)

OPTIONAL ACCESSORIES

The following optional accessories can be ordered separately.

Auxiliary Switch Kit

Order no.: SW2



The auxiliary switches are field-installable parts providing two SPDT freely-adjustable switches.

SPARE PARTS

Spare Parts Kit

Order no.: A7209.2071

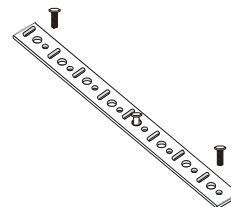
The spare parts kit contains the following items:

- Anti-rotation bracket and screws
- Access cover screw
- Plastic protective cap for protection standard IP54
- Mechanical end limit screw and retainer

Anti-Rotation Bracket Kit

Order no.: A7209.2073

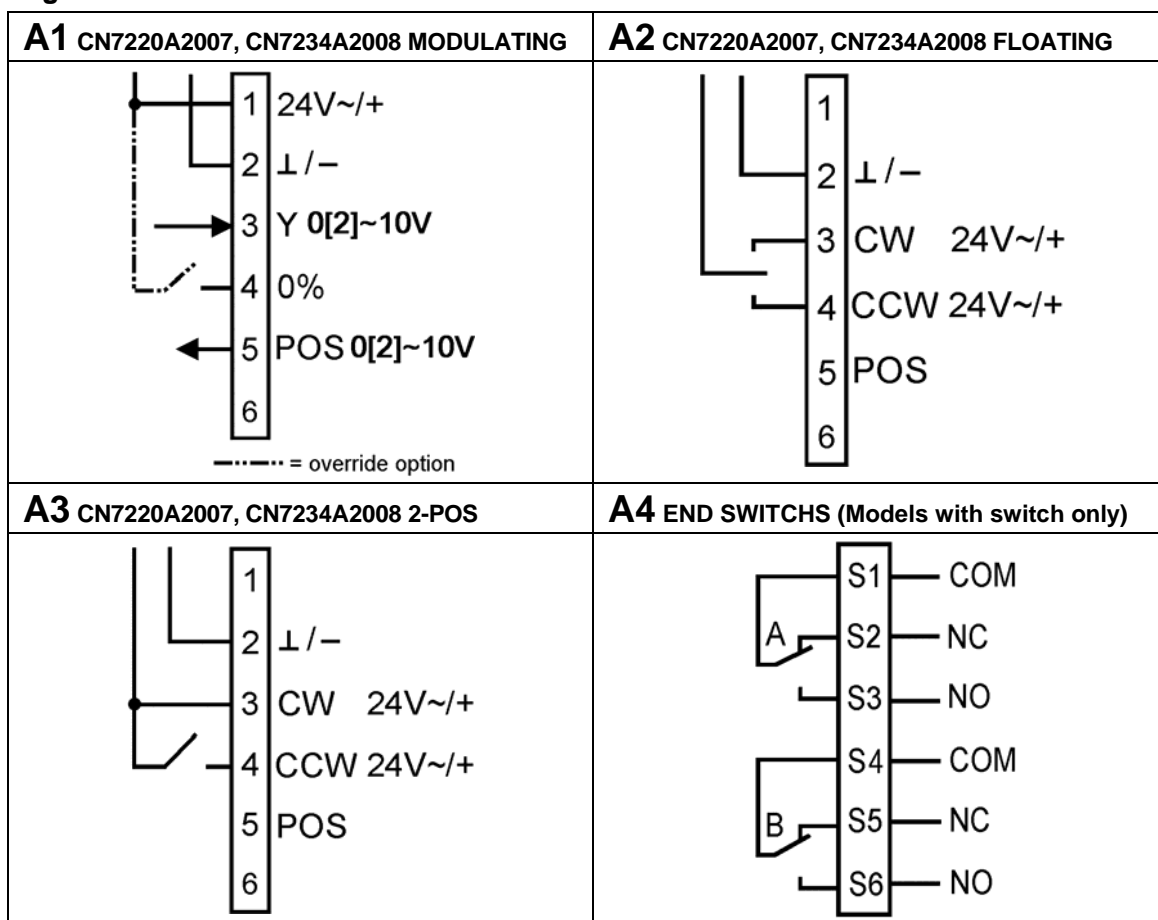
The anti-rotation bracket kit can be ordered separately.



Contains:

- 10 anti-rotation brackets
- 20 screws

Wiring Diagrams



NOTE: Internal end switches S1 and S4 must be connected to the same power source.

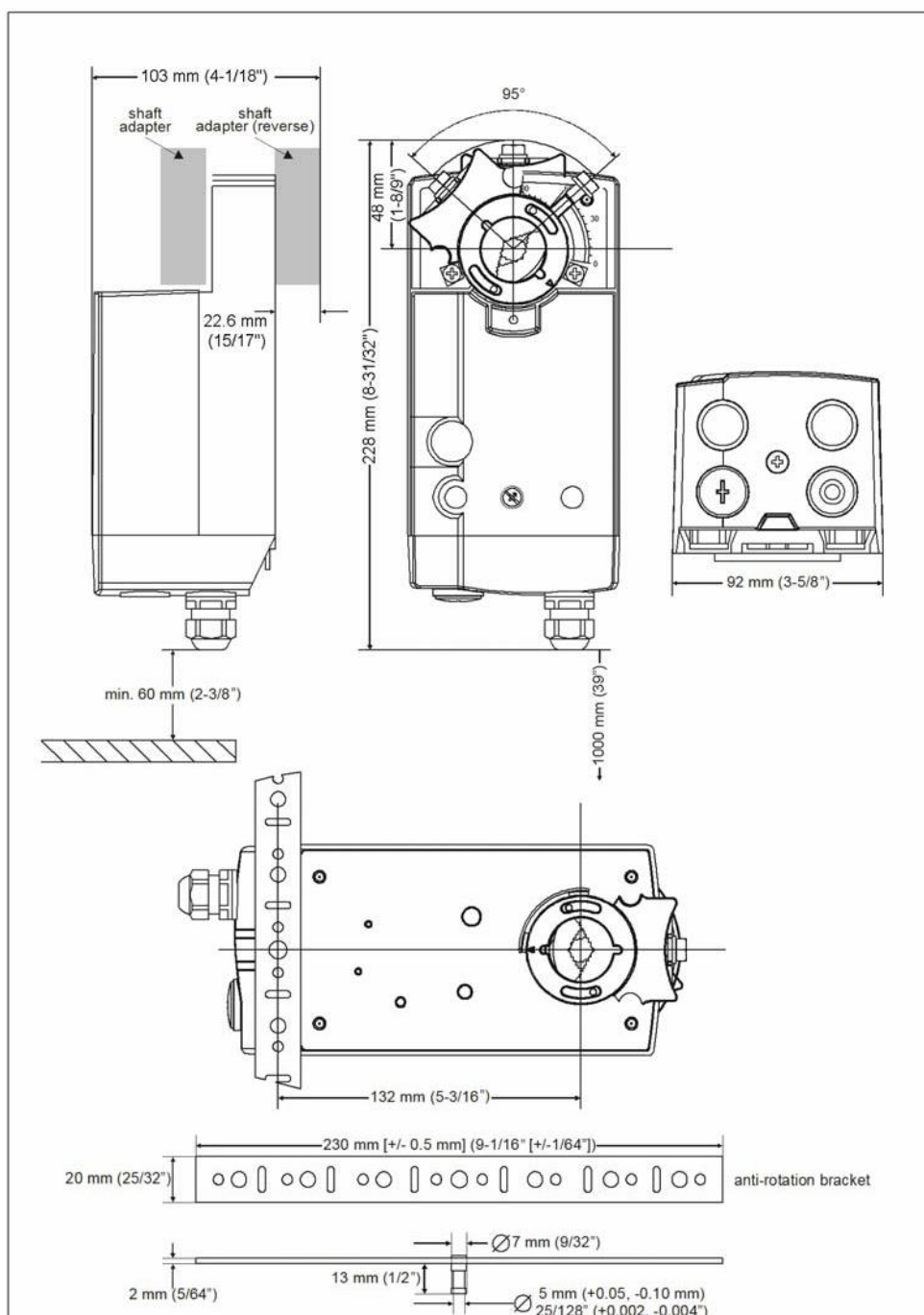
Below 2 tables summarize the information presented in the preceding wiring diagrams.

Terminal	Function selection switch		
	Modulating	Floating	2-position
1	24 V ~/+ (power)	unused	unused
2	common +/-	common +/-	common +/-
3	0[2]...10 V (control)	24 V ~/+ (control signal)	24 V ~/+ (control signal)
4	24 V ~/+ (override)	24 V ~/+ (control signal)	24 V ~/+ (control signal)
5	0[2]...10 V (feedback)	unused	unused

NOTE: All cables connected to these terminals must be equipped with spark suppression.

Connecting cable		Terminal	Description
End switches (Models with internal switches only)	CCW (left) 5°	S1	common
		S2	normally closed
		S3	normally open
	CW (right) 85°	S4	common
		S5	normally closed
		S6	normally open

DIMENSIONS



S05, S10, S20 Series Spring Return Direct Coupled Actuators

CS4105, CS4110, CS4120, CS7505, CS7510, CS7520, CS8105,
CS8110, CS8120

PRODUCT DATA



APPLICATION

CS41XX, CS75XX, CS81XX Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

Applications include:

- Volume control dampers, mounted directly to the drive shaft or remotely (with the use of accessory hardware).
- Quarter-turn rotary valves, such as ball or butterfly valves mounted directly to the drive shaft.
- Linear stroke globe or cage valves mounted with linkages to provide linear actuation.

FEATURES

- Brushless DC submotor with electronic stall protection for floating/modulating models.
- Brush DC submotor with electronic stall protection for 2-position models.
- Self-centering shaft adapter (shaft coupling) for wide range of shaft sizes.
- Models available with three torque ratings: 44 lb-in. (5 N·m), 88 lb-in. (10 N·m), and 175 lb-in. (20 N·m).
- Models available for use with two-position, single pole single throw (spst), line-voltage or low-voltage controls.
- Models available for use with floating or switched single-pole, double-throw (spdt) controls.
- Models available for use with proportional current or voltage controls.
- Models available with combined floating/modulating control in a single device.
- Models available with adjustable zero and span.
- Models available with line-voltage internal and switches.
- Access cover to facilitate connectivity.
- Metal housing with built-in mechanical end limits.
- Spring return direction field-selectable.
- Shaft position indicator and scale.
- Manual winding capability with locking function.
- UL (cUL) listed and CE compliant.
- All Models are plenum-rated per UL873.



SPECIFICATIONS

Models: See Tables 2, 3 and 4.

Dimensions: See Fig. 1.

Device Weight: 7 lb (3.2 kg).

Temperature Ratings:

Ambient: -40°F to 140°F (-40°C to 60°C).

Shipping and Storage: -40°F to 158°F (-40°C to 70°C).

Humidity Ratings: 5% to 95% RH noncondensing.

Electrical Connections:

Field wiring 14 to 22 AWG (2.0 to 0.344 mm sq) to screw terminals, located under the removable access cover.

Electrical Ratings: See Table 1.

End Switches (Two SPDT):

Settings (fixed): 7° nominal stroke, 85° nominal stroke.

Ratings (maximum load):

Low-Voltage Models: 250 VAC, 5A resistive, 3A inductive.

Line-Voltage Models: 250 VAC, 5A resistive.

Mounting: Self-centering shaft adapter (shaft coupling).

Round Damper Shafts: 0.375 to 1.06 in. (10 to 27 mm).

Square Damper Shafts: 1/2 to 3/4 in. (13 to 19 mm).

Actuator can be mounted with shaft in any position.

NOTE: For 175 lb-in. (20 N•m) models: 3/4 in. or greater shaft diameter recommended.

Minimum Damper Shaft Length: 1 in. (25 mm); 3 in. (76 mm) recommended.

Timing (At Rated Torque and Voltage):

Drive Open (typical):

Floating, Modulating Models: 90 seconds.

Two-Position Models: 45 seconds ±5 seconds.

Spring Close: 20 seconds typical.

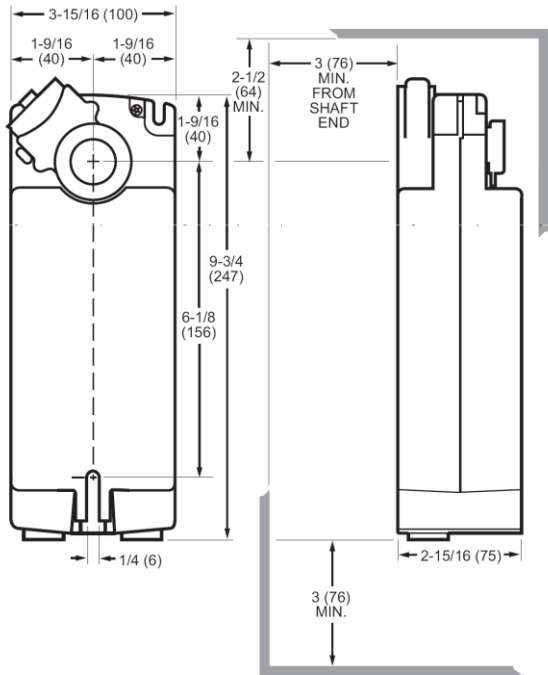


Fig. 1. Dimensional drawing of actuator in in. (mm).

Table 1. Electrical Ratings.

Model(s)	Power Input		Power Consumption (VA)					
	Voltage	Frequency	44 lb-in. (5 N•m)		88 lb-in. (10 N•m)		175 lb-in. (20 N•m)	
			Driving	Holding	Driving	Holding	Driving	Holding
Floating, Modulating	24 VAC±20% (Class 2), 24 VDC	50/60 Hz.	13	5	14	5	16	5
Two-Position, Low-voltage	24 VAC±20% (Class 2), 24 VDC	50/60 Hz.	25	8	30	8	40	8
Two-Position, Line-voltage	100-250 VAC	50/60 Hz.	45	13	45	13	60	13

Table 2. O.S. Number Selection (see Table 3 also).

C	Motorized Actuator									
S	Fail Safe Function (Spring Return)									
41	100-250 VAC Two-Position Control; Reversible Mount									
75	24 VAC/VDC Modulating and Floating Control; Reversible Mount									
81	24 VAC/VDC Two-Position Control; Reversible Mount									
05	44 lb-in. (5 N•m)									
10	88 lb-in. (10 N•m)									
20	175 lb-in. (20 N•m)									
A^a	Standard U.S. Model									
B^b	Standard European Model									
E^b	Selectable control signal; Adjustable zero and span; Includes service and auto-adapt modes									
H^a										
1	No Feedback									
2	Voltage Feedback Signal									
0	No End Switches									
2	Two End Switches									
XX	System Controlled Numbers									
C	S	75	20	A	2	0	XX			

^a Model manufactured for sale in the United States.^b Model manufactured for sale in Europe.**Table 3. Actuator Catalog Numbering (see Table 2 also).**

S	Spring Return Fail Safe Mode									
N	Non-Spring Return Fail Safe Mode									
05	44 lb-in. (5 N•m); Spring Return Only									
10	88 lb-in. (10 N•m); Spring Return Only									
20	175 lb-in. (20 N•m)									
34	300 lb-in. (34 N•m); Non-Spring Return Only									
24	24 VAC/VDC Floating Control									
24-2POS	24 VAC/VDC Two-Position Control									
120-2POS	120 VAC Two-Position Control									
230-2POS	230 VAC Two-Position Control									
010	24 VAC/VDC Modulating and Floating Control									
	Fixed Zero/Span, No End Switches									
-SW2	Internal End Switches									
-SER^a	Enhanced Modulating; Adjustable Zero/Span									
S	10	24-2POS	-SW2							

^a Enhanced models include two internal end switches.**Table 4. Available Model**

Model	Description
CS4105A1002	100-250 VAC Two-Position Control; Reversible Mount; 5N•m; Standard U.S Model; No Feedback; No End Switches;
CS4110A1002	100-250 VAC Two-Position Control; Reversible Mount; 10N•m; Standard U.S Model; No Feedback; No End Switches;
CS4110A1200	100-250 VAC Two-Position Control; Reversible Mount; 10N•m; Standard U.S Model; No Feedback; Two End Switches;
CS4120A1001	100-250 VAC Two-Position Control; Reversible Mount; 20N•m; Standard U.S Model; No Feedback; No End Switches;
CS4120A1209	100-250 VAC Two-Position Control; Reversible Mount; 20N•m; Standard U.S Model; No Feedback; Two End Switches;
CS7505A2008	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 5N•m; Standard U.S Model; Voltage Feedback Signal; No End Switches;
CS7510A2008	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 10N•m; Standard U.S Model; Voltage Feedback Signal; No End Switches;
CS7510A2206	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 10N•m; Standard U.S Model; Voltage Feedback Signal; Two End Switches;
CS7510H2209	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 10N•m; Selectable control signal; Adjustable zero and span; Includes service and auto-adapt modes; Voltage Feedback Signal; Two End Switches;
CS7520A2007	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 20N•m; Standard U.S Model; Voltage Feedback Signal; No End Switches;
CS7520A2205	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 20N•m; Standard U.S Model; Voltage Feedback Signal; Two End Switches;
CS7520H2208	24 VAC/VDC Modulating and Floating Control; Reversible Mount; 20N•m; Selectable control signal; Adjustable zero and span; Includes service and auto-adapt modes; Voltage Feedback Signal; Two End Switches;
CS8105A1008	24 VAC/VDC Two-Position Control; Reversible Mount; 5N•m; Standard U.S Model; No Feedback; No End Switches;
CS8110A1008	24 VAC/VDC Two-Position Control; Reversible Mount; 10N•m; Standard U.S Model; No Feedback; No End Switches;
CS8110A1206	24 VAC/VDC Two-Position Control; Reversible Mount; 10N•m; Standard U.S Model; No Feedback; Two End Switches;
CS8120A1007	24 VAC/VDC Two-Position Control; Reversible Mount; 20N•m; Standard U.S Model; No Feedback; No End Switches;
CS8120A1205	24 VAC/VDC Two-Position Control; Reversible Mount; 20N•m; Standard U.S Model; No Feedback; Two End Switches;

Stroke: 95° ±3°, mechanically limited.

Design Life (at Rated Voltage):

Two-position models: 50,000 full stroke cycles;
50,000 full stroke spring returns.

Floating and Modulating models: 60,000 full stroke cycles;
1,500,000 repositions; 60,000 full stroke spring returns.

Controller Type:

S05, S10, S20: See Table 3.

S05, S10, S20: Modulating or Floating; controlled by selector switch.

Input Impedance: 95K ohms minimum.

Feedback Signal: 0-10 VDC or 2-10 VDC;

Driving current is 3 mA minimum.

Torque Ratings:

Typical Holding, Driving, Spring Return:

S05: 44 lb-in. (5 N•m).

S10: 88 lb-in. (10 N•m).

S20: 175 lb-in. (20 N•m).

Stall Maximum (fully open at 24°C):

S05: 100 lb-in. (11.3 N•m).

S10: 200 lb-in. (22.6 N•m).

S20: 350 lb-in. (39.6 N•m).

Noise Rating at 1m (Maximum):

Holding: 20 dBA (no audible noise).

Two-position models:

Driving: 50 dBA.

Spring Return: 65 dBA.

Floating and Modulating models:

Driving: 40 dBA.

Spring Return: 50 dBA.

Environmental Protection Ratings:

NEMA2 (US Models) or IP54 (European Models) when mounted on a horizontal shaft with access cover below the shaft.

Accessories:

32004254-002 Self-Centering Shaft Adapter (supplied with actuator).

50030966-001 Anti-Rotation Bracket (supplied with actuator).

Sizing

Required Torque

In lieu of data from a Specification Engineer or Manufacturer, required torque for a given damper load can be determined using the following method:

$$T_R = T_D \times A_D$$

Where:

— T_R = Required torque for the damper load.

— T_D = Damper torque rating from the manufacturer, expressed in either (lb-in.)/(sq ft) or (N•m)/(sq m). the damper load.

— A_D = Damper area expressed in either sq ft or sq m.

Actuators Required

In lieu of data from a Specification Engineer or Manufacturer, the number of required actuators for a given damper load can be determined using the following method:

$$N = \frac{T_R}{T_A \times SF}$$

Where:

— N = Number of actuators.

— T_R = Required torque for the damper load. (See above.)

— T_A = Actuator torque rating.

— SF = Safety factor.

NOTE: The safety factor accounts for variables such as mis-alignments, aging of the damper, etc. 0.8 is a typical safety fac

