

BC 04.1



BETEC CAD.

Motorized Fire Smoke Dampers



MSFD-GB-30C1-A

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.





BETEC CAD.

BREAKS FIRE & SMOKE

“BUILDING CONDITIONED AIR FOR LIFE SAFETY”

BETEC CAD. manufactures life safety dampers, based on SMACNA, NFPA & UL technological data, in the interest of improving the safety for public benefit.

Today, as per BOCA & IBC Standards, building safety is a demandable choice by the public in case of fire accidents. **BETEC CAD's** Fire, Smoke and Combination of Fire / Smoke dampers are manufactured in accordance with UL 555/555S and BS 476 P20-22 standards to prevent the spread of Smoke or Fire breakouts.

LIFE SAFETY DAMPERS – MSFD-GB-20/30; MFD-GB-20/30 FOR BUILDING & COMMERCIAL VENTILATION



Motorized Fire Damper

Motorized Fire / Smoke Damper

Fire Rating : 3 Hrs / 1-1/2 Hrs; Leakage Rating : Class-I / Class-II

For more details about **BETEC CAD's** UL Classified Products.

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UL 555 / 555S - Classified Motorized Damper**B 20 Series****Motorized Fire Damper UL 555**

Fire Dampers are required by the International Uniform Building Code to maintain the required fire resistance rating of walls, partitions, and floors when they are penetrated by air ducts or other ventilation openings.

A duct or ventilation openings in any of the fire rated partitions would permit a fire to spread from the compartment of origin to adjoining compartments or space. Motorized Fire Dampers are Installed in these ducts or ventilation openings. They close automatically upon detection of heat by a Thermal responsive device (TRD), blocking the openings and preventing the spread of fire in to the adjoining compartment.

Motorized Smoke Damper UL 555S

Smoke Dampers are required by the International Uniform Building Code to maintain the required smoke leakage resistance rating of walls, partitions, and floors when they are penetrated by air ducts or other ventilation openings.

Smoke Dampers can be used in two different applications, where they simply close and prevent the circulation of air and smoke through duct or a ventilation opening in a smoke barrier. Or they may be designed to control the spread of smoke using walls and floors as barriers and using the building's HVAC system and or dedicated fans to create pressure differences. Higher pressures surround the fire area and prevent the spread of smoke from the fire zone into other areas of the building. Smoke Dampers are operated with electric actuator. They may be controlled by a smoke or heat detector signal, a fire alarm signal, or in a variety of ways by the building control system to accomplish the intent of the design.

Motorized Fire Smoke Damper UL 555 / 555S

UL 555 requires each Fire damper with its installed actuator to be rated for Fire endurance test for 1½ or 3 hr. for a specific temperature of 1800°F (1000°C).

UL 555S requires each smoke damper with its installed actuator to be rated for operation at a specific velocity of airflow when open and to close against a specific pressure differential. Dampers should be selected to operate at the pressures and velocities they will see in their application, with a minimum of 4" w.g. and 2000fpm.

UL defines leakage classes by the maximum allowable leakage through a closed damper at 4" w.g. measured in cfm per square foot of damper area.

UL555 / 555S Tests

Cycling Test (UL 555 / UL 555S)

Temperature Degradation Test (UL 555S)

Operational Test (UL 555S)

AMCA 500 D Leakage Test (UL 555 S)

Fire Endurance Test and Hose Stream Test (UL 555 / UL555S)

Salt Spray Exposure Test (UL 555 / UL 555S)

Leakage Rating Decision

UL Standard 555S identifies three leakage classes as Classes I, II, III - based on the required applications.

1-Single Skin 3 V blades style is appropriate for use in airflow velocities slightly over 2000 fpm.

2-Aerofoil style blades are appropriate for use with velocities up to 3000 fpm.

Specifications

Combination Fire/Smoke dampers meeting or exceeding the following specifications shall be furnished and installed at locations shown on plans or as described in schedules. Dampers shall meet the requirements of NFPA 90A and SMACNA, Class II leakage rated dampers for use in smoke control systems and 1½ hrs / 3 hr. fire rating in accordance with the latest version of UL 555/UL555S.

As part of the UL standards, fire/smoke dampers shall have demonstrated a capacity to open and close under HVAC system operating conditions, with pressures up to 4 inches w.g. in the closed position and 2000 fpm air velocity in the open position.

In addition to the leakage ratings already specified herein, the dampers and their actuator shall be qualified under UL 555S to an elevated temperature of 250°F (121°C) or 350°F (177°C) depending upon the actuator. Appropriate pneumatic or electric actuator shall be installed by the damper manufacturer at the time of damper fabrication. Damper and actuator shall be supplied as a single entity which meets all applicable UL 555S standards for the both dampers and actuator. Each damper shall be rated for leakage and airflow in either direction through the damper. Damper and actuator assembly shall be factory cycled at least 15 times to assure operation.

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UL 555S - Classified Motorized Smoke Damper

B-20 Series

Type : Motorized Smoke Damper

Model : MSD-GB-20C1-A/R; MSD-GSB-20C1-A/R

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

MSD B-20 Series is a high performance UL 555S Classified smoke damper with Class-I leakage rating, installed vertically or horizontally (with blades running horizontally) and is rated for airflow and leakage in either direction.

UL-555S Test Ratings

Leakage Rating : Class - I

Max Velocity : 2000 fpm

Temperature : 250 °F (121 °C)

Max Operating Pressure: 4 in. w.g (1000 pa)

Standard Construction

Frame

16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blades

Parallel operated 3 'V' type blade made of 16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blade Seals

Silicon rubber blade seals.

Jamb Seals

Stainless steel.

Jack Shaft

1/2" x 1/2" (12 mm) Galvanized steel square shaft.

Actuator

Honeywell (24V AC, 120V AC, 230V AC).

Sleeve

Minimum 0.9 mm, single section is field or factory installed.

Multiple section is factory installed.

Sleeve thickness as per NFPA table 3-4.6.3.

Optional Fittings

Retaining Angles

1 1/2" x 1 1/2" x 16 gauge (40 x 40 x 1.5 mm).

Thermal Response Device (TRD)

165°F (74°C).

Limit Switches

For BMS open / close indication.

Indicator

Externally mounted open, close visible Indicator.

Push Button

For manual reset of damper.

Transitions (R)

Neck adapter for round duct connections.

Junction Box

Smoke Detector



MSD-GB-20C1-A

Model : MSD-GB-20C1-A/R UL 555 Damper meets the required standards of SMACNA, NFPA, IBC, BOCA, ICBO, UL.

MSD - B-20 Series - Model Details

Model	Material		Damper Operation	
	Frame	Blade	Standard	Optional
MSD-GB-20C1-A/R	GI	GI	FC	FO
MSD-GSB-20C1-A/R	GI	SS	FC	FO

Minimum Sleeve thickness for Breakeaway joints as per NFPA 90A Table 3-4.6.3

Air Duct Diameter or Maximum Width		Minimum sleeve thickness	
Inch	mm	Inch	gauge
12 or Less	305	0.018	26
13-30	330-762	0.024	24
31-54	787-1372	0.03	22
55-84	1397-2134	0.036	20
85 or more	2159	0.047	18

Actuator Location		Operating Voltage	
Standard	Optional	Standard	Optional
Left Side	Right side	230 V	120 V / 24 V

Actuator location standard: Left side from rear view
(Jack shaft view)

Note :

FC : Fail Close in the event of Fire

FO : Fail Open in the event of Fire

WHILE ORDERING INDICATE THE DAMPER IS FC/FO (FAIL CLOSE / FAIL OPEN)

Optional Construction (UL Certification N/A)

Frame : Stainless Steel 16 gauge (304/316L)

Blade : Stainless Steel 16 gauge (304/316L)

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UL 555S - Classified Motorized Smoke Damper

B-20 Series

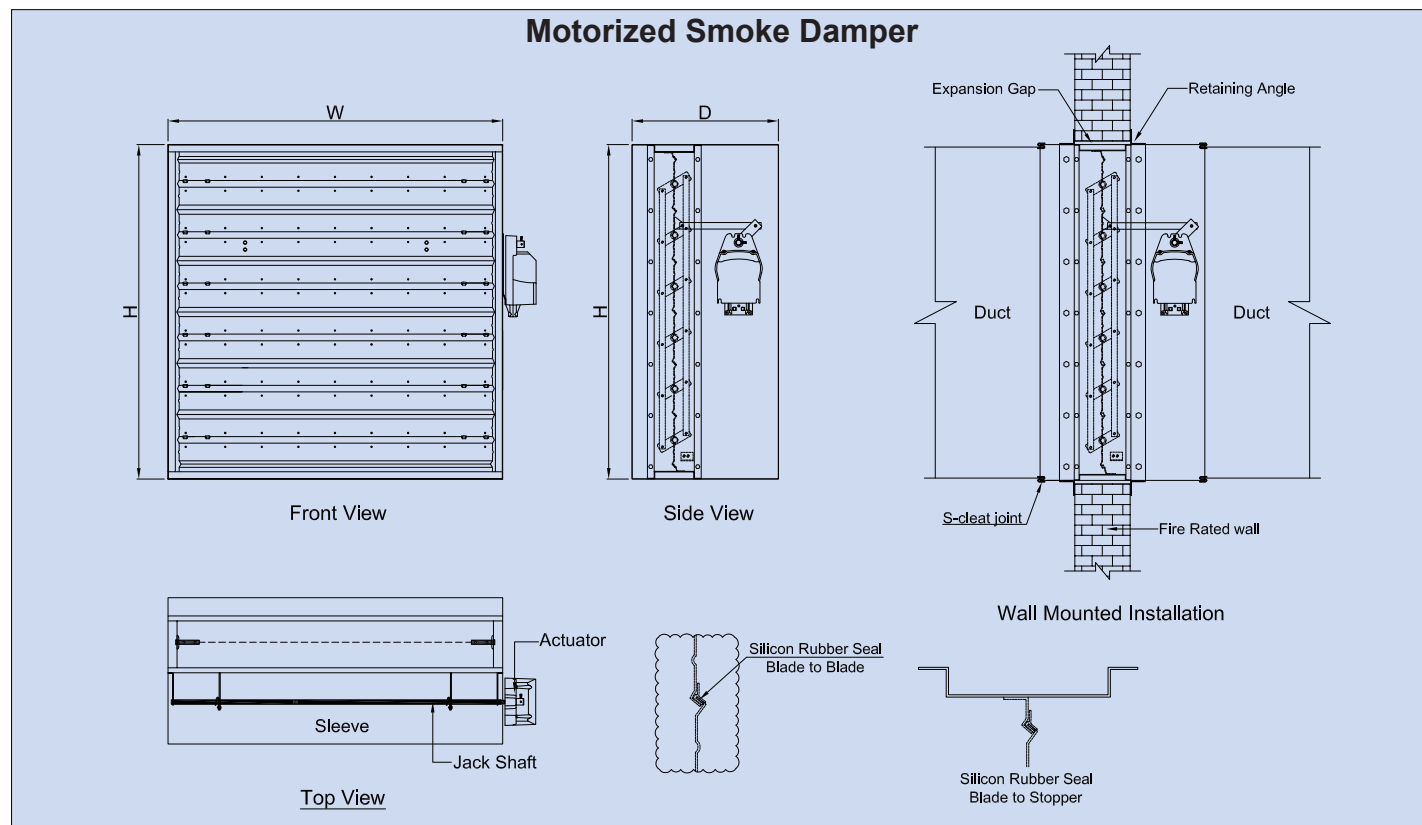
Type : Motorized Smoke Damper

Model : MSD-GB-20C1-A/R; MSD-GSB-20C1-A/R

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)



UL Classified (see mark on product)
UL Classified to American/Intl safety standards
UL Standard 555 (Listing # R21925)

Size Limitation		
Module	Size : Width X Height	Mounting Position
Single	Min X Min. 6" x 6"	V/H
Single	Max X Max. 36" x 36"	V/H
Multiple	Max X Max 72" x 36"	V/H

Standard Sizes Any Combination of W x H			
Width (W)	Height (H)	Depth (D)	Module
9"	9"	16"	Single
10"	9"	16"	Single
10"	10"	16"	Single
12"	12"	16"	Single
16"	16"	16"	Single
20"	20"	16"	Single
24"	24"	16"	Single
30"	30"	16"	Single
36"	36"	16"	Single
72"	36"	16"	Multiple

Note : 9" x 9" - Sleeve will have reducer (with adopter neck)

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.



UL 555S - Classified Motorized Smoke Damper

B-21 Series

Type : Motorized Smoke Damper

Model : MSD-GB-21C1-A/R

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

MSD B-21 Series is a high performance UL 555S Classified smoke damper with Class- I leakage rating, installed vertically or horizontally (with blades running horizontally) and is rated for airflow and leakage in either direction.

UL-555S Test Ratings

Leakage Rating : Class - I

Max Velocity : 2000 fpm

Max Operating Pressure: 4 in. w.g (1000 pa)

Operating Temperature : 250 °F (121°C) for ½ hr

Additional Test Ratings

Operating Temperature :250°C (482 °F) for 1 hr* (HKFSD)

:250°C (482 °F) for 2 hr* (HKFSD)

Standard Construction

Frame

16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blades

Parallel operated 3 'V' type blade made of 16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blade Seals

Silicon rubber blade seals.

Jamb Seals

Stainless steel.

Jack Shaft

12 mm diameter Galvanized steel shaft.

Actuator

Honeywell, Belimo, Seimens (24V AC, 120V AC, 230V AC).

Sleeve

Minimum 0.9 mm, single section is field or factory installed.

Multiple section is factory installed.

Sleeve thickness as per NFPA table 3-4.6.3.

Optional Fittings

Retaining Angles

1½" x 1½" x 16 gauge (40 x 40 x 1.5 mm).

Thermal Response Device (TRD)

165°F (74°C).

Limit Switches

For BMS open / close indication.

Indicator

Externally mounted open, close visible Indicator.

Push Button

For manual reset of damper.

Transitions (R)

Neck adapter for round duct connections.

Junction Box

Smoke Detector

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Model : MSD-GB-21C1-A/R UL 555S Damper meets the required standards of SMACNA, NFPA, IBC, BOCA, ICBO, UL.

MSD - B-21 Series - Model Details

Model	Material		Damper Operation	
	Frame	Blade	Standard	Optional
MSD-GB-21C1-A/R	GI	GI	FC	FO

Minimum Sleeve thickness for Breakeaway joints as per NFPA 90A Table 3-4.6.3

Air Duct Diameter or Maximum Width		Minimum sleeve thickness	
Inch	mm	Inch	gauge
12 or Less	305	0.018	26
13-30	330-762	0.024	24
31-54	787-1372	0.03	22
55-84	1397-2134	0.036	20
85 or more	2159	0.047	18

Actuator Location		Operating Voltage	
Standard	Optional	Standard	Optional
Left Side	Right side	230 V	120 V / 24 V

Actuator location standard: Left side from rear view
(Jack shaft view)

Note :

FC : Fail Close in the event of Fire

FO : Fail Open in the event of Fire

* The temperature ratings are for Honeywell 20 Nm actuators with thermal enclosures.

Optional Construction (UL Certification N/A)

Frame : Stainless Steel 16 gauge (304/316L)

Blade : Stainless Steel 16 gauge (304/316L)

UL 555S - Classified Motorized Smoke Damper

B-21 Series

Type : Motorized Smoke Damper

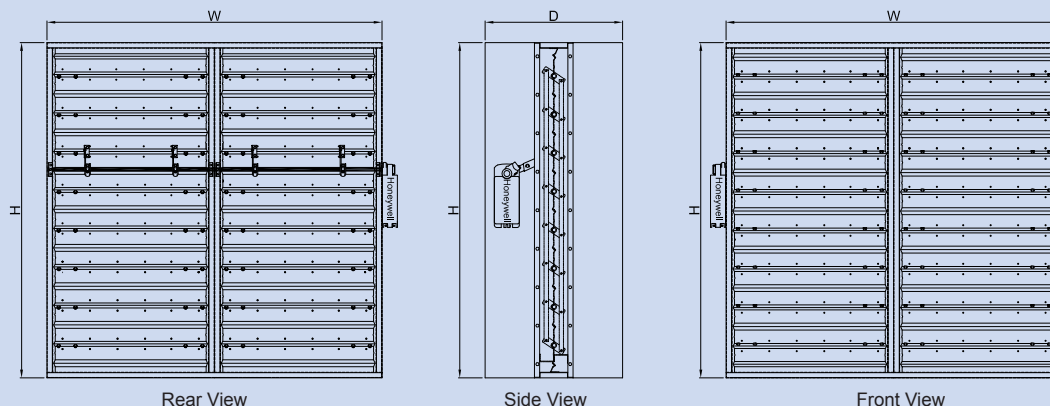
Model : MSD-GB-21C1-A/R

Leakage Rating : Class - I

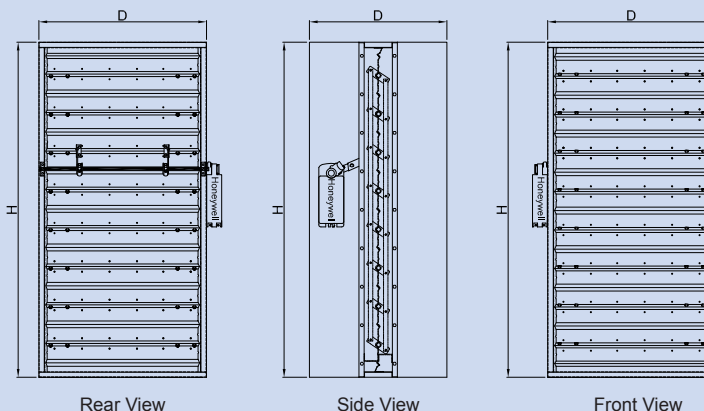
Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

Motorized Smoke Damper



Module	Size (WxH)	Actuator Options
Single	24" x 48"	Honeywell 9 / 20 Nm
		Belimo 7.9 Nm
		Siemens 16 Nm
Single	36" x 48"	Honeywell 20 Nm
Single	48" x 48"	Honeywell 20 Nm
Multiple	96" x 48"	Siemens 16 Nm
		Belimo 7.9 Nm
Multiple	144" x 96"	Honeywell 9 / 20 Nm
Multiple	288" x 48"	Honeywell 20 Nm



UL Classified (see mark on product)
UL Classified to American/Intl safety standards
UL Standard 555 (Listing # R21925)

Size Limitation		
Module	Size : Width X Height	Mounting Position
Single	Min X Min. 6" x 9"	V/H
Single	Max X Max. 24" x 48"	V/H
Multiple	Max X Max. 48" x 48"	V/H
Multiple	Max X Max. 144" x 96"	V/H
	Max X Max. 288" x 48"	

Standard Sizes Any Combination of W x H			
Width (W)	Height (H)	Depth (D)	Module
6"	9"	16"	Single
8"	9"	16"	Single
10"	10"	16"	Single
12"	12"	16"	Single
16"	16"	16"	Single
20"	20"	16"	Single
24"	24"	16"	Single
24"	48"	16"	Single
48"	48"	16"	Single/Multiple
144"	96"	16"	Multiple

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UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30 Series

Type : Motorized Fire Smoke Damper

Model : MSFD-GB-20/30C1-A/R; MSFD-GSB-20/30C1-A/R

Fire Rating : 20 Series-1½ hour ; 30 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

MSFD B-20/30 Series is a high performance UL 555 / 555S Classified combination of fire and smoke damper with 1½hr. / 3hr. fire rating , installed vertically or horizontally (with blades running horizontally) and is rated for airflow and leakage Class-I leakage in either direction.

UL- 555/555S Test Ratings

Fire Rating : 1½ hrs. / 3 hrs

Leakage Rating : Class - I

Max Velocity : 2000 fpm

Temperature : 250 °F (121 °C)

Max Operating Pressure: 4 in. w.g (1000 pa)

Standard Construction

Frame

16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blades

Parallel operated 3 'V' type blade made of 16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blade Seals

Silicon rubber blade seals.

Jamb Seals

Stainless steel.

Jack Shaft

½" x ½" (12 mm) Galvanized steel square shaft.

Thermal Response Device (TRD)

165°F (74°C).

Actuator

Honeywell (24V AC, 120V AC, 230V AC).

Sleeve

Minimum 0.9 mm, single section is field or factory installed.

Multiple section is factory installed.

Sleeve thickness as per NFPA table 3-4.6.3.

Optional Fittings

Retaining Angles

1½" x 1½" x 16 gauge (40 x 40 x 1.5 mm).

Limit Switches

For BMS open / close indication.

Indicator

Externally mounted open, close visible Indicator.

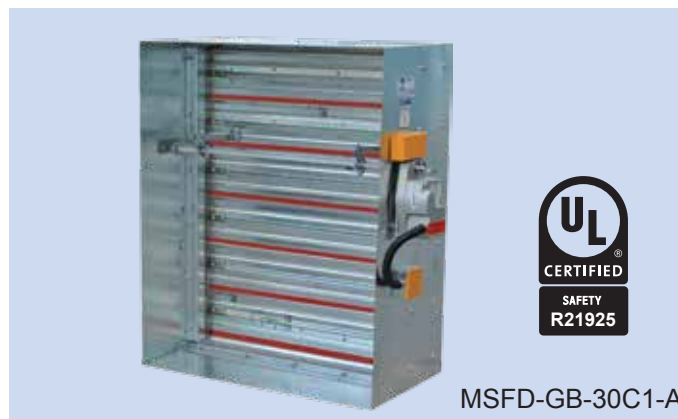
Push Button

For manual reset of damper.

Transitions (R)

Neck adapter for round duct connections.

Junction Box



MSFD-GB-30C1-A

Model : MSFD-GB/GSB-20/30C1-A/R UL 555/555S Damper meets the required standards of SMACNA, NFPA, IBC, BOCA, ICBO, UL.

MSFD - B-20/30 Series - Model Details

Model	Material		Damper Operation	
	Frame	Blade	Standard	Optional
MSFD-GB-20C1-A/R	GI	GI	FC	FO
MSFD-GSB-20C1-A/R	GI	SS	FC	FO
MSFD-GB-30C1-A/R	GI	GI	FC	FO
MSFD-GSB-30C1-A/R	GI	SS	FC	FO

Minimum Sleeve thickness for Breakeaway joints as per NFPA 90A Table 3-4.6.3

Air Duct Diameter or Maximum Width		Minimum sleeve thickness	
Inch	mm	Inch	gauge
12 or Less	305	0.018	26
13-30	330-762	0.024	24
31-54	787-1372	0.03	22
55-84	1397-2134	0.036	20
85 or more	2159	0.047	18

Actuator Location		Operating Voltage	
Standard	Optional	Standard	Optional
Left Side	Right side	230 V	120 V / 24 V

Actuator location standard: Left side from rear view
(Jack shaft view)

Note :

FC : Fail Close in the event of Fire

FO : Fail Open in the event of Fire

WHILE ORDERING INDICATE THE DAMPER IS FC/FO (FAIL CLOSE / FAIL OPEN)

Optional Construction (UL Certification N/A)

Frame : Stainless Steel 16 gauge (304/316L)

Blade : Stainless Steel 16 gauge (304/316L)

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UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30 Series

Type : Motorized Fire Smoke Damper

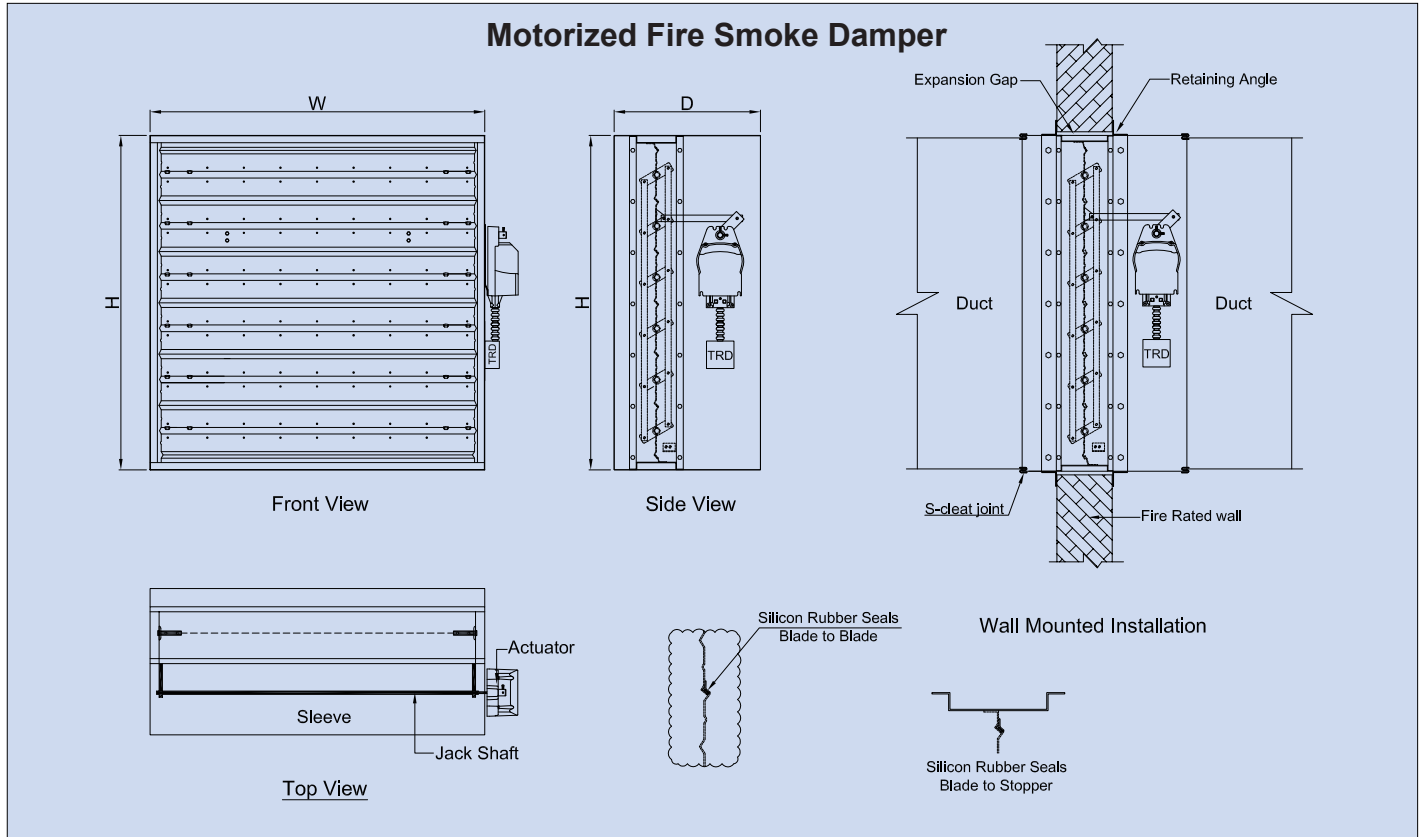
Model : MSFD-GB-20/30C1-A/R; MSFD-GSB-20/30C1-A/R

Fire Rating : 20 Series-1½ hour ; 30 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)



UL Classified (see mark on product)
UL Classified to American/Intl safety standards
UL Standard 555 (Listing # R21925)

Size Limitation		
Module	Size : Width X Height	Mounting Position
Single	Min X Min. 6" x 6"	V/H
Single	Max X Max. 36" x 36"	V/H
Multiple	Max X Max 72" x 36"	V

Standard Sizes Any Combination of W x H			
Width (W)	Height (H)	Depth (D)	Module
9"	9"	16"	Single
10"	9"	16"	Single
10"	10"	16"	Single
12"	12"	16"	Single
16"	16"	16"	Single
20"	20"	16"	Single
24"	24"	16"	Single
30"	30"	16"	Single
36"	36"	16"	Single
72"	36"	16"	Multiple

Note : 9" x 9" - Sleeve will have reducer (with adopter neck)

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UL 555/555S - Classified Motorized Fire Smoke Damper

B-21/31 Series

Type : Motorized Fire Smoke Damper

Model : MSFD-GB-21/31C1-A/R

Fire Rating : 21 Series-1½ hour ; 31 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

MSFD B-21/31 Series is a high performance UL 555 / 555S Classified combination of fire and smoke damper with 1½hr. / 3hr. fire rating , installed vertically or horizontally (with blades running horizontally) and is rated for airflow and leakage Class - I leakage in either direction.

UL- 555/555S Test Ratings

Fire Rating : 1½ hrs. / 3 hrs

Leakage Rating : Class - I

Max Velocity : 2000 fpm

Max Operating Pressure: 4 in. w.g (1000 pa)

Operating Temperature : 250 °F (121 °C) for ½ hr

Additional Test Ratings

Operating Temperature :250°C (482 °F) for 1 hr* (HKFSD)

:250°C (482 °F) for 2 hr* (HKFSD)

Standard Construction

Frame

16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blades

Parallel operated 3 'V' type blade made of 16 gauge (1.4 mm - 1.7 mm) thick galvanized steel.

Blade Seals

Silicon rubber blade seals.

Jamb Seals

Stainless steel.

Jack Shaft

12 mm diameter Galvanized steel shaft.

Thermal Response Device (TRD)

165°F (74°C).

Actuator

Honeywell, Belimo, Seimens (24V AC, 120V AC, 230V AC)

Sleeve

Minimum 0.9 mm, single section is field or factory installed.

Multiple section is factory installed.

Sleeve thickness as per NFPA table 3-4.6.3.

Optional Fittings

Retaining Angles

1½" x 1½" x 16 gauge (40 x 40 x 1.5 mm).

Limit Switches

For BMS open / close indication.

Indicator

Externally mounted open, close visible Indicator.

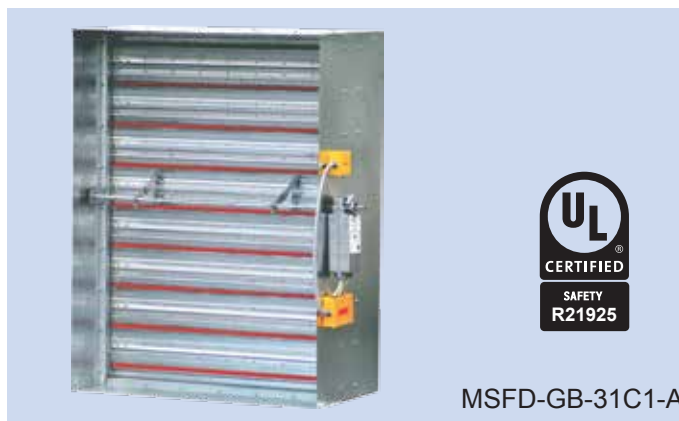
Push Button

For manual reset of damper.

Transitions (R)

Neck adapter for round duct connections.

Junction Box



MSFD-GB-31C1-A

Model : MSFD-GB-21/31C1-A/R UL 555/555S Damper meets the required standards of SMACNA, NFPA, IBC, BOCA, ICBO, UL.

MSFD - B-20/30 Series - Model Details

Model	Material		Damper Operation	
	Frame	Blade	Standard	Optional
MSFD-GB-21C1-A/R	GI	GI	FC	FO
MSFD-GB-31C1-A/R	GI	GI	FC	FO

Minimum Sleeve thickness for Breakeaway joints as per NFPA 90A Table 3-4.6.3

Air Duct Diameter or Maximum Width		Minimum sleeve thickness	
Inch	mm	Inch	gauge
12 or Less	305	0.018	26
13-30	330-762	0.024	24
31-54	787-1372	0.03	22
55-84	1397-2134	0.036	20
85 or more	2159	0.047	18

Actuator Location		Operating Voltage	
Standard	Optional	Standard	Optional
Left Side	Right side	230 V	120 V / 24 V

Actuator location standard: Left side from rear view
(Jack shaft view)

Note :

FC : Fail Close in the event of Fire

FO : Fail Open in the event of Fire

* The temperature ratings are for Honeywell 20 Nm actuators with thermal enclosures.

Optional Construction (UL Certification N/A)

Frame : Stainless Steel 16 gauge (304/316L)

Blade : Stainless Steel 16 gauge (304/316L)

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UL 555/555S - Classified Motorized Fire Smoke Damper

B-21/31 Series

Type : Motorized Fire Smoke Damper

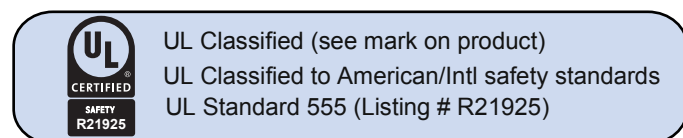
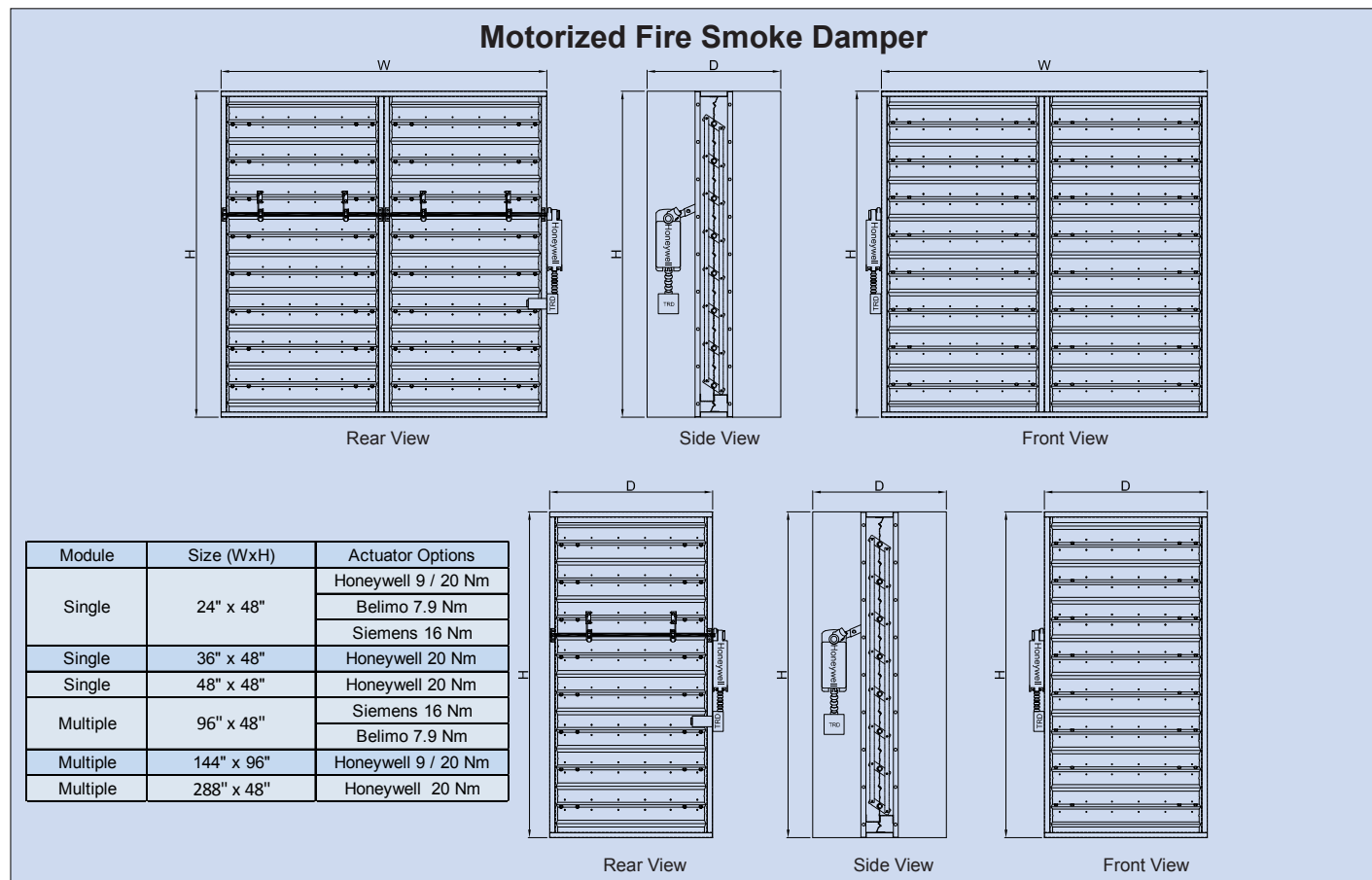
Model : MSFD-GB-21/31C1-A/R

Fire Rating : 21 Series-1½ hour ; 31 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)



Size Limitation		
Module	Size : Width X Height	Mounting Position
Single	Min X Min. 6" x 9"	V/H
Single	Max X Max. 24" x 48"	V/H
Multiple	Max X Max. 48" x 48"	V/H
Multiple	Max X Max. 144" x 96"	V - 3 hrs
		V/H - 1 ½ hrs

Standard Sizes Any Combination of W x H			
Width (W)	Height (H)	Depth (D)	Module
6"	9"	16"	Single
8"	9"	16"	Single
10"	10"	16"	Single
12"	12"	16"	Single
16"	16"	16"	Single
20"	20"	16"	Single
24"	24"	16"	Single
24"	48"	16"	Single
48"	48"	16"	Single/Multiple
144"	96"	16"	Multiple

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper

B-21/31 Series

Type : Motorized Fire Smoke Damper

Model : MSFD-GB-21/31C2-A/R

Fire Rating : 21 Series-1½ hour ; 31 Series-3 hour.

Leakage Rating : Class - II

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

MSFD B-21/31 Series is a high performance UL 555 / 555S Classified combination of fire and smoke damper with 1½hr. / 3hr. fire rating, installed vertically or horizontally (with blades running horizontally) and is rated for airflow and leakage Class - II leakage in either direction.

UL-555S Test Ratings

Fire Rating : 1½ hrs. / 3 hrs

Leakage Rating : Class - II

Max Velocity : 2000 fpm

Max Operating Pressure: 4 in. w.g (1000 pa)

Operating Temperature : 250°F (121°C) for ½ hr- Class-II

Additional Test Ratings

Operating Temperature :250°C (482 °F) for 1 hr* (HKFSD)

:250°C (482 °F) for 2 hr* (HKFSD)

Standard Construction

Frame

(1.4 mm - 1.9 mm) thick galvanized steel.

Blades

Parallel operated 3 'V' type blade made of 14 gauge (1.4 mm - 1.9 mm) thick galvanized steel.

Blade Seals

Silicon rubber blade seals.

Jamb Seals

Stainless steel.

Jack Shaft

12 mm diameter Galvanized steel shaft.

Thermal Response Device (TRD)

165°F.

Actuator

Honeywell, Belimo, Seimens (24V AC, 120V AC, 230V AC)

Sleeve

Minimum 0.9 mm, single section is field or factory installed.

Multiple section is factory installed.

Sleeve thickness as per NFPA table 3-4.6.3.

Limit Switches

For BMS open / close indication.

Optional Fittings

Retaining Angles

1½" x 1½" x 16 gauge (40 x 40 x 1.5 mm).

Indicator

Externally mounted open, close visible Indicator.

Push Button

For manual reset of damper.

Transitions (R)

Neck adapter for round duct connections.

Junction Box

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.



Model : MSFD-GB-21/31C2-A/R UL 555/555S Damper meets the required standards of SMACNA, NFPA, IBC, BOCA, ICBO, UL.

MSFD - B-21/31 Series - Model Details				
Model	Material		Damper Operation	
	Frame	Blade	Standard	Optional
MSFD-GB-21C2-A/R	GI	GI	FC	FO
MSFD-GB-31C2-A/R	GI	GI	FC	FO

Minimum Sleeve thickness for Breakeaway joints as per NFPA 90A Table 3-4.6.3			
Air Duct Diameter or Maximum Width		Minimum sleeve thickness	
Inch	mm	Inch	gauge
12 or Less	305	0.018	26
13-30	330-762	0.024	24
31-54	787-1372	0.03	22
55-84	1397-2134	0.036	20
85 or more	2159	0.047	18

Actuator Location		Operating Voltage	
Standard	Optional	Standard	Optional
Left Side	Right side	230 V	120 V / 24 V

Actuator location standard: Left side from rear view (Jack shaft view)

Note :

FC : Fail Close in the event of Fire

FO : Fail Open in the event of Fire

* The temperature ratings are for Honeywell 20 Nm actuators with thermal enclosures.

Optional Construction (UL Certification N/A)

Frame : Stainless Steel 16 gauge (304/316L)

Blade : Stainless Steel 16 gauge (304/316L)

UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

Fire Rating : 20/21 Series-1½ hour ; 30/31 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

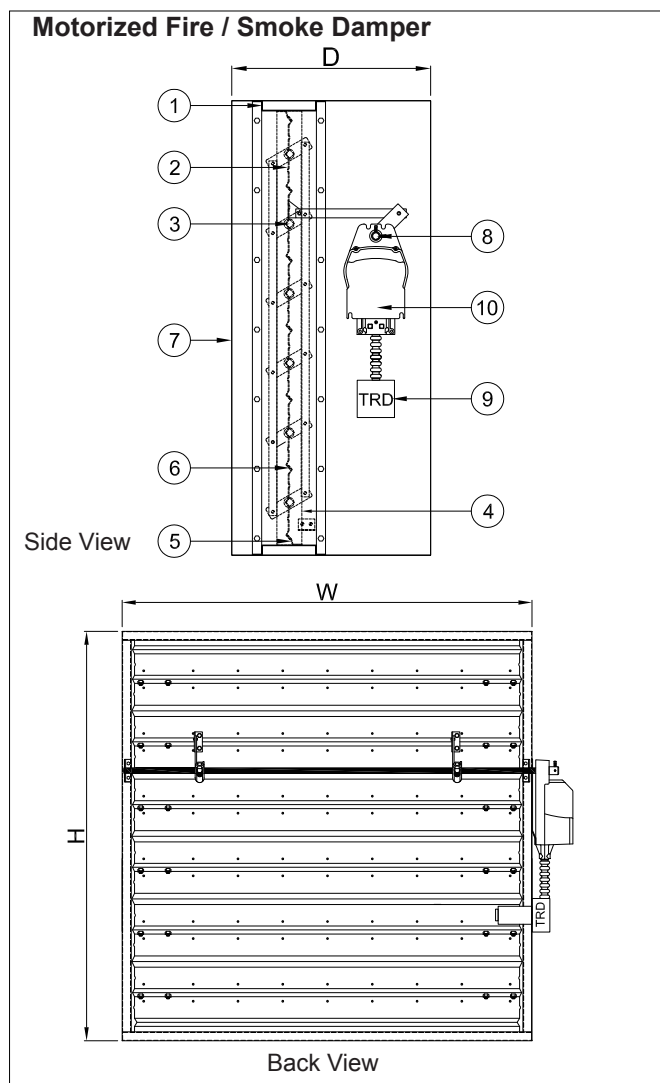
Construction : Galvanized Steel (GI)

Legends

1. Frame :16 gauge (1.4 mm-1.7 mm) thickness.
2. Blade : 3 'V' type blade 16 gauge (1.4 mm - 1.7 mm) thickness.
3. Blade Axle : ½ x ½ " (12x12 mm) .
4. Jamb Seal : Stainless steel jamb seals.
5. Blade stopper : 18 gauge (12 mm) thickness.
6. Gasket : Silicon rubber seals (For smoke application).
7. Sleeve : Sleeve thickness as per NFPA &UL standards. Standard 16" (400mm) length.
8. Jack shaft : Drive Shaft for the Actuator.
9. TRD : Electro Thermal responsive device.
- 10.Actuator : Honeywell / Seimens / Belimo

Note:

1. Non standard intermediate sizes as a Single Module Damper also available on request.
2. For sizes larger than mentioned in the table are available as Multiple module Dampers with the combination sizes given in the table.
3. Sleeve thickness as per NFPA 90A (Table 3-4.6.3) / UL 555 standards based on the Damper width or height for break away joints for Duct – sleeve joint.
4. For Duct – sleeve connections refer Betec CAD catalogue followed pages as per NFPA 90A / UL standards. (Contractor's scope)
5. Retaining Angles Shown. (Contractor's scope)



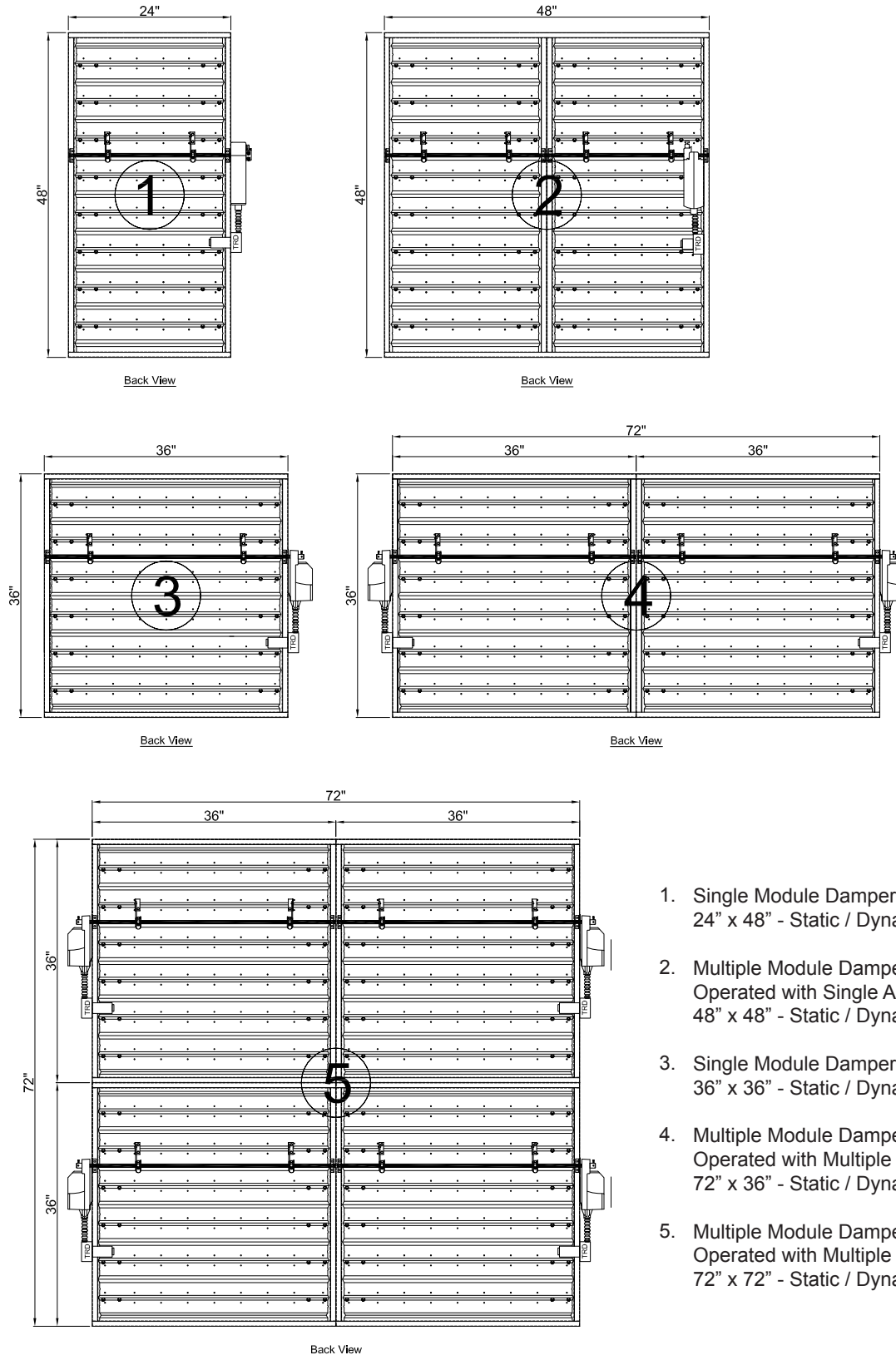
Multiple Damper Installation on site. Picture : Courtesy - Jebel Ali Down Town Site - Dubai - U.A.E



Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper Single / Multiple Module Damper Constructions

B-20/30/31 Series

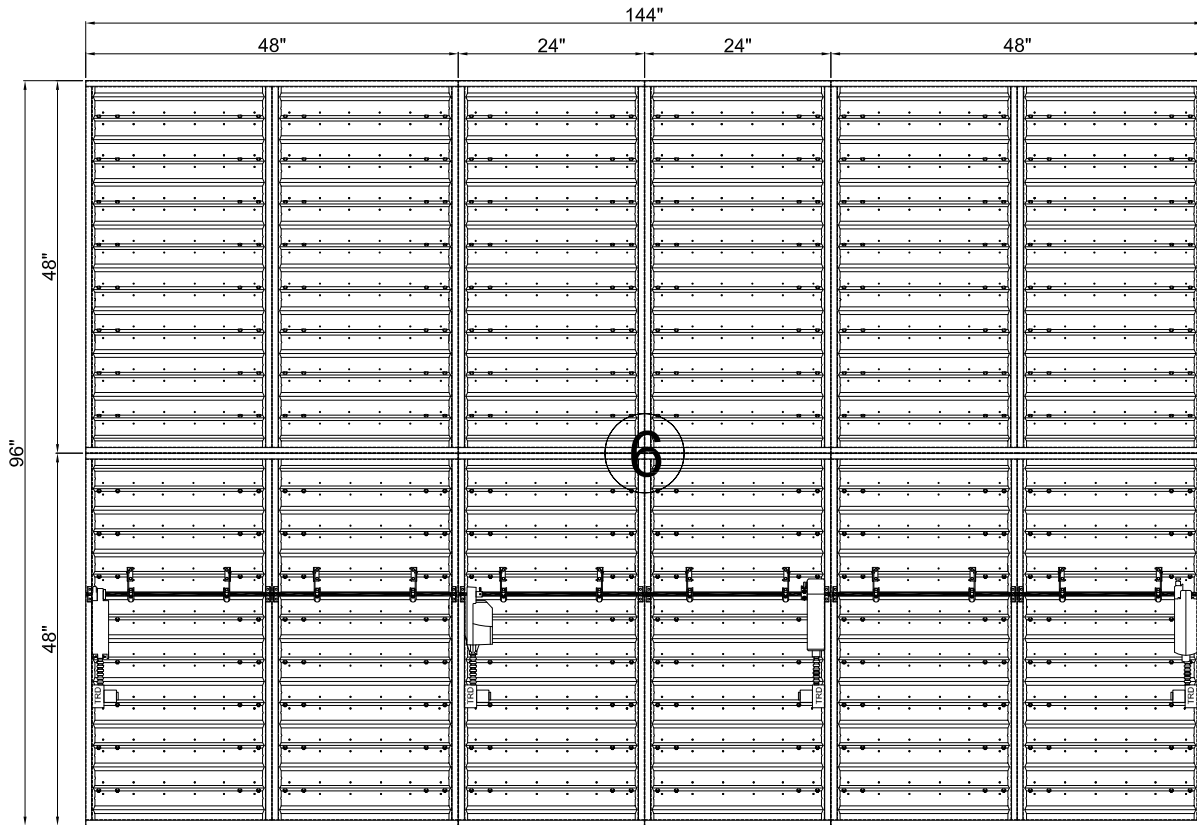


1. Single Module Damper Construction
24" x 48" - Static / Dynamic Rated.
2. Multiple Module Damper Construction
Operated with Single Actuator.
48" x 48" - Static / Dynamic Rated.
3. Single Module Damper Construction
36" x 36" - Static / Dynamic Rated.
4. Multiple Module Damper Construction
Operated with Multiple Actuator.
72" x 36" - Static / Dynamic Rated.
5. Multiple Module Damper Construction
Operated with Multiple Actuator.
72" x 72" - Static / Dynamic Rated.

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

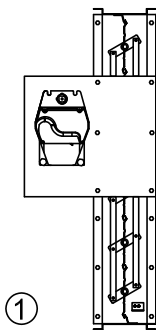
UL 555/555S - Classified Motorized Fire Smoke Damper Single / Multiple Module Damper Constructions Dampers - Alternate Constructions

B-20/30/31 Series

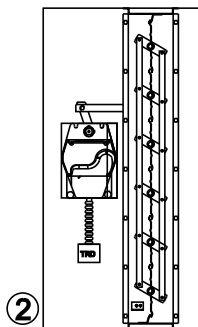


6. Multiple Module Damper Construction
Operated with Multiple Actuator. 144" x 96" - Static Rated.

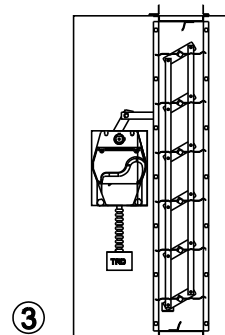
UL 555 / UL 555S - Rated Dampers - Alternate Constructions



Type 1 – Damper Construction
Damper Sleeve and the retaining angles are in the scope of site contractor & strictly should be as recommended by 'UL 555 / NFPA 90A / Damper Manufacturer / Consultant.



Type 2 – Damper Construction
The retaining angles are in the scope of site contractor & strictly should be recommended by 'UL 555/NFPA 90A Damper Manufacturer / Consultant. - Manufacturers Standard



Type 3 – Damper Construction
Recommended by 'UL 555 / NFPA 90A / Damper Manufacturer – **BETEC CAD.**

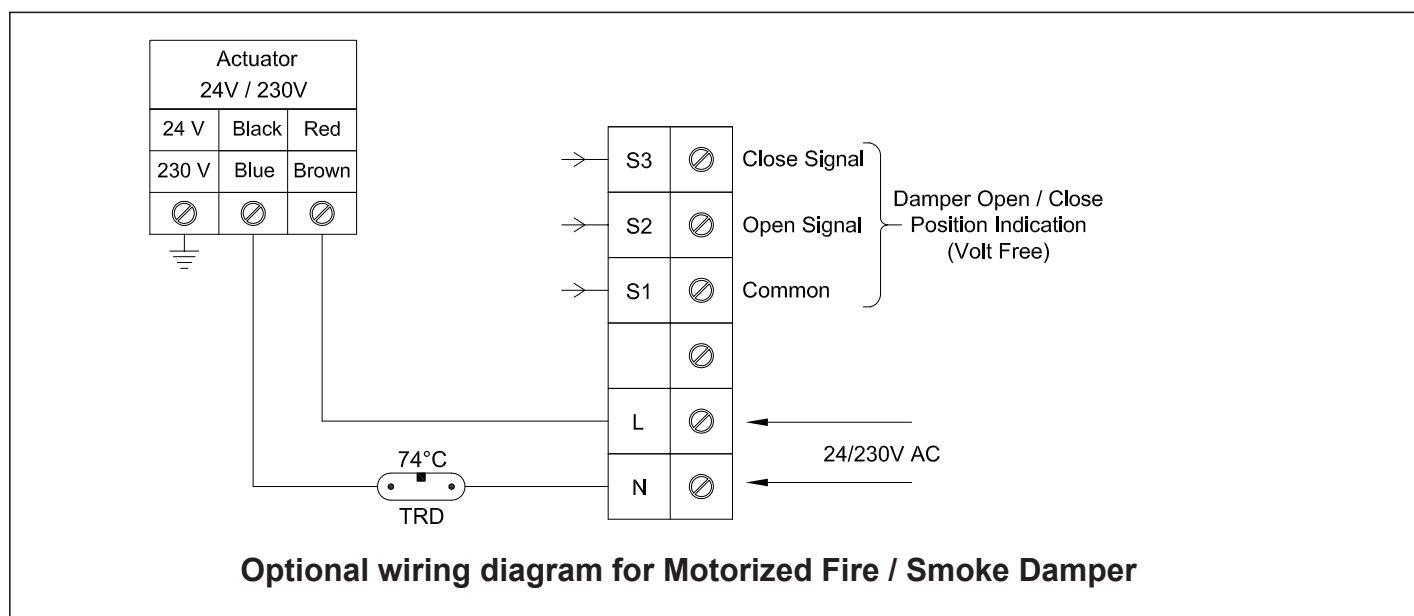
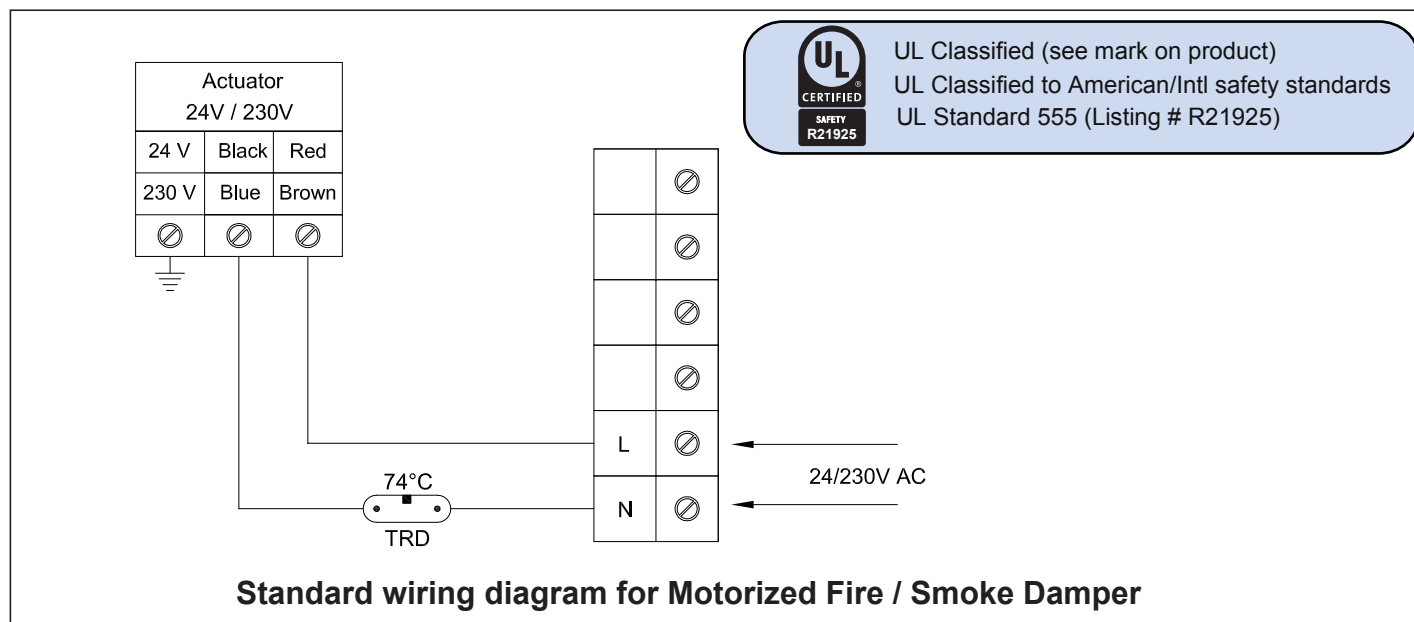
Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

UL 555/555S Rated Dampers - Control wiring Diagram

Model : MSD / MSFD



Optional Control Fittings :

- Smoke Detectors
- Momentary Switch
- Fire Alarm connection with relay
- TOR (Remote override of 165° F (74° C) or 212° F (100° C) closure allows damper to perform smoke management function during a fire emergency)
- 165° F (74° C), 212° F (100° C), 250° F (121° C)
- Sealed transitions and sleeves
- NEMA / IP rated Enclosures

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

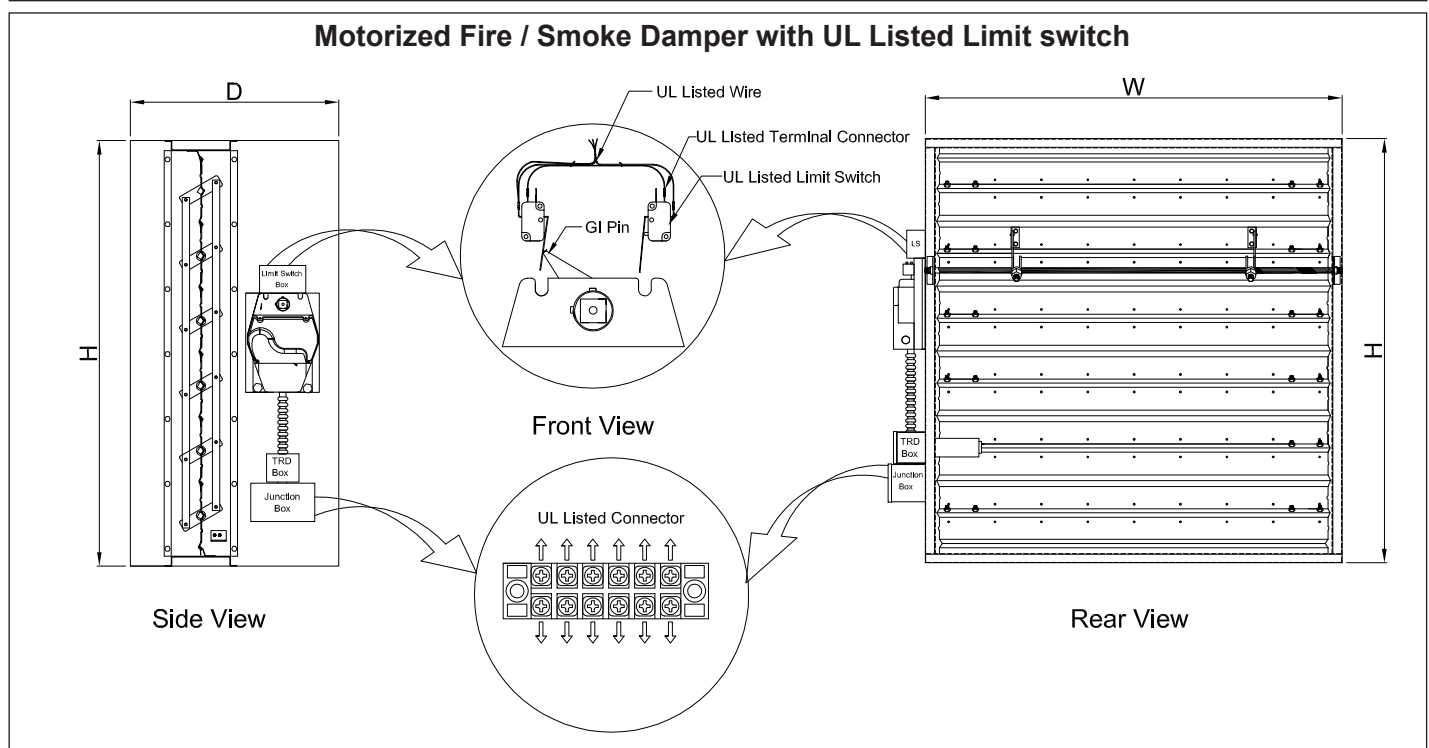
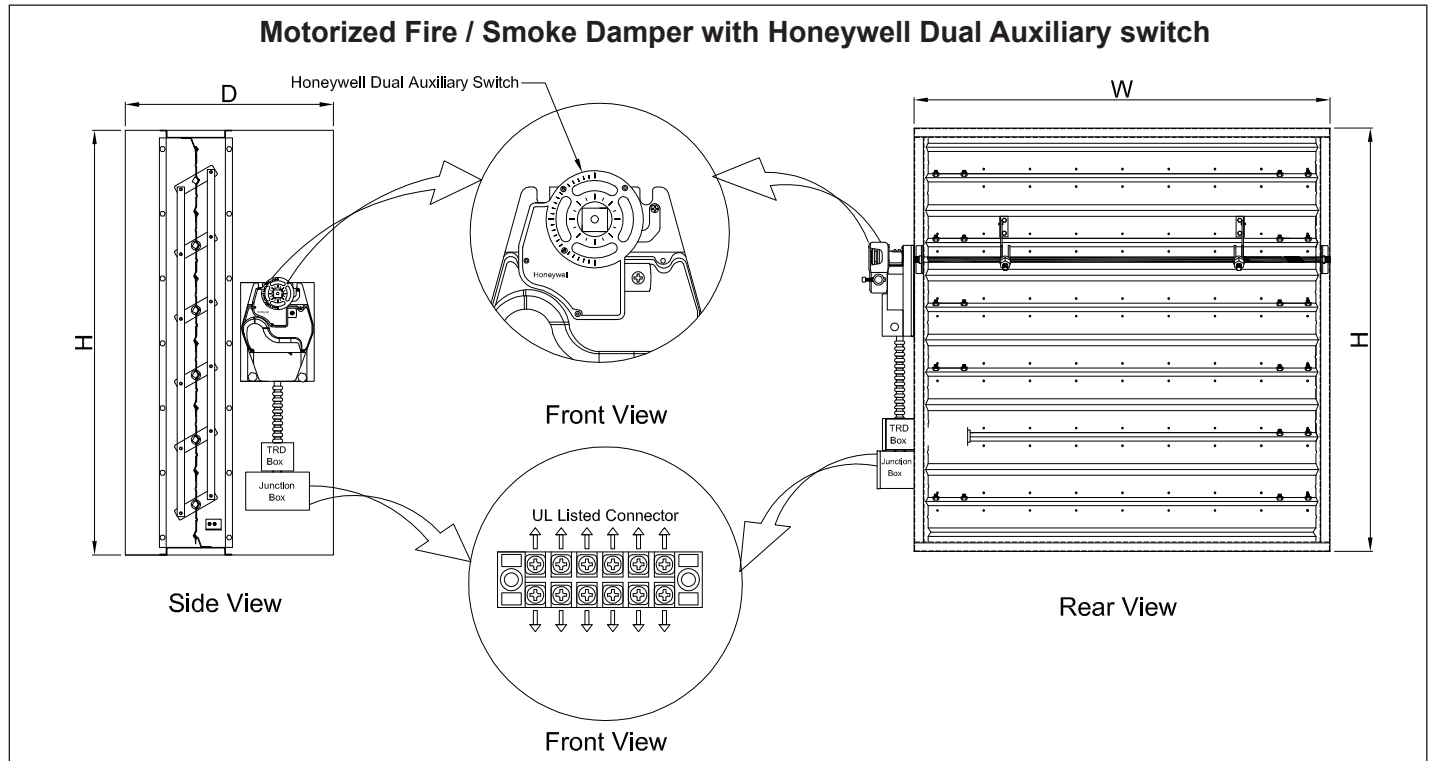
UL 555/555S Rated Dampers - With Honeywell Dual Auxiliary switch / UL Listed Limit switch

Fire Rating : 20/21 Series-1½ hour ; 30/31 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)



Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper
B-20/30/31 Series

UL 555/555S Rated Dampers - Actuator Details

Fire Rating : 20/21 Series-1½ hour ; 30/31 Series-3 hour.

Leakage Rating : Class - I

Blade Type : 3V Single Skin; A : Parallel Operation

Construction : Galvanized Steel (GI)

List of Approved Actuators				
Model	Brand	Torque	Operating Volts	Internal Auxiliary Switches
MS4209F	HONEYWELL	9 Nm	120 V	Optional
MS4309F	HONEYWELL	9 Nm	120 V	Optional
MS4709F	HONEYWELL	9 Nm	230 V	Optional
MS4809F	HONEYWELL	9 Nm	230 V	Optional
MS8209F	HONEYWELL	9 Nm	24 V	Optional
MS8309F	HONEYWELL	9 Nm	24 V	Optional
MS4120F1006	HONEYWELL	20 Nm	120 V	Optional
MS4120F1204	HONEYWELL	20 Nm	120 V	Inbuilt
MS4620F1005	HONEYWELL	20 Nm	230 V	Optional
MS4620F1203	HONEYWELL	20 Nm	230 V	Inbuilt
MS8120F1002	HONEYWELL	20 Nm	24 V	Optional
MS8120F1200	HONEYWELL	20 Nm	24 V	Inbuilt
FSNF-24S- US	BELIMO	7.9 Nm	24 V	Inbuilt
FSNF-230S- US	BELIMO	7.9 Nm	230 V	Inbuilt
GGD121.1U	SIEMENS	16 Nm	24 V	Optional
GGD121.1U/B	SIEMENS	16 Nm	24 V	Optional
GGD126.1U	SIEMENS	16 Nm	24 V	Inbuilt
GGD221.1U	SIEMENS	16 Nm	115 V	Optional
GGD221.1U/B	SIEMENS	16 Nm	115 V	Optional
GGD226.1U	SIEMENS	16 Nm	115 V	Inbuilt
GGD321.1U	SIEMENS	16 Nm	230V	Optional
GGD321.1U/B	SIEMENS	16 Nm	230V	Optional
GGD326.1U	SIEMENS	16 Nm	230V	Inbuilt

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.



UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

UL 555 / 555S / AMCA 500 D Rating
Class II; Class III Construction

Pressure Drop Data

This pressure drop testing was conducted in accordance with AMCA Standard 500-D using the three configurations shown. All data has been corrected to represent standard air at a density of .075 lb/ft³ (1.201 kg/m³).



Actual pressure drop found in any HVAC system is a combination of many factors. This pressure drop information along with an analysis of other system influences should be used to estimate actual pressure losses for a damper installed in a given HVAC System.

AMCA Test Figures Figure 5.2 Illustrates a ducted damper exhausting air into an open area. This configuration has a lower pressure drop than Figure 5.3 Illustrates a fully ducted damper. This configuration has the lowest pressure drop of the three test configurations because entrance and exit losses are minimized by straight duct runs upstream and downstream of the damper.

Figure 5.5 because entrance losses are minimized by a straight duct run upstream of the damper.

Figure 5.5 Illustrates a plenum mounted damper. This configuration has the highest pressure drop because of extremely high entrance and exit losses due to the sudden changes of area in the system.

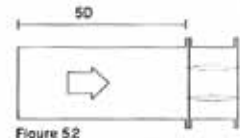


Figure 5.2

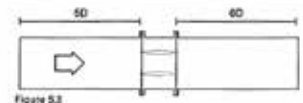
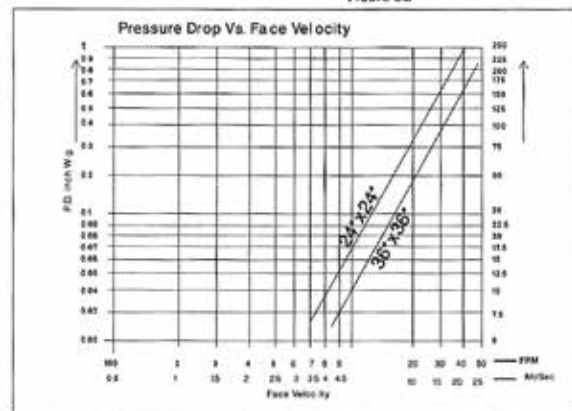


Figure 5.3

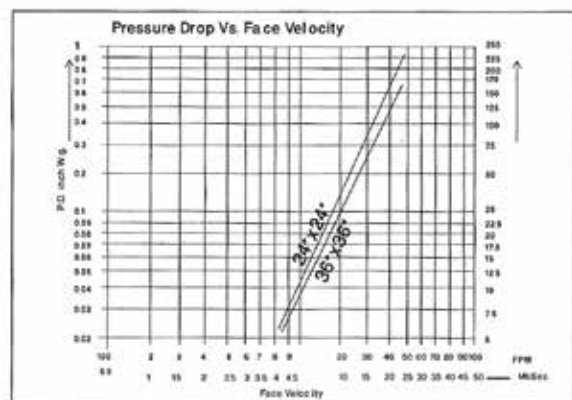
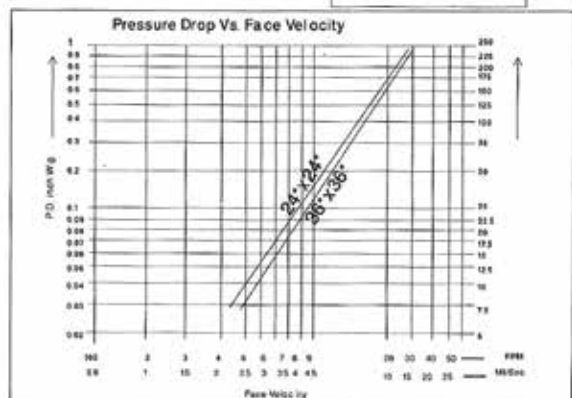


Figure 5.5



Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

UL/NFPA/SMACNA Recommended Installation Details

Expansion Clearance

Minimum 1/8" per linear foot (10 mm per linear meter) of damper — both dimensions.(1/4" (6 mm) minimum). Clearance requirements for damper sleeves within a wall /floor opening .

Sleeve to Damper Connection

1. Secure Damper to Sleeve on 6" centers (150mm) with 1/2" (12 mm) long welds, 1/4" (6 mm) bolts and nuts or No. 10 Sheet Metal Screws. Sleeve thickness must be equal to or thicker than the duct connected to it . Sleeve gauge requirements are listed in the SMACNA Fire and Smoke Radiation Damper installation guide for HVAC systems and in NFPA 90. Damper sleeve shall not extend more than 6" beyond the fire wall or partition unless damper is equipped with an actuator and / or a factory installed access door. Sleeve may extend up to 16" beyond the fire wall or partition on sides equipped with actuator and or factory installed access door.

Retaining Angles

Retaining angles shall be a minimum of 1-1/2" x 1-1/2" x 16 ga (40x40x1.6mm). Retaining angles must overlap structure opening 1 inch minimum and cover corners of openings. For one angle installations the sleeve fasteners shall be placed at 6" (152) o.c and the wall fasteners shall be placed at 12" (305) o.c . For two angle installations the fasteners shall be spaced at 8" (203) o.c. Secure retaining angle to sleeve on <= 8" (203) with 1/2" (12 mm) long welds, 1/4" (6 mm) bolts and nuts or No. 10 Sheet Metal Screws

Actuators Connections

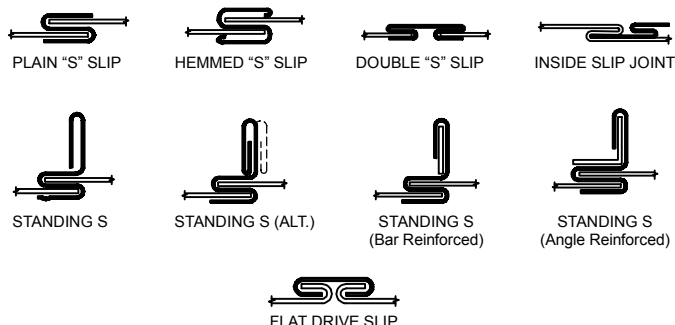
Electric actuators are required to be connected in accordance with wiring diagrams developed in compliance with applicable codes , ordinances and regulations.

Operation

To ensure optimum operation and performance , the damper must be installed so it is square and free from racking.Each fire smoke damper should be properly maintained , cycled and tested not less than every 6 months in accordance with NFPA 90 A, 92 A, UL 864.

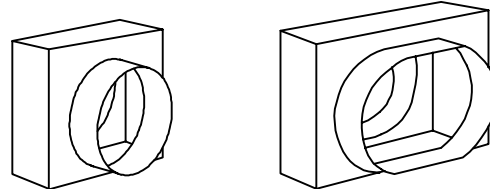
Duct sleeve Connections

Duct - sleeve joints (UL - Recommended)



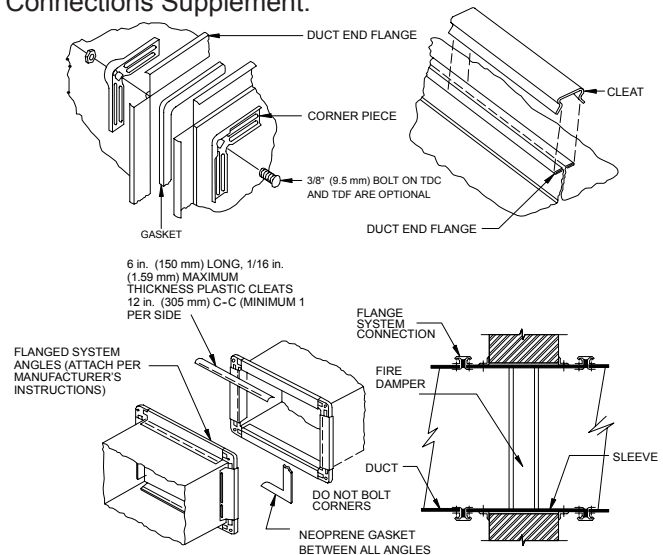
Round and Oval Break-away Connections

Round and oval spiral ducts attach to round or oval collars which are part of the damper sleeve as shown below. # 10 sheet metal screws are spaced equally around the circumference of the duct as per the following duct diameters 22" (560 mm) and smaller — 3 screws and duct diameters over 22" (560 mm) to and including 36" (915 mm) — 5 screws



Flanged Break-away Style Duct/Sleeve Connections

TDC and TDF roll-formed flanged connections using 3/8" (9.5 mm) steel bolts and nuts, and metal cleats, as tested by SMACNA, are approved break-away connections when installed as shown on the Flanged System Breakaway Connections Supplement.



(UL TESTED CONNECTIONS)

Non-Break-away Duct/Sleeve Connections

If other duct/sleeve connections are used, the sleeve shall be a minimum of 16 gage (1.6) for dampers up to 36" (914) wide x 24" (610) high and 14 gage

Type of Connection	Duct	Duct Daimensions	Sleeve Gauge
Rigid	Round - Rectangular	24" (610 mm) Max Daimeter 24" (610 mm) Max Height and 36" (915 mm) Max Width	16+ (1.613 + mm)
Rigid	Round - Rectangular	over 24" (610 mm) Max Daimeter over 24" (610 mm) Max Height and over 36" (915 mm) Max Width	14+ (1.994 + mm)
Breakaway	Round - Rectangular	12" (305 mm) and down 13-30" (330-760 mm) 31-54" (785-1370 mm) 55-84" (1400-2130mm) 85" (2160 mm) and up	26(0.55 mm) 24 (0.7 mm) 22 (0.85mm) 20 (1 mm) 18 (1.3mm)

* Breakaway connections not required

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper**B-20/30/31 Series****Operation and Maintenance****Operation**

1. Provide power connection and inspect if damper is in fully open position indicated by signal from limit switch or by visual means (no limit switch).
2. Disconnect power connection and inspect to see if damper will spring return to close position (fail safe position) indicated by signal from limit switch or by visual means (no limit switch).
3. Repeat the above process once or twice to check for proper operation.

Damper Maintenance

1. Clean damper blades & other moving parts if necessary and remove any obstruction, dirt, rust, corrosion or other observed condition that could impede proper damper operation.
2. Check linkage or coupling between actuator and damper. Tighten or adjust if necessary.
3. If necessary lubricate linkage, bearings and other moveable parts using dry lubricant such as silicone spray or TFE Dry Lube to ensure smooth operation. Never use a petroleum based lubricant as it will attract dust and eventually impede a damper operation.
4. Ensure smooth and positive operation throughout entire cycle.
5. Cycle test for each motorized fire smoke damper following the above procedure at least once every six to twelve months.
6. If during any inspection, fire / smoke damper actuator fails to operate then verify the power supplied (voltage) & appropriate control signal.
7. Any field replacement of fire / smoke damper should follow the damper manufacturer's instruction or contact **BETEC CAD.**
8. During the first year and every year after, visually inspect all dampers.
9. An appropriate record or log page should be established for each Motorized Smoke Damper installed in the building. It is suggested that record page includes damper's type, manufacturer, make & model, ratings, date installed, date of commissioning, location & recommended periodic inspection.

NFPA -105**Periodic Inspection and Testing.**

Smoke dampers for dedicated and nondedicated smoke control systems shall be inspected and tested in accordance with NFPA 92, Standard for Smoke Control Systems .

1. Each damper shall be tested and inspected 1 year after installation.
2. In buildings not containing a hospital, each damper shall be tested and inspected every 4 years thereafter.
3. In buildings containing a hospital, each damper shall be tested and inspected every 6 years thereafter.
4. Care shall be exercised that all tests are completed in a safe manner by personnel wearing the appropriate personal protective equipment.
5. Full unobstructed access to the damper shall be verified and corrected as required

Periodic Testing for Dampers That Do Not Use a Fusible Link to Operate.

Testing of dampers with position indication wired to indication lights, control panels, or BAS Building Alarm System (BAS) shall comply with the following procedure:

1. The signal from the damper's position indicator device shall be used to confirm that the damper is in the full-open position.
2. The damper shall be commanded to the closed position.
3. The signal from the damper's position indicator device shall be used to confirm that the damper reaches its full-closed position.
4. The damper shall be commanded to the open position.
5. The signal from the damper's position indicator device shall be used to confirm that the damper reaches its full-open position.

Periodic Testing for Fusible Link – Operated Dampers

Testing of fusible link–operated dampers shall comply with the following procedures:

1. For safety considerations, the fan shall be off.
2. The fusible link shall be removed with the damper in the full-open position. Before the fusible link is removed, it shall be verified that all obstructions, including hands, are out of the path of the damper blades.
3. The damper shall close completely without assistance once the fusible link is removed. If the damper is designed with a latch to hold the damper in the full-closed position, the damper shall latch properly.
4. The damper shall be returned to the full-open position and the fusible link shall be replaced. If the link appears damaged, it shall be replaced with a functionally equivalent link.

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

UL/NFPA/SMACNA Recommended Installation Details

Test Standards:

UL 555 Fire Dampers

UL 555S Smoke Dampers

Fire Endurance Test and Hose Stream Test (UL 555)

Dampers are exposed to a standard test fire for a period of either 1½ or 3 hours. This standard test fire is controlled to follow the time temperature curve illustrated. Immediately after conclusion of this fire test, the dampers are subjected to a high pressure hose stream test during which water, at a nozzle pressure of 30 psi (207 kPa) for 1½ hour dampers and 45 psi (310 kPa) for 3 hour dampers, is applied to the dampers from a distance of 20 feet (6 meters). The hose stream test provides an extreme shock that ensures the dampers are structurally strong enough to withstand the rigors of the severest fire conditions.

Operational Reliability Cycle Test (UL 555S)

Fire Smoke Dampers intended for operation by gravity or spring force (not driven by an actuator) must be cycled open and closed 250 times. Fire Smoke Dampers that are driven by an electric or pneumatic actuator must be cycled open and closed (by their actuator) 20,000 times. In addition to the 20,000 full stroke cycles, if the Fire Smoke Damper is also intended for use as a Volume control damper, it must be cycled open and closed (by its modulating actuator) 100,000 repositioning cycles. These operational cycling tests are accomplished prior to the temperature degradation and leakage tests (described below) and ensure that the damper will function reliably after repeated operations.

Salt Spray Exposure Test (UL 555 & UL 555S)

A damper sample is exposed to salt spray in a test chamber for a period of 120 hours. After this exposure, the damper must close (and latch if a latch is provided). This test demonstrates a damper's ability to function after a more severe fouling than the damper is likely to experience during its intended application.

Operational Performance Test (UL 555& UL555S)

A damper is subjected to airflows and pressures and must demonstrate its ability to operate in the manner expected by its configuration and intended application. Smoke and combination fire smoke damper actuators must operate the dampers open and close three times and combination fire smoke dampers must also close as they would if their heat responsive device would operate. A damper model's airflow velocity and differential pressure ratings are based on the velocity and pressure conditions against which the damper demonstrates its ability to operate.

Temperature Degradation and Cycling Test (UL 555 & UL 555S)

A damper with an actuator that has previously been subjected to the OPERATIONAL RELIABILITY CYCLE TEST (described above) is exposed to an elevated temperature of 250°F (121°C) minimum (or higher in multiples of 100°F (38°C) for a period of 30 minutes.

After this 30 minutes exposure and while still at the elevated temperature, the damper actuator must operate the damper open and closed three times. Time of operation cannot exceed 75 seconds for any of the open or close operations.

Leakage Test (UL 555S)

At least three damper sizes of each model being tested (minimum width by maximum height, maximum width by minimum height, and maximum width by maximum height) that have previously been subjected to both the operational reliability cycle test and the temperature degradation and cycling test. must be tested for leakage. The minimum airflow and pressure ratings of dampers shall be 2000 fpm (10.2 m/s) and 4 in.wg. (1 kPa). Ratings shall be set in 1000 fpm (5 m/s) increments from the minimum pressure. Leakage testing must be conducted at 400 fpm (2 m/s) higher than the rated airflow and .5 in. wg(.1 kPa) higher than the rated pressure. A damper's leakage rating is based on the worst case performance of the three damper sizes tested. See page 5 of this manual for an explanation of damper leakage ratings.



UL 555 Fire Tests - Pictures courtesy UL - USA

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.



UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

Storage / Warranty / Troubleshooting

UL 555 / 555s - Fire / Smoke / Fire Smoke Dampers

RECEIVING AND HANDLING / STORAGE

The dampers need to be handled carefully while loading or unloading as per the upright arrow marks given on the unit in the right position. Care should be taken in lifting the product in all 4 corners and placing them on a raised floor level. Don't pull or push the product on the floor level. Store the product always dry in environment do not expose the product to the dust or humid environment. Do not store at temperatures in excess of 100°F. Never expose this product to temperatures exceeding 140°F (60 °C). After receiving the dampers, check for both obvious and hidden damages. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for. Damper must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. For your safety and protection, follow all instructions and adhere to applicable building and electrical codes.

SAFETY WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

WARRANTY

Betec cad warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove to be defective during the warranty period will be required or replaced at our option. Betec cad shall not be liable for damages resulting from misapplication or misuse of its products. Betec cad shall not be responsible for any installation or removal costs.

Betec cad shall not be responsible for any service work done by a third party or back charges from the direct party.

DISCLAIMARY

BETEC CAD's products are designed based on "SMACNA" and "NFPA" technological data in the interest of improving the safety for the public benefit. **BETEC CAD** disclaims any liability for any personal injury, loss of life, property damage, or other damage of any nature whatsoever, whether special, indirect, consequential or compensatory, direct or indirectly resulting from any accidents, regardless of legal theory. In no event shall **BETEC CAD's** liability exceed the amount paid by the customer / contractor to that individual product cost OR US\$1000/-which ever is lesser, regardless of legal theory.

Motorized Fire / Smoke Dampers Damper Troubleshooting

The following is a possible cause and correction list for common concerns with the dampers

Syptom	Possible Cause	Correction
Damper does not fully open and / or close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linking loose	Close damper, disconnect power, adjust and tighten linkages
	Defective motor	Check the wiring or Replace the motor
	Foreign screw in damper linkage	Check Damper retaining angle screws installation
	Contaminants on damper	Clean with a non-oil based solvent (see Damper Maintenance)
TRD Sensor tripped	TRD Heated	Reset manually (see Damper Maintenance)
Damper does not Operate	No power supplied to the actuator	Add power supply to the device

Selected Products of the company have been Classified / Listed / Tested by various international testing authorities.

UL 555/555S - Classified Motorized Fire Smoke Damper

B-20/30/31 Series

UL - Laboratory Tests - North Brook. (Pictures: Courtesy - UL - USA)



UL Fire tests - Damper after 30 mnts, Pictures courtesy UL-USA



UL Fire tests - Damper after 3 hrs. Pictures courtesy UL-USA



BETEC CAD's Tunnel Ventilation Damper 4 Hrs, Fire Resistance Tests
Conducted by - BRE - UK Test Standard : BS476 Part 20-22



Damper Condition after 2 Hrs



Damper Condition after 4 Hrs

BS476 Part 20-22. (4 hrs Fire Test)

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November - 2019