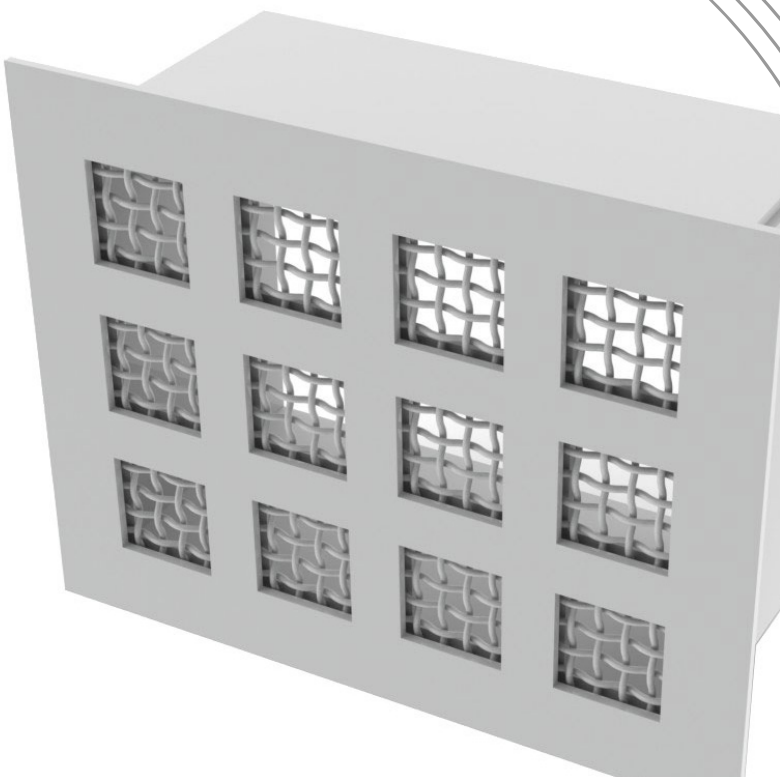
Titus
Redefine your comfort zone.™

security products

metric sizes | secure | lethal objects | monitoring areas | suicide deterrent | humid areas | prevents corrosion | minimum security | medium security | maximum security

J



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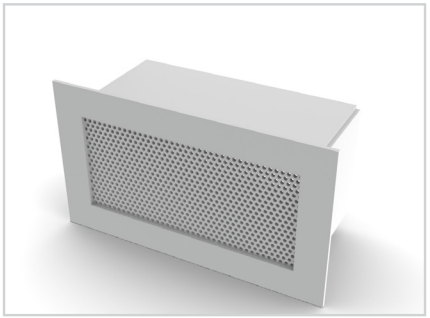
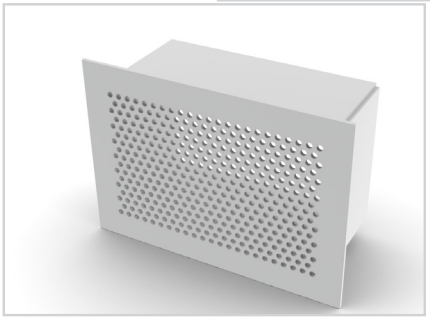


SG-SD

SUICIDE DETERRENT

- The standard for suicide deterrent maximum security grilles

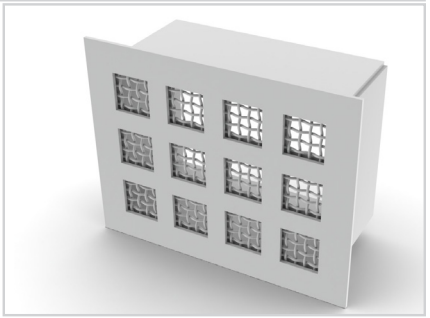
Complies with NIC Guidelines for Suicide Prevention and California Title 24



SG-PR / SG-PRA / SG-PRT

ROUND PERFORATED

- Allow greater airflow without compromising security
- Stainless steel and aluminum models available for kitchens, showers and other corrosive or humid areas
- Transfer grille model available for secure air transfer through wall



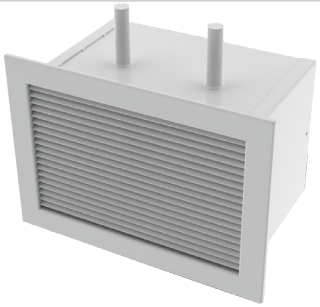
SG-PS

SQUARE PERFORATED

- The industry standard square perforated maximum security grille
- 10-gauge #2 mesh behind face is backed up by an additional $^{3}/_{16}$" steel plate

medium security grilles

pages: J16-J18



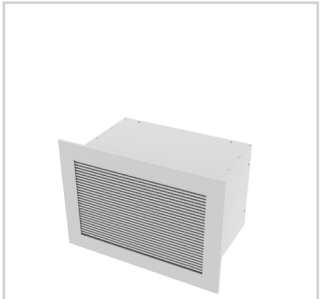
SG-3300RL

STEEL FIXED BAR

- Exceptionally strong bar grille for sidewall applications
- Steel blades pierce frame and are individually welded to prevent removal
- Blades backed by heavy $^{3}/_{8}$" woven steel mesh held in place by welded angles

minimum security grilles

pages: J19-J28



SG-1500FL

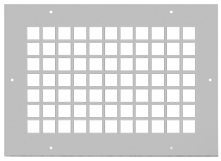
ALUMINUM FIXED BAR

- Has 1/8" extruded aluminum bars on 1/2" centers
- 0° deflection
- Ideal for showers and other humid areas

SG-TDC

LOUVERED CORE

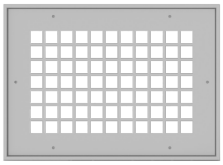
- Designed for premium performance with security for supervised areas
- Available in 1-, 2-, 3-, and 4-way deflection
- 12-gauge lattice face covers diffuser
- Available in stainless steel



SG-LFO / SG-LFO-AA

LATTICE FACE

- Use over standard grilles or duct where additional security is needed
- Face has 1 3/16" square holes on 1" centers
- Available in steel, aluminum and stainless steel
- Available in round hole pattern



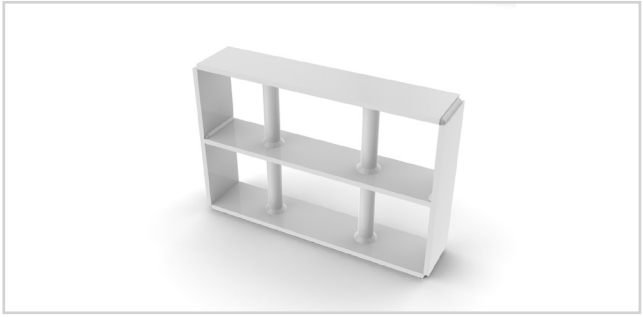
SG-LFF / SG-LFF-AA

LATTICE FACE & FRAME

- Use as supply or return grille for minimum security areas
- Available with opposed-blade damper
- Face has 1 3/16" square holes on 1" centers
- Available in steel, aluminum and stainless steel
- Available in round hole pattern

barrier grilles

pages: J29-J32



SG-BG-FM

BARRIER & FRAME

- Ideal barrier for wall, roof or duct penetration
- Has 3/4" diameter vertical bars on 6" centers
- 2 1/2 x 1/4" flat bars on 6" centers
- 2 1/2 x 1/4" frame

SG-BG-SLV

BARRIER & SLEEVE

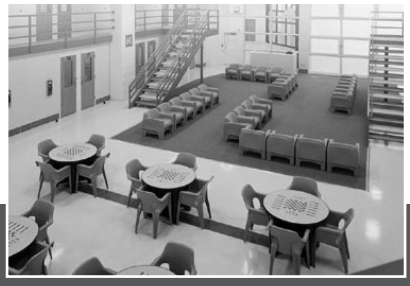
- Easily slides into wall, duct or roof opening
- Has a 3/4" diameter vertical and horizontal bars with maximum 6" spacing

Titus
Redefine your comfort zone.™

Overview

Titus offers a complete line of security grilles to accommodate maximum, medium and minimum security applications that require secure HVAC outlets. Titus security grilles are designed to provide superior performance in supply and return applications without compromising security and safety. Security grilles feature heavy-gauge material with all welded construction and integral stitch welded sleeves in lengths up to 18". Options include opposed blade dampers, angle frames, anchor bars, and sleeve barriers.

- Can be used in supply or return applications
- Constructed of heavy-gauge steel or aluminum
- 3/16" sleeve is stitch welded on all seams
- Available with front or rear operated dampers
- Optional angle frame, anchor bars, and sleeve barriers
- Standard finish is British White

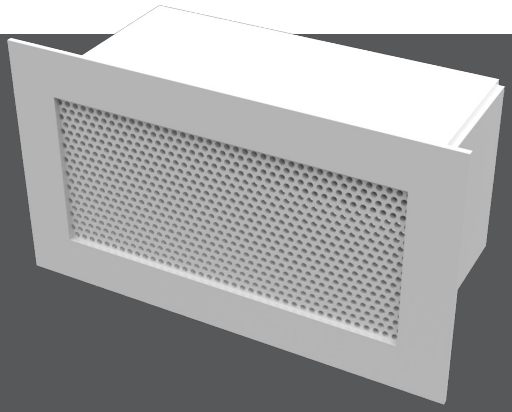


APPLICATION ICONS KEY

long periods without supervision & several opportunities to come into direct contact with the security product	maximum security
intermittent periods without direct supervision & many opportunities to come into direct contact with the security product	medium security
mostly supervised & few opportunities to come into direct contact with the security product	minimum security
for use in areas where supervision is required	monitoring areas
especially suited to work in areas where high humidity may become a factor	humid areas
designed to prevent the occurence of suicide attempts	suicide deterrent
for use in areas to prevent the concealment of harmful or dangerous objects, contraband and any other inappropriate devices from authorities	lethal objects
for use in corrosive environment applications	prevents corrosion
maintains security in wall openings between secure and non-secure areas	secure
Diffuser module sizes are hard metric & inlets are soft. Metric linear and grille products are converted to the nearest ¼" for ordering. Contact us for more information.	metric sizes

SG-SD

- Face plate: 3/16" steel with 3/16" diameter holes on 9/32" staggered centers and 1" border
- Sleeve: 3/16" steel
- All welded construction



SG-SD

Complies with NIC Guidelines for Suicide Prevention and California Title 24

metric sizes | suicide deterrent | maximum security

See website for Specifications

AVAILABLE MODEL:

SG-SD / Steel

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

Suicide Deterrent

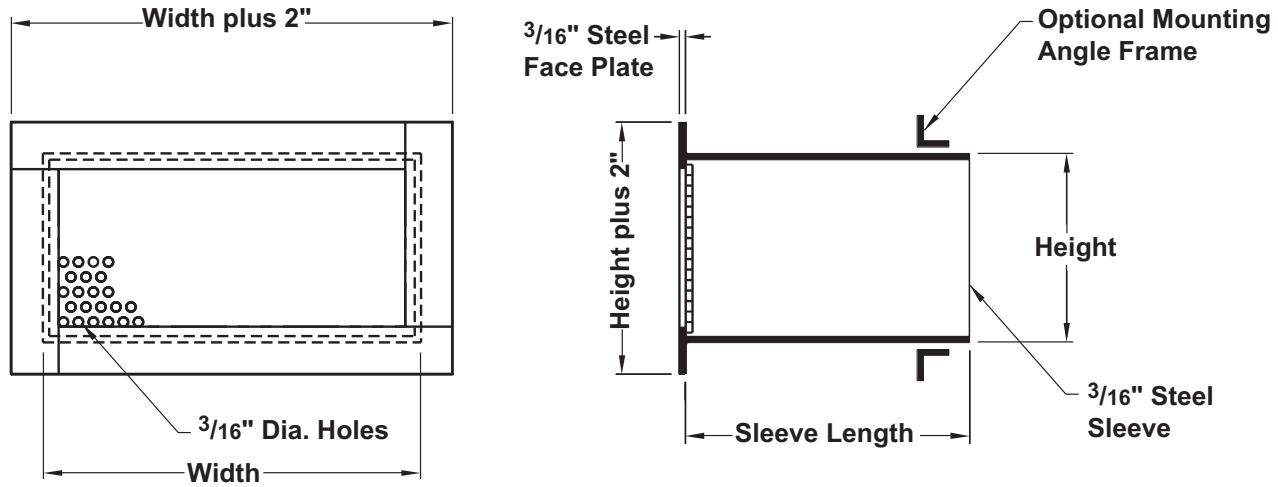
The SG-SD is a maximum security grille. The design of this grille allows a greater effective free area and superior airflow without compromising security and safety. The SG-SD complies with National Institute of Corrections guidelines for suicide prevention and California Title 24.

OPTIONS

- Angle Frame - 1½" x 1½" x 3/16" steel angle iron shipped loose for field wielding. Frame is mill finish.
- Anchor Bars - ¾" diameter steel bars, 3" in height. Positioned 3" from back of face plate on top and bottom of sleeve
- Rear Operated Damper - AG-15 steel opposed blade damper. Slot operated from rear of the grille.
- Sleeve Barrier Grille - constructed of ¾" diameter steel bars with maximum 6" opening

SG-SD UNIT DIMENSIONS

SG-SD



Notes:

For standard product, width and height should be specified in even 1" increments.

Typical mounting is accomplished by using an angle frame ($1^1/_2$" x $1^1/_2$" x $^3/_{16}$") shipped loose for field welding.

Dimensions Available	
Width:	6 to 30"
Height:	4 to 30"
Sleeve Length:	4 to 18" in 1" increments

Disclaimer:

The SG-SD is designed to increase inmate safety through compliance with the most recent known industry guidelines and design practices for products of its type. This is not meant to imply that the product cannot be used to inflict harm or is "suicide proof". Titus warrants only the construction and airflow performance of the product as cataloged.

All dimensions are in inches

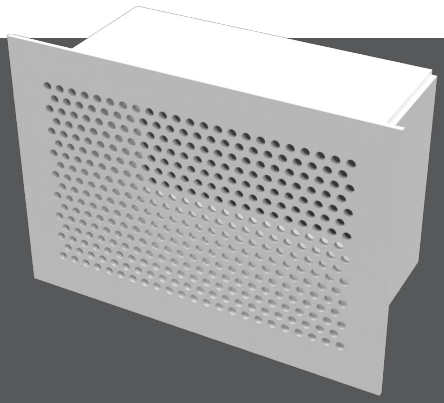
SG-SD

Neck Size (in)	Neck Area (Sq. ft)	Area Factor Ak	Neck Velocity, fpm	100	150	200	250	300	350	400	450	500
			Velocity Pressure	0.001	0.001	0.003	0.004	0.006	0.008	0.010	0.013	0.016
6x6	0.250	0.088	Airflow, cfm	25	38	50	63	75	88	100	113	125
			Face Velocity, fpm	225	338	451	564	676	789	902	1014	1127
			Total Pressure	0.005	0.012	0.022	0.034	0.049	0.066	0.086	0.109	0.135
			Noise Criteria	-	-	-	-	-	-	11	14	18
			Throw, FT	1-2-8	2-4-13	3-8-17	5-11-21	8-13-23	10-15-25	11-17-27	13-19-28	14-21-30
8x8	0.444	0.164	Airflow, cfm	44	67	89	111	133	155	178	200	222
			Face Velocity, fpm	212	318	424	530	636	742	848	953	1059
			Total Pressure	0.005	0.011	0.020	0.031	0.045	0.062	0.080	0.102	0.126
			Noise Criteria	-	-	-	-	-	-	13	17	21
			Throw, FT	1-2-9	2-5-16	4-9-22	7-14-27	9-16-31	13-19-33	15-22-36	16-24-38	18-27-40
10x10	0.694	0.265	Airflow, cfm	69	104	139	174	208	243	278	312	347
			Face Velocity, fpm	202	303	404	505	606	707	808	909	1009
			Total Pressure	0.005	0.011	0.019	0.030	0.043	0.058	0.076	0.096	0.119
			Noise Criteria	-	-	-	-	-	11	16	20	23
			Throw, FT	1-3-11	3-6-20	5-11-27	8-17-33	11-20-39	15-23-42	18-27-45	20-30-47	22-33-50
12x12	1.000	0.392	Airflow, cfm	100	150	200	250	300	350	400	450	500
			Face Velocity, fpm	194	291	388	485	582	679	776	873	970
			Total Pressure	0.005	0.010	0.018	0.028	0.041	0.055	0.072	0.092	0.113
			Noise Criteria	-	-	-	-	-	13	18	22	25
			Throw, FT	1-3-12	3-7-23	6-12-31	9-19-39	12-23-46	17-27-50	21-31-53	23-35-57	26-39-60
18x18	2.250	0.936	Airflow, cfm	225	338	450	563	675	788	900	1013	1125
			Face Velocity, fpm	178	267	356	445	533	622	711	800	889
			Total Pressure	0.004	0.009	0.016	0.026	0.037	0.050	0.065	0.083	0.102
			Noise Criteria	-	-	-	-	12	17	22	26	29
			Throw, FT	2-4-16	4-9-34	7-16-45	11-25-56	16-34-67	22-39-75	29-45-80	34-51-85	37-56-90
24x24	4.000	1.736	Airflow, cfm	400	600	800	1000	1200	1400	1600	1800	2000
			Face Velocity, fpm	167	251	334	418	501	585	668	752	836
			Total Pressure	0.004	0.009	0.015	0.024	0.034	0.046	0.061	0.077	0.095
			Noise Criteria	-	-	-	-	15	20	25	29	32
			Throw, FT	2-5-20	5-11-44	9-20-58	14-31-73	20-44-87	27-51-100	35-58-107	44-65-113	48-73-120
30x30	6.250	2.804	Airflow, cfm	625	938	1250	1563	1875	2188	2500	2813	3125
			Face Velocity, fpm	159	239	318	398	478	557	637	717	796
			Total Pressure	0.004	0.008	0.014	0.022	0.032	0.044	0.057	0.073	0.090
			Noise Criteria	-	-	-	12	18	23	27	31	34
			Throw, FT	3-6-23	6-13-52	10-23-71	16-36-89	23-52-106	31-62-124	41-71-134	52-80-142	59-89-149

- Data obtained from tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006
- All data based upon supply performance
- All pressures are in inches of water
- The negative static pressure for return performance is equal to the total pressure of supply at the same cfm
- Throw values are for terminal velocities of 150, 100 and 50 fpm under isothermal conditions. See the section, Engineering Guidelines, in this catalog for throw information.
- Noise Criteria values are based on a room absorption of 10 dB
- Dash (-) in space indicates NC value less than 10
- Return NC is 2 NC higher than supply NC at the same cfm

SG-PR

- Face plate: 3/16" steel with 5/16" diameter holes on 7/16" staggered centers and 1" border
- Sleeve: 3/16" steel
- All welded construction
- Transfer grille model available for secure air transfer through wall
- Stainless steel and aluminum models available for kitchens, showers and other corrosive or humid areas



SG-PR

humid areas | prevents corrosion | metric sizes | maximum security

See website for Specifications

AVAILABLE MODELS:

SG-PR / Steel
SG-PRA / Aluminum
SG-PRT / Steel

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

Round Perforated

The SG-PR is a maximum security grille. The design of this grille allows a greater effective free area and superior airflow without compromising security and safety. Model SG-PRA is used in areas where moisture may cause a problem with standard steel grilles. The SG-PRT is provided with two face plates welded to each end of a sleeve for block walls or for pouring in place in concrete walls.

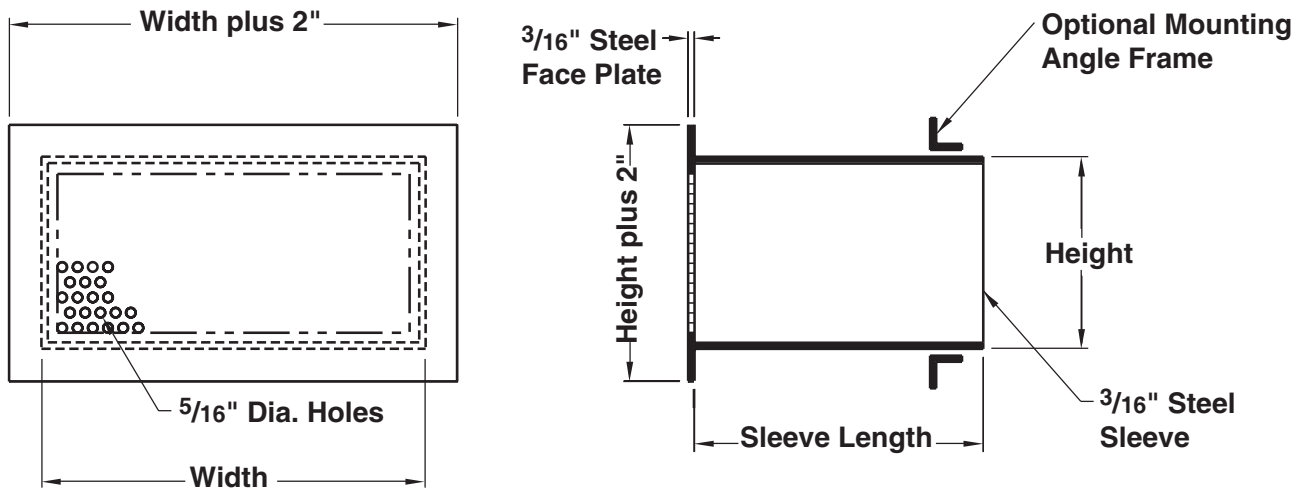
Note: The SG-PR is also available in stainless steel for corrosive environments

OPTIONS

- Angle Frame - 1½" x 1½" x 3/16" steel angle iron shipped loose for field wielding. Frame is mill finish.
- Anchor Bars - ¾" diameter steel bars, 3" in height. Positioned 3" from back of face plate on top and bottom of sleeve.
- Face Operated Damper - AG-15 steel opposed-blade damper. Slot operated from face of the grille.
- Rear Operated Damper - AG-15 steel opposed blade damper. Slot operated from rear of the grille.
- Sleeve Barrier Grille - constructed of ¾" diameter steel bars with maximum 6" opening

SG-PR UNIT DIMENSIONS

SG-PR



Notes:

For standard product, width and height should be specified in even 1" increments.

Typical mounting is accomplished by using an angle frame ($1^1/_2$" x $1^1/_2$" x $^3/_{16}$") shipped loose for field welding.

Dimensions Available	
Width:	6 to 30"
Height:	4 to 30"
Sleeve Length:	4 to 18" in 1" increments

All dimensions are in inches

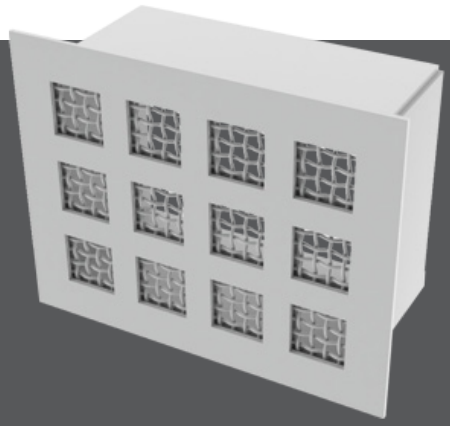
SG-PR / SG-PRA

Neck Size (in)	Neck Area (sq. ft)	Area Factor Ak	Neck Velocity, fpm	100	150	200	250	300	350	400	450	500
			Velocity Pressure	0.001	0.001	0.003	0.004	0.006	0.008	0.010	0.013	0.016
6x6	0.25	0.078	Airflow, cfm	25	38	50	63	75	88	100	113	125
			Face Velocity, fpm	224	337	449	561	673	785	897	1010	1122
			Total Pressure	0.005	0.011	0.020	0.031	0.044	0.060	0.079	0.100	0.123
			Noise Criteria	-	-	-	-	-	-	-	-	-
			Throw, FT	1-2-8	2-4-13	3-8-17	5-11-21	8-13-25	10-15-29	11-17-34	13-19-38	14-21-42
8x8	0.44	0.153	Airflow, cfm	44	67	89	111	133	156	178	200	222
			Face Velocity, fpm	204	306	408	510	612	714	816	918	1020
			Total Pressure	0.004	0.010	0.017	0.027	0.039	0.053	0.070	0.088	0.109
			Noise Criteria	-	-	-	-	-	-	-	-	11
			Throw, FT	1-2-9	2-5-16	4-9-21	6-13-27	9-16-32	12-19-37	14-21-43	16-24-48	18-27-53
9x9	0.56	0.201	Airflow, cfm	56	84	113	141	169	197	225	253	281
			Face Velocity, fpm	196	294	392	490	588	686	784	882	981
			Total Pressure	0.004	0.009	0.017	0.026	0.037	0.051	0.066	0.084	0.104
			Noise Criteria	-	-	-	-	-	-	-	11	15
			Throw, FT	1-2-9	2-5-18	4-9-24	7-15-29	9-18-35	13-21-41	16-24-47	18-27-53	20-29-59
12x12	1.00	0.392	Airflow, cfm	100	150	200	250	300	350	400	450	500
			Face Velocity, fpm	178	267	356	446	535	624	713	802	891
			Total Pressure	0.004	0.008	0.015	0.023	0.033	0.045	0.059	0.074	0.092
			Noise Criteria	-	-	-	-	-	10	15	19	23
			Throw, FT	1-3-11	3-6-22	5-11-30	8-17-37	11-22-45	15-26-52	19-30-60	22-34-67	25-37-75
16x16	1.78	0.764	Airflow, cfm	178	267	356	444	533	622	711	800	889
			Face Velocity, fpm	162	243	324	405	486	567	648	729	810
			Total Pressure	0.003	0.007	0.013	0.020	0.029	0.040	0.052	0.066	0.081
			Noise Criteria	-	-	-	-	12	18	24	28	32
			Throw, FT	1-3-13	3-7-28	6-13-38	9-20-48	13-28-57	17-33-67	22-38-76	28-43-86	32-48-95
18x18	2.25	1.004	Airflow, cfm	225	338	450	563	675	788	900	1013	1125
			Face Velocity, fpm	156	234	312	389	467	545	623	701	779
			Total Pressure	0.003	0.007	0.012	0.019	0.028	0.038	0.049	0.062	0.077
			Noise Criteria	-	-	-	-	16	22	27	32	36
			Throw, FT	1-3-13	3-8-30	6-13-42	9-21-53	13-30-63	18-37-74	24-42-84	30-47-95	35-53-105
20x20	2.78	1.281	Airflow, cfm	278	417	556	694	833	972	1111	1250	1389
			Face Velocity, fpm	150	226	301	376	451	527	602	677	752
			Total Pressure	0.003	0.007	0.012	0.018	0.026	0.036	0.047	0.060	0.074
			Noise Criteria	-	-	-	12	19	25	30	35	39
			Throw, FT	2-4-14	4-8-32	6-14-46	10-22-57	14-32-69	19-40-80	25-46-92	32-52-103	38-57-115
24x24	4.00	1.956	Airflow, cfm	400	600	800	1000	1200	1400	1600	1800	2000
			Face Velocity, fpm	142	212	283	354	425	496	566	637	708
			Total Pressure	0.003	0.006	0.011	0.017	0.025	0.033	0.044	0.055	0.068
			Noise Criteria	-	-	-	18	25	31	36	40	45
			Throw, FT	2-4-15	4-9-35	7-15-53	11-24-67	15-35-80	21-47-94	27-53-107	35-60-120	43-67-134
26x26	4.69	2.355	Airflow, cfm	469	704	939	1174	1408	1643	1878	2112	2347
			Face Velocity, fpm	138	207	276	345	414	483	552	620	689
			Total Pressure	0.003	0.006	0.011	0.016	0.024	0.032	0.042	0.053	0.066
			Noise Criteria	-	-	11	20	27	33	38	43	47
			Throw, FT	2-4-16	4-9-36	7-16-57	11-25-71	16-36-86	22-49-100	29-57-114	36-64-129	45-71-143
30x30	6.25	3.283	Airflow, cfm	625	938	1250	1563	1875	2188	2500	2813	3125
			Face Velocity, fpm	131	197	263	329	394	460	526	592	657
			Total Pressure	0.002	0.006	0.010	0.015	0.022	0.030	0.040	0.050	0.062
			Noise Criteria	-	-	16	24	31	37	43	47	51
			Throw, FT	2-4-17	4-10-39	8-17-64	12-27-80	17-39-97	24-53-113	31-64-129	39-72-145	48-80-161

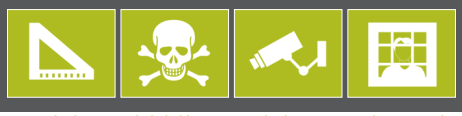
- Data obtained from tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006
- All data based upon supply performance
- All pressures are in inches of water
- The negative static pressure for return performance is equal to the total pressure of supply at the same cfm
- Throw values are for terminal velocities of 150, 100 and 50 fpm under isothermal conditions. See the section Engineering Guidelines, in this catalog for throw information.
- Noise Criteria values are based on a room absorption of 10 dB
- Dash (-) in space indicates NC value less than 10
- Return NC is 2 NC higher than supply NC at the same cfm

SG-PS

- Face plate - 3/16" steel plate with 2" square holes, 1" fret bars and 1" border
- Steel mesh screen - 10-gauge x #2 mesh wire located between the face plate and back-up plate
- Back-up plate - 3/16" steel
- Sleeve - 3/16" steel
- All welded construction



SG-PS



metric sizes | lethal objects | monitoring areas | maximum security

See website for Specifications

AVAILABLE MODEL:

SG-PS / Steel

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

Square Perforated

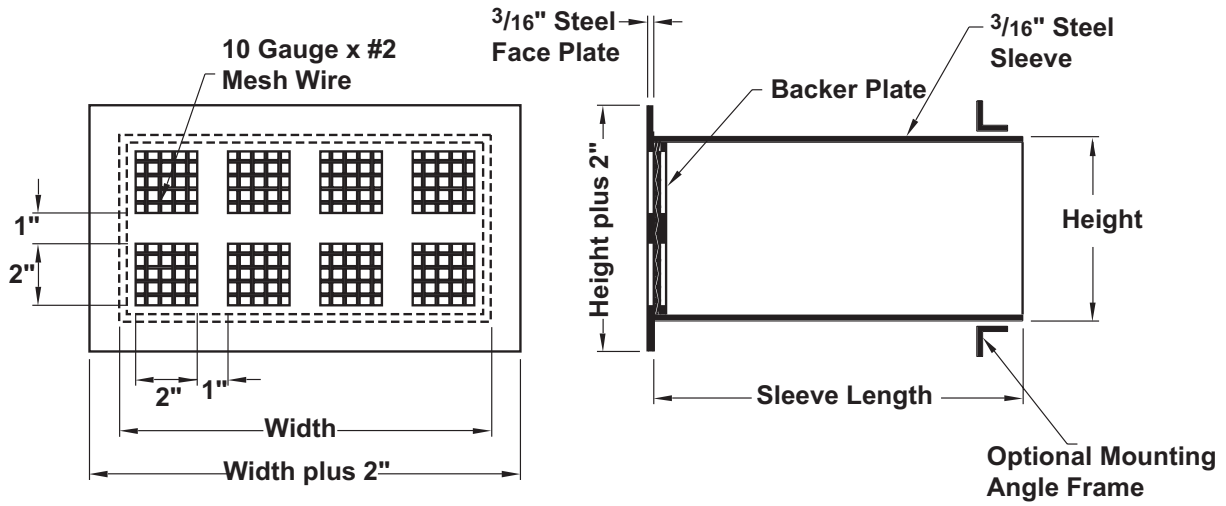
The SG-PS is a maximum security grille. The design of this grille allows a greater effective free area and superior airflow without compromising security and safety. It is used in areas of maximum security and/or minimum supervision where absolute grille integrity must be maintained. The SG-PS effectively prevents the concealment of dangerous or potentially lethal objects or other contraband of concern to authorities.

OPTIONS

- Angle Frame - 1½" x 1½" x 3/16" steel angle iron shipped loose for field wielding. Frame is mill finish.
- Anchor Bars - ¾" diameter steel bars, 3" in height. Positioned 3 " from back of face plate on top and bottom of sleeve.
- Face Operated Damper - AG-15 steel opposed blade damper. Slot operated from face of the grille.
- Rear Operated Damper - AG-15 steel opposed blade damper. Slot operated from rear of the grille.
- Sleeve Barrier Grille - constructed of ¾" diameter steel bars with maximum 6" opening

SG-PS UNIT DIMENSIONS

SG-PS



Notes:

For standard product, width and height should be specified in even 1" increments.

Typical mounting is accomplished by using an angle frame ($1^1/_2$" x $1^1/_2$" x $^3/_{16}$") shipped loose for field welding.

Dimensions Available	
Width: Height: Sleeve Length:	6 to 30" 4 to 30" 4 to 18" in 1" increments

All dimensions are in inches

SG-PS

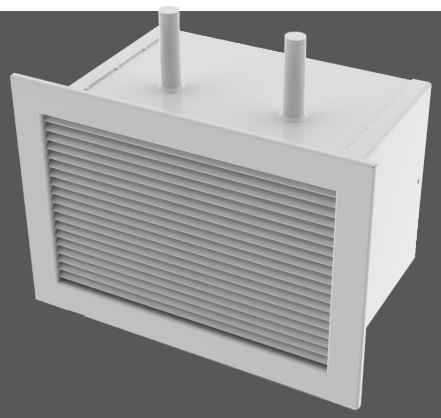
Nominal Duct Size (in.)	Nominal Duct Area sq. ft	Hole Area sq. ft	Face Velocity (fpm)	150	275	400	525	650	775	900	1025	1150
			Velocity Pressure	0.000	0.001	0.002	0.003	0.005	0.007	0.010	0.013	0.016
			Total Pressure	0.005	0.017	0.037	0.063	0.097	0.138	0.186	0.241	0.303
			Neck Velocity	67	122	178	233	289	344	400	456	511
6x6	0.25	0.11	Airflow, cfm	17	31	44	57	72	86	100	114	128
			NC (Noise Criteria)	-	-	-	13	19	24	29	33	36
			Throw, Ft.	1-2-5	2-5-9	4-7-11	6-9-13	7-10-14	9-11-16	10-12-17	10-13-18	11-14-19
12X12	1.00	0.44	Airflow, cfm	67	122	178	233	289	344	400	456	511
			NC (Noise Criteria)	-	-	-	19	25	30	35	39	42
			Throw, Ft.	1-3-10	5-9-18	9-13-23	12-17-26	14-20-29	17-22-31	20-24-34	21-26-36	22-27-38
18X18	2.25	1.00	Airflow, cfm	150	275	400	525	650	775	900	1025	1150
			NC (Noise Criteria)	-	-	14	22	29	34	38	42	46
			Throw, Ft.	2-5-15	7-14-27	13-20-34	17-26-39	22-31-43	26-33-47	29-36-51	31-38-54	33-41-58
24x24	4.00	1.78	Airflow, cfm	267	489	711	933	1156	1378	1600	1822	2044
			NC (Noise Criteria)	-	-	16	25	31	36	41	45	48
			Throw, Ft.	3-6-20	9-18-37	18-27-45	23-35-52	29-41-58	34-45-63	39-48-68	42-51-72	44-54-77
30x30	6.25	2.78	Airflow, cfm	417	764	1111	1458	1809	2153	2500	2847	3194
			NC (Noise Criteria)	-	-	18	27	33	38	43	47	50
			Throw, Ft.	3-8-25	11-23-46	22-33-57	29-44-65	36-51-72	43-56-79	49-60-85	52-64-91	55-68-96

- Data obtained from tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006
- All data based upon supply performance
- All pressures are in inches of water
- The negative static pressure for return performance is equal to the total pressure of supply at the same cfm
- Throw values are for terminal velocities of 150, 100 and 50 fpm under isothermal conditions. See the section Engineering Guidelines, in this catalog for throw information.
- Noise Criteria values are based on a room absorption of 10 dB
- Dash (-) in space indicates NC value less than 10
- Return NC is 2 NC higher than supply NC at the same cfm

Medium Security

SG-3300RL

- Border: 16-gauge steel frame with reinforced, welded mitered corners
- Sleeve: 14-gauge steel
- Louvers: 14-gauge steel louvers on 3/8" centers penetrating through the sleeve and welded at both ends. Each louver is reinforced by interlocking support bars spaced on 6" centers
- Steel mesh screen: 10-gauge x #2 mesh wire located behind louvers and secured by steel angles welded in position
- Strong bar grille for use in sidewall applications
- All welded construction



SG-3300RL

metric sizes | monitoring areas | medium security

See website for Specifications

AVAILABLE MODEL:

SG-3300RL / 38° Deflection / 3/8" Blade Spacing

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

Steel Fixed Bars

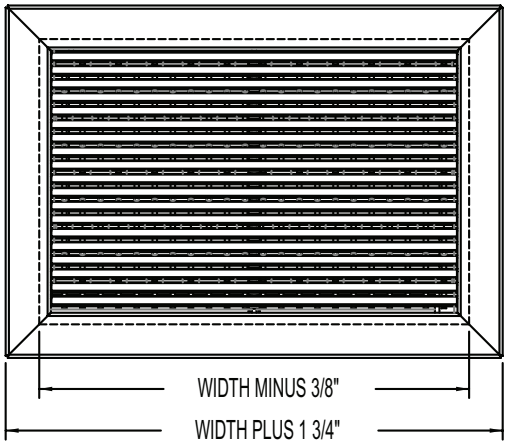
Titus medium security grilles are designed to provide excellent performance in areas requiring increased levels of supervision. Grilles are available in steel or aluminum construction to meet various application requirements. The SG-3300RL is used in sidewall applications. With heavy-gauge steel louvers welded to a steel sleeve that extends through the wall, the SG-3300RL is an exceptionally strong bar grille.

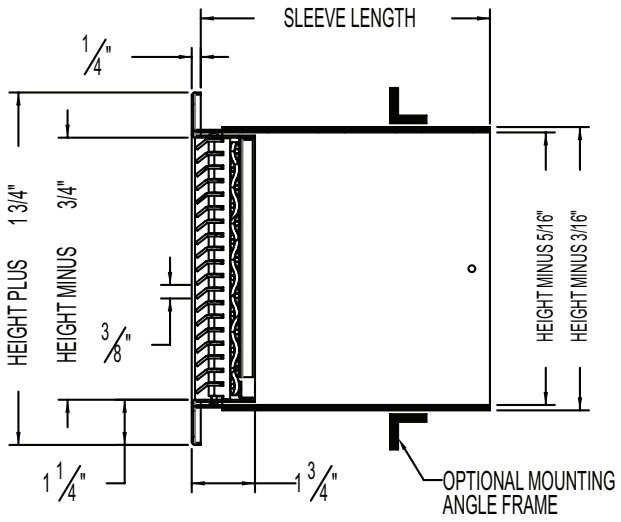
OPTIONS

- Angle Frame - 1½" x 1½" x 3/16" steel angle iron shipped loose for field wielding. Frame is mill finish.
- Anchor Bars - ¾" diameter steel bars, 3" in height. Positioned 3" from back of face plate on top and bottom of sleeve.
- Face Operated Damper - AG-35B steel opposed blade damper. Lever operated from face of the grille.
- Rear Operated Damper - AG-35B steel opposed blade damper. Slot operated from rear of the grille.
- Sleeve Barrier Grille - constructed of ¾" diameter steel bars with maximum 6" opening

SG-3300RL UNIT DIMENSIONS

SG-3300RL





Notes:

For standard product, width and height should be specified in even 1" increments.

Typical mounting is accomplished by using an angle frame ($1^1/_2$" x $1^1/_2$" x $^3/_{16}$") shipped loose for field welding.

Dimensions Available	
Width: Height: Sleeve Length:	6 to 30" 4 to 30" 4 to 18" in 1" increments

All dimensions are in inches

PERFORMANCE DATA

SG-3300RL

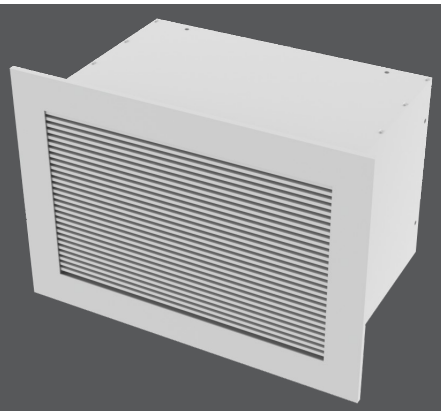
Nom. Duct Size	Nom. Duct Area	Core Area (ft²)	Core Velocity, (fpm)	300	400	500	600	700	800	1000	1100	1200
			Velocity Pressure	0.006	0.010	0.016	0.022	0.031	0.040	0.062	0.075	0.090
			Total Pressure	0.038	0.068	0.107	0.154	0.209	0.273	0.427	0.517	0.615
8x8	0.44	0.356	Airflow, cfm	107	142	178	214	249	285	356	391	427
			Noise Criteria	-	15	22	27	32	36	43	46	48
			Throw, Ft.	7-12-17	11-13-19	12-15-21	13-17-23	15-18-25	16-19-27	17-21-30	18-22-32	19-23-33
9x9	0.56	0.461	Airflow, cfm	138	184	230	277	323	369	461	507	553
			Noise Criteria	-	16	23	29	33	37	44	47	49
			Throw, Ft.	8-13-19	13-15-22	14-17-24	15-19-27	17-20-29	18-22-31	20-24-34	21-25-36	22-27-38
16x16	1.78	1.575	Airflow, cfm	472	630	787	945	1102	1260	1575	1732	1890
			Noise Criteria	13	22	28	34	39	43	49	52	55
			Throw, Ft.	14-25-35	23-28-40	26-32-45	28-35-49	31-38-53	33-40-57	37-45-63	38-47-67	40-49-69
20x20	2.78	2.509	Airflow, cfm	753	1004	1255	1505	1756	2007	2509	2760	3011
			Noise Criteria	15	24	30	36	41	45	51	54	57
			Throw, Ft.	18-31-44	29-36-51	33-40-57	36-44-62	39-47-67	41-51-72	46-57-80	48-59-84	51-62-88
26x26	4.69	4.317	Airflow, cfm	1295	1727	2158	2590	3022	3453	4317	4749	5180
			Noise Criteria	17	26	33	38	43	47	54	57	59
			Throw, Ft.	24-41-58	38-47-66	43-52-74	47-58-81	51-62-88	54-66-94	61-74-105	64-78-110	66-81-115

- Data obtained from tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006
- All data based upon supply performance
- All pressures are in inches of water
- The negative static pressure for return performance is equal to the total pressure of supply at the same cfm
- Throw values are for terminal velocities of 150, 100 and 50 fpm under isothermal conditions. See the section Engineering Guidelines, in this catalog for throw information.
- Noise Criteria values are based on a room absorption of 10 dB
- Dash (-) in space indicates NC value less than 10
- Return NC is 2 NC higher than supply NC at the same cfm

Minimum Security

SG-1500FL

- Louvers: 3/16" x ¾" welded aluminum bars with zero degree deflection
- Sleeve: 0.09" aluminum sleeve is welded to the frame
- All welded construction
- Ideal for showers and other humid areas



SG-1500FL

metric sizes | humid areas | monitoring areas | minimum security

See website for Specifications

AVAILABLE MODEL:

SG-1500RL / 0° Deflection / ½" Blade Spacing

FINISHES

Standard Finish - #04 Mill

OVERVIEW

Aluminum Fixed Bars

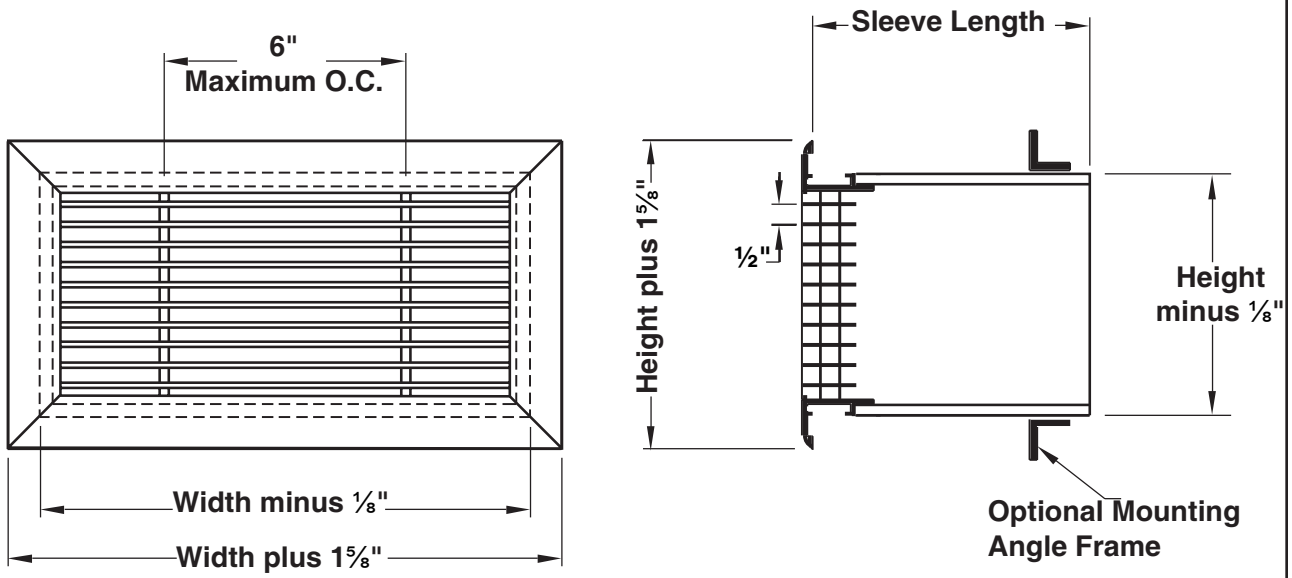
Titus minimum security grilles are designed where additional security is still necessary and maximum performance is required. The SG-1500FL is an all aluminum security grille ideal for shower areas. The rust proof construction makes this grille an excellent choice for areas exposed to constant humidity.

OPTIONS

- Angle Frame - 1½" x 1½" x 1/8" aluminum angle iron shipped loose for field wielding. Frame is mill finish.
- Anchor Bars - ½" diameter aluminum bars, 3" in height. Positioned 3 inches from back of face plate on top and bottom of sleeve.
- Face Operated Damper - AG-15-AA steel opposed blade damper. Slot operated from face of the grille.
- Rear Operated Damper - AG-15-AA steel opposed blade damper. Slot operated from rear of the grille.
- Sleeve Barrier Grille - constructed of ½" diameter steel bars with maximum 6" opening

SG-1500RL UNIT DIMENSIONS

SG-1500FL



Notes:

For standard product, width and height should be specified in even 1" increments.

Typical mounting is accomplished by using an angle frame ($1^1/_2$" x $1^1/_2$" x $^3/_{16}$") shipped loose for field welding.

Dimensions Available	
Width:	6 to 30"
Height:	4 to 30"
Sleeve Length:	4 to 18" in 1" increments

All dimensions are in inches

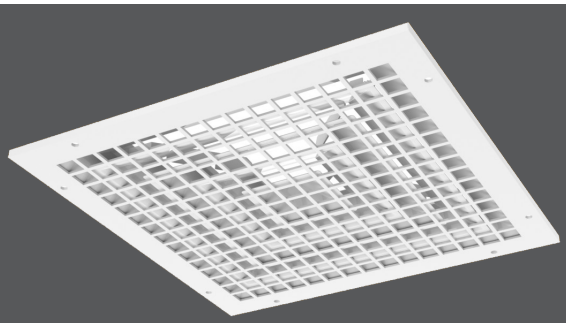
SG-1500FL

Nominal Duct Size	Nominal Duct Area	Core Area sq. ft	Core Velocity, (fpm)	300	400	500	600	700	800	1000	1100	1200
			Velocity Pressure	0.006	0.010	0.016	0.022	0.031	0.040	0.062	0.075	0.090
			Total Pressure	0.038	0.068	0.107	0.154	0.209	0.273	0.427	0.517	0.615
6x6	0.25	0.187	Airflow, cfm	56	75	93	112	131	149	187	205	224
			Noise Criteria	-	-	17	22	26	30	36	38	41
			Throw, Ft.	6-9-14	8-11-16	10-13-18	11-14-19	12-15-21	13-16-22	15-18-25	15-19-26	16-19-28
8x8	0.44	0.356	Airflow, cfm	107	142	178	214	249	285	356	391	427
			Noise Criteria	-	13	19	24	28	32	38	41	43
			Throw, Ft.	8-12-19	11-16-22	13-17-25	16-19-27	17-21-29	18-22-31	20-25-35	21-26-36	22-27-38
9x9	0.56	0.461	Airflow, cfm	138	184	230	277	323	369	461	507	553
			Noise Criteria	-	14	20	25	29	33	39	42	44
			Throw, Ft.	9-14-22	12-18-25	15-20-28	18-22-31	19-23-33	20-25-35	23-28-39	24-29-41	25-31-43
12x12	1.00	0.857	Airflow, cfm	257	343	428	514	600	686	857	943	1028
			Noise Criteria	-	16	23	28	32	36	42	44	47
			Throw, Ft.	12-19-29	17-24-34	21-27-38	24-29-42	26-32-45	28-34-48	31-38-54	33-40-56	34-42-59
16x16	1.78	1.575	Airflow, cfm	472	630	787	945	1102	1260	1575	1732	1890
			Noise Criteria	11	19	25	30	34	38	44	47	49
			Throw, Ft.	17-25-40	23-33-46	28-36-52	33-40-57	35-43-61	38-46-65	42-52-73	44-54-77	46-57-80
18x18	2.25	2.015	Airflow, cfm	604	806	1007	1209	1410	1612	2015	2216	2418
			Noise Criteria	12	20	26	31	35	39	45	48	50
			Throw, Ft.	19-29-45	26-37-52	32-41-58	37-45-64	40-49-69	43-52-74	48-58-83	50-61-87	52-64-90
20x20	2.78	2.509	Airflow, cfm	753	1004	1255	1505	1756	2007	2509	2760	3011
			Noise Criteria	13	21	27	32	36	40	46	49	51
			Throw, Ft.	21-32-50	29-41-58	36-46-65	41-50-71	44-54-77	48-58-82	53-65-92	56-68-97	58-71-101
24x24	4.00	3.660	Airflow, cfm	1098	1464	1830	2196	2562	2928	3660	4026	4392
			Noise Criteria	14	22	28	33	38	41	47	50	53
			Throw, Ft.	26-39-61	34-50-70	43-56-79	50-61-86	54-66-93	57-70-99	64-79-111	67-82-117	70-86-122
26x26	4.69	4.317	Airflow, cfm	1295	1727	2158	2590	3022	3453	4317	4749	5180
			Noise Criteria	15	23	29	34	38	42	48	51	53
			Throw, Ft.	28-42-66	37-54-76	47-60-85	54-66-94	58-71-101	62-76-108	70-85-121	73-90-127	76-94-132
30x30	6.25	5.793	Airflow, cfm	1738	2317	2896	3476	4055	4634	5793	6372	6951
			Noise Criteria	16	24	30	35	39	43	49	52	54
			Throw, Ft.	32-49-77	43-63-88	54-70-99	63-77-108	68-83-117	72-88-125	81-99-140	85-104-147	88-108-153

- Data obtained from tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006
- All data based upon supply performance
- All pressures are in inches of water
- The negative static pressure for return performance is equal to the total pressure of supply at the same cfm
- Throw values are for terminal velocities of 150, 100 and 50 fpm under isothermal conditions. See the section Engineering Guidelines, in this catalog for throw information.
- Noise Criteria values are based on a room absorption of 10 dB
- Dash (-) in space indicates NC value less than 10
- Return NC is 2 NC higher than supply NC at the same cfm

SG-TDC

- Face plate: 12-gauge steel with 13/16" square holes and 3/16" fret bars
- Louvered diffuser: Titus Model TDC border 1 (surface mount) with 1-, 2-, 3- or 4-way blow pattern
- Screw holes provided in face plate. Tamper proof screws provided by others.
- Available in stainless steel



SG-TDC

metric sizes monitoring areas minimum security

See website for Specifications

AVAILABLE MODEL:

SG-TDC / Steel

OVERVIEW

Louvered Core – Lattice Face

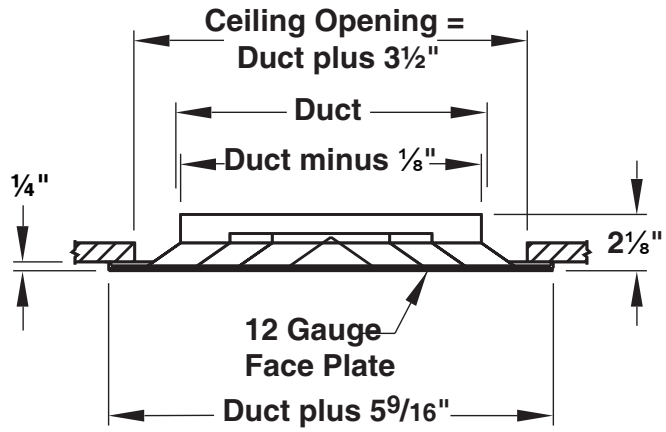
Titus minimum security grilles are designed where additional security is still necessary and maximum performance is required. The SG-TDC is typically used in areas of constant supervision or lobbies or entryways. It is made of the Titus TDC diffuser with a heavy gauge steel lattice grille. The grille can be attached in the field.

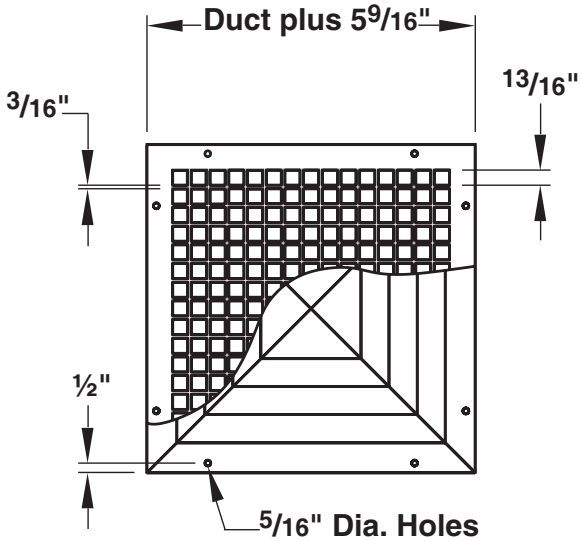
OPTIONS

- Face Operated Damper - AG-35B steel opposed blade damper. Slot operated from face of the grille.
- Rear Angle Frame - 1½" x 1½" x 3/16" steel angle frame with ¼"x 20 NC weld nuts (bolts provided by others)

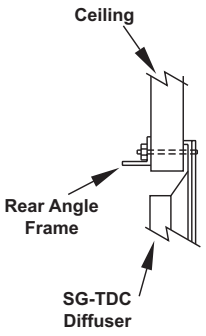
SG-TDC UNIT DIMENSIONS

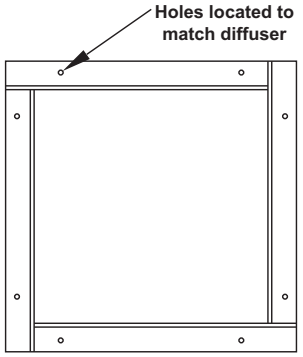
SG-TDC





Optional 1½" x 1½" x 3/16"
Rear Angle Frame





Screw Hole Location per Side	
Neck Size	Location and Number of Holes
6"	One hole at center line
9 to 18"	Two holes 3" from edge
21 to 24"	Three holes equally spaced

Note: All security screws are to be provided by others due to wall/ceiling variations, desired material, specifications, screw style and local requirements. Typical mounting is performed by inserting screws through the lattice face and the diffuser and attaching directly to the ceiling.

All dimensions are in inches

SG-TDC

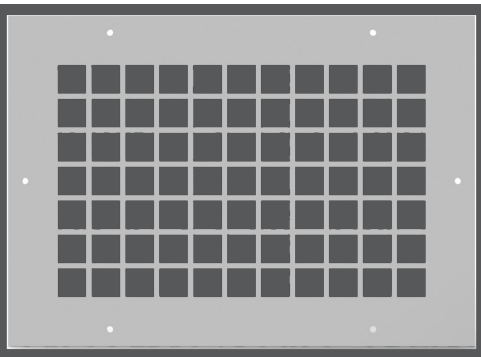
Neck Size (Inches)	Nominal Duct Area	Neck Velocity Total Pressure	100 0.006	200 0.022	300 0.050	400 0.089	500 0.137	600 0.197	700 0.275
6 x 6 AD 0.25 ft²	0.25	Airflow, cfm	25	50	75	100	125	150	175
		NC (Noise Criteria)	-	-	-	19	23	29	33
		Throw, ft.	1-1-2	1-2-3	1-3-5	3-5-7	3-6-9	4-7-11	5-7-12
9 x 9 AD 0.56 ft²	0.44	Airflow, cfm	55	110	170	225	280	335	390
		NC (Noise Criteria)	-	-	12	22	29	35	40
		Throw, ft.	1-1-2	1-3-5	3-5-8	5-7-12	6-9-13	7-10-16	8-11-18
12 x 12 AD 1.00 ft²	0.56	Airflow, cfm	100	200	300	400	500	600	700
		NC (Noise Criteria)	-	-	17	26	33	39	44
		Throw, ft.	1-1-2	2-4-6	4-6-9	6-9-13	7-10-16	9-13-21	10-14-21
15 x 15 AD 1.56 ft²	1.00	Airflow, cfm	155	310	470	625	780	935	1090
		NC (Noise Criteria)	-	-	20	29	36	42	47
		Throw, ft.	1-2-4	2-5-8	4-8-12	8-11-12	10-14-23	11-17-27	10-19-30
18 x 18 AD 2.25 ft²	1.78	Airflow, cfm	225	450	675	900	1125	1350	1575
		NC (Noise Criteria)	-	11	24	33	40	46	50
		Throw, ft.	1-2-4	3-7-11	4-9-16	8-13-22	11-17-28	13-20-32	14-22-36
21 x 21 AD 3.06 ft²	2.25	Airflow, cfm	305	610	920	1225	1530	1835	2140
		NC (Noise Criteria)	-	13	26	35	42	47	53
		Throw, ft.	1-3-5	3-8-13	7-11-19	10-16-25	13-20-30	15-23-37	17-26-42
24 x 24 AD 4.00 ft²	2.78	Airflow, cfm	400	800	1200	1600	2000	2400	2800
		NC (Noise Criteria)	-	15	28	37	44	50	54
		Throw, ft.	1-3-5	4-6-14	8-13-22	12-13-29	16-23-36	18-27-43	20-30-47

NC-20 NC-30 NC-40 NC-50

- Neck velocities are in feet per minute
- All pressures are in inches of water
- Throw values, measured in feet, are for terminal velocities of 150, 100 and 50 fpm. See the section, Engineering Guidelines, in this catalog for throw information.
- Noise Criteria (NC) values based on a room absorption of 10 dB, re 10^{-12} watts
- Dividing lines denote ranges of NC values
- The negative static pressure for the return is equal to the total pressure of the supply at the same cfm
- Return Noise Criteria is 2 NC greater than the supply NC at the same cfm
- Dash (—) in space indicates Noise Criteria value less than 10
- Data obtained from tests conducted in accordance with ANSI/ASHRAE Standard 70–2006
- Performance is based on standard construction

SG-LFO

- Face Plate - Steel:12-gauge with 13/16" square holes on 1" centers - 66% free area
- Face Plate - Aluminum: 1/8" aluminum with 13/16" square holes on 1" centers - provides 66% free area. 3/16" diameter screw holes provided in face plate. Tamper proof screws provided by others.
- Available in round hole pattern
- Screw Hole Location: Screw hole quantities and locations vary by duct size. Please consult the factory for screw hole quantity and location.



SG-LFO

metric sizes | prevents corrosion | monitoring areas | minimum security

See website for Specifications

AVAILABLE MODELS:

SG-LFO / Steel
SG-LFO-AA / Aluminum

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

Lattice Face – 13/16" Square Holes on 1" Centers

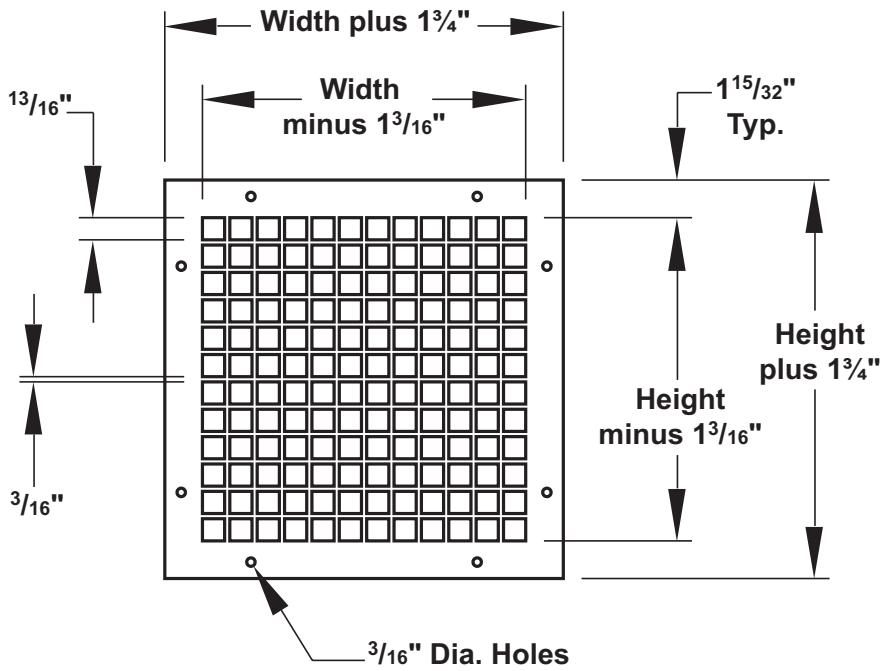
Titus model SG-LFO is a minimum security grille. It is designed to be used in any area where additional security is required. The SG-LFO is also available in stainless steel for corrosive environment applications.

OPTIONS

- Face Plate with Round Hole Pattern - 5/16" diameter holes on 7/16" staggered centers
- No Screw Holes

SG-LFO UNIT DIMENSIONS

SG-LFO



Dimensions Available	
Width: Height:	6 to 30" 4 to 30"
Available in 1" increments	

Notes:

These models are attached to the wall or ceiling using screws inserted through the face of the grille sandwiching it to the wall or ceiling. Screws to be provided by others due to varying wall and ceiling characteristics. All screws should comply with local requirements and the controlling engineer's specifications.

The SG-LFO is dimensioned the same as the 300/350 Series grilles (Duct + 1¾" overall dimensions) so the SG-LFO can be field assembled to the grille to provide a secured air passage.

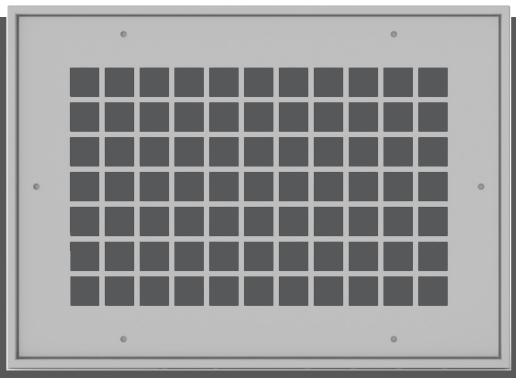
The SG-LFO is also available in stainless steel for corrosive environments.

For standard product, width and height should be specified in even 1" increments.

All dimensions are in inches

SG-LFF

- Face Plate - Steel: 12-gauge steel with $^{13}/_{16}$" square holes on 1" centers - provides 66% free area
- Face Plate - Aluminum: $^{1}/_{8}$" aluminum with $^{13}/_{16}$" square holes on 1" centers - provides 66% free area. $^{3}/_{16}$" diameter screw holes provided in face plate. Tamper proof screws provided by others.
- Available in round hole pattern
- Screw Hole Location - Screw hole quantities and locations vary by duct size. Please consult the factory for screw hole quantity and location.



SG-LFF

metric sizes | prevents corrosion | monitoring areas | minimum security

See website for Specifications

AVAILABLE MODELS:

SG-LFF / Steel
SG-LFF-AA / Aluminum

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

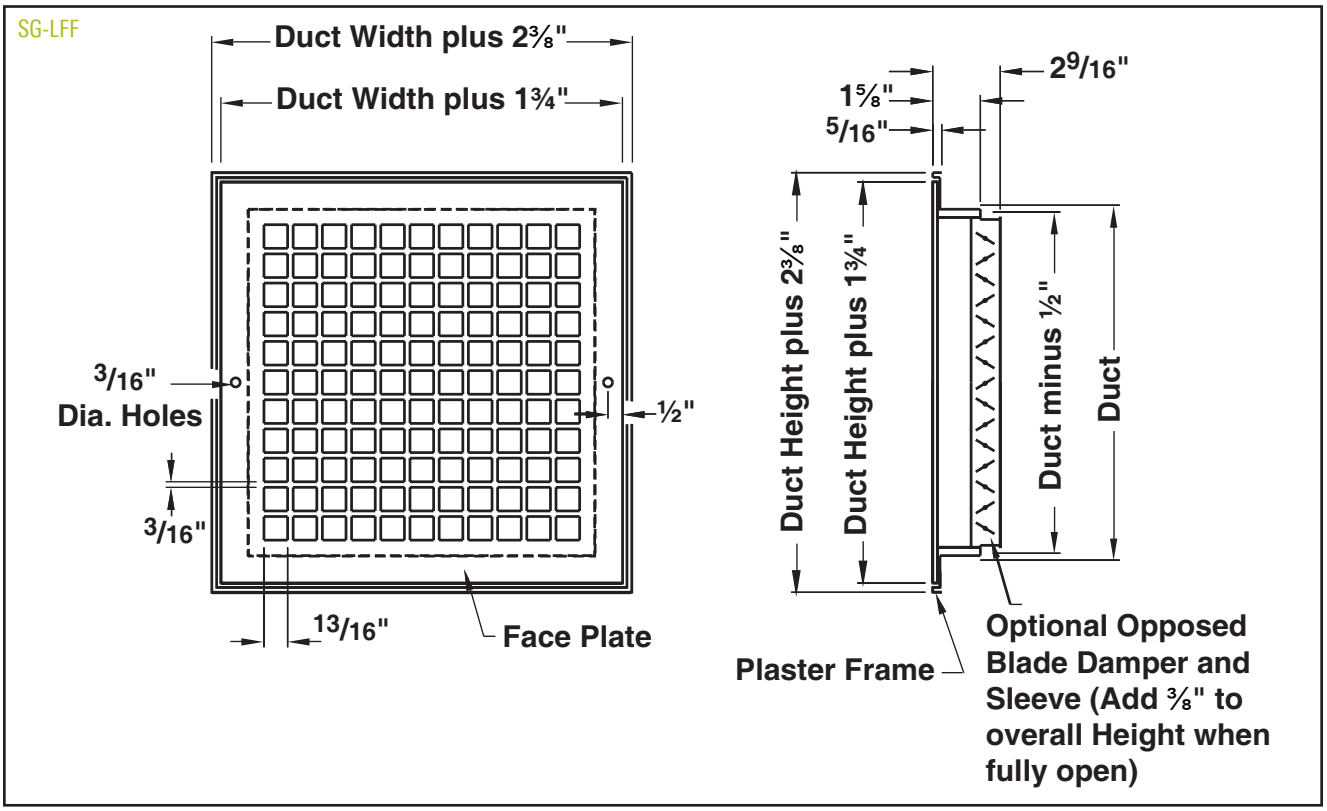
Lattice Face with Plaster Frame – $^{13}/_{16}$" Square Holes on 1" Centers

Titus model SG-LFF is a minimum security grille used in any area where additional security is required. It is economical alternative return grille for minimum security areas. The SG-LFF is also available in stainless steel for corrosive environment applications.

OPTIONS

- Face Operated Damper - Steel: AG-15 steel opposed blade damper. Slot operated from face of the grille.
- Face Operated Damper - Aluminum: AG-15-AA aluminum opposed blade damper. Slot operated from face of the grille.
- Face Plate with Round Hole Pattern: $^{5}/_{16}$" diameter holes on $^{7}/_{16}$" staggered centers

SG-LFF UNIT DIMENSIONS



Dimensions Available	
Width: Height:	6 to 30″ 4 to 30″
Available in 1″ increments	

Notes:

These models are attached to the wall or ceiling using screws inserted through the face of the grille. Screws to be provided by others due to varying wall and ceiling characteristics. All screws should comply with local requirements and the controlling engineer's specifications.

The SG-LFF is also available in stainless steel for corrosive environments.

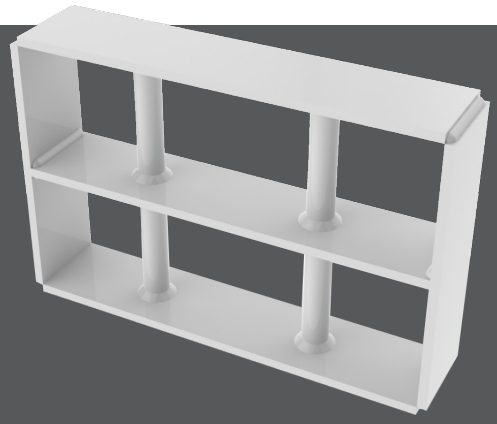
For standard product, width and height should be specified in even, 1″ increments.

All dimensions are in inches

Barrier Grilles

SG-BG-FM

- Barrier Grille - Constructed of ¾" diameter steel bars and 2½ x ¼" steel flat bars located on 6" centers
- Frame - 2½ x ¼" steel with welded corners
- Ideal barrier for wall, roof or duct penetration
- All welded construction



SG-BG-FM

metric sizes | monitoring areas | secure

See website for Specifications

AVAILABLE MODEL:

SG-BG-FM

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

OVERVIEW

Barrier with Frame

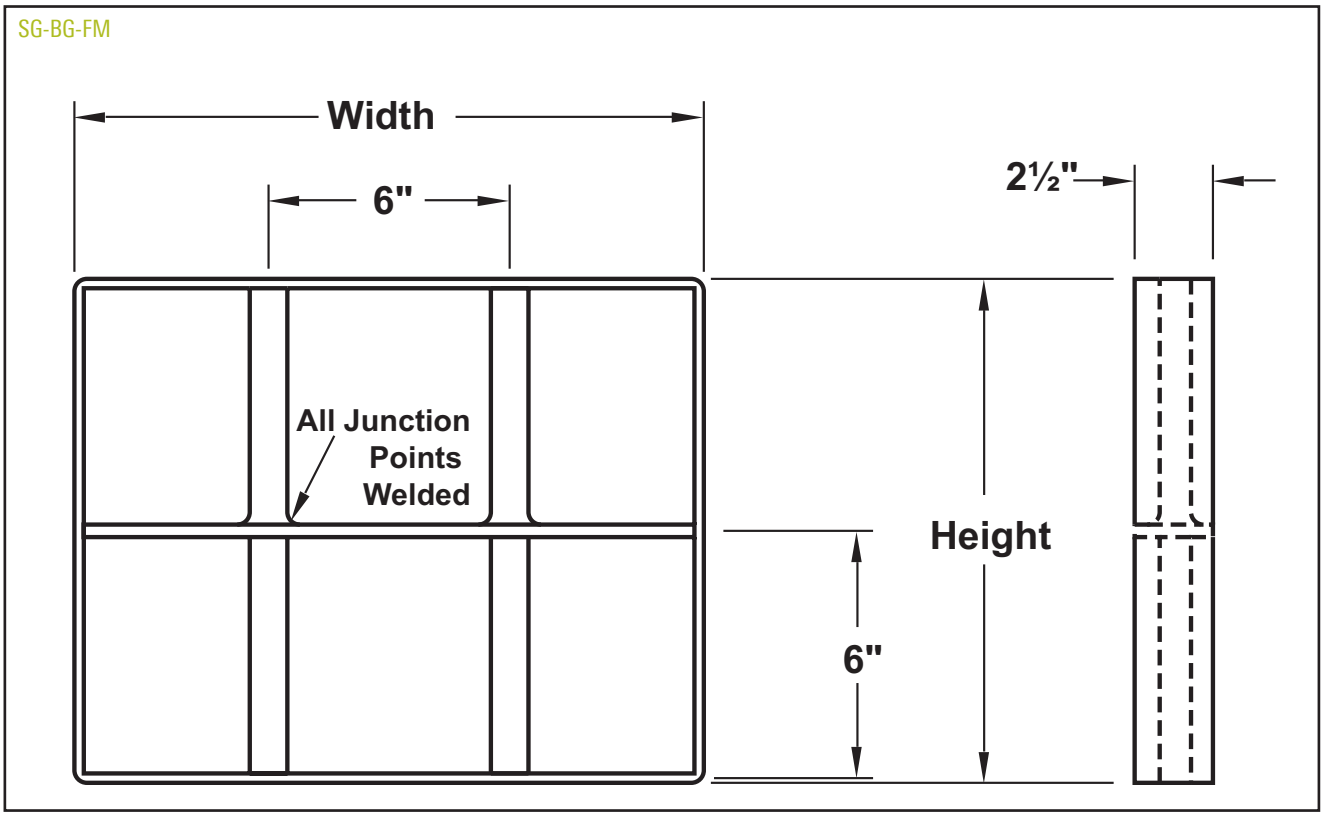
Titus model SG-BG-FM is a framed barrier grille typically used to effectively maintain security in wall openings between secure and non-secure areas. This barrier grille restricts passage through duct openings.

OPTIONS

- Vertical Bars Only - ¾" diameter steel bars on 6" centers.
- Horizontal Bars Only - 2½ x ¼" steel bars on 6" centers.
- Finish - #04 Mill.

SG-BG-FM UNIT DIMENSIONS

SG-BG-FM



Dimensions Available	
Width: Height:	6 to 30" 4 to 30"
Available in 1" increments	

Notes:

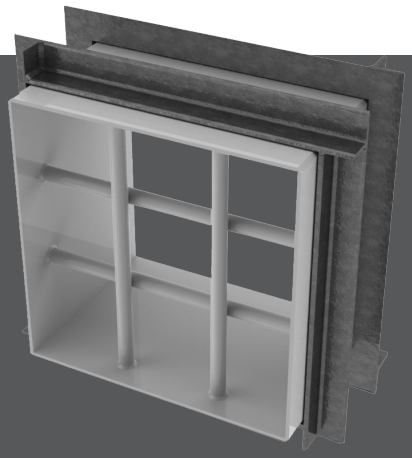
Titus SG-BG security bars are constructed from hot-rolled carbon steel (SAE 1008, 1010 or 1015). The standard steel hardness can range from 100-126 Brinell depending on composition and heat treatment. This material does not comply with ASTM Standards A628, A629 or A750.

For standard product, width and height dimensions should be specified in even, 1" increments.

All dimensions are in inches

SG-BG-SLV

- Sleeve Barrier Grille - Constructed of ¾" diameter steel bars with maximum opening of 6 inches
- Sleeve: 3/16" steel
- Angle Frames - Two frames constructed of 1½ x 1½ x 3/16" steel angle iron shipped loose for field welding. Frames are mill finish.
- Easily slides into wall, duct or roof opening
- All welded construction



SG-BG-SLV

metric sizes | monitoring areas | secure

See website for Specifications

AVAILABLE MODEL:

SG-BG-SLV

FINISHES

Standard Finish - #26 White
Optional Finish - #04 Mill

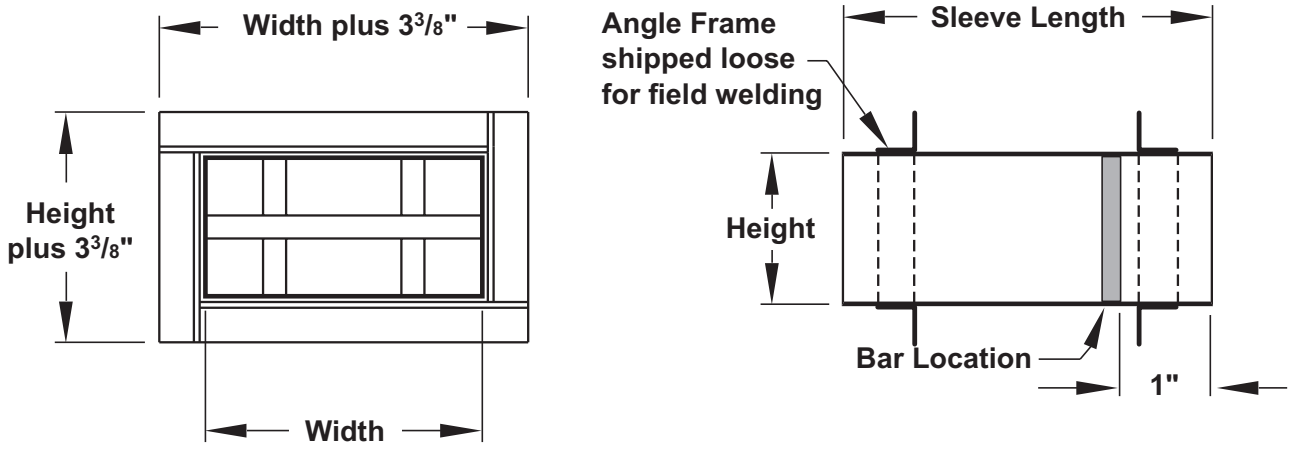
OVERVIEW

Barrier with Sleeve

Titus model SG-BG-SLV is a barrier mounted inside a 3/16" thick sleeve for installation in a wall or other opening as a completing unit. This unit effectively maintains security between secure and non-secure areas. Duct connections can be quickly made at both ends. This makes the SG-BG-SLV an ideal installation in security walls.

SG-BG-SLV UNIT DIMENSIONS

SG-BG-SLV



Dimensions Available	
Width:	6 to 30"
Height:	4 to 30"
Sleeve Length:	4 to 18" in 1" increments

Notes:

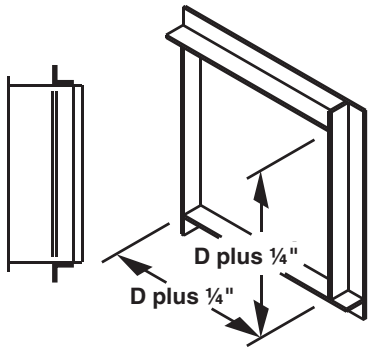
For standard product, width and height should be specified in even 1" increments.

Typical mounting is accomplished by using an angle frame (1½" x 1½" x 3/16") shipped loose for field welding.

All dimensions are in inches

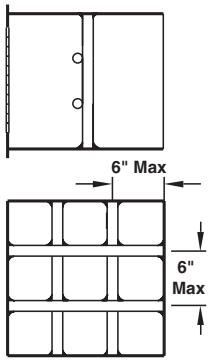
Options

Angle Mounting Frame (AF)



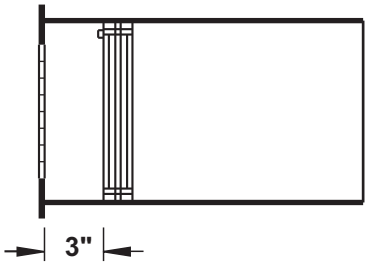
Angle Frame shipped loose for field installation.

Sleeve Barrier Grille (BG)



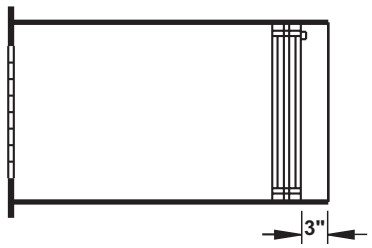
Barrier grille inside security grille sleeve. Horizontal and vertical bars are both ¾" steel.

Face Operated Damper (DF)



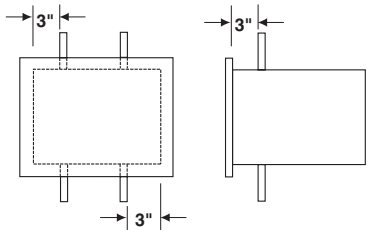
SG-PS, SG-PR are slot operated. SG-1500, SG-3300 are lever operated.

Rear Operated Damper (DR)



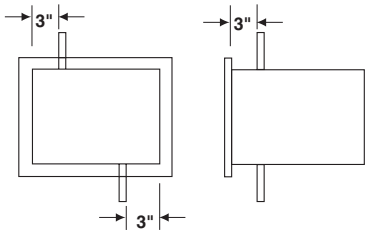
All models are slot operated.

Anchor Bars (AB)



For sleeve widths less than 12". Steel anchor bars are ¾" diameter and 3" tall. Aluminum anchor bars are ½" diameter and 3" tall.

Anchor Bars (AB)



For sleeve widths equal to or greater than 12". Steel anchor bars are ¾" diameter and 3" tall. Aluminum anchor bars are ½" diameter and 3" tall.

All dimensions are in inches

Application Suggestions

Model Number	Security Level	Description	Usage	Material
SG-PS	Maximum	Designed as a maximum security grille with 3/16" thick face plate with 2" square holes backed by 10-gauge x # 2 mesh and a 3/16" thick back-up plate	Cells and other high security areas where maximum security inmates may be left unattended for long periods of time	Steel
SG-SD	Maximum	Designed as a maximum security grille with 3/16" thick steel face plate and 9/32" diameter holes on staggered centers. Sleeve is 3/16" thick steel.	Cells, dayrooms and other high security areas where maximum security inmates may be left unattended for long periods of time	Steel
SG-PR	Maximum	Designed as a maximum security grille with 3/16" thick steel face plate and 5/16" diameter holes staggered on 7/16" centers. Sleeve is 3/16" thick steel.	Cells, dayrooms, and other high security areas where maximum security inmates may be left unattended for long periods of time	Steel
SG-PRA	Medium	Designed as a medium security grille with 1/8" thick aluminum face plate and 5/16" diameter holes staggered on 7/16" centers. Sleeve is 1/8" thick aluminum.	Secure areas where high structural integrity must be maintained while the grille is exposed to wet conditions such as showers	Aluminum
SG-3300RL	Medium	Medium security grille with 16-gauge steel borders and 14-gauge steel blades set on 38° deflection angle. Blades are backed by 10-gauge 3/8" steel mesh for added safety.	Medium security cells, dayrooms, any place where a medium security prisoner may be left unattended for long periods of time	Steel
SG-1500FL	Minimum	Minimum security grille with 1/8" thick extruded aluminum frame and 1/8" thick extruded aluminum louvers spaced ½" apart	Minimum security areas such as showers, reception rooms, and other security areas where minimum security inmates are under close supervision	Aluminum
SG-TDC	Minimum	Minimum security diffuser with 1-, 2-, 3- or 4-way blow. 12-gauge lattice face with 13/16" square holes on 1" centers.	Ceilings throughout lobbies, entry ways, and other areas under constant supervision	Steel
SG-BG-SLV	Max-Min	¾" diameter steel bars on maximum 6" centers with ¾" diameter crossbars on maximum 6" centers. Standard sleeve is 3/16" thick with two 1½ x 1½ x 3/16" angle frames for wall mounting.	Wall and roof penetration barriers	Steel
SG-BG-FM	Max-Min	¾" diameter steel bars on 6" centers with 2½ x ¼" crossbars on 6" centers	Wall and roof penetration barriers	Steel

Notes:

Security grilles may be used in psychiatric facilities, hospitals, high security buildings, zoos and other buildings requiring secure HVAC outlets.

Careful attention must be given to areas where inmates or patients are prone to suicide attempts. The best prevention of suicide is to place the grille in an inaccessible area and use grilles with minimized face openings.

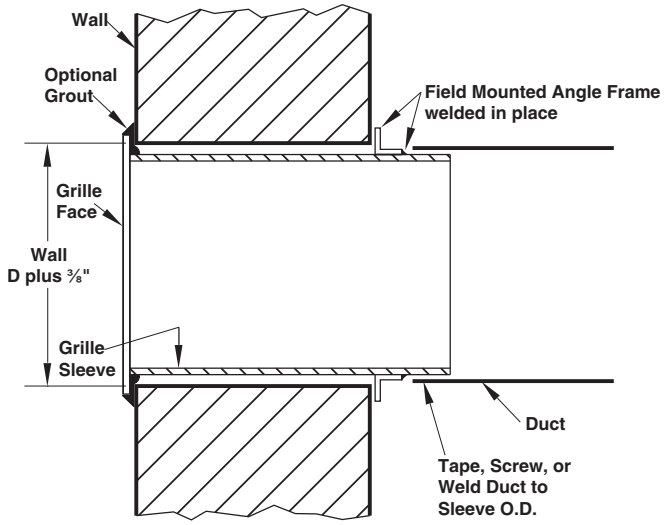
Titus defers to the job engineer to make the decision of which grille and what configuration to use.

Typical Installation Methods

Models: SG-PS, SG-SD, SG-PR, SG-PRA, SG-PRT, SG-3300RL, SG-1500FL

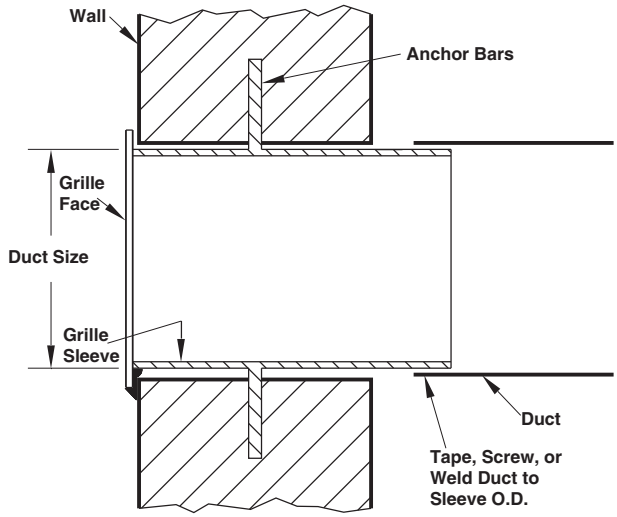
Angle Frame Mounting

The grille is slipped into the wall opening and angles are welded in place from the back side. The duct is then connected to the rear of the grille sleeve.



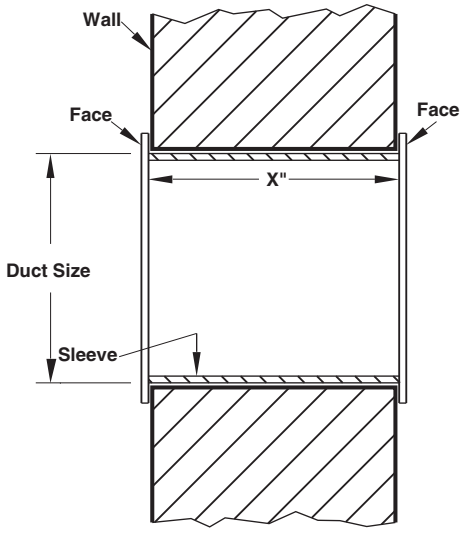
Anchor Bar Mounting

The grille is grouted into the wall as the wall is built. Tabs are factory welded to the sleeve to ensure the grille cannot be slipped out of the wall. The duct is then connected to the rear of the sleeve.



Transfer Grille Installation

The grille is grouted into the wall as the wall is built. The two factory welded grille faces keep it from being slipped out of the wall.



PRESSURE LOSS THROUGH PERFORATED PLATE BASED ON FREE AREA