# SARMAAFARIN

## 39HX Series
## Air Handling Unit

**Double Skin, Two Inches Insulation**

AEROACOUSTIC

ISO 9001

*Certificate No.: 9190.C308*

FORM SSI - 39HX (1403)

**39HX**

850 up to 52600 cfm

# INTRODUCTION

The forehead text represents an air handling with outstanding characteristics to assure new HVAC policies and fulfill our customer's satisfaction. 39HX brings forward more details to comply with your needs so let us dive into the contents:

**Introduction**



Sarma Afarin 39HX Series of Air Handling Units incorporate state-of-the-art technology to provide heating and cooling and meet filtration, pressurization, condensation, control, and sanitization standards required by the critical applications where clean and ultra-clean air is needed. It fits applications that are sensitive to dust and other contaminants, such as residences and residential buildings, food industry, wood industry, textile industry, printing and paper industry, metalworking and automotive industries. It could also meet the criteria of applications where extended hygiene requirements are needed and the entry of particles and germs need to be minimized, such as hospitals, surgery rooms and pharmaceutical industry.

The units are custom engineered to produce the specified psychrometric conditions and to achieve the environmental design criteria for the area being served. This is the result of detailed research in the thermal, aerodynamic and acoustic fields, and allows Sarma Afarin to offer technically superior units at competitive prices.

Taking the requirements of our customers into consideration, our design engineers can design different configurations of air handling units to suit different types of applications.

**39HX series specifications**

Using plug fans which eliminates belt abrasion and makes cleaning easier.

Using steam humidifiers in order to meet hygiene criteria.

Using curved shape and continuous-single profile casing which makes cleaning easier, reduces the accumulation of particles, and reduces leakage.

Using stainless steel for surfaces that are potentially in contact with condensed water and humidifier (Units with all internal surfaces made of stainless steel are available upon request).

Using multiple stages of filtration which ensures the minimum presence of particles and contaminants in supply air.

For Extended Hygiene Requirements, a stage of HEPA filters is included in the unit.

## Model number nomenclature

**39 HX 121 22 - S**

**Products Series**
Air Handling Unit

**Air Handling Unit Type**
HX: Double Skin-2" Insulation

**Configuration Based on Table**
With HEPA : 2nd digit equal to 2
Without HEPA:2nd digit equal to 3

**Internal Panel Material**
--: Galvanized Steel
S: Stainless Steel*

**Unit size**

| | | |
|---|---|---|
| 22 | 45 | 77 |
| 23 | 55 | 78 |
| 33 | 56 | 97 |
| 34 | 66 | 98 |
| 44 | 67 | 99 |

*In hygiene applications Internal Panel material should be made of stainless steel(EUROVENT-RS/10).

# TECHNICAL DATA

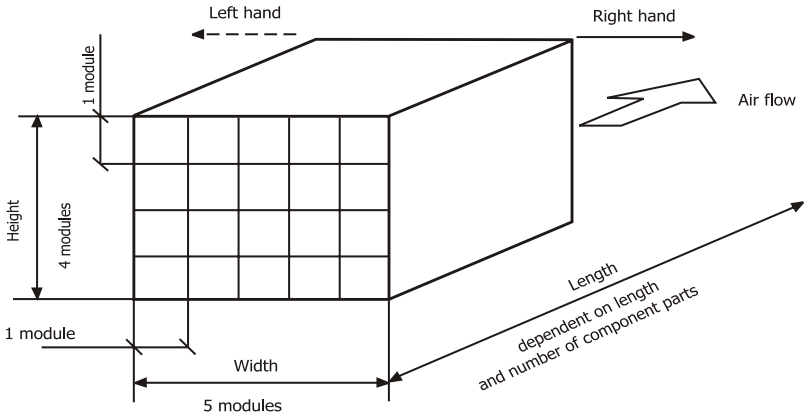
The 39HX line of Sarma Afarin air handling units is based on a modular system. The first and second digits of unit size denote the number of modules in height and width respectively. This modular sizing determines the cross-section available for air flow and encodes the unit size. Each module has a constant value of 315 mm, which determines exterior dimensions of units using the following formulas:

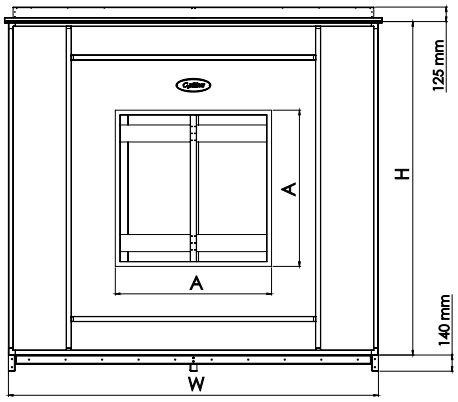
Dimension = (n×315) + 40 mm

The following picture clarifies modular dimensions for 39HX12145 model as an example:

Height = (4×315) + 40 = 1300 mm

Width = (5×315) + 40 = 1615 mm




| Unit Size | | | 22 | 23 | 33 | 34 | 44 | 45 | 55 | 56 |
|---|---|---|---|---|---|---|---|---|---|---|
| Air Volume Flow Rate[CFM] | FPM | 400 | 840 | 1560 | 2320 | 3320 | 4440 | 5760 | 7240 | 9040 |
| | | 450 | 945 | 1755 | 2610 | 3735 | 4995 | 6480 | 8145 | 10170 |
| | | 500 | 1050 | 1950 | 2900 | 4150 | 5550 | 7200 | 9050 | 11300 |
| | | 550 | 1155 | 2145 | 3190 | 4565 | 6105 | 7920 | 9955 | 12430 |
| | | 600 | 1260 | 2340 | 3480 | 4980 | 6660 | 8640 | 10860 | 13560 |
| | | 700 | 1470 | 2730 | 4060 | 5810 | 7770 | 10080 | 12670 | 15820 |
| Coil Face Area | | [ sq. ft.] | 2.1 | 3.9 | 5.8 | 8.3 | 11.1 | 14.4 | 18.1 | 22.6 |
| Cross Section Dimention | | W[mm] | 670 | 985 | 985 | 1300 | 1300 | 1615 | 1615 | 1930 |
| | | H[mm] | 935 | 935 | 1250 | 1250 | 1565 | 1565 | 1880 | 1880 |
| | | W[No Module] | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 |
| | | H[No Module] | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 |
| Air Discharge | | A[mm] | 230 | 290 | 450 | 450 | 590 | 645 | 905 | 905 |
| | | V[mm] | 220 | 190 | 268 | 268 | 355 | 328 | 355 | 355 |
| | | O[mm] | 220 | 348 | 268 | 425 | 355 | 485 | 355 | 513 |

| Unit Size | | | 66 | 67 | 77 | 78 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|---|---|---|
| Air Volume Flow Rate[CFM] | FPM | 400 | 11720 | 13920 | 16040 | 18760 | 23760 | 26920 | 30080 |
| | | 450 | 13185 | 15660 | 18045 | 21105 | 26730 | 30285 | 33840 |
| | | 500 | 14650 | 17400 | 20050 | 23450 | 29700 | 33650 | 37600 |
| | | 550 | 16115 | 19140 | 22055 | 25795 | 32670 | 37015 | 41360 |
| | | 600 | 17580 | 20880 | 24060 | 28140 | 35640 | 40380 | 45120 |
| | | 700 | 20510 | 24360 | 28070 | 32830 | 41580 | 47110 | 52640 |
| Coil Face Area | | [ sq. ft.] | 29.3 | 34.8 | 40.1 | 46.9 | 59.4 | 67.3 | 75.2 |
| Cross Section Dimention | | W[mm] | 1930 | 2245 | 2245 | 2560 | 3190 | 3190 | 3190 |
| | | H[mm] | 2195 | 2195 | 2510 | 2510 | 2510 | 2825 | 3140 |
| | | W[No Module] | 6 | 7 | 7 | 8 | 10 | 10 | 10 |
| | | H[No Module] | 6 | 6 | 7 | 7 | 7 | 8 | 9 |
| Air Discharge | | A[mm] | 905 | 905 | 1000 | 1220 | 1220 | 1220 | 1220 |
| | | V[mm] | 513 | 513 | 623 | 513 | 513 | 670 | 828 |
| | | O[mm] | 513 | 670 | 623 | 670 | 985 | 985 | 985 |

# TECHNICAL DATA

Sarma Afarin 39HX Air Handling Units can be manufactured in multiple configurations, with a wide selection of components to meet customer requirements. To ensure the maximum flexibility and the best solution for costumer's application, units are available in 315 mm increment in both height and width.

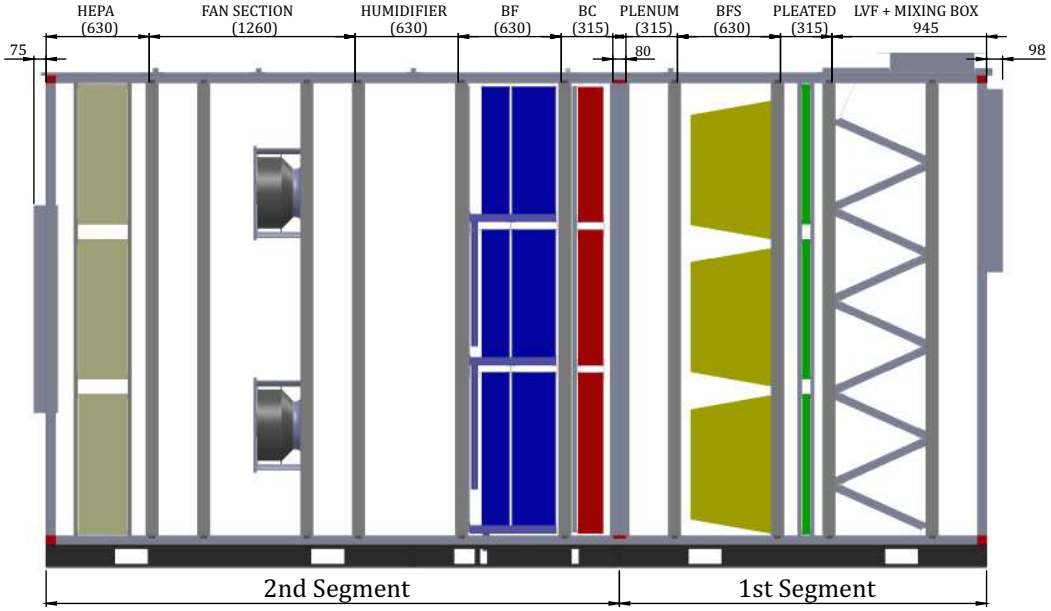
We have considered 36 configurations with different arrangement of filters and other components, which could cover a wide variety of our customers' demands. Upon the request, other configurations are available to meet the customer requirements.

**Sections Arrangement (by default all configurations have MB, LVF, PLN, and Fan sections*)**

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HUM* | ● | ● | ● | | | | ● | ● | ● | | | | ● | ● | ● | | | |
| BF* | ● | ● | | ● | ● | | ● | ● | | ● | ● | | ● | ● | | ● | ● | |
| BC* | ● | | ● | ● | | ● | ● | | ● | ● | | ● | ● | | ● | ● | | ● |
| BFS* | ● | ● | ● | ● | ● | ● | | | | | | | ● | ● | ● | ● | ● | ● |
| PLT* | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | |
| **Configuration NO.** | **121** | **122** | **123** | **124** | **125** | **126** | **221** | **222** | **223** | **224** | **225** | **226** | **321** | **322** | **323** | **324** | **325** | **326** |
| No. Modules HEPA Excluded | 19 | 18 | 17 | 17 | 16 | 15 | 17 | 16 | 15 | 15 | 14 | 13 | 18 | 17 | 16 | 16 | 15 | 14 |
| Length[mm] | 6238 | 5923 | 5608 | 5608 | 5293 | 4978 | 5608 | 5293 | 4978 | 4978 | 4663 | 4348 | 5923 | 5608 | 5293 | 5293 | 4978 | 4663 |
| **Configuration NO.** | **131** | **132** | **133** | **134** | **135** | **136** | **231** | **232** | **233** | **234** | **235** | **236** | **331** | **332** | **333** | **334** | **335** | **336** |
| No. Modules HEPA Excluded | 17 | 16 | 15 | 15 | 14 | 13 | 15 | 14 | 13 | 13 | 12 | 11 | 16 | 15 | 14 | 14 | 13 | 12 |
| Length[mm] | 5608 | 5293 | 4978 | 4978 | 4663 | 4348 | 4978 | 4663 | 4348 | 4348 | 4033 | 3718 | 5293 | 4978 | 4663 | 4663 | 4348 | 4033 |

*PLT: Pleated Filter(315 mm), BFS: Bag Filter(630 mm), BC: Heating Coil(315 mm), BF: Cooling Coil(630 mm), HUM: Humidifier(630 mm)
*MB: Mixing Box(630 mm), FAN(1260 mm), PLN: Plenum(315 mm), LVF: Aluminum Low Velocity Filter(630 mm)`

The Unit length is determined by the number and size of internal components required. The side for services (connections and access) is defined as right hand or left hand in the direction of the air flow.
Thanks to the modular construction of the 39HX series, it can meet the limitations of customer's spacing and the requirements of a wide range of applications with different air flow rates. In the following chart, the flow rate of units at different flow speeds are shown, and customers can easily use this chart to choose an appropriate unit that meets their required flow rate.




Note: Dimensions are in mm.

| Table 3 Total Weight(kg) of different Configuration With HEPA* | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AHU Size | 121 | 122 | 123 | 124 | 125 | 126 | 221 | 222 | 223 | 224 | 225 | 226 | 321 | 322 | 323 | 324 | 325 | 326 |
| 22 | 853 | 812 | 765 | 729 | 687 | 641 | 721 | 679 | 633 | 597 | 555 | 508 | 817 | 775 | 728 | 692 | 651 | 604 |
| 23 | 1052 | 1002 | 939 | 915 | 865 | 801 | 891 | 841 | 778 | 754 | 704 | 640 | 1008 | 959 | 895 | 871 | 821 | 757 |
| 33 | 1219 | 1159 | 1072 | 1072 | 1011 | 924 | 1037 | 976 | 889 | 889 | 829 | 741 | 1167 | 1107 | 1020 | 1020 | 959 | 872 |
| 34 | 1439 | 1367 | 1267 | 1277 | 1206 | 1105 | 1225 | 1154 | 1053 | 1064 | 993 | 892 | 1378 | 1307 | 1206 | 1217 | 1146 | 1045 |
| 44 | 1623 | 1541 | 1422 | 1451 | 1369 | 1250 | 1388 | 1306 | 1187 | 1216 | 1134 | 1015 | 1554 | 1472 | 1353 | 1382 | 1300 | 1181 |
| 45 | 1860 | 1767 | 1627 | 1675 | 1582 | 1441 | 1595 | 1502 | 1362 | 1410 | 1317 | 1177 | 1782 | 1689 | 1548 | 1596 | 1504 | 1363 |
| 55 | 2198 | 2067 | 1880 | 1971 | 1841 | 1654 | 1907 | 1776 | 1589 | 1680 | 1550 | 1363 | 2112 | 1981 | 1794 | 1885 | 1754 | 1567 |
| 56 | 2485 | 2337 | 2141 | 2245 | 2097 | 1901 | 2164 | 2016 | 1821 | 1924 | 1776 | 1580 | 2389 | 2241 | 2045 | 2149 | 2001 | 1805 |
| 66 | 2753 | 2580 | 2361 | 2502 | 2329 | 2110 | 2408 | 2235 | 2017 | 2157 | 1985 | 1766 | 2647 | 2474 | 2256 | 2396 | 2223 | 2005 |
| 67 | 3053 | 2869 | 2632 | 2788 | 2604 | 2368 | 2675 | 2491 | 2254 | 2410 | 2227 | 1990 | 2936 | 2752 | 2516 | 2672 | 2488 | 2251 |
| 77 | 3311 | 3104 | 2847 | 3036 | 2829 | 2572 | 2905 | 2698 | 2440 | 2630 | 2423 | 2165 | 3186 | 2978 | 2721 | 2910 | 2703 | 2446 |
| 78 | 3578 | 3353 | 3083 | 3289 | 3065 | 2795 | 3141 | 2917 | 2647 | 2853 | 2629 | 2359 | 3441 | 3217 | 2946 | 3153 | 2928 | 2658 |
| 97 | 4151 | 3903 | 3613 | 3836 | 3588 | 3298 | 3652 | 3404 | 3114 | 3337 | 3089 | 2799 | 3993 | 3745 | 3455 | 3678 | 3430 | 3140 |
| 98 | 4453 | 4190 | 3888 | 4128 | 3865 | 3563 | 3923 | 3659 | 3358 | 3598 | 3334 | 3033 | 4283 | 4020 | 3718 | 3958 | 3695 | 3393 |
| 99 | 4760 | 4481 | 4168 | 4424 | 4145 | 3832 | 4195 | 3916 | 3603 | 3859 | 3580 | 3267 | 4580 | 4301 | 3987 | 4244 | 3965 | 3651 |

* Weight of 2 rows and 6 rows are considered for heating and cooling coils, respectively

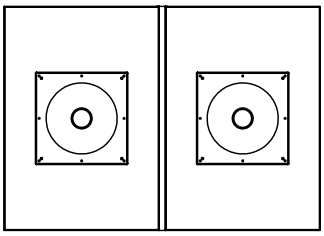
| Table 4 - Total Weight(kg) of different Configuration Without HEPA* | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AHU Size | 131 | 132 | 133 | 134 | 135 | 136 | 231 | 232 | 233 | 234 | 235 | 236 | 331 | 332 | 333 | 334 | 335 | 336 |
| 22 | 775 | 733 | 686 | 650 | 609 | 562 | 665 | 623 | 577 | 541 | 499 | 452 | 738 | 696 | 650 | 614 | 572 | 525 |
| 23 | 949 | 899 | 836 | 812 | 762 | 698 | 814 | 764 | 700 | 676 | 626 | 563 | 905 | 855 | 792 | 768 | 718 | 654 |
| 33 | 1093 | 1032 | 945 | 945 | 885 | 797 | 936 | 875 | 788 | 788 | 728 | 640 | 1041 | 981 | 893 | 893 | 833 | 745 |
| 34 | 1283 | 1211 | 1110 | 1121 | 1050 | 949 | 1098 | 1026 | 925 | 936 | 865 | 764 | 1222 | 1151 | 1050 | 1061 | 989 | 889 |
| 44 | 1438 | 1356 | 1237 | 1266 | 1184 | 1065 | 1231 | 1149 | 1031 | 1059 | 977 | 859 | 1369 | 1287 | 1168 | 1197 | 1115 | 996 |
| 45 | 1641 | 1548 | 1408 | 1456 | 1363 | 1223 | 1408 | 1315 | 1174 | 1222 | 1130 | 989 | 1563 | 1470 | 1329 | 1377 | 1285 | 1144 |
| 55 | 1947 | 1816 | 1629 | 1721 | 1590 | 1403 | 1687 | 1557 | 1370 | 1461 | 1330 | 1143 | 1861 | 1730 | 1543 | 1634 | 1504 | 1317 |
| 56 | 2195 | 2047 | 1851 | 1954 | 1807 | 1611 | 1908 | 1761 | 1565 | 1668 | 1520 | 1325 | 2099 | 1951 | 1755 | 1858 | 1711 | 1515 |
| 66 | 2425 | 2253 | 2034 | 2175 | 2002 | 1783 | 2115 | 1943 | 1724 | 1864 | 1692 | 1473 | 2320 | 2147 | 1929 | 2069 | 1896 | 1678 |
| 67 | 2682 | 2499 | 2262 | 2418 | 2234 | 1997 | 2342 | 2158 | 1922 | 2078 | 1894 | 1657 | 2566 | 2382 | 2145 | 2301 | 2118 | 1881 |
| 77 | 2898 | 2691 | 2434 | 2623 | 2416 | 2158 | 2529 | 2322 | 2065 | 2254 | 2047 | 1789 | 2772 | 2565 | 2308 | 2497 | 2290 | 2032 |
| 78 | 3117 | 2893 | 2622 | 2829 | 2605 | 2334 | 2721 | 2497 | 2227 | 2433 | 2209 | 1938 | 2981 | 2756 | 2486 | 2692 | 2468 | 2198 |
| 97 | 3596 | 3348 | 3058 | 3281 | 3033 | 2743 | 3143 | 2895 | 2605 | 2828 | 2580 | 2290 | 3438 | 3189 | 2899 | 3123 | 2874 | 2585 |
| 98 | 3842 | 3579 | 3277 | 3517 | 3253 | 2952 | 3358 | 3094 | 2793 | 3033 | 2769 | 2467 | 3672 | 3409 | 3107 | 3347 | 3083 | 2782 |
| 99 | 4094 | 3815 | 3501 | 3758 | 3479 | 3165 | 3575 | 3296 | 2982 | 3239 | 2960 | 2646 | 3913 | 3634 | 3321 | 3577 | 3298 | 2985 |

* Weight of 2 rows and 6 rows are considered for heating and cooling coils, respectively

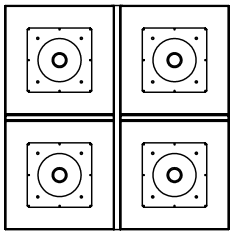
| Table 5 - Weight of different parts of the 39HX series Air Handling Unit (kg) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | Mixing Box | LVF | Pleated Filter | Bag Filter | Standard Coil (Rows) | | | | Droplet Eliminator | Steam Humidifier | AC Fans | HEPA Filter |
| | | | | | 1 | 2 | 4 | 6 | | | | |
| 22 | 20 | 5 | 2 | 3 | 6 | 8 | 20 | 25 | 12 | 50 | 5 | 13 |
| 23 | 24 | 6 | 2 | 5 | 7 | 11 | 30 | 37 | 20 | 50 | 11 | 20 |
| 33 | 29 | 10 | 4 | 6 | 11 | 20 | 50 | 66 | 32 | 50 | 11 | 31 |
| 34 | 39 | 11 | 5 | 9 | 14 | 25 | 59 | 81 | 40 | 50 | 16 | 42 |
| 35 | 49 | 15 | 6 | 10 | 15 | 27 | 63 | 87 | 43 | 50 | 43 | 53 |
| 44 | 45 | 17 | 7 | 9 | 18 | 32 | 74 | 103 | 53 | 50 | 22 | 57 |
| 45 | 57 | 20 | 9 | 12 | 21 | 40 | 90 | 127 | 69 | 50 | 26 | 72 |
| 46 | 116 | 25 | 10 | 13 | 29 | 52 | 116 | 163 | 84 | 50 | 54 | 86 |
| 47 | 136 | 29 | 12 | 17 | 32 | 59 | 132 | 186 | 99 | 50 | 59 | 101 |
| 55 | 76 | 26 | 1 | 17 | 48 | 79 | 152 | 208 | 111 | 76 | 86 | 90 |
| 56 | 134 | 30 | 13 | 19 | 56 | 89 | 162 | 219 | 117 | 76 | 86 | 109 |
| 57 | 157 | 35 | 15 | 23 | 66 | 98 | 171 | 231 | 123 | 76 | 51 | 127 |
| 66 | 156 | 38 | 16 | 21 | 72 | 109 | 193 | 264 | 138 | 76 | 51 | 131 |
| 67 | 184 | 42 | 19 | 26 | 75 | 114 | 206 | 281 | 146 | 76 | 94 | 153 |
| 68 | 211 | 46 | 21 | 27 | 82 | 125 | 216 | 303 | 149 | 76 | 77 | 176 |
| 77 | 205 | 50 | 22 | 32 | 90 | 136 | 234 | 325 | 171 | 76 | 77 | 180 |
| 97 | 295 | 71 | 31 | 43 | 106 | 158 | 262 | 369 | 195 | 76 | 102 | 258 |
| 98 | 326 | 78 | 36 | 52 | 114 | 169 | 276 | 391 | 207 | 76 | 128 | 296 |
| 99 | 356 | 86 | 40 | 63 | 122 | 180 | 290 | 413 | 219 | 76 | 153 | 333 |

Grid Fan: 1

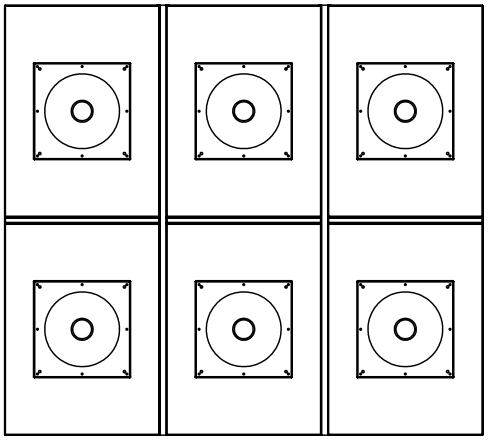
Grid Fan: 2



Grid Fan: 4



Grid Fan: 6



**Pressure Loss of Filters**

In the following diagrams, pressure losses for different kinds of filters used in 39HX series are shown. Diagrams show pressure loss for clean filters. In order to have a realistic condition in selecting fans, both of the clean and dirty filter conditions should be taken into consideration. Following diagrams show pressure drop for different types of filters.

| Design Pressure Drop Across the filters[inWg] | | | | | | |
|---|---|---|---|---|---|---|
| FPM* | LVF-2"-G2 | PLT-G4 | Bag-M5 | Bag-F8 | Bag | HEPA-H14 |
| 200 | 0.03 | 0.11 | 0.12 | 0.24 | 0.39 | 0.96 |
| 250 | 0.04 | 0.13 | 0.16 | 0.30 | 0.49 | 1.14 |
| 300 | 0.05 | 0.16 | 0.21 | 0.36 | 0.58 | 1.32 |
| 350 | 0.06 | 0.19 | 0.26 | 0.42 | 0.67 | 1.49 |
| 400 | 0.07 | 0.22 | 0.31 | 0.48 | 0.77 | 1.65 |
| 450 | 0.09 | 0.26 | 0.37 | 0.54 | 0.86 | 1.81 |
| 500 | 0.10 | 0.30 | 0.43 | 0.60 | 0.95 | 1.97 |
| 550 | 0.12 | 0.35 | 0.49 | 0.67 | 1.05 | 2.12 |
| 600 | 0.14 | 0.40 | 0.55 | 0.73 | 1.14 | 2.27 |

*FPM = Air Flow Rate[CFM] / Face Area of each Filter[Sq. ft]

| Face Velocity [FPM] | Heating Coil Air Pressure Drop [inWg] | | | | Cooling Coil Air Pressure Drop [inWg]* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Row/FPI | | | | | | | | | |
| | 1/8 | 1/12 | 2/8 | 2/12 | 4/8 | 4/12 | 6/8 | 6/12 | 8/8 | 8/12 |
| 200 | 0.02 | 0.05 | 0.02 | 0.05 | 0.09 | 0.11 | 0.13 | 0.16 | 0.15 | 0.21 |
| 250 | 0.04 | 0.07 | 0.04 | 0.07 | 0.13 | 0.17 | 0.19 | 0.24 | 0.23 | 0.32 |
| 300 | 0.06 | 0.09 | 0.06 | 0.09 | 0.18 | 0.23 | 0.26 | 0.33 | 0.32 | 0.44 |
| 350 | 0.08 | 0.12 | 0.08 | 0.12 | 0.23 | 0.29 | 0.34 | 0.43 | 0.40 | 0.56 |
| 400 | 0.10 | 0.15 | 0.10 | 0.15 | 0.28 | 0.36 | 0.42 | 0.54 | 0.50 | 0.70 |
| 450 | 0.13 | 0.18 | 0.13 | 0.18 | 0.34 | 0.43 | 0.51 | 0.65 | 0.59 | 0.84 |
| 500 | 0.16 | 0.22 | 0.16 | 0.22 | 0.40 | 0.51 | 0.60 | 0.77 | 0.69 | 0.99 |
| 550 | 0.19 | 0.26 | 0.19 | 0.26 | 0.46 | 0.60 | 0.70 | 0.90 | 0.80 | 1.15 |
| 600 | 0.22 | 0.30 | 0.22 | 0.30 | 0.53 | 0.68 | 0.80 | 1.03 | 0.91 | 1.32 |

* In case of high wet bulb temperature multiply with 1.5

| Sections Face Area[sq. ft] | | | | | |
|---|---|---|---|---|---|
| AHU Size | LVF | PLT | Bag | Coil | HEPA |
| 22 | 6.8 | 3.7 | 4.0 | 2.1 | 3.7 |
| 23 | 10.1 | 5.7 | 6.0 | 3.9 | 5.7 |
| 33 | 15.1 | 8.5 | 9.0 | 5.8 | 8.5 |
| 34 | 20.3 | 11.5 | 12.0 | 8.3 | 11.5 |
| 35 | 25.2 | 14.1 | 15.0 | 10.8 | 14.1 |
| 44 | 27.0 | 15.1 | 16.0 | 11.1 | 15.1 |
| 45 | 33.5 | 18.8 | 20.0 | 14.4 | 18.8 |
| 46 | 40.6 | 22.7 | 24.0 | 18.1 | 22.7 |
| 47 | 47.1 | 26.4 | 28.0 | 21.4 | 26.4 |
| 55 | 42.0 | 23.5 | 25.0 | 18.1 | 23.5 |
| 56 | 50.7 | 28.2 | 30.0 | 22.6 | 28.2 |
| 57 | 58.8 | 33.2 | 35.0 | 26.7 | 33.2 |
| 66 | 60.8 | 33.8 | 36.0 | 29.3 | 33.8 |
| 67 | 70.6 | 39.6 | 42.0 | 34.8 | 39.6 |
| 68 | 81.0 | 45.1 | 48.0 | 40.6 | 45.1 |
| 77 | 82.4 | 46.4 | 49.0 | 40.1 | 46.4 |
| 97 | 118.2 | 66.6 | 70.1 | 59.4 | 66.6 |
| 98 | 135.1 | 75.2 | 80.1 | 67.3 | 75.2 |
| 99 | 152.0 | 84.6 | 90.1 | 75.2 | 84.6 |

**Size Selection**

Central station air handling unit selection usually starts with required airflow and preferred coil face velocity. Use the following formula to estimate the coil face area:

Coil Face Area (square feet) =

$$\frac{\text{Air volume flow rate (CFM)}}{\text{coil face velocity (fpm)}}$$

Use the following table to find the preferred unit size that has the suitable coil face area. To prevent moisture carry over for aluminum, copper and E-Coated fins use 550, 450, 400 as face velocity limit respectively otherwise use drift eliminator.

Example:

Given Data:

- Air Volume Rate: 14200 CFM
- Desired Coil Face Velocity: 475 fpm
- Sections: Aluminum filter, Bag (ePM10-90%), Cooling Coil, and Heating Coil
- External Pressure Drop: 0.9 inWg

$$\text{Coil Face Area} = \frac{14200}{475} = 29.9 \text{ (sq.ft.)}$$

According to table 1, AHU size 66 has 29.3 sq. ft. so coil face velocity is equal to 485 fpm. You can read following information from table 1:

Width: 1930 mm, Height = 2195 mm
Air Discharge Size = 905 mm

Form table 2, you can extract configuration Number and length.

Config. No. = 334, Length = 4663 mm

So the AHU model number is 39HX33466. This model does not include HEPA Filter therefore lookup weight in table 4. Note that in this table heating and cooling coil are considered 1 and 6 rows, respectively. Weight of 39HX33466 = 2069 kg. In case of coil's update, use table 5 for modification of unit weight.

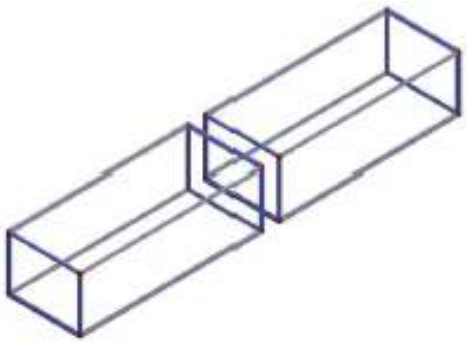
**2.1 Casing**

The 39HX series have a frame, made from hollow aluminum profile with two chambers that are joined together. Aluminum profiles in 39HX series have the following specifications:

Thermal break profile which reduces the cold and heat transfer between inner and outer area.

Using a single profile for each chamber reduces the possibility of leakage and contaminant entrance.

Having curved inner surfaces eliminates the accumulation of dusts and contaminants within the air handling units and makes cleaning easier.



Two Chambers of Casing with Continuous Profiles

The profile holds a 42 mm dual-skin casing wall with panels, doors, inspection hatches and removable center posts. The standard casing wall construction of 39HX series consists of 1mm internal and 1.5 mm external plates made of galvanized steel. The XPS (Extruded Polystyrene) insulation inserted between the skins of the panels is non-flammable and also has acoustic and thermal insulating properties.

As various markets have different requirements, there are also versions with different plate materials, such as stainless steel.

The casing of 39HX series achieves a great mechanical performance when measured against Eurovent test standards of EN1886:2007. Mechanical characteristics of the 39HX series are listed in the following table:

| Unit | Mechanical Strength | Body Sealing | Thermal Transmission | Thermal Bridging |
|---|---|---|---|---|
| 39HX Series | D1 | L1 | T2 | TB2 |

**2.2 Filters**

People spend on average up to 90% of their life indoors not only at home, but also in various places such as offices, schools, restaurants, shopping malls or cinemas. It goes without saying that having a clean indoor air is crucial for the health of the population as a whole and in particular vulnerable groups such as babies, children, patients and elderly people.

Numerous studies have proven a close correlation between Indoor Air Quality (IAQ) and our health. These also show that particular matter (PM) affects people more than any other pollutants. Air filters play an essential role in all kinds of indoor climate areas. Applying correctly selected, efficient air filters in ventilation systems can significantly reduce the amount of particle matters. It also has a strong impact on the energy performance of buildings as well as air handling units.

**Standards for Coarse and Fine Dust Filters**

There are two European standards defining the filtration performance of filters for general ventilation. The well-known EN 779:2012 and the new global standard EN ISO 16890:2016. Both standards Deal with the evaluation of the filtration effect of coarse and fine dust filters used in general ventilation. Yet, in EN 779:2012 the efficiency classification for medium and fine filters is based on 0.4µm particles, while EN ISO 16890 defines the efficiency for various fractions of particle size, namely: PM10, PM2.5, PM1, and coarse dust, where PM stands for Particulate Matter.

The ISO 16890 test standard has been valid for the classification of air filters since January 2017 and, since August, also as DIN EN ISO 16890:2017. Since July 2018, it has completely replaced the previous industry standard EN 779. The advantage of ISO 16890 is that filter efficiency is determined realistically, which reflects the overall dust classification system recommended by the World Health Organization (WHO). This makes the selection of the best possible filters for different requirements much easier.

**EN 779:2012 Standard**

In many countries in the world, the coarse and fine dust filters used in air-conditioning and ventilation systems are usually selected in accordance with the classification described in the EN 779 standard entitled "particulate air filters for general ventilation". The methodology described in this standard is based on a laboratory test procedure, with the aim of achieving reproducible and comparable results. However, since the test aerosols and test dusts used will not usually resemble the air pollutants that an air filter is exposed to in actual operation, the results of the laboratory test are transferable to actual applications only with very restricted relevance.

For coarse filters, the filter effect is evaluated by measuring initial gravimetric arrestance when challenging the filter with synthetic test dust using ASHRAE test dust. For fine filters, the filter effect is evaluated by measuring the efficiency against 0.4µm DEHS droplets. The classification of classes defined in EN779:2012 is shown in the following table:

| Coarse | Class | Final pressure drop (pa) | Average arrestance (Am*) of synthetic dust | Average efficiency (Em**) of 0.4 µm particles (%) | Minimum efficiency (Em) of 0.4 µm particles (%) |
|---|---|---|---|---|---|
| Filter Group | G1 | 250 | 50≤Am<65 | - | - |
| | G2 | 250 | 65≤Am<80 | - | - |
| | G3 | 250 | 80≤Am<90 | - | - |
| | G4 | 250 | 90≥Am | - | - |
| Medium | M5 | 450 | - | 40≤Em<60 | - |
| | M6 | 450 | - | 60≤Em<80 | - |
| Fine | F7 | 450 | - | 80≤Em<90 | 35 |
| | F8 | 450 | - | 90≤Em<95 | 55 |
| | F9 | 450 | - | 95≥Em | 70 |

This standard evaluates the filtration efficiency for the particle size of 0.4µm. However, the particle spectrum in the outdoor air is much wider. This means that a large proportion of the hazardous particulate matter is not taken into account during the measurement process of this standard.

**ISO 16890 Standard**

In contrast to EN 779, the test procedure according to ISO 16890 is much more differentiated and is based on the local air quality of the respective process site. Unlike the old standard, the filters are rated in the test according to a broad particle range of 0.3-10 microns. This is derived from the typical dispersion densities of urban and rural regions. The advantage is that the filter takes into account the actual particle sizes prevailing the air. The filters are classified according to the Particulate Matter classes PM1, PM2.5, PM10, and coarse dust (ISO coarse). The ISO 16890 standard thus uses the same evaluation parameters as the World Health Organization (WHO) uses for measurement. For coarse filters, the filter effect is evaluated by measuring the initial gravimetric arrestance when challenging the filter with synthetic test dust using AC-fine test dust. For fine filters, the fractional efficiency is measured in the range of 0.3 to 10µm particle diameter. The following picture shows a comparison between different particulate matter sizes.


To be assigned to a specific particulate matter group in this standard, filter needs to retain at least 50 percent of the corresponding particle size range. Filter that capture less than 50 percent of PM10 particles are designated as coarse dust filters. The efficiency of the filter is given in down-rounded 5-percent increments. A filter that captures 87 percent of PM1 particles is thus classified as ISO ePM1 85%, where the “e” stands for “efficiency”. The following table shows particulate matter size classification.

| Particulate matter size classification according to ISO 16890 | | |
|---|---|---|
| **Classes** | **Particulate Matter Diameter** | **Minimum Efficiency** |
| ISO ePM1 | 0.3<x<1 | e(PM1), min≥50% |
| ISO ePM2.5 | 0.3<x<2.5 | e(PM2.5), min≥50% |
| ISO ePM10 | 0.3<x<10 | e(PM10), min≥50% |
| ISO coarse | 0.3<x<10 | e(PM10), min≤50% |

The direct conversion of EN 779 and ISO 16890 classes is not possible. To facilitate an indicative comparison, particularly for the purpose of replacing existing filters, the Eurovent Association has developed the following table matching both EN 779 and ISO 16890 classes for the same filters.

| EN 779:2012 | ISO 16890 Range of actual measured average efficiencies | | |
|---|---|---|---|
| **Filter Class** | **$ePM_1$** | **$ePM_{2.5}$** | **$ePM_{10}$** |
| M5 | 5% - 35% | 10% - 45% | 40% - 70% |
| M6 | 10% - 40% | 20% - 50% | 60% - 80% |
| F7 | 40% - 65% | 65% - 75% | 80% - 90% |
| F8 | 65% - 90% | 75% - 95% | 90% - 100% |
| F9 | 80% - 90% | 85% - 95% | 90% - 100% |

**Standard for High Efficiency Air Filters (EPA, HEPA, ULPA)**[1]

When the very highest levels of air purity are required - for example clean rooms for the pharma or food industries, or in hospital operating theatres - EPA, HEPA, and ULPA filters are the solution. These filters are classified based on the values for local particle collection efficiencies (local values) and integral efficiency (integral value). Each is assessed on the basis of the most penetrating particle size (MPPS). For the classification of EPA filter, a leak testing is not possible and not necessary. Therefore, no local values as leak detection limits are given for this group.

To test the filter element, it is subjected to a constant airflow from an aerosol with an

1 EPA: Efficient Particulate Air filter
HEPA: High Efficiency Particulate Air filter ULPA: Ultra Low Penetration Air filter

average particle size which corresponds to the hardest particle size to capture (MPPS: Most Penetrating Particle Size). Using movable probes, local particle concentrations are measured on the downstream side, which give together with the particle concentrations measured on the upstream side the result for the local penetration and the local collection efficiencies, respectively. The integral efficiency is calculated by averaging the local results.

| Filter Group | Class | MPPS* integral Values | | MPPS Local Values | |
|---|---|---|---|---|---|
| | | Efficiency(%) | Penetration(%) | Efficiency(%) | Penetration(%) |
| EPA | E10 | 85 | 15 | - | - |
| | E11 | 95 | 5 | - | - |
| | E12 | 99.5 | 0.5 | - | - |
| HEPA | H13 | 99.95 | 0.05 | 99.75 | 0.25 |
| | H14 | 99.995 | 0.005 | 99.975 | 0.025 |
| ULPA | U15 | 99.9995 | 0.0005 | 99.9975 | 0.0025 |
| | U16 | 99.99995 | 0.00005 | 99.99975 | 0.00025 |
| | U17 | 99.999995 | 0.0000 | 99.9999 | 0.0001 |

***MPPS: Most Penetrating Particle Size**

An important issue for filters used in air handling units beside their permeability is their installation to the inner surface of the air handling unit. If proper sealing is not provided between the filter frame and inner surface of the air handling unit, air shall penetrate through the holes it can find and prevent the filter from operating efficiently. On this issue, there is a filter bypass leakage classification as per EN1886 that measures the efficiency of the installation and is shown in table blow. This table lists the total admissible bypass leakage k in % of the design air flow over the filters as a function of the built-in filter class. The standard slide-in construction for filters in 39HX series is suitable for filter class F9.

| Maximum filter bypass leakage allowed as per EN1886-2007 | | | | | |
|---|---|---|---|---|---|
| Filter Class | G1-F5 | F6 | F7 | F8 | F9 |
| Total bypass leakage k% | 6 | 4 | 2 | 1 | 0.5 |

A wide variety of filter types is available to meet any filtration requirements, including low velocity filter, pleated filter, bag filter, HEPA filter and other types. Filters are divided into categories as per their particle permeability, material structures, intended uses and their placing inside the air handling unit.

## Low Velocity Filter (LVF)

Low Velocity Filters (Metal Filters) are washable and consist of multi-layered aluminum flat wire. These filters are arranged in v-bank housing which increases the filtration area. Filter class: G2-G3 Filter thickness: 50 mm Filter frame: Galvanized steel

## Bag Filter

Bag filters are arranged vertically and increase the area of filtration. These filters are made of synthetic fibers. Filter category: M5-M6-F7-F8-F9 Bag length: 500 mm Filter frame: Galvanized steel

## Pleated Filter

Pleated filters are made from finely woven synthetic mats. They are mostly used in initial stages of filtration. Filter class: M5, M6 Filter thickness: 50 mm Filter frame: Galvanized steel

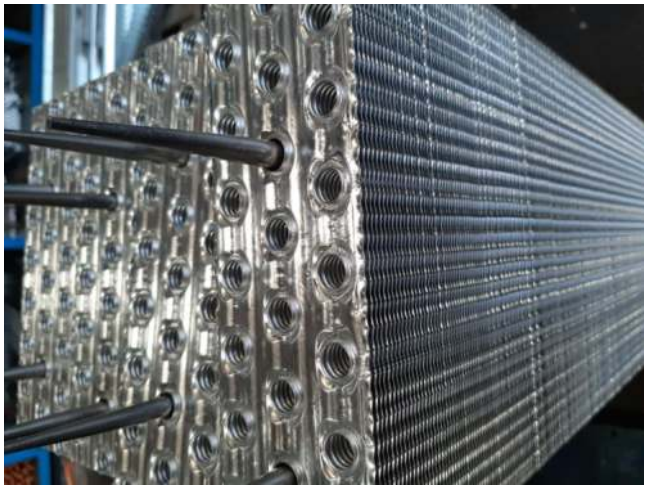
## HEPA Filter

HEPA filters consist of a high-quality fiberglass medium. These filters are used for rooms with extended hygiene requirements. Filter class: H13-H14 Filter thickness: 300 mm Filter frame: Galvanized steel

## 2.3 Coils

Heat exchangers used for heating, cooling and/or dehumidifying the air in HVAC systems are usually of the finned pipe type and they are called as coils. Air to be conditioned that flows outside of the finned pipes contact the fin surface. A heating or cooling fluid is circulated inside the pipes. Coils may be hot water coils, vapor coils, cold water coils, DX coils and electric coils. We manufacture all types of coils in our own coil workshop. 1/2" pipe is used in 39HX air handling unit coils.

All water type coils manufactured are tested with the 30 bar pressurized air test in the water pool inside the factory. Test pressure of DX coils vary as per refrigerant type.



| Physical Data (Chilled Water and Hot Water Coils) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit Size** | **22** | **23** | **33** | **34** | **35** | **44** | **45** | **46** | **47** | **55** | **56** |
| **cfm at 550 FPM** | 1155 | 2145 | 3190 | 4565 | 5940 | 6105 | 7920 | 9955 | 11770 | 9955 | 12430 |
| **Face area (sq.ft)** | 2.1 | 3.9 | 5.8 | 8.3 | 10.8 | 11.1 | 14.4 | 18.1 | 21.4 | 18.1 | 22.6 |
| **Tube Face** | 16 | 16 | 24 | 24 | 24 | 32 | 32 | 32 | 32 | 20/20 | 20/20 |
| **Connection Size(in) Cooling Coil** | 3-in MPT supply and return | | | | | | | | | | |
| **Connection Size(in) Heating Coil** | 2-in MPT supply and return | | | | | | | | | | |

| Physical Data (Chilled Water and Hot Water Coils) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Unit Size** | **57** | **66** | **67** | **68** | **77** | **78** | **71** | **81** | **91** |
| **cfm at 550 FPM** | 14685 | 16115 | 19140 | 22330 | 22055 | 25795 | 32670 | 37015 | 41360 |
| **Face area (sq.ft)** | 26.7 | 29.3 | 34.8 | 40.6 | 40.1 | 46.9 | 59.4 | 67.3 | 75.2 |
| **Tube Face** | 20/20 | 16/36 | 16/36 | 16/36 | 28/32 | 28/32 | 28/32 | 32/36 | 24/24/28 |
| **Connection Size(in) Cooling Coil** | 3-in MPT supply and return | | | | | | | | |
| **Connection Size(in) Heating Coil** | 2-in MPT supply and return | | | | | | | | |

| UNIT SIZE | Circuiting Type | Total Number of TXV's | Coil Section Face Area (sq ft) | Suction Connections Diam (in. OD) | Liquid Refrigerant Diam (in. OD)* |
|---|---|---|---|---|---|
| 22 | Quarter | 2 | 2.1 | 1 | 1/2 |
| | Half | 2 | 2.1 | 1 1/8 | 1/2 |
| | Full | 2 | 2.1 | 1 3/8 | 5/8 |
| 23 | Quarter | 2 | 3.9 | 1 | 1/2 |
| | Half | 2 | 3.9 | 1 1/8 | 1/2 |
| | Full | 2 | 3.9 | 1 3/8 | 5/8 |
| 33 | Quarter | 2 | 5.8 | 1 | 1/2 |
| | Half | 2 | 5.8 | 1 3/8 | 5/8 |
| | Full | 2 | 5.8 | 1 5/8 | 5/8 |
| 34 | Half | 2 | 8.3 | 1 3/8 | 5/8 |
| | Full | 2 | 8.3 | 1 5/8 | 5/8 |
| 35 | Half | 2 | 10.8 | 1 3/8 | 5/8 |
| | Full | 2 | 10.8 | 1 5/8 | 5/8 |
| 44 | Half | 2 | 11.1 | 1 3/8 | 5/8 |
| | Full | 2 | 11.1 | 1 5/8 | 5/8 |
| 45 | Half | 2 | 14.4 | 1 3/8 | 5/8 |
| | Full | 2 | 14.4 | 1 5/8 | 5/8 |
| 46 | Half | 2 | 18.1 | 1 3/8 | 5/8 |
| | Full | 2 | 18.1 | 1 5/8 | 5/8 |
| 47 | Half | 2 | 21.4 | 1 3/8 | 5/8 |
| | Full | 2 | 21.4 | 1 5/8 | 5/8 |

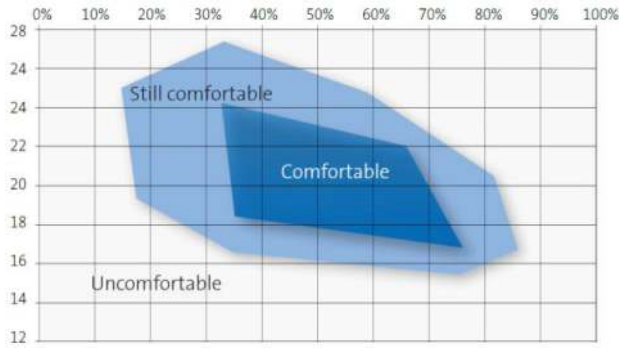
| UNIT SIZE | Circuiting Type | Total Number of TXV's | Coil Section (Upper / Lower) | Face Area (sq ft) | Suction Connections Diam (in. OD) | Liquid Refrigerant Diam (in. OD)* |
|---|---|---|---|---|---|---|
| 55 | Half | 4 | U | 9.05 | 1 1/8 | 5/8 |
| | | | L | 9.05 | 1 1/8 | 5/8 |
| | Full | 4 | U | 9.05 | 1 3/8 | 5/8 |
| | | | L | 9.05 | 1 3/8 | 5/8 |
| 56 | Half | 4 | U | 11.3 | 1 1/8 | 5/8 |
| | | | L | 11.3 | 1 1/8 | 5/8 |
| | Full | 4 | U | 11.3 | 1 3/8 | 5/8 |
| | | | L | 11.3 | 1 3/8 | 5/8 |
| 57 | Half | 4 | U | 13.35 | 1 1/8 | 5/8 |
| | | | L | 13.35 | 1 1/8 | 5/8 |
| | Full | 4 | U | 13.35 | 1 3/8 | 5/8 |
| | | | L | 13.5 | 1 3/8 | 5/8 |

| UNIT SIZE | Circuiting Type | Total Number of TXV's | Coil Section (Upper / Lower) | Face Area (sq ft) | Suction Connections Diam (in. OD) | Liquid Refrigerant Diam (in. OD)* |
|---|---|---|---|---|---|---|
| 66 | Half | 4 | U | 9 | 1 1/8 | 5/8 |
| | | | L | 20.3 | 1 3/8 | 5/8 |
| | Full | 4 | U | 9 | 1 3/8 | 7/8 |
| | | | L | 20.3 | 1 5/8 | 7/8 |
| 67 | Half | 4 | U | 10.8 | 1 1/8 | 5/8 |
| | | | L | 24 | 1 3/8 | 5/8 |
| | Full | 4 | U | 10.8 | 1 3/8 | 7/8 |
| | | | L | 24 | 1 5/8 | 7/8 |
| 68 | Half | 4 | U | 12.5 | 1 1/8 | 5/8 |
| | | | L | 28.1 | 1 3/8 | 5/8 |
| | Full | 4 | U | 12.5 | 1 3/8 | 7/8 |
| | | | L | 28.1 | 1 5/8 | 7/8 |
| 77 | Half | 4 | U | 18.7 | 1 3/8 | 5/8 |
| | | | L | 21.4 | 1 3/8 | 5/8 |
| | Full | 4 | U | 18.7 | 1 5/8 | 7/8 |
| | | | L | 21.4 | 1 5/8 | 7/8 |
| 97 | Half | 4 | U | 27.7 | 1 3/8 | 5/8 |
| | | | L | 31.7 | 1 3/8 | 5/8 |
| | Full | 4 | U | 27.7 | 1 5/8 | 7/8 |
| | | | L | 31.7 | 1 5/8 | 7/8 |
| | Double | 8 | U | 27.7 | 1 5/8 | 1 1/8 |
| | | | L | 31.7 | 1 5/8 | 1 1/8 |
| 98 | Half | 4 | U | 31.7 | 1 3/8 | 5/8 |
| | | | L | 35.6 | 1 3/8 | 5/8 |
| | Full | 4 | U | 31.7 | 1 5/8 | 7/8 |
| | | | L | 35.6 | 1 5/8 | 7/8 |
| | Double | 8 | U | 31.7 | 1 5/8 | 1 1/8 |
| | | | L | 35.6 | 1 5/8 | 1 1/8 |
| 99 | Half | 6 | U | 23.75 | 1 3/8 | 5/8 |
| | | | U | 23.75 | 1 3/8 | 5/8 |
| | | | L | 27.7 | 1 3/8 | 5/8 |
| | Full | 6 | U | 23.75 | 1 5/8 | 7/8 |
| | | | U | 23.75 | 1 5/8 | 7/8 |
| | | | L | 27.7 | 1 5/8 | 7/8 |
| | Double | 12 | U | 23.75 | 1 5/8 | 1 1/8 |
| | | | U | 23.75 | 1 5/8 | 1 1/8 |
| | | | L | 27.7 | 1 5/8 | 1 1/8 |

## 2.4 Humidifier

Humidifier is one of the most important and critical components of the air handling unit. By heating outside air during the cold season, humidity indoors can be lowered to below 30% RH. Persons who are exposed to such dry room air over a longer period then often suffer from drying phenomena. So, adequate humidification during the heating period therefore leads to comfortable room air quality and is conductive to health.

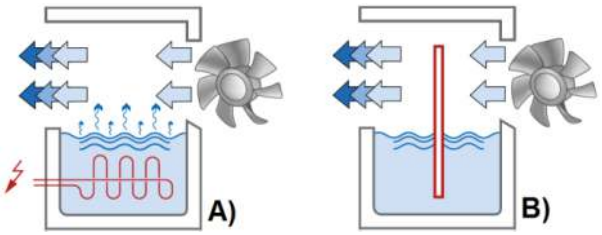
The following picture shows comfort diagram based on relative humidity and temperature.




Comfort Diagram

Generally, there are two types of humidifiers for air handling units, and they are distinguished according to their function.

Adiabatic humidifiers, such as evaporative humidifiers and high pressure spray humidifiers are characterized by an almost isenthalpic state change. These humidifiers include evaporative and high pressure spray humidifiers. Other humidifiers used in air handling units, such as steam humidifiers, are isothermal humidifiers.




Schematic Principle of A) Steam and B) Adiabatic Humidifier

It is very important that length of humidifier section is sized properly to prevent drift of water drops to the components after the humidifier. Also, the drain pan and the draining of the water shall be considered with care as it is cell that contains water and steam. Materials used in the drain pan of 39HX series are selected carefully in order to prevent corrosion and any possible contaminant accumulation.

For reason of hygiene, only steam humidifiers are to be used in operating departments (DIN1946-4).

## 2.5 Fans

Most of the energy consumed by an air handling unit is the electricity used to run the fan motor, whilst only a small percentage of the energy goes to heat generation. Therefore, high fan efficiency means power saving.

Free running impellers with EC or AC external rotor motors are particularly characterized by their high power-to-weight ratio in conjunction with the compact drive concept. With no belts or sheaves, and fewer bearings, these fans are more reliable and require less maintenance than belt-drive fans. Direct drive enables this fan type to be used in a wide variety of applications in accordance with hygiene requirements (DIN 1946, VDI 6022). Plug fans provide the following advantages:

- Very compact length
- It is possible to combine several fans in parallel making a fan array
- Direct drive, no power losses due to a belt drive
- No belt abrasion, suitable for hygiene applications
- Low maintenance and easy cleaning

Direct drive AC plug fan

Sarma-Afarin hygienic air handling units include multiple AC or EC plug fan assemblies arranged in a fan array. Fan arrays provide the following advantages:

- Increased redundancy in the event of fan failure
- More homogenous flow pattern through the coils and better flow distribution
- Better sound spectrum that is easier to attenuate with conventional insulated ductwork
- Less AHU unit length and footprint than units incorporating large single fan/motor designs
- Standardization of components reduces inventory requirements, facilitates prompt identification and replacement, and provides for ease of service
- Reduced maintenance scope and cost as components are smaller and easier to handle and transport in the event replacement is required. All fans incorporate sealed for life bearings and eliminate maintenance and alignment issues associated with belt and pulley drive systems
- Great for retrofit applications
- Where (optional) backdraft dampers are installed, the ideal quantity of fans only need to be enabled during after-hours use, to ensure efficient operation without risk of instability

## 3.1 Applications with Extended Hygiene Requirements

When air handling units are used in hospitals, pharmaceutical plants or special industrial facilities, they shall provide some hygiene standards according to the site that they shall be conditioning the air inside. These standards may vary from one room of the site to another. For example, in a hospital even the operating rooms may have different requirements as per the type of operation to be performed. While many air handling unit manufacturers offer hygienic air handling units as a different series, Sarma Afarin 39HX air handling units can be manufactured to meet the hygiene standards by the specifications that can be selected from the selection software as they are full flexible units. In the 39HX series with extended Hygiene requirements, a stage of filtration with HEPA filters is included at the end of the air handling unit. Moreover, Hygiene requirements are observed at the highest level according to the available standards.

Although hygiene criteria varies as per the criteria of the relevant sites, we have observed the hygiene criteria as below, which are in conformity with EN1886, EN13053, EUROVENT (RS 6/C/011-2017), DIN1946-4, and VDI6022 standards. In the following Tables, hygiene criteria that are observed in the 39HX series with extended hygiene requirements are listed:

| Casing and Panels | Standard(s) |
|---|---|
| Panel/profile connections without drilling the panel body | EUROVENT |
| Thermal Bridging TB2 | EN1886, EUROVENT |
| Casing strength D1 | EN1886 |
| Thermal transmittance T2 | EN1886 |
| Casing air leakage L1 | EN1886, EUROVENT |
| Filter bypass leakage F9 | EN1886 |
| Lower parts of the casing which could potentially be in contact with condensation water are made of stainless steel | DIN1946-4, EUROVENT |
| Completely smooth interior surfaces without sharp edges | DIN1946-4, EUROVENT |

| Coils and Humidifier | Standard(s) |
|---|---|
| Minimum thickness of 0.004 mm for fins | EUROVENT |
| The distance between the fins is 2mm | EUROVENT, EN13053 |
| All drain pans and condense trays have a sufficient slope and are made of stainless steel | EUROVENT, VDI6022, DIN1946-4 |
| For reason of hygiene, only steam humidifiers are used | DIN1946-4 |
| For hygiene reasons, coolers with dehumidification and | EUROVENT, DIN1946-4, |
| humidifiers are not arranged immediately before air filters | VDI6022 |

| Filters and Fans | Standard(s) |
|---|---|
| Filters are installed near the outdoor air suction opening and at the end of the air handling unit | DIN1946-4, EUROVENT |
| Air filters are changeable from dusty air side | DIN1946-4, EUROVENT, VDI6022 |
| The use of air filters of higher classes is recommended for hygiene reasons | VDI6022 |
| Each filter stage is equipped with a differential-pressure gauge | VDI6022, EUROVENT |
| No recirculated air is allowed | EUROVENT |
| For hygiene reasons, fans without spiral casing and belt-drive are used (EC plug fans) | EUROVENT, DIN1946-4 VDI6022 |

# REMOTE MONITORING SYSTEM

The remote monitoring system is provided by Sarmaafarin on its chillers and packages on request of customers. By directly connecting the monitoring system to the main control unit, all information and alarms can be transmitted to any location via a fixed connection line. Real time monitoring of operating conditions on installed units, recording of data in abnormal situations, maintenance management and setting desired temperature in the home from a smart phone, are just some of many opportunities provided to designers and users of home systems at any time and from anywhere. Storing customer information for at least one year has a significant impact on the proper functioning and operational life of the system, making it easier to maintain the system.


## Features and Benefits of Monitoring

- Observation of important parameters at any moment
- Displaying the current status of system on a chart based on live data
- Recording important values in the case of abnormal events
- Quick diagnosis of system faults and troubleshooting from anywhere
- Customized pages for the customer
- Selecting important parameters, notifications and warnings by the custom
- Applicable settings via PC or Smart phone
- Different access levels with specific passwords for users
- Collecting and building an annual archive of information

**Selection Software**

Sarma Afarin 39HX Air Handling Unit consists of multiple sections that make it flexible to meet the expectations of a wide range of customers. Sarma Afarin A.H.U. selection software has made it easy for users to select their required sections and see the performance of their air handling unit in advance. The following pictures show some pages of our selection software output.

| General Data | |
|---|---|
| Project Name | SarmaAfarin |
| Customer Name | R&D |
| Letter Date | 1398/09/27 |
| Offer Number | 95151201 |
| Revision | 1.0.0 |
| AHU Type | 39HX |
| With Reference to | |
| To Fulfill | |

| Customer Information | |
|---|---|
| Project City | Tehran |
| Project Address | ----- |
| Customer ID | |
| Contact Tel. | ----- |
| Contact Email | ----- |

| | | |
|---|---|---|
| AHU No./Tag | 1 | 1 |
| Unit Size | 39HX12177 | |

| Customer Request | | |
|---|---|---|
| Air Flow | 24000 cfm | |
| External Pressure Drop | inH2O | |
| Altitude | 5900 ft | |
| Requirement Cooling | 528000 Btuh | |
| Requirement Heating | 432000 Btuh | |
| AHU No./Tag | 1 | 1 |
| Unit Size | 39HX12177 | |

| Coils Inlet Condition | | |
|---|---|---|
| Cooling | Air Temperature Dry / Wet | 80/67 oF |
| | Water Temperature | 44°F |
| | Water Flow Rate | 105.6 gpm |
| Heating | Air Dry Temperature | 68 °F |
| | Water Temperature | 180 °F |
| | Water Flow Rate | 43.2 gpm |
| | Inlet/Outlet Side | Right |

| Cooling Coil (Chilled Water) - Outlet Condition | | |
|---|---|---|
| Specifications (Row/FPI/Fin/Circuit) | 4/8/Aluminium/Full | |
| Total Cooling Capacity / Deviation | 605091.9 Btuh<br>15% | |
| Sensible Cooling Capacity | 526081 Btuh | |
| Leaving Air Temperature Dry / Wet | 61.6/60.9 °F | |
| Leaving Water Temperature | 53.9 °F | |
| Face Area/Face Velocity | 40.1 sq. ft | 599 FPM |
| Pressure Drop Water/Air Side | 37.8/0.606 inH2O | |

| Heating Coil (Hot Water) - Outlet Condition | |
|---|---|
| Specifications (Row/FPI/Fin/Circuit) | 2/8/Aluminium/Full |
| Heating Capacity / Deviation | 925463.6 Btuh<br>1.1e+02% |
| Leaving Air Temperature | 107 oF |
| Leaving Water Temperature | 137 oF |
| Pressure Drop Water/Air Side | 11.8/0.258 inH2O |

| DX Coil | |
|---|---|
| Specifications (Row/FPI) | 4/12 |

## 4.3 Tests

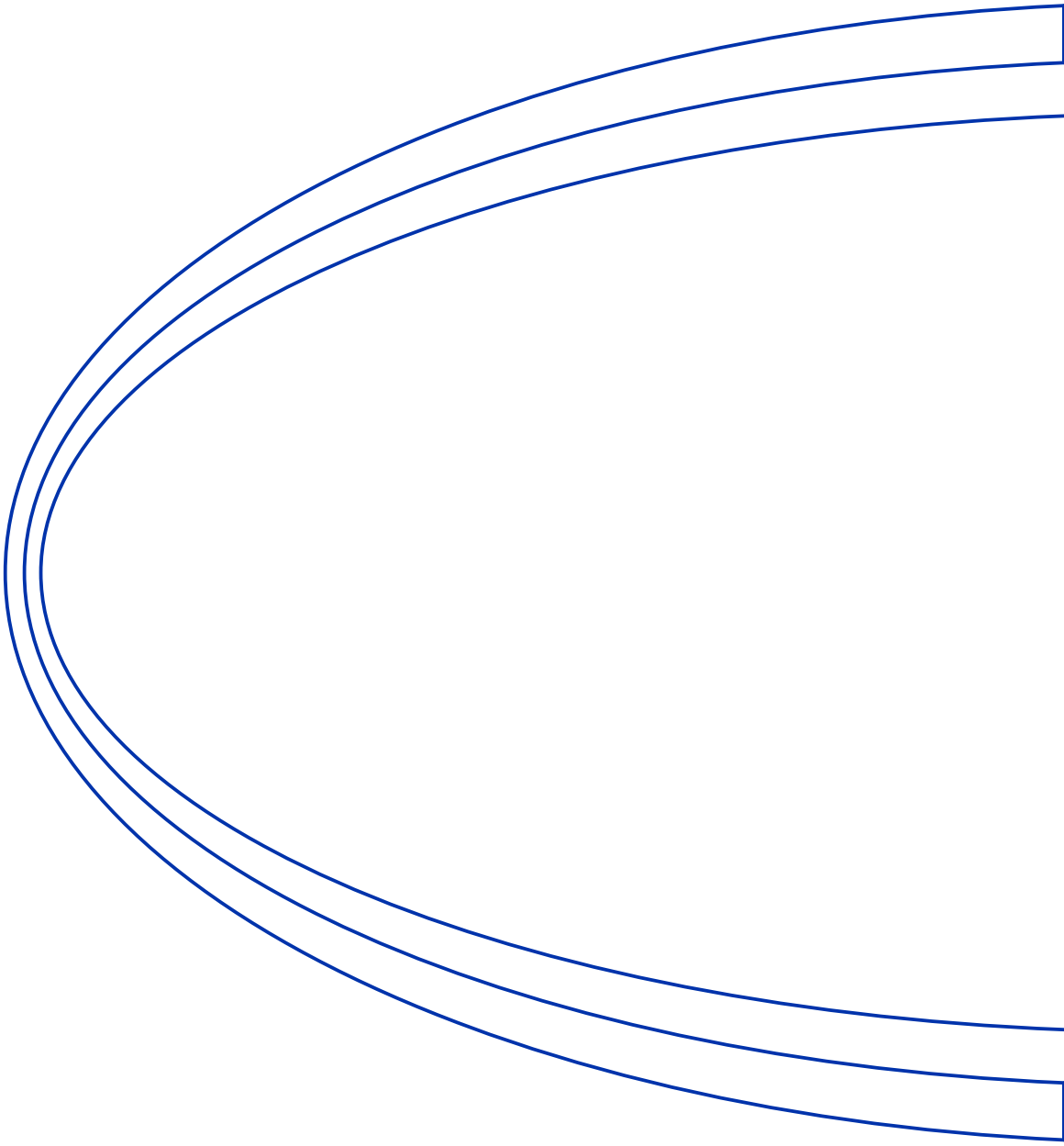
We conduct different types of tests on 39HX air handling units to ensure the trouble-free operation of the units.

Besides the tests required for installation and manufacturing per component (coil leak, fan balancing, noise measurement, etc.) for air handling unit, each unit is also tested for final quality control as a finished product in Sarma Afarin factory.

Sarma Afarin company has a test planning process for each kind of product, which measures all the necessary parameters.

Other than the standard quality control tests, both product development and performance tests may be performed in great details. Pressure Test

Pressure Test of Heat Exchangers




**Sanaye Sarmaafarin Iran**

**شرکت صنایع سرما آفرین ایران**

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**سهروردی شمالی، خیابان خرمشهر، شماره ۱۹۴، تهران - ۱۵۳۷۷، صندوق پستی: ۱۷۹۹-۱۳۱۴۵ تلفن: ۸۸۷۶۲۰۳۸ فاکس: ۸۸۷۶۲۰۳۳**