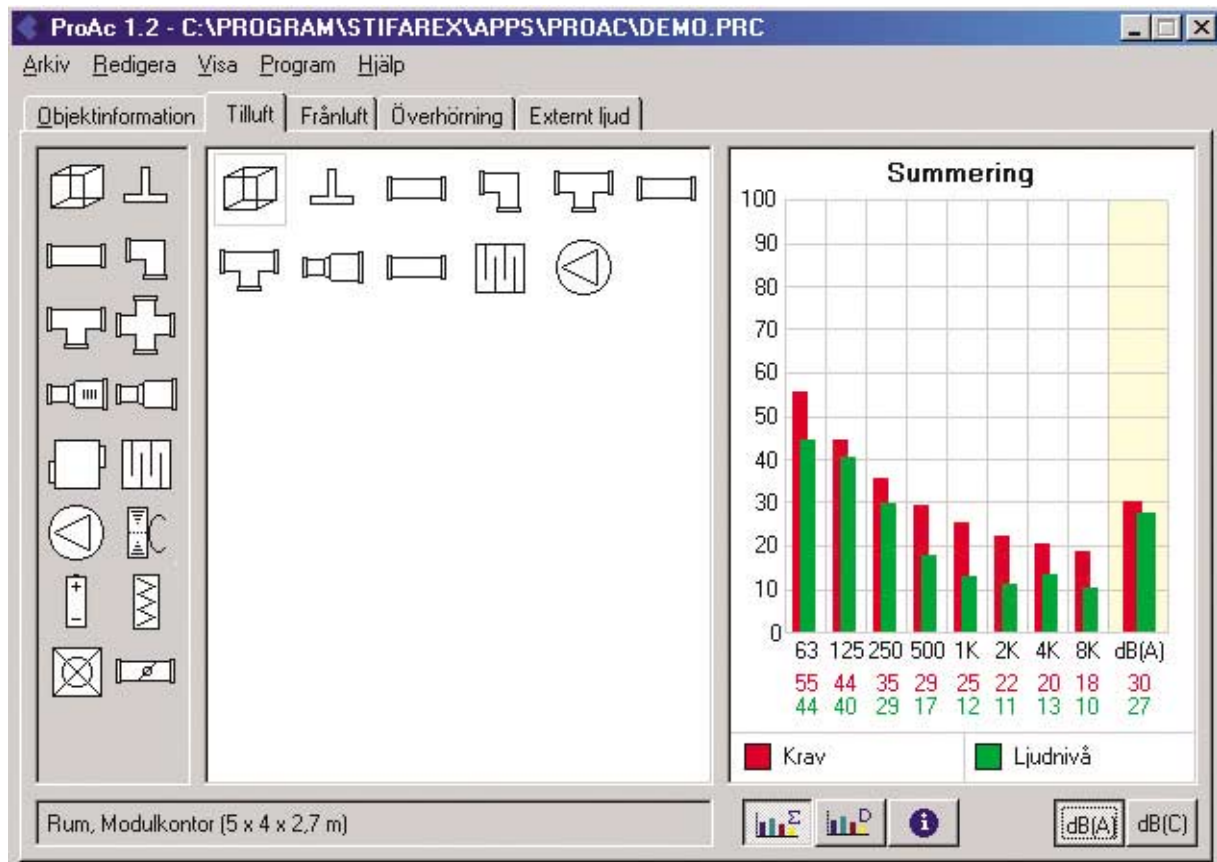




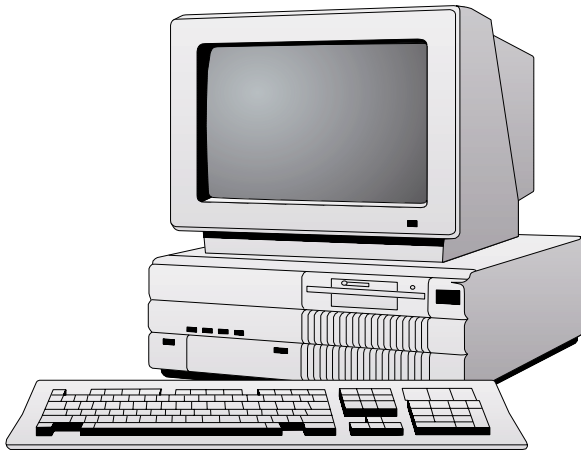
Manual

ProAc 1.2



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The latest version of the program can always be obtained from the Internet and from our website at www.stifarex.se

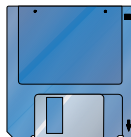


System requirements

- PC- at least 486'a or better
- at least 4mb RAM
- 5mb free space on hard drive for ProAc (12 MB for all programs). See also installation alternatives
- VGA color monitor
- Operating system -
 - Windows 3.1 or later
 - Windows 95
 - Windows NT 3.51 or later

Installation

N.B. All other programs must be shut down before installation, otherwise there may be conflicts between open files that cause the installation to be aborted. All Stifab Farex programs are installed at the same time: ProAc, ProAir and ProClim. Several installation alternatives are available from floppy discs. Complete installation requires up to 12 MB of hard drive space, minimal installation 1.3 MB. This excludes all measurement figures (*.wmf) and product illustrations (*.bmp) and other programs. Insert floppy disc 1 into drive A: (B:), select RUN from Program Manager, browse to the floppy file SETUP.EXE and click OK. Follow instructions on the screen. Updates and information is available from <http://www.stifarex.se>



The hierarchy structure on the right is default:



Printer

ProAc uses those printers already installed in Windows. Line thickness etc has been adapted to different printers' resolution, but can be thin depending on how the printer is installed. Should the text affect the lines in some way or should the lines look strange, one recommendation is to select True-type printout for graphics. The font may be chosen from ProAc: go to File, Settings for printers. Arial is the default setting. Select another font that suits the printer better if necessary.



Starting and operating the program

Starting and operating the program

The program is tested and checked so that the technical air calculations are correct and there are no known viruses on the original floppy discs or CD-ROM. The program used for virus control was SOHPHOS Sweep system for Windows NT with continuous updates.

Stifab Farex cannot be held responsible for the operational security of the program in the computer environment where it is installed.

Start up the program from the program file selected. The first time the program is used, select the language and database file for the desired country. English is the default language on installation.

N.B. When entering numbers with decimal fractions, use the country system defined in Windows settings. For example, the Swedish setting uses a comma to separate decimals from whole numbers.

There are a number of short commandos in the program which follow the Windows standard. Some buttons and cascade menus have certain letters underlined, in which case ALT + letter can be used instead of using the pointer and clicking with the mouse.

All data for printing is sent to the standard printer selected in Windows, but a dialogue box provides the option of changing this setting. If a fax-printer is installed it is possible to fax the pages directly. Save calculations: all calculations, i.e. input data for a room, can be saved to a file name which normally has 8 characters, but avoid åäö as these can give rise to problems.

There are some files in the program hierarchy which allow direct access to word processing programs. We cannot be held responsible for changes or modifications made in these files.

General program information

ProAc is used for calculating sound pressure levels in rooms and externally (outdoors), or for checking cross-talk requirements between rooms.

The program consists of 4 calculation modules (tabs) which can be used independently of each other.

The calculation method always uses the same basic prerequisites and the sound requirements must always be defined (for a room or for an external measurement point), the transition from duct to measurement point (terminal or exterior wall grille) and sound generators (e.g. a fan).

The idea is first to create a duct system with all its component items and then to easily evaluate which components generate or attenuate sound.

The finesse in this program is that all items in the duct system between the fan and the terminal can be described and all duct components are shown together with their sound attenuation (L_d) or sound generation (L_w).

Naturally, ProAc has connections to databases for terminals, ceiling devices and attenuators, which means that most of the input data is readily available.

Direct Sound attenuator selection

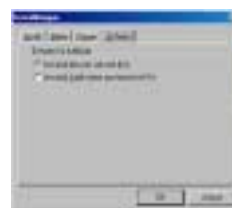
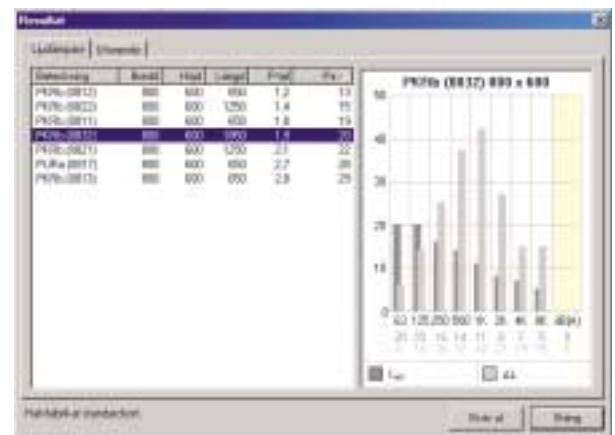
There is also a quick dimensioning module for sound attenuators.

Direct attenuator selection is found under File and with limited input data (airflow and dimensions) this function enables dimensioning of the attenuator regarding sound attenuation, pressure drop and inherent sound generation.

Printouts from selected sound attenuator(s) are available.

Settings

Under File there is the alternative *Settings*, where it is possible to change language, units (l/s or m³/h) and colours.



Object information tab

Fill in the information that is relevant for the object. An almost unlimited number of lines may be written in the field under Notes, but bear in mind that only the first three lines are shown on print-outs.

None of this information is necessary for calculations using ProAc.

Common functioner

The three buttons Summary, Item and Information are common to all the tabs describing the duct system. The appropriate button is selected depending on what information is being searched for.

Under **Summary**, sound levels and requirement levels are obtained for the duct item in question. Normally the values are shown in dB(A), but it is also possible to obtain the equivalent values in dB(C).

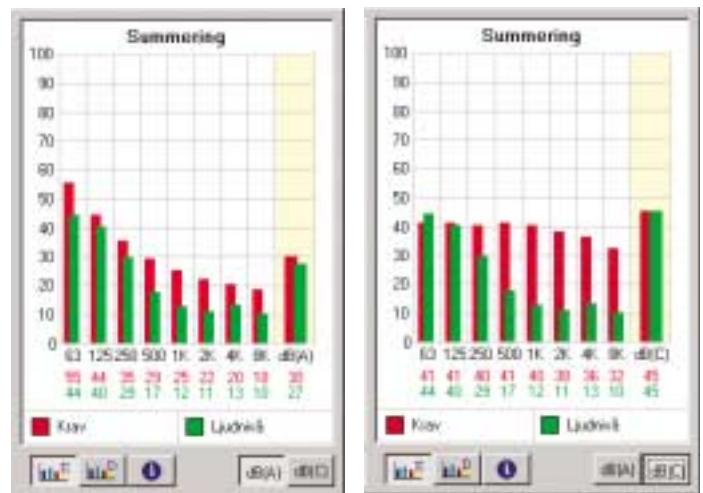
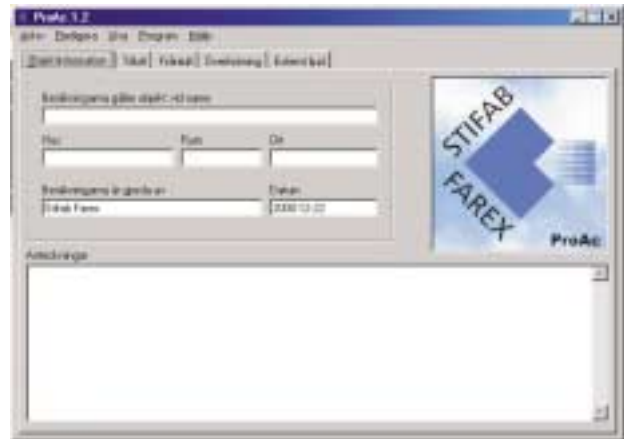
The values are presented graphically in the form of bar charts and numerically in the form of numbers in the various octave bands.

The basic setting in ProAc illustrates sound levels with a green bar and requirement levels to achieve the desired acoustic climate with a red bar. If the sound level exceeds the requirement limit, this is indicated by a red exclamation mark next to the duct items "Room" and "Fan". A red exclamation mark in other places means that unreasonable values have been entered under one or more of the duct items.

The acoustic properties of the separate items are obtained under the Items tab. The data available are sound generation and sound attenuation.

The values are presented graphically in the form of bar charts and numerically in the form of numbers for the different octave bands.

The default setting in ProAc is to illustrate sound generation with a dark grey bar and sound attenuation with a light grey bar..



The **Information** tab provides basic technical air data, plus information regarding measurements and dimensions for each individual item.



Supply Air tab

This makes a calculation of sound levels in a room in terms of the supply air system. The supply air duct system is built up using this program. Characteristics of the *room* are entered in the initial stage of the calculation process, followed by the type of terminal in the room. To simplify the process, there is an icon for room in the program. By double clicking on the desired icon, a dialog box is shown containing the information judged to be relevant for the characteristics of the item. The duct system is constructed in this way with the aid of icons for various duct items, concluding with a fan.

Continuously updated information on sound levels in the room is given during this construction of the duct system.

In those cases where the supply air system is similar to the exhaust air system a great deal of time may be saved by making use of the function "Copy items from supply air system" which is found under "Edit".

Exhaust Air tab

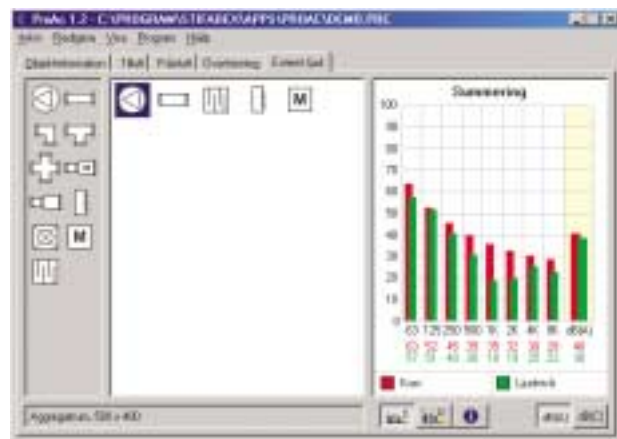
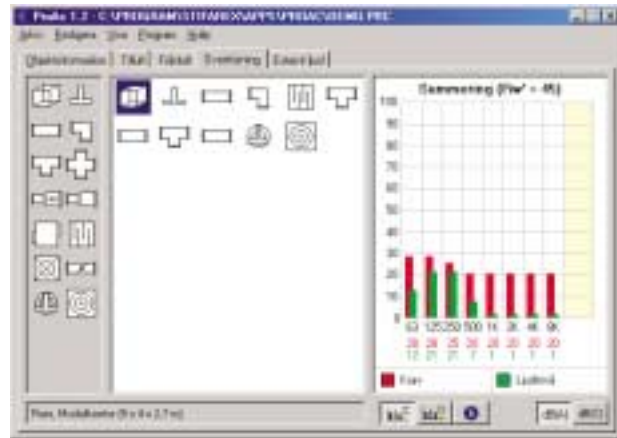
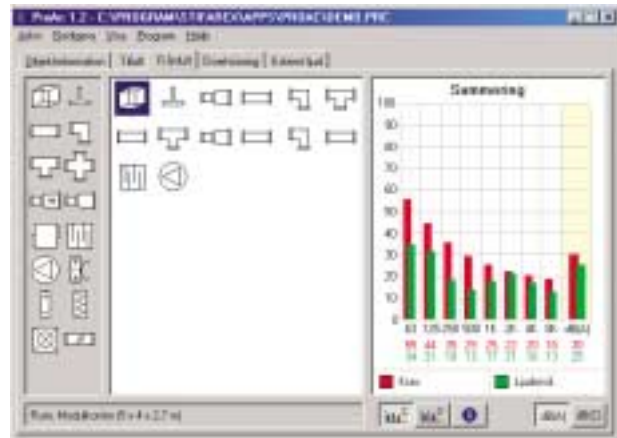
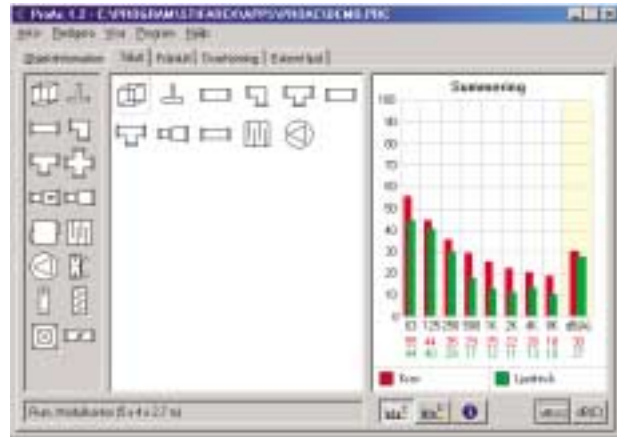
This makes a calculation of the sound level in a room with regard to the exhaust air system. It has the same construction as above under Supply Air. Since the exhaust system is similar to the supply system, much time can be saved by using the function under "Edit/Copy items from supply air system".

Cross-talk tab

This gives two results: calculation of which $R'w_{50-3150\text{ Hz}}$ the duct system corresponds to, as well as a comparison of the sound level from the transmitting room with reference to inherent sound generation in the terminals in the desired room. Terminals in the transmitting room are corrected with regard to orifice damping and the Q factor. The duct system is completed with *Terminal in transmitting room* and *Room with sound source*.

External Sound tab

This makes a calculation of the sound level at a measurement point outdoors with regard to external or expelling air system. Calculations are initiated by firstly stating the properties for the air handling unit, followed by information on the duct system in question. By double-clicking on the desired icon, a dialogue box is shown with the information considered relevant to the properties of the duct item. The duct system is completed with measurement point at a defined distance from the duct inlet or outlet. During the construction of the duct system updated information is continuously obtained regarding the sound level at the measurement point.



ProAC



Duct items

Properties for Room

This duct item is found under the tabs for *Supply air*, *Exhaust air* and *Cross-talk*.

It consists of two sub-tabs:

1. Room

“Type of room” is used to give standard values for the room damping and requirements for the sound level.

The dimensions of the room are defined in metres and the resulting room area and room volume are also shown on *Print out*. If it is wished to use other than standard values for damping, there is the option of “Room damping described as” where the alternatives are undamped, normally damped, hard damped and extremely damped. If detailed knowledge of the room is available, specify the absorption factor directly in figures.

2. Sound requirements

The sound requirements are specified here for the room.

There are various ways of defining the sound requirements (Lk):

- State the total sound requirement in dB(A) and/or dB(C)
- State self-defined sound requirements for each octave band.

When “Type of room” is selected, values for dB(A) and dB(C) are normally suggested. There is usually a difference of 15 db between the dB(A) and dB(C) requirements.

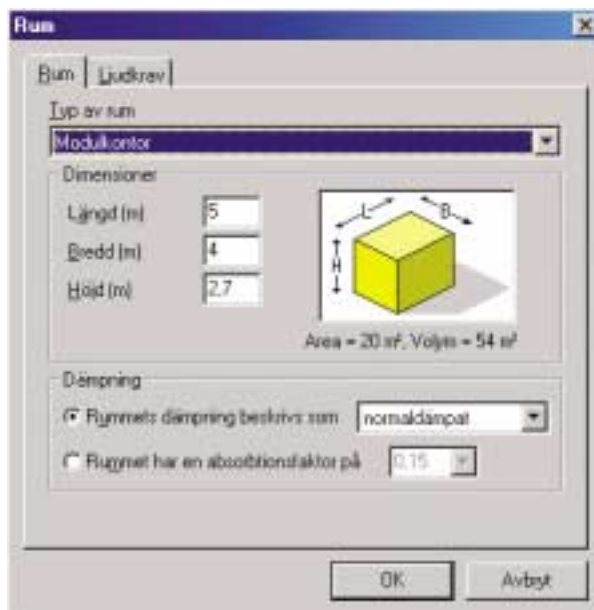
Under “Sound requirements for cross-talk” the requirements for calculations involving cross-talk are defined.

These values have no significance other than in the tab for *Cross-talk*.

“Silent” is the equivalent of 8 dB lower (in every frequency band) than the inherent sound generated in the terminal in the receiver room, i.e. if propagated sound from the transmitter room via the duct is 8 dB lower than that produced by the terminal in every frequency band, it will not be heard.

“Audible” is the equivalent of a sound level as high as the inherent generated sound from the terminal in the receiver room.

Conversation understood is the equivalent of 5 dB higher level than the inherent generated sound from the terminal in the receiver room.



Properties for Terminal and connection

These duct items are found under the tabs *Supply air*, *Exhaust air* and *Cross-talk*.

They consist of three sub-tabs:

1. Terminal

First state the airflow of the terminal in l/s (or m³/h depending on the selection made in *Settings*).

How many terminals (sound sources) with the above stated airflow are in the room? If "Use sound data for existing terminal" is selected, there is the option of selecting terminals from the Stifab Farex range (both supply and exhaust terminals may be chosen from the tab for *Cross-talk*).

By using the relevant button ("Supply terminal" or "Exhaust terminal") a new dialogue box appears for the choice of terminal. Here too it is possible to see a detailed illustration of appearance, a dimensions figure, dimensioning diagrams, sound data and measurements.

Selection of the terminal is started by selecting spread pattern, which then indicates which types of terminal are suitable for the spread pattern stated. Selection of size has probably already been made with the help of ProAir, but if there is any uncertainty the dimensioning figure should be used. After completed selection, the pressure drop is obtained for the selected terminal (indicated for open damper position). If a pressure drop differing from the proposed value is desired, it is possible to change the figure. The relevant damping range is shown in brackets.

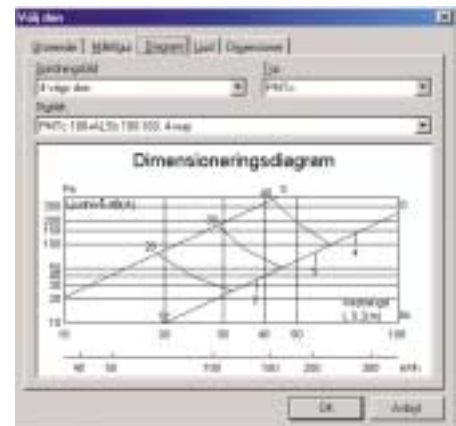
In those cases where a terminal is missing or where other types of terminals are desired, there is the option of saving self-defined types of terminals. By using the button "Browse..." a new dialogue box appears where data for sound generation and sound attenuation can be entered. There is a standard terminal given as an example but the idea behind this box is that users can save data for different types of terminals.

2. Location

The location of the terminal indicates where in the room the terminal is placed. ProAc distinguishes between the following locations:

- Centre of room, freely suspended (spread 360°); Q = 1
- Wall or ceiling, middle of surface (spread 180°); Q = 2
- Wall or ceiling, close to two surfaces (spread = 90°); Q = 4
- Wall or ceiling, close to three surfaces (spread = 45°); Q = 8

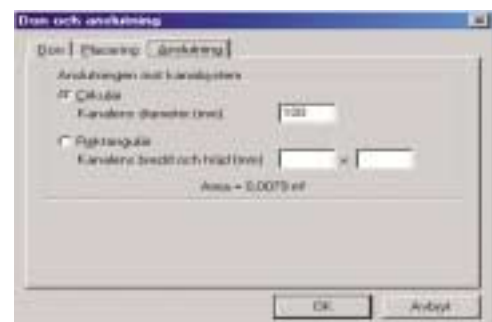
Distance from terminal to point of measurement gives the distance in metres from the sound source (terminal) to the position of the intended measurement point or ear).



Ljudning	
Q1	Q2
Q3	Q4
Q5	Q6
Q7	Q8

3. Connection

Describes how the terminal is connected to the next duct item. Connection measurement are entered in millimetres and can be stated for circular or square ducts. This selection influences the next duct item, which is automatically given the same dimension. The resulting cross-sectional area in square metres.



Propertis for Ducts

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

The only property which can be modified is the duct length in metres. All other properties, e.g. dimensions, are automatically retrieved from the previous duct item.

Propertis for bent duct

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

This duct item has no modifiable properties. Information regarding dimensions or other properties is retrieved automatically from the previous duct item.

Properties for T-duct

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

The two different types of T-duct included are "Connection to main duct" and "Passes branch duct". "Connection to main duct" means that the duct system from the room is connected to a larger main duct. This means that the ProAc program requires information about the connection to the main duct. The main duct may be circular or rectangular in section and dimensions are stated in millimetres.

"Passes a branch duct" means that the duct system from the room is considered to be a main duct and a smaller branch is passed on the way to the fan. The duct dimension is the same before and after. Other dimensions, e.g. airflow, are automatically retrieved from the previous duct item.

Airflow after a T-duct is stated in l/s (or m³/h, depending on the selection made under *Settings*). In order to make clear the two different types of T-duct, the principle is marked with a red dot for each new airflow that is entered.

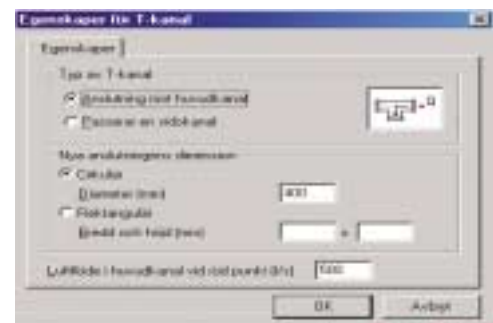
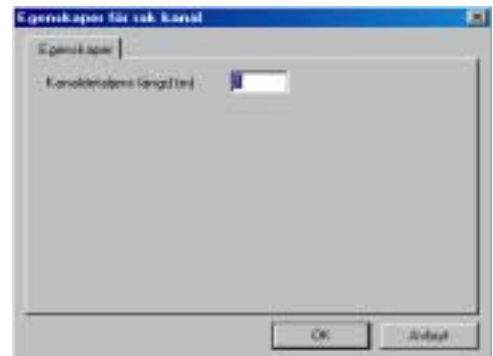
Propertis for X-duct

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

The two different types of X-duct included are "Connection to main duct" and "Passes two branch ducts". "Connection to main duct" means that the duct system from the room is connected to a larger main duct with one further smaller branch close to the connection. This means that the ProAc program requires information about the connection to the main duct. The main duct may be circular or rectangular in section and dimensions are stated in millimetres.

"Passes a branch duct" means that the duct system from the room is considered to be a main duct and a smaller branch is passed on the way to the fan. The duct dimension is the same before and after. Other dimensions, e.g. airflow, are automatically retrieved from the previous duct item.

Airflow after a X-duct is stated in l/s (or m³/h, depending on the selection made under *Settings*). In order to make clear the two different types of X-duct, the principle is marked with a red dot for each new airflow that is entered.



Properties for Air flow changes

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

The only property which can be modified is the duct item's new airflow in *l/s* (or m^3/h , depending on the selection made under *Settings*). All other properties, e.g. dimensions, are automatically retrieved from the previous duct item.

Properties for Dimension changes

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

The only property which can be modified is the duct item's new dimensions in millimetres. As an aid, the cross-sectional area in m^2 is given for the dimension entered. All other properties, e.g. dimensions, are automatically retrieved from the previous duct item.



Properties for Plenum box

This duct item is found under the tabs for *Supply air*, *Exhaust air* and *Cross-talk*.

It consists of three sub-tabs:

1. Properties

The outer dimensions of the plenum box are defined in millimetres. The thickness of the absorption material (glass wool with reinforced surface layer) is stated as well as the proportion of surfaces covered in the plenum box.

2. Inlet/Outlet

The location of the inlet in relation to the outlet has great significance for the sound attenuation (especially in the upper frequencies). The figure shows which number describes the location of the inlet in relation to the outlet. Select the desired location by pointing with the mouse and clicking or via the cascade menu.

3. Connection

This describes how the plenum box is connected to the next duct item. The connection dimension is stated in millimetres and can be entered either as a circular or rectangular duct. This selection controls the dimension of the next duct item, which is automatically given the same dimension. The option of increasing the airflow in *l/s* from the plenum box is also available.



Properties for Sound Attenuators

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

It consists of two sub-tabs:

1. Properties

The different types of sound attenuators that may be selected are circular, MEGA-bend, Maxilow, MEGA attenuators and Hygiene attenuators. By marking the desired type of attenuator, the relevant data for that selected is shown under designation and attenuation. Product designations are shown in alphabetical order and with the smallest dimension first. The list can be sorted into various categories, e.g. connection width (or diameter) or P number by clicking on it. Select the attenuator that provides the required damping by using the button "Suggest" or by analysing the information presented at the bottom of the screen.

-Damping refers to the proportion of damping that the selected attenuator has (see catalogue data).

-Damping requirement corresponds to the difference between the sound requirement (Lk) and sound level (Lp) in a room without a selected attenuator. Negative signs mean that no damping requirement is necessary in that particular octave band.

- "Room" corresponds to the sound level in the room resulting from the selected attenuator (red figures mean that the sound level in the room is higher than sound requirement in the relevant frequency band).

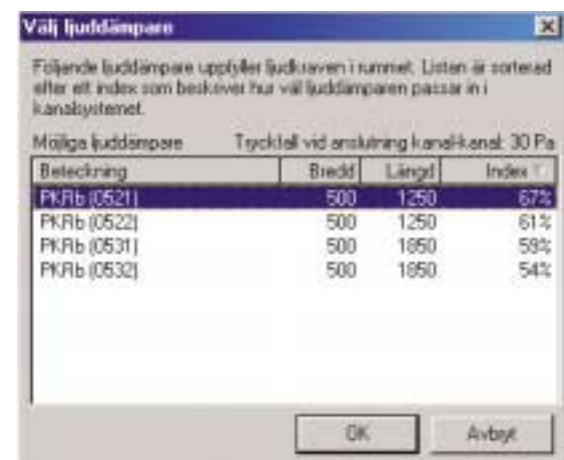
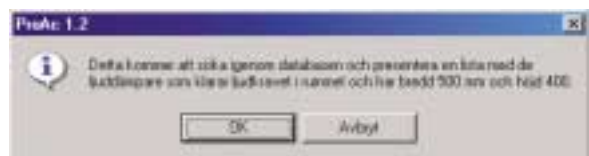
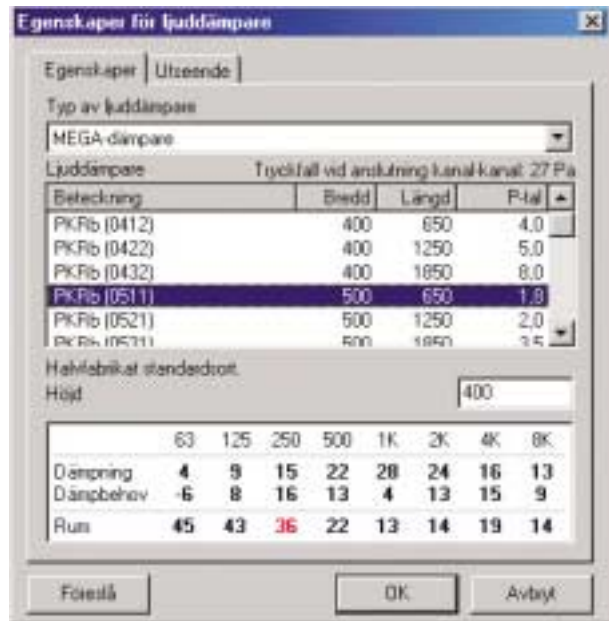
A calculation of the pressure drop through the attenuator in Pascals is made, but it must be emphasized that the figure shown is a result of ideal conditions in terms of straight sections of duct and the shape of the duct system before and after the attenuator. If no pressure drop is calculated then the value is less than 1 Pascal.

The button "Suggest" gives the option of allowing ProAc to make suggestions for which sound attenuators fulfill the sound requirements for the room in question.

The sound attenuator database can be searched with reference to the selected dimensions and desired sound level in the room. The attenuators that fulfill such requirements are shown together with an index that describes how well suited each one is to the system (index 100% means that the attenuator dampens exactly according to the damping requirements in each frequency band).

2. Appearance

Consists of an illustration of the attenuator selected under properties. The illustration is updated if another product code is selected.



Properties for Fan

This duct item is found under the tabs for *Supply air* and *Exhaust air* (plus in *External sound* under the tab for *Air handling unit*).

Information from the supplier of the fan/air unit should preferably be used.

By selecting "As in self-defined sound data" the option to save different types of fans/air handling units is possible. With the help of the button "Browse ..." a new dialogue box is opened where the sound generated from the fan (Lw) can be shown. Check how the air unit manufacturer has chosen to state sound data: for the fan only, or possibly including *filters, heat exchangers, batteries* and so on.

If detailed information is not available for the fan, there is the option of using "As in formula" which provides an estimated value of the sound generation based on total pressure in Pascals, what type of fan blade is used (forward or backward bend) and at what operating point the fan will be working. By operating point is meant efficiency, and the alternatives in the program are unknown, optimal, 10 – 25% of optimal, or between 25 – 50% of optimal.

Properties for self-defined items

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

It enables various types of duct items not already defined in ProAc to be saved.

The name given to the item will be printed out and saved in your personal list for self-defined items. Enter the sound generation (Lw) and attenuation (Ld) for each frequency band. Should it be desired to remove a saved duct item, the button "Delete" will erase the duct item from your personal list.

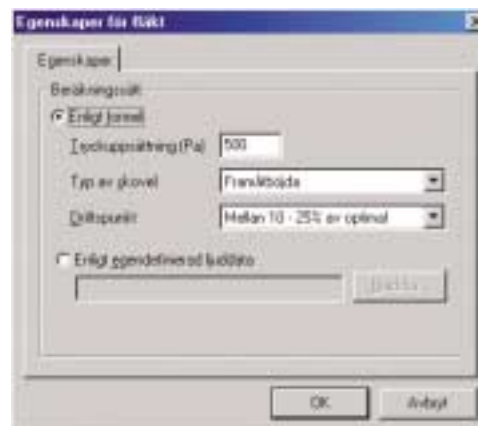
Properties for Damper

This duct item is found under the tabs for *Supply air*, *Exhaust air* and *Cross-talk*.

The damper in question is shown under type of damper. Here it is possible to browse through the Stifab Farex range of dampers. With the help of the button "Browse ..." a new dialogue box is opened where the choice of damper is made. Here it is also possible to see a detailed description of appearance, dimensions figures, dimensioning diagrams, sound data and measurements. Selection of damper starts with choice of type, which then leads to what sizes are available for that type.

Pressure drop for the dampers are given in Pascals. If the stated value is outside the values in the dimensioning diagram, a message box will appear requesting a specification of the throttling range of the damper.

Should types of damper other than those listed be desired, refer to the duct item "Self-defined items".



Properties for Heat Exchangers

This duct item is found under the tabs for *Supply air*, *Exhaust air*, *Cross-talk* and *External sound*.

Normally the manufacturer of the air handling unit will state the damping their product provides. There are some examples of the various types of heat exchanger available on the market in the ProAc program. Two types of heat exchanger are shown in the database with regard to sound attenuation:

- Rotating WX
- Flat WX

Check how the air unit manufacturer has chosen to state sound data: for the fan only, or possibly including *filters*, *heat exchangers*, *batteries* etc.

Properties for Filters

This duct item is found under the tabs for *Supply air* and *Exhaust air*.

Normally the manufacturer of the air handling unit will state the damping their filter units provide. There are some examples of the various types of filters available on the market in the ProAc program. Four types of filters are shown in the database with regard to sound attenuation:

- Short pre-filter
- Long coarse filter G3 (EU3)
- Long fine filter F5 (EU5)
- Long fine filter F9 (EU9)

Check how the air unit manufacturer has chosen to state sound data: for the fan only, or possibly including *filters*, *heat exchangers*, *batteries* etc.

Properties for Batteries

This duct item is found under the tabs for *Supply air* and *Exhaust air*.

Normally the manufacturer of the air handling unit will state the damping their battery units provide. There are some examples of the various types of batteries available on the market in the ProAc program. Three types of filters are shown in the database with regard to sound attenuation:

- Heating
- Electrical
- Cooling

Check how the air unit manufacturer has chosen to state sound data: for the fan only, or possibly including *filters*, *heat exchangers*, *batteries* etc.



Properties for Room with sound source

This duct item is found under the tab for *Cross-talk*. It consists of two sub-tabs:

1. Room

Under the heading "Room dimensions", the room dimensions are defined in metres. The damping properties of the room are specified in terms of an absorption factor directly in figures. In order to obtain some guidance regarding normal values for absorption factors, the duct item *Room* can be opened where the values for undamped, normally damped, hard damped and extremely damped rooms are found under the heading "Room damping described as".

2. Sound generation

The sound generation in the room is described under this tab. There are different methods of defining sound generation:

- Normal voice
- Loud voice
- Very loud voice
- State self-defined sound generation for each octave band.

There are examples of computer (with fan) and typewriter, but the idea is that the user is able to save different sound sources himself.

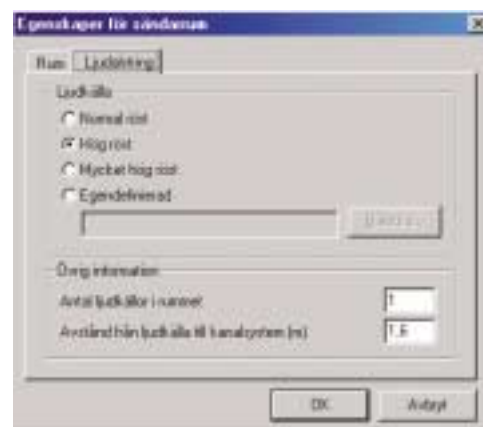
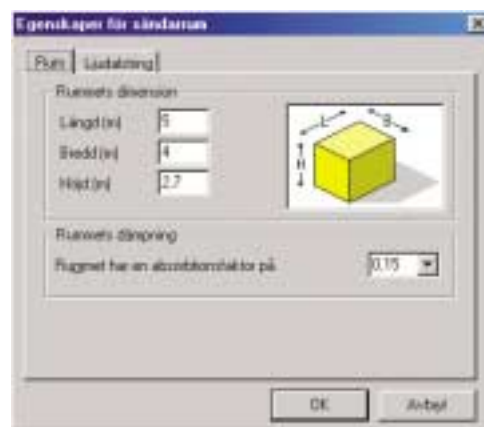
Under other information, the number of same sound sources in the transmitter room plus the distance between the sound source and the duct system (normally the distance to the terminal) are stated.

Properties for Terminals in Transmitter Room

This duct item is found under the tab for *Cross-talk*.

Similar to Properties for Terminals: see p. 8.

Provides correction for sound attenuation (L_d) when RW calculations are made. Corrections are made with regard to orifice damping and the Q factor.



Properties for Air Handling Unit Room

This duct item is found under the tab *External Sound*

It consists of two sub-tabs:

1. Sound source

The type of connection alternative for the fan together with the airflow in *l/s* are stated under this tab.

The connection alternatives referred to in ProAc are:

- Fan outdoors
- Free extraction fan in air handling unit room
- Duct connected fan in air handling unit room

2. Fan

The sound generation of the fan is specified here. The calculation is made in the same way as under the duct item *Fan*.

3. Air handling unit room

This tab is only relevant if the alternative "Free extraction fan in air handling unit room" has been marked under "Sound source". It describes the size of the suction/pressure chamber in which the fan is located. The dimensions are given in metres.

The damping in the room is specified using the absorption factor expressed directly in figures. In order to obtain some guidance regarding normal values for absorption factors, the duct item *Room* can be opened where the values for undamped, normally damped, hard damped and extremely damped rooms are found under the heading "Room damping described as".

4. Connection

This tab is only relevant if the alternative "Duct connected fan in air handling unit room" has been marked under "Sound source". It describes how the fan is connected to the next duct item. The connection measurements are given in millimetres and can be stated for both circular and rectangular ducts. This specification controls the dimensions of the next duct item which is automatically given the same dimension. The resulting cross-sectional area is stated in square metres.

Properties for Exterior Wall Grilles

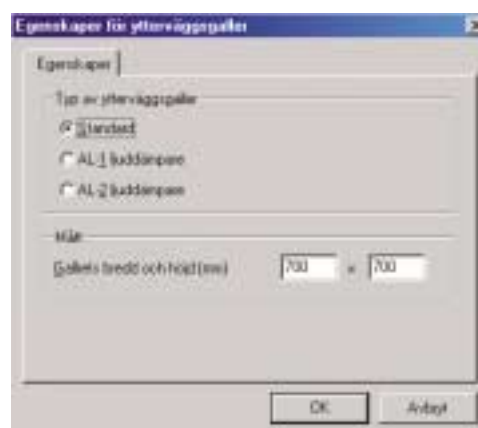
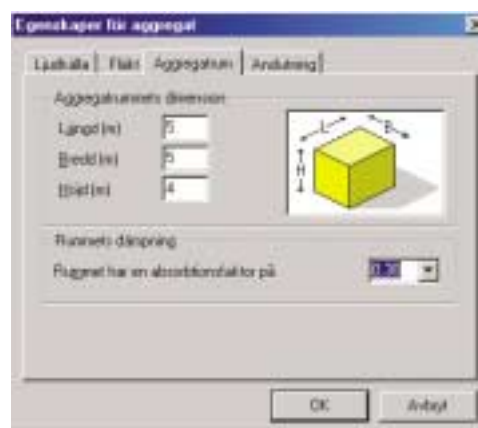
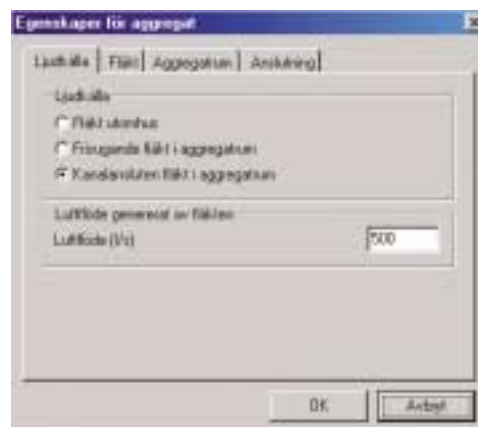
This duct item is found under External sound.

There are three types of exterior wall grilles in ProAc. Standard normally describes grilles without acoustic properties. There are grilles with sound attenuating properties in the Stifab Farex range: ALDa-1 and ALDa-2. The sound attenuating properties are independent of the dimensions as the air slots always have the same separation distance.

To prevent the air velocity through the exterior wall grille becoming too high, there is the option of stating the dimensions for the grille in millimetres.

This will also affect the sound generation for the grille.

Always check the velocity/pressure drop through the exterior wall grille.



Properties for Measurement Point

This duct item is found under the tab External Sound.

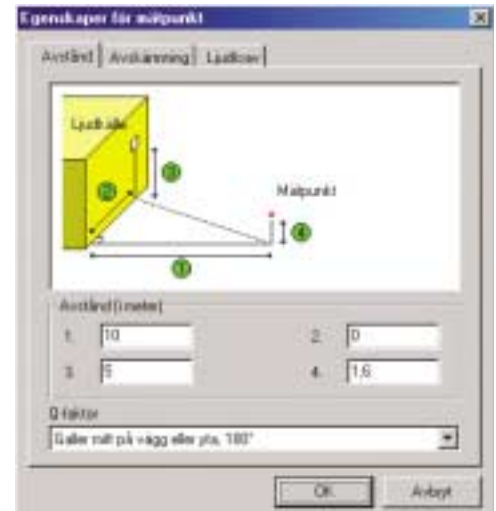
It consists of three sub-tabs:

1. Distance

The difference in distance between the last duct item (e.g. *Exterior wall grille*) and the point of measurement where the stated sound requirements must be fulfilled. To describe this point as correctly as possible, the distance is stated in X, Y and Z directions. The Q factor also takes into consideration the location of the last duct item.

The options that ProAc differentiates between are (compare these with duct item Terminals and connections, sub-tab Location):

- Freely suspended
- Wall or roof in centre of surface (180° spread); Q=2
- Wall or roof near two surfaces (90° spread); Q=4
- Wall or roof near three surfaces (90° spread); Q=8



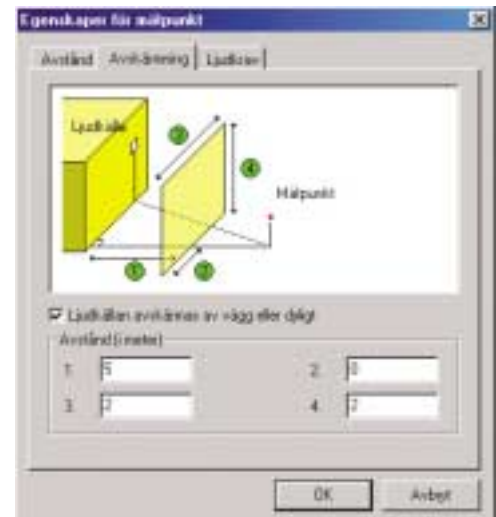
2. Obstructions

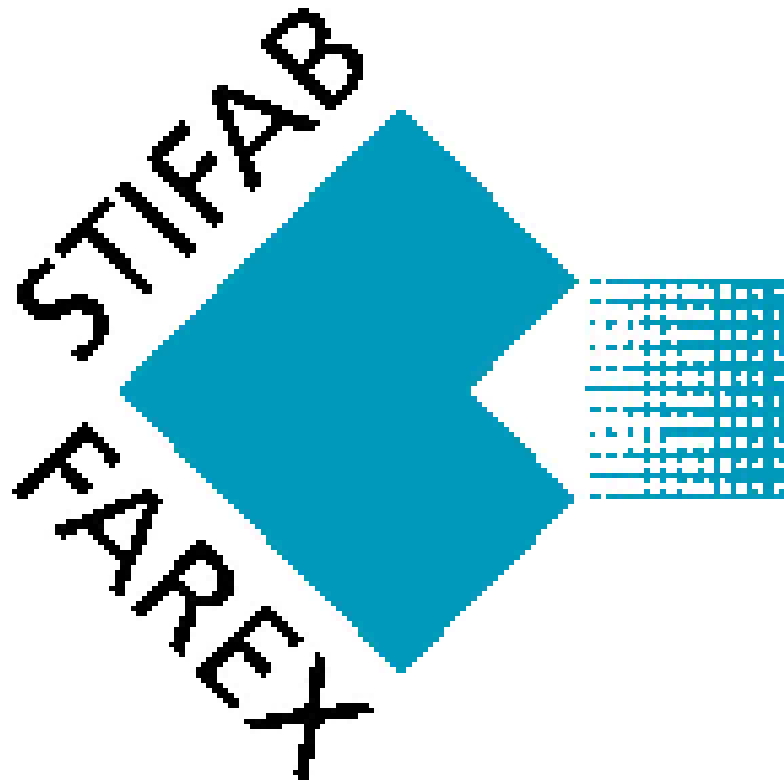
If there are any barriers of acoustic significance between the last duct item (*Exterior wall grille*) and the measurement point at which sound requirements must be fulfilled, tick the box for "Sound source obstructed by wall or other object". This will give the option of stating the dimensions of the barrier together with the distance between the barrier and the last duct item.

3. Sound requirements

The different sound requirements that must be fulfilled at the place/point of measurement are specified here. There are two different ways of defining the sound requirements (Lk):

- State the total sound requirements in dB(A) and/or dB(C)
- State self-defined sound requirements for each octave band.





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