

D. DEFINITIONS AND FILTER CHARACTERISTICS

D.1 Definitions and formulae

D.1.1 Basic symbols and notation

- T** - current period of the measurement.
- T_b** - period after which the results are saved in the logger set in the **LOGGER STEP** (*path: MENU / INPUT / MEASUREMENT SETUP / LOGGER STEP*).
- T_c** - period of the measurement is set in the **INTEGR. PERIOD** (*path: MENU / INPUT / MEASUREMENT SETUP / INTEGR. PERIOD*).
- T_e** - exposure time (period during which a person is exposed to the action of noise). This parameter can be set in the **EXPOSURE TIME** (*path: MENU / SETUP / EXPOSURE TIME*). The available values are from 1 minute to 8 hours with 1 minute step.
- T_{8h}** - period equal to 8 hours (28 800 seconds).
- τ** - detector time constant is set in the **DETECTOR** (equal to **IMPULSE**, **FAST** or **SLOW** in the case of sound mode and equal to **100 ms**, **125 ms**, **200 ms**, **500 ms**, **1 s**, **2 s**, **5 s** or **10 s** in the case of vibration mode; *path: MENU / INPUT / PROFILE x / DETECTOR*). The available values are equal to **IMPULSE**, **FAST** or **SLOW**.
- a_w(t)** - the temporary value of the measured sound with the weighting filter **W** (equal to **A**, **C** or **Z** in the case of sound mode and equal to **HP1**, **HP3**, **HP10**, **KB**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wh**, **Wg**, **Wb** in the case of vibration mode; *path: MENU / INPUT / PROFILE x / FILTER*) on the input of the RMS detector.
- p_w(t)** - the temporary value of the measured sound with the weighting filter **W** (equal to **A**, **C** or **Z** in the case of sound mode and equal to **HP1**, **HP3**, **HP10**, **KB**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wh**, **Wg**, **Wb** in the case of vibration mode; *path: MENU / INPUT / PROFILE x / FILTER*) on the output of the RMS detector calculated from the equation:

$$p_w(t) = \left(\frac{1}{\tau} \int_{-\infty}^t a_w^2(t_x) \exp\left(-\frac{t_x - t}{\tau}\right) dt_x \right)^{1/2}$$

where:

t_x - time (variable of the integration).

$$r_w(t) = \begin{cases} a_w(t) & \text{path : MENU / SETUP / RMS INTEGRATION / LINEAR} \\ p_w(t) & \text{path : MENU / SETUP / RMS INTEGRATION / EXPONENTIAL} \end{cases}$$

- p₀** - the reference value equal to 20 μPa.
- Q** - the exchange rate in decibels equal to **2**, **3**, **4** or **5** and is set in the **EXCHANGE RATE** (*path: MENU / INPUT / DOSIMETER SETUP / EXCHANGE RATE*). The value of **Q** influences the calculations of dose meter results, namely **DOSE**, **D_{8h}** and **LAV**. The exposure rate equal to 3 complies with ISO R 1999 "Assessment of Occupational Noise Exposure for Hearing Conservation Purposes", while **Q** equal to 5 complies with the American "Occupational Safety and Health Act" – OSHA. The value of **q** used in the calculations of **DOSE**, **D_{8h}** and **LAV** is taken from the formula:

$$q = \begin{cases} \frac{Q}{\log 2} & \text{for } Q \neq 3 \\ 10 & \text{for } Q = 3 \end{cases}$$

L_T - the threshold sound level is set in the **THRESHOLD LEVEL** (*path: MENU / INPUT / DOSIMETER SETUP / THRESHOLD LEVEL*). The available values are as follows: **None**, **75 dB**, **80 dB**, **85 dB** or **90 dB**.

L_c - the criterion sound level is set in the **CRITERION LEVEL** (*path: MENU / INPUT / DOSIMETER SETUP / CRITERION LEVEL*). The available values are as follows: **80 dB**, **84 dB**, **85 dB** or **90 dB**.

$L(t)$ - sound level (a function of time) measured with the selected time constant (**IMPULSE**, **FAST** or **SLOW**; *path: MENU / INPUT / PROFILE x / FILTER*) and the weighting filter (equal to **A**, **C** or **Z**) calculated from the formula:

$$L(t) = 20 \log \frac{p_w(t)}{p_0}$$

$L_d(t)$ - sound level (a function of time), depends on the selected threshold level. In the case when the **None** option was selected:

$$L_d(t) = L(t)$$

In the other cases (when the **THRESHOLD LEVEL** (*path: MENU / INPUT / DOSIMETER SETUP / THRESHOLD LEVEL*) is equal to **75 dB**, **80 dB**, **85 dB** or **90 dB**) this sound level is taken from the formula:

$$L_d(t) = \begin{cases} L(t) & \text{for } L(t) \geq L_T \\ -\infty & \text{for } L(t) < L_T \end{cases}$$

D.1.2 Definitions of the quantities measured in sound mode

PEAK value

The **PEAK** value (Peak Sound Pressure or Peak Sound Level) depends on the weighting filter **W** (equal to **A**, **C** or **Z**) and is calculated for the given **T** from the formula:

$$\text{PEAK} = 20 \log \left(\max_T \left| \frac{a_w(t)}{p_0} \right| \right)$$

In the case of the **PEAK** value saved as the main result $T = T_c$. When the **PEAK** value is saved in the files of the logger (time history) - $T = T_b$.

SPL function

The **SPL** function (**S**ound **P**ressure **L**evel) - gives an equivalent of the **Sound Level Meter** according to the **IEC 651 Standard** (meeting the requirements for the **Type "1"** instrument). The value of the functions depends on the weighting filter **W** (equal to **A**, **C** or **Z**; *path: MENU / INPUT / PROFILE x / FILTER*) and is calculated from the formula:

$$\text{SPL} = 20 \log \left(\max_{T_1} \frac{p_w(t)}{p_0} \right)$$

where:

T_1 - the last second of the measurement.

MAX result

The **MAX** result means the maximal value on the detector output for the integration period. The **MAX** result for the period of 1 second is equal to the value of the **SPL** function. The **MAX** result is calculated according to the formula:

$$\text{MAX} = 20 \log \left(\max_T \frac{p_w(t)}{p_0} \right)$$

In the case of the **MAX** value saved as the main result $T = T_c$. When the **MAX** value is saved in the files of the logger (time history) - $T = T_b$.

MIN result

The **MIN** result is calculated according to the formula:

$$\text{MIN} = 20 \log \left(\min_T \frac{p_w(t)}{p_0} \right)$$

In the case of the **MIN** value saved as the main result $T = T_c$. When the **MIN** value is saved in the files of the logger (time history) - $T = T_b$.

LEQ function

The **LEQ** function enables the user to calculate the RMS value of sound pressure in the given time period. The instrument operates as the standard **Integrating Sound Level Meter** and conforms to the **IEC 804 Standard** (meeting the requirements for the **Type 1** instrument). The value of the **LEQ** function is calculated according to the formula:

$$\text{LEQ} = 20 \log \left(\frac{1}{T} \int_0^T (r_w(t)/p_0)^2 dt \right)^{1/2}$$

In the case the **LEQ** value saved as the main result $T = T_c$.



Note: For $T = T_b$ the **LEQ** values are saved in the files of the logger (time history) as the **RMS** results (see below).

RMS result

The **RMS** result, saved in the logger's file, is calculated according to the formula of the **LEQ** function. The value of the **RMS** result is calculated according to the formula:

$$\text{RMS} = 20 \log \left(\frac{1}{T_b} \int_0^{T_b} (r_w(t)/p_0)^2 dt \right)^{1/2}$$

SEL result

The **SEL** result (Sound Exposure Level) is essentially the subset of the **LEQ** function. Its value is equal to the **LEQ result referred to the integration time equal to one second** (so, for the **INT. TIME=1 s**, **SEL** is always equal to **LEQ**). The value of the **SEL** function is calculated according to the formula:

$$\text{SEL} = 20 \log \left(\int_0^T (r_w(t)/p_0)^2 dt \right)^{1/2} = \text{LEQ} + 10 \cdot \log \frac{T[\text{s}]}{1[\text{s}]}$$

In the case of the **SEL** value saved as the main result $T = T_c$. The **SEL** value is not saved in the files of the logger (time history).

Ltm3 and Ltm5 results

The Ltm3 and Ltm5 results (Takt-Maximal Levels) are calculated according to the German standard TA Larm.

LEPd result

The **LEPd** result (Exposure level related to 8-hours working day) is calculated on the base of the **LEQ** from the formula:

$$\text{LEPd} = \text{LEQ} + 10 \cdot \log \frac{T_e}{T_{8h}}$$

OVL result

The **OVL** result (Overload) presents the percentage of the overloaded input signal, which occurred during the selected T_c - measurement time set in the **INTEGR. PERIOD** (*path: MENU / INPUT / MEASUREMENT SETUP / INTEGR. PERIOD*).

Statistical Levels Ln

The noise level **L(t)** is the continuous random variable. The probability that the temporary noise level **L(t)** belongs to the interval $\langle L_k, L_k + \Delta L \rangle$ is called the class density and it can be expressed by the equation:

$$P_k [L_k \leq L(t) \leq L_k + \Delta L] = \sum_{i=1}^n \Delta t_i / P$$

where:

Δt_i - time intervals, in which the noise level $L(t) \in \langle L_k, L_k + \Delta L \rangle$ occurs,

ΔL - so-called class interval or distribution class of the series,

P - total observation period.

In the case when the class interval approaches infinity, the probability of **L(t)** tends to the probability of L_k . In practice, ΔL value is strictly determined and it depends mainly on the dynamics of the measurements performed in the instrument. In SVAN 957 instrument, there are 120 classes and the width of each class is equal to 1 dB.

The histogram is the set of the class density values calculated for all classes. In the SVAN 957 instrument the histogram is saved in the result files if the **SAVE STATISTICS** (*path: MENU / FILE / SAVE OPTIONS / SAVE STATISTICS*) is activated (cf. the detailed description of the relevant table in App. B).

The statistical distribution function, which determines the probability (expressed in %) of the noise occurrence on the level equal or less than $L_k + \Delta L$ is given by the formulae:

$$P[L(t) \leq L_j] = \sum_{k=1}^j P_k(L)$$

The cumulative density function, expressed by the equation:

$$P[L(t) > L_j] = 1 - P[L(t) \leq L_j]$$

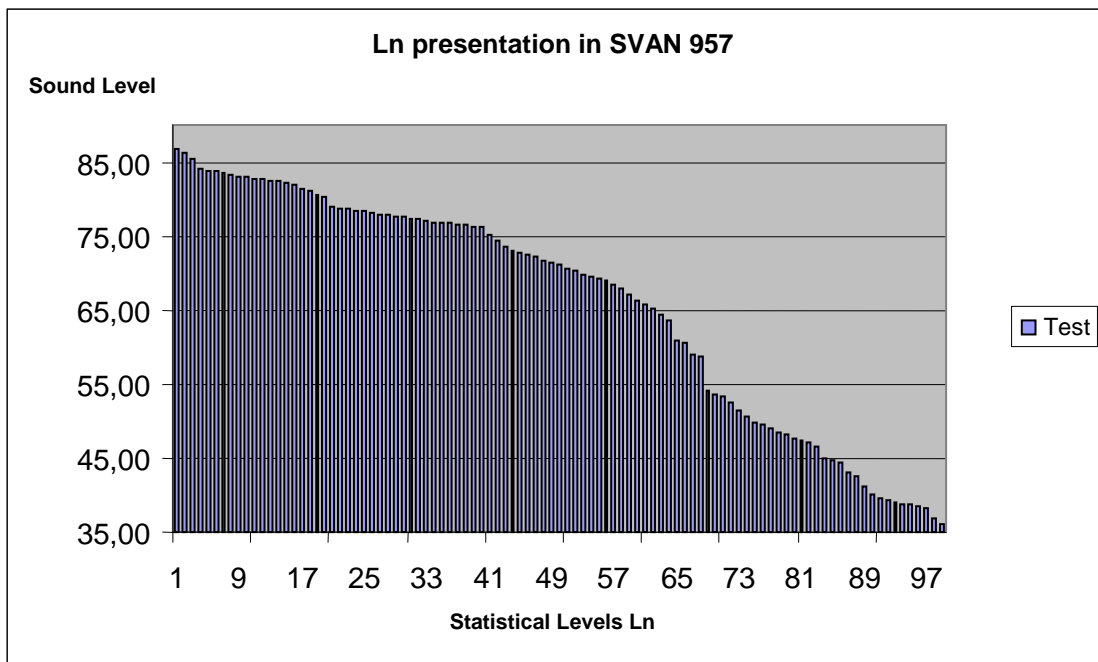
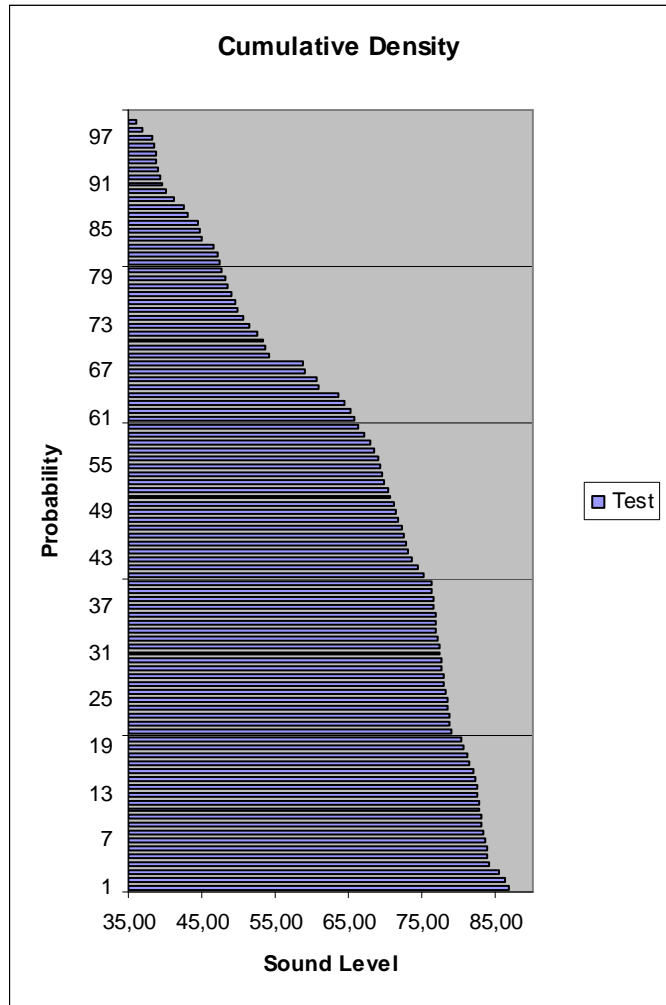
is directly used to determine so-called statistical levels **Ln** or position parameters of the distribution.

The **Ln** is the certain boundary level surpassed by the temporary noise level values in not more than **n%** of the observation period.

Example: Let us assume that **L35** is equal to 76.8 dB. It means that during the measurements the noise level 76.8 dB was exceeded in not more than 35% of the observation period.

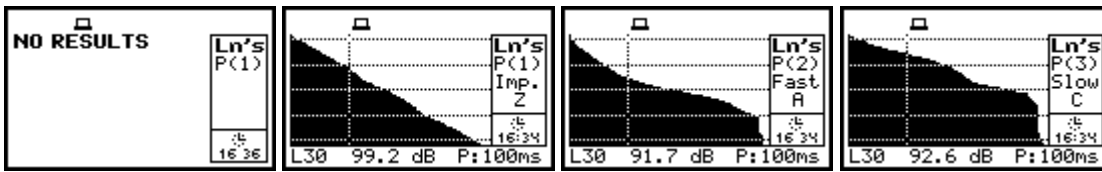
The cumulative density function for the exemplary data is presented in Figure on the right side. In order to determine the **Ln** level one has to draw the horizontal cursor and find out the crossing point between the cumulative density function and the cursor. In SVAN 957 instrument the user can determine 99 statistical levels - from **L01** to **L99** (1% step of observation period).

The display in SVAN 957 instrument has only 64 pixels on the vertical axis and 128 on the horizontal one. It is obvious that the change of the axes is more suitable for the presentation of 99 statistical levels. In this case, the user has to draw the vertical cursor and the value on it gives the required statistical level (the value of the noise level, which happened during the performed measurements in not more than selected percentage of the observation period).



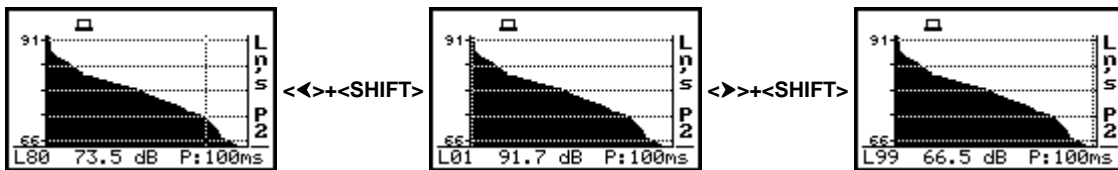
Two presentation modes of the statistical levels are available in the SVAN 957 instrument. In both modes, the **Ln** values, selected by the cursor, are displayed in the bottom line together with its value and units (dB). The P value indicating the observation period equal to 100 ms (it means that the statistical results are updated every 100 ms) is placed at the end of the bottom line. The profile's number

the statistics are taken from, the RMS detector (**Lin.**, or **Exp.**: **Fast**, **Slow** or **Imp.**), the filter's name (**A**, **C** or **Z**) and real time are displayed on the right side of the view in the first presentation mode. The selection of the profile is made by pressing the **<SHIFT>** and **<▲>** or the **<SHIFT>** and **<▼>** push-buttons. The same result can be achieved after pressing the **<ALT>** and **<◀>** or **<ALT>** and **<▶>** push-buttons.



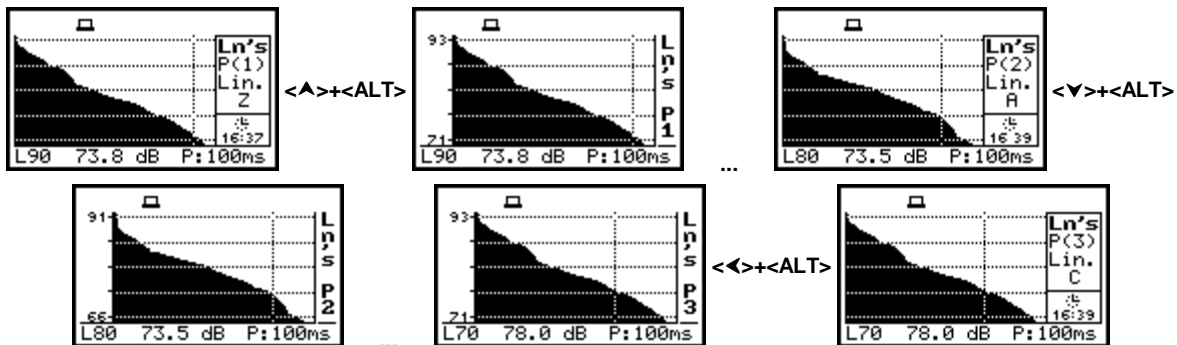
Results shown in the first presentation mode of statistical levels

The selection of the **Ln** to be displayed is done by pressing the **<◀>**, **<▶>** push-buttons. The statistics **L01** is immediately available after pressing the **<SHIFT>** and **<◀>** while the **L99** - after pressing the **<SHIFT>** and **<▶>** push-buttons.



Results shown in the second presentation mode; the selection of the statistical level

The change of the presentation mode is done by pressing the **<ALT>** and **<▲>** or the **<ALT>** and **<▼>** push-buttons. The second presentation mode of statistical levels differ slightly from the first one: the description on the left side is shorter but on the right side the value of the statistical levels are shown.



Results shown in both presentation modes of statistical levels; the change of the mode

D.1.3 Definitions of the results measured in dosimeter mode

DOSE result

The **DOSE** result is the quantity of noise received by the worker, expressed as the percentage of the whole day acceptable value. This result is calculated from the formula:

$$DOSE = \frac{100\%}{T_{8h}} \int_0^T 10^{\frac{L_d(t) - L_c}{q}} dt$$

D_8h result

The **D_8h** result is the quantity of noise received by the worker during 8 hours. This result is calculated from the formula:

$$D_{8h} = \frac{100\%}{T} \int_0^T 10^{\frac{L_d(t) - L_c}{q}} dt = \frac{T_{8h}}{T} \cdot DOSE$$

LAV result

The **LAV** result is the average level of the acoustic pressure for the given time period of the measurement. This result is calculated from the formula:

$$LAV = q \cdot \log \left(\frac{1}{T} \int_0^T 10^{\frac{L_d(t)}{q}} dt \right)$$

In the case of **Q** (the exchange rate) equal to 3 the **LAV** result has the same value as **LEQ** (if the **EXPONENTIAL** option is selected in the **RMS INTEGRATION** (path: *MENU / SETUP / RMS INTEGRATION*)).

TLAV result

The **TLAV** result is the average level of the acoustic pressure of the measurement. This result is calculated from the formula:

$$LAV = q \cdot \log \left(\int_0^T 10^{\frac{L_d(t)}{q}} dt \right)$$

SEL8 result

The **SEL8** result is the **SEL result corresponding to the integration time equal to 8 hours**. The **SEL8** result is calculated on the base of the **LEQ** according to the formula:

$$SEL8 = LEQ + 10 \cdot \log \frac{T_{8h} [s]}{1 [s]}$$

PSEL result

The **PSEL** result (individual Sound Exposure Level to the noise) is equal to the standing sound level in a measurement period. The **PSEL** result is calculated on the base of the **LEQ** according to the formula:

$$PSEL = LEQ + 10 \cdot \log \frac{T}{T_{8h}}$$

E result

The **E** result (Exposition) represents the amount of the acoustical energy received by the worker and it is expressed in the linear units (Pa²h). The **E** value is calculated according to the formula:

$$E = \frac{T [s]}{3600} p_o^2 \cdot 10^{\frac{LEQ}{10}}$$

E_8h result

The **E_8h** result (Exposition in 8 hours) represents the amount of the acoustical energy received by the worker during 8 hours. The **E_8h** value is calculated according to the formula:

$$E_{8h} = 8 [h] \cdot p_o^2 \cdot 10^{\frac{LEQ}{10}}$$

The **E_8h** result is expressed in the linear units (Pa²h).

D.1.4 Definitions of the quantities measured in vibration mode

PEAK value

The **PEAK** value is calculated for the given **T** from the formula:

$$\mathbf{PEAK} = \max_{\mathbf{T}} |a_{\mathbf{W}}(t)|$$

In the case of the **PEAK** value saved as the main result **T** = **T_c**. When the **PEAK** value is saved in the files of the logger (time history) - **T** = **T_b**.

P-P value

The **P-P** result, saved in the logger's file, is calculated according to the formula:

$$\mathbf{P - P} = \max_{\mathbf{T}} (0, a_{\mathbf{W}}(t)) - \min_{\mathbf{T}} (0, a_{\mathbf{W}}(t))$$

For the **P-P** result saved in the files of the logger (time history) **T** = **T_b**.

MAX result

The **MAX** result, saved in the logger's file, is calculated according to the formula:

$$\mathbf{MAX} = \max_{\mathbf{T}_b} (p_{\mathbf{W}}(t))$$

The **MAX** main result is calculated according to the formula:

$$\mathbf{MAX} = \max_{\mathbf{T}} (p_{\mathbf{W}}(t)) \quad \text{for } \tau \neq 1 \text{ second}$$

MTVV result

The **Maximum Transient Vibration Value** - **MTVV**, saved as the main result, is defined (according to the **ISO 8041** standard) as:

$$\mathbf{MTVV} = \max_{\mathbf{T}} (p_{\mathbf{W}}(t)) \quad \text{for } \tau = 1 \text{ second}$$

RMS result

The **RMS** result is calculated according to the formula:

$$\mathbf{RMS} = \left(\frac{1}{\mathbf{T}} \int_0^{\mathbf{T}} r_{\mathbf{W}}^2(t) dt \right)^{1/2}$$

For the **RMS** result saved in the files of the buffer (time history) **T** = **T_b**.

VDV result

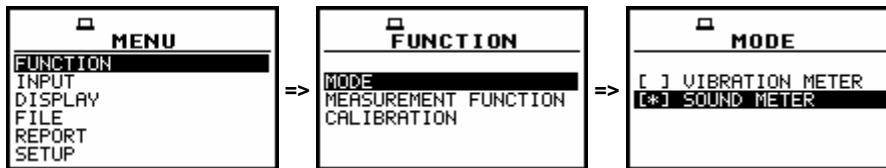
The fourth power vibration dose value (**VDV**) expressed in meters per second taken to the power of 1.75 ($\text{m/s}^{1.75}$) is calculated from the formula:

$$\mathbf{VDV} = \left(\int_0^{\mathbf{T}} r_{\mathbf{W}}^4(t) dt \right)^{1/4}$$

D.2 Frequency characteristics of the implemented digital filters

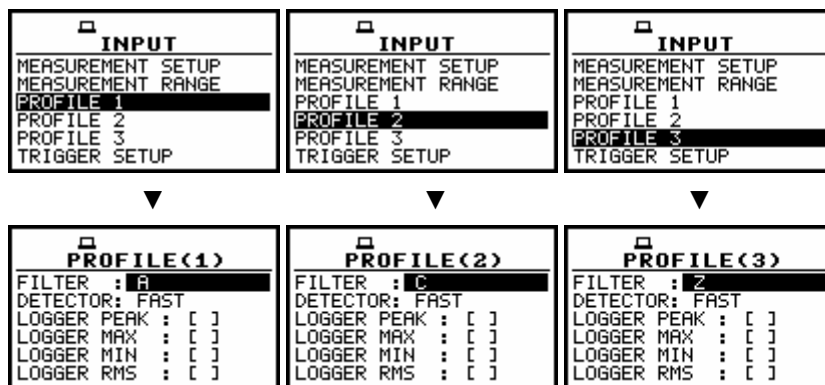
D.2.1 Digital weighting filters implemented in sound mode

The sound mode is selected in the MENU / FUNCTION / MODE window (**SOUND METER**).



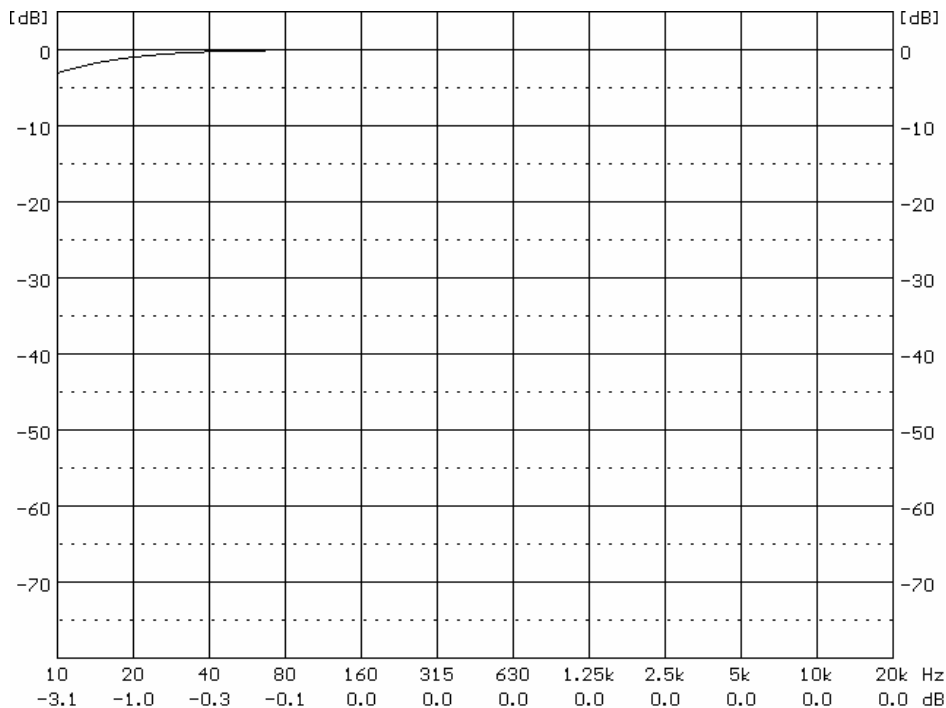
MENU, FUNCTION and MODE windows; sound mode selection

The weighting filters, which are available in sound mode (**Z**, **A**, and **C**) are selected in the MENU / INPUT / PROFILE (x) windows.

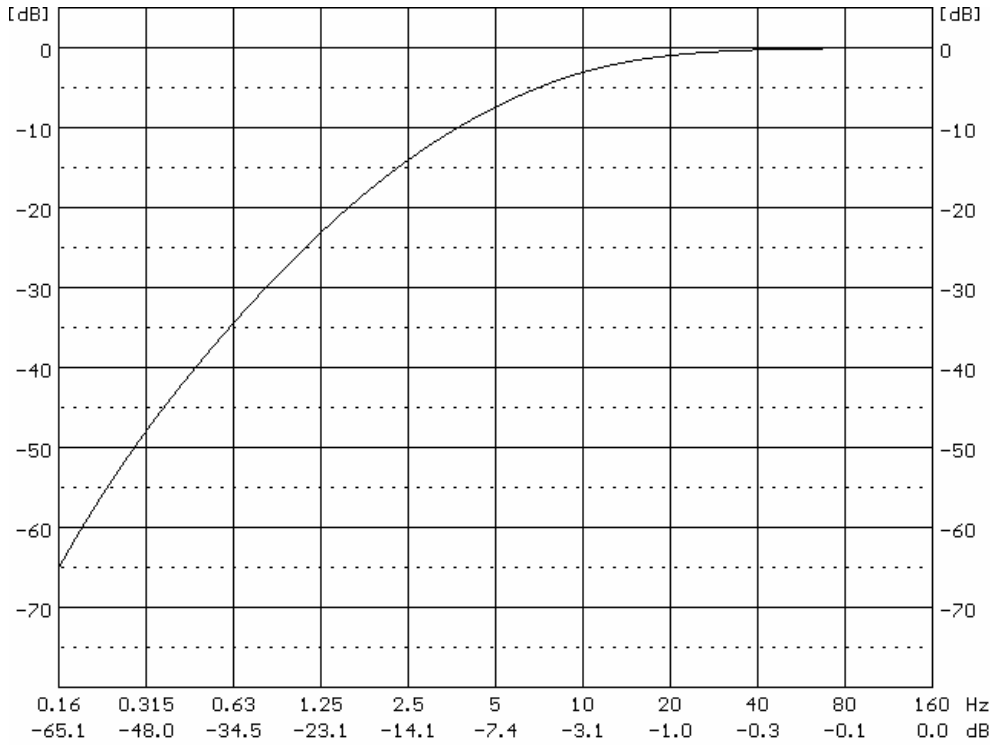


INPUT and PROFILE (x) windows; weighting filter selection

Z: cut-off frequency: 10.0 Hz / -3.0 dB.

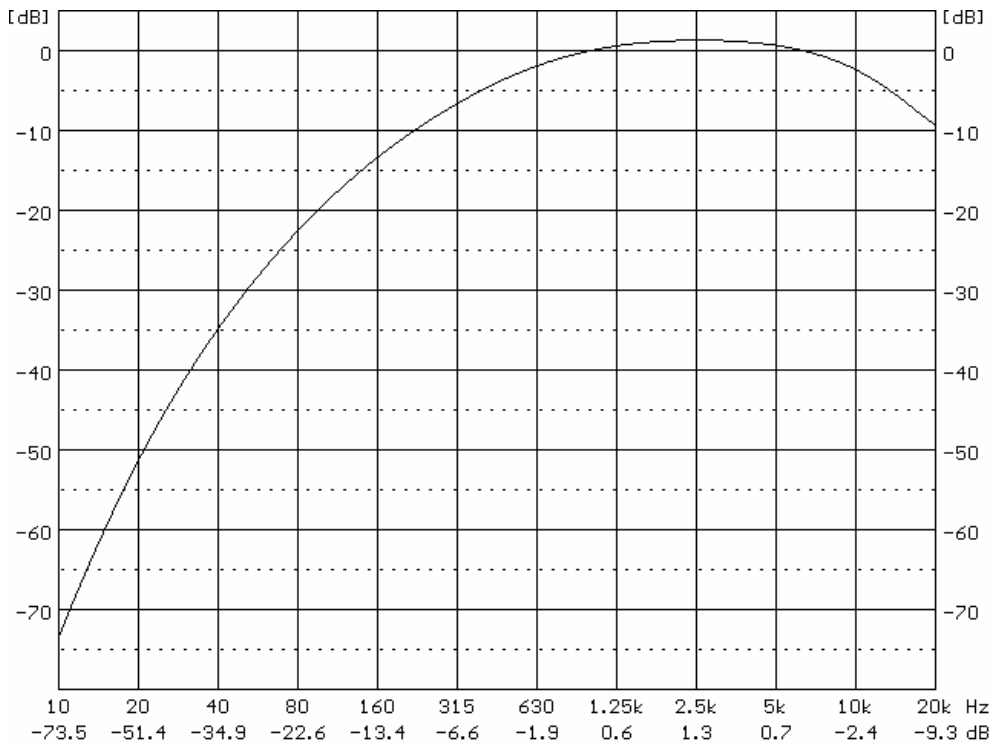


Full band frequency characteristics of Z filter implemented in the instrument



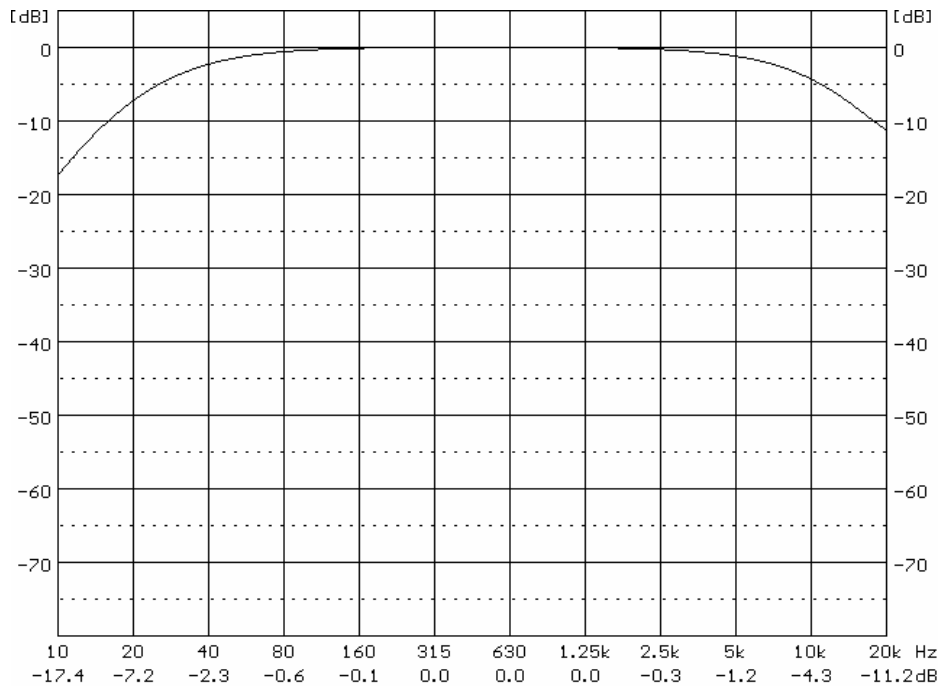
Low band frequency characteristics of Z filter implemented in the instrument

A type 1 according to the IEC 651 standard.



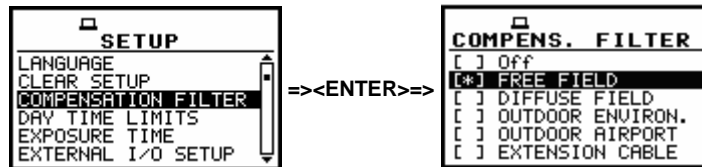
Frequency characteristics of A filter implemented in the instrument

C type 1 according to the IEC 651 standard.

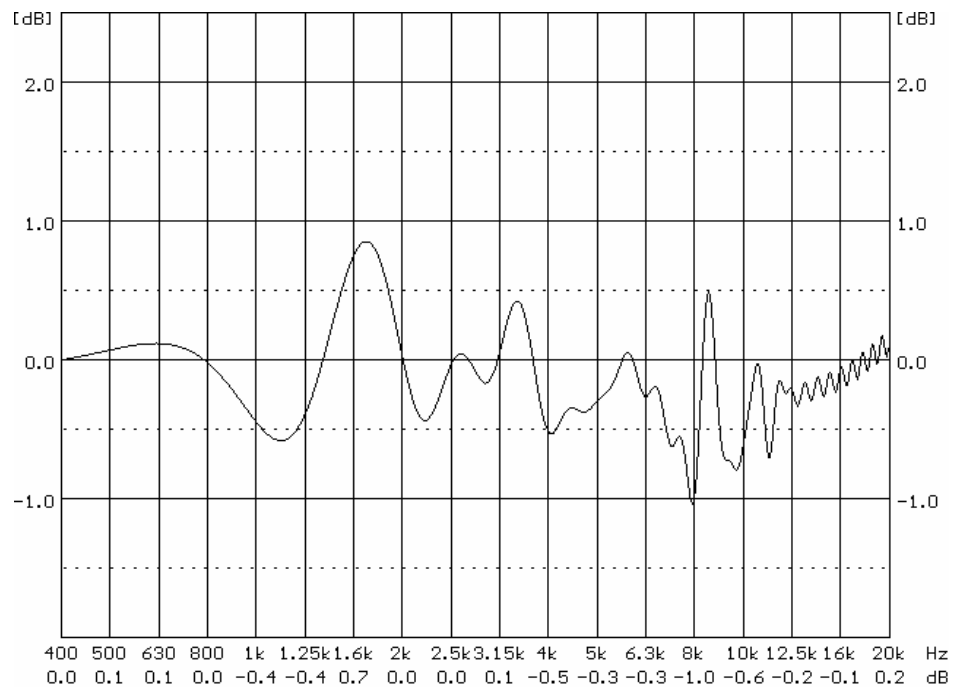


Frequency characteristics of C filter implemented in the instrument

The **FREE FIELD** filter is set in MENU / SETUP / COMPENSATION / FREE FIELD position

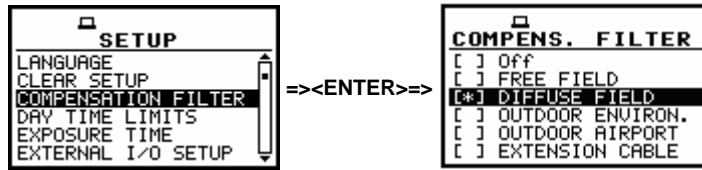


SETUP and COMPENSATION FILTER windows; the activation of FREE FIELD filter

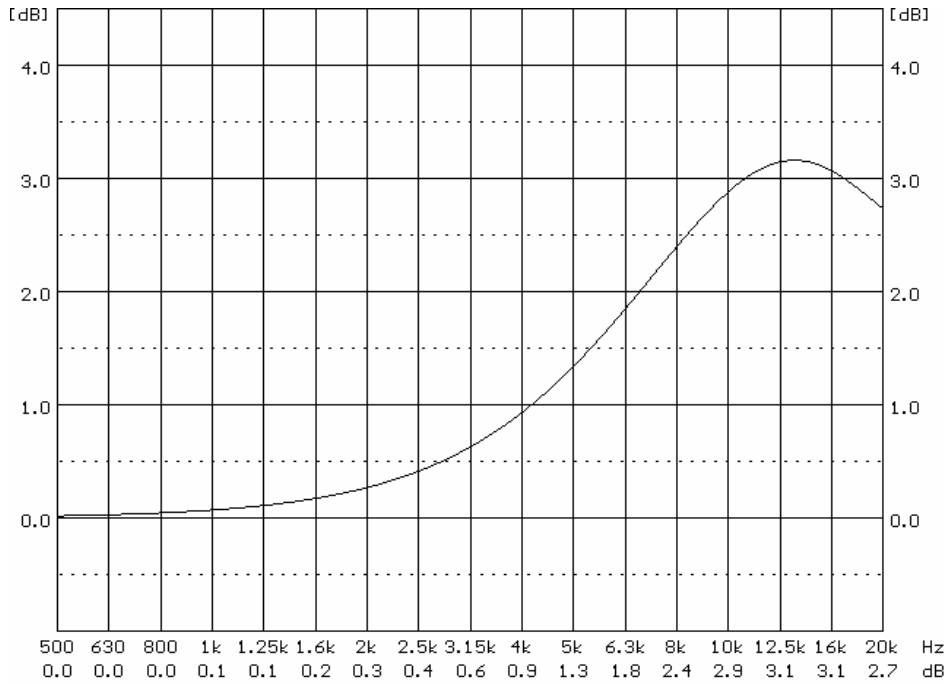


Frequency characteristics of FREE FIELD filter implemented in the instrument

DIFFUSE FIELD filter is set in MENU / SETUP / COMPENSATION FILTER / FREE FIELD position

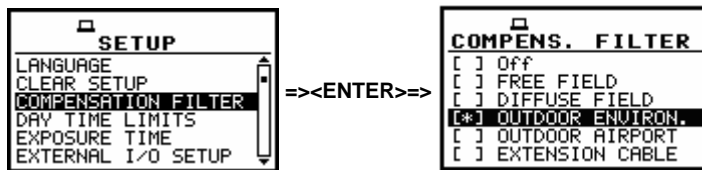


SETUP and COMPENSATION FILTER windows; the activation of DIFFUSE FIELD filter

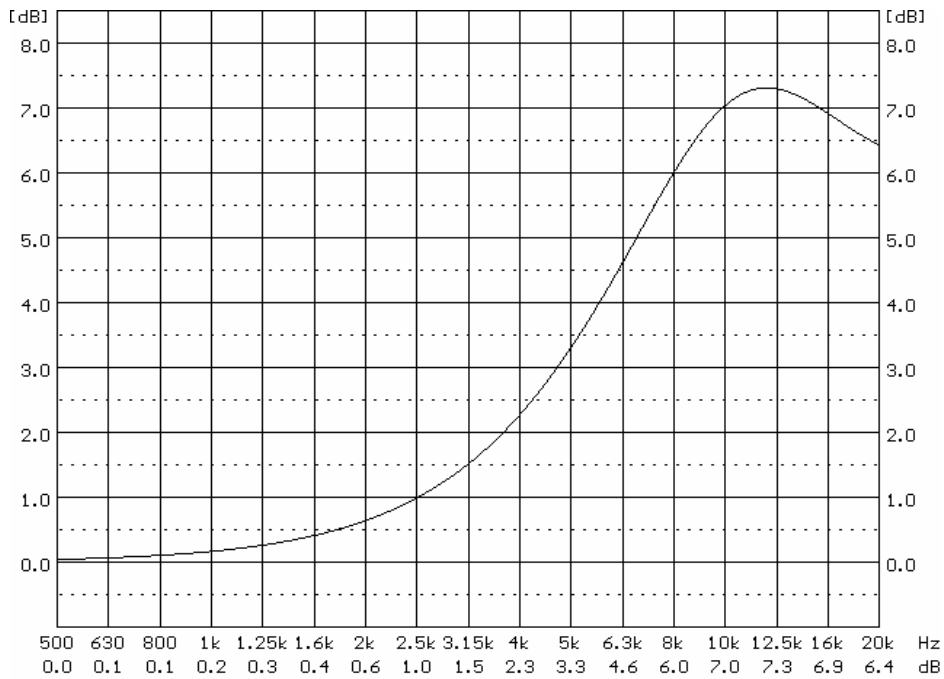


Frequency characteristics of DIFFUSE FIELD filter implemented in the instrument

The **ENVIRONMENTAL** filter is set in MENU / SETUP / COMPENSATION FILTER / OUTDOOR ENVIRON. position.

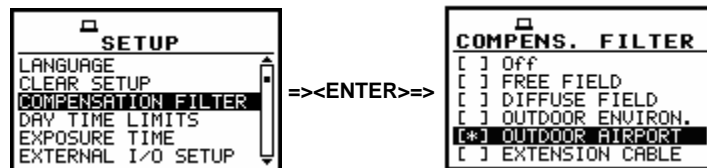


SETUP and COMPENSATION FILTER windows; activation of OUTDOOR ENVIRONMENTAL filter

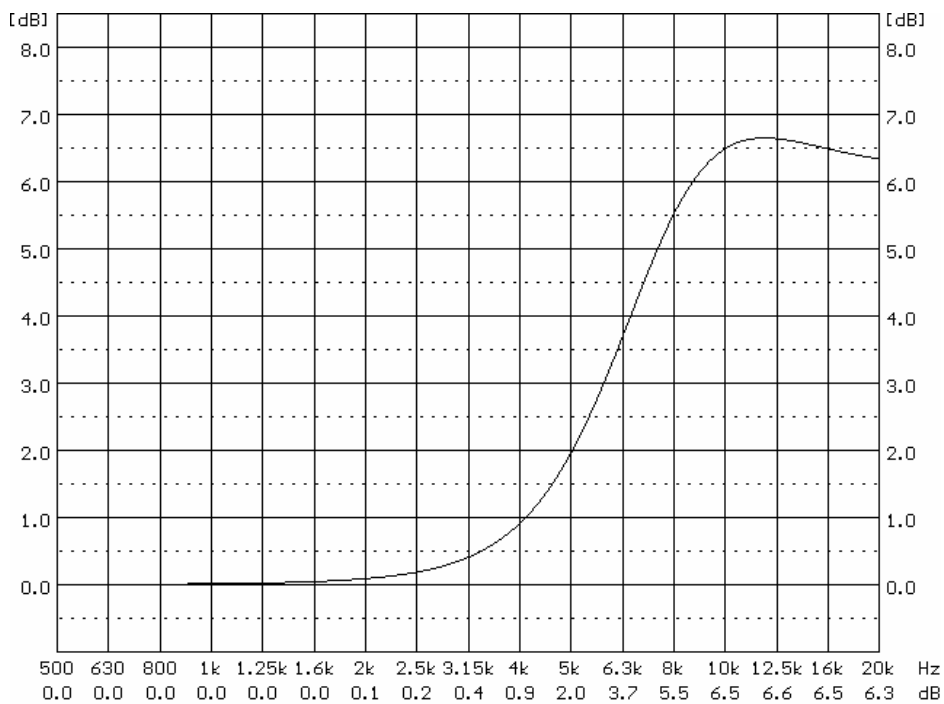


Frequency characteristics of ENVIRONMENTAL filter implemented in the instrument

AIRPORT filter set in MENU / SETUP / COMPENSATION FILTER / OUTDOOR AIRPORT position.



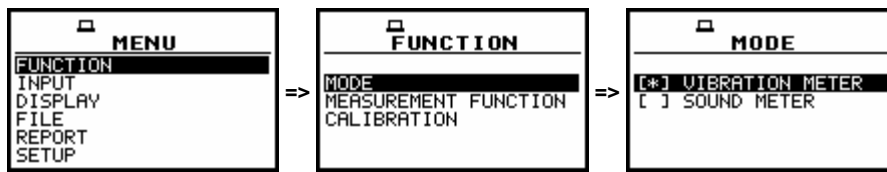
SETUP and COMPENSATION FILTER windows; the activation of OUTDOOR AIRPORT filter



Frequency characteristics of AIRPORT filter implemented in the instrument

D.2.2 Digital weighting filters implemented in vibration mode

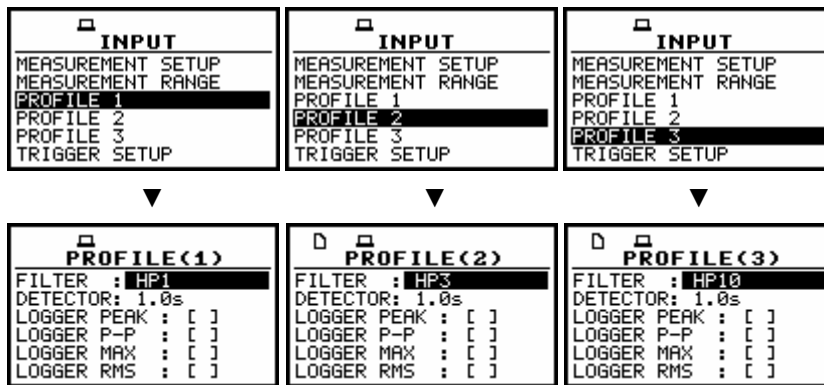
The vibration mode of the **SVAN 957** instrument is selected in the MENU / FUNCTION / MODE window (**VIBRATION METER**)



MENU, FUNCTION and MODE windows; vibration mode selection

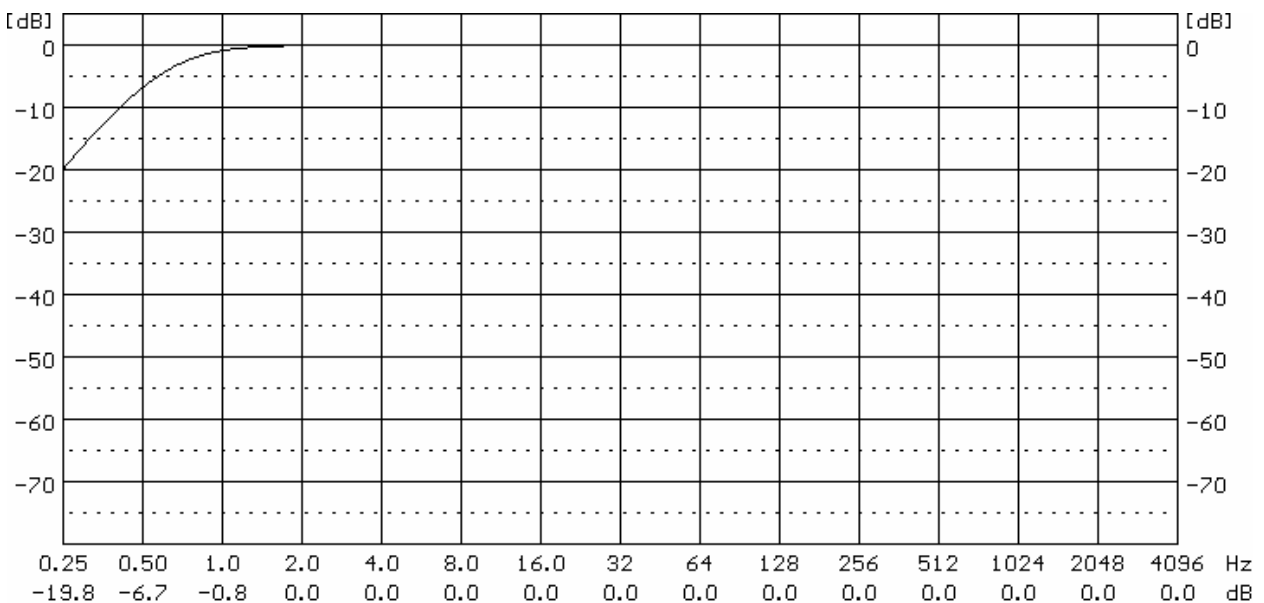
D.2.2.1 Digital filters implemented in the vibration mode for the acceleration measurements

The weighting filters, which are available in vibration mode are selected in the MENU / INPUT / PROFILE (x) windows. The first three of them (**HP1**, **HP3**, and **HP10**) are dedicated for the acceleration measurements of the vibration signal in the different frequency ranges.



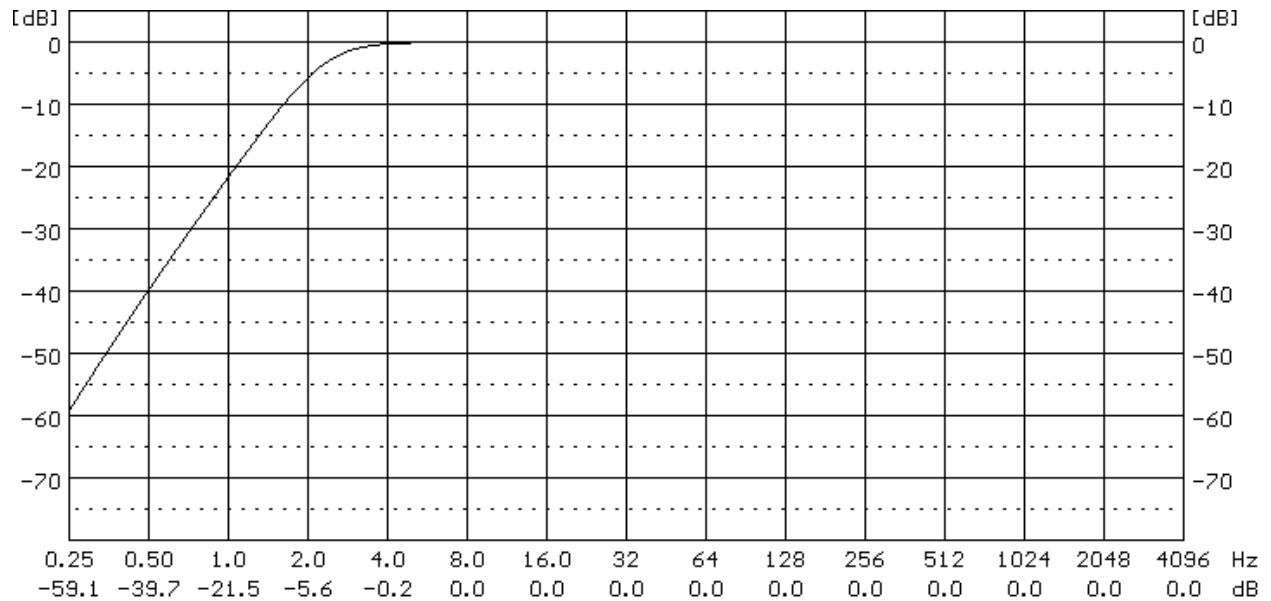
INPUT and PROFILE (x) windows; weighting filter selection in acceleration measurements

The **HP1** filter is used for the acceleration measurements (the vibration signal) in the frequency range from 1 Hz to 20 kHz.



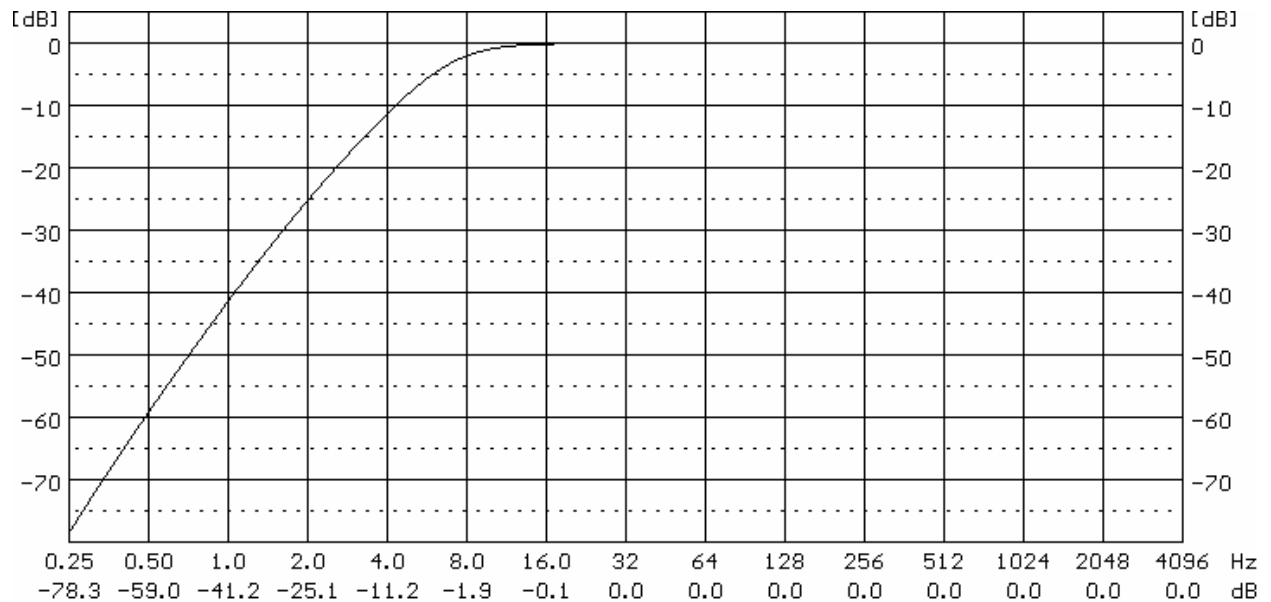
Characteristics of HP1 digital filter implemented for the acceleration measurements in VM

The **HP3** filter is used for the acceleration measurements (the vibration signal) in the frequency range from 3.5 Hz to 20 kHz.



Characteristics of HP3 digital filter implemented for the acceleration measurements in VM

The **HP10** filter is used for the acceleration measurements (the vibration signal) in the frequency range from 10 Hz to 20 kHz.



Characteristics of HP10 digital filter implemented for the acceleration measurements in VM

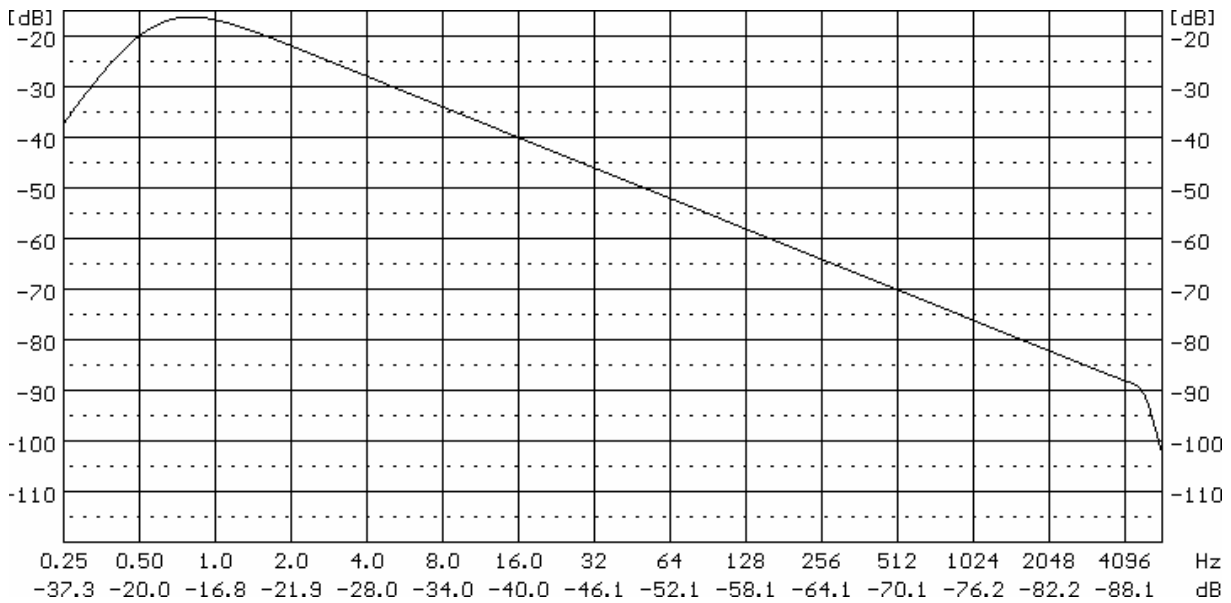
D.2.2.2 Digital filters implemented in the vibration mode for the velocity measurements

The following four filters (**Vel1**, **Vel3**, **Vel10** and **VelMF**) are dedicated for the velocity measurements of the vibration signal in the different frequency ranges.

PROFILE(1)	PROFILE(1)	PROFILE(1)	PROFILE(1)
FILTER : Vel1	FILTER : Vel3	FILTER : Vel10	FILTER : VelMF
DETECTOR: 1.0s	DETECTOR: 1.0s	DETECTOR: 1.0s	DETECTOR: 1.0s
LOGGER PEAK : []	LOGGER PEAK : []	LOGGER PEAK : []	LOGGER PEAK : []
LOGGER P-P : []	LOGGER P-P : []	LOGGER P-P : []	LOGGER P-P : []
LOGGER MAX : []	LOGGER MAX : []	LOGGER MAX : []	LOGGER MAX : []
LOGGER RMS : []	LOGGER RMS : []	LOGGER RMS : []	LOGGER RMS : []

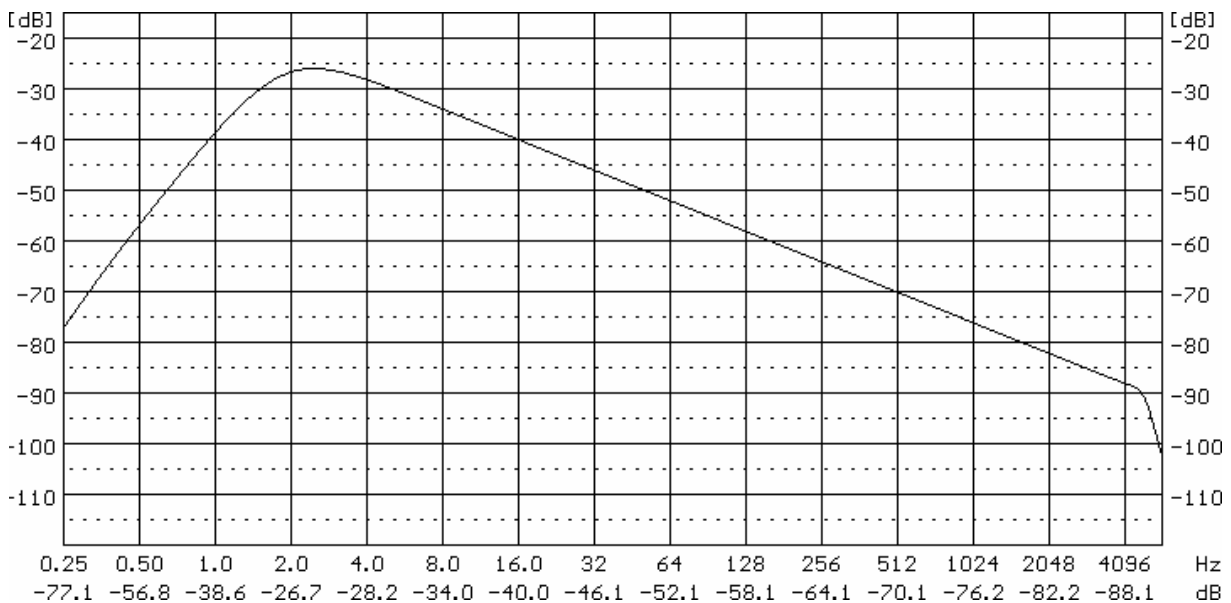
PROFILE(1) windows; the selection of the weighting filter in velocity measurements

The **Vel1** filter is used for the velocity measurements (the vibration signal) in the frequency range from 1 Hz to 20 kHz.



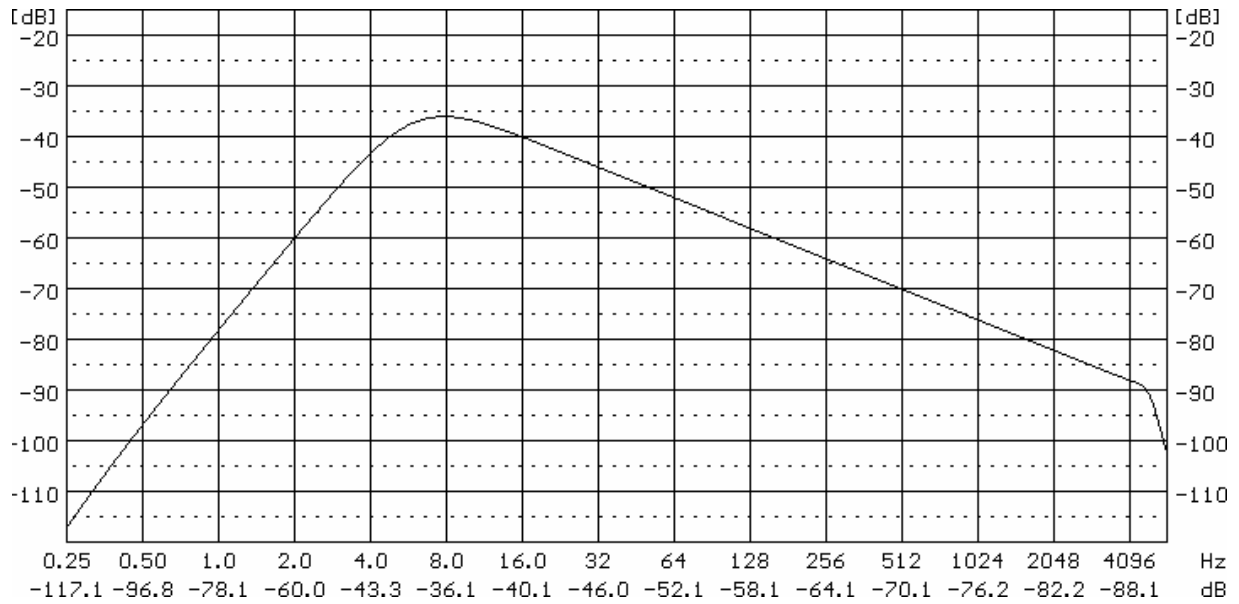
Characteristics of Vel1 digital filter implemented for the velocity measurements in VM

The **Vel3** filter is used for the velocity measurements in the frequency range from 1 Hz to 20 kHz.



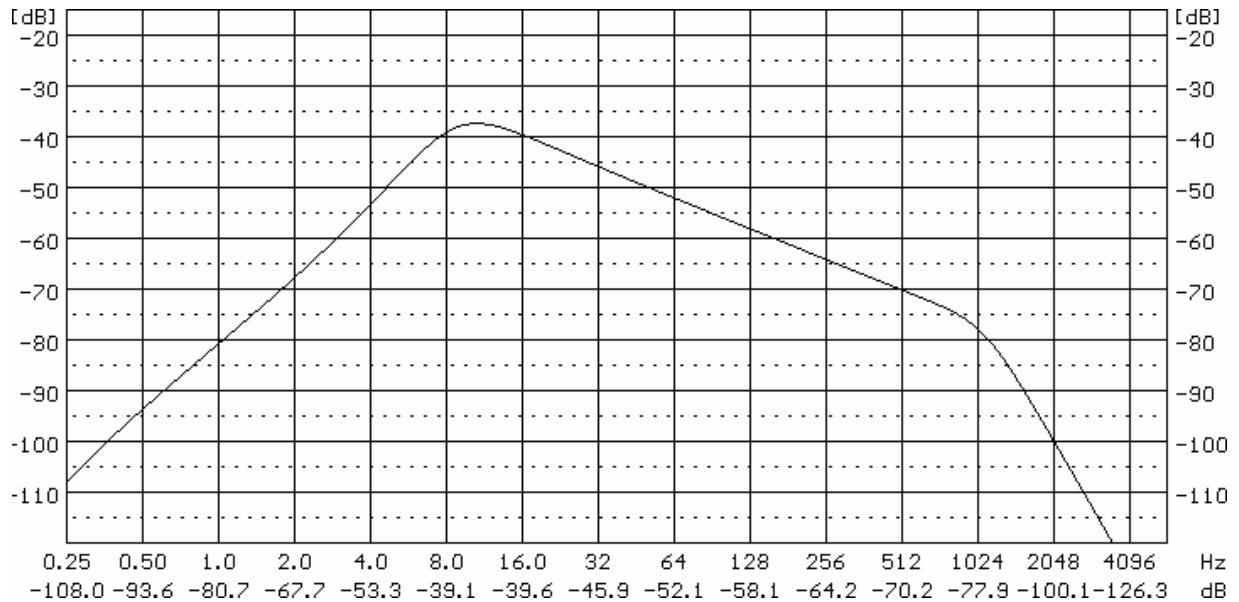
Characteristics of Vel3 digital filter implemented for the velocity measurements in VM

The **Vel10** filter is used for the velocity measurements in the frequency range from 1 Hz to 20 kHz.



Characteristics of Vel10 digital filter implemented for the velocity measurements in VM

The **VelMF** filter is used for the evaluation of the state of the machines. This filter is used for the measurements in the frequency range from 10 Hz to 1000 Hz and conforms to the ISO 10816 standard.



Characteristics of VelMF digital filter implemented for the velocity measurements in VM

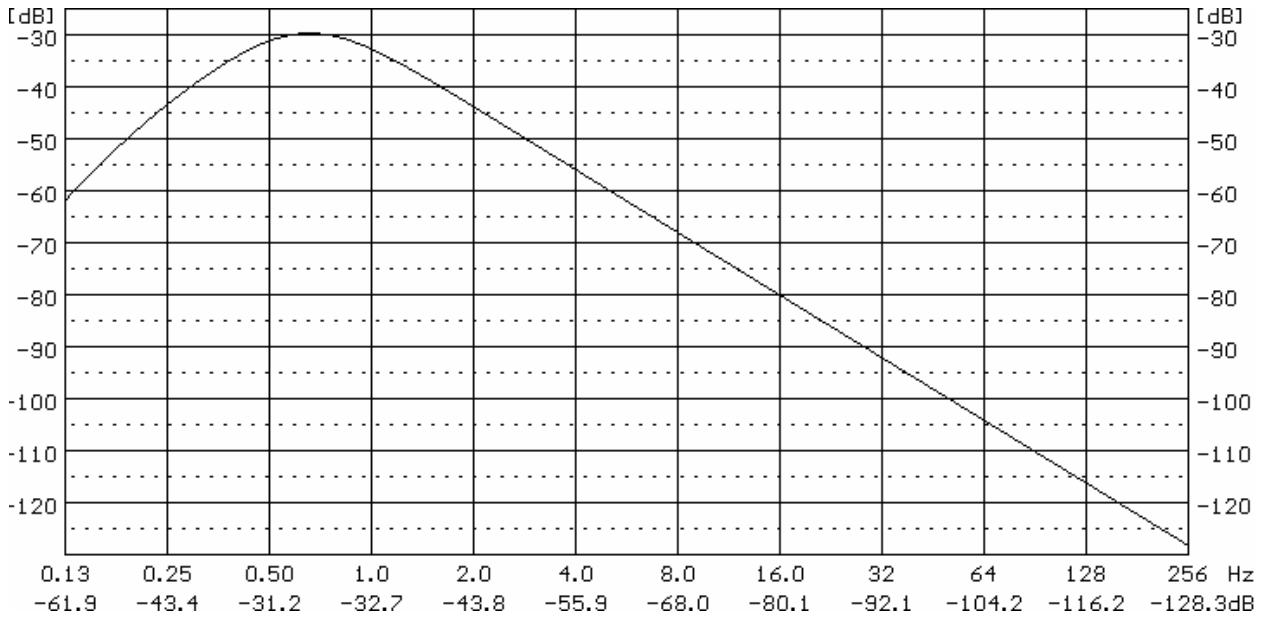
D.2.2.3 Digital filters implemented in the vibration mode for the displacement measurements

The following three filters (**Di11**, **Di13** and **Di110**) are dedicated for the displacement measurements of the vibration signal in the different frequency ranges.

PROFILE(1)	PROFILE(1)	PROFILE(1)
FILTER : Di11	FILTER : Di13	FILTER : Di110
DETECTOR: 1.0s	DETECTOR: 1.0s	DETECTOR: 1.0s
LOGGER PEAK : []	LOGGER PEAK : []	LOGGER PEAK : []
LOGGER P-P : []	LOGGER P-P : []	LOGGER P-P : []
LOGGER MAX : []	LOGGER MAX : []	LOGGER MAX : []
LOGGER RMS : []	LOGGER RMS : []	LOGGER RMS : []

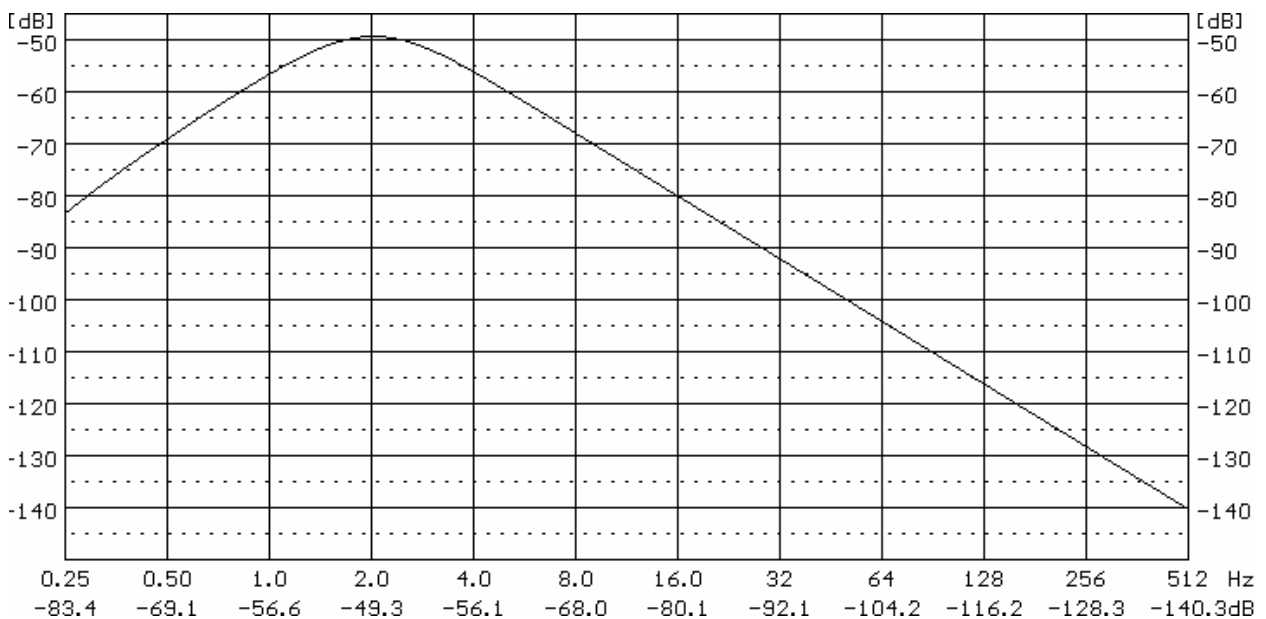
PROFILE(1) windows; the selection of the weighting filter in displacement measurements

The **Di11** filter is used for the displacement measurements in the frequency range [1 Hz to 20 kHz].



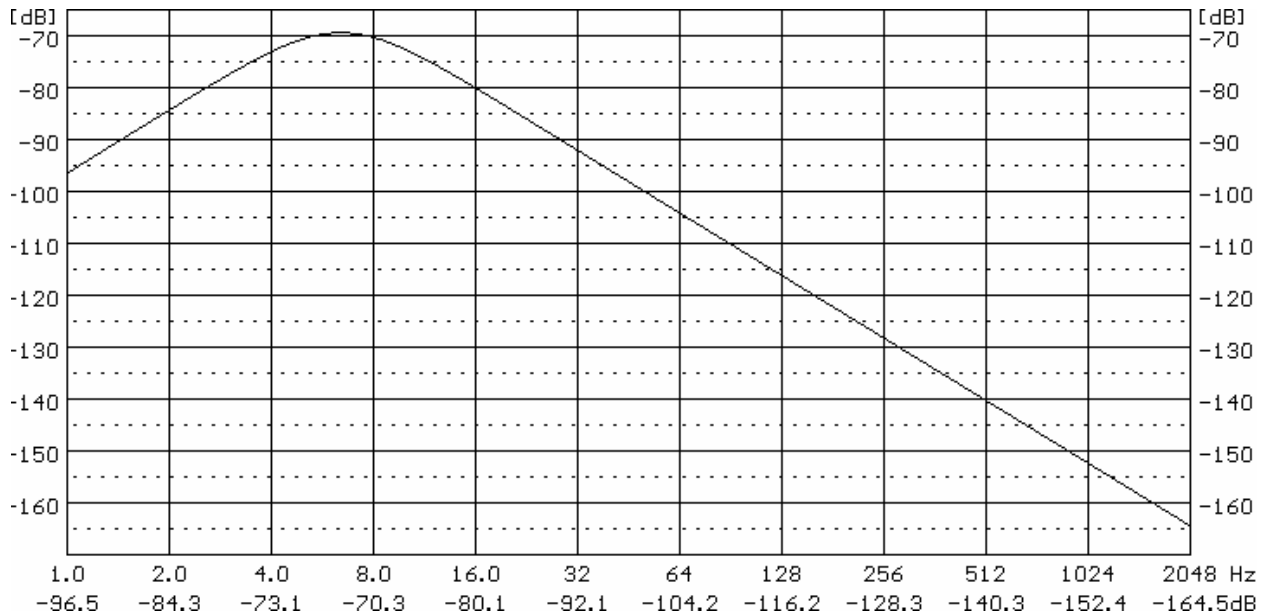
Characteristics of Di11 digital filter implemented for the displacement measurements in VM

The **Di13** filter is used for the displacement measurements in the frequency range [1 Hz to 20 kHz].



Characteristics of Di13 digital filter implemented for the displacement measurements in VM

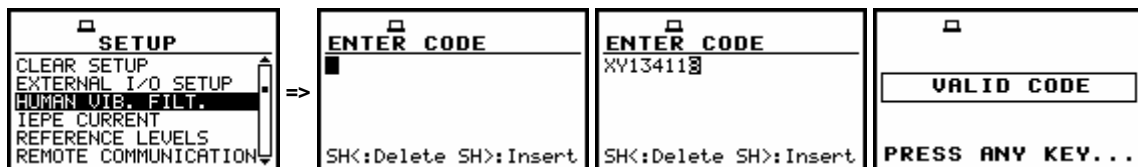
The **Dil10** filter is used for the displacement measurements in the frequency range [1 Hz to 20 kHz].



Characteristics of Dil10 digital filter implemented for the displacement measurements in VM

D.2.2.4 Digital filters used in the HUMAN VIBRATION investigations

The **HUMAN VIBRATION FILTERS** are the optional feature of the **SVAN 957** instrument. They should be activated by the introduction of a special code, unique for the serial number of the meter. The mentioned code has to be input in the **ENTER CODE** window opened after pressing the **<ENTER>** push-button in the **SETUP** list with the **HUMAN VIB. FILT.** text selected.



SETUP and ENTER CODE windows; the activation of human vibration option

After the successful introduction of the activation code, the **HUMAN VIB. FILT.** text is removed from the **SETUP** list and will not be visible any more even after the upgrade of the internal software.



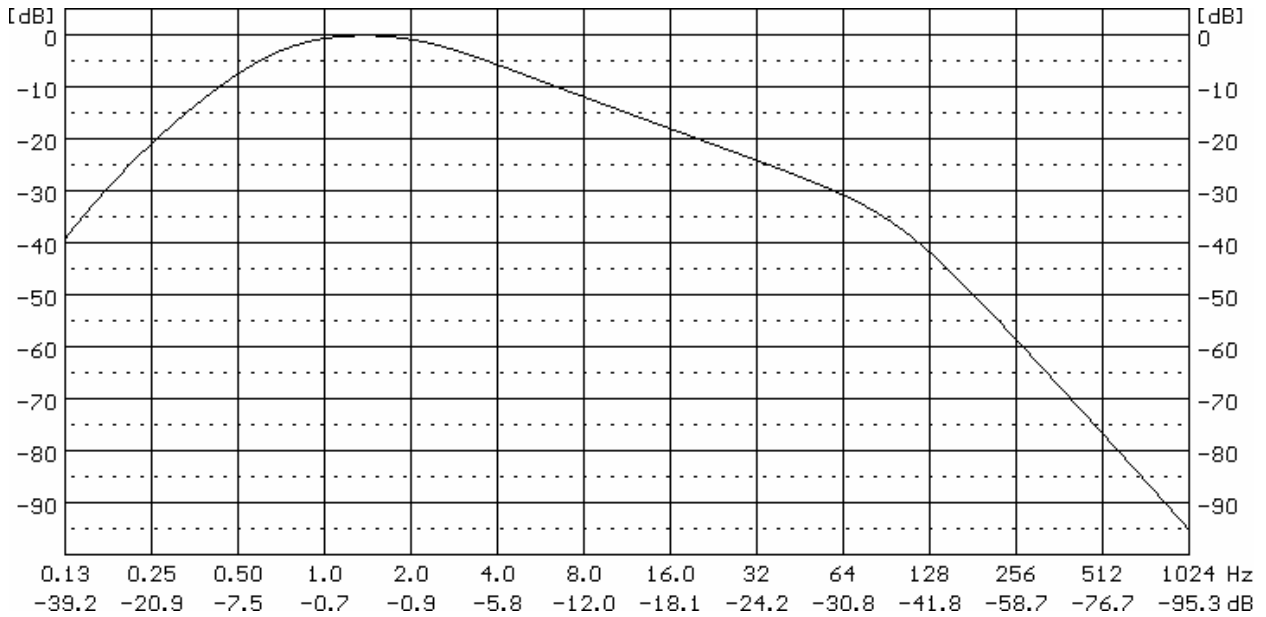
SETUP windows after the successful activation of human vibration option

In the **SVAN 957** instrument there are various filters conforming to old ISO 2631 and ISO 8041 (version dated as 1990-07-15) standards (**W-Bxy**, **W-Bz**, **H-A** and **W-Bc**), still used in certain countries for the assessment of the influence of the vibration signal on the human body. The mentioned above filters can be set in the same manner as other filters, in the **PROFILE (x)** windows.

PROFILE(1)	PROFILE(1)	PROFILE(1)	PROFILE(1)
FILTER : W-Bxy	FILTER : W-Bz	FILTER : H-A	FILTER : W-Bc
DETECTOR: 1.0s	DETECTOR: 1.0s	DETECTOR: 1.0s	DETECTOR: 1.0s
LOGGER PEAK : []	LOGGER PEAK : []	LOGGER PEAK : []	LOGGER PEAK : []
LOGGER P-P : []	LOGGER P-P : []	LOGGER P-P : []	LOGGER P-P : []
LOGGER MAX : []	LOGGER MAX : []	LOGGER MAX : []	LOGGER MAX : []
LOGGER RMS : []	LOGGER RMS : []	LOGGER RMS : []	LOGGER RMS : []

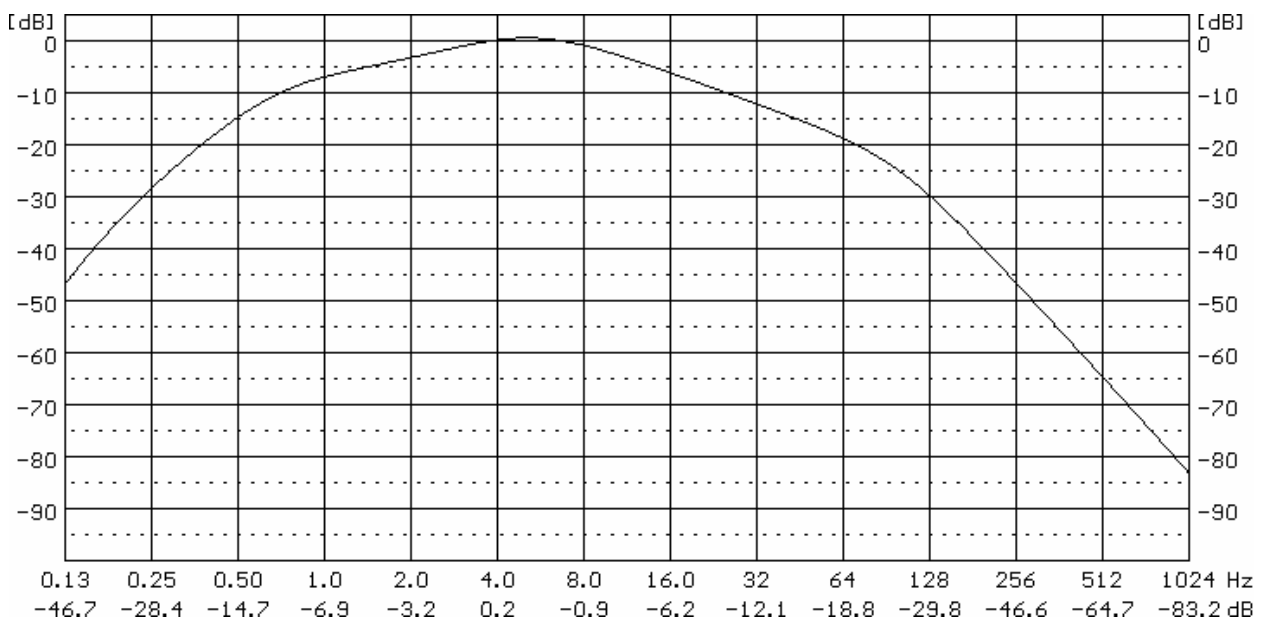
PROFILE(1) windows; the selection of old weighting filters in human vibration option

The mentioned above filters can be set in the same manner as the other filters, in the **PROFILE (x)** windows. The first one of them, the **W-Bxy** filter, is used for the assessment of the influence of the vibration signal on the human body in the horizontal direction. It conforms to the ISO 2631 and ISO 8041 (rev. dated as 1990-07-15) standards.



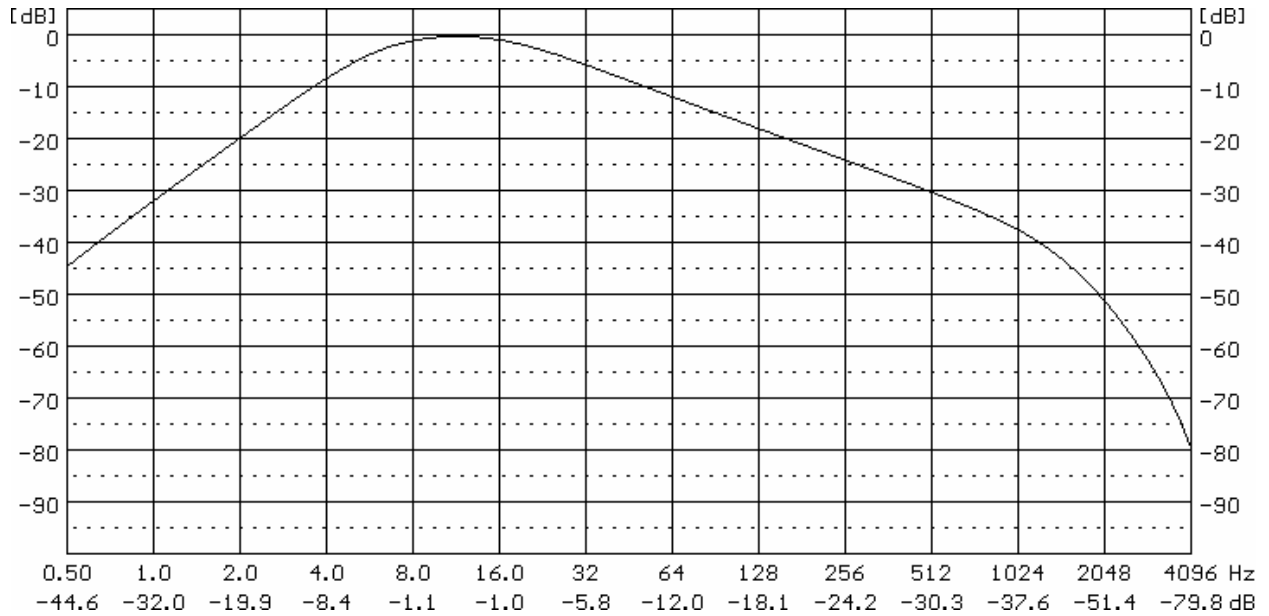
Characteristics of W-Bxy digital filter implemented in the instrument in VM

The **W-Bz** filter is used for the assessment of the vibration signal influence on the human body in the vertical direction. It conforms to the ISO 2631 and ISO 8041 (rev. dated as 1990-07-15) standards.



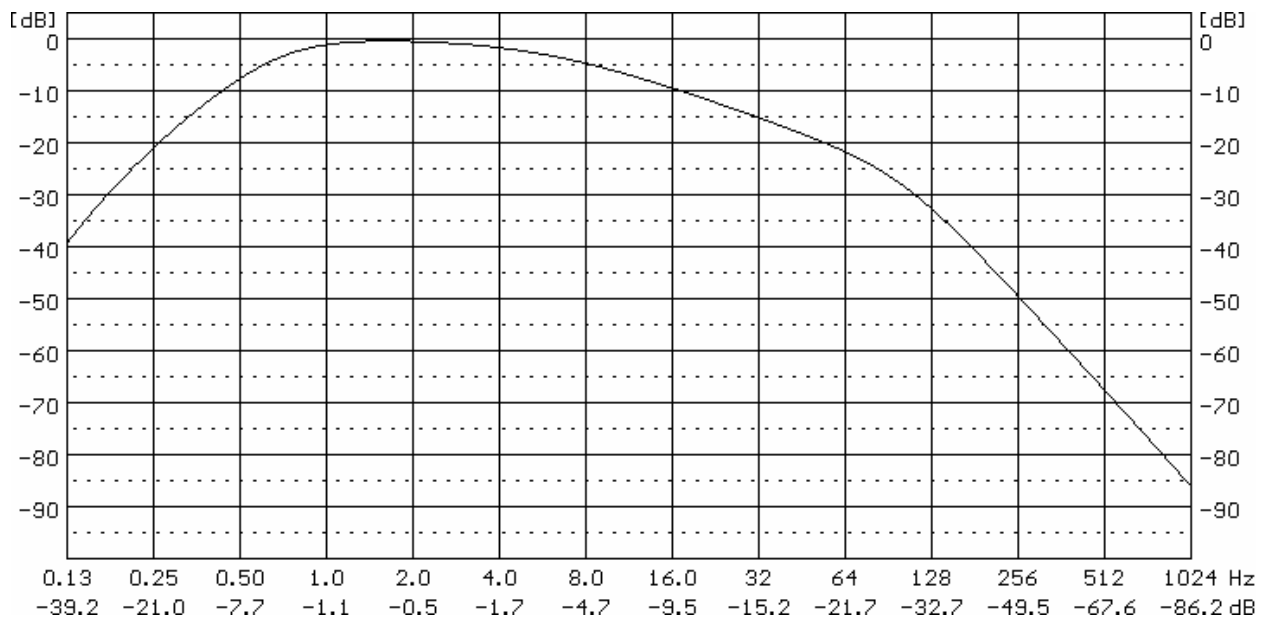
Characteristics of W-Bz digital filter implemented in the instrument in VM

The **H–A** filter is used for the assessment of the influence of the local vibration signal on the human body. It conforms to the ISO 2631 and ISO 8041 (rev. dated as 1990-07-15) standards.



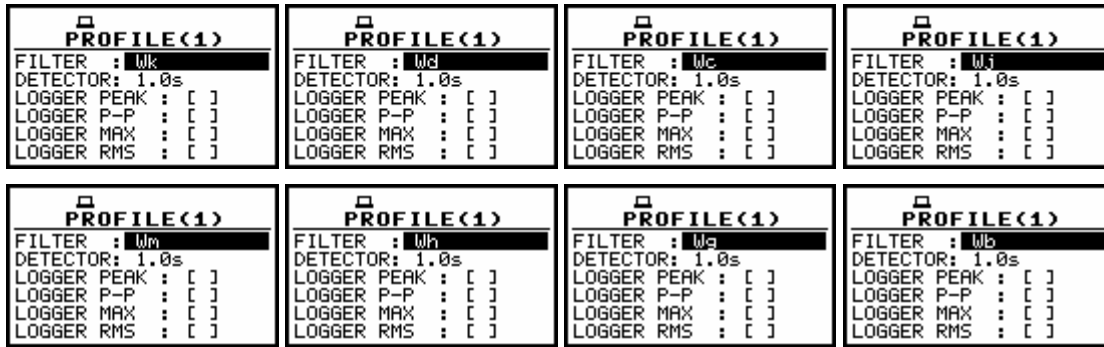
Characteristics of H–A digital filter implemented in the instrument in VM

The **W–Bc** filter is used for the assessment of the influence of the vibration signal on the human body during the seat-back measurements. It conforms to the ISO 2631 and ISO 8041 (rev. dated as 1990-07-15) standards.



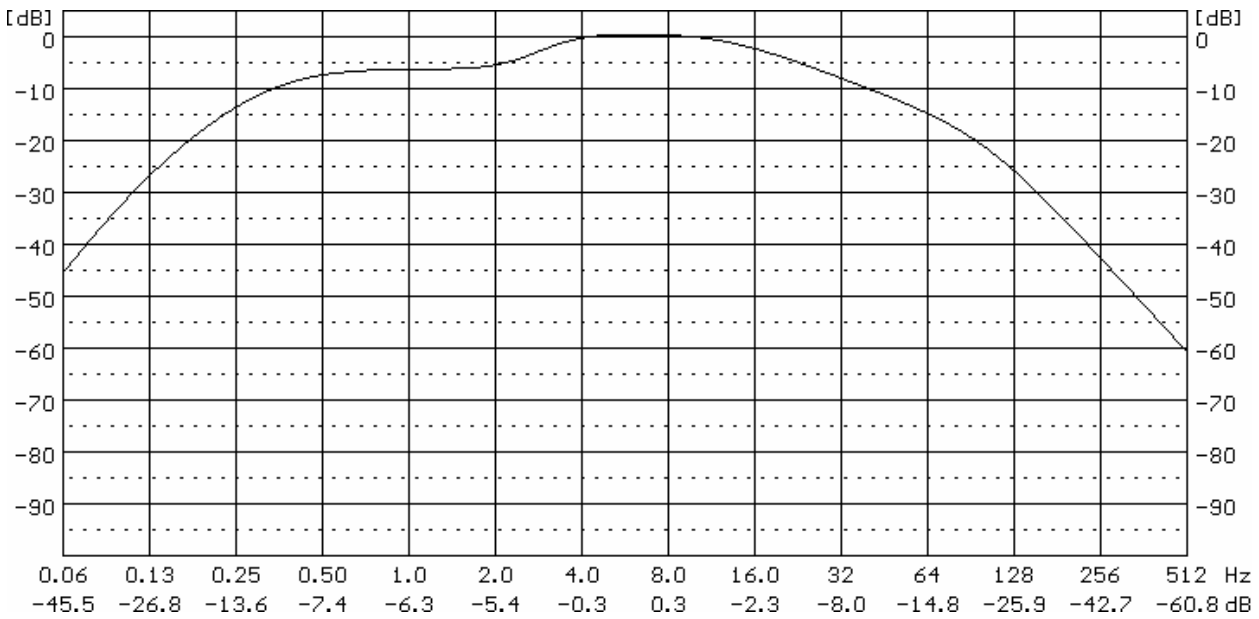
Characteristics of W–Bc digital filter implemented in the instrument in VM

In the **SVAN 957** instrument there are also various filters conforming to new ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards (**Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wh**, **Wg** and **Wb**). They are currently used in many countries for the assessment of the influence of the vibration signal on the human body.



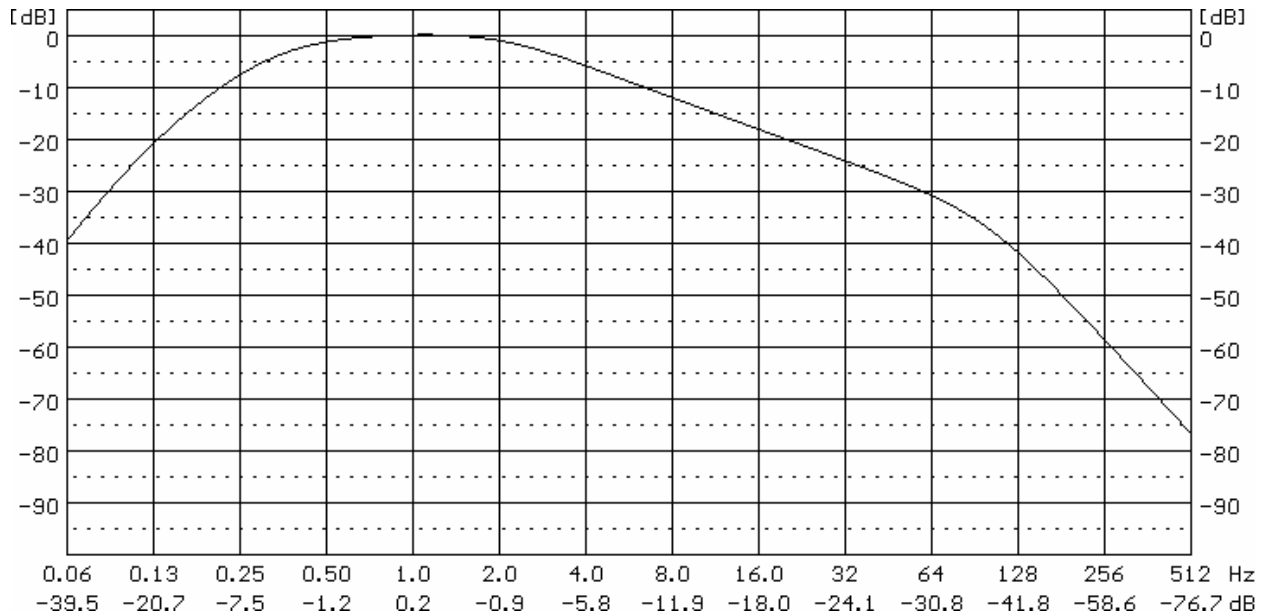
PROFILE(1) windows; the selection of new weighting filters in human vibration option

The mentioned above filters can be set in the same manner as other filters, in the **PROFILE (x)** windows. The **Wk** filter is used for the assessment of the influence of the vibration signal on the human body in the **z** direction and for vertical recumbent direction. It conforms to the ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards.



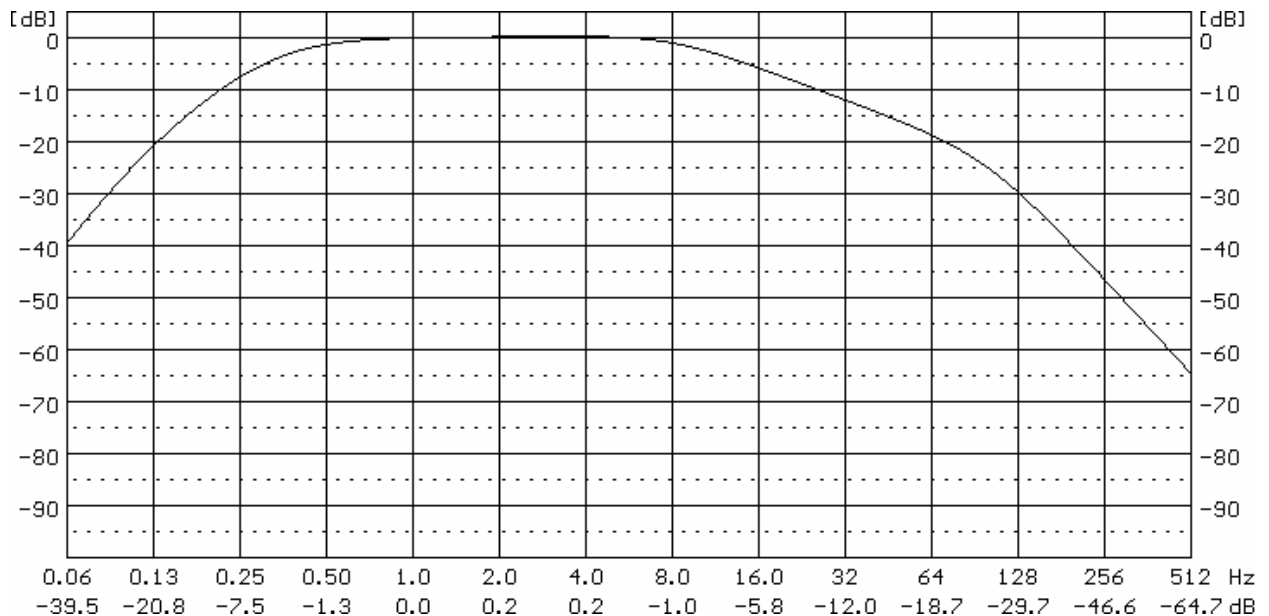
Characteristics of Wk digital filter implemented in the instrument in HVM

The **Wd** filter is used for the assessment of the influence of the vibration signal on the human body in the x and y directions and for horizontal recumbent direction. It conforms to the ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards.



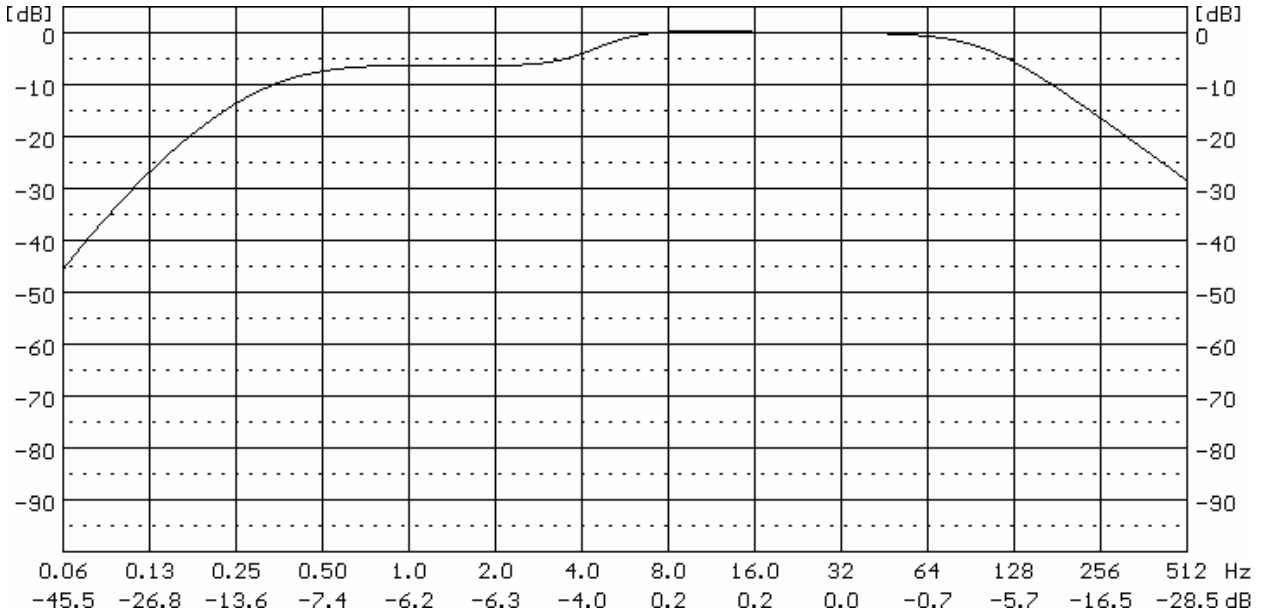
Characteristics of Wd digital filter implemented in the instrument in HVM

The **Wc** filter is used for the assessment of the influence of the vibration signal on the human body during the seat-back measurements. It conforms to the ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards.



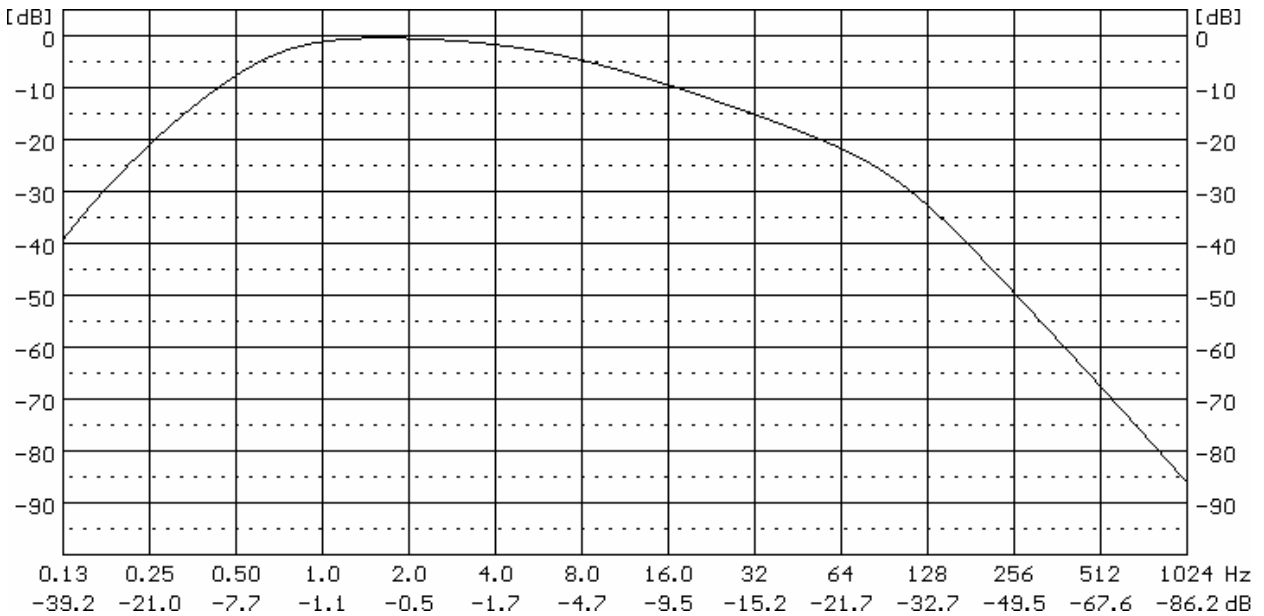
Characteristics of Wc digital filter implemented in the instrument in HVM

The **Wj** filter is used for the assessment of the influence of the vibration signal under the head of the recumbent person. It conforms to the ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards.



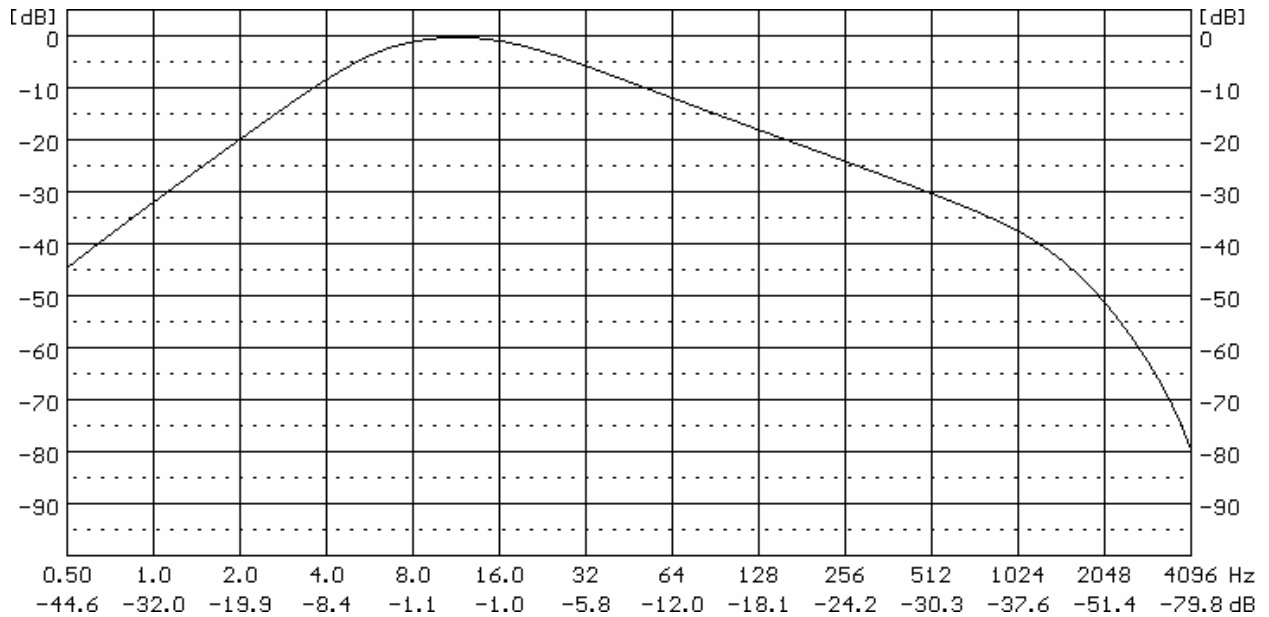
Characteristics of Wj digital filter implemented in the instrument in HVM

The **Wm** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards.



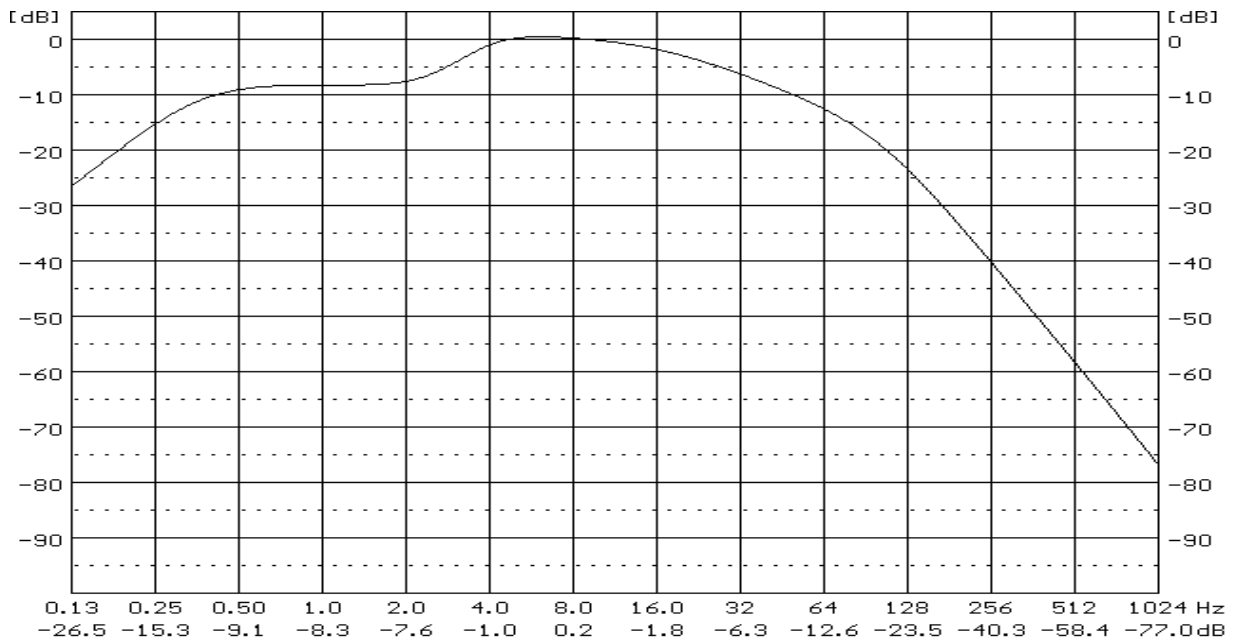
Characteristics of Wm digital filter implemented in the instrument in HVM

The **Wh** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO 2631-1-97 and ISO 8041 (revision dated as 1999-11-01) standards.



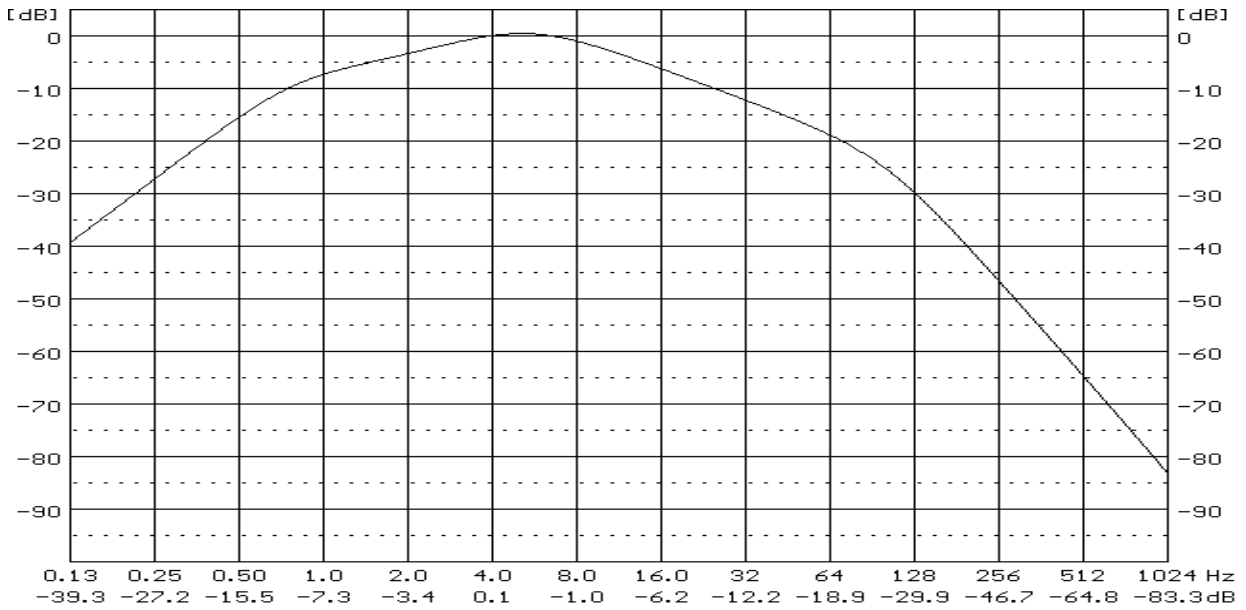
Characteristics of Wh digital filter implemented in the instrument in HVM

The **Wg** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the BS 6841:1987 standard.



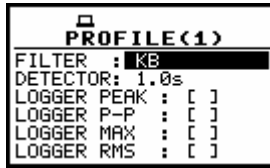
Characteristics of Wg digital filter implemented in the instrument in HVM

The **Wb** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO/FDIS 8041:2004(E) standard.



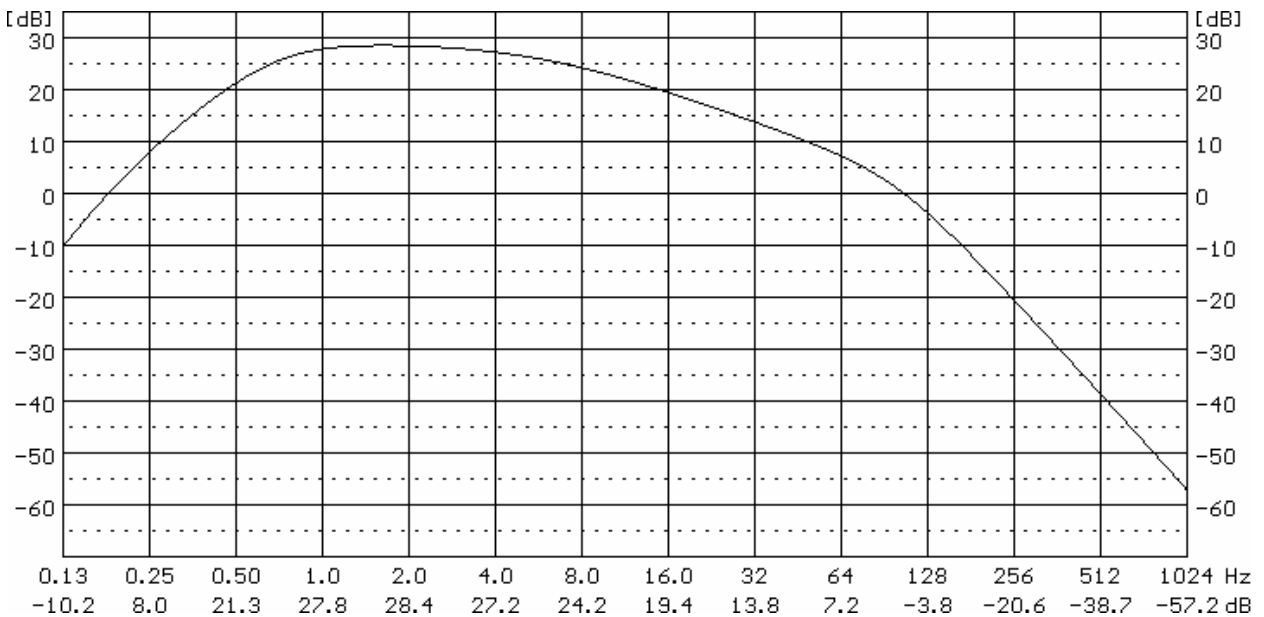
Characteristics of Wb digital filter implemented in the instrument in HVM

D.2.2.4 Digital filter used for vibration measurements on ships



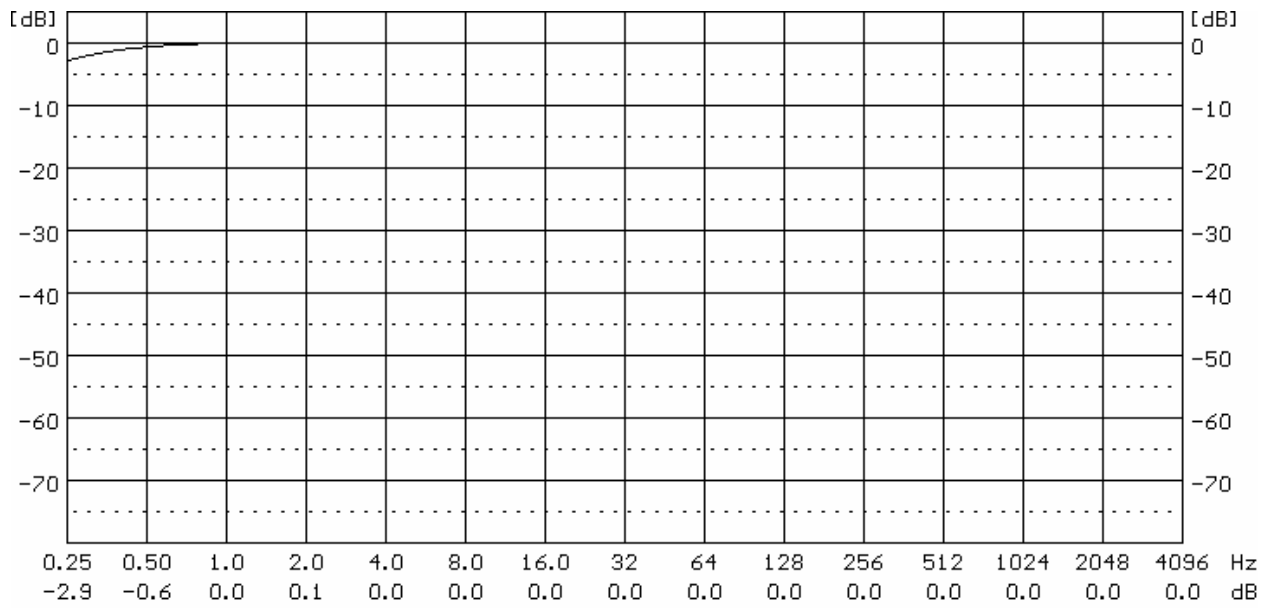
PROFILE(1) window; the selection of KB filter

The **KB** filter is used for the vibration measurements on ships. Its characteristics, presented below, is taken from the formulae: $KB = W - Bc + 28.9 \text{ dB}$.



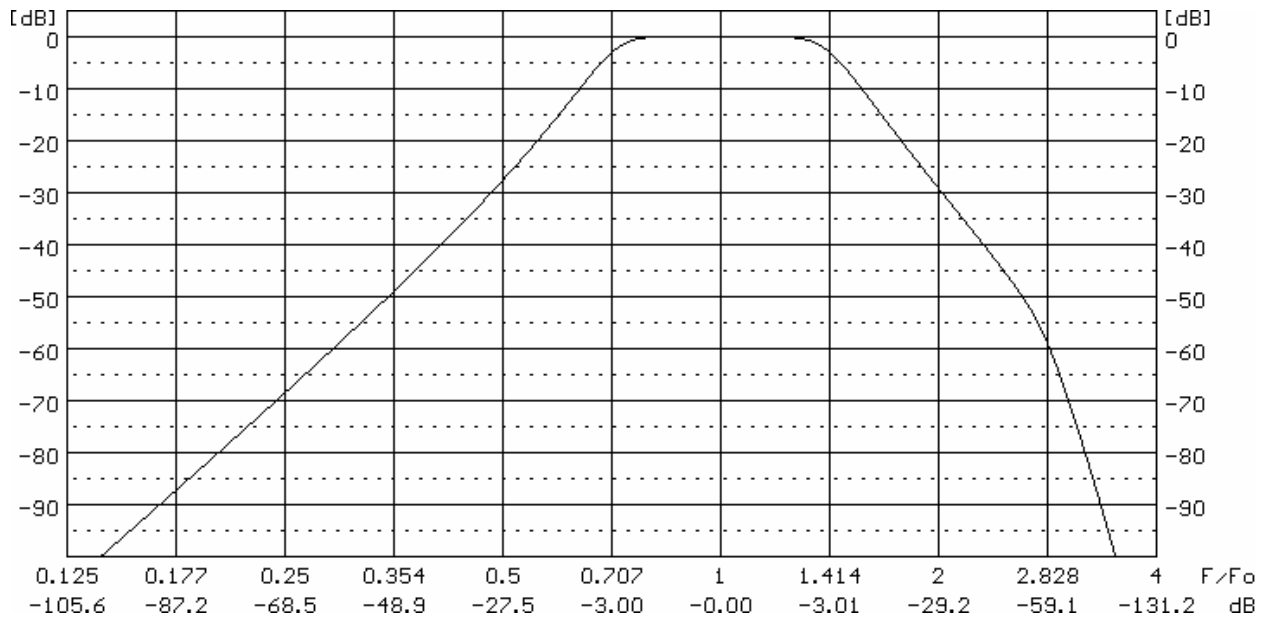
Characteristics of KB digital filter implemented in the instrument in VM

D.2.3 Digital HP filter implemented in 1/1 & 1/3 OCTAVE and FFT analysis

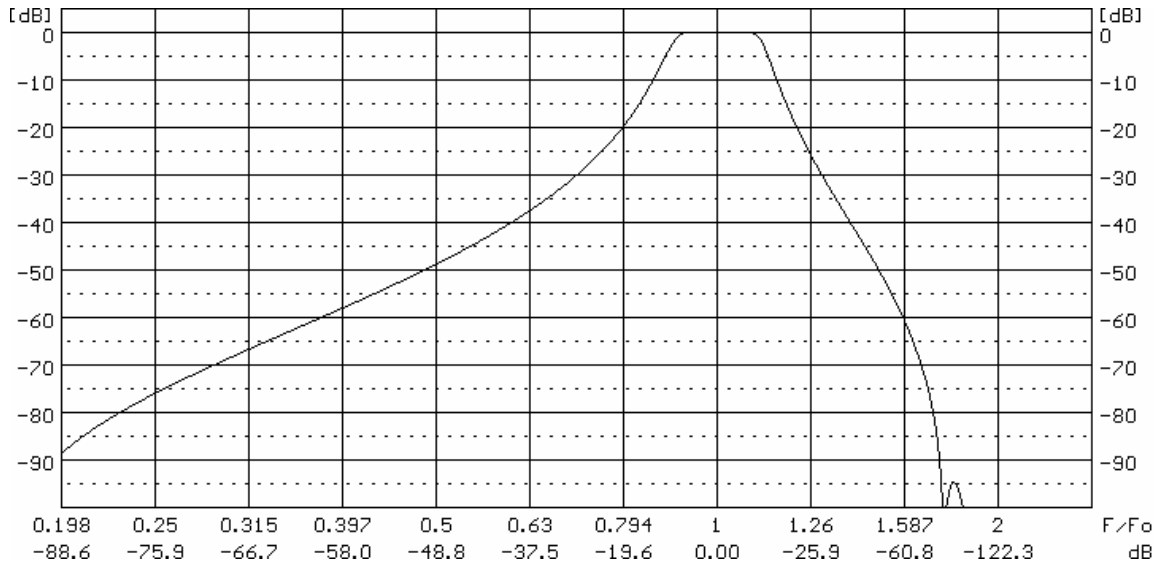


Characteristics of HP digital filter implemented in the instrument in FFT, 1/1 and 1/3 OCTAVE analysis

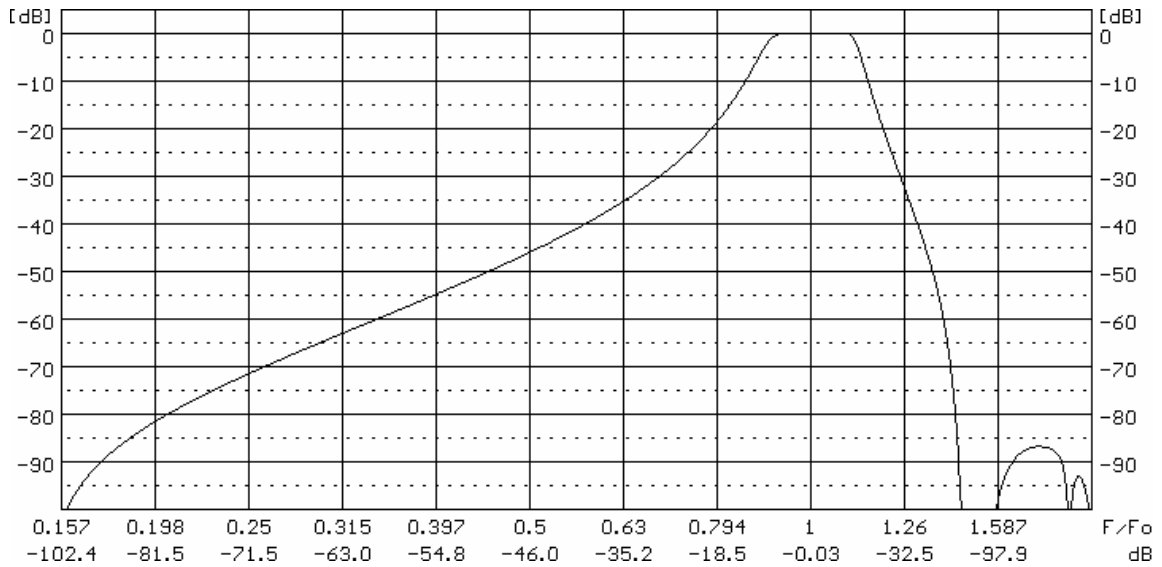
D.2.4 Digital 1/1 OCTAVE and 1/3 OCTAVE filters implemented in the SVAN 957



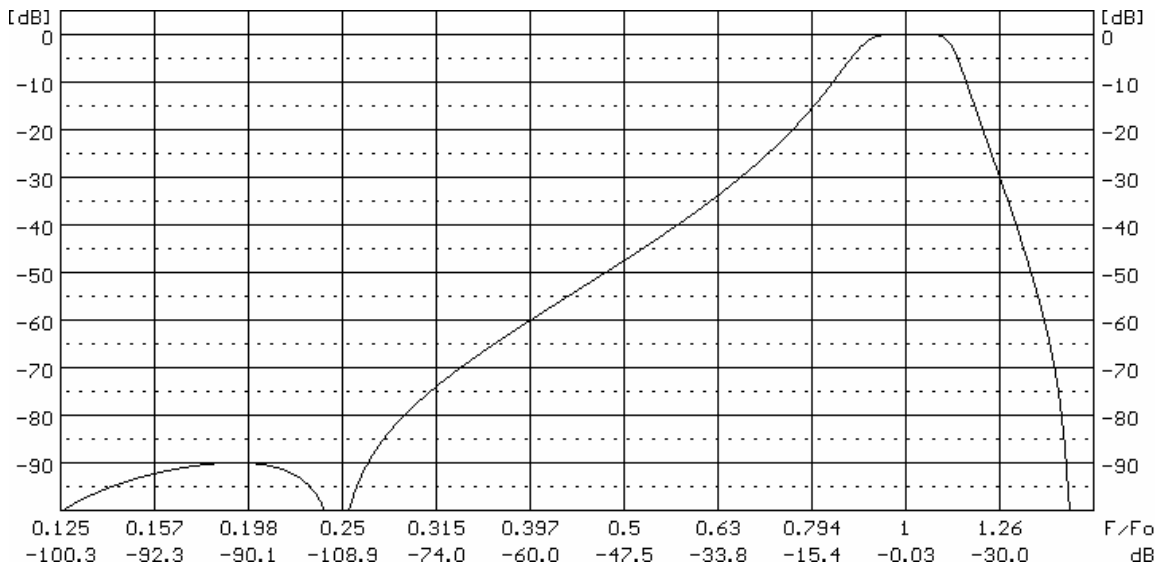
Characteristics of the exemplary digital 1/1 OCTAVE filter implemented in the instrument



Characteristics of the exemplary lower digital 1/3 OCTAVE filter implemented in the instrument



Characteristics of the exemplary middle digital 1/3 OCTAVE filter implemented in the instrument



Characteristics of the exemplary upper digital 1/3 OCTAVE filter implemented in the instrument