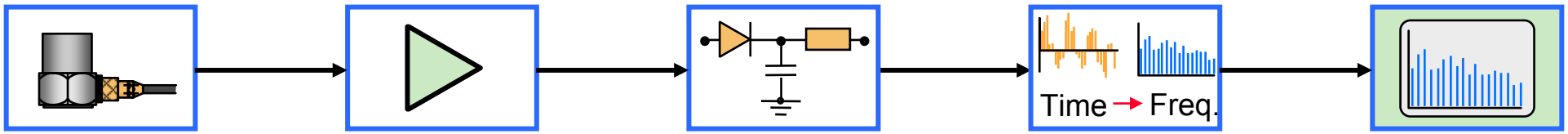
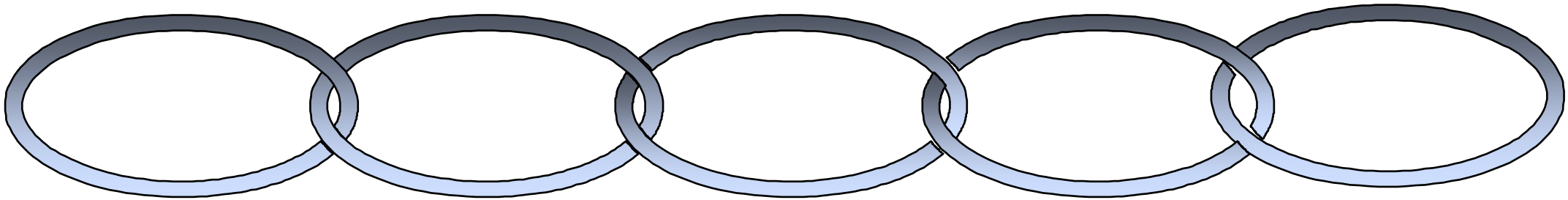
Snímače vibrací a úprava signálu

Měřicí řetězec

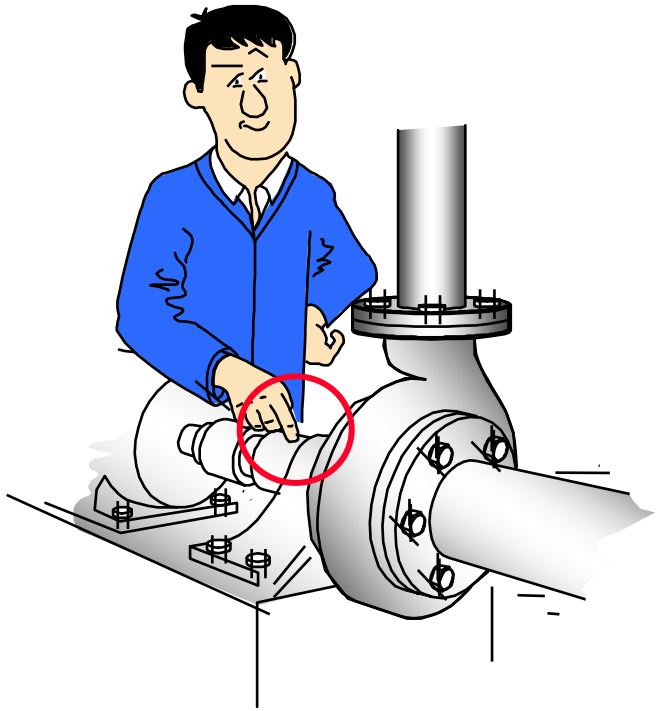
Snímač | Předzesilovač | Detektor/ Průměrování | Frekvenční analýza | Výstup

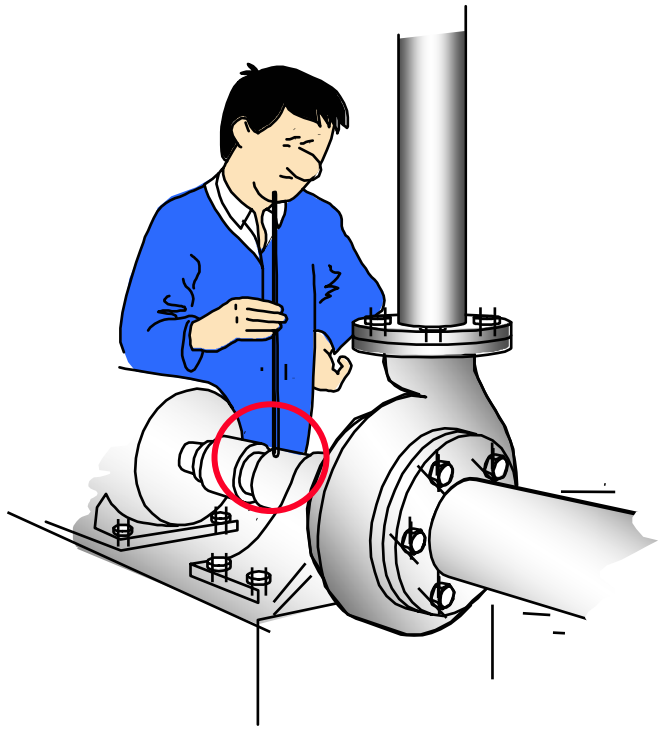


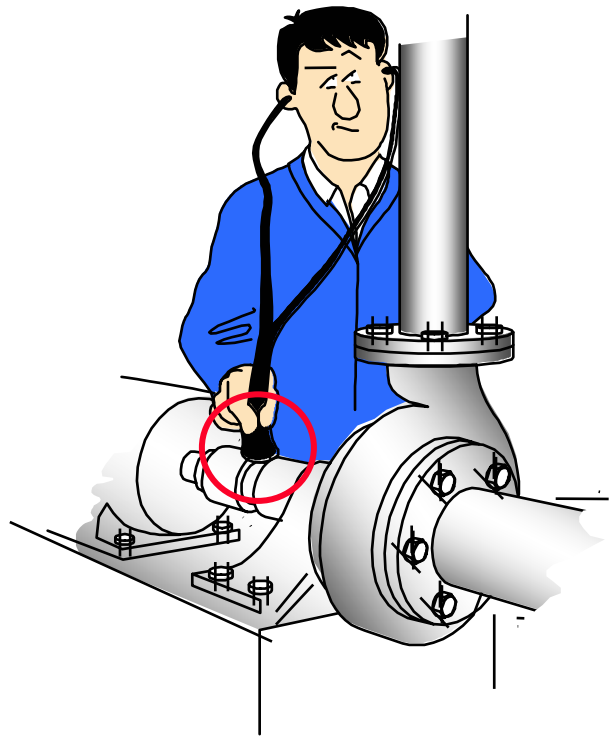


Brüel & Kjær

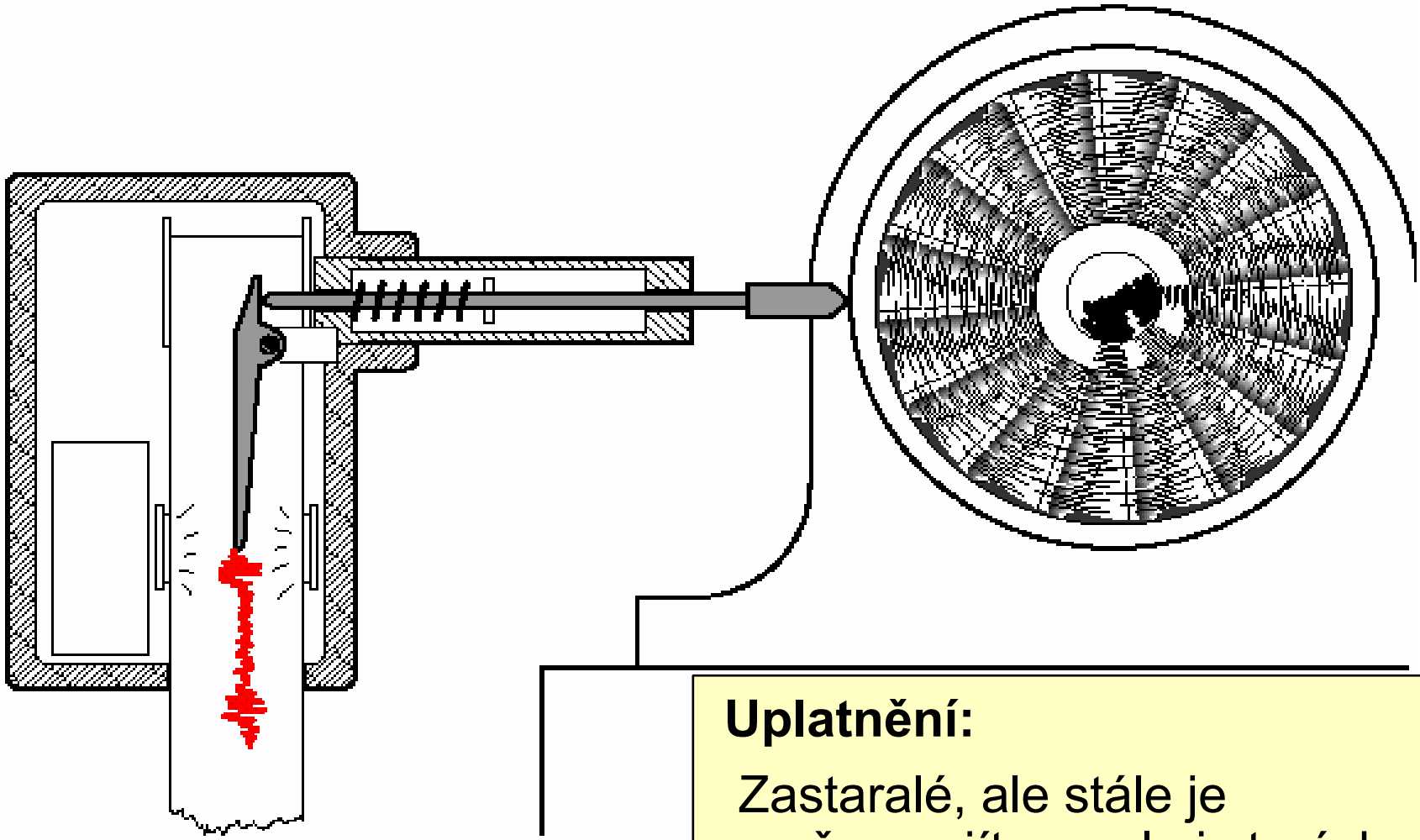
Dřívější metody “měření” vibrací







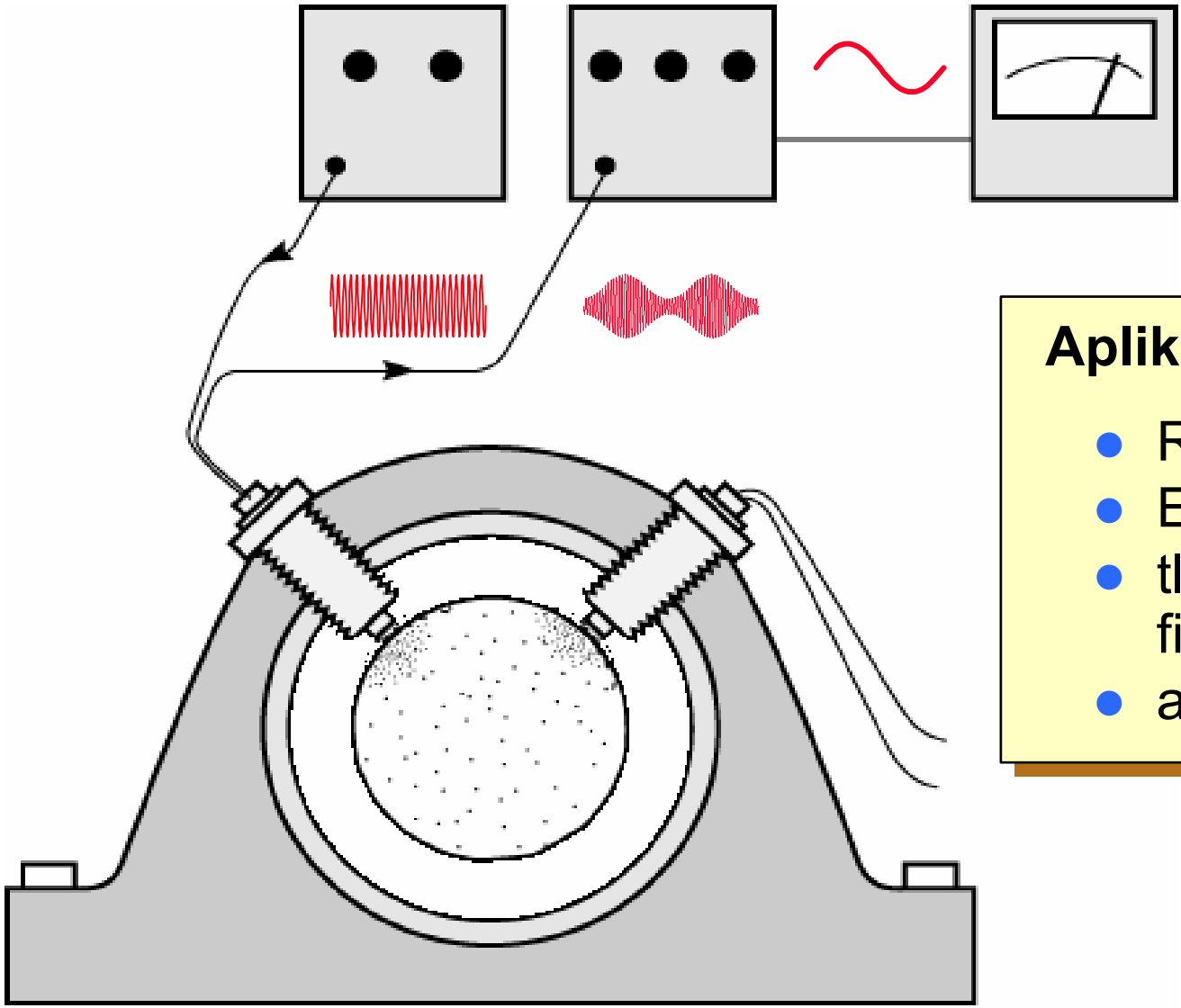
Mechanický pákový snímač výchylky



Uplatnění:

Zastaralé, ale stále je možno najít ve velmi starých provozech (energetika apod.)

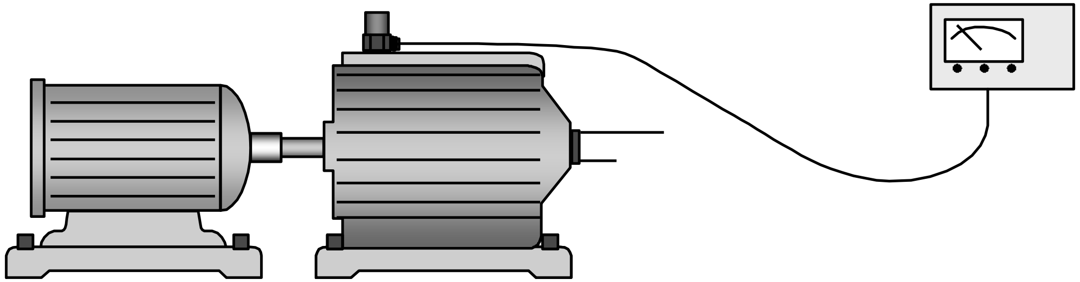
Bezkontaktní snímače “Eddy Current - Proximity”

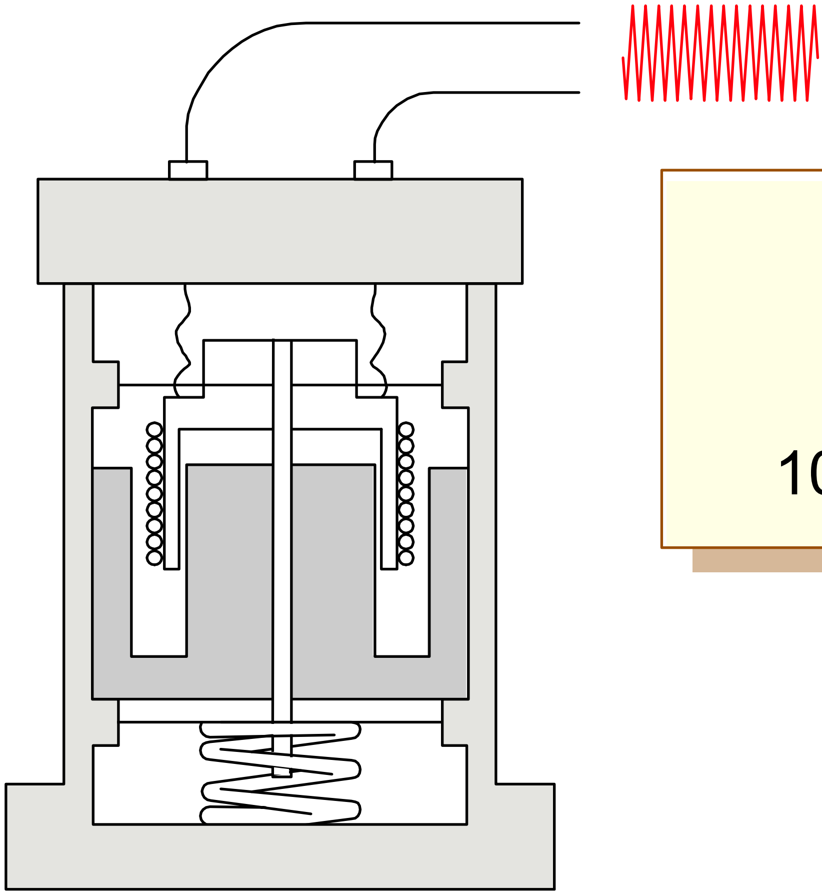


Aplikace:

- Relativní pohyby
- Excentricita hřídelí
- tloušťka olejového filmu
- atd.

Indukční snímač rychlosti (pohyblivé tělísko)



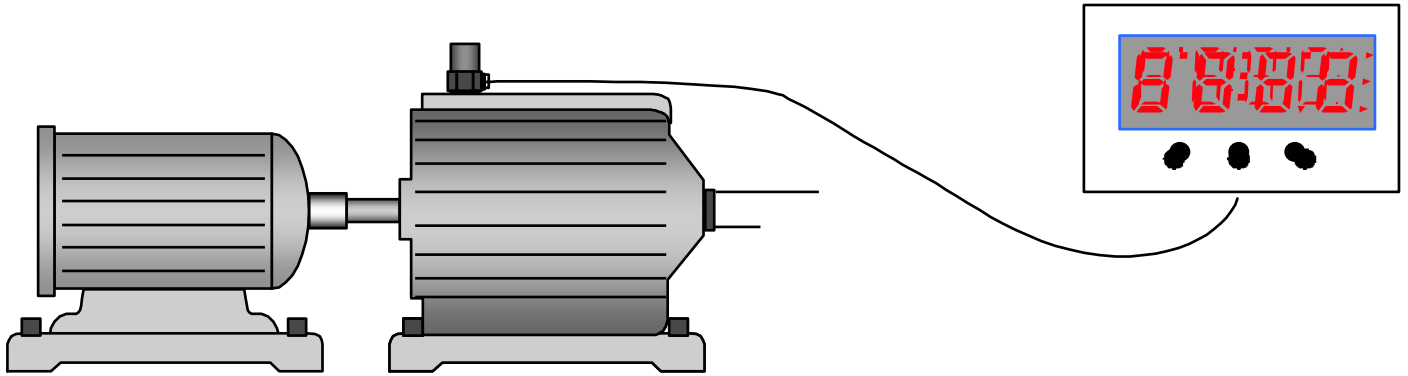


$e = Blv$

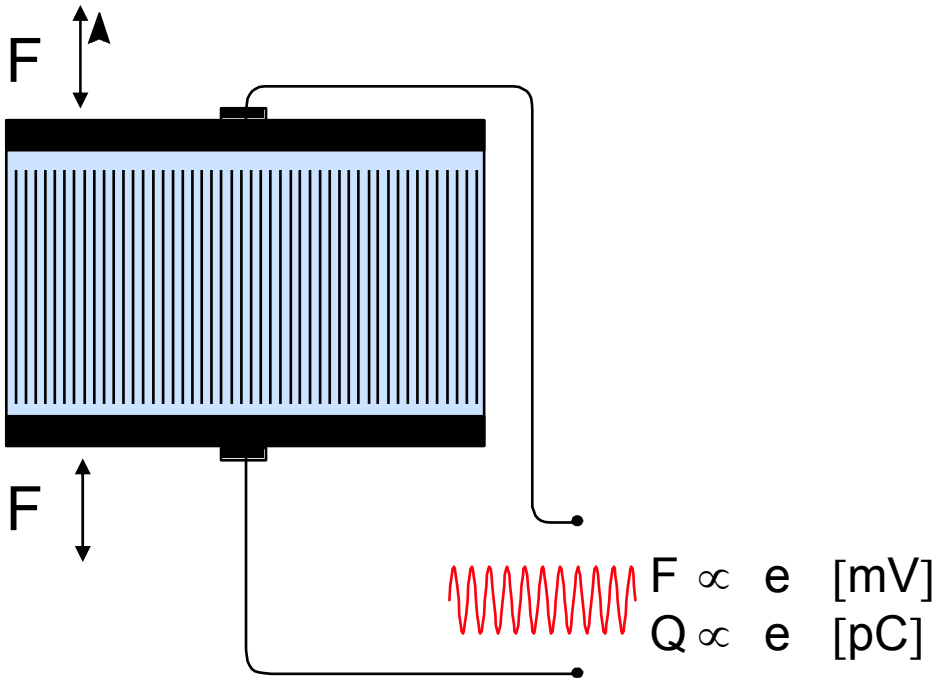
Omezení
frekvenčního
rozsahu:
10 < f < 1000 Hz

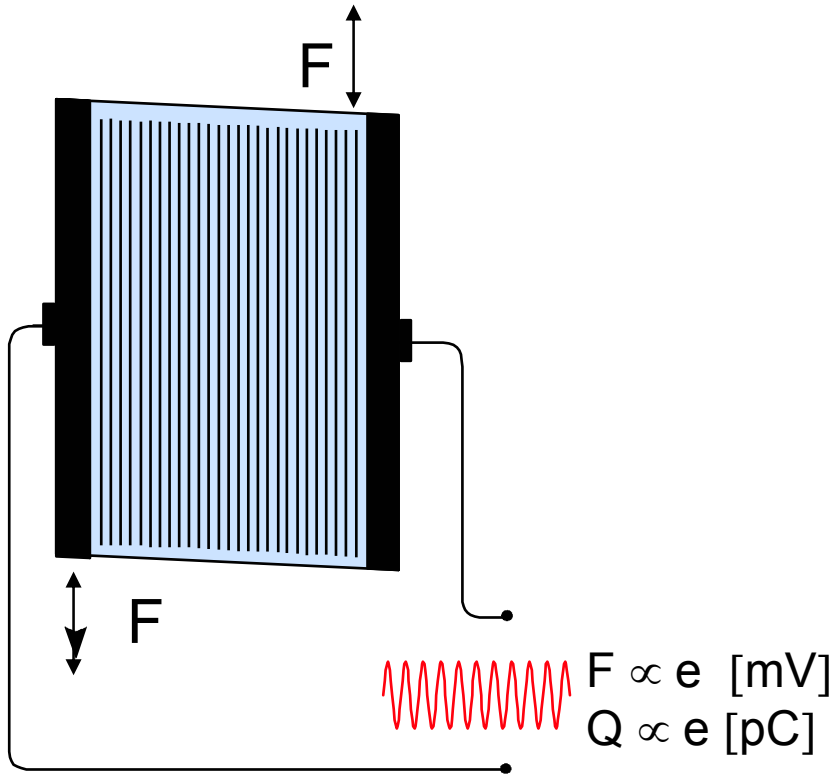
Brüel & Kjær

Piezoelektrický akcelerometr



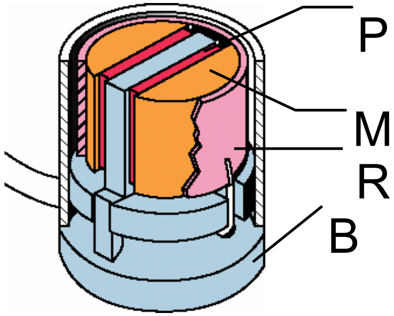
Princip funkce - stlačení nebo střih



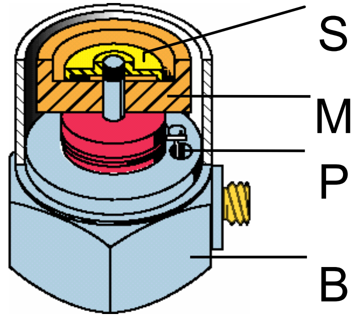


Typy akcelerometrů

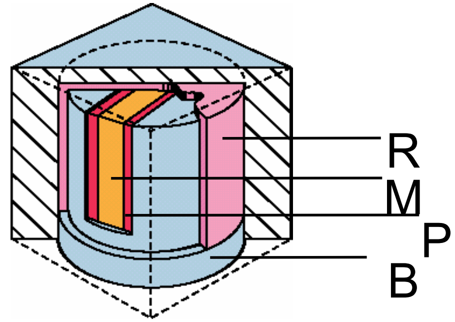
Planar Shear



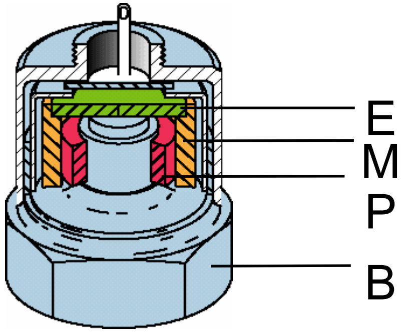
Centre-mounted Shear



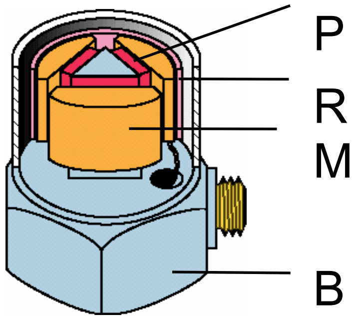
ThetaShear®



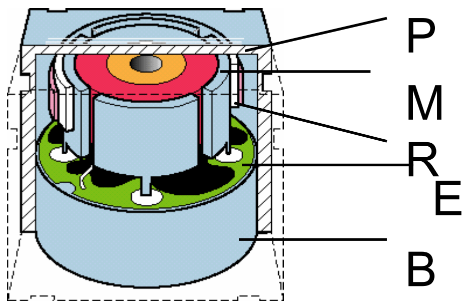
Annular Shear



Delta Shear®



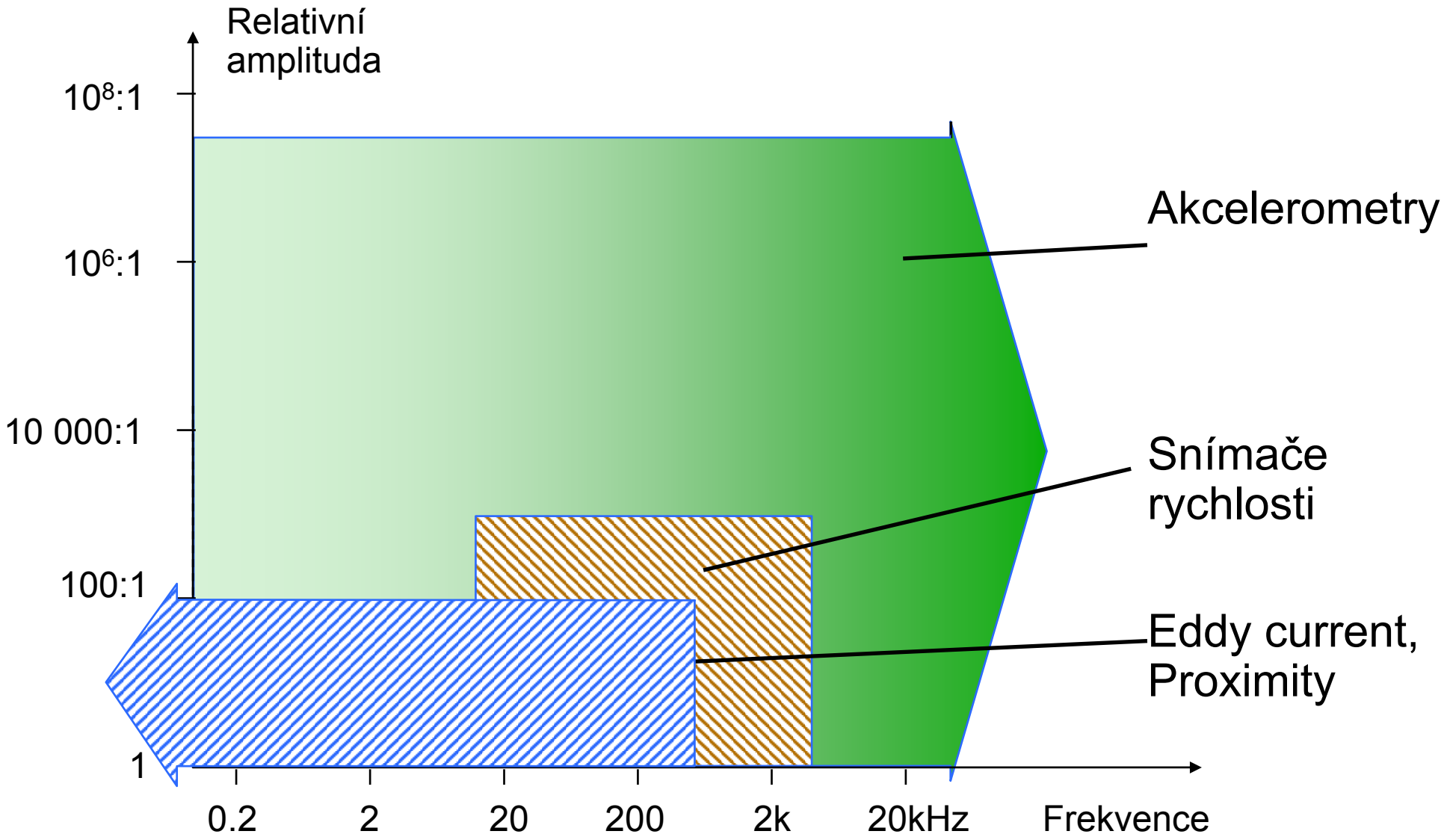
OrthoShear®



P: Piezoelektrický člen | **E: Zabudovaná elektr.** | **S: Pružina**

R: Připevňovací kroužek | **B: Základna**

Pracovní rozsahy snímačů vibrací

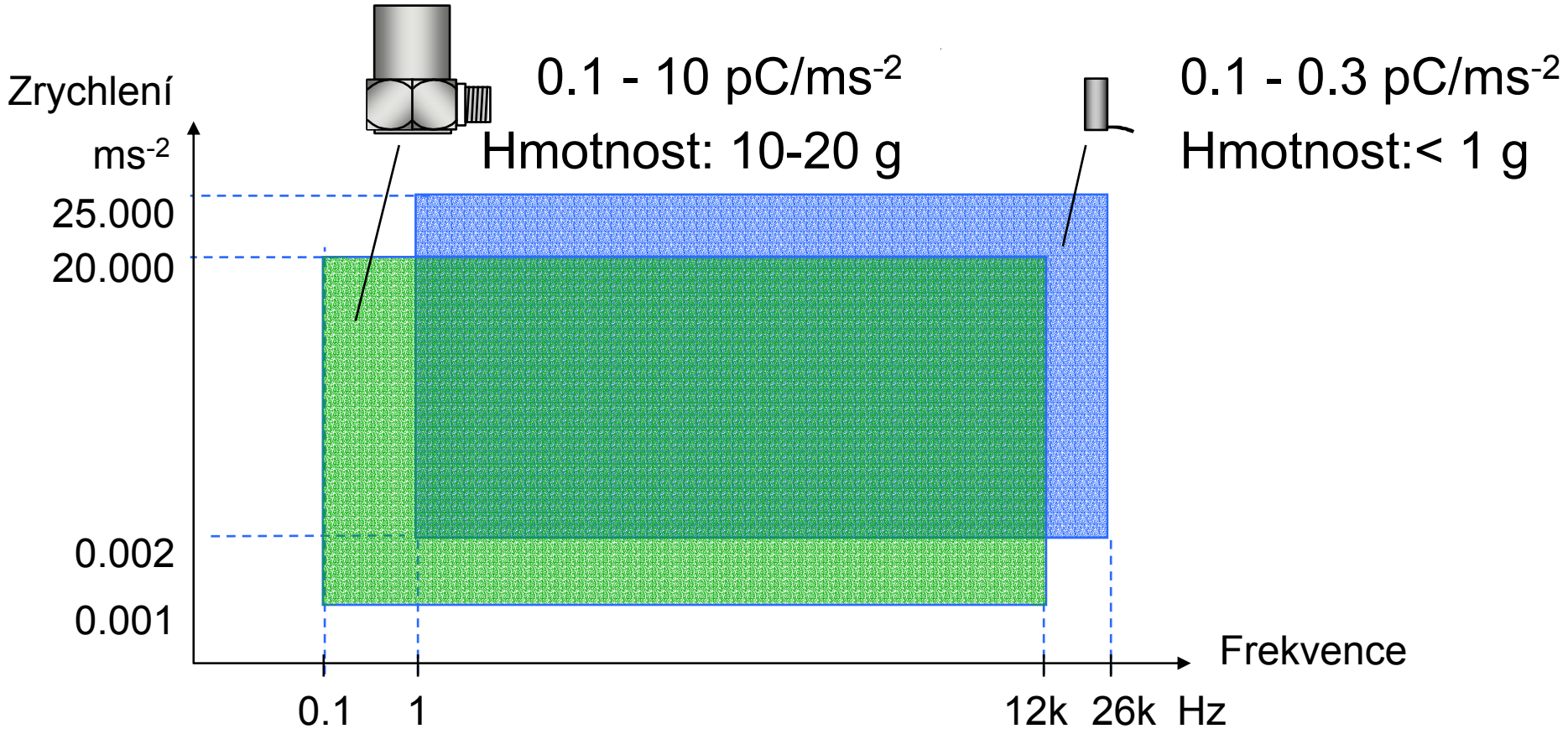


Volba akcelerometru

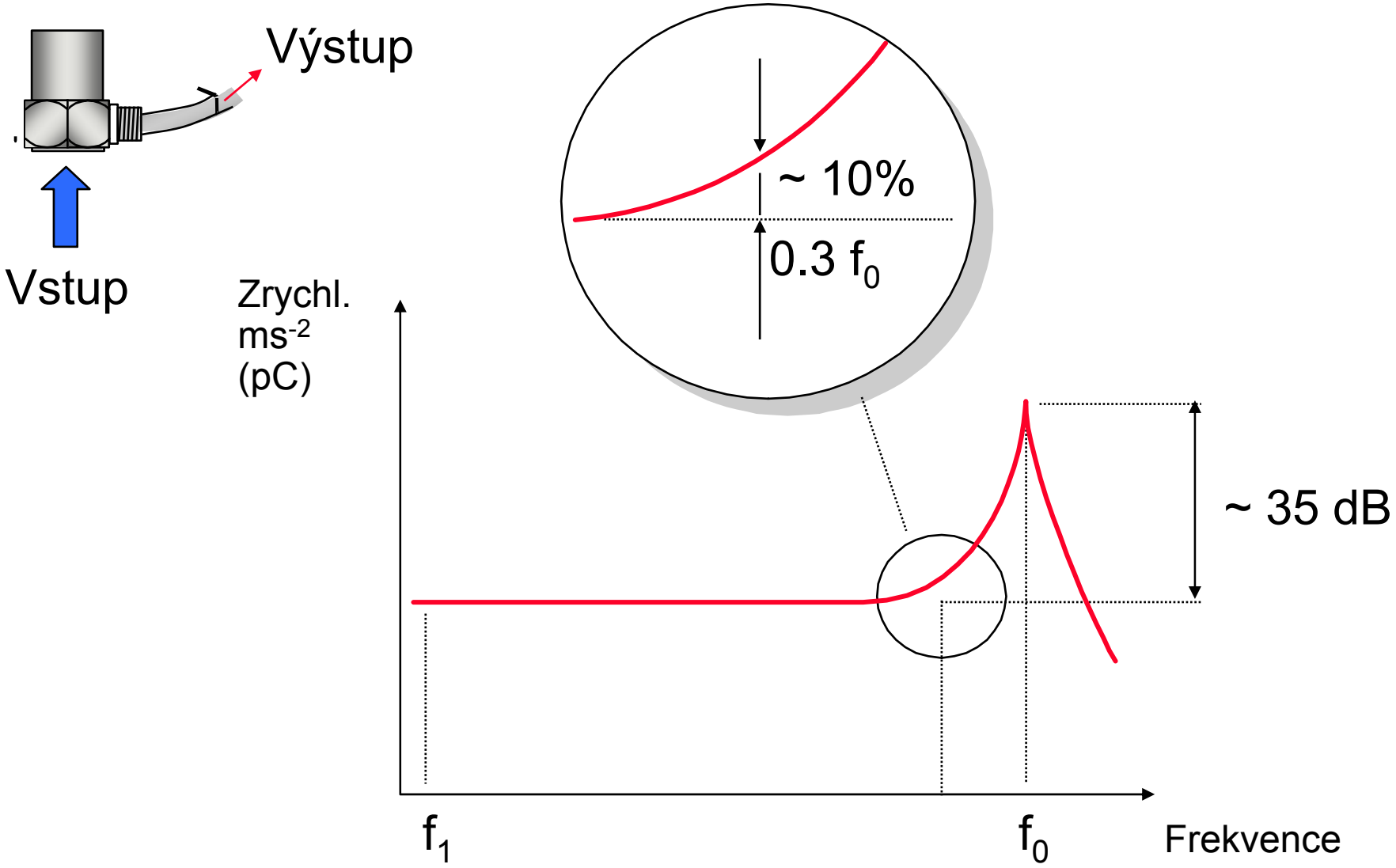
- “Těžký” a tedy citlivý

nebo

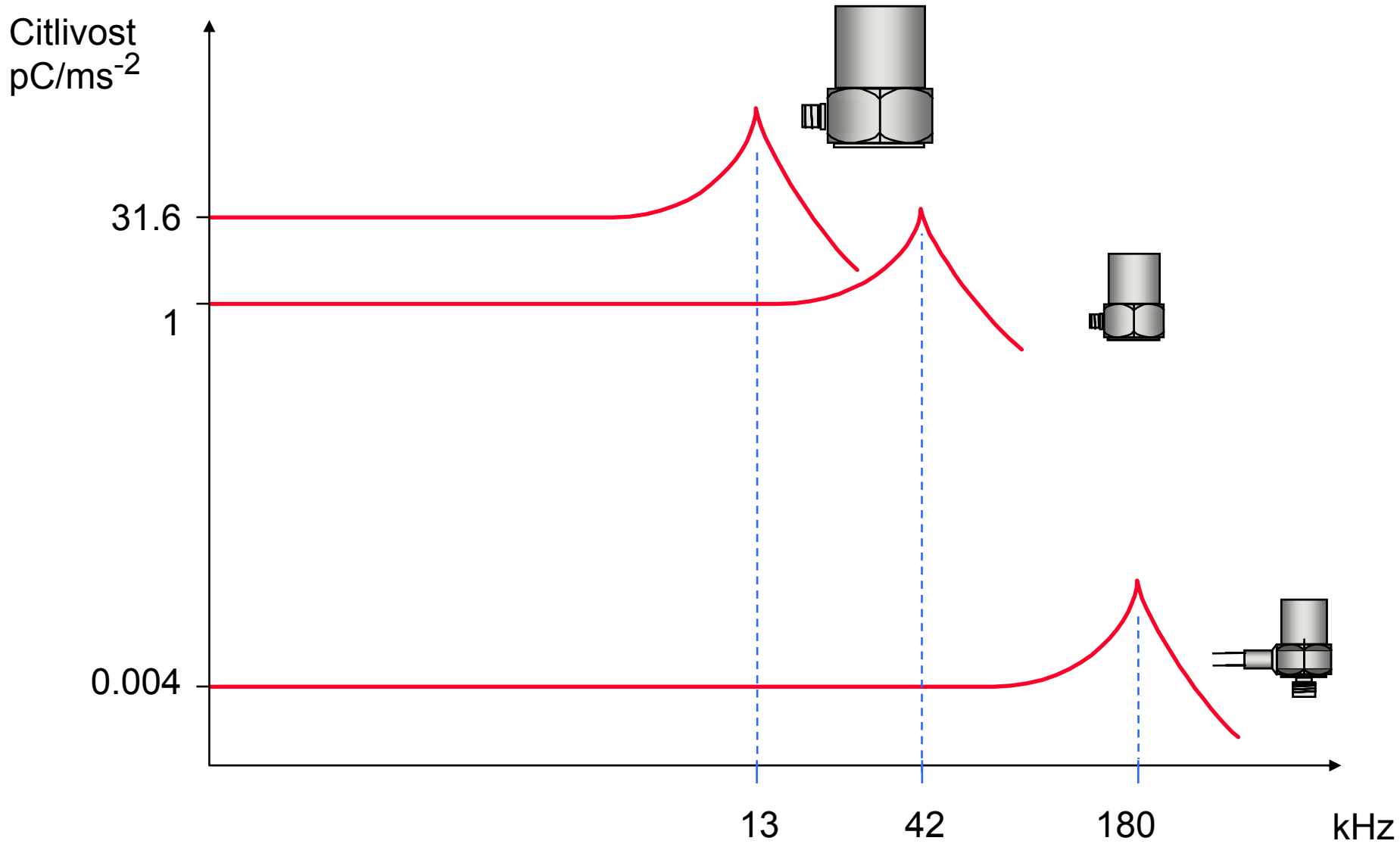
- Lehký s vysokofrekvenčním rozsahem



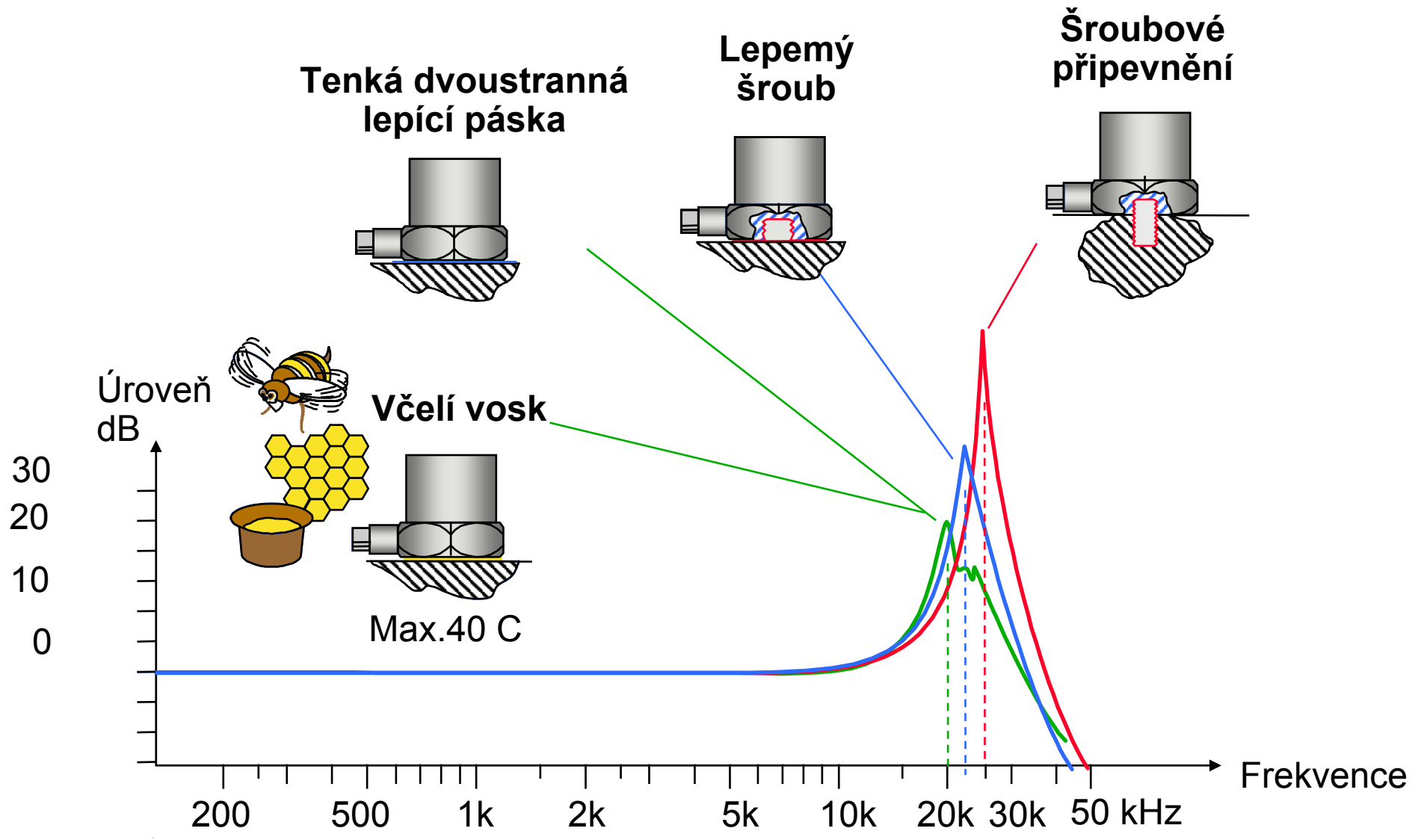
Použitelný frekvenční rozsah



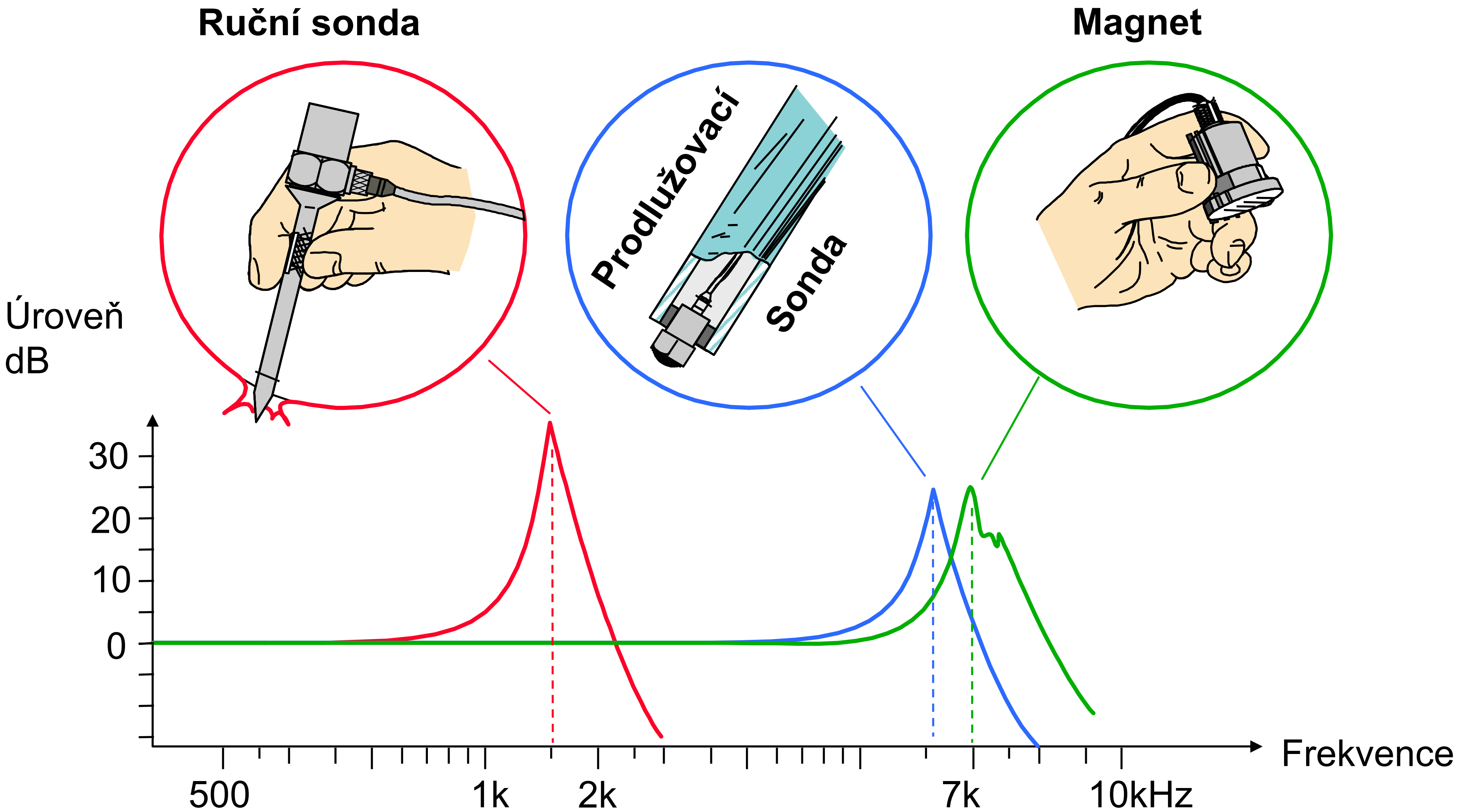
Citlivost a frekvenční rozsah



Montáž akcelerometrů - připevňování

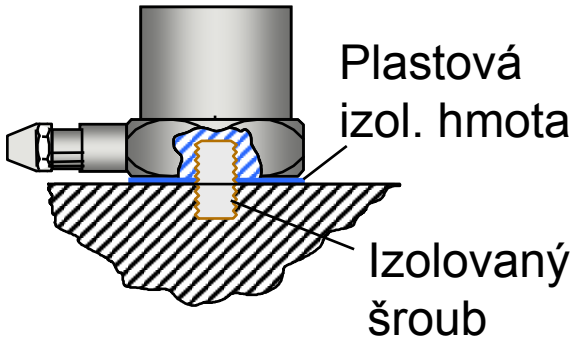


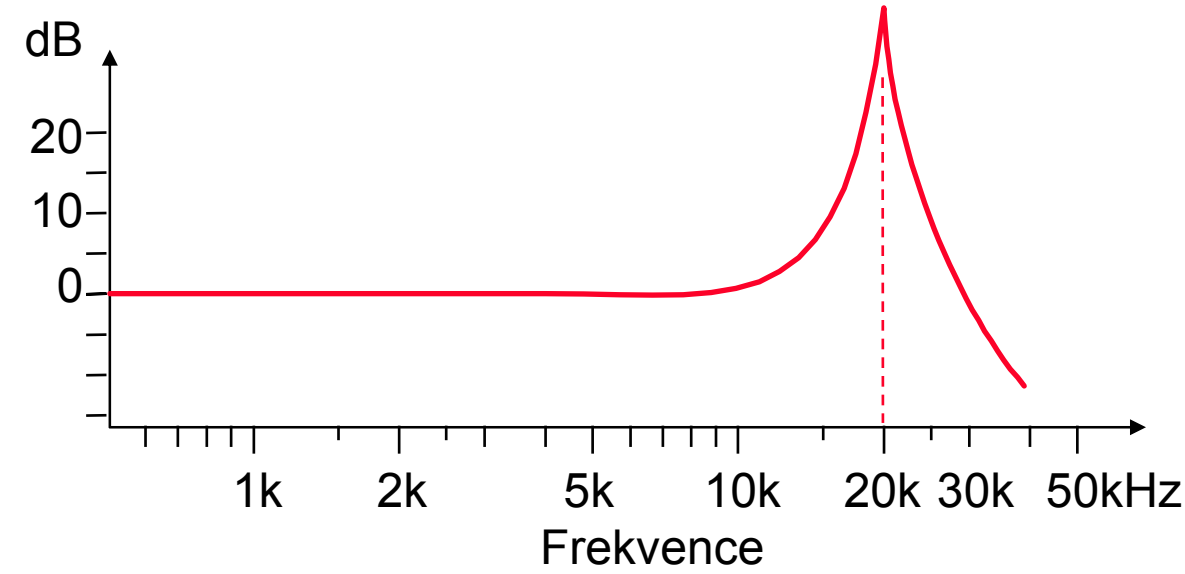
Montáž akcelerometrů - přidržení rukou



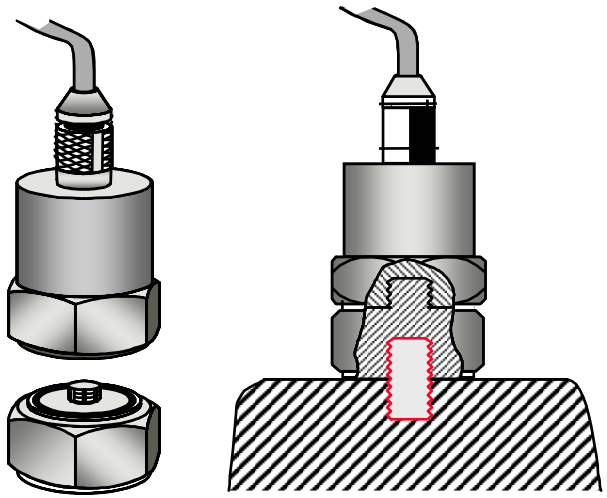
Izolace akcelerometrů

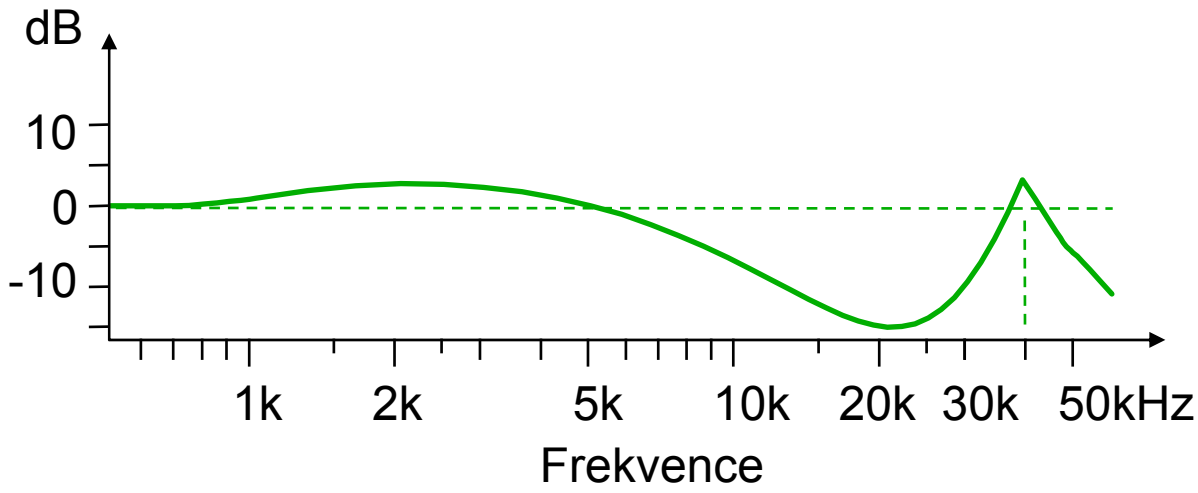
Elektricky
(Prevence zemnících smyček)



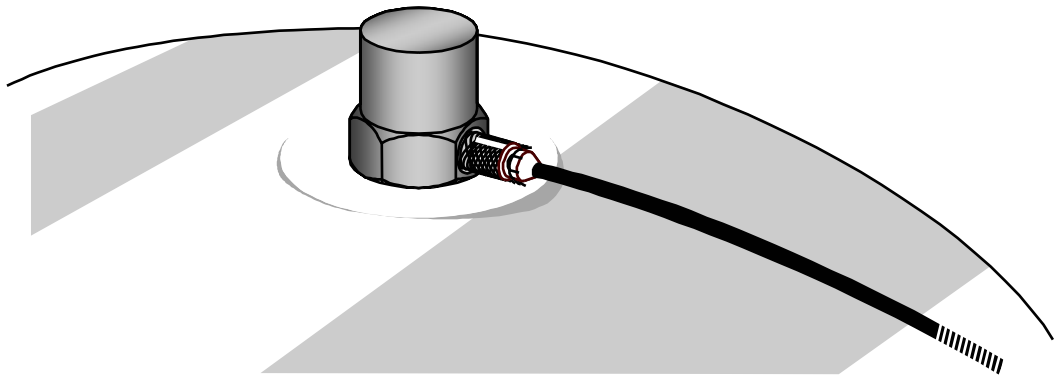


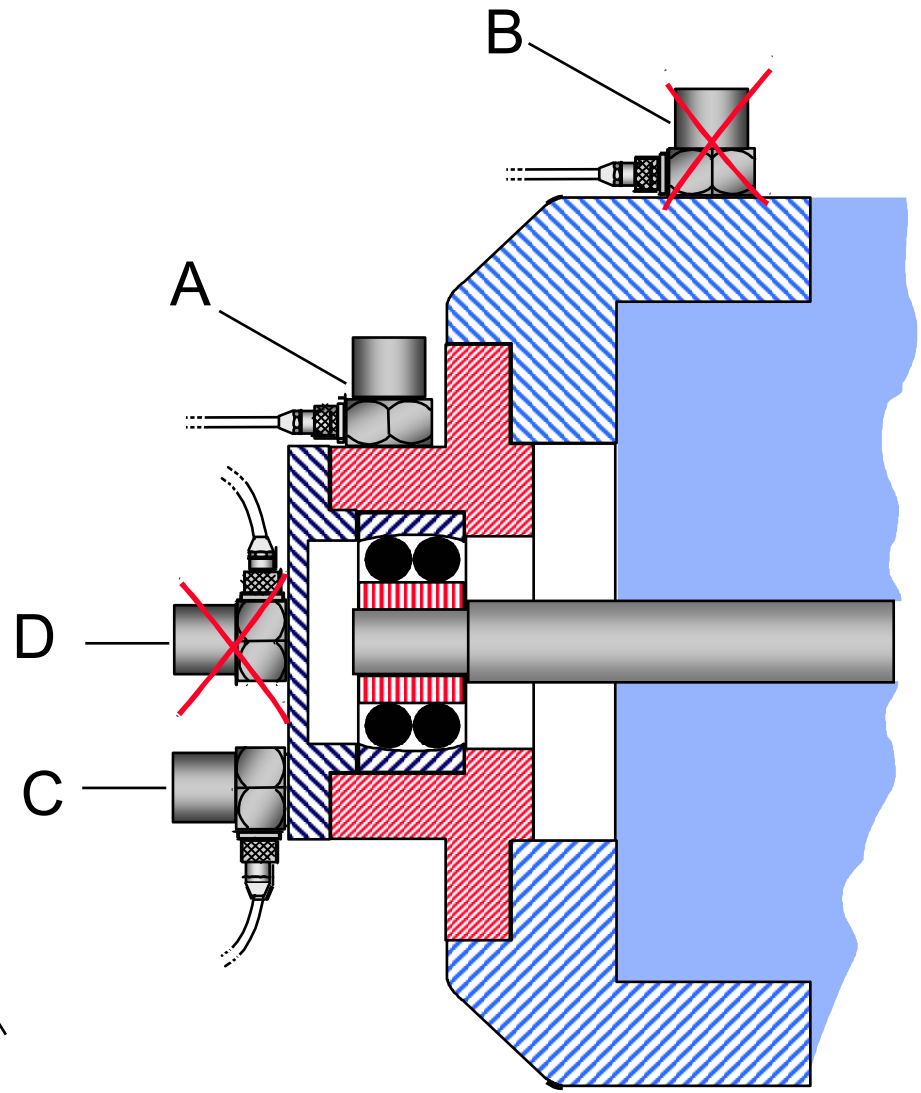
Mechanicky
(Ochrana před vysokofr. otřesy)



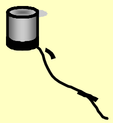


Volba měřícího místa



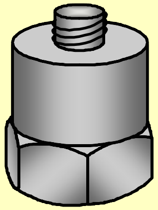


Zatížení měřeného objektu



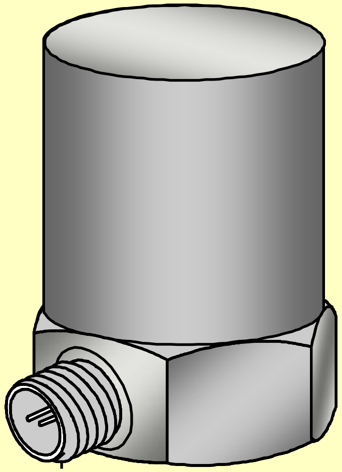
0,1 pC/ms^{-2}

0.65 g M > 7 g



10 pC/ms^{-2}

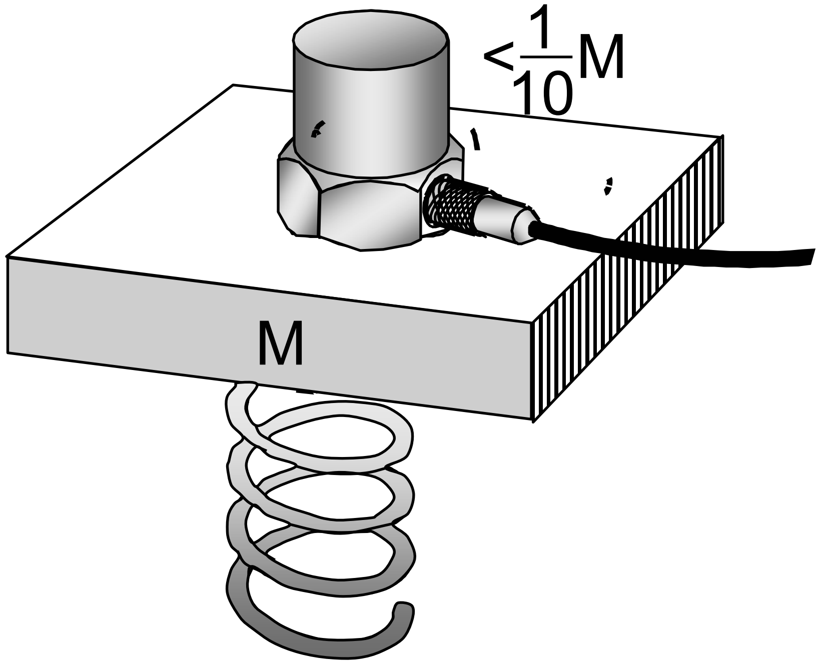
54 g ⟹ M > 600 g



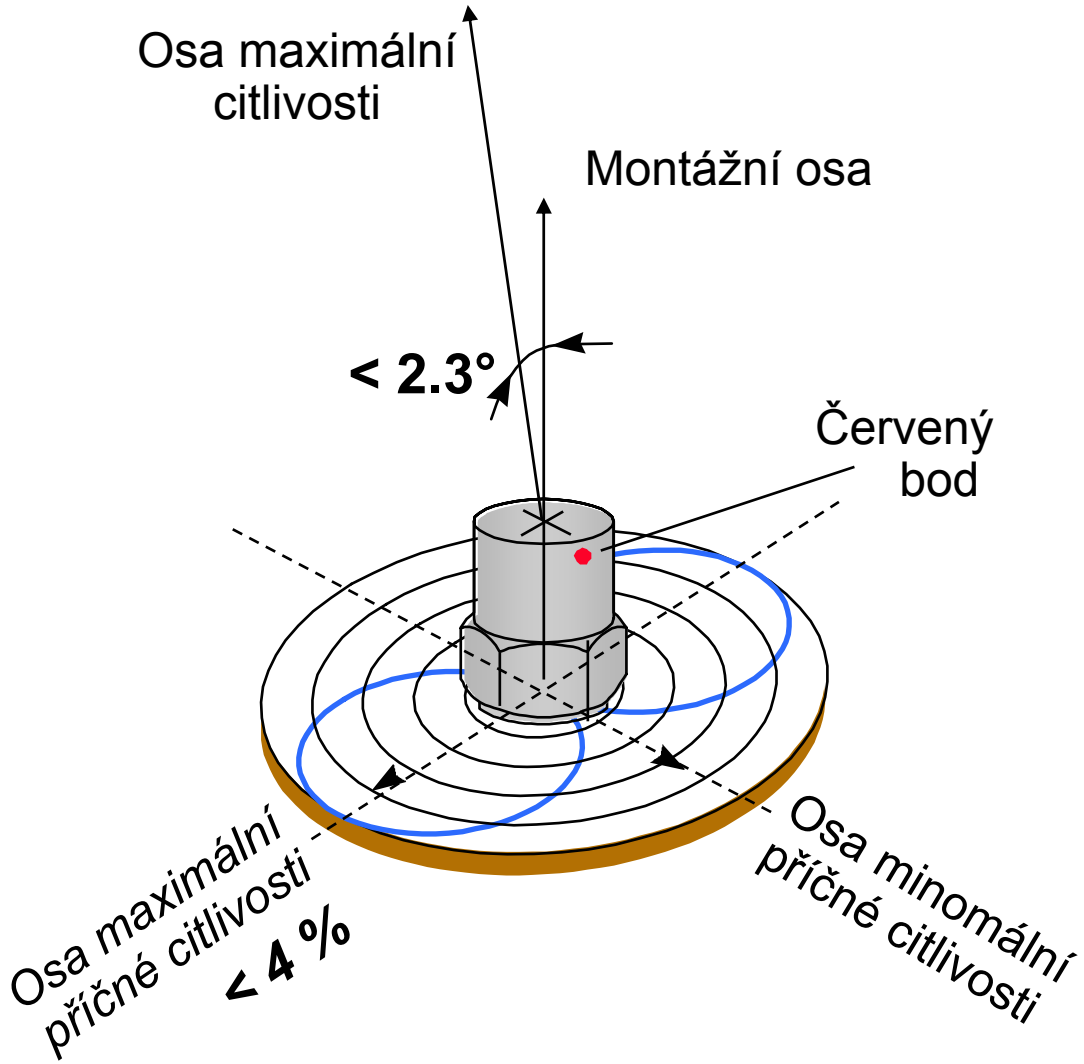
1000 pC/ms^{-2}

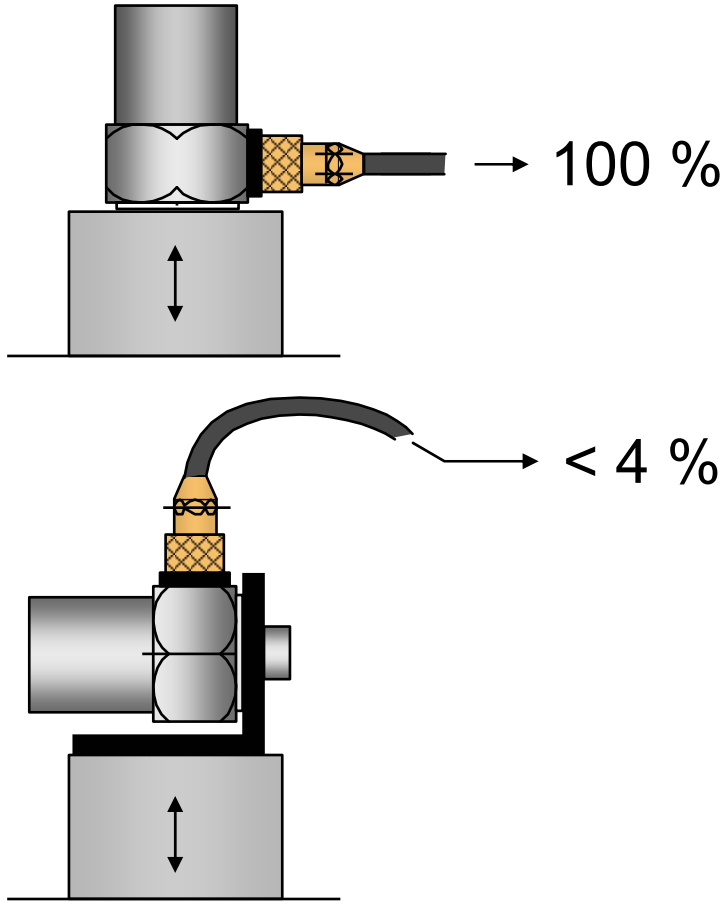
470 g M > 5 kg

Dynamická zátěž
(hmotnost)



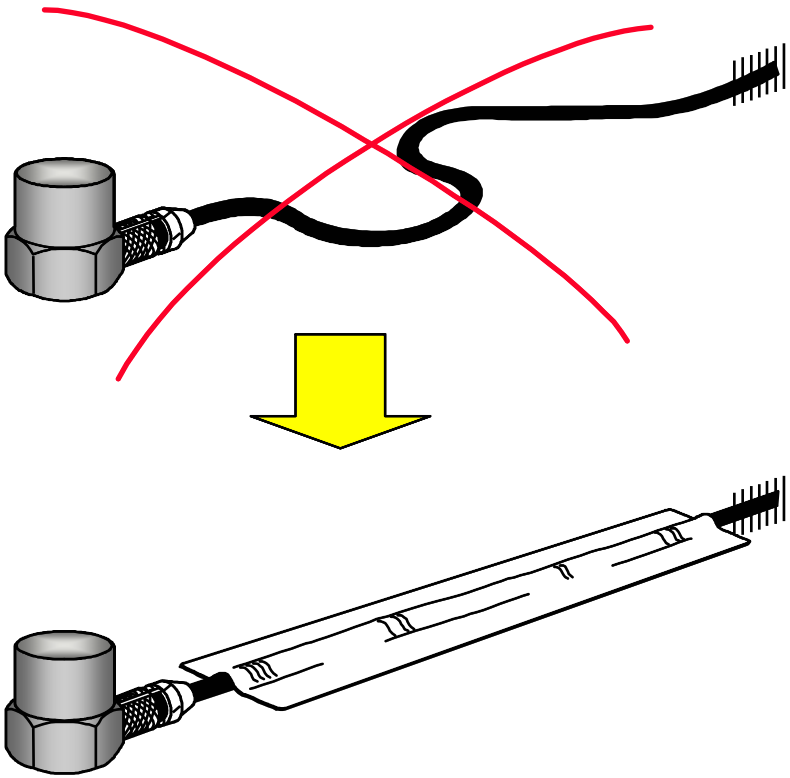
Příčná citlivost

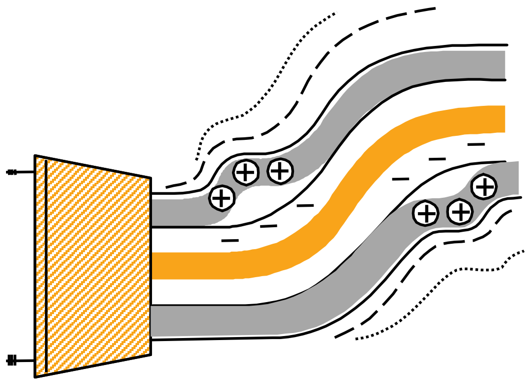


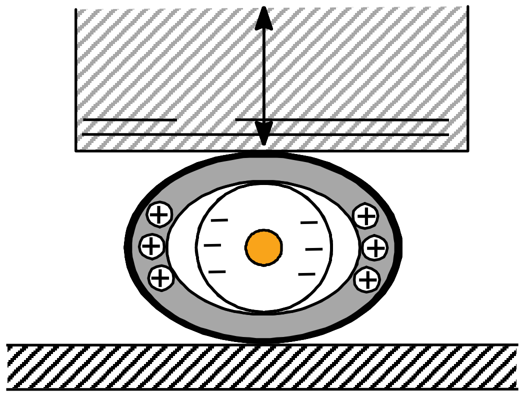


Max. příčná citlivost < 4 %

Triboelektrický šum







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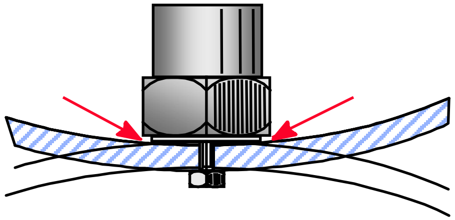
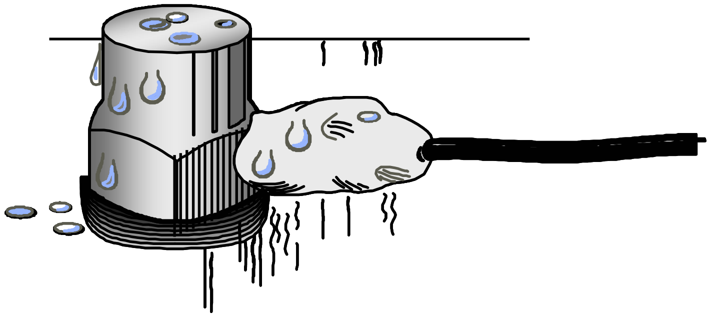
Vliv prostředí

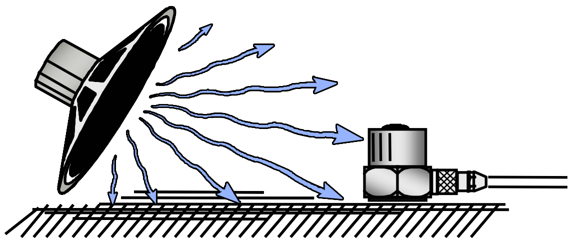
- Namáhání základny



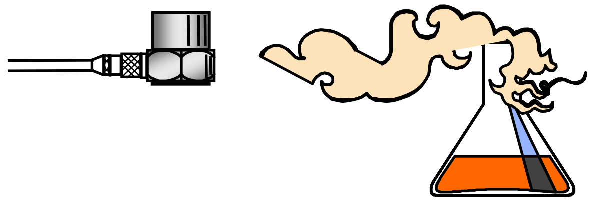
- Vlhkost



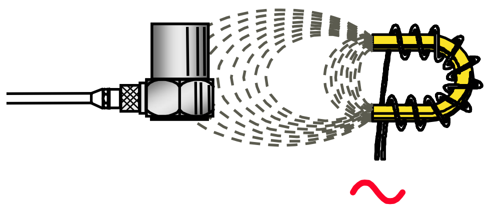
- Akustický šum



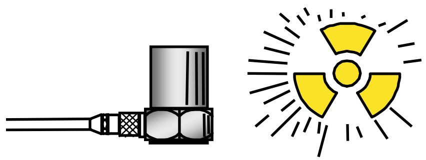
- Korozivní látky



- Magnetické pole

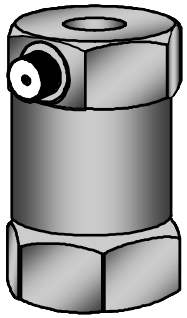


- Radioaktivita

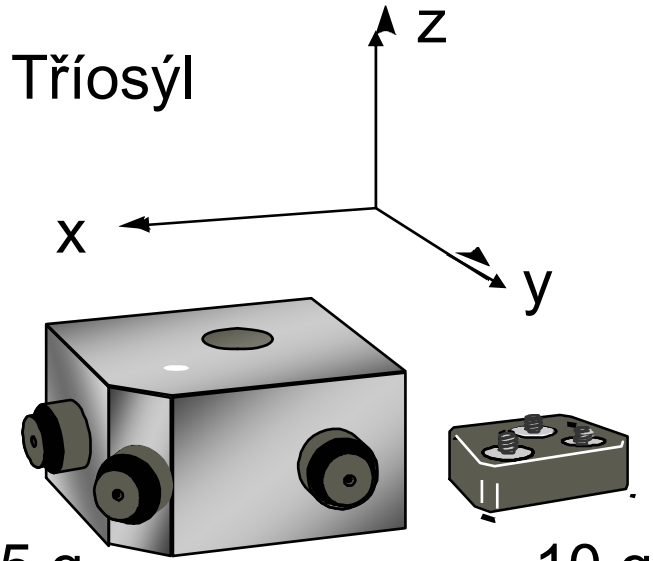


Speciální akcelerometry

Kalibrační

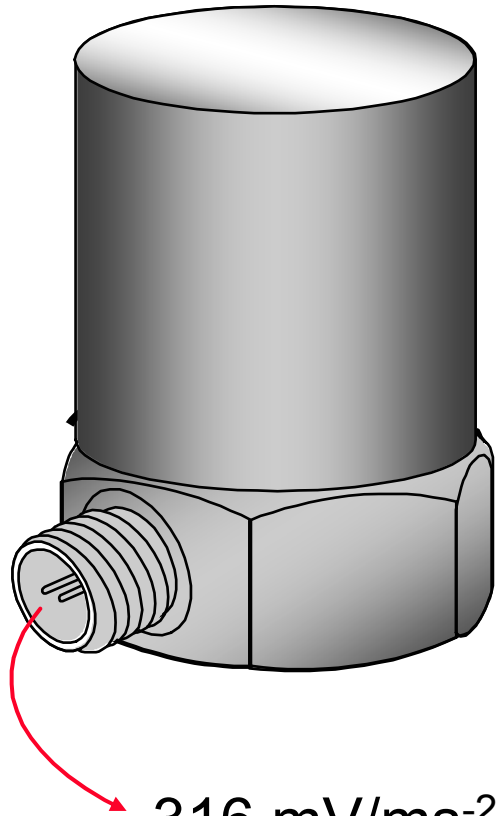


Tříosýl



S vysokou citlivostí

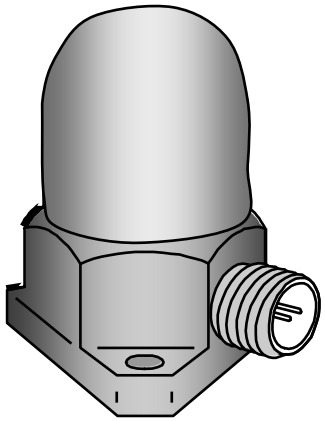
(vestavěný předzesilovač)



316 mV/ms^{-2}

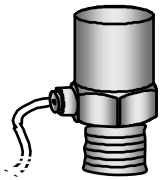
$a_{min.}$ = 20 x 10^{-6} ms^{-2}

Vysokoteplotní



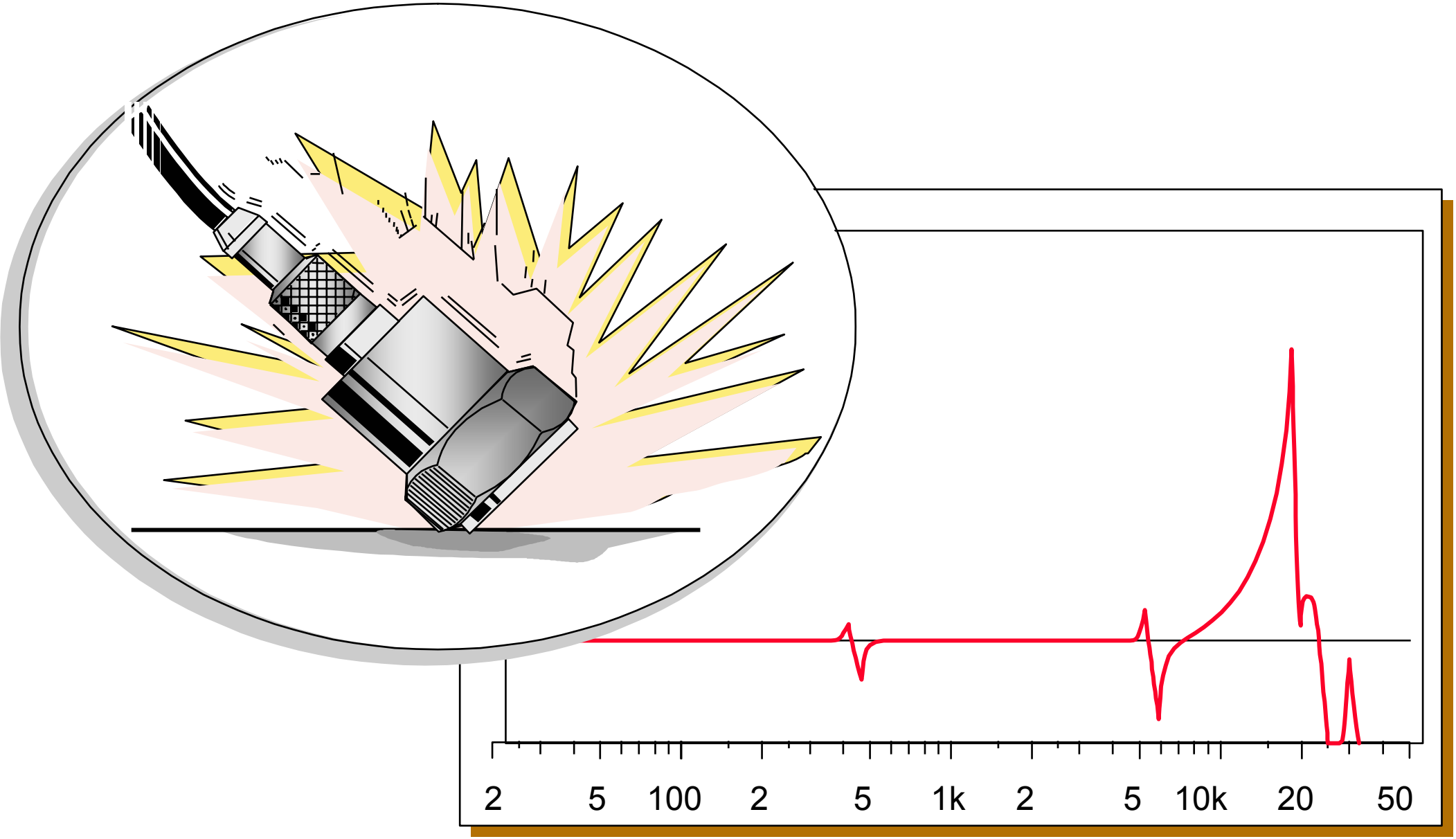
$T_{max.}$ = 400° C

Rázový



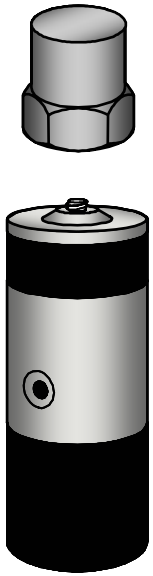
$a_{max.}$ = 1000 km^{-2}

Opatrné zacházení s akcelerometry ...



Ověření akcelerometrů (měřicích řetězců)

- V provozu
  - Kontrola citlivosti
  - kalibrace



Freq. = 159.2 Hz
= 1000 ω

Acc. = 10 ms^{-2}

- V laboratoři
  - Frekvenční odezva