High intensity piezo-electric microphone

M/01/F
M/01/FA
M/01/T
M/01/TA

20nC/bar nom. • vibration compensated (/*A)
250/300°C max. temp.

High sensitivity dynamic pressure transducers, finding application for high intensity acoustic, turbulence, and cavitation measurements, particularly where these phenomena may be superimposed upon high static pressure fluid media. The sensing element converts axial pressure applied via a diaphragm to electrical charge.
Response to static loading comprises generation of an initial condition charge followed by exponentiation to zero at a rate determined by instrumentation properties and leakage, thus a pressure field comprising both static and dynamic components will convert to dynamic charge only, with the static element transparent. The charge sensitivity is the slope of the charge vs. pressure characteristic of the transducer, $(\partial q/\partial p)/P$ up to its safe static pressure limit, and will be invariant for Q vs. P linear.

ACOUSTIC PROPERTIES

These relate to transducer dimensions and are application specific, being dependant upon level of obstrusiveness as seen by the fluid medium.
Thus transducers ported through walls with diaphragms flush and therefore unobstrusive, have a worst case upper frequency limit detemined by diaphragm diameter ≡ 0.5x acoustic wave length, i.e. 6kHz in air.
Microphones inserted into a fluid medium constitute an obstacle that will introduce boundary effects such as diffraction and reflection, of increasing significance at higher frequencies, and in the case of fluid flow, turbulence.

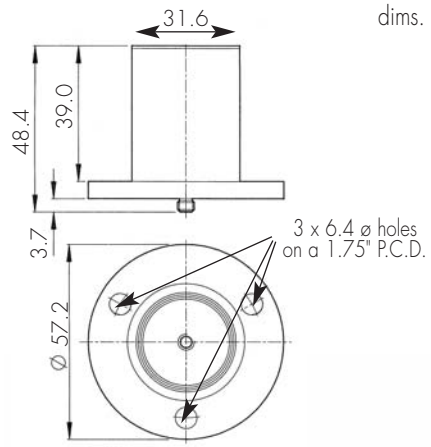
VIBRATION

This if present, represents a spurious signal source, generating an inertial charge by virtue of the inherent mass of the pressure sensing element. Its significance, determined by comparative acoustic and vibration frequency spectra and signal levels, possibly imposing a constraint on dynamic range. This may be raised by inclusion of a compensatory vibration sensor within the pressure transducer.

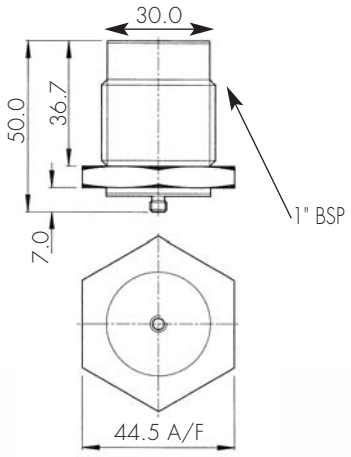
options

- charge vs. pressure up to 500 bar
- wideband temperature calibration 50/+300°C
- proof pressure test of transducers, transducers/cables to 150bar
- hermetic connectors
- integral cables
- case isolated signal for cmr

M/01/F & M/01/FA



M/01/T & M/01/TA



APPLICATION NOTES

Sound pressure reference level :
(0dB) = 2 x 10^{-4} µbar, i.e. 1bar = 194dB spl.The nominal 20nC/bar pressure sensitivity, together with an instrumentation noise level of 0.01pC, would presuppose a spl threshold of 68dB ex additional environmental noise sources. Axial vibration (worst case) in the case of uncompensated transducers (/F, /T) generates 148dB spl/g, reducing to 128dB spl/g in the case of the /FA & /TA accelerometer compensated devices.
Thus, in the latter case, 1mg axial acceleration would equal the hypothetical 68dB spl noise floor. Potential useage overlaps the domains of acoustic and explosive type phenomena, and is determined by noise and signal levels, the latter based on the charge handling capability of the associated instrumentation and perceived disadvantage of thermal charge generation.

CALIBRATION

Pressure sensitivity is derived from axial vibration of the transducer with and without a mass attached to the diaphragm. This gives the charge sensitivity at ambient pressure $(\partial q/\partial p)/Pamb$. High ambient pressure operation should be preceded by proof pressure sensitivity stabilisation and hermeticity testing. Similarly elevated temperature operation will require a programme of thermal cycling.

PRESSURE/CHARGE/CONVERSION MODE	D33 COMPRESSION	
Pt. No	**M/01/F,T**	**M/01/FA,TA**
Pressure sensitivity nC/bar @ 20°C	18/22	
Vibration sens. pC/g @ 20°C	80/130	10/15
Capacitance nF	3.6/4.2	5/6
Resonant frequency kHz	40	30
Temperature range °C	- 50/+250	
Press./vib. sensitivity deviation re 20°C	-5% @ -50°C +15% @ +250°C	
Max static Wkg. pressure, bar	200	
Case material	s/steel 303 S31	
Weight gm	190 (F), 240 (T)	240 (FA), 320 (TA)
Connector	Microdot skt. 10/32 UNF thd.	
Case seal	welded, hermetic diaphragm	