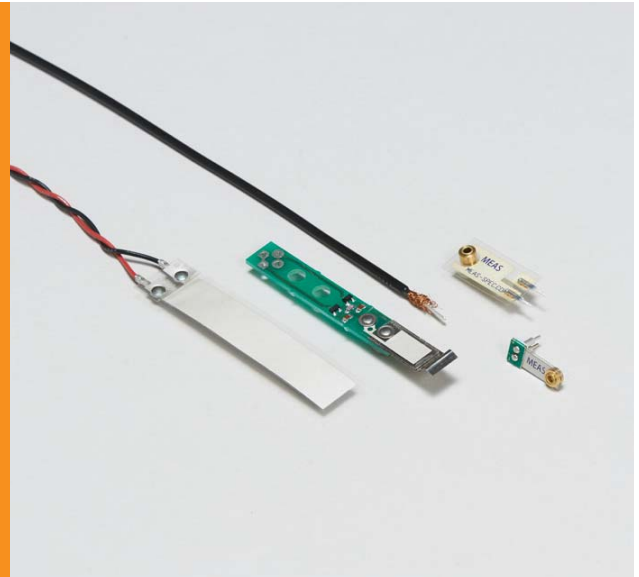


# PIEZO FILM SENSORS



## PIEZO FILM



|                      | DT1, SDT1                                                                                                                                             | Piezo Cable                                                                                                                                | CM-01                                                                                                                | FLDT1                                                                                                                                          |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Package              | Unshielded element with twisted pair or shielded element with shielded cable                                                                          | Shielded coaxial 20 gage piezo cable                                                                                                       | Metallized plastic housing                                                                                           | Unshielded film element with screen printed leads                                                                                              |
| Type                 | Flexible film, adhesive mount                                                                                                                         | Polymer jacketing, armored jacketing                                                                                                       | Contact microphone                                                                                                   | Flexible film, adhesive mount                                                                                                                  |
| Range                | 15 mV/ $\mu\epsilon$ up to 1% strain                                                                                                                  | $\mu\text{Pa}$ sensitivity                                                                                                                 | 40 V/mm; 8 Hz to 2.2 kHz                                                                                             | 15 mV/ $\mu\epsilon$ , up to 1% strain                                                                                                         |
| Unique Features      | <ul style="list-style-type: none"> <li>Thin, flexible, robust</li> <li>Withstands &gt;2% strain</li> <li>Ultra-low power (Self generating)</li> </ul> | <ul style="list-style-type: none"> <li>Continuous lengths of up to 1 km</li> <li>Shielded construction</li> </ul>                          | <ul style="list-style-type: none"> <li>Low noise</li> <li>Shielded construction</li> <li>High sensitivity</li> </ul> | <ul style="list-style-type: none"> <li>Thin, flexible</li> <li>Leads screen printed on film</li> <li>Connects to standard connector</li> </ul> |
| Accuracy             | $\pm 20\%$ (Typical)                                                                                                                                  | $\pm 20\%$ (Typical)                                                                                                                       | —                                                                                                                    | $\pm 20\%$ (Typical)                                                                                                                           |
| Operating Temp.      | -40°C to 70°C (Higher available custom)                                                                                                               | -40°C to 85°C                                                                                                                              | 5°C to 60°C                                                                                                          | -40°C to 70°C; (Higher available custom)                                                                                                       |
| Dimensions (mm)      | Application dependent                                                                                                                                 | $\varnothing 3$ (Continuous lengths)                                                                                                       | $\varnothing 18 \times 11$ high                                                                                      | 12 x 30 active; (Custom available)                                                                                                             |
| Typical Applications | Dynamic strain gage, contact microphone, acoustic pickup                                                                                              | Perimeter and fence security, geophone, impact sensors, intrusion detection, seat occupancy (e.g. airbag), patient bed vital signs monitor | Electronic stethoscope, contact microphone, vibration                                                                | Event timing, dynamic strain, motion detection                                                                                                 |

## PIEZO FILM



### Sleep Monitor Strip

|                      |                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Package              | Unshielded element with crimps                                                                                                                              |
| Type                 | Flexible film, adhesive mount                                                                                                                               |
| Range                | 15 mV/ $\mu\epsilon$ up to 1% strain                                                                                                                        |
| Unique Features      | <ul style="list-style-type: none"> <li>• Thin, flexible, robust</li> <li>• Withstands &gt;2% strain</li> <li>• Ultra-low power (Self generating)</li> </ul> |
| Accuracy             | $\pm 20\%$ (Typical)                                                                                                                                        |
| Operating Temp.      | -40°C to 70°C<br>(Higher available custom)                                                                                                                  |
| Dimensions (mm)      | 28 $\mu$ m PVDF; 8mm x 800mm                                                                                                                                |
| Typical Applications | Respiration and heart beat monitoring for mattress or seat                                                                                                  |



### BL Traffic Sensor

|                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Center Core: 16 gage copper wire<br>Piezoelectric Material:<br>Piezoelectric film cable<br>Outer Sheath: 0.016" thick brass                                                       |
| Spiral wrapped PVDF piezo film cable                                                                                                                                              |
| 15 mV/ $\mu\epsilon$ up to 1% strain                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• Flexible, durable, available in many lengths</li> <li>• Withstands &gt;2% strain</li> <li>• Ultra-low power (Self generating)</li> </ul> |
| $\pm 20\%$ (Typical)                                                                                                                                                              |
| -40°C to 70°C<br>(Higher available custom)                                                                                                                                        |
| 0.260" wide x 0.063" thick; 0.005"                                                                                                                                                |
| Traffic counting, classifying, toll booths, speed detection, red light cameras                                                                                                    |



### Laboratory Amplifier

|                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bench top                                                                                                                                                           |
| Piezo film lab amp                                                                                                                                                  |
| 0.1 Hz to 100 kHz                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Voltage or charge mode settings</li> <li>• Multi-pole high-pass and low-pass filters</li> <li>• Adjustable gain</li> </ul> |
| Application dependent                                                                                                                                               |
| 0°C to 40°C                                                                                                                                                         |
| 150 x 100 x 100                                                                                                                                                     |
| Low frequency dynamic strain, pyroelectric signals, machine vibration, piezo cable and traffic sensor interface                                                     |



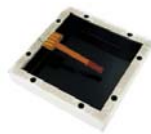
### 80 KHz Transducers

|                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------|
| Pin mounted                                                                                                            |
| Air ultrasound transducer                                                                                              |
| 80 kHz                                                                                                                 |
| <ul style="list-style-type: none"> <li>• Small size</li> <li>• Low mechanical Q</li> <li>• Shielded package</li> </ul> |
| Application dependent                                                                                                  |
| -20°C to 80°C                                                                                                          |
| $\varnothing 6 \times 9$                                                                                               |
| Air ranging, ultrasonic mouse, digitizers                                                                              |



### NDT-1

|                      |                                                                                                                        |
|----------------------|------------------------------------------------------------------------------------------------------------------------|
| Package              | Adhesive mounted                                                                                                       |
| Type                 | High frequency ultrasound transducer                                                                                   |
| Range                | 3 MHz                                                                                                                  |
| Unique Features      | <ul style="list-style-type: none"> <li>• Flexible</li> <li>• High bandwidth, low Q</li> <li>• Low impedance</li> </ul> |
| Accuracy             | Application dependent                                                                                                  |
| Operating Temp.      | -20°C to 60°C                                                                                                          |
| Dimensions (mm)      | 12 x 30                                                                                                                |
| Typical Applications | Thickness measurement, speed of sound measurement, pulse/echo NDT                                                      |



### Tammer Box

|                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|
| Flat film or box mounted                                                                                                  |
| Tamper detection sensor                                                                                                   |
| Application dependent                                                                                                     |
| <ul style="list-style-type: none"> <li>• Low power</li> <li>• Custom shapes and sizes</li> <li>• High security</li> </ul> |
| Application dependent                                                                                                     |
| -40°C to 85°C                                                                                                             |
| Application dependent                                                                                                     |
| Encryption modules, POS card readers, PIN entry devices                                                                   |



### ACH-01

|                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------|
| Ceramic base, plastic cover, shielded cable                                                                                 |
| Adhesive mount                                                                                                              |
| $\pm 250$ g (Typical)                                                                                                       |
| <ul style="list-style-type: none"> <li>• Extremely high bandwidth</li> <li>• Low cost</li> <li>• Ultra-low power</li> </ul> |
| $\pm 20\%$ (Typical)                                                                                                        |
| -40°C to 85°C                                                                                                               |
| 18.80 x 13.21 x 6.10                                                                                                        |
| Vibration sensing, gear box and high speed monitoring, high speed bearings and centrifuges, speaker motional feedback       |



### LDTC Family

|                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Piezo film elements with or without mass                                                                                                           |
| Cantilever beam with vertical or horizontal pins                                                                                                   |
| $\pm 10$ g (Typical)                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Very low cost</li> <li>• High sensitivity (1 V/g)</li> <li>• Ultra-low power (Self generating)</li> </ul> |
| $\pm 20\%$ (Typical)                                                                                                                               |
| -40°C to 70°C                                                                                                                                      |
| 19.05 x 6.35 x 6.35                                                                                                                                |
| Wake-up switch, load imbalance, antitheft devices, impact sensing, vital signs monitoring                                                          |