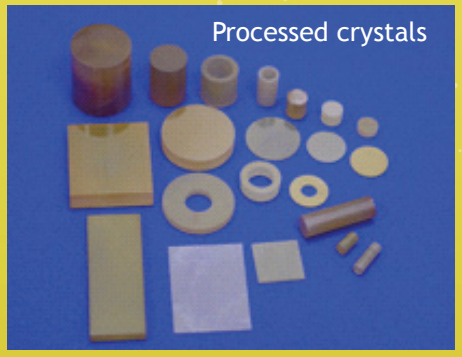
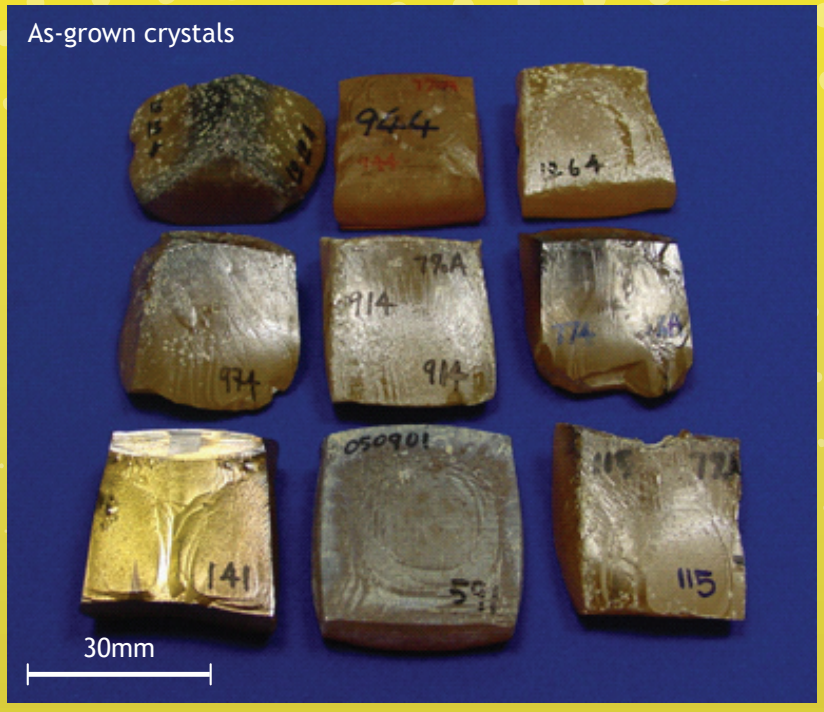
PZN-(5-7)%PT SINGLE CRYSTAL PRODUCTS


Crystal growth facility


Processed crystals



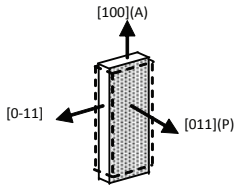
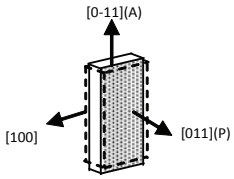
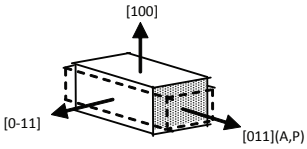
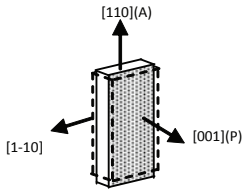
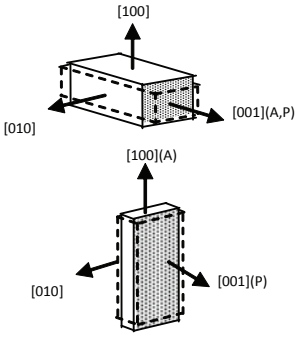
Properties at a glance *(See behind for description of various crystal types and their symbols)*

Crystal type	011P-32A	011P-32S	011P-31T	011P-33T	001P-31T -110L	001P-33(31)T -100L
%PT (Nominal)	5.5	6	6	6	6-7	6-7
$\varepsilon_{33}^T / \varepsilon_o$	4000	4500	4500	4500	6500	6500
d_{ij} (pC/N)	-2600 (d_{32})	-3000 (d_{32})	1100 (d_{31})	1900 (d_{33})	-1200 (d_{31})	2400 (d_{33}) -1400 (d_{31})
E_C (kV/mm)	0.55	0.58	0.58	0.58	0.35	0.35
$E_{RO/RT}$* (kV/mm)	0.85 (E_{RO})	0.70 (E_{RO})	0.70 (E_{RO})	0.70 (E_{RO})	0.90 (E_{RT})	0.90 (E_{RT})
$\sigma_{RO/RT}$** (MPa)	10 (σ_{RO})	6 (σ_{RO})	>85	5 (σ_{RO})	80 (σ_{RT})	5 (σ_{RO}) - (σ_{RO})
s (pm²/N)	170 (s_{22}^E)	180 (s_{22}^E)	54 (s_{11}^E)	12 (s_{33}^D)	40 (s_{11}^E)	16 (s_{33}^D) 90 (s_{11}^E)
d/s (C/m²)	15	16	20	158	32	150 (d_{33}/s_{33}^D) 17 (d_{31}/s_{11}^E)
k_{ij}	0.90(k_{32})	0.91(k_{32})	0.75(k_{31})	0.90(k_{33})	0.80(k_{31})	0.90(k_{33}) 0.50(k_{31})
v_{ii} (m/s)	850 (v_{22}^E)	800 (v_{22}^E)	1500 (v_{11}^E)	3250 (v_{33}^D)	1800 (v_{11}^E)	2750 (v_{33}^D) 1200 (v_{11}^E)
$T_{RO/RT}$ (°C)	110 (T_{RO})	106 (T_{RO})	106 (T_{RO})	106 (T_{RO})	100 (T_{RT})	100 (T_{RT})
Main Applications	U/W projectors (with pressure release)	Hydrophones	Sensors & actuators of large transverse force	Sensors & actuators	Sensors & actuators of large transverse force	Sensors & actuators

**Transformation field at zero compressive stress in the active direction.*
***Transformation compressive stress in the active direction at zero applied field.*

PZN-(5-7)%PT SINGLE CRYSTAL PRODUCTS

DESCRIPTION AND ORIENTATION OF VARIOUS PZN-(5-7)%PT CRYSTAL TYPES AND THIER SYMBOLS

011P-32A / 011P-32S		[011]-poled transverse (32) mode crystal of $[0\text{-}11]^{1}$ x $[100]^{2(A)}$ x $[011]^{3(P)}$. Type A is recommended for Actuator and Type S for Sensor applications, notably as motor section of underwater projectors and sensing elements of hydrophones respectively.
011P-31T		[011]-poled transverse (31) mode crystal of $[0\text{-}11]^{1(A)}$ x $[100]^{2}$ x $[011]^{3(P)}$ cut for transverse-mode transducers (31T) where high transverse loads are present.
011P-33T		[011]-poled longitudinal (33) mode crystal of $[0\text{-}11]^{1}$ x $[100]^{2}$ x $[011]^{3(A,P)}$ cut for longitudinal mode transducers (33T) when relatively high d_{33} and crystal stiffness are advantageous.
001P-31T-110L		[001]-poled crystal of $[110]^{1(A)}$ x $[1\text{-}10]^{2}$ x $[001]^{3(P)}$ cut as transverse-mode transducers (31T) where a high d_{31}/s_{11}^{E} value is advantageous.
001P-33T-100L **001P-31T-100L**		[001]-poled crystal of $[100]^{1}$ x $[010]^{2}$ x $[001]^{3(A,P)}$ cut as longitudinal mode transducer (33T). Said cut may also be used as transverse mode transducer (31T), i.e., $[100]^{1(A)}$ x $[010]^{2}$ x $[001]^{3(P)}$.

* *For other crystal compositions and cuts, please kindly contact us with your request.*

Key on crystal designation / symbols:

* *011P and 001P indicate poling direction being [011] and [001], respectively, which is also the 3-direction.*
* *33, 32 and 31 denote the mode of actuation/sensing, 33 being the longitudinal mode, and 32 and 31 are the transverse modes with the active direction being along the 2- and 1-axis.*
* *A, S and T denote actuator, sensor and transducer, respectively.*
* *100L and 110L indicate the active length directions in [001]-poled crystals.*
* *Superscripts (A) and (P) next to directional axes denote the active and poling direction respectively.*

CRYSTAL DIMENSIONS AND TOLERANCES

Direction	Dimensional Range	Tolerances (+/-)
Thickness (i.e., poling direction) (mm)	0.3 - 3.0	0.015
Other two orthogonal directions (mm)	2.0 - 25.0	0.030

Crystals can be supplied in either unpoled (either bare or electroded) or electroded and poled condition. Our standard electrode consists of a thin NiCr bond coat followed by a thicker AuPd electrode layer, both applied via the RF sputter-deposition technique.
Crystals of smaller dimensions, larger thickness in poling direction and/or tighter tolerances are available upon request.

MICROFINE
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