



Health & Safety
Executive

**OFFSHORE TECHNOLOGY
REPORT - OTO 98 101**

**A Study of the Repeatability of
Explosion Tests
Preliminary Data Report for Test 5**

Explosions in Full Scale Offshore Module Geometries

Health & Safety Executive Contract MaTSU 8847/3522

Preliminary Data Report for Test 5

Summary of Experimental Conditions	
Date	2nd July 1997
Time	16:04
Test Series	B
Confinement Configuration	C1
Obstacle Configuration	O1
Ignition Position	(X:13.5, Y:5, Z:4.25)
Mean Equivalence Ratio	1.09
Water Sprays	MV25 Full Area
Polythene Cut	No

All data contained in this preliminary report is subject to final confirmation.

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Table 1: Flame Arrival Times

Ionisation Probe	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Flame Arrival Time (msec)
IP-1	0.5	0.5	2.0	351.2
IP-2	6.0	0.5	2.0	317.8
IP-3	10.0	0.5	2.0	286.8
IP-4	14.0	0.5	2.0	271.4
IP-5	18.0	0.5	2.0	293.2
IP-6	22.0	0.5	2.0	327.9
IP-7	27.5	0.5	2.0	375.9
IP-8	0.5	4.0	2.0	355.9
IP-9	6.0	4.0	2.0	327.4
IP-10	14.0	4.0	2.0	240.7
IP-11	22.0	4.0	2.0	324.3
IP-12	27.5	4.0	2.0	356.9
IP-13	0.5	8.0	2.0	352.9
IP-14	6.0	8.0	2.0	327.0
IP-15	10.0	8.0	2.0	288.6
IP-16	14.0	8.0	2.0	276.5
IP-17	18.0	8.0	2.0	312.7
IP-18	22.0	8.0	2.0	281.0
IP-19	27.5	8.0	2.0	318.0
IP-20	0.5	11.5	2.0	378.7
IP-21	2.0	11.5	2.0	367.9
IP-22	6.0	11.5	2.0	338.2
IP-23	10.0	11.5	2.0	263.1
IP-24	14.0	11.5	2.0	-
IP-25	18.0	11.5	2.0	287.4
IP-26	22.0	11.5	2.0	-
IP-27	26.0	11.5	2.0	280.7
IP-28	27.5	11.5	2.0	271.6
IP-29	0.5	0.5	4.0	284.3
IP-30	6.0	0.5	4.0	293.6
IP-31	10.0	0.5	4.0	277.5
IP-32	14.0	0.5	4.0	251.8
IP-33	18.0	0.5	4.0	289.5

Ionisation Probe	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Flame Arrival Time (msec)
IP-34	22.0	0.5	4.0	319.7
IP-35	26.0	0.5	4.0	342.3
IP-36	27.5	0.5	4.0	377.9
IP-37	0.5	4.0	4.0	346.0
IP-38	6.0	4.0	4.0	313.3
IP-39	14.0	4.0	4.0	102.3
IP-40	22.0	4.0	4.0	314.9
IP-41	26.0	4.0	4.0	335.7
IP-42	27.5	4.0	4.0	350.8
IP-43	0.5	8.0	4.0	379.0
IP-44	2.0	8.0	4.0	343.6
IP-45	6.0	8.0	4.0	348.6
IP-46	10.0	8.0	4.0	-
IP-47	14.0	8.0	4.0	243.7
IP-48	18.0	8.0	4.0	283.8
IP-49	22.0	8.0	4.0	313.7
IP-50	26.0	8.0	4.0	310.6
IP-51	27.5	8.0	4.0	384.8
IP-52	26.0	10.0	4.0	379.5
IP-53	27.5	10.0	4.0	310.8
IP-54	0.5	11.5	4.0	-
IP-55	2.0	11.5	4.0	356.9
IP-56	6.0	11.5	4.0	-
IP-57	10.0	11.5	4.0	-
IP-58	14.0	11.5	4.0	311.2
IP-59	18.0	11.5	4.0	310.6
IP-60	22.0	11.5	4.0	343.7
IP-61	26.0	11.5	4.0	-
IP-62	27.5	11.5	4.0	-
IP-63	0.5	0.5	6.0	-
IP-64	6.0	0.5	6.0	-
IP-65	10.0	0.5	6.0	-
IP-66	14.0	0.5	6.0	-
IP-67	18.0	0.5	6.0	-

Ionisation Probe	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Flame Arrival Time (msec)
IP-68	22.0	0.5	6.0	-
IP-69	27.5	0.5	6.0	-
IP-70	0.5	4.0	6.0	-
IP-71	6.0	4.0	6.0	-
IP-72	14.0	4.0	6.3	-
IP-73	22.0	4.0	6.0	-
IP-74	27.5	4.0	6.0	-
IP-75	0.5	8.0	6.0	-
IP-76	6.0	8.0	6.0	-
IP-77	10.0	8.0	6.0	-
IP-78	14.0	8.0	6.0	-
IP-79	18.0	8.0	6.0	-
IP-80	22.0	8.0	6.0	-
IP-81	27.5	8.0	6.0	-
IP-82	0.5	11.5	6.0	-
IP-83	2.0	11.5	6.0	-
IP-84	6.0	11.5	6.0	-
IP-85	10.0	11.5	6.0	-
IP-86	14.0	11.5	6.0	-
IP-87	18.0	11.5	6.0	-
IP-88	22.0	11.5	6.0	-
IP-89	26.0	11.5	6.0	-
IP-90	27.5	11.5	6.0	-

NB Failure of one of the three logging computers resulted in the loss of IP61-IP90.

Ionisation Probe	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Flame Arrival Time (msec)
IP-68	22.0	0.5	6.0	-
IP-69	27.5	0.5	6.0	-
IP-70	0.5	4.0	6.0	-
IP-71	6.0	4.0	6.0	-
IP-72	14.0	4.0	6.3	-
IP-73	22.0	4.0	6.0	-
IP-74	27.5	4.0	6.0	-
IP-75	0.5	8.0	6.0	-
IP-76	6.0	8.0	6.0	-
IP-77	10.0	8.0	6.0	-
IP-78	14.0	8.0	6.0	-
IP-79	18.0	8.0	6.0	-
IP-80	22.0	8.0	6.0	-
IP-81	27.5	8.0	6.0	-
IP-82	0.5	11.5	6.0	-
IP-83	2.0	11.5	6.0	-
IP-84	6.0	11.5	6.0	-
IP-85	10.0	11.5	6.0	-
IP-86	14.0	11.5	6.0	-
IP-87	18.0	11.5	6.0	-
IP-88	22.0	11.5	6.0	-
IP-89	26.0	11.5	6.0	-
IP-90	27.5	11.5	6.0	-

NB Failure of one of the three logging computers resulted in the loss of IP61-IP90.

Table 2: Internal Overpressures

Pressure Transducer	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Maximum Overpressure (mbar)	1.5ms Running Average			
					Maximum Overpressure (mbar)	Time of Arrival (ms)	Idealised Profile Representation	
							Rise Time (ms)	Duration (ms)
PI-1	0.8	0.5	0.0	348	332	369.3	91.1	103.7
PI-2	6.0	0.5	0.0	-	-	-	-	-
PI-3	12.5	0.5	0.0	227	225	309.6	83.3	192.2
PI-4	22.0	0.5	0.0	262	259	321.5	57.9	140.4
PI-5	27.5	0.5	0.0	350	330	369.8	90.2	114.6
PI-6	0.5	6.0	0.0	440	419	369.3	86.9	105.4
PI-7	9.0	6.0	0.0	256	242	376.8	-	-
PI-8	14.0	6.0	0.0	247	241	312.2	91.4	191.4
PI-9	21.0	6.0	0.0	251	248	309.8	60.6	155.3
PI-10	27.5	6.0	0.0	369	354	369.7	91.2	114.7
PI-11	0.5	11.5	0.0	472	463	375.4	83.7	96.2
PI-12	12.3	11.5	0.0	284	279	311.3	67.1	170.4
PI-13	27.5	11.5	0.0	376	366	377.8	94.8	105.3
PI-14	0.5	0.5	4.0	367	347	365.9	91.4	111.8
PI-15	4.5	0.6	4.0	262	243	318.0	60.0	136.1
PI-16	11.2	0.0	5.5	221	207	310.3	84.7	193.9
PI-17	12.0	0.5	4.0	191	188	310.4	93.8	201.2
PI-18	22.0	0.5	4.0	201	197	323.0	70.0	157.3
PI-19	27.5	0.5	4.0	290	283	371.3	94.5	120.9
PI-20	10.2	4.0	4.0	213	208	305.9	87.0	195.3
PI-21	0.5	7.0	4.0	306	291	367.4	96.8	120.6
PI-22	18.0	8.0	4.0	229	226	323.1	88.8	175.7
PI-23	27.5	6.0	4.0	305	298	370.4	97.6	123.9
PI-24	0.5	11.5	4.0	306	288	372.3	96.9	124.9
PI-25	10.0	11.5	4.0	212	198	308.1	68.2	177.3
PI-26	18.0	11.5	4.0	236	229	317.4	70.1	163.7
PI-27	27.5	11.5	4.0	392	376	372.1	84.5	100.4
PI-28	0.8	0.8	8.0	393	372	345.0	56.4	105.5
PI-29	13.9	1.7	8.0	203	197	309.1	83.0	190.2
PI-30	26.1	1.7	8.0	330	286	368.1	94.6	124.5
PI-31	5.9	5.0	8.0	287	284	308.4	55.5	160.3
PI-32	18.9	5.0	8.0	284	280	307.8	63.6	166.7
PI-33	1.1	11.1	8.0	220	201	348.6	73.0	122.5
PI-34	12.8	11.2	8.0	218	213	316.4	76.1	178.5
PI-35	26.1	11.3	8.0	-	-	-	-	-

Table 3 : External Overpressures

Pressure Transducer	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Maximum Overpressure (mbar)	Maximum Overpressure 1.5ms Running Average (mbar)
PE-1	34.0	6.0	1.0	-	-
PE-2	40.0	6.0	1.0	297	280
PE-3	52.0	6.0	1.0	320	297
PE-4	76.0	6.0	1.0	172	137
PE-5	47.2	25.2	1.0	246	205
PE-6	61.3	39.3	1.0	158	131
PE-7	14.0	18.0	1.0	161	158
PE-8	14.0	24.0	1.0	-	-
PE-9	14.0	36.0	1.0	138	136
PE-10	14.0	60.0	1.0	-	-
PE-11	-21.2	25.2	1.0	267	197

Table 4: Gas Concentrations

Measuring Position	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Natural Gas Concentration (%)
1	24.1	4.4	1.4	9.7
2	12.0	8.3	0.8	9.7
3	1.0	2.4	1.1	9.7
4	7.7	9.8	3.5	9.7
5	14.1	5.2	4.3	9.7
6	26.2	2.0	5.3	9.7
7	7.6	8.1	4.9	9.7
8	19.8	7.8	7.7	9.7

Table 5: Weather Conditions

Air Temperature (°C)	Atmospheric Pressure (mbar)	Wind Speed (ms ⁻¹)	Wind Direction (° from Magnetic North)
11.7	968	0	34

Table 6: Confinement Configuration

Confinement Configuration	Rig Face*	Confinement
C1	North	Open
	East	Open
	South	Open
	West	Open

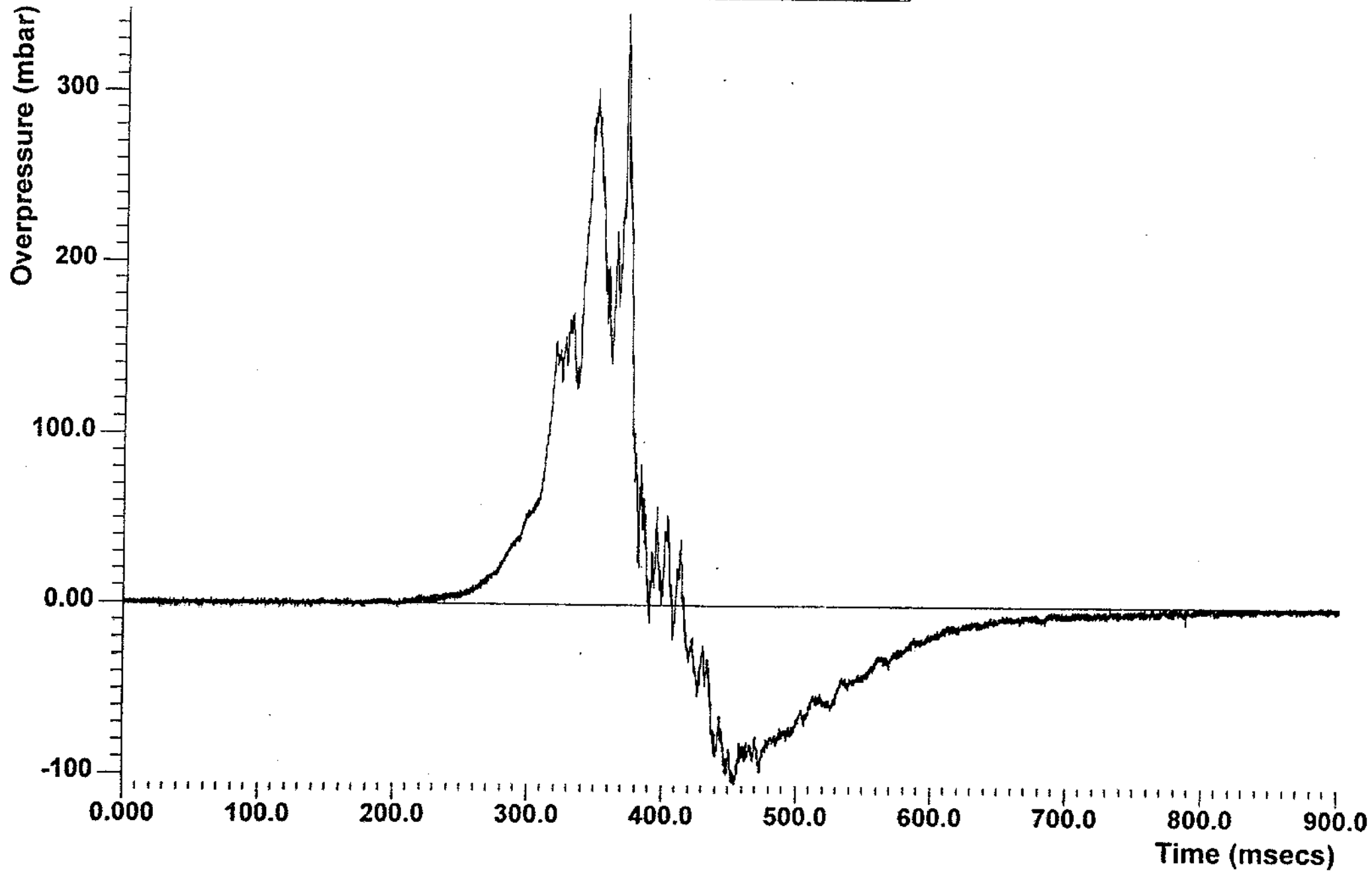
* - Origin is at the junction of the West and South faces at ground level. Roof and floor also confined.

Table 7: Water Deluge Configuration

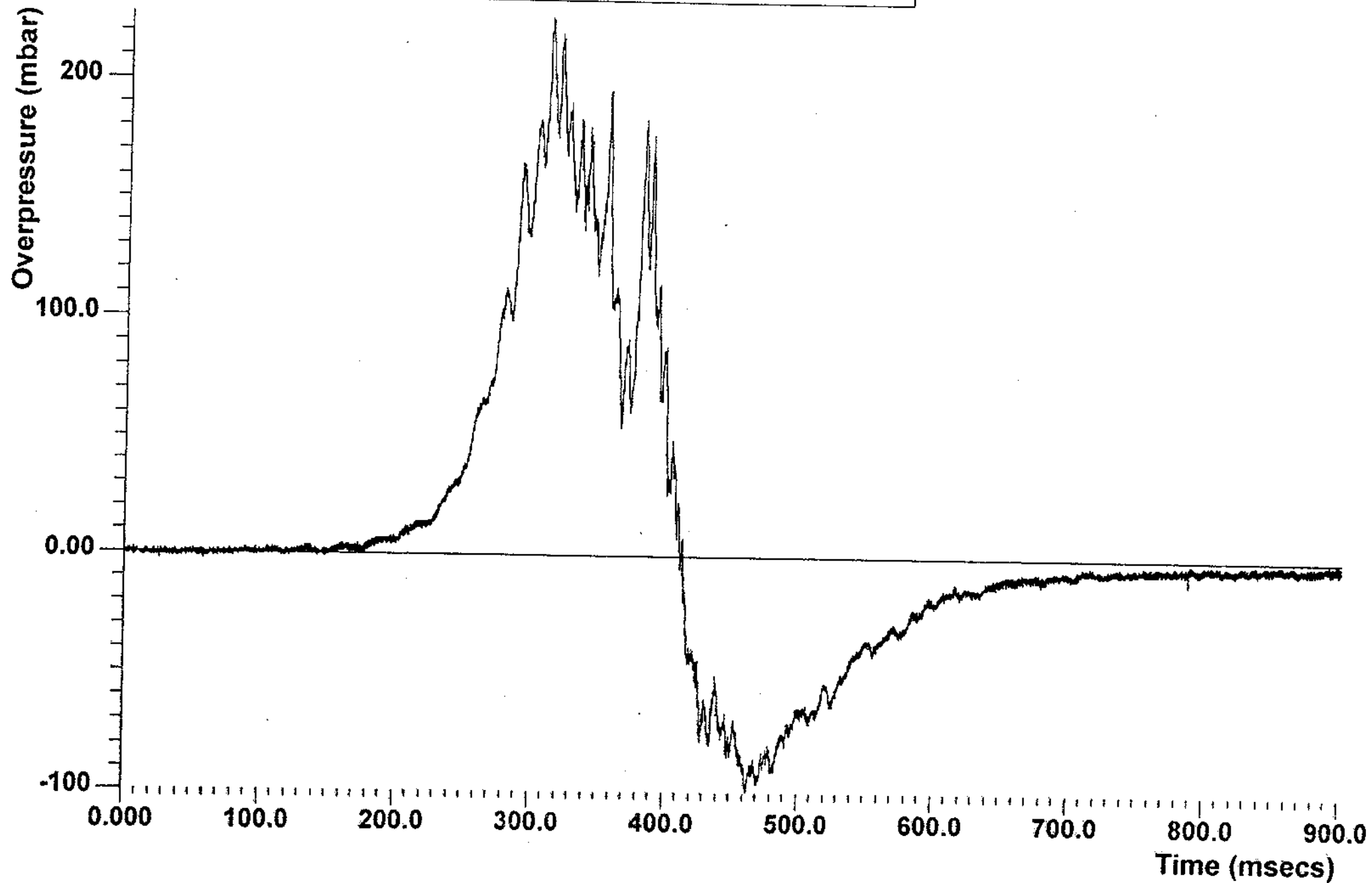
Nozzle Type	MV25
Number of Nozzles in Mezzanine Deck	75
Number of Nozzles in Cellar Deck	17
Water Inlet Pressure (barg)	-
Water Pressure at Nozzle (barg)	-
Total Water Flowrate (l min ⁻¹)	5453
Area Coverage - Cellar Deck (l min ⁻¹ m ⁻²)	16.2

Appendix A: Internal Overpressure Profiles

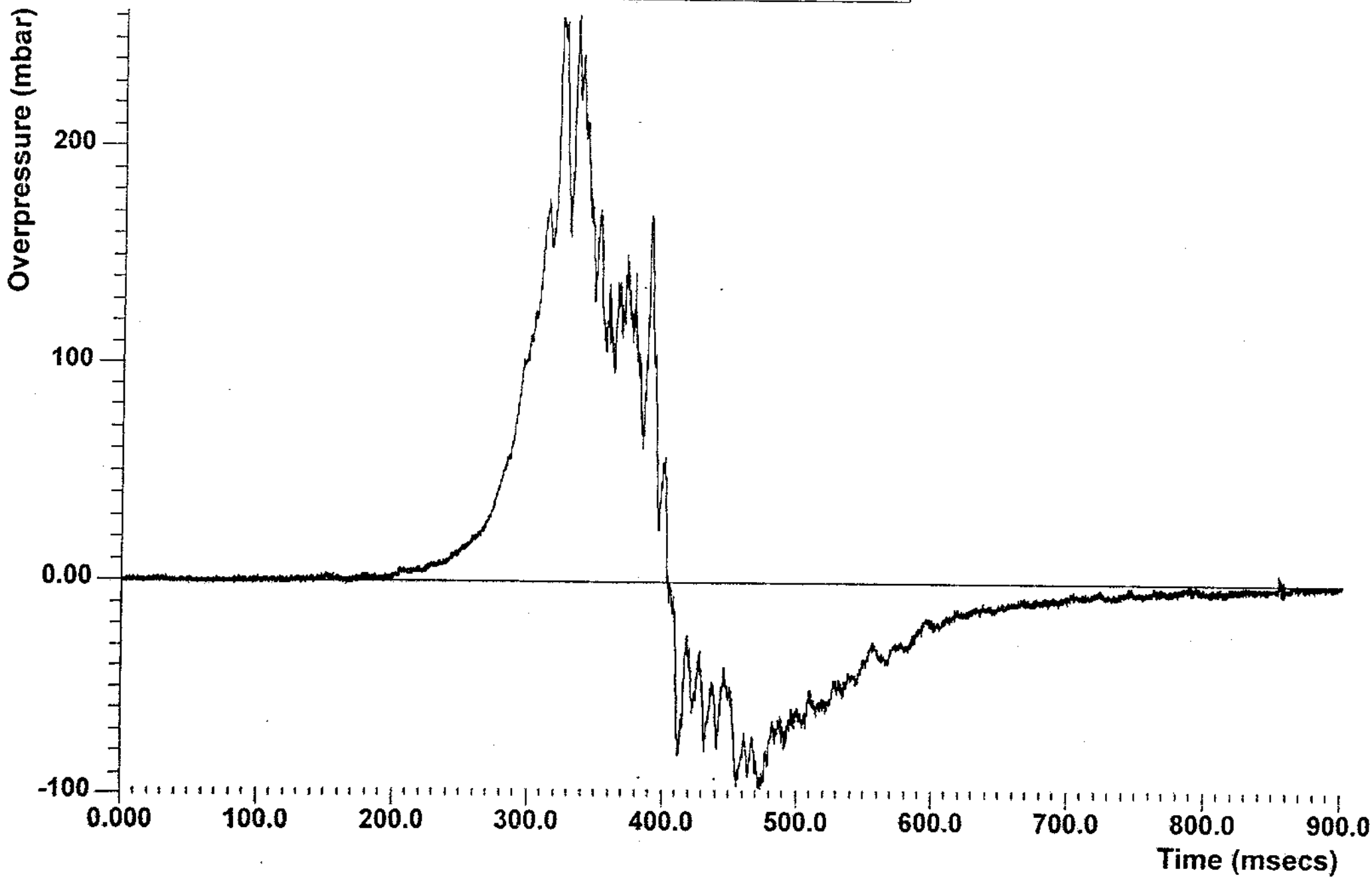
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-1



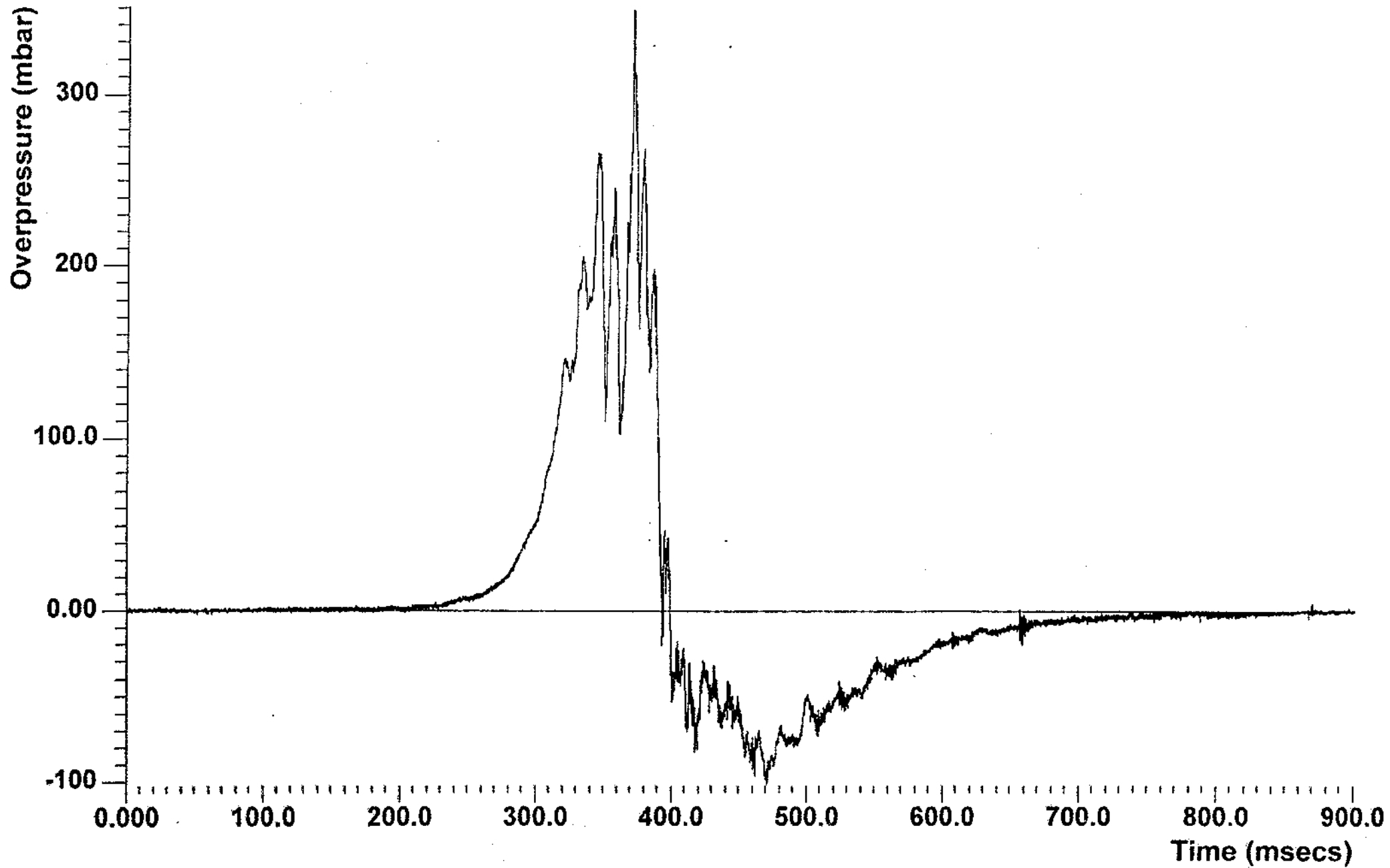
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Transducer no: PI-3



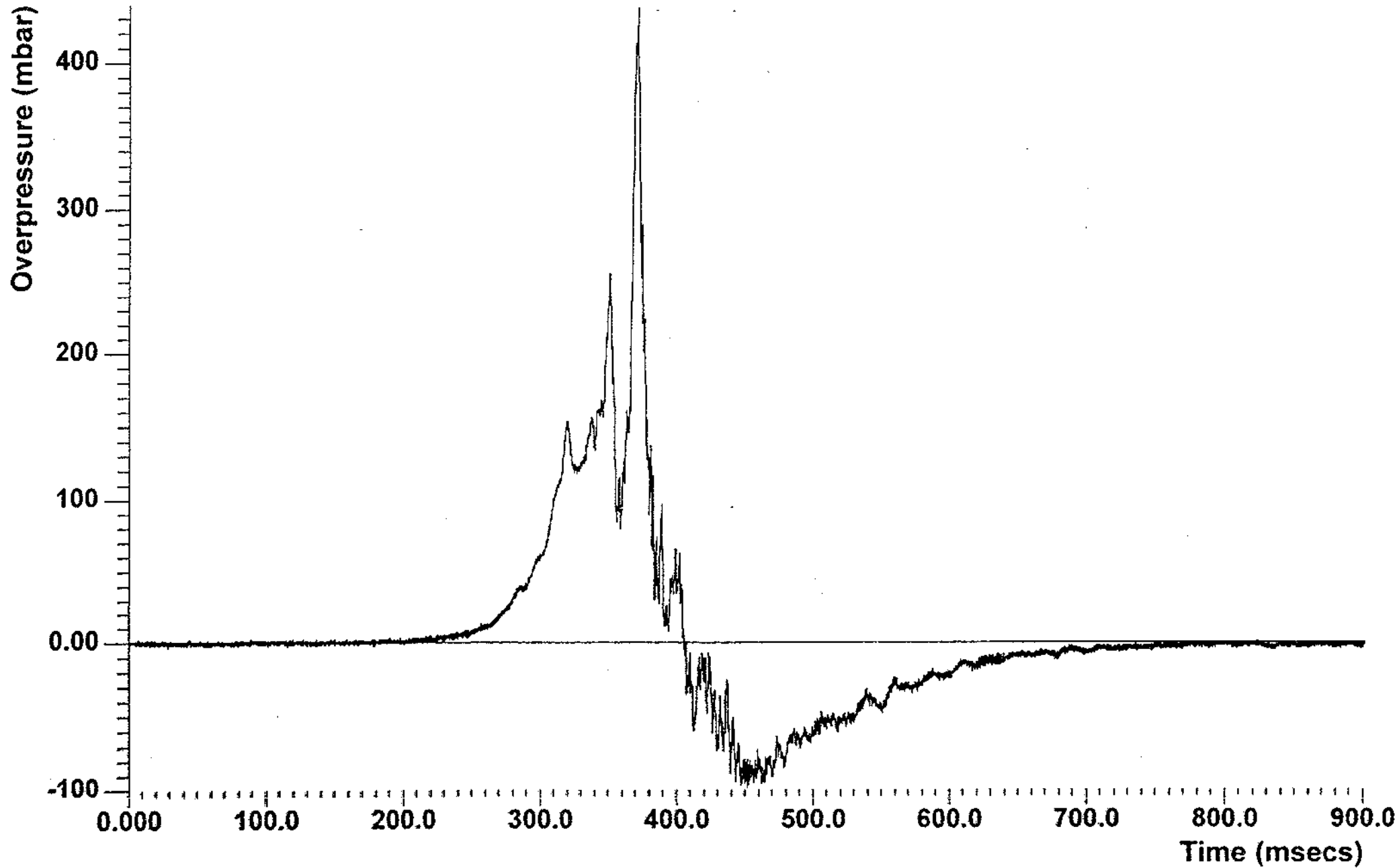
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Transducer no: PI-4



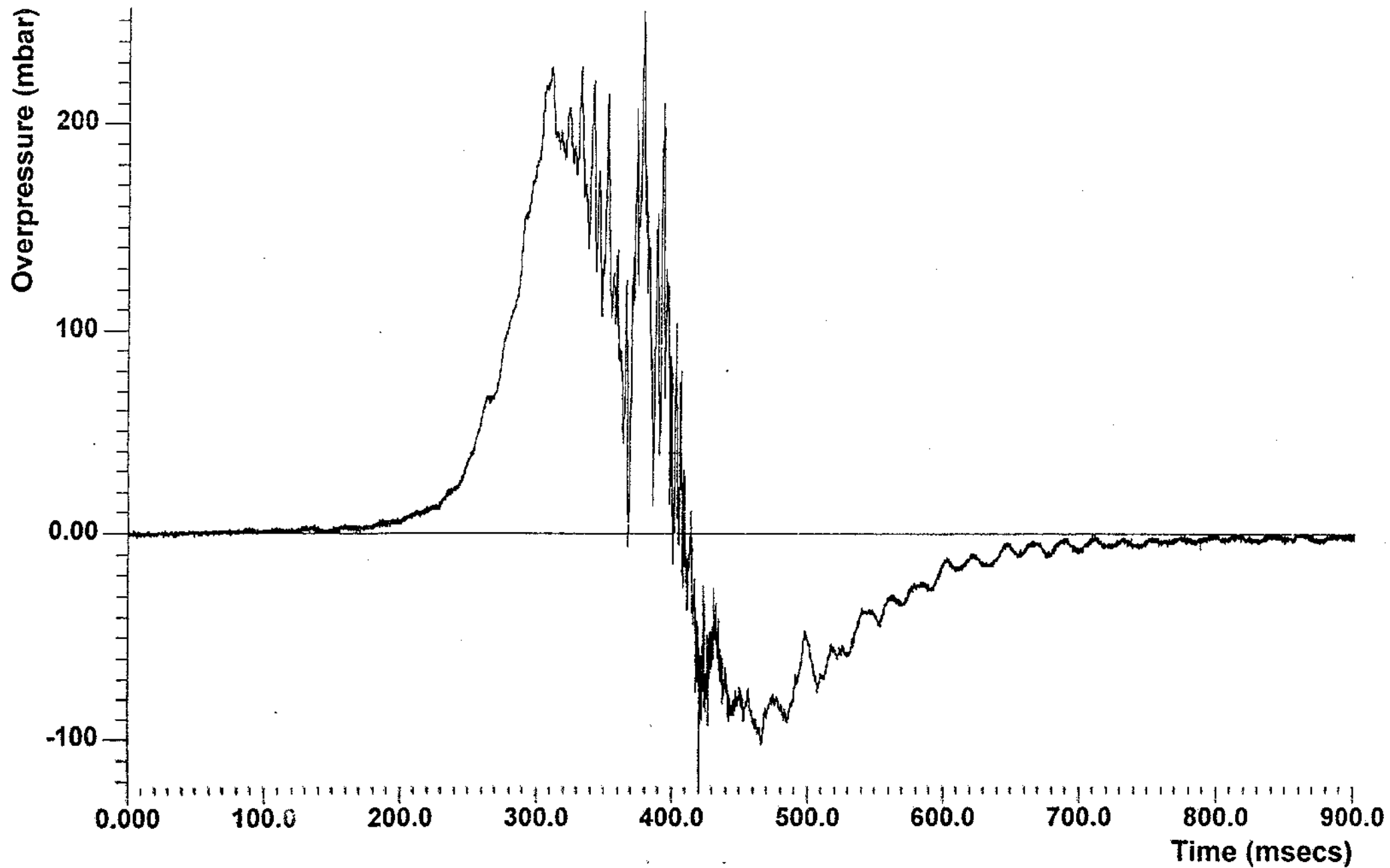
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Transducer no: PI-5



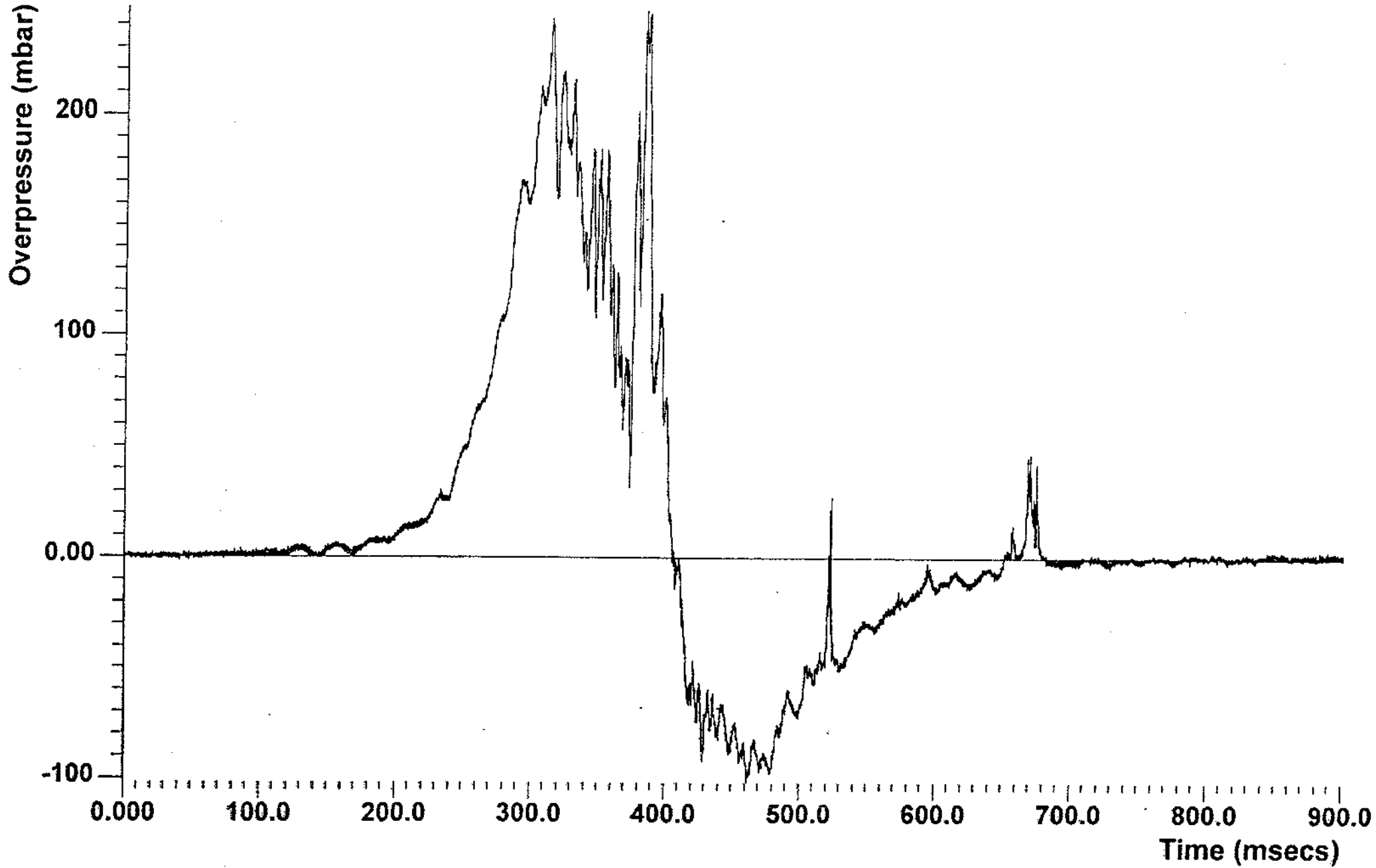
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Transducer no: PI-6



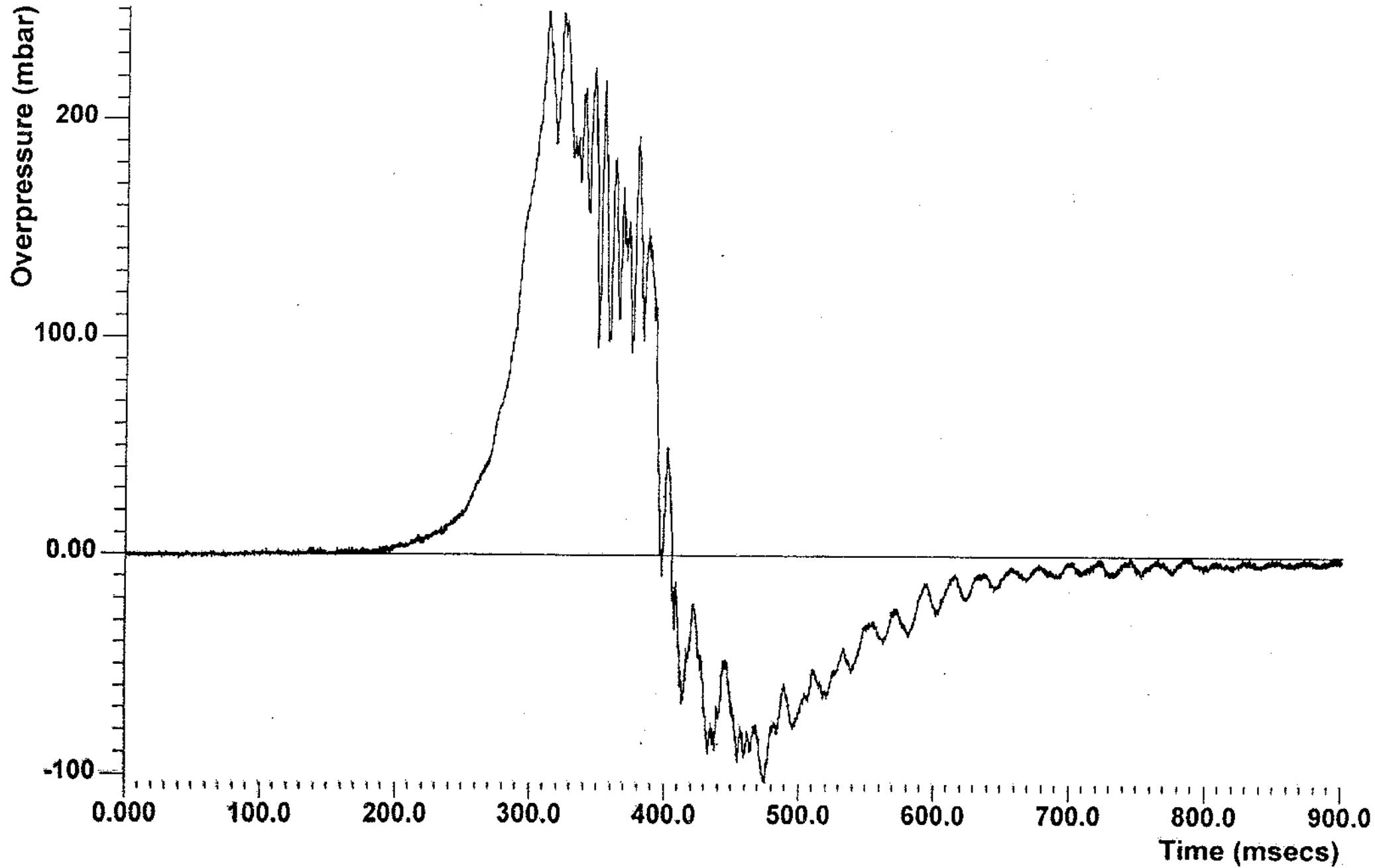
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Transducer no: PI-7



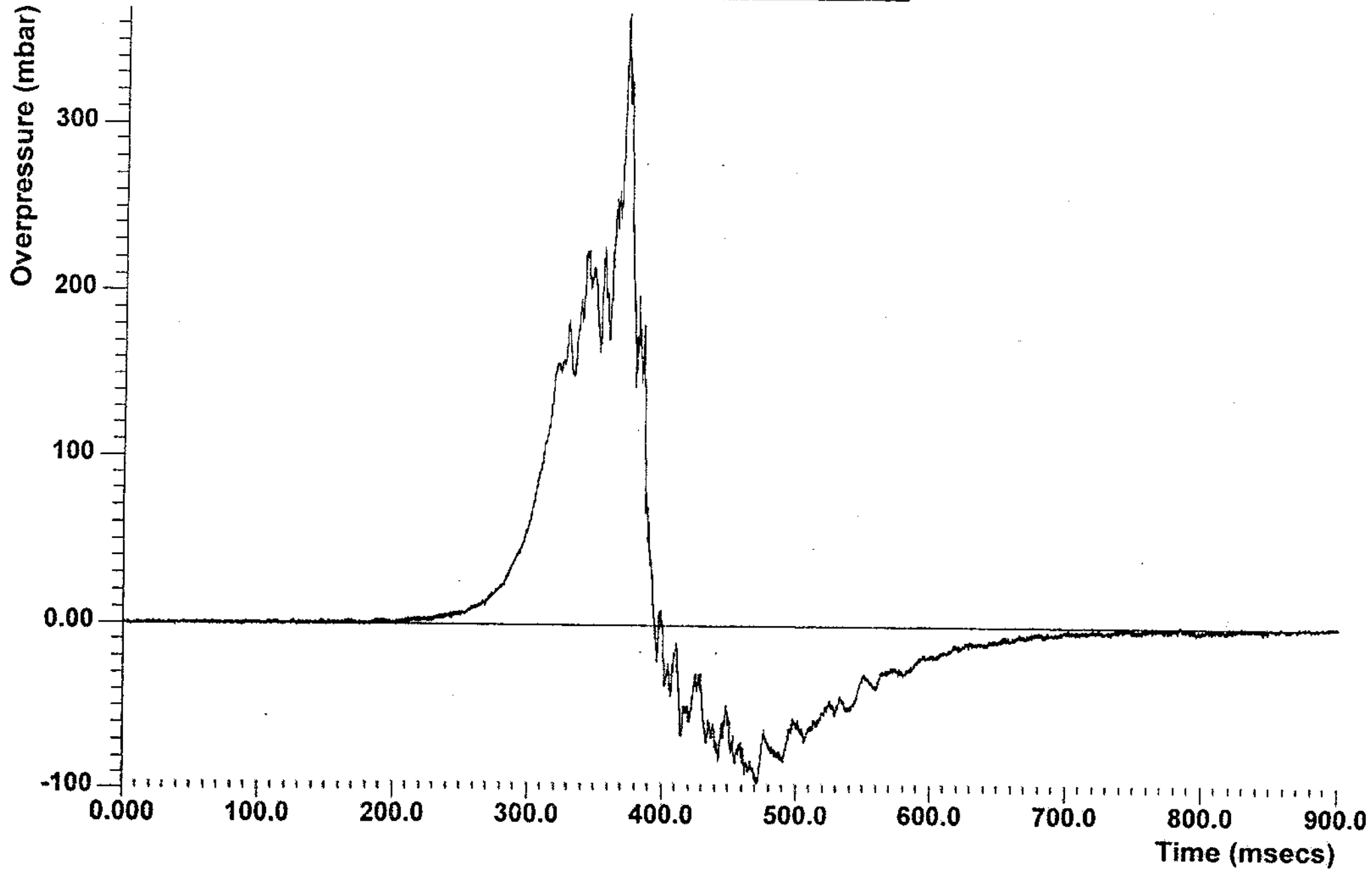
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-8



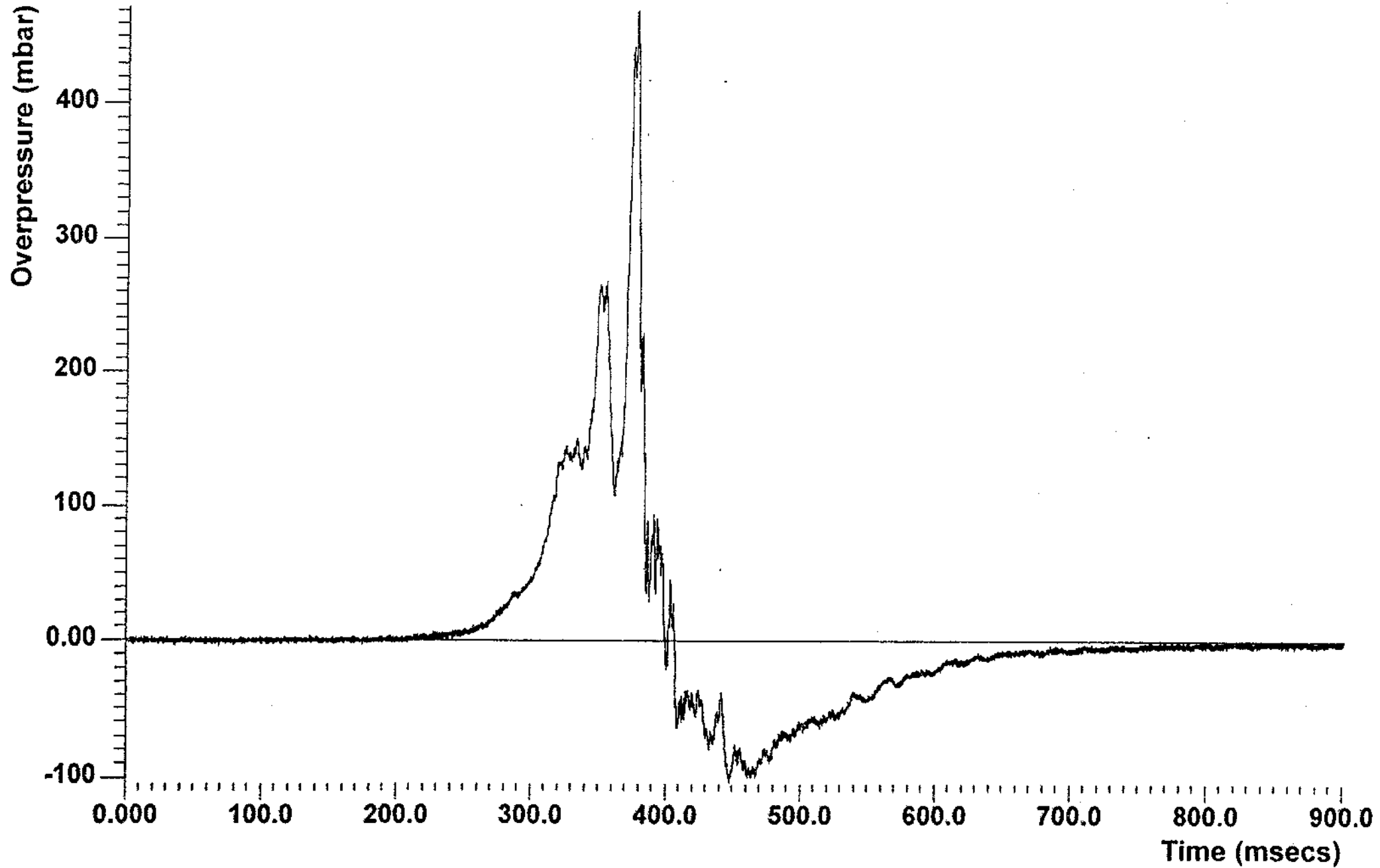
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Transducer no: PI-9



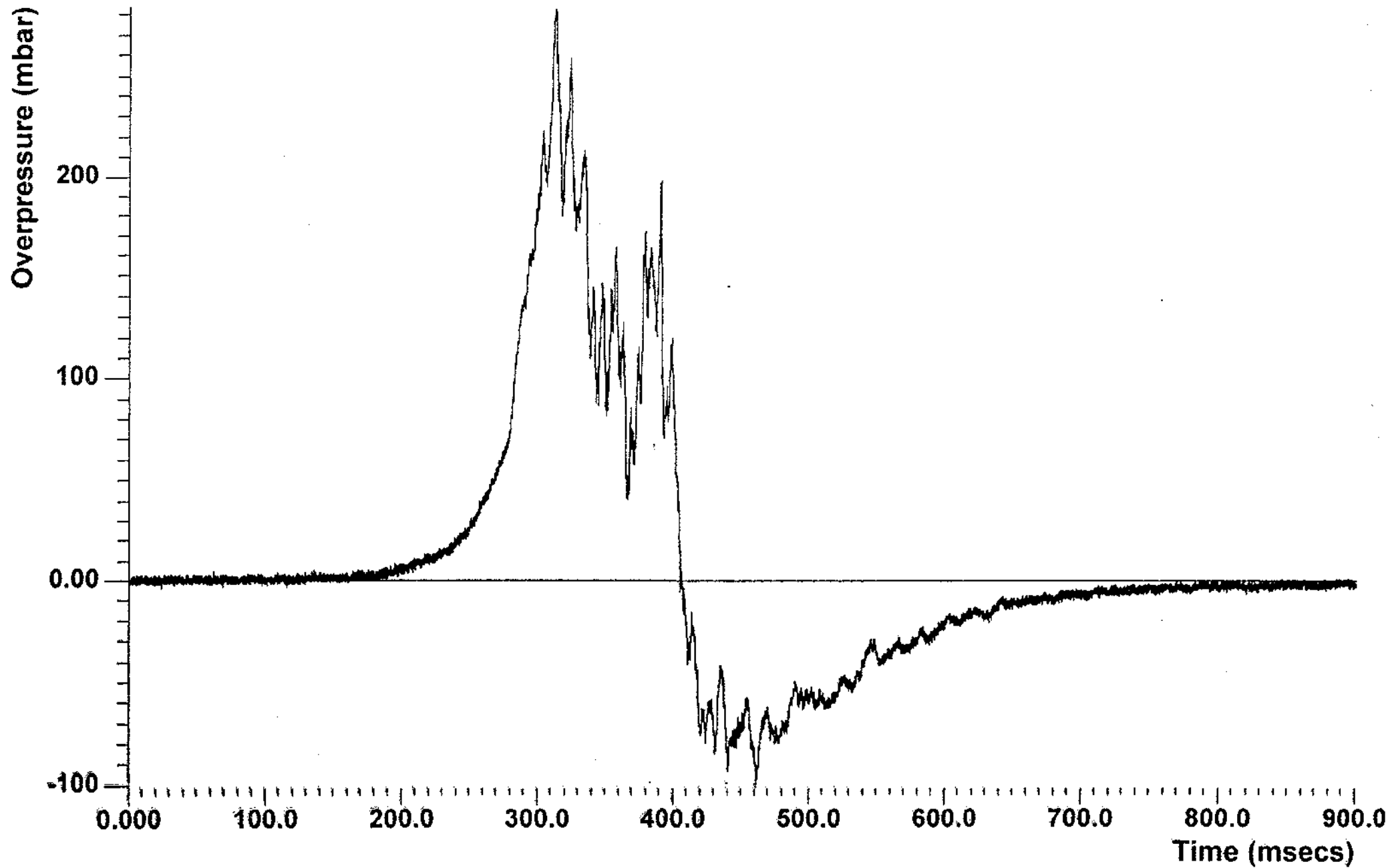
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Transducer no: PI-10



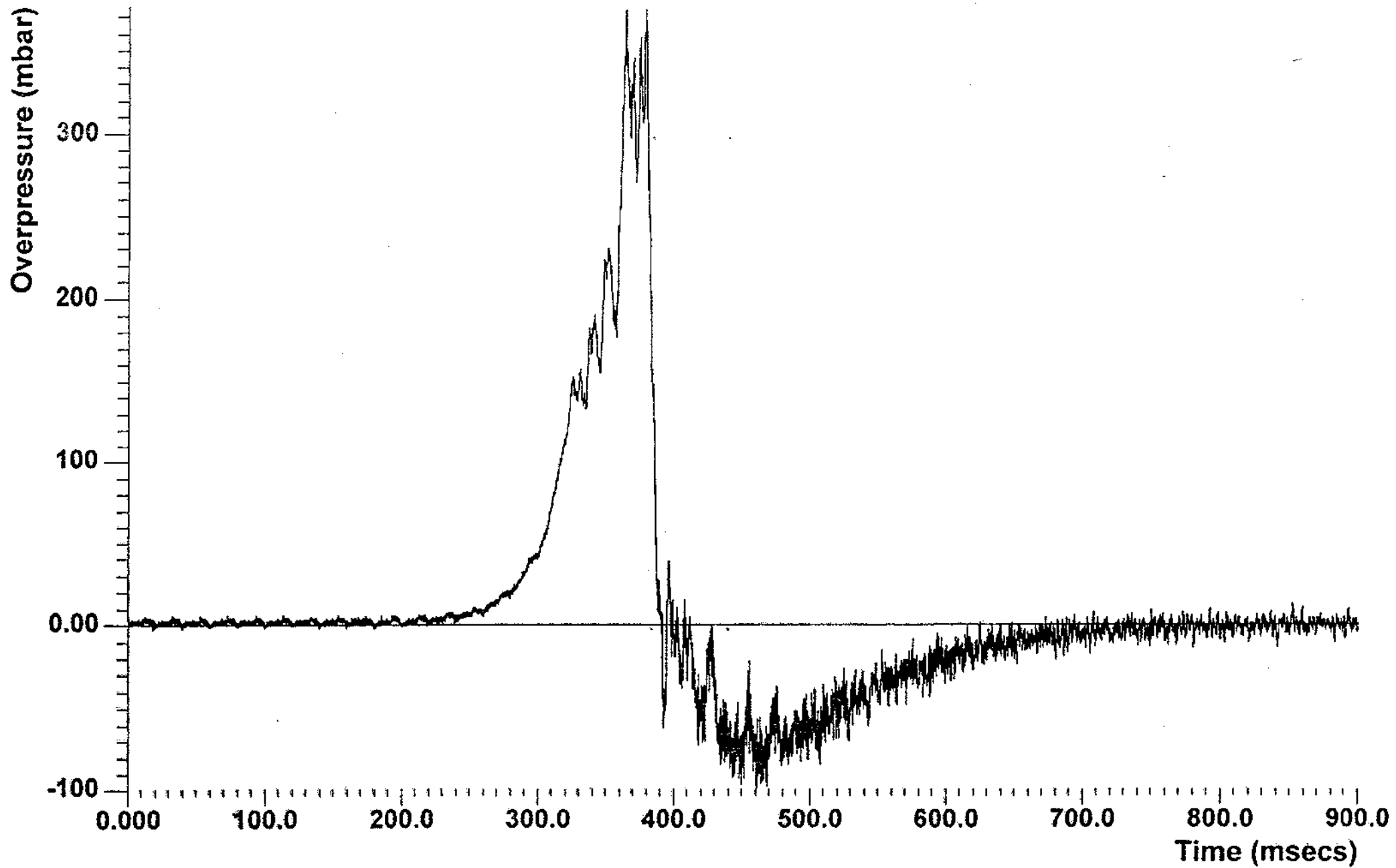
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Transducer no: PI-11



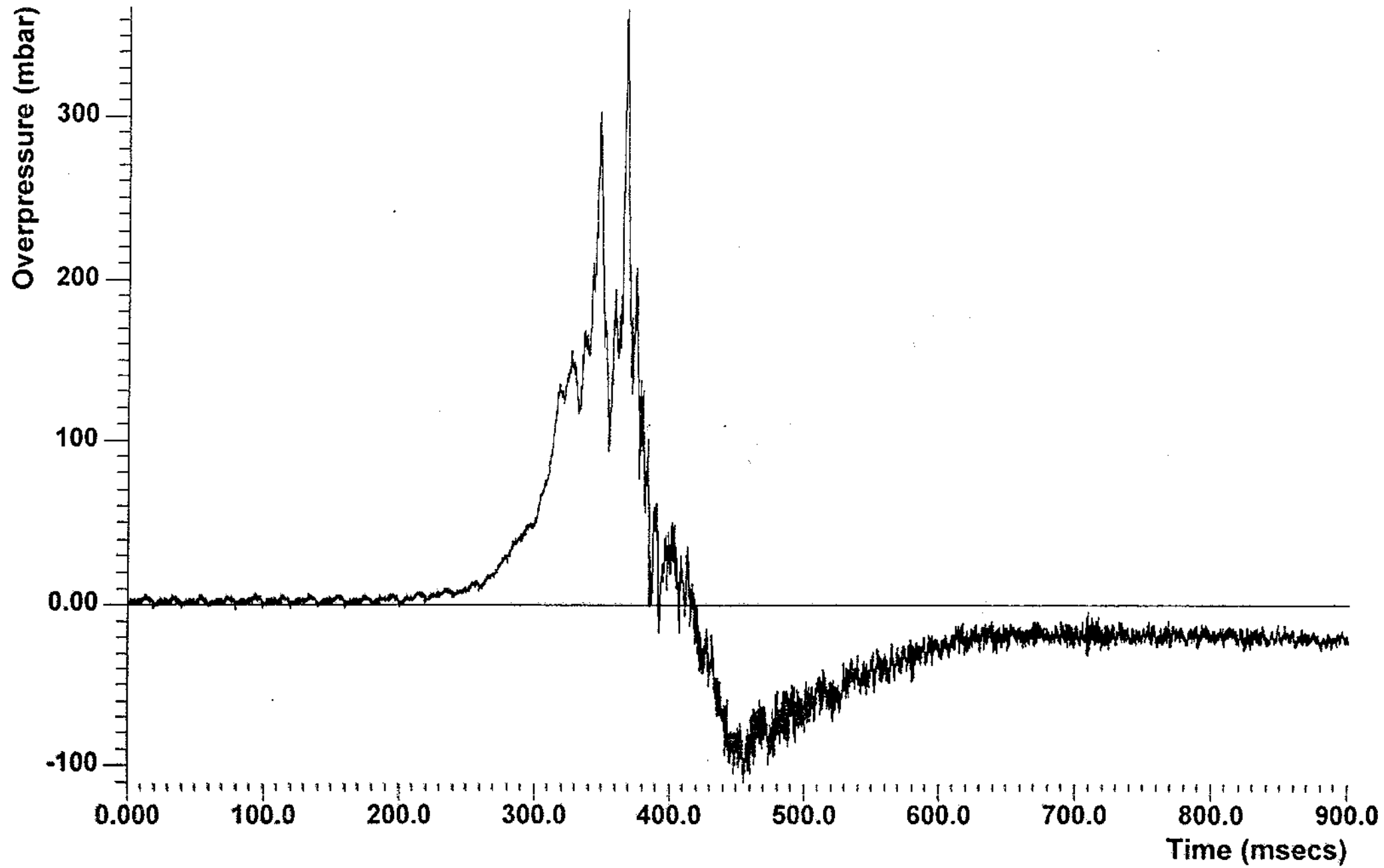
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Transducer no: PI-12



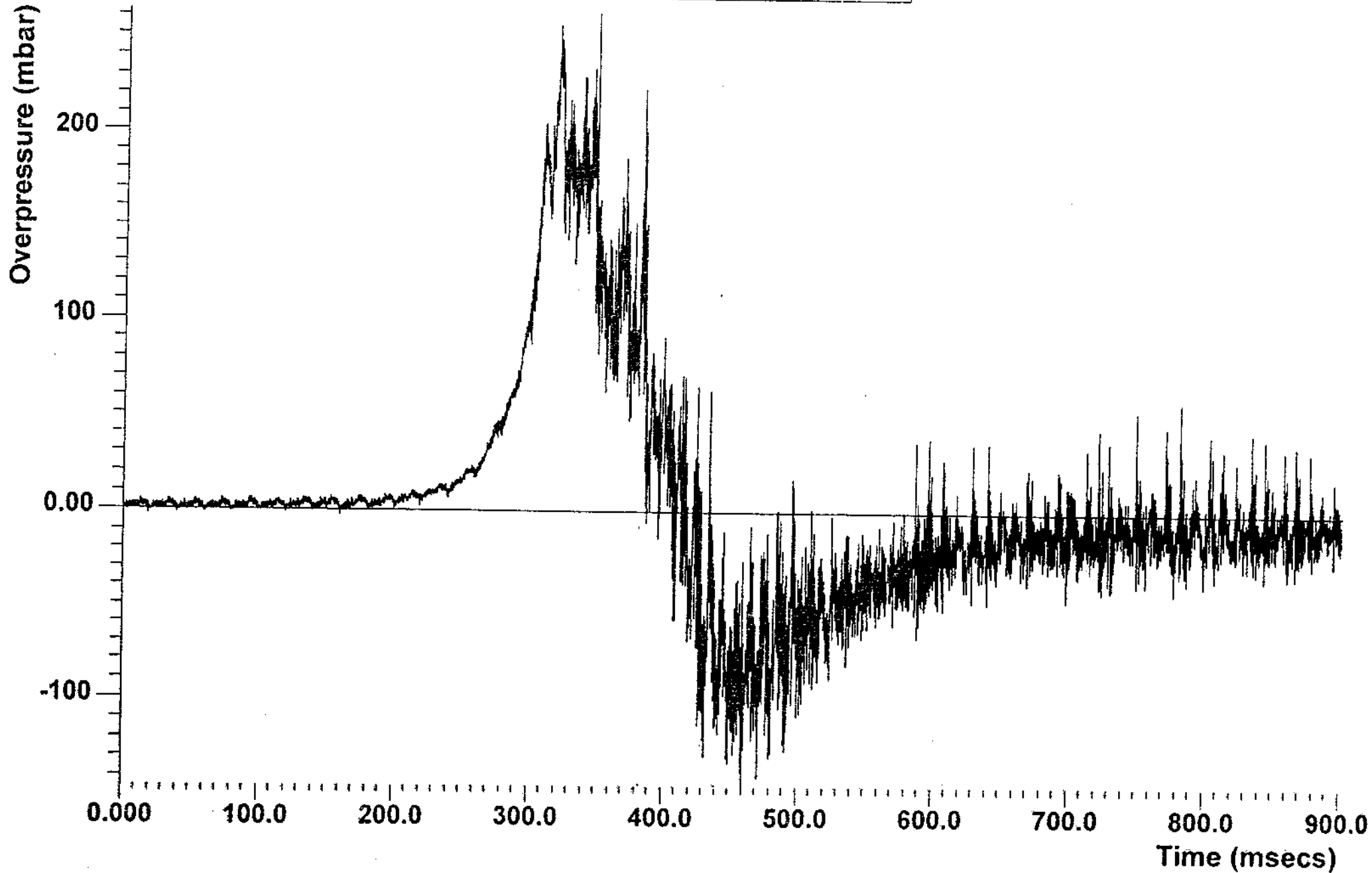
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Transducer no: PI-13



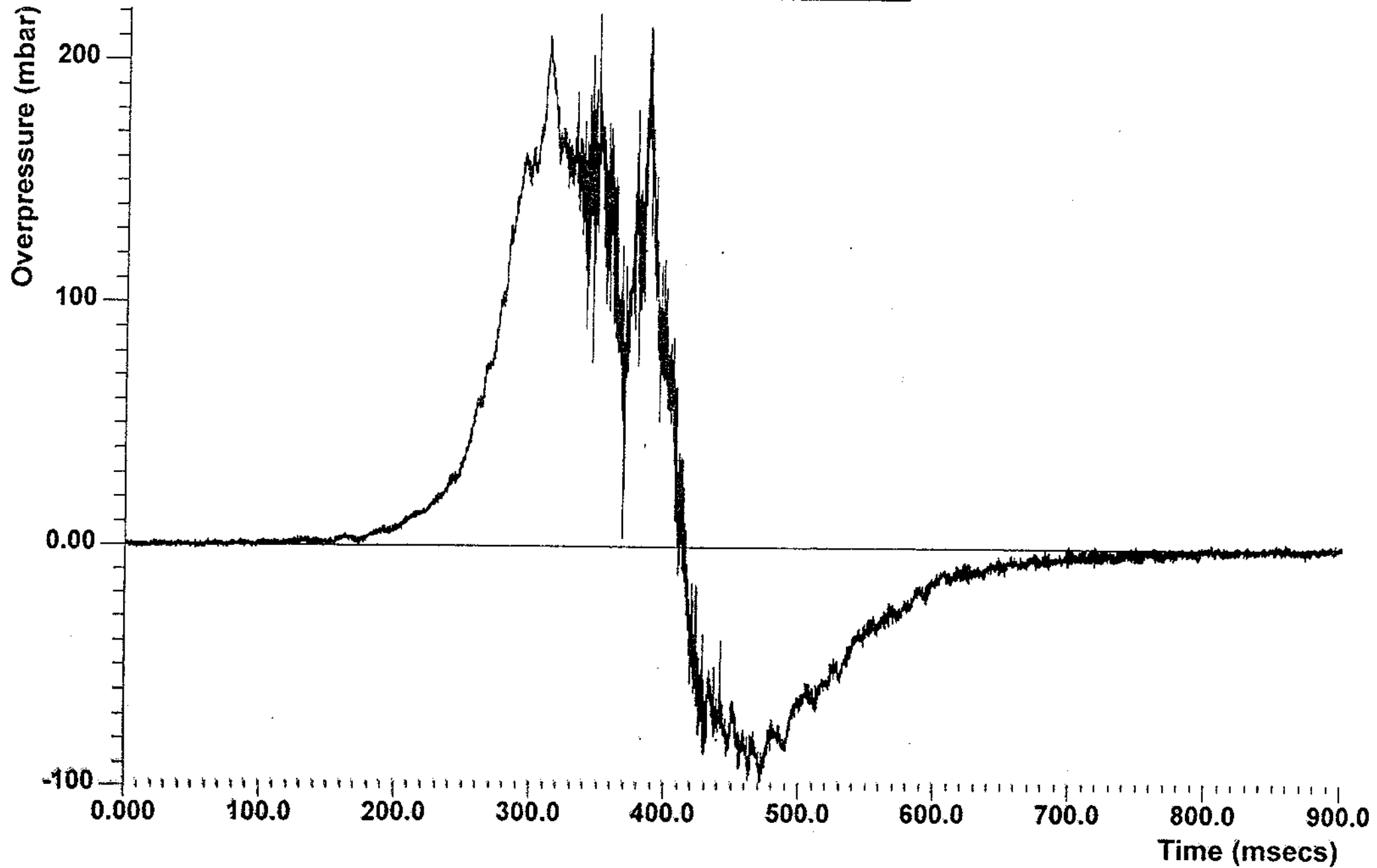
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Transducer no: PI-14



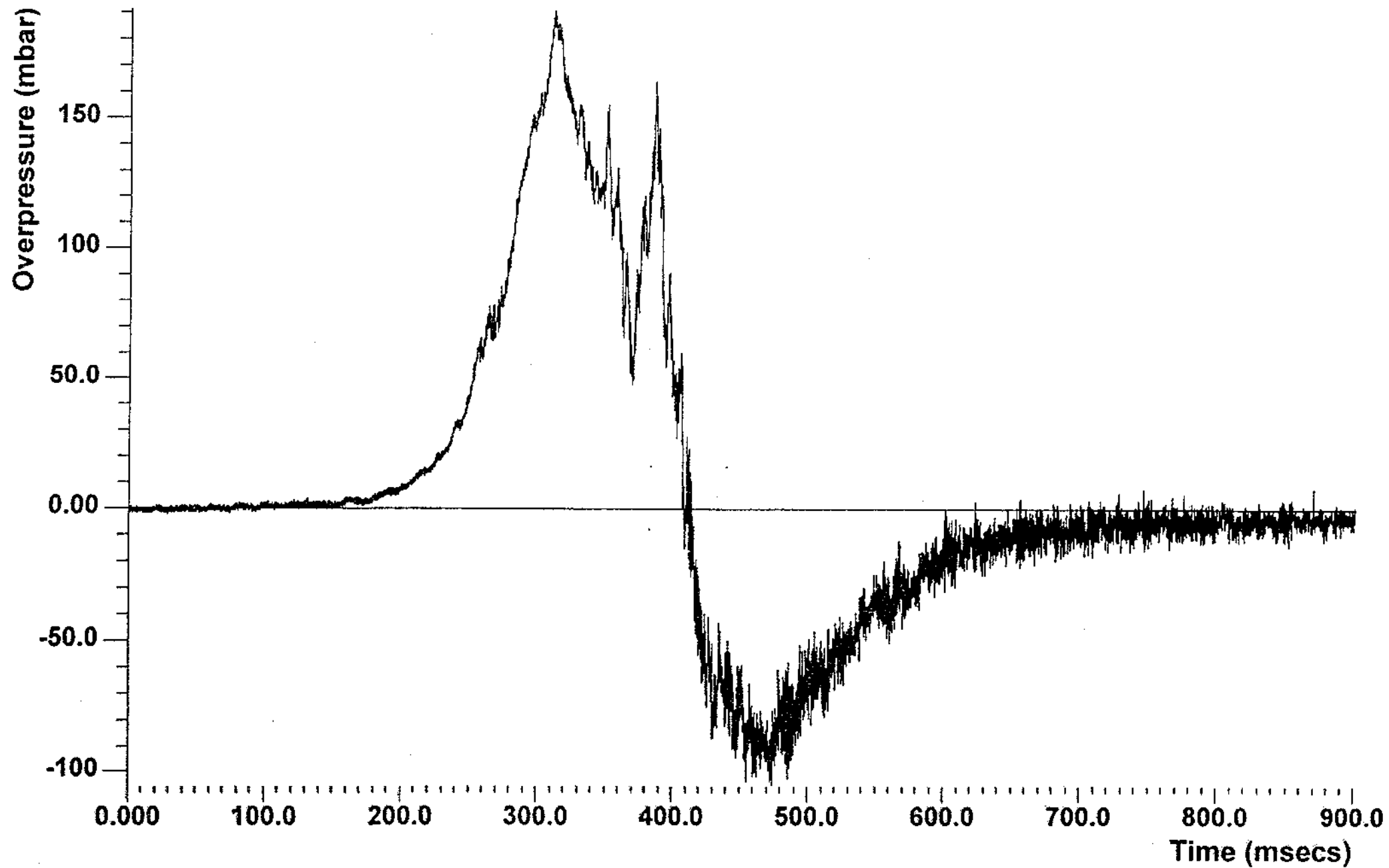
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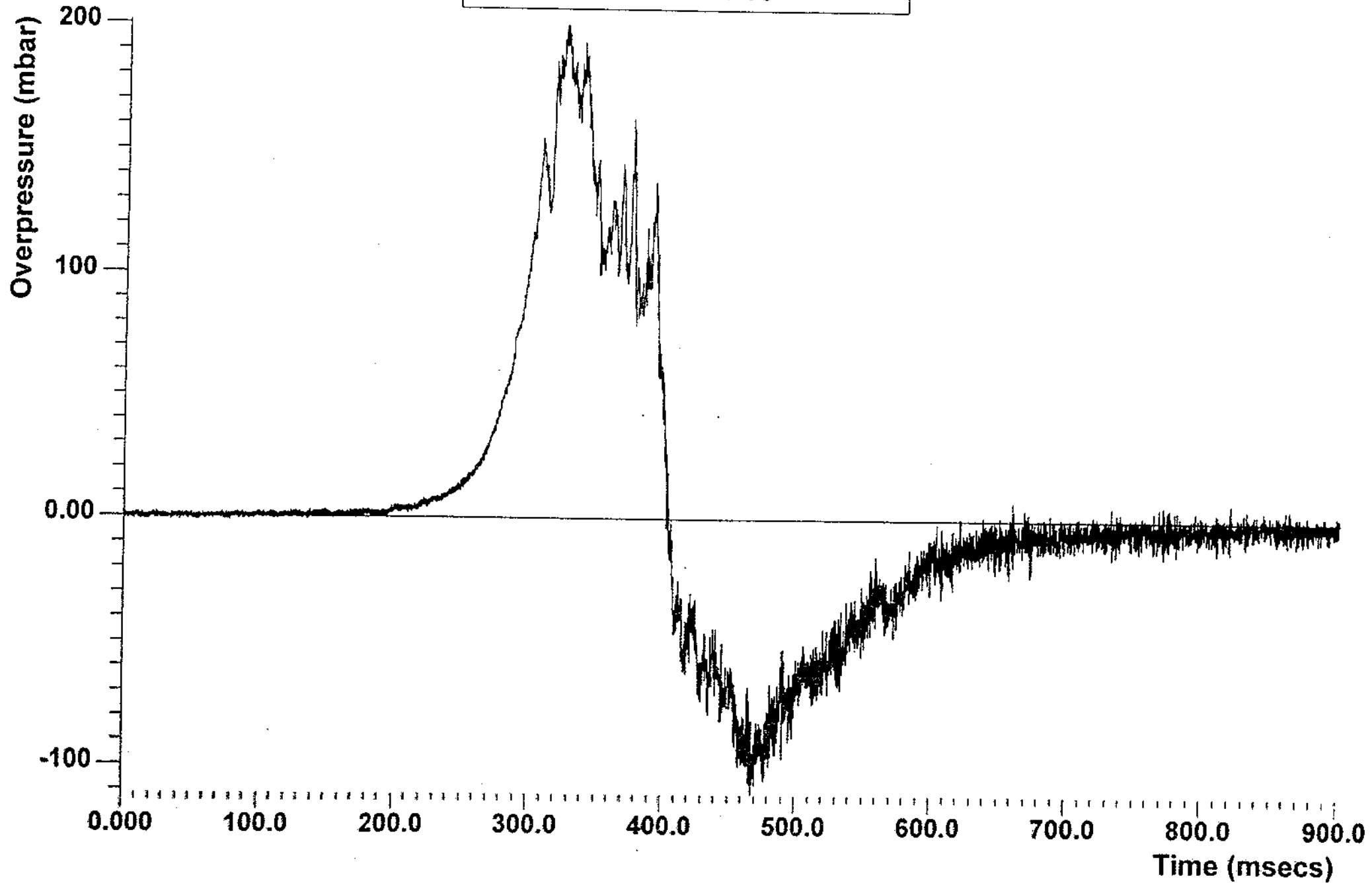
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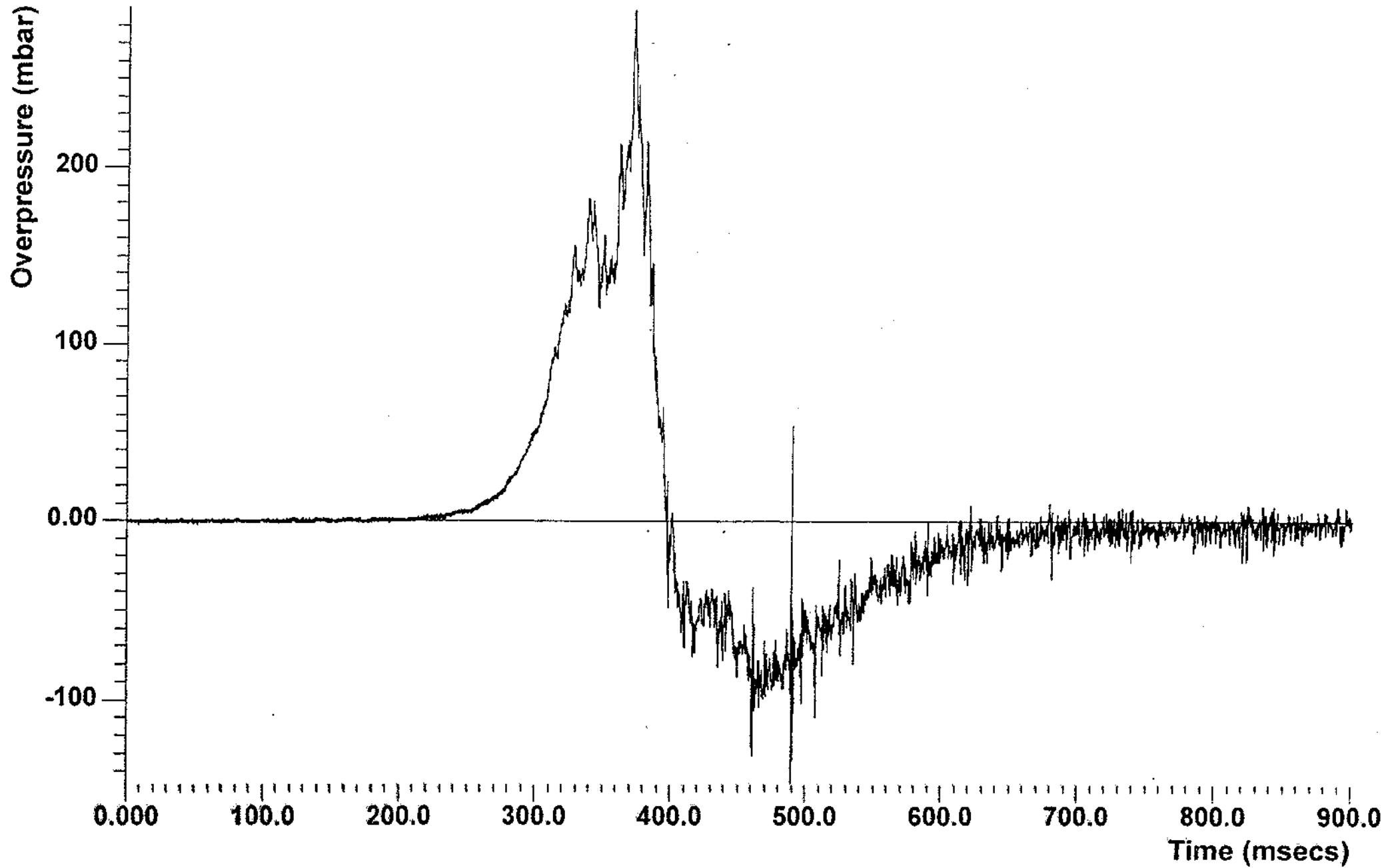
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Transducer no: PI-17



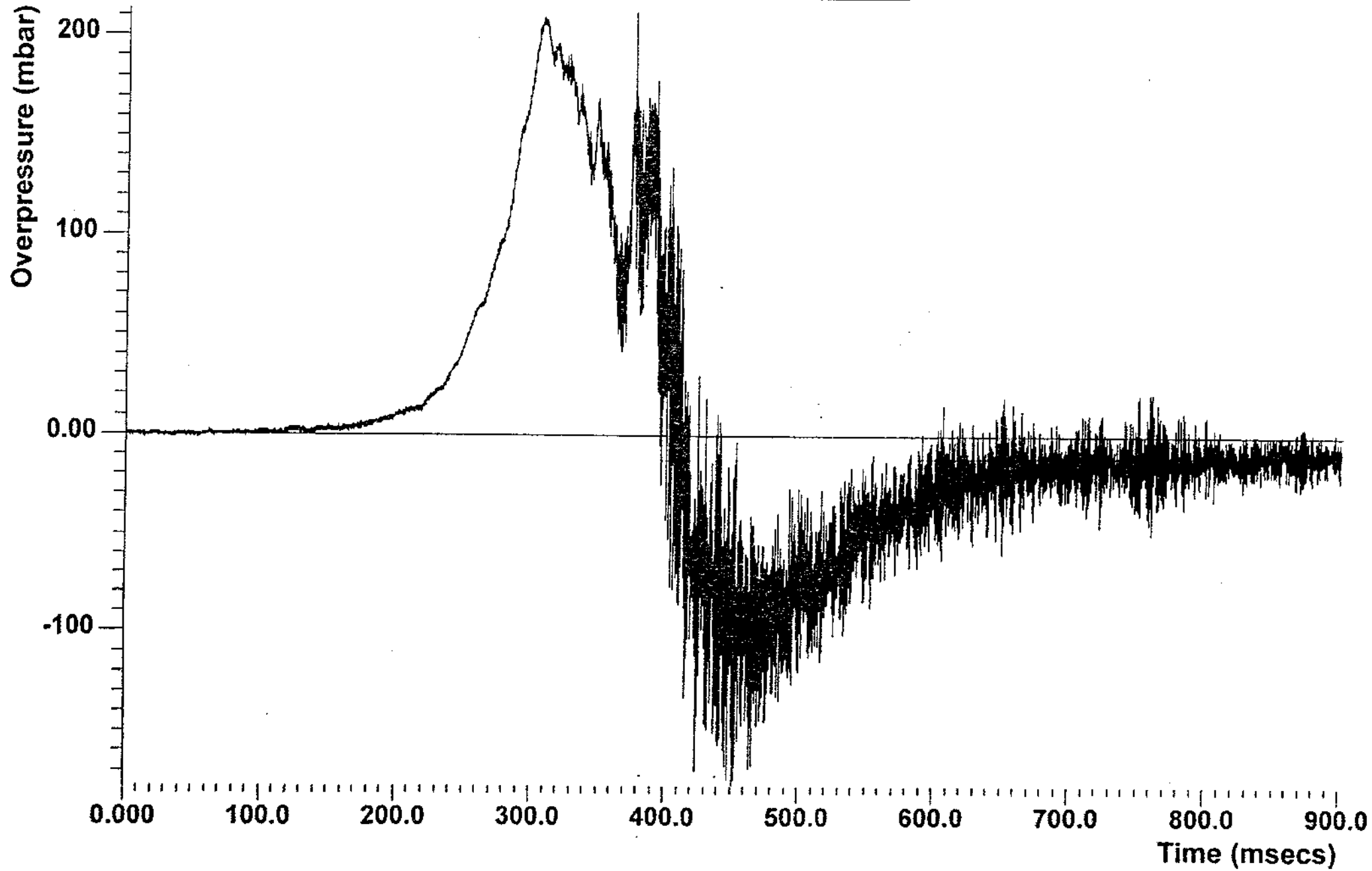
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Transducer no: PI-18



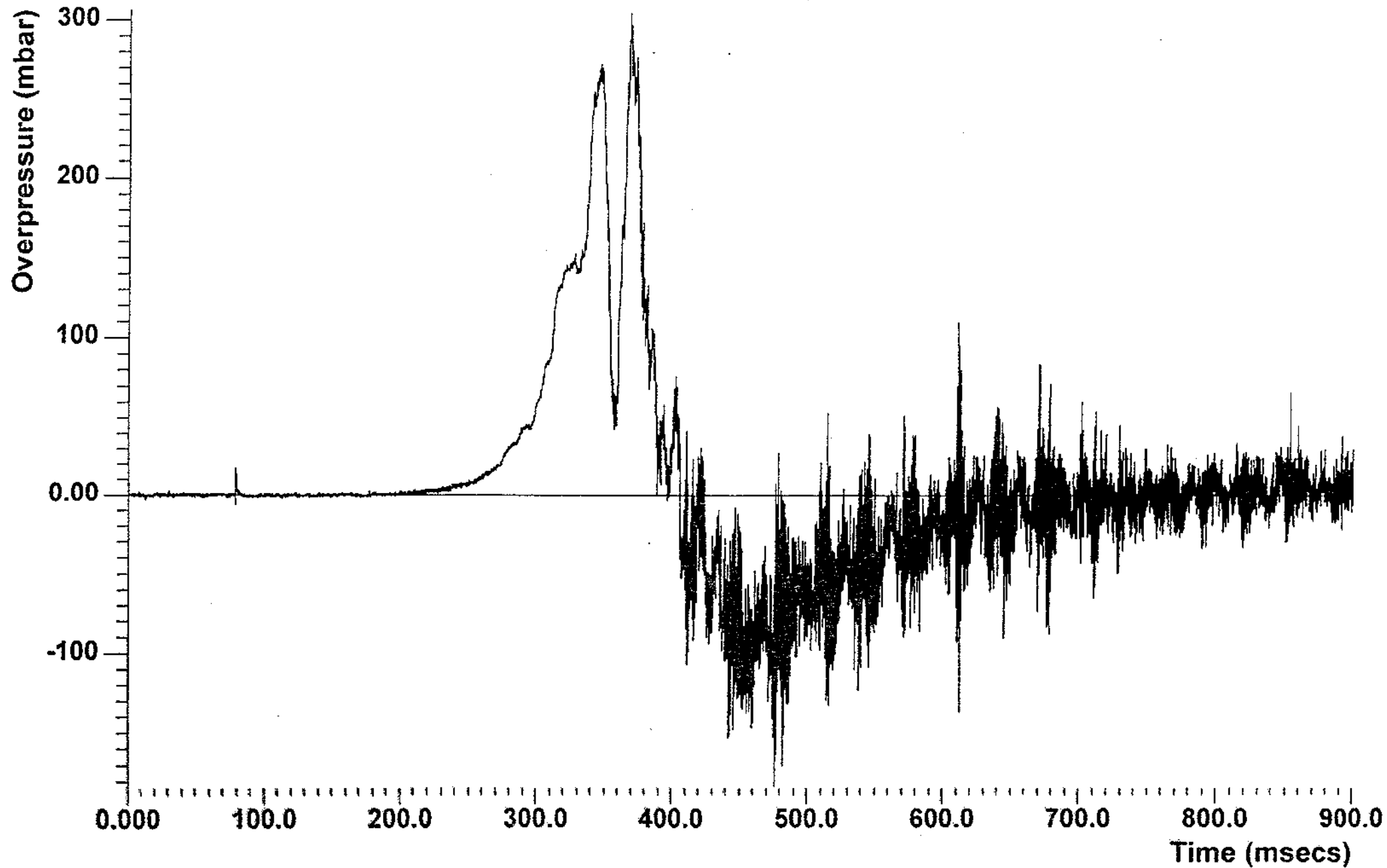
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Transducer no: PI-19



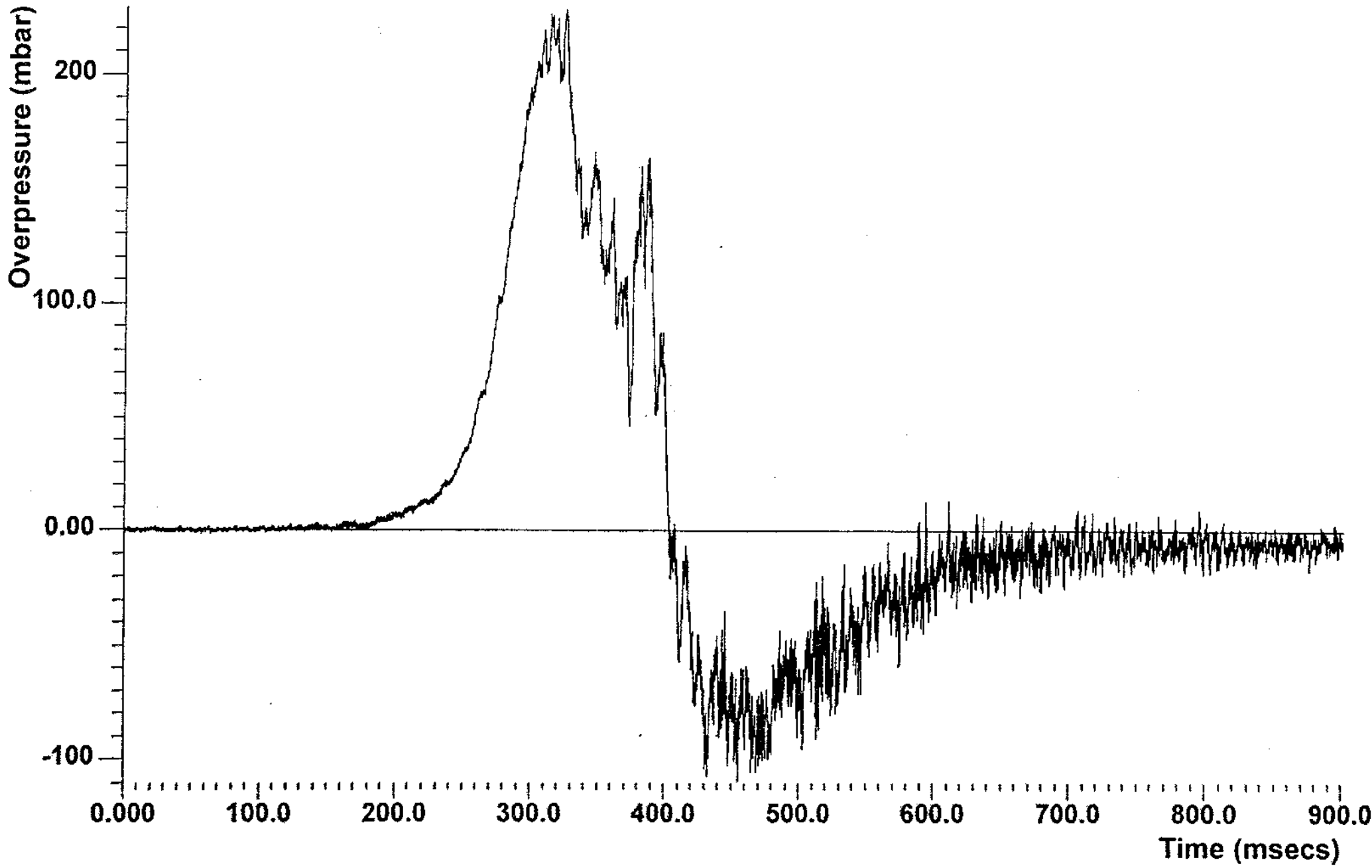
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Transducer no: PI-20



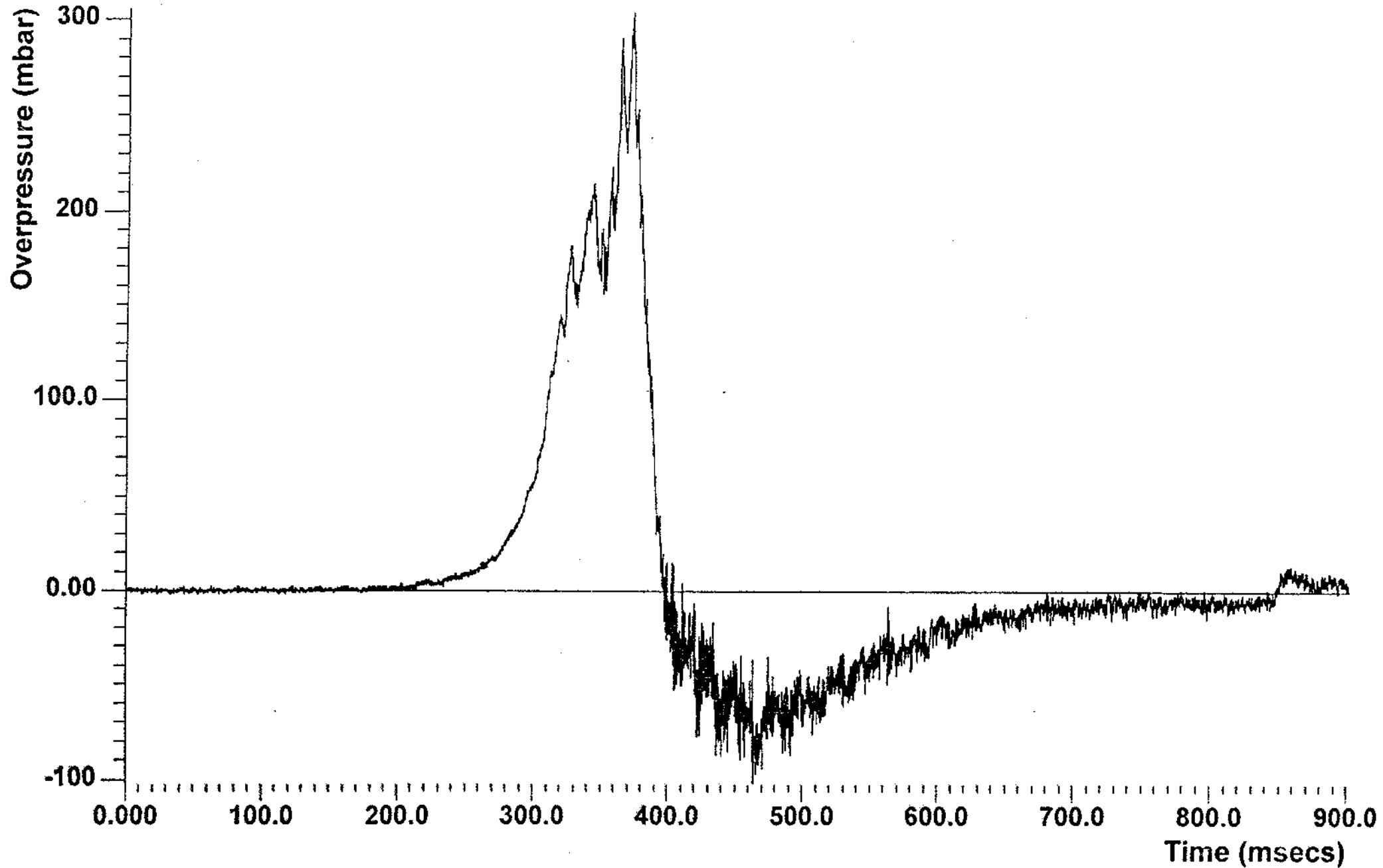
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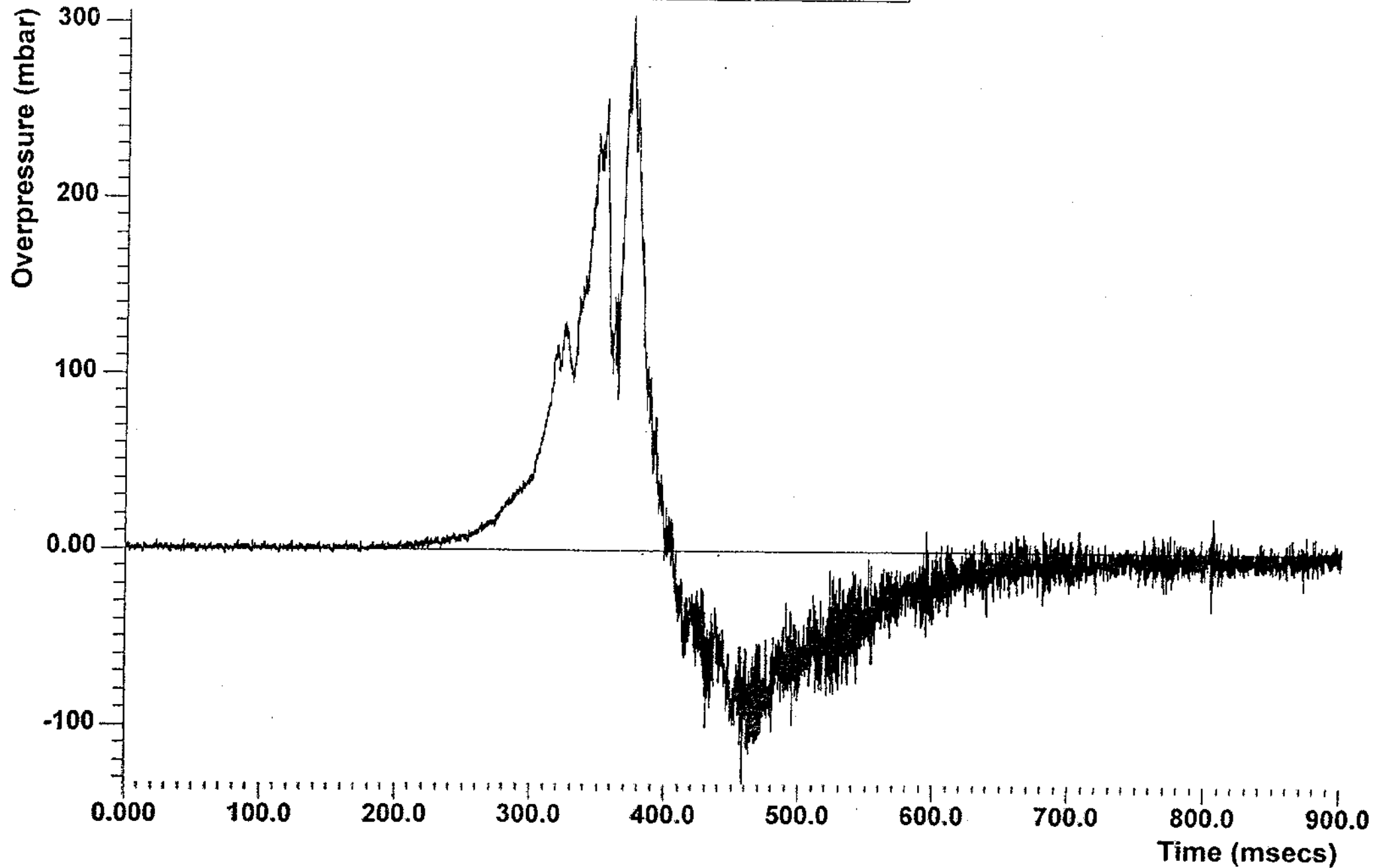
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Transducer no: PI-22



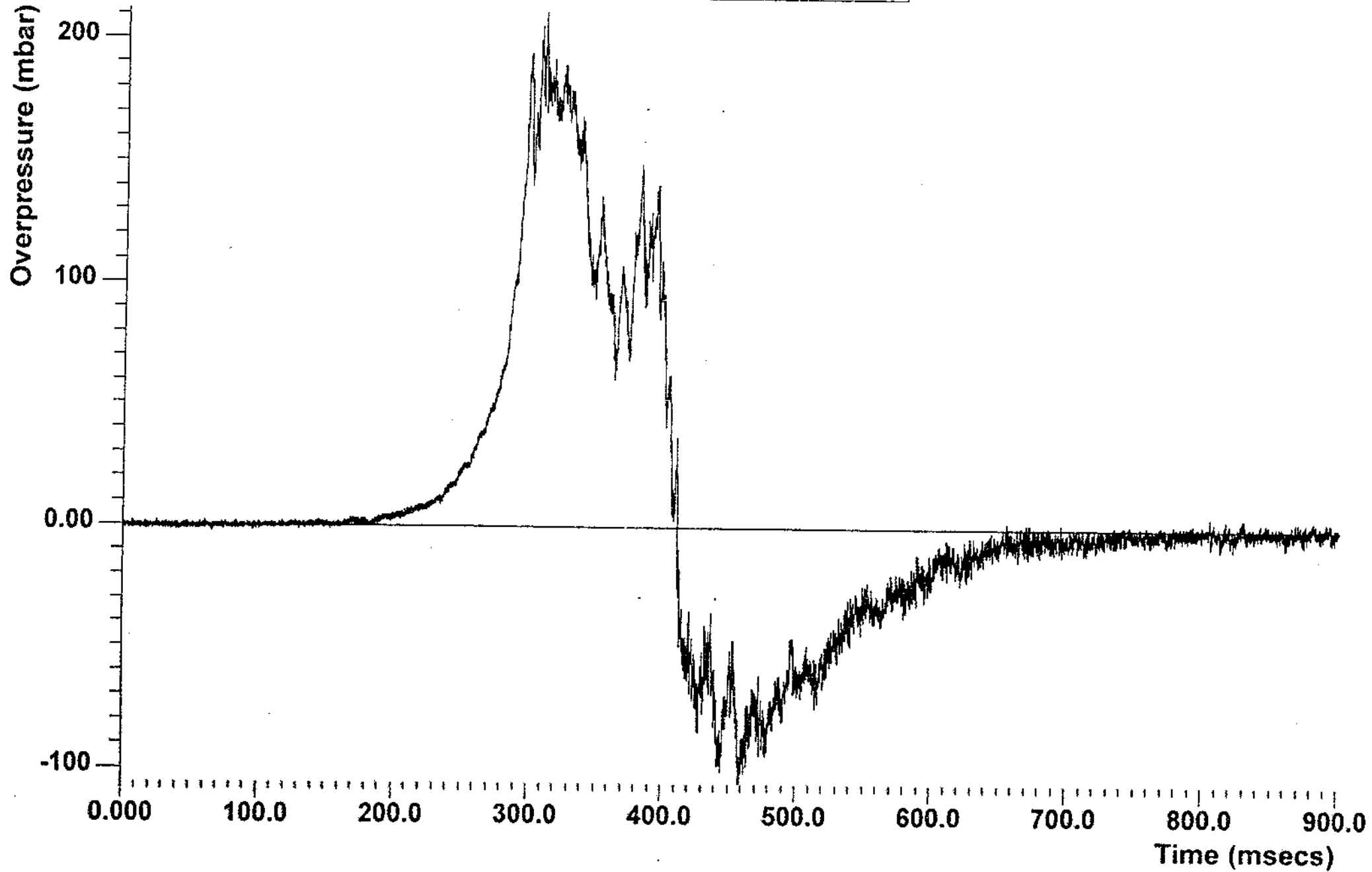
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Transducer no: PI-23



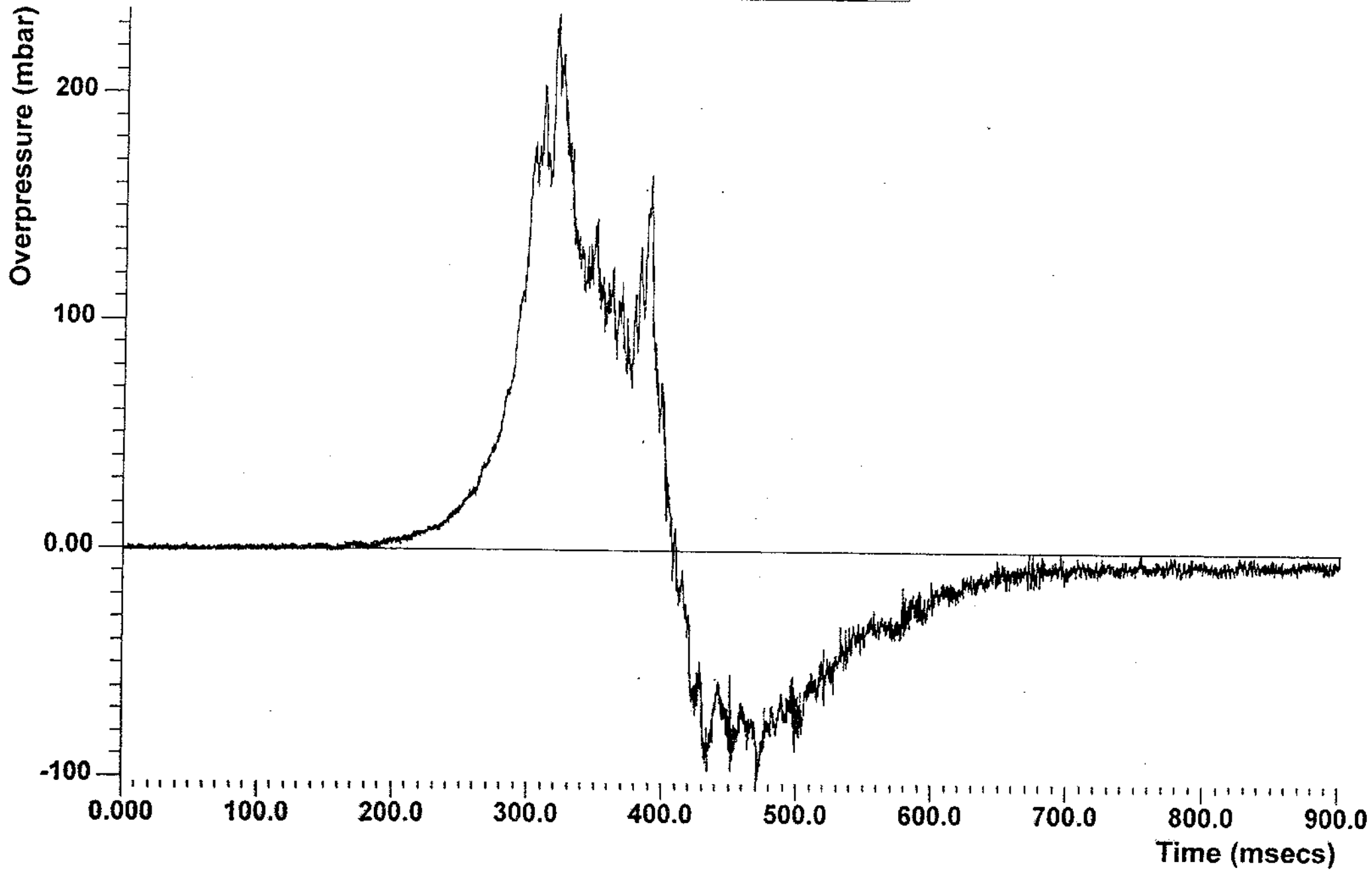
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Transducer no: PI-24



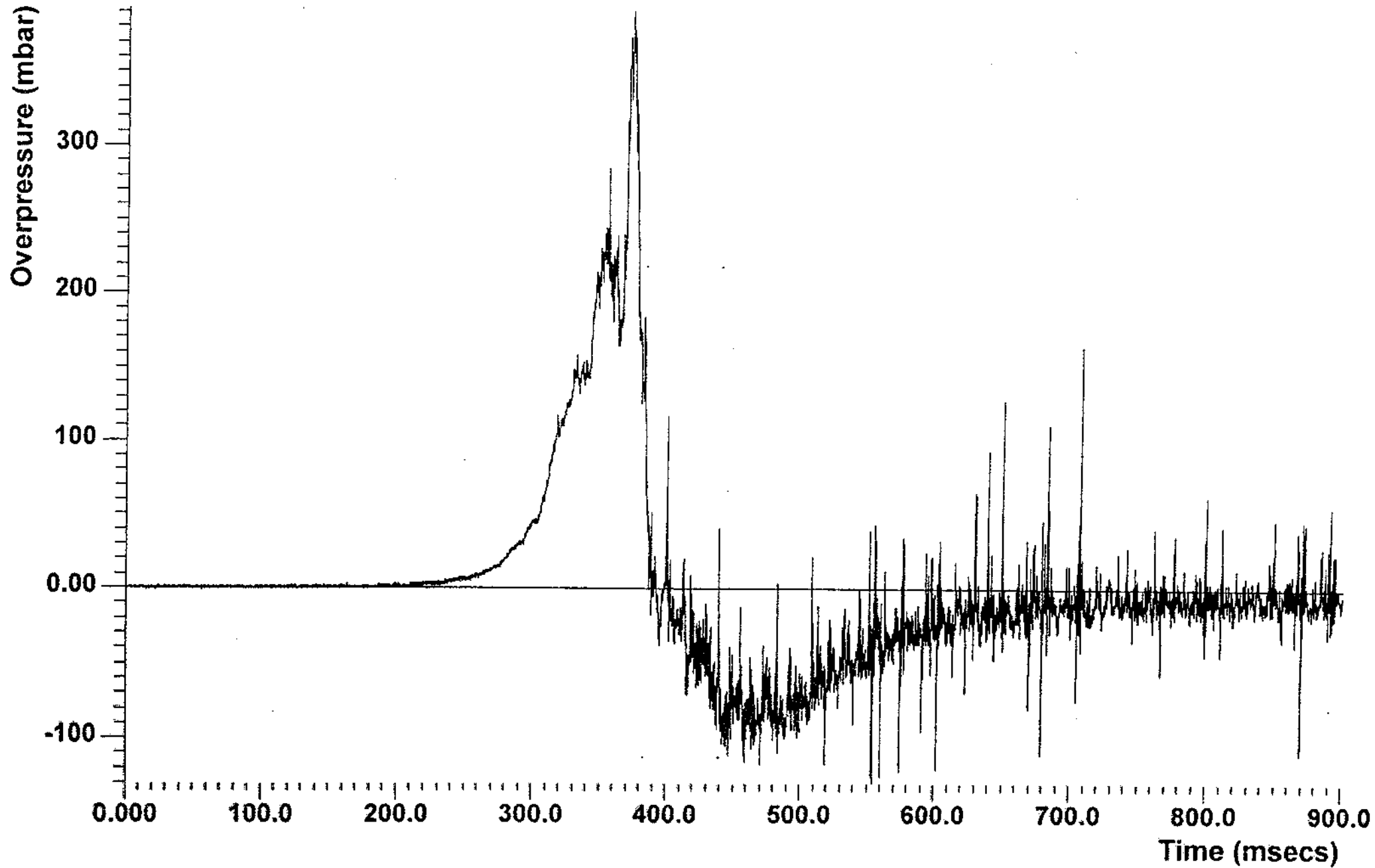
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Transducer no: PI-25



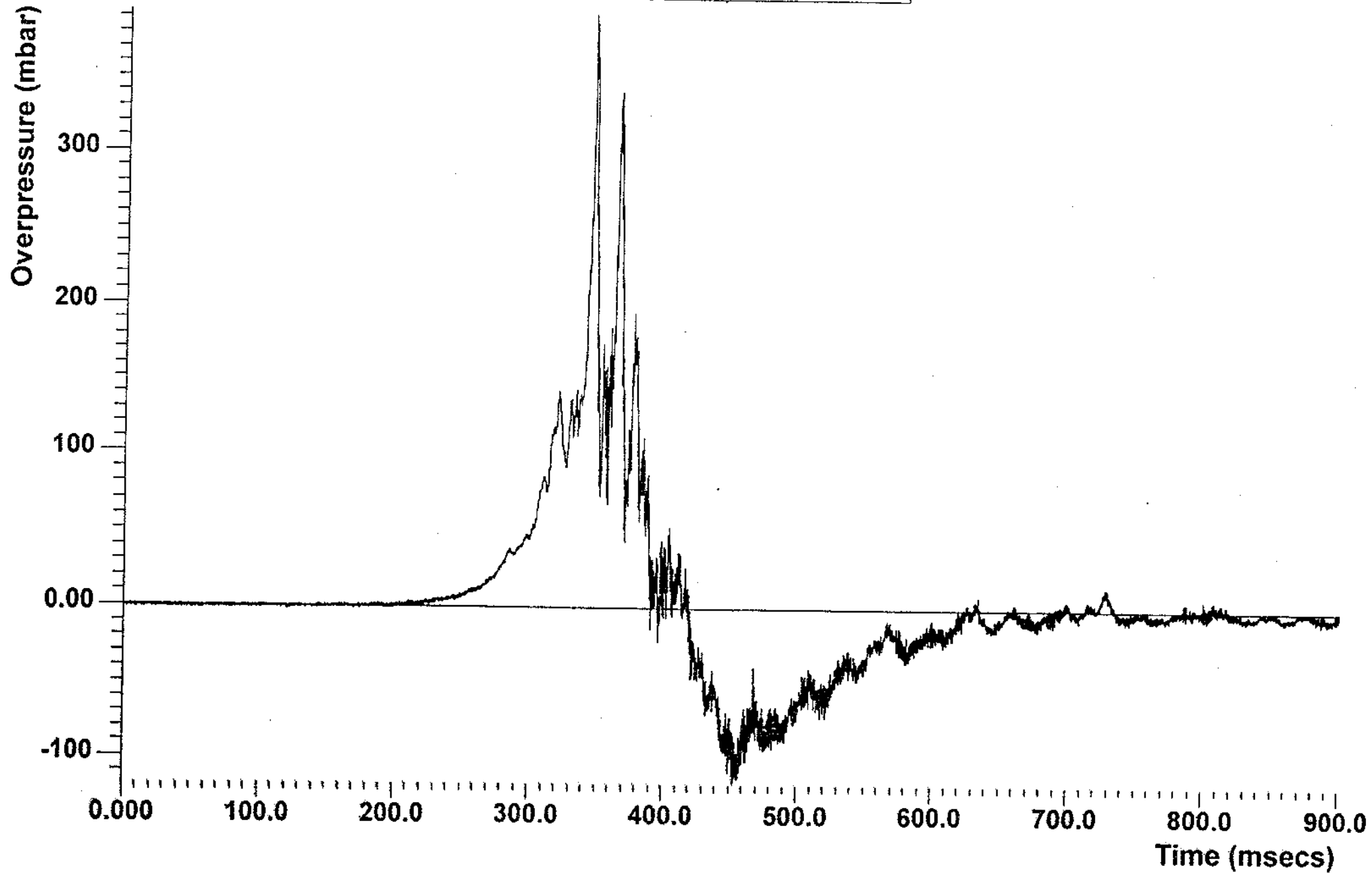
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Transducer no: PI-26



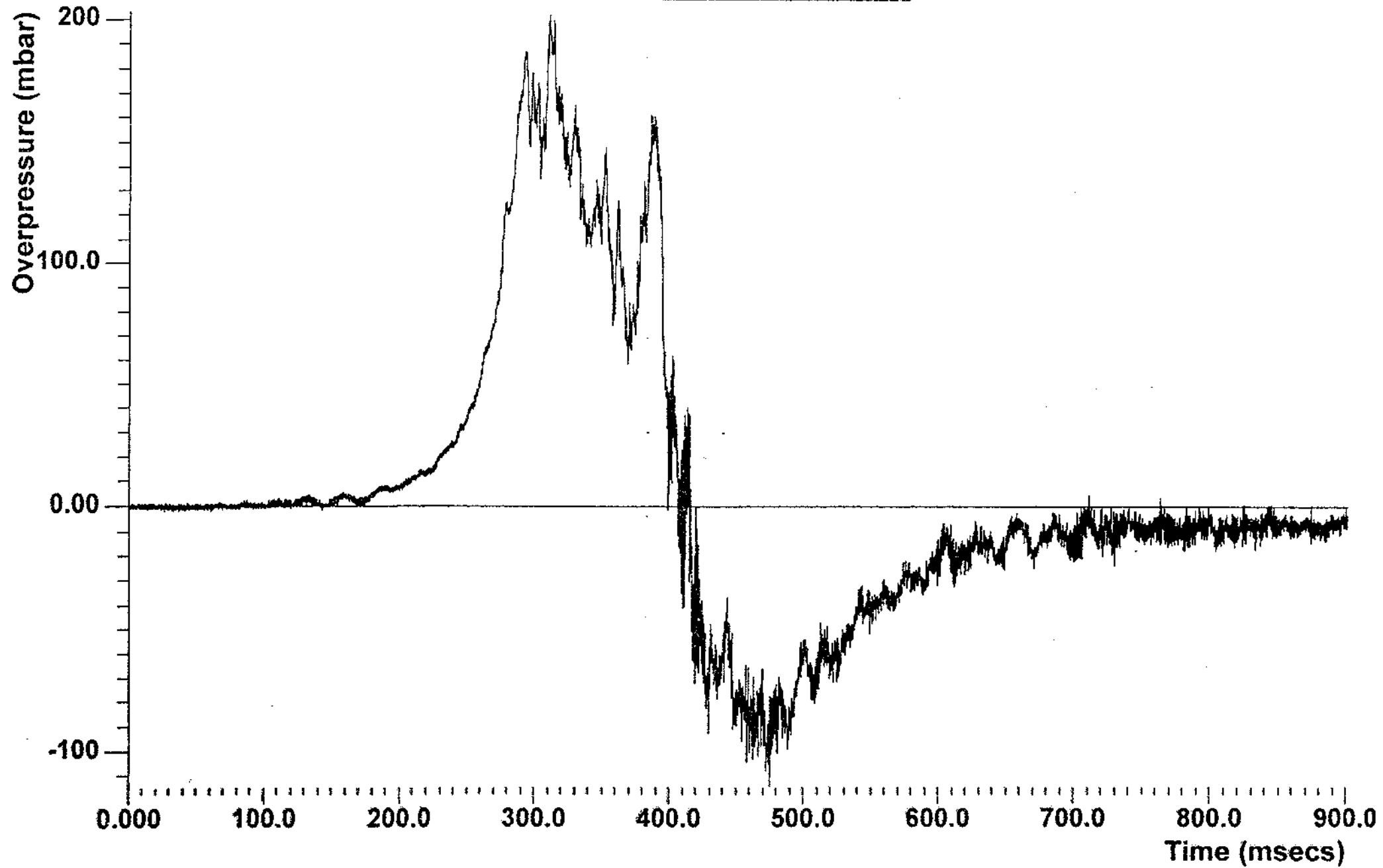
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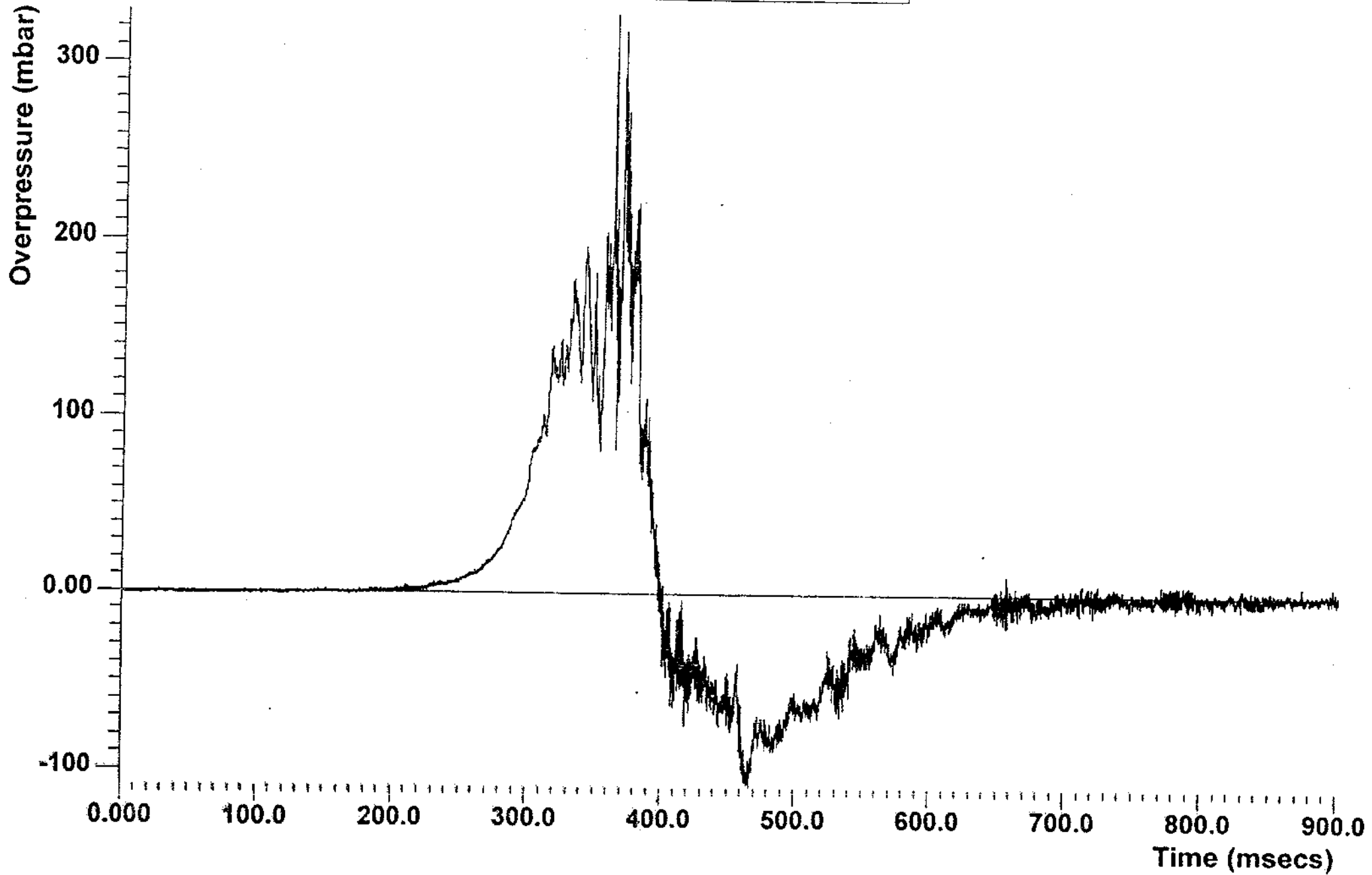
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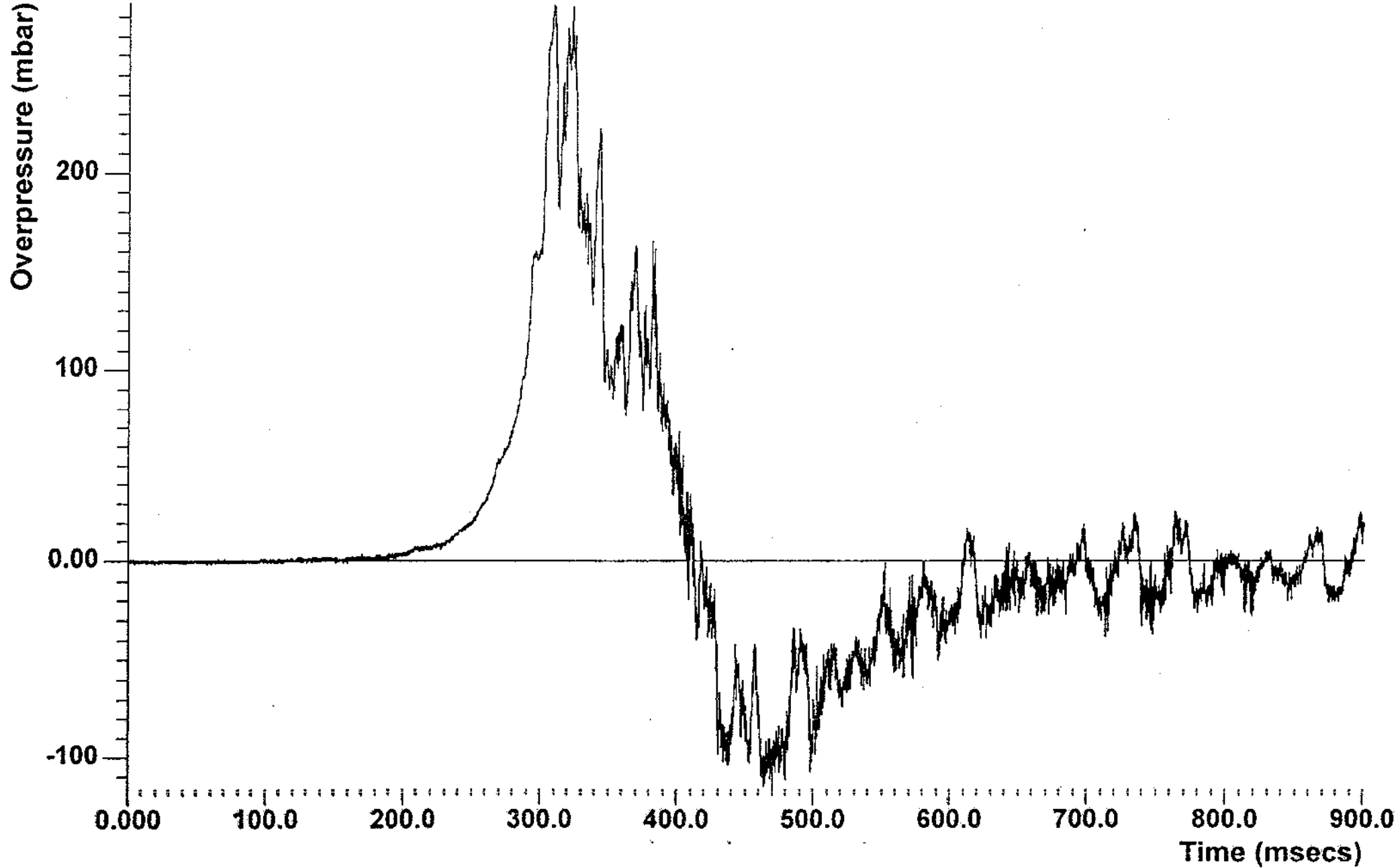
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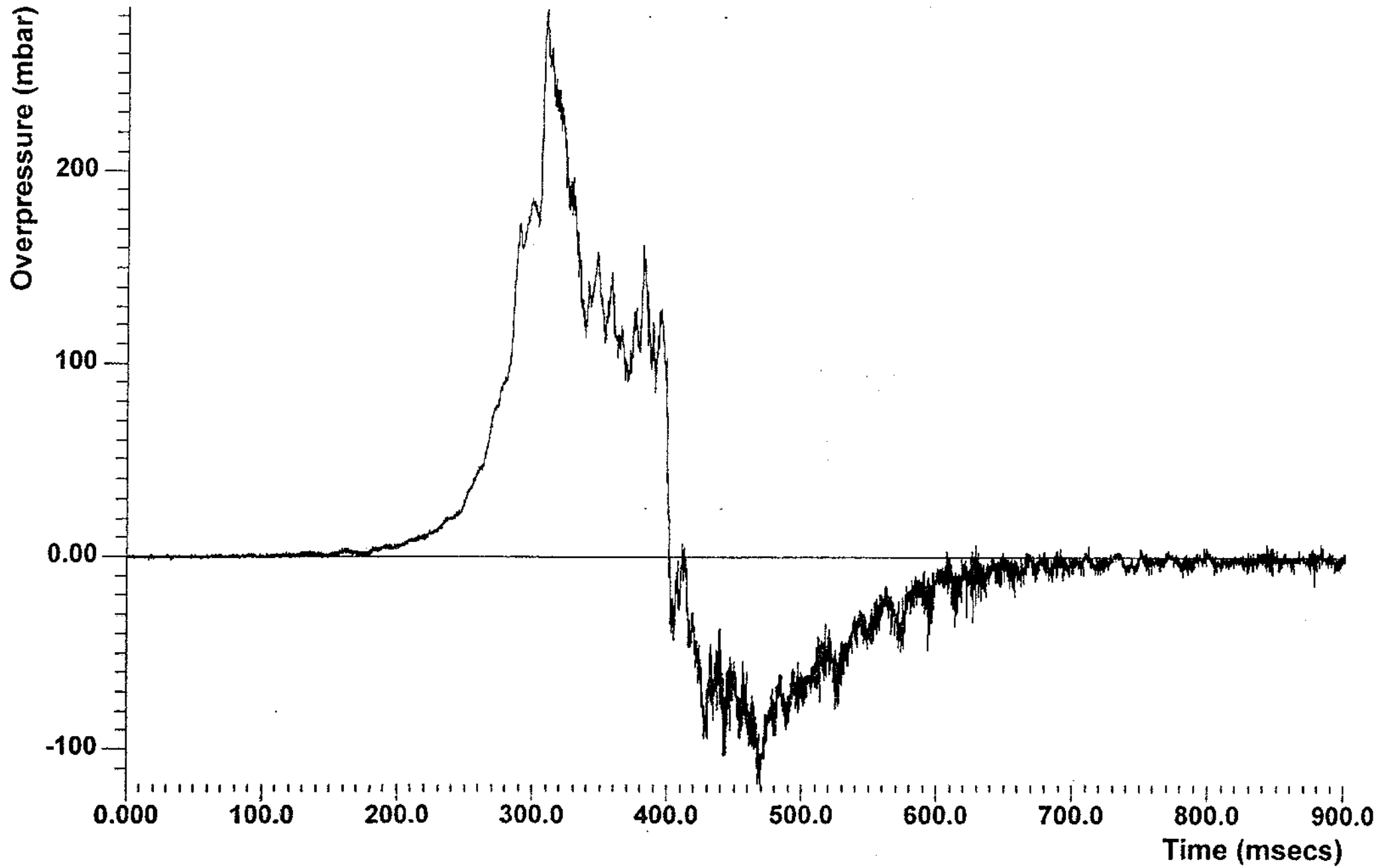
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-30



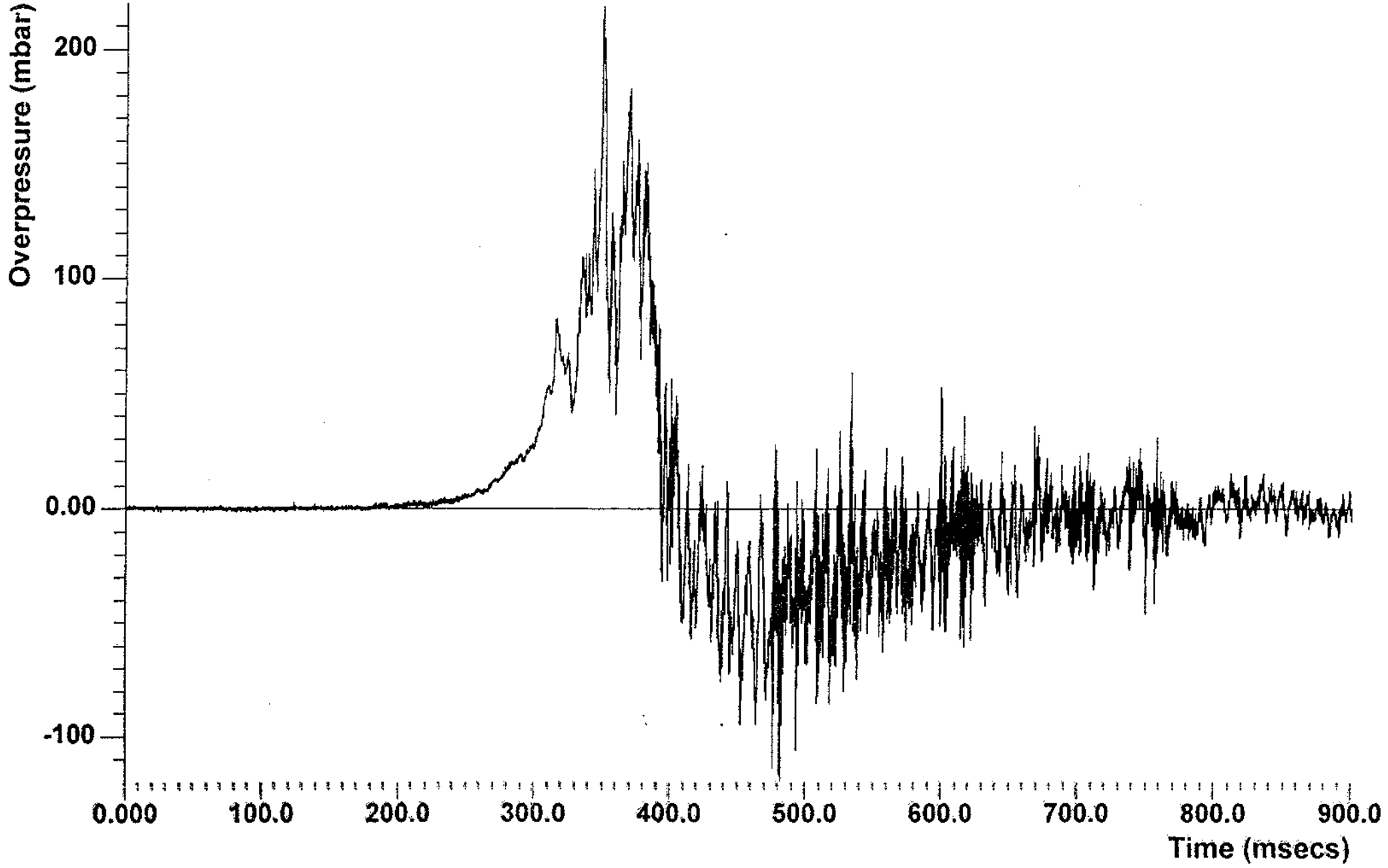
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-31



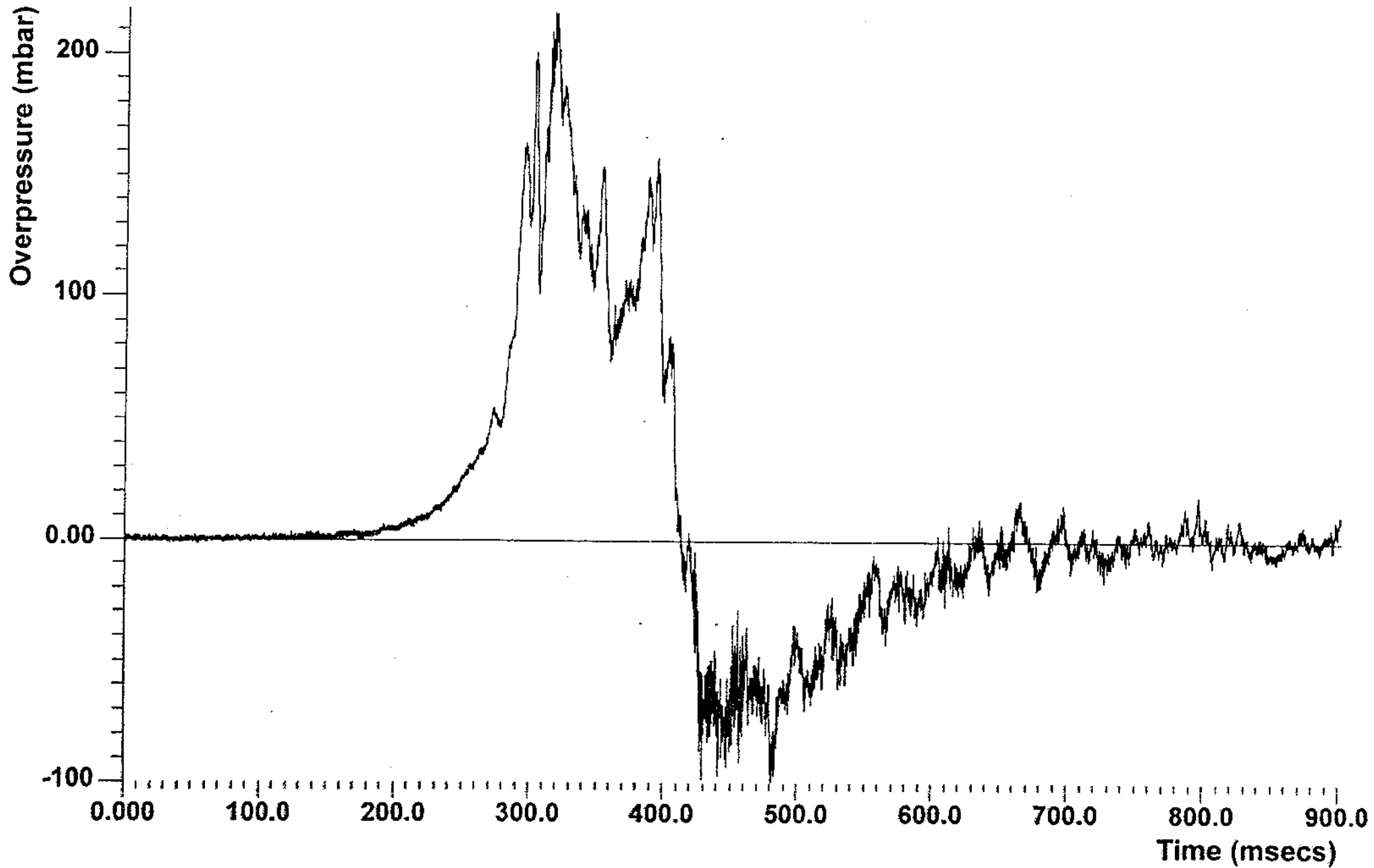
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-32



Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-33



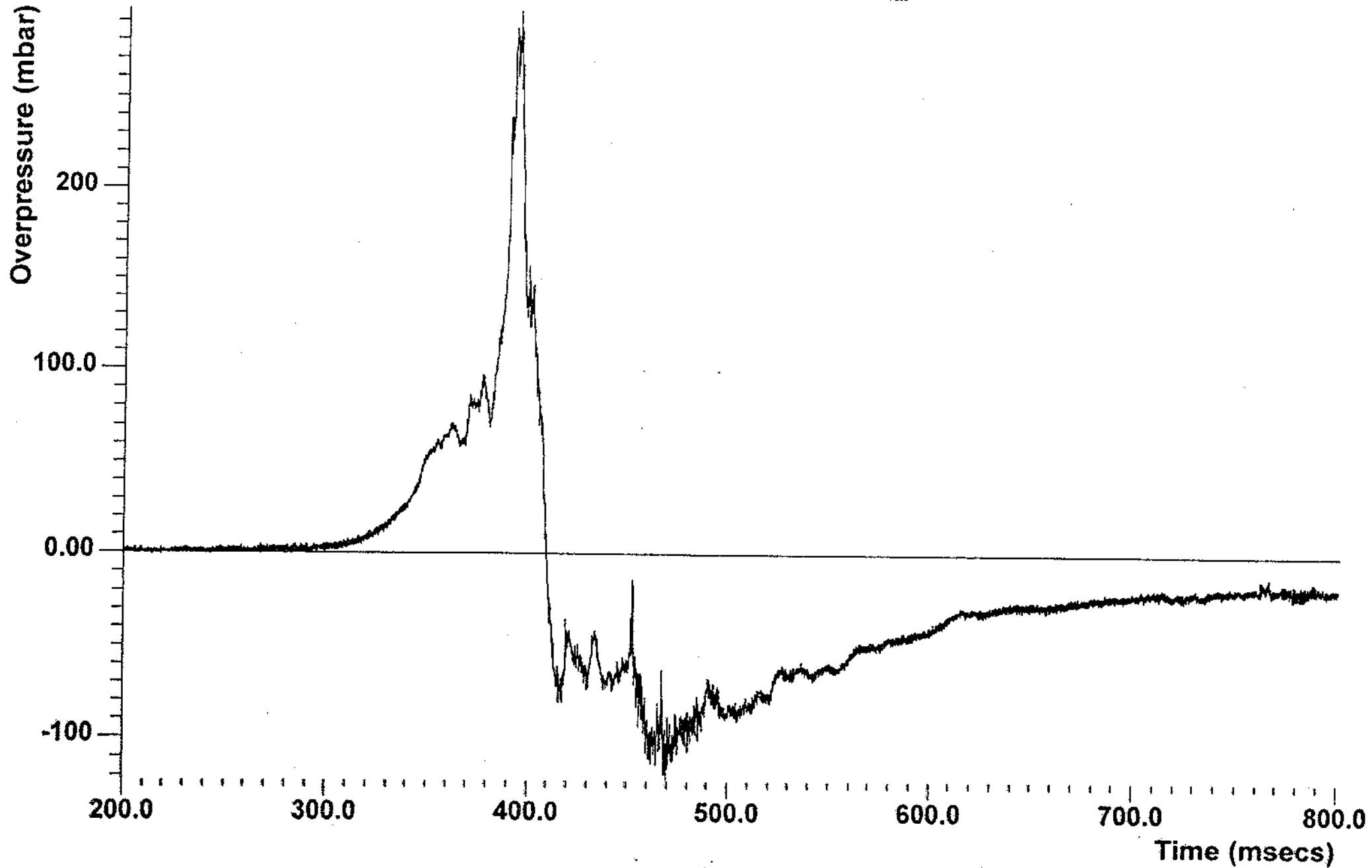
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PI-34



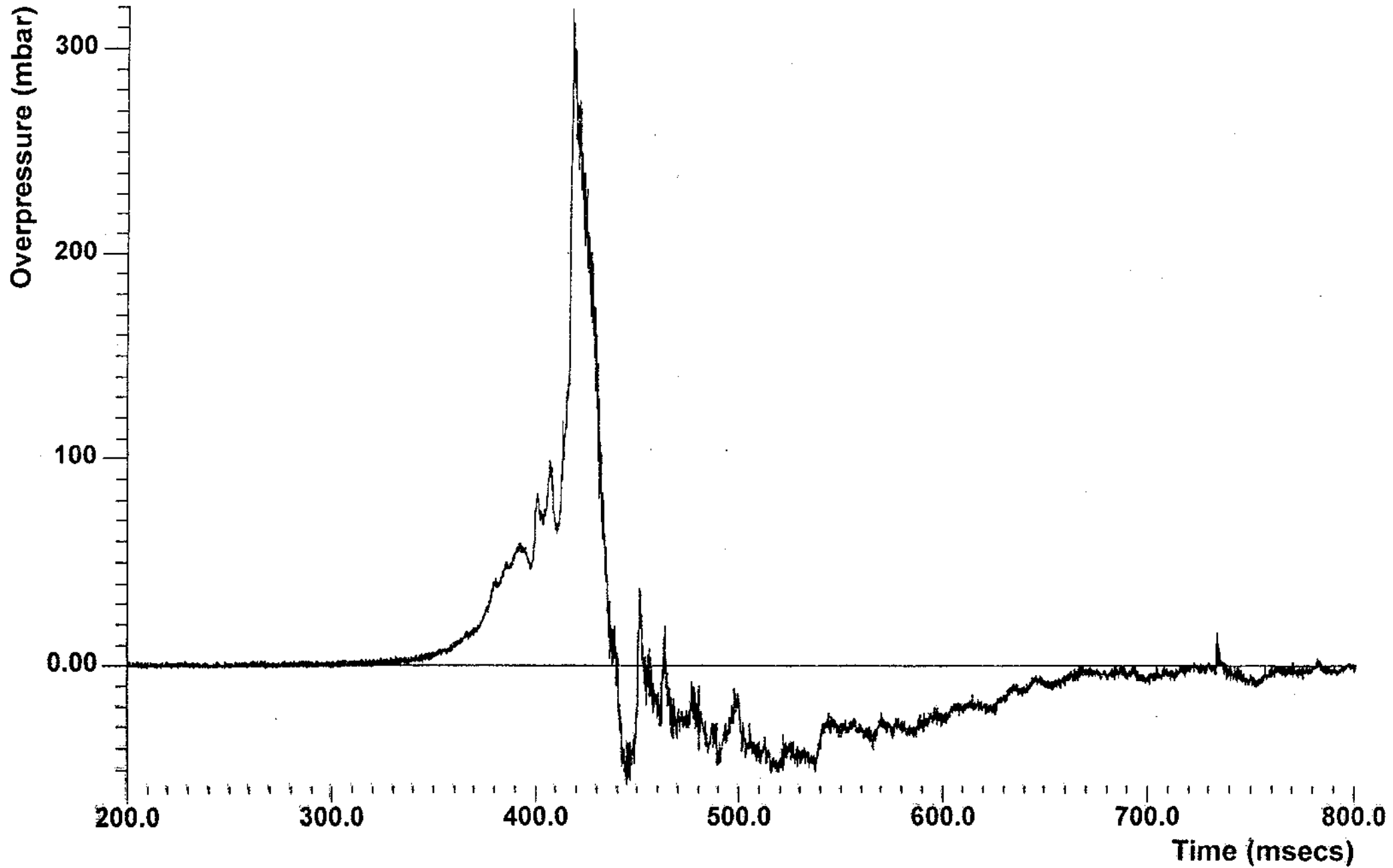
Appendix B: External Overpressure Profiles

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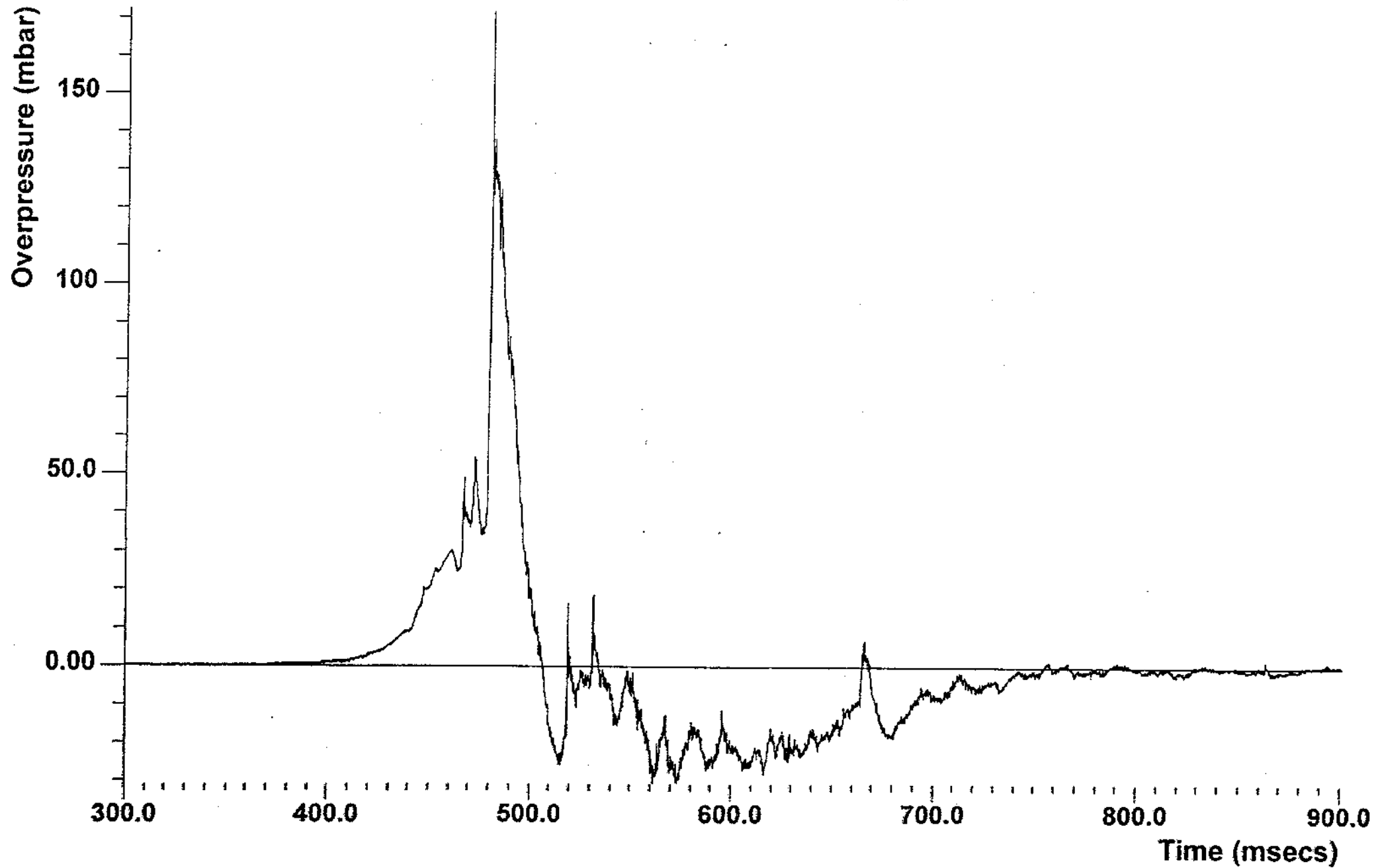
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-2



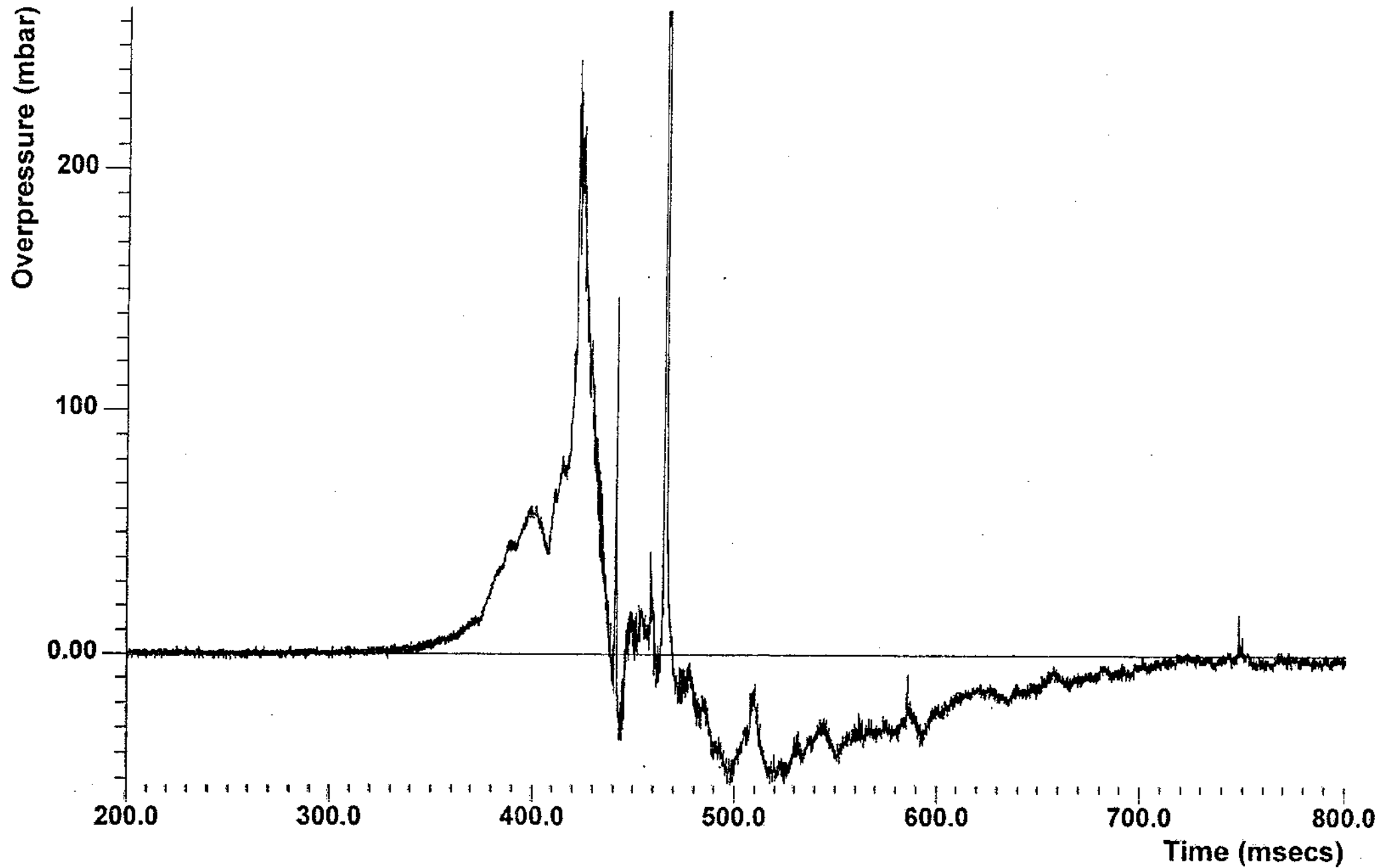
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-3



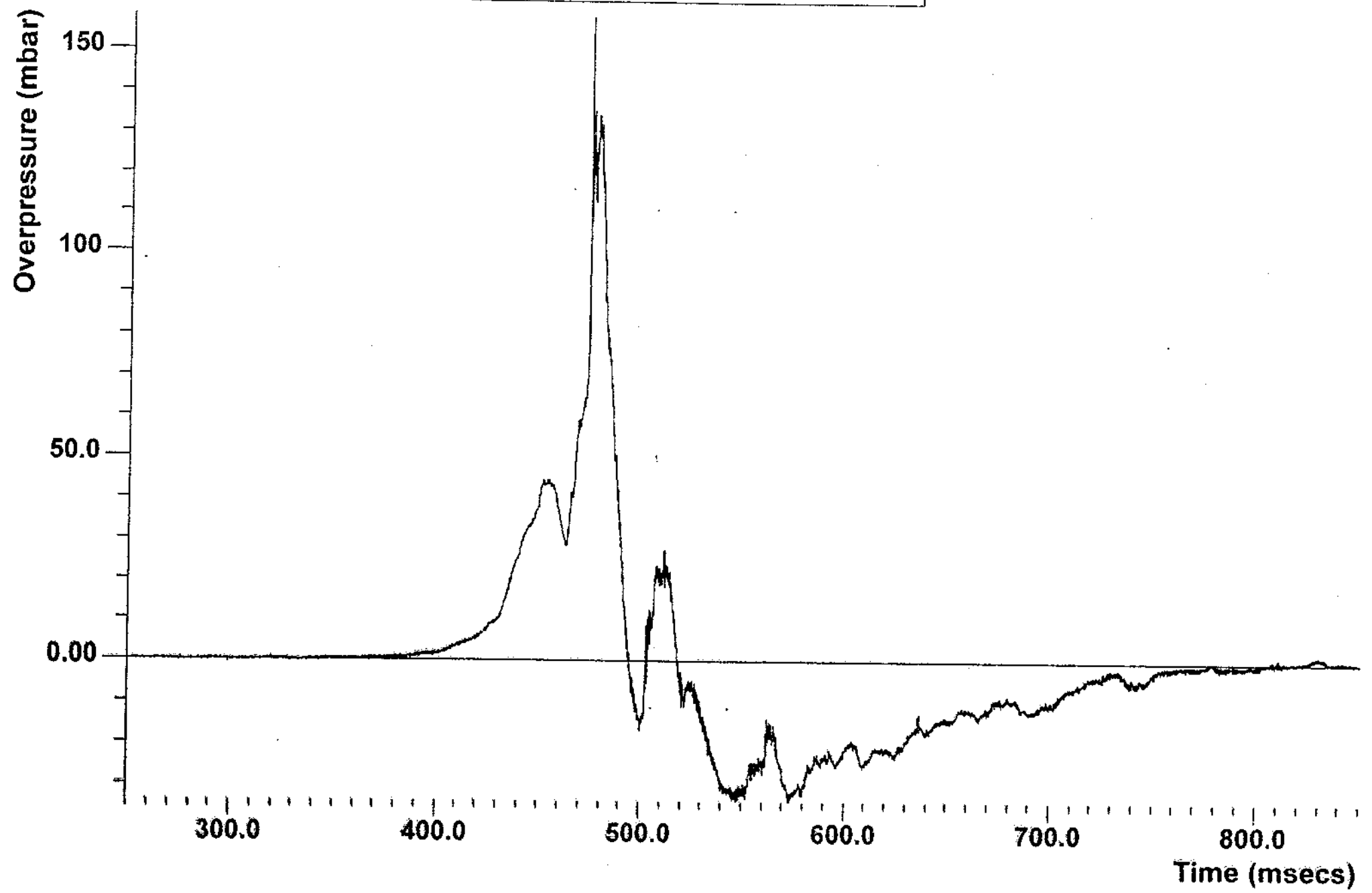
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-4



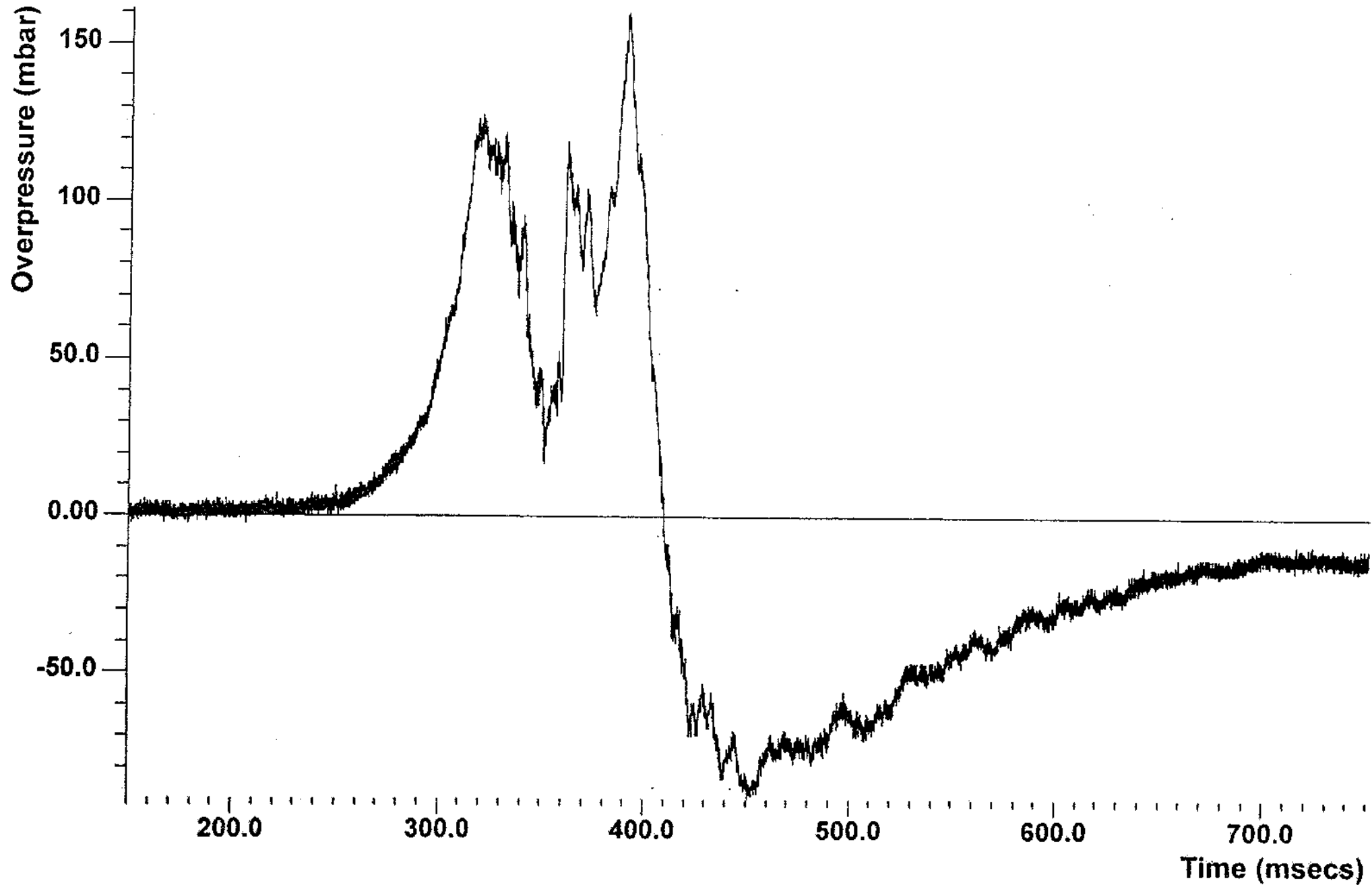
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-5



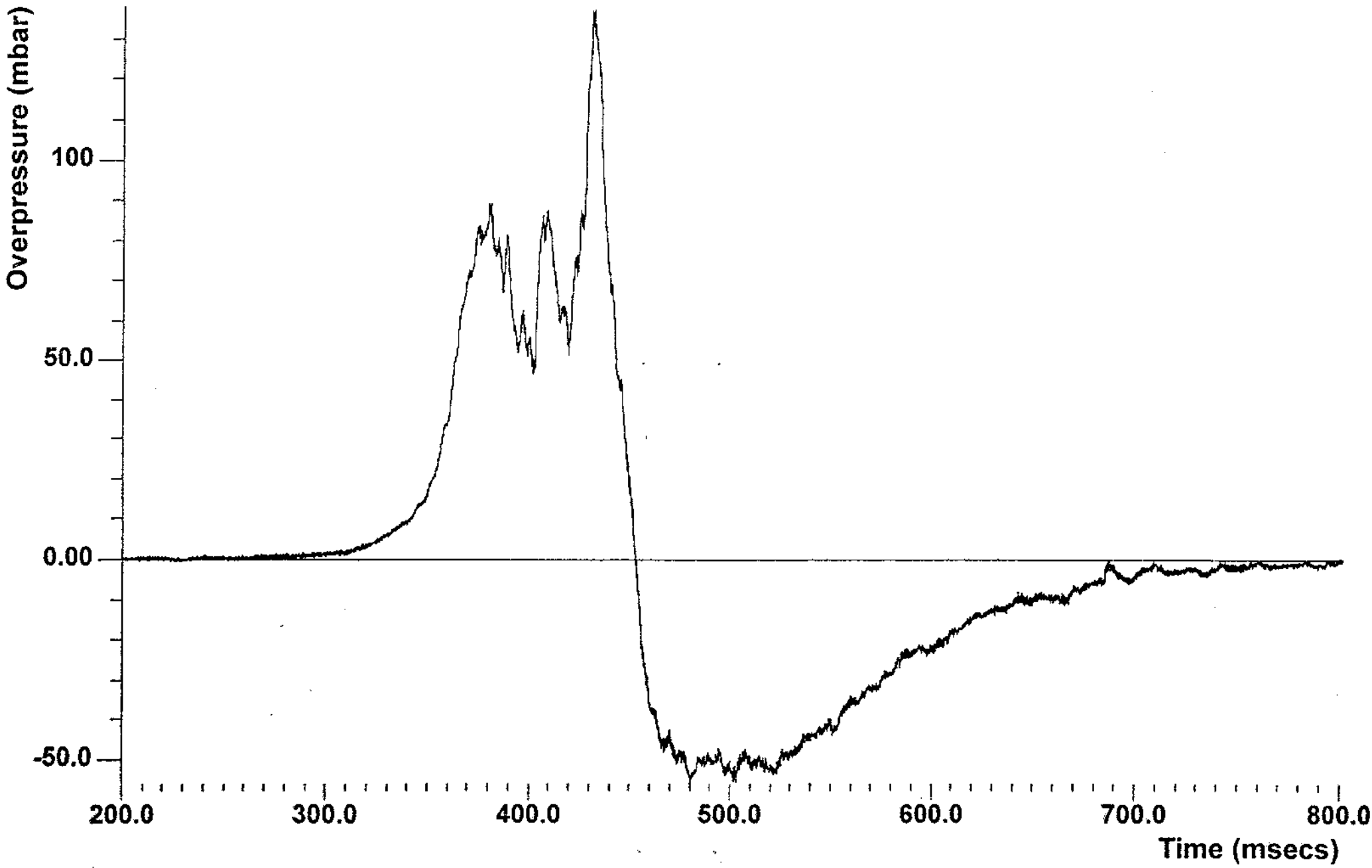
Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-6



Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-7



Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-9



Test: HSE5 (O1, C1, I2, DL)
Transducer no: PE-11

