



**OFFSHORE TECHNOLOGY
REPORT - OTO 98 106**

**A Study of the Repeatability of
Explosion Tests
Preliminary Data Report for Test 10**

Explosions in Full Scale Offshore Module Geometries

Health & Safety Executive Contract MaTSU 8847/3522

Preliminary Data Report for Test 10

Summary of Experimental Conditions	
Date	23rd July 1997
Time	13:46
Test Series	C
Confinement Configuration	C2
Obstacle Configuration	O1
Ignition Position	(X:13.5, Y:5.0, Z:4.25)
Mean Equivalence Ratio	1.06
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	399.5
IP-2	6.0	0.5	2.0	338.9
IP-3	10.0	0.5	2.0	335.5
IP-4	14.0	0.5	2.0	308.2
IP-5	18.0	0.5	2.0	339.7
IP-6	22.0	0.5	2.0	361.4
IP-7	27.5	0.5	2.0	410.5
IP-8	0.5	4.0	2.0	390.2
IP-9	6.0	4.0	2.0	357.2
IP-10	14.0	4.0	2.0	311.1
IP-11	22.0	4.0	2.0	359.1
IP-12	27.5	4.0	2.0	395.6
IP-13	0.5	8.0	2.0	398.9
IP-14	6.0	8.0	2.0	362.5
IP-15	10.0	8.0	2.0	338.3
IP-16	14.0	8.0	2.0	312.2
IP-17	18.0	8.0	2.0	340.0
IP-18	22.0	8.0	2.0	362.3
IP-19	27.5	8.0	2.0	396.5
IP-20	0.5	11.5	2.0	400.4
IP-21	2.0	11.5	2.0	423.8
IP-22	6.0	11.5	2.0	-
IP-23	10.0	11.5	2.0	345.5
IP-24	14.0	11.5	2.0	353.3
IP-25	18.0	11.5	2.0	364.2
IP-26	22.0	11.5	2.0	401.1
IP-27	26.0	11.5	2.0	399.5
IP-28	27.5	11.5	2.0	397.1
IP-29	0.5	0.5	4.0	409.0
IP-30	6.0	0.5	4.0	359.6
IP-31	10.0	0.5	4.0	-
IP-32	14.0	0.5	4.0	294.8
IP-33	18.0	0.5	4.0	337.2

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	361.3
IP-35	26.0	0.5	4.0	372.0
IP-36	27.5	0.5	4.0	395.3
IP-37	0.5	4.0	4.0	387.2
IP-38	6.0	4.0	4.0	354.5
IP-39	14.0	4.0	4.0	153.4
IP-40	22.0	4.0	4.0	-
IP-41	26.0	4.0	4.0	353.4
IP-42	27.5	4.0	4.0	394.4
IP-43	0.5	8.0	4.0	-
IP-44	2.0	8.0	4.0	-
IP-45	6.0	8.0	4.0	-
IP-46	10.0	8.0	4.0	321.5
IP-47	14.0	8.0	4.0	293.1
IP-48	18.0	8.0	4.0	327.7
IP-49	22.0	8.0	4.0	355.5
IP-50	26.0	8.0	4.0	-
IP-51	27.5	8.0	4.0	450.2
IP-52	26.0	10.0	4.0	420.1
IP-53	27.5	10.0	4.0	425.0
IP-54	0.5	11.5	4.0	394.0
IP-55	2.0	11.5	4.0	435.5
IP-56	6.0	11.5	4.0	354.1
IP-57	10.0	11.5	4.0	349.8
IP-58	14.0	11.5	4.0	357.2
IP-59	18.0	11.5	4.0	381.3
IP-60	22.0	11.5	4.0	399.3
IP-61	26.0	11.5	4.0	404.9
IP-62	27.5	11.5	4.0	426.5
IP-63	0.5	0.5	6.0	394.8
IP-64	6.0	0.5	6.0	366.4
IP-65	10.0	0.5	6.0	368.6
IP-66	14.0	0.5	6.0	322.0
IP-67	18.0	0.5	6.0	361.1

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	365.8
IP-69	27.5	0.5	6.0	368.4
IP-70	0.5	4.0	6.0	388.4
IP-71	6.0	4.0	6.0	364.2
IP-72	14.0	4.0	6.3	277.2
IP-73	22.0	4.0	6.0	366.4
IP-74	27.5	4.0	6.0	393.6
IP-75	0.5	8.0	6.0	403.7
IP-76	6.0	8.0	6.0	405.5
IP-77	10.0	8.0	6.0	319.9
IP-78	14.0	8.0	6.0	296.2
IP-79	18.0	8.0	6.0	349.4
IP-80	22.0	8.0	6.0	362.9
IP-81	27.5	8.0	6.0	392.8
IP-82	0.5	11.5	6.0	406.2
IP-83	2.0	11.5	6.0	407.6
IP-84	6.0	11.5	6.0	360.6
IP-85	10.0	11.5	6.0	349.8
IP-86	14.0	11.5	6.0	341.0
IP-87	18.0	11.5	6.0	350.8
IP-88	22.0	11.5	6.0	386.3
IP-89	26.0	11.5	6.0	425.9
IP-90	27.5	11.5	6.0	405.1

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	0.0	1.5	578.9	554.1	399.1	60.8	71.0
PI-2	5.8	0.0	1.5	440.5	433.9	375.7	75.4	111.6
PI-3	13.9	0.0	1.5	393.5	386.4	367.9	84.8	156.7
PI-4	21.9	0.0	1.5	599.0	535.5	380.7	68.6	133.2
PI-5	26.9	0.0	1.5	376.4	361.9	412.6	94.2	126.5
PI-6	0.5	6.0	0.0	412.8	397.6	400.8	81.2	129.9
PI-7	9.0	6.0	0.0	347.4	342.4	369.1	85.1	173.5
PI-8	14.0	6.0	0.0	419.1	413.1	363.6	83.2	179.3
PI-9	21.0	6.0	0.0	393.3	387.0	372.1	70.7	144.5
PI-10	27.5	6.0	0.0	376.1	367.3	390.4	65.9	109.4
PI-11	0.5	11.5	0.0	326.1	317.3	392.9	70.4	122.9
PI-12	12.3	11.5	0.0	321.5	313.1	359.2	70.6	171.8
PI-13	27.5	11.5	0.0	381.4	365.4	390.6	60.0	102.2
PI-14	0.8	0.5	4.0	407.6	382.2	387.5	67.4	130.0
PI-15	4.5	0.6	4.0	387.1	375.9	375.6	73.0	152.5
PI-16	11.2	0.0	5.5	417.3	411.4	368.3	85.6	179.3
PI-17	12.0	0.5	4.0	384.9	381.3	370.8	92.0	182.9
PI-18	22.0	0.5	4.0	467.2	452.0	373.2	65.1	140.5
PI-19	27.5	0.5	4.0	443.7	403.4	411.6	15.7	42.8
PI-20	10.2	4.0	4.0	348.1	345.2	366.8	91.8	186.8
PI-21	0.5	7.0	4.0	348.0	336.2	383.0	64.9	134.8
PI-22	18.0	8.0	4.0	344.8	338.5	360.1	72.9	161.8
PI-23	27.5	6.0	4.0	362.2	318.3	385.3	64.1	120.4
PI-24	0.5	11.5	4.0	289.0	282.7	385.3	62.7	121.0
PI-25	10.0	11.5	4.0	260.3	251.2	369.3	81.8	168.7
PI-26	18.0	11.5	4.0	307.8	271.2	358.9	62.7	147.9
PI-27	27.5	11.5	4.0	383.2	320.1	412.7	87.6	102.2
PI-28	0.8	0.8	8.0	519.9	480.7	409.0	79.5	86.9
PI-29	13.9	1.7	8.0	383.1	377.0	363.1	80.0	171.8
PI-30	26.1	1.7	8.0	505.8	360.4	410.9	95.4	128.5
PI-31	5.9	5.0	8.0	405.7	387.1	369.1	67.6	156.9
PI-32	18.9	5.0	8.0	402.0	394.2	360.6	64.8	152.6
PI-33	1.1	11.1	8.0	308.1	285.5	390.4	67.4	120.3
PI-34	12.8	11.2	8.0	320.8	308.3	354.1	60.6	163.3
PI-35	26.1	11.3	8.0	312.7	286.0	395.7	75.0	113.0

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	346.7	323.8
PE-2	40.0	6.0	1.0	-	-
PE-3	52.0	6.0	1.0	407.5	272.9
PE-4	76.0	6.0	1.0	199.1	107.7
PE-5	47.2	25.2	1.0	218.3	191.0
PE-6	61.3	39.3	1.0	128.2	119.9
PE-7	14.0	18.0	1.0	185.4	166.1
PE-8	14.0	24.0	1.0	384.9	369.2
PE-9	14.0	36.0	1.0	146.6	141.1
PE-10	14.0	60.0	1.0	116.8	100.8
PE-11	-21.2	25.2	1.0	185.7	139.8

Table 4: Gas Concentrations

Measuring Position	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Natural Gas Concentration (%)
1	25.7	4.0	0.7	9.4
2	12.0	8.0	0.8	9.4
3	1.2	3.1	1.5	9.4
4	7.7	10.9	3.8	9.4
5	13.5	5.5	4.5	9.4
6	25.9	6.0	5.2	9.4
7	4.0	8.5	4.9	9.4
8	19.8	8.0	7.6	-

Table 5: Weather Conditions

Air Temperature (°C)	Atmospheric Pressure (mbar)	Wind Speed (ms ⁻¹)	Wind Direction (° from Magnetic North)
20.1	981	3.8	66

Table 6: Confinement Configuration

Confinement Configuration	Rig Face*	Confinement
C2	North	Open
	East	Open
	South	Confined
	West	Open

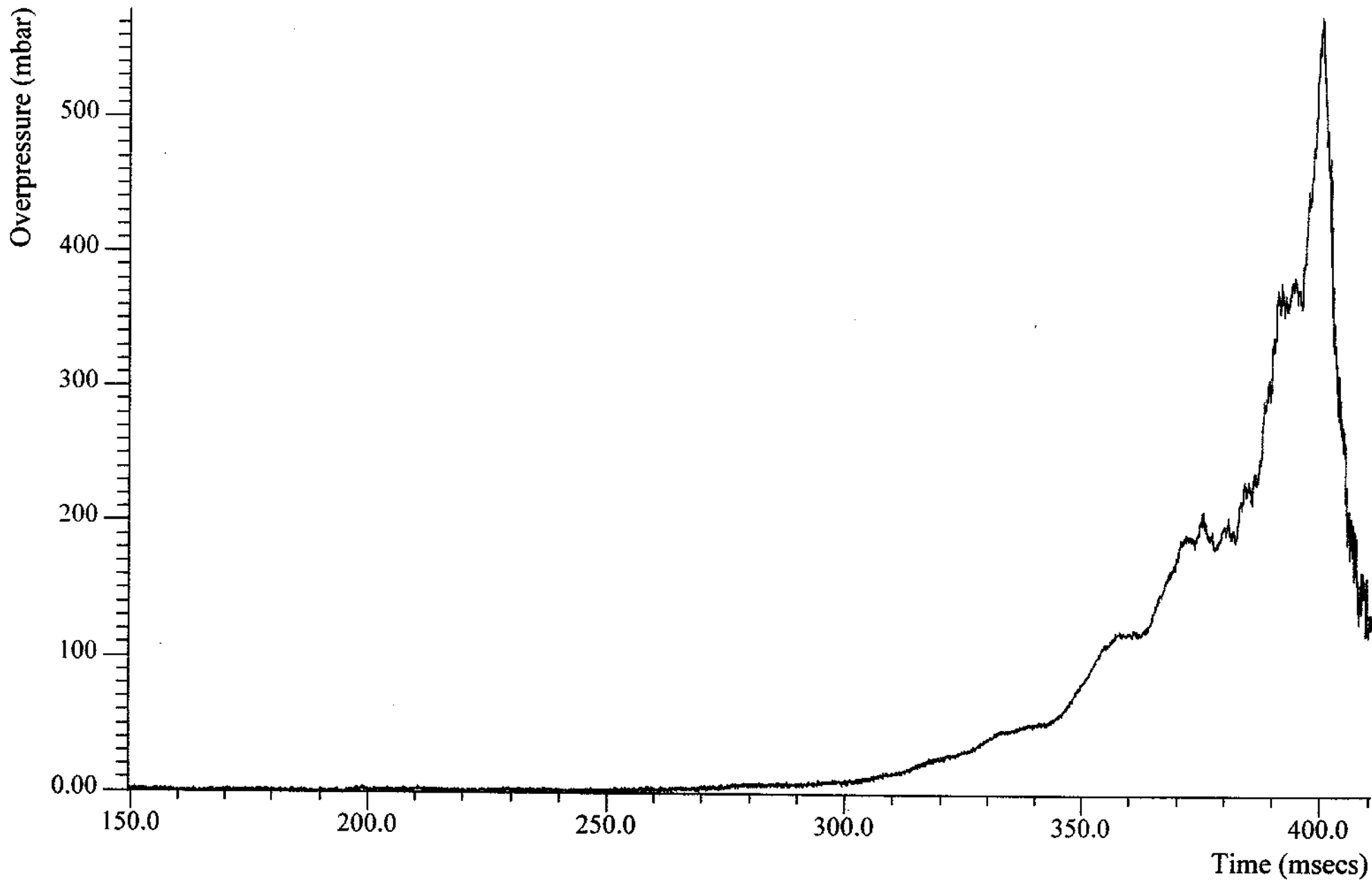
* - Origin is at the junction of the West and South faces at ground level. Roof and floor also confined.

Table 7: Water Deluge Configuration

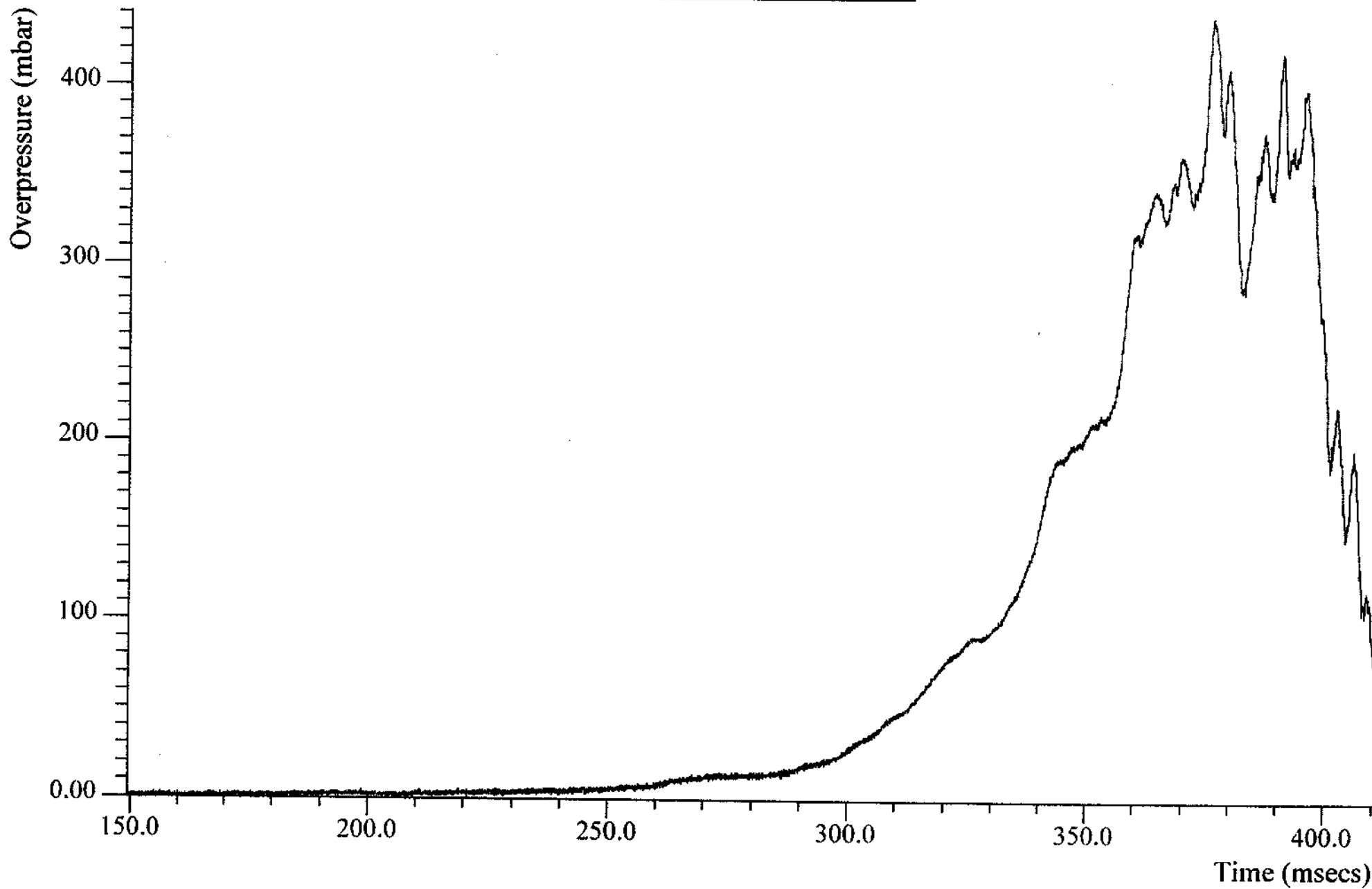
Nozzle Type	MV25
Number of Nozzles in Mezzanine Deck	75
Number of Nozzles in Cellar Deck	17
Water Inlet Pressure (barg)	-
Water Pressure at Nozzle (barg)	4.1
Total Water Flowrate (l min ⁻¹)	5550
Area Coverage - Cellar Deck (l min ⁻¹ m ⁻²)	16.5

Appendix A: Internal Overpressure Profiles

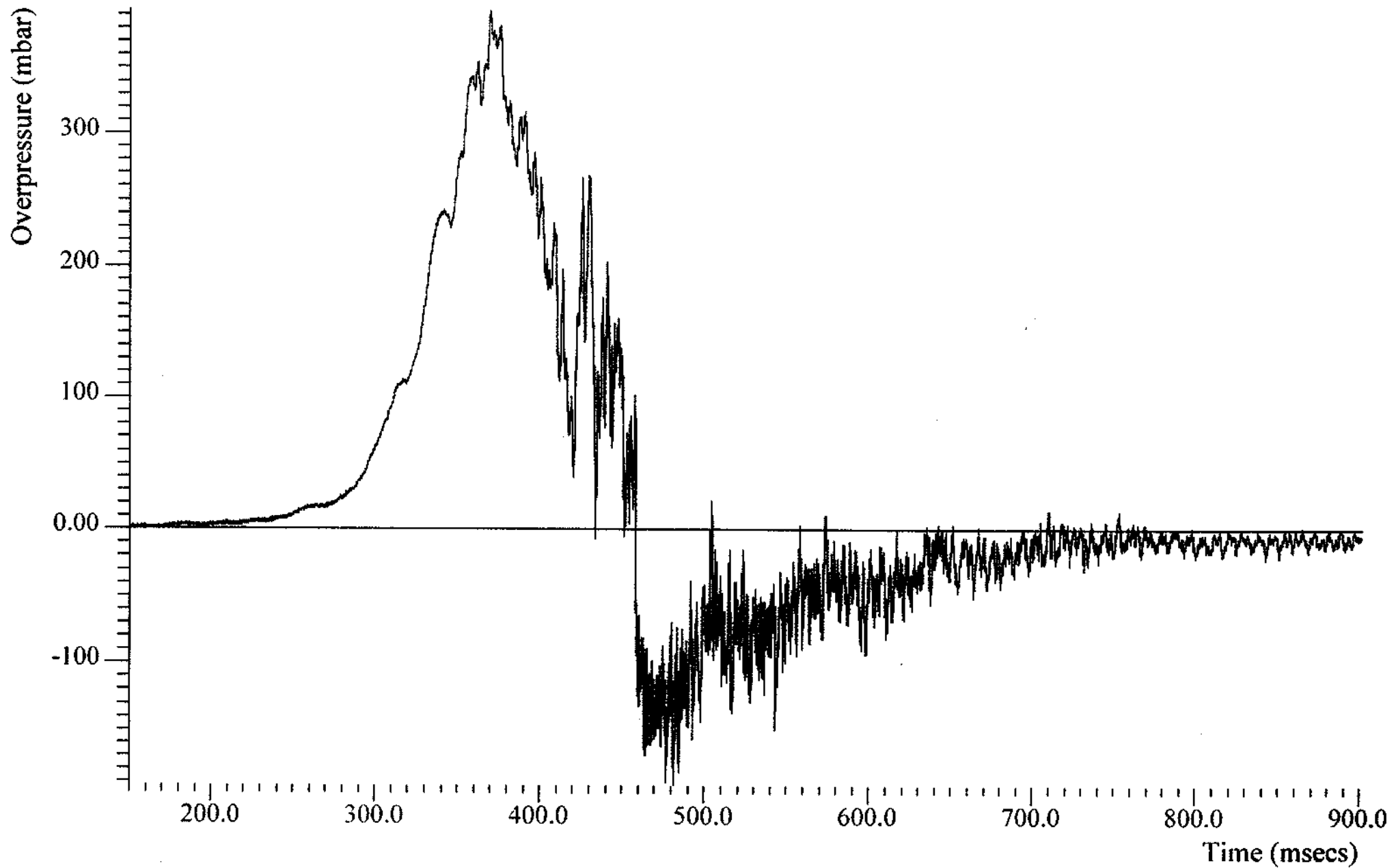
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PI-1



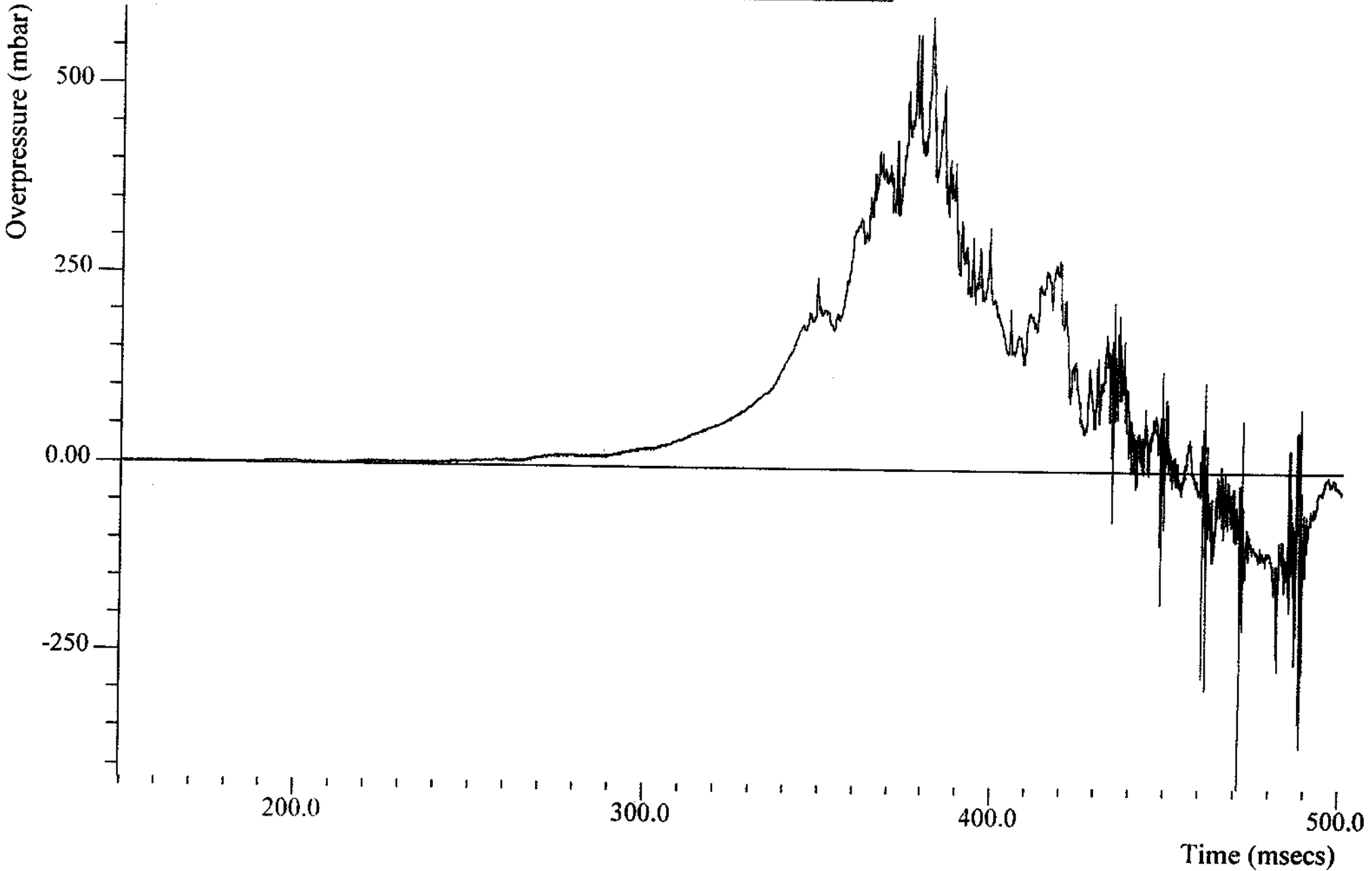
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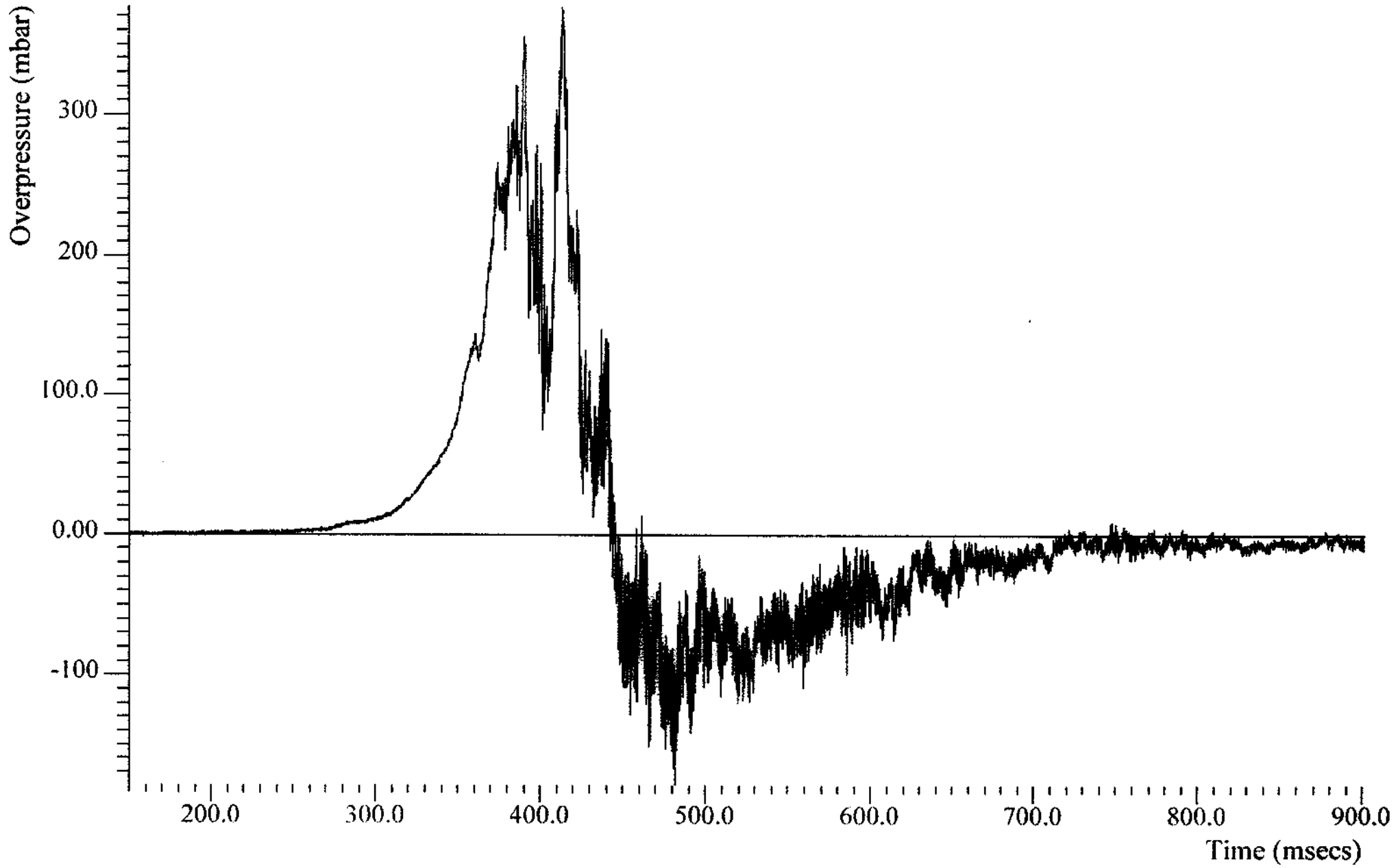
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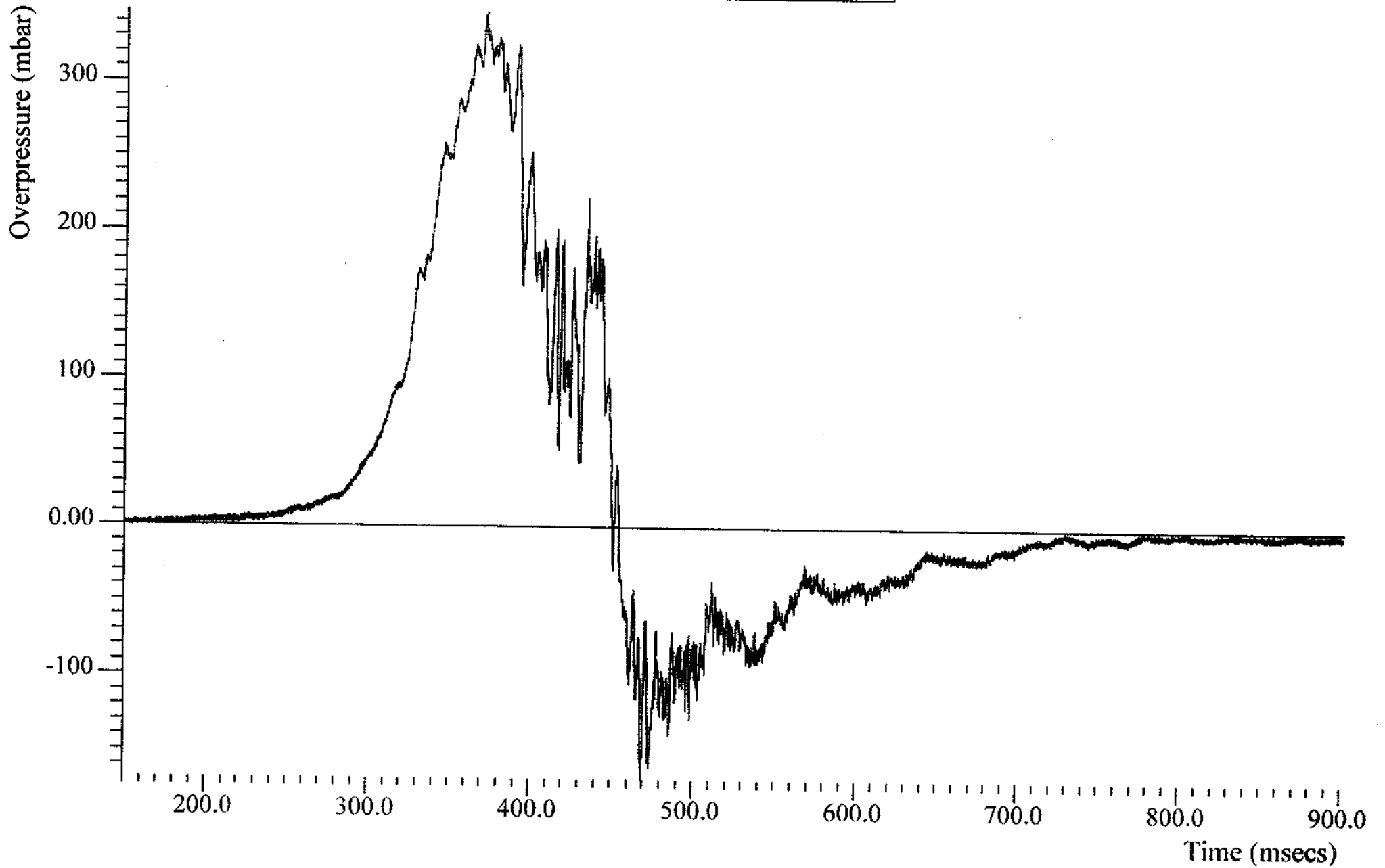
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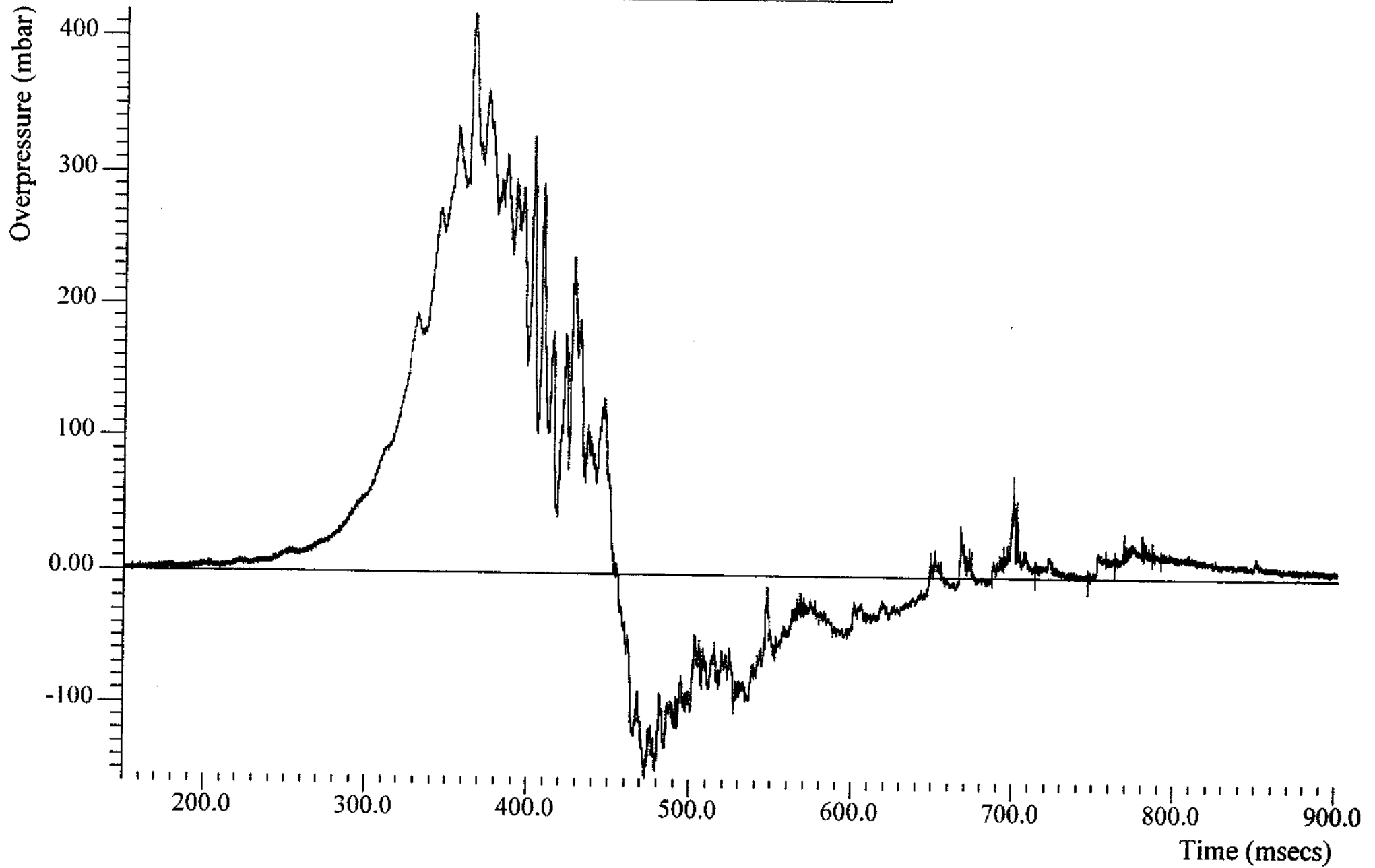
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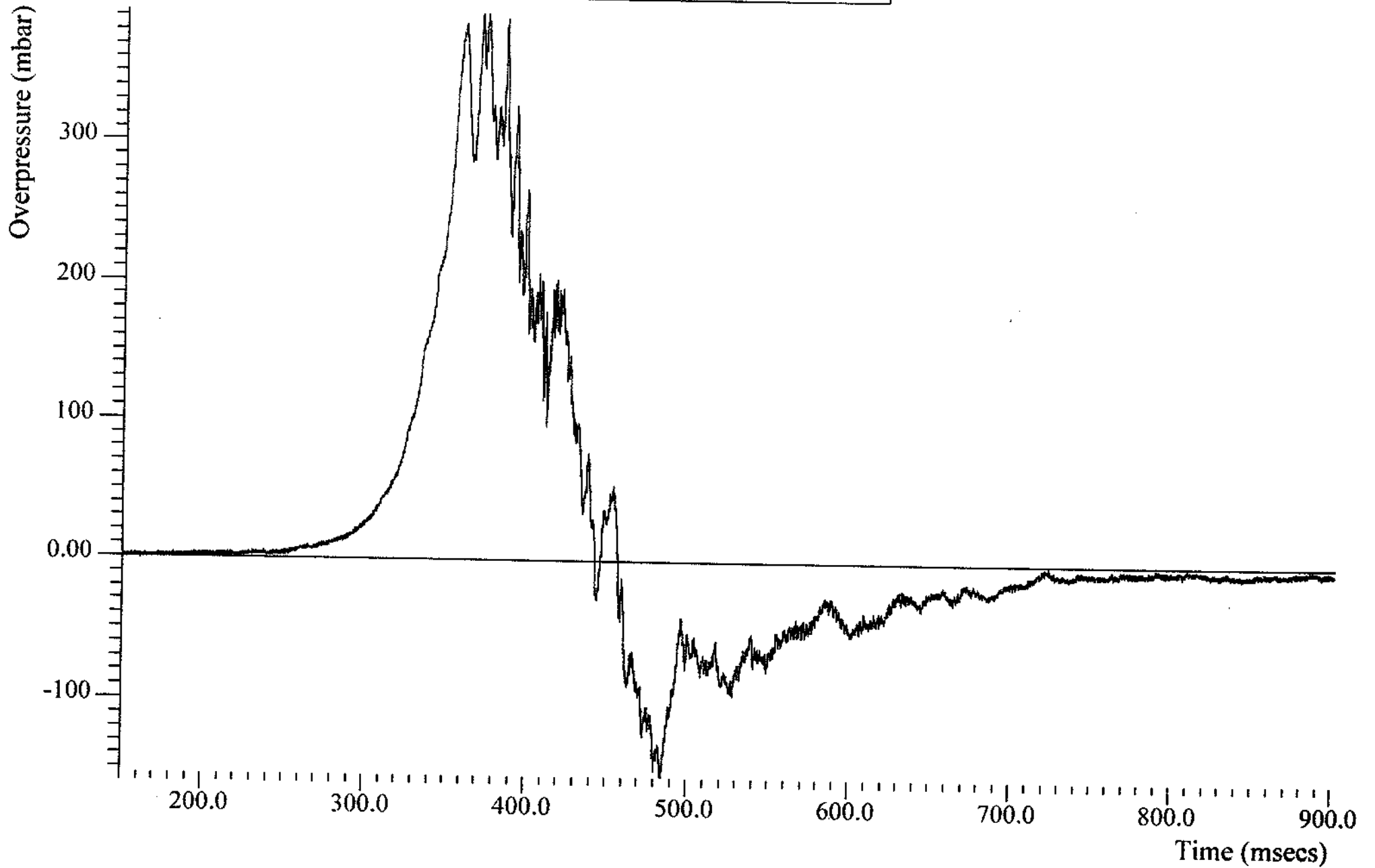
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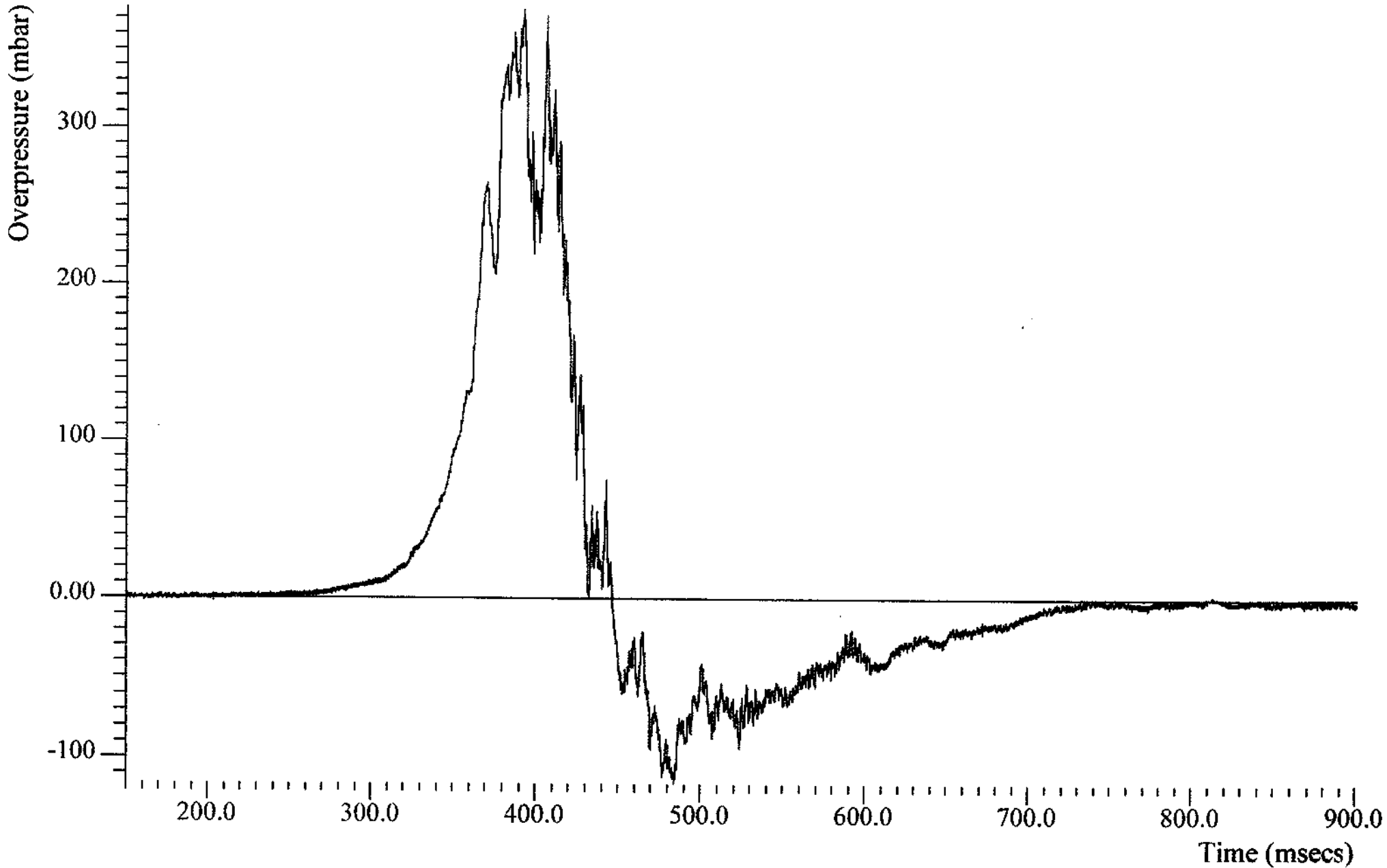
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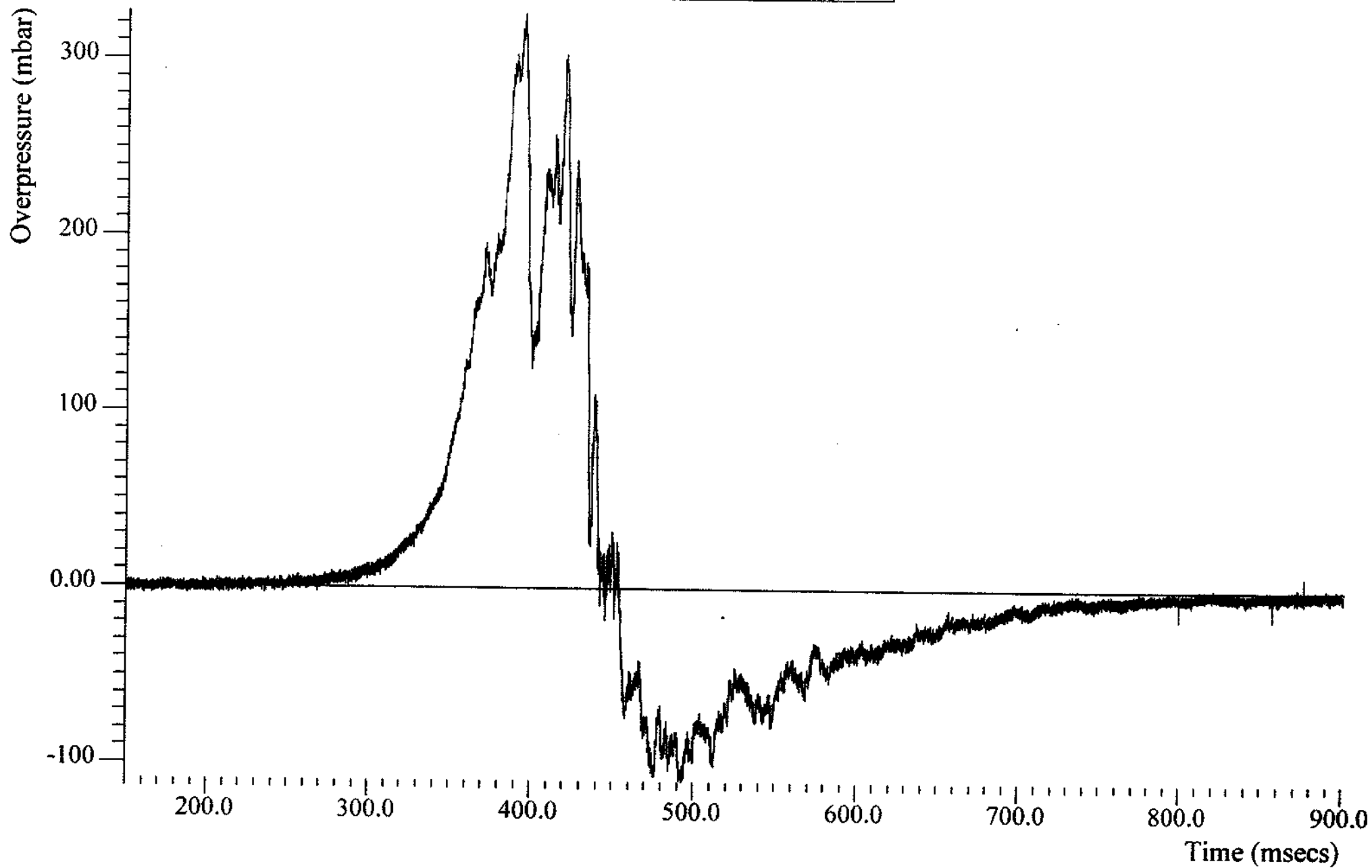
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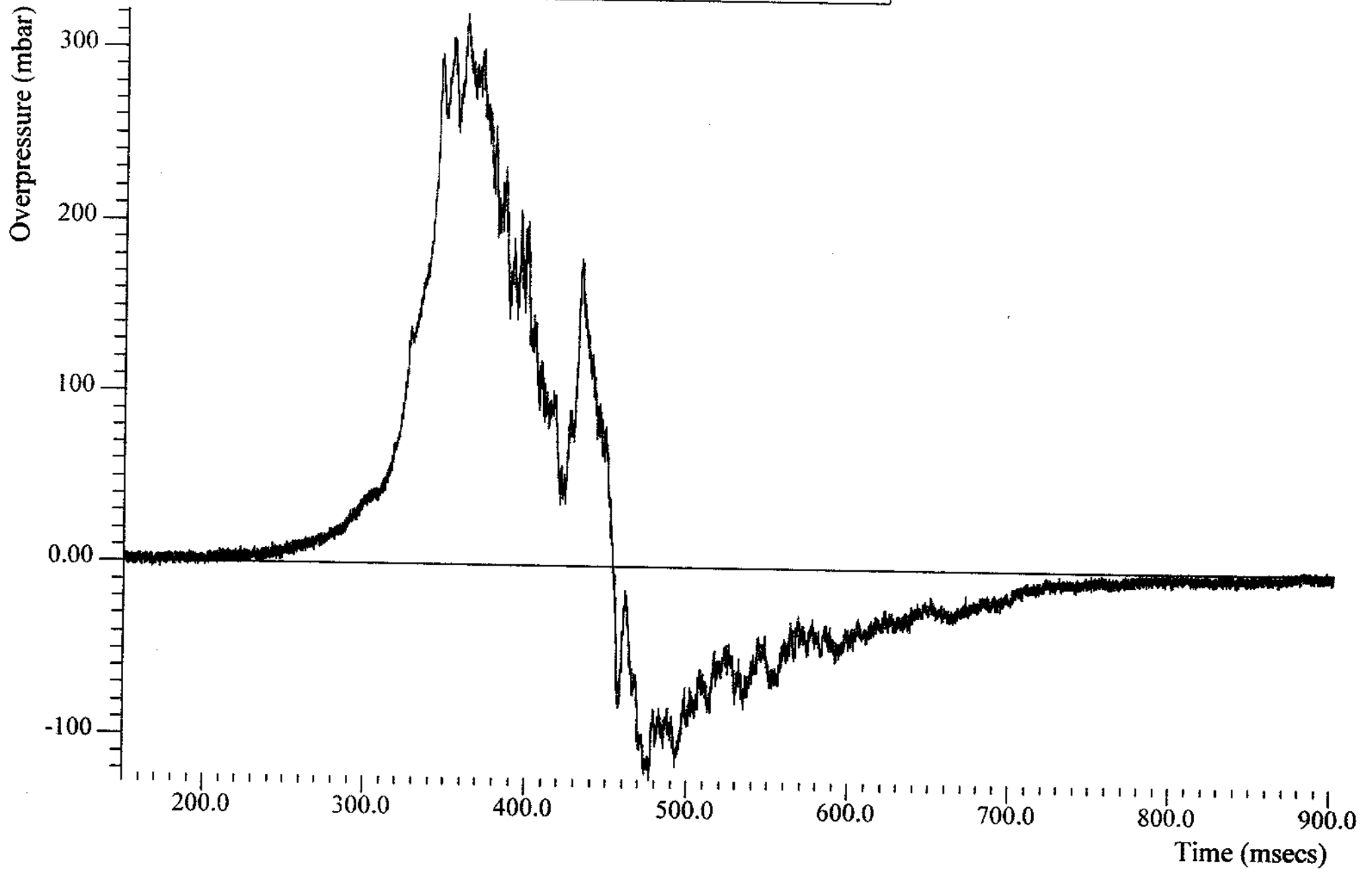
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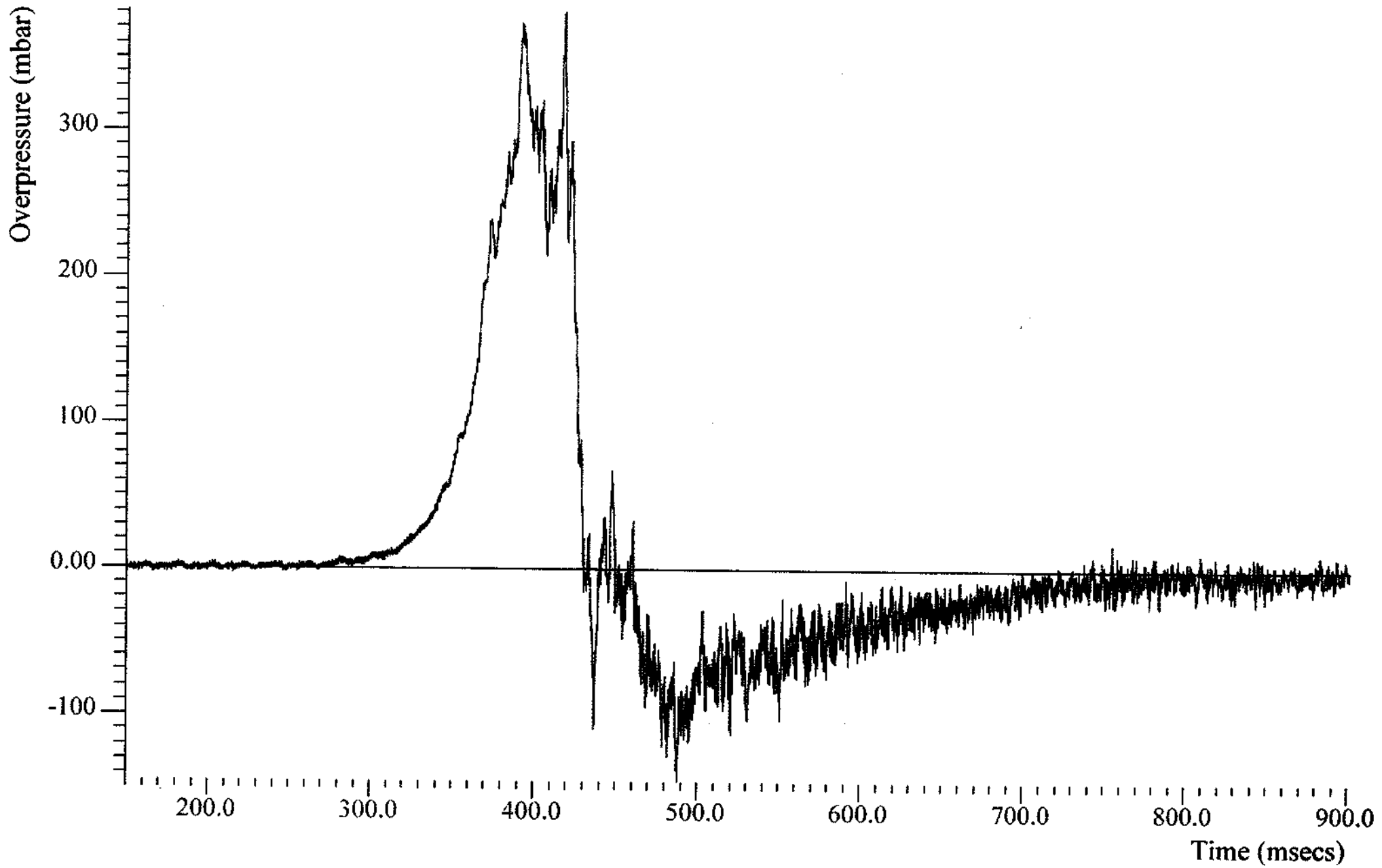
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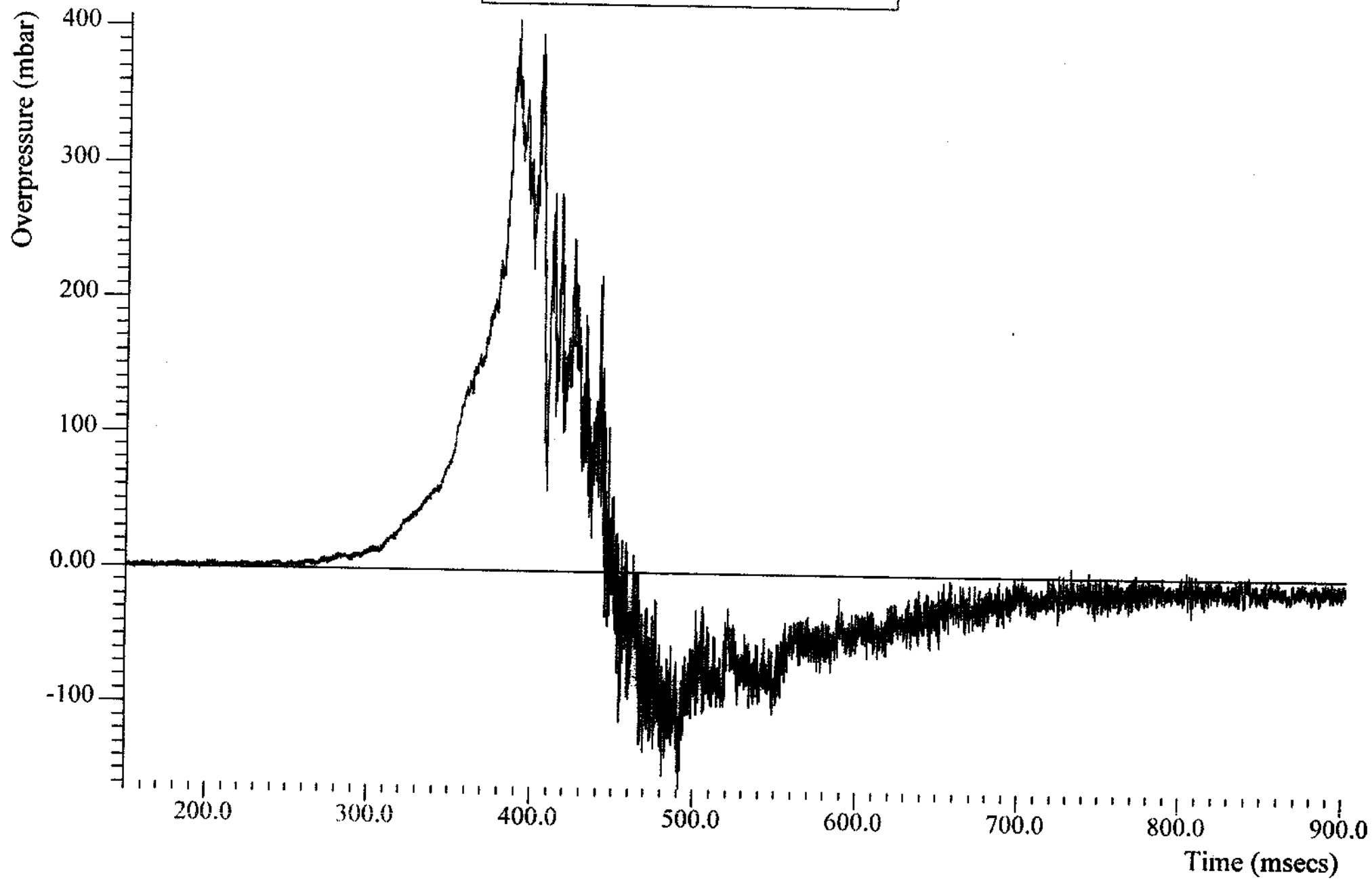
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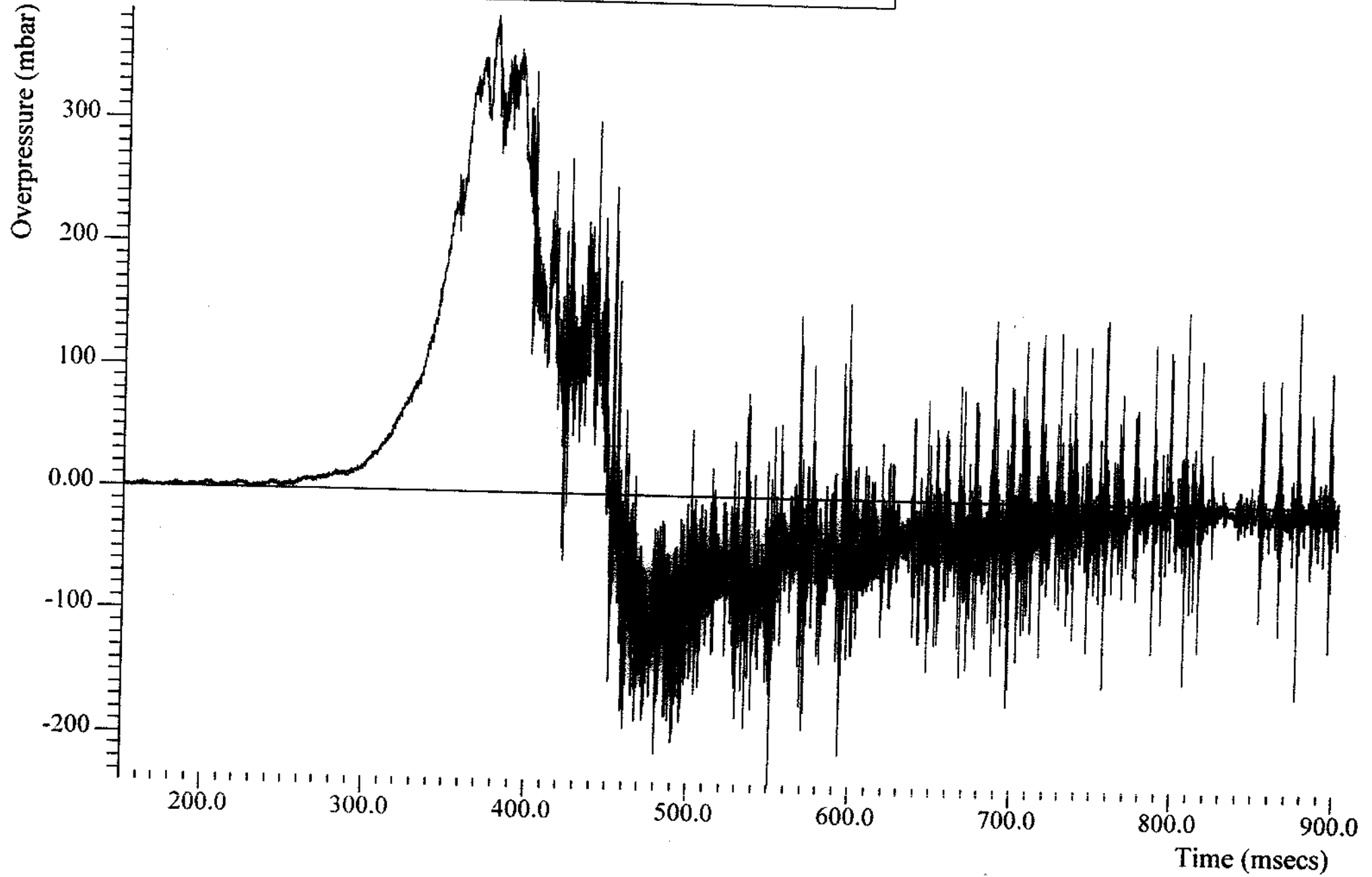
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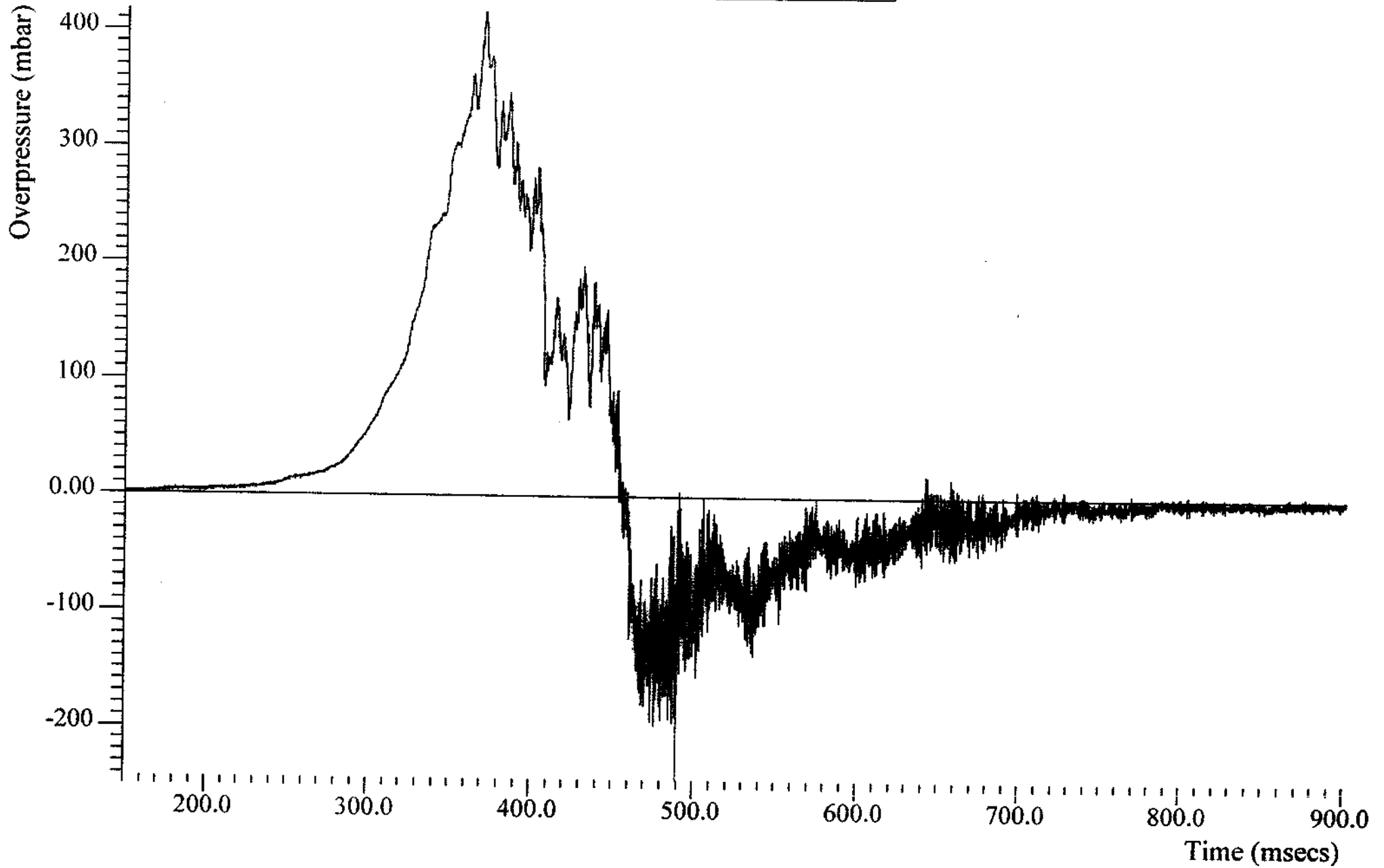
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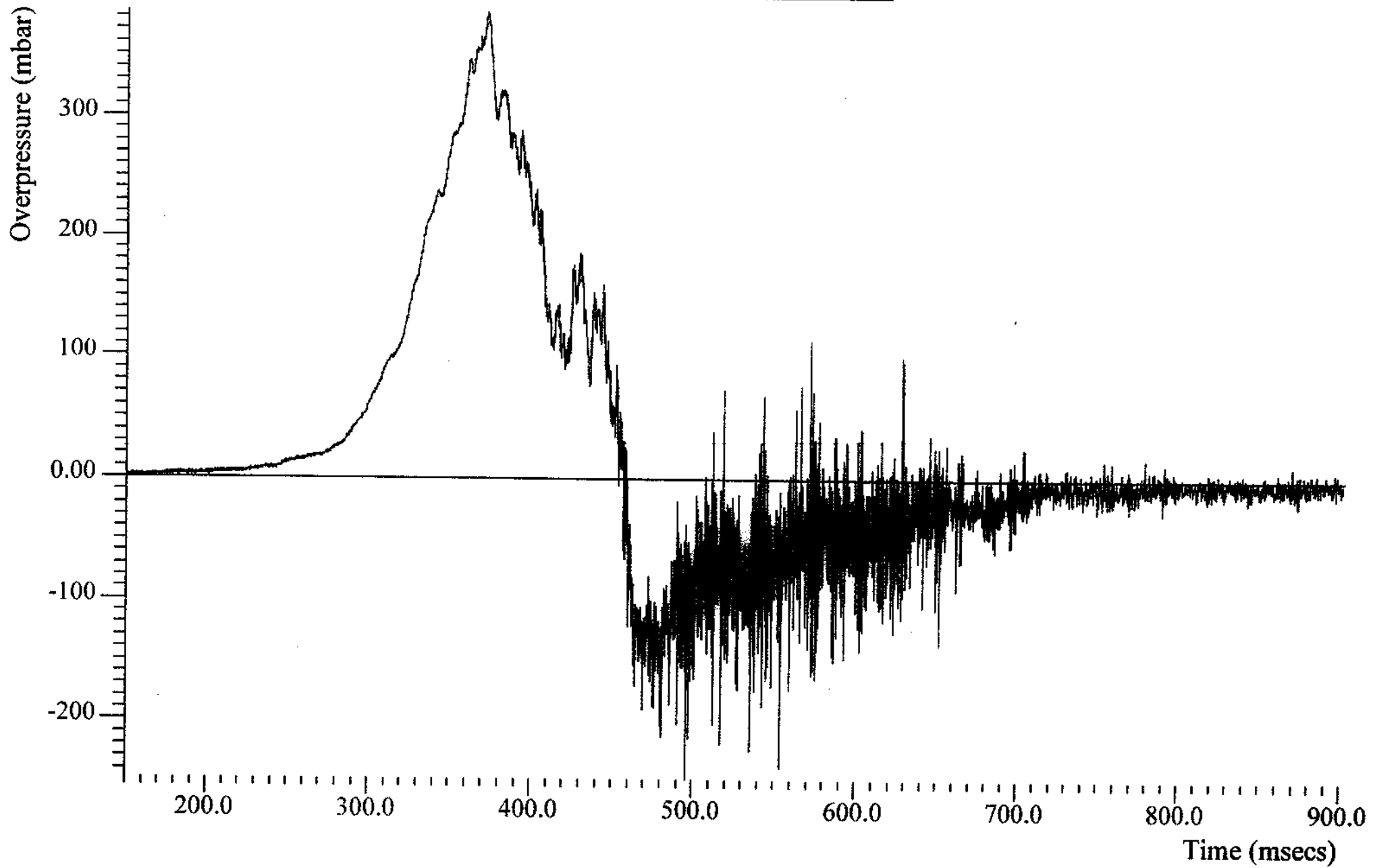
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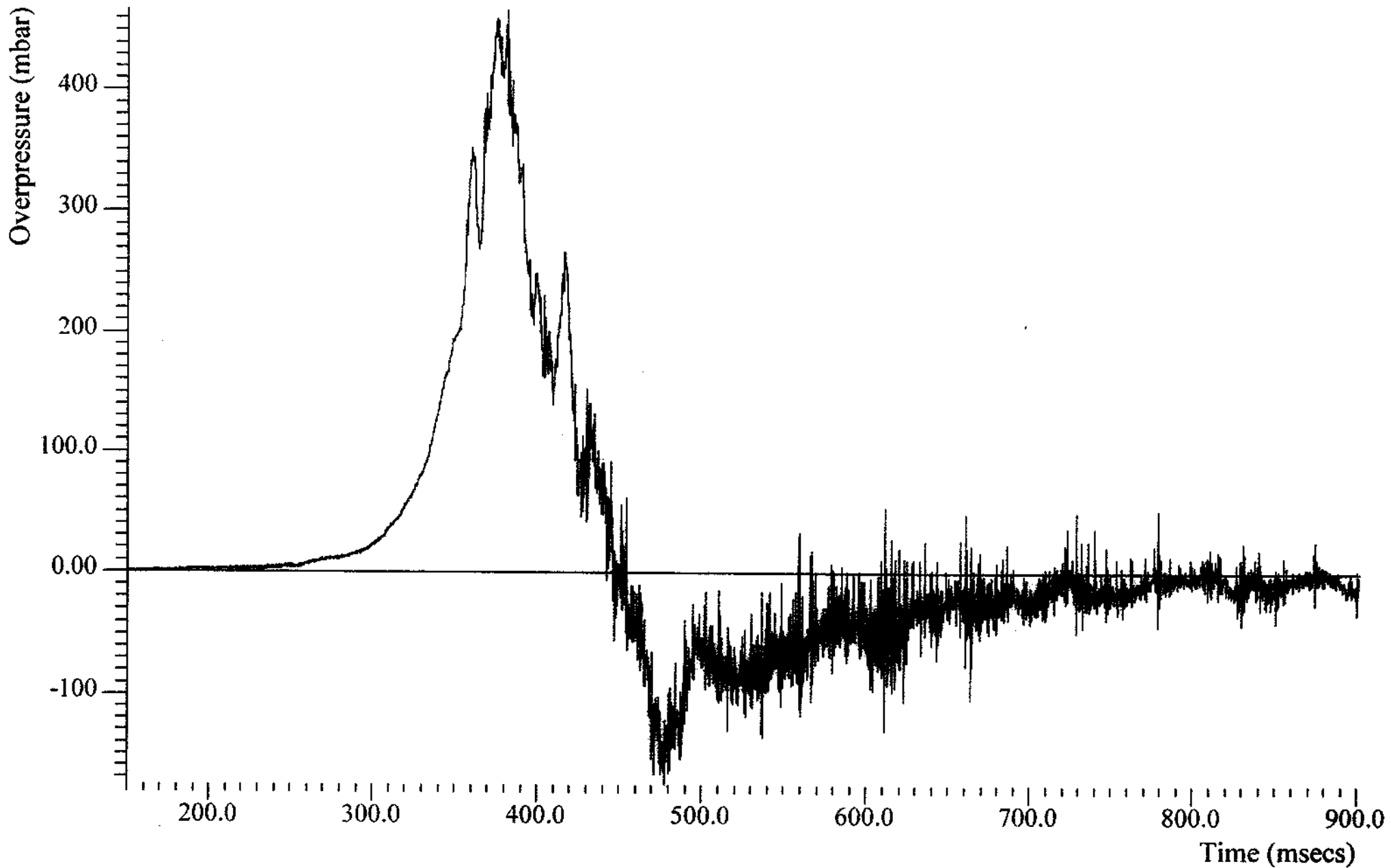
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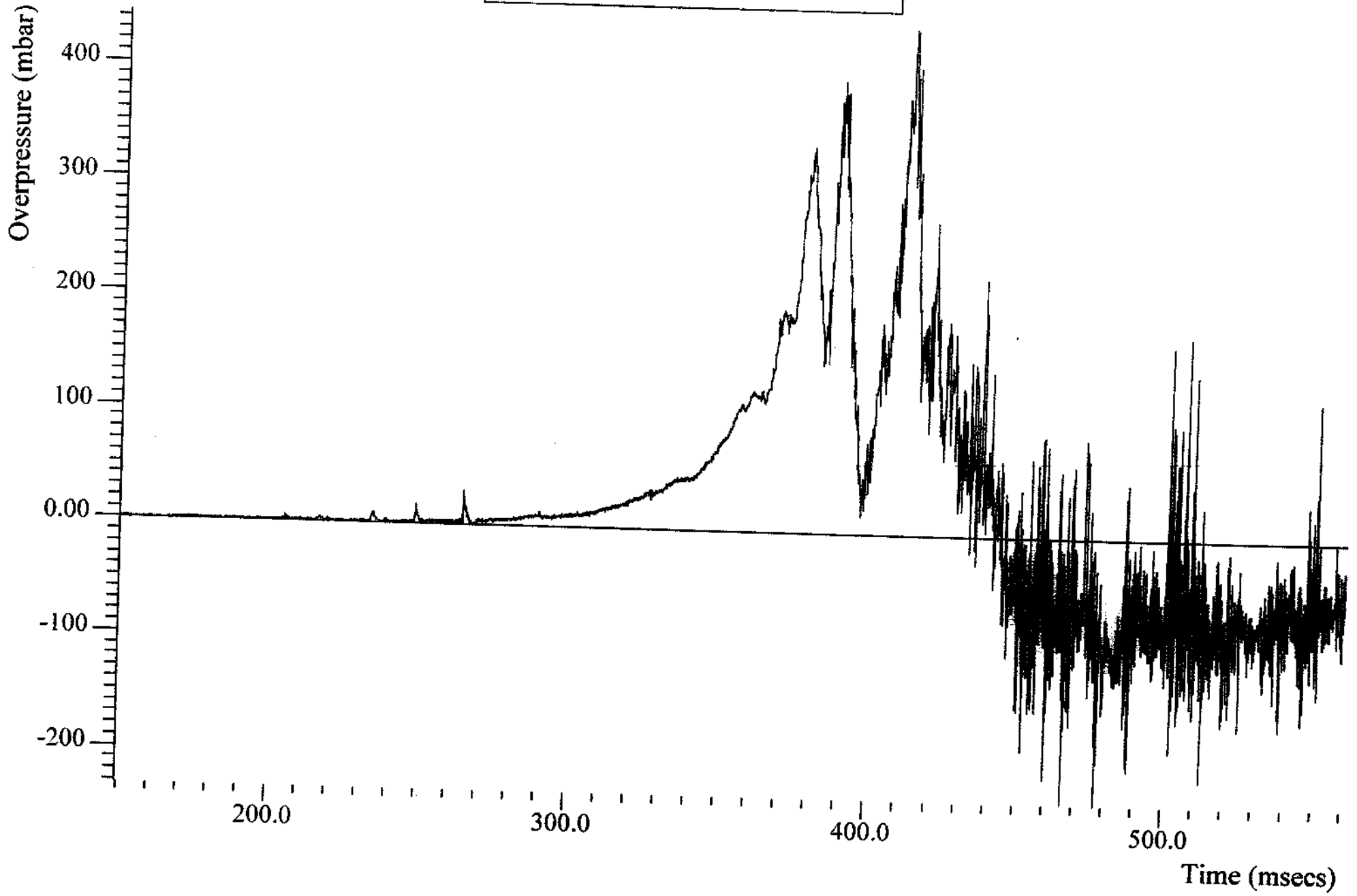
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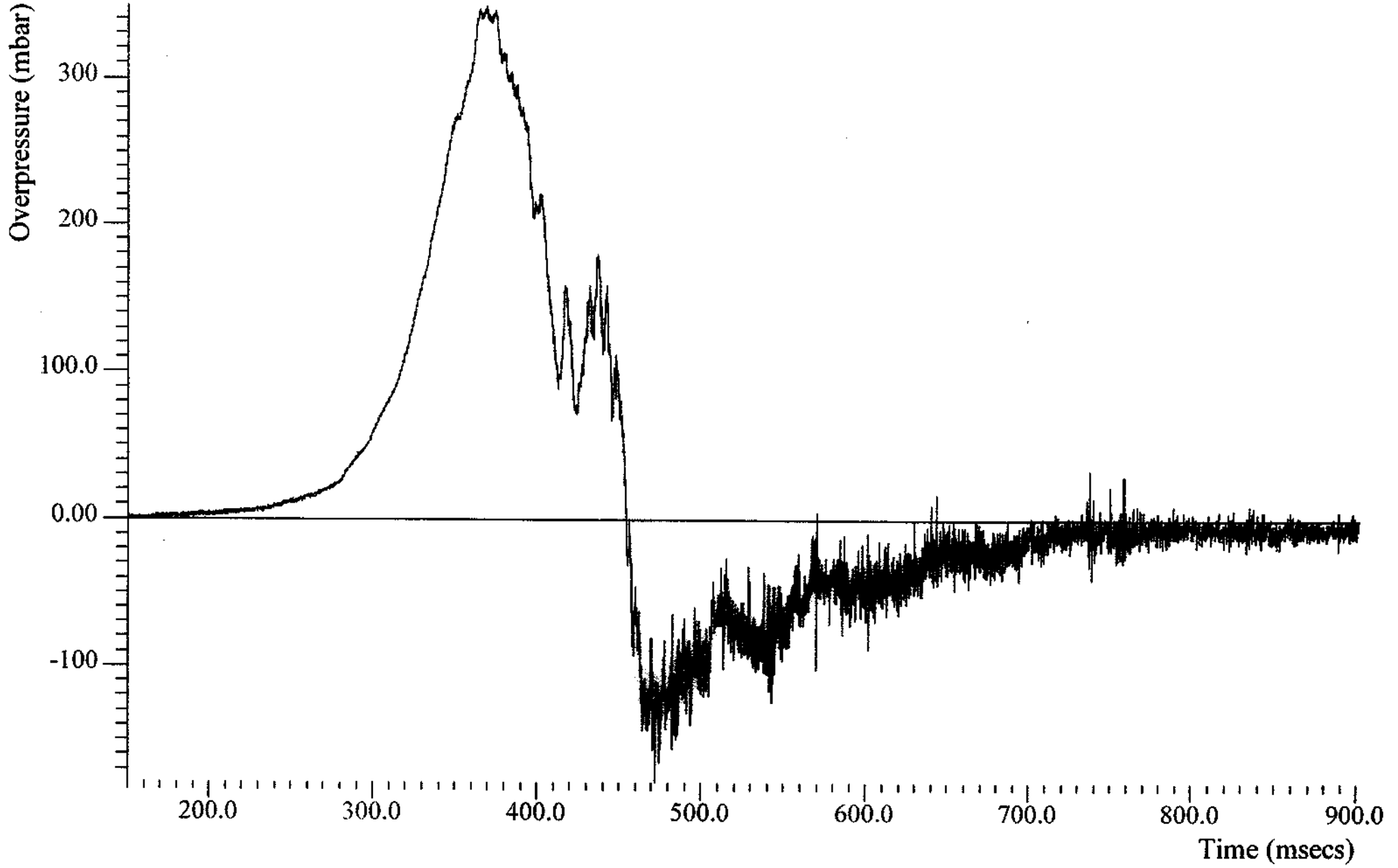
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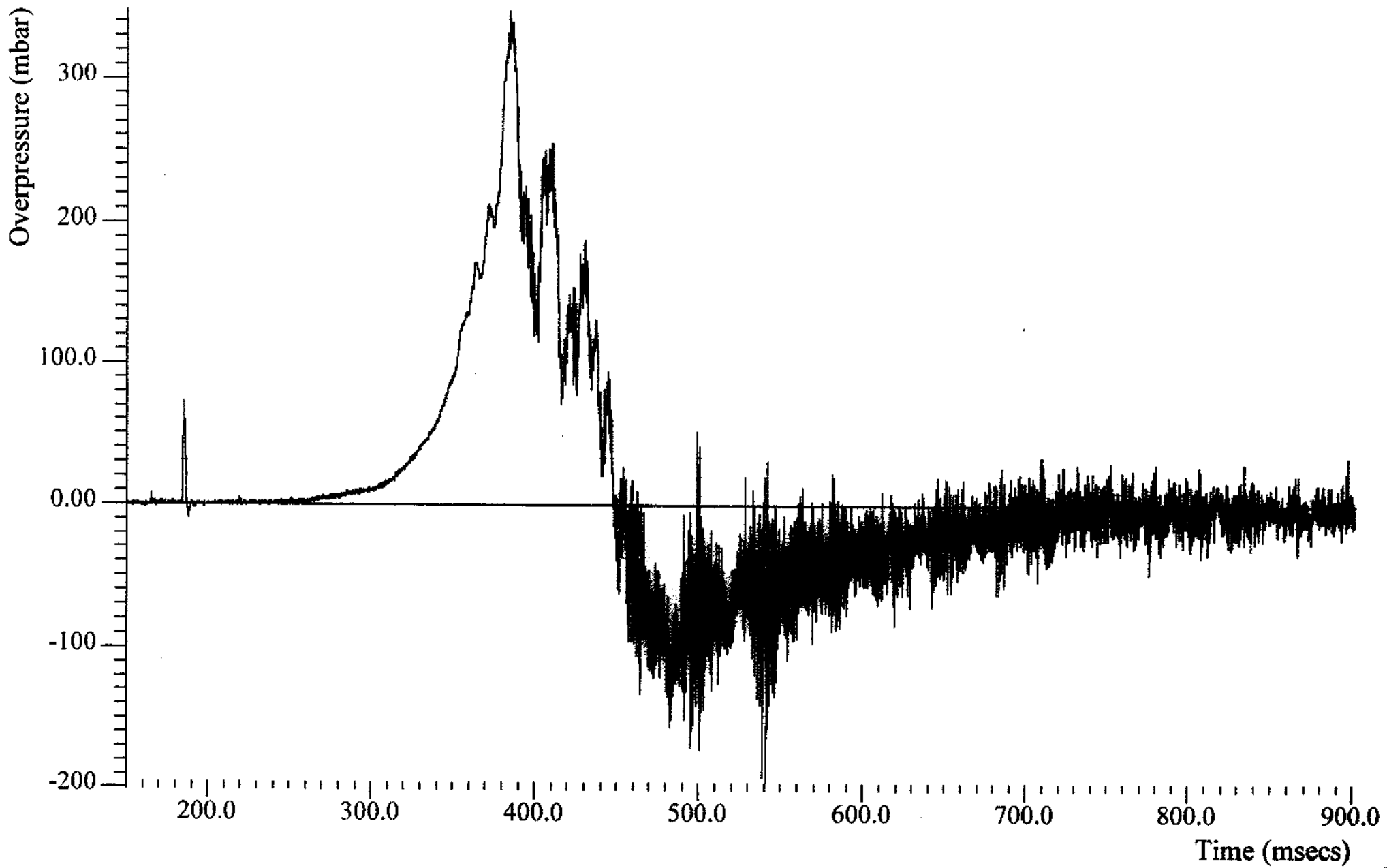
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Transducer no: PI-19



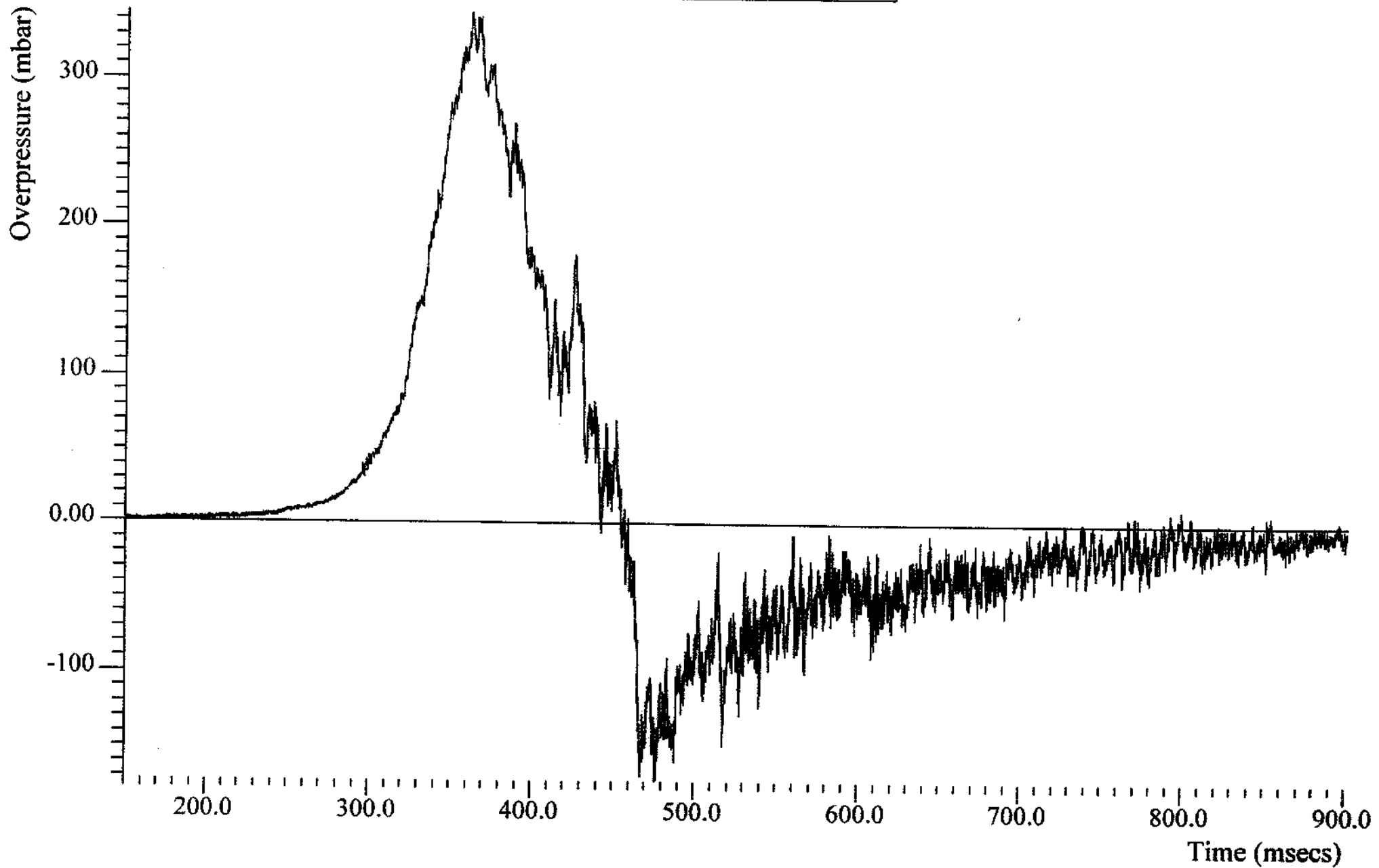
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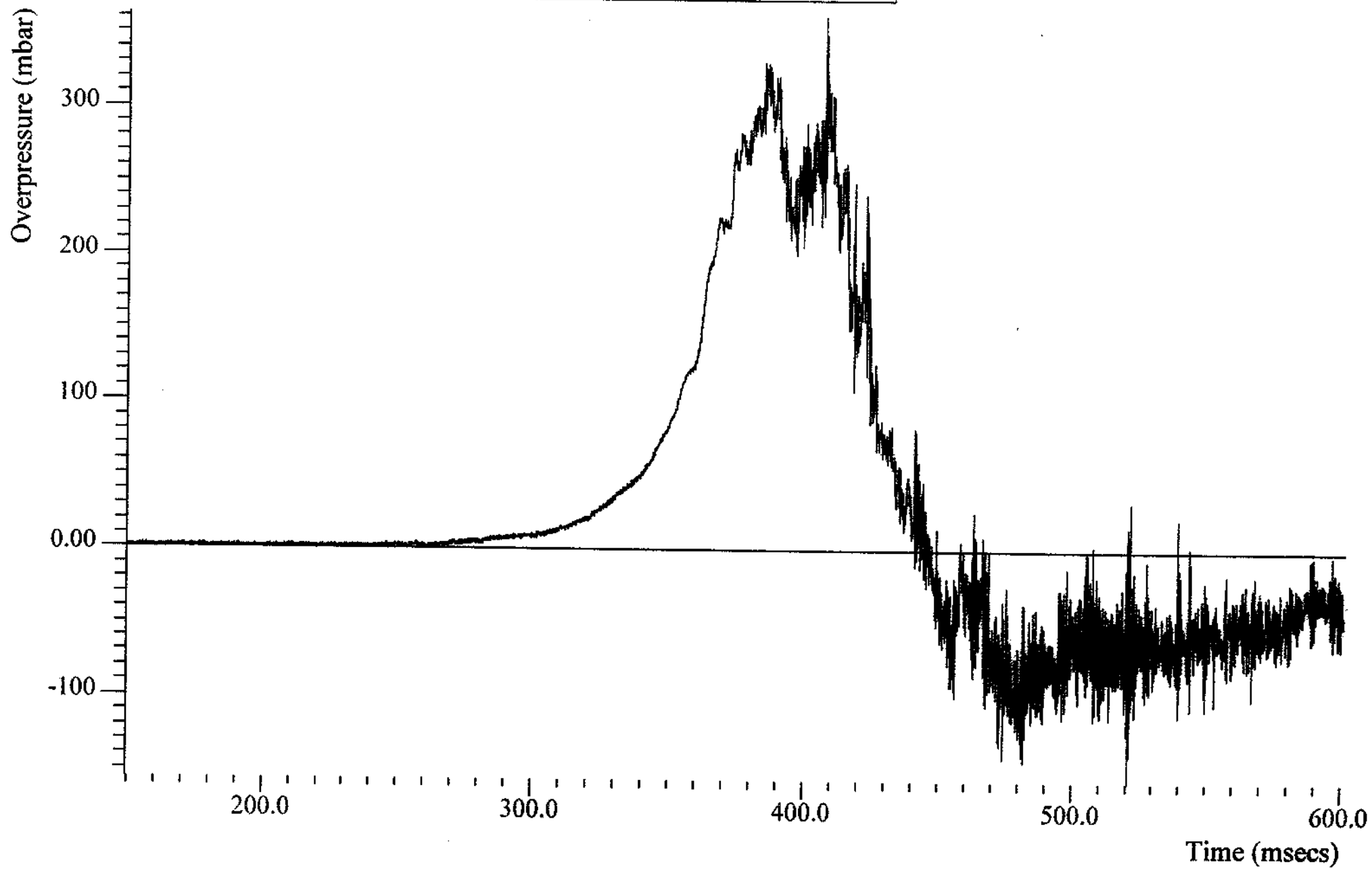
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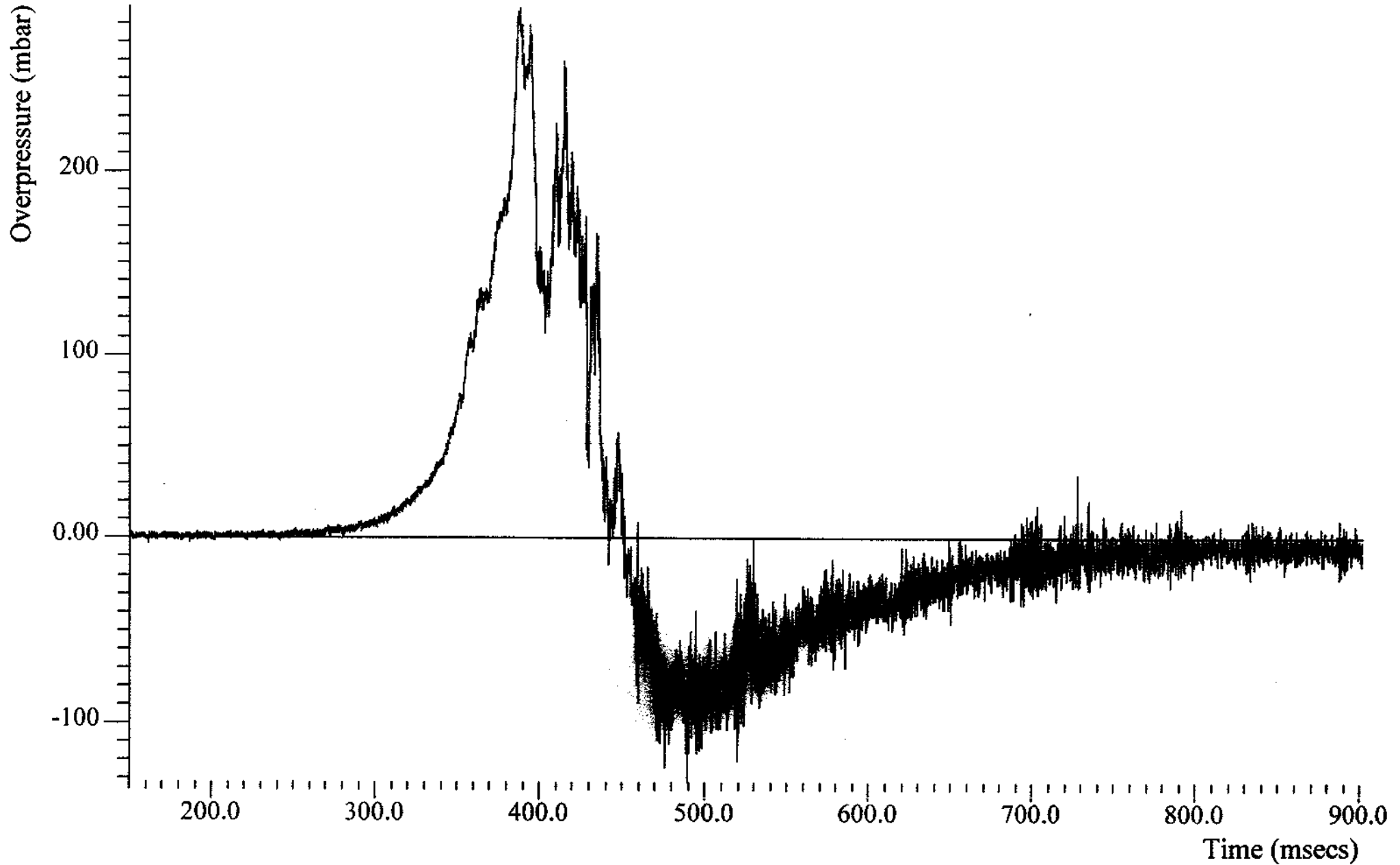
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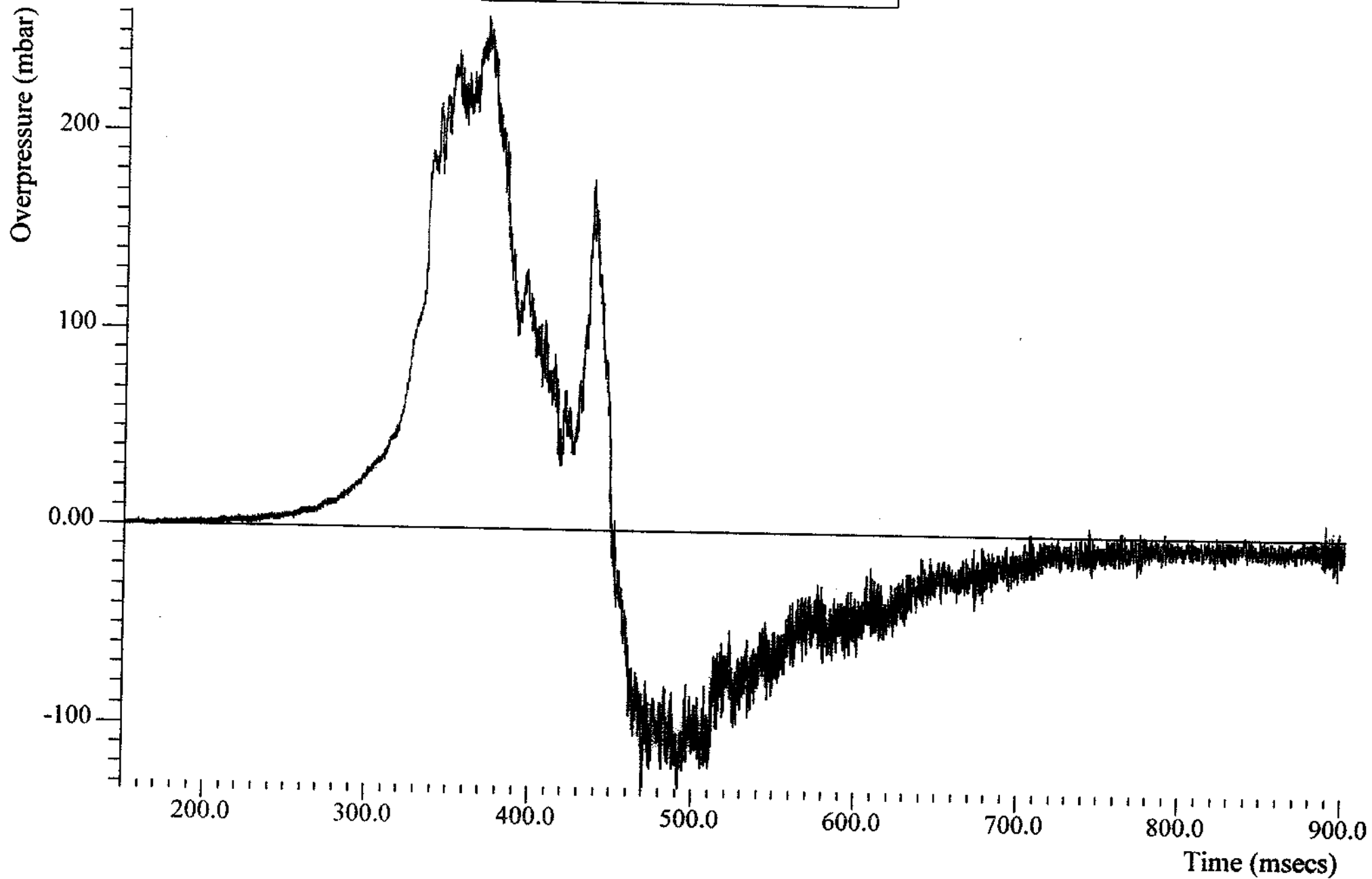
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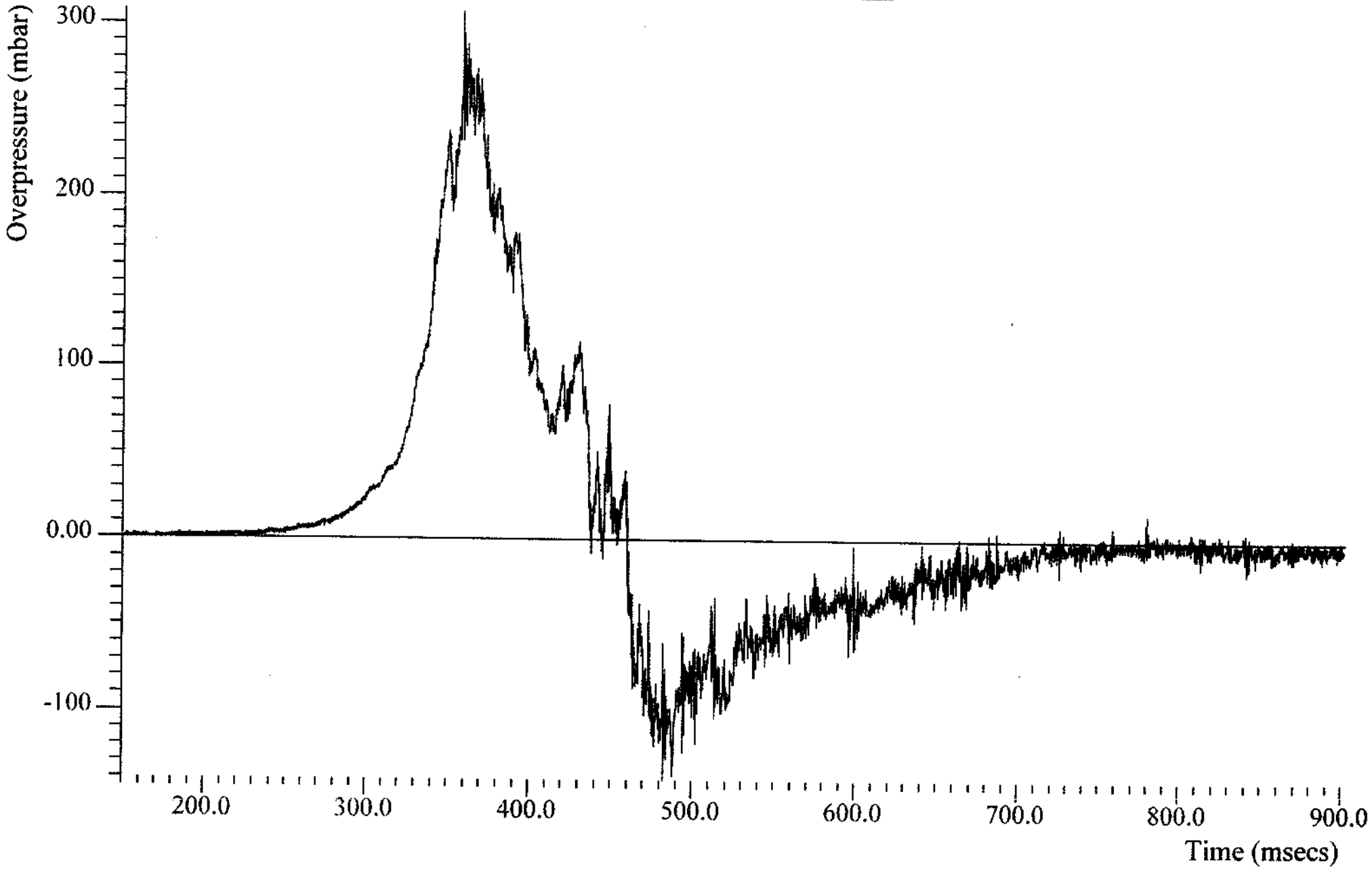
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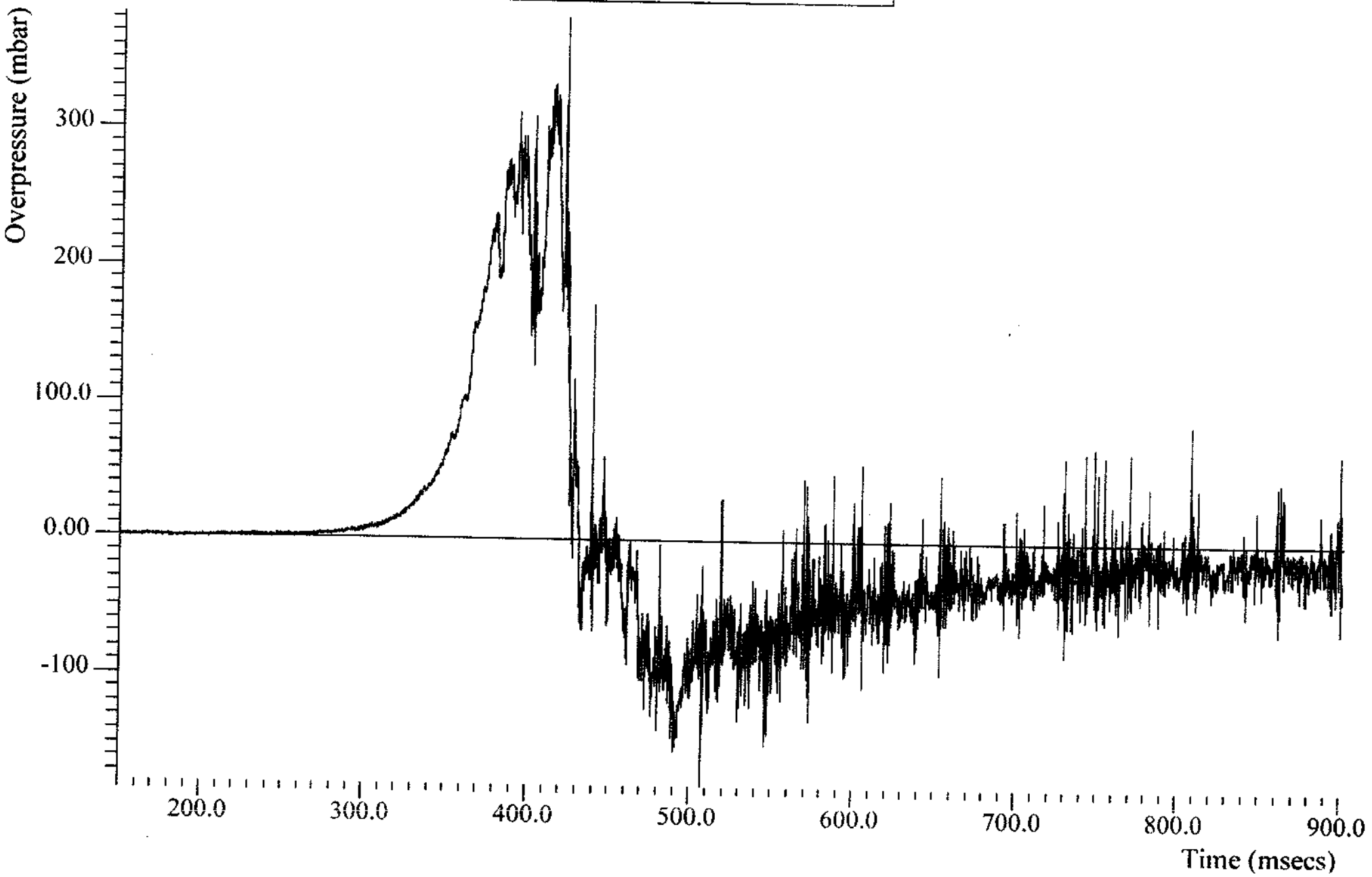
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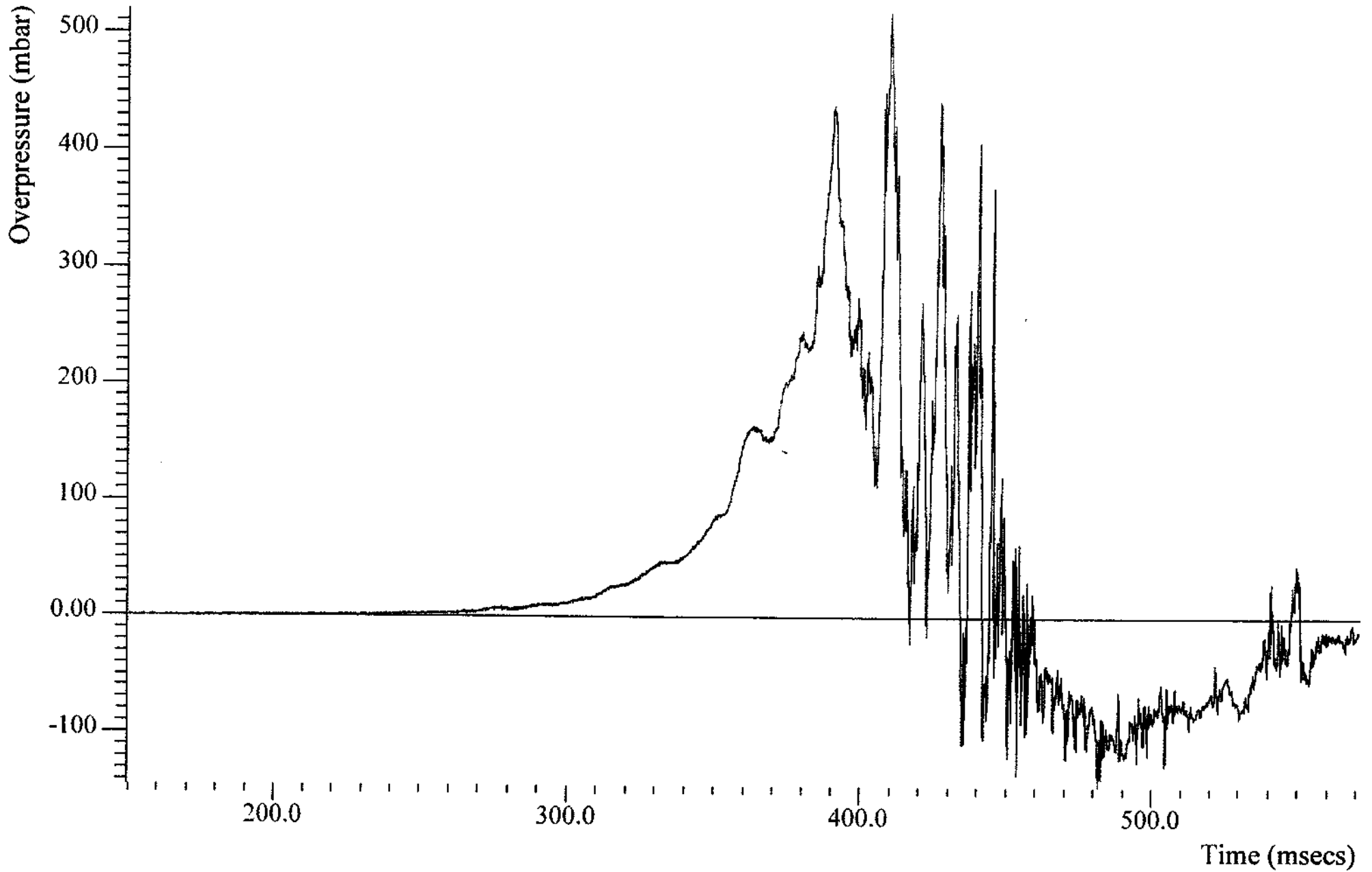
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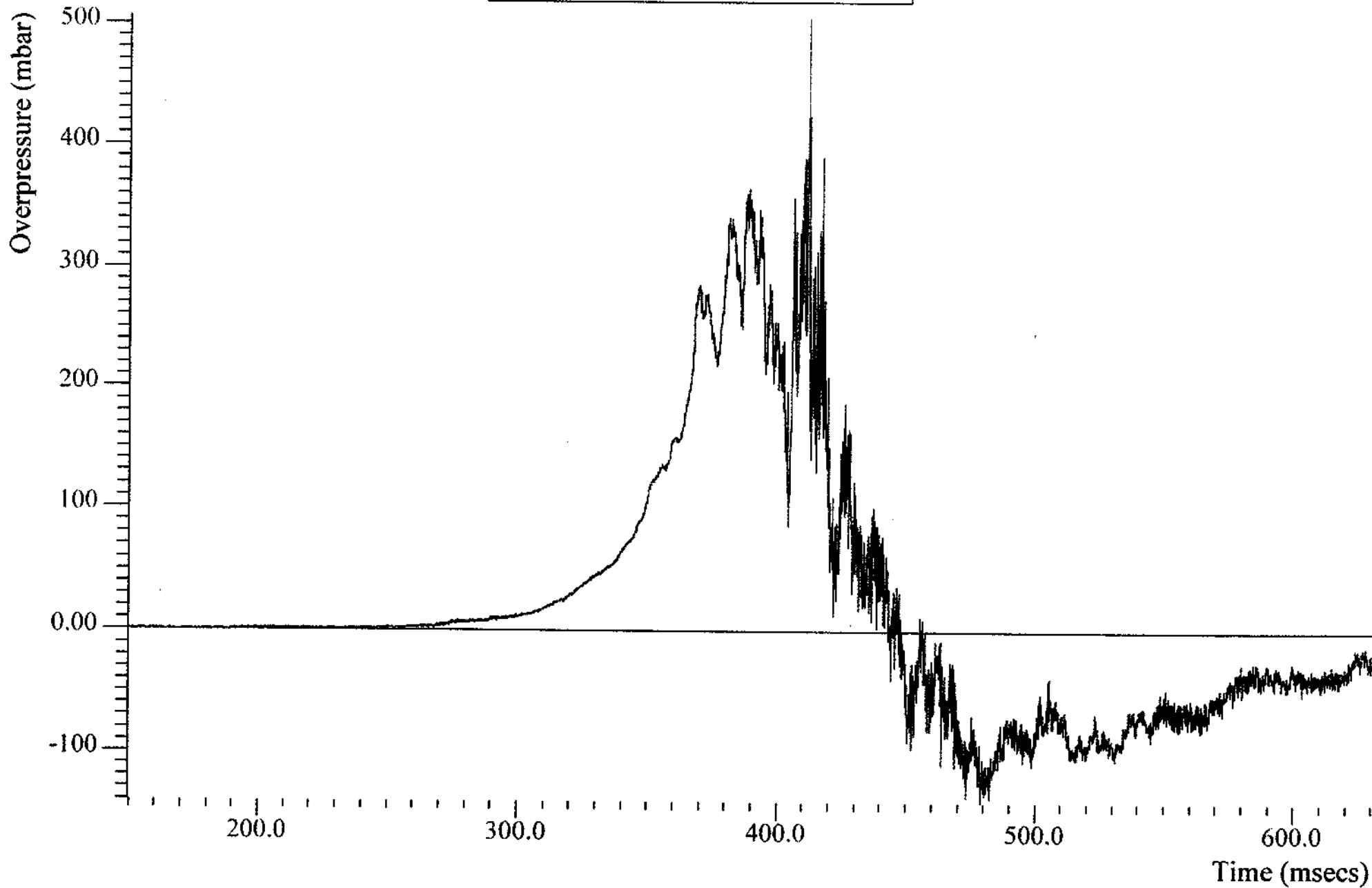
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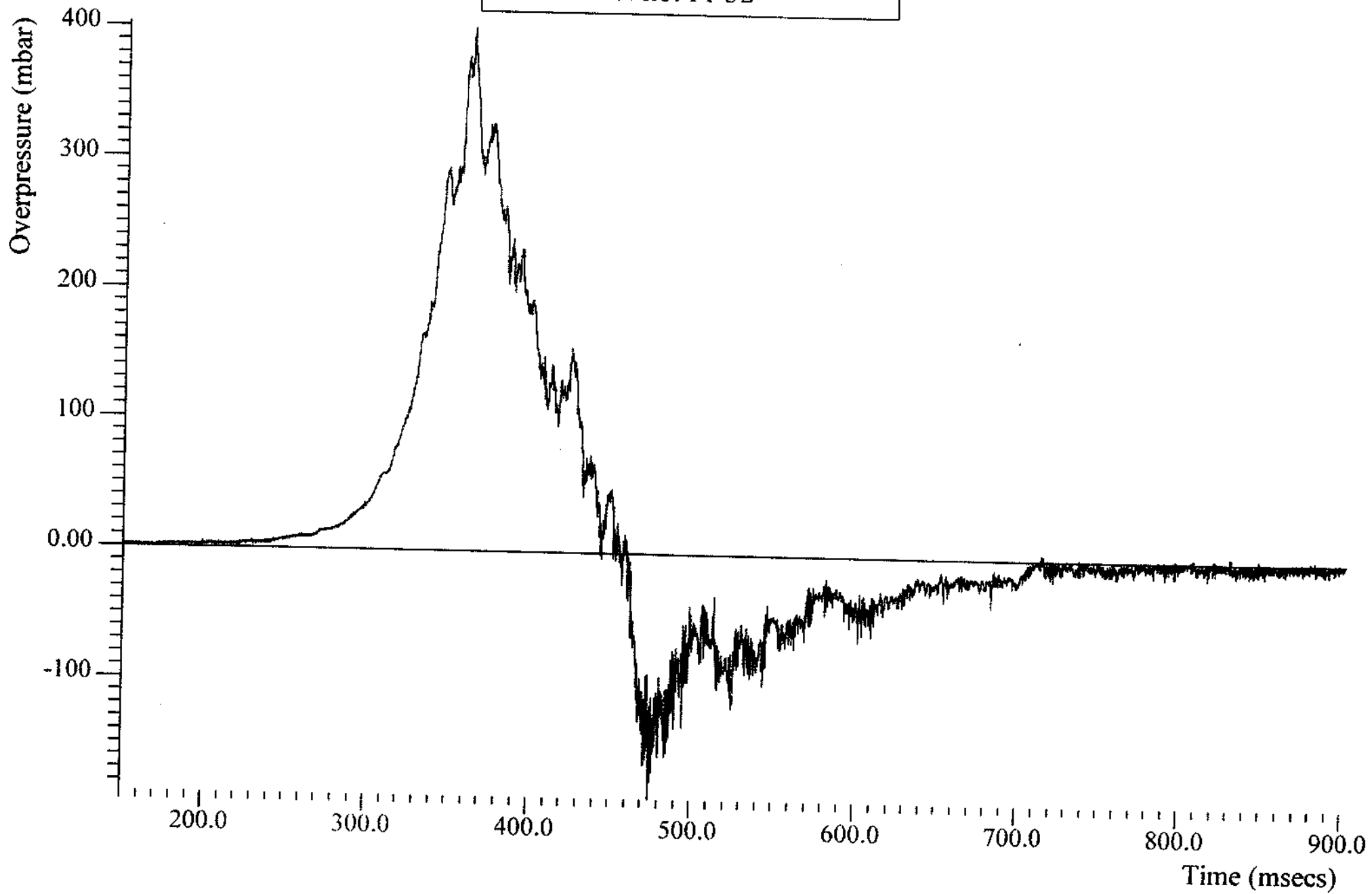
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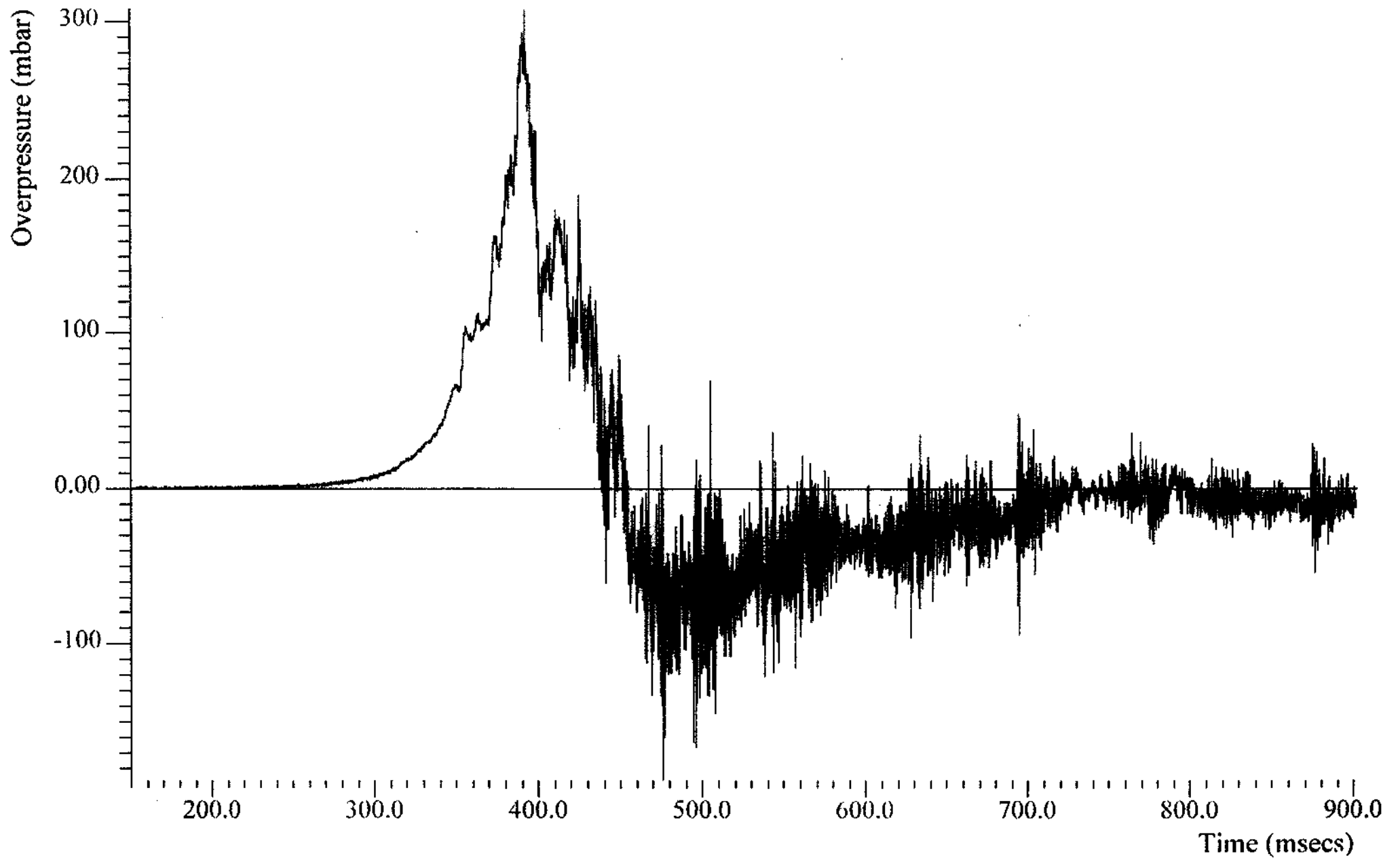
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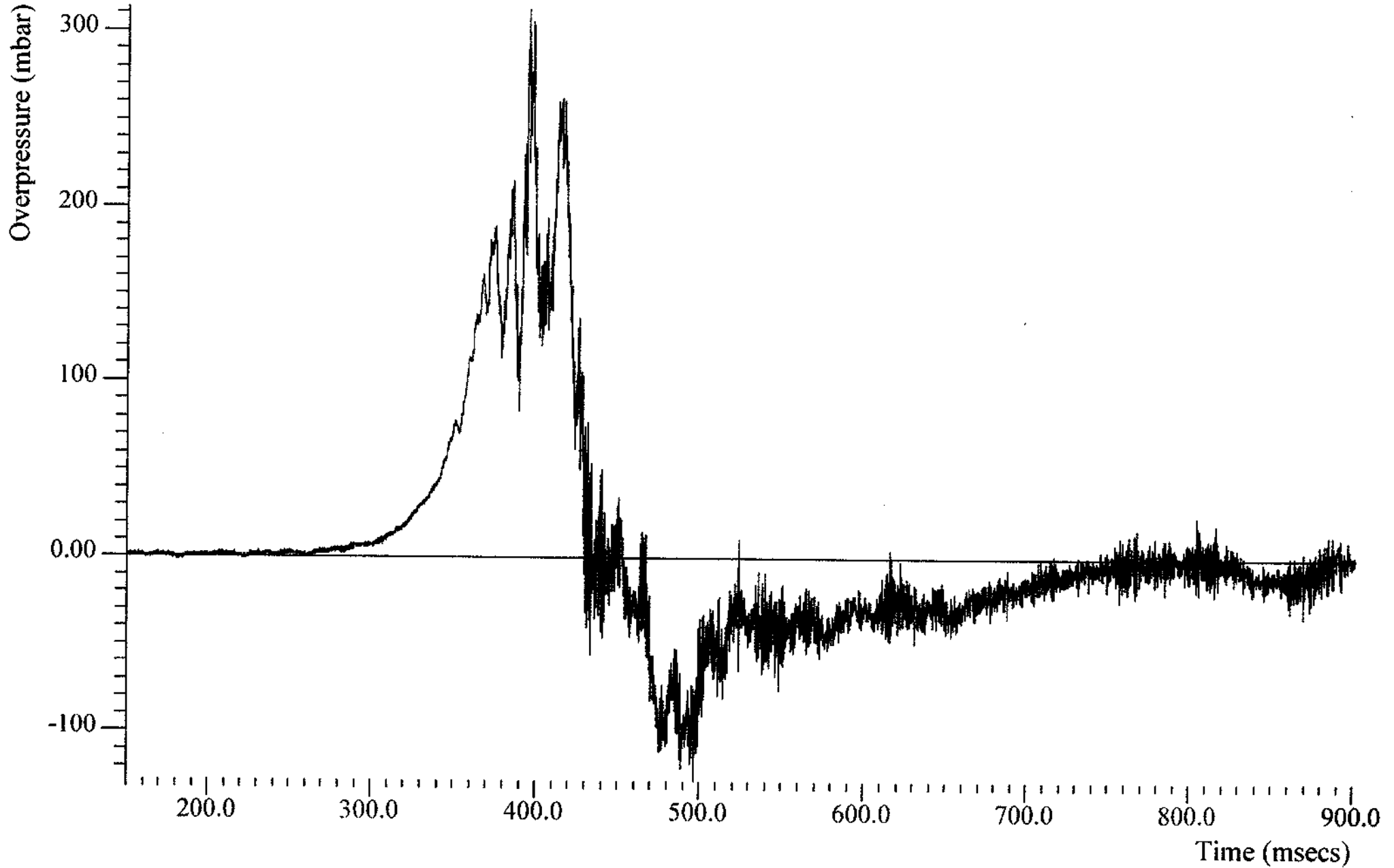
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Transducer no: PI-32



Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PI-33

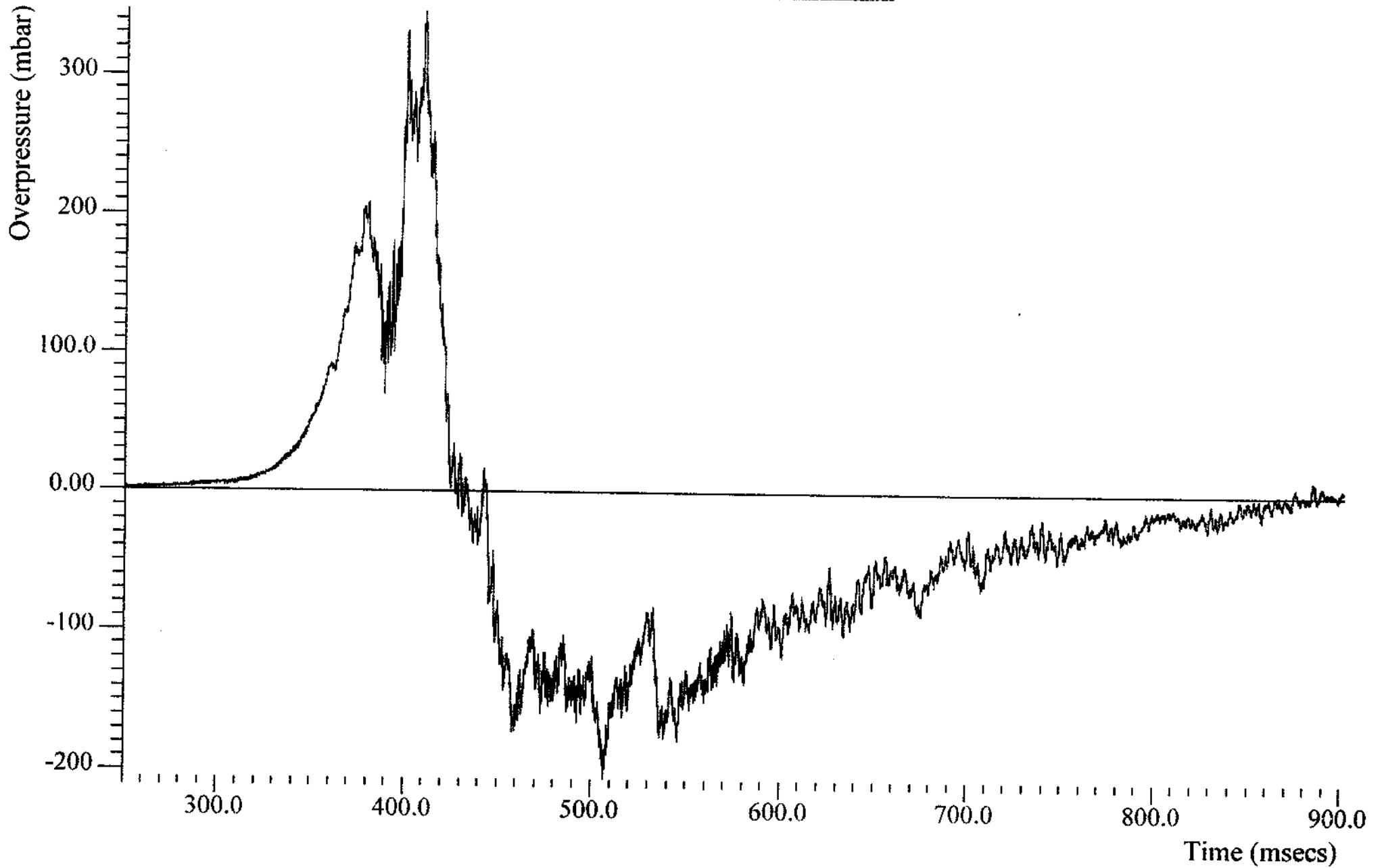


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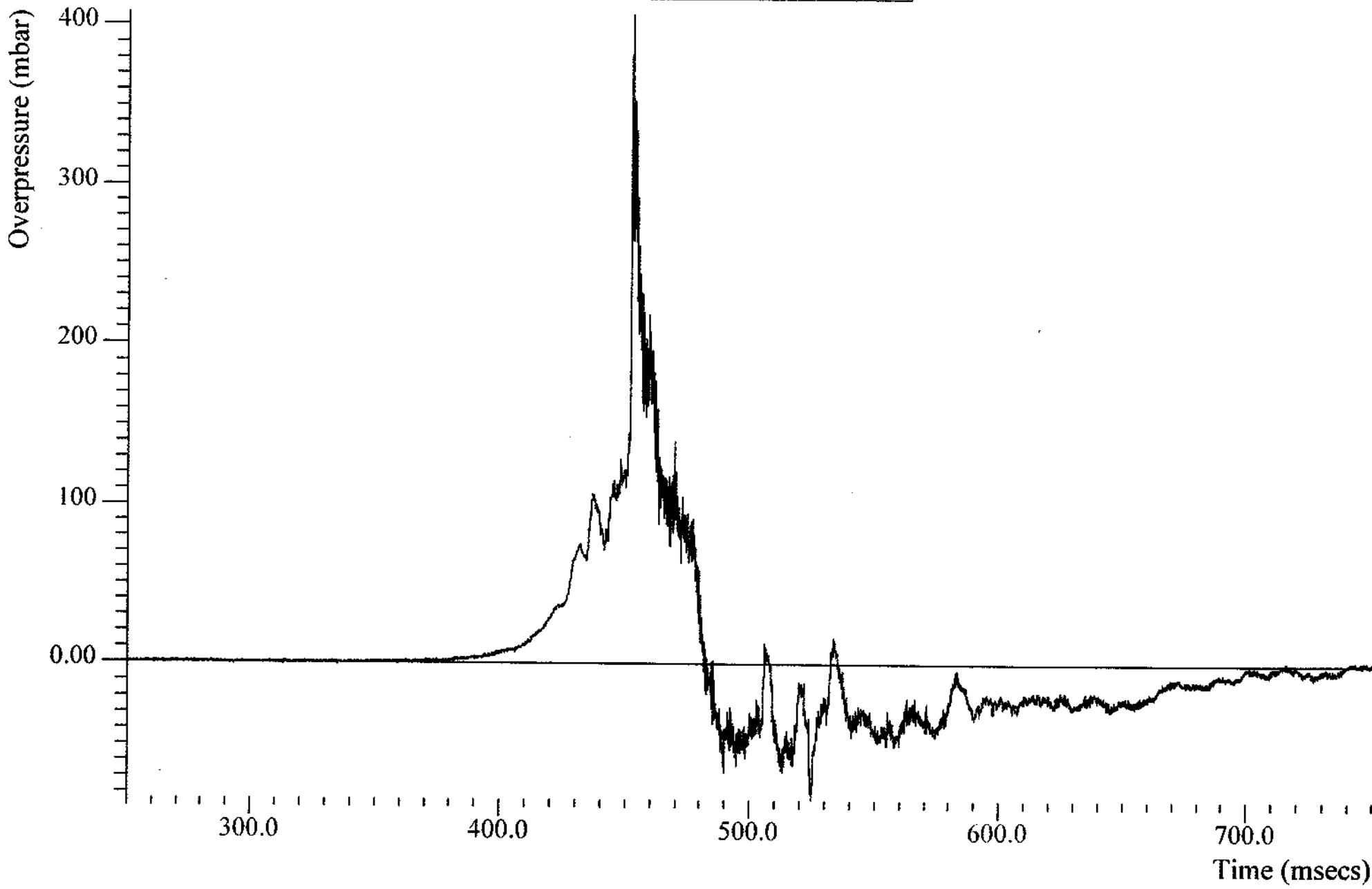


Appendix B: External Overpressure Profiles

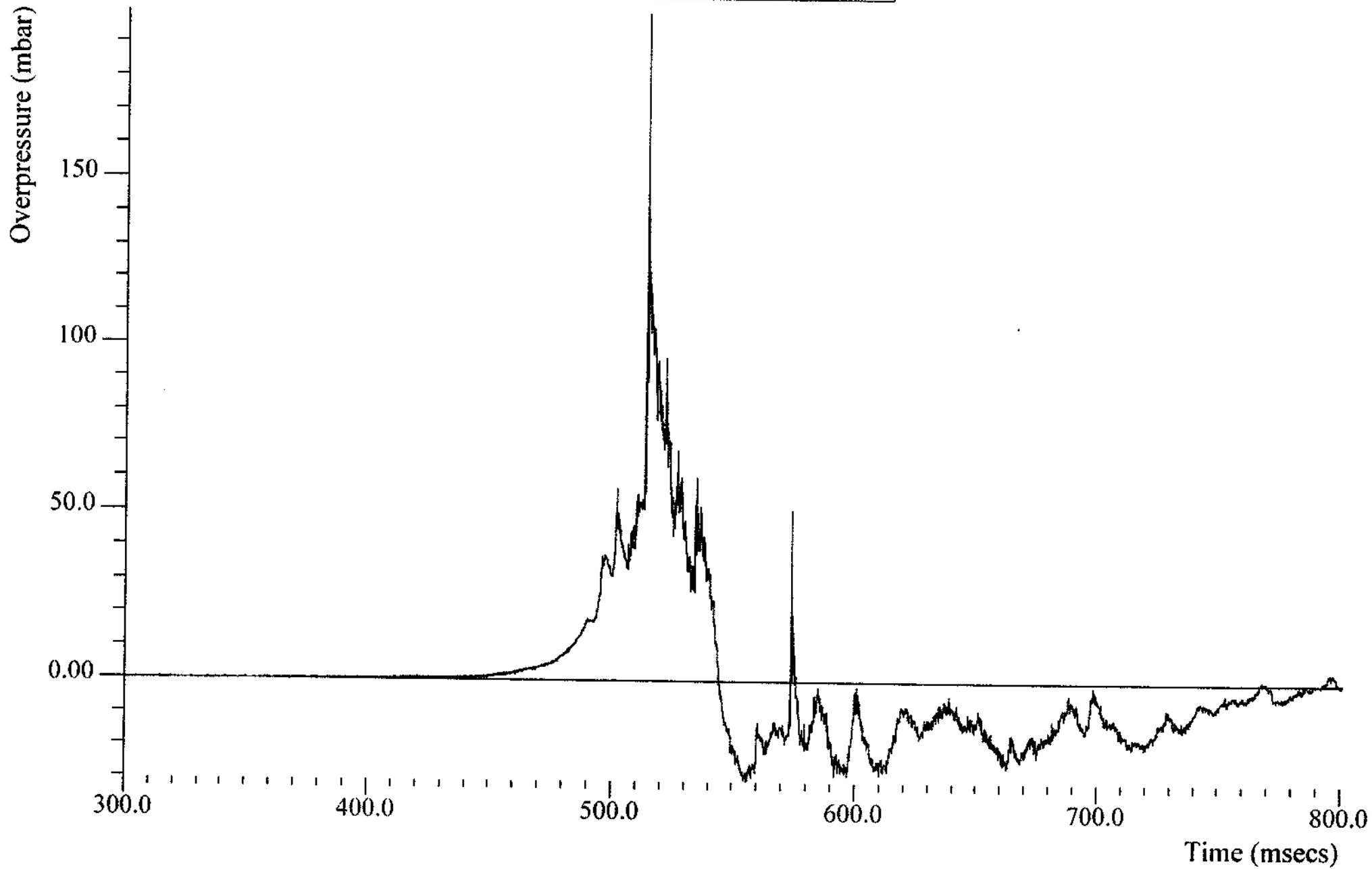
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-1



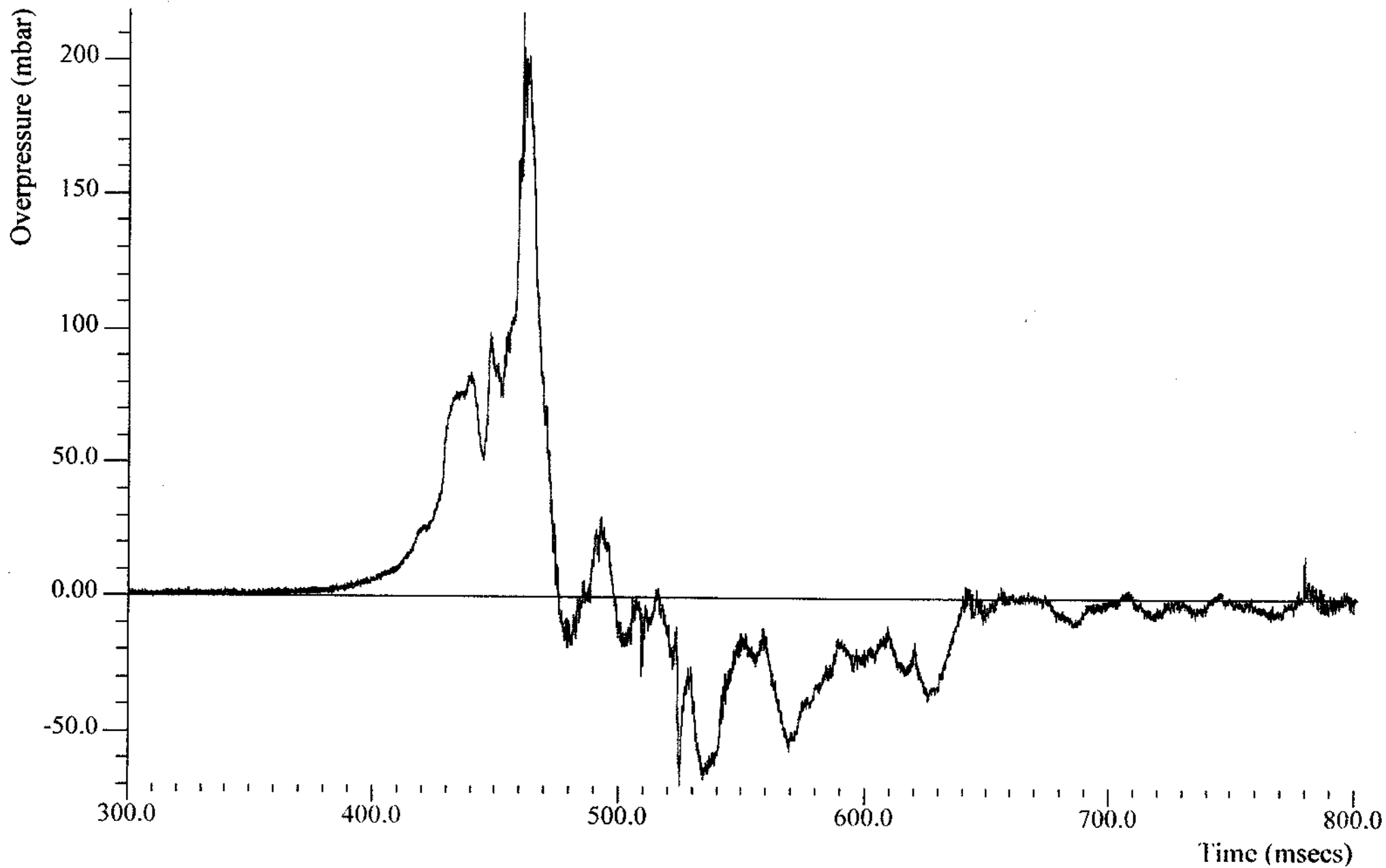
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-3



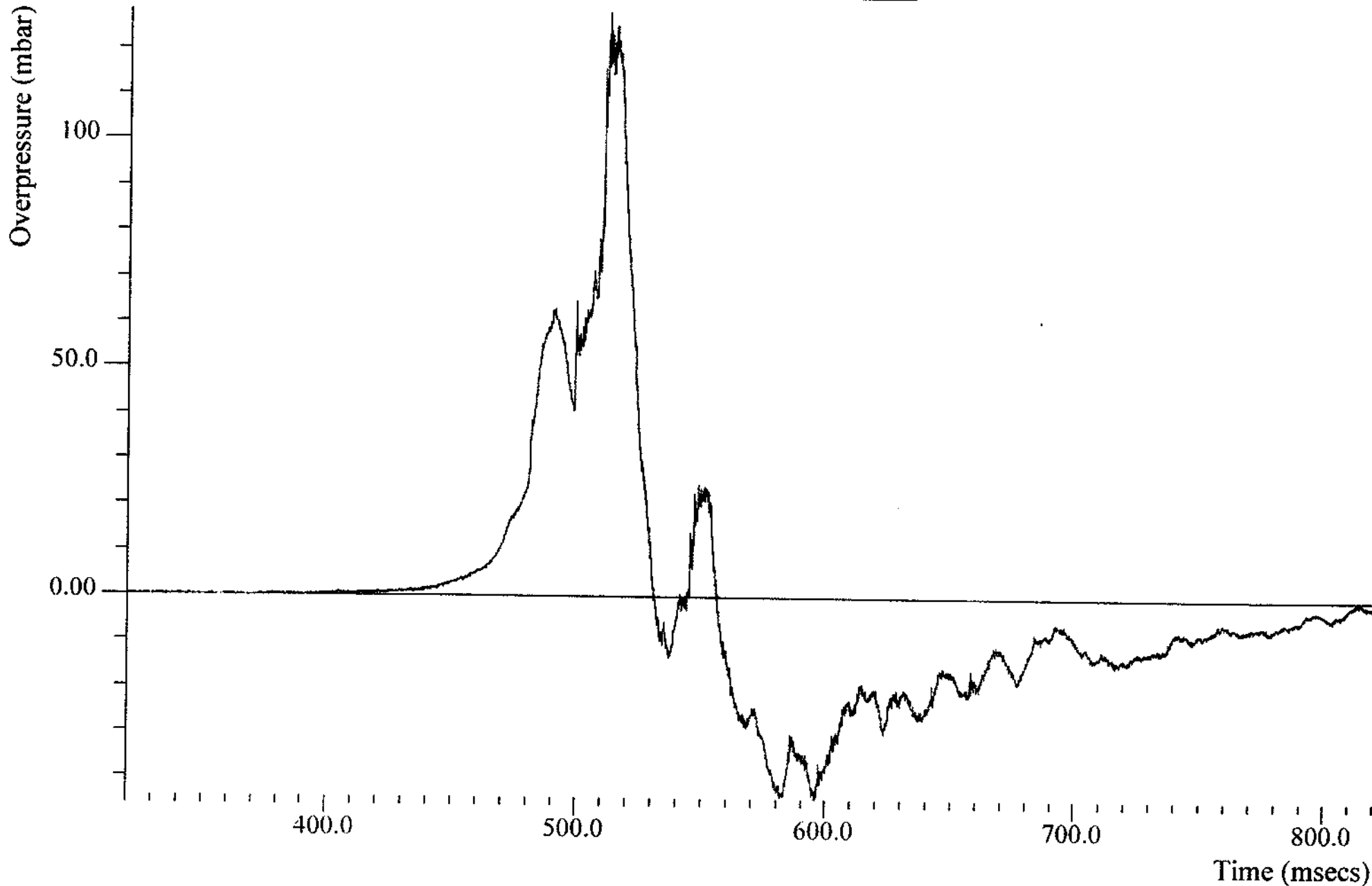
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-4



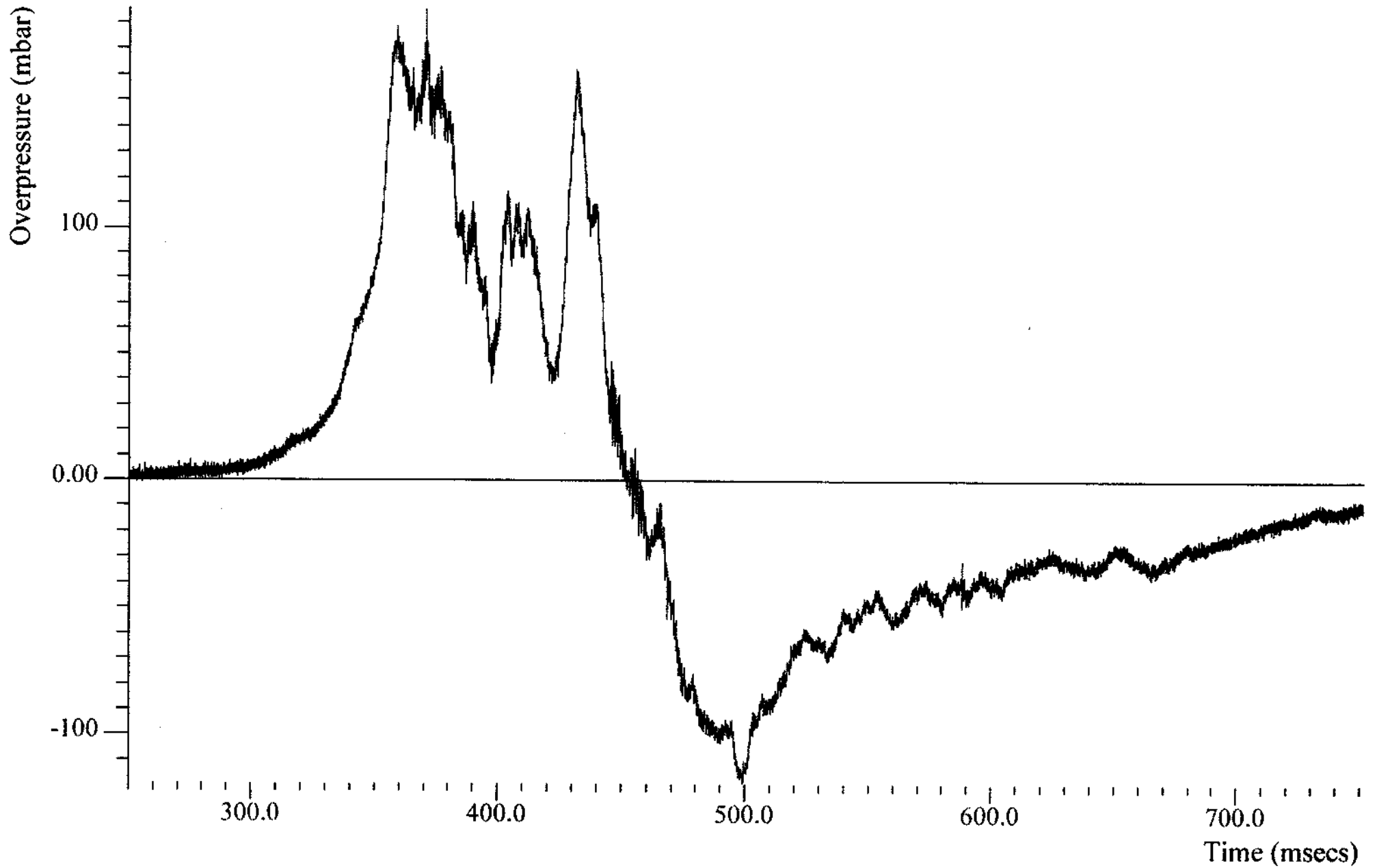
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-5



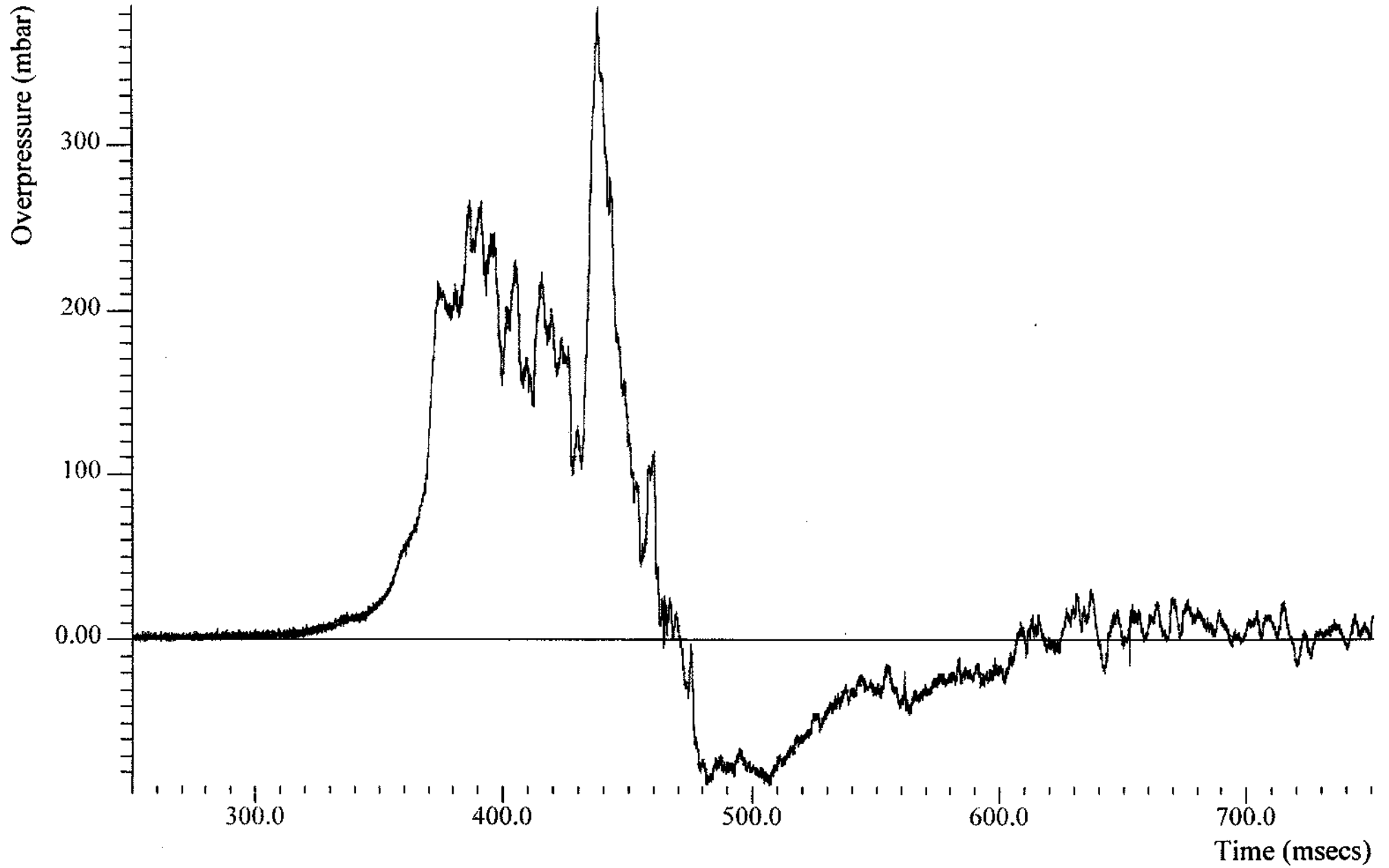
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-6



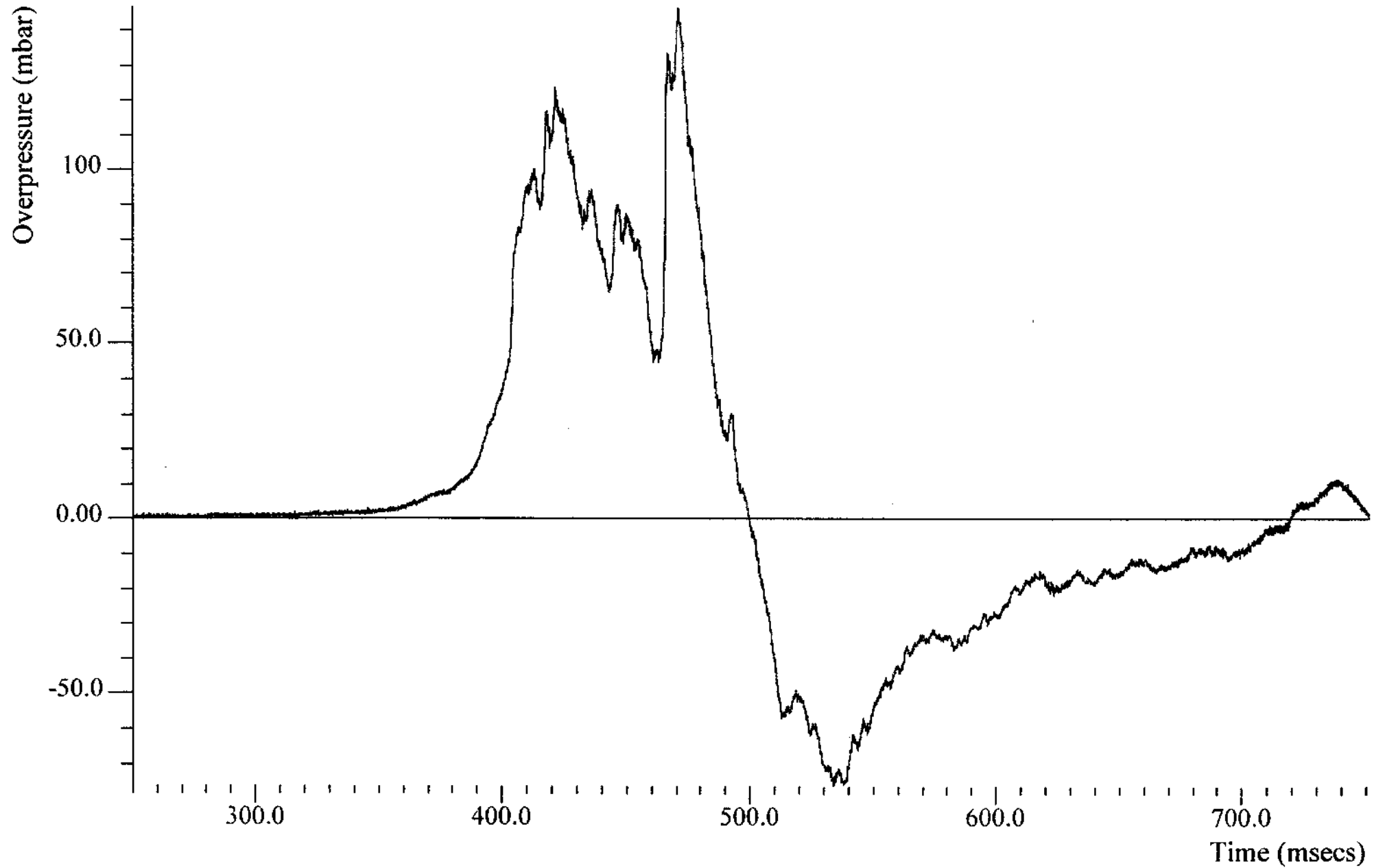
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-7



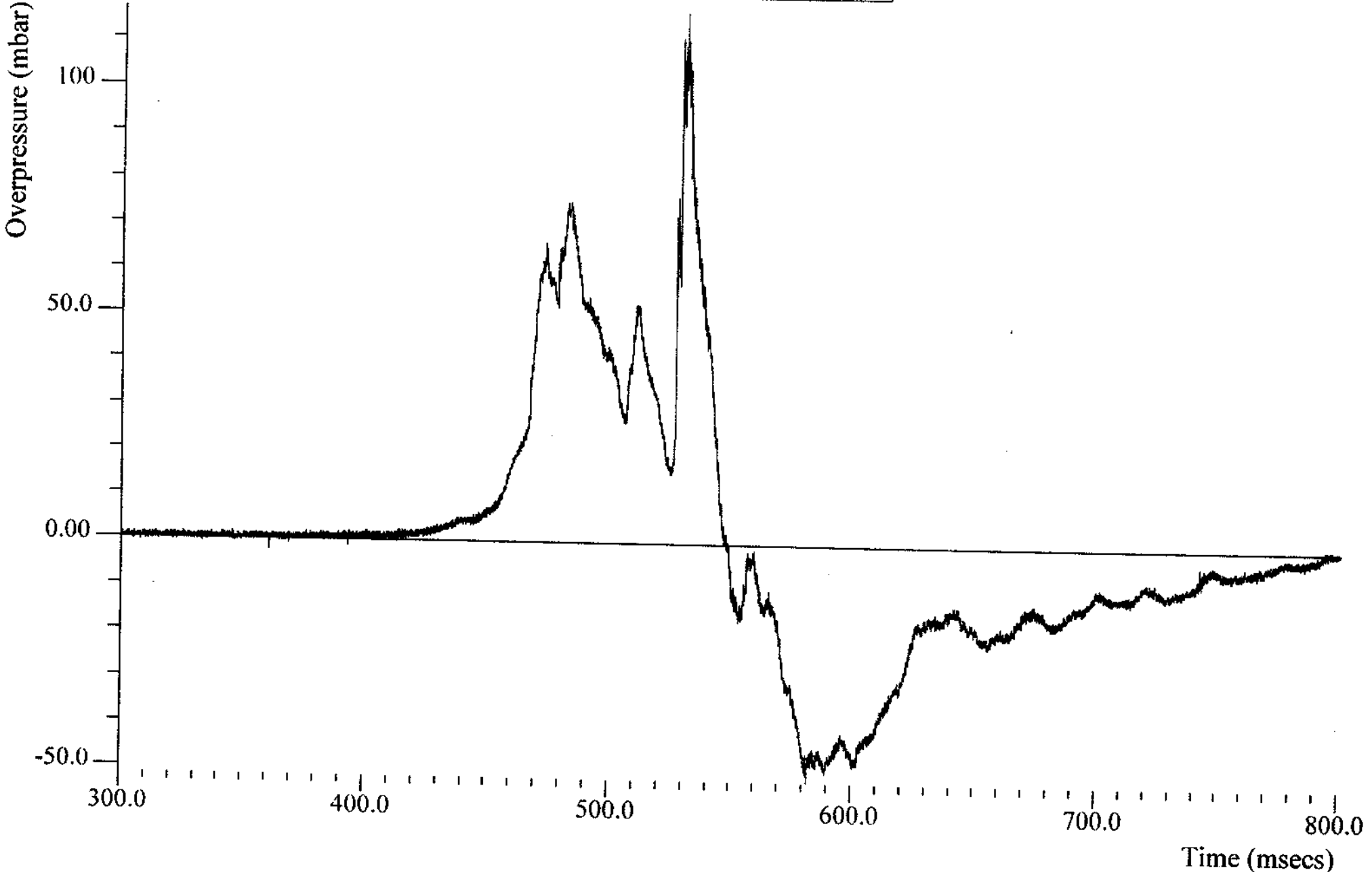
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-8



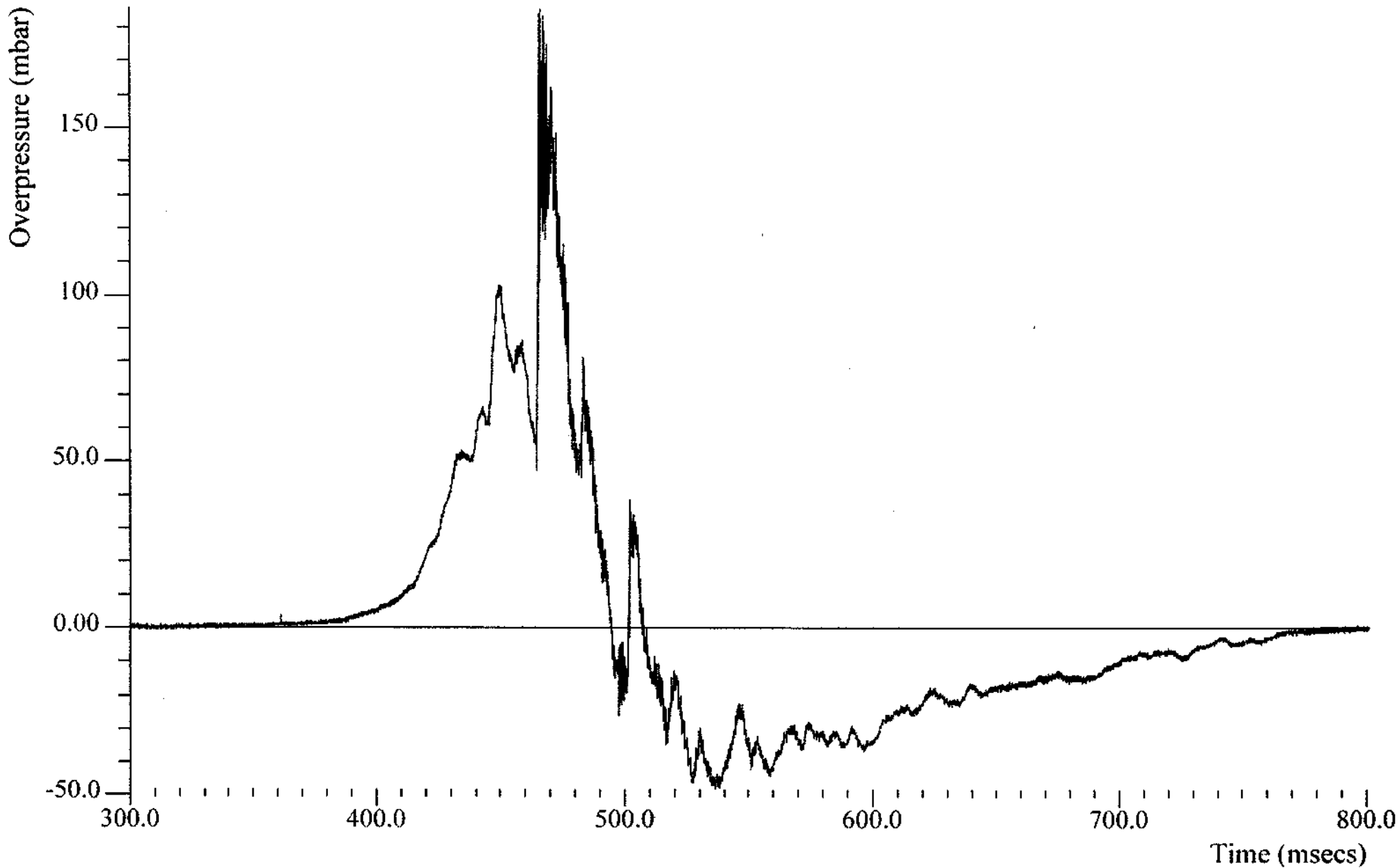
Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-9



Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-10



Test: HSE 10 (C2 I2 O1 DL)
Transducer no: PE-11

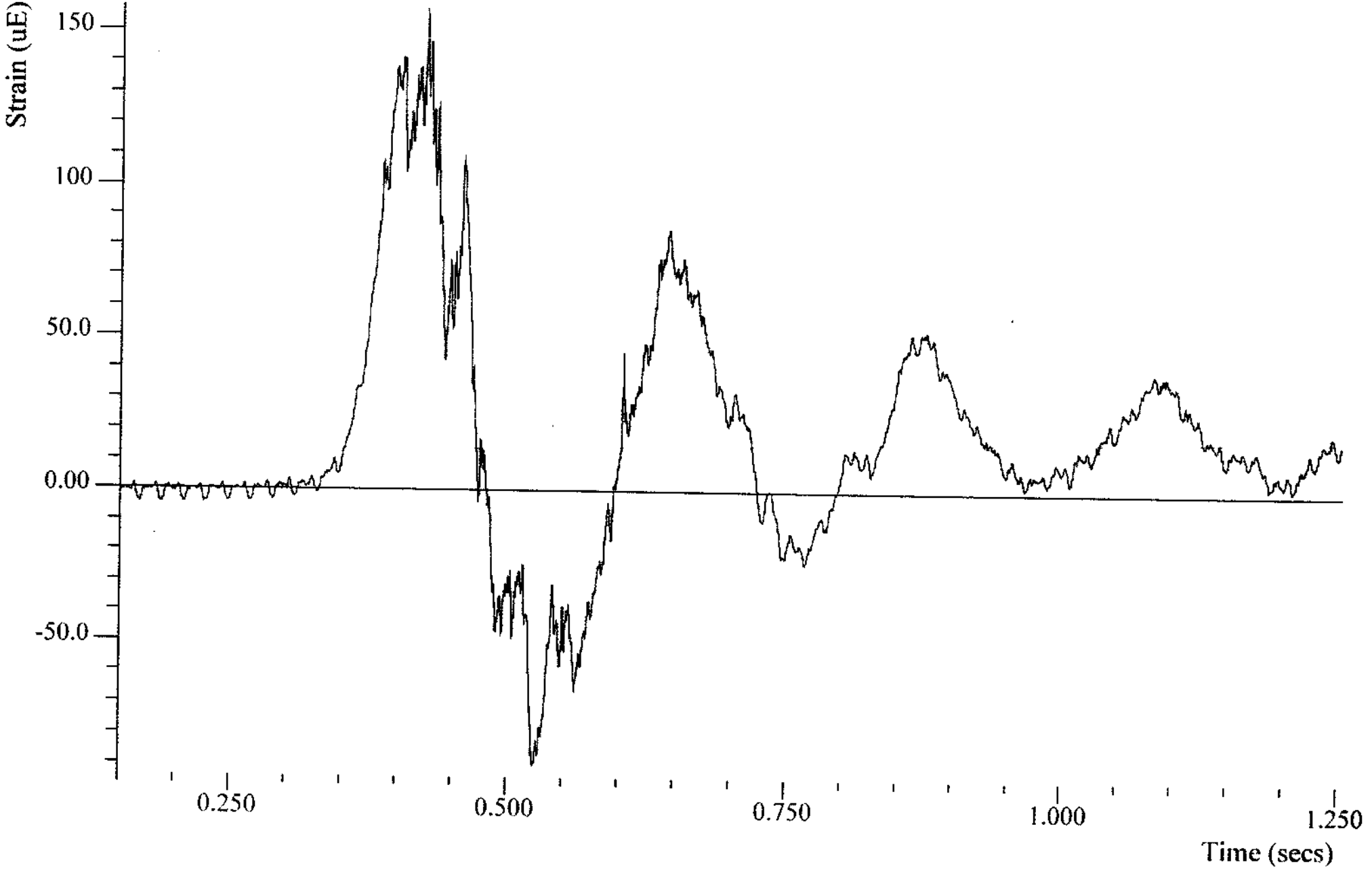


Appendix C: Strain Gauge Profiles

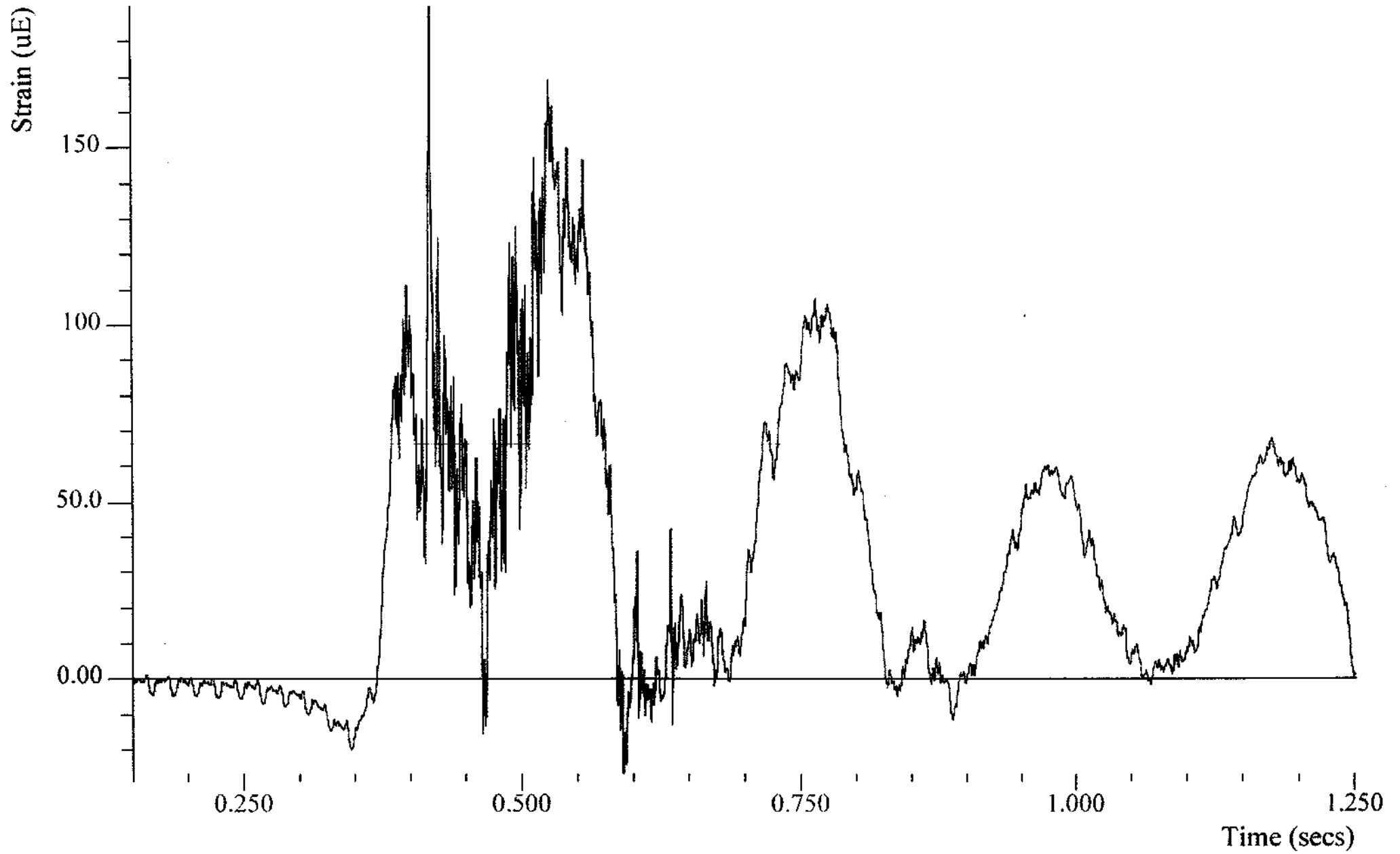
Table C1: Location of Strain Gauges

Measuring Position	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)
ST-301	28.06	-0.05	0.24
ST-302	28.01	-0.32	0.24
ST-303	28.00	-0.56	0.24
ST-304	27.90	-0.32	0.24
ST-305	20.00	-7.17	1.50
ST-306	20.00	-6.82	1.20

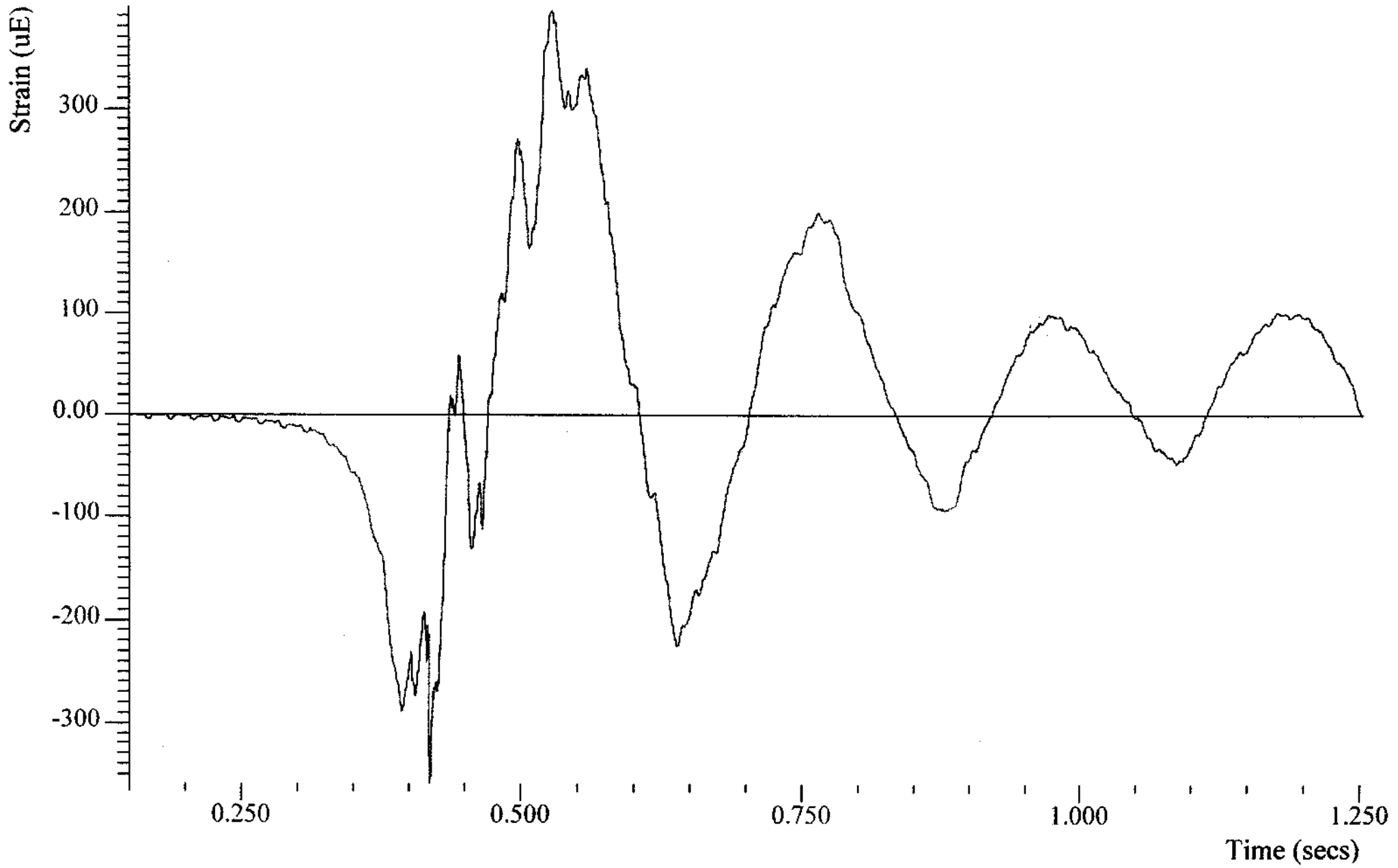
Test: HSE 10 (C2 I2 O1 DL)
Strain Gauge ST-301



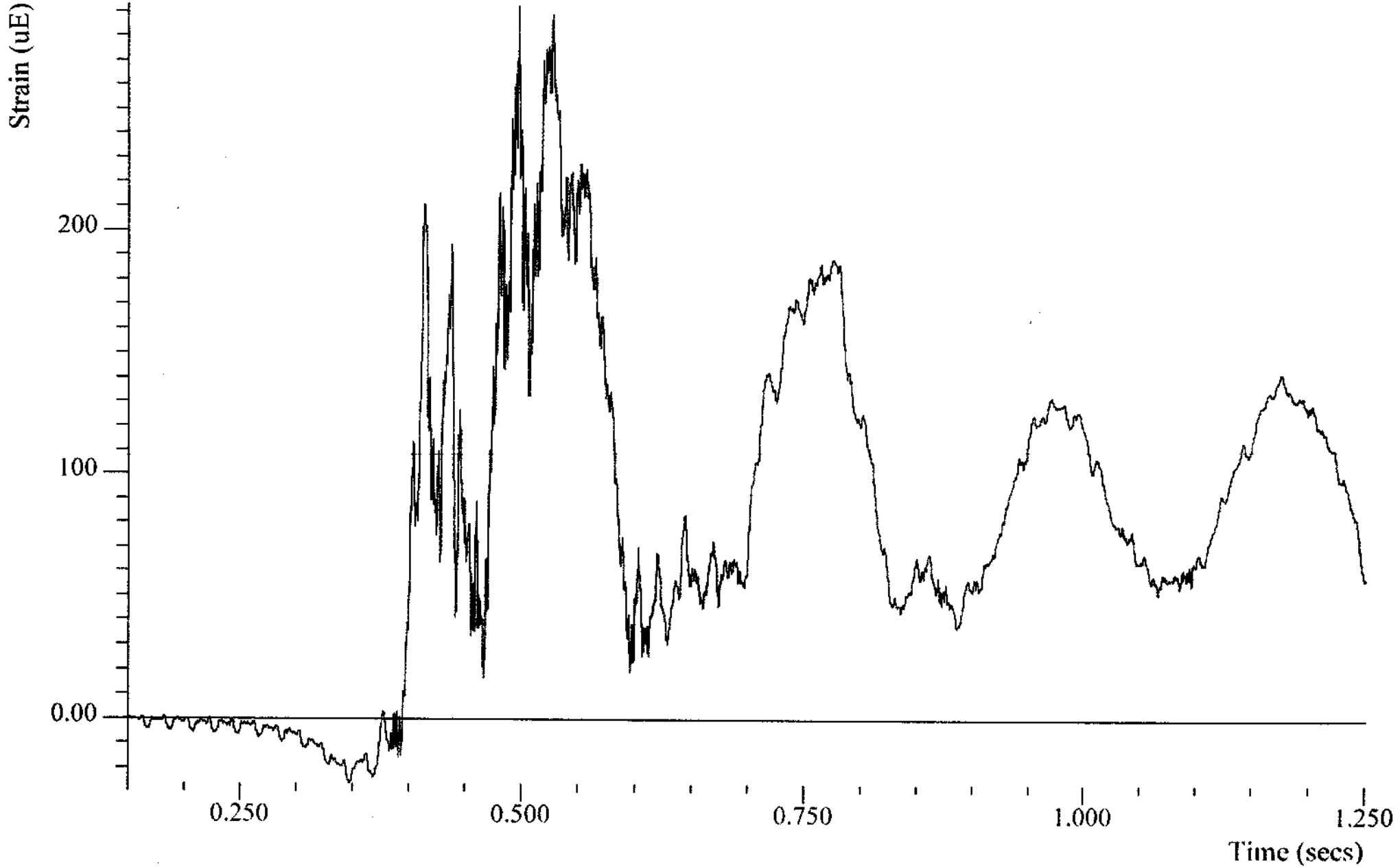
Test: HSE 10 (C2 I2 O1 DL)
Strain Gauge ST-302



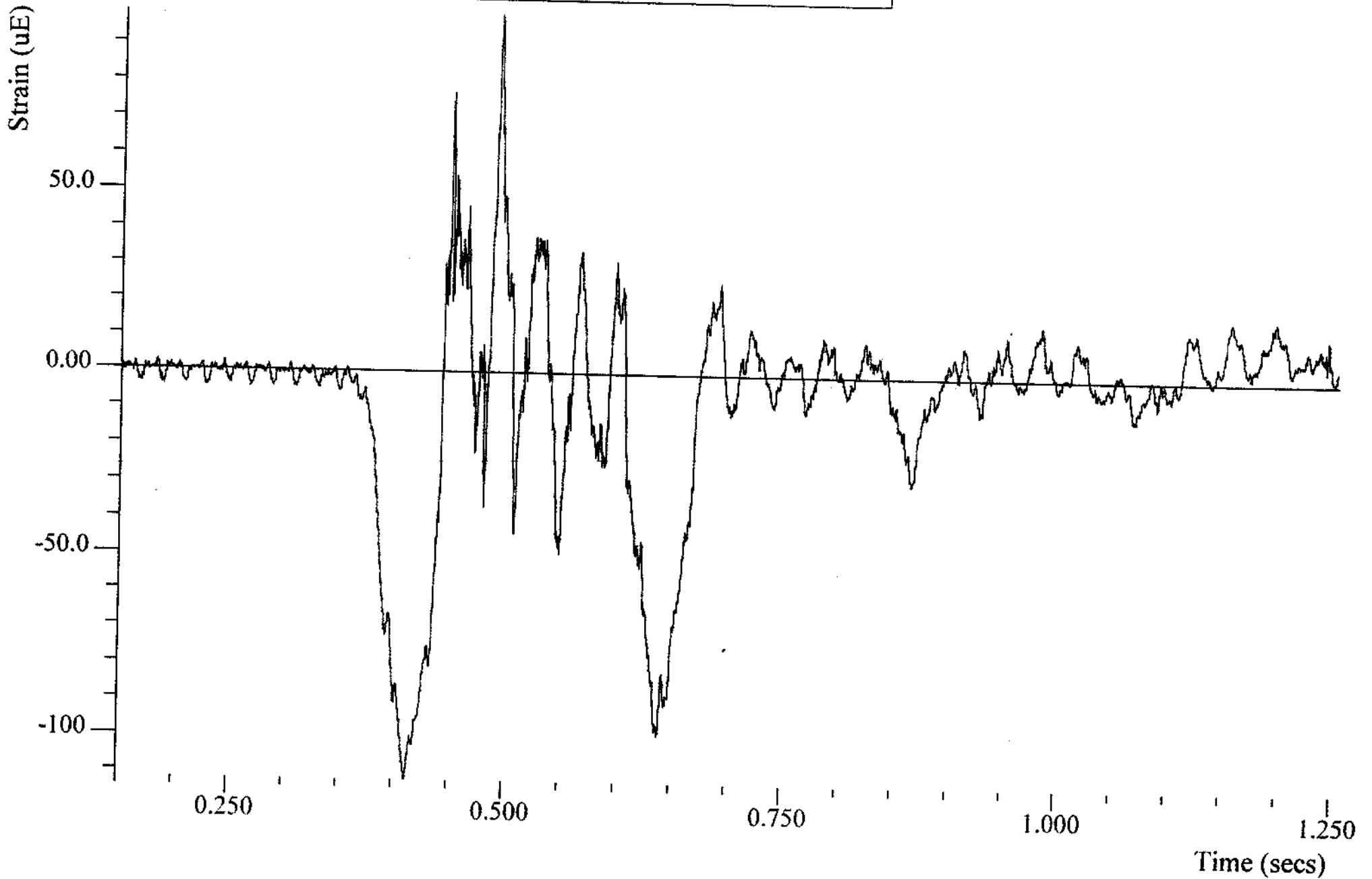
Test: HSE 10 (C2 I2 O1 DL)
Strain Gauge ST-303



Test: HSE 10 (C2 I2 O1 DL)
Strain Gauge ST-304



Test: HSE 10 (C2 I2 O1 DL)
Strain Gauge ST-306

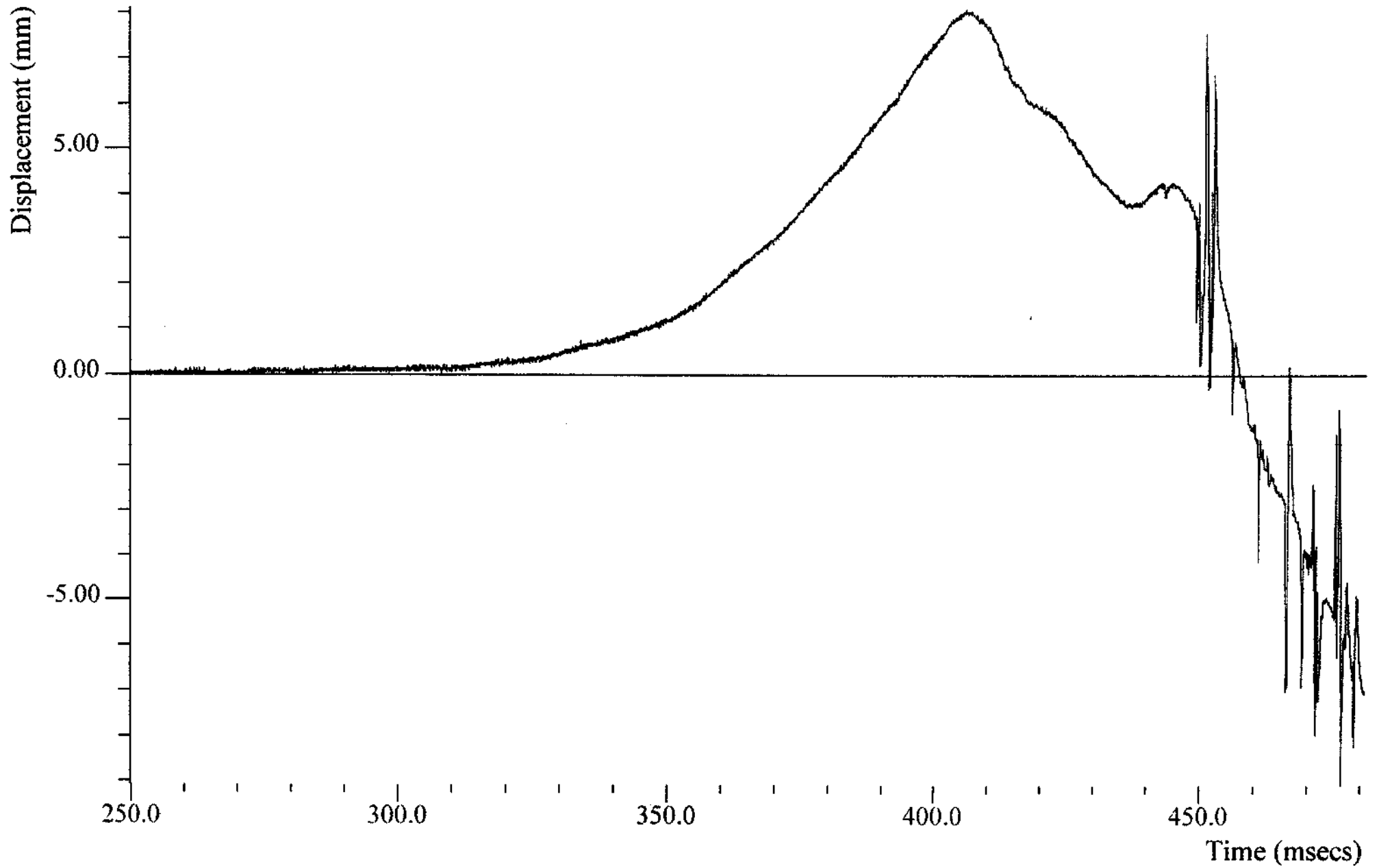


Appendix D: Linear Displacement Transducer Profiles

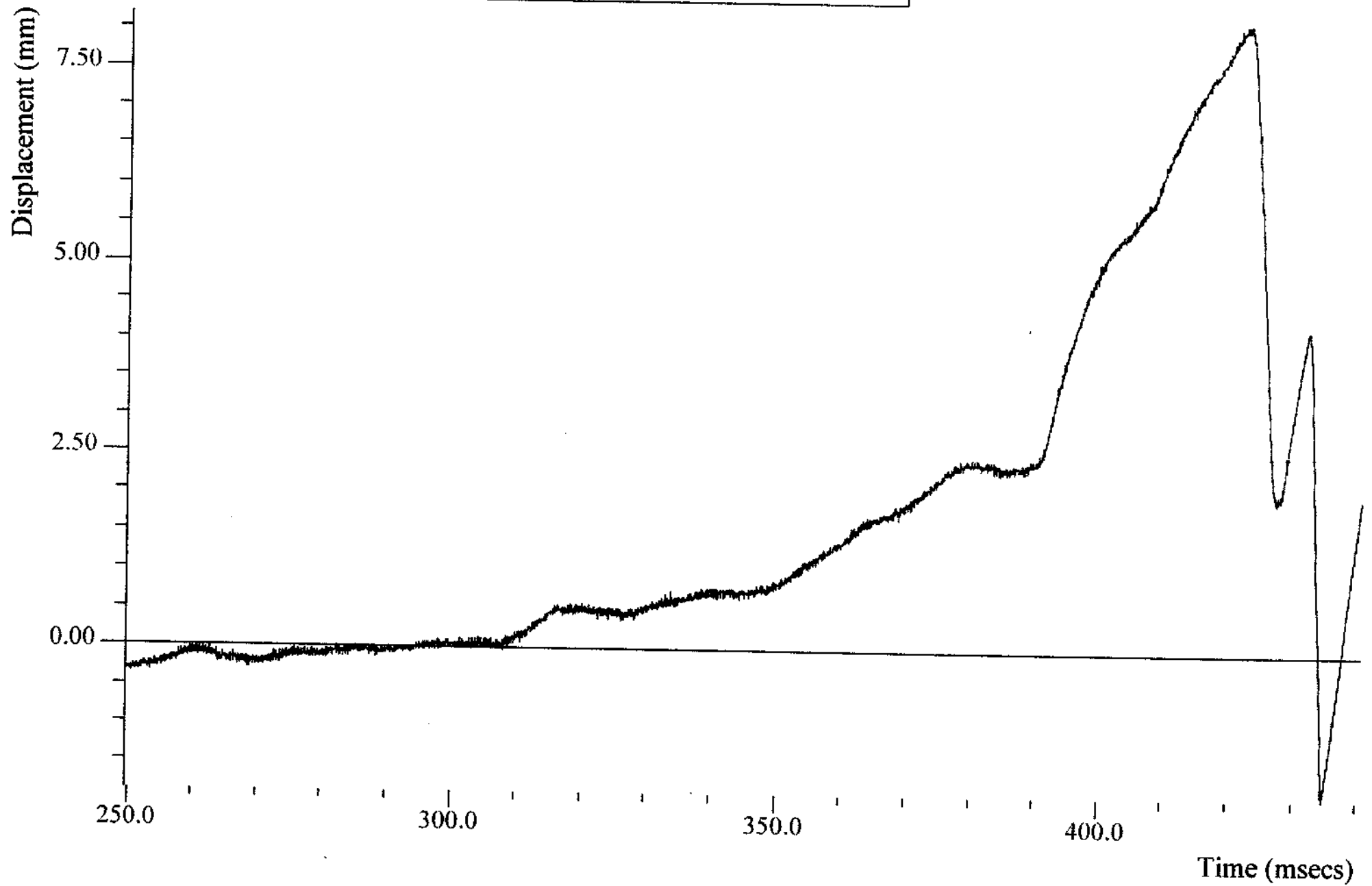
Table D1: Location of Linear Displacement Transducers

Measuring Position	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)
LD-201	0.00	-0.66	4.00
LD-202	11.50	-0.60	4.00
LD-203	24.00	-0.66	4.00

Test: HSE 10 (C2 I2 O1 DL)
Transducer no: LD-201



Test: HSE 10 (C2 I2 O1 DL)
Transducer no: LD-202



Test: HSE 10 (C2 I2 O1 DL)
Transducer no: LD-203

