



**Health & Safety  
Executive**

**OFFSHORE TECHNOLOGY  
REPORT - OTO 98 104**

**A Study of the Repeatability of  
Explosion Tests  
Preliminary Data Report for Test 8**

# Explosions in Full Scale Offshore Module Geometries

Health & Safety Executive Contract MaTSU 8847/3522

## Preliminary Data Report for Test 8

<b>Summary of Experimental Conditions</b>	
<b>Date</b>	21st July 1997
<b>Time</b>	15:37
<b>Test Series</b>	C
<b>Confinement Configuration</b>	C2
<b>Obstacle Configuration</b>	O1
<b>Ignition Position</b>	(X:13.5, Y:5, Z:4.25)
<b>Mean Equivalence Ratio</b>	1.08
<b>Water Sprays</b>	None
<b>Polythene Cut</b>	No

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

## CONTENTS

Table 1:	Flame Arrival Times
Table 2:	Internal Overpressures
Table 3:	External Overpressures
Table 4:	Gas Concentrations
Table 5:	Weather Conditions
Table 6:	Confinement Configuration
Appendix A	Internal Overpressure Profiles
Appendix B	External Overpressure Profiles
Appendix C	Strain Gauge Profiles
Appendix D	Linear Displacement Transducer Profiles

**Table 1: Flame Arrival Times**

<b>Ionisation Probe</b>	<b>X Co-ord (m)</b>	<b>Y Co-ord (m)</b>	<b>Z Co-ord (m)</b>	<b>Flame Arrival Time (msec)</b>
IP-1	0.50	0.50	2.00	544.80
IP-2	6.00	0.50	2.00	528.00
IP-3	10.00	0.50	2.00	490.40
IP-4	14.00	0.50	2.00	424.30
IP-5	18.00	0.50	2.00	504.70
IP-6	22.00	0.50	2.00	523.70
IP-7	27.50	0.50	2.00	546.00
IP-8	0.50	4.00	2.00	543.20
IP-9	6.00	4.00	2.00	525.50
IP-10	14.00	4.00	2.00	434.60
IP-11	22.00	4.00	2.00	537.10
IP-12	27.50	4.00	2.00	543.70
IP-13	0.50	8.00	2.00	543.40
IP-14	6.00	8.00	2.00	526.30
IP-15	10.00	8.00	2.00	494.00
IP-16	14.00	8.00	2.00	461.30
IP-17	18.00	8.00	2.00	509.50
IP-18	22.00	8.00	2.00	529.60
IP-19	27.50	8.00	2.00	545.70
IP-20	0.50	11.50	2.00	543.90
IP-21	2.00	11.50	2.00	539.10
IP-22	6.00	11.50	2.00	525.10
IP-23	10.00	11.50	2.00	506.10
IP-24	14.00	11.50	2.00	505.40
IP-25	18.00	11.50	2.00	516.70
IP-26	22.00	11.50	2.00	527.20
IP-27	26.00	11.50	2.00	541.20
IP-28	27.50	11.50	2.00	546.30
IP-29	0.50	0.50	4.00	544.60
IP-30	6.00	0.50	4.00	519.50
IP-31	10.00	0.50	4.00	509.80
IP-32	14.00	0.50	4.00	391.10
IP-33	18.00	0.50	4.00	496.00

<b>Ionisation Probe</b>	<b>X Co-ord (m)</b>	<b>Y Co-ord (m)</b>	<b>Z Co-ord (m)</b>	<b>Flame Arrival Time (msec)</b>
IP-34	22.00	0.50	4.00	521.00
IP-35	26.00	0.50	4.00	539.70
IP-36	27.50	0.50	4.00	544.10
IP-37	0.5	4.00	4.00	541.90
IP-38	6.00	4.00	4.00	510.80
IP-39	14.00	4.00	4.00	186.30
IP-40	22.00	4.00	4.00	515.60
IP-41	26.00	4.00	4.00	535.80
IP-42	27.50	4.00	4.00	542.20
IP-43	0.50	8.00	4.00	539.80
IP-44	2.00	8.00	4.00	534.60
IP-45	6.00	8.00	4.00	516.80
IP-46	10.00	8.00	4.00	473.10
IP-47	14.00	8.00	4.00	426.70
IP-48	18.00	8.00	4.00	489.00
IP-49	22.00	8.00	4.00	517.80
IP-50	26.00	8.00	4.00	537.30
IP-51	27.50	8.00	4.00	541.40
IP-52	26.00	10.00	4.00	543.40
IP-53	27.50	10.00	4.00	544.30
IP-54	0.50	11.50	4.00	542.50
IP-55	2.00	11.50	4.00	539.60
IP-56	6.00	11.50	4.00	525.80
IP-57	10.00	11.50	4.00	508.00
IP-58	14.00	11.50	4.00	512.30
IP-59	18.00	11.50	4.00	517.60
IP-60	22.00	11.50	4.00	529.90
IP-61	26.00	11.50	4.00	541.00
IP-62	27.50	11.50	4.00	544.30
IP-63	0.50	0.50	6.00	546.80
IP-64	6.00	0.50	6.00	531.10
IP-65	10.00	0.50	6.00	515.40
IP-66	14.00	0.50	6.00	513.30
IP-67	18.00	0.50	6.00	517.50

<b>Ionisation Probe</b>	<b>X Co-ord (m)</b>	<b>Y Co-ord (m)</b>	<b>Z Co-ord (m)</b>	<b>Flame Arrival Time (msec)</b>
IP-68	22.00	0.50	6.00	530.40
IP-69	27.50	0.50	6.00	550.50
IP-70	0.50	4.00	6.00	543.40
IP-71	6.00	4.00	6.00	524.00
IP-72	14.00	4.00	6.30	414.20
IP-73	22.00	4.00	6.00	525.80
IP-74	27.50	4.00	6.00	544.90
IP-75	0.50	8.00	6.00	544.90
IP-76	6.00	8.00	6.00	523.40
IP-77	10.00	8.00	6.00	500.70
IP-78	14.00	8.00	6.00	449.40
IP-79	18.00	8.00	6.00	489.30
IP-80	22.00	8.00	6.00	524.00
IP-81	27.50	8.00	6.00	543.20
IP-82	0.50	11.50	6.00	551.20
IP-83	2.00	11.50	6.00	541.60
IP-84	6.00	11.50	6.00	533.50
IP-85	10.00	11.50	6.00	514.30
IP-86	14.00	11.50	6.00	511.30
IP-87	18.00	11.50	6.00	517.50
IP-88	22.00	11.50	6.00	531.20
IP-89	26.00	11.50	6.00	543.40
IP-90	27.50	11.50	6.00	545.70

**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	0.80	0.00	1.50	4470	2491	548.00	11.90	26.80
PI-2	5.80	0.00	1.50	2389	1564	552.40	37.30	68.20
PI-3	13.90	0.00	1.50	1466	1405	562.40	59.80	80.90
PI-4	21.90	0.00	1.50	2005	1418	558.30	48.00	68.00
PI-5	26.90	0.00	1.50	3921	1713	545.20	14.30	46.20
PI-6	0.50	6.00	0.00	4000	3214	550.70	14.60	27.30
PI-7	9.00	6.00	0.00	1624	1416	558.50	59.20	82.80
PI-8	14.00	6.00	0.00	1711	1364	567.20	69.50	87.10
PI-9	21.00	6.00	0.00	1121	1060	549.70	49.40	81.60
PI-10	27.50	6.00	0.00	1605	1455	544.30	19.30	54.40
PI-11	0.50	11.50	0.00	1946	1727	546.70	18.50	34.70
PI-12	12.30	11.50	0.00	1178	1020	562.90	70.90	89.80
PI-13	27.50	11.50	0.00	2,671	2270	549.10	17.40	25.90
PI-14	0.80	0.50	4.00	3974	2798	546.60	9.40	22.30
PI-15	4.50	0.60	4.00	1558	1406	553.80	39.20	64.90
PI-16	11.20	0.00	5.50	1521	1450	563.70	61.20	80.20
PI-17	12.00	0.50	4.00	1817	1426	563.80	60.90	77.80
PI-18	22.00	0.50	4.00	1207	1136	558.90	53.40	77.00
PI-19	27.50	0.50	4.00	2277	1481	547.80	17.30	51.10
PI-20	10.20	4.00	4.00	1421	1303	560.60	62.20	83.30
PI-21	0.50	7.00	4.00	1371	1223	546.50	24.20	51.60
PI-22	18.00	8.00	4.00	1144	1017	556.30	66.50	90.30
PI-23	27.50	6.00	4.00	1484	1202	548.40	26.20	54.40
PI-24	0.50	11.50	4.00	1633	1328	543.50	16.10	43.20
PI-25	10.00	11.50	4.00	713	642	560.00	74.50	95.00
PI-26	18.00	11.50	4.00	785	697	559.20	68.20	89.20
PI-27	27.50	11.50	4.00	3095	2150	545.10	11.40	30.60
PI-28	0.80	0.80	8.00	4301	3243	550.10	11.40	21.00
PI-29	13.90	1.70	8.00	1823	1530	564.60	58.80	72.80
PI-30	26.10	1.70	8.00	7974	2219	555.20	27.50	29.50
PI-31	5.90	5.00	8.00	-	-	-	-	-
PI-32	18.90	5.00	8.00	1745	1317	559.00	56.60	79.10
PI-33	1.10	11.10	8.00	3856	1402	552.50	21.80	23.90
PI-34	12.80	11.20	8.00	928	811	561.50	67.80	88.00
PI-35	26.10	11.30	8.00	-	-	-	-	-

**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	34.00	6.00	1.00	1616	1247
PE-2	40.00	6.00	1.00	1163	841
PE-3	52.00	6.00	1.00	1061	889
PE-4	76.00	6.00	1.00	394	235
PE-5	47.20	25.20	1.00	705	413
PE-6	61.30	39.30	1.00	285	239
PE-7	14.00	18.00	1.00	673	598
PE-8	14.00	24.00	1.00	-	-
PE-9	14.00	36.00	1.00	532	505
PE-10	14.00	60.00	1.00	368	319
PE-11	-21.20	25.20	1.00	461	374

**Table 4: Gas Concentrations**

Measuring Position	X Co-ord (m)	Y Co-ord (m)	Z Co-ord (m)	Natural Gas Concentration (%)
1	25.70	4.00	0.70	9.60
2	12.00	8.00	0.80	9.60
3	1.20	3.10	1.50	9.50
4	7.70	10.90	3.80	9.50
5	13.50	5.50	4.50	9.60
6	25.90	6.00	5.20	9.50
7	4.00	8.50	4.90	9.50
8	19.80	8.00	7.60	9.60



**Table 5: Weather Conditions**

<b>Air Temperature (°C)</b>	<b>Atmospheric Pressure (mbar)</b>	<b>Wind Speed (ms<sup>-1</sup>)</b>	<b>Wind Direction (° from Magnetic North)</b>
23.20	987	2.50	302

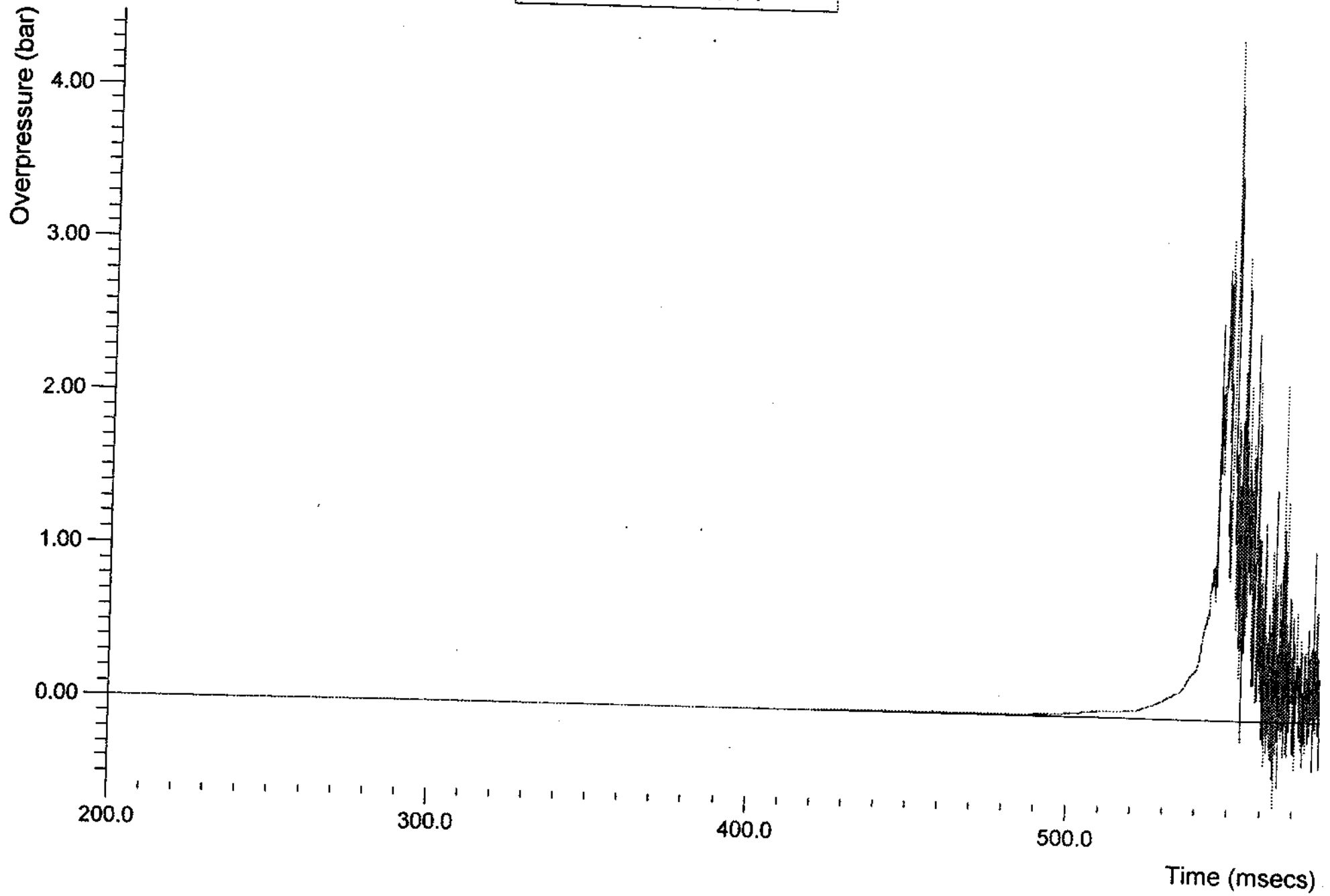
**Table 6: Confinement Configuration**

<b>Confinement Configuration</b>	<b>Rig Face*</b>	<b>Confinement</b>
C2	North	Open
	East	Open
	South	Confined
	West	Open

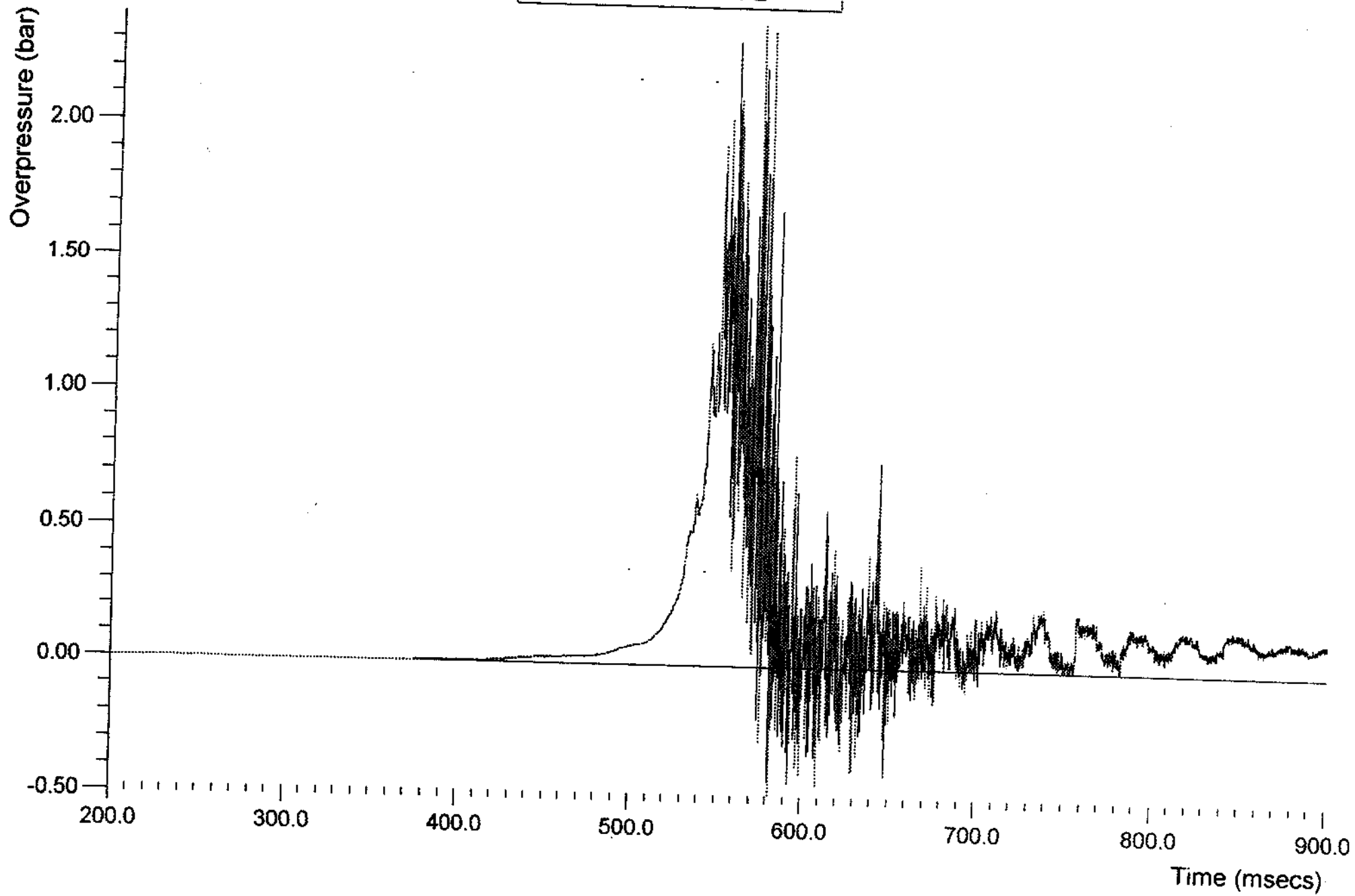
\* - Origin is at the junction of the West and South faces at ground level. Roof and floor also confined.

## **Appendix A: Internal Overpressure Profiles**

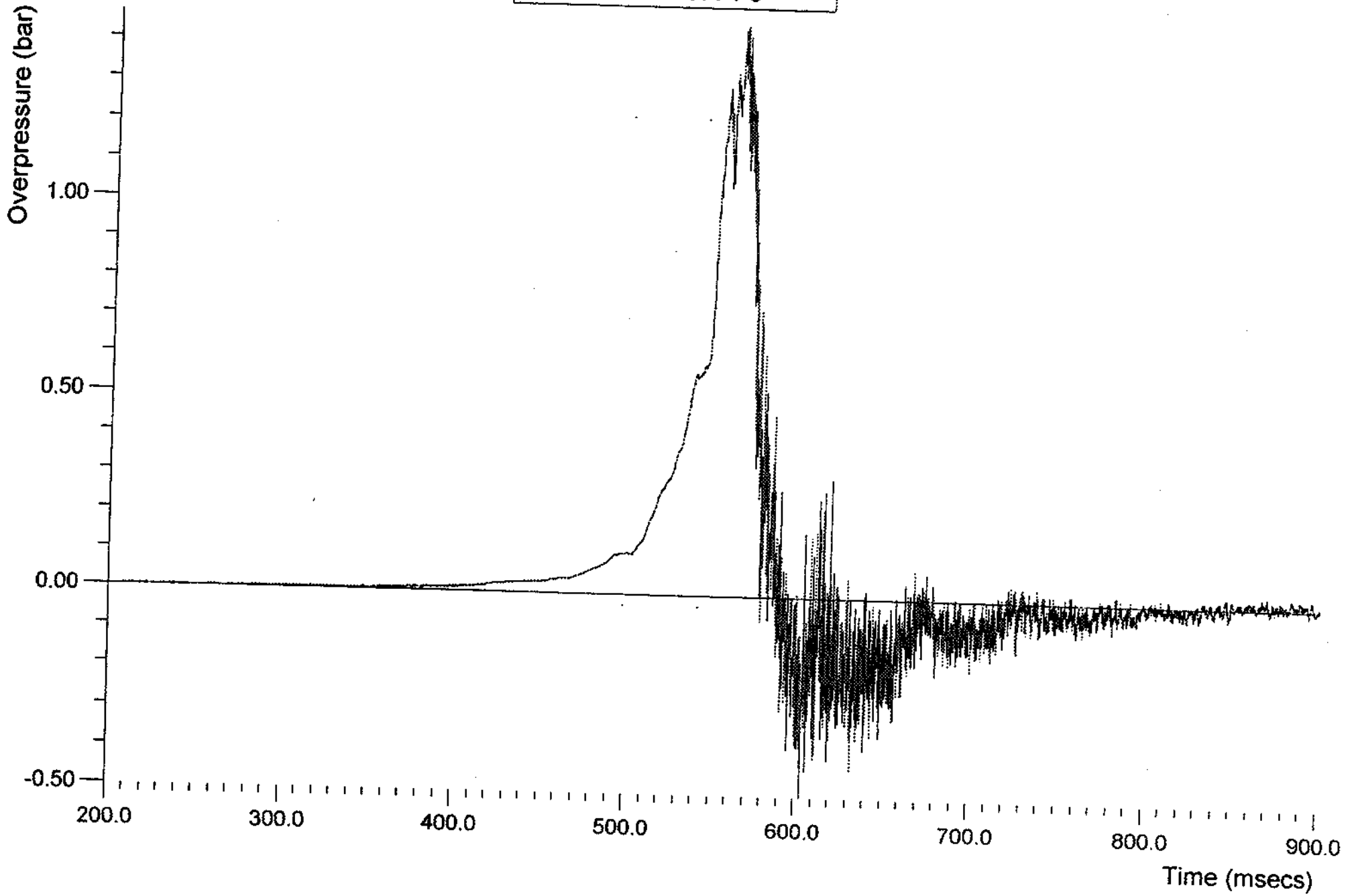
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Transducer no: PI-1



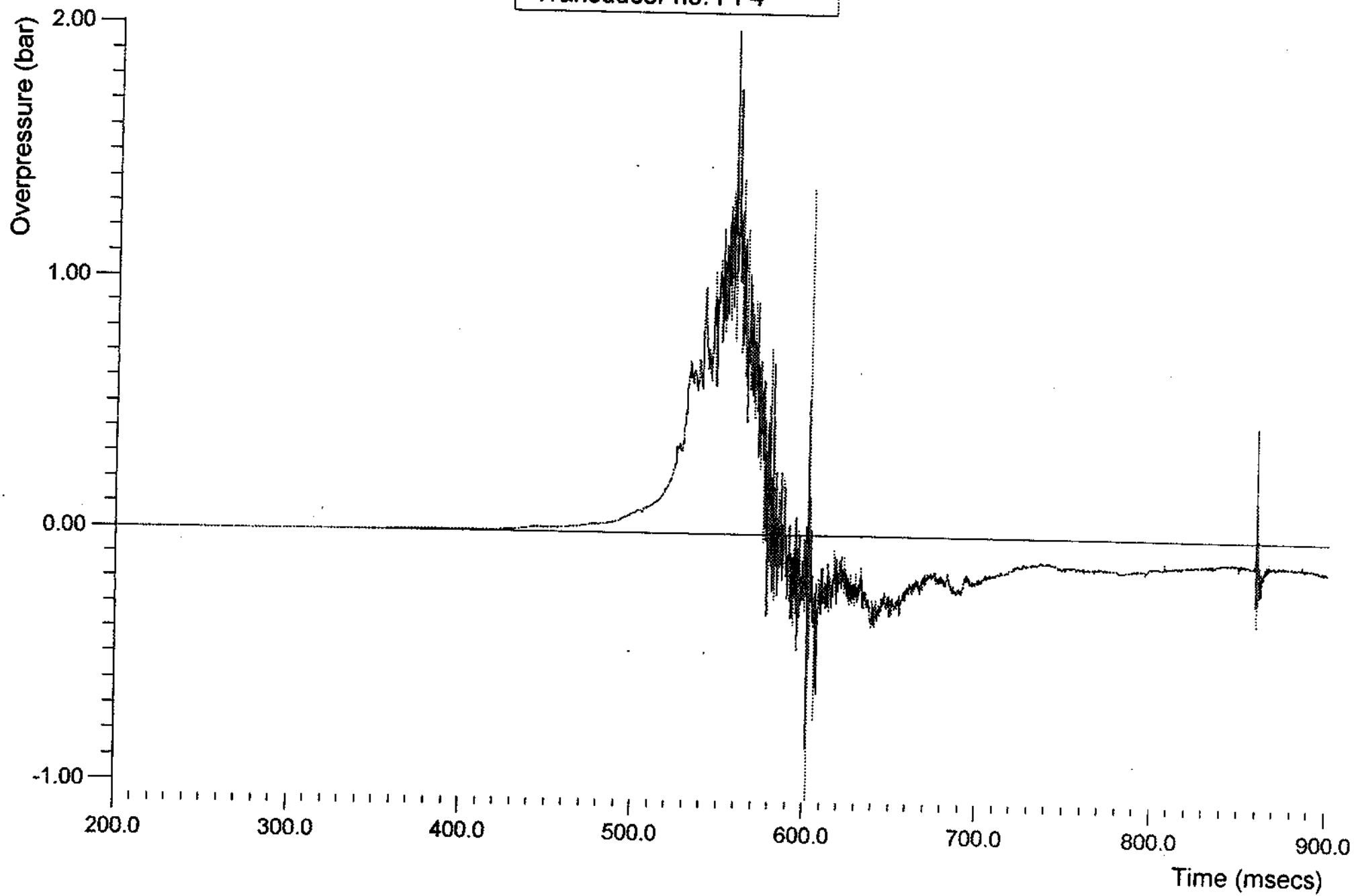
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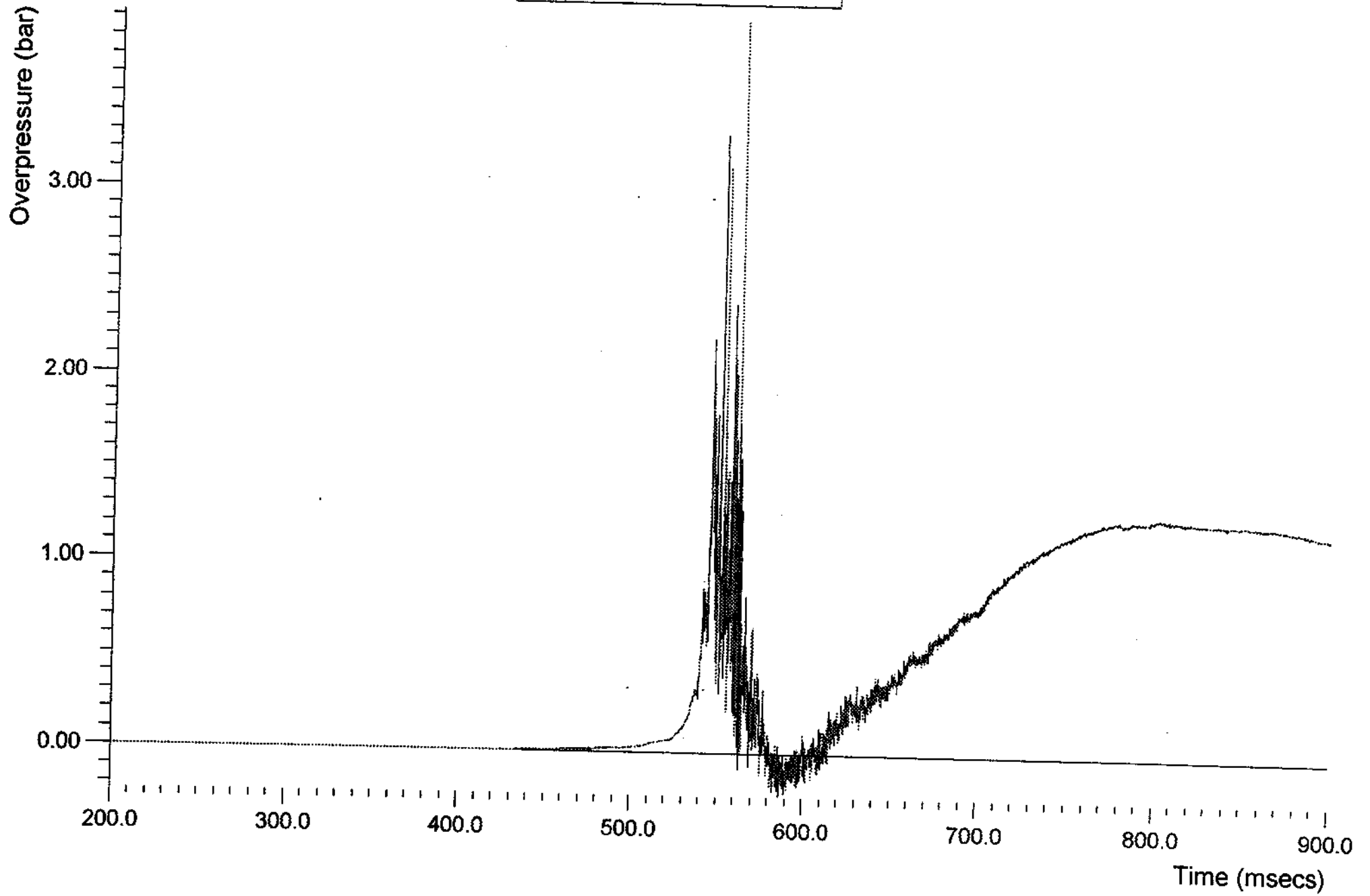
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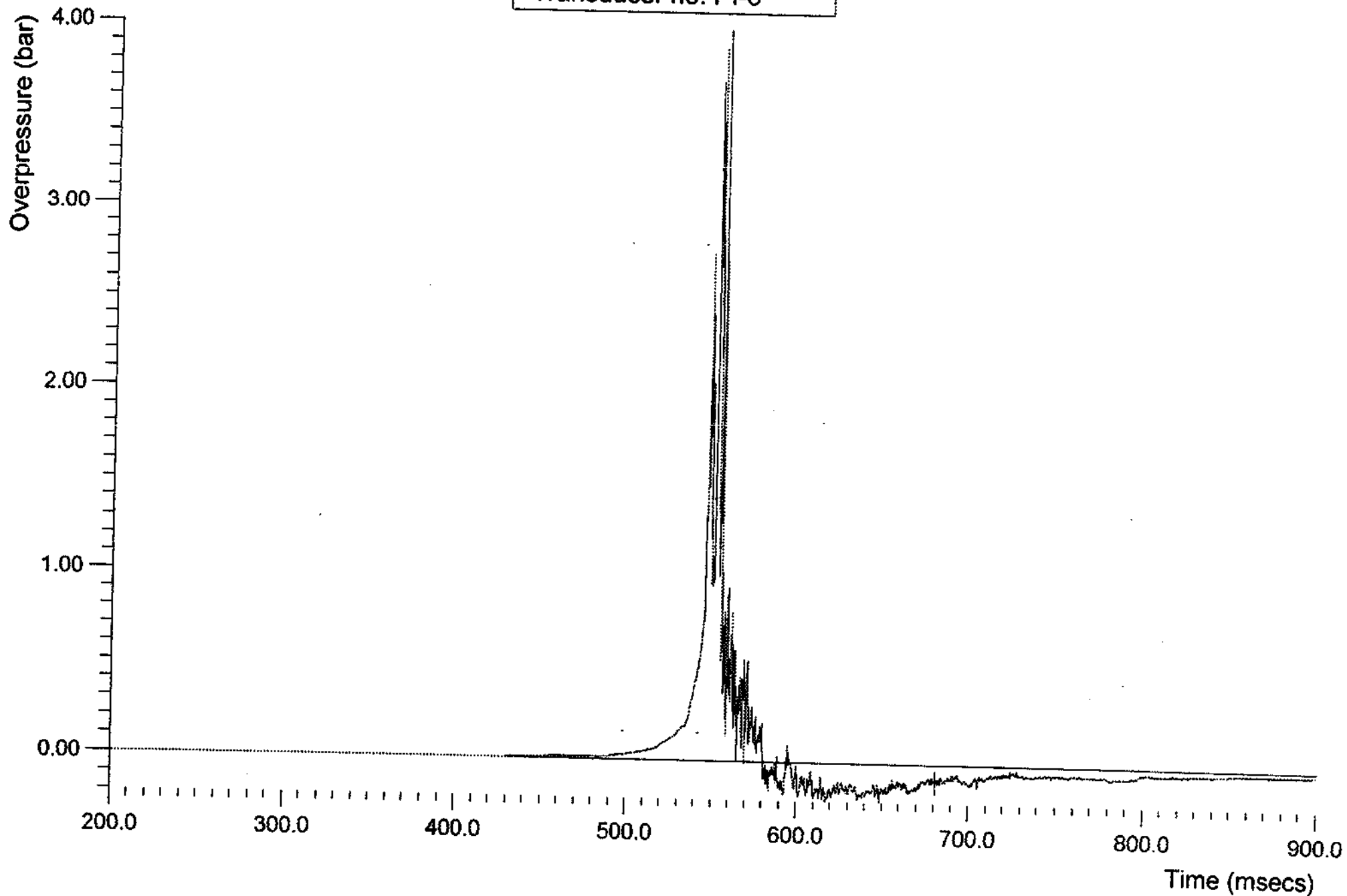
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Test: HSE 8 (O1 C2 I2)  
Transducer no: PI-5

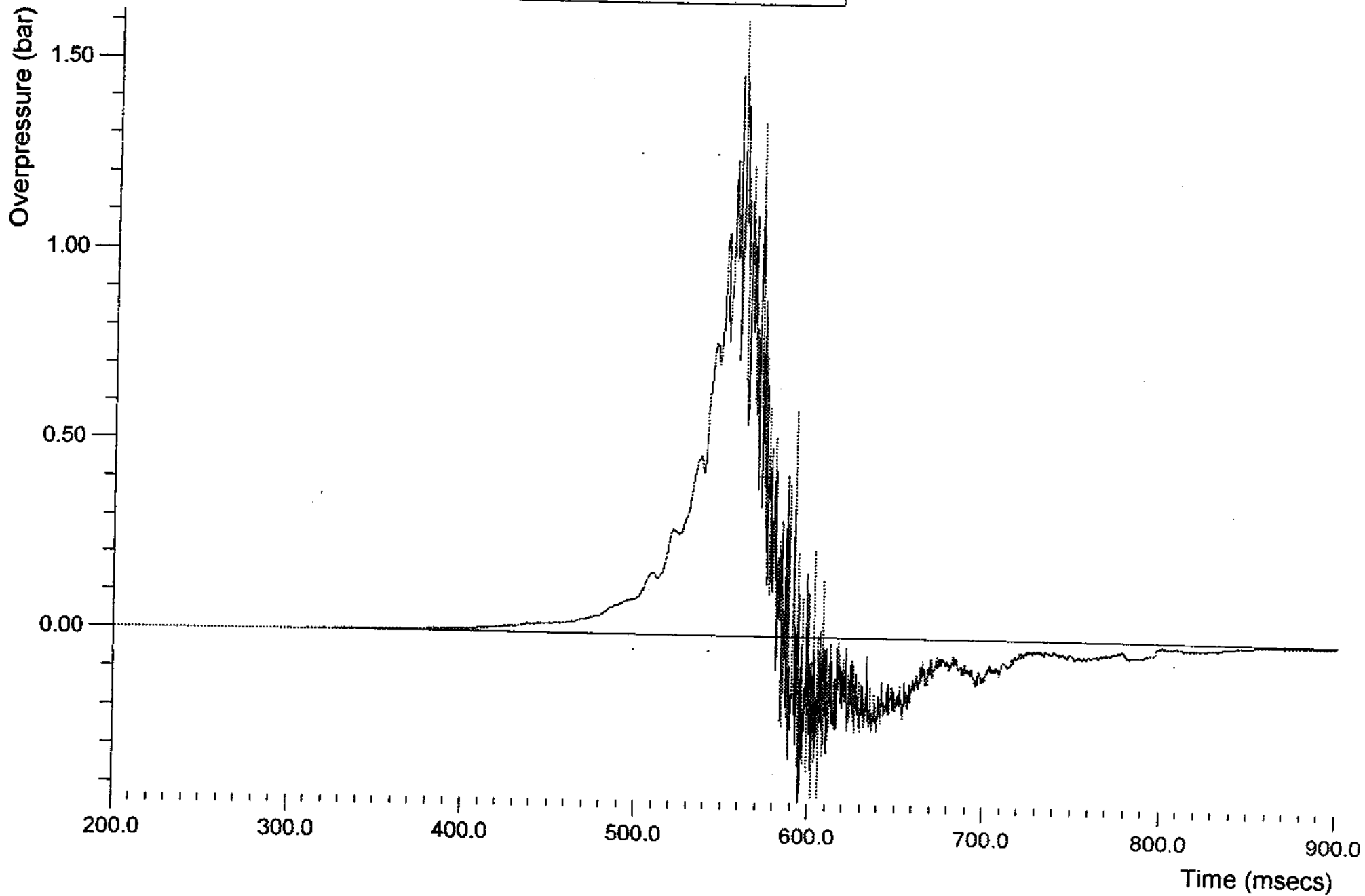


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Transducer no: PI-6

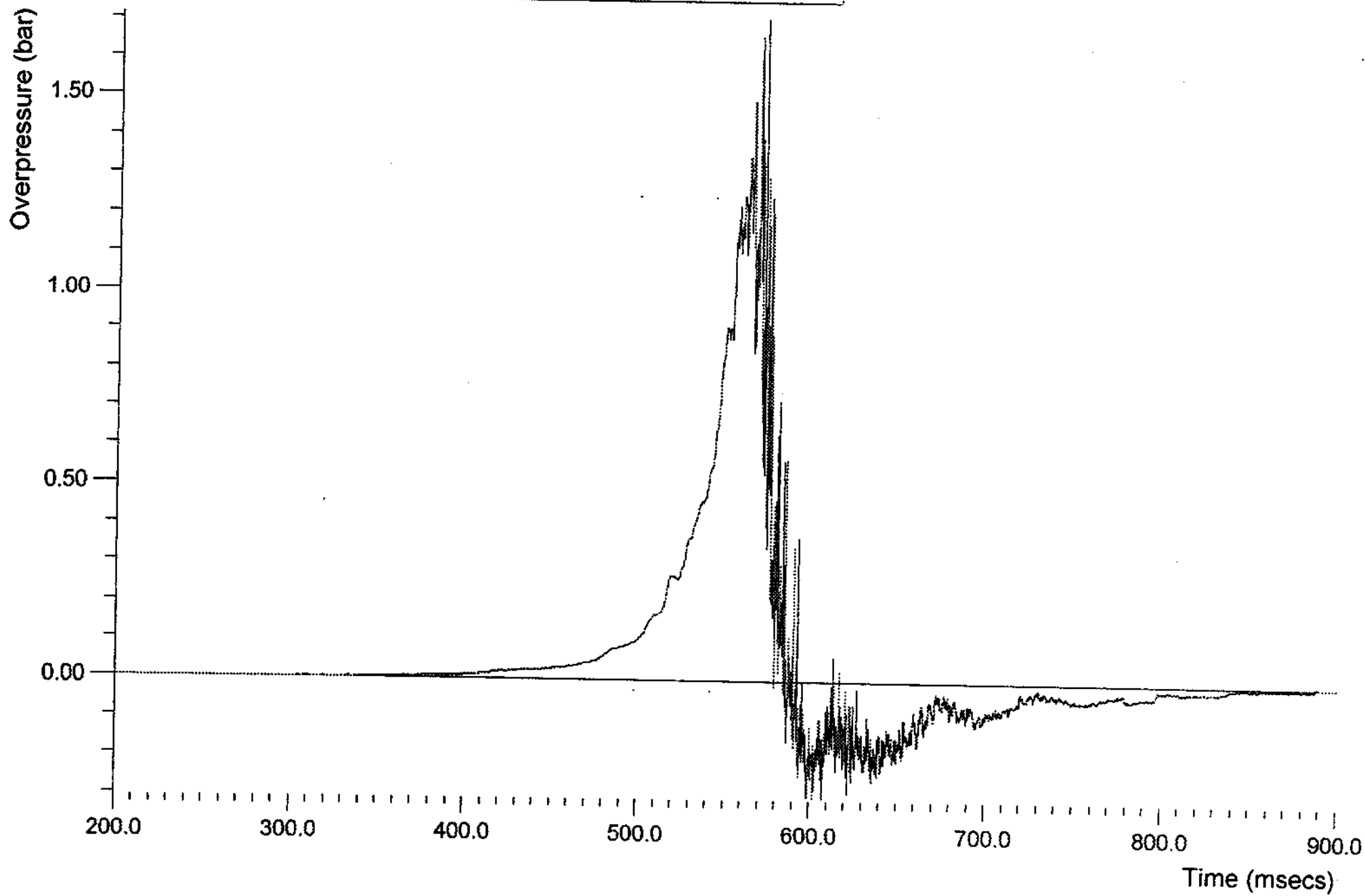




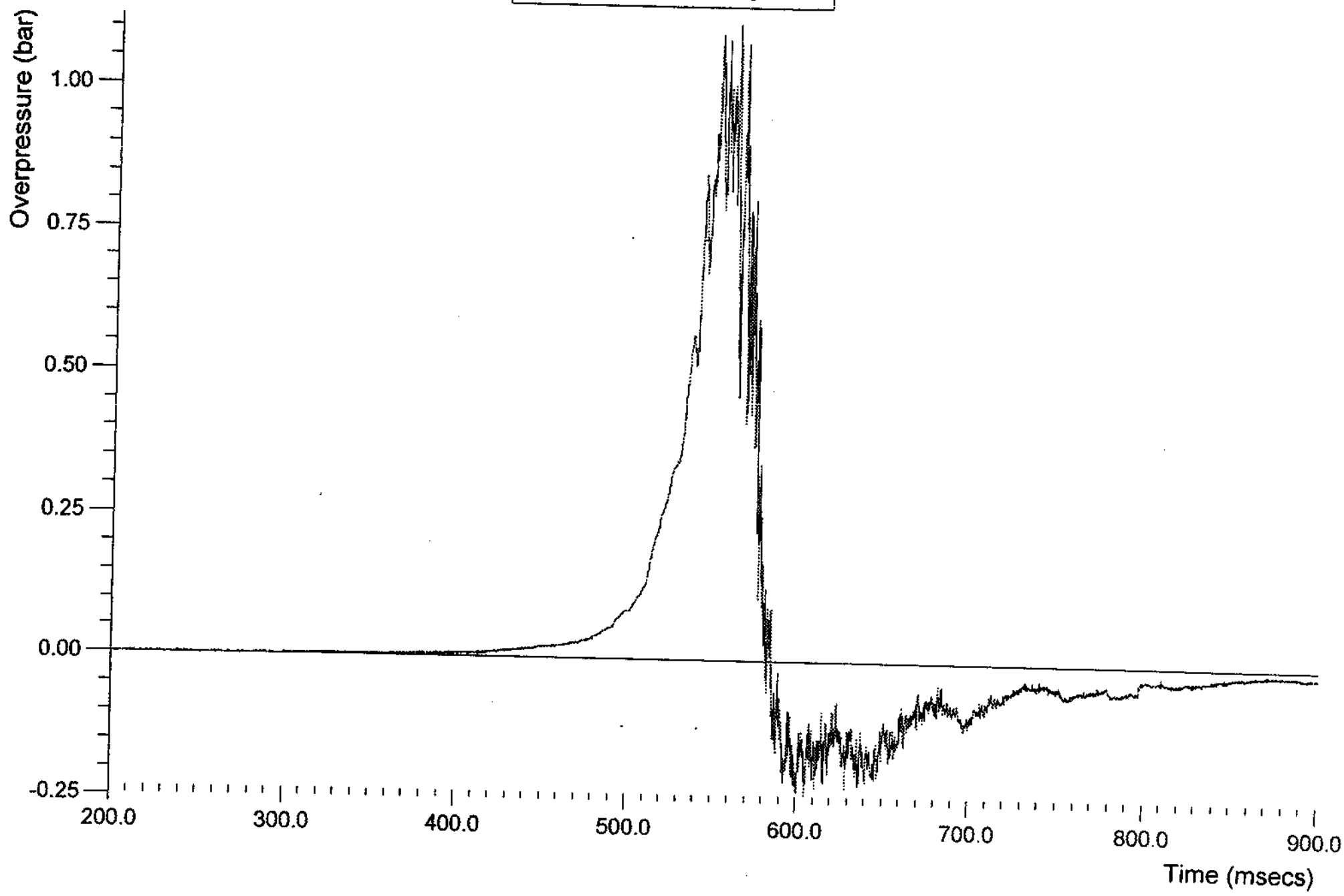
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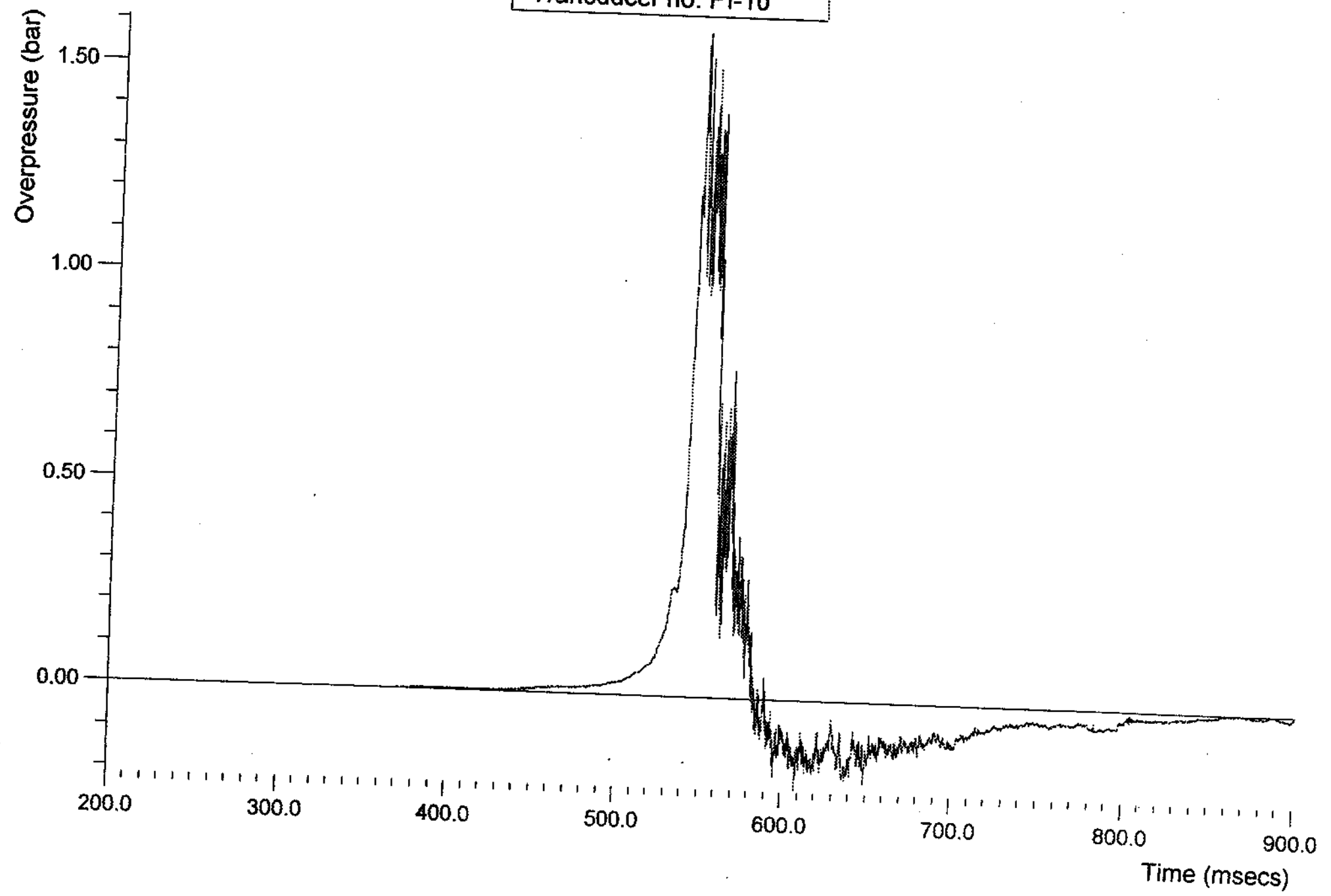
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Transducer no: PI-8



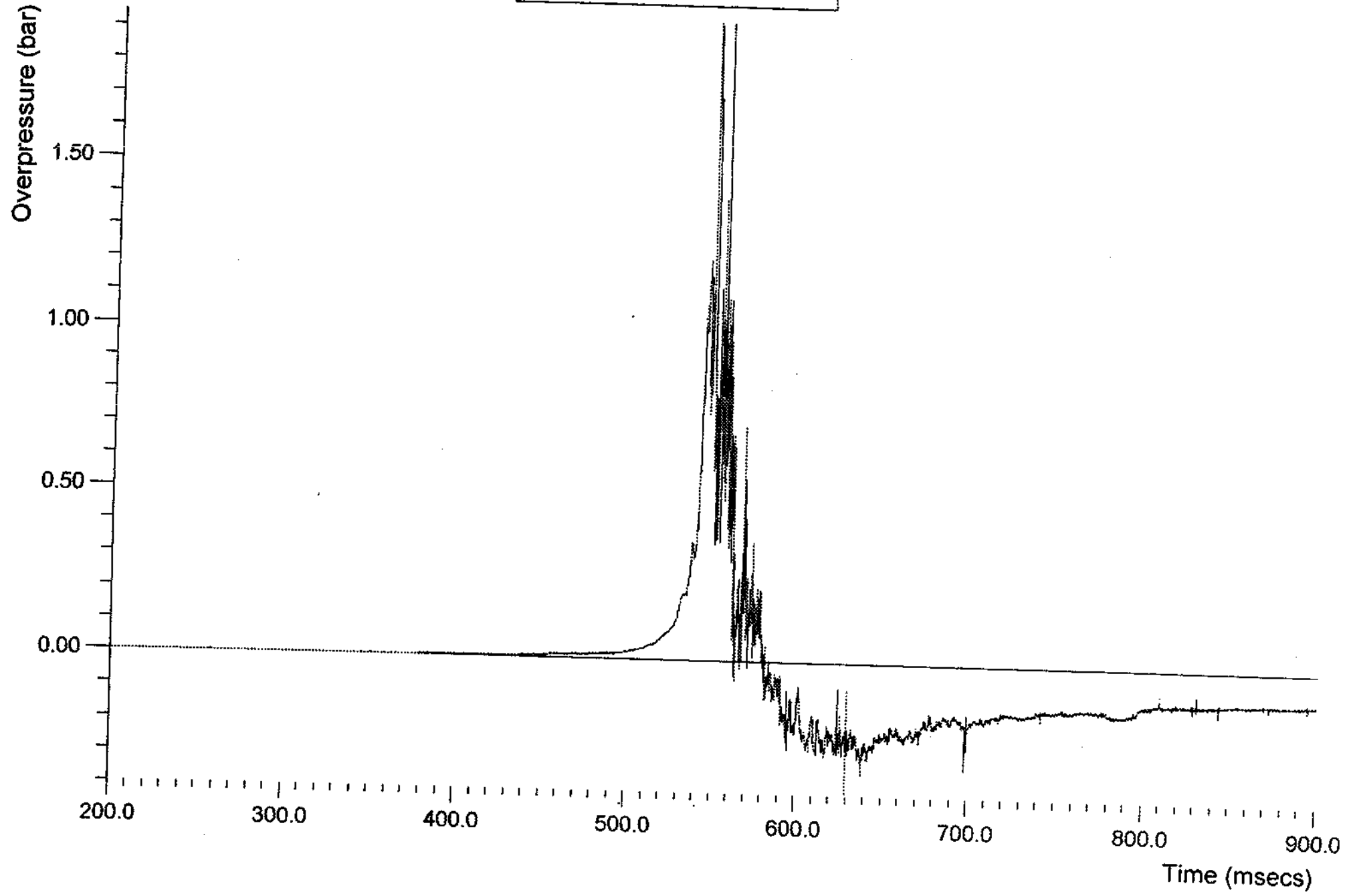
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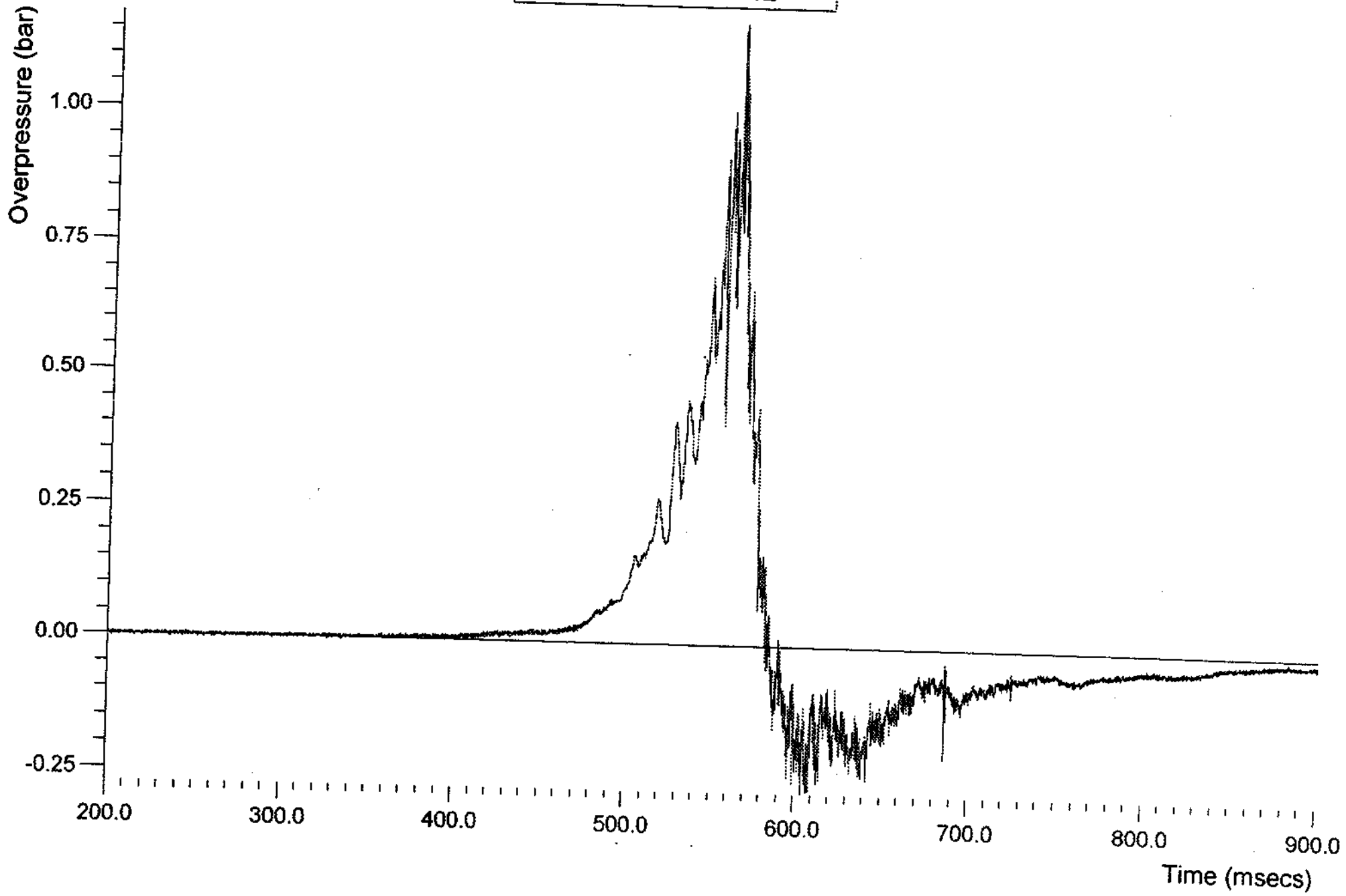
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Transducer no: PI-10



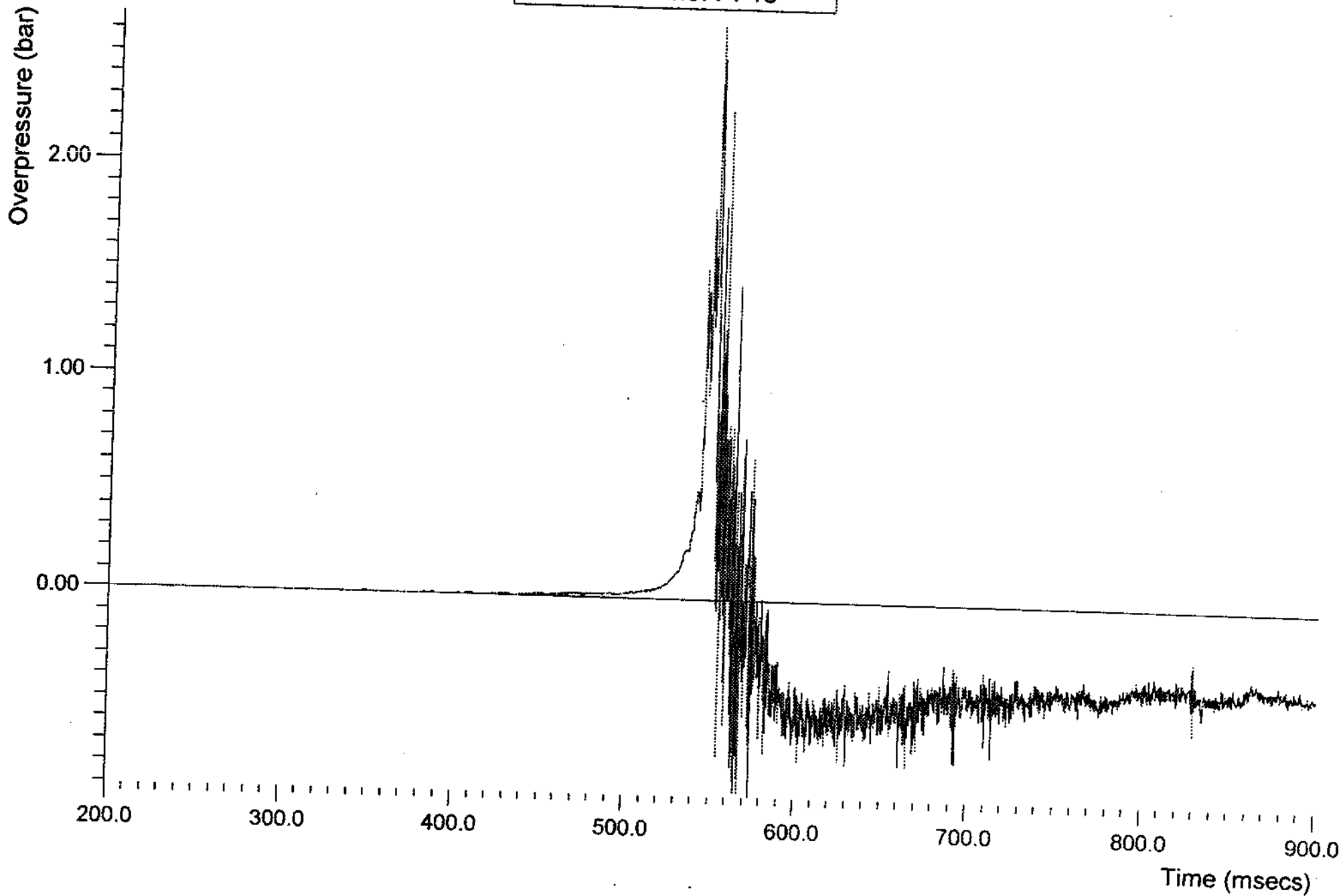
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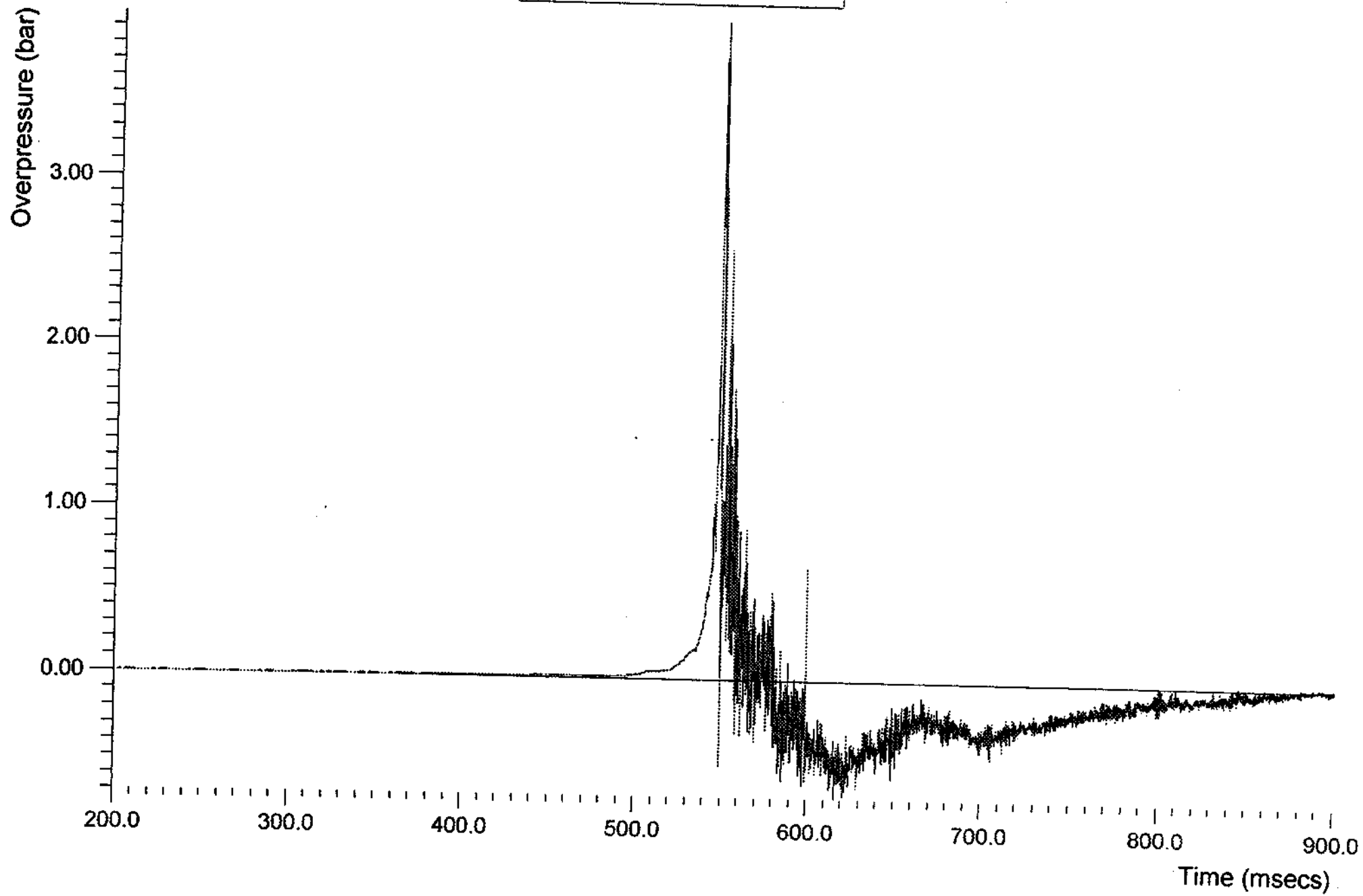
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Test: HSE 8 (O1 C2 I2)  
Transducer no: PI-13

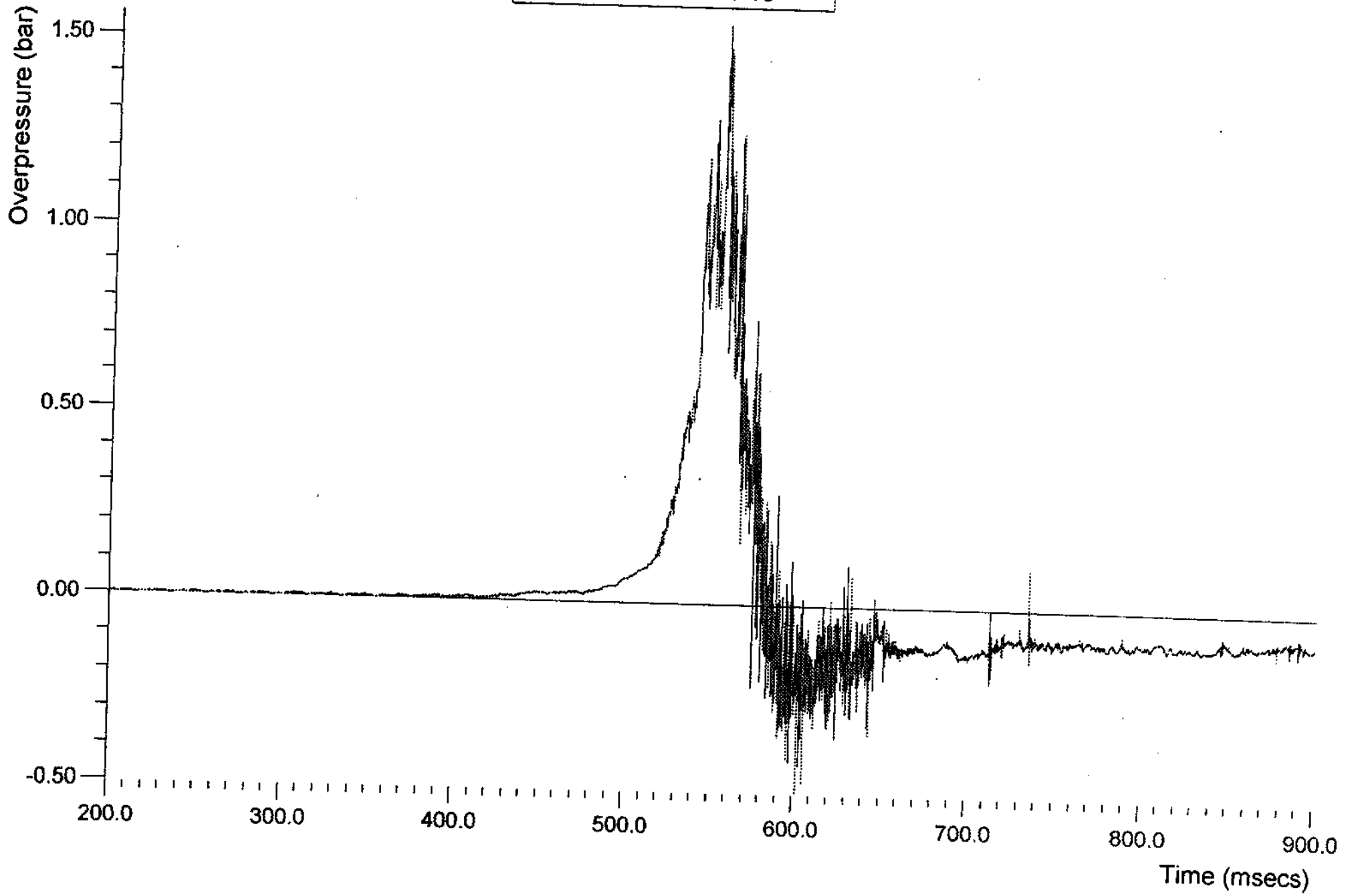


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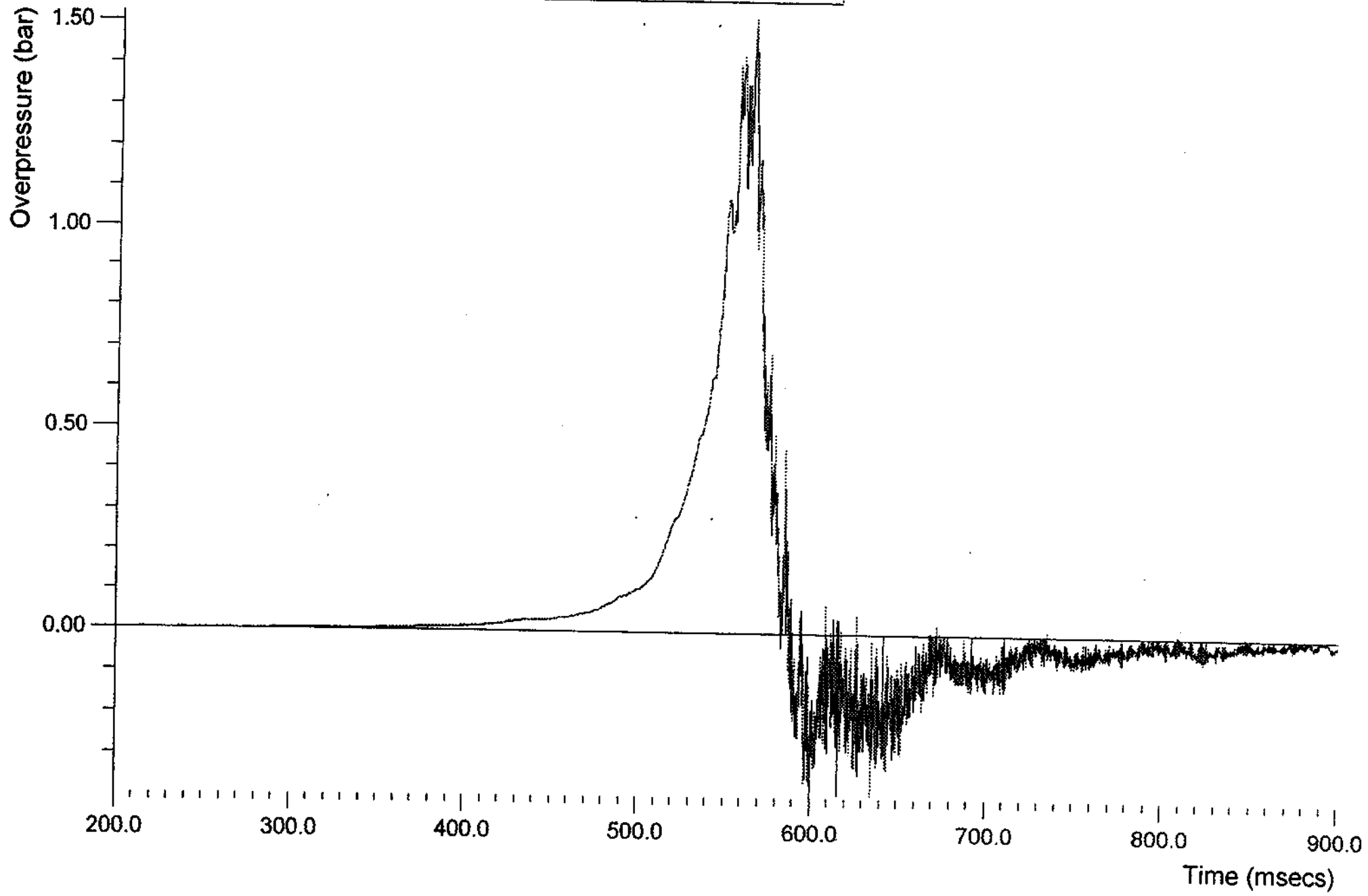




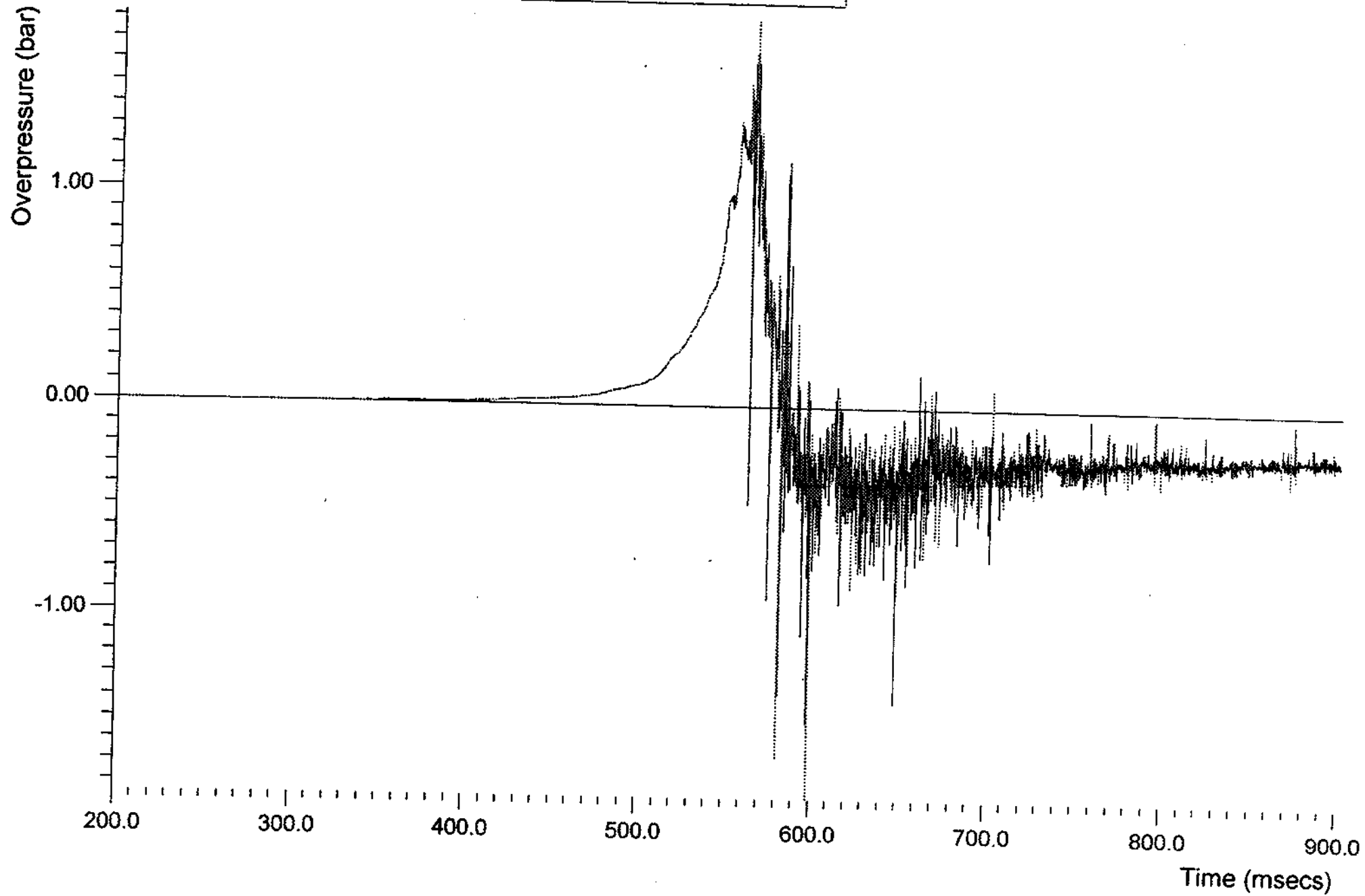
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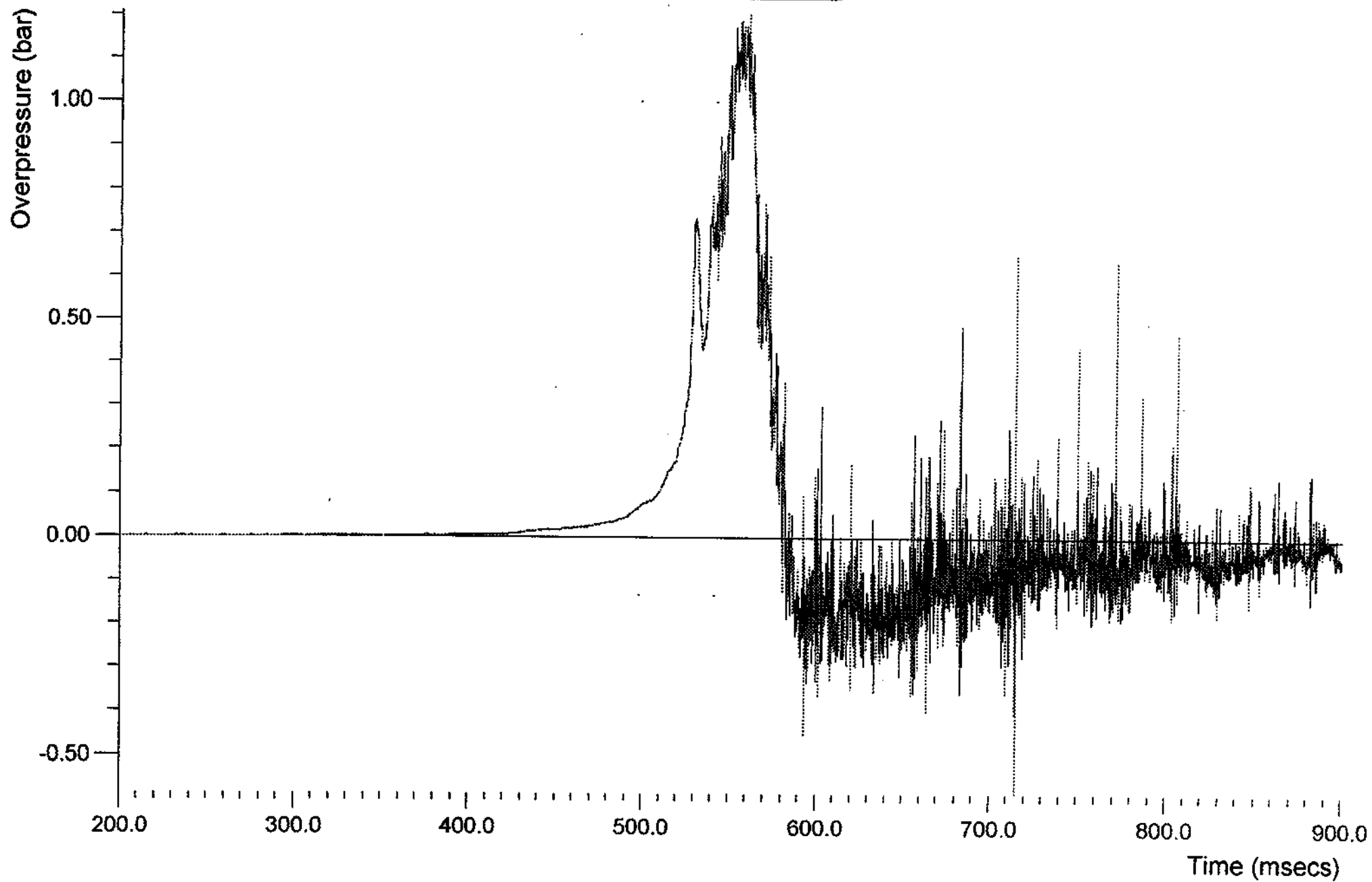
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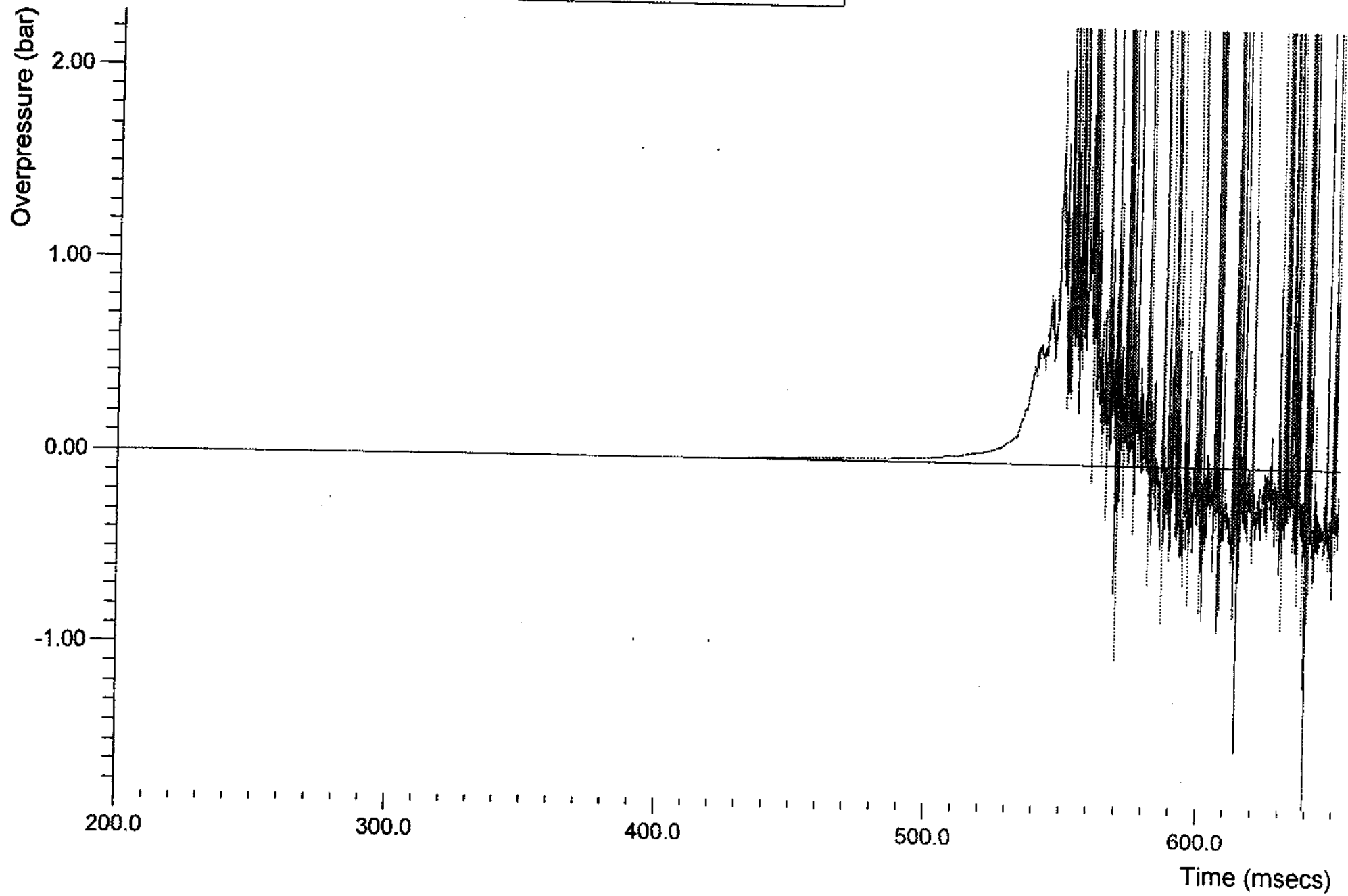
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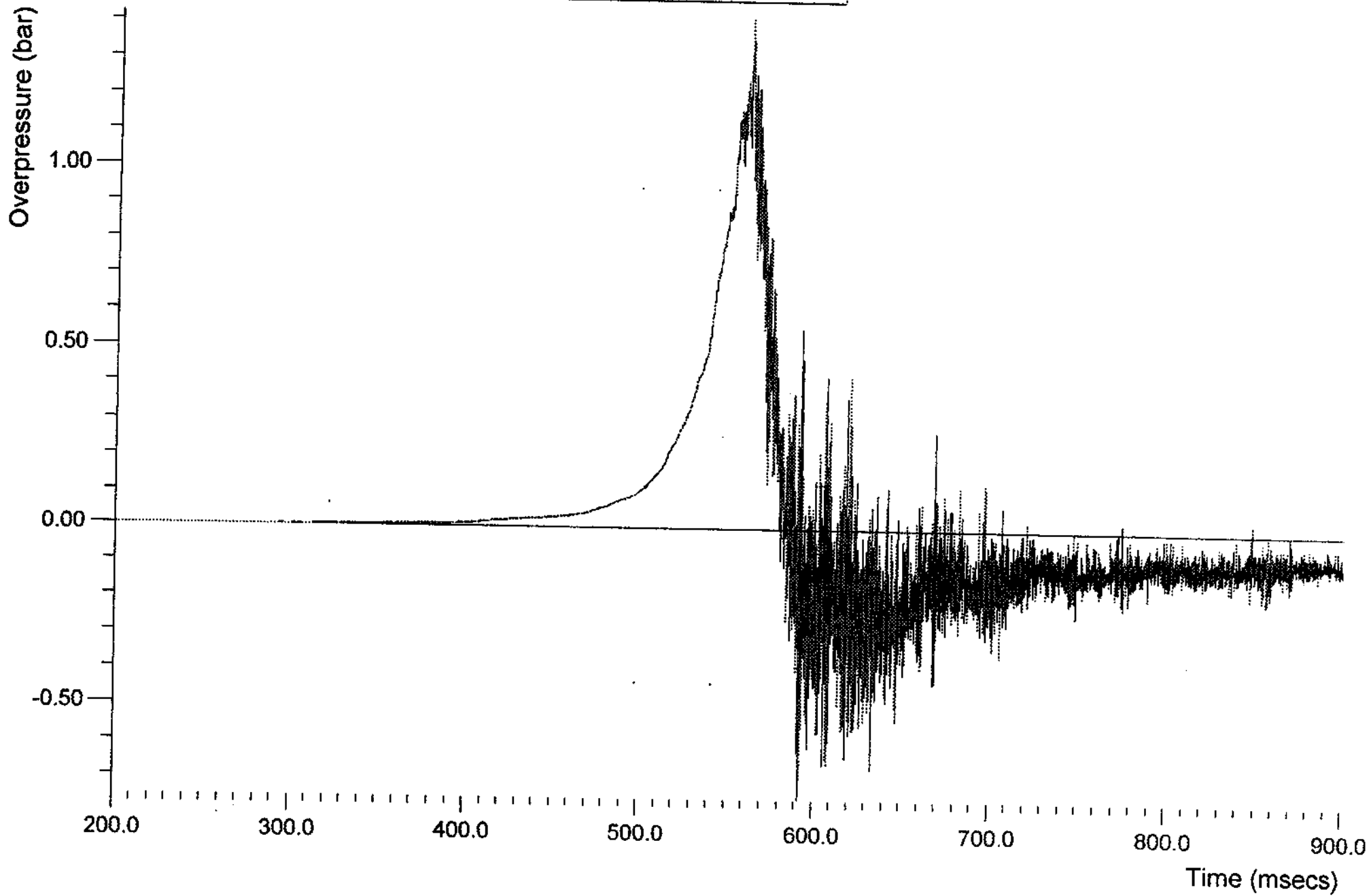
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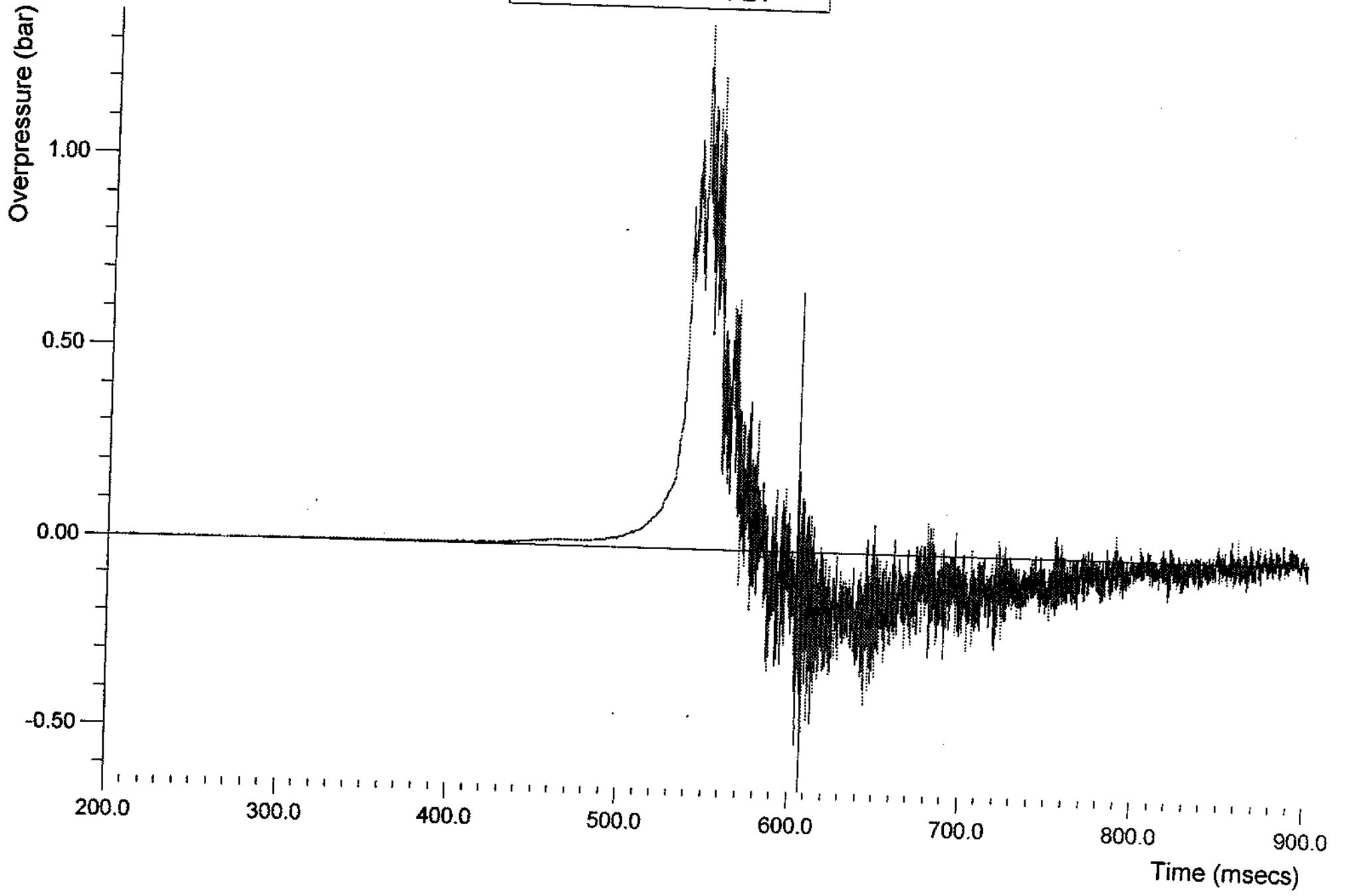
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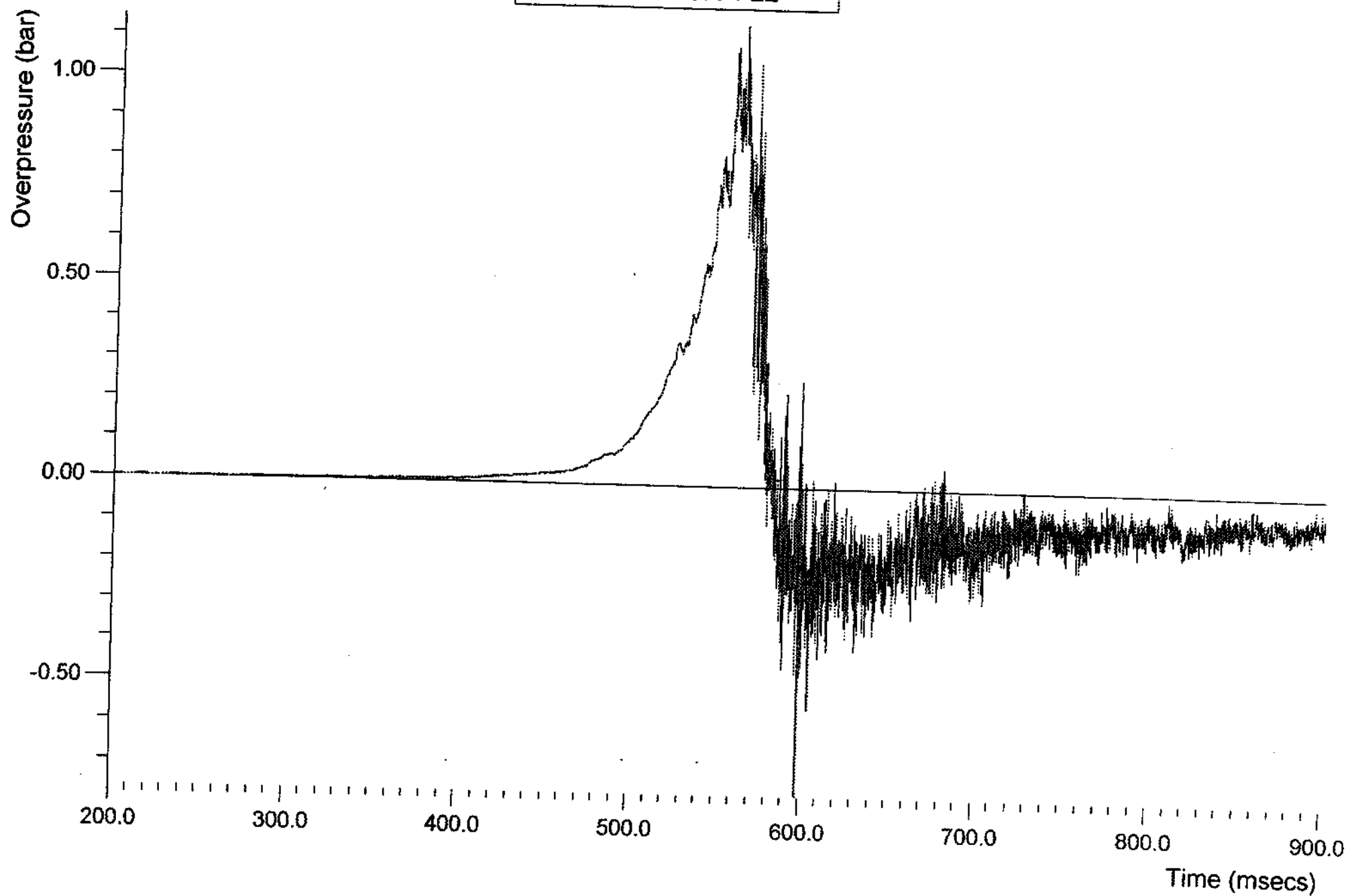
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Transducer no: PI-20



Test: HSE 8 (O1 C2 I2)  
Transducer no: PI-21

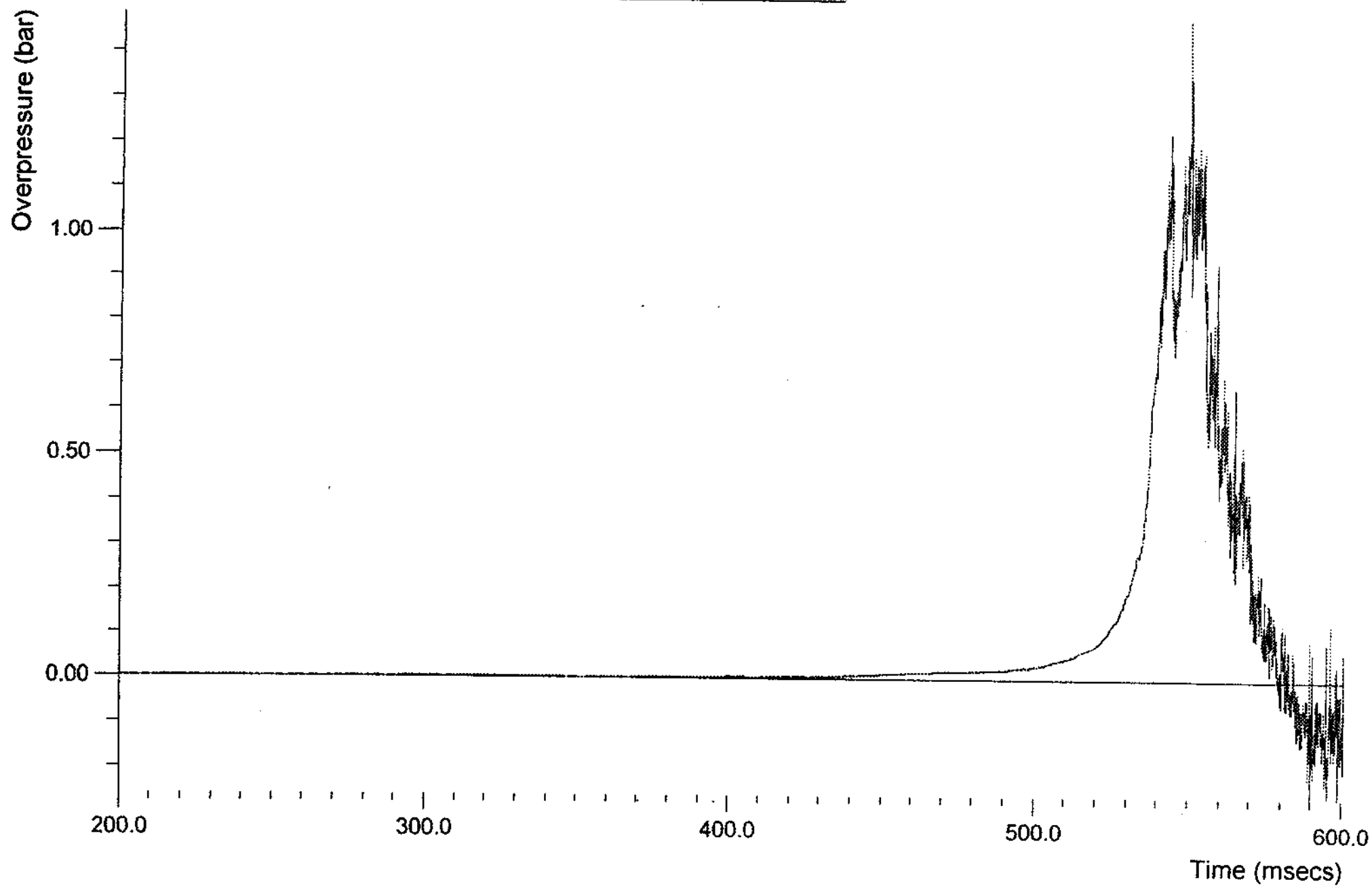


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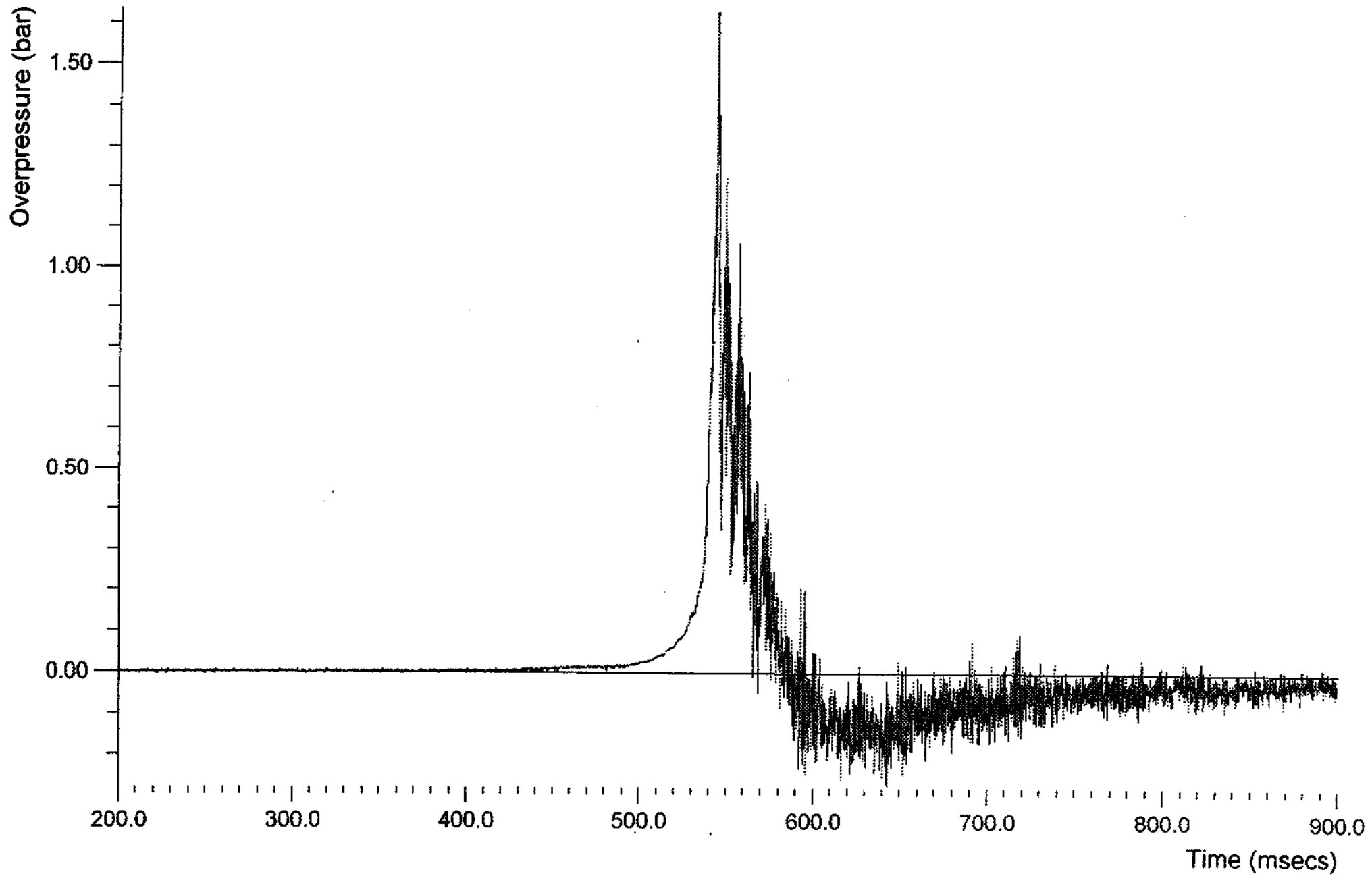




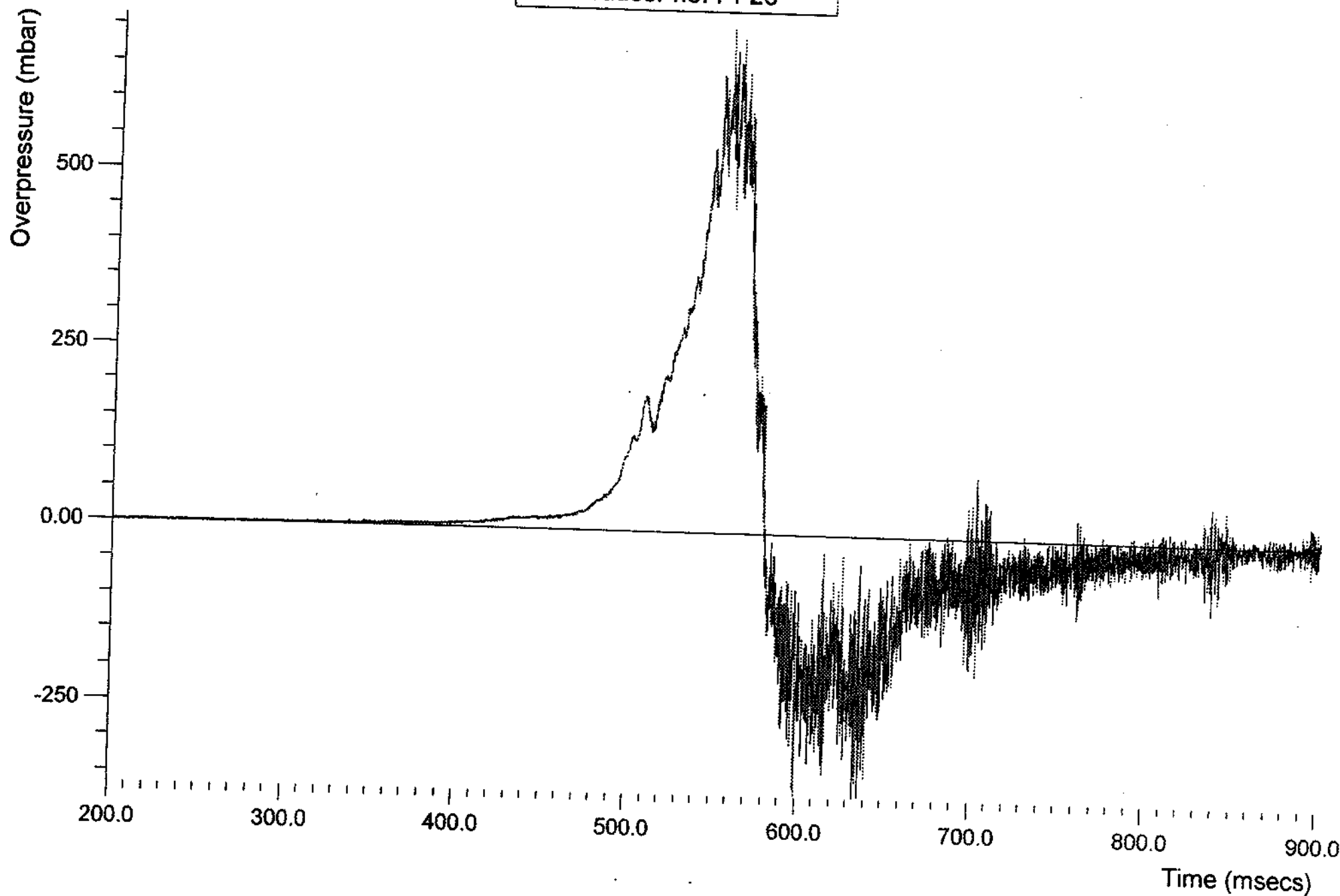
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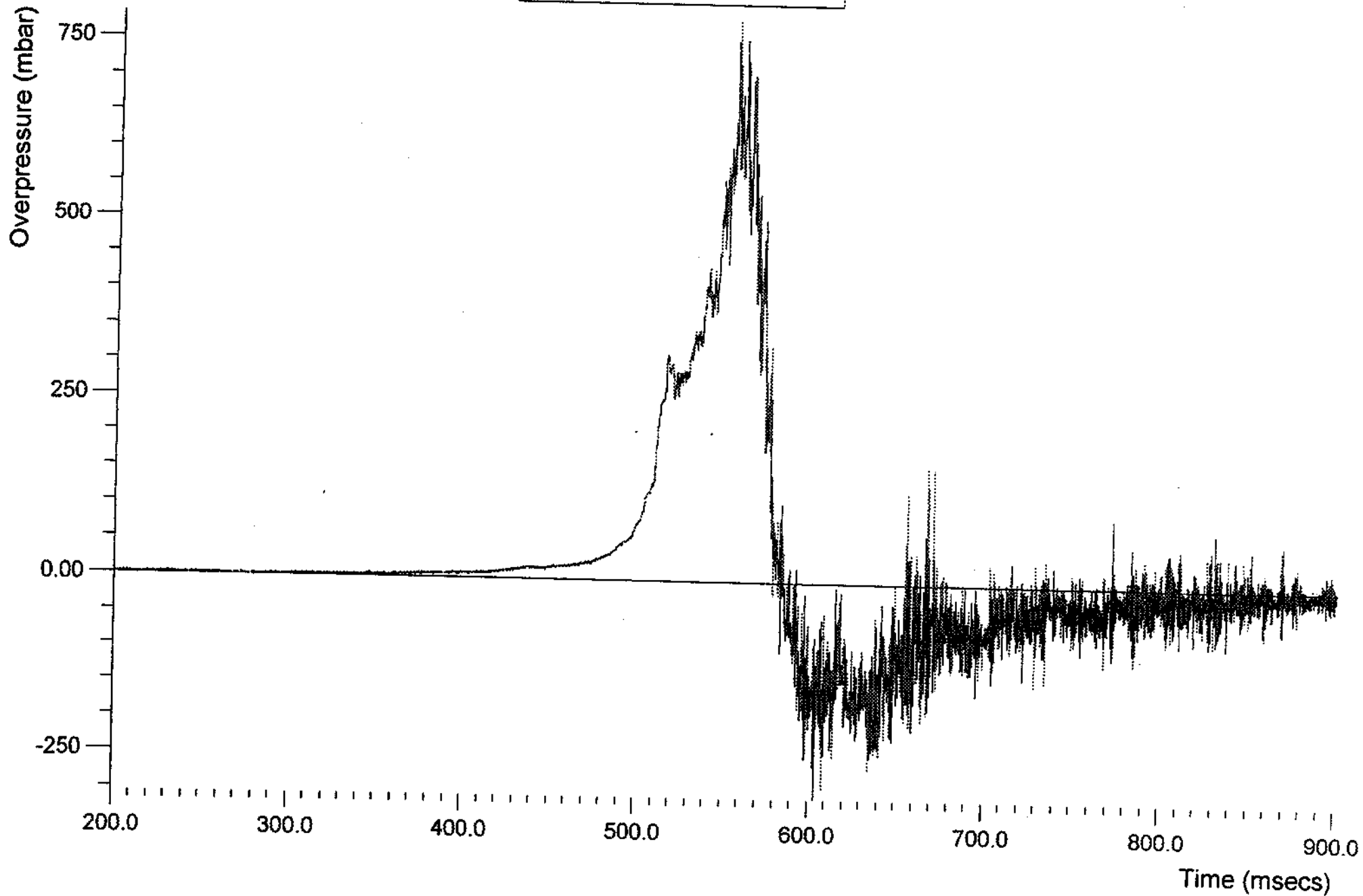
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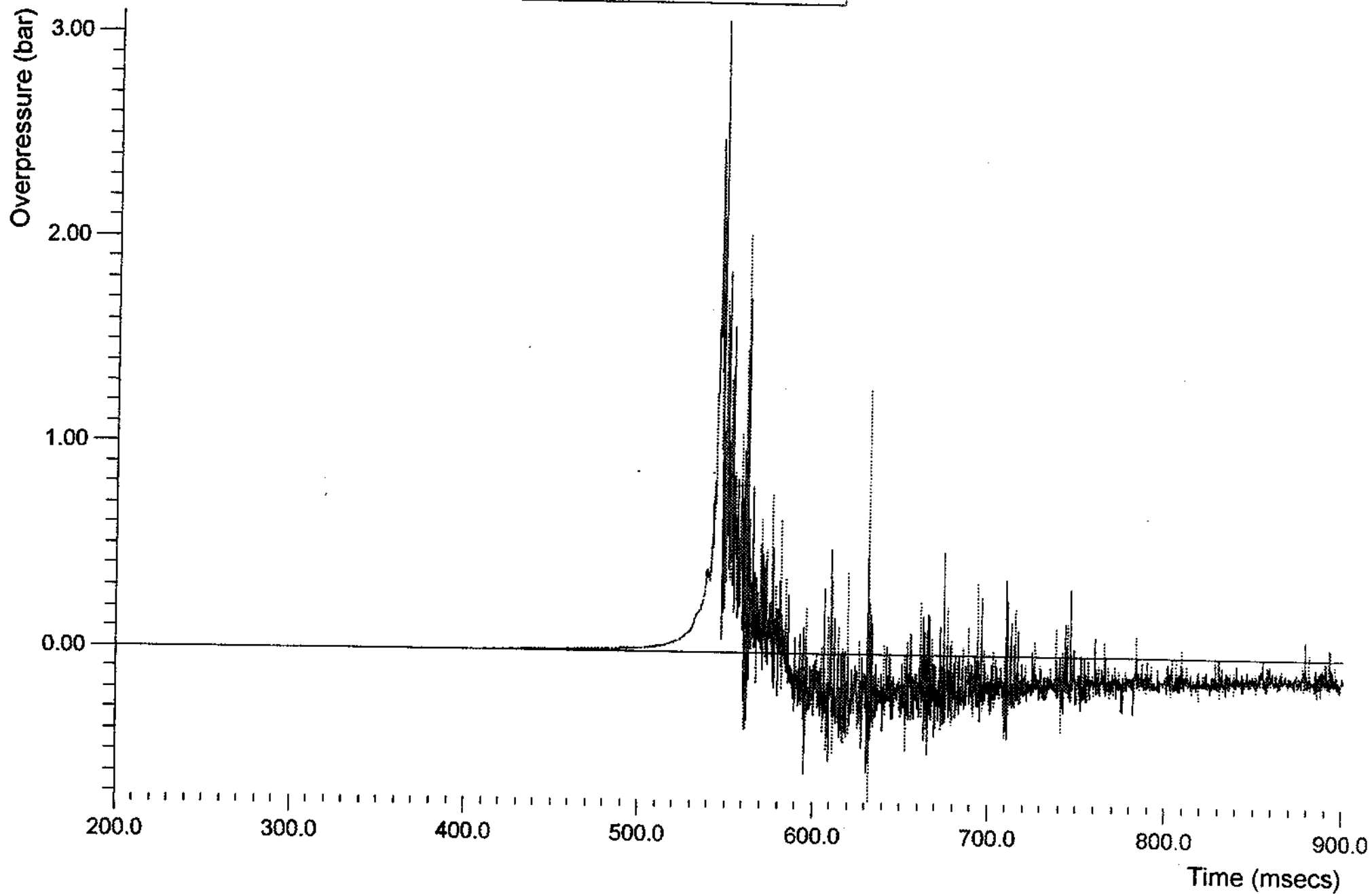
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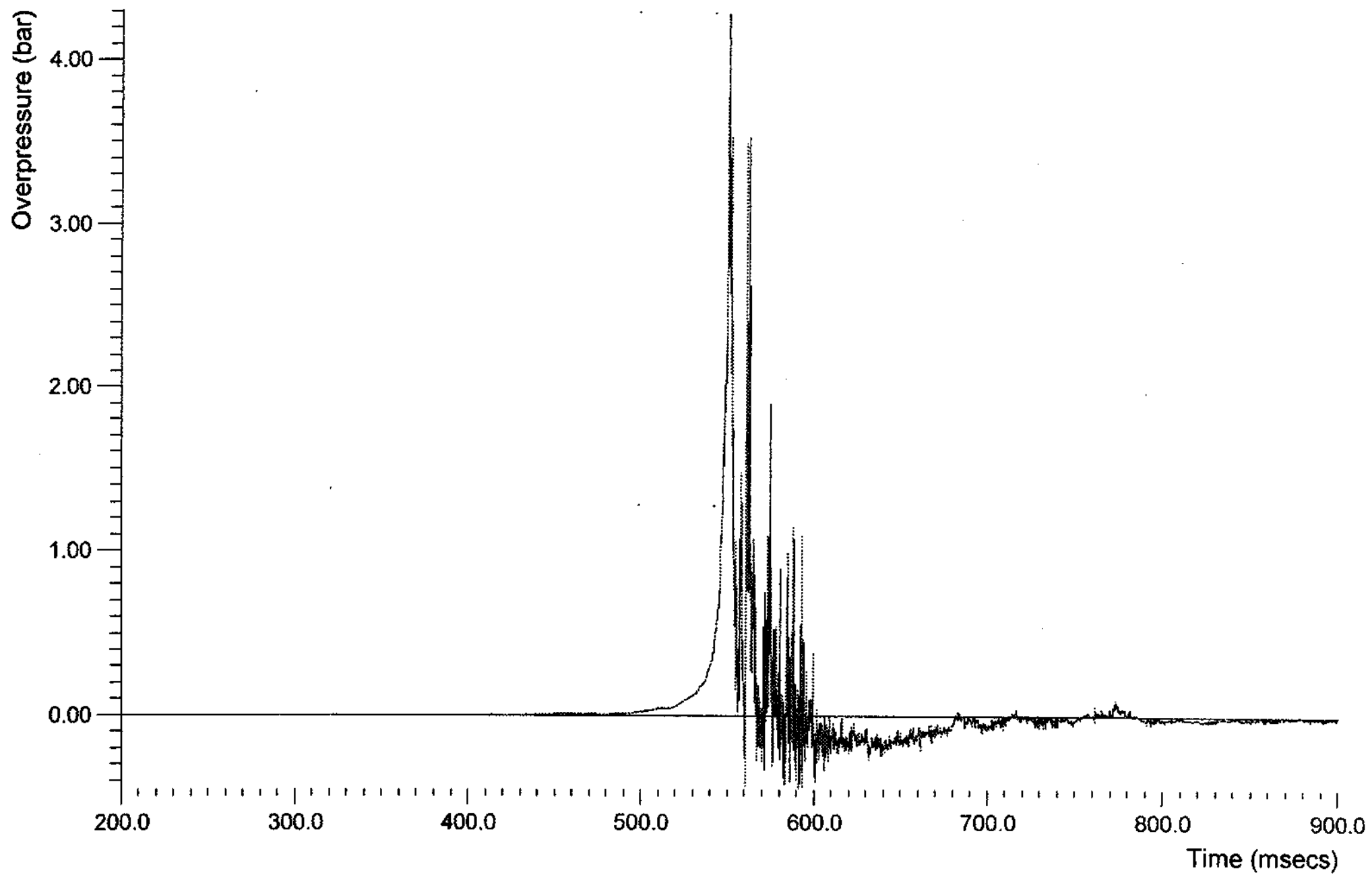
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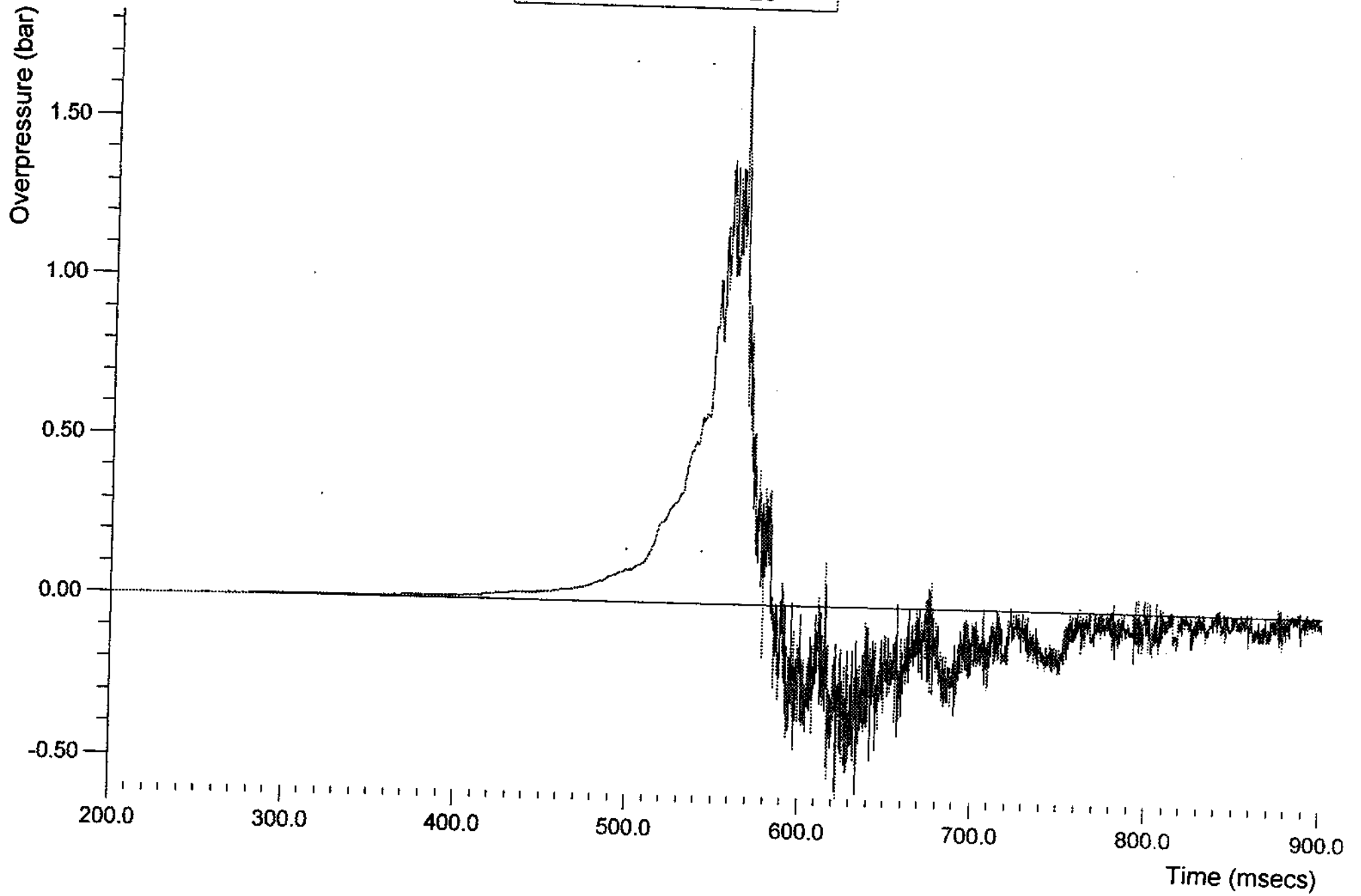
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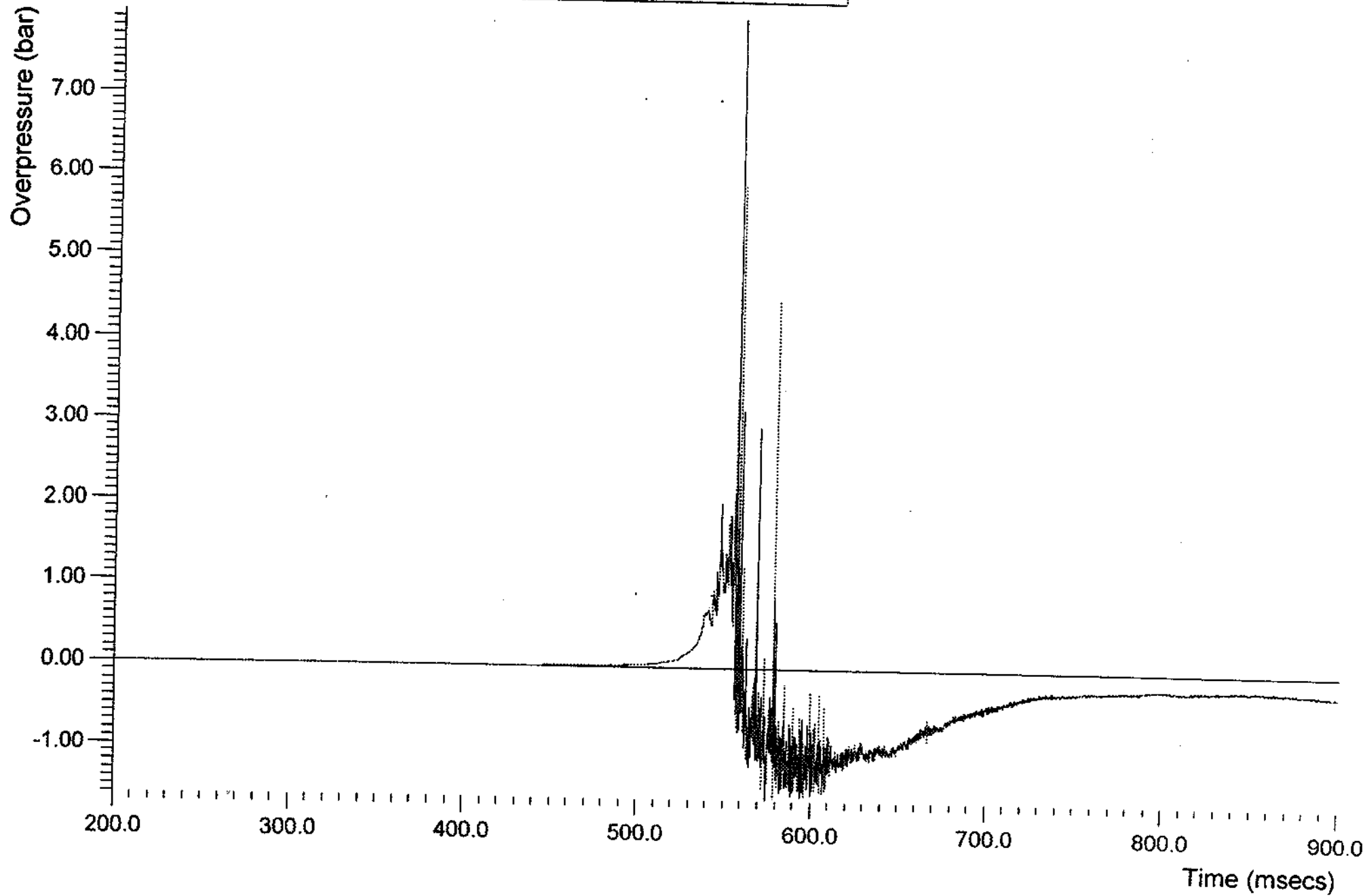
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Transducer no: PI-28



Test: HSE 8 (O1 C2 I2)  
Transducer no: PI-29

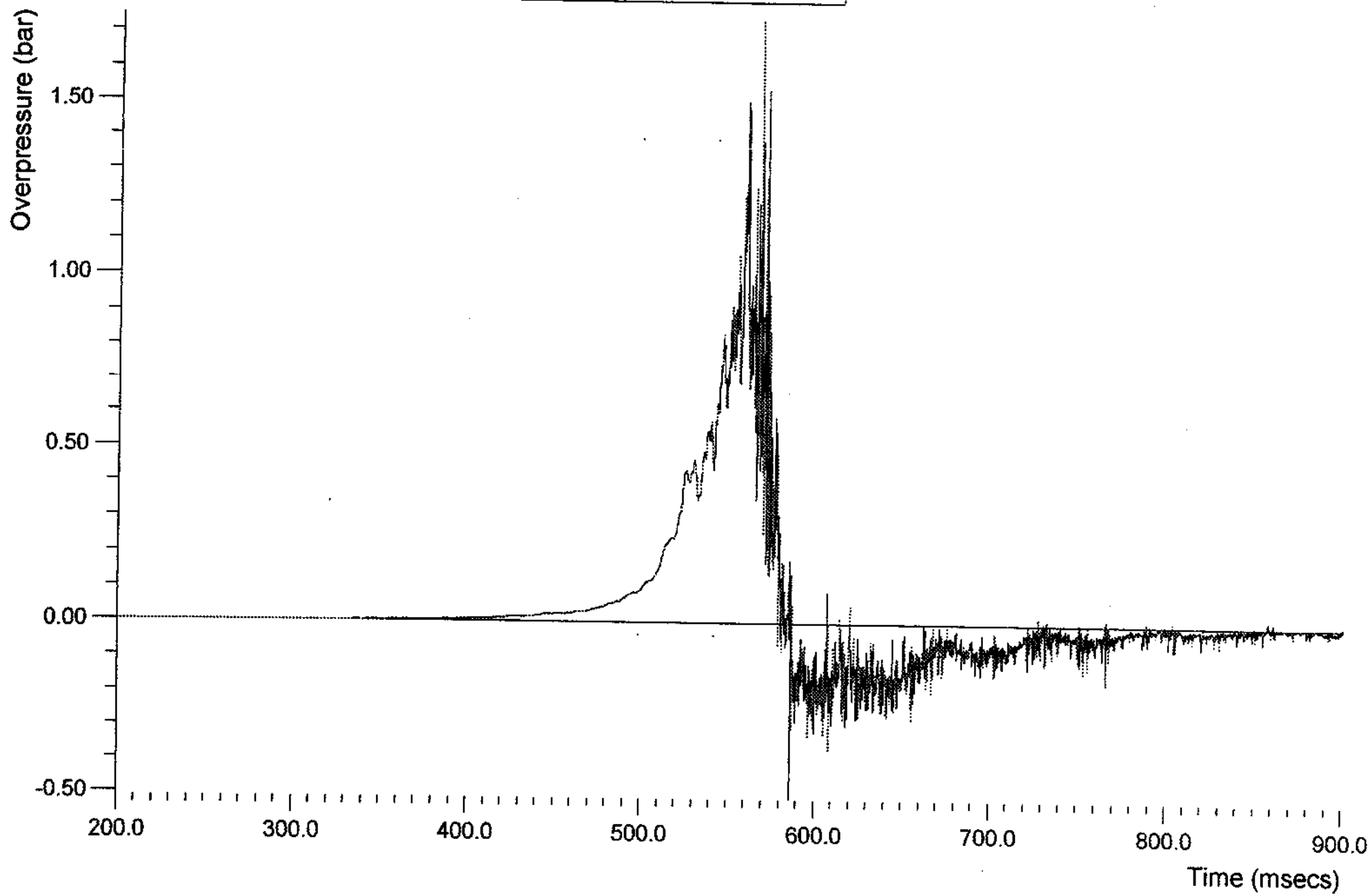


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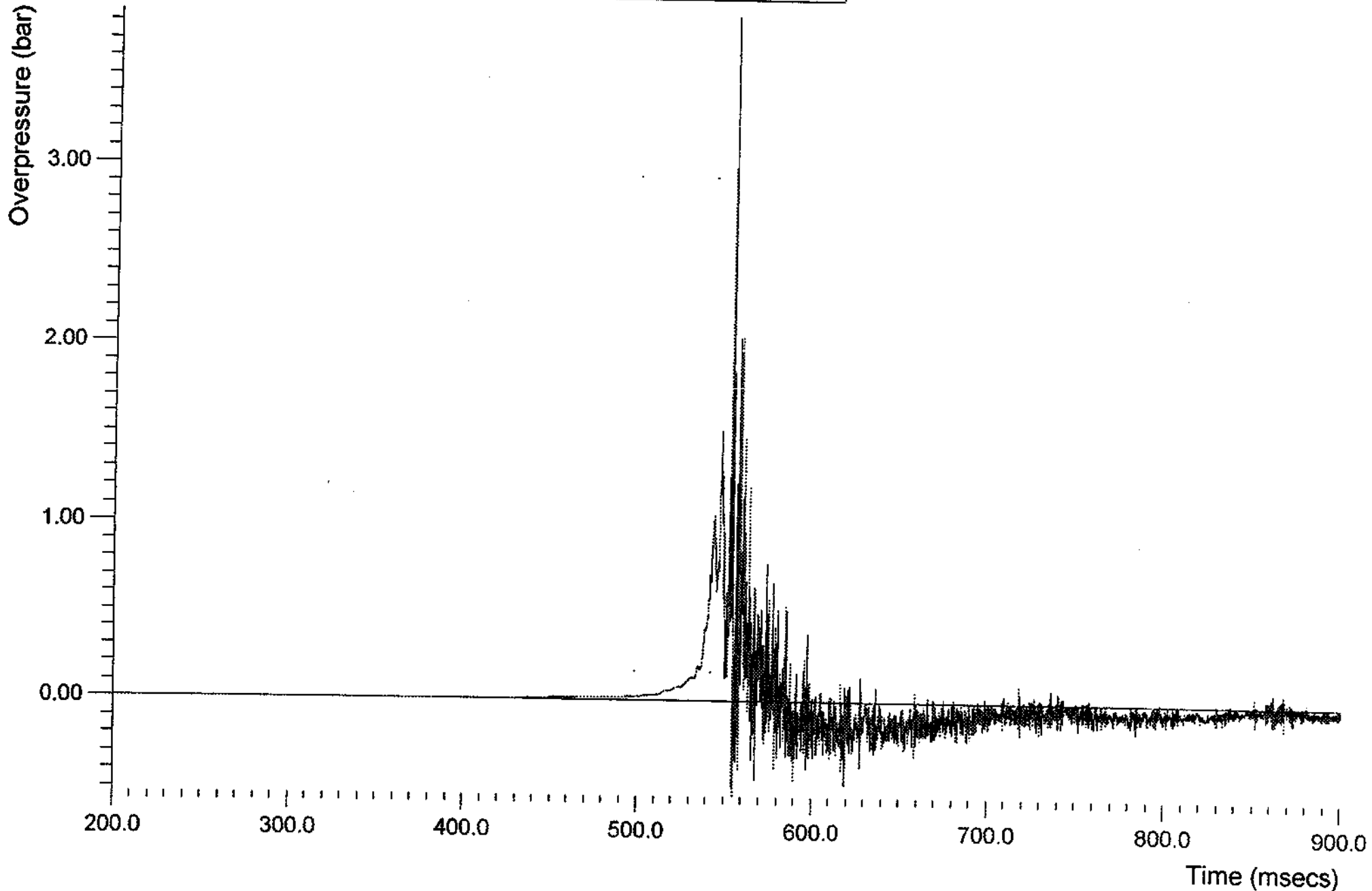




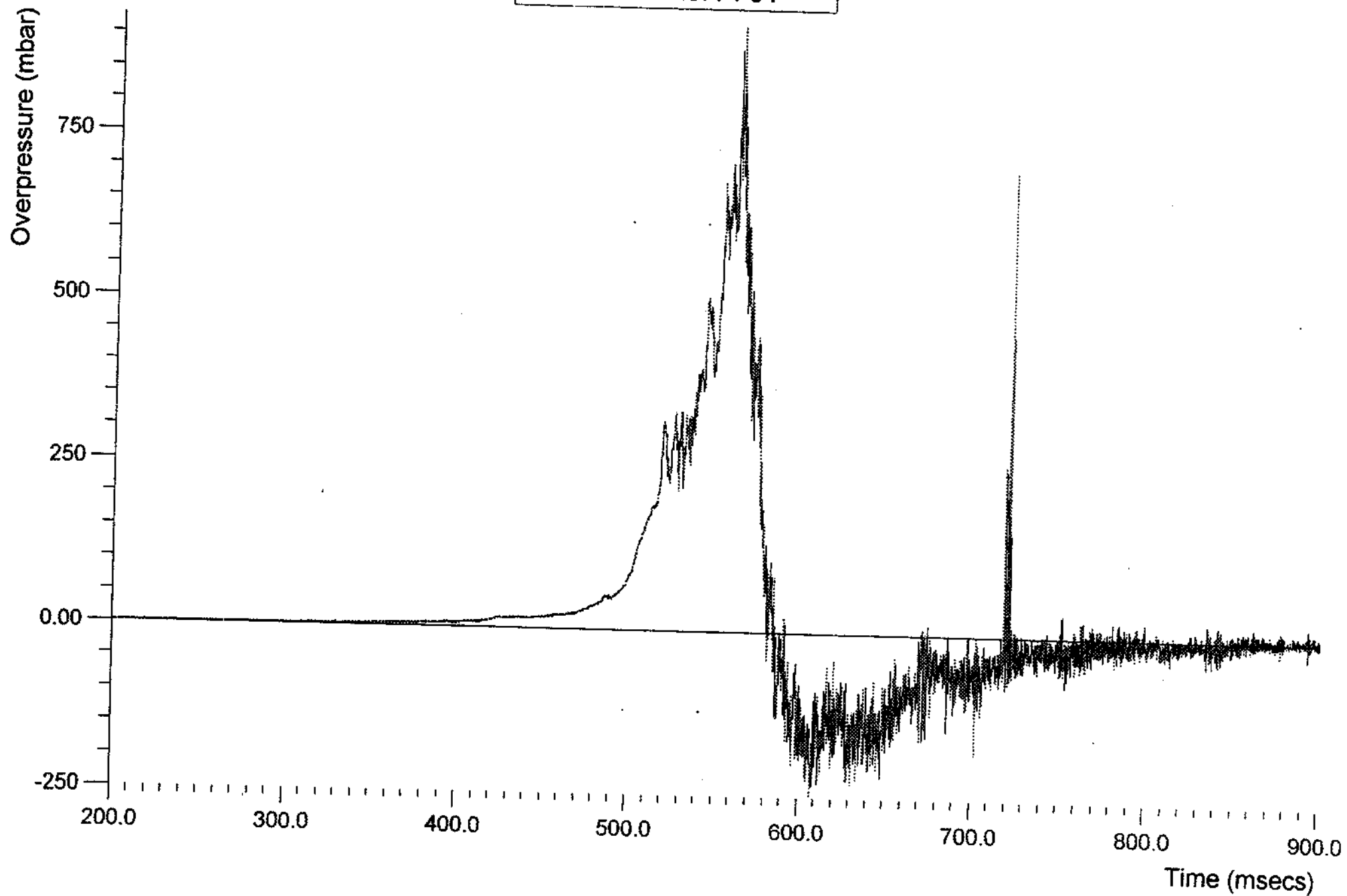
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Test: HSE 8 (O1 C2 I2)  
Transducer no: PI-33

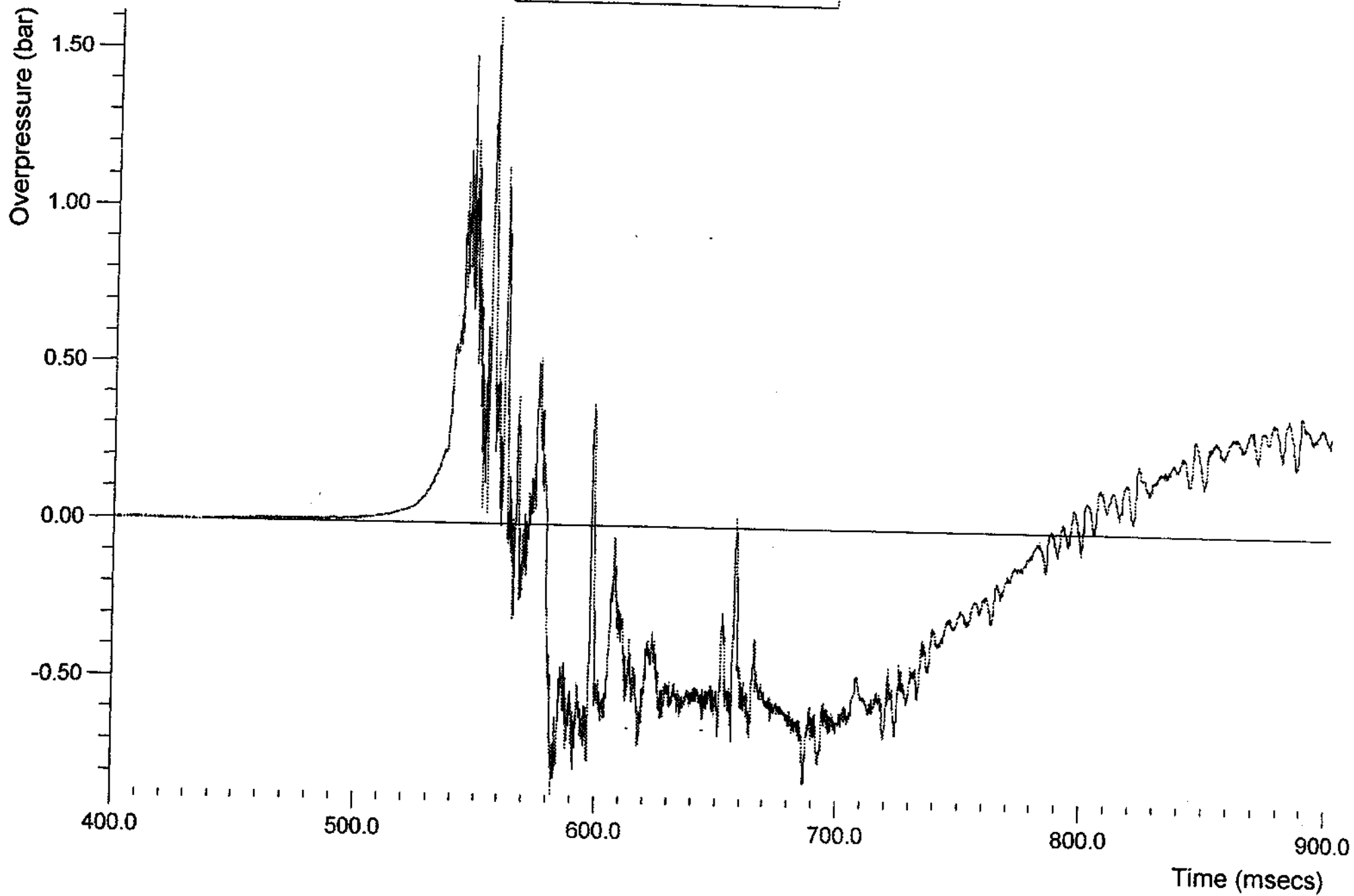


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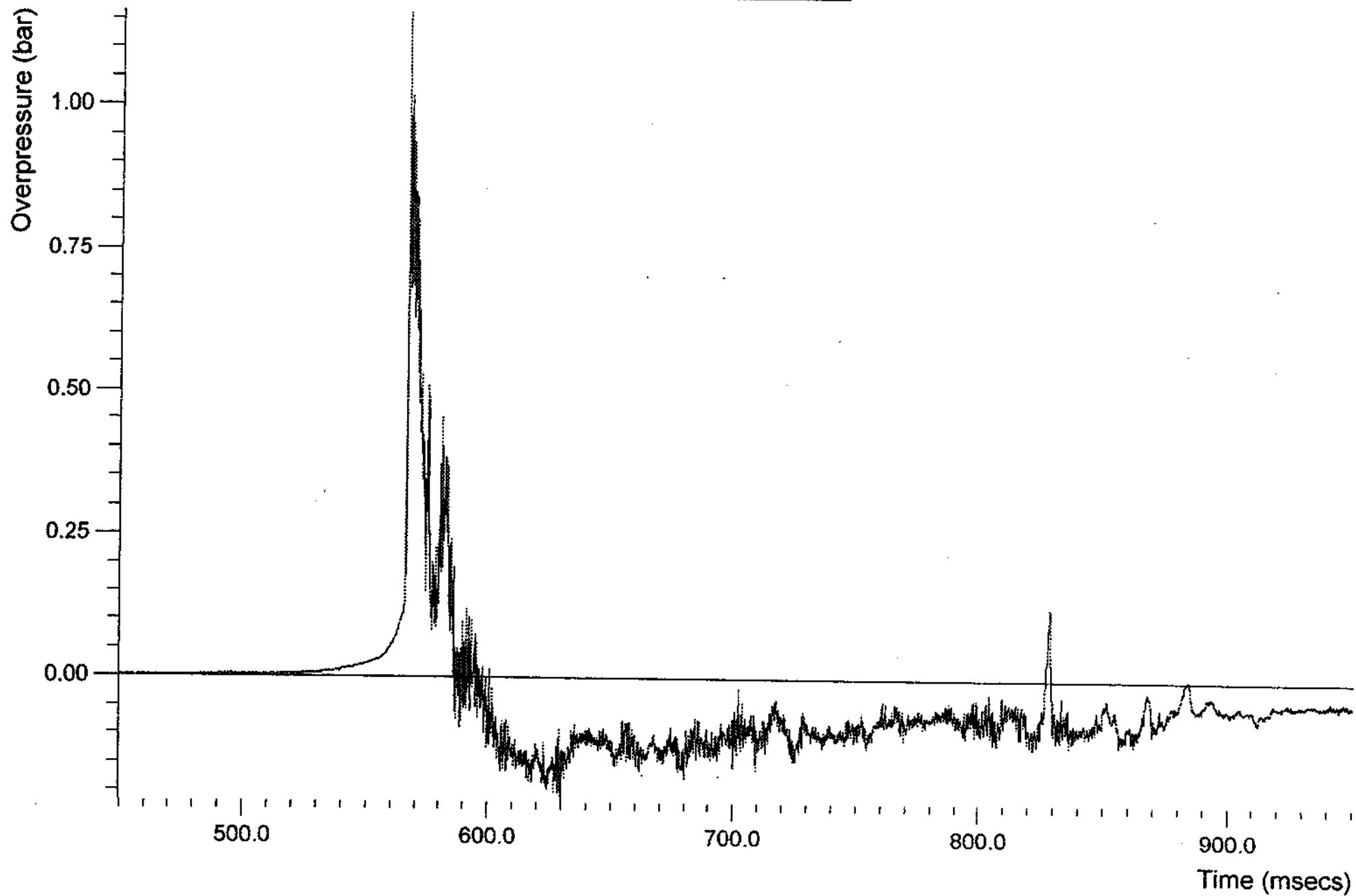


## **Appendix B: External Overpressure Profiles**

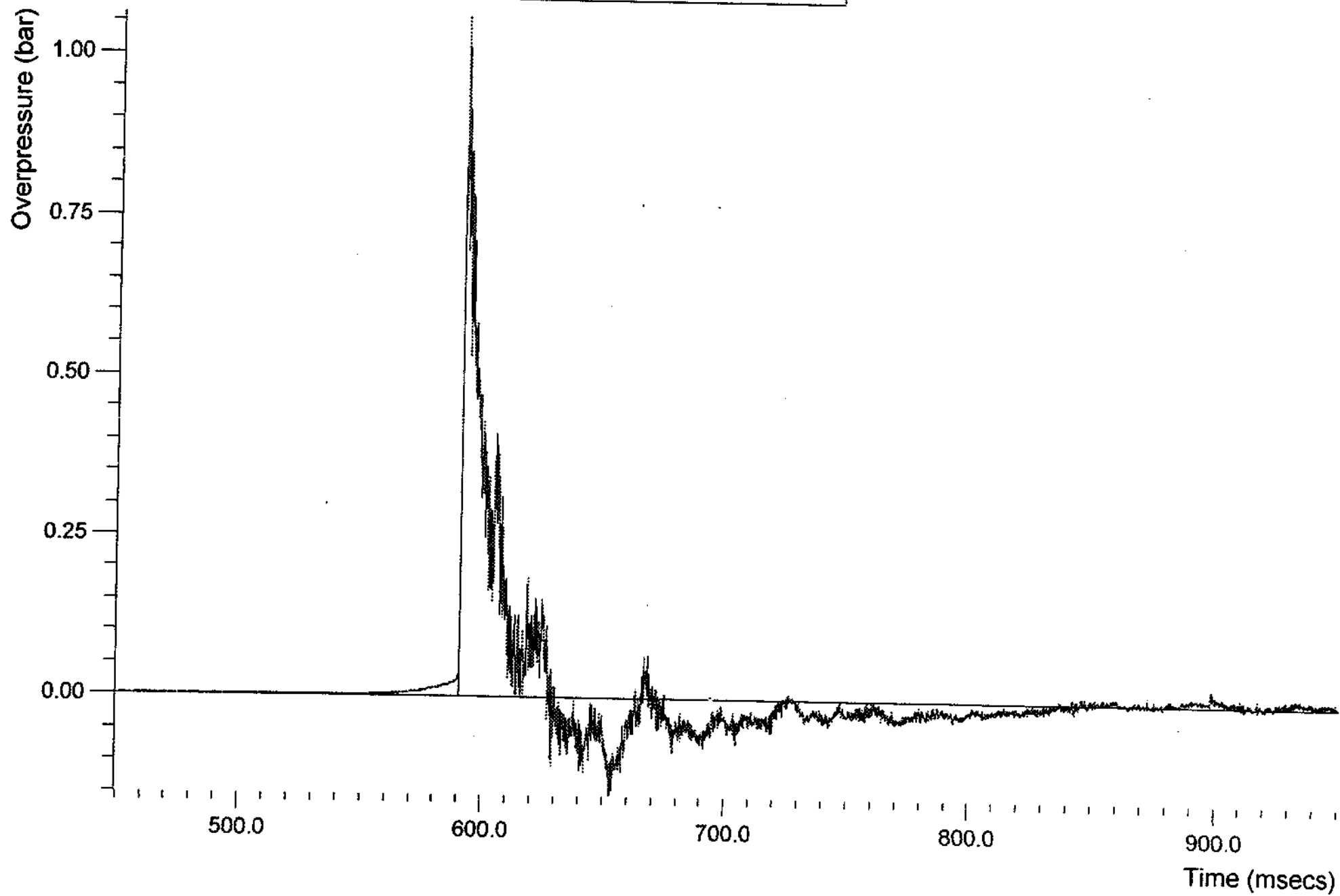
Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-1



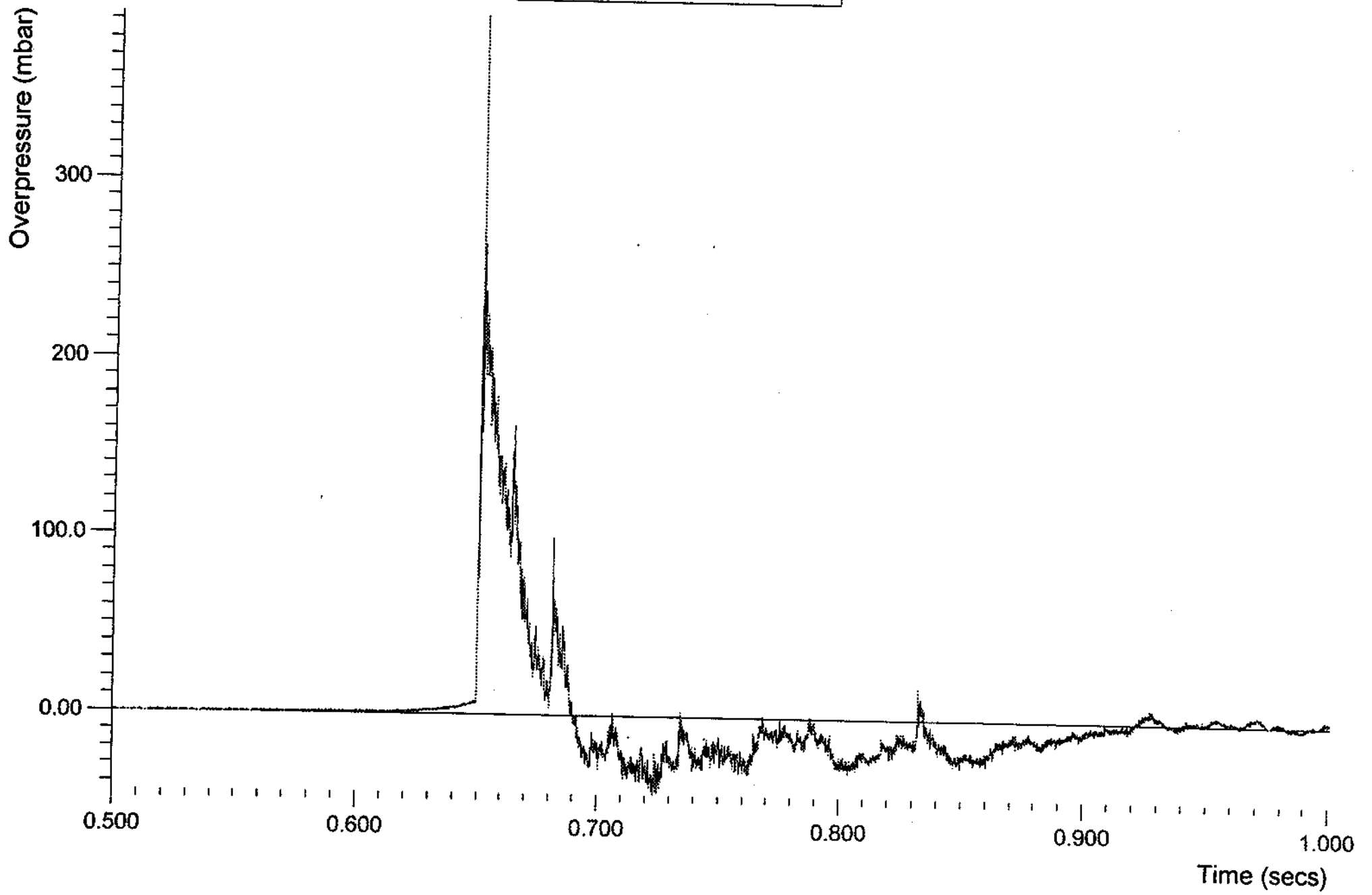
Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-2



Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-3

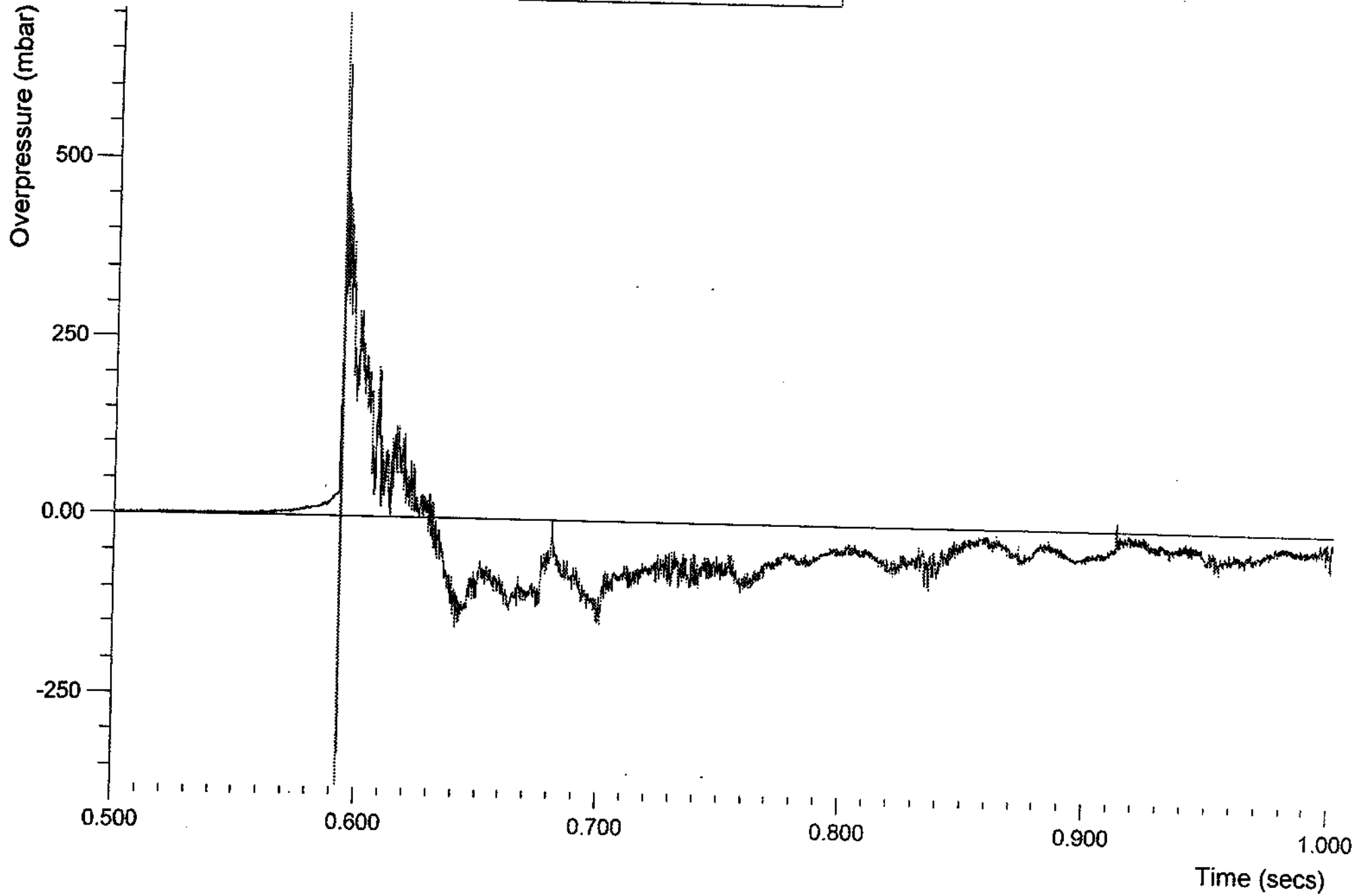


Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-4

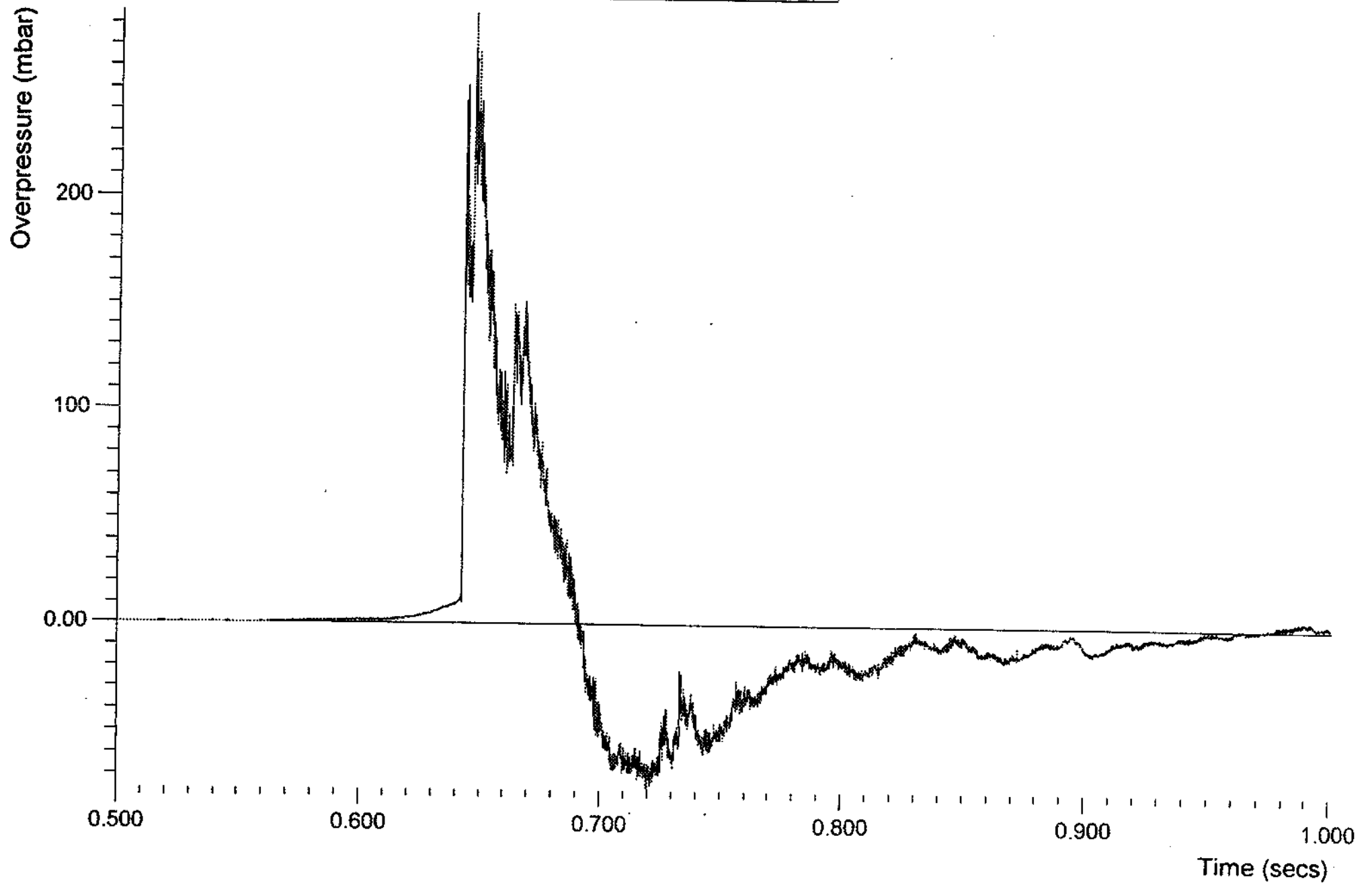




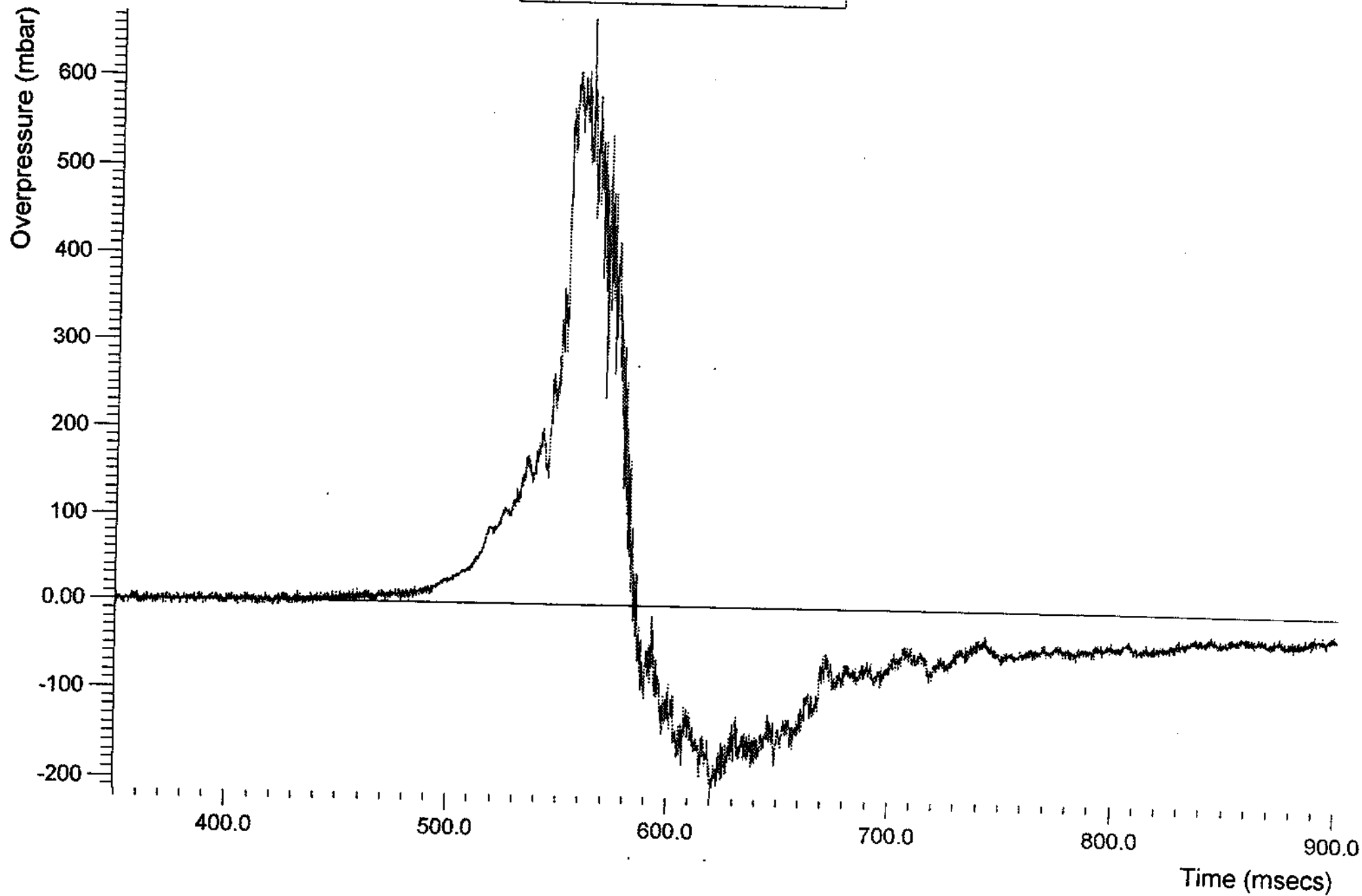
Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-5



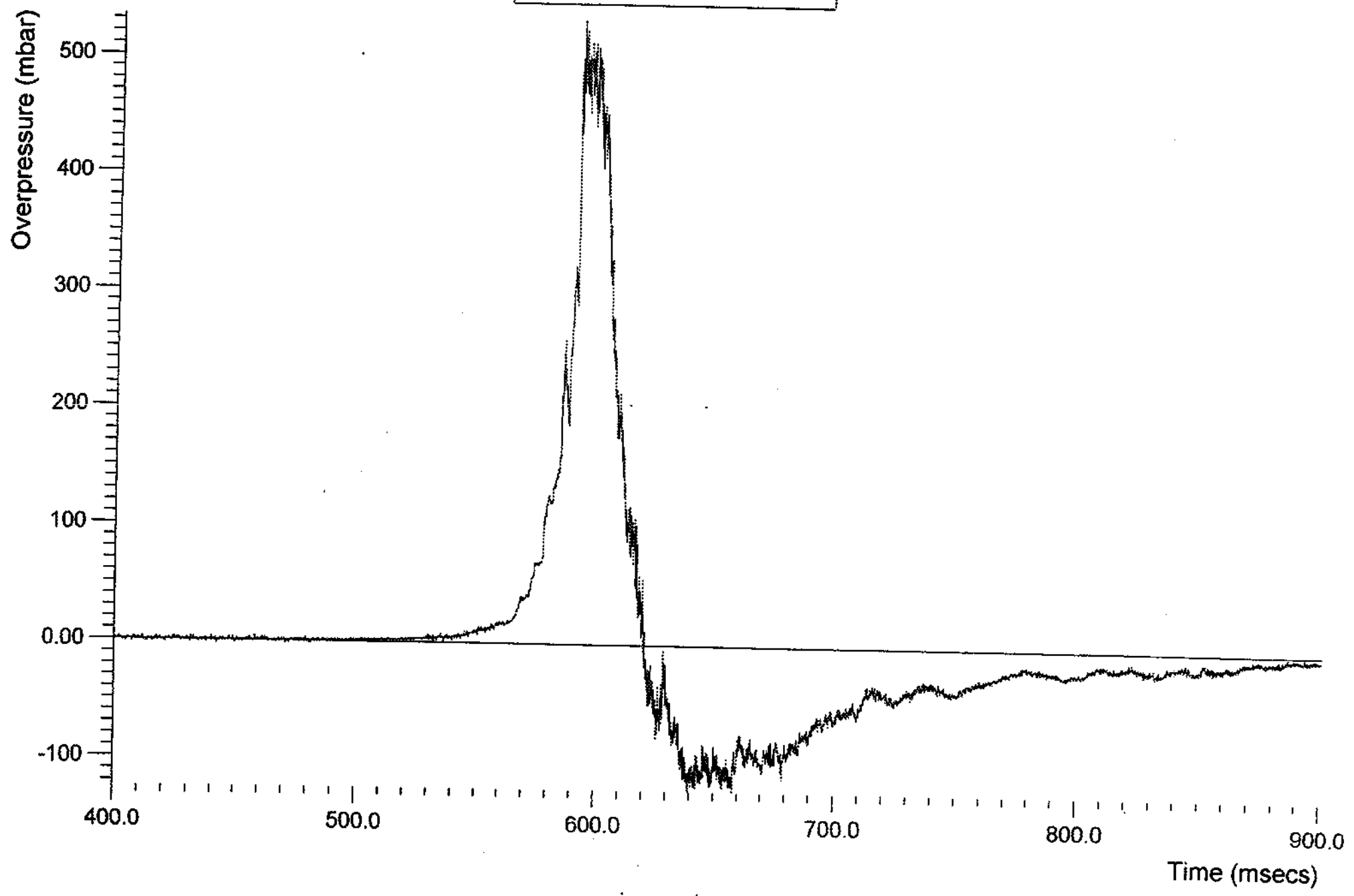
Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-6



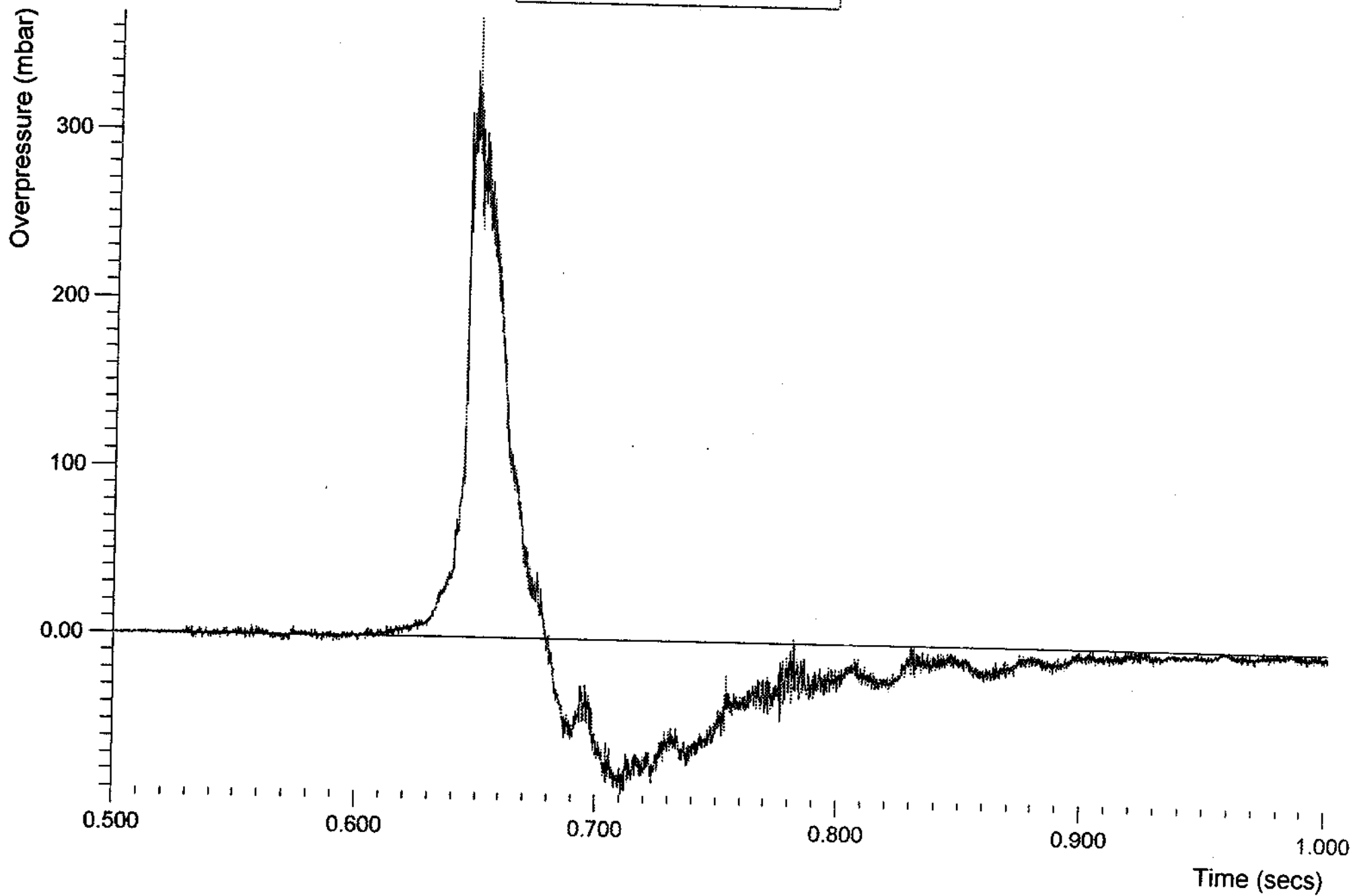
Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-7



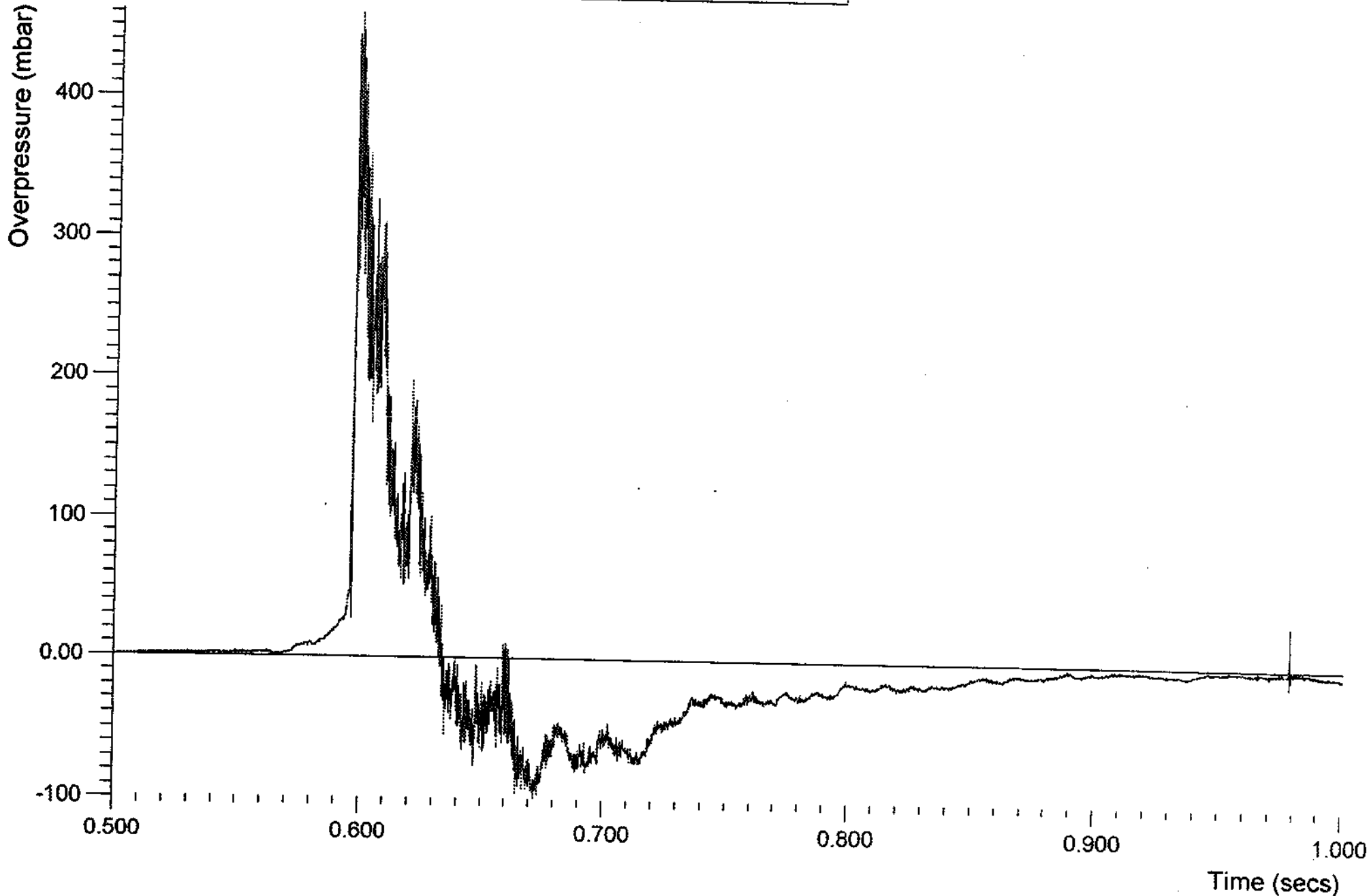
Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-9



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



Test: HSE 8 (O1 C2 I2)  
Transducer no: PE-11



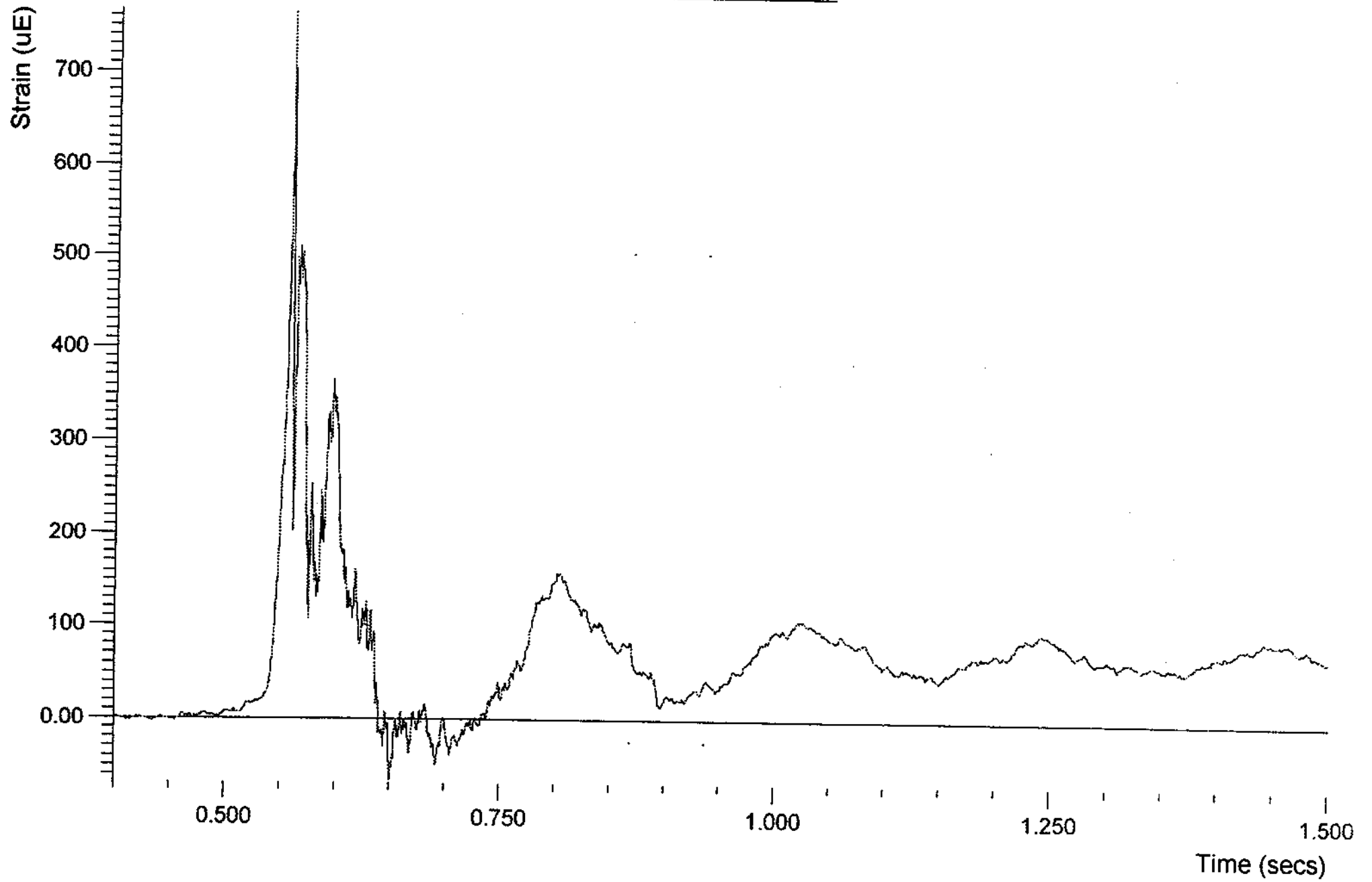
## **Appendix C: Strain Gauge Profiles**

**Table C1: Location of Strain Gauges**

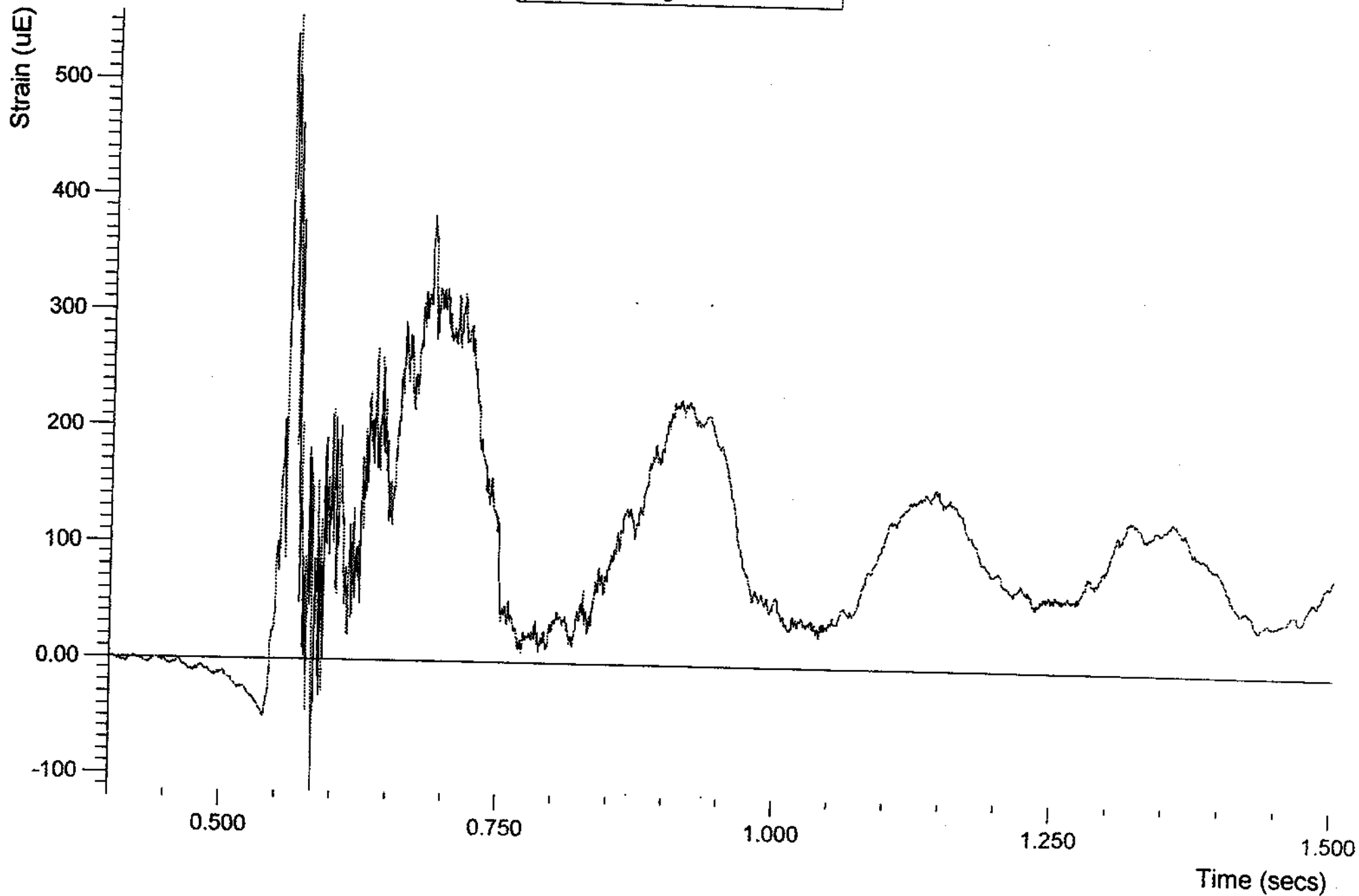
<b>Measuring Position</b>	<b>X Co-ord (m)</b>	<b>Y Co-ord (m)</b>	<b>Z Co-ord (m)</b>
ST-301	28.06	-0.05	0.24
ST-302	28.01	-0.32	0.24
ST-303	28.00	-0.56	0.24
ST-304	27.90	-0.32	0.24
ST-305	20.00	-7.17	1.50
ST-306	20.00	-6.82	1.20



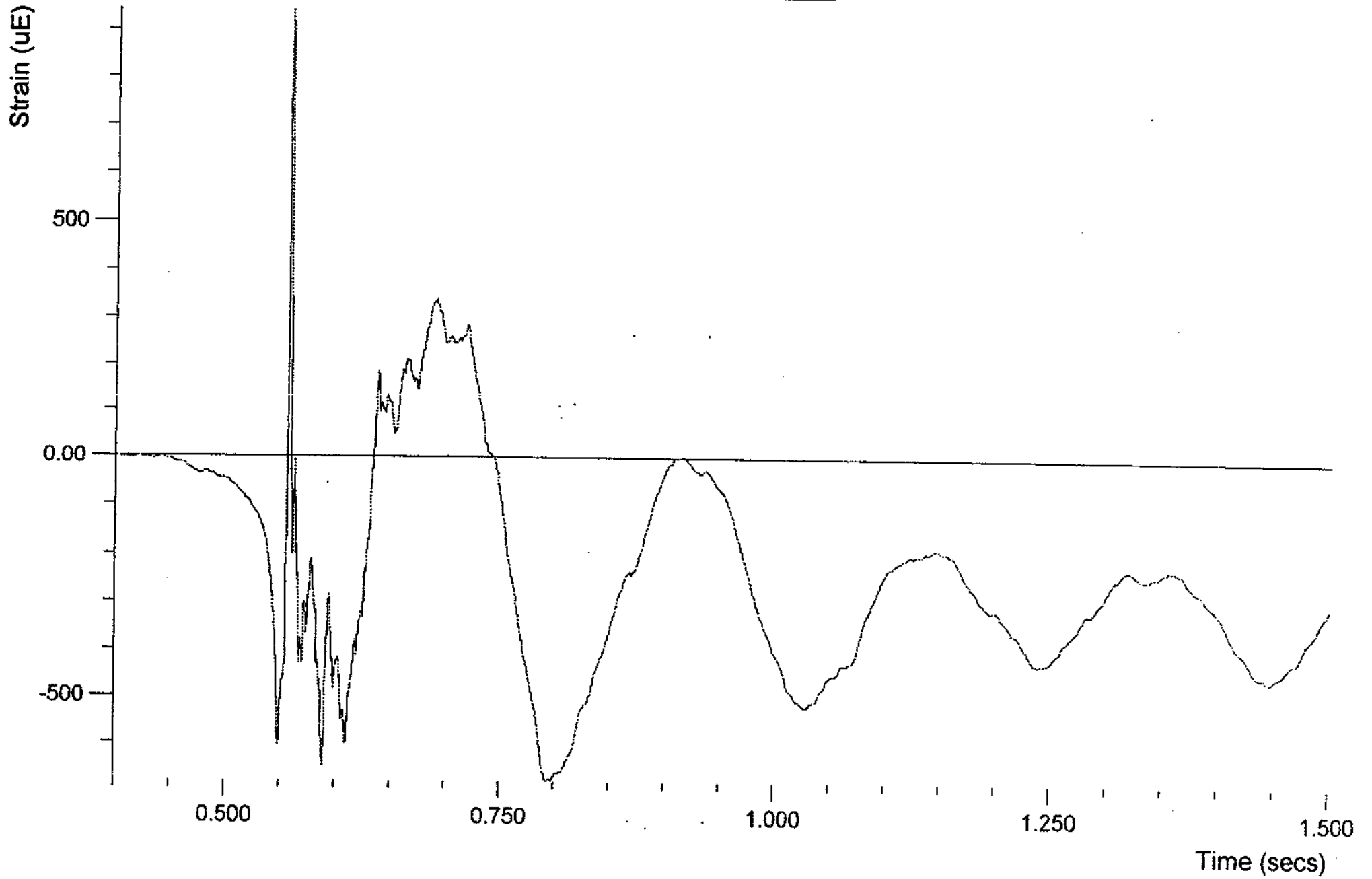
Test: HSE 8 (O1 C2 I2)  
Strain Gauge ST-301



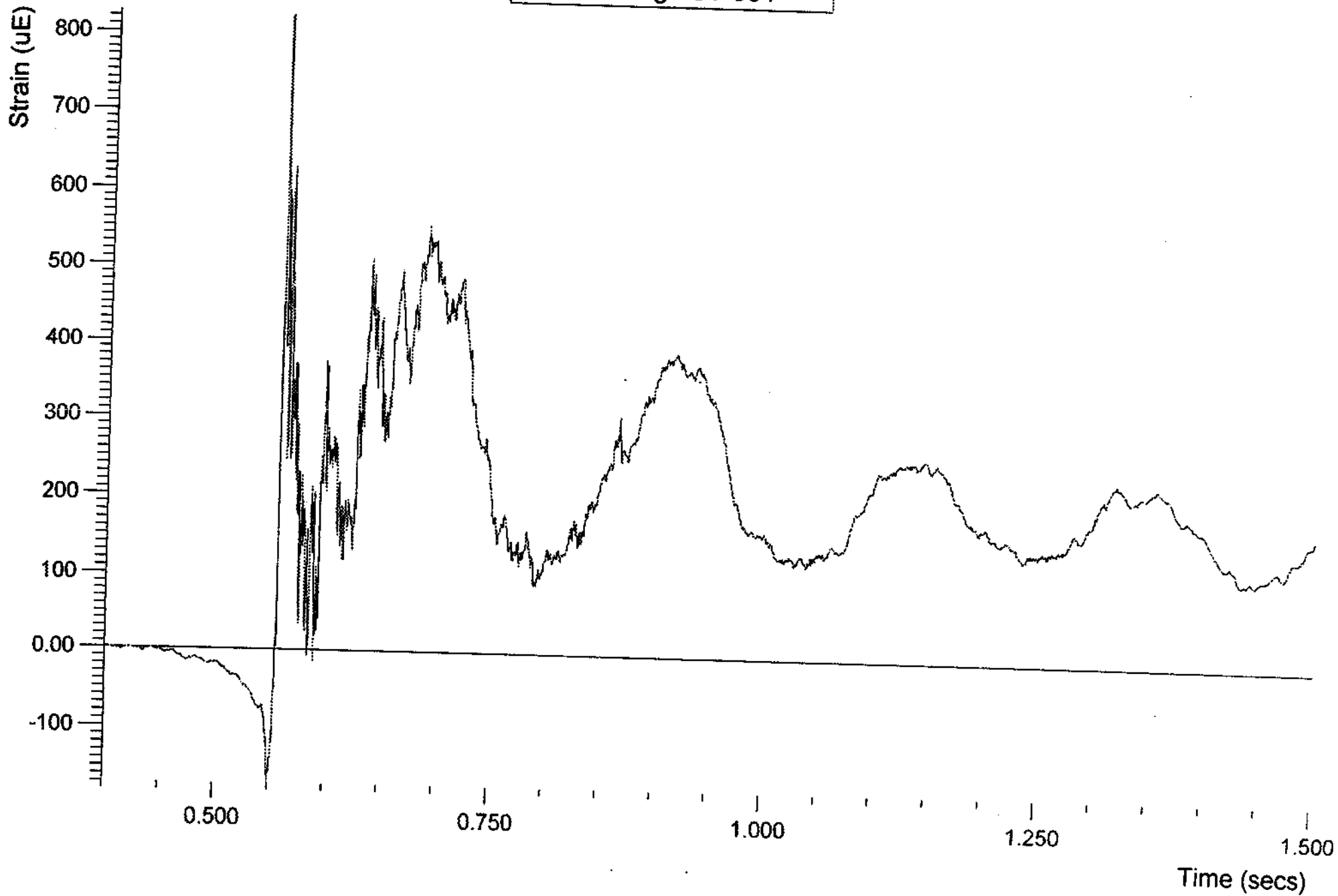
Test: HSE 8 (O1 C2 I2)  
Strain Gauge ST-302



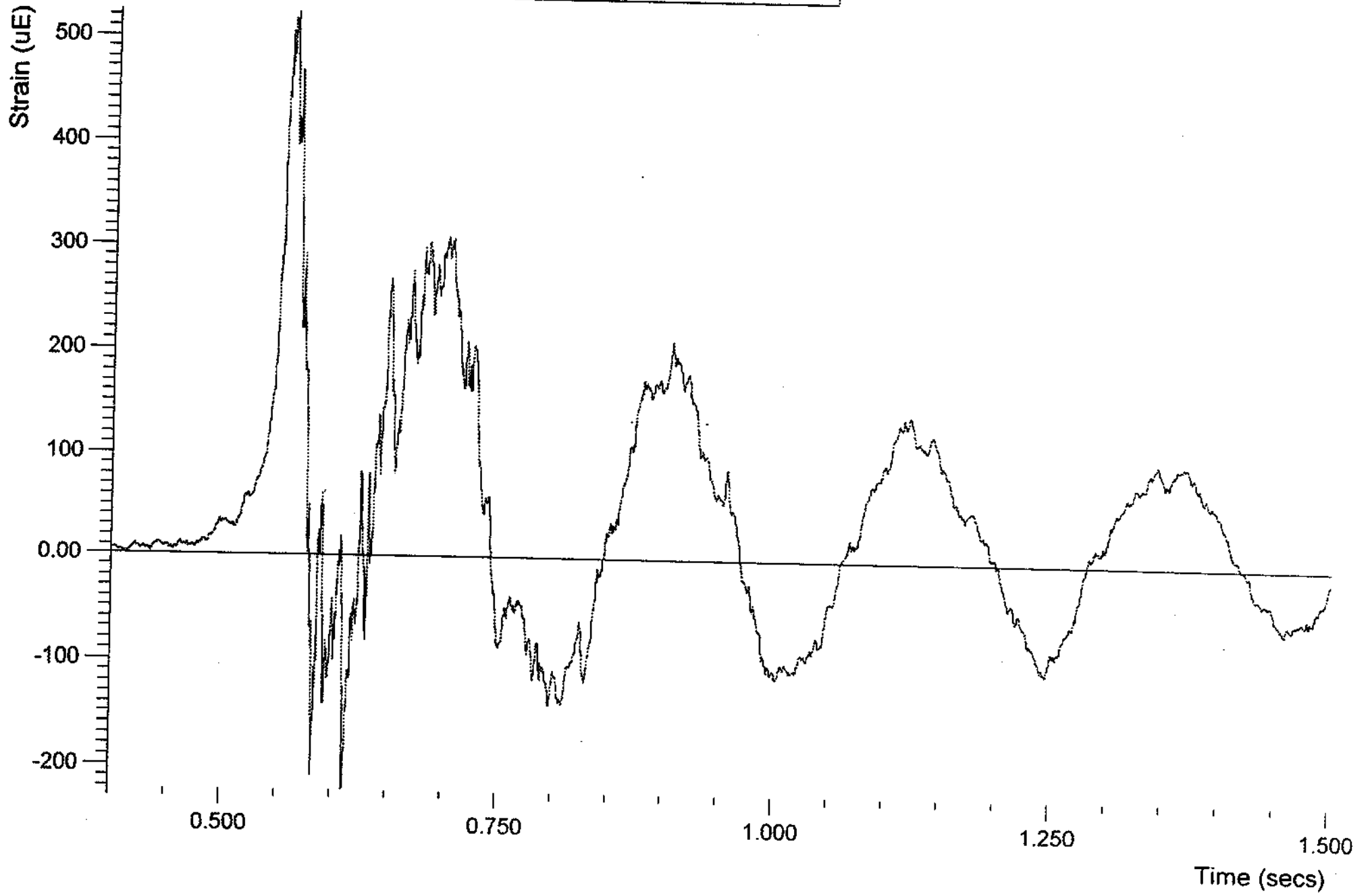
Test: HSE 8 (O1 C2 I2)  
Strain Gauge ST-303



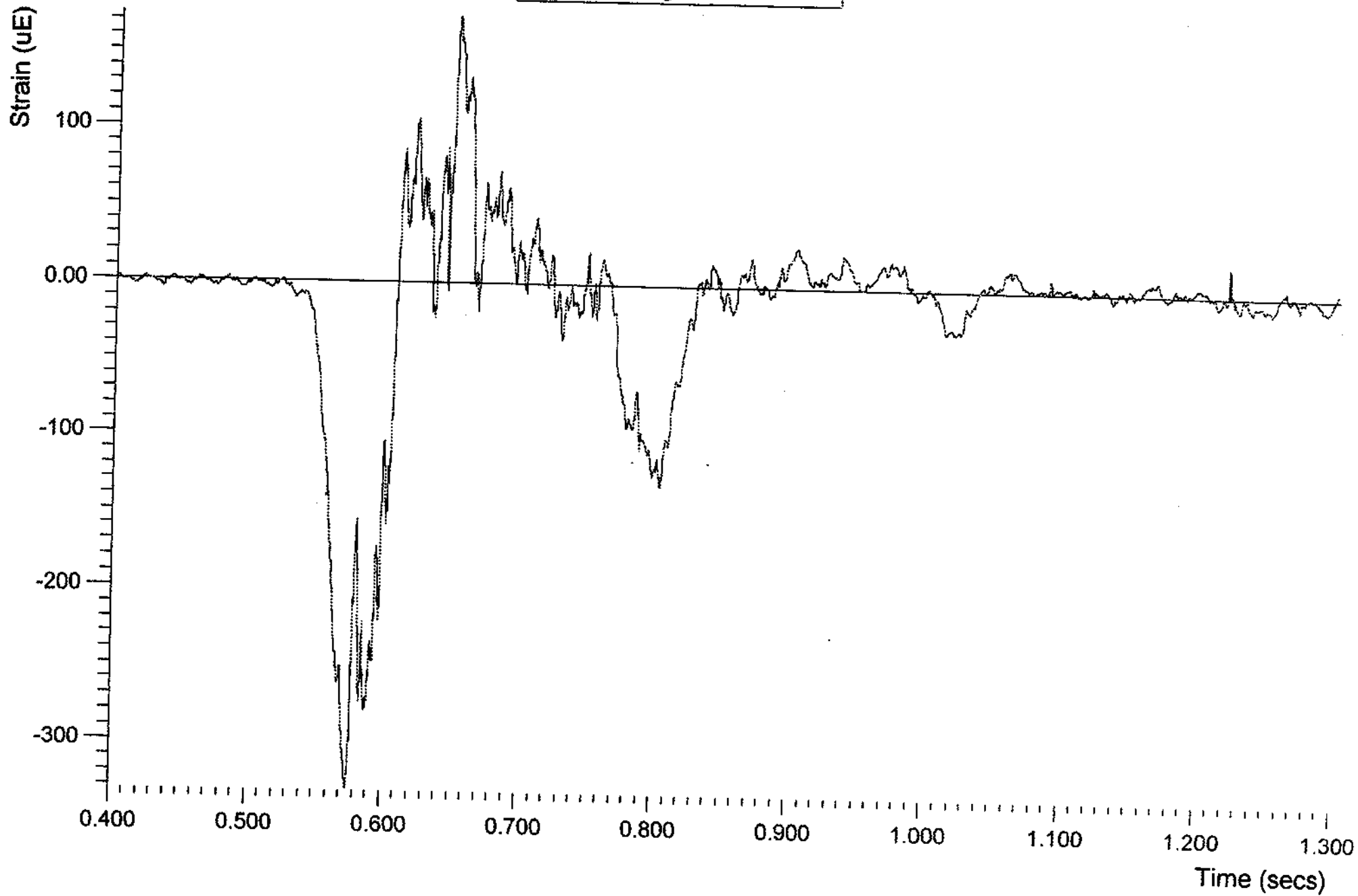
Test: HSE 8 (O1 C2 I2)  
Strain Gauge ST-304



Test: HSE 8 (O1 C2 I2)  
Strain Gauge ST-305



Test: HSE 8 (O1 C2 I2)  
Strain Gauge ST-306



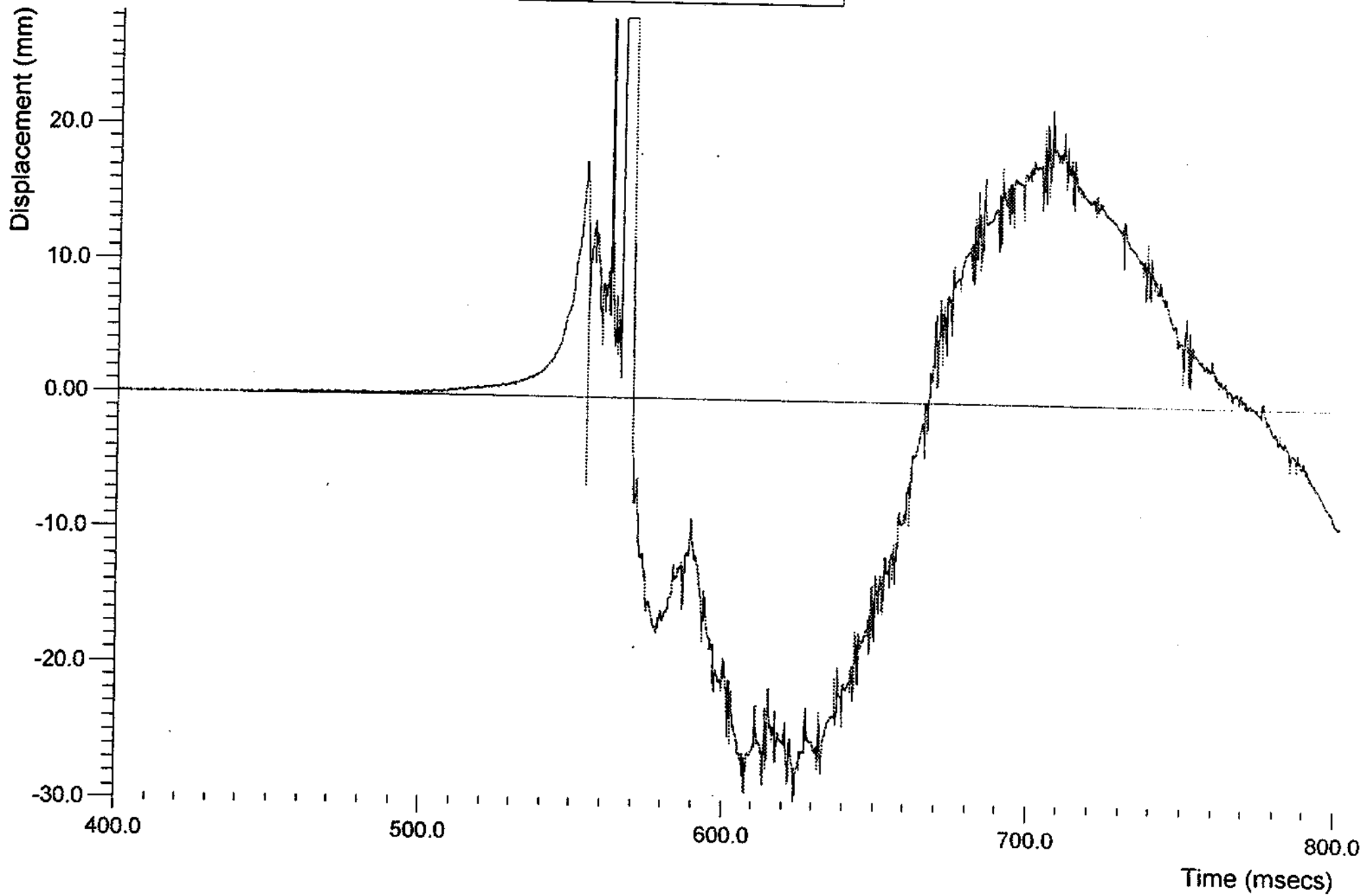
## **Appendix D: Linear Displacement Transducer Profiles**

**Table D1: Location of Linear Diaplacement Transducers**

<b>Measuring Position</b>	<b>X Co-ord (m)</b>	<b>Y Co-ord (m)</b>	<b>Z Co-ord (m)</b>
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 8 (O1 C2 I2)  
Transducer no: LD-201



Test: HSE 8 (O1 C2 I2)  
Transducer no: LD-202

