9014485

RESEARCH RABBIT (MIV)
Modified Integrated Vehicle

Phase 1

VOLKSWAGENWERK
Aktiengesellschaft
WOLFSBURG

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June 1982
Final Report
Volume III/1 Side Impact

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WASHINGTON, D.C. 20590

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15. Supplementary Notes

16. Abstract

Vehicle and vehicle occupant response data and technical data from side impact test No. 1 - Crabbed Barrier/1981 Production 4 door Rabbit at 60° impact angle and v = 30 mph impact speed are summarized in this report.

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The Test Results belong to the specified NHTSA Test Configuration for Side Impacts with the Crabbed Barrier and HSRI-SID-Dummies both of which are currently under development.

NHTSA Project DTNH 22-81-C-17085

Volume III/ 1

Table of Contents

Appendix A

Photographs

Appendix B

Vehicle and Dummy Test Response
Acceleration-/ and Velocity/Time History

B.1 Vehicle Test Response
- B.1.1 Target Vehicle
- B.1.2 Crabbed Barrier

B.2 Dummy Test Response
- B.2.1 Driver
- B.2.2 Rear Passenger

List of Illustrations and Tables

1. Introduction

The Objective of the MIV project was to optimize the contradictory design aspects of a high degree of passive safety and low fuel consumption.

The project was arranged in Phase I and II. The results of Phase I are the basis of this report. Phase II was redefined by NHTSA. According to this, the three engine/transmission concepts that were to be newly developed are no longer part of Phase II.

Possibilities were to be found for a 4 door Rabbit for further increasing occupant protection in specified side and frontal impacts. The Rabbit Modifications should be possible to implement on the production line. NHTSA's design goals were the 35 mph frontal fixed barrier impact and the 30, 35 or 40 mph side impact with the new 1.565 kg (3,450 lbs) deformable Crabbed Barrier and the new HSRI Dummy which were specially conceived for the side impact and are presently still under development.

Modifications for the 4 door Rabbit were derived from Crabbed Barrier/ Production Rabbit baseline tests.
NHTSA contract specifications called for a maximum weight increase of 20 lbs for the modified 4 door Rabbit.

The NHTSA goal to achieve the greatest possible reduction in dummy loads, in keeping with the objective of lowest possible weight together with the prerequisite that the design be suited to mass production at the lowest possible cost, required the development of a new "Integrated Structure" for the 4 Door Modified Rabbit. This concept requires that the greatest number of components be effective during a frontal and a side impact. The "Integrated Structure" approach, rather than the Budd strategy to use add-on parts, is necessary to achieve the goals established by NHTSA.

2. Method

2.1 Test Devices and Test Configuration

2.2 List of Accelerometer Location

2.2.1 Target Vehicle Instrumentation

2.2.2 Side Impactor Instrumentation

2.2.3 Dummy Instrumentation

2.3 Camera Location and Frame Rate

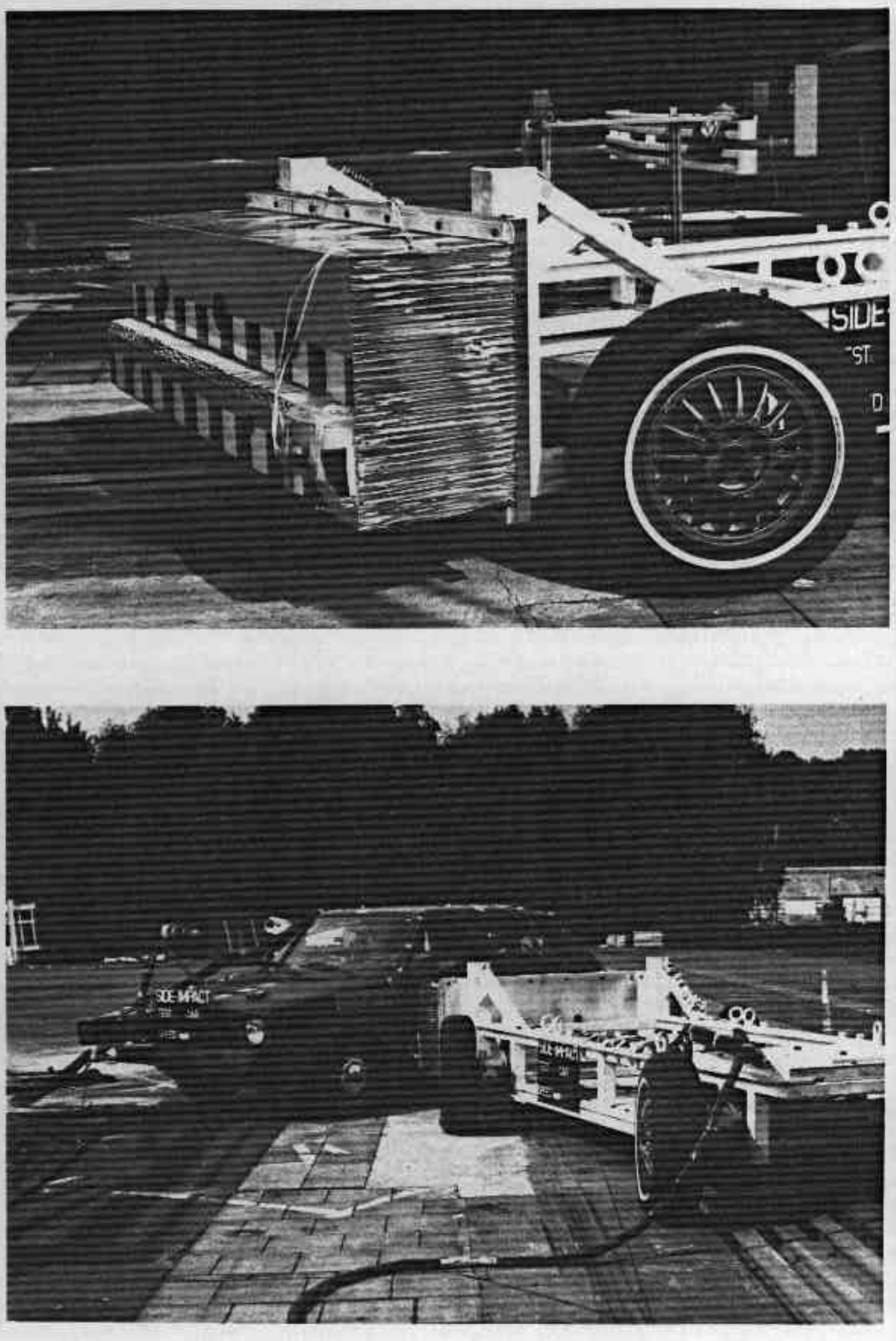


FIGURE 1 : 19° CRABBED BARRIER TEST DEVICE

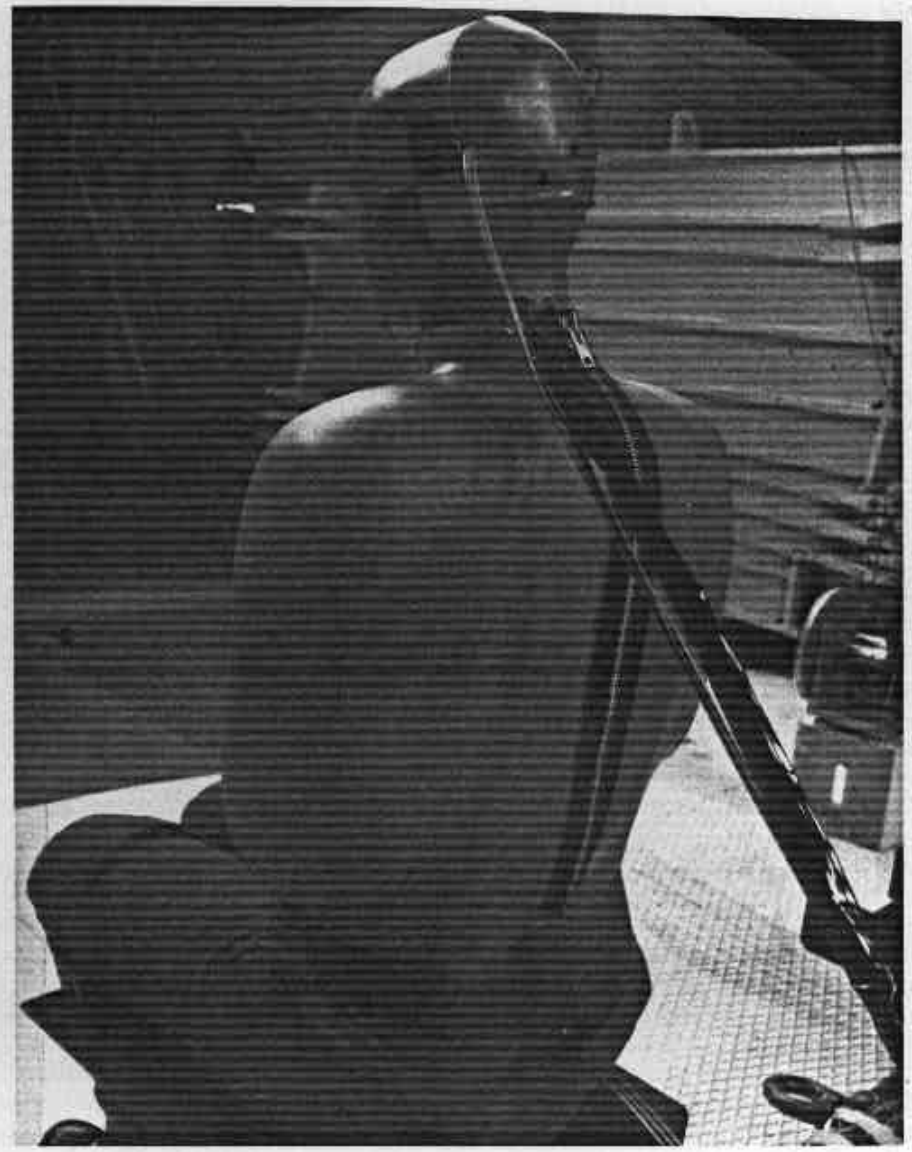
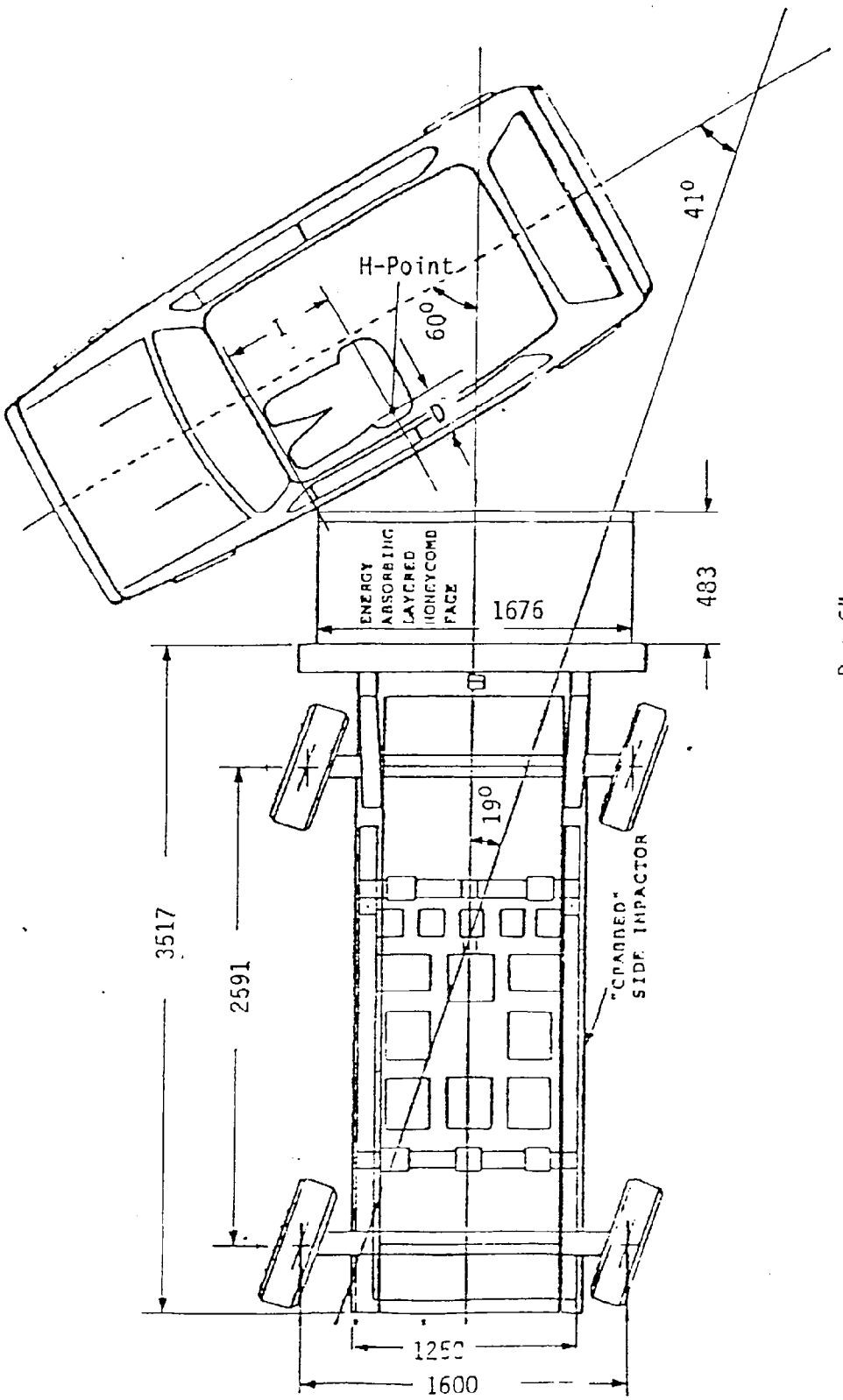


FIGURE 2 : HSRI SIDE IMPACT DUMMY



$$I = \frac{D + 6"}{0,8693} \pm 1,5 \quad (\pm 1,5") \qquad \text{(D and I in inch)}$$

Remarks: I = Impact-Point

D = Distance H-Point - Door Exterior

Figure 3: Test Configuration

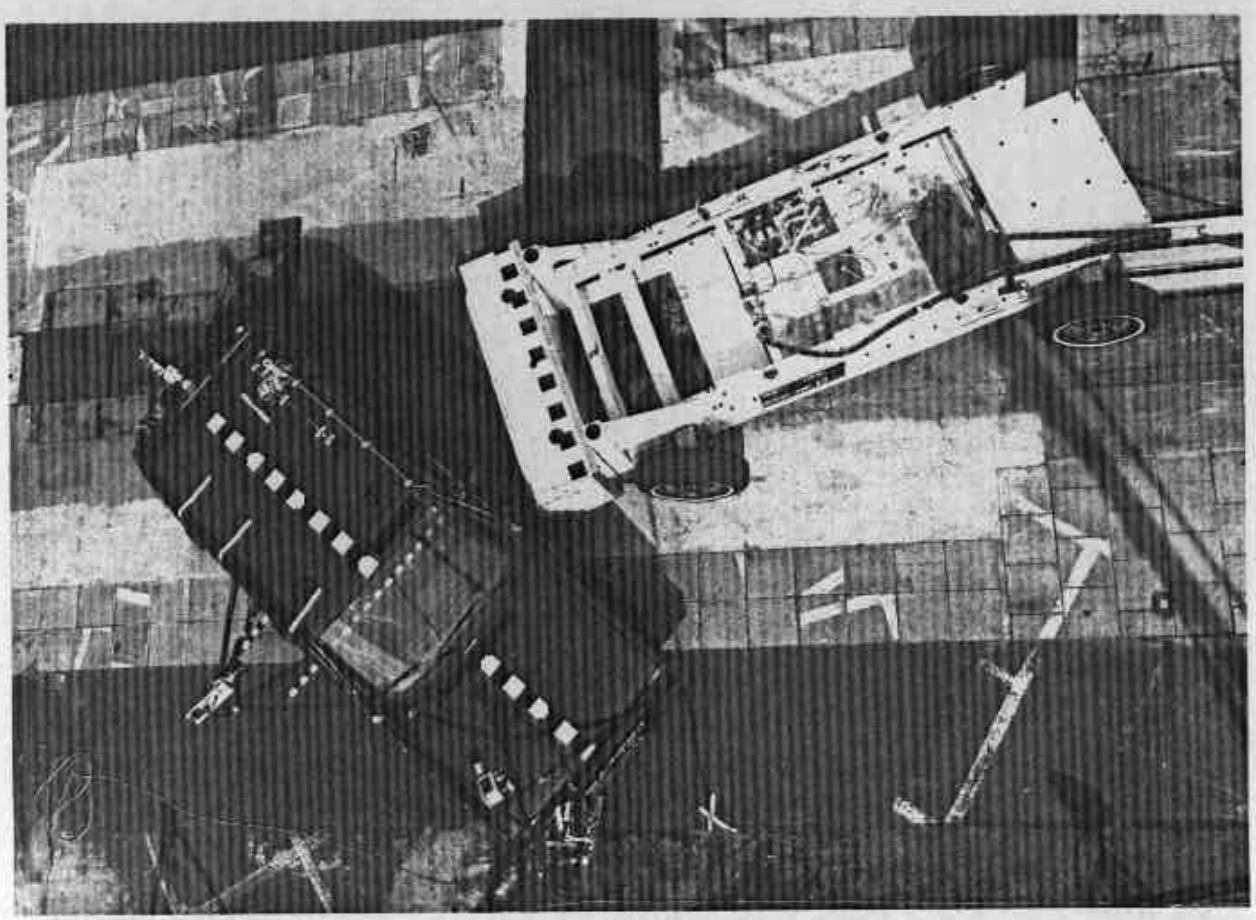


FIGURE 4 : SIDE IMPACT TEST CONFIGURATION

CRABBED BARRIER / VW RABBIT

Table 1: List of Accelerometer - Location

VEHICLE

No.	Location	Shortened Form	Direction
1	Right Front-Doorsill	TSVR	Y
2	Left Front-Doorsill	TSVL	Y
3	Left Rear-Doorsill	SHHL	Y
4	Rear Deck over Centerline	KOBO	X, Y, Z
5	Front Firewall over C_L	SWMI	X, Y, Z
6	Mid-front Edge of left Front-Door	TTRV	Y
7	Middle of left Front-Door	TTRM	Y
8	Shoulder Contact at Front-Door	SASL	Y
9	Pelvis Contact at Front-Door	BASL	Y
10	Left Front-Door on Windowsill	FBVL	Y
11	Right Front-Door on Windowsill, directly across No. 10	FBVR	Y
12	Left B-Pillar near Door Latch	BSLL	Y
13	Right B-Pillar across No. 12	BSLR	Y
14	Underneath left Front Seat attached to Seat	SGFA	Y
15	Vehicle Center of Gravity	RTMI	X, Y, Z
16	Left Front-Door Intrusion	FTWE	Y
17	B-Pillar Intrusion	THWE	Y
18	Shoulder Contact Driver	SKO1K	
19	Pelvis Contact Driver	BKO1K	
20	Shoulder Contact Left Rear Passenger	SKO3K	
21	Pelvis Contact Left Rear Passenger	BKO3K	

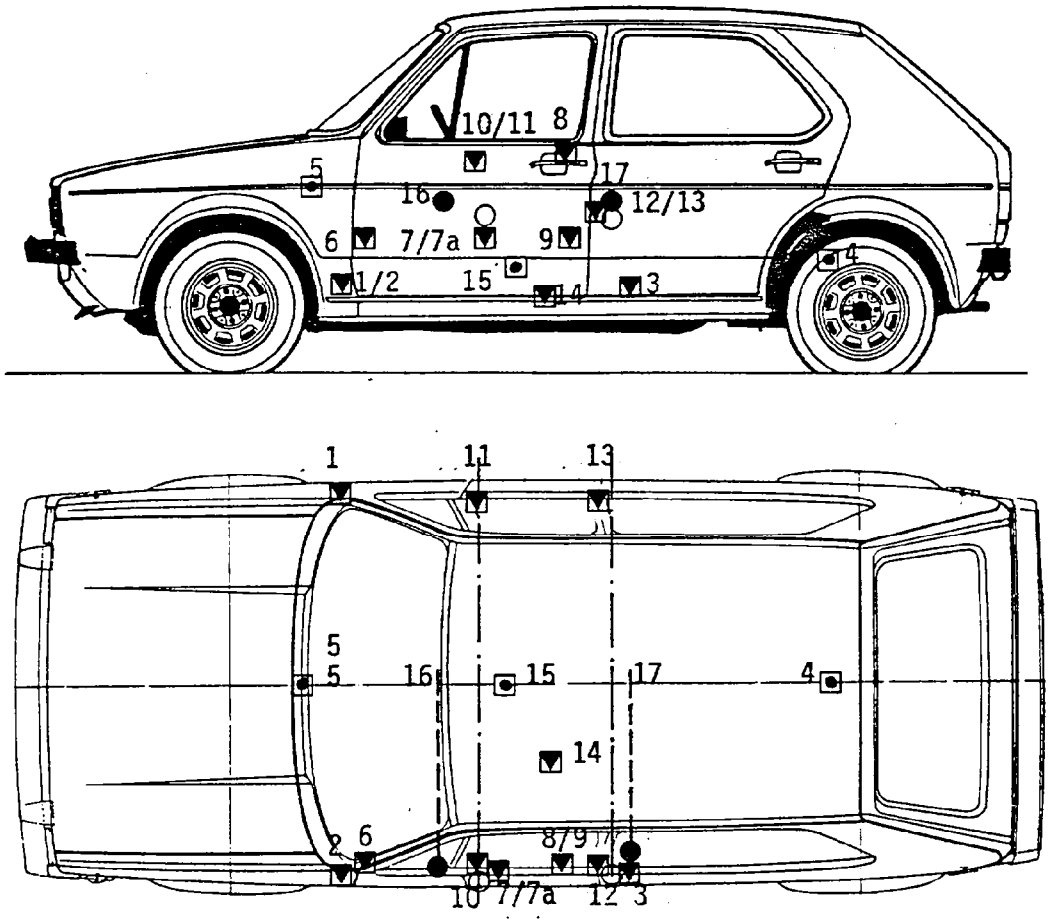
19° CRABBED SIDE IMPACTOR

1	Right Frame Rail	LTRR	X
2	Left Frame Rail	LTRL	X
3	Front Crossmember at C_L	QTVM	X
4	Right Rear Vertikal Framerail	RHTR	X, Y
5	Center of Gravity	SPKT	X, Y, Z

Declaration: X = Longitudinal
Y = Lataral
Z = Vertikal

Location of Accelerometer for the HSRI Side Impact Dummies

Location	Shortened Form	Direction
DRIVER		
Head Triaxial	KOO1	X, Y, Z
Upper Sternum	BOO1	X
Lower Sternum	BUO1	X
Left upper Rib	LOO1	Y
Left lower Rib	LUO1	Y
Right upper Rib	ROO1	Y
Right lower Rib	RUO1	Y
Upper Thorax (T 1)	TOO1	X, Y, Z
Lower Thorax (T 12)	TUO1	X, Y, Z
Pelvis Triaxial	BEO1	X, Y, Z
Chest Deflection	WEO1	Y
Shoulder Beltforce	GUO1SA	
REAR LEFT PASSENGER		
Head Triaxial	KOO3	X, Y, Z
Upper Sternum	BOO3	X
Lower Sternum	BUO3	X
Left upper Rib	LOO3	Y
Left lower Rib	LUO3	Y
Right upper Rib	ROO3	Y
Right lower Rib	RUO3	Y
Upper Thorax (T 1)	TOO3	X, Y, Z
Lower Thorax (T 12)	TUO3	X, Y, Z
Pelvis Triaxial	BEO3	X, Y, Z
Chest Deflection	WEO3	Y
Pelvis Beltforce	GUO3BA	



Axial Accelerometer (Y - Direction)

Biaxial Accelerometer (X, Y - Direction)

Triaxial Accelerometer (X, Y, Z -Direction)

Displacement Tube

Displacement Transducer

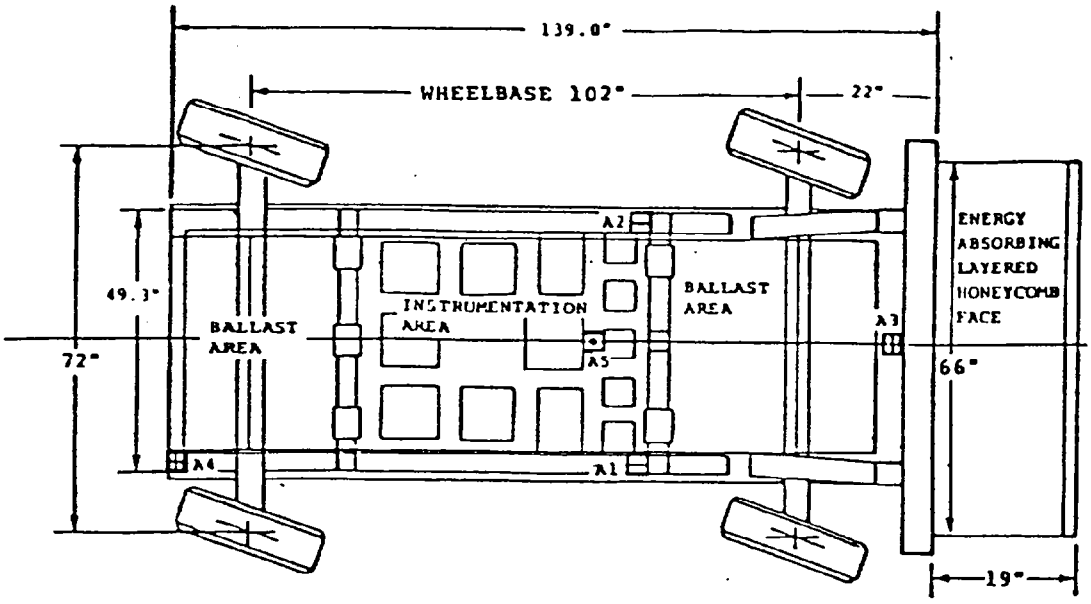
Note: See Table for Additional Information

Figure 5 : Target Vehicle Instrumentation

No.	Accelerometer - Location	Coordinates [mm] X *	Y *	Z *	Results [g_{max}] X	Y	Z
1	Occupant Compartment, right Front-Doorsill	2630	620	300	-	16	-
2	Occupant Compartment, left Front-Doorsill	2630	-620	300	-	90	-
3	Occupant Compartment, left Rear-Doorsill	1410	-560	290	-	122	-
4	Rear Deck over Vehicle Centerline	910	0	440	14	12	10
5	Front Firewall over Vehicle Centerline	2890	0	650	12	8	-
6	Mid-front Edge of Left Front Door	2550	-620	457	-	-	-
7	Middle of left Front Door	2060	-620	630	-	248	-
8	Shoulder Contact Front Door	1775	-665	850	-	-	-
9	Pelvis Contact Front Door	1840	-660	480	-	-	-
10	Left Front Door on Windowsill, slightly forward of surrogate's	2050	-650	850	-	70	-
11	Right Front Door on Windowsill, directly across from Nr. 10	2050	650	850	-	42	-
12	Left B-Pillar near Door Latch	1480	-650	670	-	120	-
13	Right B-Pillar across from Nr. 12	1480	650	670	-	38	-
14	Underneath left Front Seat attached to Seat	1960	325	285	-	111	-
15	Vehicle Center of Gravity				17	29	18
16	Displacement Transducer Front Door	2235	-	670	-	-	-
17	Displacement Transducer B-Pillar	1415	-	850	-	-	-

* Reference Points: X - Rear Bumper
Y - Vehicle Centerline
Z - Ground Level

Table 2: Summary of Target Vehicle Instrumentation



Axial Accelerometer, Longitudinal

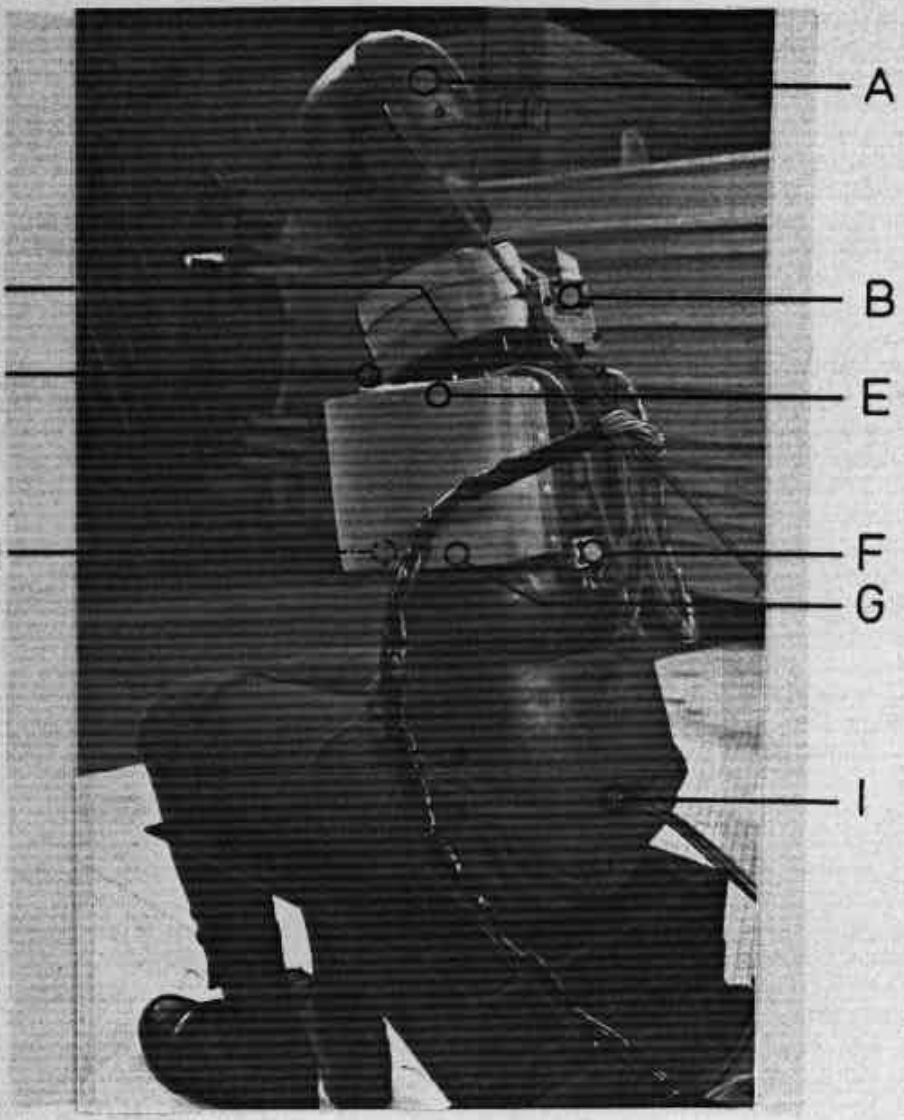
Biaxial Accelerometer, Long., Lat.

Triaxial Accelerometer, Long., Lat., Vert.

No.	Accelerometer - Location	Coordinates [mm]			Results [G]		
		X	Y	Z	Long	Lat	Vert
A 1	Right Frame Rail	2134	584	508	16	-	-
A 2	Left Frame Rail	2134	-584	508	14	-	-
A 3	Front Crossmember at Centerline	3300	0	610	17	-	-
A 4	Right rear vertikal Frame Rail	228	560	407	16	15	-
A 5	Side Impactor Center of Gravity	1727	0	305	def.	5	5

Reference Plane: X - Rear of Side Impactor
Y - Side Impactor Centerline
Z - Ground

FIGURE 6 : SIDE IMPACTOR INSTRUMENTATION



A. Head Triaxial
B. Upper Thorax (T 1), Triaxial
C. Upper Sternum, Longitudinal
D. Lower Sternum, Longitudinal
E. Left Upper Rib, Lateral (also on right)
F. Lower Thorax (T 12), Triaxial
G. Left Lower Rib, Lateral (also on right)
H. Displacement Transducer
I. Pelvis, Triaxial

Figure 7 : Location of 18 Accelerometer for Side Impact Dummy

Figure 8 :Camera Location - Ground based

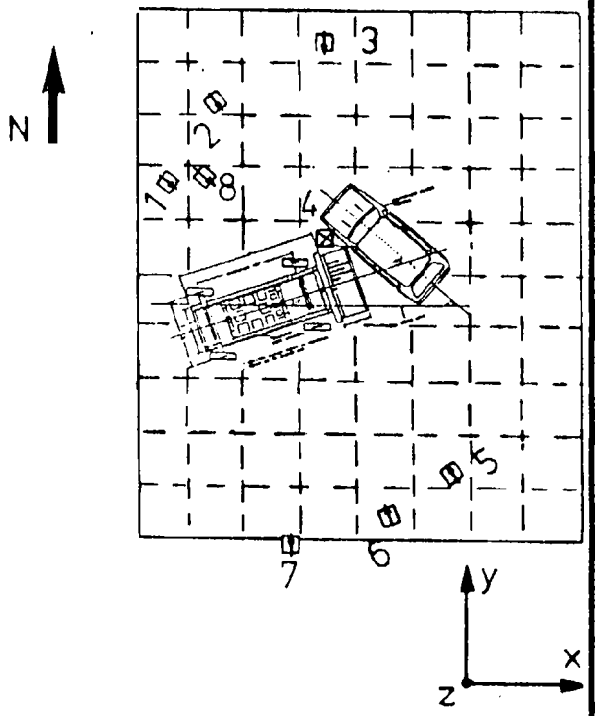
Test No: 1 Test Date: 08.24.1981

Test Type: 60° Side Impact Simulation

Vehicle A : Side Impactor

Vehicle B: VW-Rabbit

Comments: Side Impactor "Crabbed" 19°



Camera	Yes
Stills	
Movie	
Slides	
Polaroid	

Camera Symbols

- ⊙ Pit
- ⊤ Ground
- △ Barrier
- ⊠ Overhead
- □ On-Board

Frame Rate

1. 1000 fr/sec
2. 25 fr/sec
3. 400 fr/sec

Timing Light, Speed

1. 100 Hz (10 msec/light)
2. Other

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Real Fr.R.	Impact Dist-X	C. L. Dist-Y	Cam [m] Dist-Z
1	North Side -Parallel To Bullet	Overall of Both Vehicles (Locam)	16	3	10	419	-7.0	4.0	1.3
2	North Side -Parallel to Target	Close-up of Both Vehicles at Impact (Locam)	10	3	10	347	-3.0	4.5	2.2
3	North Side-Perpendicular to Bullet	Overall of Both Vehicles (Locam)	26	3	1	410	8.0	4.0	1.3
4	Overhead	Elevated - Looking Down at Impact Point (Photosonics)	10	3	10	367	-0.8	2.0	7.0
5	South Side -Parallel to Target	Close-up of Both Vehicles at Impact (Locam)	16	3	10	387	10.0	-12.0	1.3
6	South Side- Perpendicular to Target	Overall of Both Vehicles (GSMO)	16	2	-	--	5.0	-12.0	1.0
7	South Side	Overall of Both Vehicles (Locam)	16	3	10	413	2.0	-12.0	1.3
8	North Side	Overall of Both Vehicles (Mitchel)	50	2	-	---	-4.5	4.0	1.4

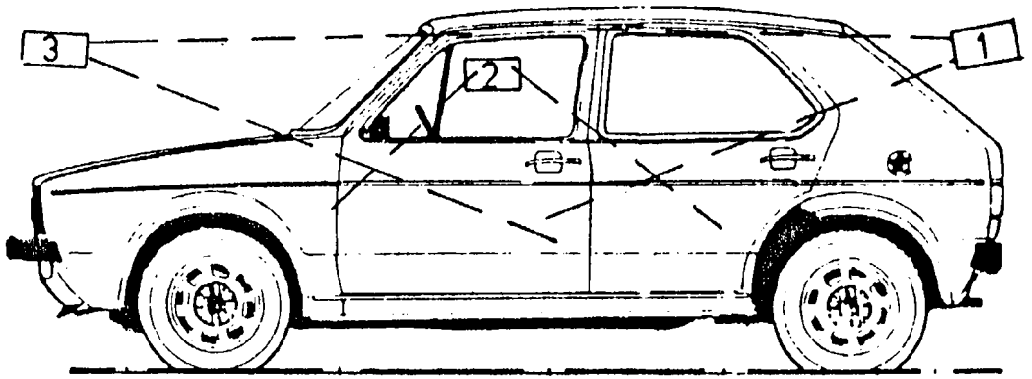
Test No.: 1 Test Date: 08.24.1881

Test Type: 60° Side Impact Simulation

Vehicle A: Side Impactor

Vehicle B: VW-Rabbit

Comments: Side Impactor "Crabbed" 19°



Camera Symbols

- ☐ on-Board
- [1] Ground
- △ Overhead

Frame Rate

1. 1000 fr/sec
2. 400 fr/sec
3. Other _____ fr/sec

Timing Light, Speed

1. 100 Hz (10msec/light)
2. Other _____

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Real Fr.R.	Impact Dist-X	C. L. Dist-Y	CAM Dist-Z [m]
1	Vehicle Rear Hatch-back Door	Front and Rear Occupant Compartment (Photosonics)	8	1	1	960			
2	Vehicle Right Front Door	Front Occupant Compartment (Photosonics)	8	1	1	1000			
3	Vehicle Front Right Side	Front and Rear Occupant Compartment (Photosonics)	8	1	1	1000			

Figure 9: Camera Locations - on Board

3. Test Parameter and Results
   - 3.1 Crash Test Summary
     - 3.1.1 Target Vehicle
     - 3.1.2 Side Impactor (19° Crabbed Barrier)
   - 3.2 Pre-Test Conditions
     - 3.2.1 Driver Pre-Test Position
     - 3.2.2 Rear Passenger Pre-Test Position
   - 3.3 Vehicle Pre- and Post-Test Position
   - 3.4 Post-Test Observations
   - 3.5 Dummy Test Response
     - 3.5.1 Dummy Test Response Summary - Driver
     - 3.5.2 Dummy Test Response Summary - Rear Passenger
     - 3.5.3 AIS and Coefficients
   - 3.6 Target Vehicle Test Response
     - 3.6.1 Pre- and Post-Test Measurements
     - 3.6.2 Exterior and Interior Vehicle Measurement
     - 3.6.3 Exterior and Interior Static Crush (Top View)
     - 3.6.4 Exterior and Interior Static Crush (Front View)
   - 3.7 Crabbed Barrier Test Response
     - 3.7.1 Pre- and Post-Test Frontal Profile
     - 3.7.2 Exterior Static Crush

Table 3: Crash Test Summary for Target Vehicle

VEHICLE DATA	TEST 1
Test Vehicle	VW Rabbit 4-Door
Overall Length/Width (mm)	3921 /1611
Test Weight by Wheel (kp)	LR 268 RR 282 LF 312 RF 342
Total Weight (kp)	1204
Wheelbase (mm)	2402
Longitudinal C.G. (from Center of Front Axle) (mm)	1097,3
Impact Angle (deg) *	60^0
Impact Speed (mph)	0 (stationary)
Maximum C.G. Resultant Velocity Change (mph // msec)	
Maximum C.G. Resultant Acceleration (G // msec)	
Maximum Door Acceleration (G // msec)**	
Maximum Exterior Static Crush (mm)	
• Level 4 (32.0")	345
• Level 3 (26.0")	359
• Level 2 (20.0")	436
• Level 1 (12.0")	263
Maximum Post-test Intrusion (mm)	362
OCCUPANTS	
Type	SID SID
Location	Driver Left Rear Pass.
Restraints	RA Pelvis Belt
INSTRUMENTATION	
Number of Data Channels	62
Number of cameras (On Board)	3

* With respect to bullet vehicle.
**At mid-rear edge of left front door.

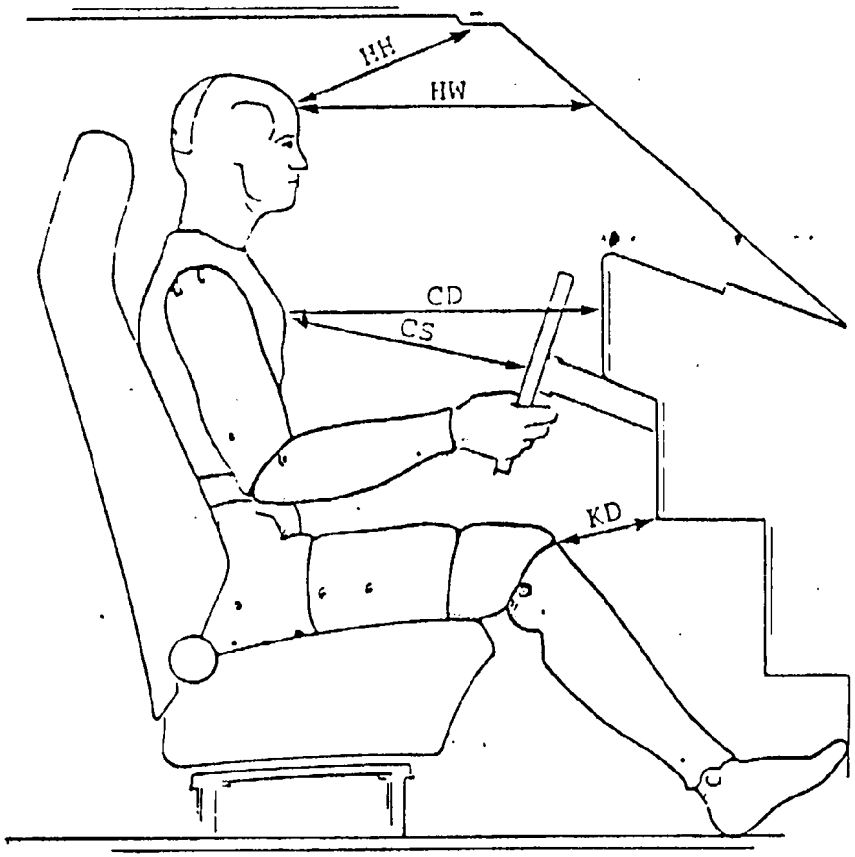
Table 4 : Crash Test Summary for Side Impactor

VEHICLE DATA	TEST 1
Test Vehicle	19° Crabbed Side Impactor
Overall Lenght/Width (mm)	4000 / 2155
Test Weight by Axle (kp)	LR 398 RR 383 LF 390 RF 401
Total Weight (kp)	1572
Wheelbase (mm)	2591
Longitudinal C.G. (from Center of Front Axle) (mm)	1266
Impact Angle (deg)	60°
Impact Speed (mph)	31,58
Maximum C.G. Resultant Velocity Change (mph / msec)	
Maximum C.G. Averange Resultant Compartment Acceleration (G / msec)	
Maximum Static Crush (mm)	
• Row C (Top of Stack Level)	75
• Row B (Mod-Stack Level)	105
• Row A (Bumper Level)	100
OCCUPANTS	
Type	-
Location	-
Restraints	-
INSTRUMENTATION	
Number of Data Channels	10
Number of Cameras (Ground Based)	7

Test No.: 1 Vehicle: 1 LF 312 (kp) RF 342 (kp)
Test Date: 8.24.81 Total Test Wt. 1204 (kp) LR 268 (kp) RR 282 (kp)

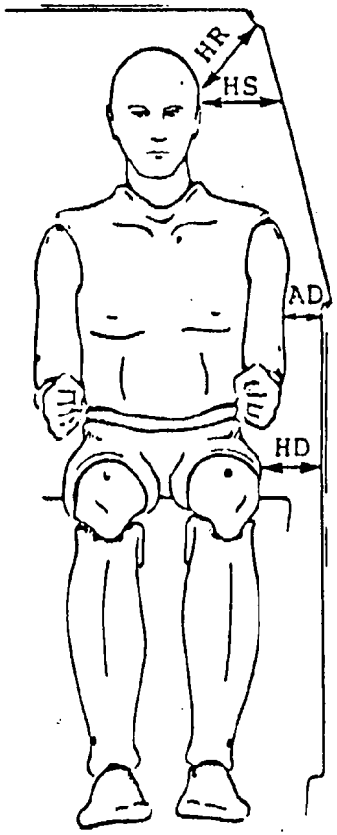
HEAD RESTS - up down other none
FRONT SEAT - forward midpoint rearward latched welded
FRONT SEAT TILT - forward midpoint back other 25° none
REAR SEAT - in place removed
STEERING WHEEL - up midpoint down not adjustable
SUN VISORS - up down removed
GLOVE COMPARTMENT - locked closed none
SEAT BELT - fastened unfastened removed none
SHOULDER HARNESSES - fastened unfastened removed
VENT WINDOW closed open removed none stationary
LEFT FRONT WINDOW - up down removed
RIGHT FRONT WINDOW - up down removed
LEFT REAR WINDOW - up down removed
RIGHT REAR WINDOW - up down removed
BACKLIGHT - in place removed
LEFT FRONT DOOR - closed locked removed
RIGHT FRONT DOOR - closed locked removed
LEFT REAR DOOR - closed locked removed
RIGHT REAR DOOR - closed locked removed
ENGINE - in place removed mounts modified
TRANSMISSION - neutral other _____ removed
DRIVESHAFT - in place removed
PARKING BRAKE - off on disconnected
FRONT BUMPER - in place removed none
REAR BUMPER - in place removed none
HOOD - in place removed none
WINDSHIELD WIPERS - in place removed
FUEL TANK - 95 Percent full empty other _____
RADIATOR - full empty none removed
BATTERY - in place removed drained
SPARE TIRE - in place removed none
JACK - in place removed none
WHEEL COVERS - in place removed none
BALLAST - none _____ kg
DUMMY LOCATION - LF RF LR RR none
DUMMY POSITIONING CRITERIA - FMVSS 208 side impact criteria other

Table 5: Pre-Test Conditions



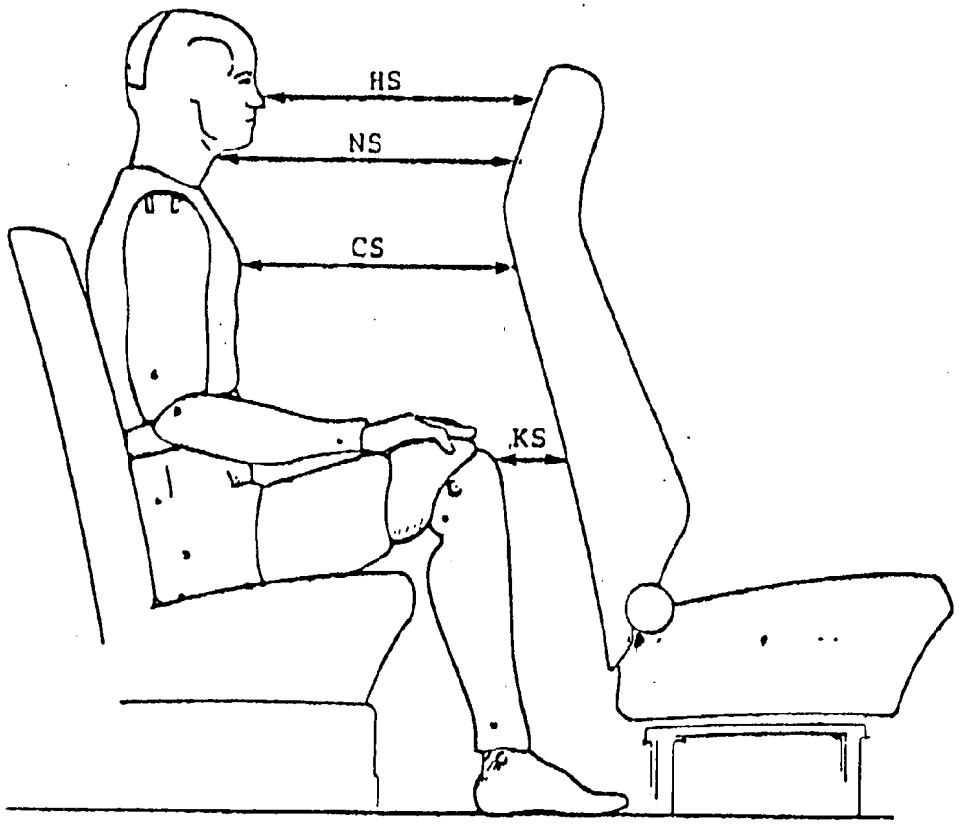
HH=	390	15.3
HW=	530	20.9
CD=	520	20.5
CS=	340	13.4
KD=	100	3.9

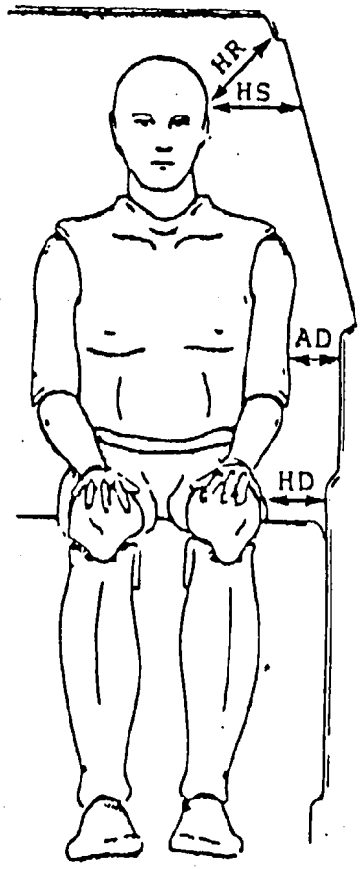
(ALL DIMENSION IN MM)



HR=	140	5.5
HS=	185	7.3
AD=	95	3.7
HD=	150	5.9

Table 6 : **Driver Pre-Test Position**





HS	465	18.3
NS	515	20.3
CS	400	15.7
KS	70	2.7

HR	100	3.9
HS	210	8.3
AD	150	5.9
HD	200	7.9

Table 7: **Rear Passenger Pre-Test Position**

Table 8 : Vehicle Pre- and Post-Test Position

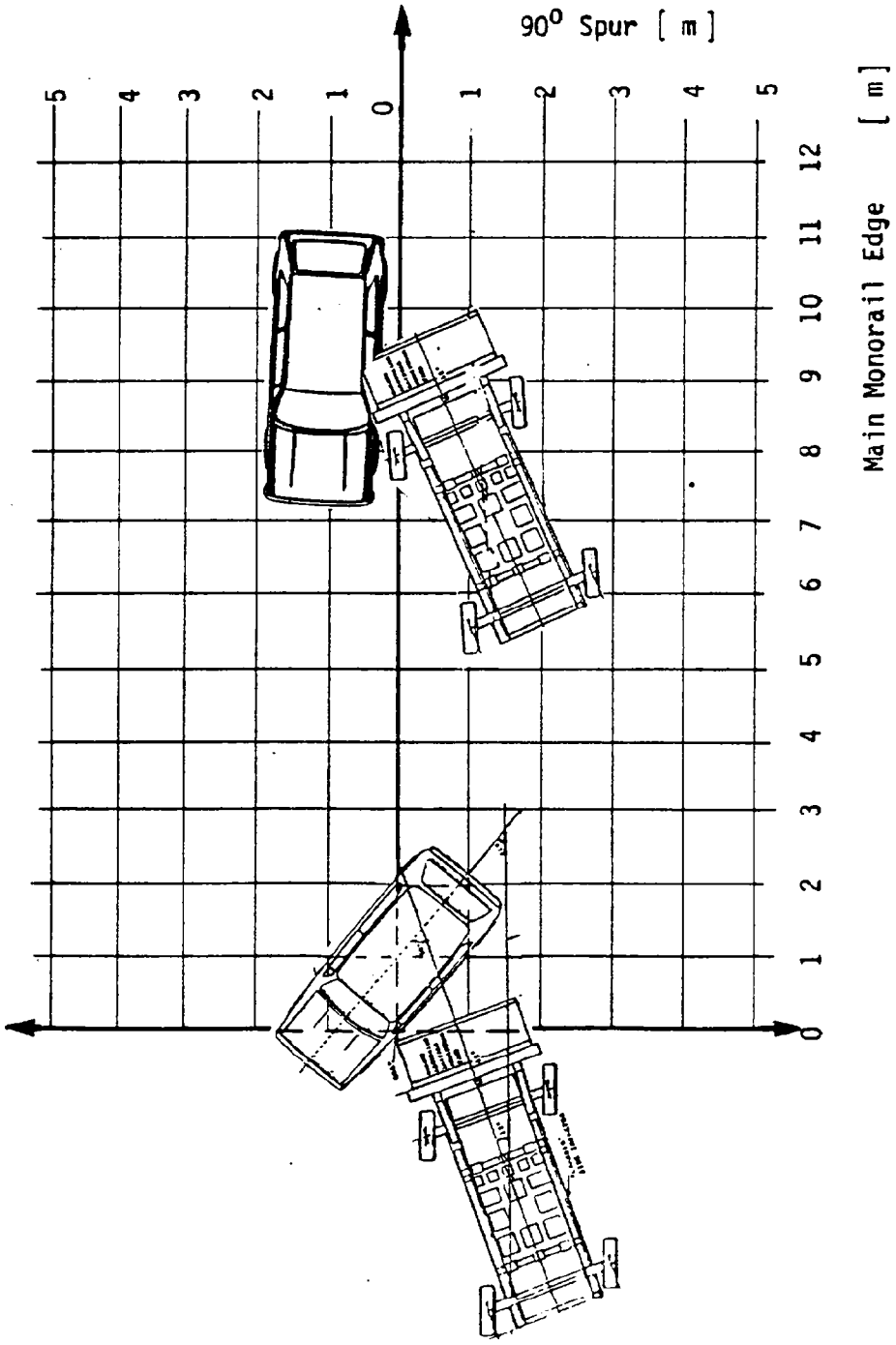


Table 9: Summary of Post-Test Observations

VEHICLE: VW Rabbit 1

Test No. (Moving Test Device) 1

Dummy Contact Points:	Left Front	Left Rear
Head	no Contact	no Contact
Chest	Upper Door Panel and lower Front-Door Panel	Upper Door Panel and Lower Rear-Door Panel
Knees/Hip	Lower Front-Door Panel	Lower Rear-Door Panel

Glazing: Left Front- and Rear Side-Window shattered. Windshield was broken but remained retained.

Doors: Left Front- and Rear Door damaged, would not open. Hinge Reinforcement tore out from Door.

Seat Belt Anchorages : Left Seat Frame damaged, but Seat Anchorages remained intact; Seat Legs and Seat-Runner fixed in the Floor-Rails.

Restraints: Driver (RA) and Left Rear (Lap - Belt) in use.

Fuel Leakage: None

General Observations: Impact point 650 mm from Front Axle.

Side Impactor Bumper impacted under the Door Beams. The Roof and the Floor were damaged on the area of the B-Pillar. B-Pillar damaged and bended on the Level of the Window-Sill. Left Front-Door separated from lower Sill. Knee-Bolster supported the A-Pillar.

Driver- and Left Rear- Dummy no damage

Form SS 7A.

TEST NO. 1 TEST DATE 08.24.1981

TEST CONFIGURATION:

Target Vehicle VW Rabbit 4-Door Speed 0- [mph]

Bullet Vehicle 19° Crabbed Side Impactor Speed 31.58 [mph]

Impact Location behind Front Axle 650 [mm] Angle 60 [deg]

PASSENGER: D R I V E R

HEAD RESPONSE:

Peak a_R 61.97 [g] Impacted Objekt none

HIC 461.76 Time T 1 30 [ms] T2 180 [ms]

CHEST RESPONSE:

Location	[g]	≥ 3ms [g]	SI	Δv_y [mph]	Imp.Time [ms]	Time a-max [ms]
Upper Sternum (X)	96.06	36		-	45	84
Lower Sternum (X)	73.95	54		-	43	84
LUR (Y)	123.91	85		24.19	40	57
LLR (Y)	123.67	94		24.59	40	58
RUR (Y)	90.09	78		24.12	43	65
RLR (Y)	89.44	82		27.27	43	64

CHEST DEFLECTION: Damper - DY - [mm]

VERTEBRAL COLUMN RESPONSE:

Location	Pk ay[g]	Pk a_R[g]	> 3 ms[g]	SI	Δv_y[mph]	Imp.Time [ms]	Time a-max [ms]
Upper Thorax (T1)	88.74	89.43	86	623	23.17	45	63
Lower Thorax (T12)	73.03	73.11	63	588	26.06	38	60.5

PELVIS RESPONSE:

Pk a_R[g] 117.95 SI 1077 ≥3 ms [g] 112.56 Impact Time [ms] 50

Table 10: Side Impact Dummy Test Response Summary

TEST NO. 1 TEST DATE 08.24.1981

TEST CONFIGURATION:

Target Vehicle VW Rabbit 4-Door Speed 0 [mph]

Bullet Vehicle 19° Crabbed Side Impactor Speed 31.58 [mph]

Impact Location behind Front Axle 650 [mm] Angle 60 [deg]

PASSENGER: L E F T R E A R

HEAD RESPONSE:

Peak a_R 47.03 [g] Impacted Objekt none

HIC 103.32 Time T 1 96 [ms] T2 180 [ms]

CHEST RESPONSE:

Location	[g]	≥ 3ms [g]	SI	Δv_y [mph]	Imp.Time [ms]	Time a-max [ms]
Upper Sternum (X)						
Lower Sternum (X)						
LUR (Y)						
LLR (Y)						
RUR (Y)						
RLR (Y)						

CHEST DEFLECTION: Damper - DY [mm]

VERTEBRAL COLUMN RESPONSE:

Location	Pk ay[g]	Pk a_R[g]	3 ms[g]	SI	Δv_y[mph]	Imp.Time [ms]	Time a-max [ms]
Upper Thorax (T1)	52.4	53.7	45.15	202		85	102.5
ower Thorax (T12)							

PELVIS RESPONSE:

Pk a_R[g] 71.63 SI 281 ≥3 ms [g] 46.11 Impact Time [ms] 48.5

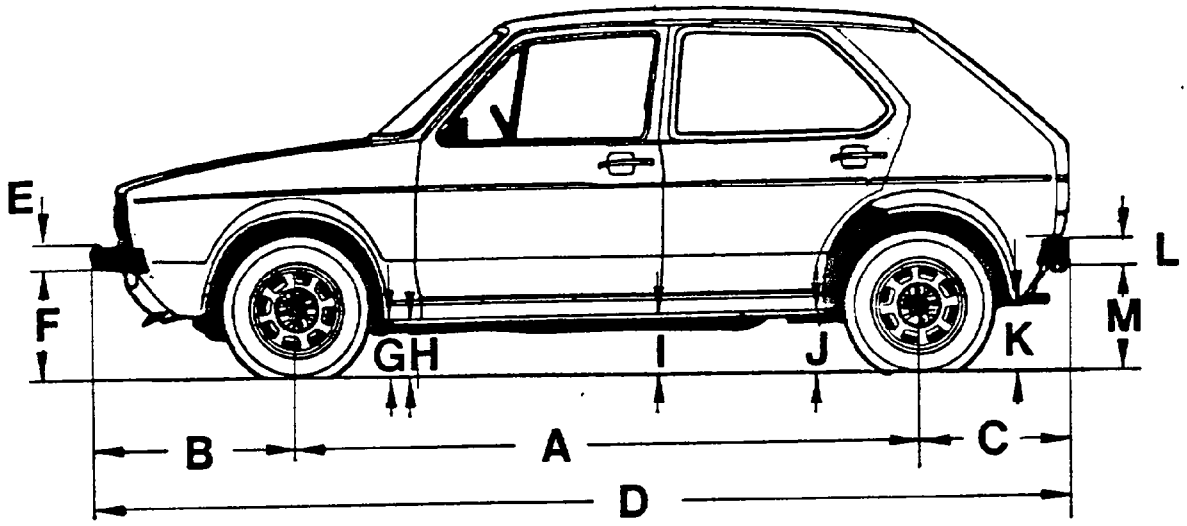
Table 11: Side Impact Dummy Test Response Summary

TEST NO. 1 TEST DATE 08.24.1981

COMPUTED COEFFICIENTS:

Location of Accelerometer	AIS B-Param.	AIS Av.Pow.	PAP TB / TE (ms)	B	Q	V_{1050}	V_{1090}	RVS
Left Upper Rib LUR	3.82	3.85	2544 51.3/ 64.4	7.0494	887.15	6.87	10.62	1.5455
Left Lower Rib LLR	3.83	3.93	2688 51.3/ 64.4	7.0554	946.03	6.87	11.25	1.6364
Upper Thorax T 1 Y	3.83	3.94	2552 59.4/ 73.1	7.0519	1027.3	6.25	13.13	2.1000
Lower Thorax T 12 Y	3.66	3.97	2640 51.9/ 69.4	6.9428	1156.4	7.50	16.25	2.1667

TABLE 12 : AIS AND COEFFICIENTS



	PRE - TEST	POST - TEST	Δ CHANGE
A	2402	2315	-87
B	820	825	5
C	699	695	-4
D	3921	3835	-88
E	125	125	0
F	355	350	- 5
G	175	180	5
H	152	180	28
I	155	190	35
J	150	185	35
K	190	210	20
L	125	125	0
M	290	310	20

Table 13: Pre-and Post-Test Measurements

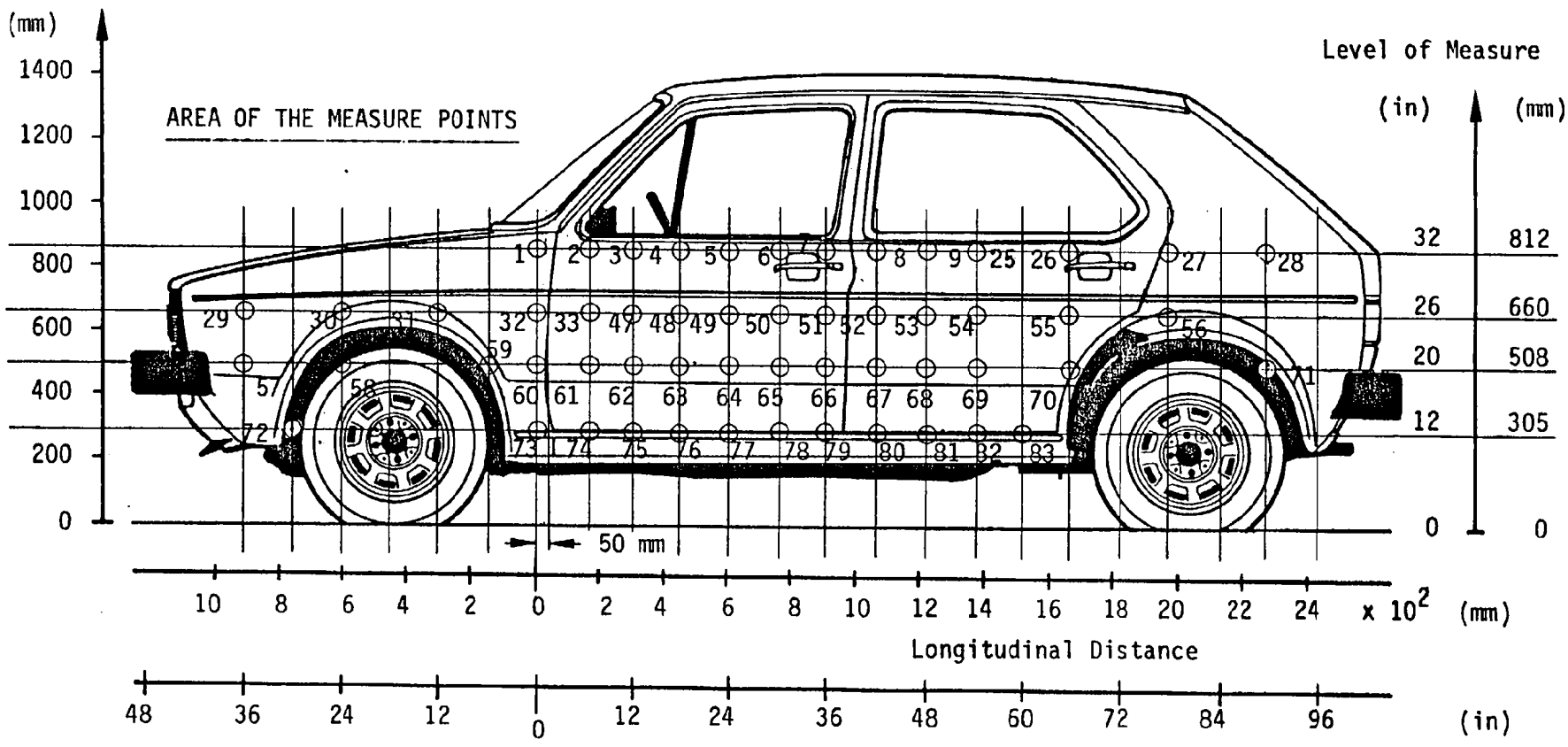


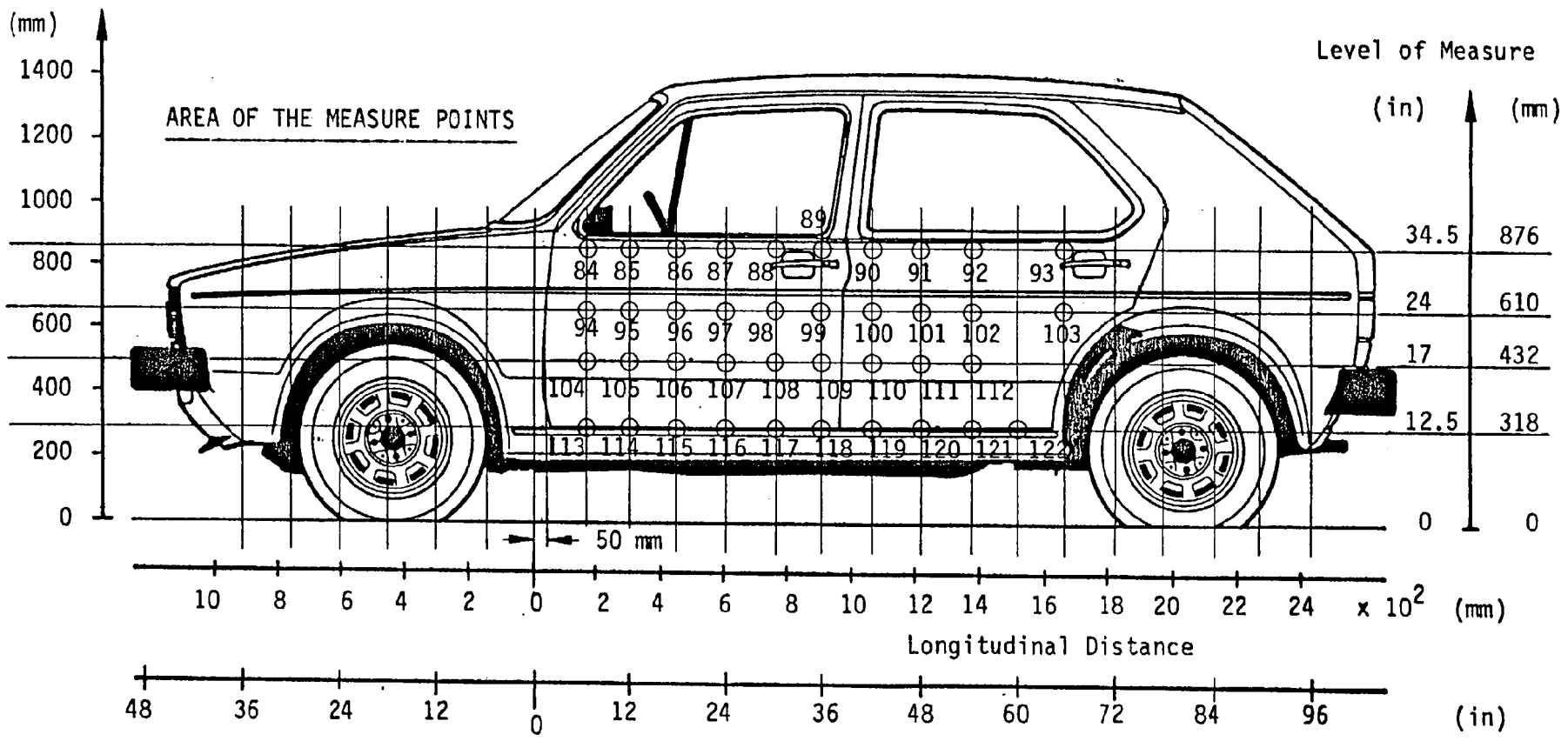
Figure 10: Vehicle Measurement Side (Exterior)

Table 14 : Exterior Static Crush for VW Rabbit

TEST NO : 1

		(Front)					Zero Distance Located at Door [mm]									(Rear)				
Location	Height [mm] *	762	610	457	305	152	0	152	305	457	610	762	914	1067	1220	1372	1524	1676	1829	1981	2286
Window-Sill	812	-	-	-	-	-	2	118	216	291	344	345	309	273	210	125	-	7	9	-	26
Bullet Vehicle Hood	660	-	23	-	1	-	12	186	290	331	359	353	318	285	224	162	-	35	-	6	-
Mid-Door	508	-	-	-	-	22	34	232	370	421	436	408	347	305	250	191	-	79	-	-	27
Rocker-Sill	305	25	-	-	-	-	20	137	163	188	213	241	263	256	156	83	40	-	-	-	-

* All heights measured above ground level.



TEST NO : 1

VEHICLE NO : 705 106-2

Figure 11 : Vehicle Measurement Side (Interior)

Table 15: Interior Static Intrusion for VW-Rabbit

TEST NO : 1

Location	Height [mm] *	Zero Distance Starting at Door [mm]											
		0	152	305	457	610	762	914	1067	1220	1372	1524	1676
Windowsill Level	876	-	75	181	232	289	298	285	283	206	130	-	6
Mid-door Level	610	-	-	245	300	327	-	325	285	188	-	-	23
Bullet Vehicle Bumper Level	432	-	175	267	330	362	342	317	280	176	-	-	-
Doorsill Level	305	-	80	107	122	147	177	210	179	61	-	-	-

* Heights measured above ground level.

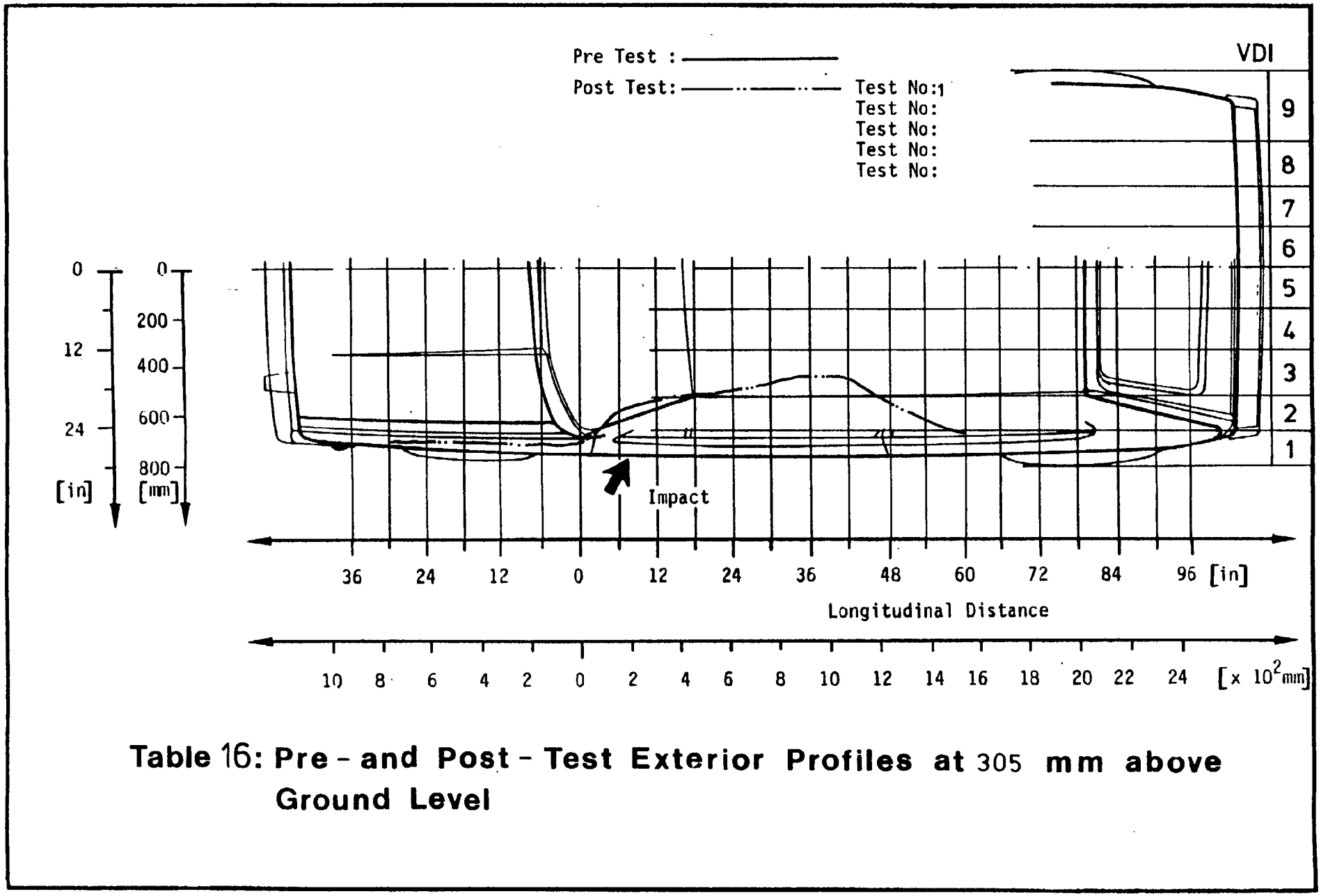


Table 16: Pre - and Post - Test Exterior Profiles at 305 mm above Ground Level

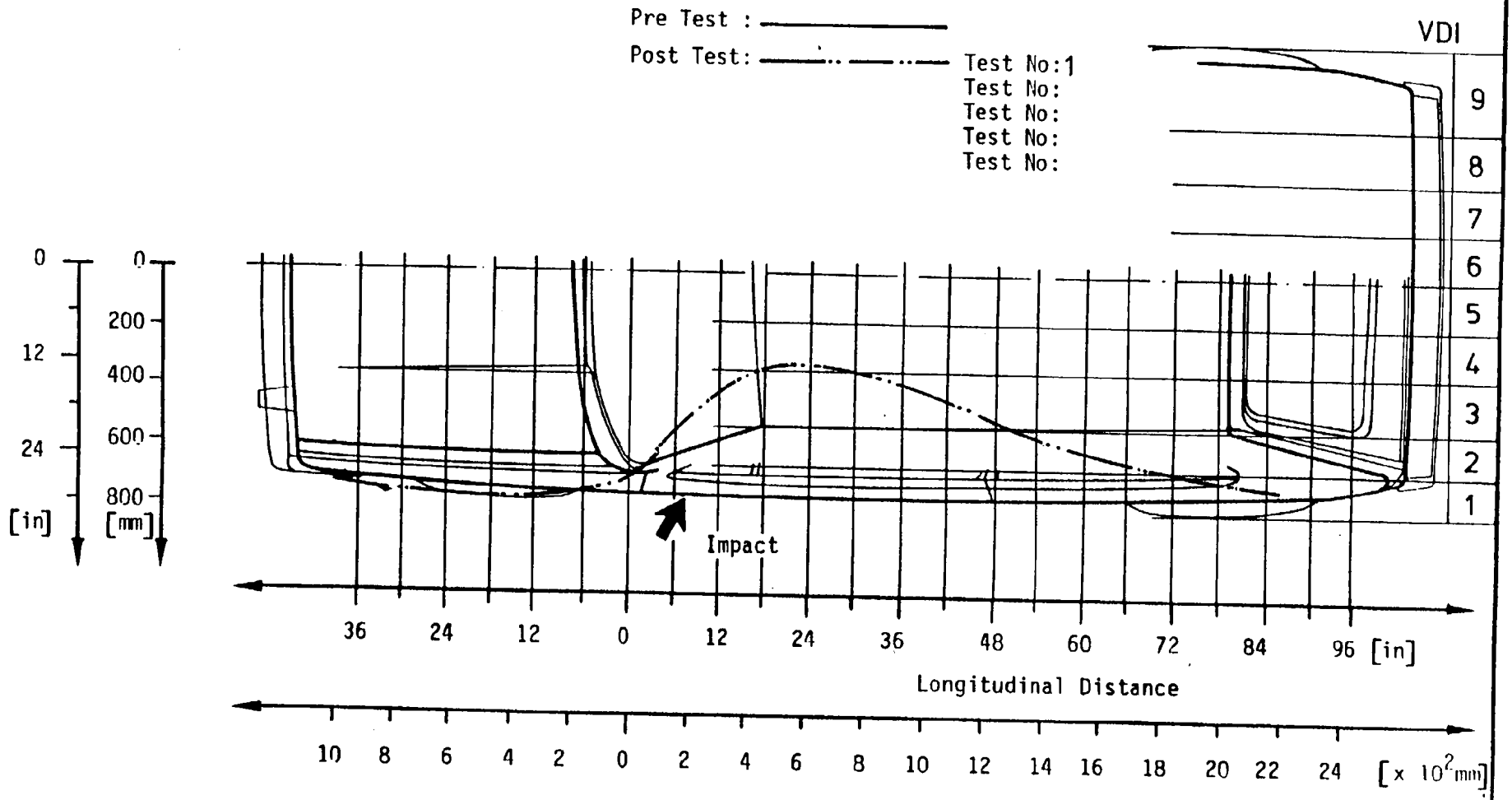


Table 17: Pre - and Post - Test Exterior Profiles at 508 mm above Ground Level

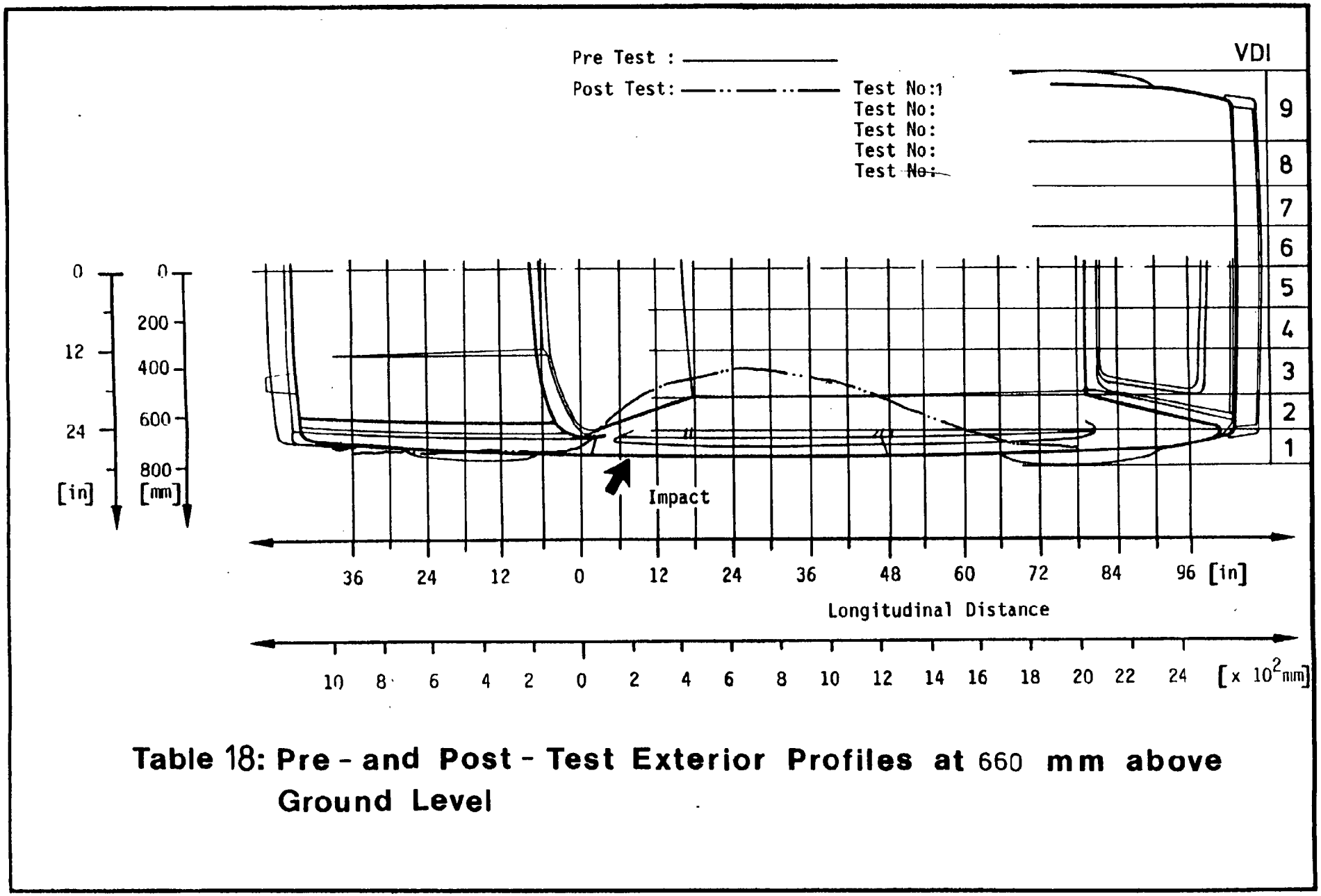


Table 18: Pre - and Post - Test Exterior Profiles at 660 mm above Ground Level

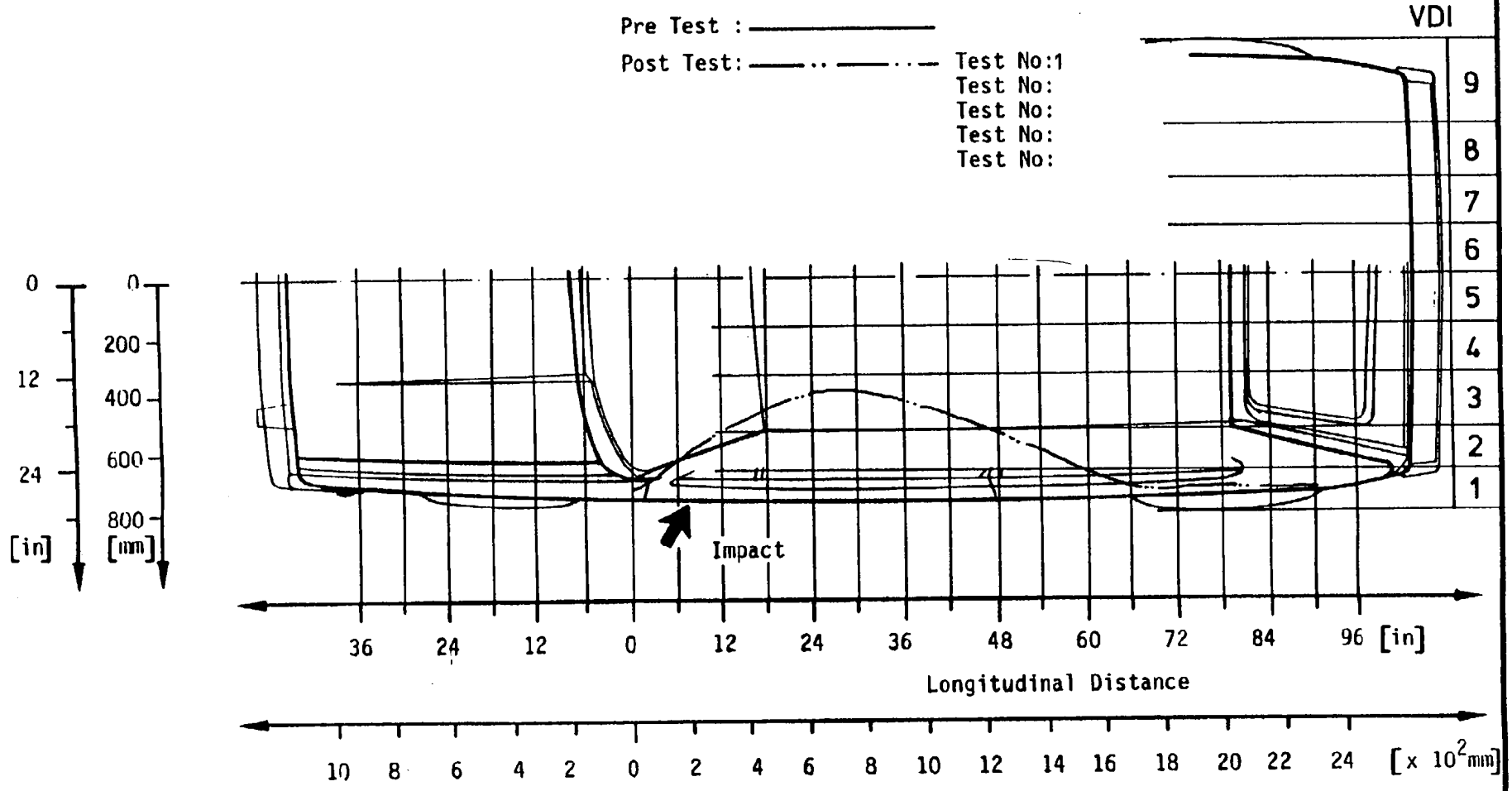


Table 19: Pre - and Post - Test Exterior Profiles at 812 mm above Ground Level

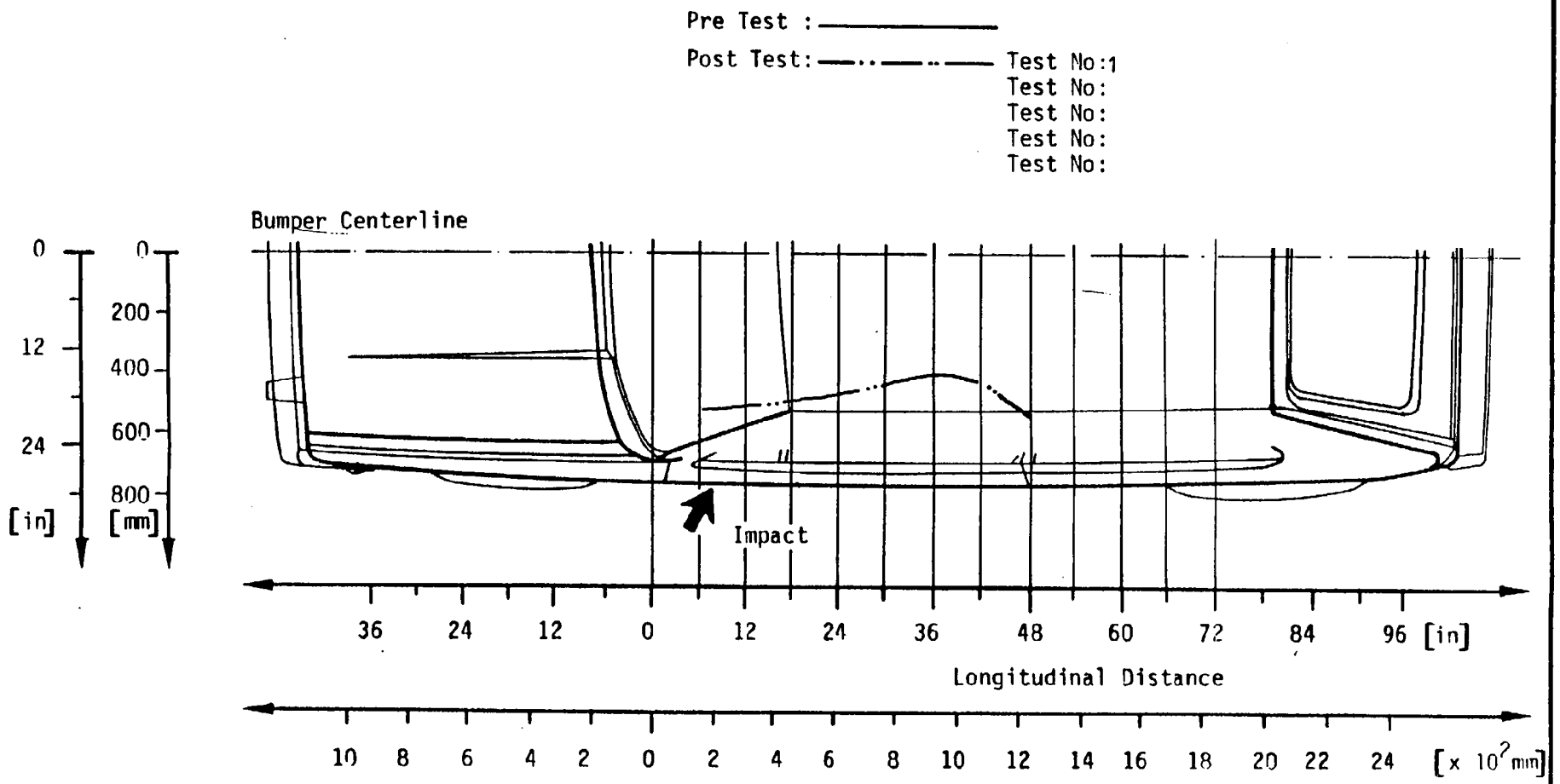


Table 20: Pre - and Post - Test Interior Profiles at 318 mm above Ground Level

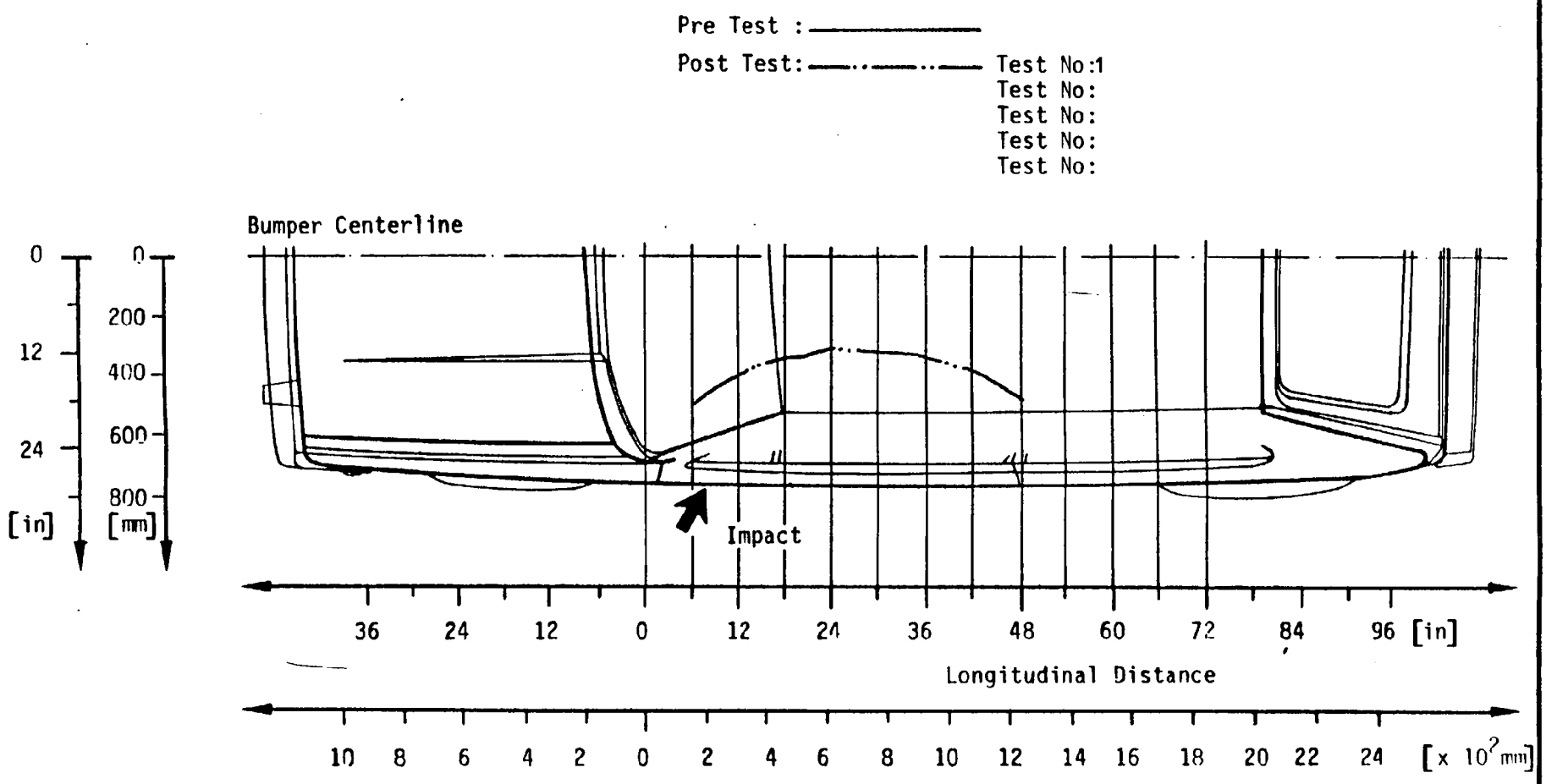


Table 21: Pre - and Post - Test Interior Profiles at 432 mm above Ground Level

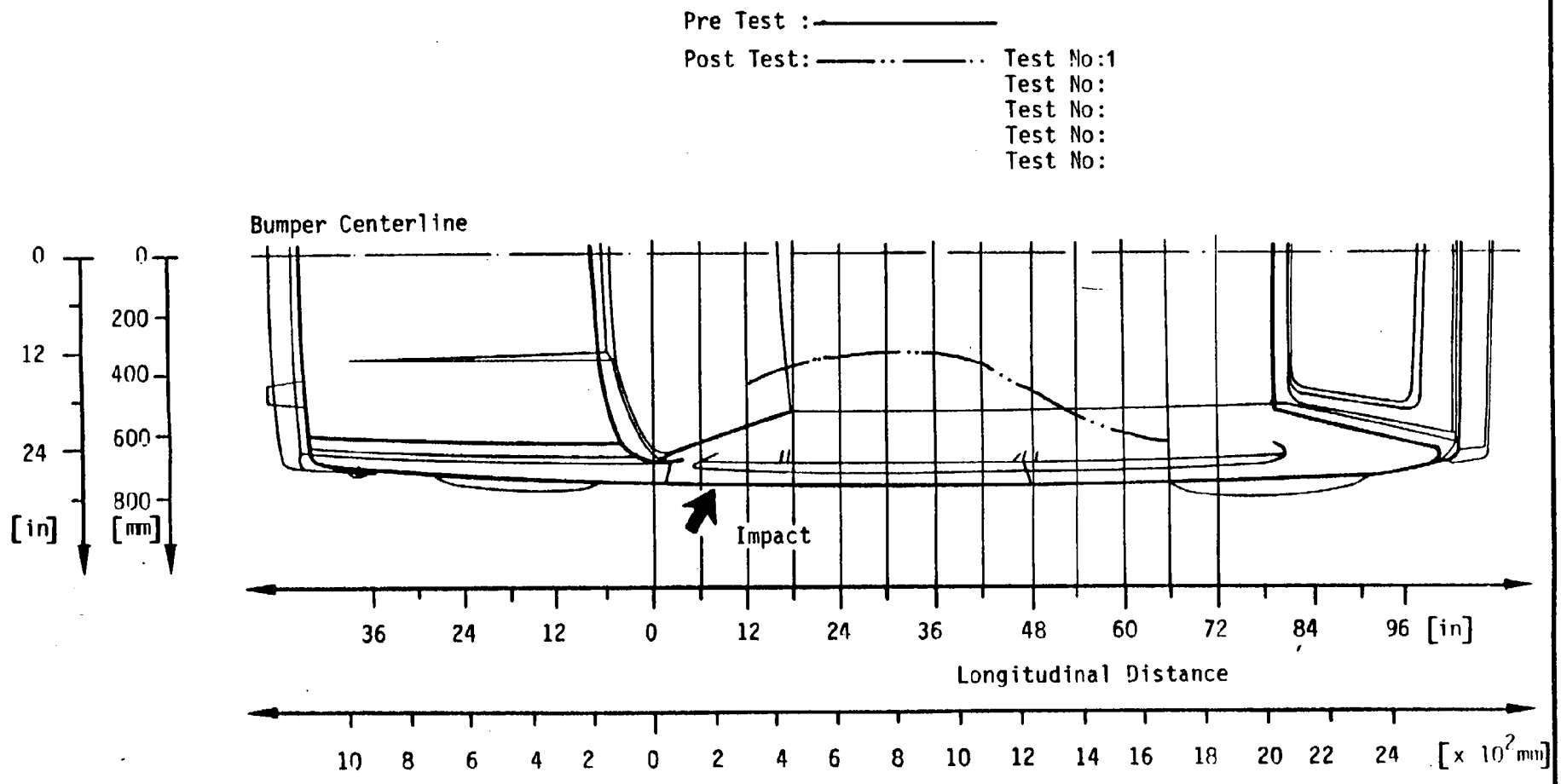


Table 22: Pre - and Post - Test Interior Profiles at 610 mm above Ground Level

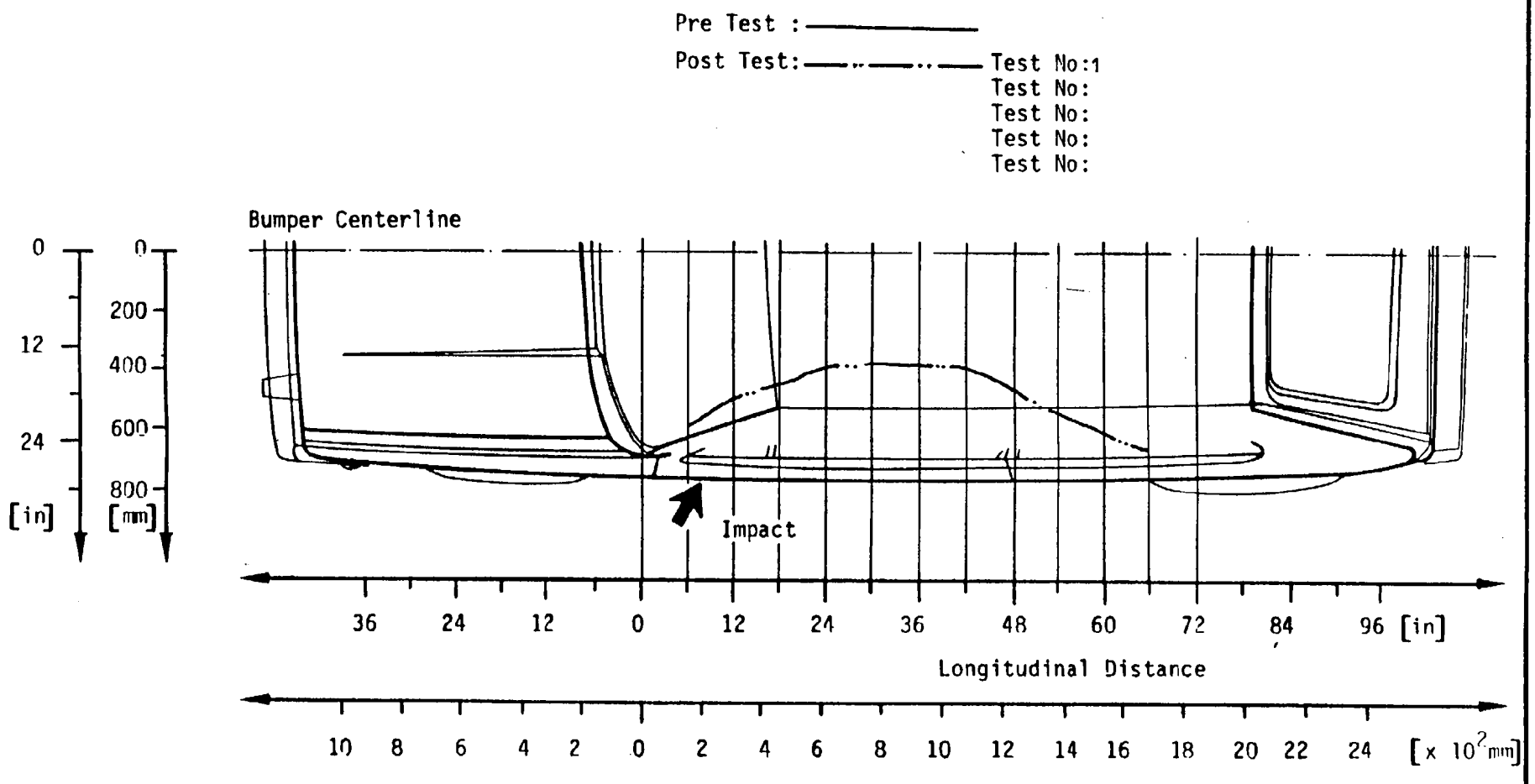


Table 23: Pre - and Post - Test Interior Profiles at 876 mm above Ground Level

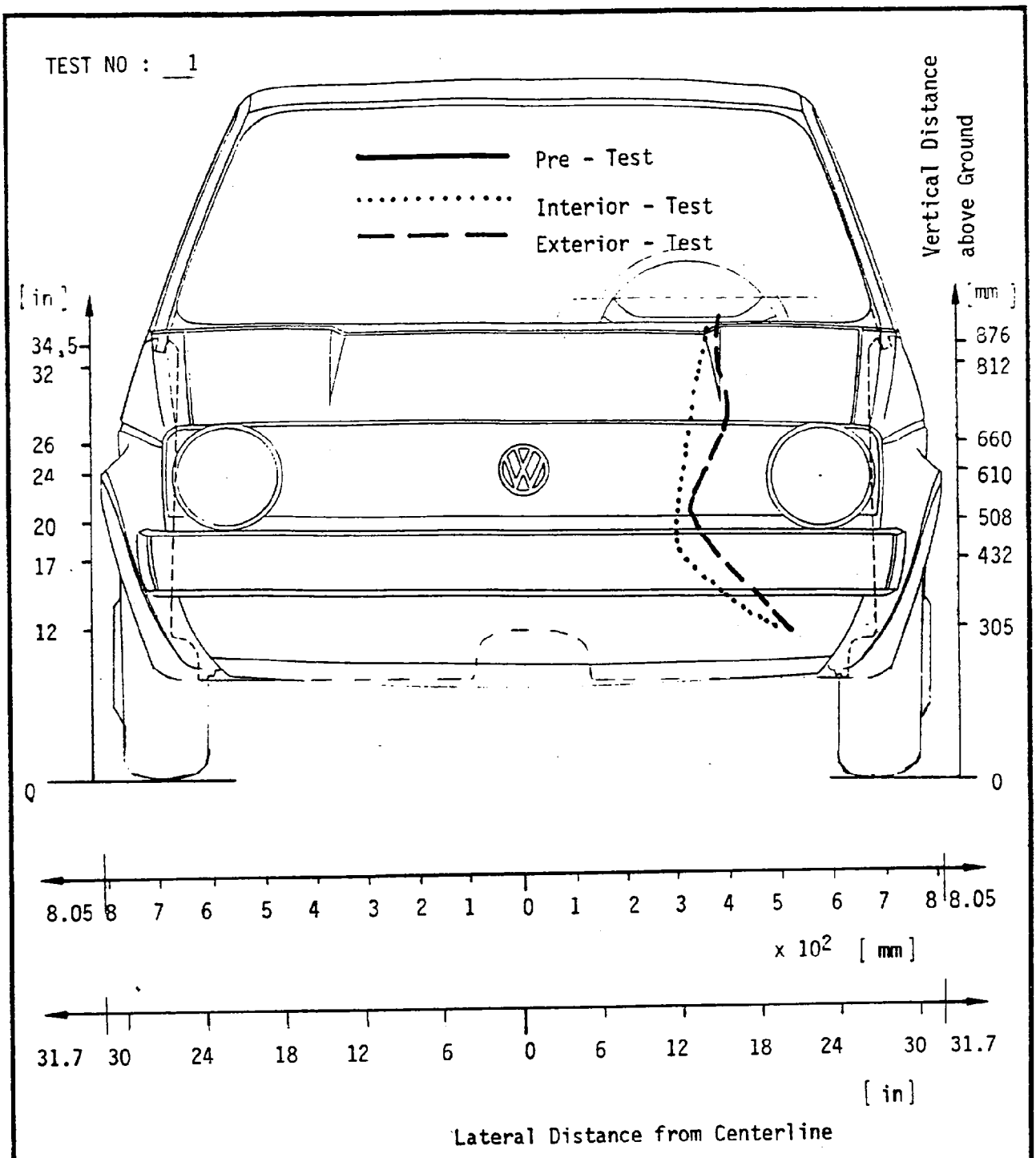


FIGURE 12 : EXTERIOR AND INTERIOR STATIC PROFILES AT THE LONGITUDINAL DISTANCE 610 MM FROM DOOR

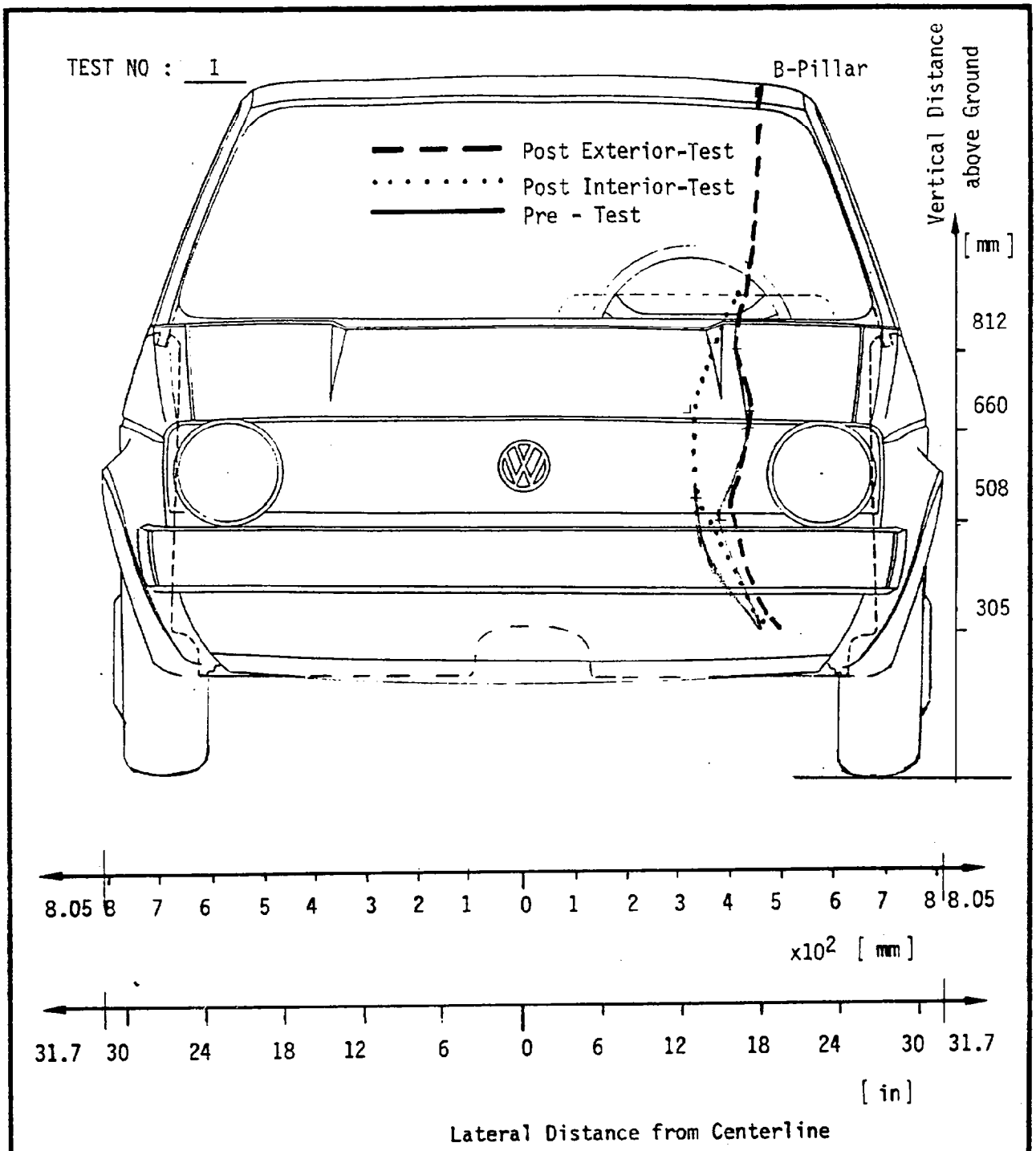


FIGURE 13 : EXTERIOR AND INTERIOR STATIC PROFILES AT THE LONGITUDINAL DISTANCE 914 MM FROM DOOR

Table 24: Exterior Static Crush for Side Impactor

TEST NO 1

Location	Height at C.L. *	Distance right of Center [mm]							Distance left of Center [mm] **							
		835	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	835
Top of Stack Level	813	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-10	-75
Mid - Stack Level	554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	-25	-105
Bumper Level	432	0	0	0	0	0	0	0	0	0	0	0	-40	-45	-40	-45	-55	-100

* Heights measured above ground level.

** Impact side.

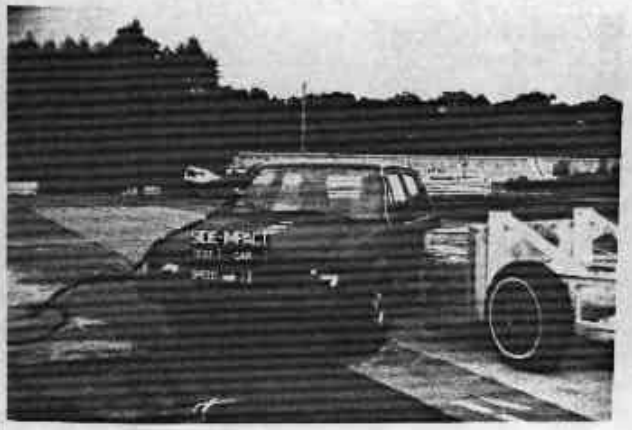
A P P E N D I X A

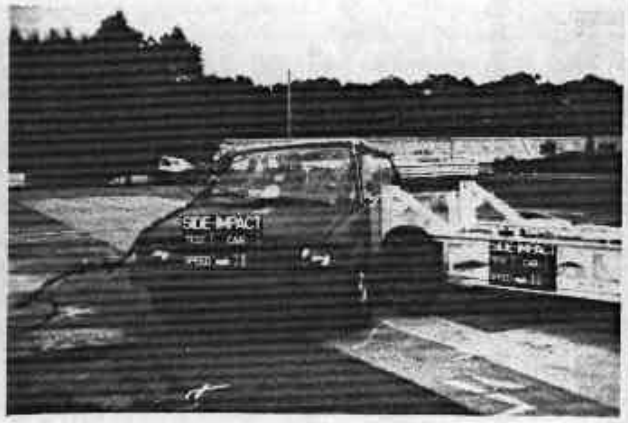
Photographs

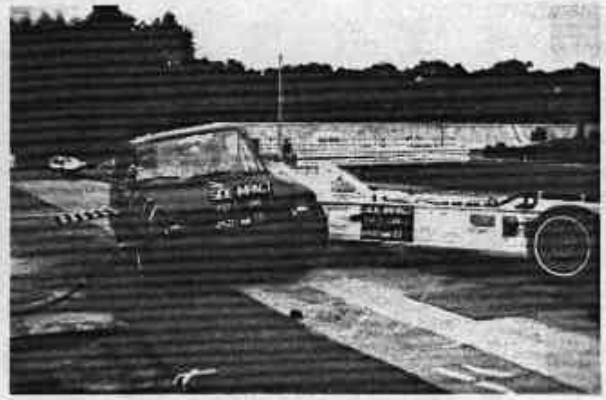
List of Illustrations

Figure A1 : Crash Sequence Figures

TEST 1 - 30 mph

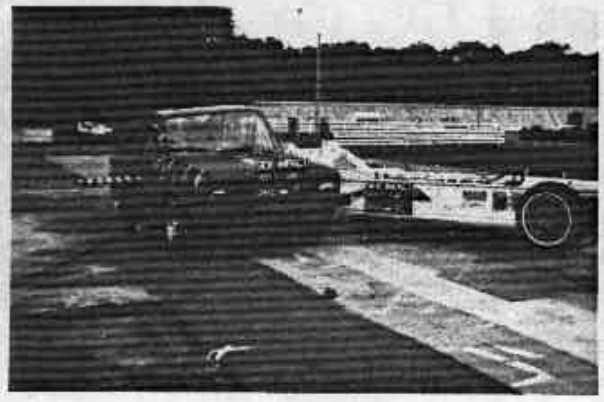










A - 2A

Form FE 16a

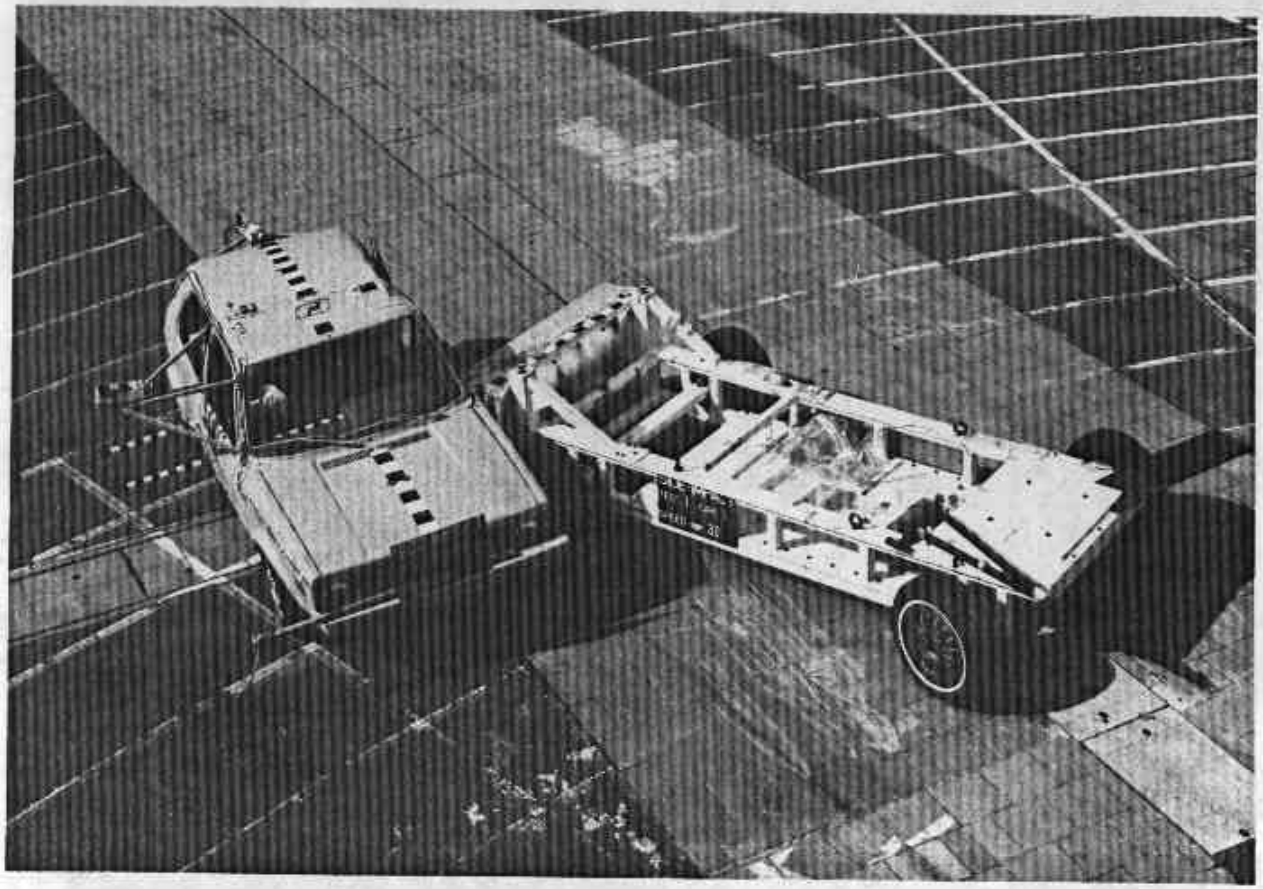


FIGURE A 2 : POST TEST 'POSITION'

CRABBED BARRIER AND VW RABBIT

FIGURE A 3 : VW RABBIT LEFT SIDE

POST TEST VIEW (FRONT-SIDE DIRECTION)

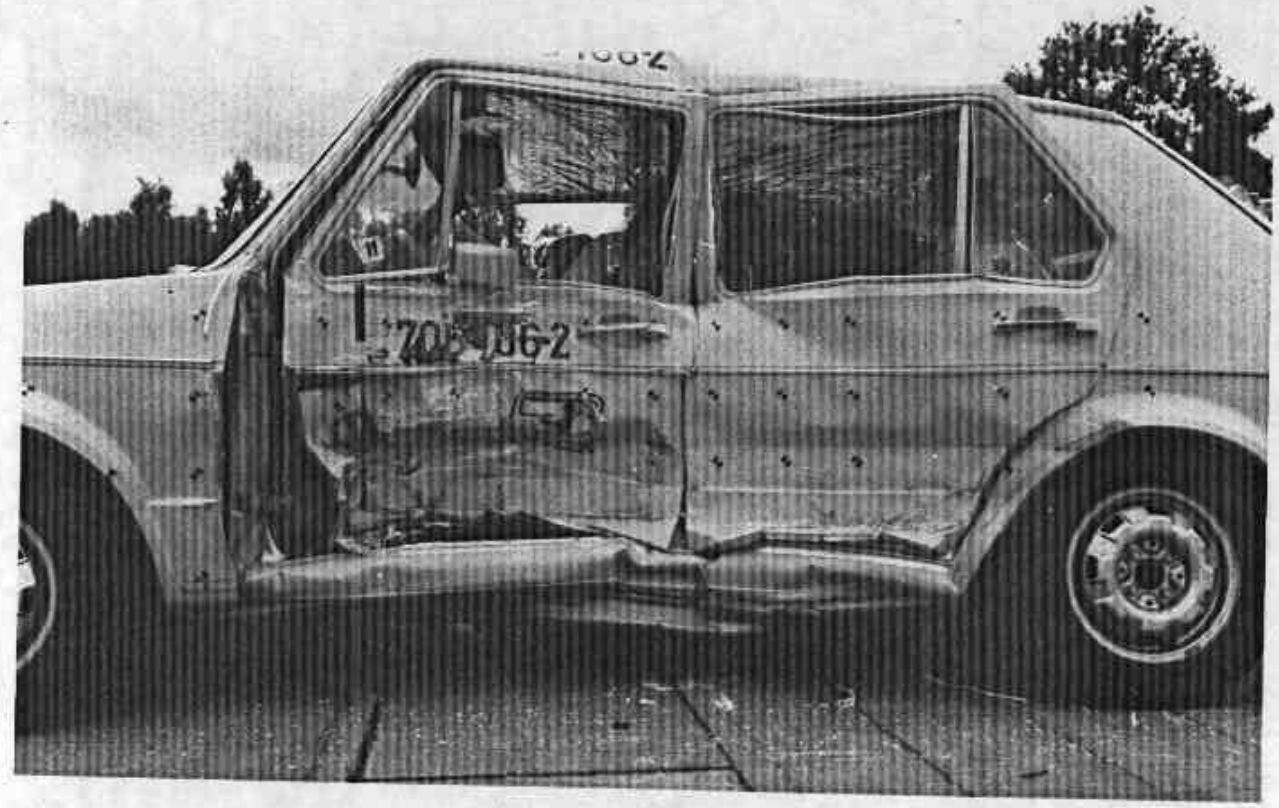


FIGURE A 4 : VW RABBIT LEFT SIDE
POST TEST VIEW

FIGURE A 5 : VW RABBIT LEFT SIDE

POST TEST VIEW (REAR-SIDE DIRECTION)

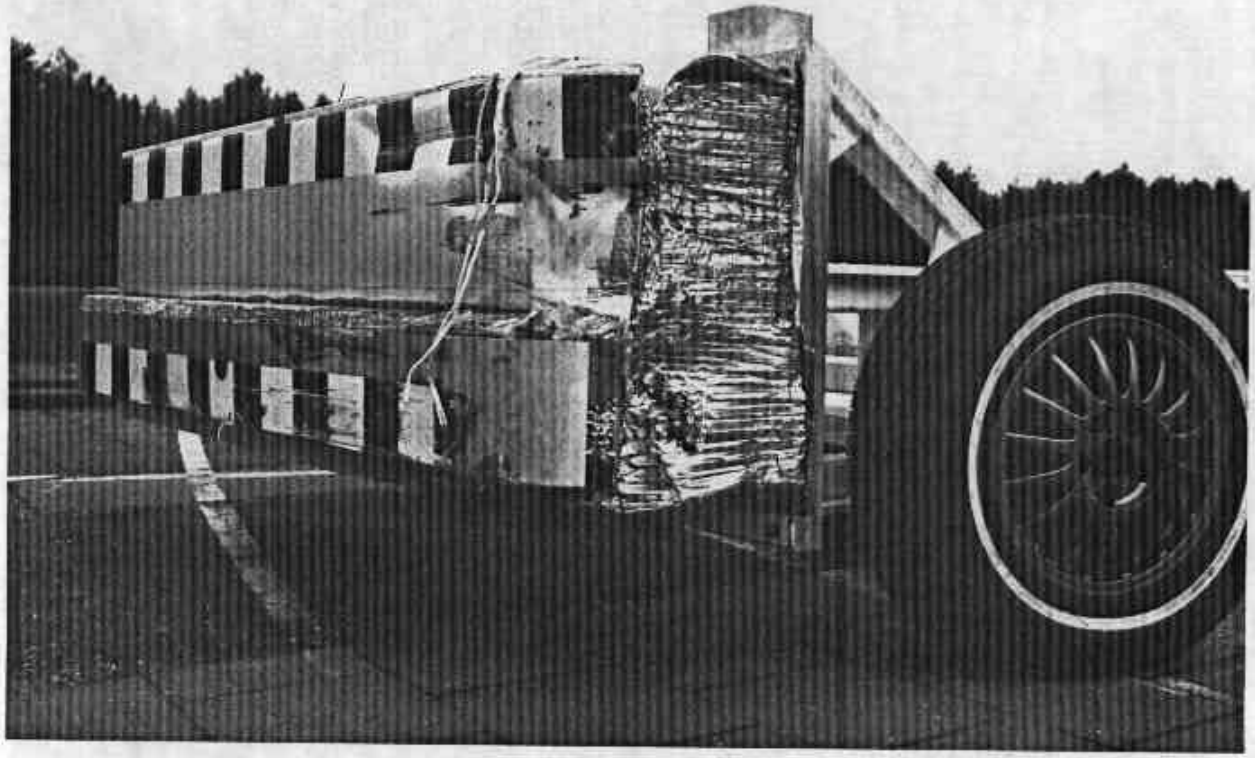


FIGURE A 6 : CRABBED BARRIER POST TEST VIEW

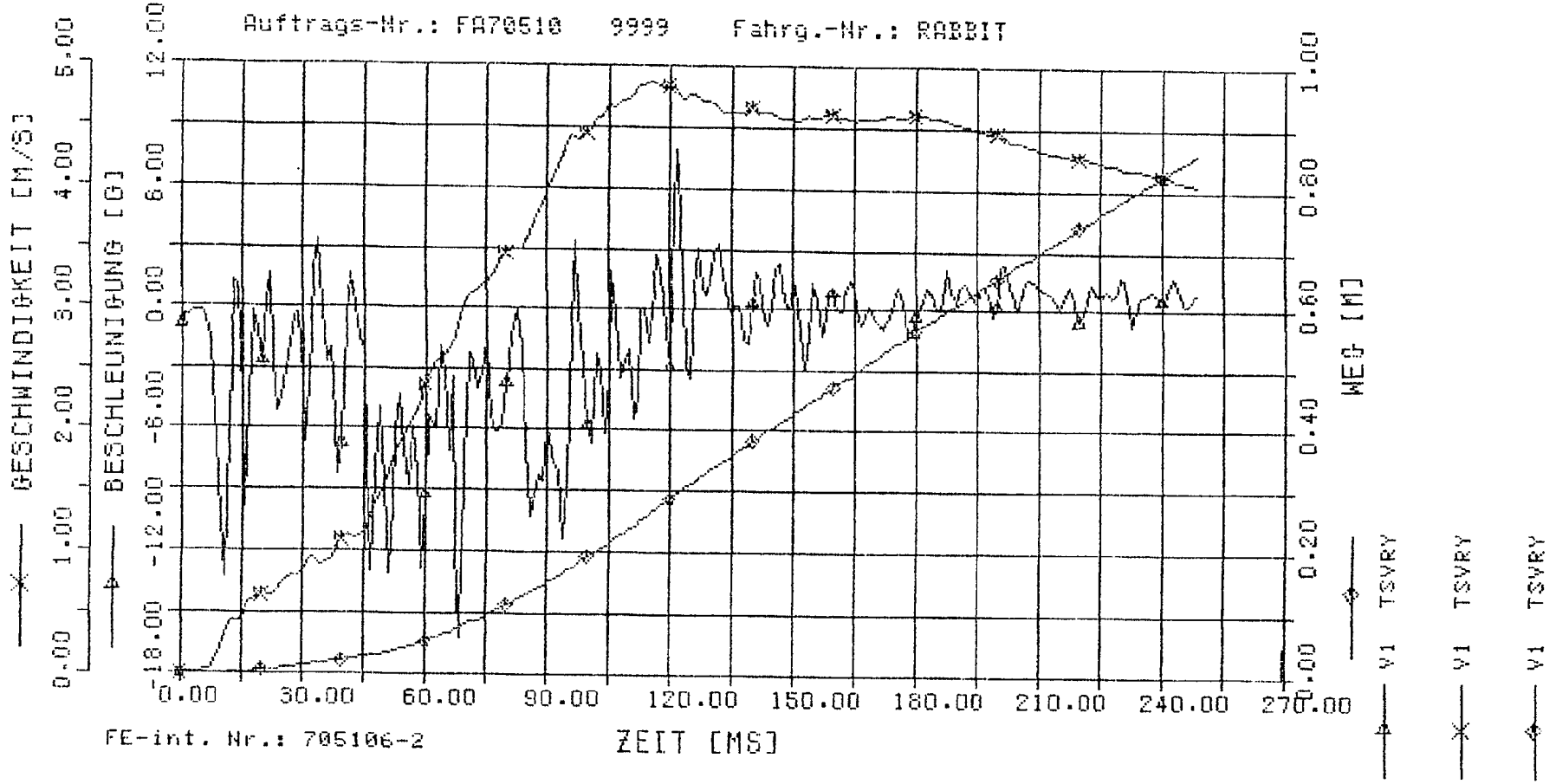
A P P E N D I X B

Vehicle and Dummy Test Respone Acceleration/ - and Velocity/Time History

B.1.1 Target Vehicle

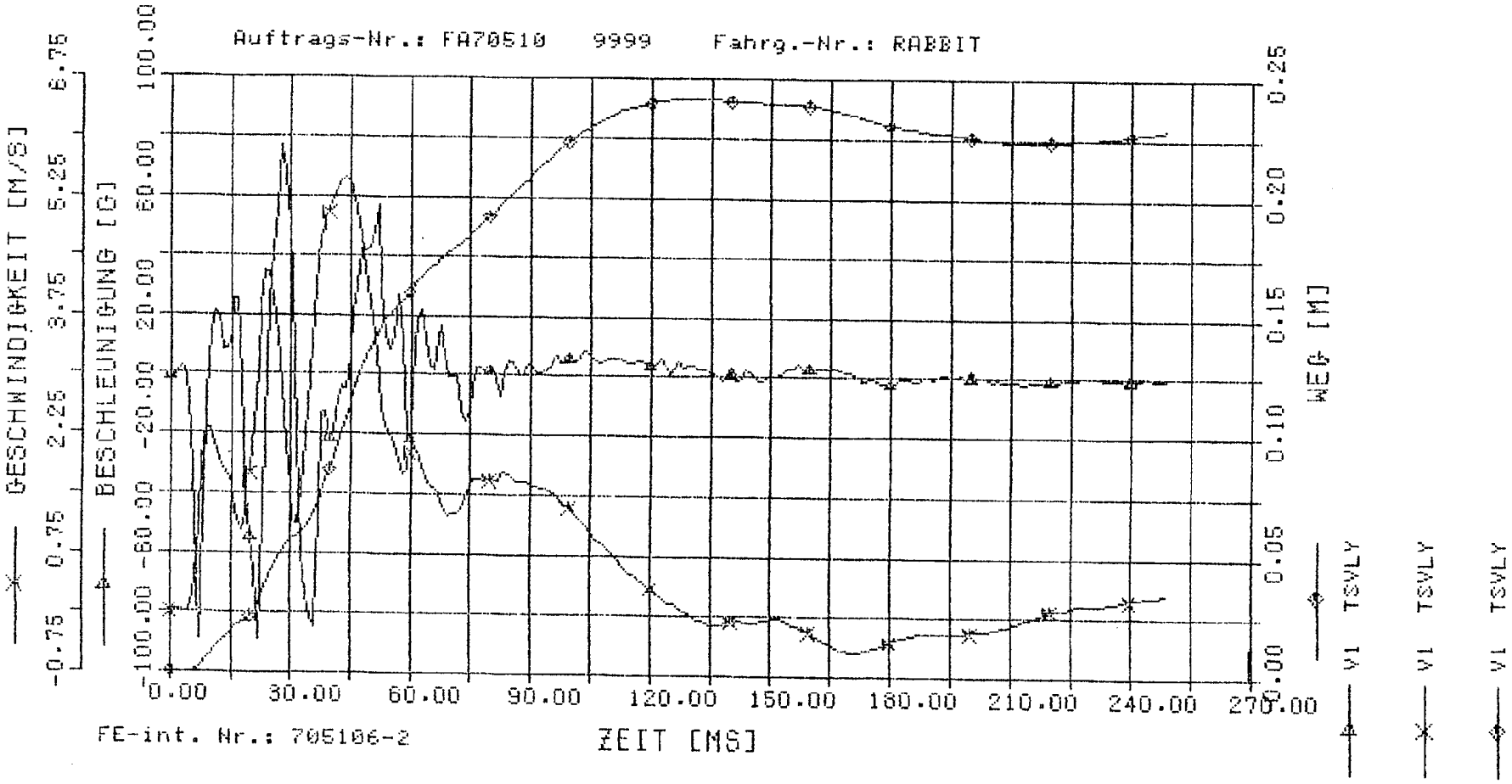
- Kenn-Werte: Auftrags-Nr. FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
TSVRY	V1	BE g	-16.248	69.00	0.00
TSVRY	V1	GE m/s	4.861	116.00	0.00
TSVRY	V1	WE m	.373	252.00	0.00



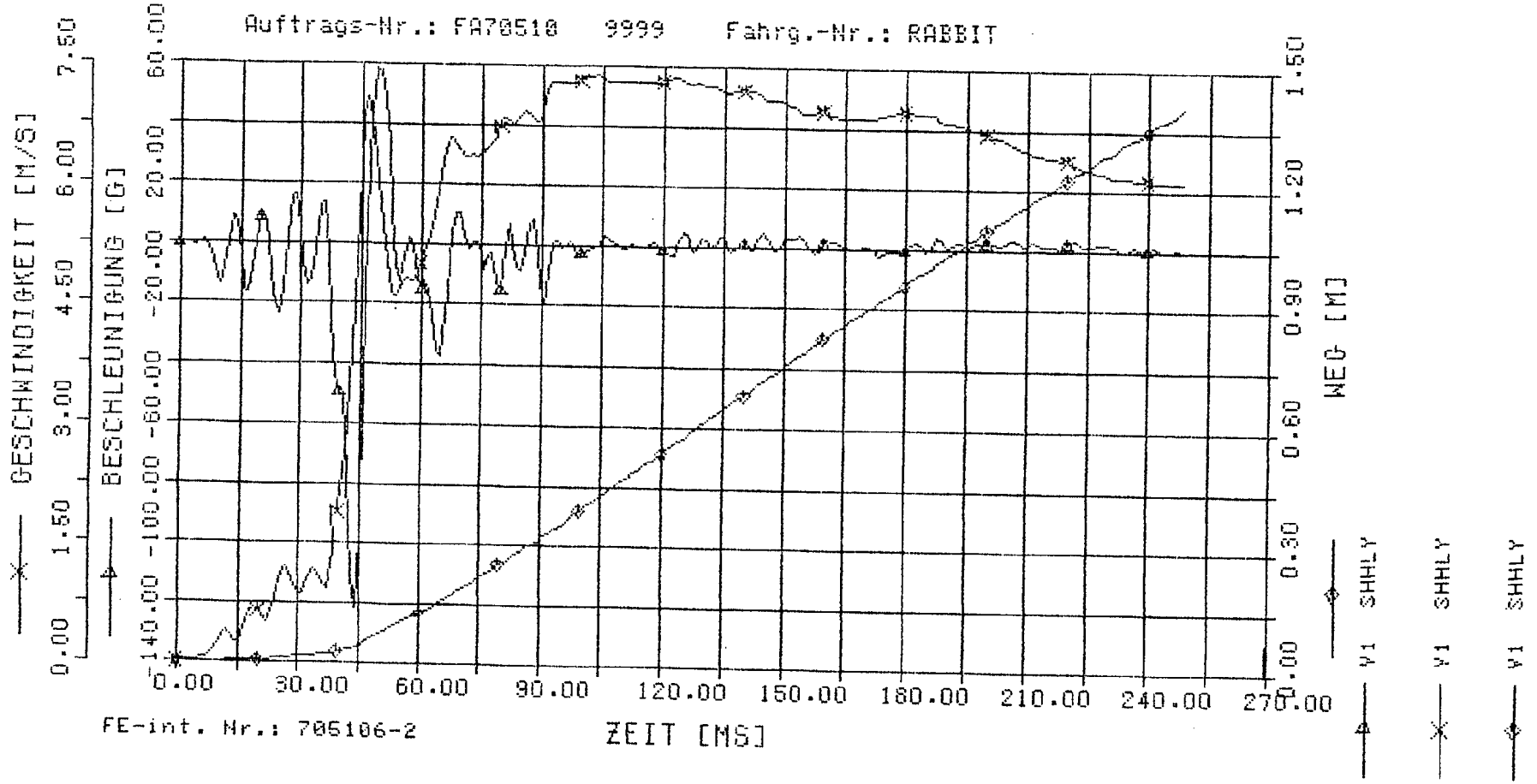
- Kenn-Werte: Auftrags-Nr.: 470510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
TSVLY	V1	BE g	-89.771	22.00	0.00
TSVLY	V1	GE m/s	5.473	44.00	0.00
TSVLY	V1	WE m	.241	130.00	0.00



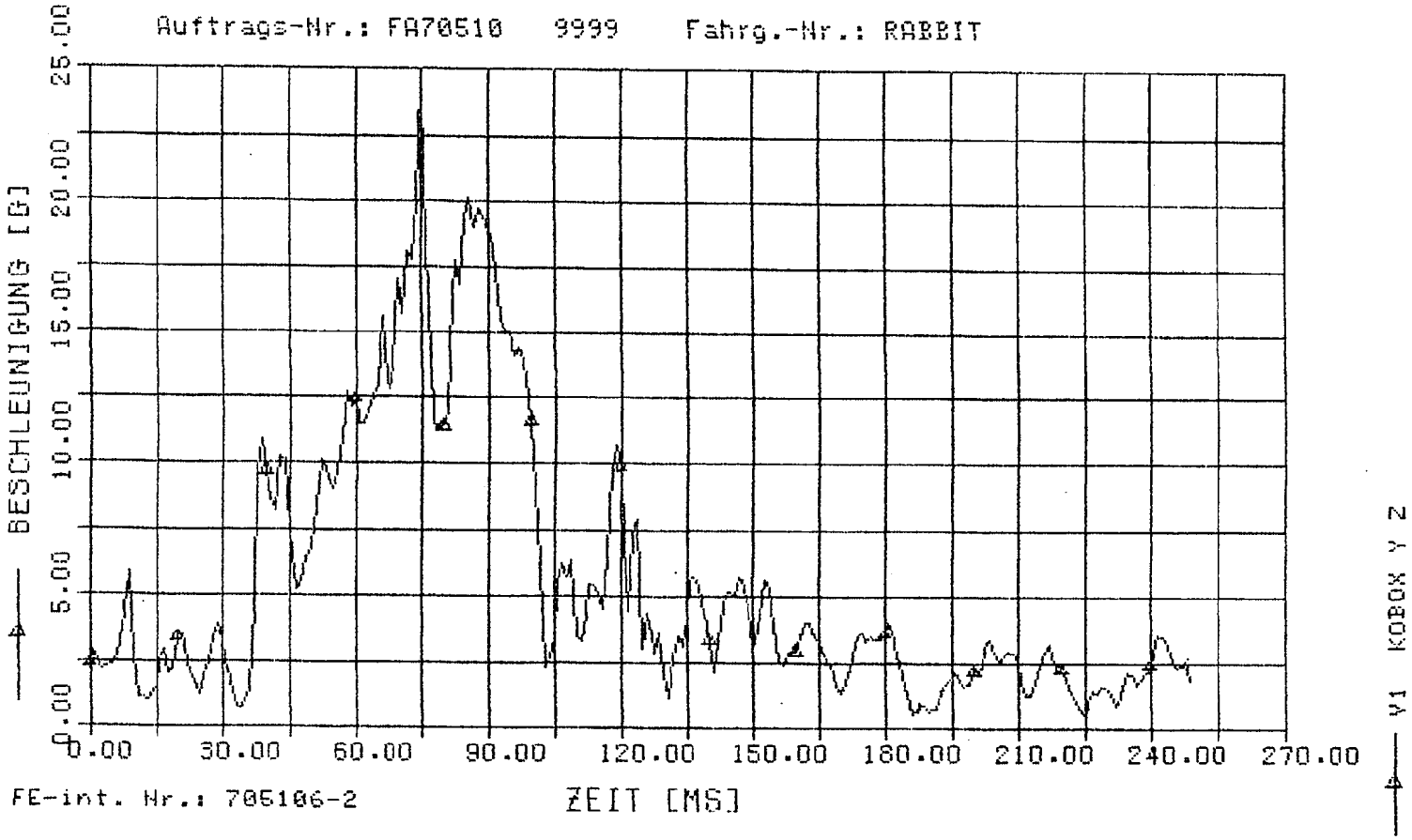
Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groess	Extremum	t Extr.	3MS
SHHLY	V1	BE g	-121.663	44.00	0.00
SHHLY	V1	GE m/s	7.374	104.00	0.00
SHHLY	V1	WE m	1.424	252.00	0.00



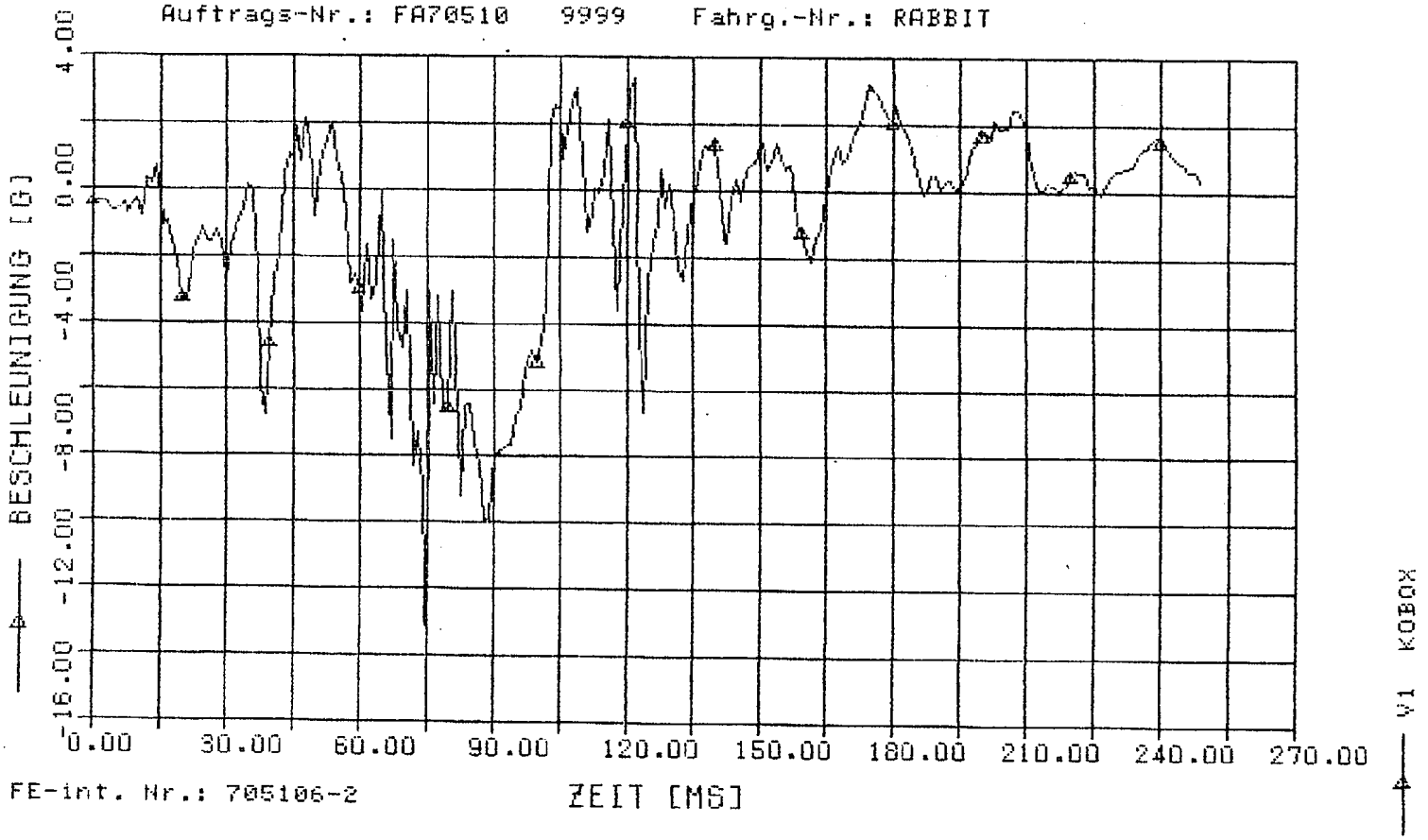
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	SMS
KOBO	V1	BE g	24.585	75.00	20.11



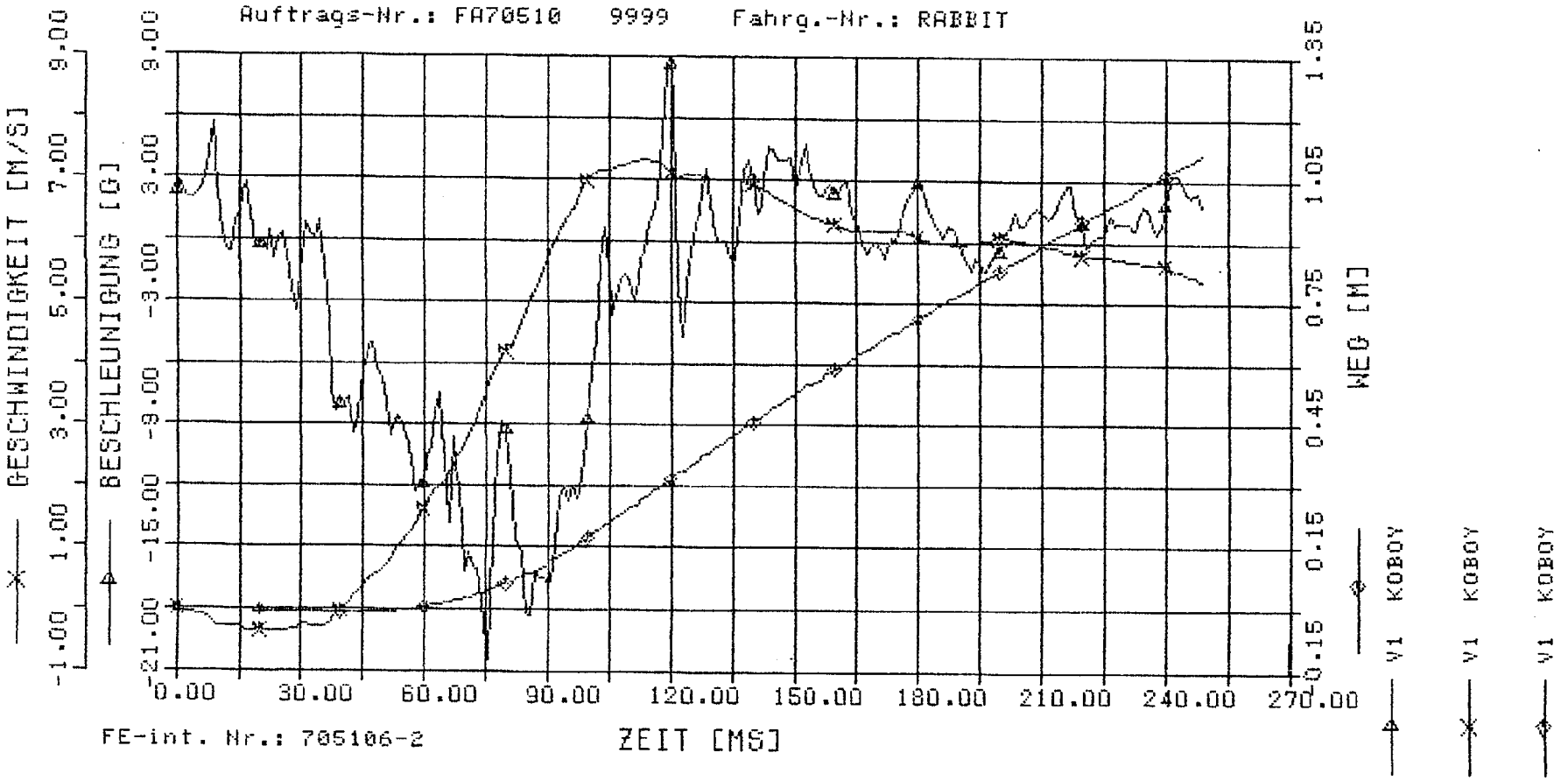
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
KOBOX	V1	BE g	-14.483	75.00	3.01



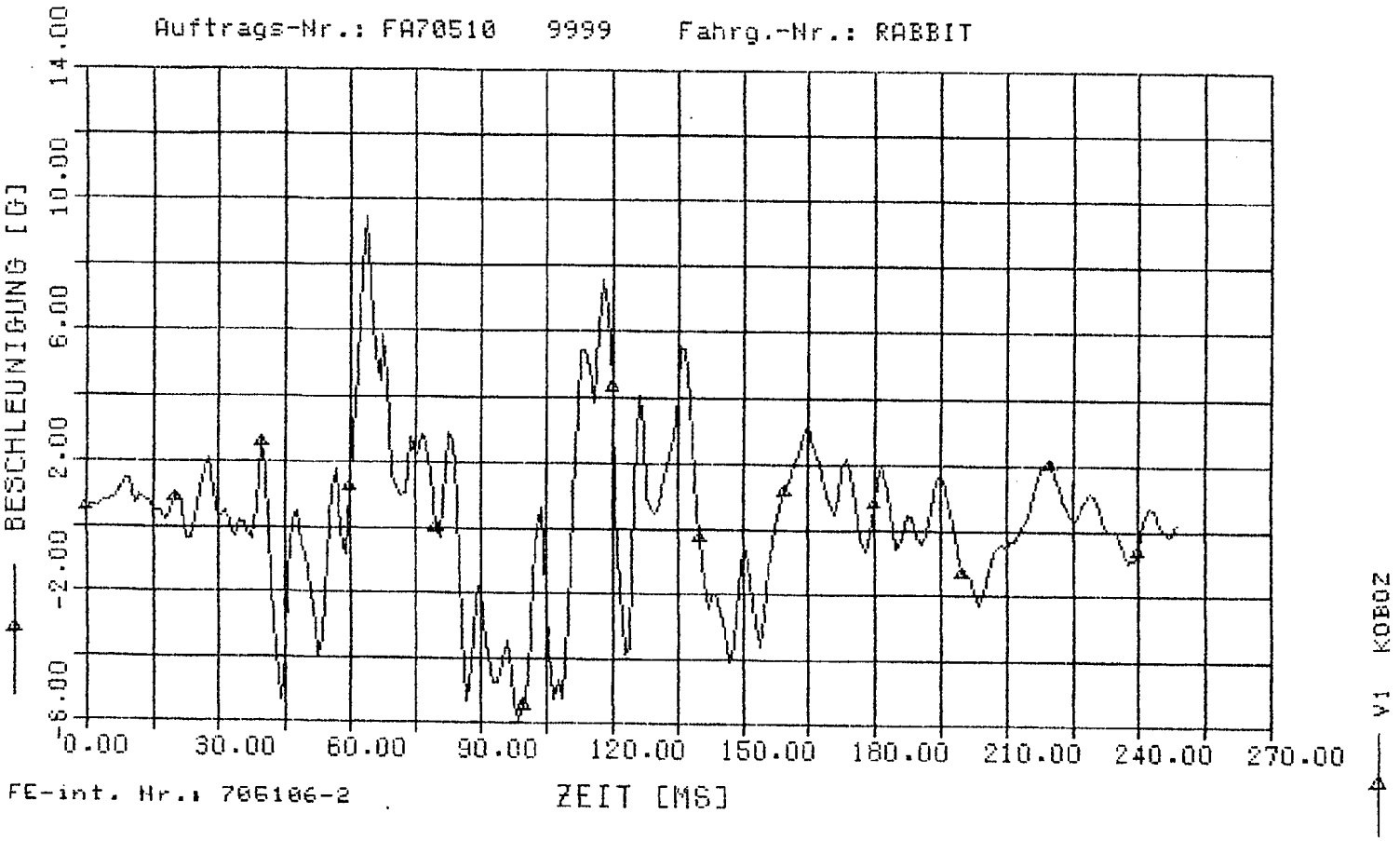
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
KOBOY	V1	BE g	-20.539	76.00	5.66
KOBOY	V1	GE m/s	7.303	114.00	0.00
KOBOY	V1	WE m	1.130	252.00	0.00



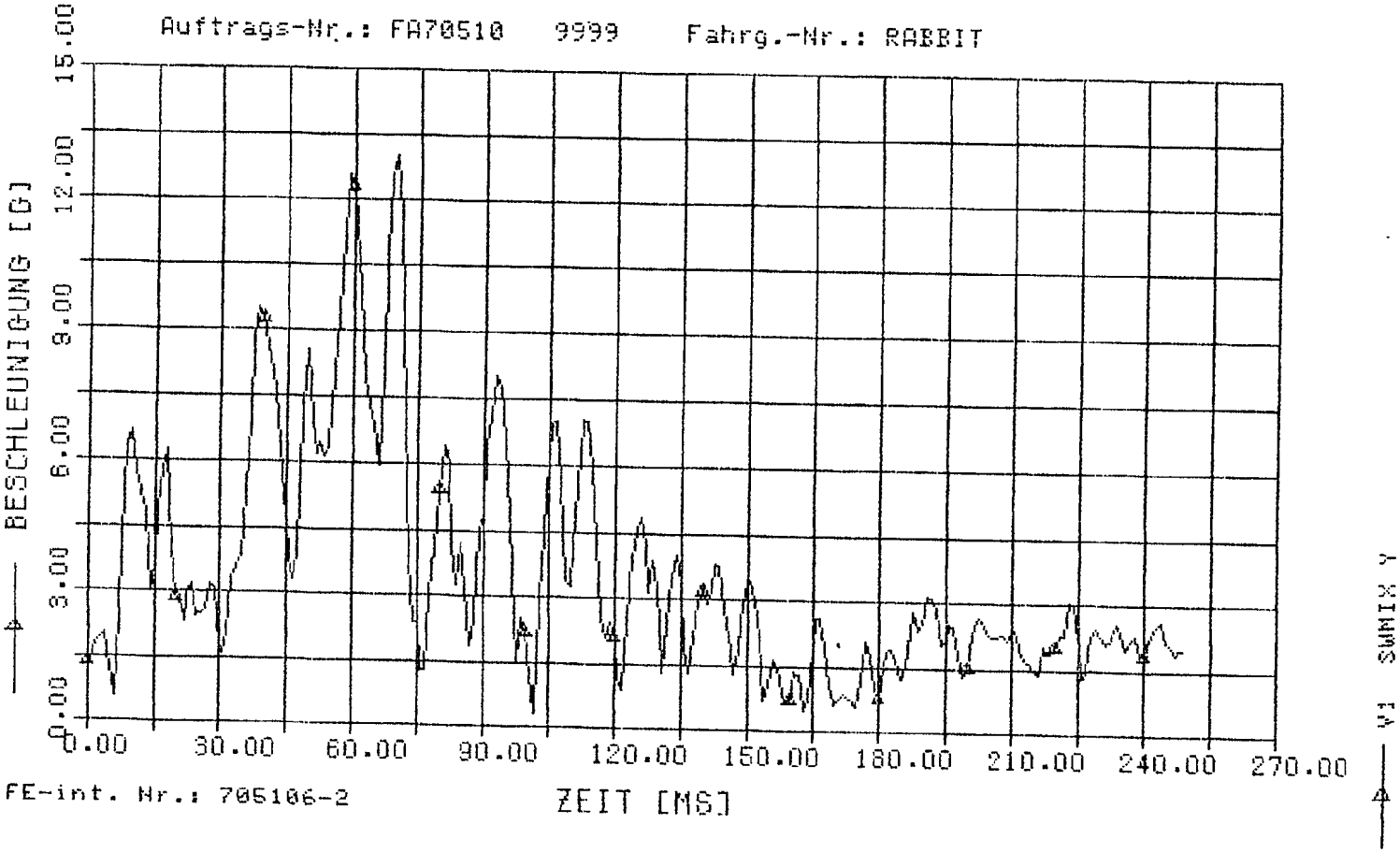
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	SMS
KOBOZ.	V1	BE	g	9.472	64.00	7.39



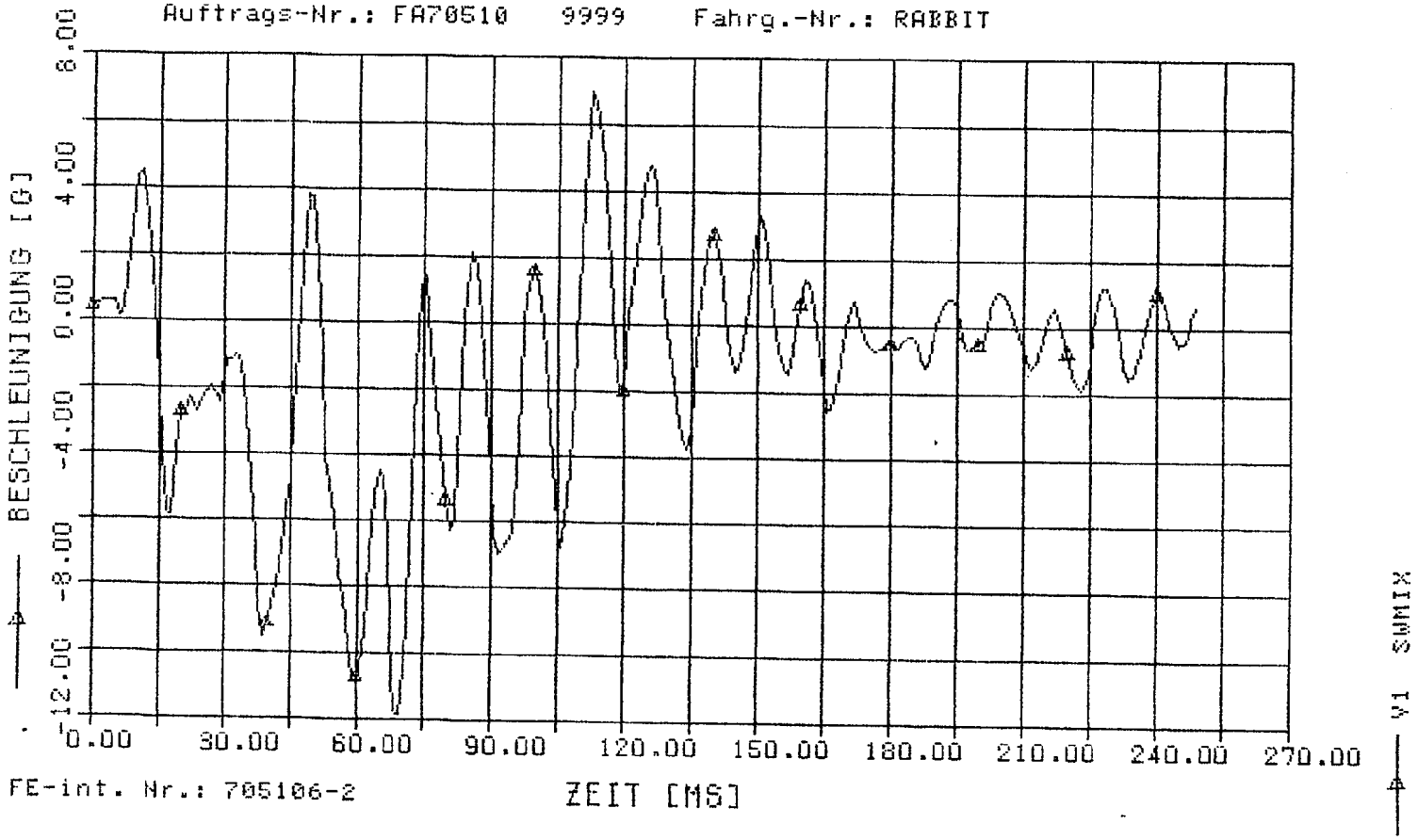
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
SWMI	V1	BE g	13.011	70.00	0.00



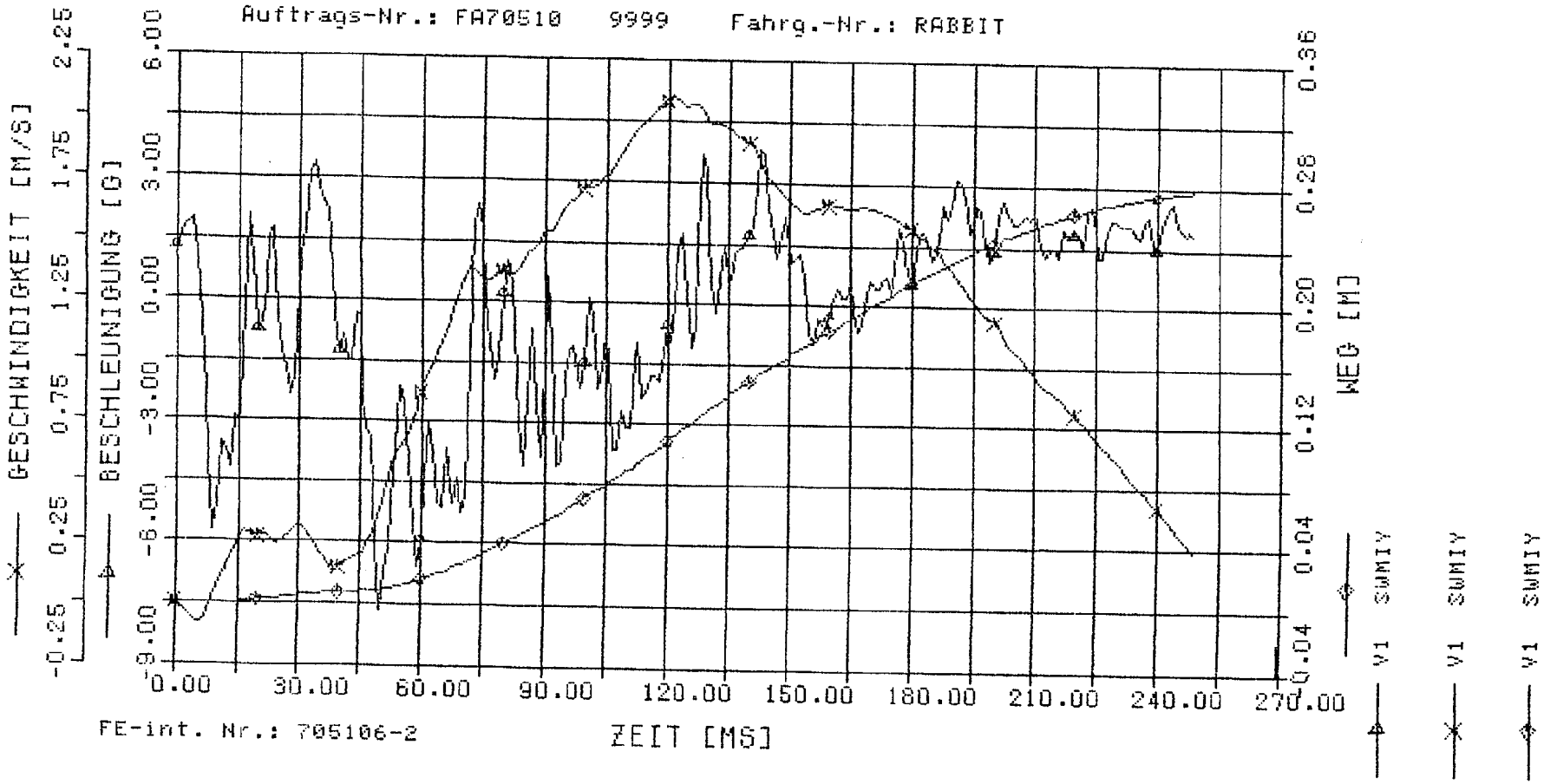
- Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
SWMIX	V1	BE g	-11.887	70.00	0.00



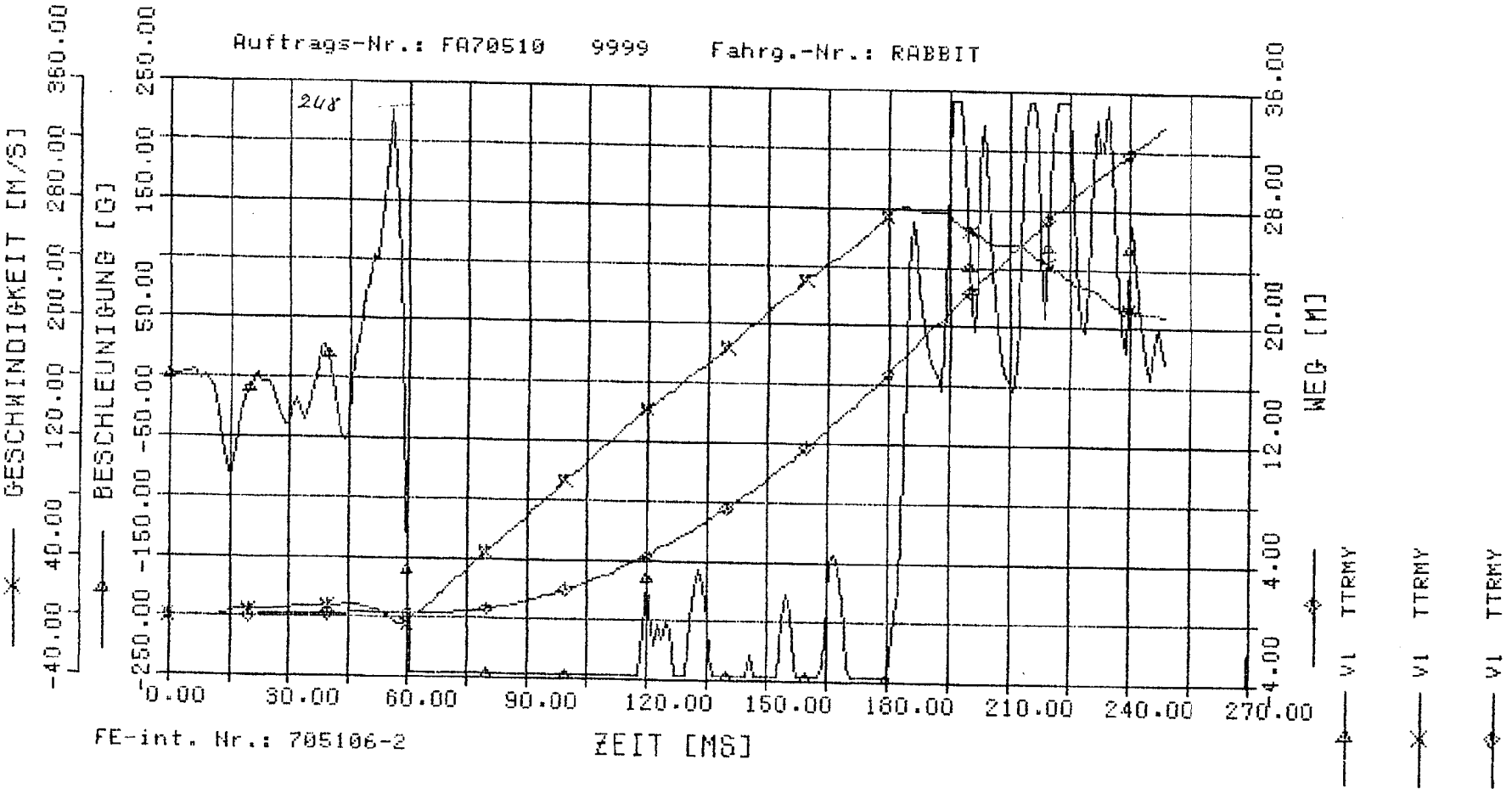
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	-3MS
SWMIY	V1	BE g	-7.665	50.00	0.00
SWMIY	V1	GE m/s	2.092	122.00	0.00
SWMIY	V1	WE m	.278	252.00	0.00



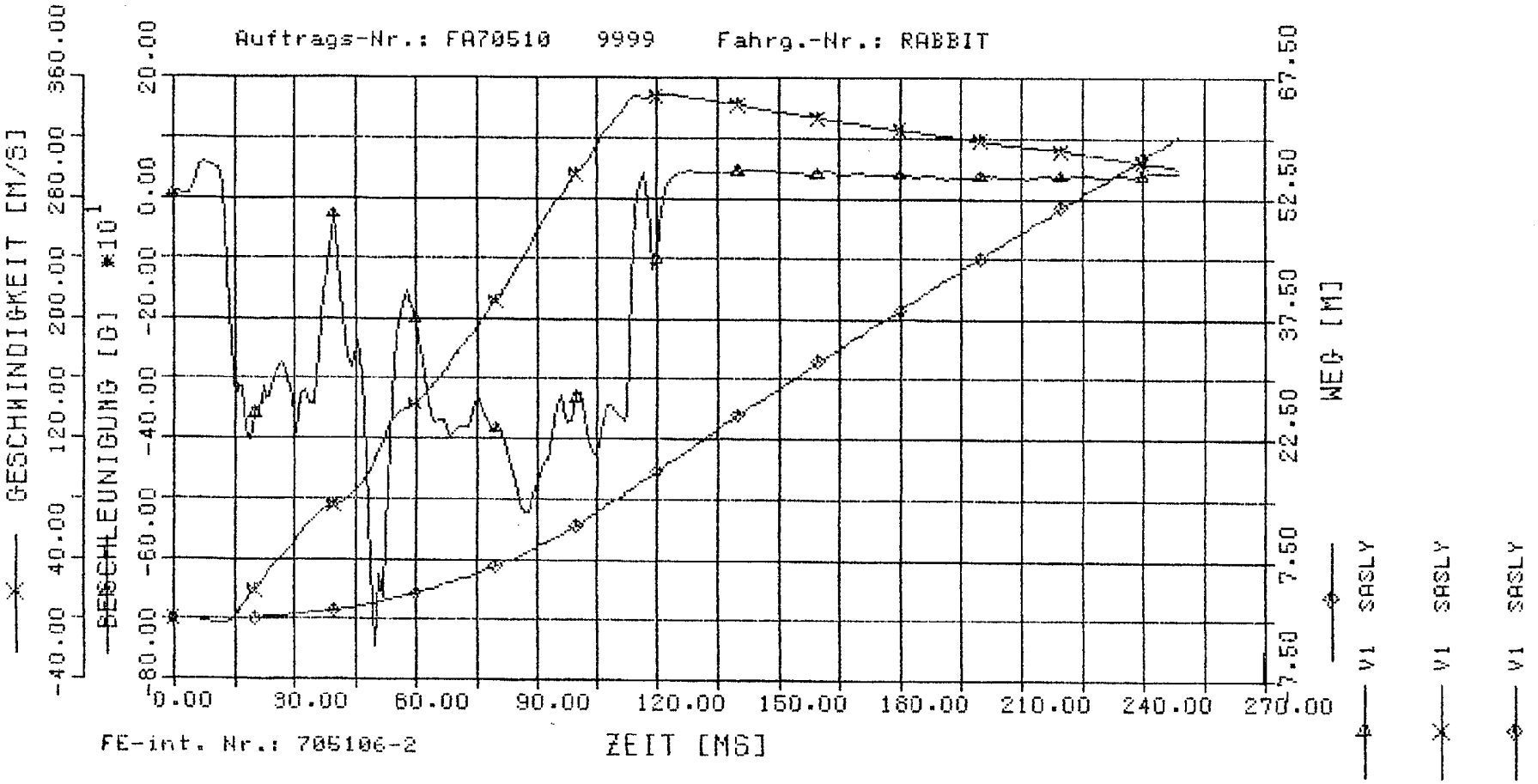
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

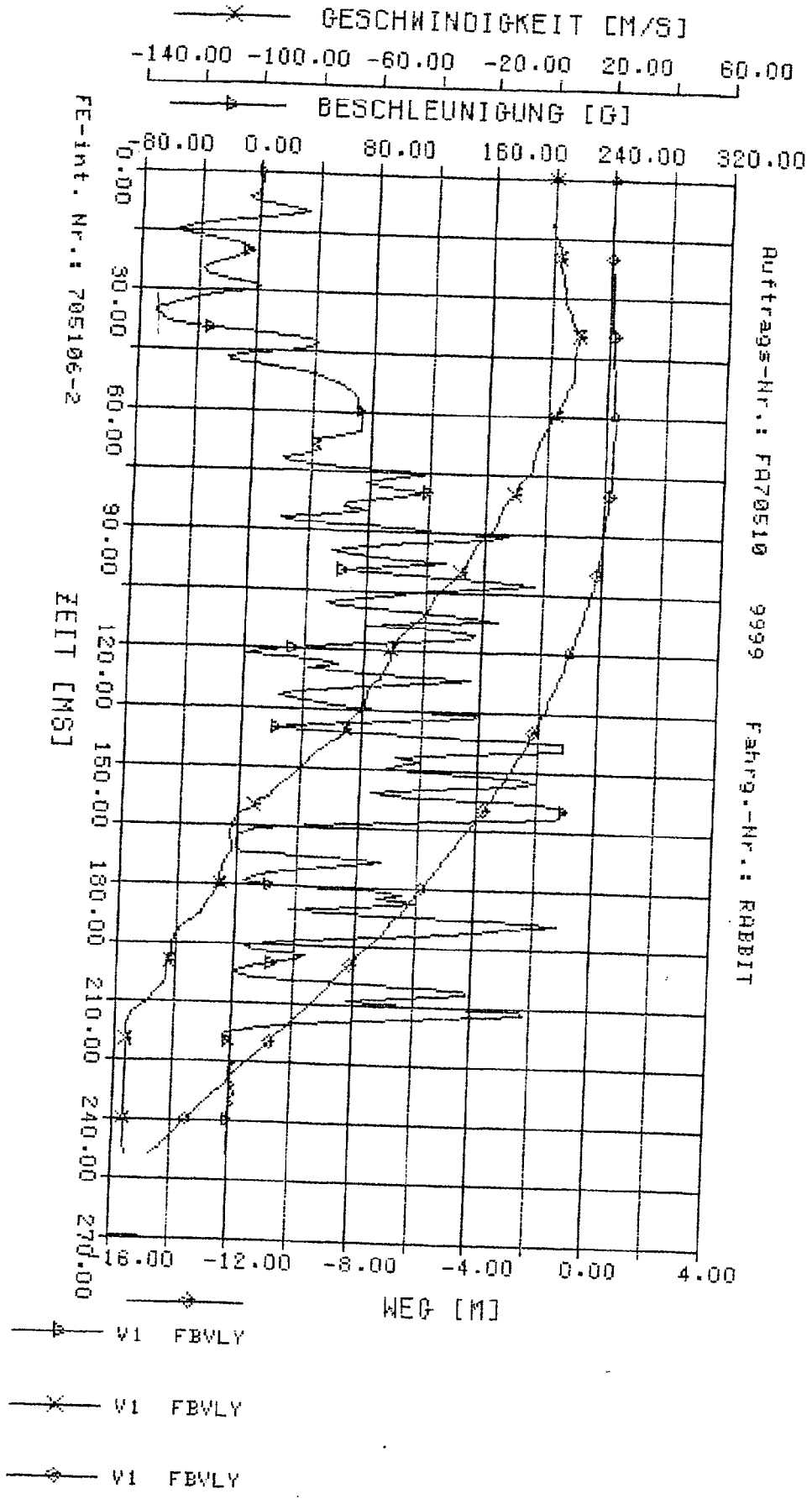
Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
TTRMY	V1	BE g	-247.817	180.00	0.00
TTRMY	V1	GE m/s	281.125	184.00	0.00
TTRMY	V1	WE m	34.303	252.00	0.00



- Kenn-Werte: Auftrags-Nr.: FAZ0510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
SASLY	V1	BE g	-747.140	50.00	0.00
SASLY	V1	GE m/s	348.265	122.00	0.00
SASLY	V1	WE m	61.053	252.00	0.00



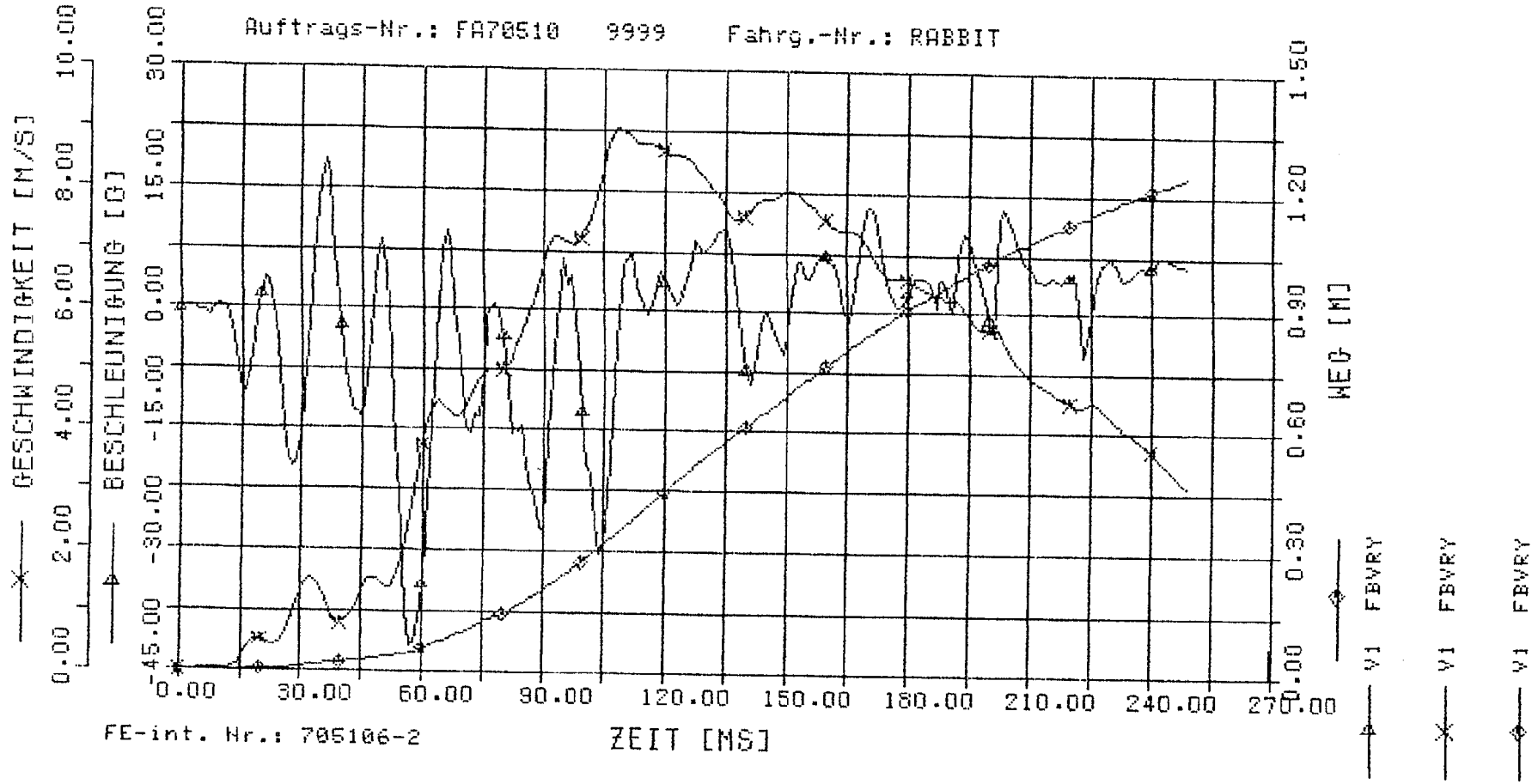


Mess-Stelle

FBVLY	UP	ber. Groesse	Extremum	t		
FBVLY	V1	BE g	217.084	Extr. 189.00		0.00
FBVLY	V1	GE m/s	-136.565	217.00		0.00
	V1	WE m	-15.132	252.00		0.00

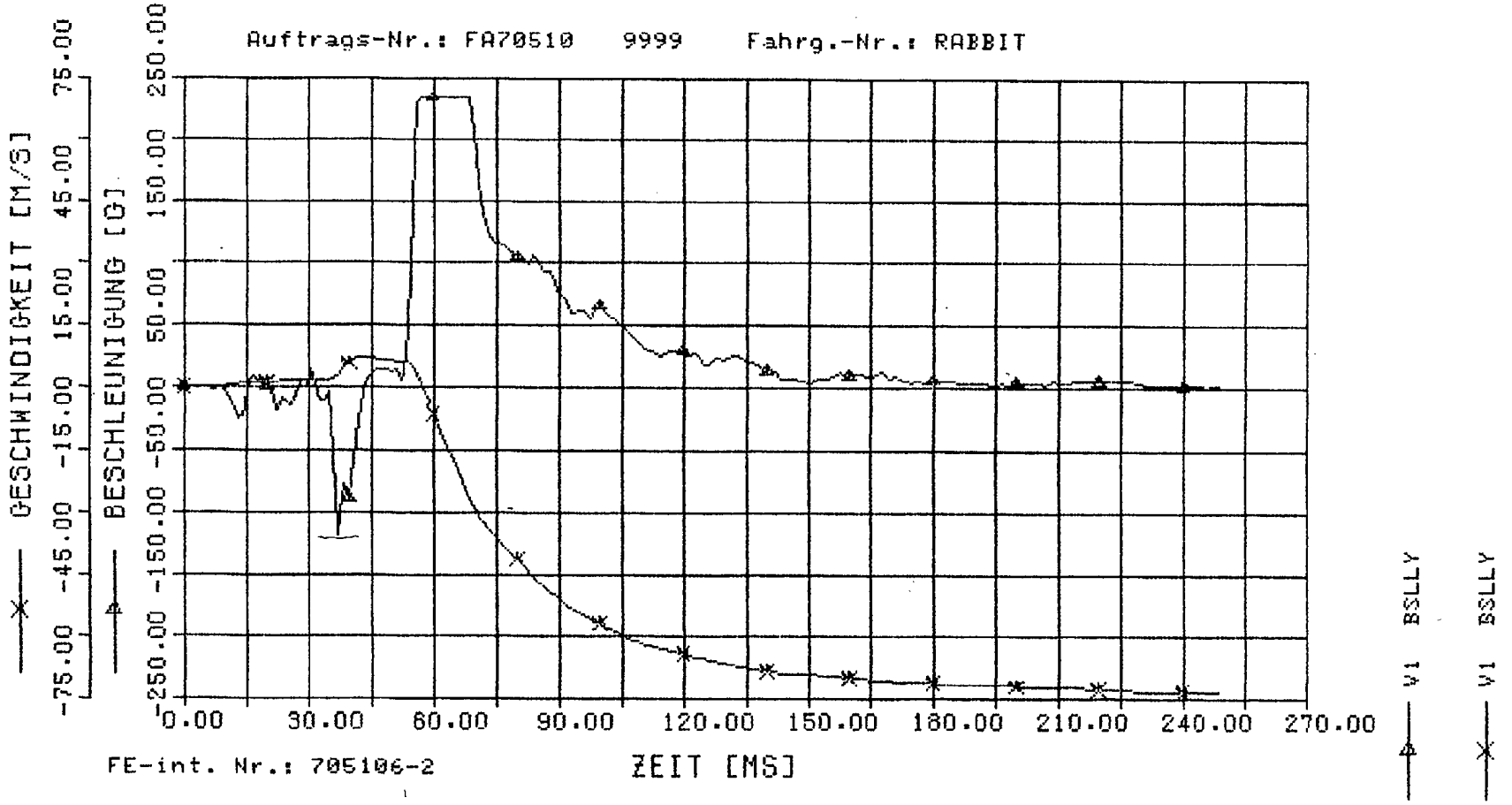
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
FBVRY	V1	BE g	-41.759	57.00	0.00
FBVRY	V1	GE m/s	9.031	109.00	0.00
FBVRY	V1	WE m	1.253	252.00	0.00



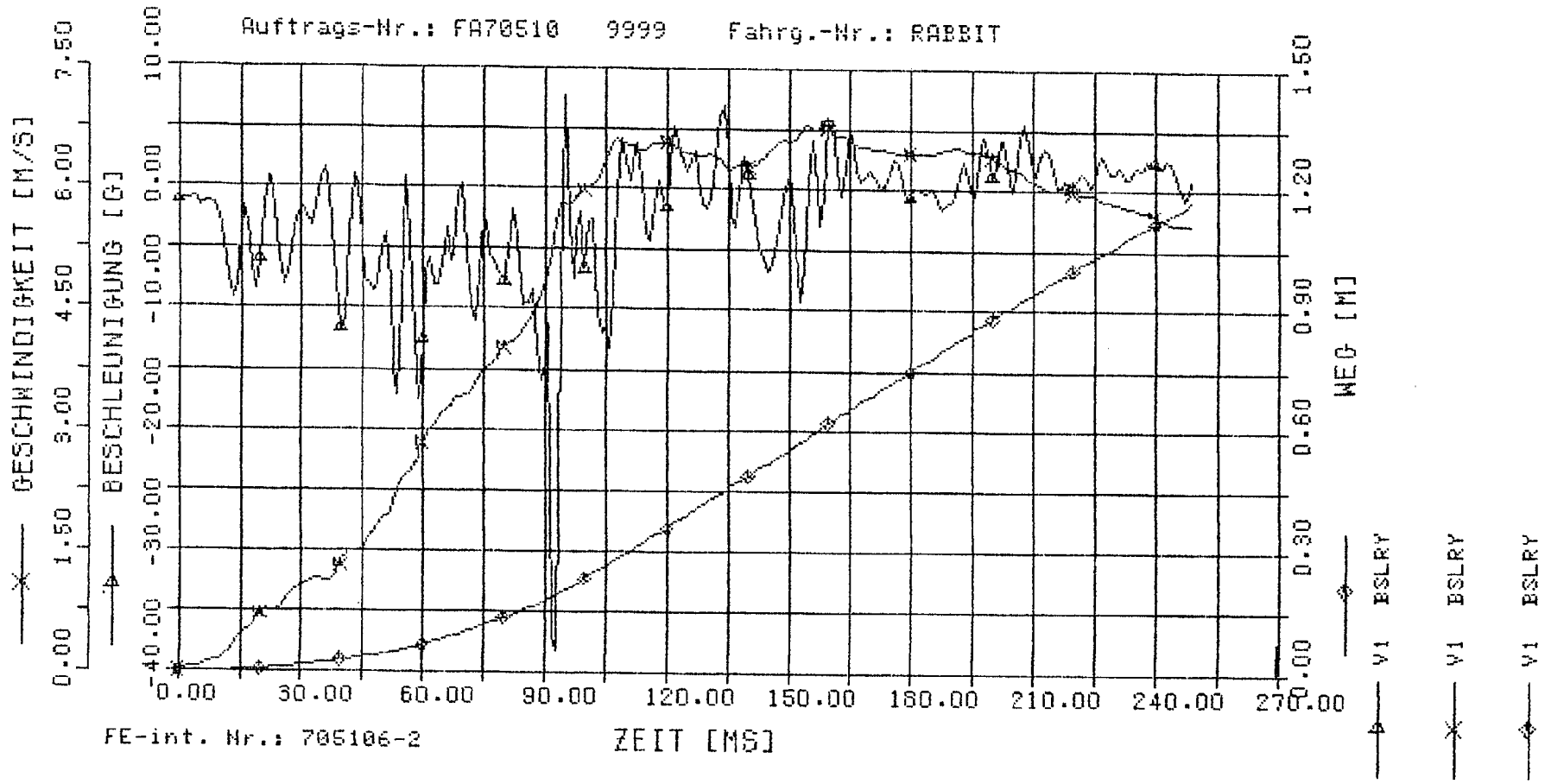
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
BSLLY	V1	BE g	233.680	62.00	0.00
BSLLY	V1	GE m/s	-73.628	252.00	0.00



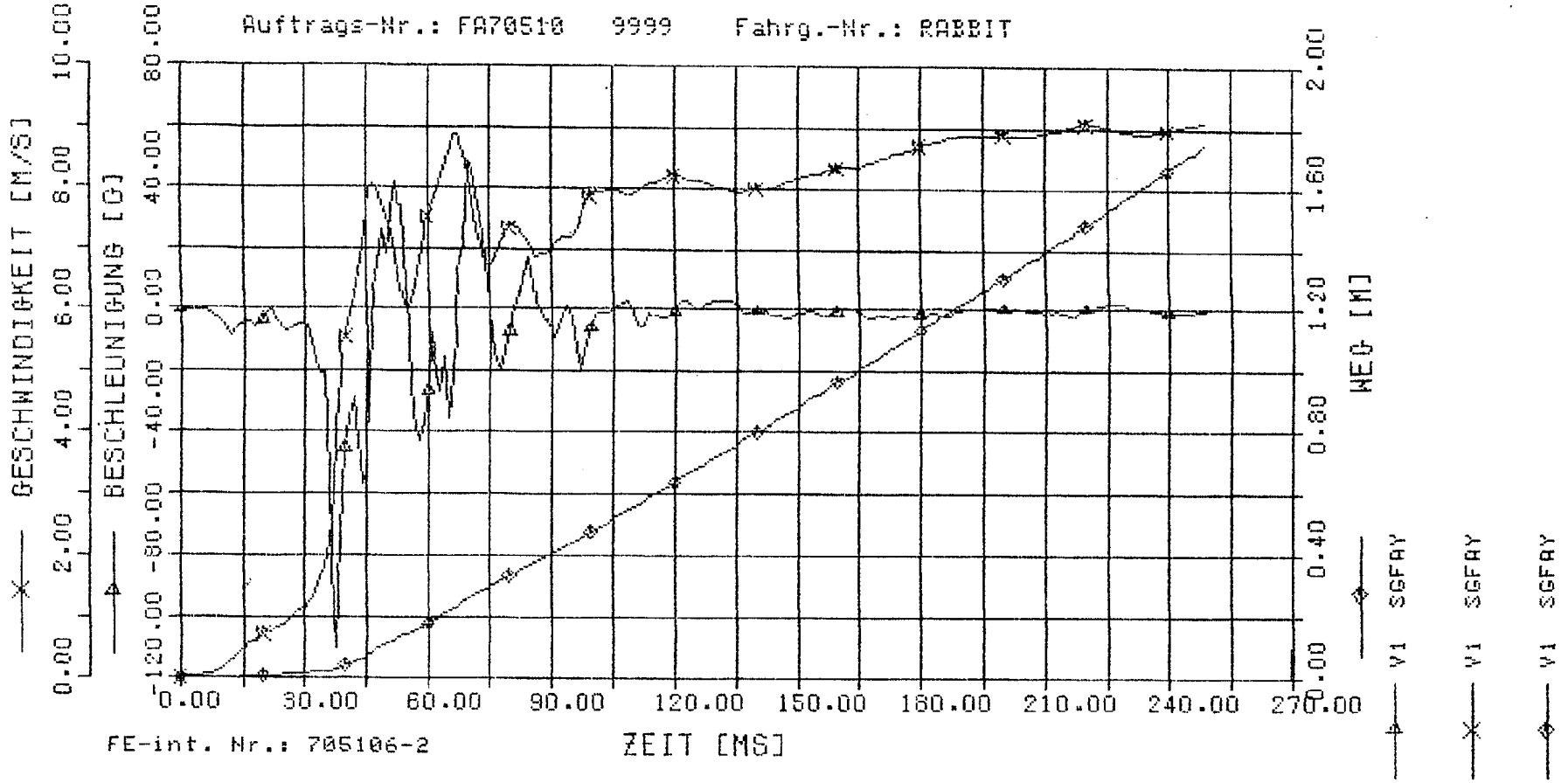
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	3MS
BSLRY	V1	BE	g	-30.330	93.00	0.00
BGLRY	V1	GE	M/S	6.790	155.00	0.00
BSLRY	V1	WE	M	1.186	252.00	0.00



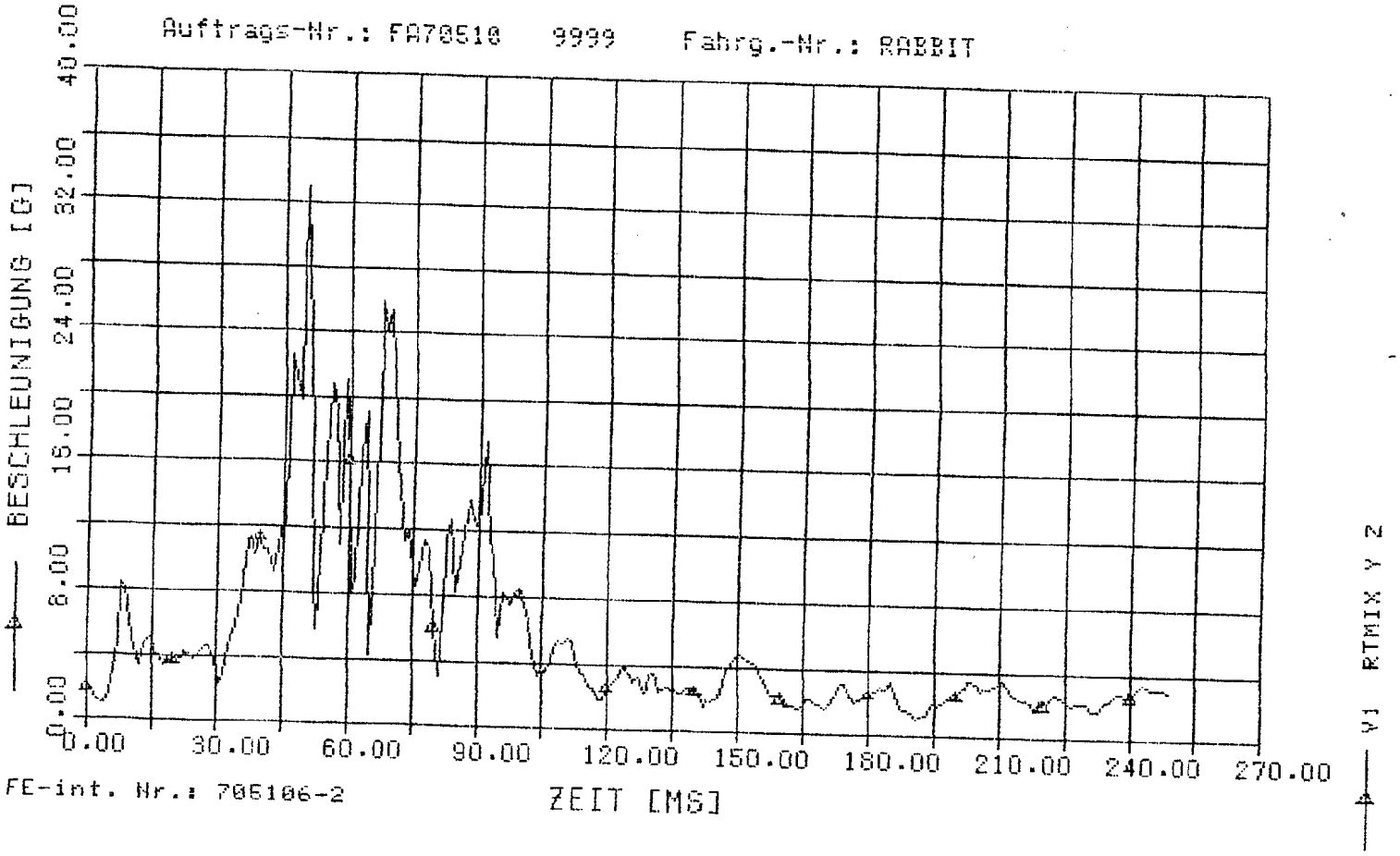
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	ΔMS
SGFAY	V1	BE	g	-110.508	38.00	0.00
SGFAY	V1	GE	m/s	9.112	252.00	0.00
SGFAY	V1	WE	m	1.773	252.00	0.00



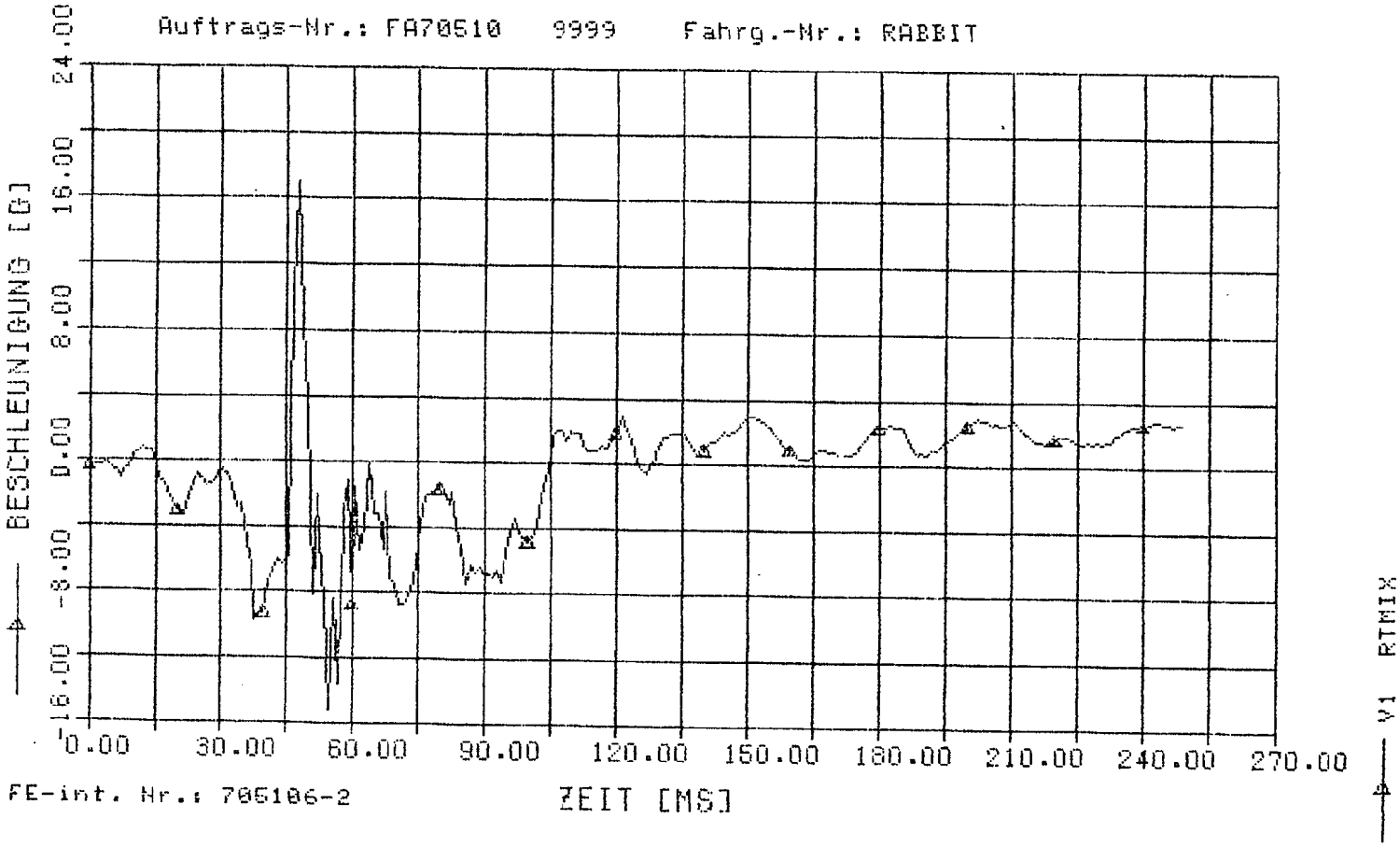
Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
RTMI	V1	BE g	32.964	50.00	0.00



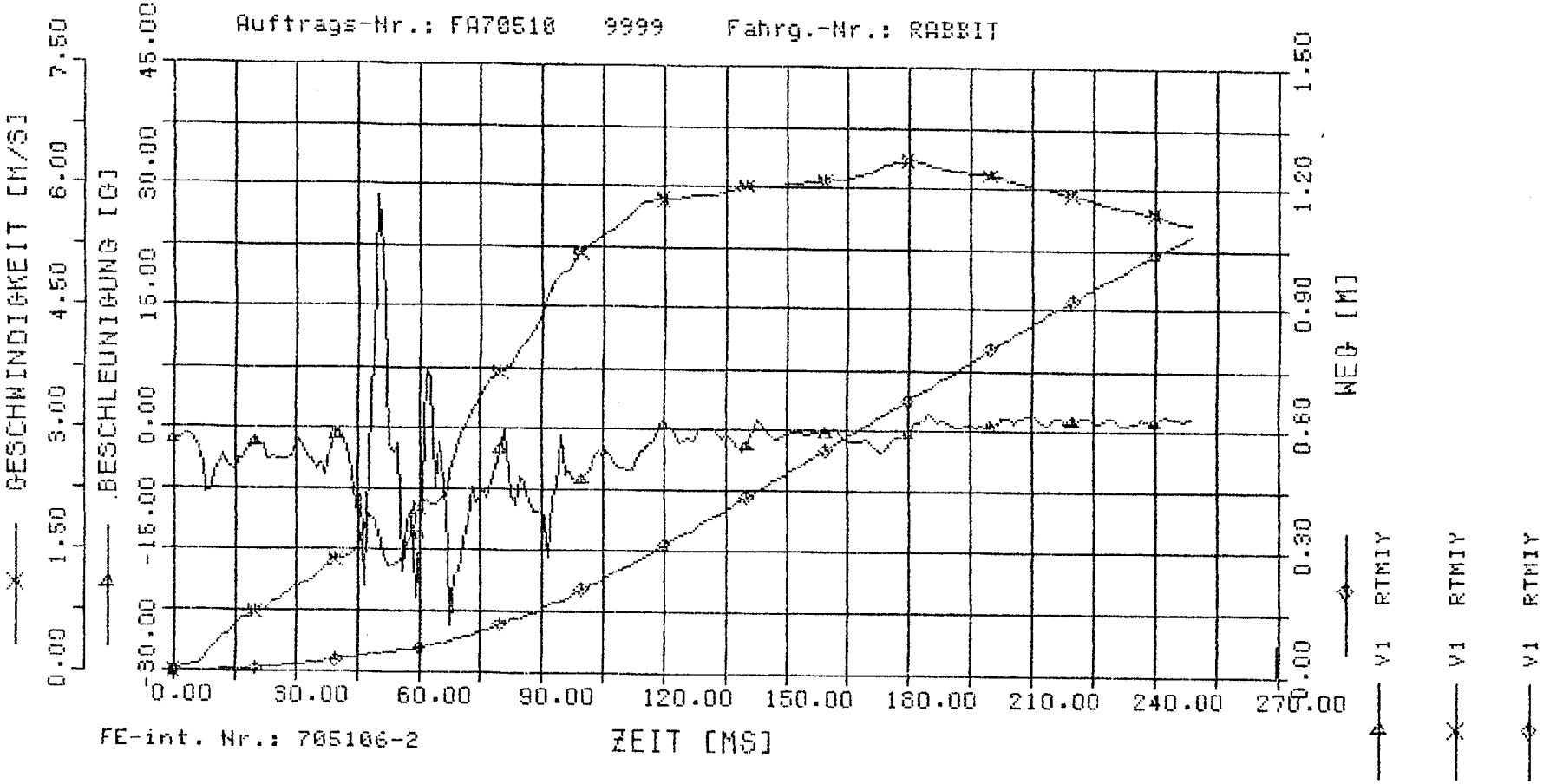
- Kenn-Werte: Auftrags-Nr.: 970510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
RTMIX	V1	BE g	17.005	48.00	0.00



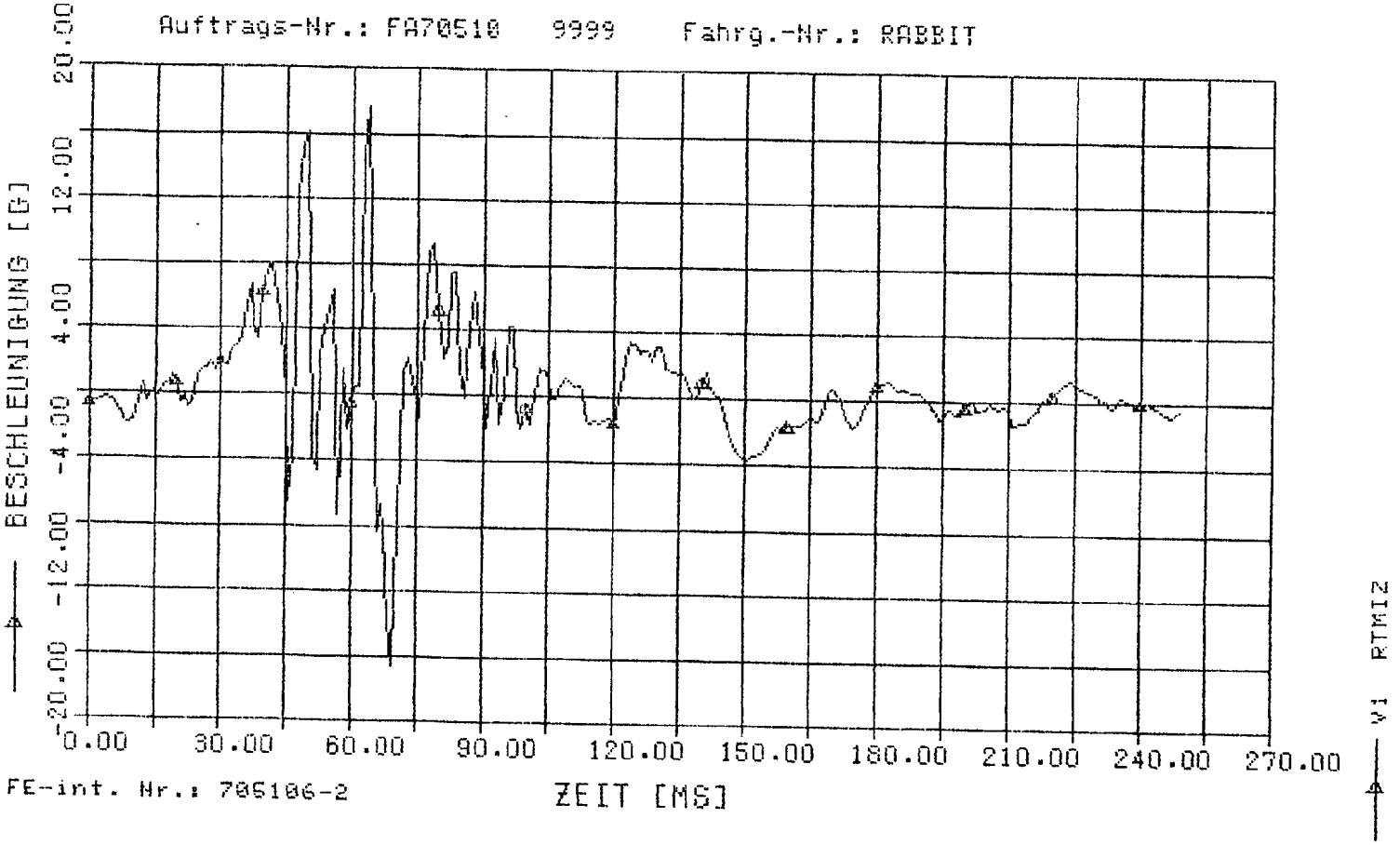
- Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	SMS
RTMIY	V1	BE g	28.508	50.00	0.00
RTMIY	V1	GE m/s	6.334	101.00	0.00
RTMIY	V1	WE m	1.104	252.00	0.00



-- Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

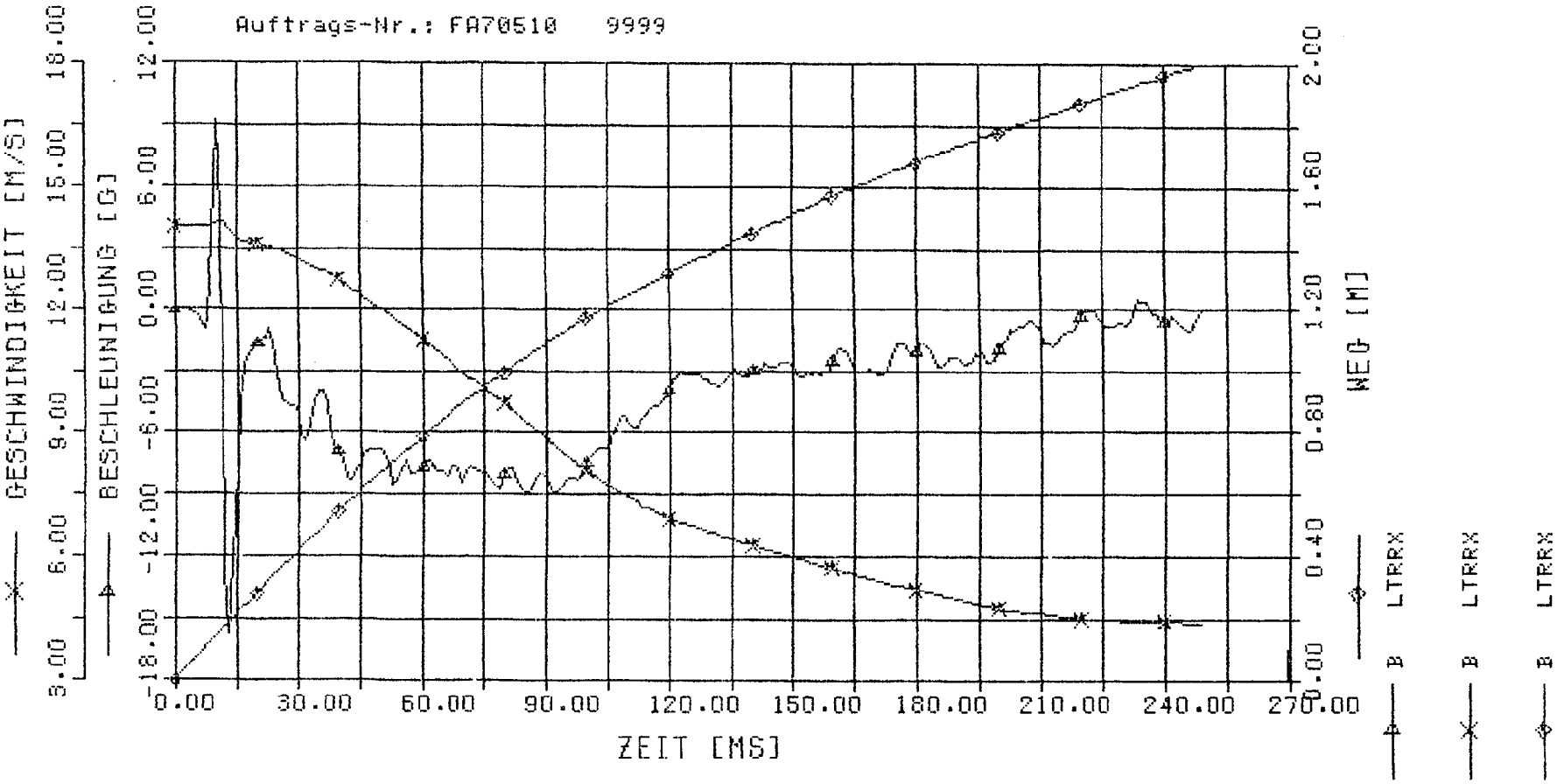
Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
RTMIZ	V1	BE g	17.705	64.00	0.00



B.1.2 Crabbed Barrier

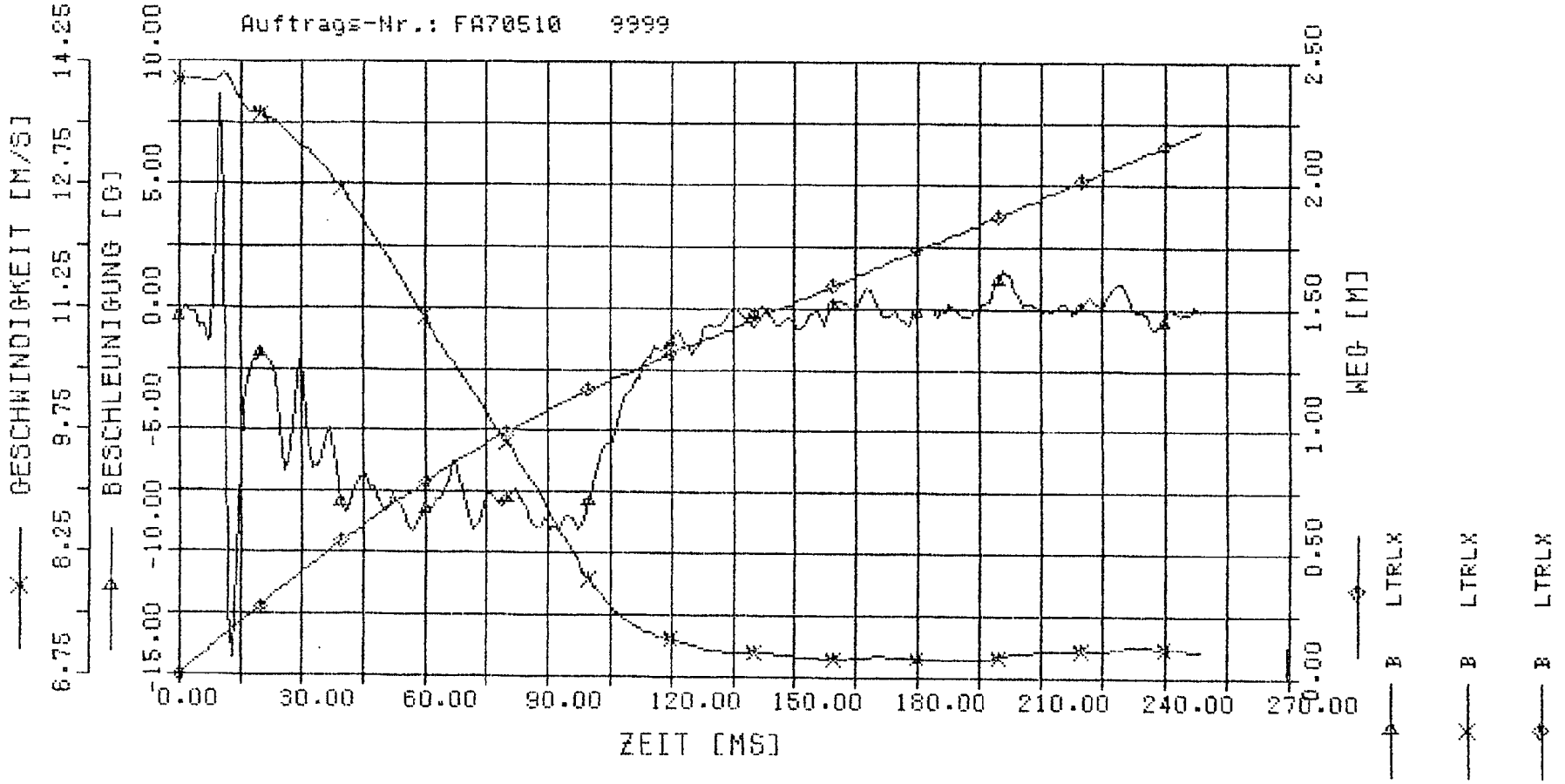
- Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
LTRRX	B	BE g	-15.758	13.00	0.00
LTRRX	B	GE m/s	14.155	11.00	0.00
LTRRX	B	WE m	2.013	252.00	0.00



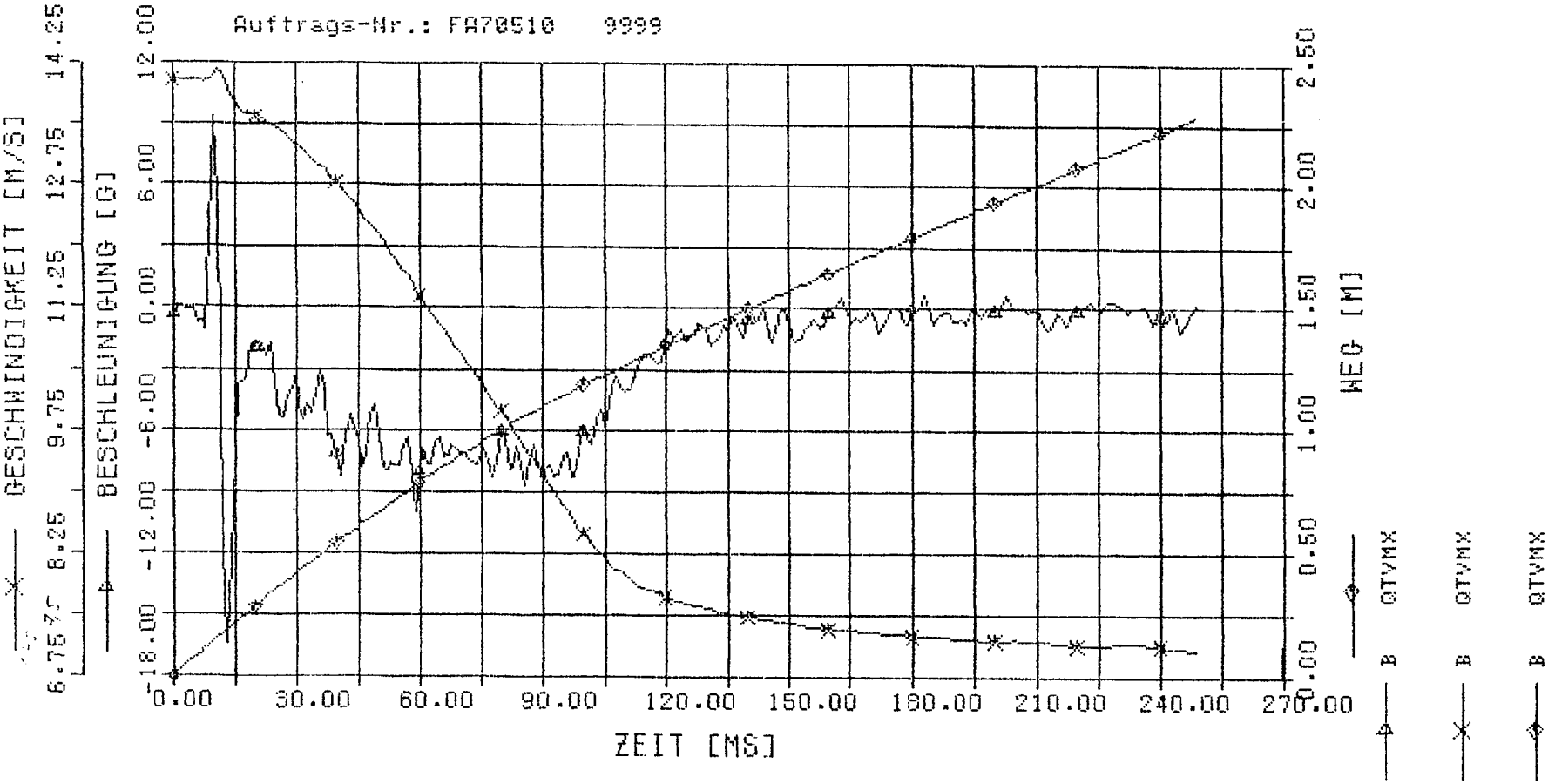
- Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
LTRLX	B	BE g	-14.287	13.00	0.00
LTRLX	B	GE m/s	14.119	11.00	0.00
LTRLX	B	WE m	2.241	252.00	0.00



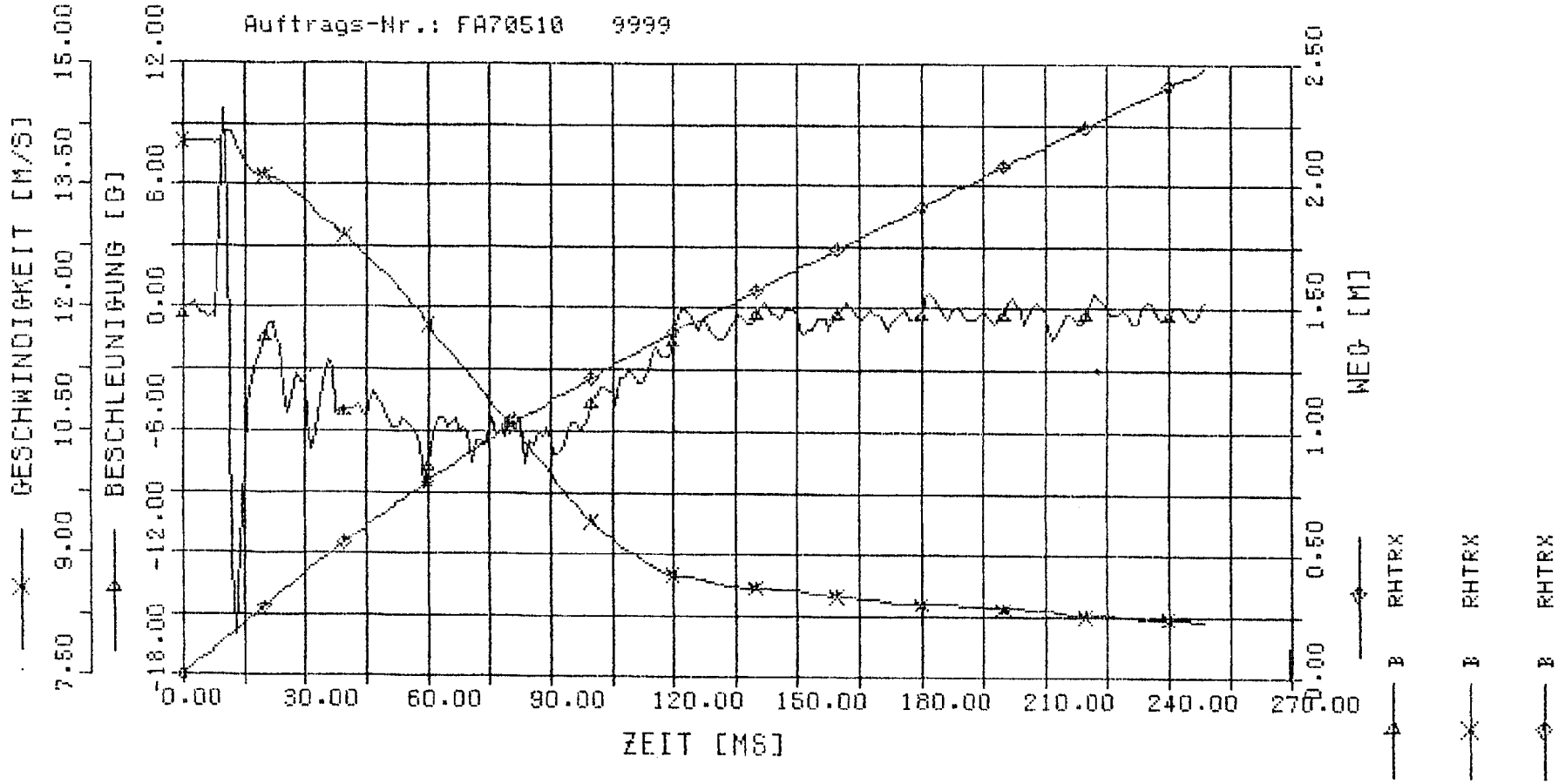
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
QTVMX	B	BE g	-16.329	13.00	0.00
QTVMX	B	GE m/s	14.157	11.00	0.00
QTVMX	B	WE m	2.304	252.00	0.00



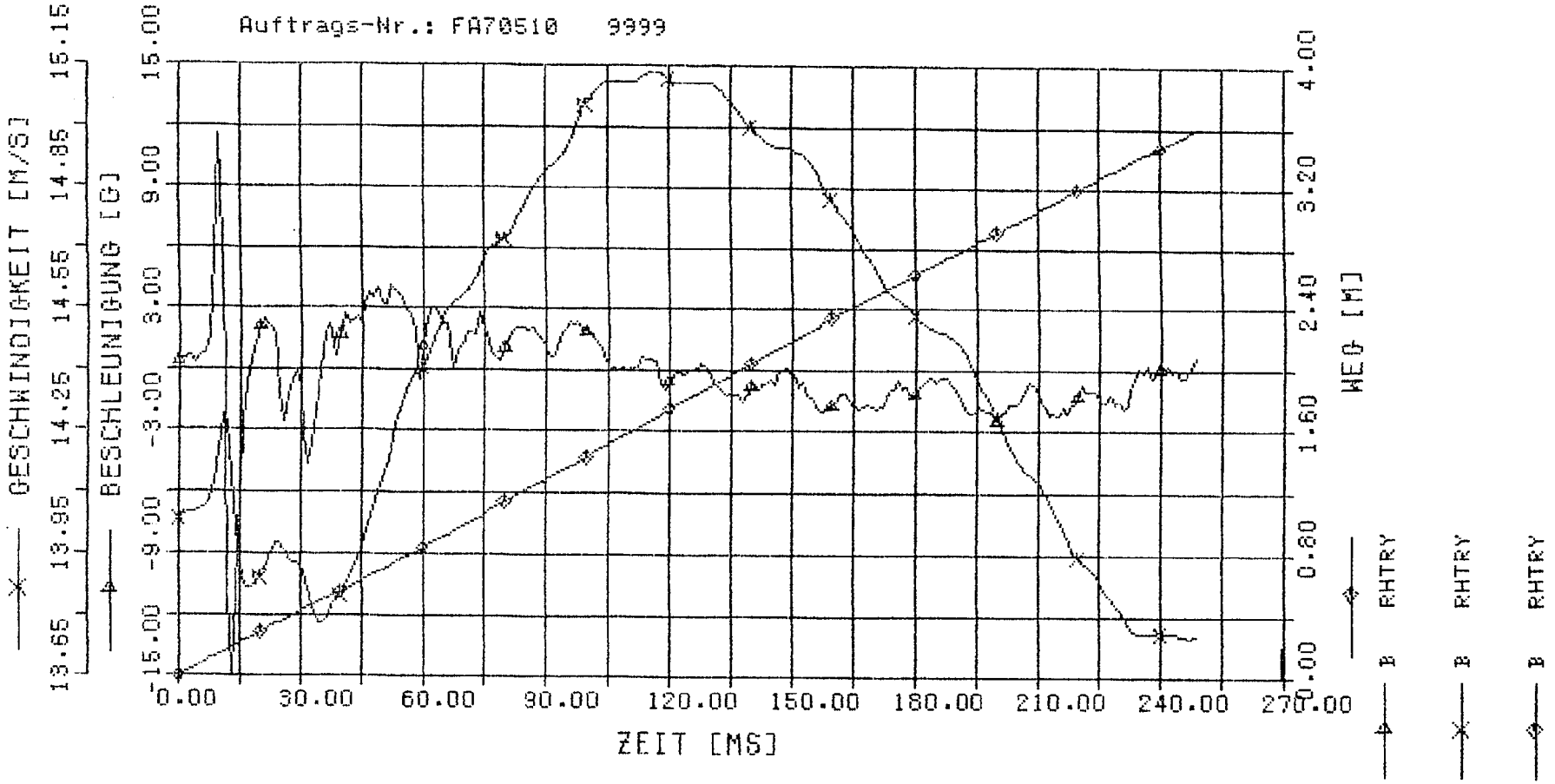
Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
RHTRX	B	BE g	-15.969	13.00	0.00
RHTRX	B	GE m/s	14.173	11.00	0.00
RHTRX	B	WE m	2.506	252.00	0.00



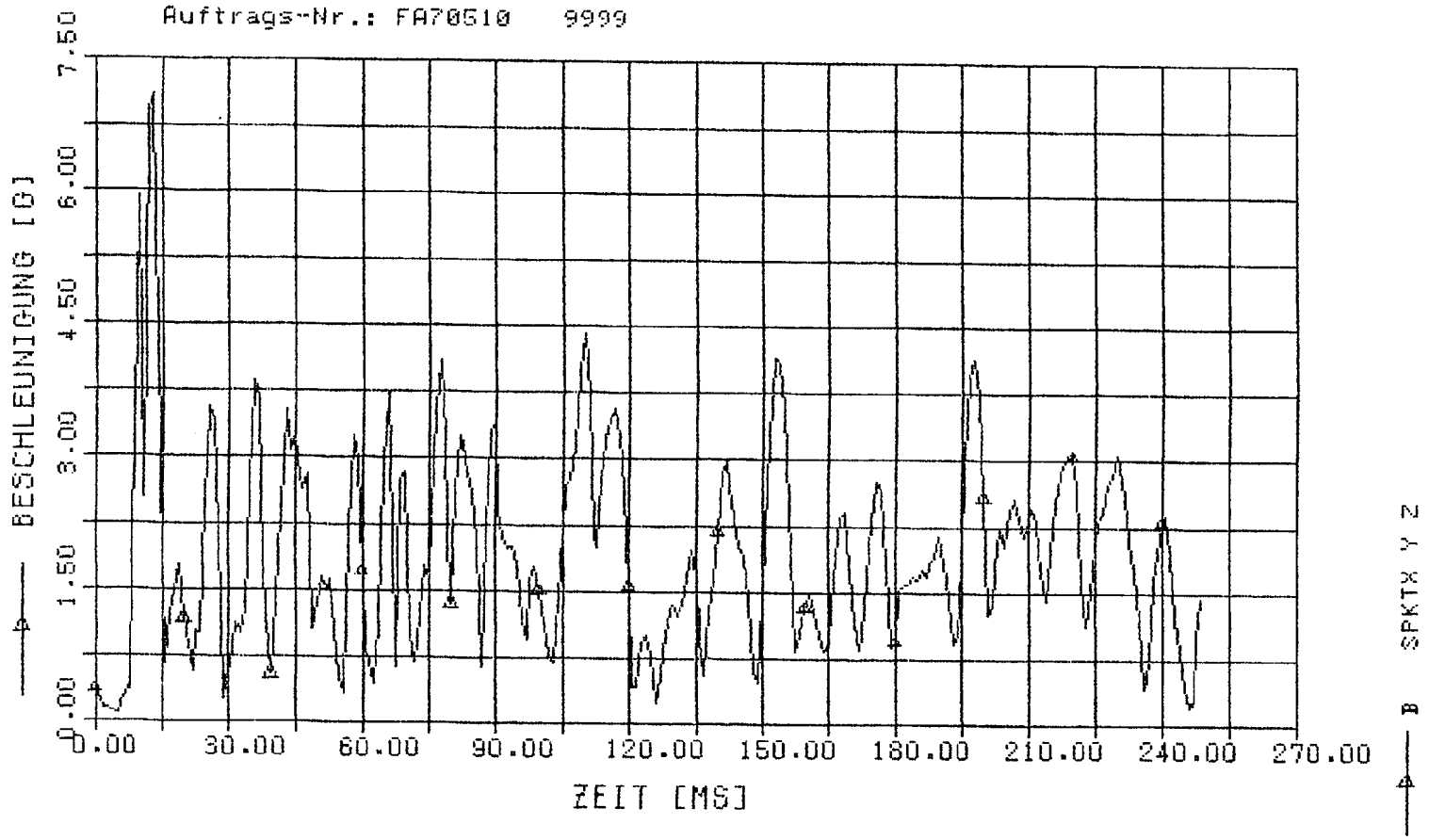
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
RHTRY	B	BE g	-14.969	13.00	0.00
RHTRY	B	GE m/s	15.135	117.00	0.00
RHTRY	B	WE m	3.639	252.00	0.00



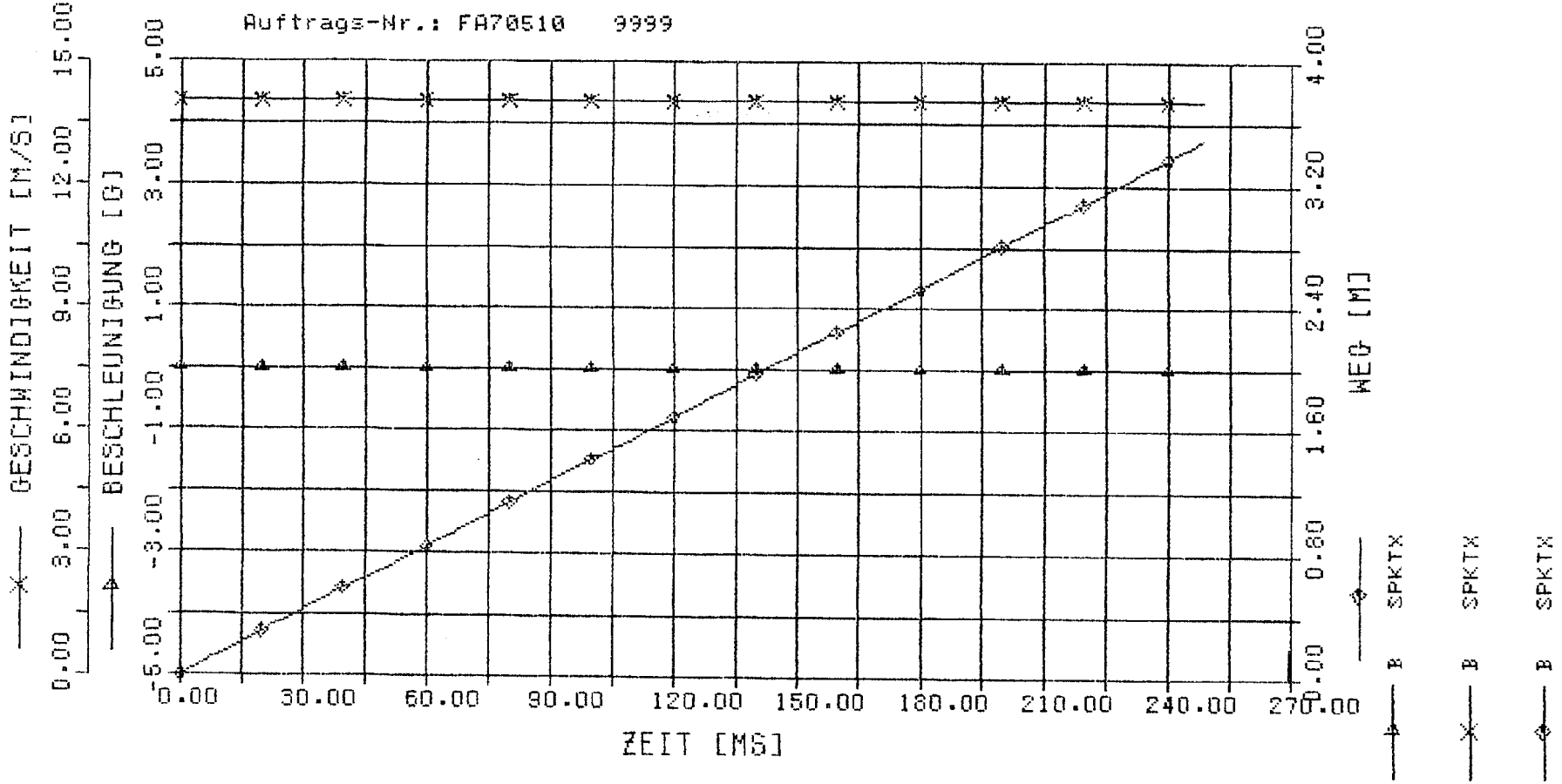
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
SPKT	B	BE g	7.091	13.00	0.00



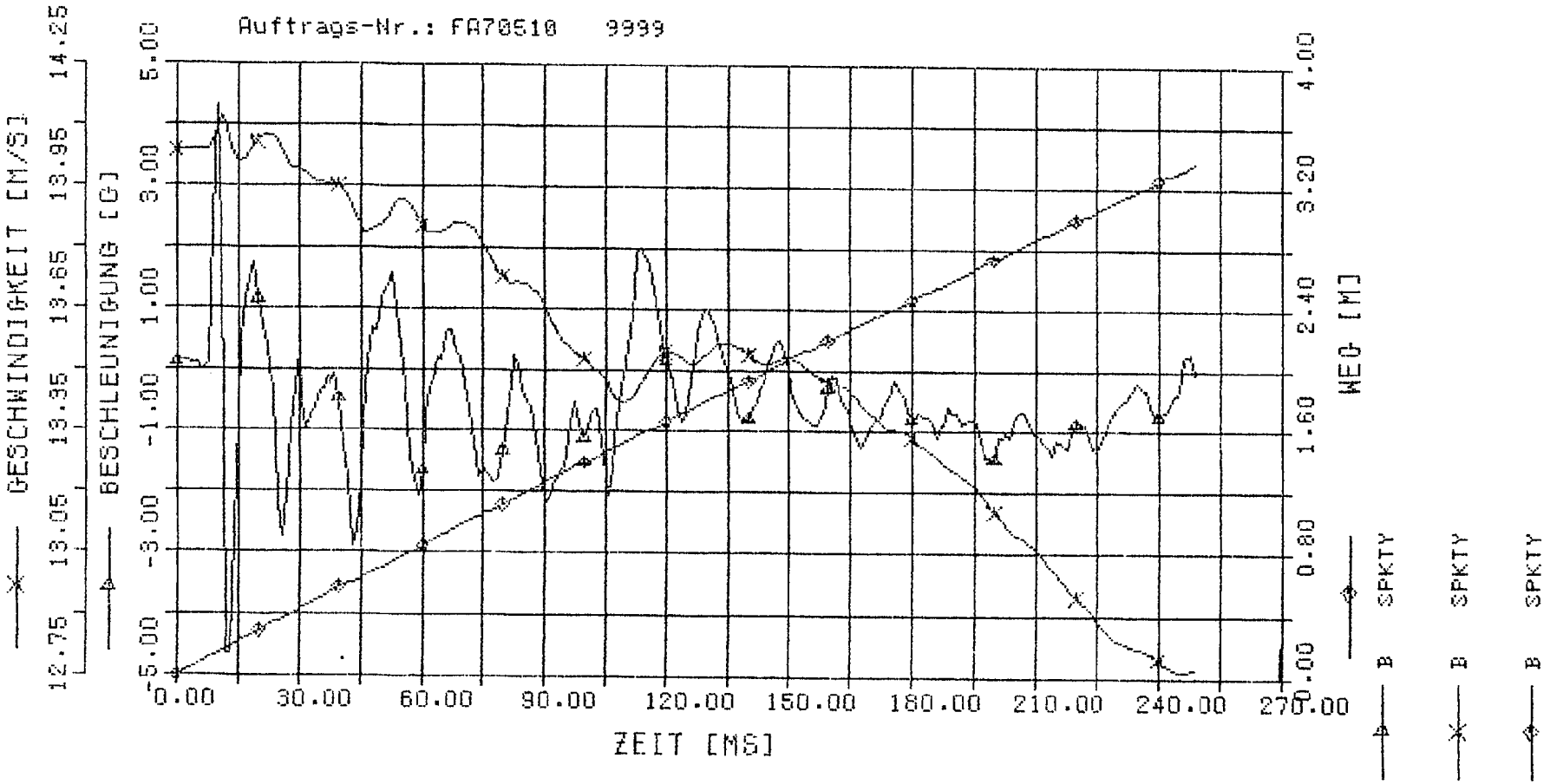
- Kenn-Werte: Auftrags-Nr. FA70510 Versuchs-Nr.: 999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
SPKTX	B	BE g	0.000	252.00	0.00
SPKTX	B	GE m/s	14.033	252.00	0.00
SPKTX	B	WE m	3.536	252.00	0.00



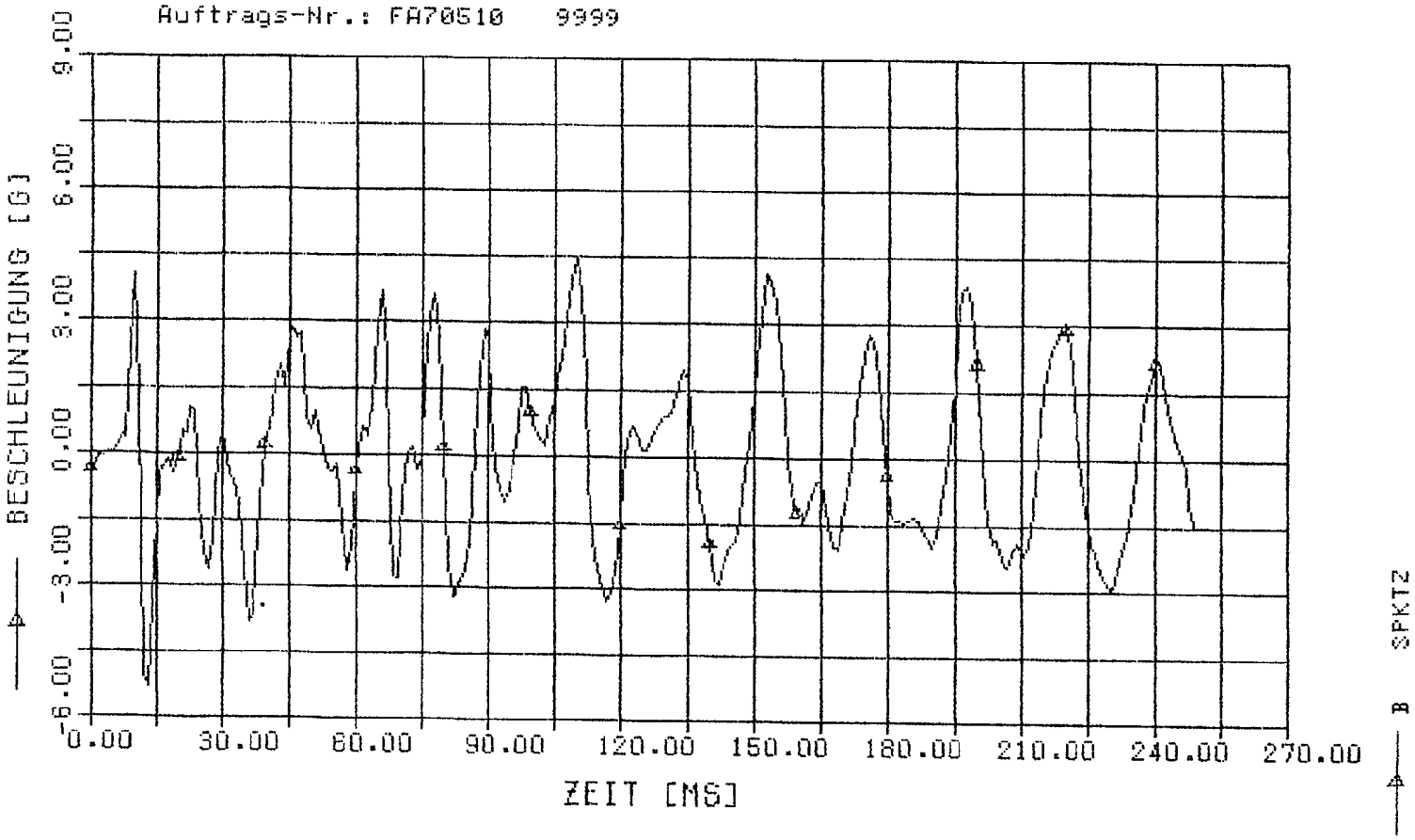
- Kenn-Werte: Auftrags-Nr.: A70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	SMS
SPKTY	B	BE	g	-4.660	13.00	0.00
SPKTY	B	GE	m/s	14.118	11.00	0.00
SPKTY	B	WE	m	3.403	252.00	0.00



- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ZMS
SPKTZ	B	BE g	-5.345	13.00	0.00

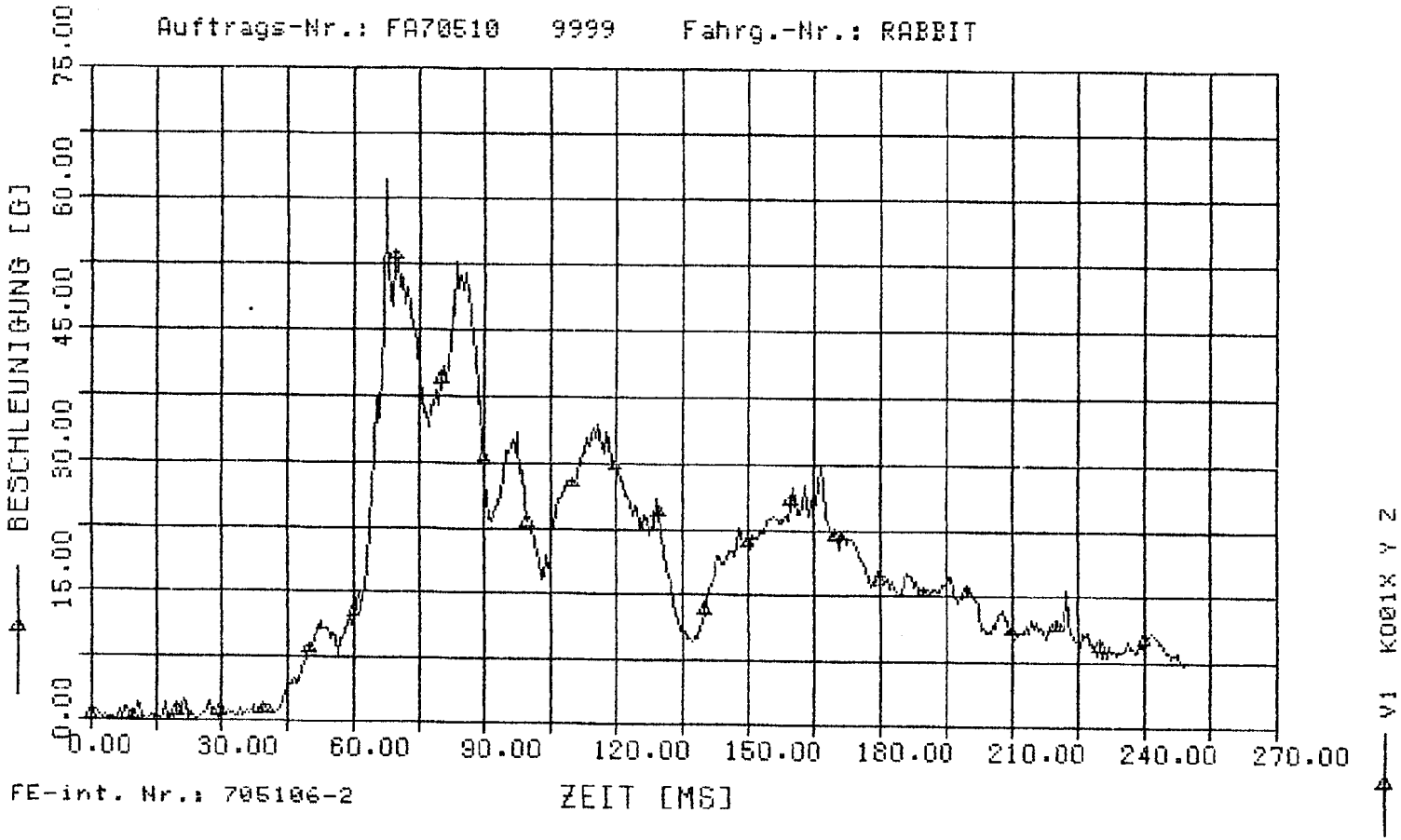


B.2 Dummy Test Response

B.2.1 Driver

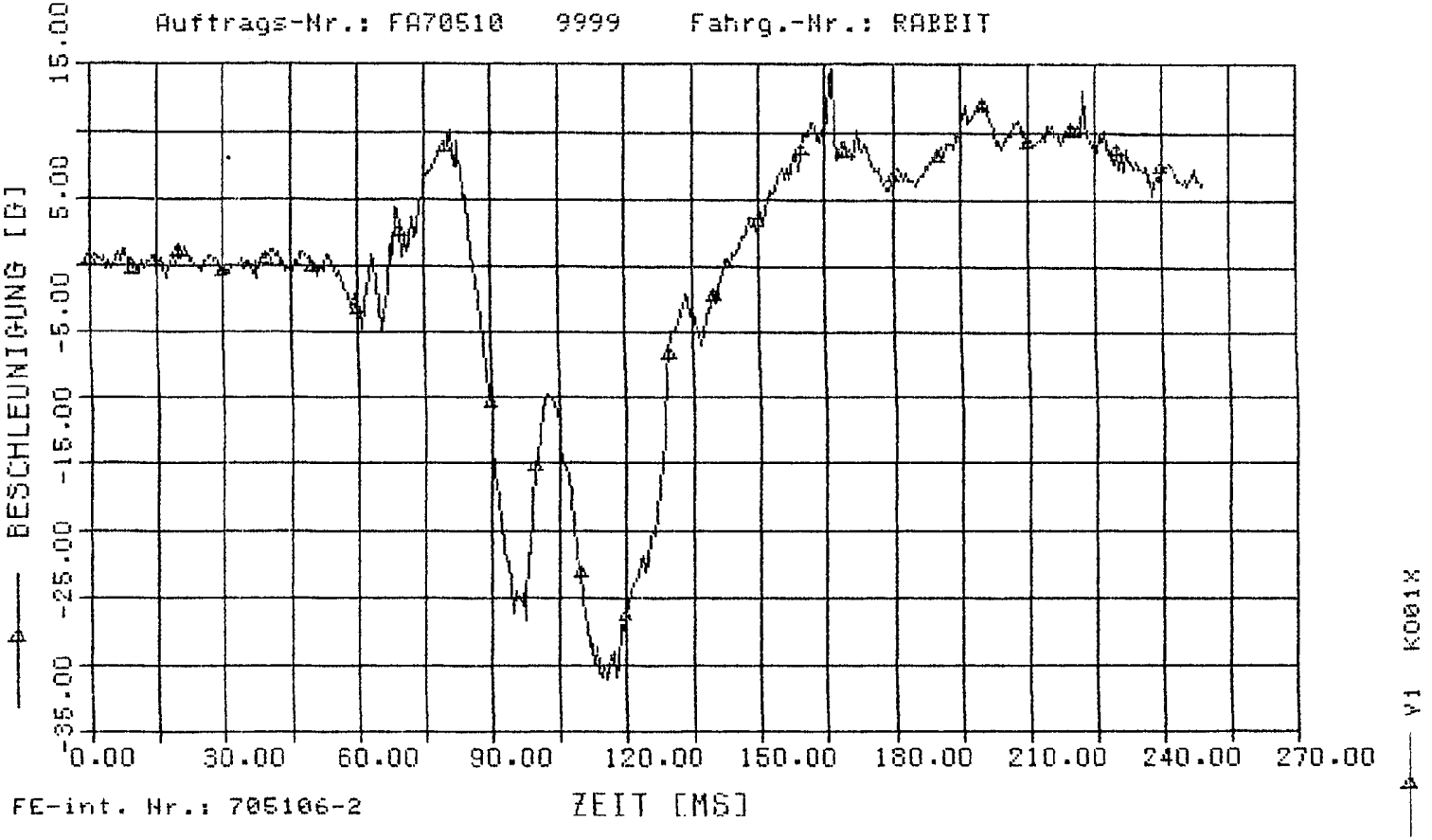
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
K001	V1	BE g	61.974	67.50	51.72



- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

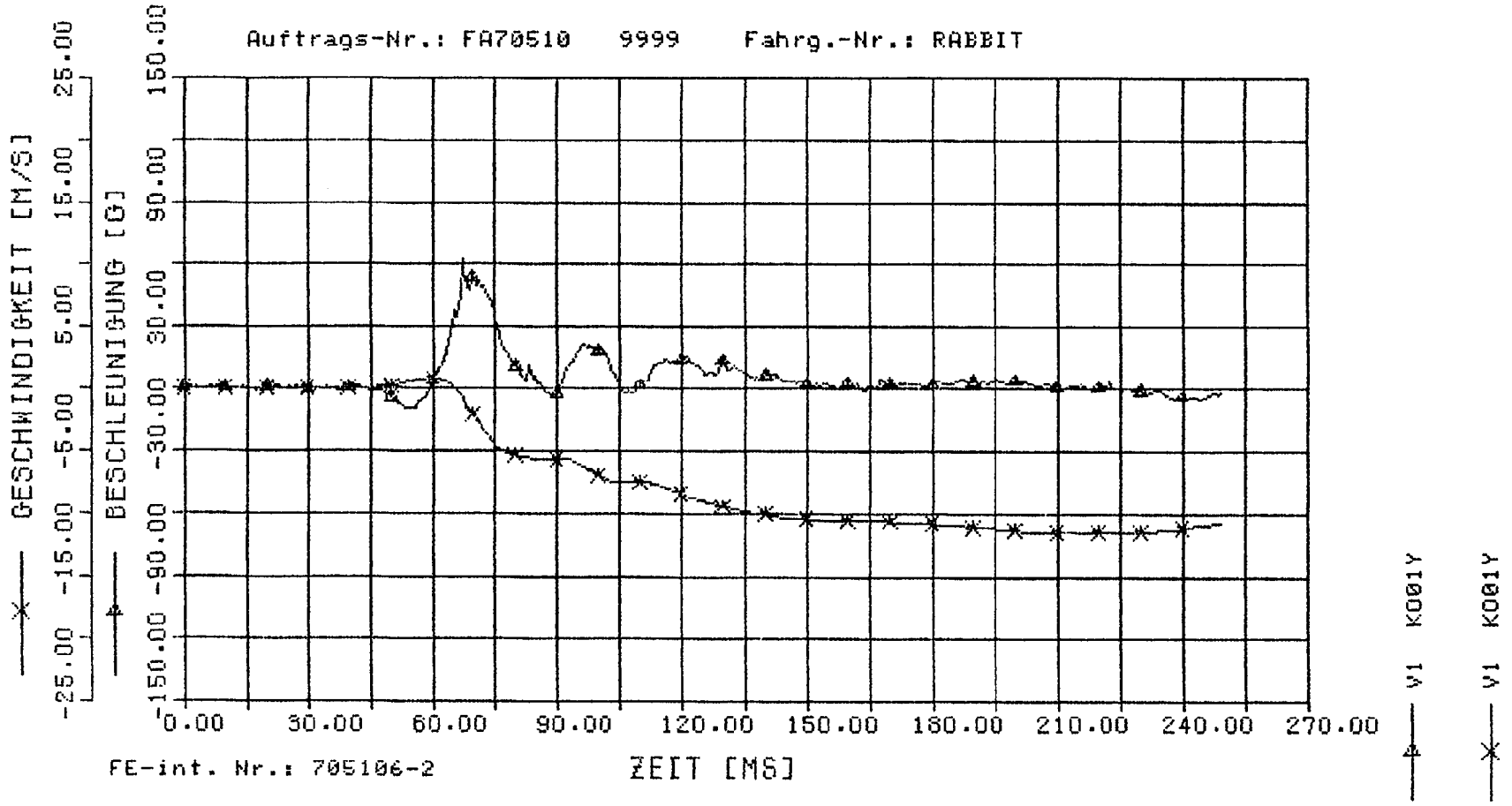
Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
K001X	V1	BE g	-31.375	116.20	11.64



FE-int. Nr.: 705106-2

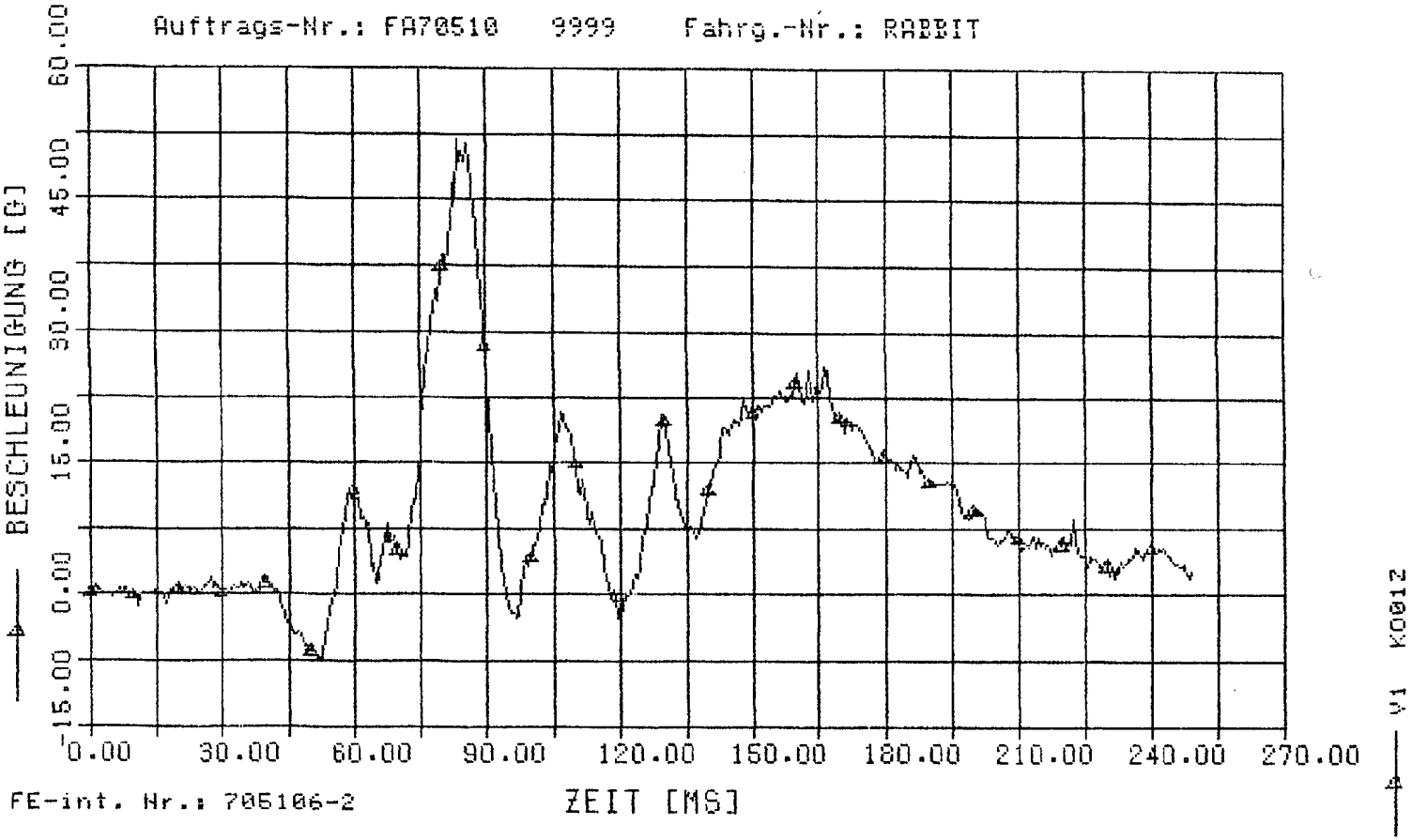
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
K001Y	V1	BE g	61.678	67.50	50.39
K001Y	V1	GE m/s	-11.561	223.30	0.00



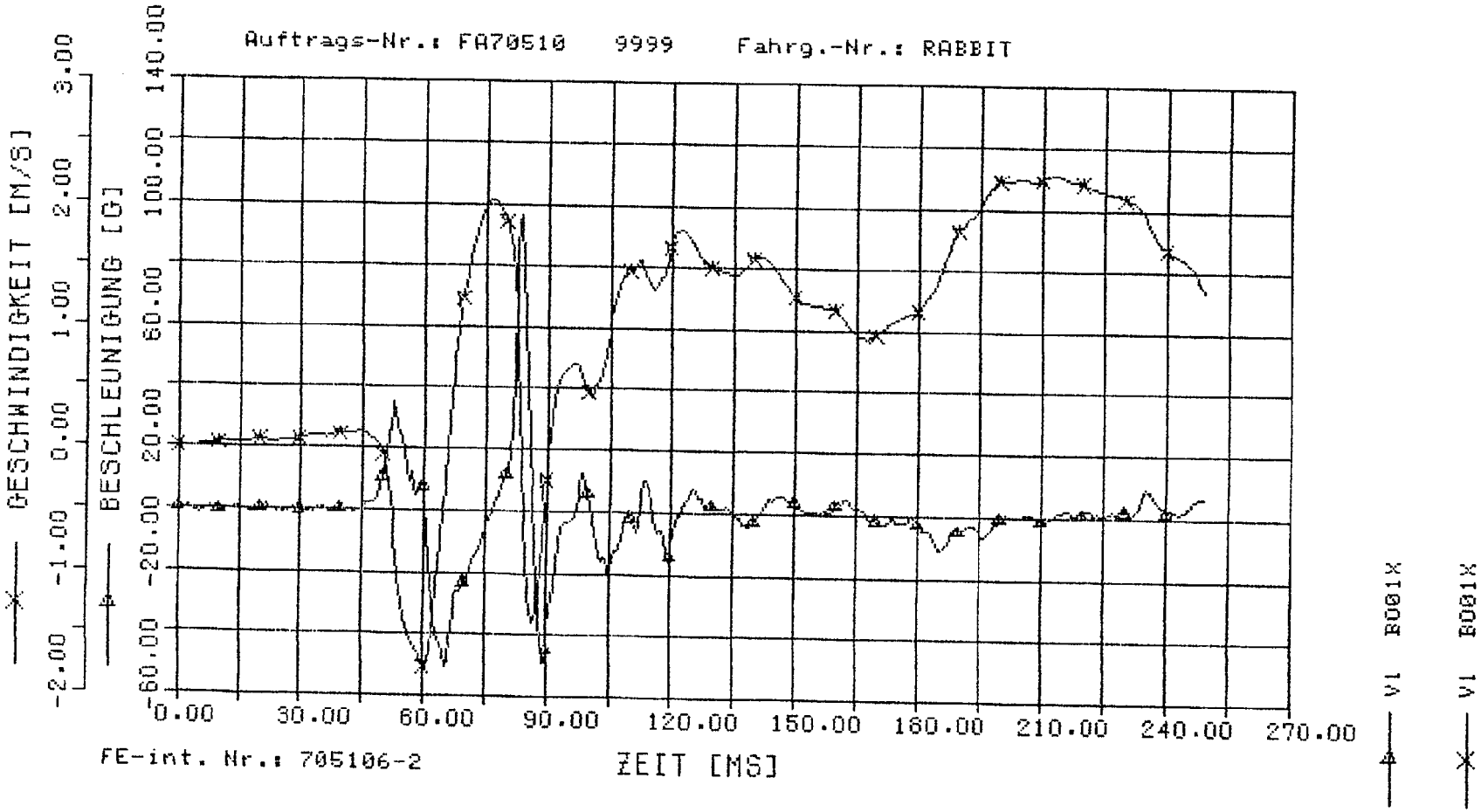
-- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
K001Z	V1	BE g	52.102	84.80	47.56



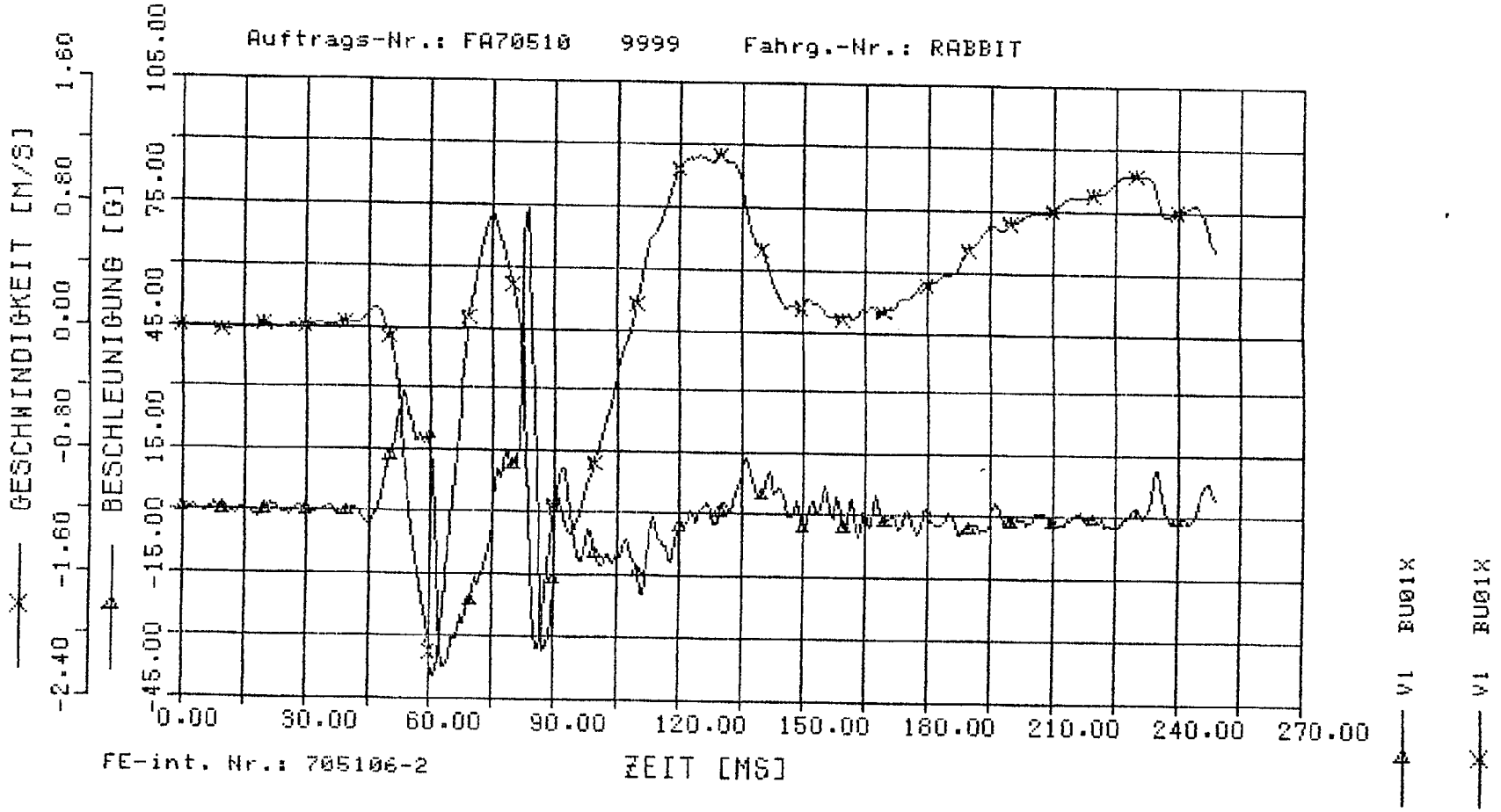
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
B001X	V1	BE g	96.063	84.00	0.00
B001X	V1	GE m/s	2.277	213.00	0.00



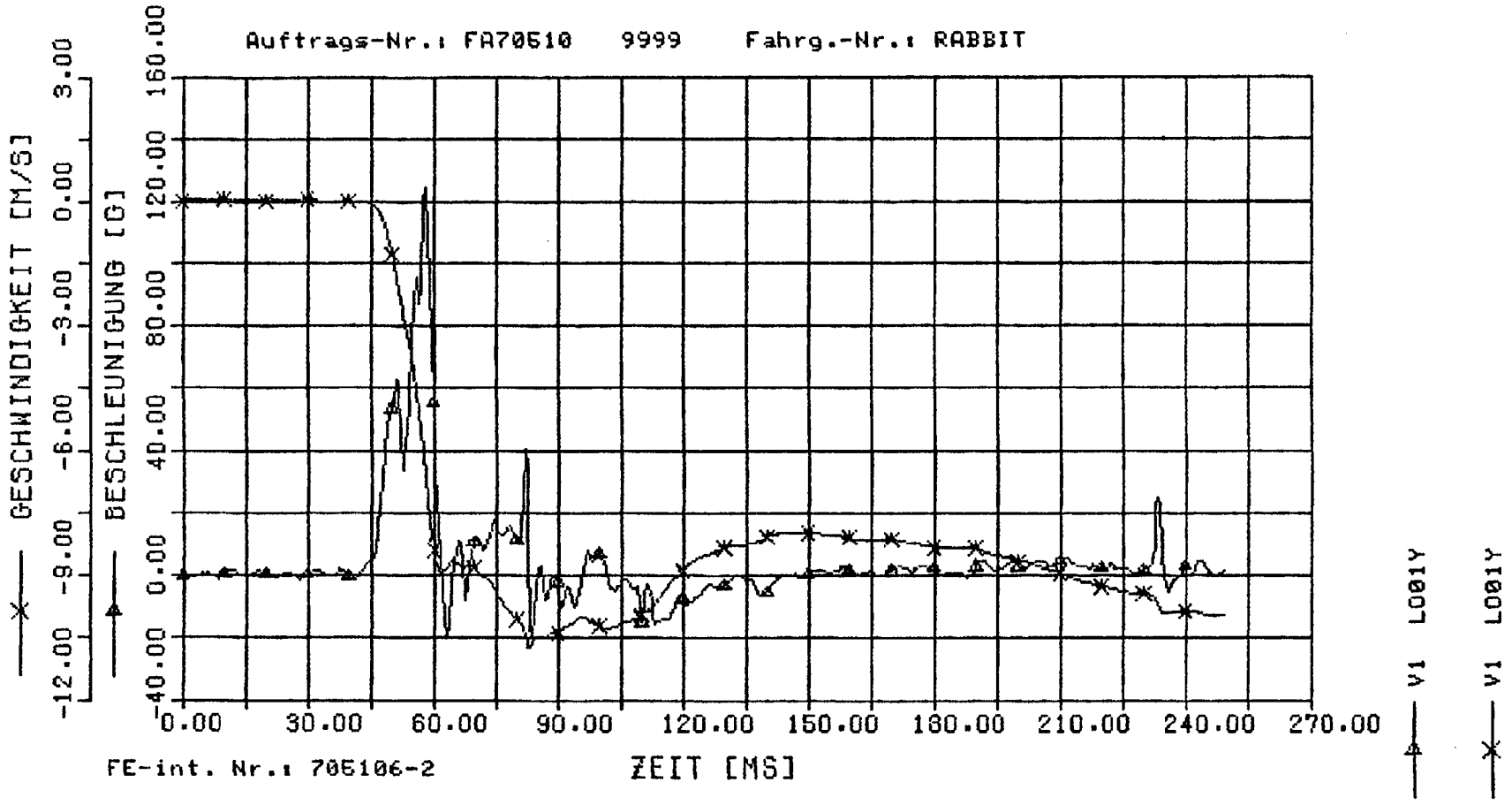
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	MS
BU01X	V1	BE g	73.954	84.00	0.00
BU01X	V1	GE m/s	-2.259	61.50	0.00



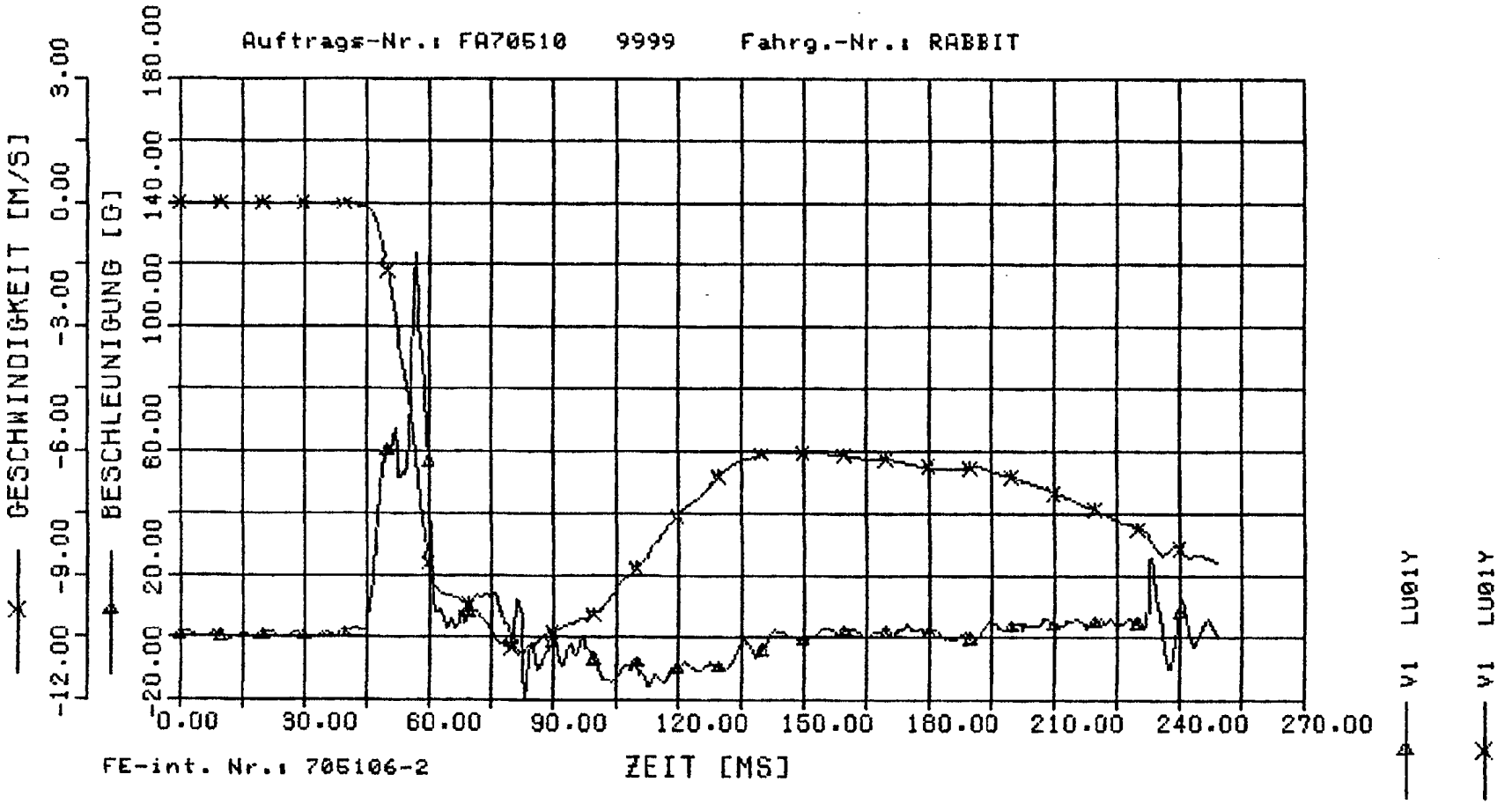
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
L001Y	V1	BE g	123.907	58.00	0.00
L001Y	V1	GE m/s	-10.748	83.00	0.00



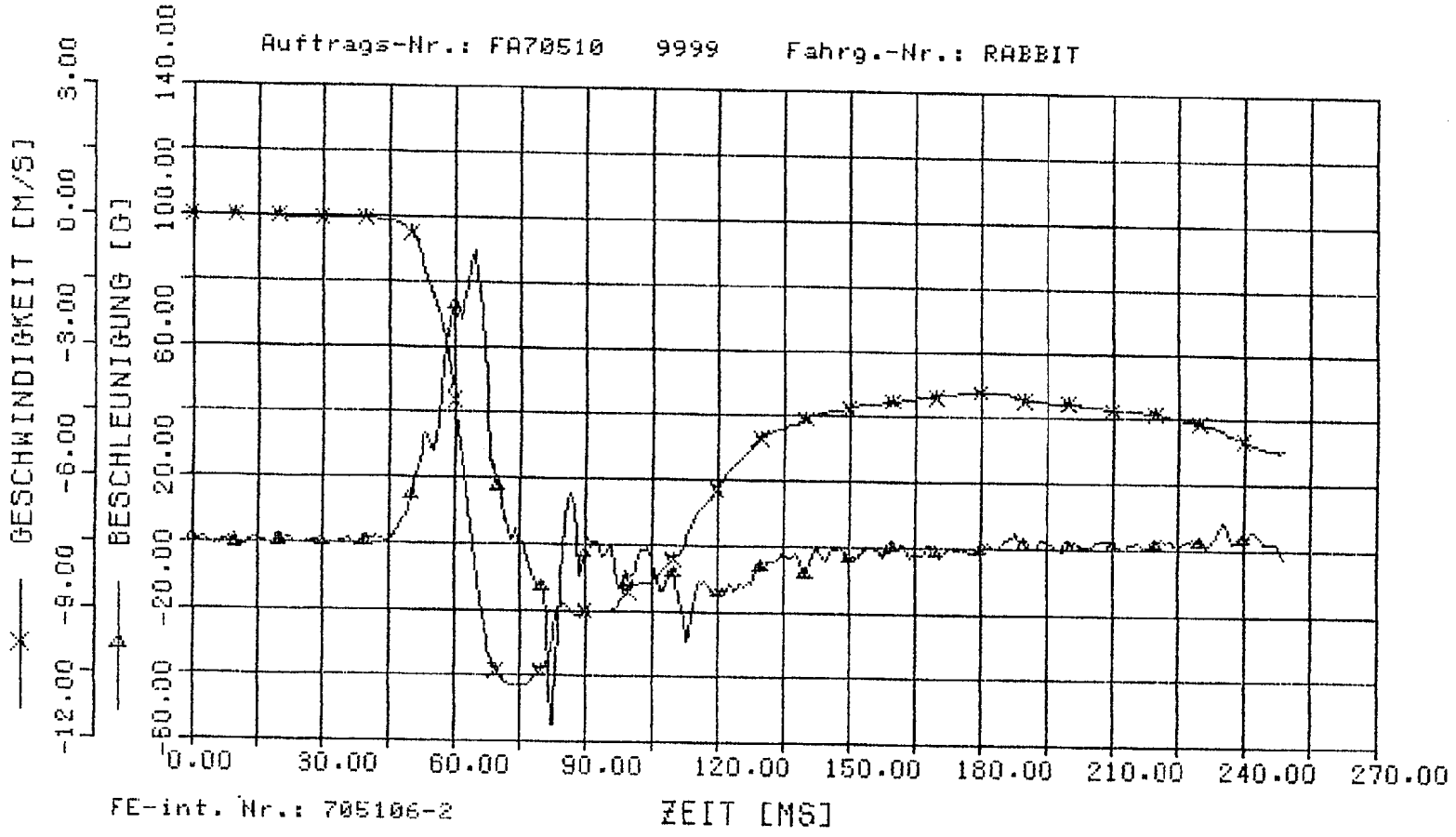
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
LU01Y	Vi	BE g	123.670	57.00	0.00
LU01Y	Vi	GE m/s	-10.928	82.50	0.00



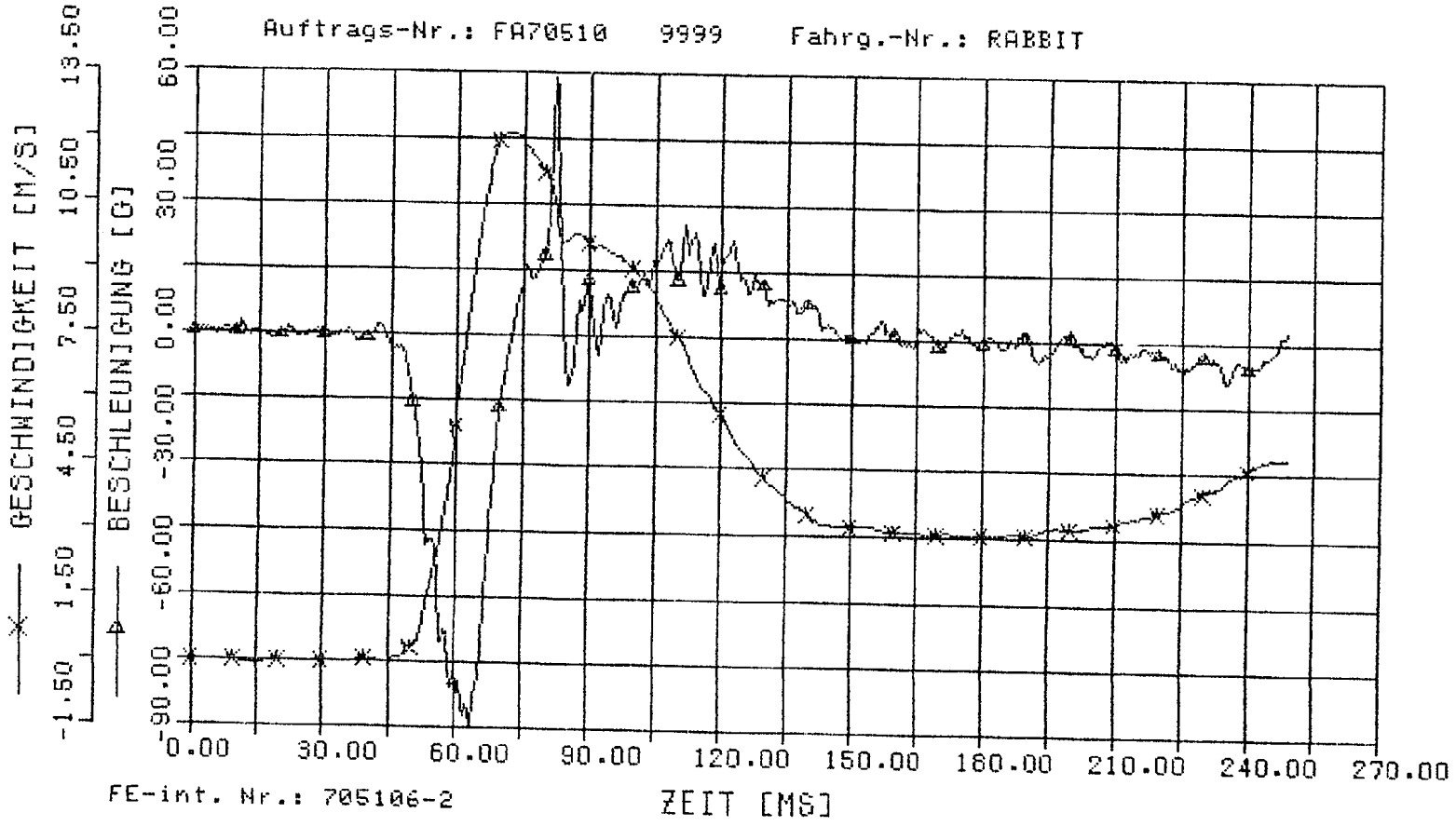
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
R001Y	V1	BE g	90.093	65.00	0.00
R001Y	V1	GE m/s	-10.750	74.50	0.00



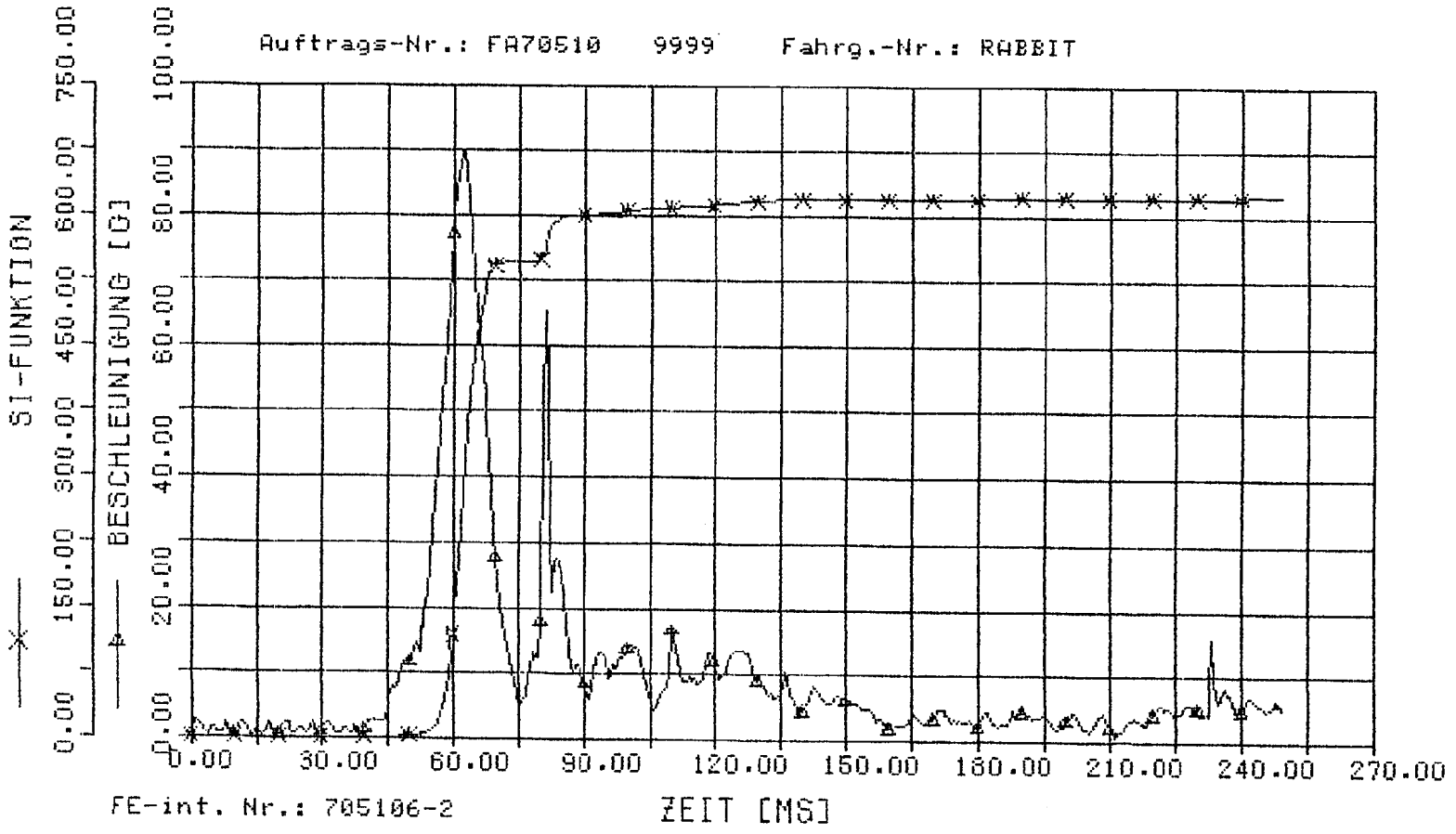
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
RU01Y	V1	BE g	-89.442	64.00	0.00
RU01Y	V1	GE m/s	12.115	72.50	0.00



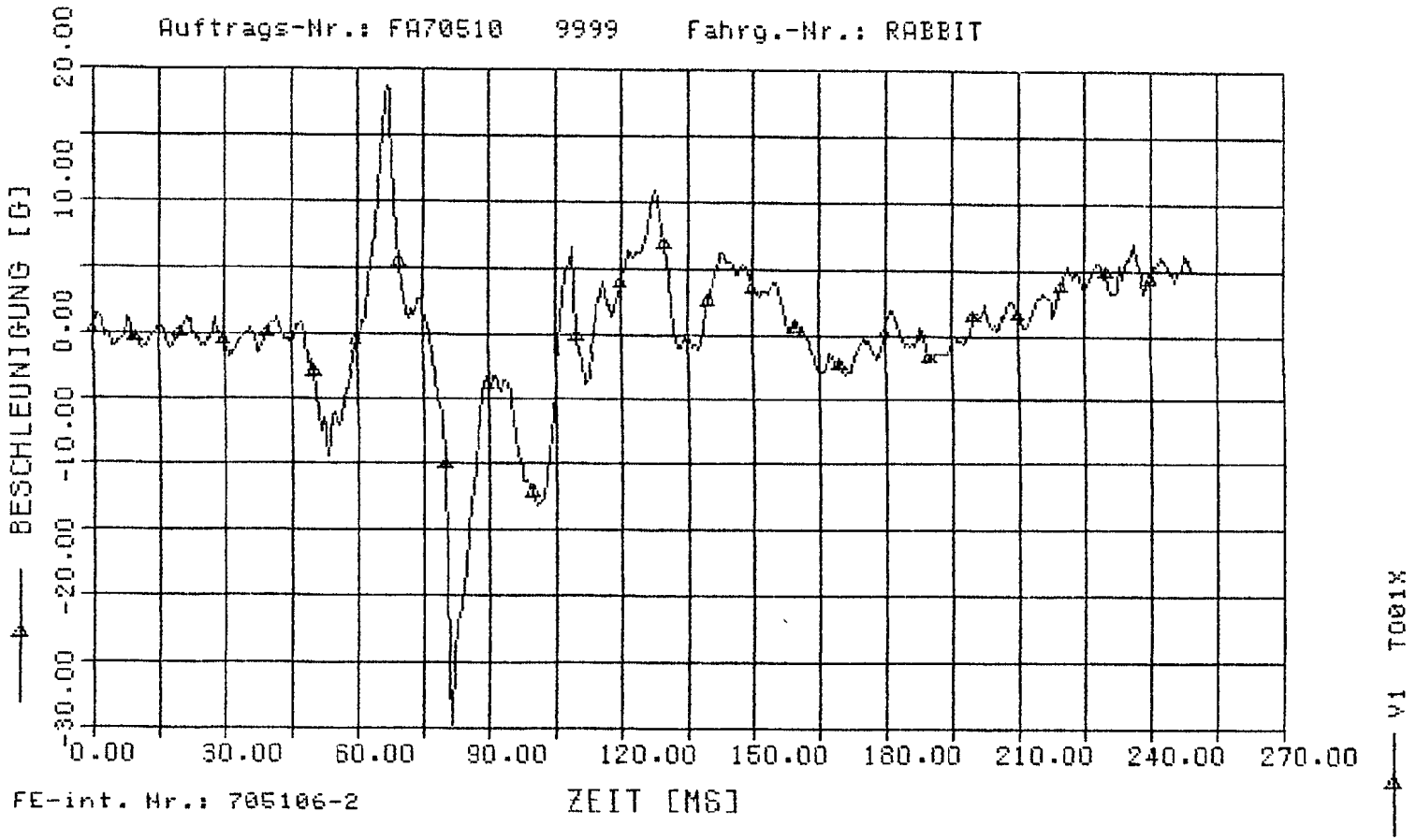
— Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	SIMS
T001	V1	BE	g	89.432	62.50	0.00
T001	V1	SI		622.594	250.00	0.00



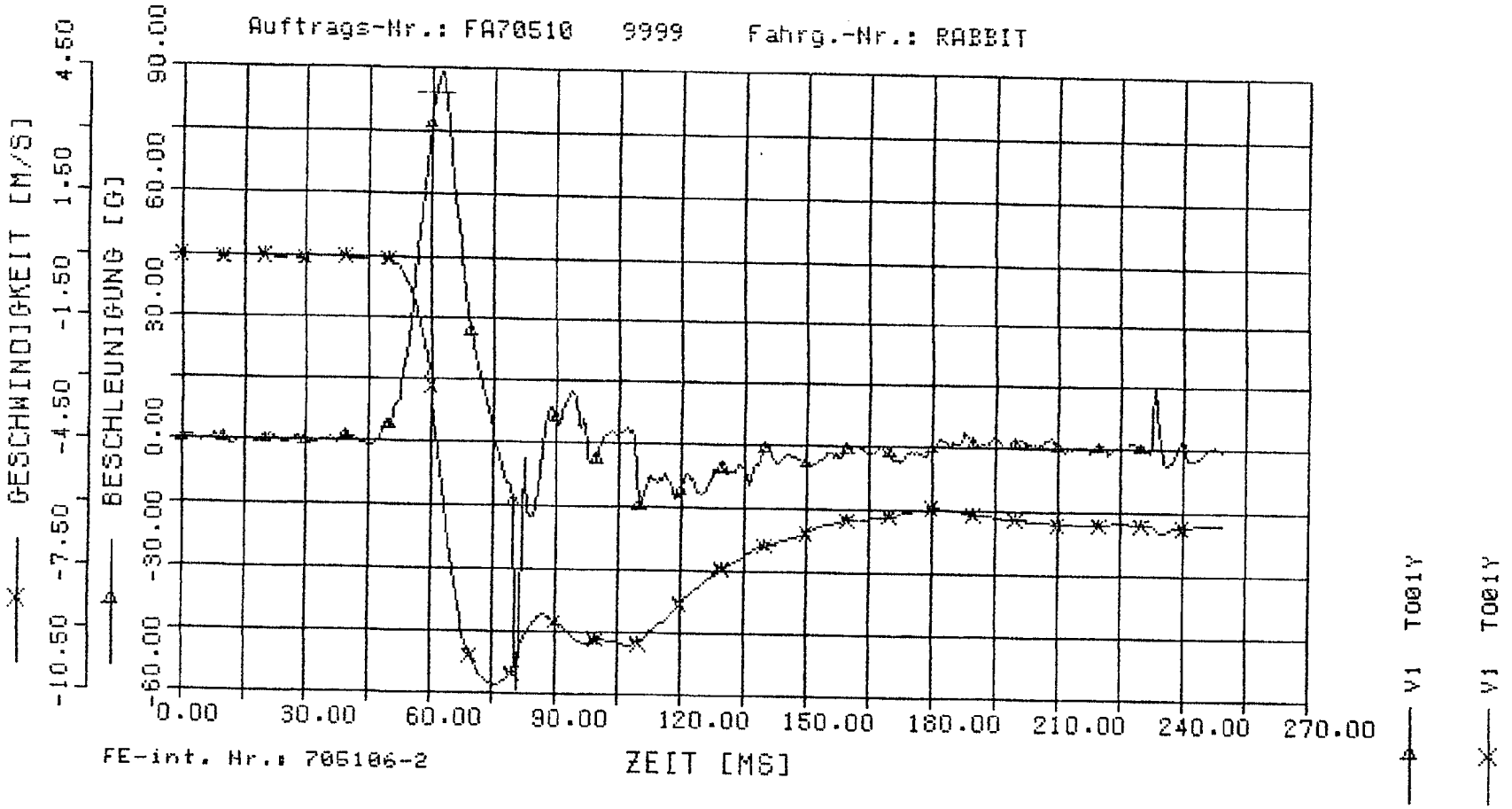
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	ΔMS
T001X	V1	BE	g	-29.662	81.50	0.00



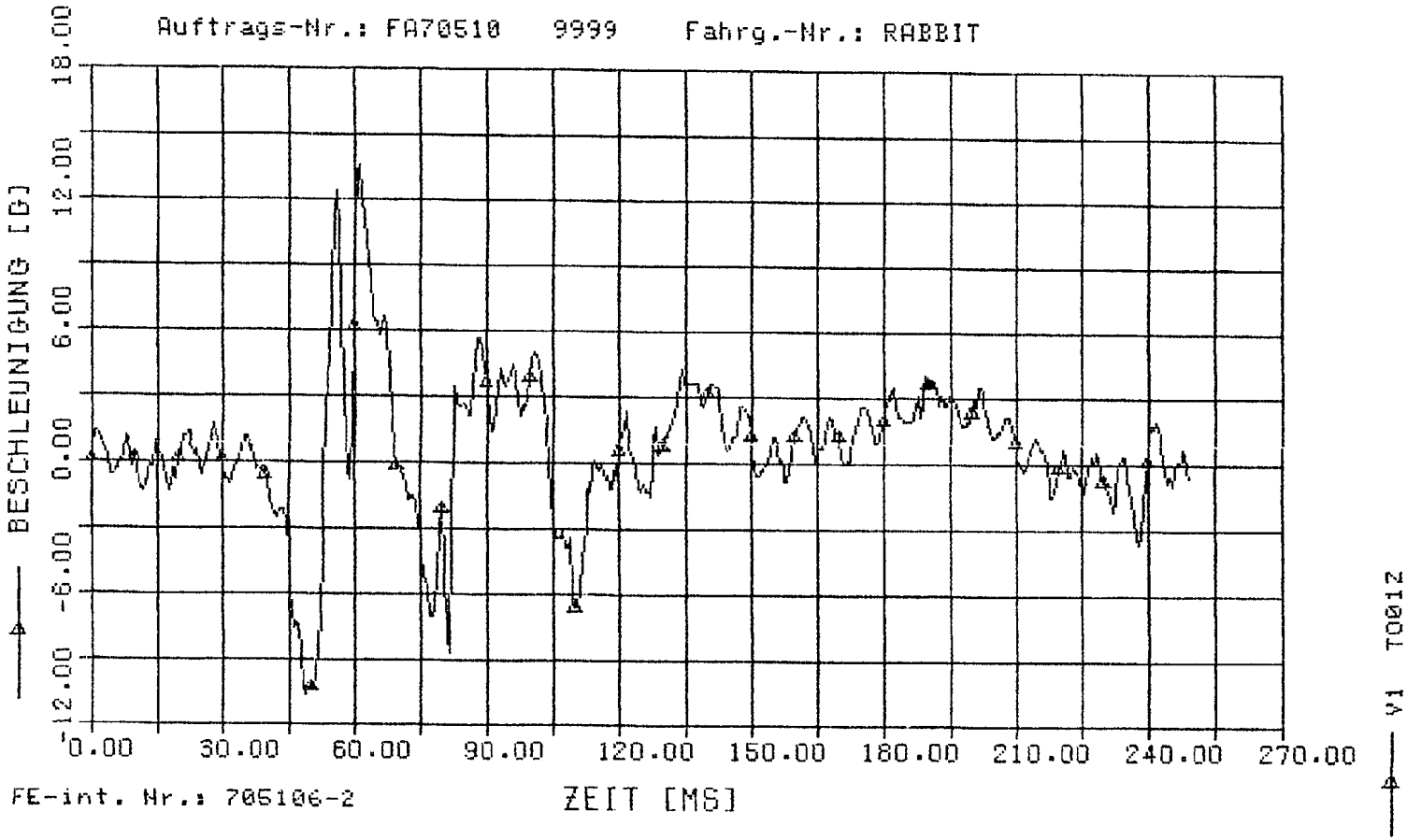
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	SMS
T001Y	V1	BE g	38.736	63.00	0.00
T001Y	V1	GE m/s	-10.298	75.50	0.00



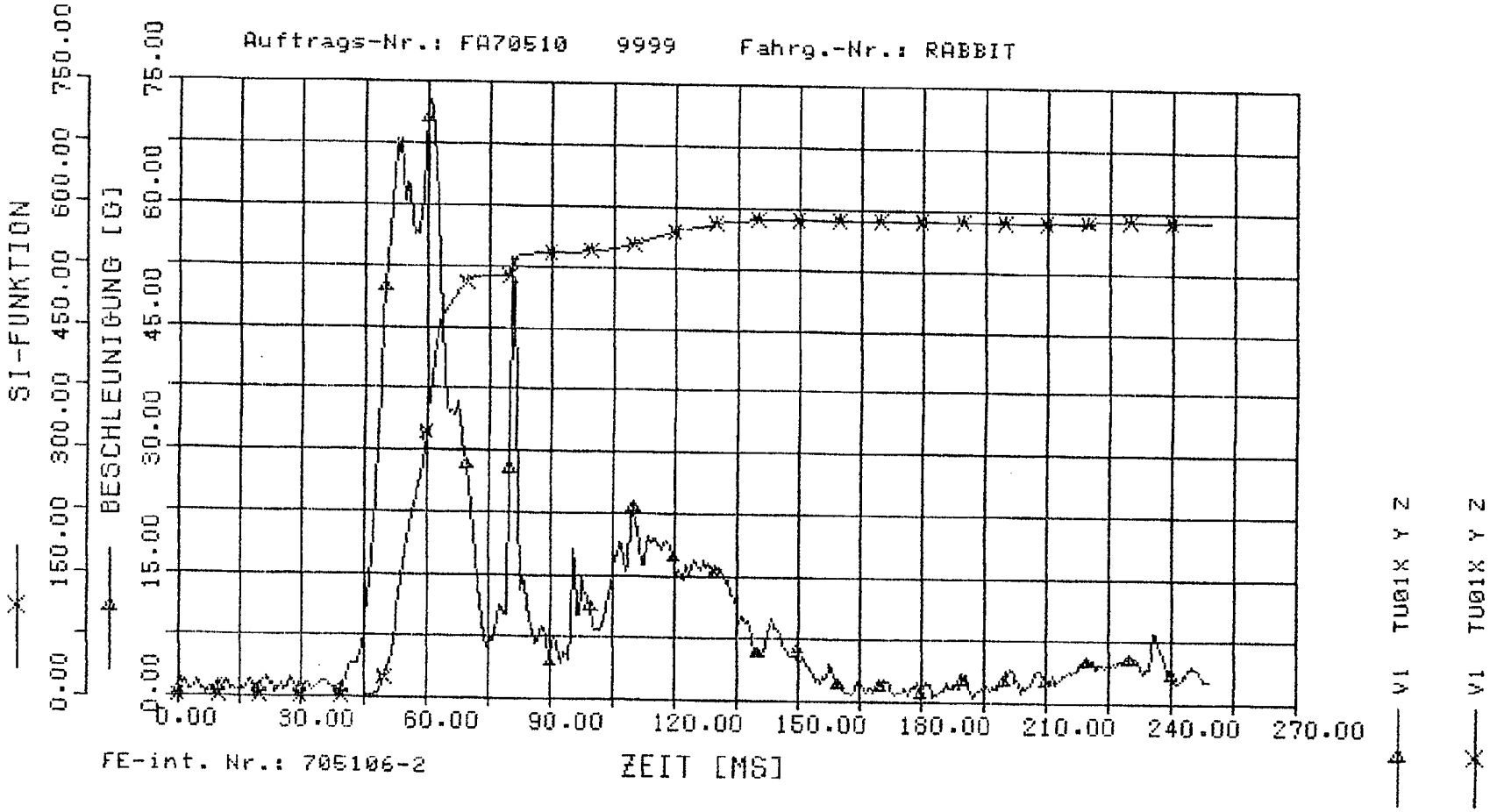
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
T001Z	V1	BE g	13.534	61.50	0.00



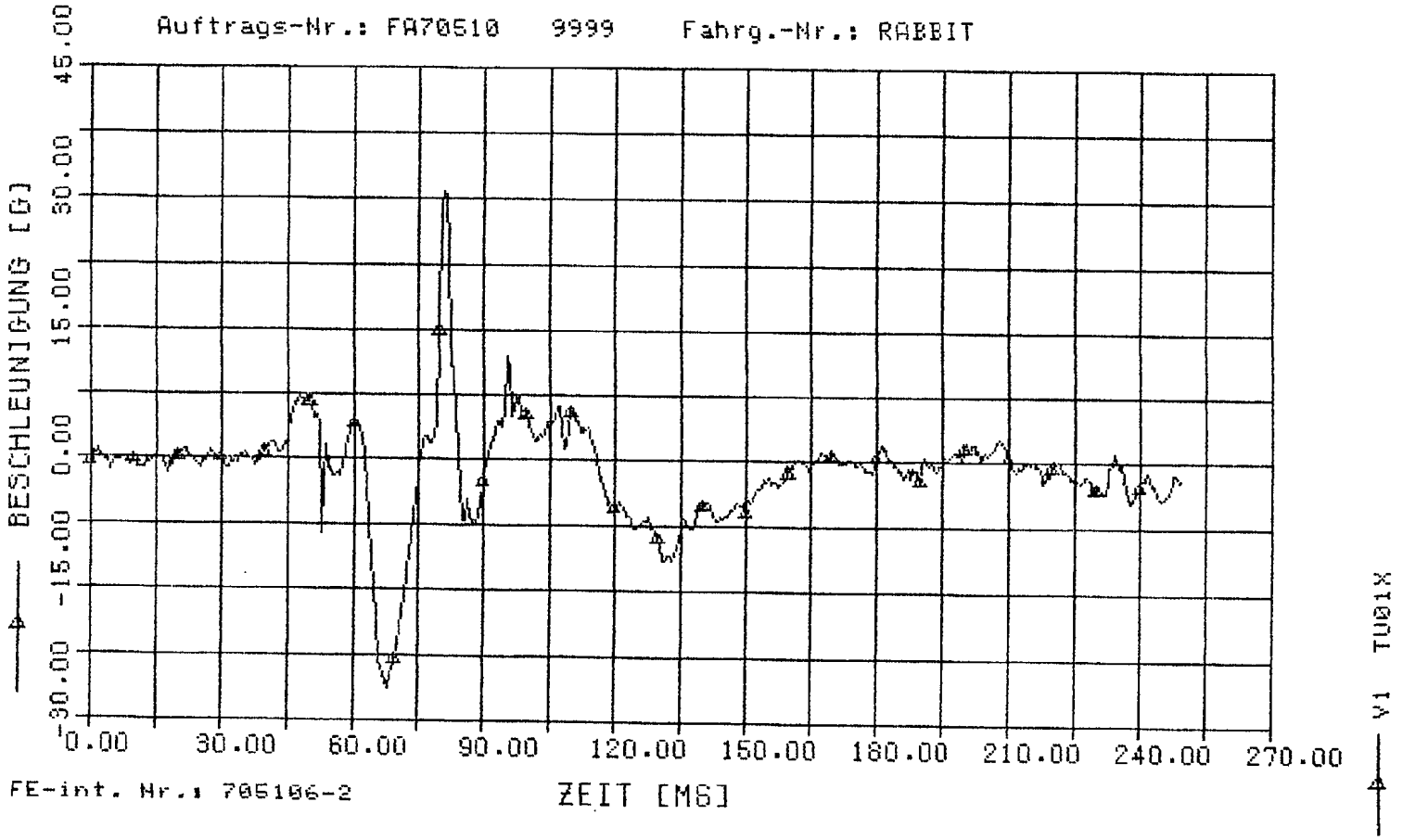
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
TU01	V1	BE g	73.109	60.50	0.00
TU01	V1	SI	588.409	250.00	0.00



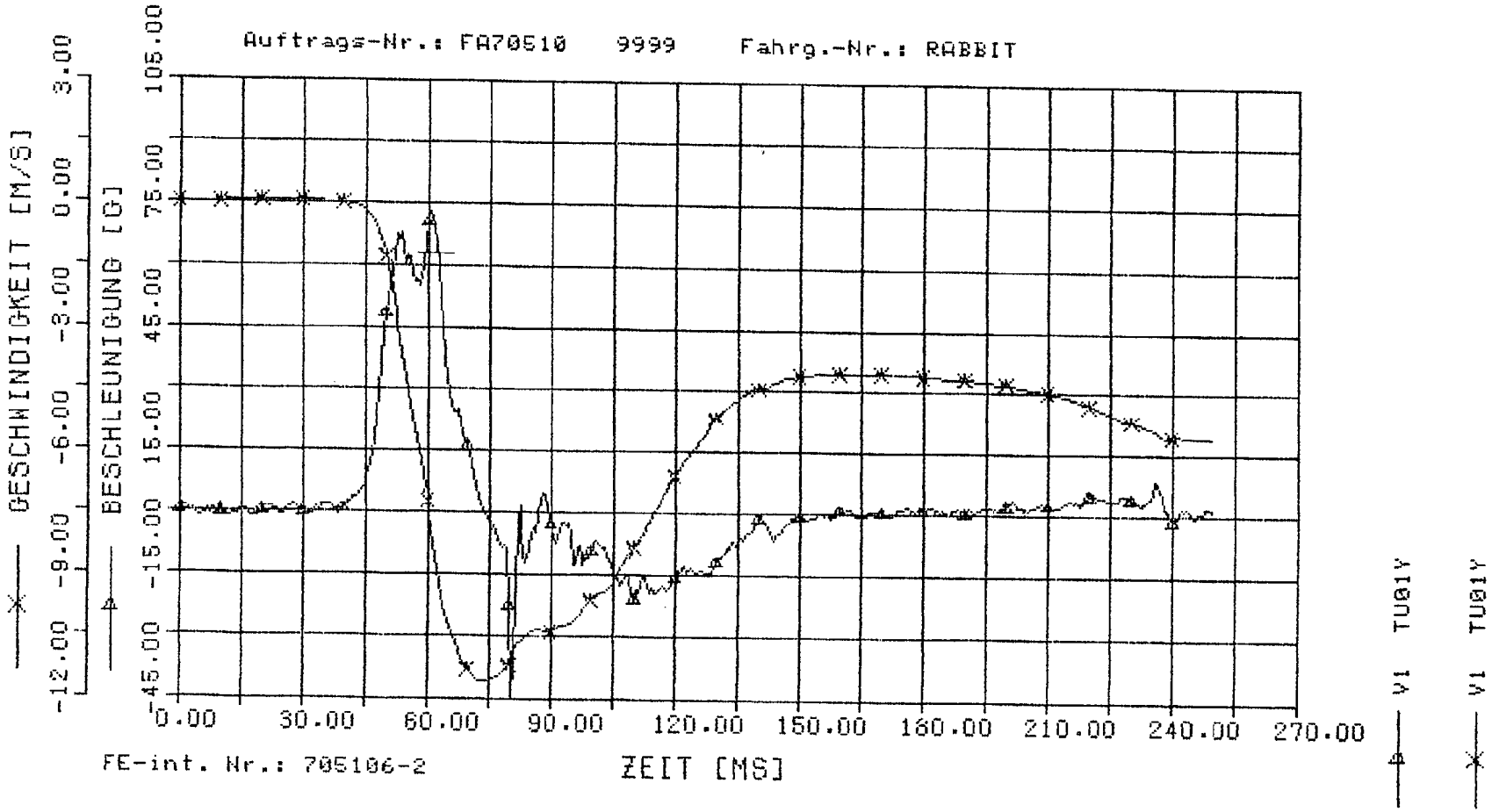
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
TU01X	V1	BE g	30.785	81.00	0.00



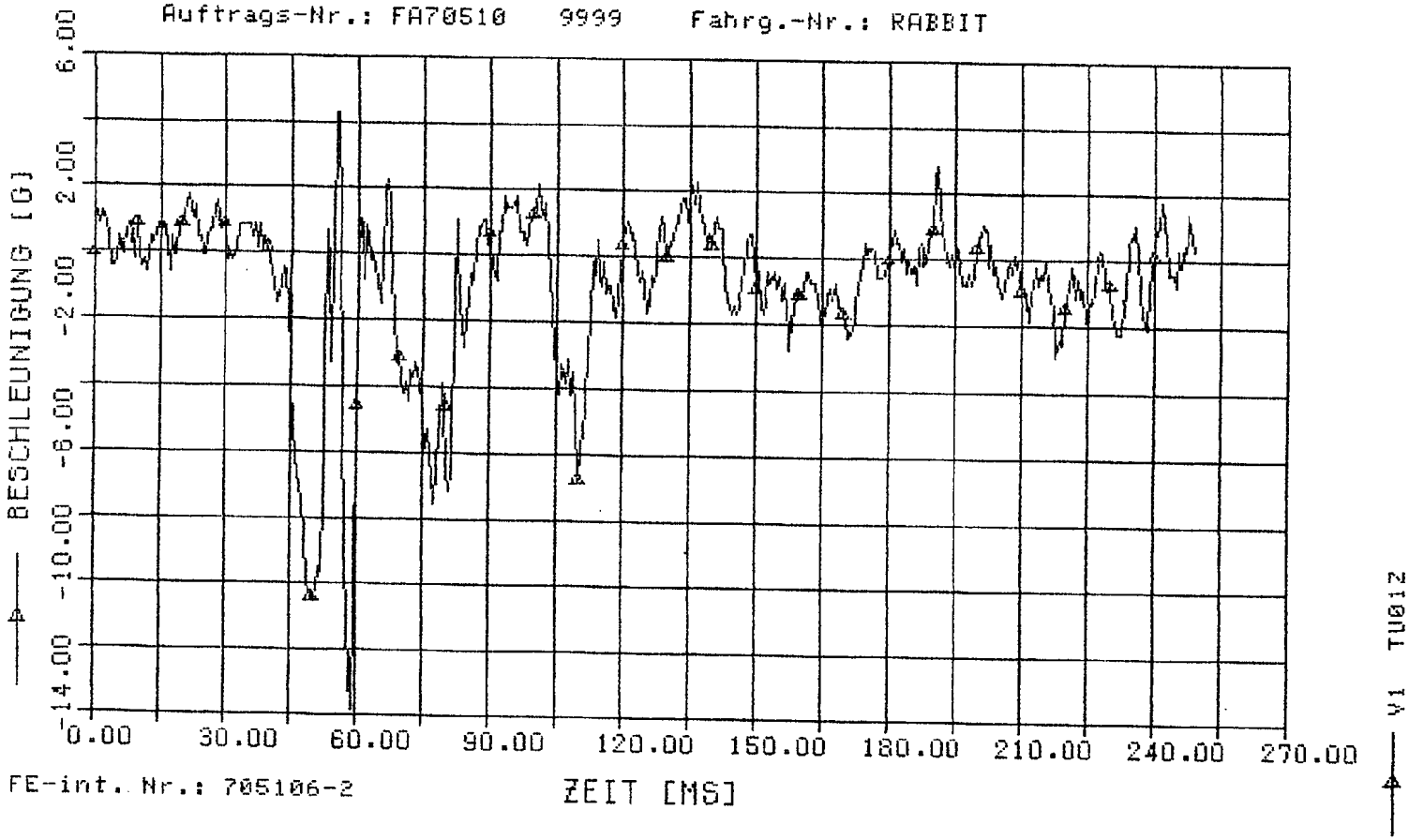
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
TU01Y	V1	BE g	73.027	60.50	0.00
TU01Y	V1	GE m/s	-11.583	73.50	0.00



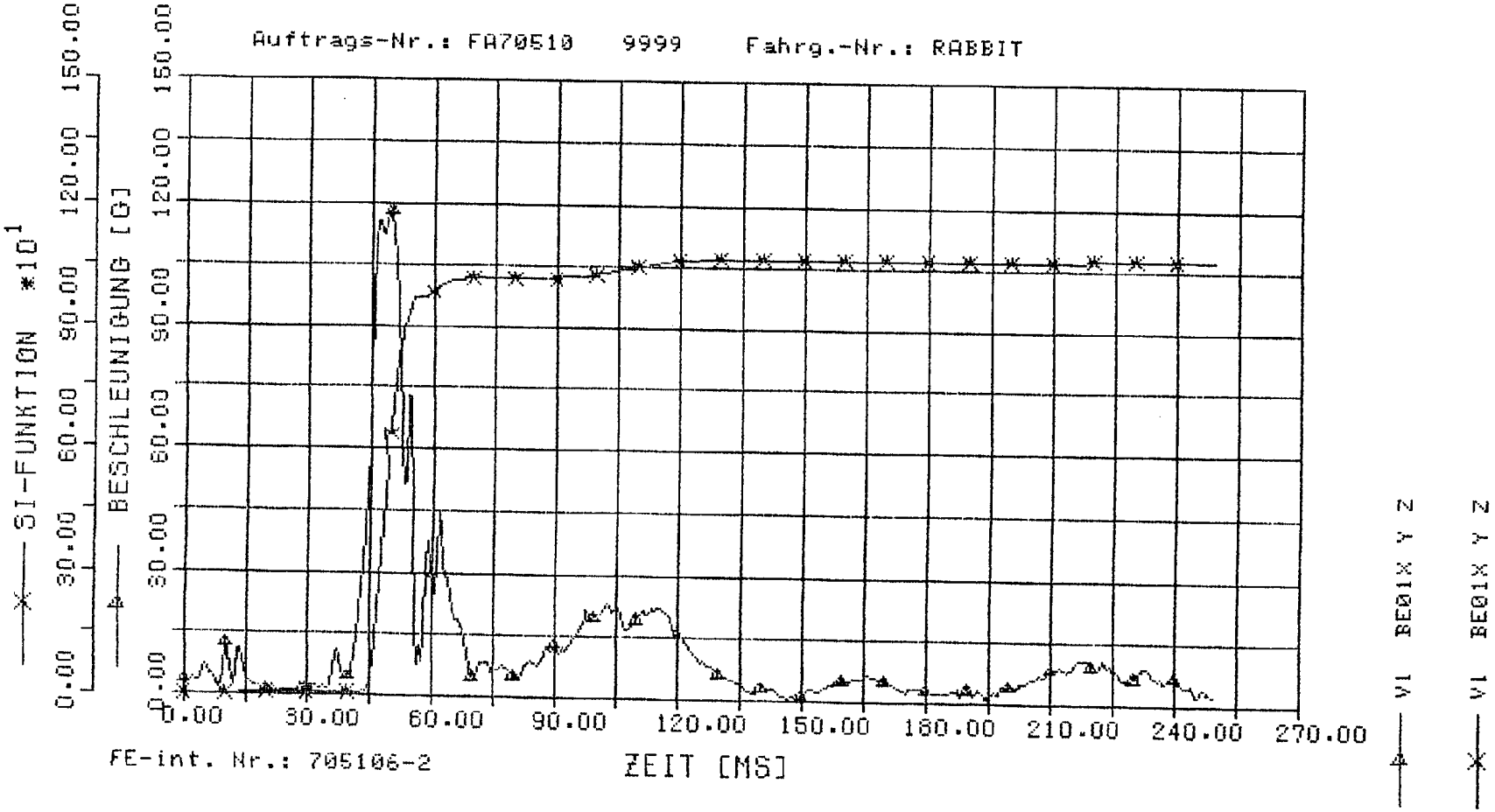
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
TU01Z	V1	BE g	-13.372	59.00	0.00



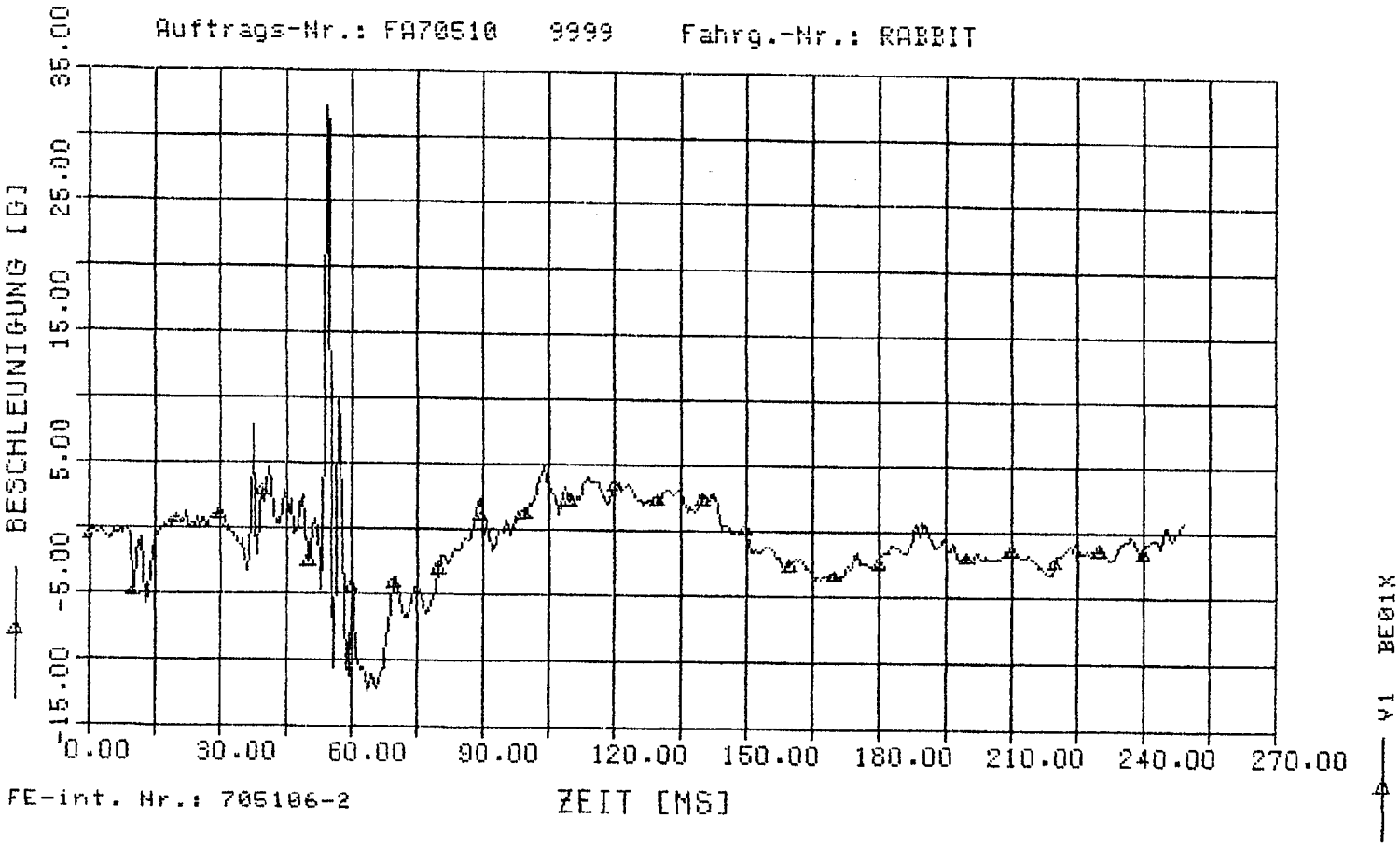
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
BE01	V1	BE g	117.947	50.00	112.56
BE01	V1	SI	1076.475	250.00	0.00



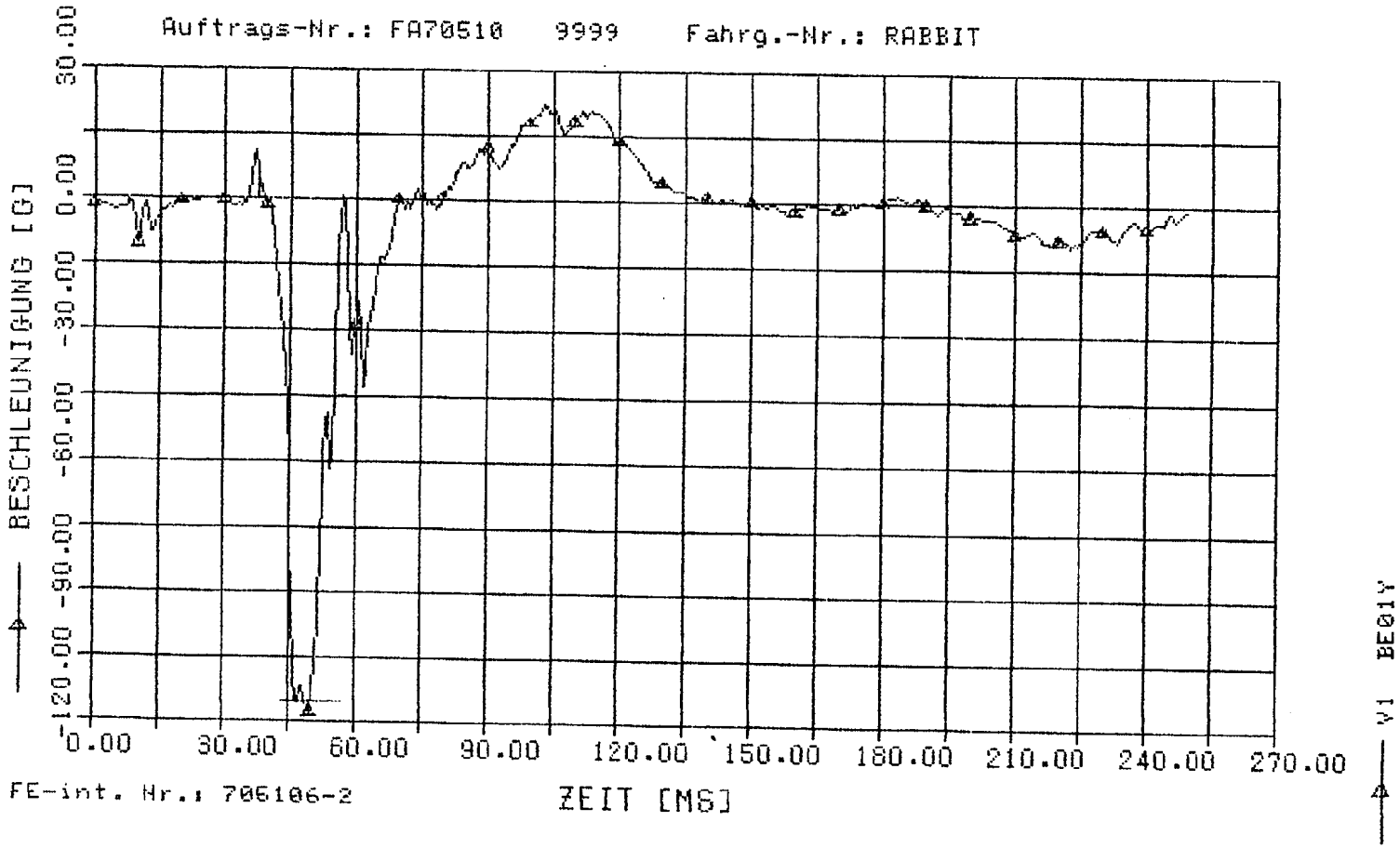
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ZMS
BE01X	V1	BE g	32.180	54.50	7.13



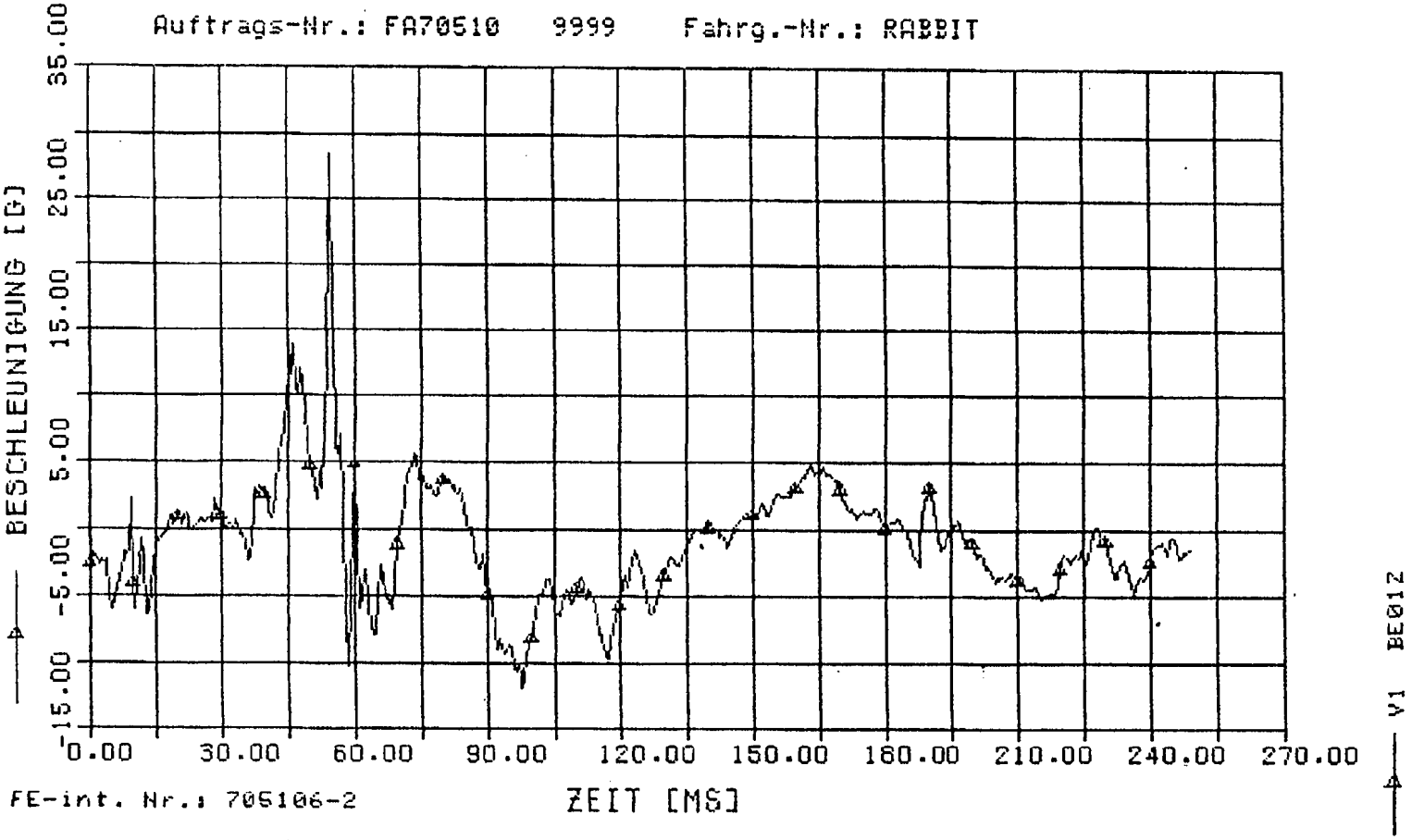
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
BE01Y	V1	BE g	-117.828	50.00	20.27



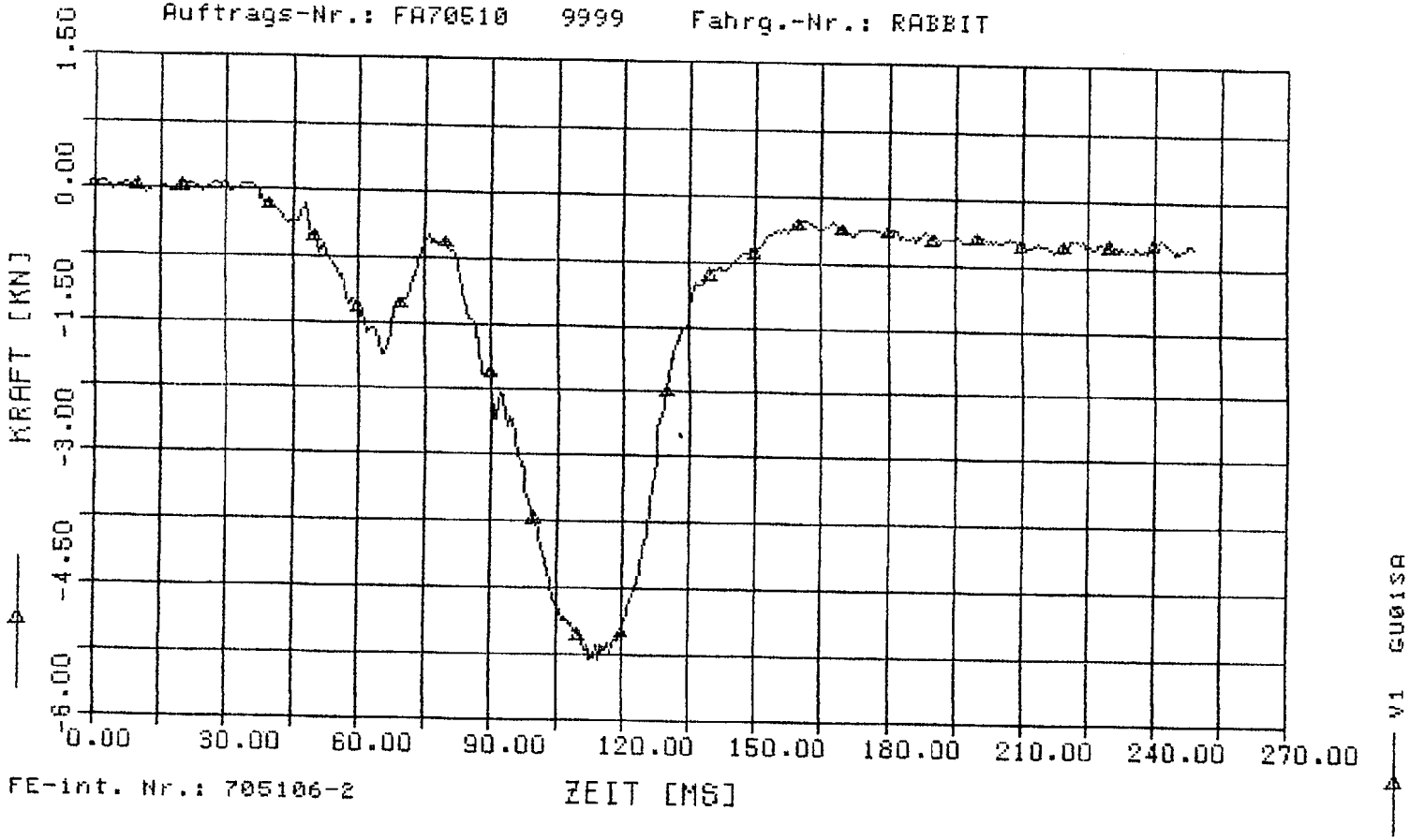
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	3MS
BE01Z	V1	BE	g	28.459	55.00	12.03



- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

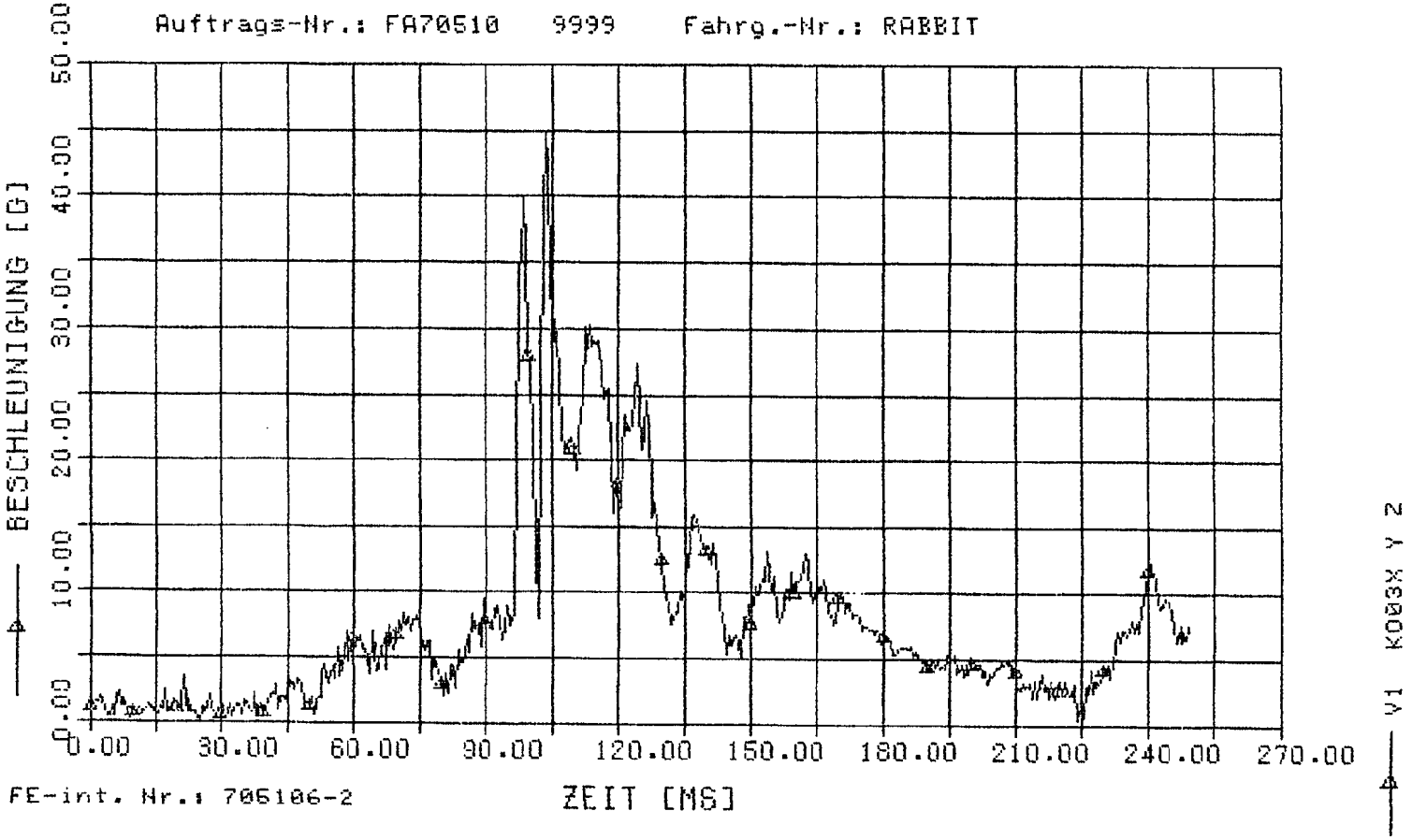
Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
GU01SA	V1	KR kN	-5.300	115.00	0.00



B.2.2 Rear Passenger

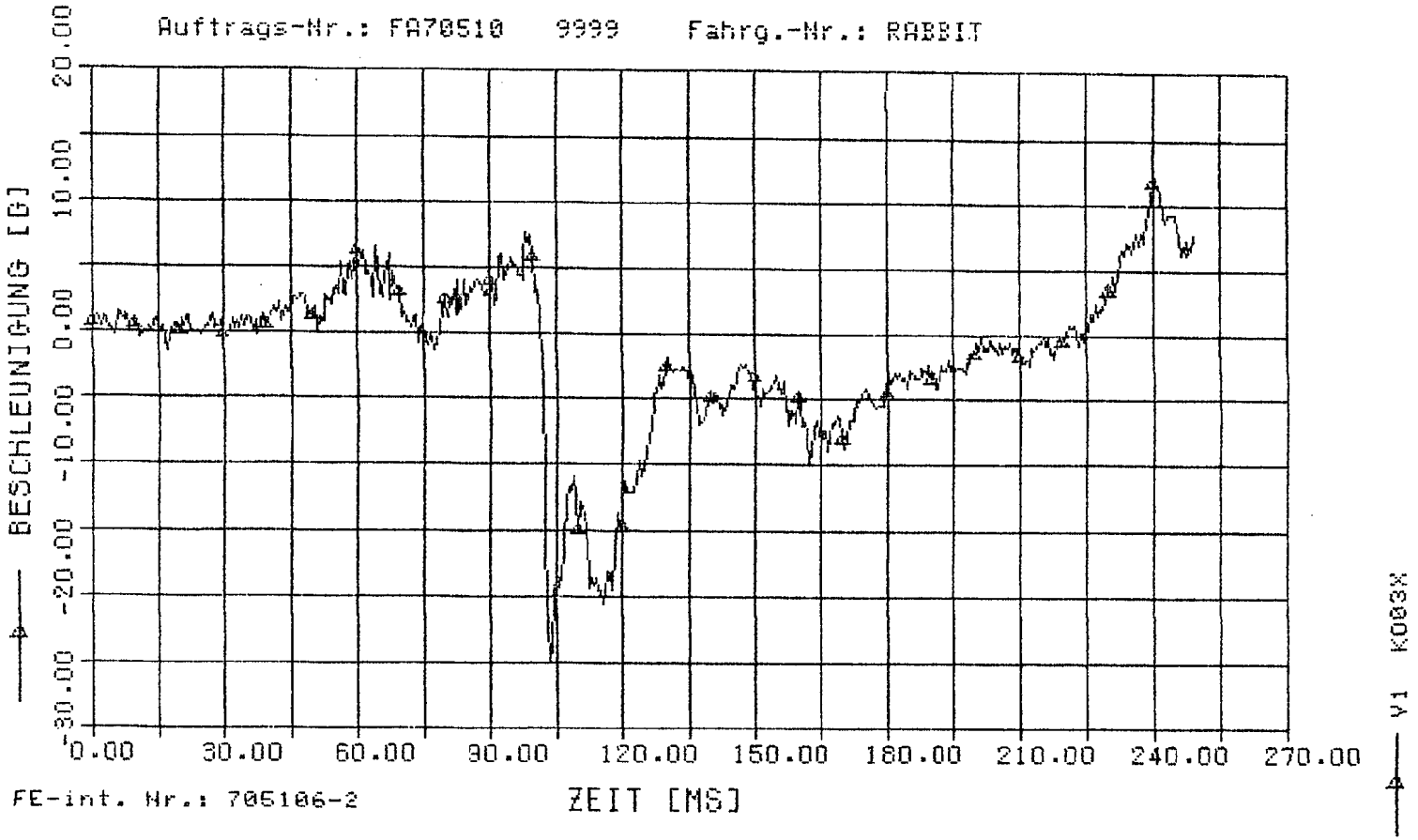
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
K003	V1	BE g	47.028	103.70	34.68



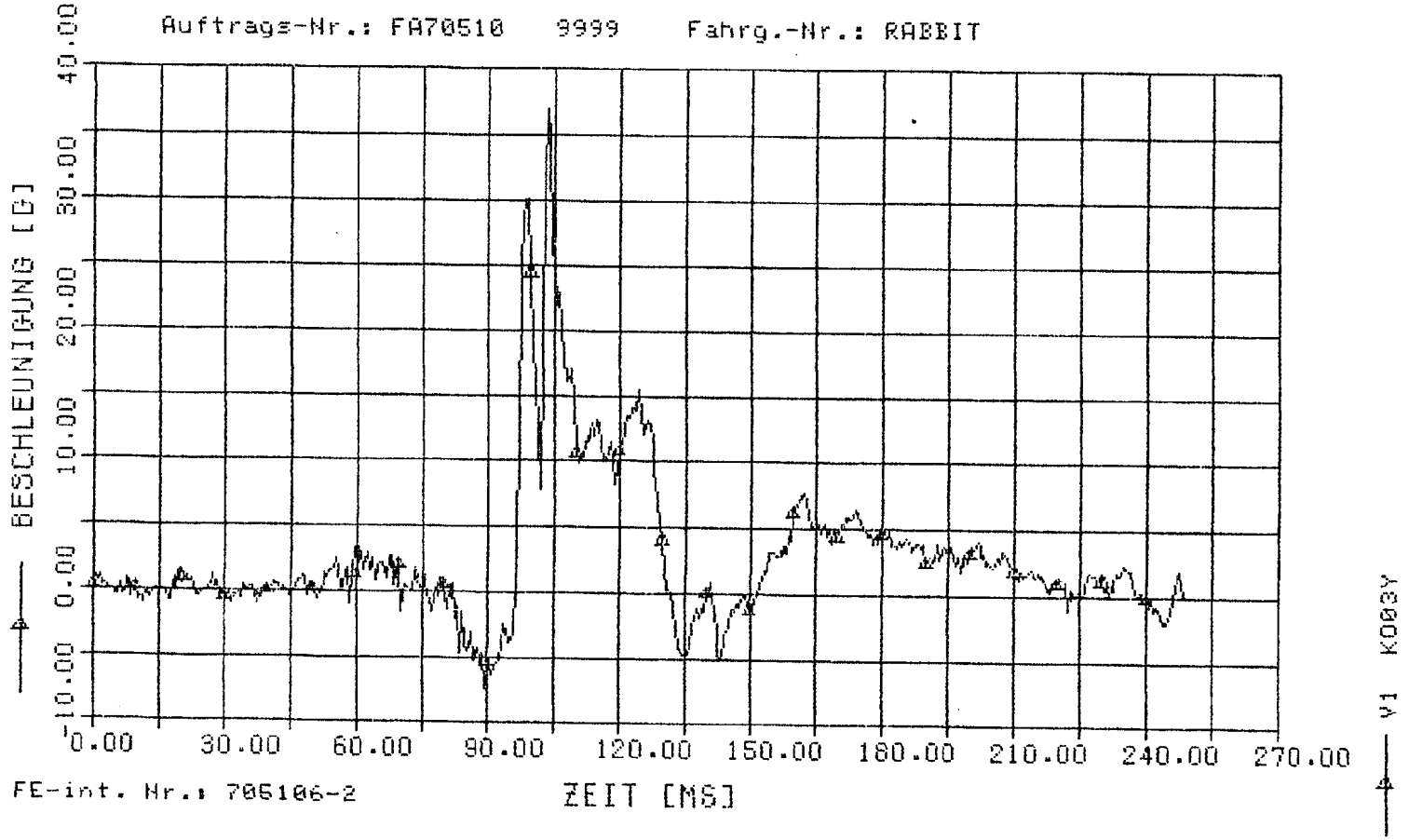
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
K003X	V1	BE g	-25.472	103.90	10.23



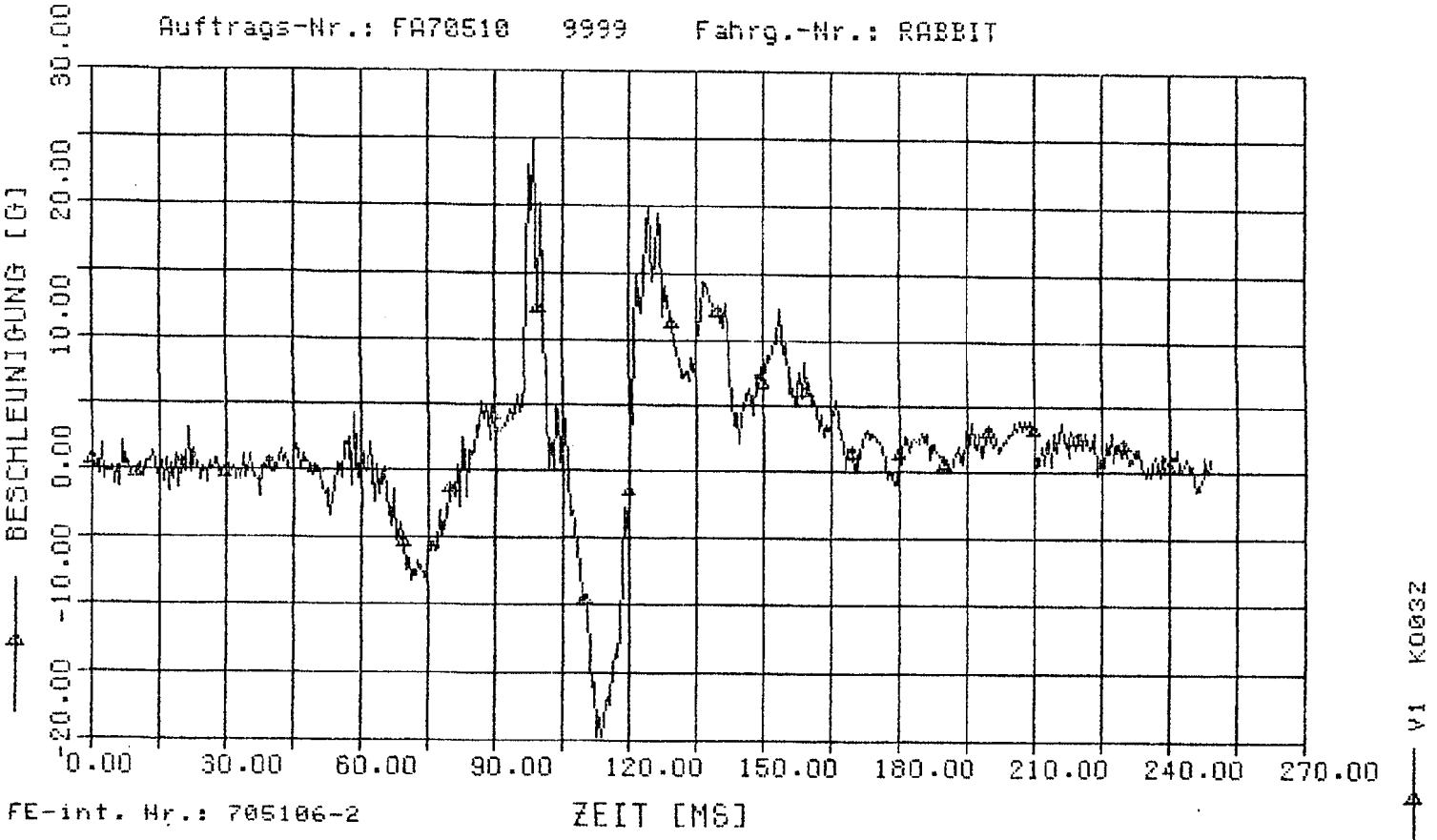
-- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	ΔMS
K003Y	V1	BE	g	38.801	103.70	28.15



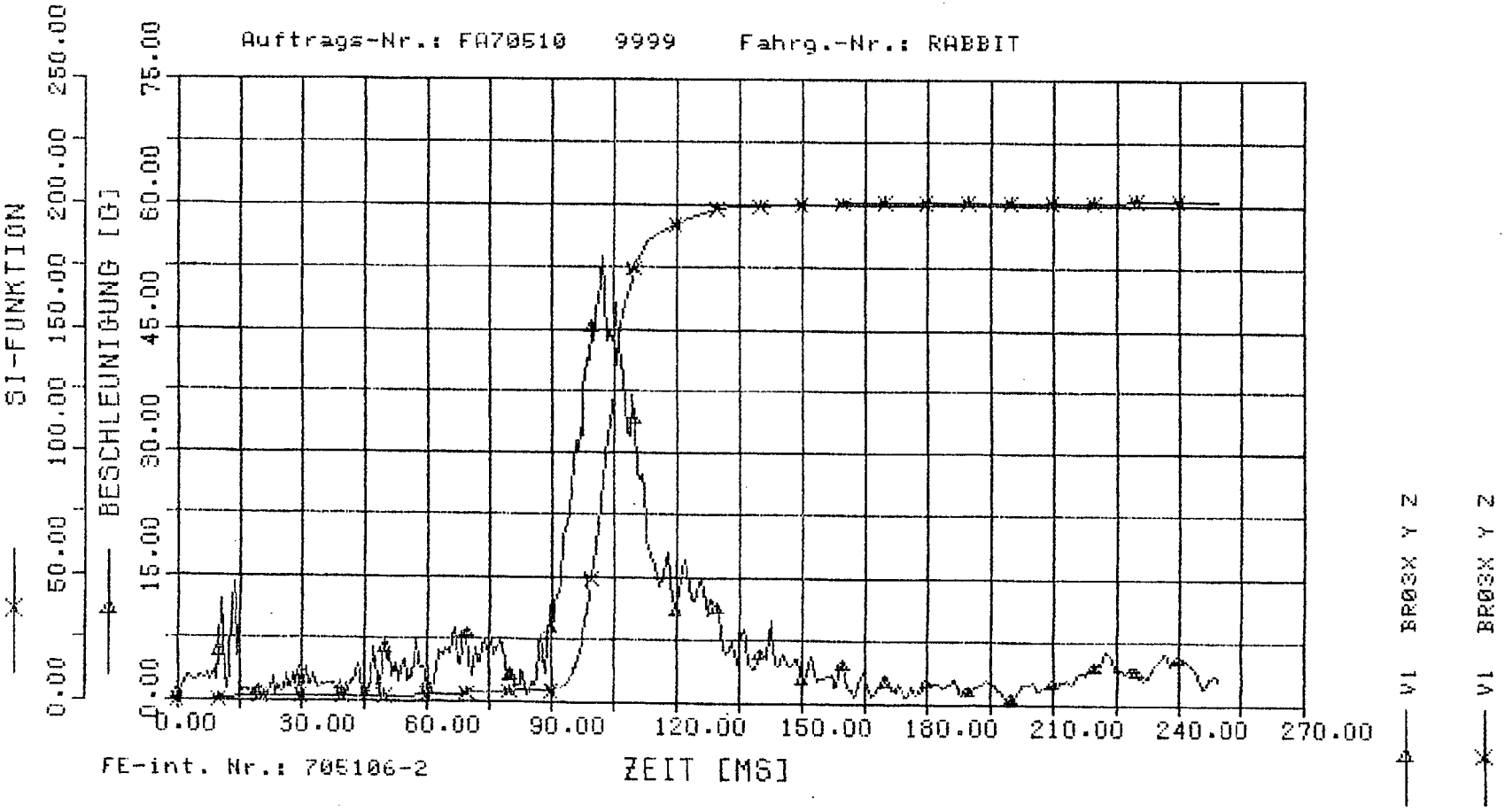
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ZMS
K0032	V1	BE g	26.053	98.90	19.72



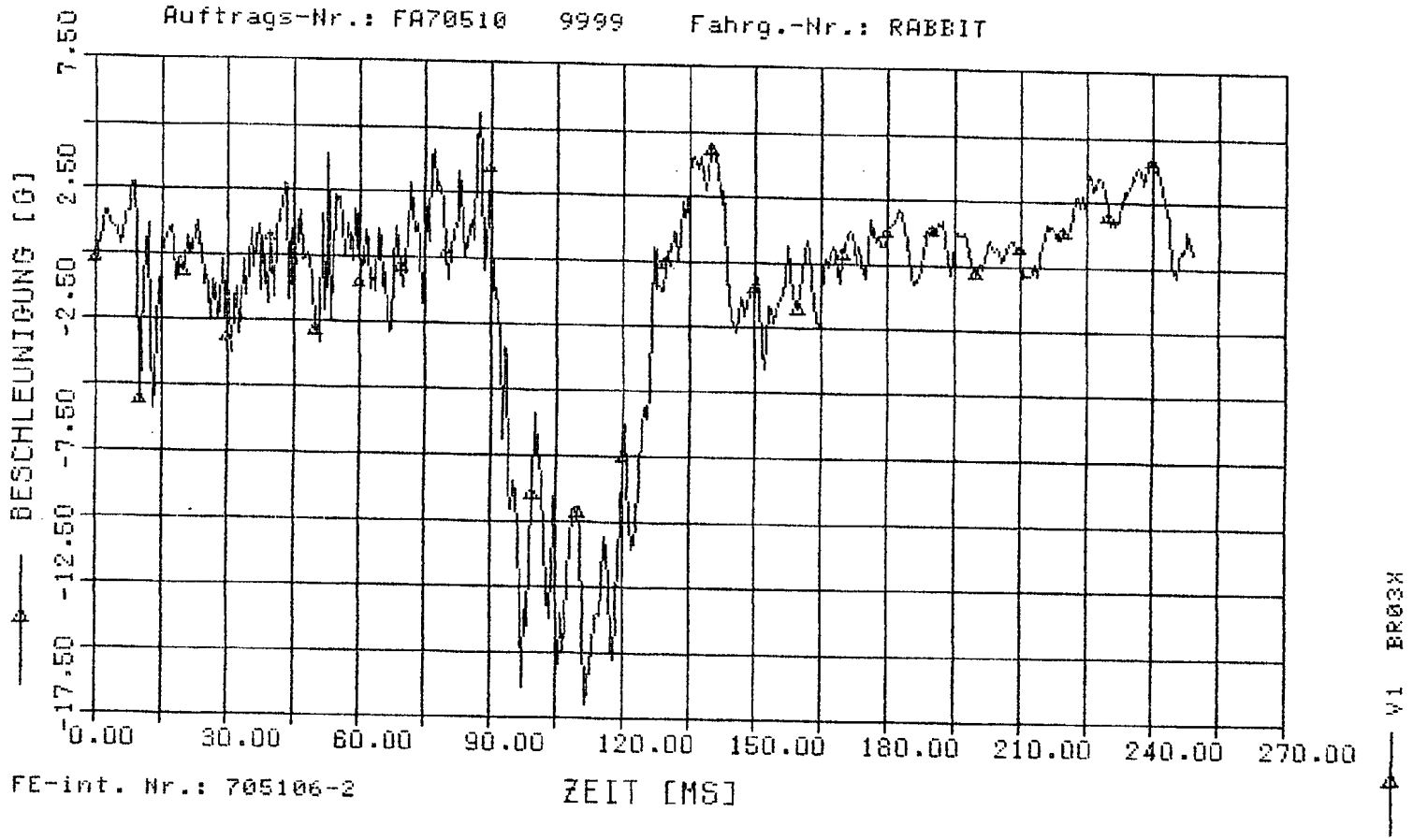
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	3MS
BR03	V1	BE	g	53.704	102.50	45.15
BR03	V1	SI		201.959	250.00	0.00



- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

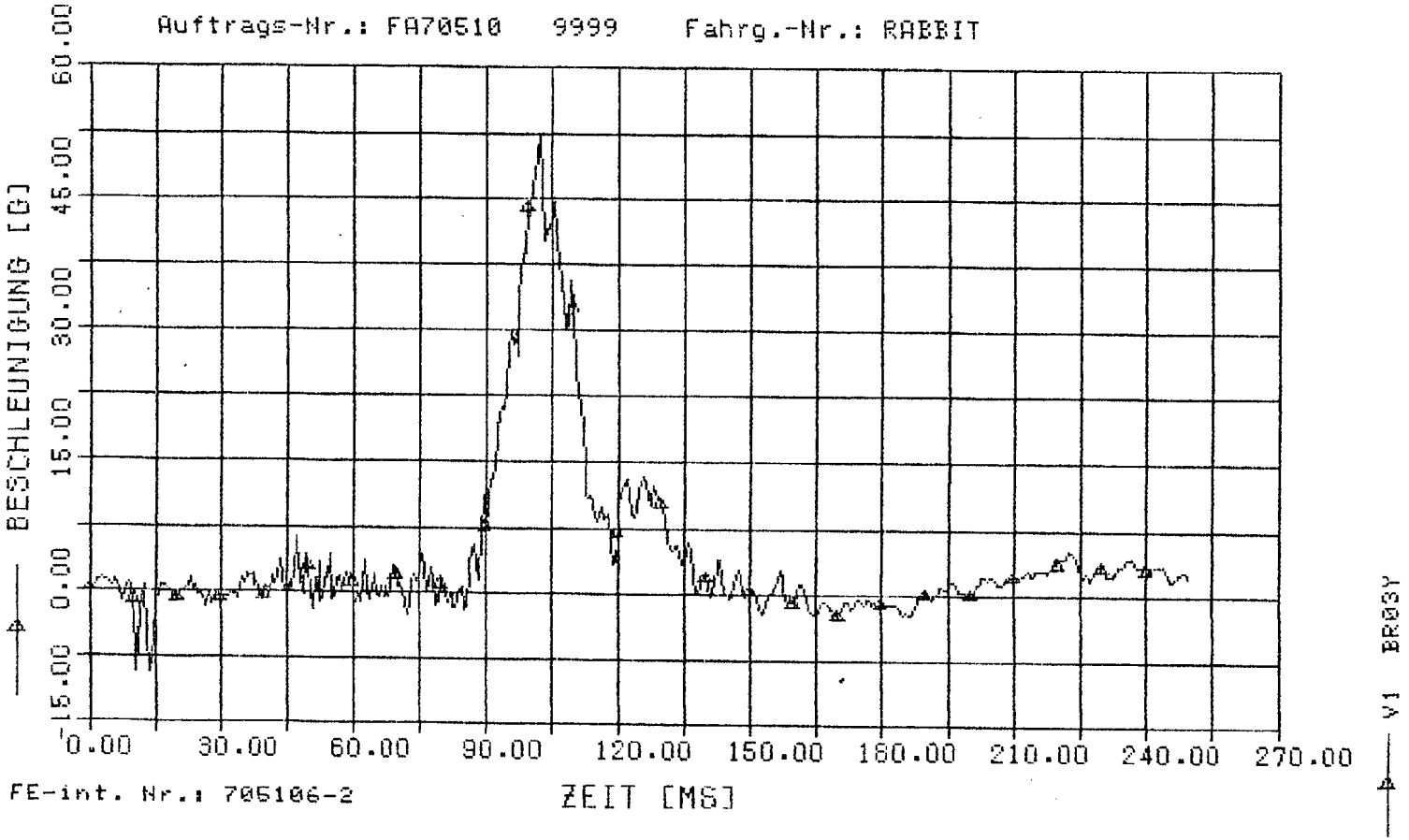
Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
BR03X	V1	BE g	-17.001	111.50	4.01



FE-int. Nr.: 705106-2

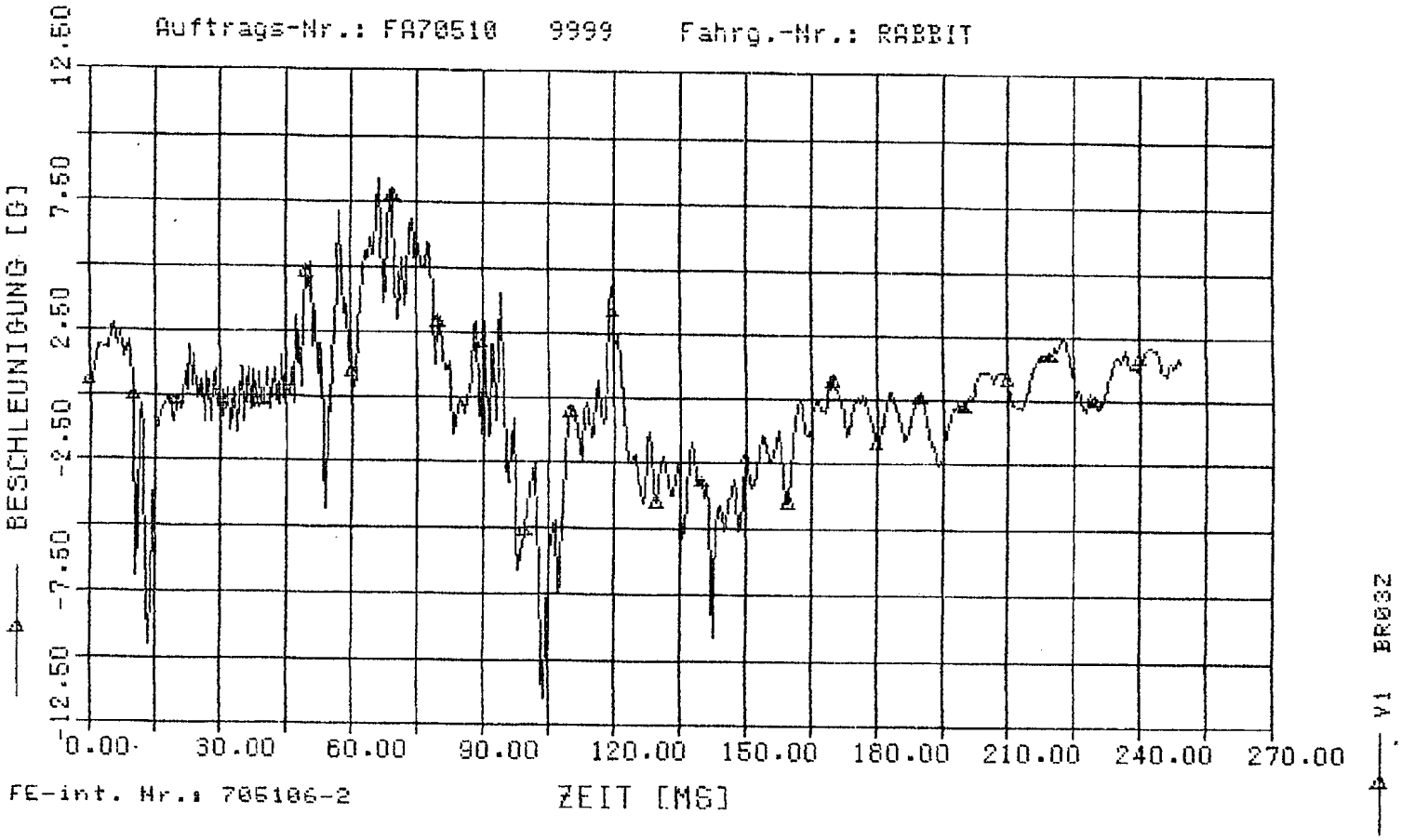
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	3MS
BR03Y	V1	BE	g	52.403	102.50	43.93



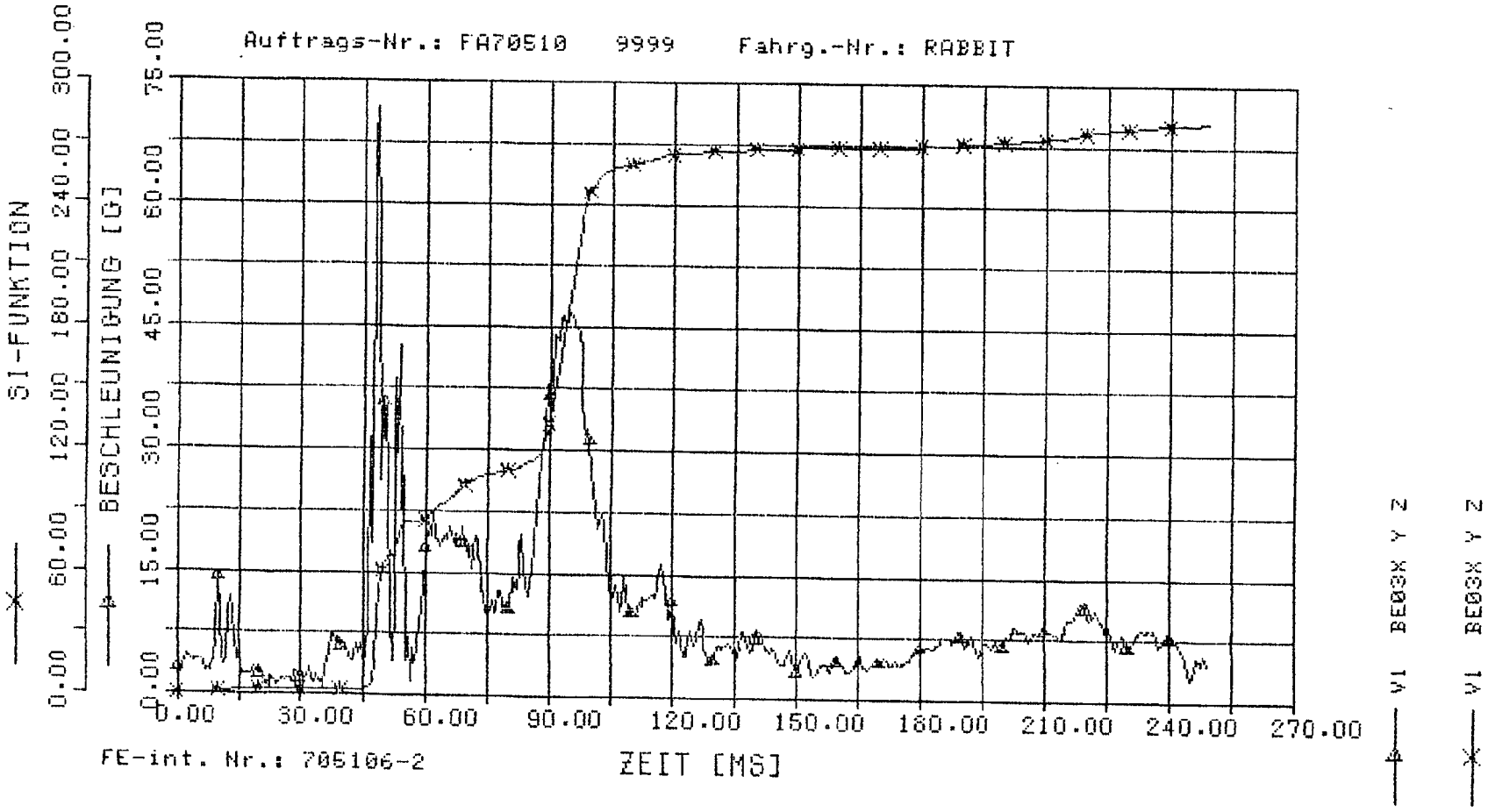
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	SMS
BR03Z	V1	BE g	-11.496	104.00	6.58



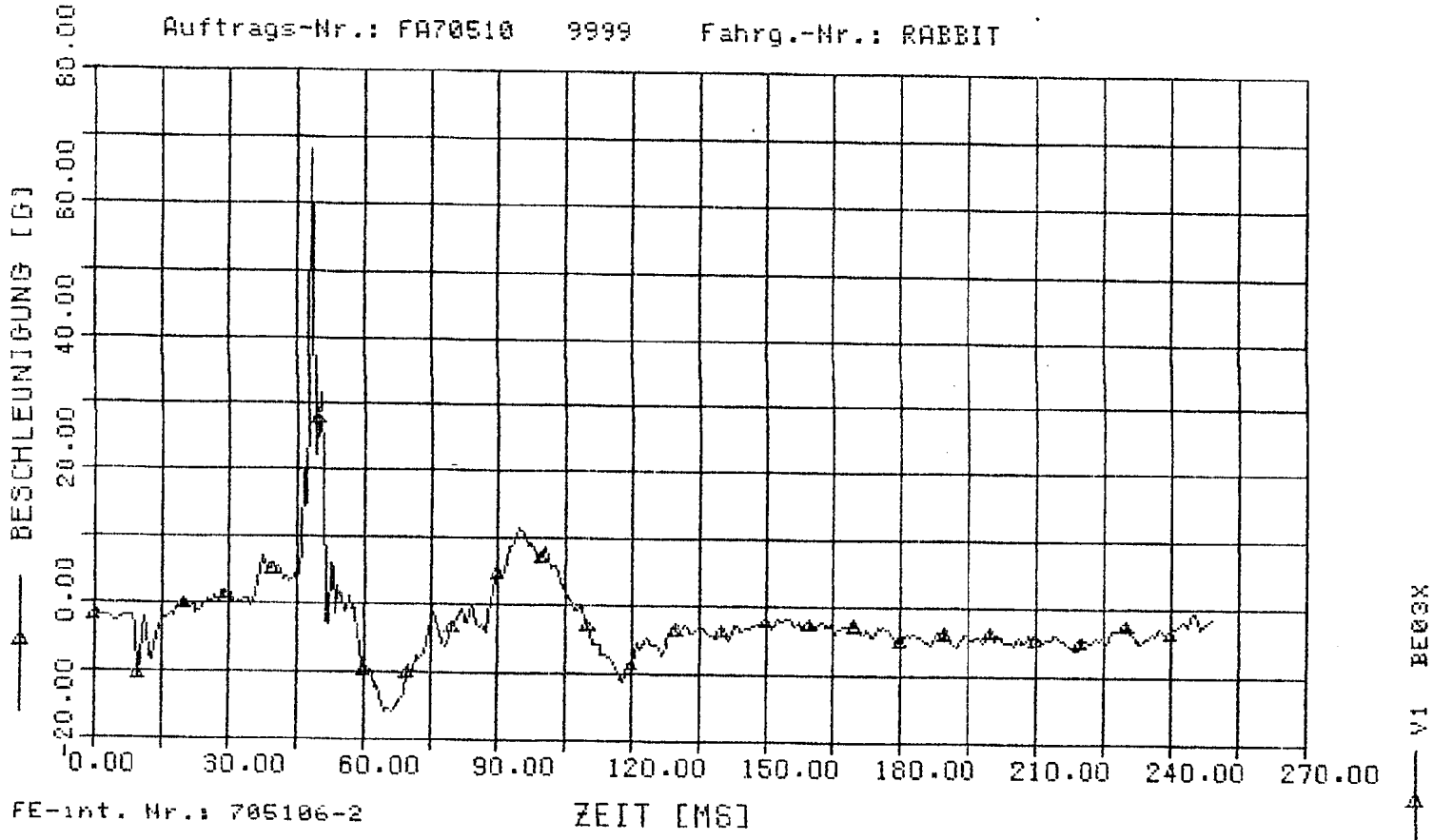
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
BE03	V1	BE g	71.630	48.50	46.11
BE03	V1	SI	281.095	250.00	0.00



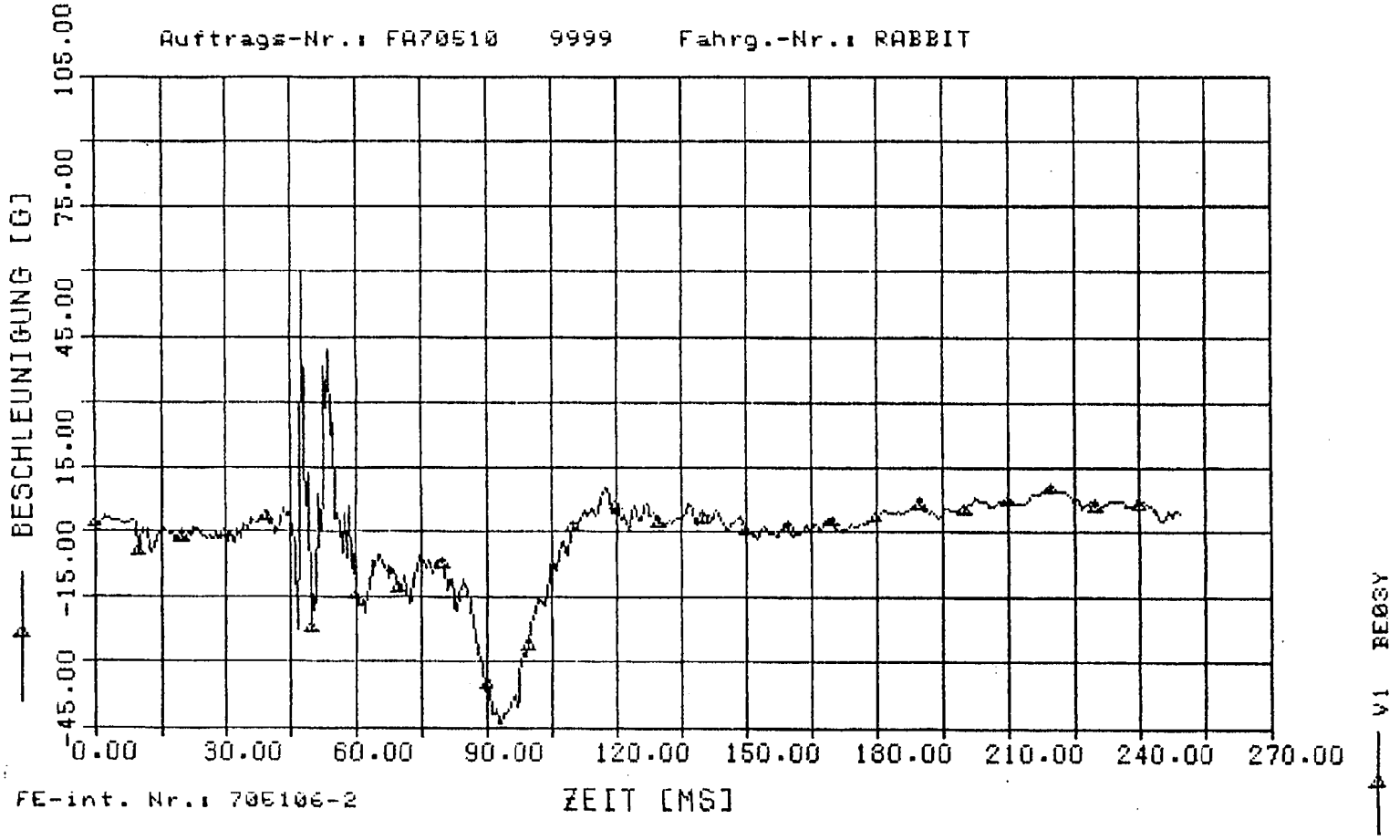
- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
BE03X	V1	BE g	68.118	40.50	19.139



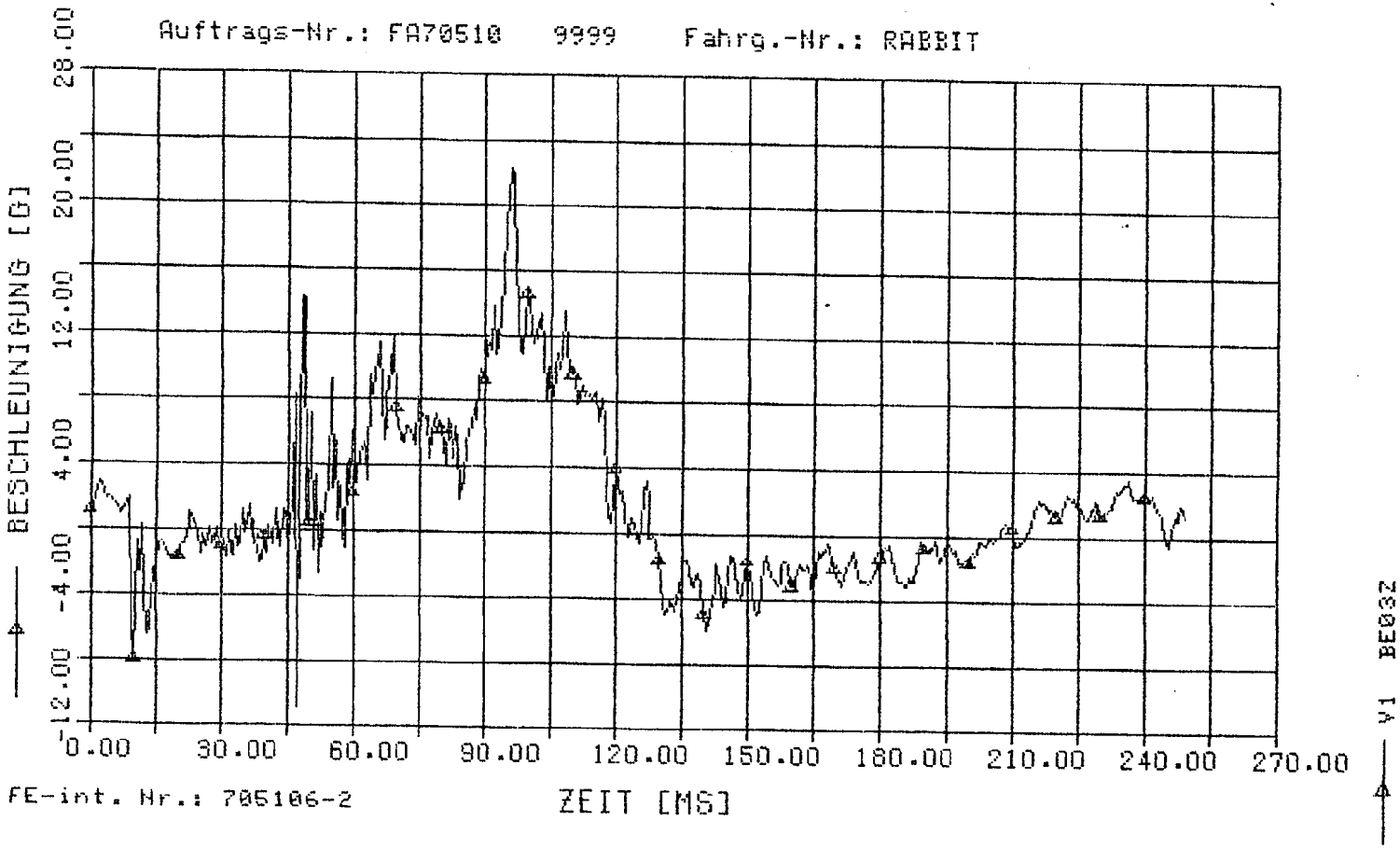
Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse		Extremum	t Extr.	3MS
BE03Y	V1	BE	g	59.848	48.00	16.97



- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	ΔMS
BE03Z	V1	BE g	22.228	96.00	14.60



- Kenn-Werte: Auftrags-Nr.: FA70510 Versuchs-Nr.: 9999

Mess-Stelle	UP	ber. Groesse	Extremum	t Extr.	3MS
GU03BA	V1	KR kN	.226	95.00	0.00