TEST REPORT FOR 50 TONNE FORCE VISCOUS DAMPING DEVICES

Taylor Devices Part Number 67DP-16394-01

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

TEST REPORT FOR 50 TONNE FORCE VISCOUS DAMPING DEVICES

Taylor Devices Part Number 67DP-16394-01

Test Report 00/2/15

PREPARED	2/15/00
CHECKED	
TEST ENGR.	2/15/00
QUALITY	2/15/00
ENGR. APVD.	2/15/00

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North Tonawanda, NY 14120-0748
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SIZE	FSCM. NO.	DRAWING NO.	REV.
A	06742	67DP-16394-4001	

1.0 TEST PLAN

1.1 Test Plan Requirements

All test plan requirements are based upon customer provided specification document.

1.2 Tolerance For Acceptance

Unless otherwise noted, all parameter tolerances are at normal ambient conditions of 20°C ± 6°C.

1.3 Test Unit

One full scale prototype viscous dampers, Taylor Devices Part No.'s 67DP-16394-01 shall be tested per the requirements of this test plan, unless otherwise noted.

1.4 Calibration Requirements

All Acceptance Test equipment listed in Table 1 shall be calibrated within the current calibration periods. Test equipment calibrations shall comply with the requirements of MIL-STD-120 and MIL-STD-45662A and shall be traceable to the National Institute of Standards and Technology (NIST).

1.5 Test Location

Each test unit shall be tested at the: Taylor Devices Seismic Test Facility
90 Taylor Drive
North Tonawanda, NY 14120-0748

TABLE 1

Test Equipment and Calibration Intervals

Equipment Class	Equipment Name	Manufacturer	Model Number	Calibration Period	Remarks
Non-Standard	Electro-Mechanical Strain-gauge	National Scale	500,000 LB	12 Months	Calibrated By Independent Testing Firm
Standard	8 Inch Stroke Potentiometer With Multiplier	TBD	TBD	Daily	Calibrated Against Gauge Blocks
Non-Standard	.5 Inch Gauge Block	Taylor Devices	TDM-1	12 Months	Calibrated With TDM 1 Certified Gauge Block
Non-Standard	Hydraulic Test Machine	Taylor Devices	N.A.	N.A.	Calibration Not Required
Standard	Wavestar Software	Tektronix	Version 1.2.2	N.A.	Calibration Not Required
Standard	Dual Beam Oscilloscope	Tektronix	720	12 Months	Calibrated By Independent Testing Firm

NOTE: If necessary other test equipment of comparable range, accuracy and calibration period may be substituted.

2.0 TESTS

2.1 Amplitude Related Characteristics

The unit shall be horizontally fixtured in a hydraulic tester as shown in Figure 2-1. The frequency that the unit is to be tested to is .3 Hz. The amplitudes that will be used are 5,10, 20, 30 and 50mm. Three complete cycles shall be run at each test displacement. Force shall be measured with a 500 kip load cell, and displacement with a potentiometer. Force and displacement data shall be recorded on a dual beam, time-base oscilloscope and transferred to Wave Star software that can be used to attain digital data. The velocities shall be determined from the slope of the displacement-time curves and recorded along with their corresponding force values. Force displacement loops will be attained from the data. Force and velocity graphs shall be constructed from the data collected.

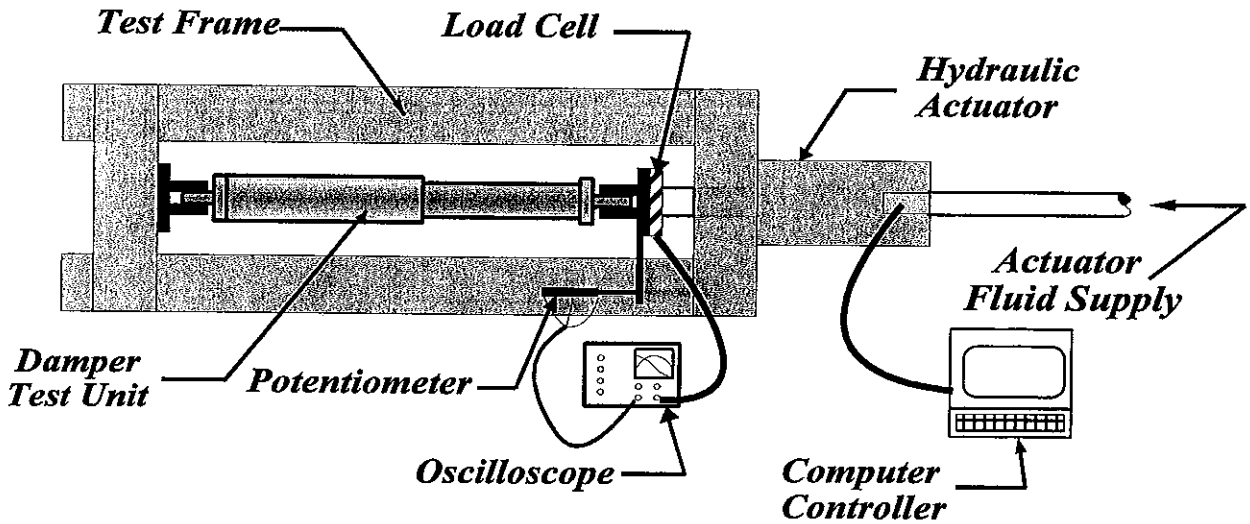


Figure 2-1

2.2 Temperature Related Characteristics

The unit shall be horizontally fixtured in a hydraulic tester as shown in Figure 2-1. The frequency that the unit is to be tested to is .3 Hz. The amplitude that will be used is 20 mm. The temperatures that will be tested to are -5, 10, 20 and 40°C. Three complete cycles shall be run at each test displacement. Force shall be measured with a 500 kip load cell, and displacement with a potentiometer. Force and displacement data shall be recorded on a dual beam, time-base oscilloscope and transferred to Wave Star software that can be used to attain digital data. The velocities shall be determined from the slope of the displacement-time curves and recorded along with their corresponding force values. Temperature shall be monitored at the midstroke position of the unit. Force versus temperature graphs shall be constructed from the data collected.

2.3 Frequency Related Characteristics

The unit shall be horizontally fixtured in a hydraulic tester as shown in Figure 2-1. The frequencies that the unit is to be tested to are .2, .3, 1.0, and 2.0Hz. The amplitude that will be used is 20 mm. Force shall be measured with a 500 kip load cell, and displacement with a potentiometer. Force and displacement data shall be recorded on a dual beam, time-base oscilloscope and transferred to Wave Star software that can be used to attain digital data. The velocities shall be determined from the slope of the displacement-time curves and recorded along with their corresponding force values.

2.4 Durability Test

The unit shall be horizontally fixtured in a hydraulic tester as shown in Figure 2-1. The unit is to be cycled for a total of 200 cycles at a frequency of .3Hz and an amplitude of 10 mm. The 200 cycles will be divided into 4 groups of 50 continuous cycles. A 2 - 3 minute pause, to recharge the accumulators will be needed between each group of cycles. Force shall be measured with a 500 kip load cell, and displacement with a potentiometer. Force and displacement data shall be recorded on a dual beam, time-base oscilloscope and transferred to Wave Star software that can be used to attain digital data. The velocities shall be determined from the slope of the displacement-time curves and recorded along with their corresponding force values. No physical damage, deterioration, or visible leakage is allowable.

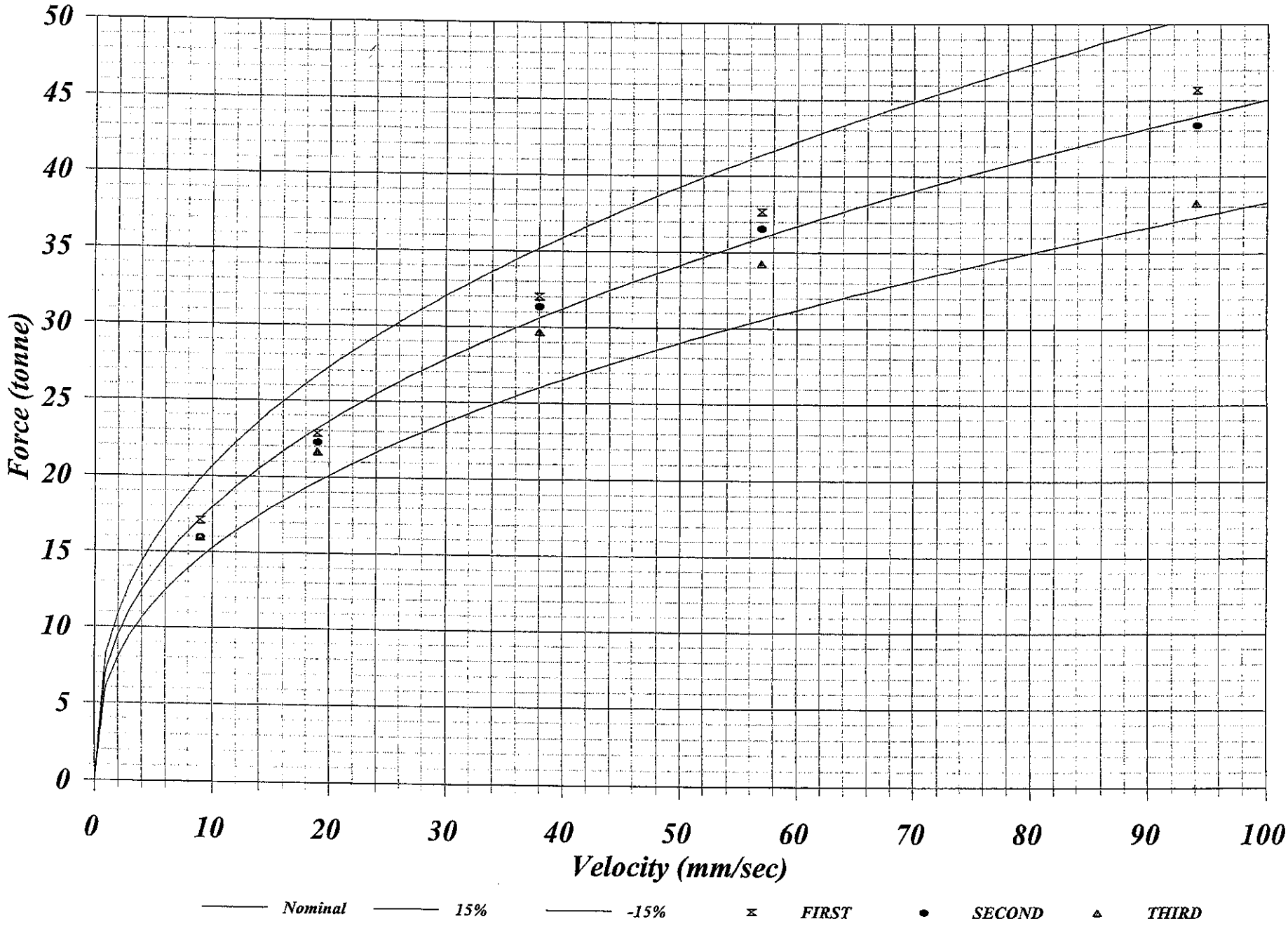
2.5 Random Vibration Test

The unit shall be horizontally fixtured in a hydraulic tester as shown in Figure 2-1. The test is to be a recreation of the vibration plot as received from the customer for the 1st story and the 24th story of the X-direction of a 24-story structure. Force shall be measured with a 500 kip load cell, and displacement with a potentiometer. Force and displacement data shall be recorded on a dual beam, time-base oscilloscope and transferred to Wave Star software that can be used to attain digital data. The velocities shall be determined from the slope of the displacement-time curves and recorded along with their corresponding force values.

SECTION 2.1

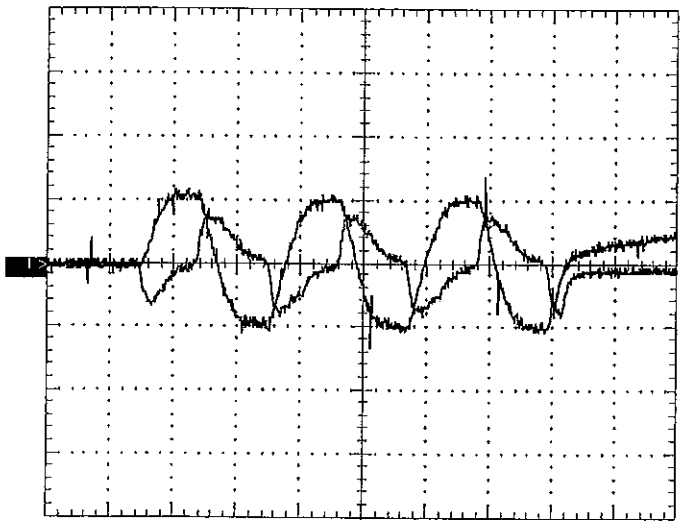
AMPLITUDE RELATED CHARACTERISTICS

2.1 Amplitude Related Tests



2.1: Amplitude Related Characteristics

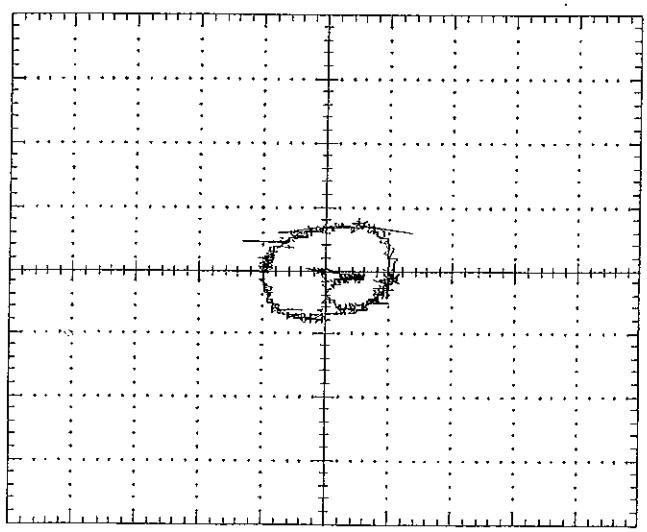
Force= 22.88 tonnes./div
Stroke= 5 mm/div
Time= 1.5 Sec/ div
Test Jd5 = .3 Hz and a peak amplitude of 5 mm
Temperature= 21.8 deg. C



1st Cycle Force = 17.14 Tonnes

2nd Cycle Force = 16.01 Tonnes

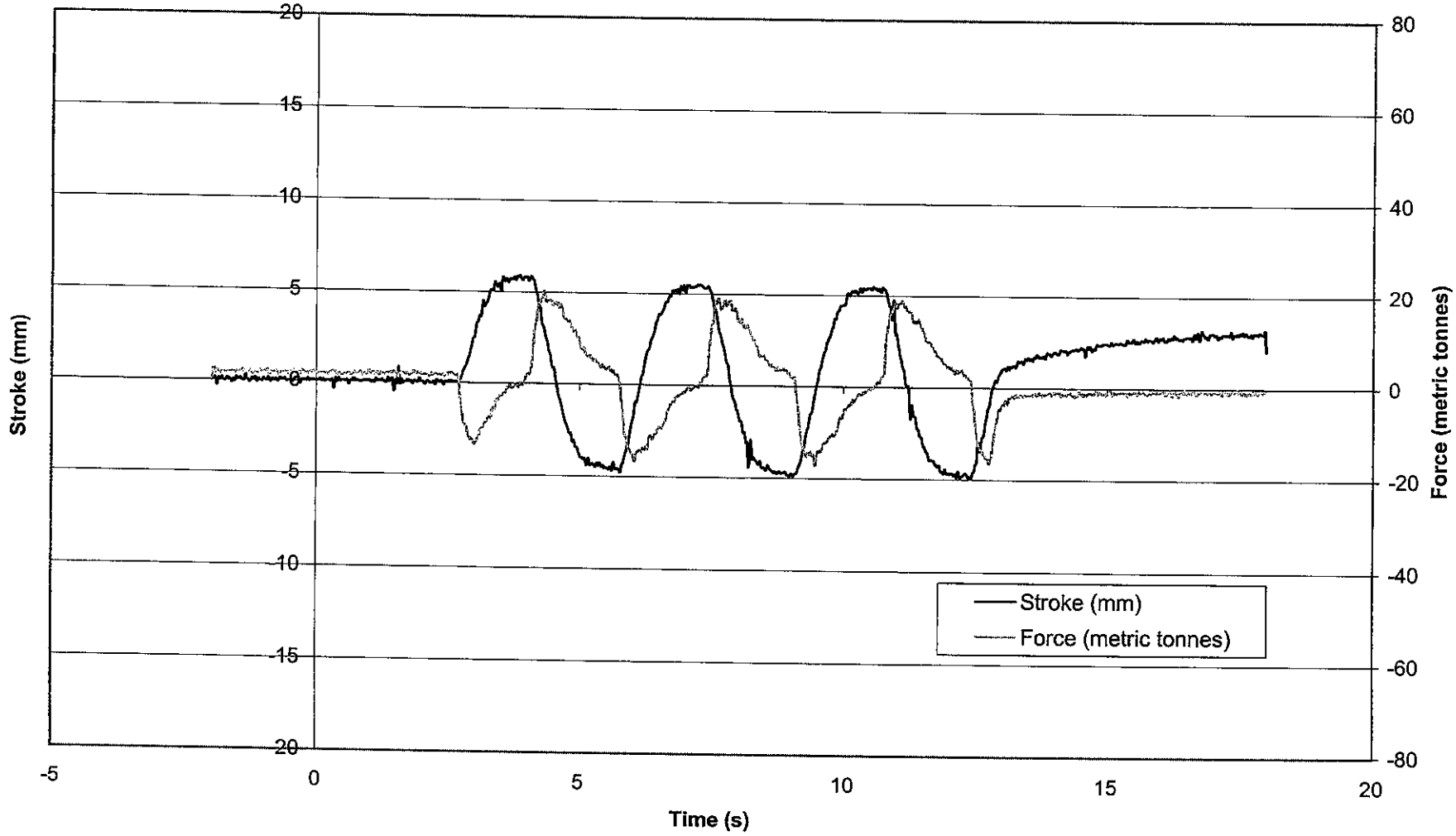
3rd Cycle Force = 16.01 Tonnes



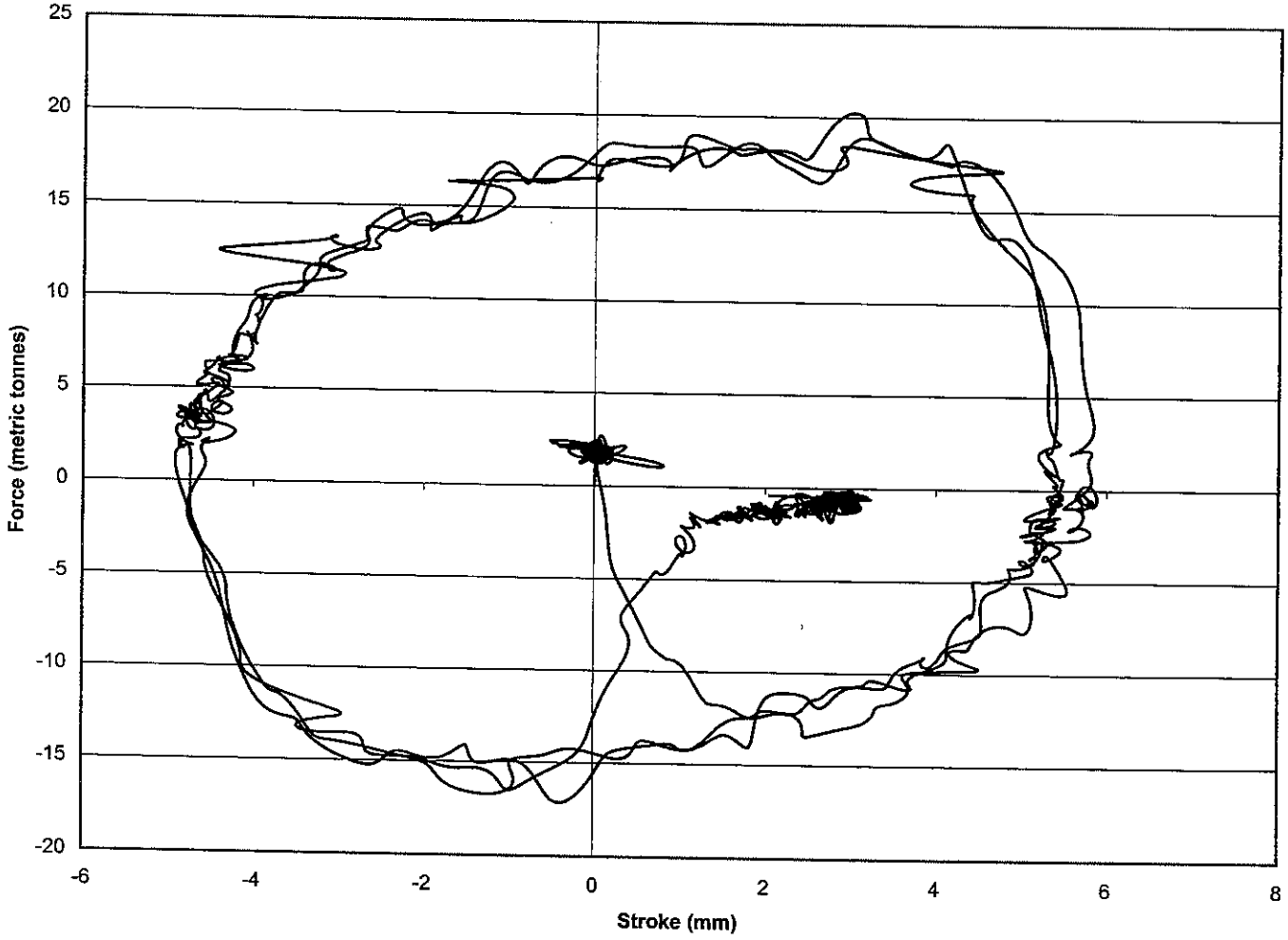
FORCE

STROKE

Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 5.0
21.0°C

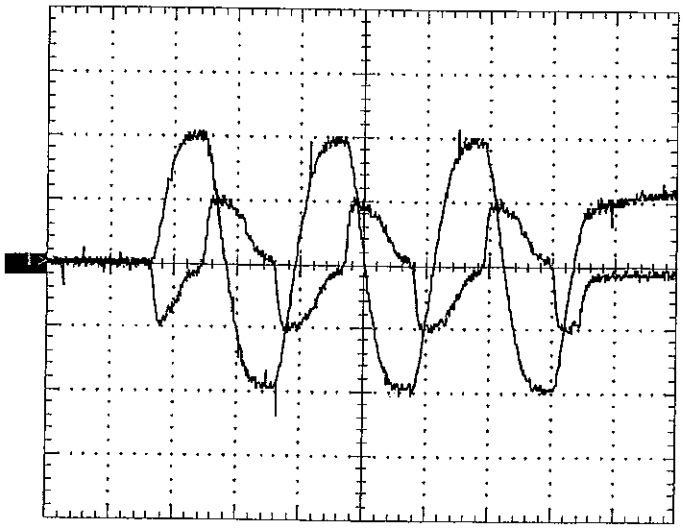


Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 5.0
21.0°C



2.1: Amplitude Related Characteristics

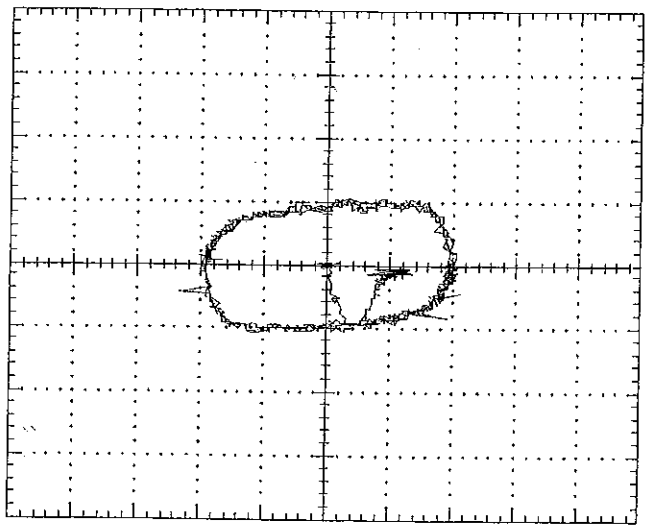
Force= 22.88 Tonnes/div
Stroke= 5mm/div
Time= 1.5 Sec/div
Test Jd6a= .3 Hz and a peak amplitude of 10 mm
Temperature= 22.3 deg. C



1st Cycle Force = 22.85 Tonnes

2nd Cycle Force = 22.26 Tonnes

3rd Cycle Force = 21.72 Tonnes



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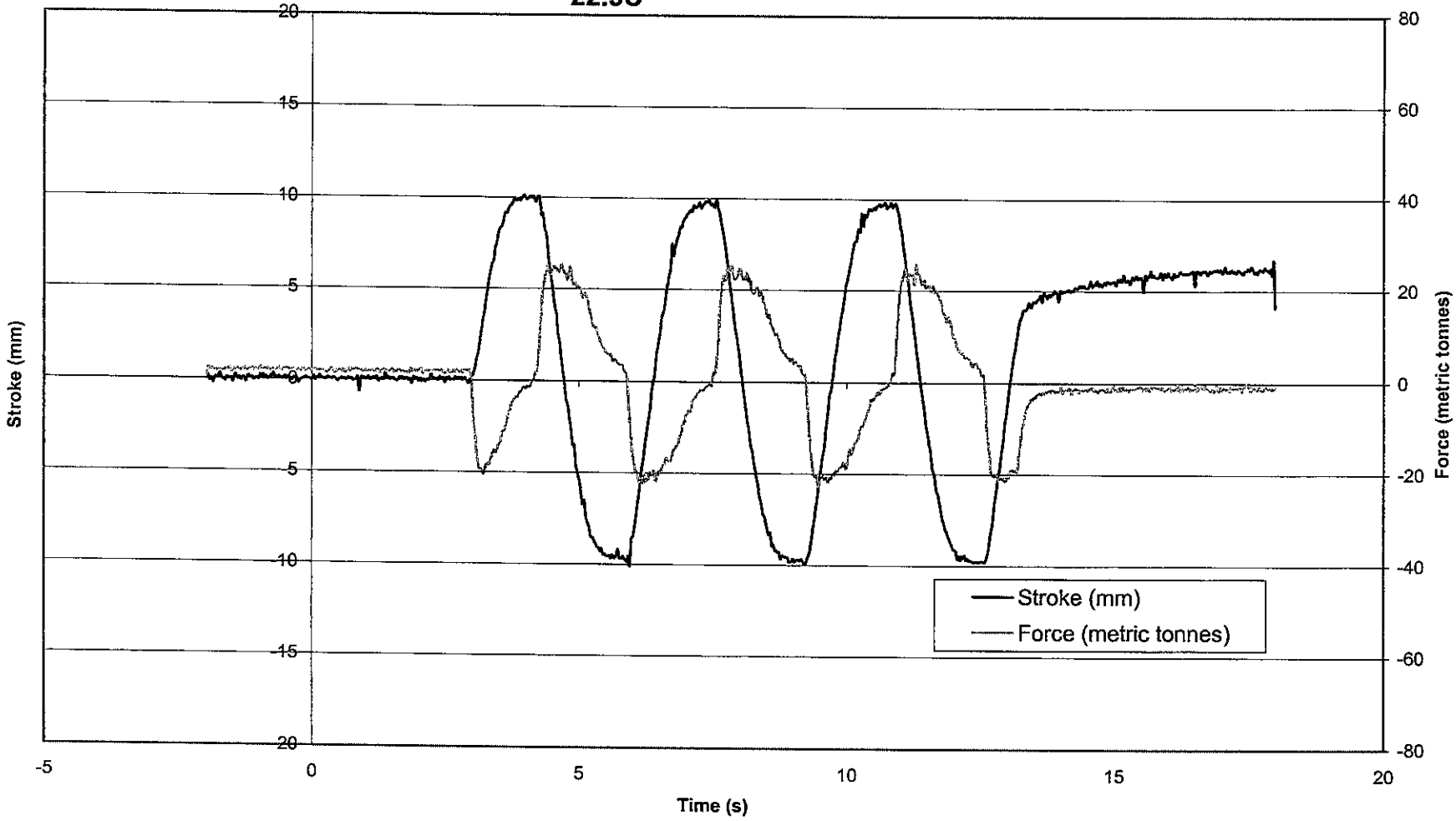
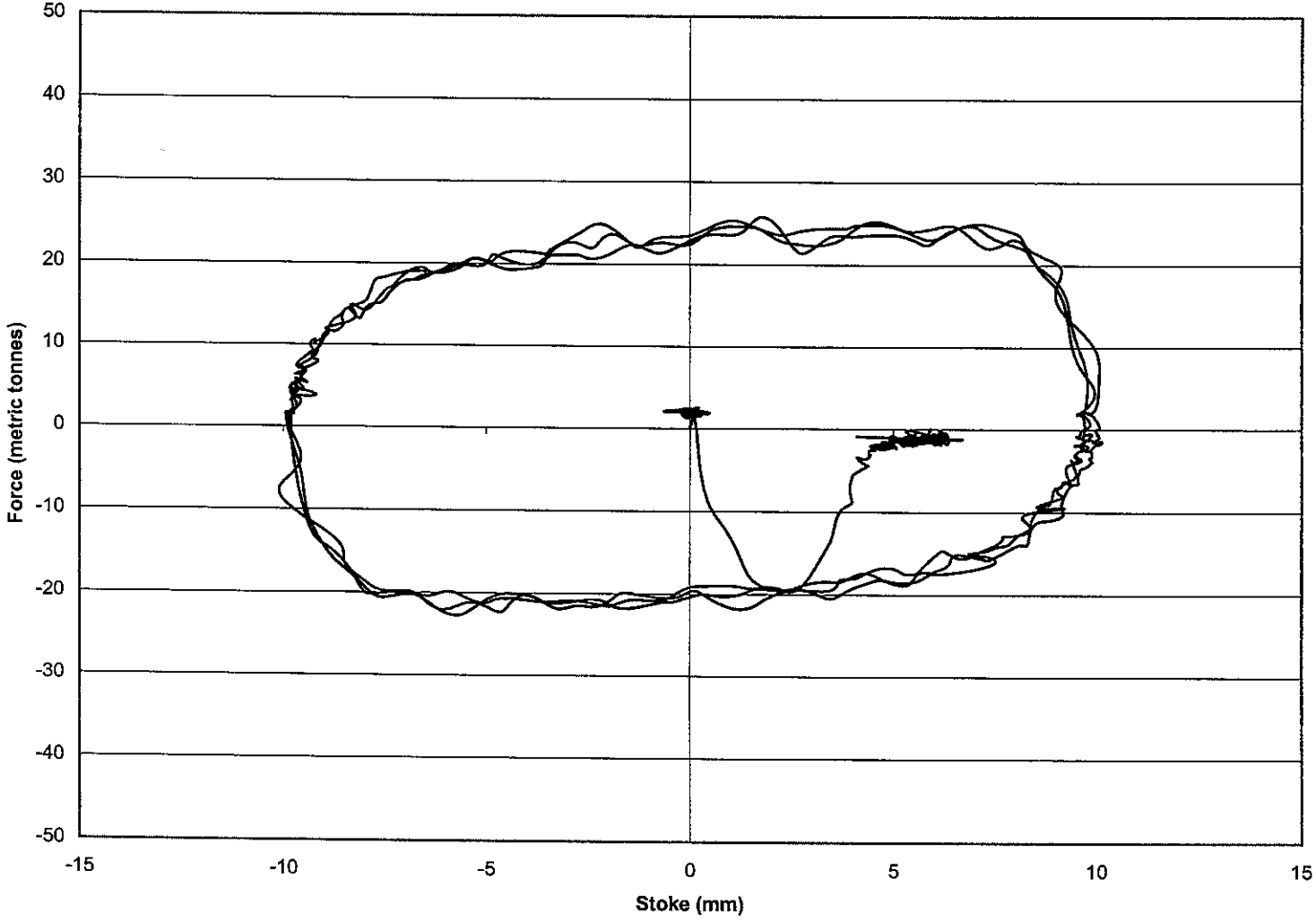
STROKE

Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
22.3C



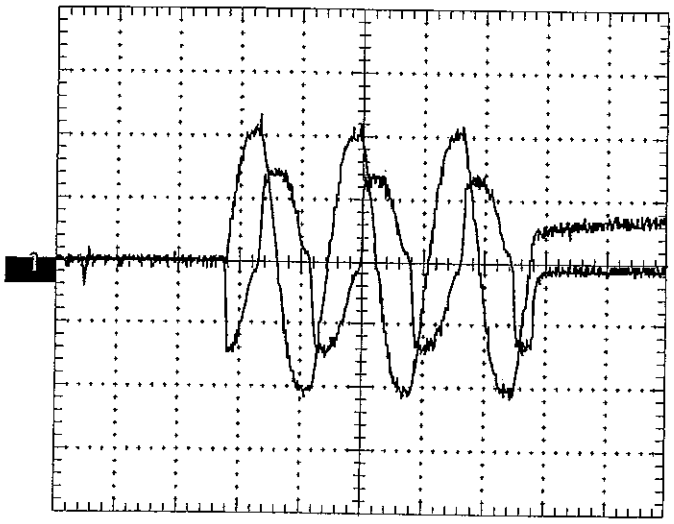
Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
22.3C



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = 20.7 deg. C
Test jd7
Three cycles @ .3 Hz

2.1: Amplitude Related Characteristics

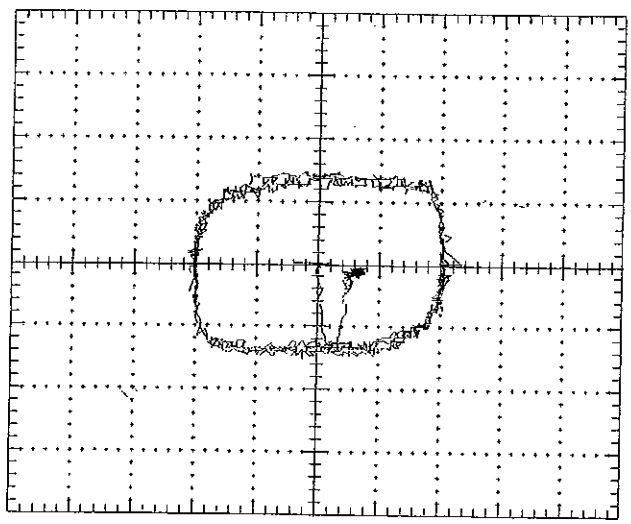
Raw Data



1st Cycle Force = 32.03 Tonnes

2nd Cycle Force = 30.89 Tonnes

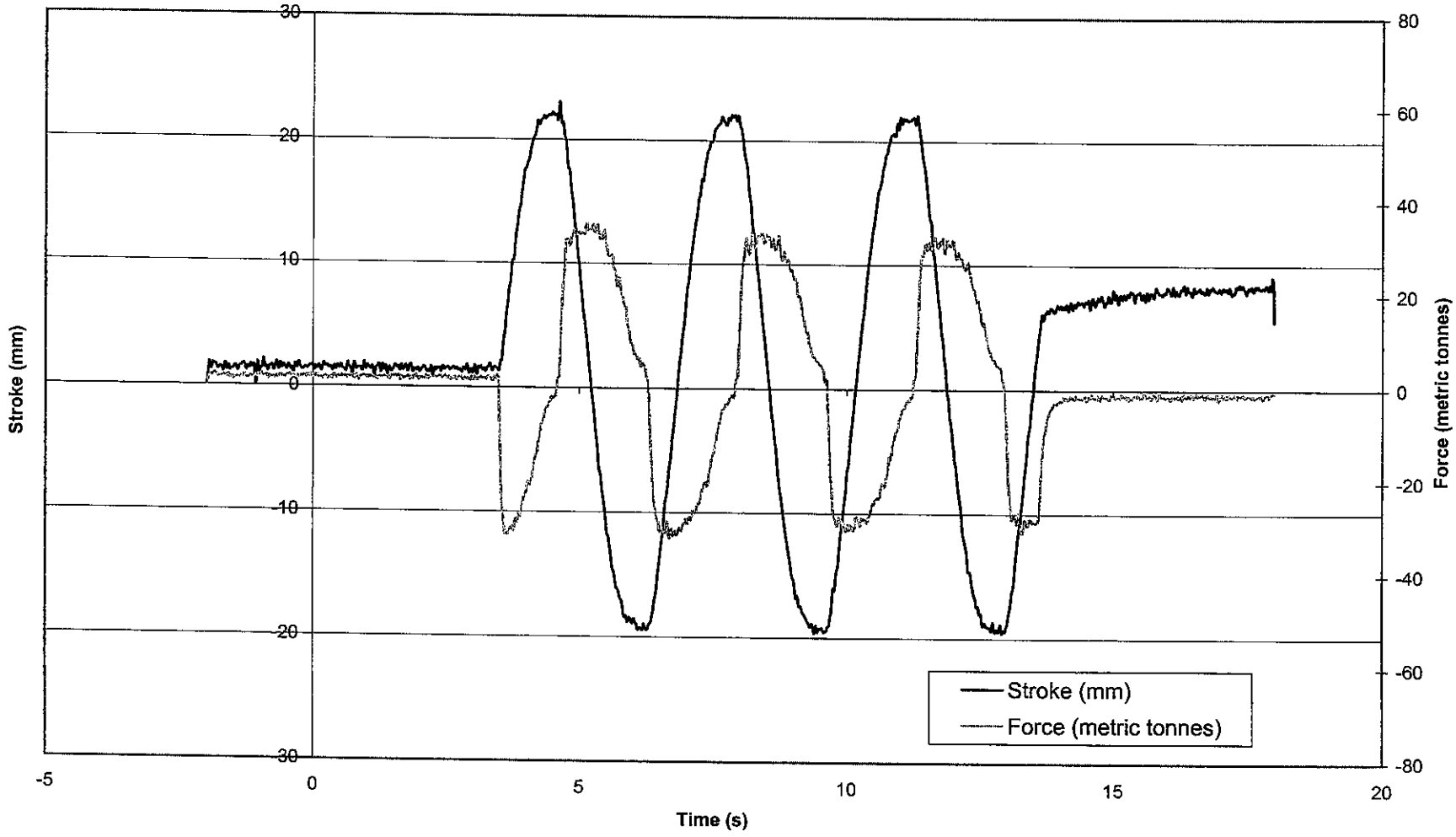
3rd Cycle Force = 29.74 Tonnes



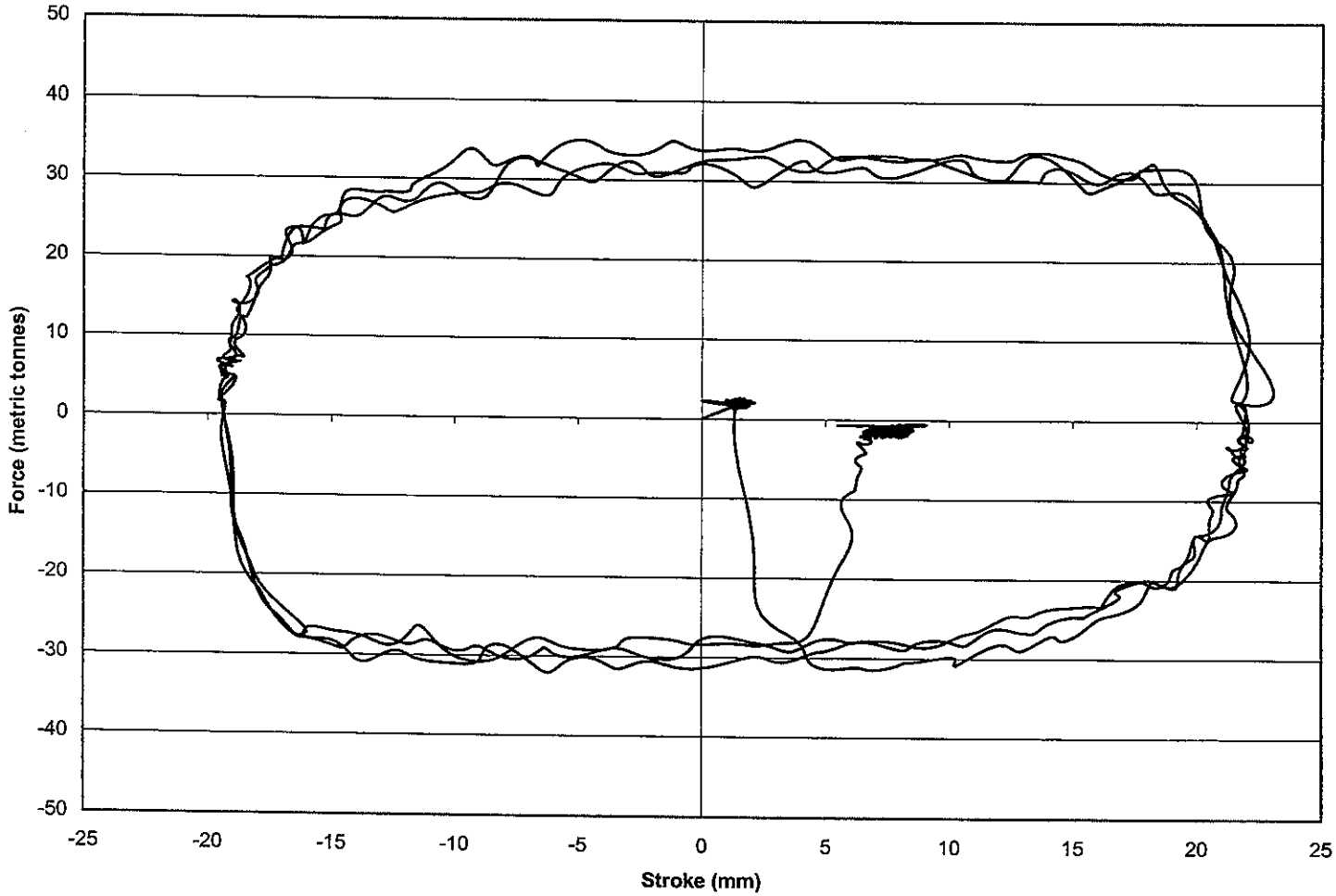
FORCE

STROKE

Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
23.5°C

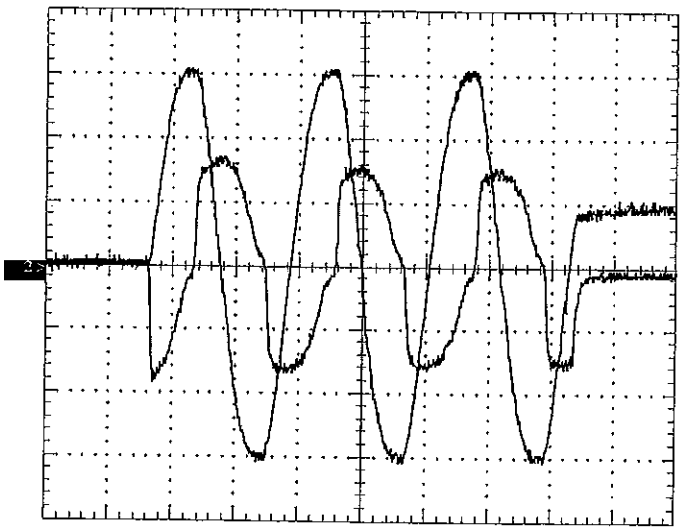


Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
23.5°C



2.1: Amplitude Related Characteristics

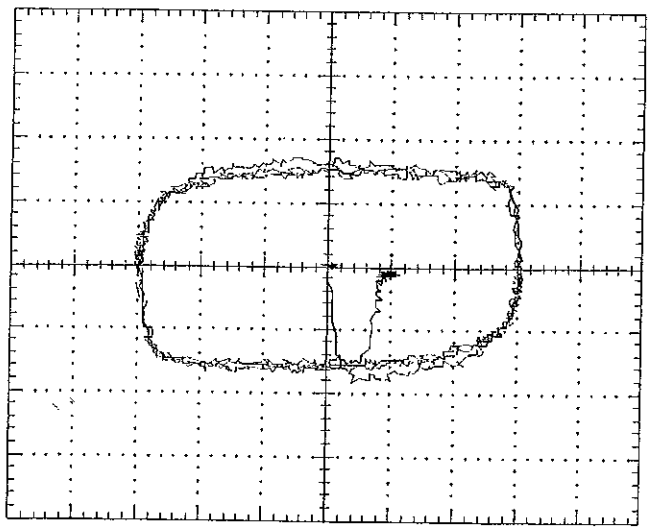
Force= 22.88 tonnes./div
Stroke= 10 mm/div
Time= 1.5 Sec/ div
Test Jd8 = .3 Hz and a peak amplitude of 30 mm
Temperature= 21.8 deg. C



1st Cycle Force = 37.73 Tonnes

2nd Cycle Force = 36.55 Tonnes

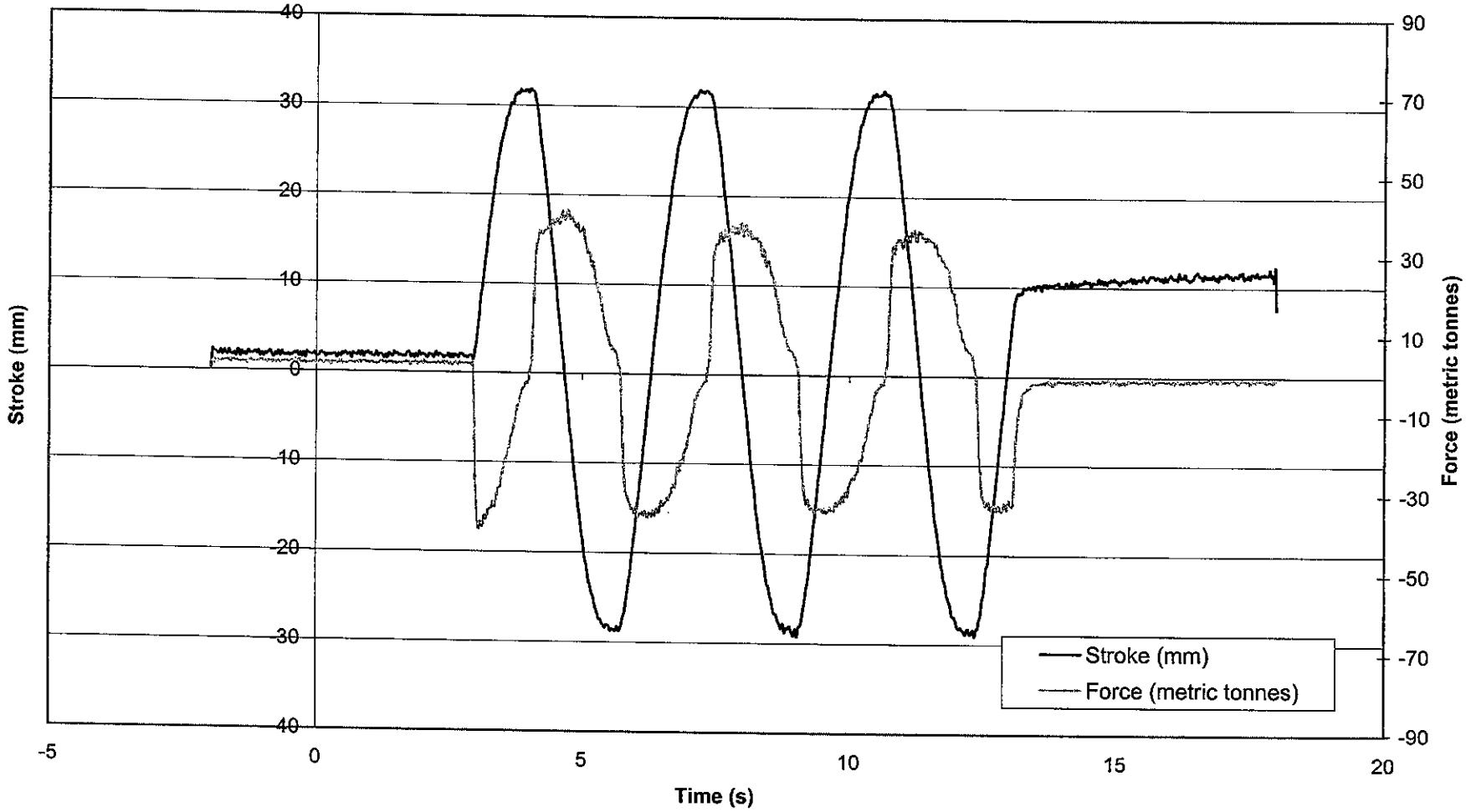
3rd Cycle Force = 34.29 Tonnes



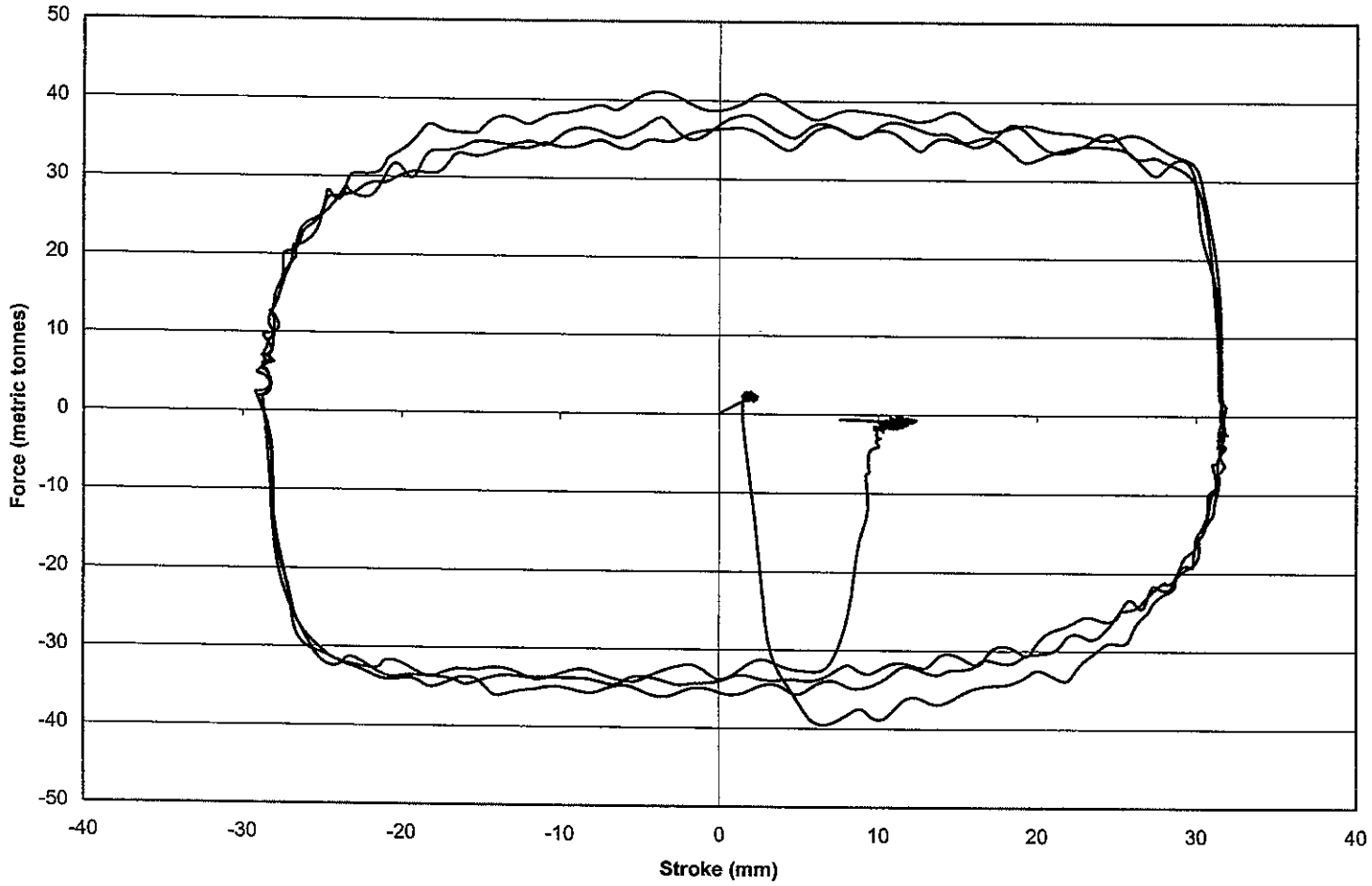
FORCE

STROKE

Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 30.0
21.8°C

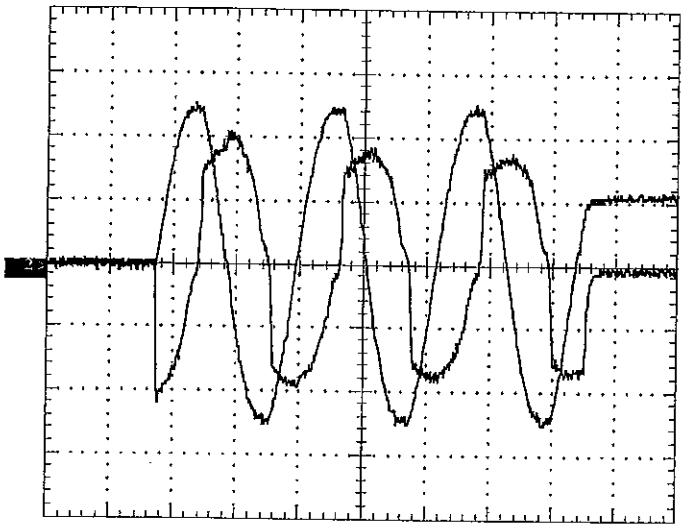


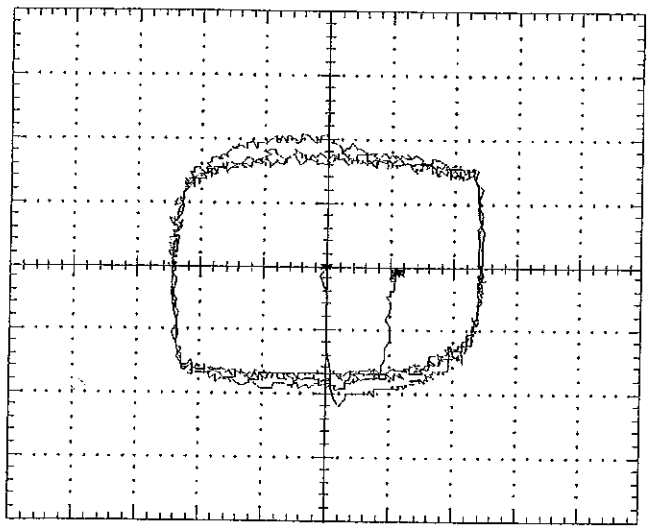
Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 30.0
21.8°C



2.1: Amplitude Related Characteristics

Force= 22.88 tonnes./div
Stroke= 20 mm/div
Time= 1.5 Sec/ div
Test Jd9 = .3 Hz and a peak amplitude of 50 mm
Temperature= 23.8 deg. C





FORCE

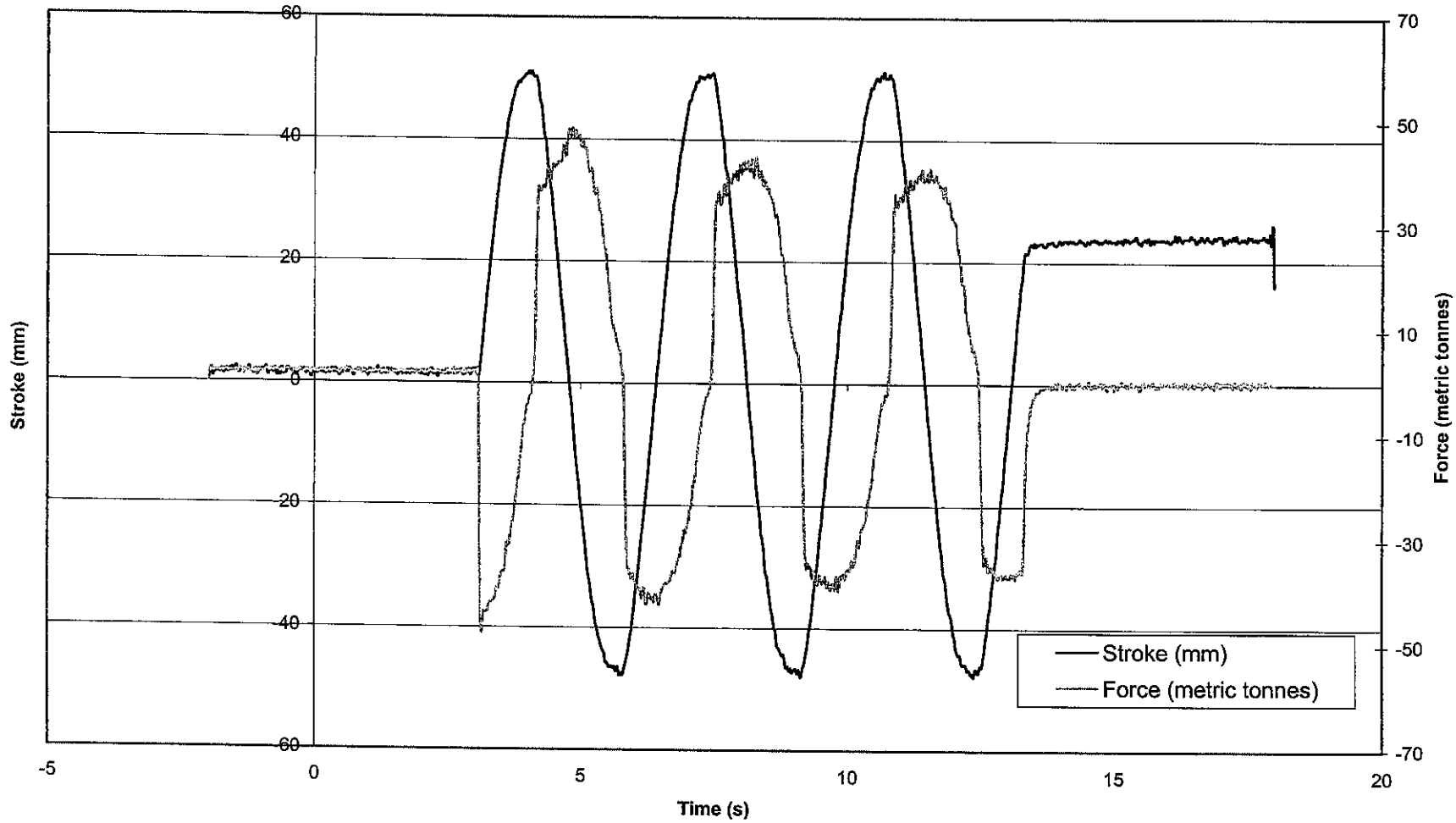
STROKE

1st Cycle Force = 45.71 Tonnes

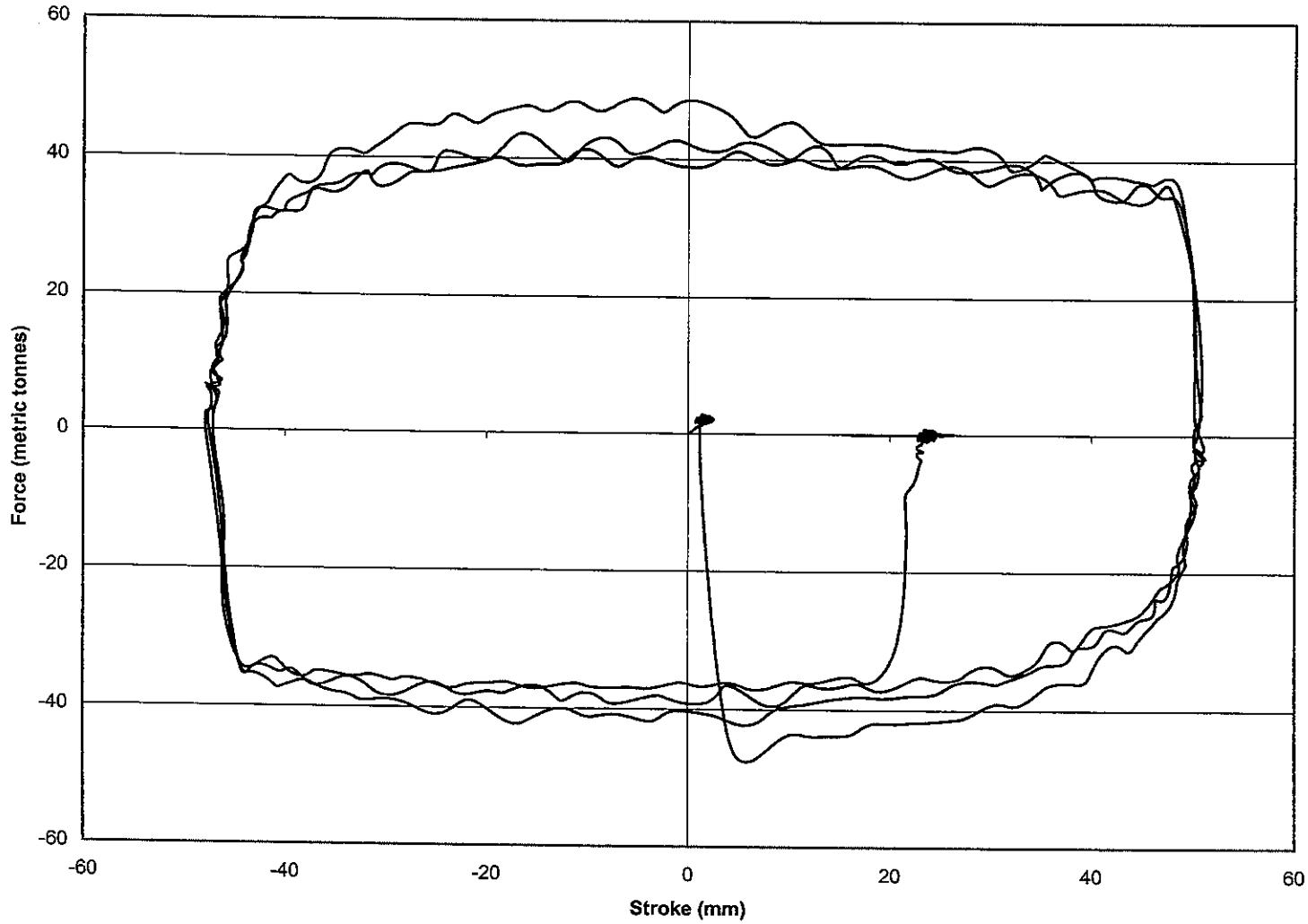
2nd Cycle Force = 40.00 Tonnes

3rd Cycle Force = 37.73 Tonnes

Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 50.0
23.8°C



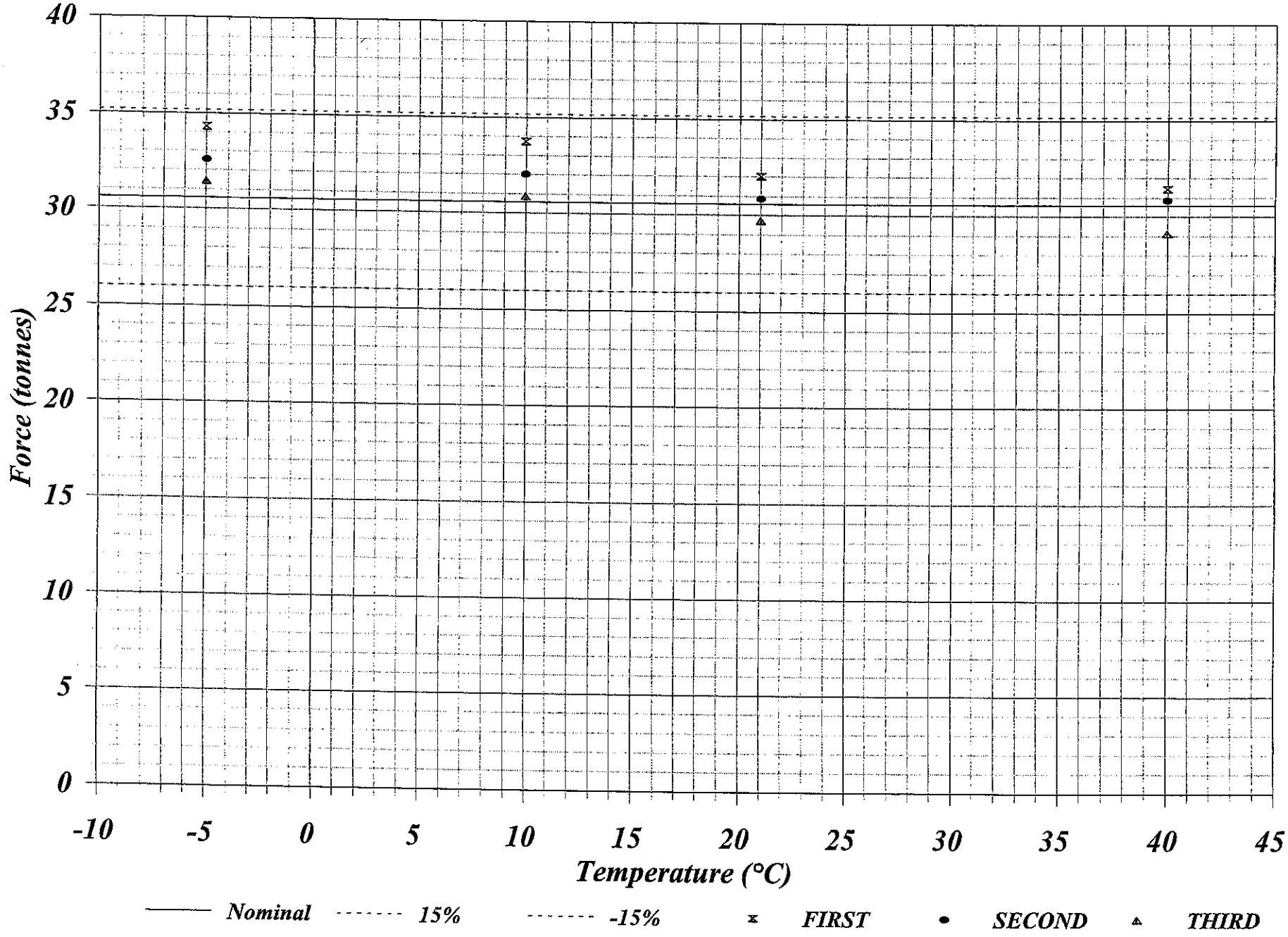
Test 2.1: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 50.0
23.8°C



SECTION 2.2

TEMPERATURE RELATED CHARACTERISTICS

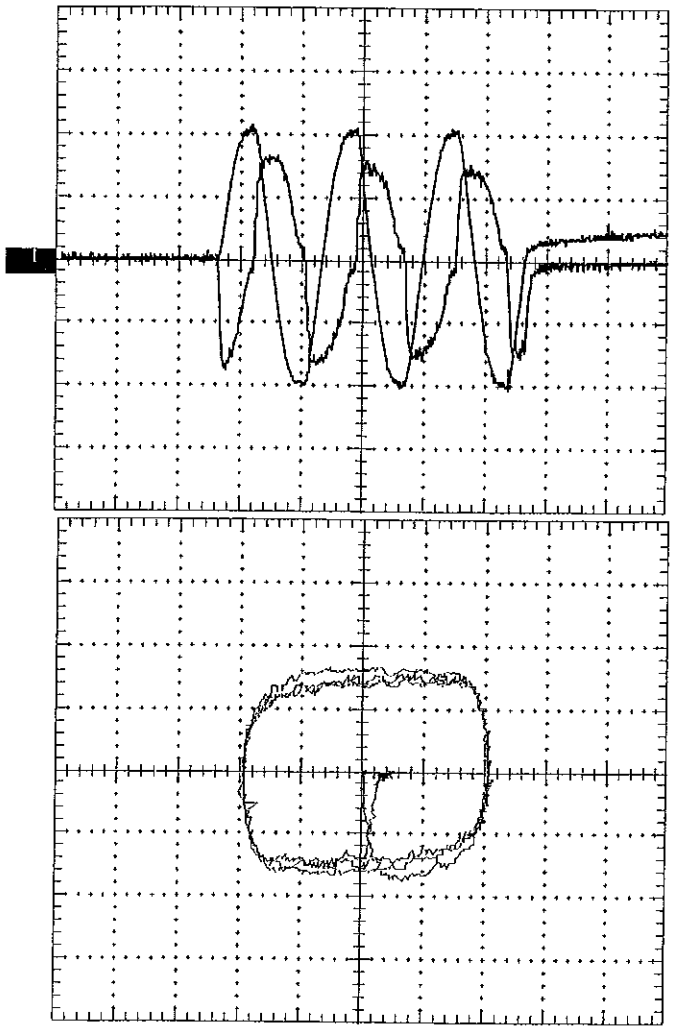
2.2 Temperature Related Characteristic



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = -5 deg. C
Test jd7
Three cycles @ .3 Hz

2.2: Temperature Related Characteristics

Raw Data



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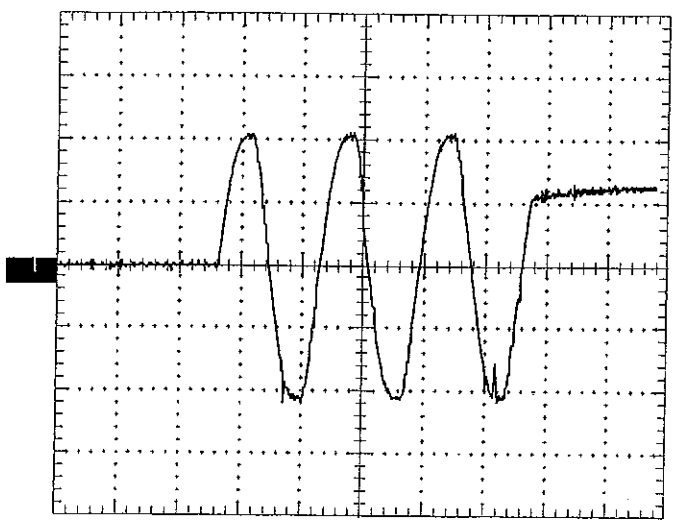


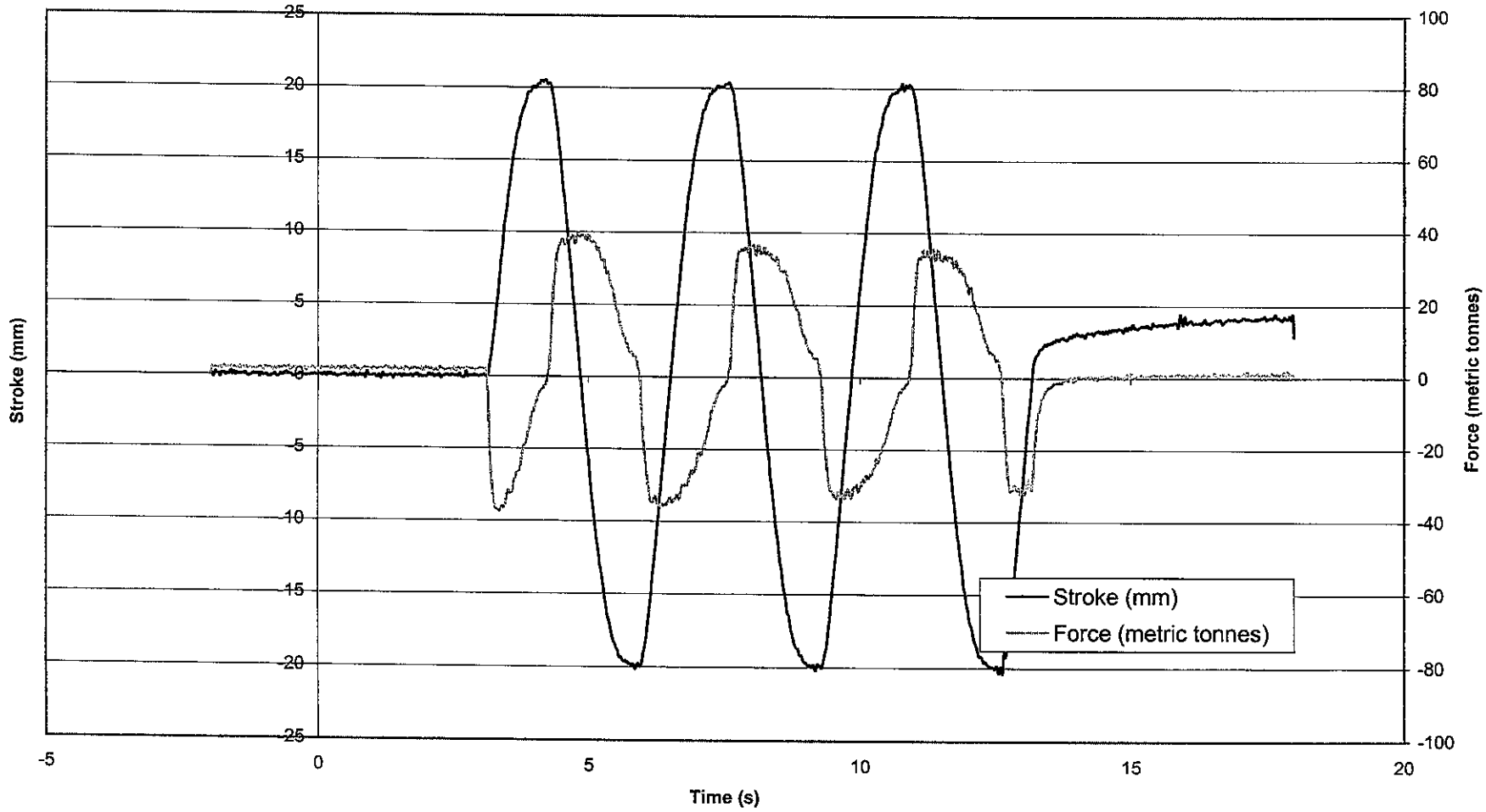
Test Machine Input To Damper

1st Cycle Force= 34.32 Tonnes

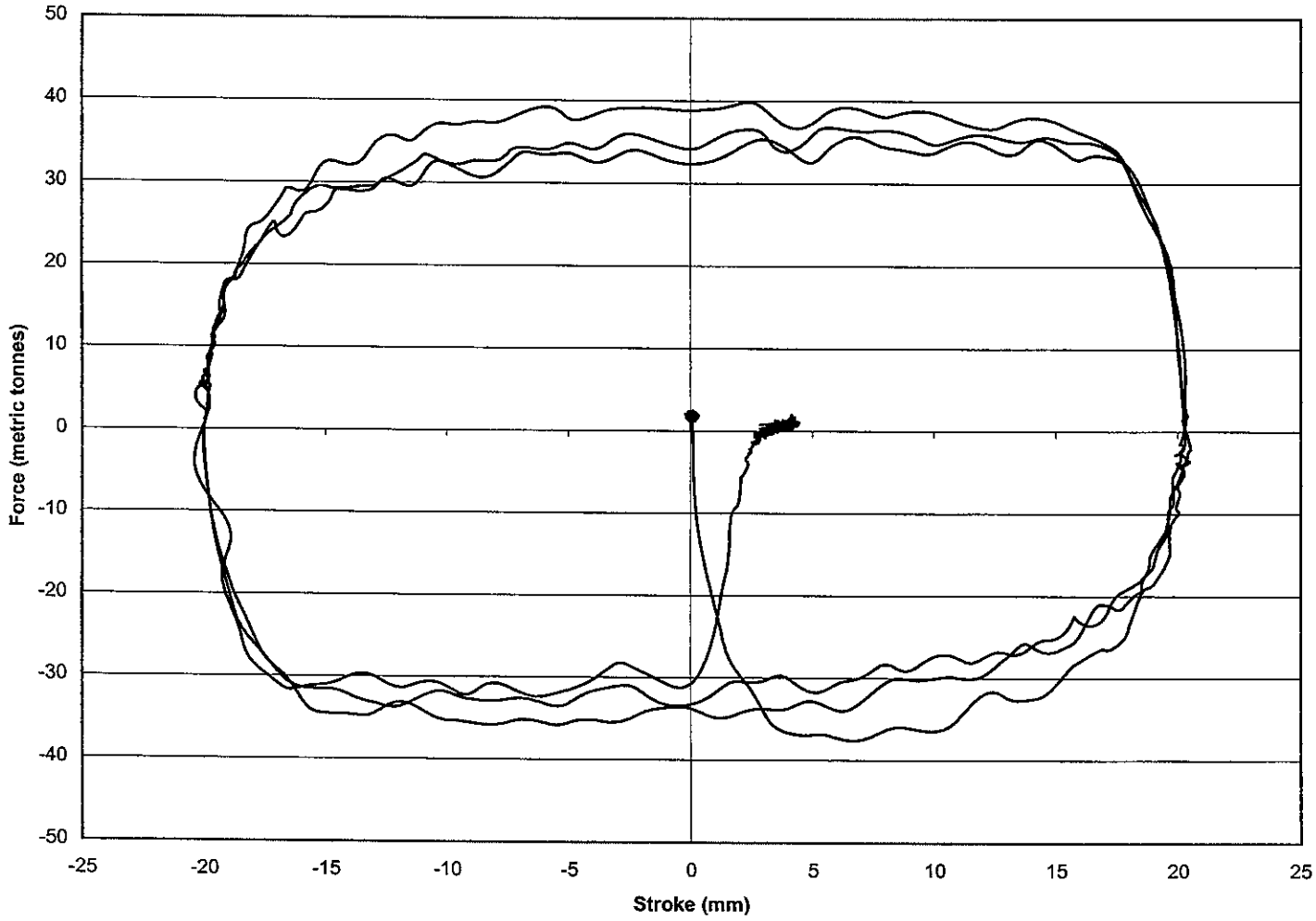
2nd Cycle Force = 32.60 Tonnes

3rd Cycle Force = 31.46 Tonnes

Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
-5.0°C



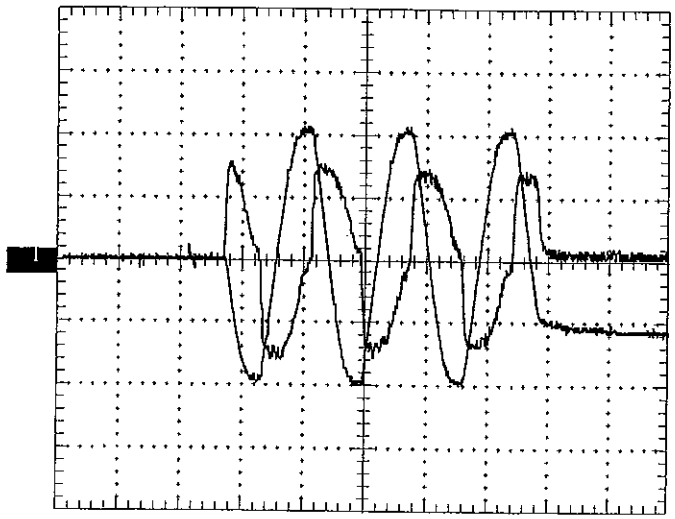
Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
-5.0°C

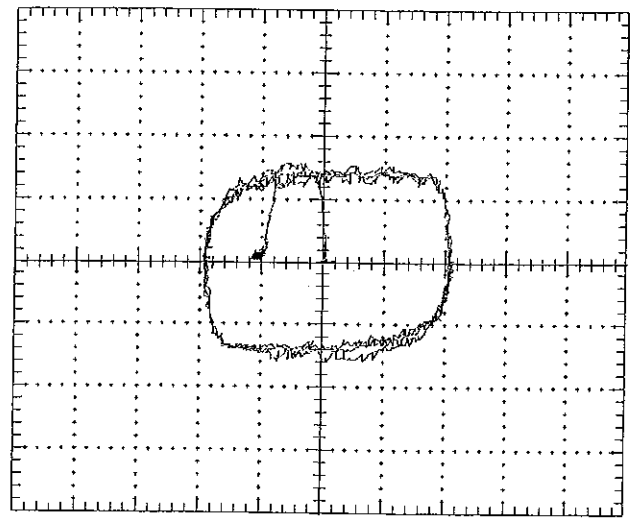


Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = 10 deg. C
Test jd7
Three cycles @ .3 Hz

2.2: Temperature Related Characteristics

Raw Data





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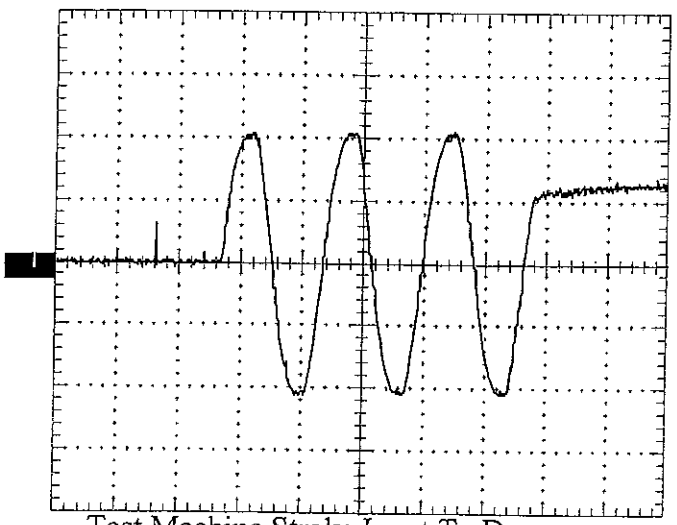


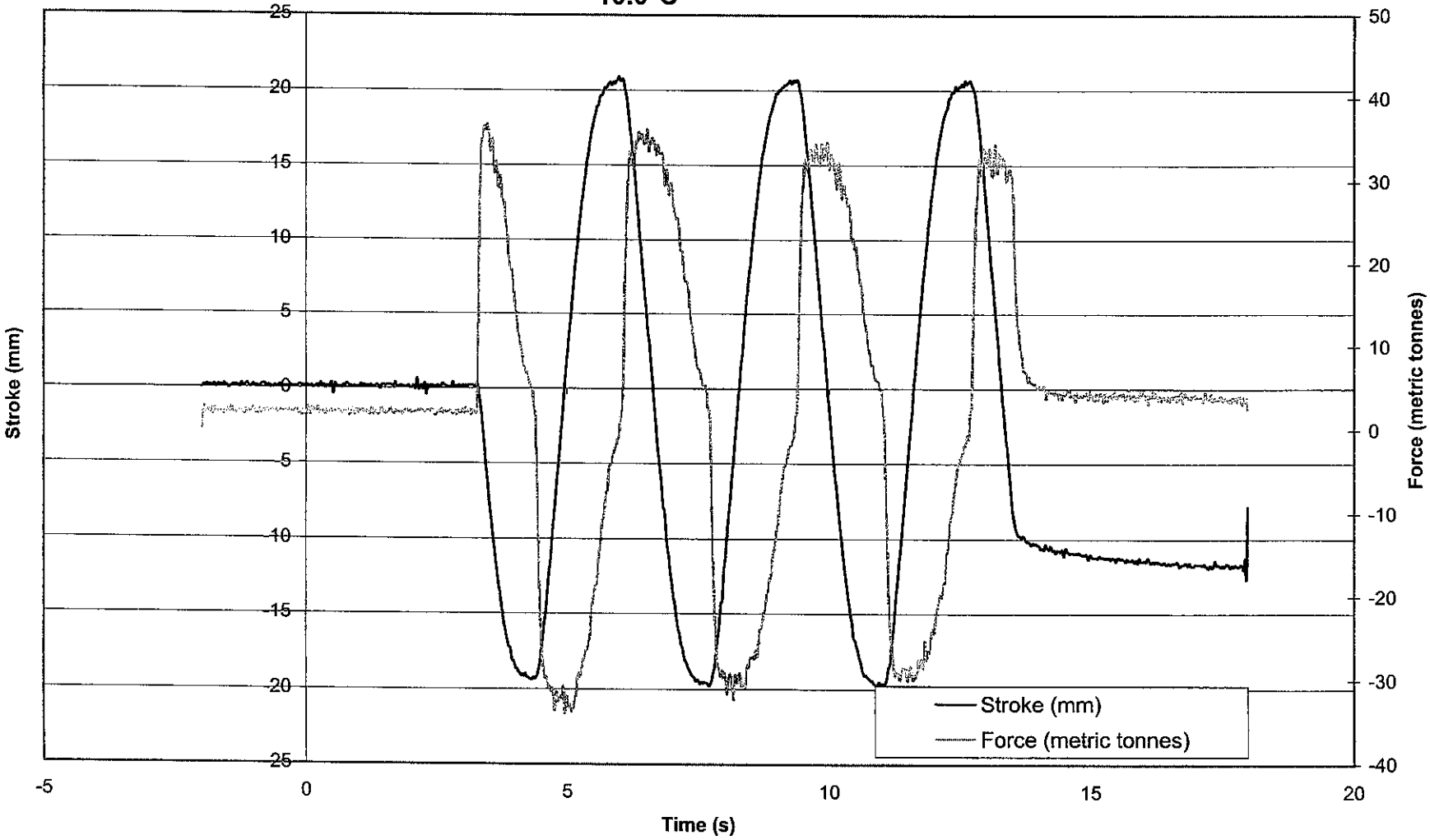
Test Machine Stroke Input To Damper

1st Cycle Force = 33.75 Tonnes

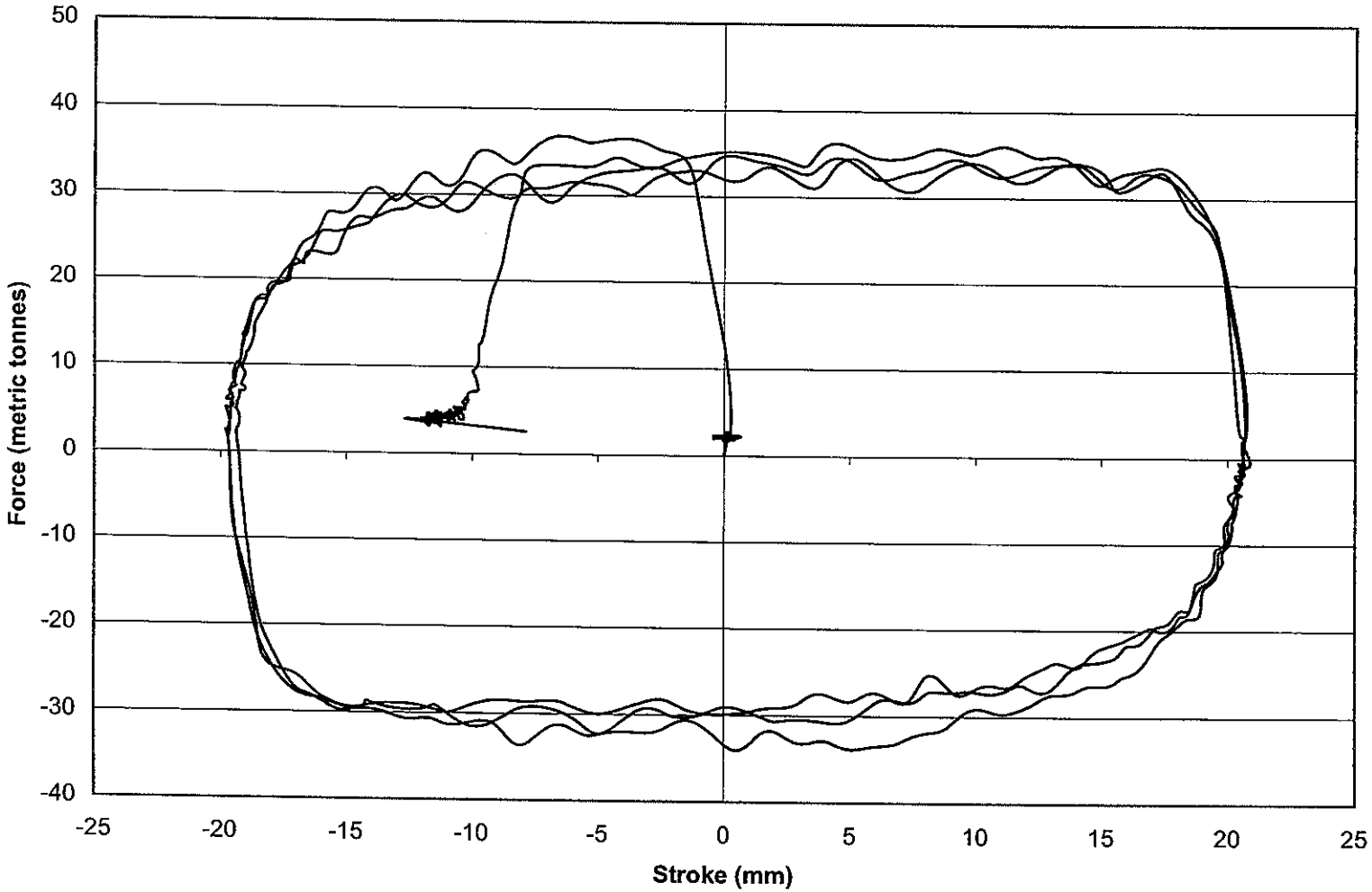
2nd Cycle Force = 32.03 Tonnes

3rd Cycle Force = 30.89 Tonnes

Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude of (mm) = 20.0
10.0°C



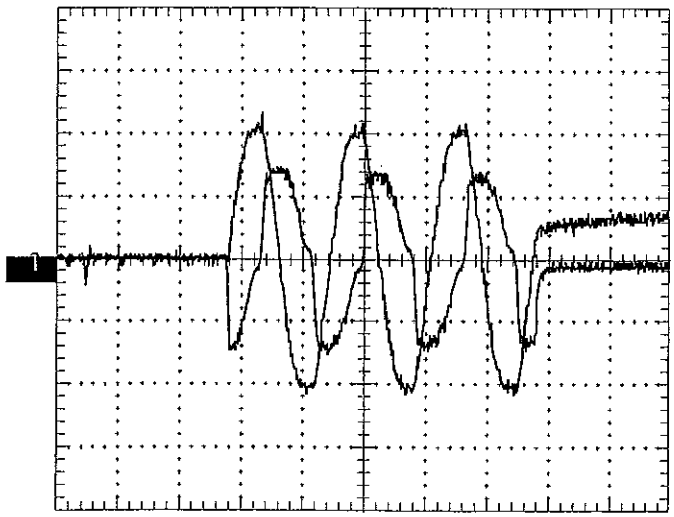
Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude of (mm) = 20.0
10.0°C



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = 20.7 deg. C
Test jd7
Three cycles @ .3 Hz

2.1: Temperature Related Characteristics

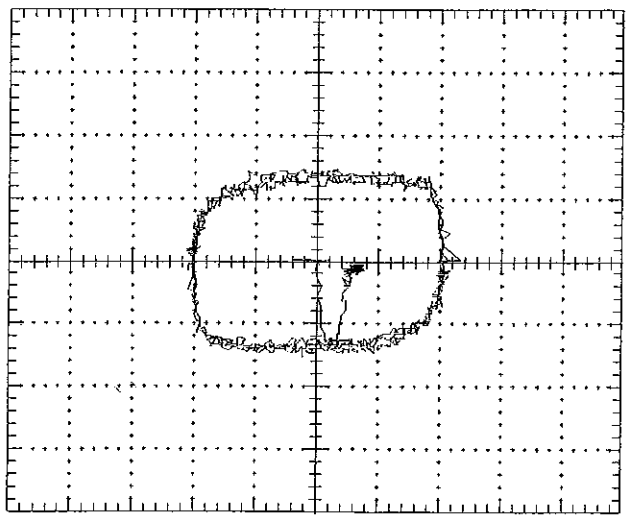
Raw Data



1st Cycle Force = 32.03 Tonnes

2nd Cycle Force = 30.89 Tonnes

3rd Cycle Force = 29.74 Tonnes



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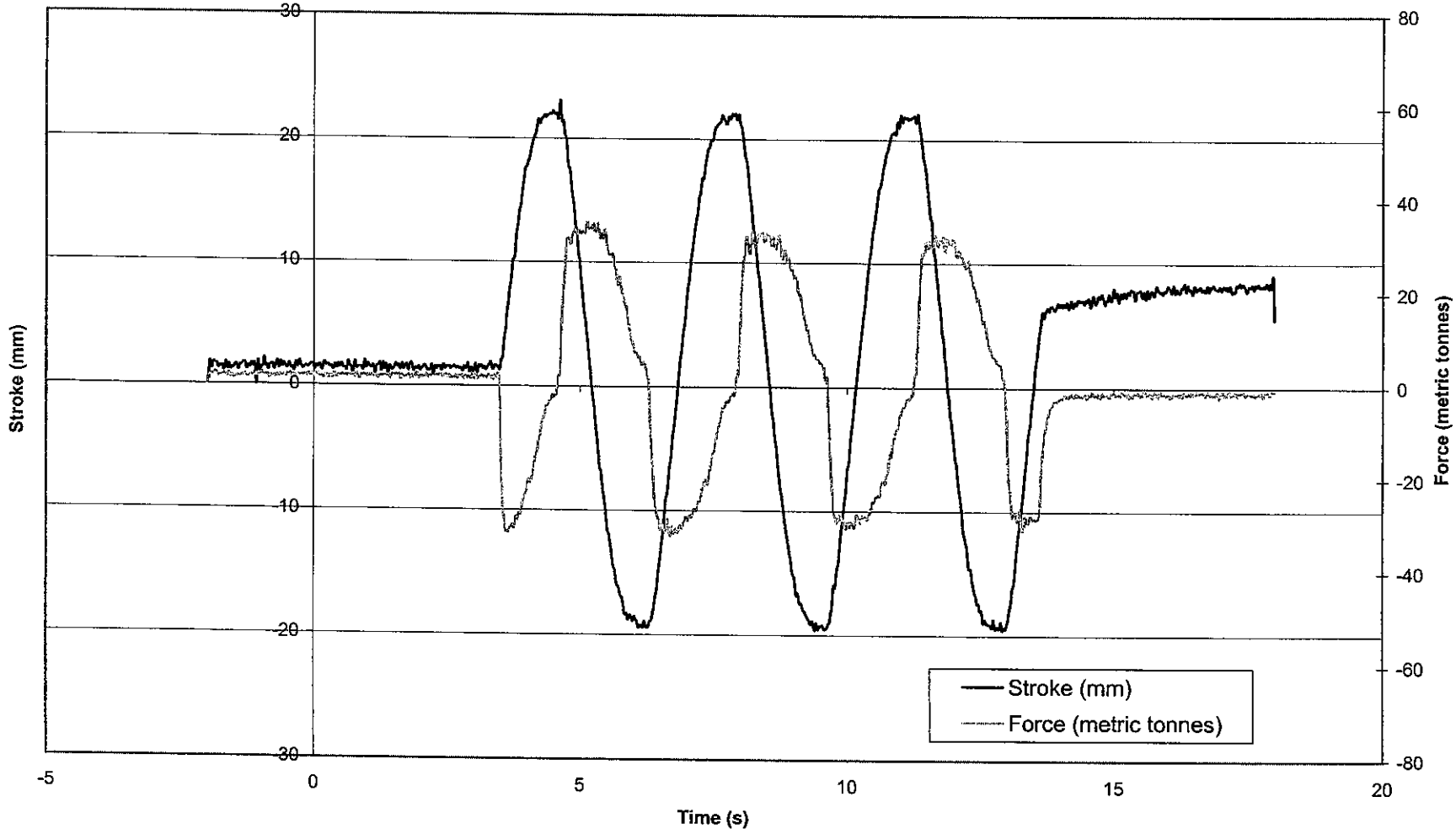
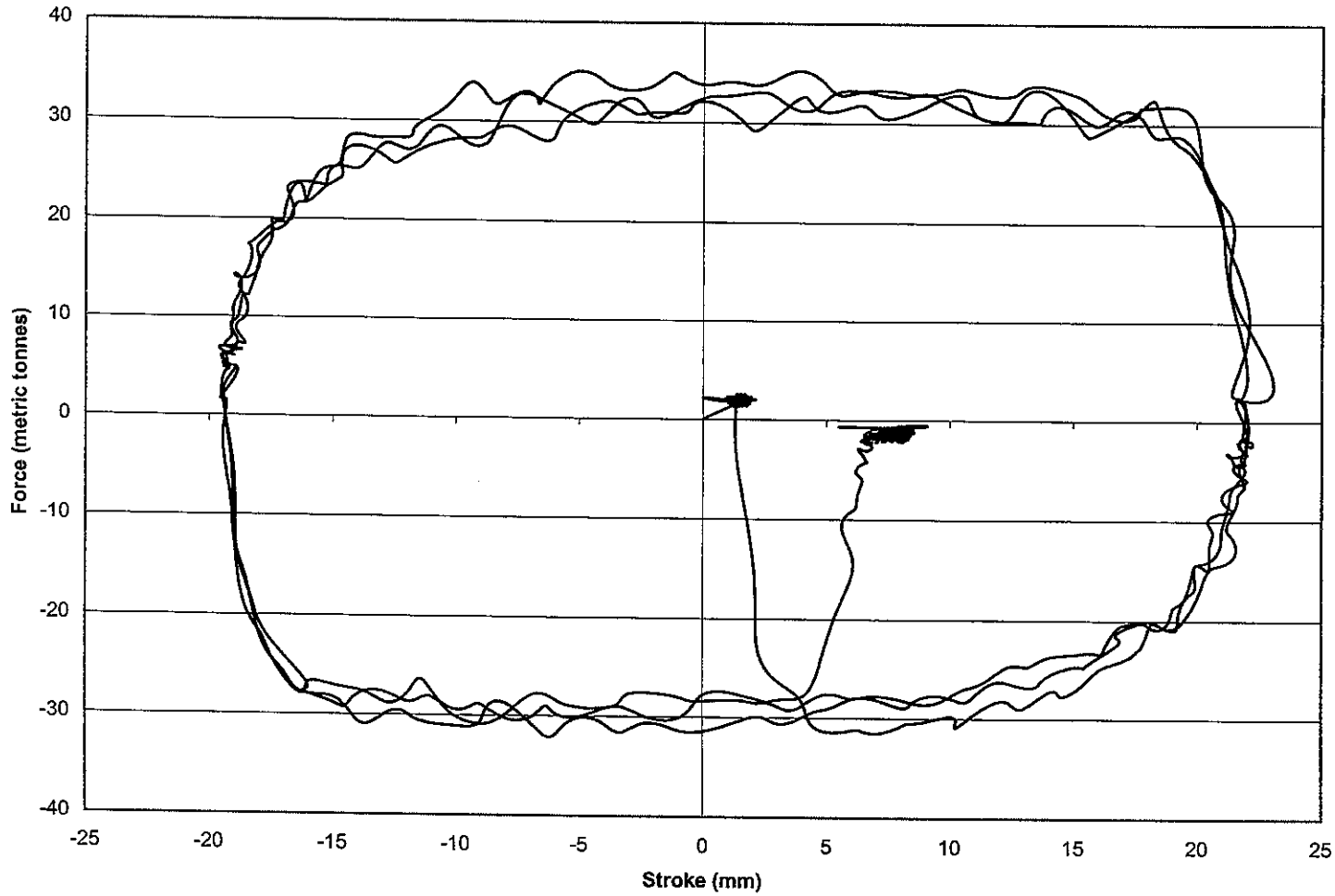
STROKE

Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
23.5°C



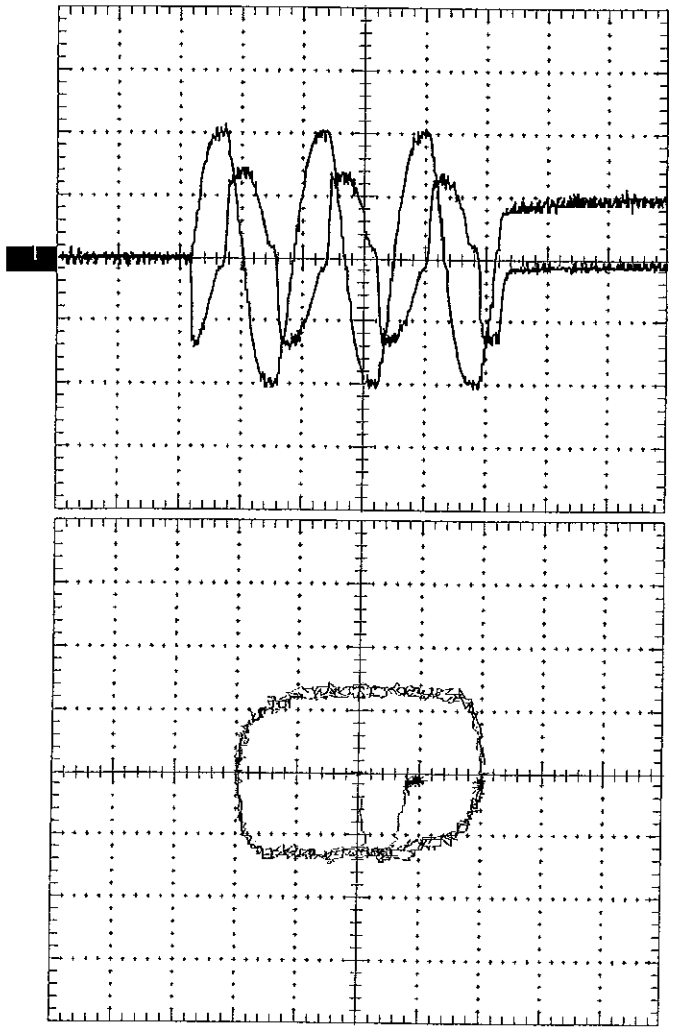
Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
23.5°C



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = 40 deg. C
Test jd7
Three cycles @ .3 Hz

2.2: Temperature Related Characteristics

Raw Data



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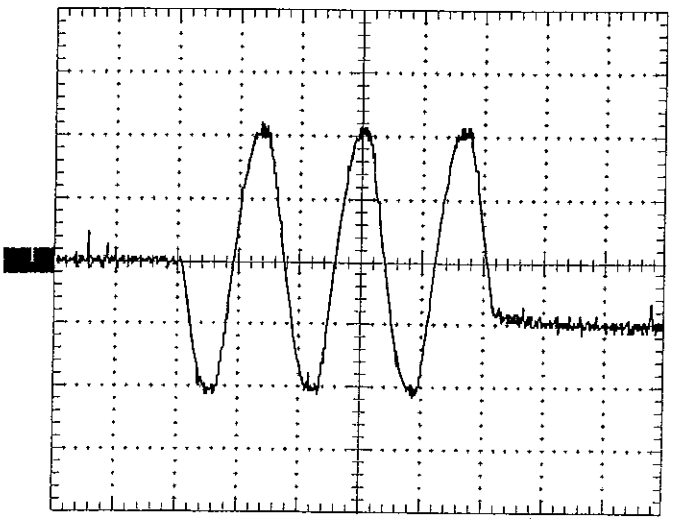
STROKE



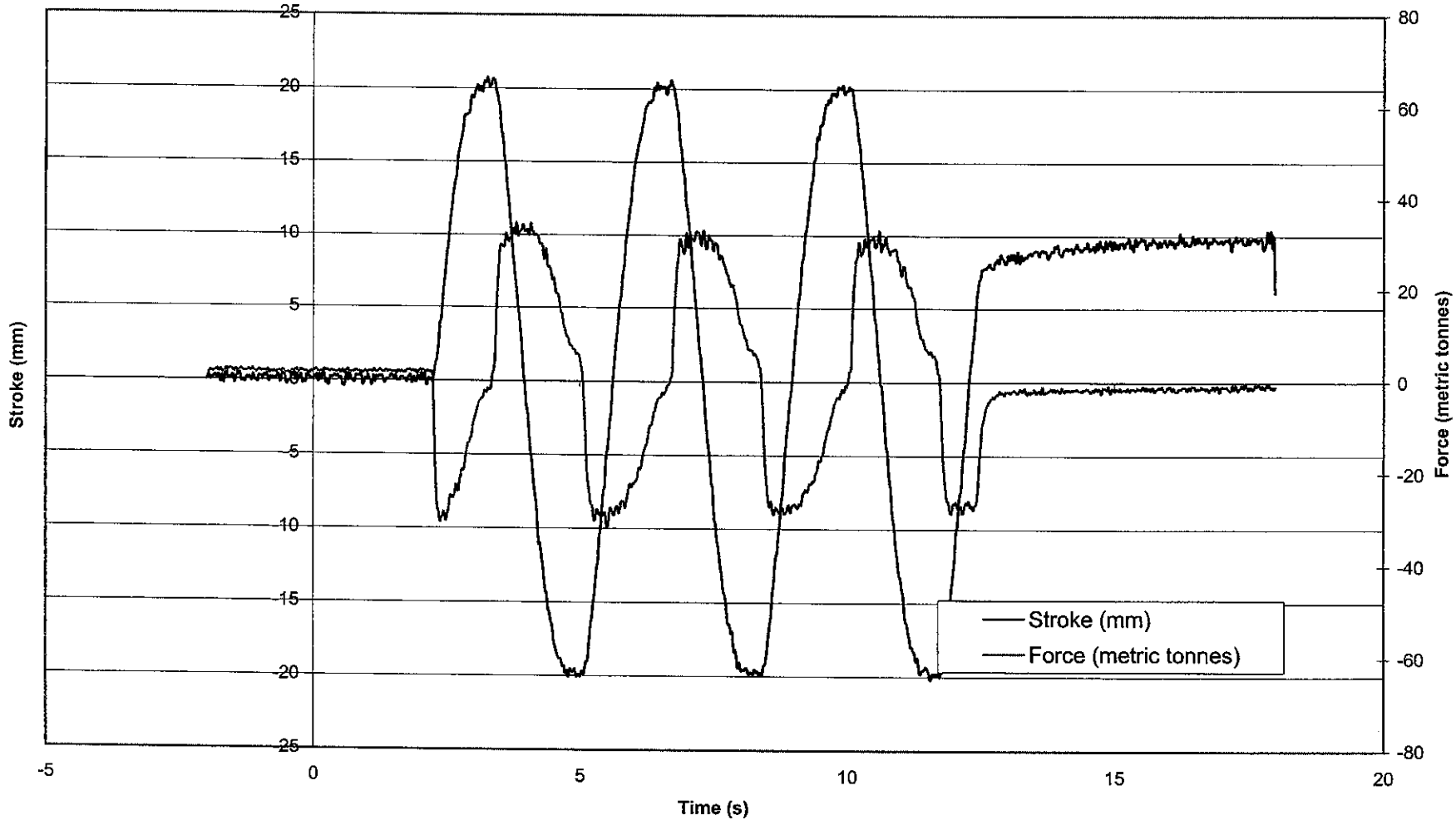
Test Machine Stroke Input To Damper

1st Cycle Force = 31.46 Tonnes

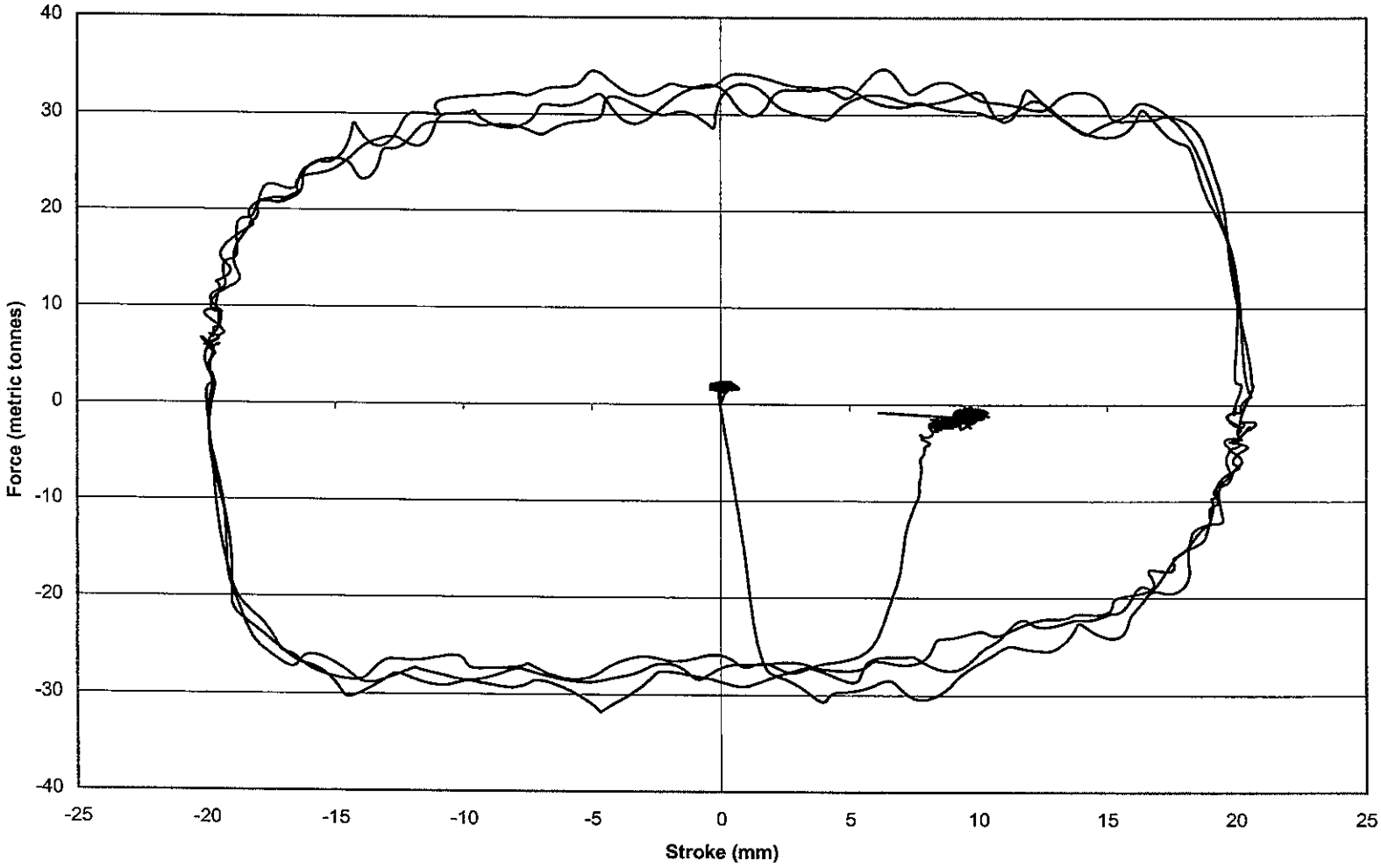
2nd Cycle Force = 30.89 Tonnes

Force 3rd cycle = 29.17 Tonnes

Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
40.0°C



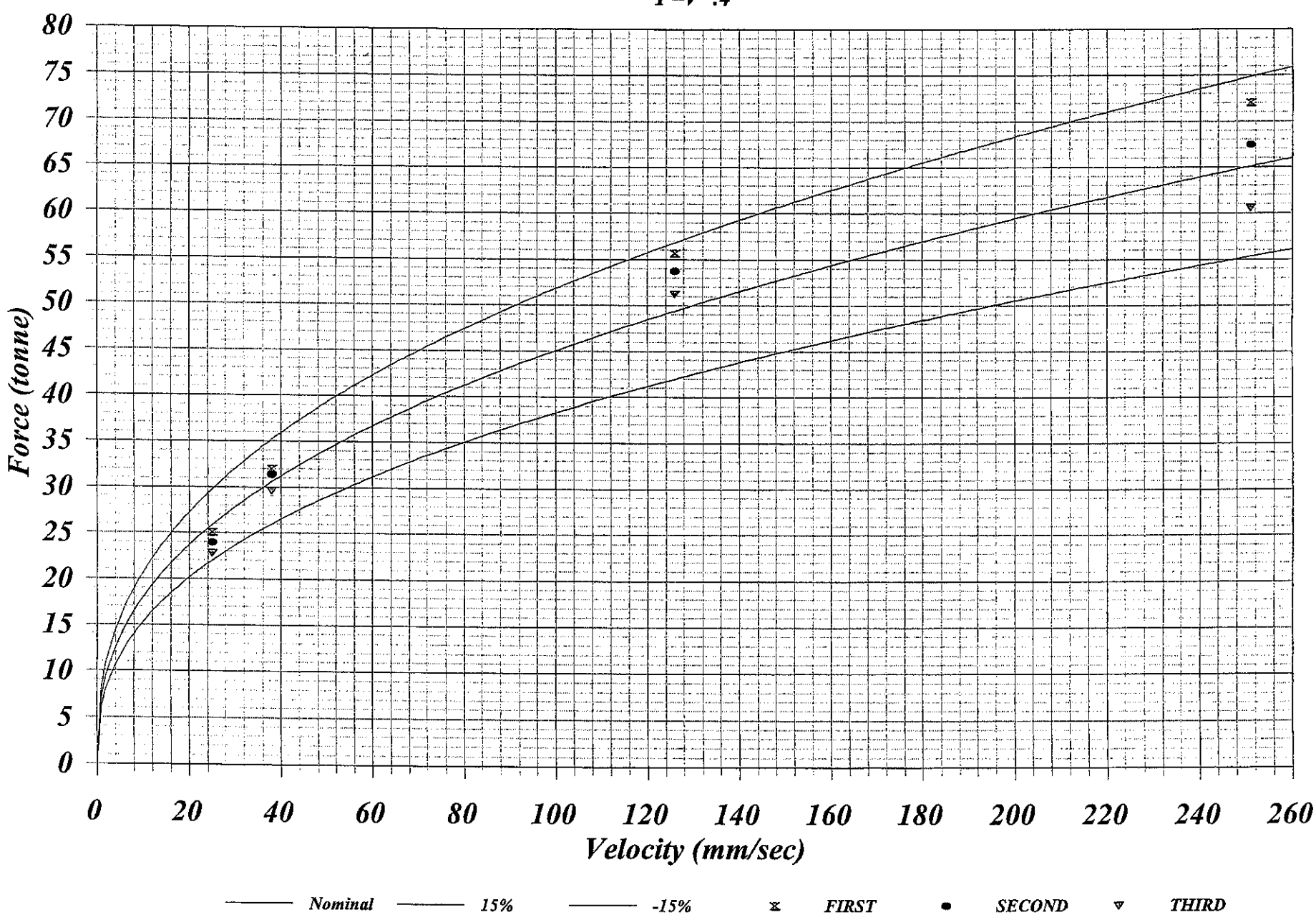
Test 2.2: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
40.0°C



SECTION 2.3

FREQUENCY RELATED CHARACTERISTICS

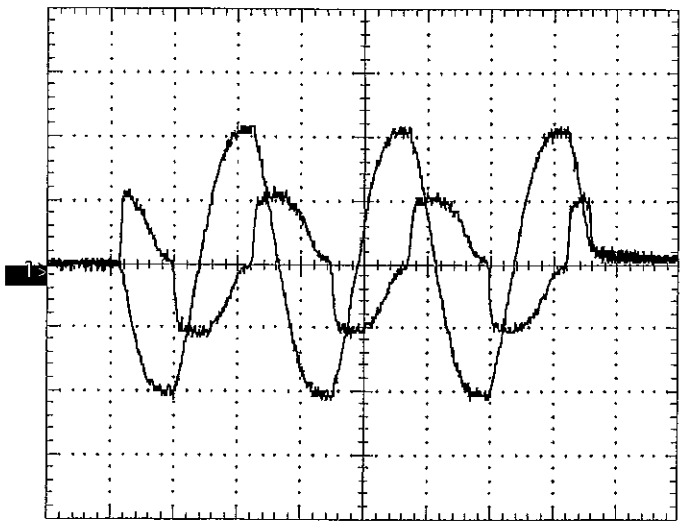
2.3 Frequency Related Tests



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = 23.7 deg. C
Test jd1
Three cycles @ .2 Hz

2.3: Frequency Related Characteristics

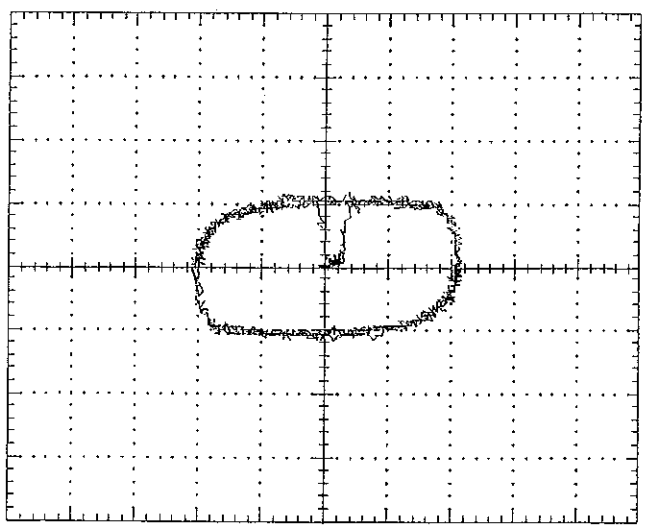
Raw Data



1st Cycle Force = 25.12 Tonnes

2nd Cycle Force = 23.99 Tonnes

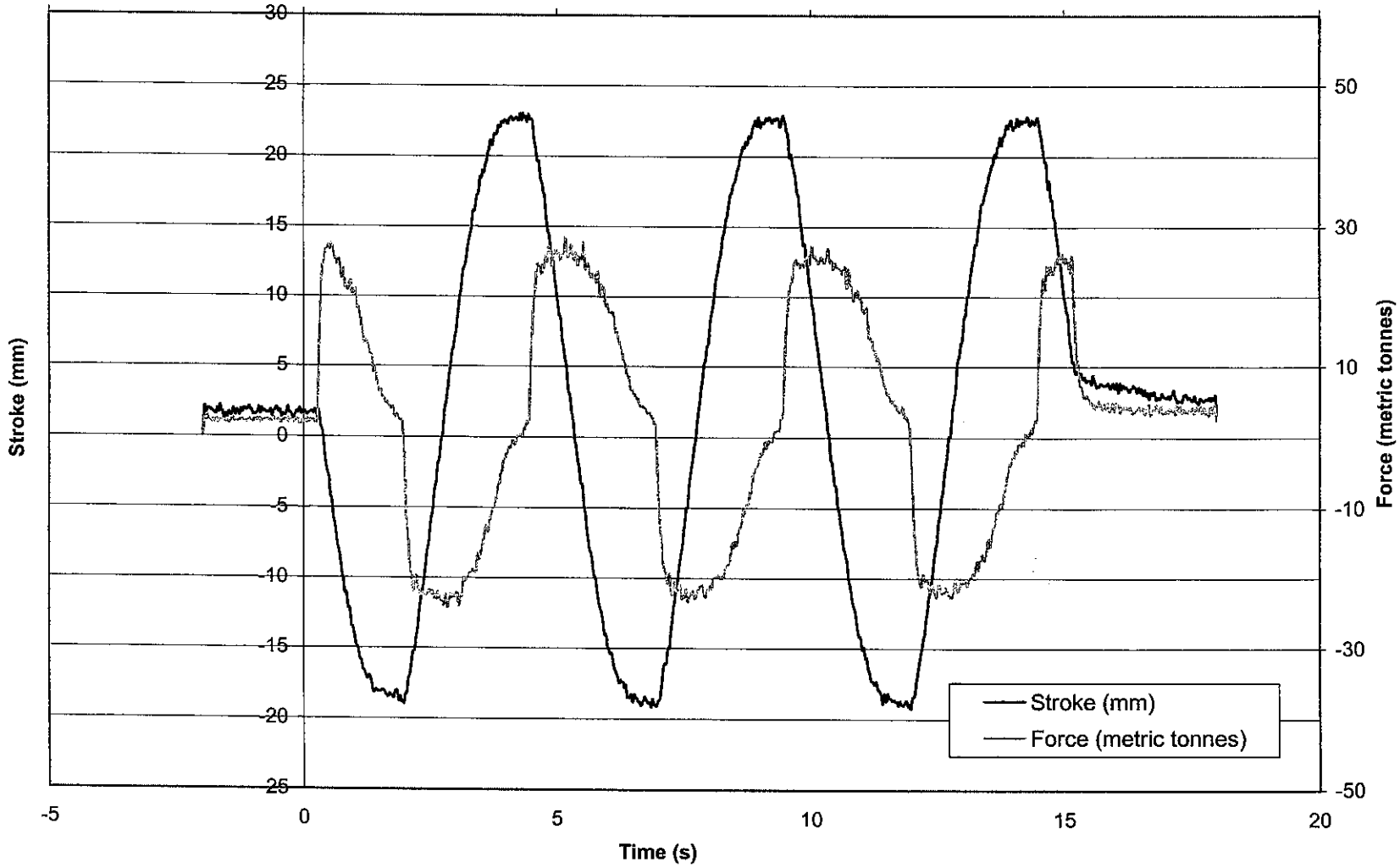
3rd Cycle Force = 22.86 Tonnes



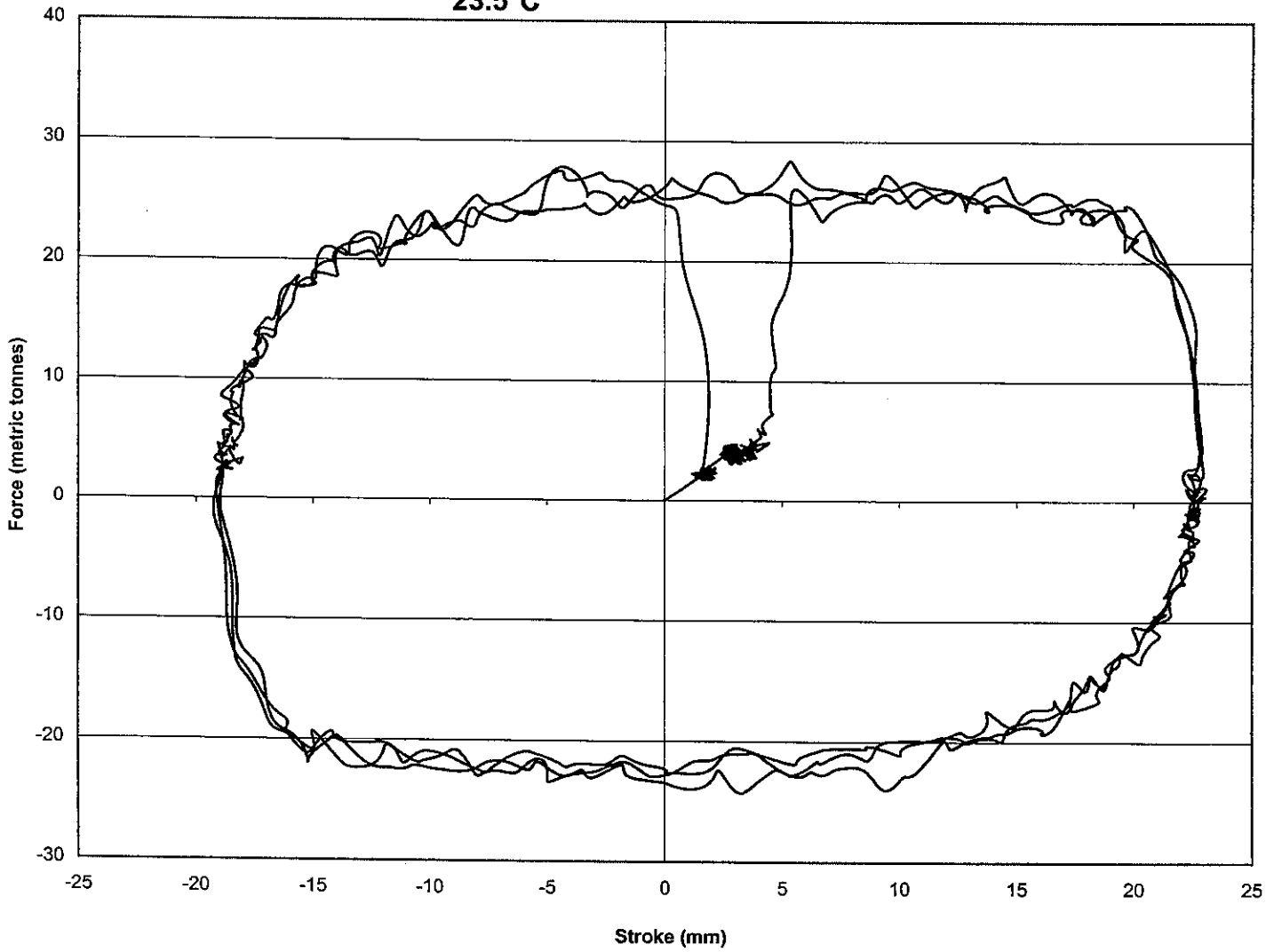
FORCE

STROKE

Test 2.3: Filtered Data
Frequency (Hz) = 0.2
Peak Amplitude (mm) = 20.0
23.5°C



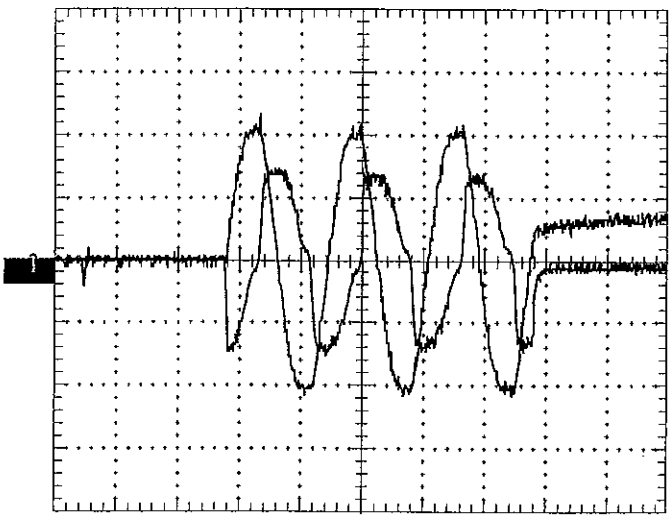
Test 2.3: Filtered Data
Frequency (Hz) = 0.2
Peak Amplitude (mm) = 20.0
23.5°C



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = 2 sec/div
Temperature = 20.7 deg. C
Test jd7
Three cycles @ .3 Hz

2.3: Frequency Related Characteristics

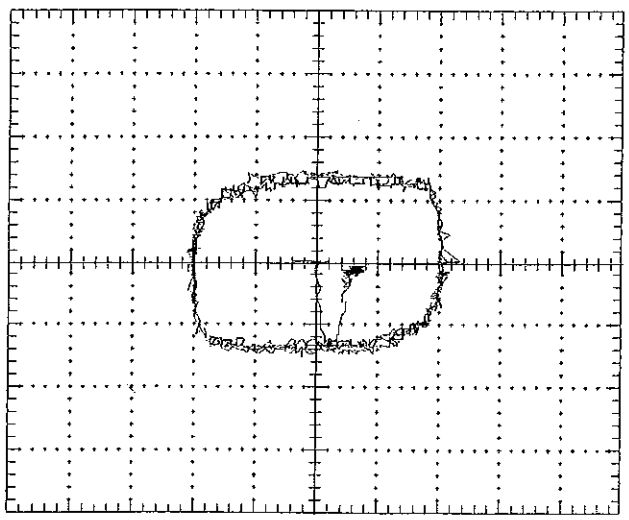
Raw Data



1st Cycle Force = 32.03 Tonnes

2nd Cycle Force = 30.89 Tonnes

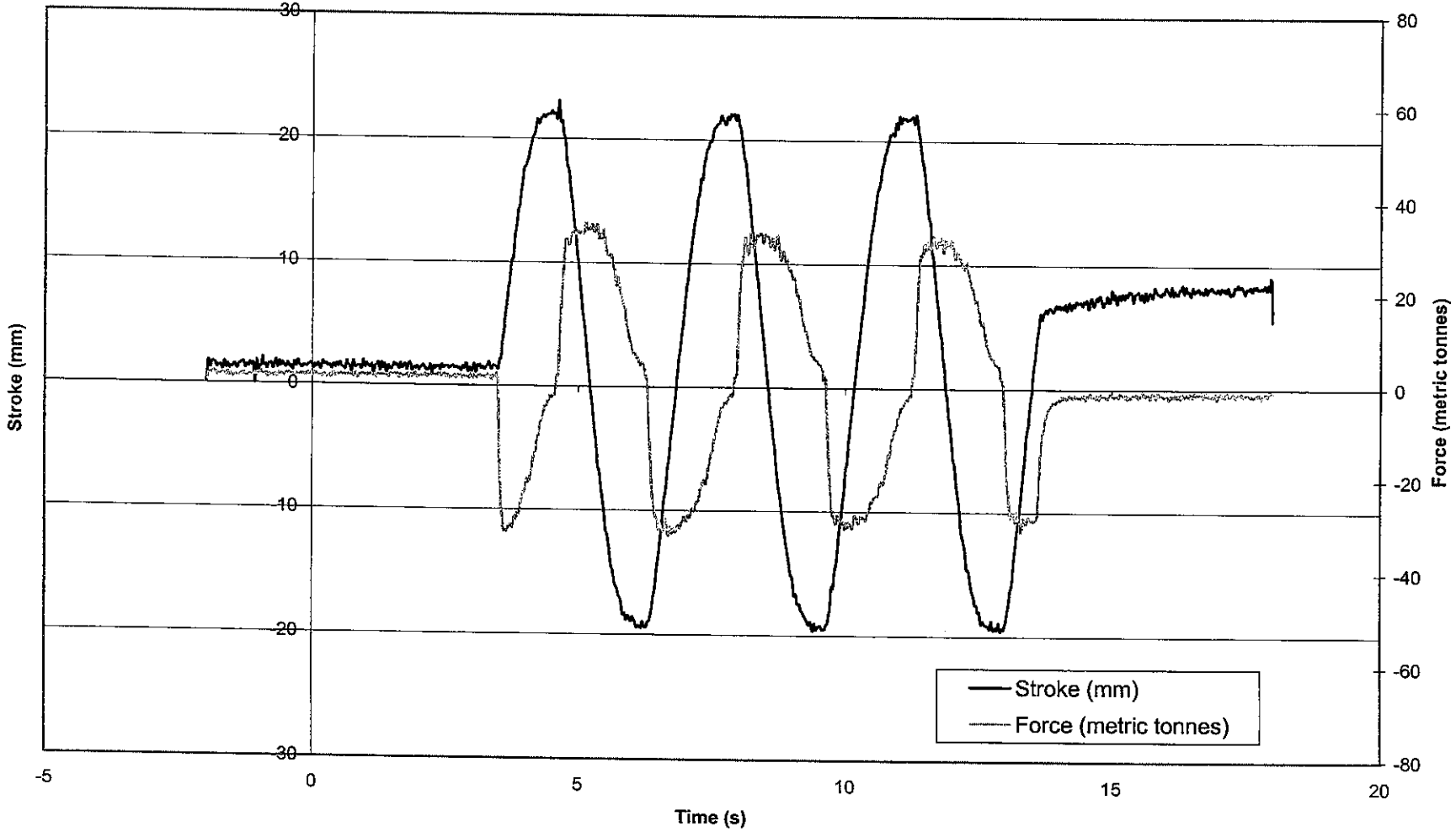
3rd Cycle Force = 29.74 Tonnes



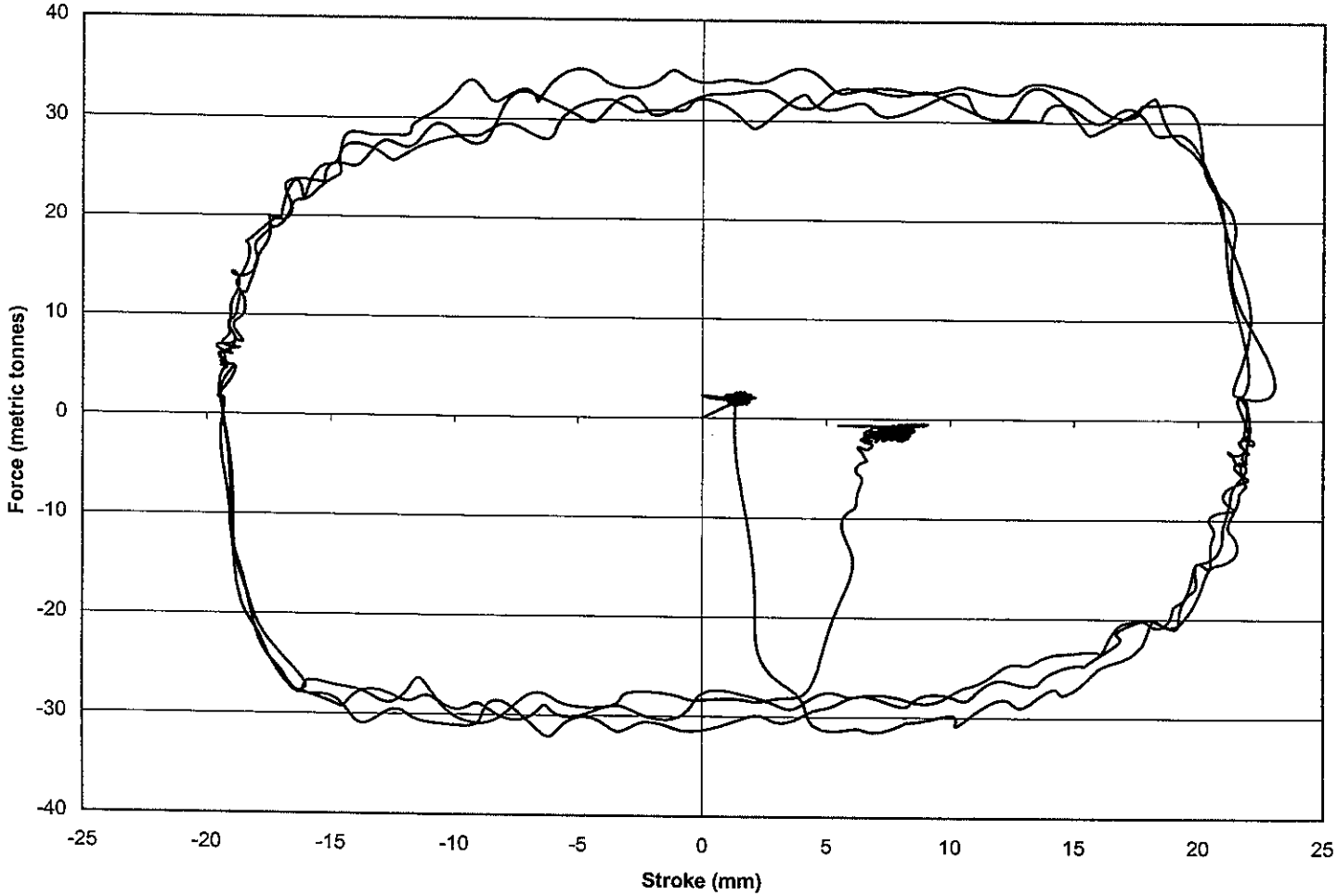
FORCE

STROKE

Test 2.3: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
23.5°C



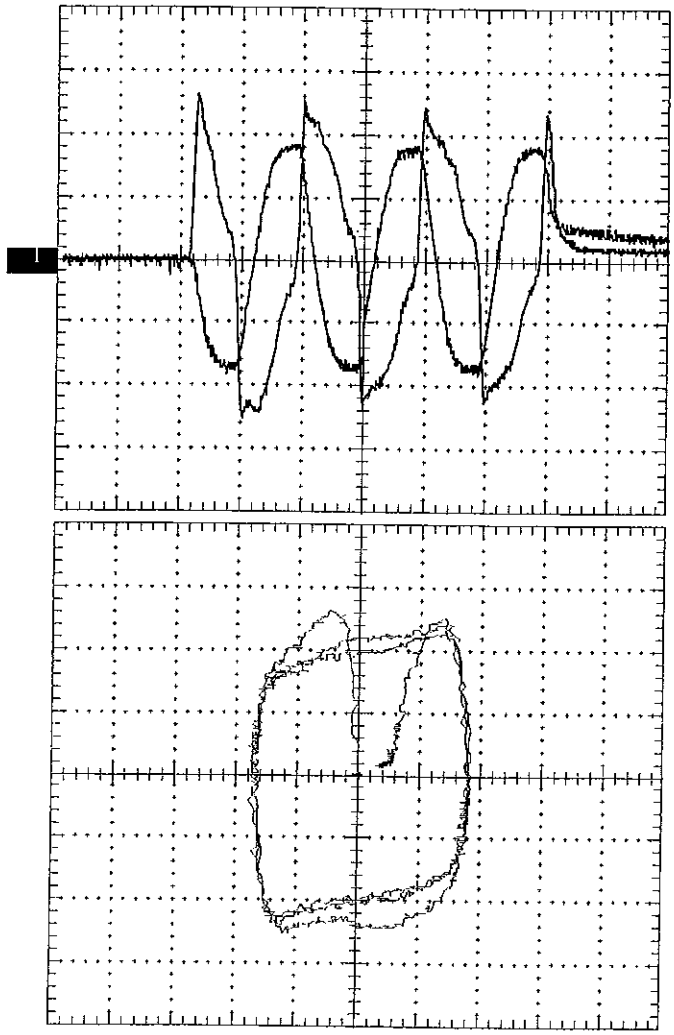
Test 2.3: Filtered Data
Frequency (Hz) = 0.3
Peak Amplitude (mm) = 20.0
23.5°C



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = .5 sec/div
Temperature = 19 deg. C
Test jd2
Three cycles @ 1Hz

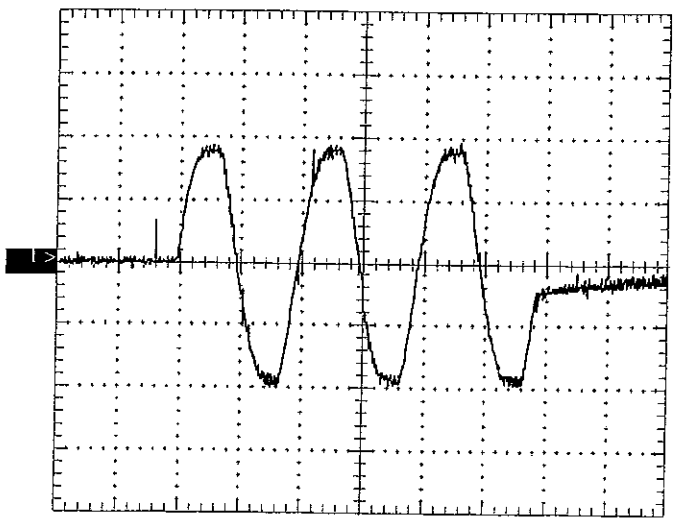
2.3: Frequency Related Characteristics

Raw Data



F
O
R
C
E

STROKE



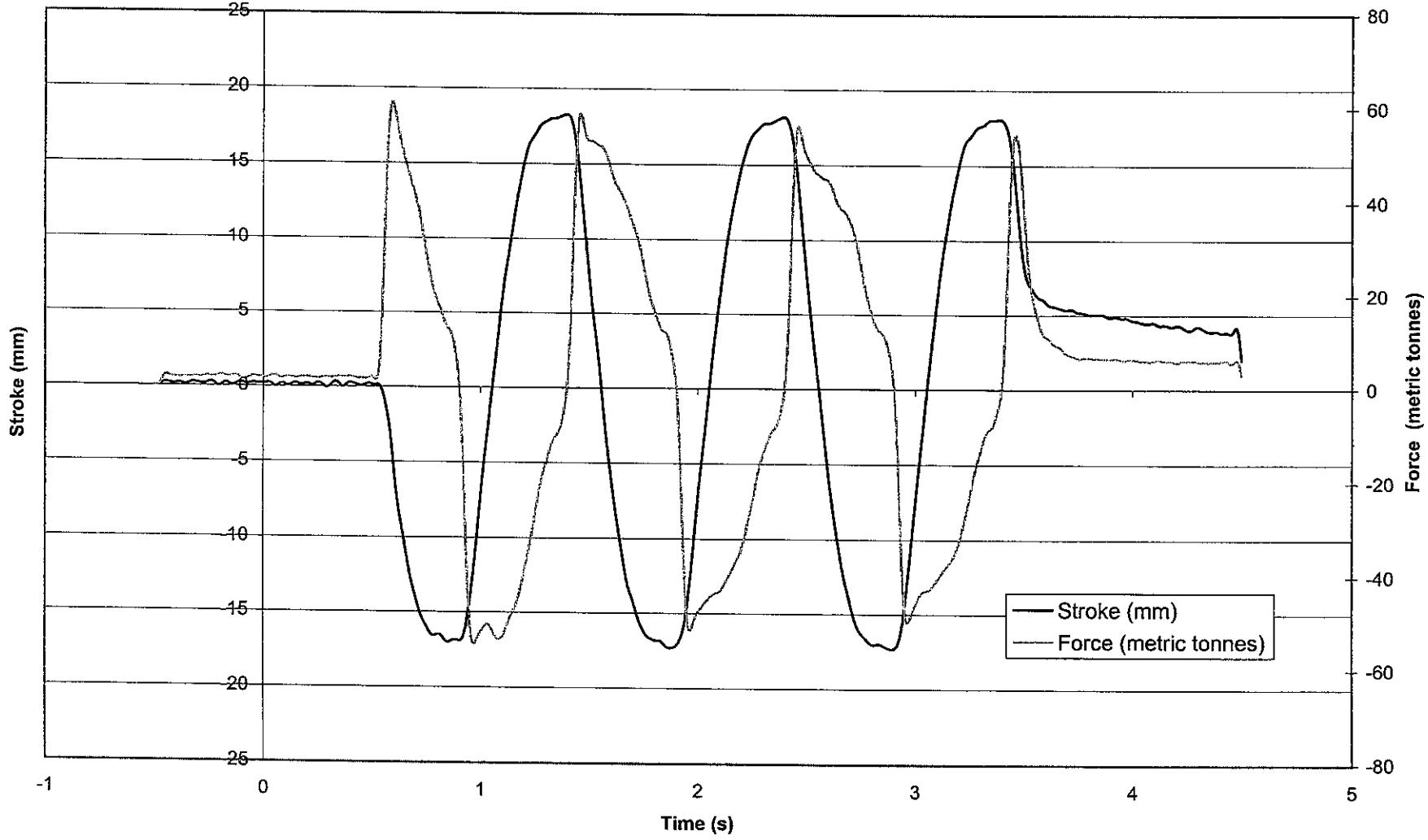
Test Machine Stroke Input To Damper

1st Cycle Force = 55.7 Tonnes

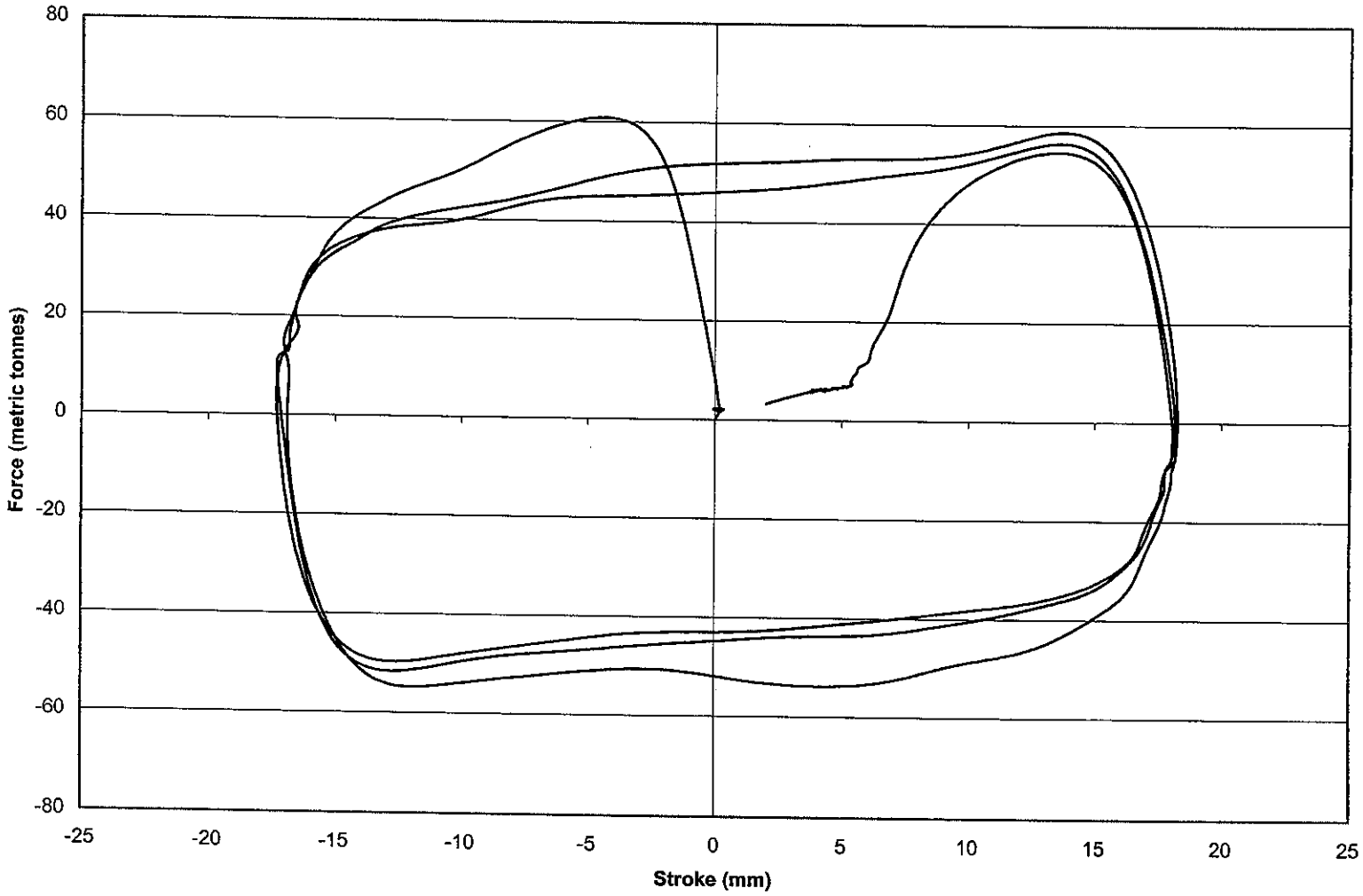
2nd Cycle Force = 53.8 Tonnes

3rd Cycle Force = 51.3 Tonnes

Test 2.3: Filtered Data
Frequency (Hz) = 1.0
Peak Amplitude (mm) = 20.0
19.0°C



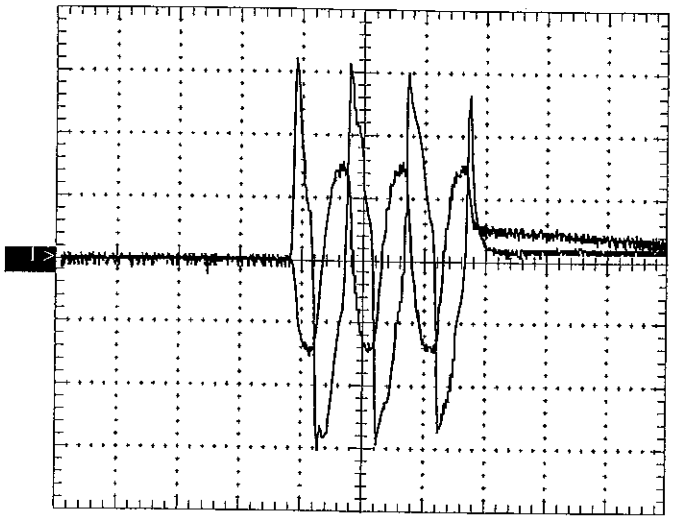
Test 2.3: Filtered Data
Frequency (Hz) = 1.0
Peak Amplitude (mm) = 20.0
19.0°C



Force = 22.88 Tonne/div
Stroke = 10 mm/div.
Time = .5 sec/div
Temperature = 21 deg. C
Test jd3
Three cycles @ 2Hz

2.3: Frequency Related Characteristics

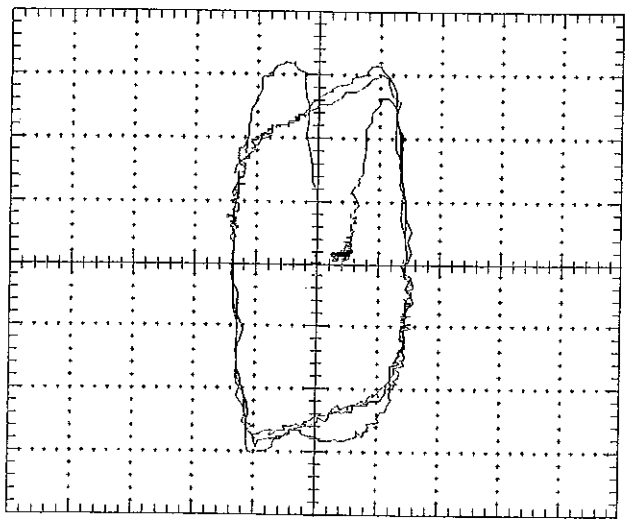
Raw Data



1st Cycle Force = 72.1 Tonnes

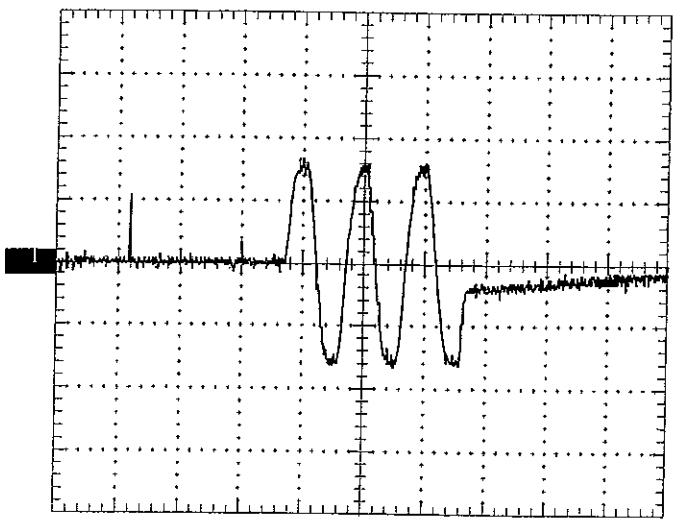
2nd Cycle Force = 67.50 Tonnes

3rd Cycle Force = 60.63 Tonnes



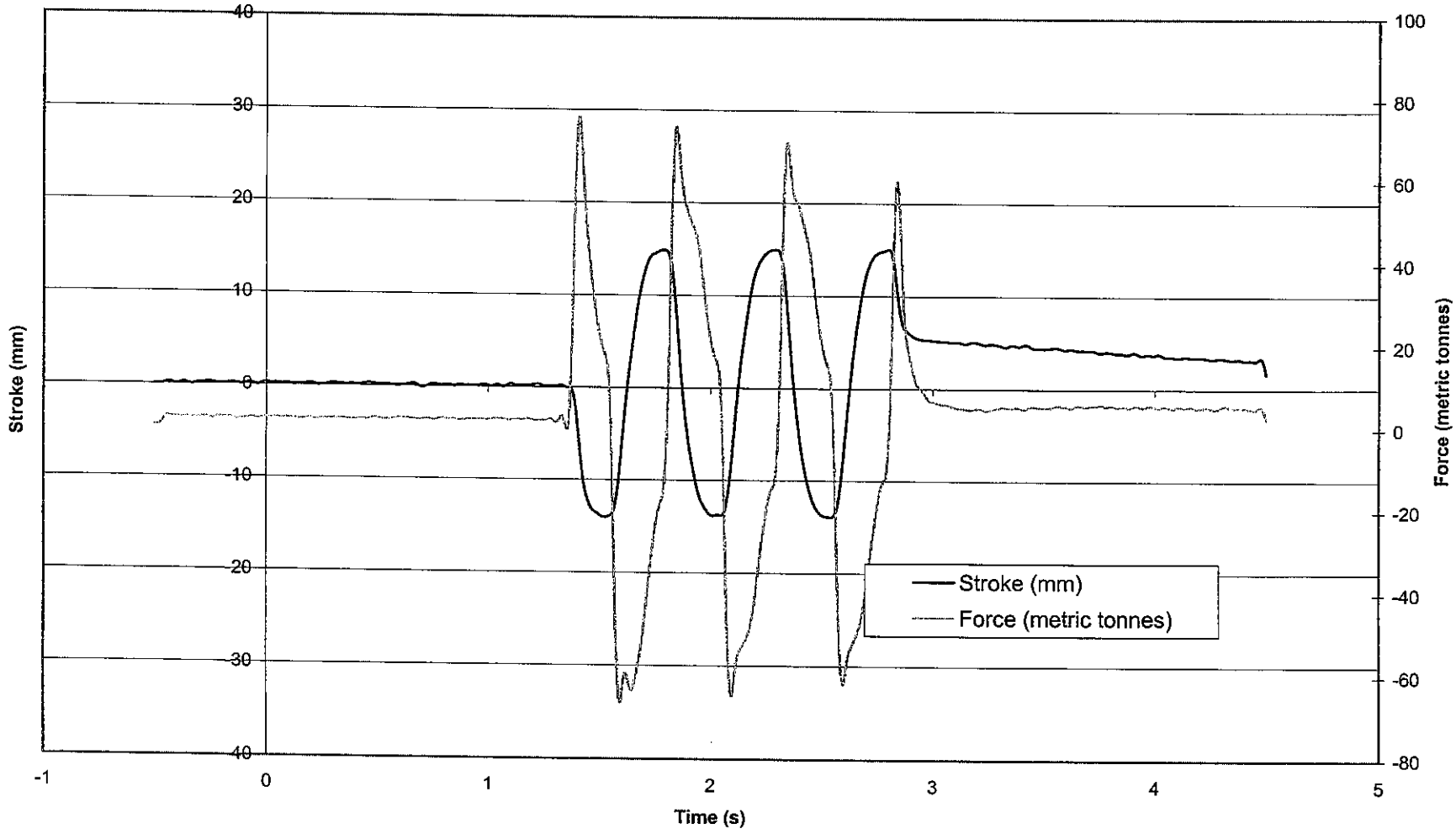
FORCE

STROKE

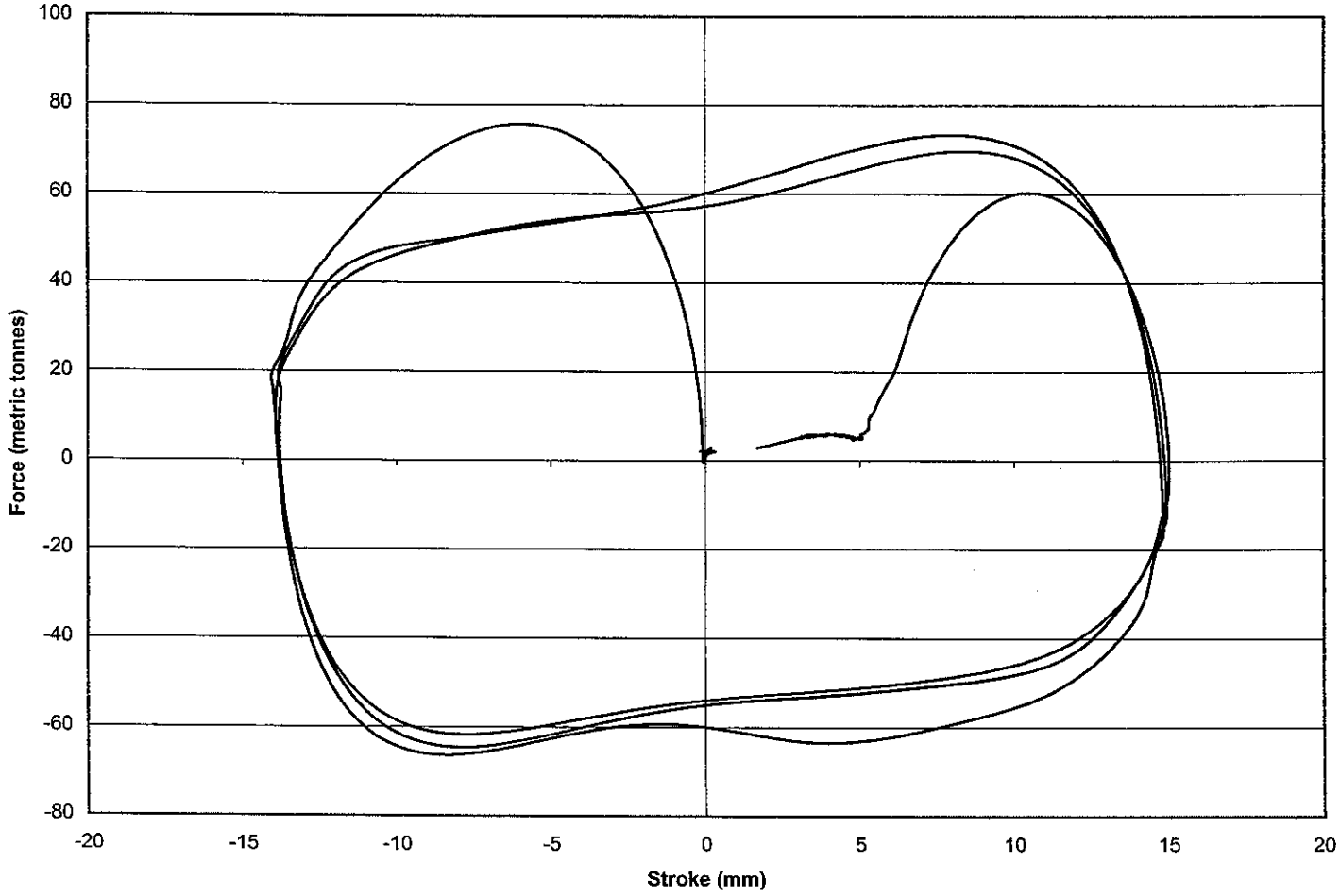


Test Machine Stroke Input To Damper

Test 2.3: Filtered Data
Frequency (Hz) = 2.0
Peak Amplitude (mm) = 20.0
21.0°C



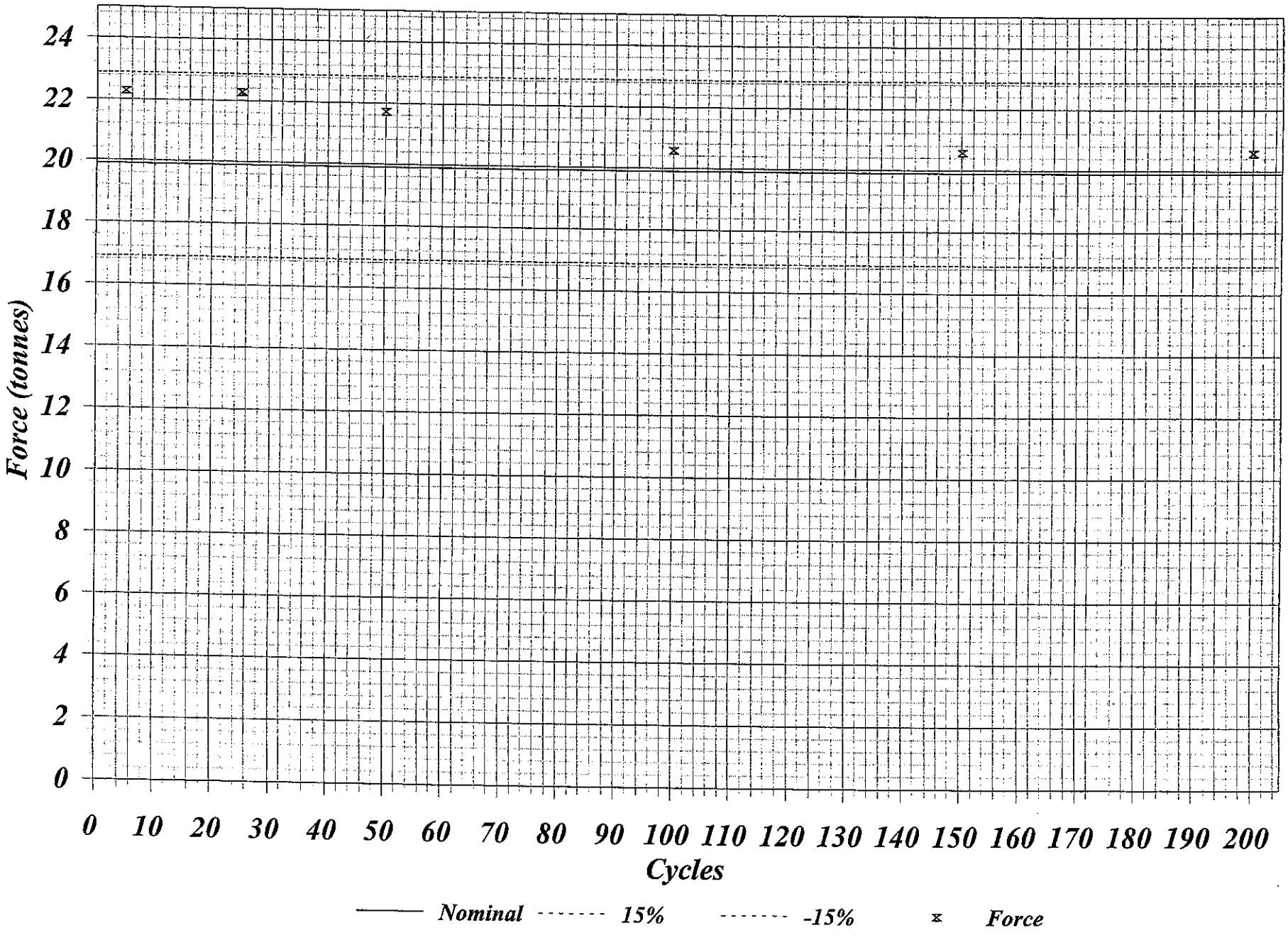
Test 2.3: Filtered Data
Frequency (Hz) = 2.0
Peak Amplitude (mm) = 20.0
21.0°C



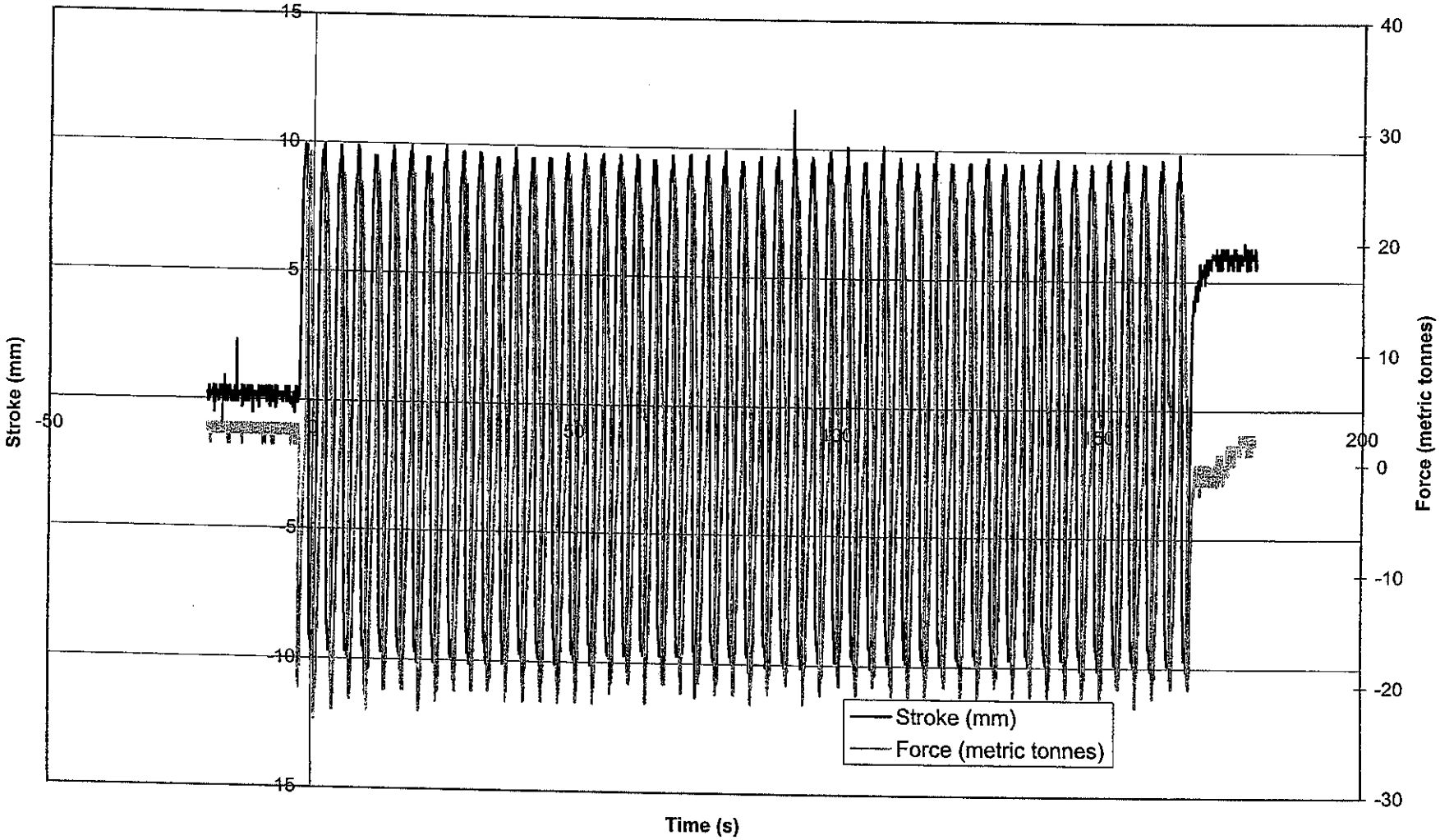
SECTION 2.4

DURABILITY TEST

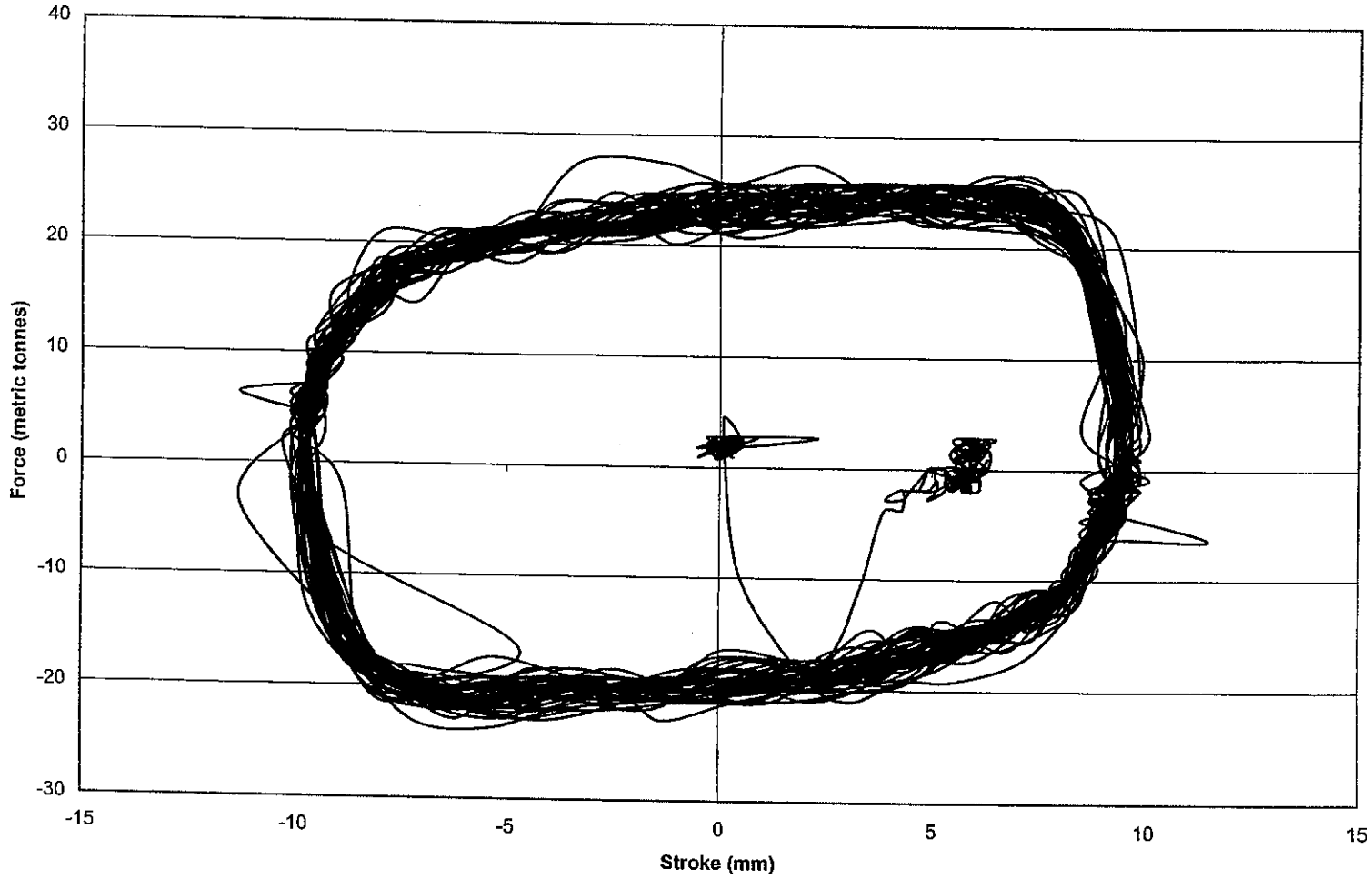
2.4 Durability Test



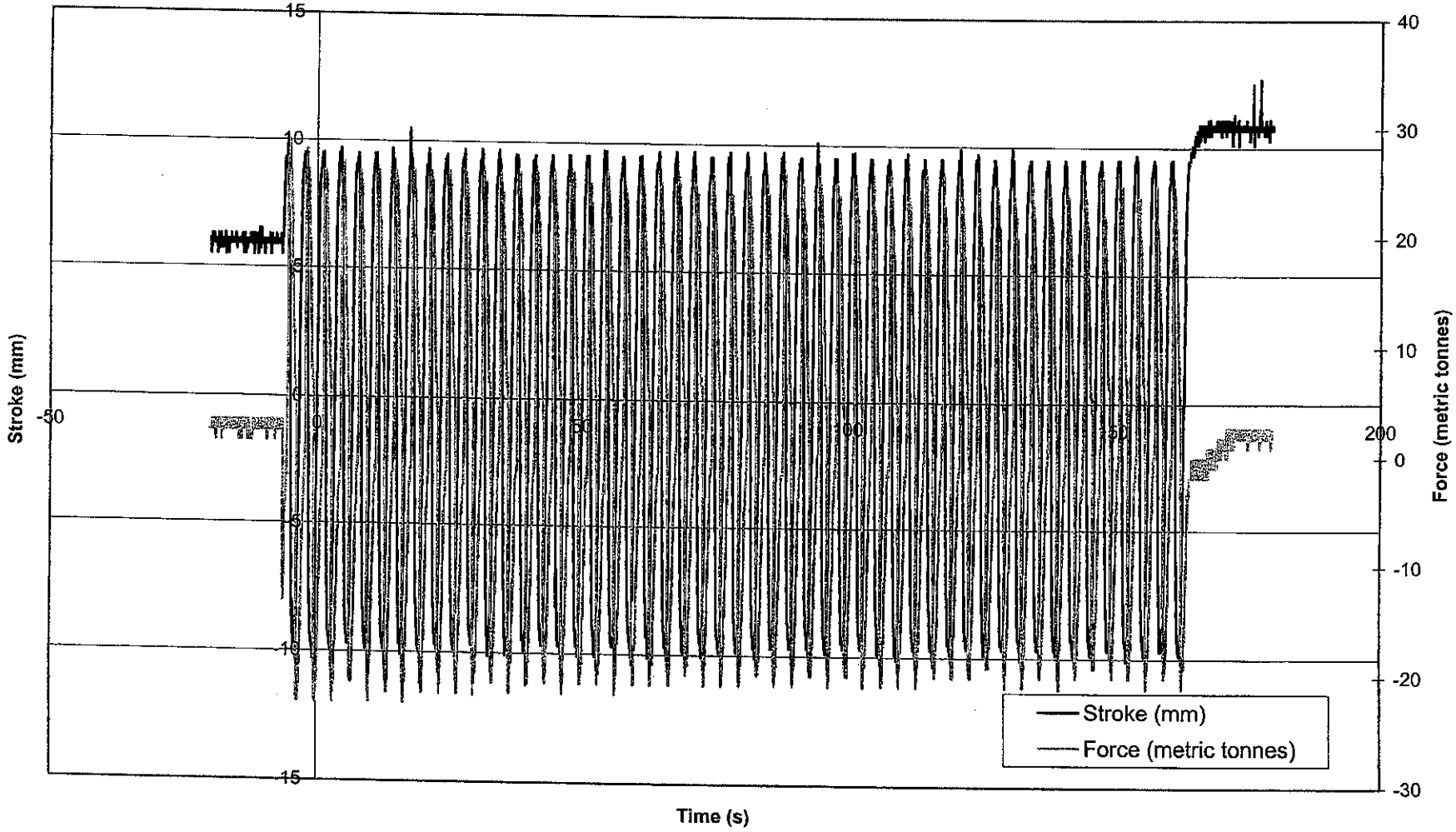
Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
20.0°C, First 50 cycles



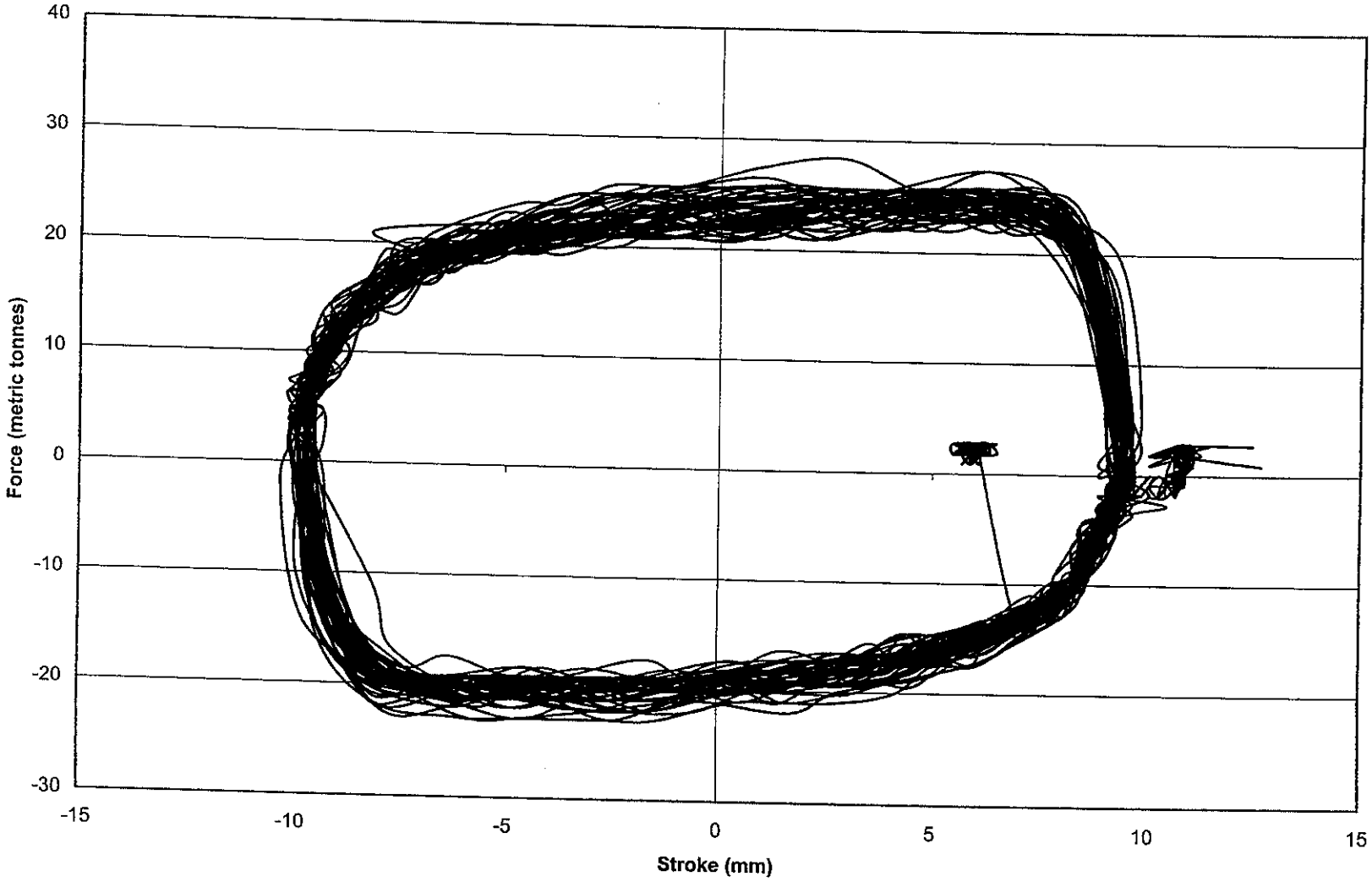
Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
20.0°C, First 50 cycles



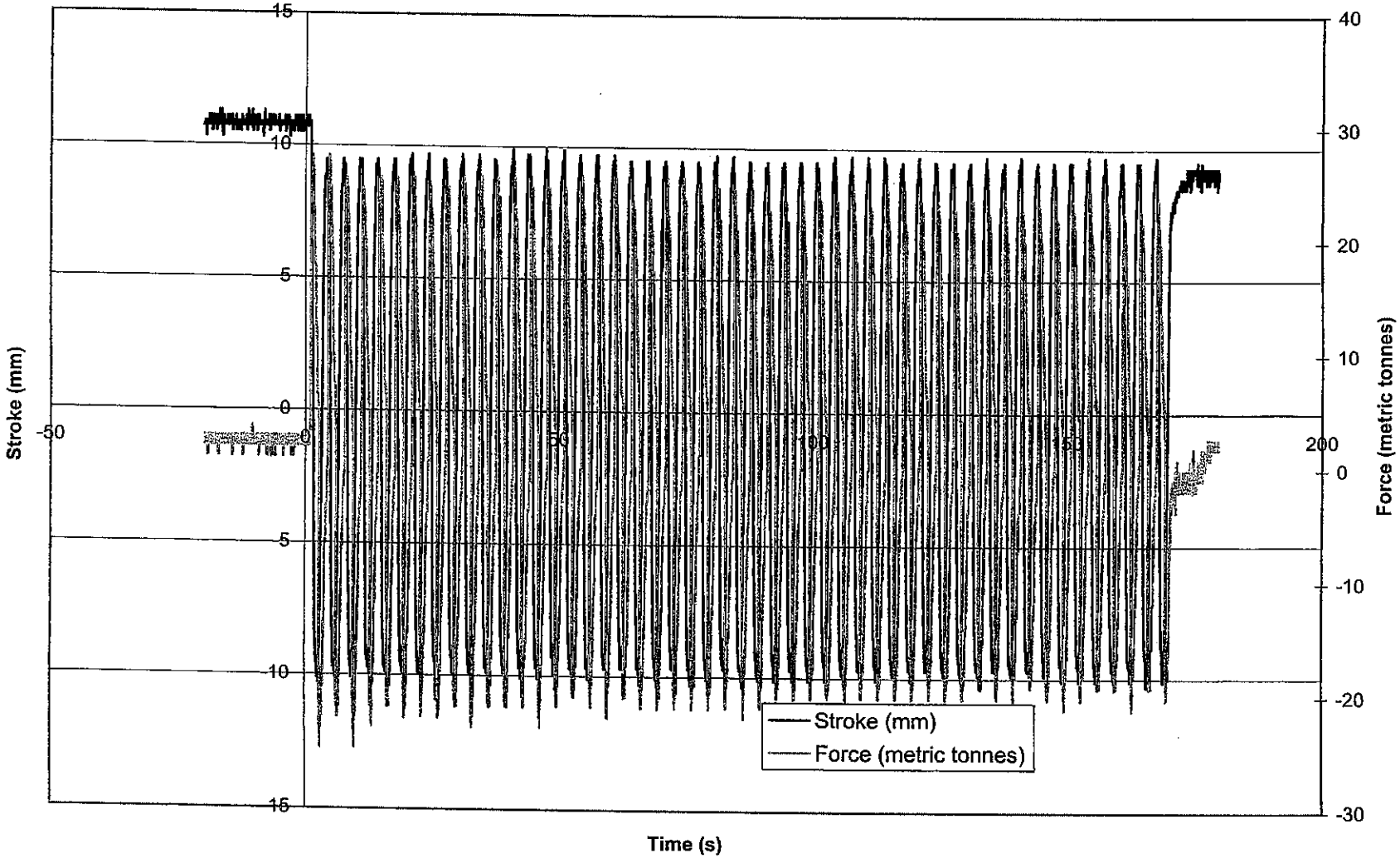
Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
27.9°C, Second 50 cycles



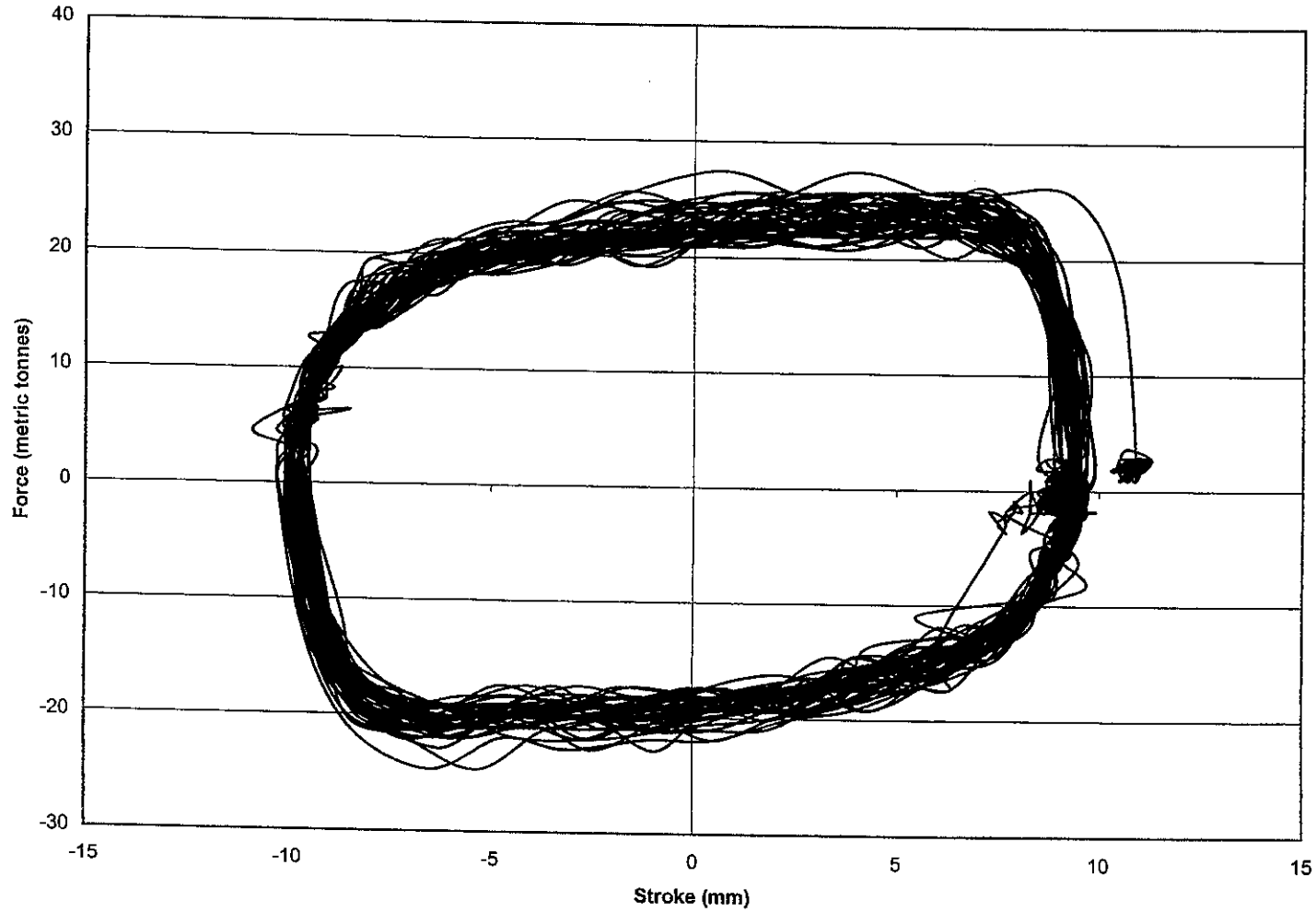
Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
27.9°C, Second 50 cycles



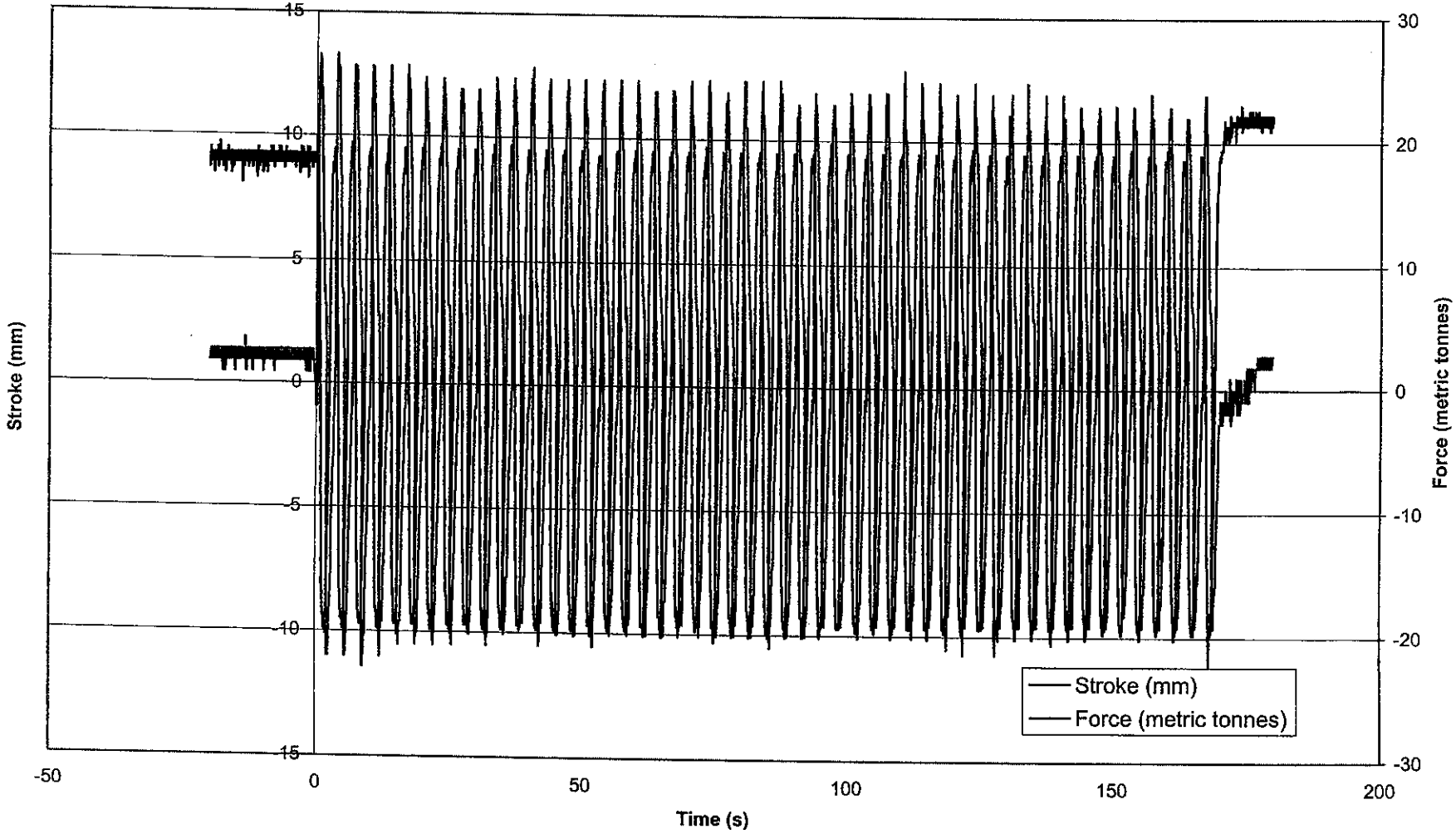
Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
35.2°C, Third 50 cycles



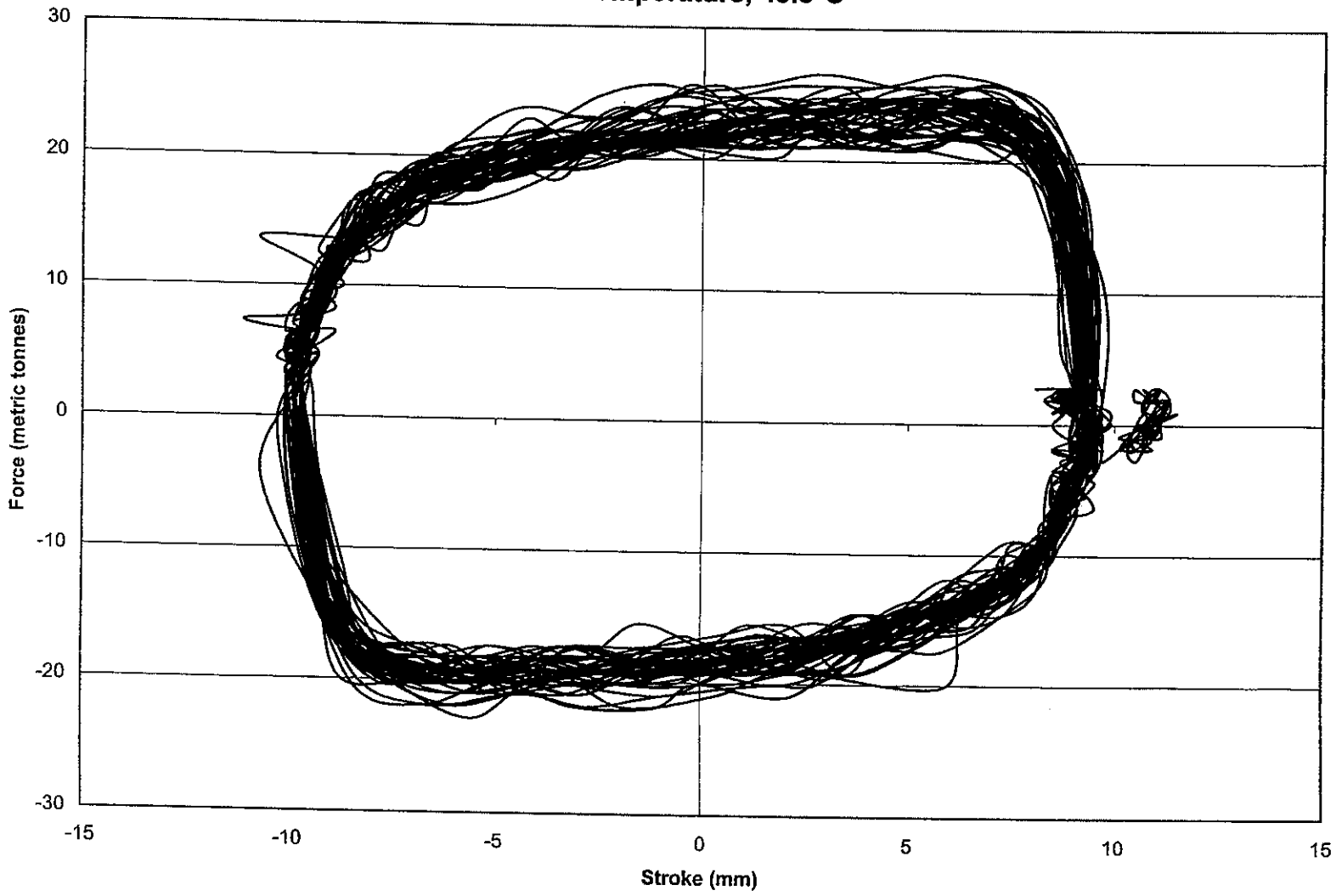
Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
35.2°C, Third 50 cycles



Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
40.2C, Last 50 cycles
Peak Temperature, 48.3°C



Test 2.4: Frequency (Hz) = 0.3
Peak Amplitude (mm) = 10.0
40.2C, Last 50 cycles
Peak Temperature, 48.3°C



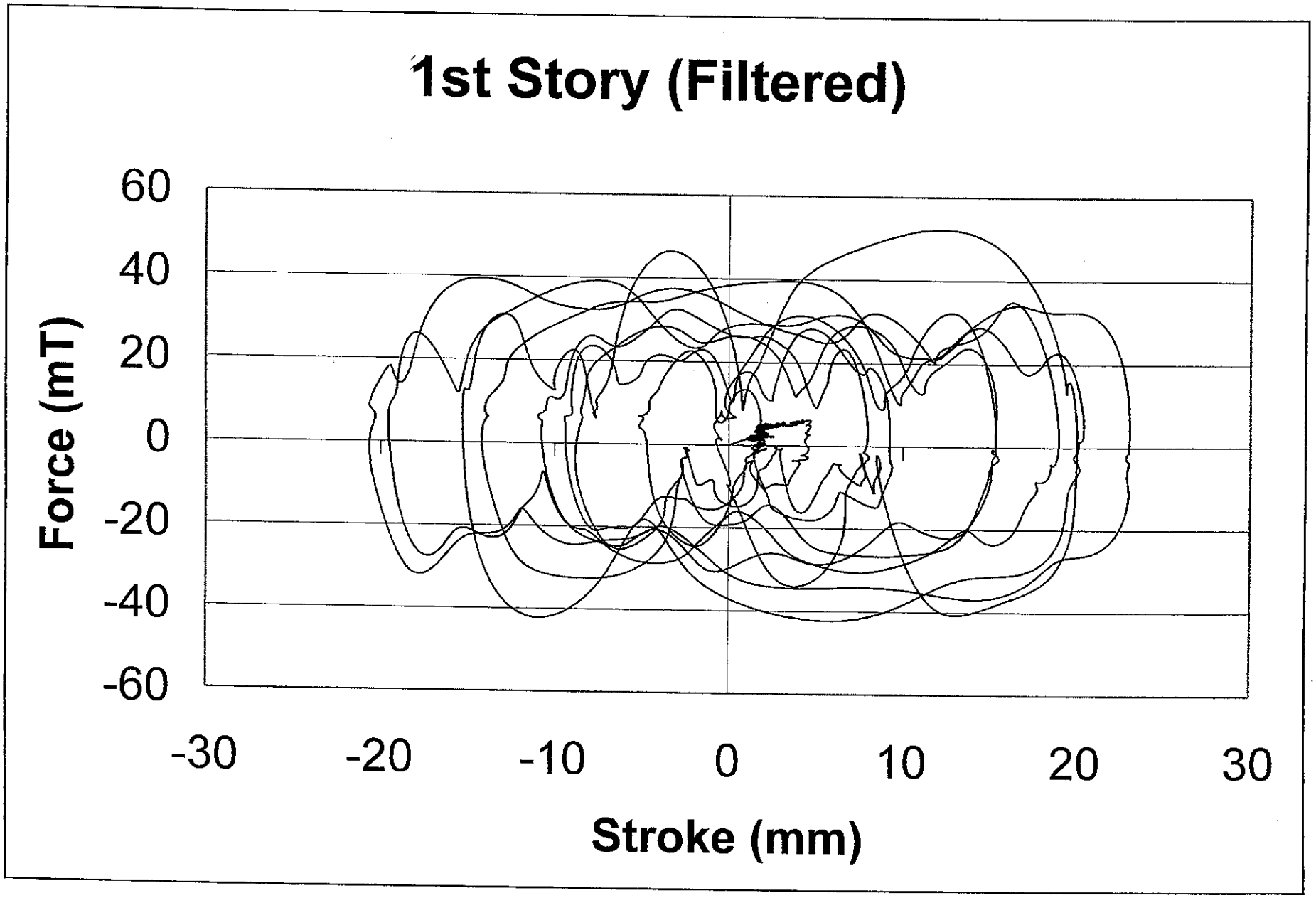
SECTION 2.5

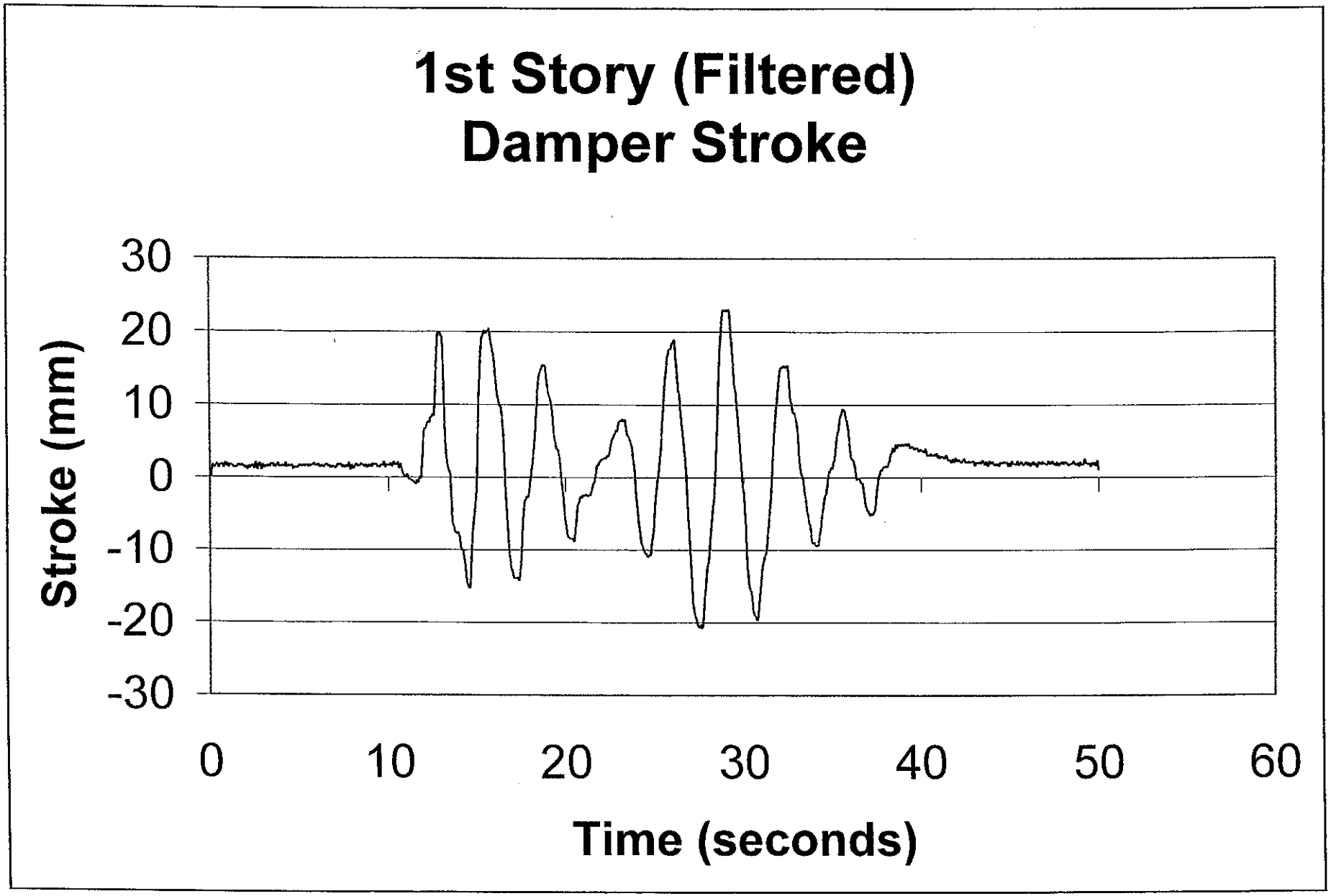
RANDOM VIBRATION TEST

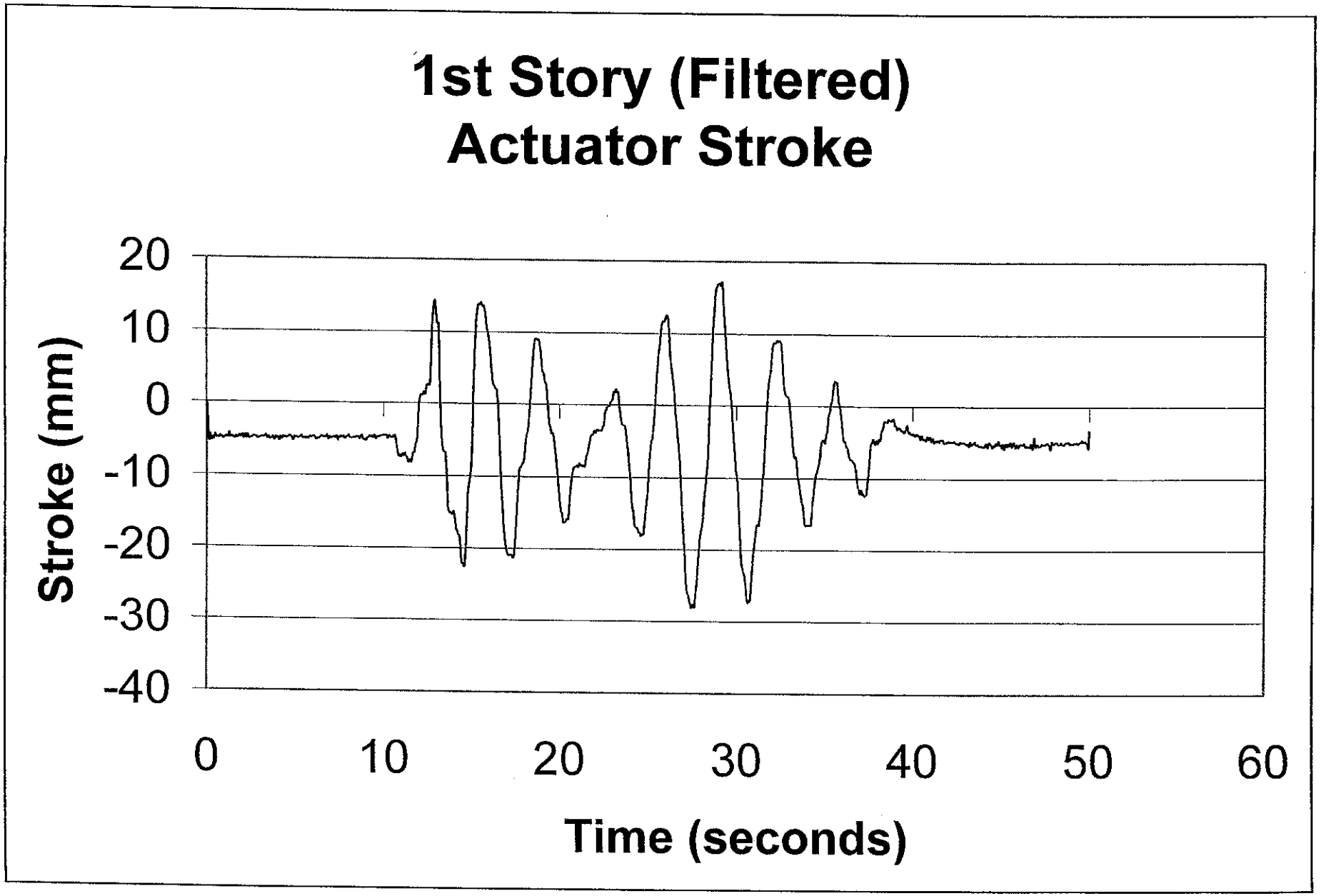
1ST STORY TEST X-DIRECTION

FILTERED DATA

DATA FILE: jst1filt.xls


1st Story (Filtered)
60
40
20
0
-20
-40
-60
Force (mT)
-30
-20
-10
0
10
20
30
Stroke (mm)

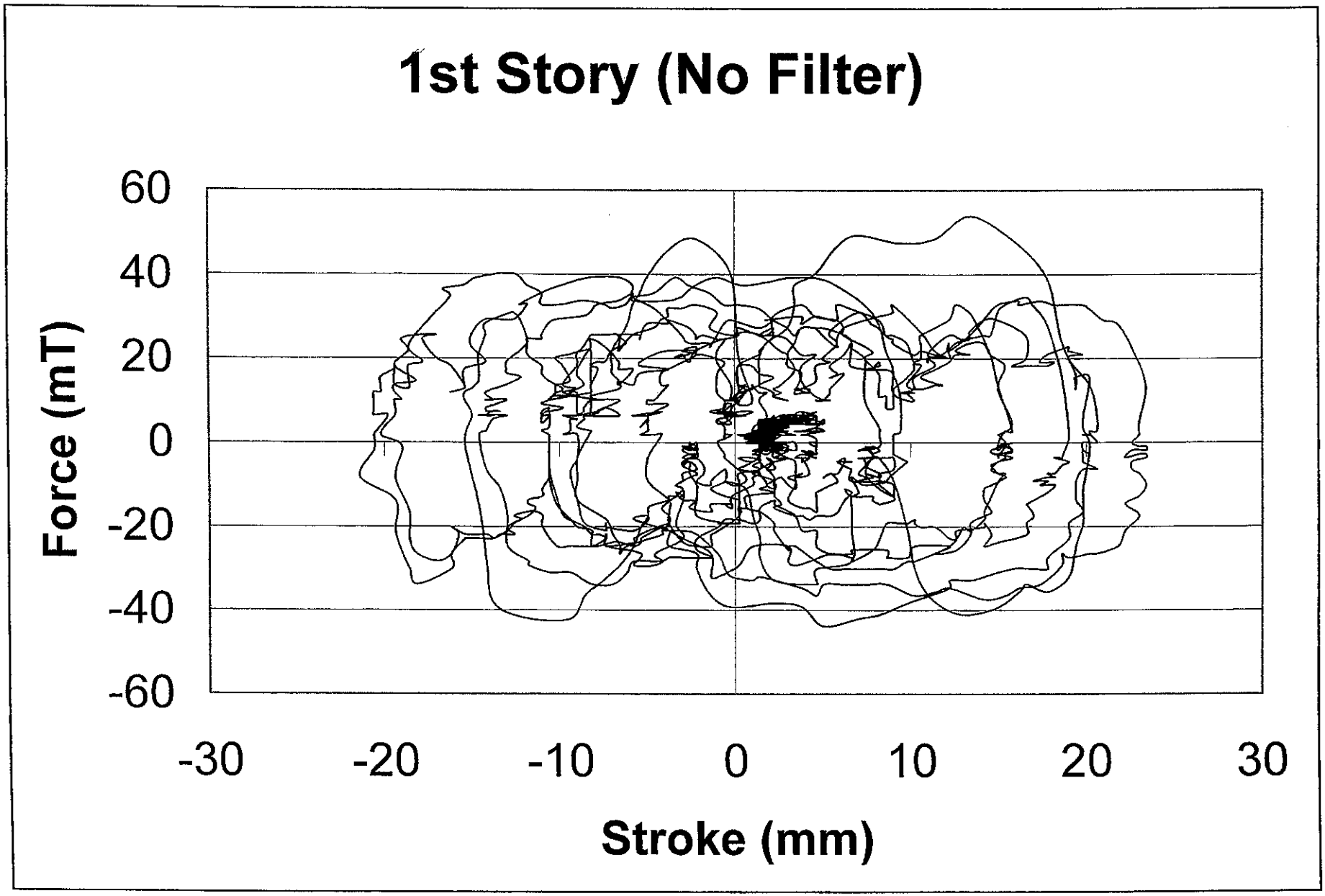

1st Story (Filtered)
Damper Stroke
Stroke (mm)
30
20
10
0
-10
-20
-30
0
10
20
30
40
50
60
Time (seconds)

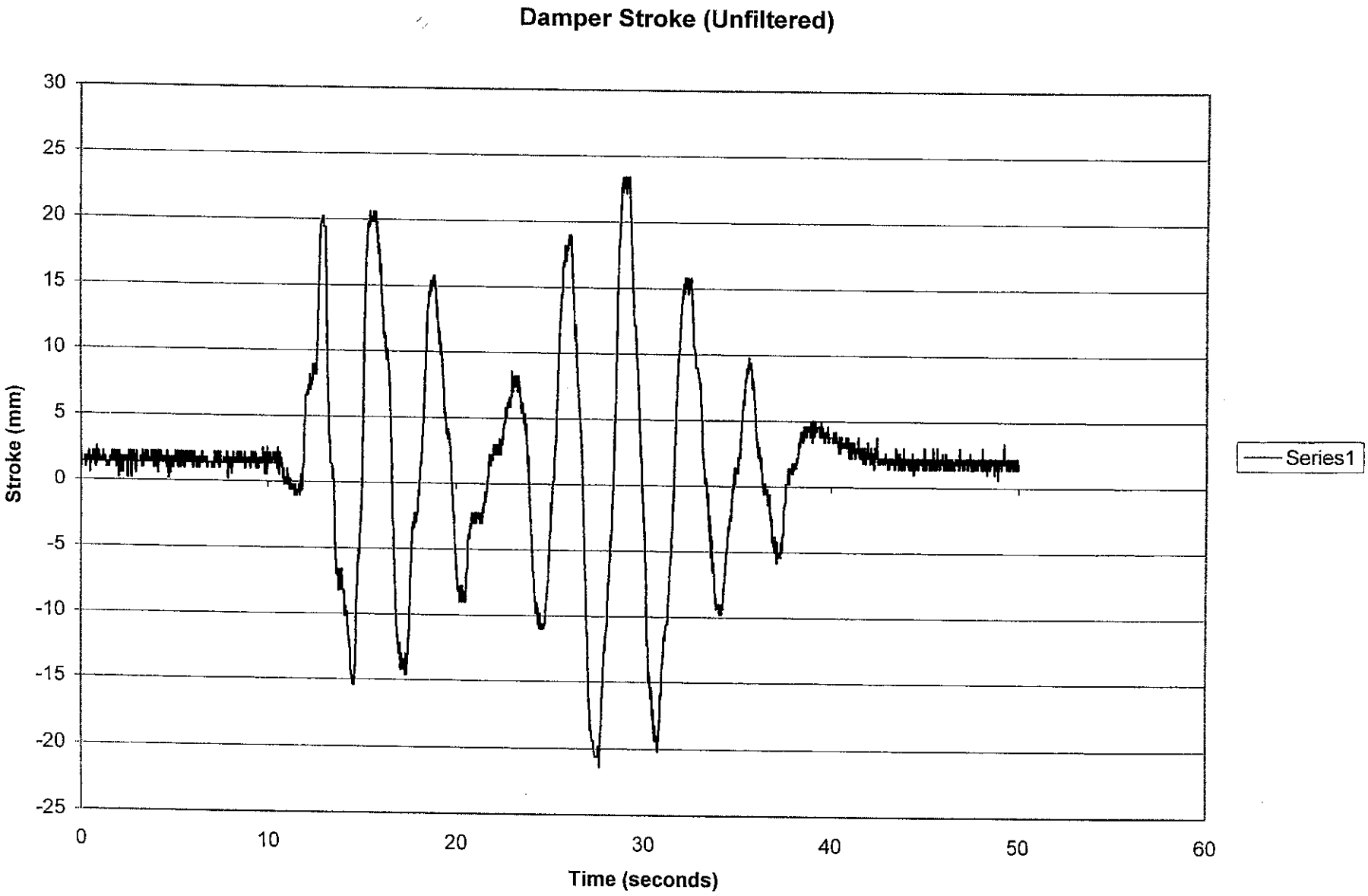

1st Story (Filtered)
Actuator Stroke
Stroke (mm)
20
10
0
-10
-20
-30
-40
0
10
20
30
40
50
60
Time (seconds)

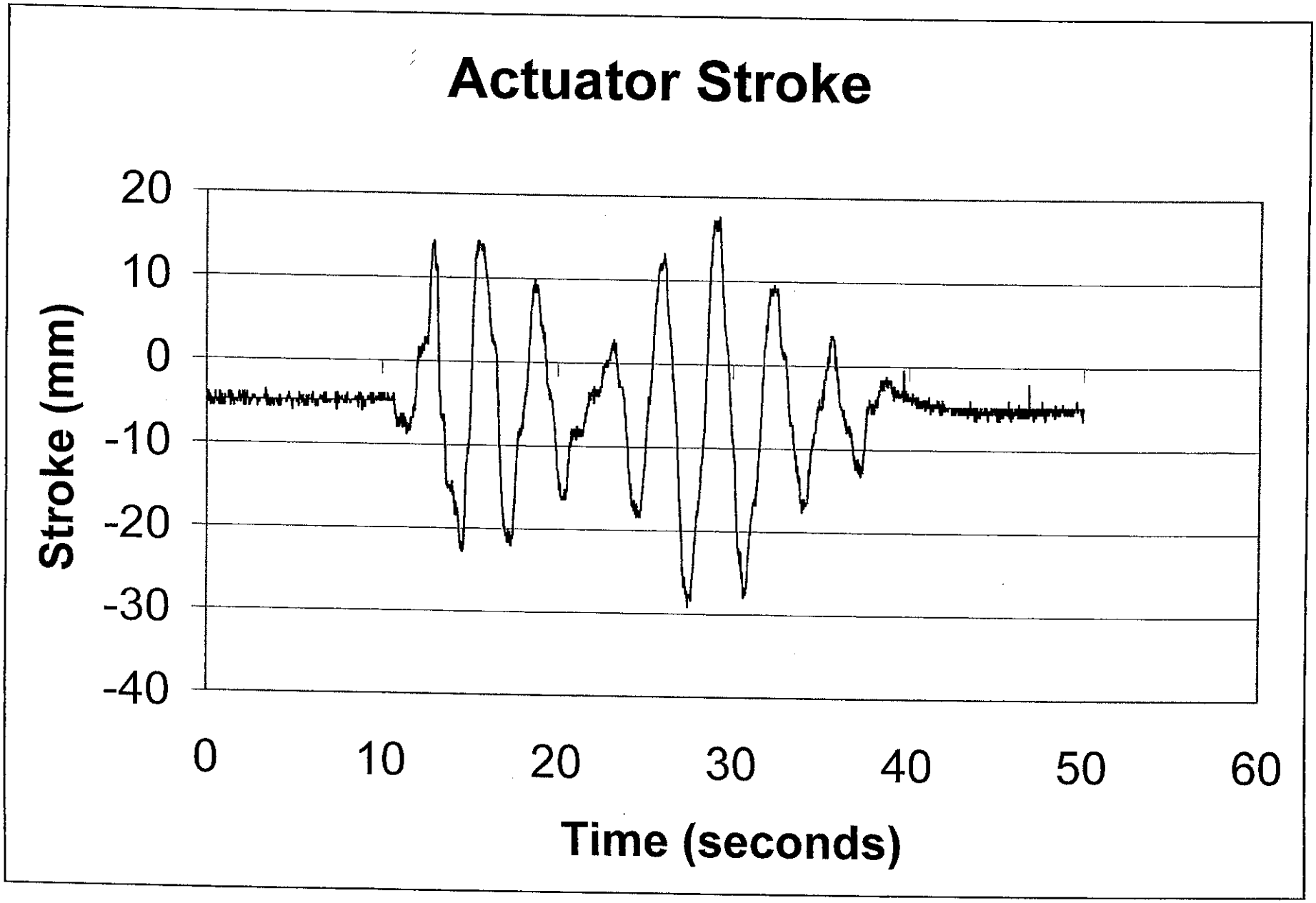
1ST STORY TEST X-DIRECTION

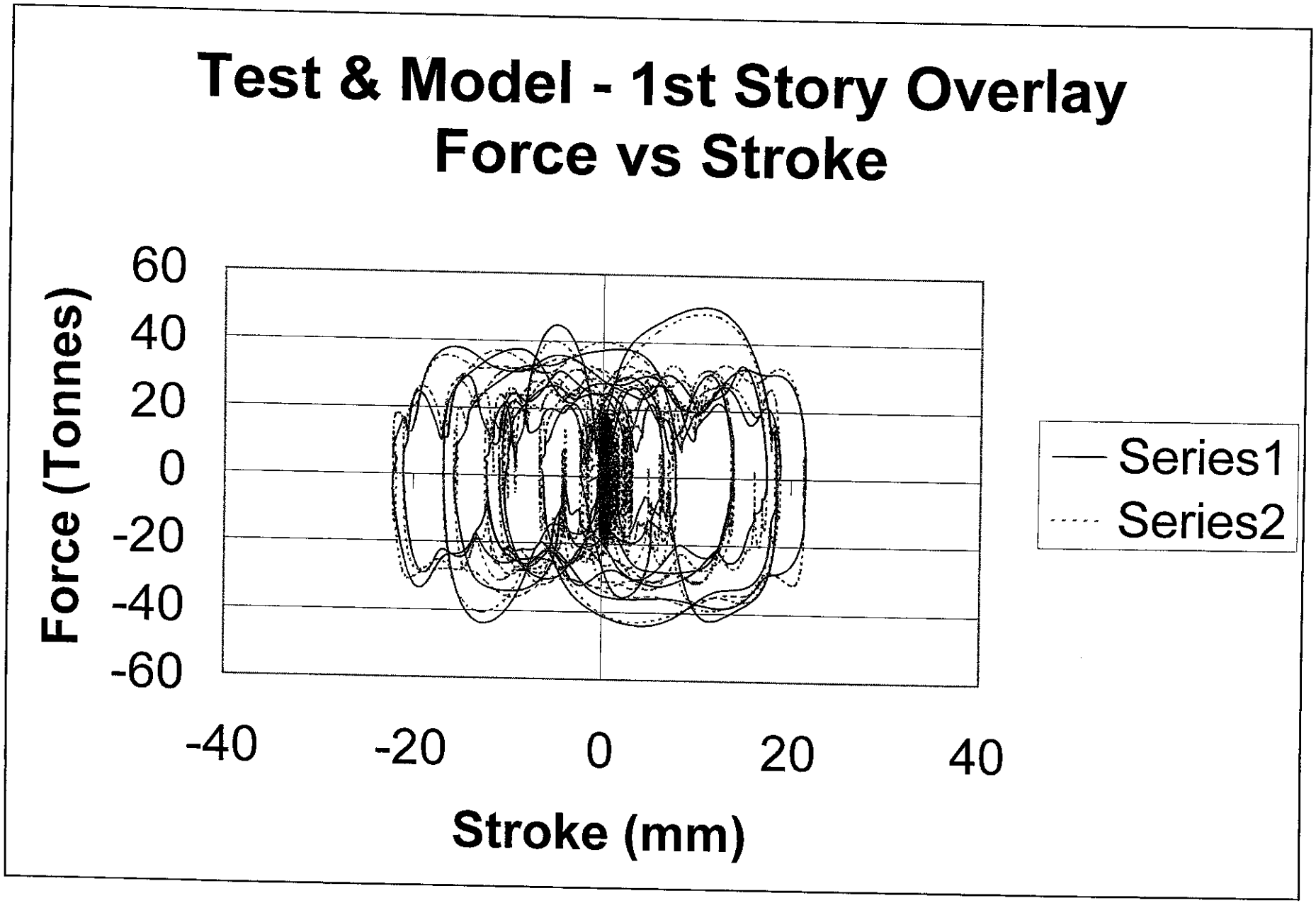
UNFILTERED DATA

DATA FILE: jst1unf.xls


1st Story (No Filter)
60
40
20
0
-20
-40
-60
Force (mT)
-30
-20
-10
0
10
20
30
Stroke (mm)


Damper Stroke (Unfiltered)
Stroke (mm)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
0
10
20
30
40
50
60
Time (seconds)
Series1

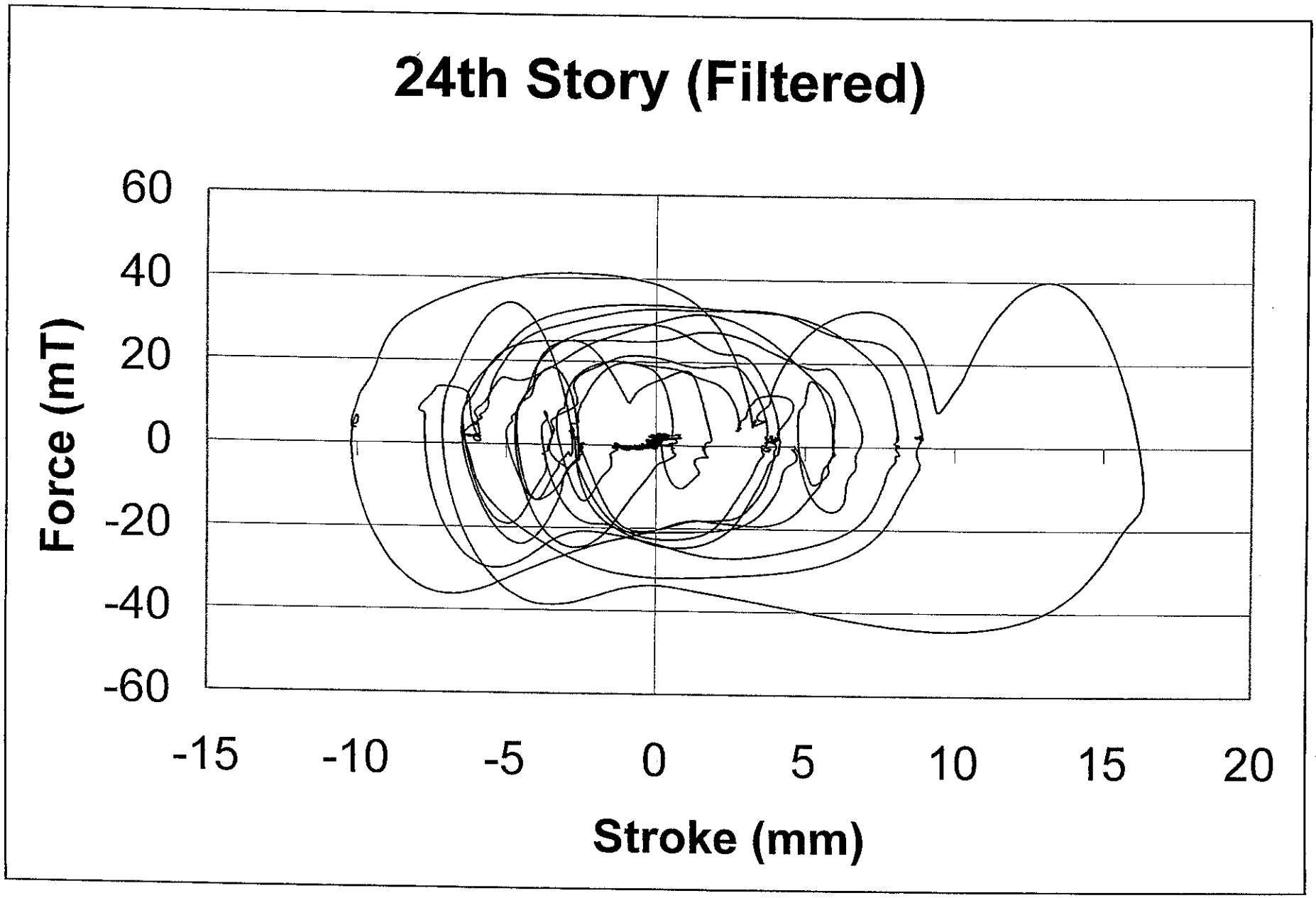

Actuator Stroke
Stroke (mm)
20
10
0
-10
-20
-30
-40
0
10
20
30
40
50
60
Time (seconds)

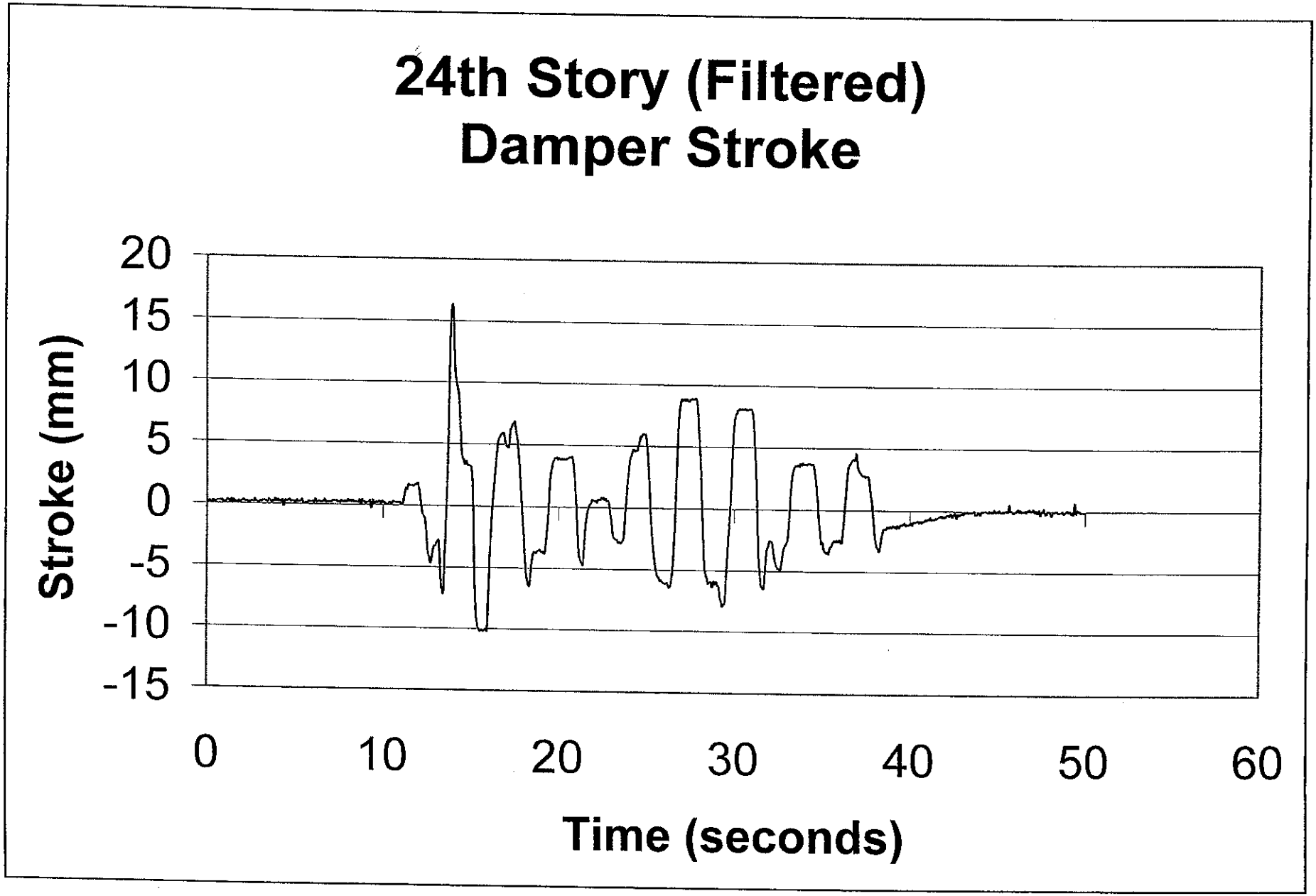

Test & Model - 1st Story Overlay
Force vs Stroke
Force (Tonnes)
60
40
20
0
-20
-40
-60
-40
-20
0
20
40
Stroke (mm)
Series1
Series2

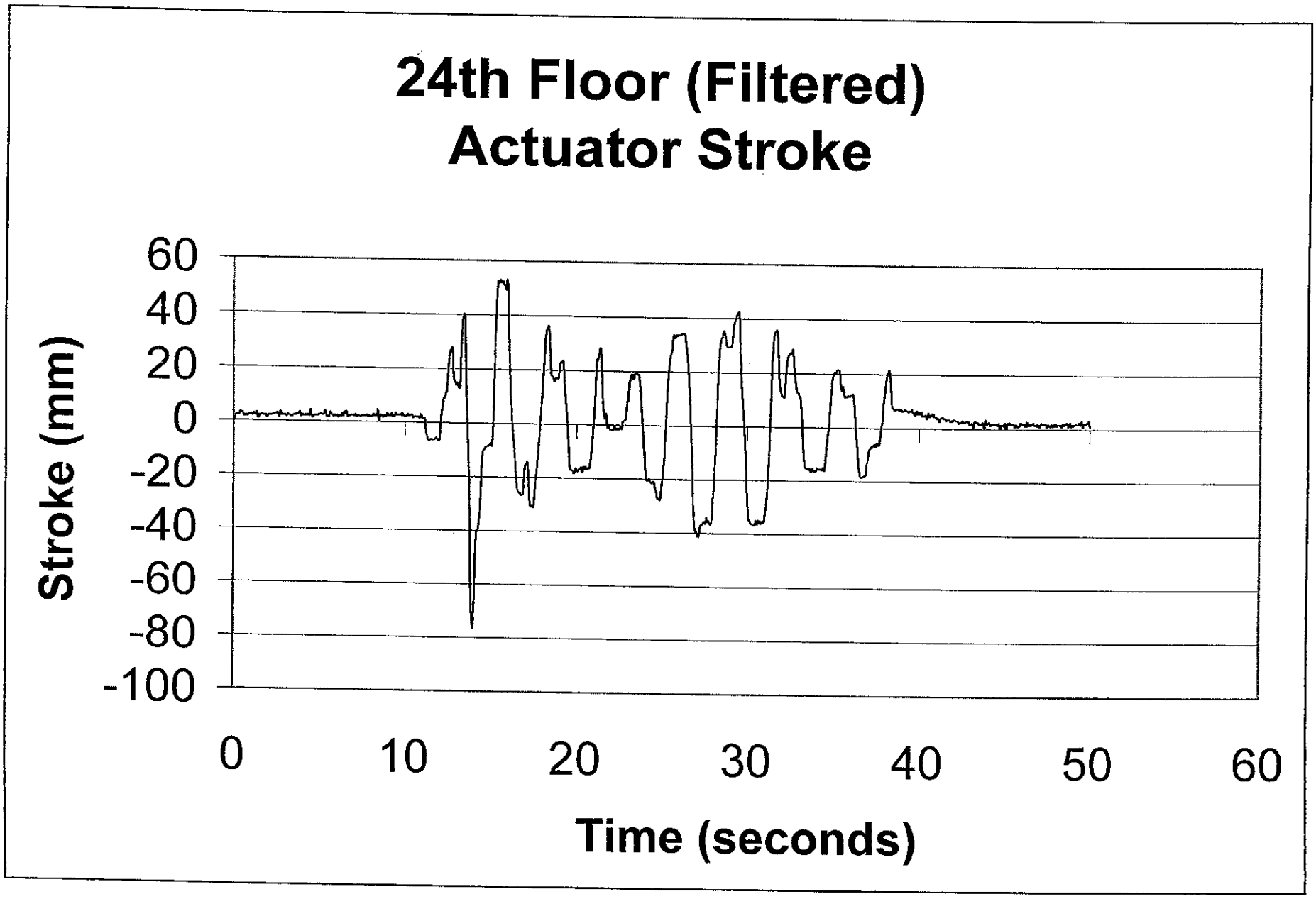
24TH STORY TEST X-DIRECTION

FILTERED DATA

DATA FILE: jst24fil.xls


24th Story (Filtered)
Force (mT)
60
40
20
0
-20
-40
-60
-15
-10
-5
0
5
10
15
20
Stroke (mm)

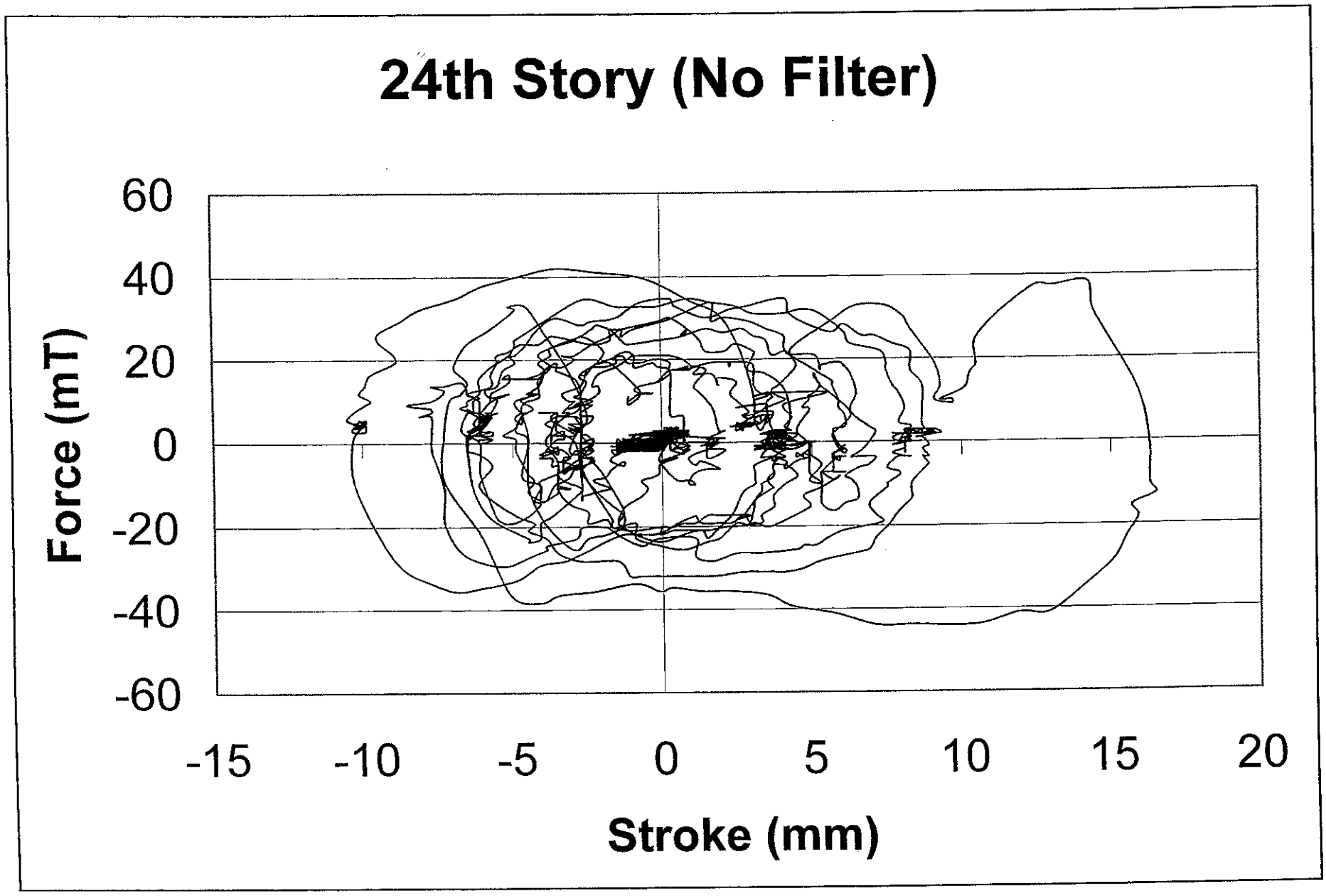

24th Story (Filtered)
Damper Stroke
Stroke (mm)
20
15
10
5
0
-5
-10
-15
0
10
20
30
40
50
60
Time (seconds)

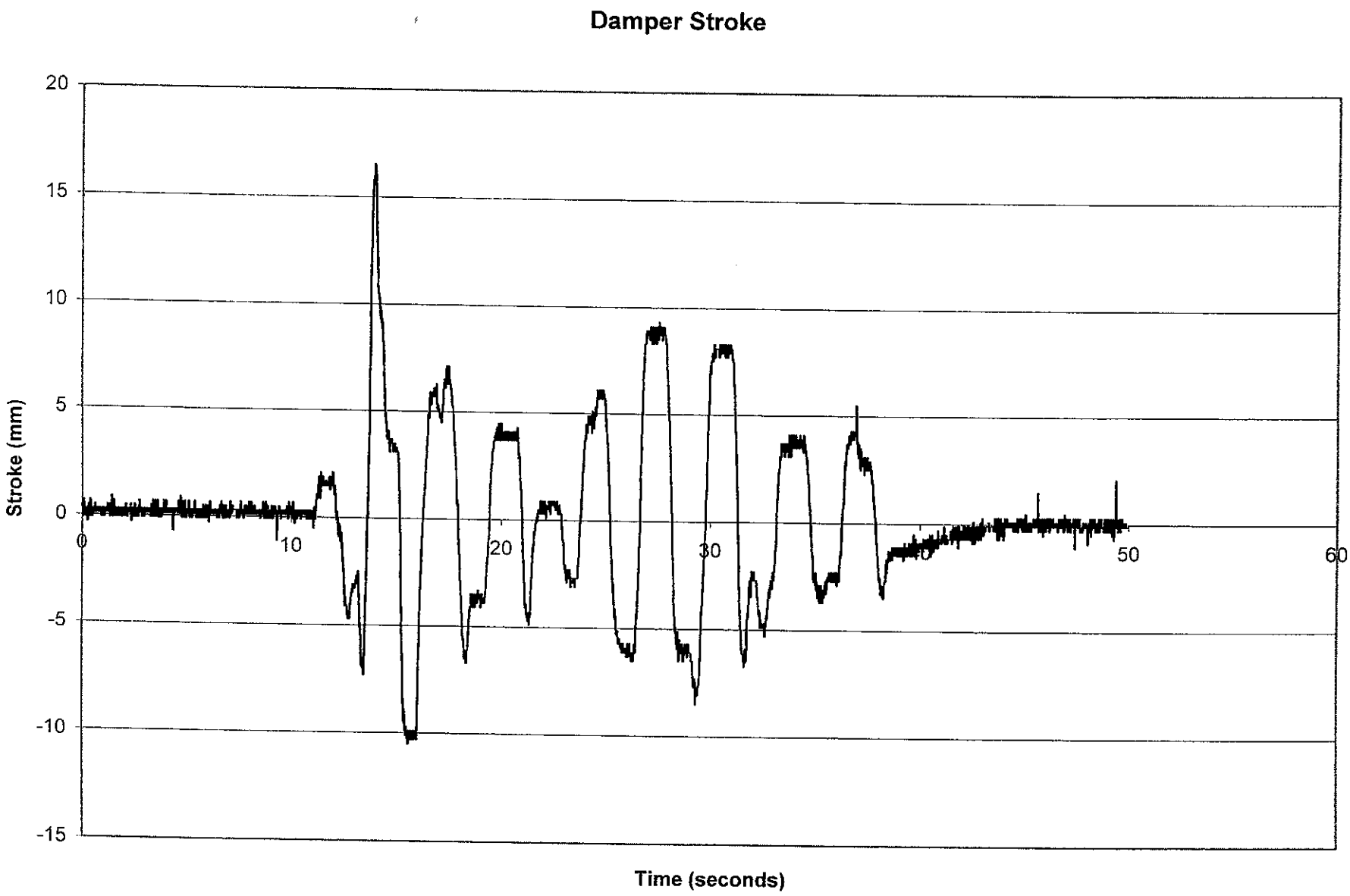

24th Floor (Filtered)
Actuator Stroke
Stroke (mm)
60
40
20
0
-20
-40
-60
-80
-100
0
10
20
30
40
50
60
Time (seconds)

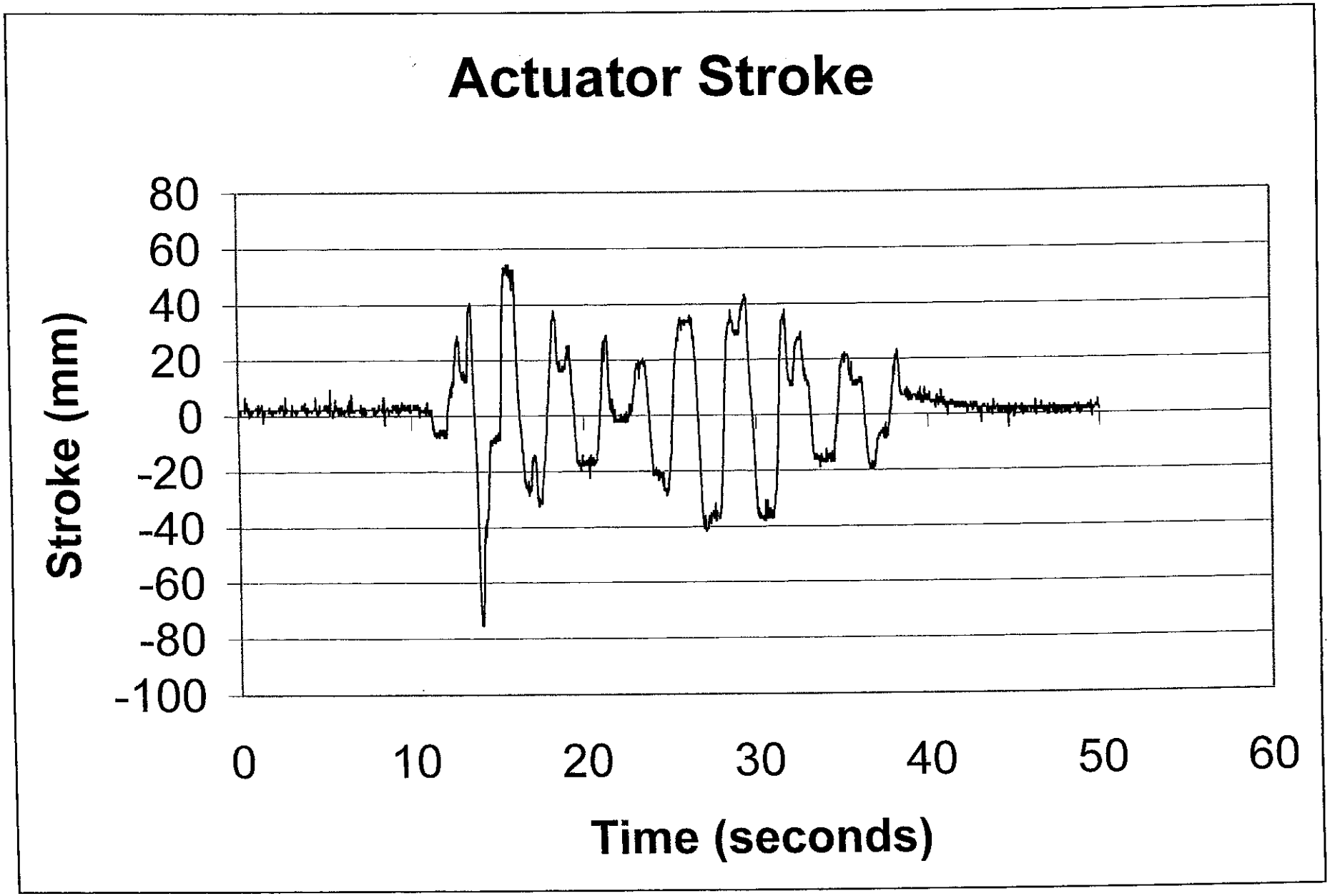
24TH STORY TEST X-DIRECTION

UNFILTERED DATA

DATA FILE: jst24unf.xls


24th Story (No Filter)
Force (mT)
60
40
20
0
-20
-40
-60
-15
-10
-5
0
5
10
15
20
Stroke (mm)


Damper Stroke
Stroke (mm)
20
15
10
5
0
-5
-10
-15
0
10
20
30
40
50
60
Time (seconds)


Actuator Stroke
Stroke (mm)
80
60
40
20
0
-20
-40
-60
-80
-100
0
10
20
30
40
50
60
Time (seconds)

CALIBRATION

CERTIFICATES

Taylor Devices, Inc.

DATE: 02-14-00 **PART NUMBER:** N/A

JOB NUMBER: N/A **CUSTOMER:** J-Project

The following equipment has been calibrated to comply wih ISO 10012-1, ANSI/NCSL Z540-1, and MIL-STD-45662A as required by contract.

Equipment	Trace Number	Date Calibrated	Date Due	Remarks
* GAGE BLOCK	TDM-34	07-23-99	07-23-00	
* OSCILLSCOPE	TD-336	02-24-99	02-24-00	
* OSCILLSCOPE	TD-349	08-30-99	08-30-00	
* CHART RECORDER	TD-372	11-02-99	05-02-00	WITH K- THERMOCOUPLE PROBE
* THERMOMETER	TD-415	02-01-00	02-01-01	K-Type
* LOAD CELL	TD-424	04-08-99	04-08-00	
*				
*				
*				
*				
*				
*				
*				
*				
*				

Test Engineer: ERIC ROTH

NORTHEAST METROLOGY C .P.
ISO 9002 CERTIFIED
77 DINGENS STREET
BUFFALO, NY 14206-2307
Phone: 716-827-3770

TDM 34

Calibration Certificate

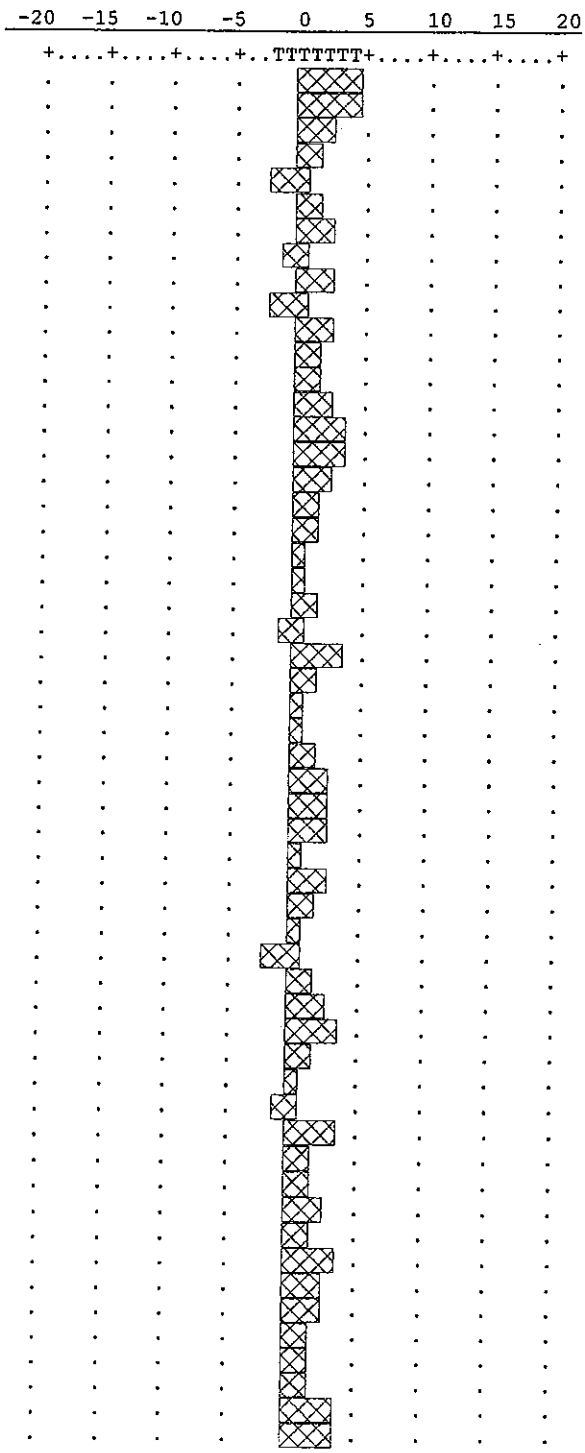
Company:	TAYLOR DEVICES INC.	**Cert #:**	5841
Address:	90 TAYLOR DRIVE PO BOX 748 NORTH TONAWANDA, NY 14120-0748	**Date:**	7/23/1999
		PO#:	P009977
Contact:	JANICE JAMIESON:(694-0800)	**Page:**	1
Dept:	PURCHASING		

Gage/Proc:	Gage Block(s) English	**Control:**	TDM-34
Mfg:	Webber - Croblox	**Model:**	Square - Grade 2
Location:	QC	**Serial #:**	TDM-34

+ / - Tolerances: +0.000004 / -0.000002
Graph Scale: +0.000001

Gage Blocks 0-1"

Nominal	Actual	Deviation	ID #
+0.050000	+0.050004	+0.000004	
+0.100000	+0.100004	+0.000004	
+0.100100	+0.100102	+0.000002	
+0.100200	+0.100201	+0.000001	
+0.100300	+0.100298	-0.000002	
+0.100400	+0.100401	+0.000001	
+0.100500	+0.100502	+0.000002	
+0.100600	+0.100599	-0.000001	
+0.100700	+0.100702	+0.000002	
+0.100800	+0.100798	-0.000002	
+0.100900	+0.100902	+0.000002	
+0.101000	+0.101001	+0.000001	
+0.102000	+0.102001	+0.000001	
+0.103000	+0.103002	+0.000002	
+0.104000	+0.104003	+0.000003	
+0.105000	+0.105003	+0.000003	
+0.106000	+0.106002	+0.000002	
+0.107000	+0.107001	+0.000001	
+0.108000	+0.108001	+0.000001	
+0.109000	+0.109000	+0.000000	
+0.110000	+0.110000	+0.000000	
+0.111000	+0.111001	+0.000001	
+0.112000	+0.111999	-0.000001	
+0.113000	+0.113003	+0.000003	
+0.114000	+0.114001	+0.000001	
+0.115000	+0.115000	+0.000000	
+0.116000	+0.116000	+0.000000	
+0.117000	+0.117001	+0.000001	
+0.118000	+0.118002	+0.000002	
+0.119000	+0.119002	+0.000002	
+0.120000	+0.120002	+0.000002	
+0.121000	+0.121000	+0.000000	
+0.122000	+0.122002	+0.000002	
+0.123000	+0.123001	+0.000001	
+0.124000	+0.124000	+0.000000	
+0.125000	+0.124998	-0.000002	
+0.126000	+0.126001	+0.000001	
+0.127000	+0.127002	+0.000002	
+0.128000	+0.128003	+0.000003	
+0.129000	+0.129001	+0.000001	
+0.130000	+0.130000	+0.000000	
+0.131000	+0.130999	-0.000001	
+0.132000	+0.132003	+0.000003	
+0.133000	+0.133001	+0.000001	
+0.134000	+0.134001	+0.000001	
+0.135000	+0.135002	+0.000002	
+0.136000	+0.136001	+0.000001	
+0.137000	+0.137003	+0.000003	
+0.138000	+0.138002	+0.000002	
+0.139000	+0.139002	+0.000002	
+0.140000	+0.140001	+0.000001	
+0.141000	+0.141001	+0.000001	
+0.142000	+0.142001	+0.000001	
+0.143000	+0.143003	+0.000003	
+0.144000	+0.144003	+0.000003	



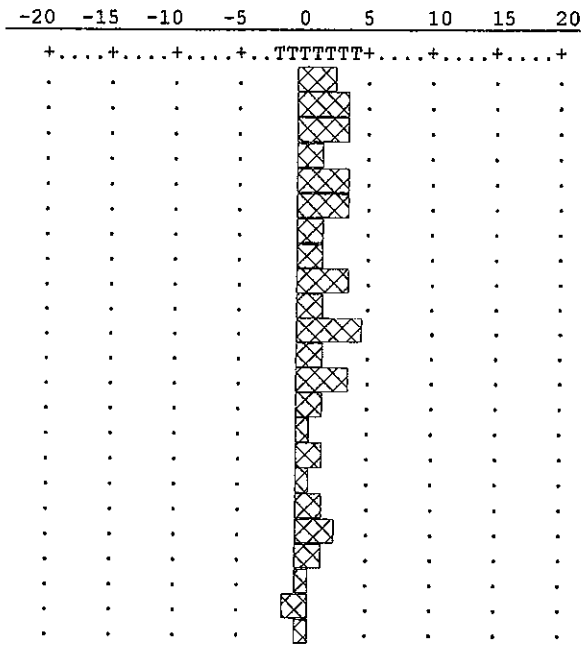
NORTHEAST METROLOGY C .P.
ISO 9002 CERTIFIED
77 DINGENS STREET
BUFFALO, NY 14206-2307
Phone: 716-827-3770

Calibration Certificate

Page #:	2	**Cert #:**	5841
Gage/Proc:	Gage Block(s) English	**Control:**	TDM-34
Mfg:	Webber - Croblox	**Model:**	Square - Grade 2
Location:	QC	**Serial #:**	TDM-34

Gage Blocks 0-1"

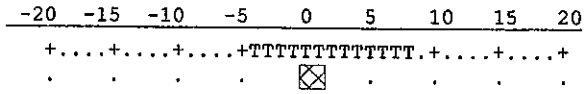
Nominal	Actual	Deviation
+0.145000	+0.145002	+0.000002
+0.146000	+0.146003	+0.000003
+0.147000	+0.147003	+0.000003
+0.148000	+0.148001	+0.000001
+0.149000	+0.149003	+0.000003
+0.150000	+0.150003	+0.000003
+0.200000	+0.200001	+0.000001
+0.250000	+0.250001	+0.000001
+0.300000	+0.300003	+0.000003
+0.350000	+0.350001	+0.000001
+0.400000	+0.400004	+0.000004
+0.450000	+0.450001	+0.000001
+0.500000	+0.500003	+0.000003
+0.550000	+0.550001	+0.000001
+0.600000	+0.600000	+0.000000
+0.650000	+0.650001	+0.000001
+0.700000	+0.700000	+0.000000
+0.750000	+0.750001	+0.000001
+0.800000	+0.800002	+0.000002
+0.850000	+0.850001	+0.000001
+0.900000	+0.900000	+0.000000
+0.950000	+0.949999	-0.000001
+1.000000	+1.000000	+0.000000



+ / - Tolerances: +0.000008 / -0.000004
Graph Scale: +0.000001

Gage Block 2"

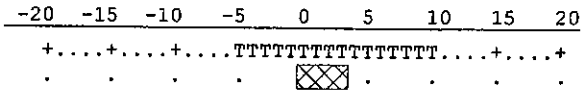
Nominal	Actual	Deviation	ID #
+2.000000	+2.000001	+0.000001	



+ / - Tolerances: +0.000010 / -0.000005
Graph Scale: +0.000001

Gage Block 3"

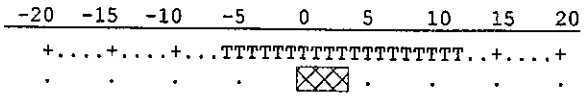
Nominal	Actual	Deviation	ID #
+3.000000	+3.000003	+0.000003	



+ / - Tolerances: +0.000012 / -0.000006
Graph Scale: +0.000001

Gage Block 4"

Nominal	Actual	Deviation	ID #
+4.000000	+4.000003	+0.000003	



Comments:

3.000 & 4.000" GAGE BLOCKS ARE NEW REPLACEMENTS (9/18/99).
Old P.O. #P009805

MISC. GAGE BLOCKS

Nominal	Actual
.500 JAW #1	5.000003
.500 JAW #2	5.000009

We certify the equipment used for this calibration is traceable to NIST through one or more of the following numbers:
NEM-7002: Working Master Gage Block Set 821/258488-97 Last / Next Cal Dates:3/17/1999 --> 3/17/2000

BUFFALO, NY 14206-2307
Phone: 716-827-3770

Page #:	3	**Cert #:**	5841
Gage/Proc:	Gage Block(s) English	**Control:**	TDM-34
Mfg:	Webber - Croblox	**Model:**	Square - Grade 2
Location:	QC	**Serial #:**	TDM-34

Gage Status: PASS

Next Calibration Due: 7/23/2000

Certified By: Norm Izirer Signature: Norm Izirer

This certificate is not valid unless all 3 page(s) are present.
READINGS ARE AS FOUND UNLESS OTHERWISE DENOTED IN COMMENTS.
Calibration performed in accordance with ISO/IEC Guide 25, ISO-9002, ISO 10012-1& NCSL Z540-1.
Gage Blocks meet or exceed Federal Specifications for the grade and accuracy applicable to these items in accordance with Federal Specification GGG-G-15C.
Calibration meets or exceeds 4 : 1 ratio, with the exception of gage blocks stated above.
Note the recording of false, fictitious or fraudulent statements or entries on this document may be punished as a felony under federal statutes.

TEKTRONIX INC DC
DC Service Depot
700 Professional Drive
Suite A
Gaithersburg, MD 20879
301-948-6316
301-926-4329 Fax

TD 336

Certificate of Traceable Calibration

Certificate #: 130756-1-THS720-B023051-1

PO#/Contract#: P8681

Customer: TAYLOR DEVICES INC
90 TAYLOR DRIVE
NORTH TONAWANDA, NY 14120
United States

Contact: JANICE .

Model: THS720

Description: OSCILLSCOPE; TEKSCOPE, HANDHELD, BATTERYPOWERED SCOPE WITH D

Manufacturer: TEKTRONIX, INC.

Serial: B023051

Asset: -

Site of Calibration: SERVICE CENTER

Cal Date: 24-Feb-1999

Due Date: 24-Feb-2000

Temperature: 72 °F

Humidity: 34 %

Calibration Interval Source: TEKTRONIX RECOMMENDED

Calibration Interval: 365 DAYS

Customer's Equipment Location: -

Tektronix certifies that the performance of the above instrument has been verified using test equipment of known accuracy which are traceable to the U.S. National Institute of Standards and Technology (NIST). The policies and procedures at this facility are based on ANSI/NCSL Z540-1-1994 (ISO Guide 25). This certificate shall not be reproduced except in full, without the written approval of the calibration facility.

INSTRUMENT CONDITION:

Received: IN TOLERANCE

Returned: IN TOLERANCE

Certificate of Traceable Calibration

Certificate #: 130756-1-THS720-B023051-1

CALIBRATION PROCEDURE:

SCOPECAL SYSTEM SOFTWARE - MANUFACTURERS SPECIFICATIONS
PROCEDURE REVISION LEVEL : V5.30

CALIBRATION EQUIPMENT USED:

Model Type	Serial Number	Manufacturer	Cal Date	Due Date
CG5011	B010328	TEKTRONIX, INC.	08-May-1998	08-May-1999
DC5010	B052632	TEKTRONIX, INC.	28-May-1998	28-May-1999
DM5110	H700473	TEKTRONIX, INC.	24-Sep-1998	24-Sep-1999
8200	92109888	DATA PRECISION	20-Nov-1998	20-May-1999
FG5010	B053078	TEKTRONIX, INC.	28-May-1998	28-May-1999
PG509	B000039	TEKTRONIX, INC.	03-Aug-1998	03-Aug-1999
SG5030	B010187	TEKTRONIX, INC.	16-Sep-1998	16-Sep-1999

Issued By: Joe E Haller III

Service Manager: BARRY FLEMING

Calibrated By: JOE HALLER

Date Issued: 24-Feb-1999

Date Printed: 24-Feb-1999

ISO 9001 Registered, KEMA certificate number 10001.10

TEKTRONIX INC DC
DC Service Depot
700 Professional Drive
Suite A
Gaithersburg, MD 20879
1-800-833-9200
301-926-4329 Fax

TD 349

Certificate of Traceable Calibration

Certificate #:	181877-1-THS720-B035533-1
PO#/Contract#:	P10126
Customer:	TAYLOR DEVICES INC 90 TAYLOR DRIVE NORTH TONAWANDA, NY 14120 United States

Contact:	JANICE JAMIESON		
Model:	THS720		
Description:	OSCILLSCOPE; TEKSCOPE, HANDHELD, BATTERYPOWERED SCOPE WITH D		
Manufacturer:	TEKTRONIX, INC.	Cal Date:	30-Aug-1999
Serial:	B035533	Due Date:	30-Aug-2000
Asset:	TD349	Temperature:	70 °F
Site of Calibration:	SERVICE CENTER	Humidity:	50 %
Calibration Interval Source:	TEKTRONIX RECOMMENDED	Calibration Interval:	366 DAYS
Customer's Equipment Location:	-		

Tektronix certifies that the performance of the above instrument has been verified using test equipment of known accuracy which are traceable to the U.S. National Institute of Standards and Technology (NIST). The policies and procedures at this facility are based on ANSI/NCSL Z540-1-1994 (ISO Guide 25). This certificate shall not be reproduced except in full, without the written approval of the calibration facility.

INSTRUMENT CONDITION:

Received:	IN TOLERANCE
Returned:	IN TOLERANCE

Certificate of Traceable Calibration

Certificate #: 181877-1-THS720-B035533-1

CALIBRATION PROCEDURE:

SCOPECAL SYSTEM SOFTWARE - MANUFACTURER'S SPECIFICATION
PROCEDURE REVISION LEVEL : V5.50

CALIBRATION EQUIPMENT USED:

Model Type	Serial Number	Manufacturer	Cal Date	Due Date
CG5011	B010328	TEKTRONIX, INC.	08-May-1998	08-Nov-1999
DM5110	H700473	TEKTRONIX, INC.	24-Sep-1998	24-Sep-1999
8200	92109888	DATA PRECISION	25-Mar-1999	25-Sep-1999
FG5010	B053078	TEKTRONIX, INC.	28-May-1998	28-Nov-1999
5700A	5080010	FLUKE	04-May-1999	04-May-2000
6061A	5375304	FLUKE	14-Jul-1999	14-Jan-2001
PG509	B000039	TEKTRONIX, INC.	05-Aug-1999	05-Aug-2000

Issued By: Joe R Haller III

Service Manager: BARRY FLEMING

Calibrated By: RONNIE MOLINA

Date Issued: 30-Aug-1999

Date Printed: 30-Aug-1999

TD 392

Certificate of Instrument Calibration and Testing

Customer Instrument

Dickson Model Number: KTx

Serial Number: 7213534

Calibration Technician: Kitty McReynolds

Calibration Date: 11/02/1999

Calibration Procedure

The customer instrument was compared to the calibration standard. Drifts and faults were determined, and any necessary mechanical or electronic adjustments were taken. The Dickson calibration system conforms to the requirements of MIL-STD-45662A, ANSI/NCSL Z540-1-1994, and ISO/IEC guide 25. Recalibration of the customer instrument is recommended within 6 months after the unit is placed into service.

Calibration Standards

Ectron Model # 1120JKT Thermocouple Calibrator/Simulator.
Serial # 26016
Certified on 11/17/98

Ectron Model # 1120JKT Thermocouple Calibrator/Simulator.
Serial # 25623
Certified on 12/21/98

The calibration standards are traceable through the National Institute of Standards and Technology test reports # 550982 and 5205

Environmental Condition

72 °F 41 %RH

Calibration Standard Reading	Customer Instrument Reading	Unit Specification
Temperature °F	Temperature °F	Temperature
50.0	50.0	±.3% of Chart Range ± 1.8 °F (±1.0 °C) Recorder Only
250.0	250.0	
450.0	449.0	

FOR YOUR NEXT CALIBRATION

No Phone Calls Required

1. Fill out and send this form along with your instrument to Dickson.
2. Label the outside of the box with "CCM"- that is your RA#.

That's all there is to it!

1. Purchase Order #: _____
   Name: _____
   Phone: _____
   Model #: _____
   Serial #: _____
2. ☐ 1-Point Deluxe NIST Calibration $129.00
   ☐ 3-Point Deluxe NIST Calibration $179.00
   ☐ 3-Point Ultima Deluxe Calibration $289.00

Note: Ultima Calibration includes incoming readings

Prices are subject to change

3. Please return via:
   ☐ Ground Freight ($10)
   ☐ 2nd Day Air($15)
   ☐ Next Day Air ($25)
4. Ship To: _____

Bill To: _____

For Dickson use only
R.A.#: _____
RCD: _____

Dickson Calibration Services

930 South Westwood Avenue Addison, Illinois 60101 630-543-3747 Fax 630-543-0498

Tektronix

TEKTRONIX INC DC
Washington D.C. Depot
700 Professional Drive
Suite A
Gaithersburg, MD 20879
1-800-833-9200
301-926-4329 Fax

TD 415

Certificate of Traceable Calibration

Certificate #:	228399-1-DTM900-112625-1
PO#/Contract#:	P11760
Customer:	TAYLOR DEVICES INC 90 TAYLOR DRIVE NORTH TONAWANDA, NY 14120 United States

Contact:	JANICE JAMIESON		
Model:	DTM900		
Description:	THERMOMETER; K-TYPE, 0.3% ACCURACY		
Manufacturer:	TEKTRONIX, INC.	Cal Date:	01-Feb-2000
Serial:	112625	Due Date:	01-Feb-2001
Asset:	TD4-15	Temperature:	72 °F
Site of Calibration:	SERVICE CENTER	Humidity:	42 %
Calibration Interval Source:	TEKTRONIX RECOMMENDED	Calibration Interval:	366 DAYS
Customer's Equipment Location:	-		

Tektronix certifies that the performance of the above instrument has been verified using test equipment of known accuracy which are traceable to the U.S. National Institute of Standards and Technology (NIST). The policies and procedures at this facility are based on ANSI/NCSL Z540-1-1994 (ISO Guide 25). This certificate shall not be reproduced except in full, without the written approval of the calibration facility.

INSTRUMENT CONDITION:

Received:	OUT OF TOLERANCE 100 DEG C @ .1 RESOLUTION MEASURED 101.4 DEG C. SPEC IS 98.8 TO 101.2 DEG C.
Returned:	IN TOLERANCE

LOAD CELL CALIBRATION TD 424

LOAD CELL (NATIONAL SMALL) SCOPE SENS. 50 MV/DV

TYPE T-C CALIBRATED BY: MBM, AE

CAPACITY 500# DATE 4/8/99

(20 MIN WARM UP) (30 MIN WARM UP) (45 MIN)

DIVISIONS	TRIAL 1	TRIAL 2	TRIAL 3	AVG. (LB)	LB/DIV.
1	45000	49000	49500	47833	(47833)
2	98000	102000	100500	100167	50083
3	150250	152500	150500	151083	50361
4	200,000	203500	202500	202000	50500
5	252000	253000	253000	252667	50533
6	302500	302500	301500	302167	50361
7	354,500	354500	353500	354167	50595
# 7.8			400000		(51282)

AVG

COMPRESSION / TENSION

OVER ALL AVERAGE SENSITIVITY 50,400 LB/DIV

CALIBRATED WITH: OSCILLOSCOPE TYPE THS 720 S/N TD336

FORCE GAUGE 400K BTL TININS S/N 88355

FIXTURE _____

AMPLIFIER BOX COOPER

DATE DUE 4-8-00
SIGNATURE TD