



Certification Test Report

Morsø Jernstøberi A/S

**Freestanding Wood Stove
Model: 7110**

Report Number 192-S-04-3

OMNI-Test Laboratories, Inc.
Product Testing & Certification

Mailing: Post Office Box 743
Street: 5465 SW Western Avenue • Suite G
Beaverton, Oregon 97075 USA



Phone: (503) 643-3788
Fax: (503) 643-3799



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Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Certification Test Report

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Freestanding Wood Stove

Model: 7110

Prepared for: Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Prepared by: OMNI-Test Laboratories, Inc.
5465 SW Western Avenue, Suite G
Beaverton, Oregon 97005
(503) 643-3788

Test Period: January 9, 2004 – January 12, 2004

Report Date: January 2004

Project Number: 192-S-04-3

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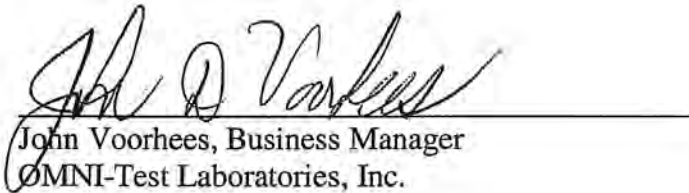
Model: 7110
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Denmark

AUTHORIZED SIGNATORIES

This report has been reviewed and approved by the following authorized signatories.



Richard C. Sparwasser, Vice President
OMNI-Test Laboratories, Inc.



John Voorhees, Business Manager
OMNI-Test Laboratories, Inc.

Model: 7110
Morsø Jernstøberi A/S
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Morsø Jernstøberi A/S
Model: 7110

Test Dates: January 9, 2004 through January 12, 2004



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Section 1

Sampling Procedures and Test Results

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

INTRODUCTION

Morsø Jernstøberi A/S retained OMNI-Test Laboratories, Inc. (O-TL) to perform U.S. Environmental Protection Agency (EPA) certification testing on the model 7110 wood stove. The 7110 wood stove is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of cast iron. The usable firebox volume was measured to be 1.04 cubic feet. The stove is vented through a 6" diameter flue collar located at the top of the unit.

The testing was performed at the O-TL laboratory in Beaverton, Oregon. The unit was received in good condition and logged in at the O-TL test facility on December 5, 2003; it was assigned and labeled with O-TL ID #575. O-TL representative, Ken Morgan conducted the certification testing and completed all testing by January 12, 2004. The EPA was notified of the testing dates in a letter dated January 8, 2004. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Svend Erik Nielsen of Morsø Jernstøberi A/S and is on file at O-TL.

The 7110 wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standard of Performance for Residential Wood Heaters (Appendix A, Methods 28 and 5G). Particulate emissions were measured using a Method 5G sampling train consisting of two filters (front and back). The weighted average emissions of the four test runs indicate a particulate emission level of 3.77 grams per hour. Test runs were conducted in each of three burn rate categories (0.80-1.25 kg/hr, 1.25-1.90 kg/hr, and maximum). Emissions for each of their individual test runs did not exceed the cap. The 7110 results are within the emission limit of 7.5 grams per hour for non-catalytic affected facilities manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992.

The wood heater was sealed after completion of testing in compliance with the EPA regulation as follows:

- “DO NOT TAMPER” labels were placed on the door and all other openings;
- Plastic material sealed with “DO NOT TAMPER” labels and tape was wrapped around the unit;
- The unit was sealed in a wood box constructed for the unit and secured with steel banding; and
- “DO NOT TAMPER” labels were placed on all outer surfaces of the box.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report.

Model: 7110
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Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	1.70	3.45
2	0.89	3.53
3	1.08	3.25
4	2.31	7.25
Weighted particulate emission average of four test runs: 3.77 grams per hour.		

Table 1.2 – Test Facility Conditions

Run	Room Temperature (°F)		Barometric Pressure (in Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	67	70	29.77	29.81	<50	<50
2	67	65	29.81	29.88	<50	<50
3	66	66	30.02	30.02	<50	<50
4	68	69	29.93	29.93	<50	<50

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Table 1.3.1 – Fuel Measurement and Crib Description Summary – PRETEST

Run	Pretest Fuel Weight (Starting weight)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lb)
1	10.6	23.5	1.4
2	7.8	22.5	1.7
3	7.8	22.9	1.4
4	13.4	23.5	1.7

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lb)	Firebox Volume (ft³)	Fuel Loading Density Wet Basis (lb/ft³)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	6.9	1.04	6.63	22.7	13.5	4	0
2	7.0	1.04	6.73	19.3	13.5	4	0
3	6.7	1.04	6.44	20.3	13.5	4	0
4	7.3	1.04	7.02	22.8	13.5	4	0

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Table 1.4 – Dilution Tunnel Gas Measurements and Sampling Data Summary

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temp (°F)
1	90	12.80	132.7	111
2	180	12.61	138.7	80
3	140	13.19	144.9	84
4	70	13.46	136.4	127

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temp Average ^a	Ending Surface Temp Average ^a	Surface Delta T ^b
1	427.0	353.8	73
2	346.8	264.6	82
3	368.2	285.2	83
4	437.8	391.0	47

a. All temperatures are in degrees F.
b. Surface Delta T represents the difference between beginning and ending average surface temperature.

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Table 1.6 – Pretest Configuration

Run	Combustion Air	Fuel Added	Fuel Removed	Time (min)
1	Open 1.50 inches.	10.6 lbs. at start; no addition; coal bed 1.4 lbs.	N/A	60
2	Open 0.375 inches.	7.8 lbs. at start; no addition; coal bed 1.7 lbs.	0.2 lbs.	80
3	Open 0.4375 inches.	7.8 lbs. at start; no addition; coal bed 1.4 lbs.	N/A	60
4	Fully open.	13.4 lbs. at start; no addition; coal bed 1.7 lbs.	N/A	60

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (in H ₂ O)	Primary Air Setting	Run Time (min)	Average Draft (in H ₂ O)
1	1.70	0	Open 1.50 inches.	90	-0.066
2	0.89	0	Open 0.375 inches.	180	-0.038
3	1.08	0	Open 0.4375 inches.	140	-0.041
4	2.31	0	Fully open.	70	-0.076

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Table 1.8 – Test Configuration

Run	Five-Minute Startup	Combustion Air
1	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 35 seconds. <u>Door</u> : Closed by 45 seconds. <u>Primary Air</u> : Fully open for 3 minutes 30 seconds, then immediately set to test setting at 3 minutes 30 seconds. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : None. <u>Fan</u> : None.	Open 1.50 inches.
2	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 40 seconds. <u>Door</u> : Closed by 50 seconds. <u>Primary Air</u> : Fully open for 4 minutes 30 seconds, then slowly adjusted to test setting by 5 minutes. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : None. <u>Fan</u> : None.	Open 0.375 inches.
3	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 50 seconds. <u>Door</u> : Closed by 60 seconds. <u>Primary Air</u> : Fully open for 4 minutes, then slowly adjusted to test setting by 4 minutes 30 seconds. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : None. <u>Fan</u> : None.	Open 0.4375 inches.
4	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 45 seconds. <u>Door</u> : Closed by 50 seconds. <u>Primary Air</u> : Fully open. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : None. <u>Fan</u> : None.	Fully open.

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TEST RESULTS AND DISCUSSION

A total of four test runs were conducted in the following categories: two in the 0.80 to 1.25 kg/hr dry category; one in the 1.26 to 1.90 kg/hr dry category; and one at maximum.

The weighted particulate emission level was measured to be 3.77 grams per hour.

The proportionality results for all four test runs were acceptable. Quality check results for each test run are presented Section 2 of this report.

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APPLIANCE DESCRIPTION

Appliance Manufacturer: Morsø Jernstøberi A/S

Wood Stove Model: 7110

Type: Freestanding, radiant-type room heater

WOOD HEATER DESCRIPTION:

Materials of Construction: The unit is constructed primarily of cast iron with stainless steel secondary air tubes.

Air Introduction System: Air enters the firebox through an opening located at the bottom/back of the appliance. Secondary air enters the appliance through the bottom/back and is channeled internally to both sides of the firebox supplying three 1" diameter tubes.

Combustion Control Mechanisms: The combustion air inlet is controlled by a handle located below the fuel-loading door to the right of the appliance.

Combustor: N/A.

Internal Baffles: A cast iron baffle with ceramic wool on the top side is mounted in the upper portion of the firebox. The flame path is forced to the front of the firebox where it travels up through the opening between the baffle and primary air manifold.

Other Features: None.

Flue Outlet: The 6" diameter flue outlet is located in the top of the unit.

WOOD HEATER OPERATING INSTRUCTIONS

Specific written instructions: See Section 4 of this report. All markings and instruction materials were reviewed for content prior to printing.

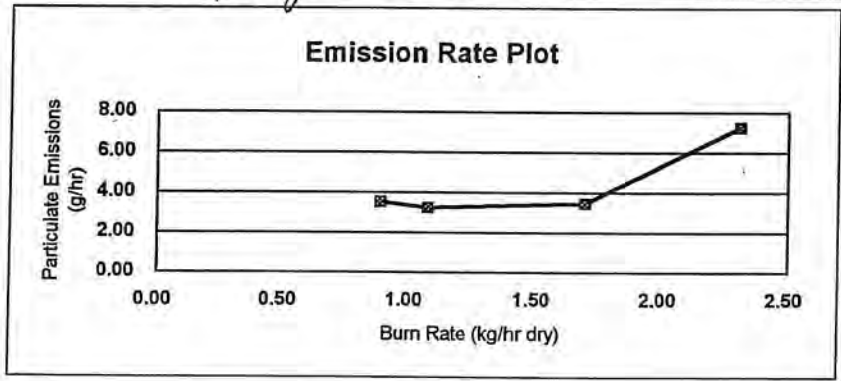
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Section 2

Test Data by Run

EPA Weighted Average Emissions EPA Method 28

Client: Morso	Status: FINAL
Stove Model: 7110	Stove Type: Non-Catalytic Stove
Test Dates: 1/09/04 - 1/12/04	
Project Number: 192-S-04-3	
Tracking Number: 575	Weighted Average (g/hr) 3.77
Signature/Date: <i>J. J. Morgan 1-14-04</i>	



Run #	2				
Burn Rate (dry kg/hr)	0.89				
Catagory	2				
Overall Efficiency (%)	63%				
Emissions (g/hr)	3.53				
Cap (g/hr)	15				
Weighting Factor	0.439	26.51%			
Heat Output (BTU/hr)	10754				
Run #	3				
Burn Rate (dry kg/hr)	1.08				
Catagory	2				
Overall Efficiency (%)	63%				
Emissions (g/hr)	3.25				
Cap (g/hr)	15				
Weighting Factor	0.549	33.18%			
Heat Output (BTU/hr)	13050				
Run #	1				
Burn Rate (dry kg/hr)	1.70				
Catagory	3				
Overall Efficiency (%)	63%				
Emissions (g/hr)	3.45				
Cap (g/hr)	18				
Weighting Factor	0.507	30.65%			
Heat Output (BTU/hr)	20542				
Run #	4				
Burn Rate (dry kg/hr)	2.31				
Catagory	4				
Overall Efficiency (%)	63%				
Emissions (g/hr)	7.25				
Cap (g/hr)	18				
Weighting Factor	0.160	9.67%			
Heat Output (BTU/hr)	27913				

J. J. Morgan

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Run 1

Wood Heater Test Data - EPA Method 5G

Signature/Date: *John J. Morgan 1-16-04*

Run:	1
Manufacturer:	Monro
Model:	7110
Tracking No.:	575
Project No.:	192-S-04-3
Test Date:	09-Jan-04
Beginning Clock Time:	11:34
Recording Interval:	10 min.
Total Sampling Time:	90 min.

PM Control Module: 21

Dilution Tunnel MW(dry):	29.00 lb/lb-mole
Dilution Tunnel MW(wet):	28.56 lb/lb-mole
Dilution Tunnel H ₂ O:	4.00 percent
Dilution Tunnel Static:	-0.850 "H ₂ O
Pilot Tube Cp:	0.99
Meter Box Y Factor:	1.003
Barometric Pressure:	29.77
Begin:	29.8
Middle:	29.81
End:	29.81

Velocity Traverse Data								
	Pl.1	Pl.2	Pl.3	Pl.4	Pl.5	Pl.6	Pl.7	Pl.8
Initial dP	0.024	0.038	0.040	0.034	0.024	0.034	0.042	0.036
Initial Temp.	115	114	114	114	114	114	114	114

OMNI Equipment Numbers:

Tunnel Velocity:	12.80 ft/sec.
Initial Tunnel Flow:	131.8 scfm
Average Tunnel Flow:	132.7 scfm
Tunnel Area:	0.196 ft ²
Post-Test Leak Check:	0.400±5 cfm @ "Hg
Fuel Moisture (dry basis):	22.74 %
Total Particulate:	12.5 mg
Filter Holder No.:	
Average:	29.79 "Hg

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H ₂ O	Catalyst Temp.									
0	221,600		0.00	67	0	114	0.034	6.9			503	329	395	442	466		427.0	496	73	64	67	-0.065	NA									
10	226,810	0.52	0.75	77	1	127	0.034	4.7	-2.2	498	309	372	426	434		407.8	655	72	50	58	-0.078	NA										
20	231,995	0.52	0.75	77	1	127	0.034	2.8	-1.9	525	295	370	426	426		408.4	656	73	58	68	-0.078	NA										
30	237,245	0.53	0.75	83	1	124	0.034	1.5	-1.3	557	276	381	443	439		419.2	629	75	46	46	-0.078	NA										
40	242,470	0.52	0.75	84	1	115	0.034	0.9	-0.6	552	270	389	457	453		424.2	549	76	46	46	-0.070	NA										
50	247,735	0.53	0.75	86	1	106	0.034	0.6	-0.3	488	270	400	460	450		413.6	461	76	46	46	-0.063	NA										
60	253,040	0.53	0.75	88	1	103	0.034	0.4	-0.2	444	272	390	446	438		398.0	428	76	46	69	-0.060	NA										
70	258,340	0.53	0.75	90	1	101	0.034	0.3	-0.1	416	274	377	430	423		384.0	402	75	46	71	-0.058	NA										
80	263,640	0.53	0.75	91	1	98	0.034	0.1	-0.2	395	274	365	415	408		371.4	383	75	46	69	-0.055	NA										
90	269,050	0.54	0.75	91	1	96	0.034	0.0	-0.1	369	270	350	393	387		353.8	360	74	47	70	-0.053	NA										
Avg/Total	47,450	0.53	0.68	83.40		111.11	0.034	100.39								78		74.50	49.50			-0.066	#DIV/0!									

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
 Model: 7110
 Project No.: 575
 Tracking No.: 192-S-04-3
 Run: 1
 Test Date: 01/09/04

Burn Rate	1.70 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00027 grams/dscf 2.16 grams/hour 3.45 grams/hour
Average Tunnel Temperature	111 degrees Fahrenheit
Average Delta p	0.034 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	47.45 cubic feet 83 degrees Fahrenheit 12.80 feet/second 7964.45 dscf/hour 46.12 dscf
Total Particulates - mn Average Delta H Total Time of Test	12.5 mg 0.68 inches H2O 90 minutes

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: Morso 7110 Project #: 192-s-04-3 Tracking #: 575 Page of
 Date: 1-09-04 Test Crew: K. Morgan Run #:
 OMNI Equipment ID #:

Preburn [x] Test []	Fuel Weight		Delta Weight	Stack Draft	Coal Bed: Data: 0 =					TEMPERATURES (oF)			Actual: <u>1.4</u> Coal Bed: <u>Not Used</u>	
	Time	Weight			Top	Bottom	Back	Left	Right	Flue	Catalyst			
0	10.6			-0.58	58	186	260	296	326	444				
10	9.3	1.3		-0.65	58	204	273	287	329	537				
20	7.5	1.8		-0.73	59	226	292	274	347	622				
30	5.4	2.1		-0.78	60	254	310	293	386	670				
40	3.6	1.8		-0.78	60	284	339	339	419	670				
50	2.1	1.5		-0.73	63	321	384	406	456	611				
60	1.4	0.7		-0.65	66	329	394	440	466	500				
80														
90														
00														
10														
20														
30														
40														
50														
60														
70														
80														
90														
AVG														

PRELIMINARY: 1.70 Kg/hr @ 3.90

V

Technician signature: K. Morgan Date: 1-09-04

2.7082-34

FUEL DATA

Client: Morso

Model: 7110 Woodstove

Project #: 192-S-043 Tracking #: 575

Date: ~~12-09-03~~ 1/9/04 Test Crew: K. MORGAN

Run #: 1K 575 1

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. Morgan

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>23.4</u>	<u>22.8</u>	<u>22.8</u>	<u>2x4</u>
2	<u>8</u> ft	<u>25.3</u>	<u>23.2</u>	<u>23.4</u>	<u>2x4</u>
3	ft				
Length of cut pieces: <u>4 @ 9"</u> inches					
Pre-Burn Fuel Average Moisture: <u>23.48%</u>					
Time (clock): <u>09:30</u> Room Temperature (F): <u>57</u> Initials: <u>K</u>					

TEST FUEL					
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>4</u>	<u>4x4</u>	<u>8</u>	<u>1K 6.9</u>
CALCULATED LOAD WEIGHT:	<u>7.3</u>				<u>7.0</u> (2x4)
					<u>0</u> (4x4)
					<u>7.0</u> Total
FUEL PIECE LENGTH:	<u>13.5"</u>				<u>6.9</u>
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			Type	
1	<u>23.6</u>	<u>23.0</u>	<u>22.7</u>	<u>2x4</u>	
2	<u>23.3</u>	<u>22.0</u>	<u>21.6</u>	<u>2x4</u>	
3	<u>21.8</u>	<u>23.3</u>	<u>23.3</u>	<u>2x4</u>	
4	<u>22.4</u>	<u>23.6</u>	<u>22.3</u>	<u>2x4</u>	
5					
6					
7					
8					
9					
10					
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>22.74%</u>					
Time (clock): <u>09:45</u> Room Temperature (F): <u>59</u> Initials: <u>K</u>					

Technician signature: K. Morgan Date: 1-09-04
12-09-03 K

Run Notes

Client/Model: Morso

Model: 7110 Woodstove

Project #: 192-S-04-3

Tracking Number: 575

Run #: 1

Date: ~~12-09-03~~ ^K 1-09-04

Test Crew: K. MORGAN

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

OPEN 1.50"

SECONDARY: FIXED

TERTIARY: NONE

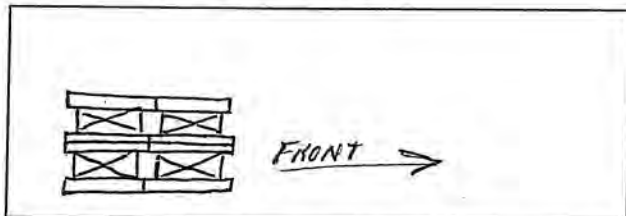
FAN: NONE

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
# 43	TEST SETTING				X	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
 FUEL LOADING: Loaded by 35 sec.
 DOOR: Closed by 45 sec.
 PRIMARY AIR: Full open 3-1/2 min
Test setting at 3 1/2 min.

OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

SAME AS ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: NONE

Technician signature: K. J. Morgan

Date: ~~12-09-03~~ ¹⁻⁰⁹⁻⁰⁴ 1-09-04 K

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7110 Woodstove

Project No.: 192-S-04-3

Tracking No.: 575

Date: ~~12-09-03~~ ^K 1-09-04

Run No.: 1 Booth: 1

Test Crew: K. MORGAN

Start Time: 11:34 Stop Time: 13:04

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: <50 Final: <50

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: ∅ @ 3.1" w.c. Post: ∅ @ 3.1" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 1-08-04 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.77</u>	<u>29.80</u>	<u>29.81</u>
Room Temp (°F)	<u>64 65 67 am</u>	<u>67</u>	<u>68 70 am</u>

Technician signature: K. Morgan Date: 1-09-04

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Run 2

Wood Heater Test Data - EPA Method 5G

Signature/Date: *K. J. Morgan* 1-16-04

Run:	2
Manufacturer:	Morso
Model:	7110
Tracking No.:	575
Project No.:	192-S-04-3
Test Date:	09-Jan-04
Beginning Clock Time:	14:55
Recording Interval:	10 min.
Total Sampling Time:	180 min.

PM Control Module: 21

Dilution Tunnel MW (dry):	29.00 lb/lb-mole
Dilution Tunnel MW (wet):	28.56 lb/lb-mole
Dilution Tunnel H ₂ O:	4.00 percent
Dilution Tunnel Static:	-0.520 "H ₂ O
Pitot Tube Cp:	0.99
Meter Box Y Factor:	1.003
Barometric Pressure:	29.81
	29.88
	29.86
	29.86

Tunnel Velocity:	12.61 ft/sec.
Initial Tunnel Flow:	138.0 scfm
Average Tunnel Flow:	138.7 scfm
Tunnel Area:	0.196 ft ²
Post-Test Leak Check:	0.0607 cfm@"Hg
Fuel Moisture (dry basis):	19.33 %
Total Particulate:	24.7 mg
Filter Holder No.:	

Velocity Traverse Data							
	PL.1	PL.2	PL.3	PL.4	PL.5	PL.6	PL.8
Initial dP	0.032	0.034	0.036	0.032	0.032	0.040	0.042
Initial Temp.	85	84	84	84	84	84	84

OMNI Equipment Numbers:

Wood Heater Temperature Data, °F

Elapsed Time	Particulate Sampling Data				Fuel Weight, lb				Wood Heater Temperature Data, °F								Stack						
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior		Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H ₂ O
0	269.500	0.53	0.00	74	0	84	0.035	101	7.0	-	362	288	341	367	376	376	346.8	262	70	63	67	-0.040	NA
10	274.750	0.53	0.75	76	1	88	0.035	102	5.8	-1.2	359	277	321	348	357	357	332.4	310	71	52	66	-0.048	NA
20	279.965	0.52	0.75	80	1	87	0.035	101	4.8	-1	354	270	306	333	338	338	320.2	366	71	49	66	-0.055	NA
30	285.250	0.53	0.75	83	1	88	0.035	102	3.5	-1.3	402	256	297	335	337	337	325.4	402	71	48	66	-0.058	NA
40	290.500	0.53	0.75	84	1	89	0.035	101	2.6	-0.9	427	251	300	344	344	344	333.2	404	71	47	65	-0.058	NA
50	295.790	0.53	0.75	85	1	87	0.035	101	1.8	-0.8	453	246	309	359	358	358	345.0	387	71	47	65	-0.055	NA
60	301.080	0.53	0.75	85	1	85	0.035	101	1.4	-0.4	454	242	328	374	374	374	354.4	333	71	47	65	-0.048	NA
70	306.380	0.53	0.75	86	1	81	0.035	101	1.3	-0.1	425	244	340	374	375	375	351.6	282	71	47	65	-0.043	NA
80	311.675	0.53	0.75	86	1	79	0.035	101	1.1	-0.2	386	251	340	367	368	368	342.4	255	70	47	65	-0.038	NA
90	316.980	0.53	0.75	86	1	80	0.035	101	1.0	-0.1	357	256	336	359	361	361	333.8	239	70	47	65	-0.035	NA
100	322.275	0.53	0.75	87	1	80	0.035	100	0.9	-0.1	334	258	330	348	350	350	324.0	227	70	47	66	-0.033	NA
110	327.570	0.53	0.75	87	1	77	0.035	100	0.7	-0.2	317	259	322	336	338	338	314.4	214	69	47	66	-0.033	NA
120	332.880	0.53	0.75	87	1	76	0.035	100	0.6	-0.1	302	257	313	326	327	327	305.0	206	69	47	66	-0.030	NA
130	338.180	0.53	0.75	87	1	75	0.035	100	0.5	-0.1	287	254	304	314	313	313	294.4	198	69	48	65	-0.028	NA
140	343.480	0.53	0.75	86	1	75	0.035	100	0.4	-0.1	275	250	300	304	303	303	286.4	192	69	49	65	-0.025	NA
150	348.770	0.53	0.75	86	1	73	0.035	100	0.3	-0.1	269	246	298	298	298	298	281.8	186	69	49	65	-0.025	NA
160	354.070	0.53	0.75	85	1	73	0.035	100	0.2	-0.1	259	241	296	289	290	290	275.0	182	68	49	65	-0.023	NA
170	359.350	0.53	0.75	85	1	71	0.035	100	0.1	-0.1	252	236	296	281	282	282	269.4	179	68	49	65	-0.023	NA
180	364.634	0.53	0.75	85	1	72	0.035	100	0.0	-0.1	247	232	296	273	275	275	264.6	173	67	48	65	-0.023	NA
Avg/Total	95.134	0.53	0.71	84.21		80.01	0.035	100.64									82		69.74	48.79		-0.038	#DIV/0!

2-12-08-34

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
 Model: 7110
 Project No.: 575
 Tracking No.: 192-S-04-3
 Run: 2
 Test Date: 01/09/04

Burn Rate	0.89 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00027 grams/dscf 2.22 grams/hour 3.53 grams/hour
Average Tunnel Temperature	80 degrees Fahrenheit
Average Delta p	0.035 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	95.13 cubic feet 84 degrees Fahrenheit 12.61 feet/second 8322.44 dscf/hour 92.54 dscf
Total Particulates - mn Average Delta H Total Time of Test	24.7 mg 0.71 inches H2O 180 minutes

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page of

Client/Model: MORSO 7110 Project #: 19Z-S-04-3 Tracking #: 575
 Date: 12-09-03 h Test Crew: K. Morgan Run #: 2
 OMNI Equipment ID #:

Preburn Test	[X]		[]		Coal Bed:		Data:		0 =		Range: <u>1.4-1.7</u>		Actual: <u>1.7</u>	
	Time	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	Catalyst	Not Used	
0	7.8			-0.078	69	323	258	294	332	329	614			
10	6.6	1.2		-0.060	69	365	263	312	350	347	407			
20	5.5	1.1		-0.060	67	387	268	311	346	343	429			
30	4.3	1.2		-0.063	67	434	267	308	359	351	445			
40	3.4	0.9		-0.058	68	461	266	314	378	375	418			
50	2.7	0.7		-0.055	67	465	268	324	388	397	388			
60	2.5	0.2		-0.050	66	447	274	338	390	405	340			
70	1.9	*0.4		-0.043	66	396	284	347	378	391	285			
80	1.7	0.2		-0.040	67	364	288	342	368	377	263			
90														
00														
10														
20														
30														
40														
50														
60														
70														
80														
90														
AVG														

Removed 0.2 lb @ 60 min.
 STA @ 55 min.

PRELIMINARY: 0.89 Kg/hr @ 3.68 g/hr

Technician signature: K. A. Morgan Date: 1-09-04

27508-34

FUEL DATA

Client: Morso

Model: 7110 Woodstove

Project #: 192-S-04-3 Tracking #: 575

Date: 1-09-04

Test Crew: K. Morgan

Run #: K
575 2

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. MORGAN

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>24.1</u>	<u>24.1</u>	<u>22.8</u>	<u>2x4</u>
2	<u>8</u> ft	<u>21.2</u>	<u>21.8</u>	<u>20.8</u>	<u>2x4</u>
3	ft				
Length of cut pieces: <u>4@9"</u> <u>5@14"</u> inches		Pre-Burn Fuel Average Moisture: <u>22.47%</u>			
Time (clock): <u>12:30</u>		Room Temperature (F): <u>65</u>	Initials: <u>K</u>		

TEST FUEL					
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>4</u>	<u>4x4</u>	<u>0</u>	
CALCULATED LOAD WEIGHT:	<u>7.3</u>	ACTUAL LOAD WEIGHT:	<u>7.0</u>	<u>0</u>	(2x4)
			<u>0</u>		(4x4)
FUEL PIECE LENGTH:	<u>13.5"</u>		<u>7.0</u>		Total
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>18.7</u>	<u>18.6</u>	<u>20.6</u>	<u>2x4</u>	
2	<u>19.5</u>	<u>18.9</u>	<u>19.3</u>	<u>2x4</u>	
3	<u>19.3</u>	<u>19.4</u>	<u>19.9</u>	<u>2x4</u>	
4	<u>19.1</u>	<u>18.8</u>	<u>19.8</u>	<u>2x4</u>	
5					
6					
7					
8					
9					
10					
OVERALL TEST FUEL LOAD MOISTURE AVERAGE:					<u>19.33%</u>
Time (clock): <u>1:00</u>		Room Temperature (F): <u>68</u>	Initials: <u>K</u>		

Technician signature: K. Morgan Date: 1-09-04

Run Notes

Client/Model: Morso
 Model: 7110 Woodstove
 Project #: 192-S-04-3
 Tracking Number: 575
 Run #: 2 Date: 1-09-04
 Test Crew: Ki Morgan
 OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

OPEN 0.375"

SECONDARY: FIXED

TERTIARY: NONE

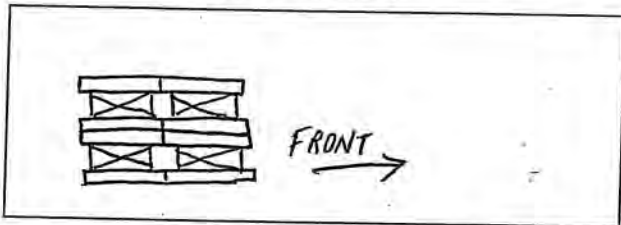
FAN: NONE

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0	TEST SETTING					
55					X	
60				0.2		
74					X	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
 FUEL LOADING: Closed Loaded by 40 sec.
 DOOR: Closed by 50 sec.
 PRIMARY AIR: Fully OPEN 4.5 min, then slowly Adjusted to test setting. Test setting at 5.0 min.
 OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

SAME AS ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: NONE

Technician signature: Ki Morgan Date: 1-09-04

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7110 Woodstove

Project No.: 192-S-04-3

Tracking No.: 575

Date: 1-09-04

Run No.: 2

Booth: 1

Test Crew: K. MORGAN

Start Time: 14:55

Stop Time: 17:55

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: _____ CO: _____ CO₂(DT): >

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂			<u>N/A</u>				
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: < 50 Final: < 50

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: φ @ 3.1" w.c. Post: φ @ 3.2" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 1-08-04 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.81</u>	<u>29.88</u>	<u>29.88</u>
Room Temp (°F)	<u>67</u>	<u>65</u>	<u>65</u>

Technician signature: K. Morgan Date: 1-09-04

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Run 3

Wood Heater Test Data - EPA Method 5G

Run: 3
Manufacturer: Morso
Model: 7110
Tracking No.: 575
Project No.: 192-S-04-3
Test Date: 10-Jan-04
Beginning Clock Time: 13:30
Recording Interval: 10 min.
Total Sampling Time: 140 min.

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial ρP	0.034	0.042	0.044	0.036	0.032	0.038	0.042	0.038	
Initial Temp.	91	91	91	91	90	90	90	90	

PM Control Module: 21
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.56 lb/lb-mole
Dilution Tunnel H₂O: 4.00 percent
Dilution Tunnel Stat: -0.520 "H₂O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.003
Barometric Pressure: 30.02

Signature/Date: *K.A. Mays* 1-16-04
Tunnel Velocity: 13.19 ft/sec.
Initial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.9 scfm
Tunnel Area: 0.196 ft²
Post-Test Leak Check: -0.12 @ 7 cfm @ "Hg
Fuel Moisture (dry basis): 20.25 %
Total Particulate: 16.8 mg
Filter Holder No.:

OMNI Equipment Numbers:

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter of	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel ρP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H ₂ O	Catalyst Temp.									
0	365.100		0.00	64	0	91	0.038	6.7				343	390	407		368.2	369	64	60	66	-0.050	NA										
10	370.250	0.51	0.75	68	1	95	0.038	5.2	-1.5	426	261	332	380	391		358.0	401	66	49	66	-0.060	NA										
20	375.400	0.51	0.75	72	1	94	0.038	3.9	-1.3	424	257	321	366	370		347.6	430	66	47	67	-0.060	NA										
30	380.590	0.52	0.75	76	1	95	0.038	2.8	-1.1	441	252	311	364	362		346.0	430	66	46	67	-0.060	NA										
40	385.795	0.52	0.75	78	1	92	0.038	1.8	-1	469	246	312	373	370		354.0	431	67	46	68	-0.058	NA										
50	391.040	0.52	0.75	80	1	89	0.038	1.3	-0.5	483	242	326	387	386		364.8	387	68	46	68	-0.053	NA										
60	396.285	0.52	0.75	81	1	83	0.038	1.1	-0.2	464	242	347	392	389		366.8	281	67	45	68	-0.040	NA										
70	401.550	0.53	0.75	82	1	83	0.038	0.9	-0.2	414	240	351	381	378		352.8	287	67	46	68	-0.040	NA										
80	406.780	0.52	0.75	82	1	80	0.038	0.7	-0.2	376	240	363	370	366		343.0	229	66	46	67	-0.033	NA										
90	412.095	0.53	0.75	83	1	78	0.038	0.6	-0.1	341	239	359	355	352		329.2	209	66	46	67	-0.028	NA										
100	417.375	0.53	0.75	83	1	77	0.038	0.4	-0.2	322	239	349	341	341		318.4	198	66	46	67	-0.028	NA										
110	422.660	0.53	0.75	83	1	77	0.038	0.3	-0.1	304	236	332	327	329		305.6	215	66	46	66	-0.028	NA										
120	427.940	0.53	0.75	83	1	77	0.038	0.2	-0.1	294	233	320	316	320		296.6	217	66	46	66	-0.028	NA										
130	433.215	0.53	0.75	83	1	76	0.038	0.1	-0.1	284	228	313	310	313		289.6	212	66	46	67	-0.025	NA										
140	438.505	0.53	0.75	83	1	76	0.038	0.0	-0.1	278	225	308	306	309		285.2	208	66	46	66	-0.025	NA										
Avg/Total	73.405	0.52	0.70	78.73		84.03	0.038	100.52								83		66.20	47.13		-0.041	#DIV/0!										

1-16-04-20

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
 Model: 7110
 Project No.: 575
 Tracking No.: 192-S-04-3
 Run: 3
 Test Date: 01/10/04

Burn Rate	1.08 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00023 grams/dscf 2.01 grams/hour 3.25 grams/hour
Average Tunnel Temperature	84 degrees Fahrenheit
Average Delta p	0.038 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	73.41 cubic feet 79 degrees Fahrenheit 13.19 feet/second 8691.71 dscf/hour 72.52 dscf
Total Particulates - mn Average Delta H Total Time of Test	16.8 mg 0.70 inches H2O 140 minutes

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: MARSO 7110 Project #: 19Z-S-04-3 Tracking #: 575 Page of
 Date: 1-10-04 Test Crew: K. Morgan Run #: 3
 OMNI Equipment ID #:

Preburn Test	[X] []		Coal Bed: Data: 0 = 0										Actual: 1.4		
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	TEMPERATURES (oF)			Left	Right	Flue	Coal Bed:	Not Used Catalyst
0	7.8		-0.075	64	357	152	215	297	301	640					
10	6.5	1.3	-0.060	64	398	176	229	316	316	439					
20	5.1	1.4	-0.065	65	423	195	238	318	322	513					
30	3.8	1.3	-0.063	65	448	205	249	334	337	498					
40	2.7	1.1	-0.063	66	468	224	274	363	368	464					
50	1.8	0.9	-0.060	66	463	245	309	353	393	446					
60	1.4	0.4	-0.053	67	448	258	330	390	406	387					
70															
80															
90															
00															
10															
20															
30															
40															
50															
60															
70															
80															
90															
AVG															

STIRRED @ 46 MIN

PRELIMINARY: 1.08 kg/hr @ 3.76

Technician signature: K. Morgan Date: 1-10-04

223 of 2 - 34

FUEL DATA

Client: Morso

Model: 7110 Woodstove

Project #: 192-S-04-3 Tracking #: 575

Date: 1-10-04 Test Crew: K. Morgan

Run #: 3

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. MORGAN

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>23.4</u>	<u>22.4</u>	<u>22.6</u>	<u>2x4</u>
2	<u>8</u> ft	<u>23.4</u>	<u>23.4</u>	<u>22.0</u>	<u>2x4</u>
3	ft				
Length of cut pieces: <u>4 @ 8" = 5 @ 14" inches</u>					
Pre-Burn Fuel Average Moisture: <u>22.9%</u>					
Time (clock): <u>11:30</u> Room Temperature (F): <u>60</u> Initials: <u>K</u>					

TEST FUEL					
FUEL TYPE AND AMOUNT: <u>2x4</u> <u>4</u> <u>4x4</u> <u>0</u>					
CALCULATED LOAD WEIGHT: <u>7.3</u>		ACTUAL LOAD WEIGHT: <u>6.7</u> (2x4)			
		<u>0</u> (4x4)			
FUEL PIECE LENGTH: <u>13.5"</u>		<u>6.7</u> Total			
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>19.5</u>	<u>19.8</u>	<u>20.5</u>	<u>2x4</u>	
2	<u>21.8</u>	<u>20.9</u>	<u>20.4</u>	<u>2x4</u>	
3	<u>18.9</u>	<u>19.1</u>	<u>19.3</u>	<u>2x4</u>	
4	<u>20.4</u>	<u>21.2</u>	<u>21.2</u>	<u>2x4</u>	
5					
6					
7					
8					
9					
10					
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>20.25</u>					
Time (clock): <u>11:45</u> Room Temperature (F): <u>62</u> Initials: <u>K</u>					

Technician signature: K. Morgan Date: 1-10-04

2-24-04-34

Run Notes

Client/Model: Morso
Model: 7110 Woodstove
Project #: 192-S-04-3
Tracking Number: 575

Run #: 3 Date: 1-10-04

Test Crew: K. MORGAN

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

OPEN 0.4375"

SECONDARY: FIXED

TERTIARY: NONE

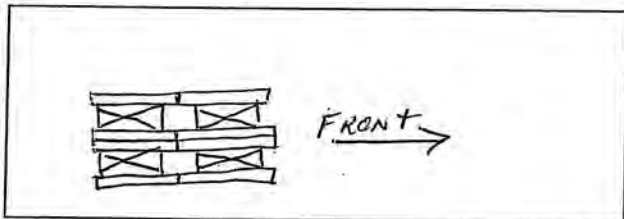
FAN: NONE

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0	TEST setting					
46					X	
60					X	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 50 sec.
DOOR: closed by 60 sec.
PRIMARY AIR: Fully open 4.0 min
slowly Adj. to test setting,
test setting at 4.5 min.
OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

SAME AS ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: NONE

Technician signature: K. Morgan Date: 1-10-04

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7110 Woodstove

Project No.: 192-S-04-3

Tracking No.: 575

Date: 1-10-04 Run No.: 3 Booth: 1

Test Crew: K. Morgan Start Time: 13:30 Stop Time: 15:50

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: _____ CO: _____ CO₂(DT): _____

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂			<u>N/A</u>				
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: <50 Final: <50

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.6

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0 @ 3.2" w.c. Post: 0 @ 3.1" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 1-08-04 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>30.02</u>	<u>29.99</u>	<u>29.98 30.02</u>
Room Temp (°F)	<u>66</u>	<u>67</u>	<u>67 66</u>

Technician signature: K. J. Morgan Date: 1-10-04

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Run 4

Wood Heater Test Data - EPA Method 5G

K. J. Morgan 1-16-04

Run: **4**
 Manufacturer: Morso
 Model: 7110
 Tracking No.: 575
 Project No.: 192-S-04-3
 Test Date: 12-Jan-04
 Beginning Clock Time: 11:41
 Recording Interval: 10 min.
 Total Sampling Time: 70 min.

PM Control Module: 21
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.520 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 1.003
 Barometric Pressure: Begin 29.93 Middle 29.93 End 29.93 "Hg

Signature/Date: _____
 Tunnel Velocity: 13.46 ft/sec
 Initial Tunnel Flow: 135.6 scfm
 Average Tunnel Flow: 136.4 scfm
 Tunnel Area: 0.196 ft²
 Post-Test Leak Check: 0.12827 cfm@ "Hg
 Fuel Moisture (dry basis): 22.78 %
 Total Particulate: 23.3 mg
 Filter Holder No.: _____

Velocity Traverse Data						
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.8
Initial dP	0.028	0.042	0.044	0.032	0.028	0.040
Initial Temp	129	129	128	128	128	128

OMNI Equipment Numbers:

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, oF										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H2O	Catalyst Temp.									
0	439.000		0.00	71	0	128	0.037	7.3			540	304	400	480	465		437.8	528	68	61	68	-0.073	NA									
10	444.200	0.52	0.75	74	1	147	0.037	4.6	-2.7	533	301	386	463	467			430.0	734	78	57	68	-0.088	NA									
20	449.445	0.52	0.75	79	1	145	0.037	2.3	-2.3	586	284	393	457	474			438.8	730	81	54	68	-0.088	NA									
30	454.680	0.52	0.75	82	1	135	0.037	1.0	-1.3	601	271	411	474	501			451.6	660	82	53	68	-0.083	NA									
40	459.950	0.53	0.75	86	1	124	0.037	0.6	-0.4	556	263	419	489	506			446.6	564	82	53	69	-0.075	NA									
50	465.235	0.53	0.75	87	1	118	0.037	0.3	-0.3	507	260	412	481	491			430.2	516	80	54	69	-0.070	NA									
60	470.555	0.53	0.75	88	1	113	0.037	0.1	-0.2	462	258	397	462	470			409.8	472	79	54	69	-0.068	NA									
70	475.845	0.53	0.75	89	1	109	0.037	0.0	-0.1	429	255	383	440	448			391.0	437	79	54	69	-0.063	NA									
Avg/Total	36.845	0.53	0.66	82.00		127.41	0.037	100.46									47	78.63	55.00			-0.076	#DIV/0!									

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
 Model: 7110
 Project No.: 575
 Tracking No.: 192-S-04-3
 Run: 4
 Test Date: 01/12/04

Burn Rate	2.31 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00065 grams/dscf 5.29 grams/hour 7.25 grams/hour
Average Tunnel Temperature	127 degrees Fahrenheit
Average Delta p	0.037 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	36.85 cubic feet 82 degrees Fahrenheit 13.46 feet/second 8186.70 dscf/hour 36.07 dscf
Total Particulates - mn Average Delta H Total Time of Test	23.3 mg 0.66 inches H2O 70 minutes

2-29 of 2-34

FUEL DATA

Client: Morso

Model: 7110 Woodstove

Project #: 192-S-04-3 Tracking #: 575

Date: 1-12-04 Test Crew: K. Morgan Run #: 4

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. Morgan

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>23.4</u>	<u>22.8</u>	<u>22.6</u>	<u>2x4</u>
2	<u>8</u> ft	<u>24.8</u>	<u>23.4</u>	<u>24.2</u>	<u>2x4</u>
3	_____ ft	_____	_____	_____	_____
Length of cut pieces: <u>5@14"</u> <u>5@9"</u> inches		Pre-Burn Fuel Average Moisture: <u>23.53%</u>			
Time (clock): <u>09:55</u>		Room Temperature (F): <u>62</u>	Initials: <u>KL</u>		

TEST FUEL				
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>4</u>	<u>4x4</u>	<u>0</u>
CALCULATED LOAD WEIGHT:	<u>7.3</u>	ACTUAL LOAD WEIGHT:	<u>7.3</u>	(2x4)
			<u>0</u>	(4x4)
FUEL PIECE LENGTH: <u>13.5"</u>			<u>7.3</u>	Total
MOISTURE CONTENT (METER -- DRY BASIS)				
PIECE	READINGS			TYPE
1	<u>23.8</u>	<u>23.8</u>	<u>23.6</u>	<u>2x4</u>
2	<u>19.5</u>	<u>19.5</u>	<u>20.5</u>	<u>2x4</u>
3	<u>24.2</u>	<u>23.6</u>	<u>23.4</u>	<u>2x4</u>
4	<u>23.4</u>	<u>23.7</u>	<u>24.4</u>	<u>2x4</u>
5	_____	_____	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>22.78%</u>				
Time (clock): <u>10:10</u>	Room Temperature (F): <u>64</u>	Initials: <u>KL</u>		

Technician signature: K. J. Morgan Date: 1-12-04

Run Notes

Client/Model: Morso

Model: 7110 Woodstove

Project #: 192-S-04-3

Tracking Number: 575

Run #: 4 Date: 1-12-04

Test Crew: K. MORGAN

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Fully OPEN

SECONDARY: FIXED

TERTIARY: NONE

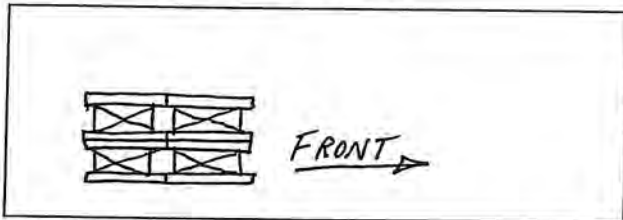
FAN: NONE

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
<u>8:40</u>	<u>TEST SETTINGS</u>				<u>X</u>	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
 FUEL LOADING: Loaded by 45 sec.
 DOOR: Closed by 50 sec.
 PRIMARY AIR: Full-open, NO Adjustments made.

OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Fully Open

SECONDARY: FIXED

TERTIARY: NONE

FAN: NONE

Technician signature: K. Morgan Date: 1-12-04

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7110 Woodstove

Project No.: 192-S-04-3

Tracking No.: 575

Date: 1-12-04

Run No.: 4

Booth: 1

Test Crew: KEN MORGAN

Start Time: 11:41

Stop Time: 12:51

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: N/A

Initial: N/A

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂			<u>N/A</u>				
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: < 50 Final: < 50

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0 @ 3.1" W.C. Post: 0 @ 3.2" W.C.

Flue Pipe Cleaned Prior to First Test in Series: Date: 1-08-04 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.93</u>	<u>29.93</u>	<u>29.93</u>
Room Temp (°F)	<u>68</u>	<u>68</u>	<u>69</u>

Technician signature: K. A. Morgan Date: 1-12-04

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

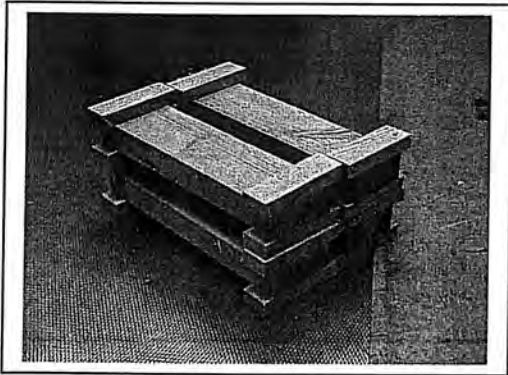
Section 3

Drawings and Fuel Photographs

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Morsø Jernstøberi A/S
Model: 7110

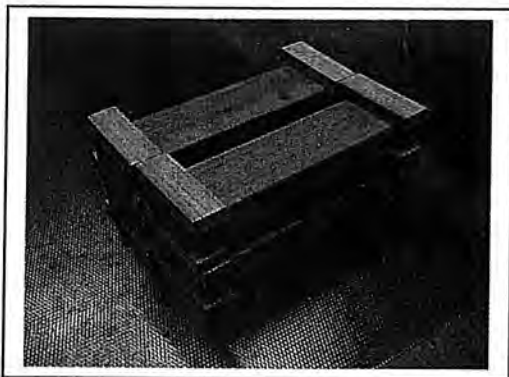
Run 1 - Fuel



Run 1 - Newly Loaded Stove



Run 2 - Fuel



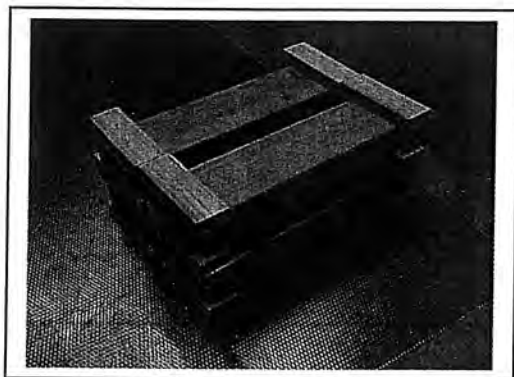
Run 2 - Newly Loaded Stove



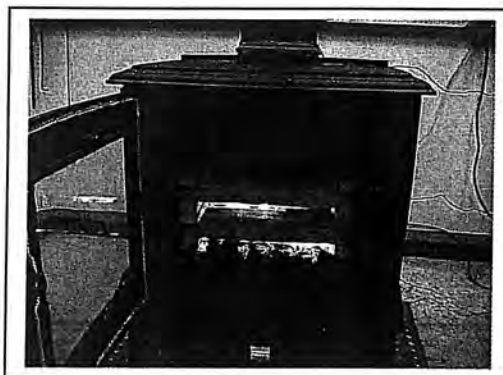
Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Morsø Jernstøberi A/S
Model: 7110

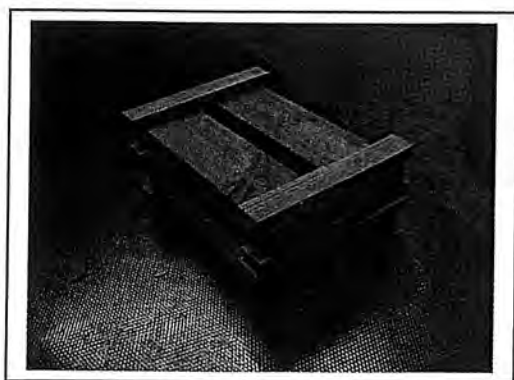
Run 3 - Fuel



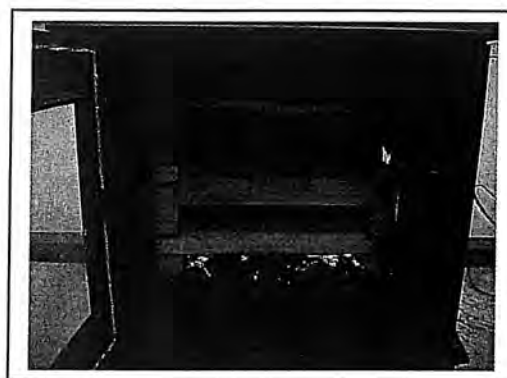
Run 3 – Newly Loaded Stove



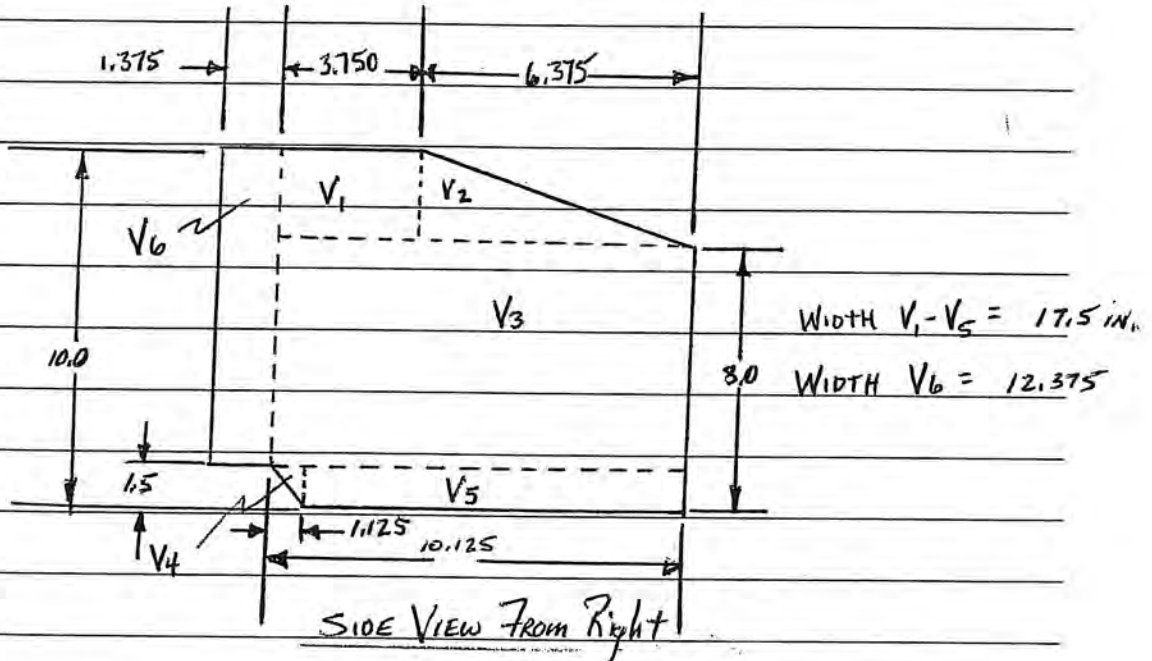
Run 4 - Fuel



Run 4 – Newly Loaded Stove



MORFO 7110 FIREBOX VOLUME



$$\begin{aligned}
 V_1 &= 2.0 \times 3.75 \times 17.5 &= 131.25 \\
 V_2 &= \frac{1}{2} (6.375 \times 2.0 \times 17.5) &= 111.5625 \\
 V_3 &= 6.5 \times \frac{10.125}{9.6} \times 17.5 &= 1151.71875 \\
 V_4 &= \frac{1}{2} (1.125 \times 1.5 \times 17.5) &= 14.765625 \\
 V_5 &= 1.5 \times 9.0 \times 17.5 &= 236.25 \\
 V_6 &= 8.5 \times 1.375 \times 12.375 &= 144.6328125
 \end{aligned}$$

} IN³

$$\begin{aligned}
 V_T &= 1790.1796875 \text{ IN}^3 \\
 &= 1.04 \text{ ft}^3
 \end{aligned}$$

7.3 lb. IDEAL

RANGE 6.6 - 8.0 lb.

Project Number: 192-5-04-3 Tech. Initialed: JK

Date: 11-08-04

Nykøbing Mors d. 22.01.2004

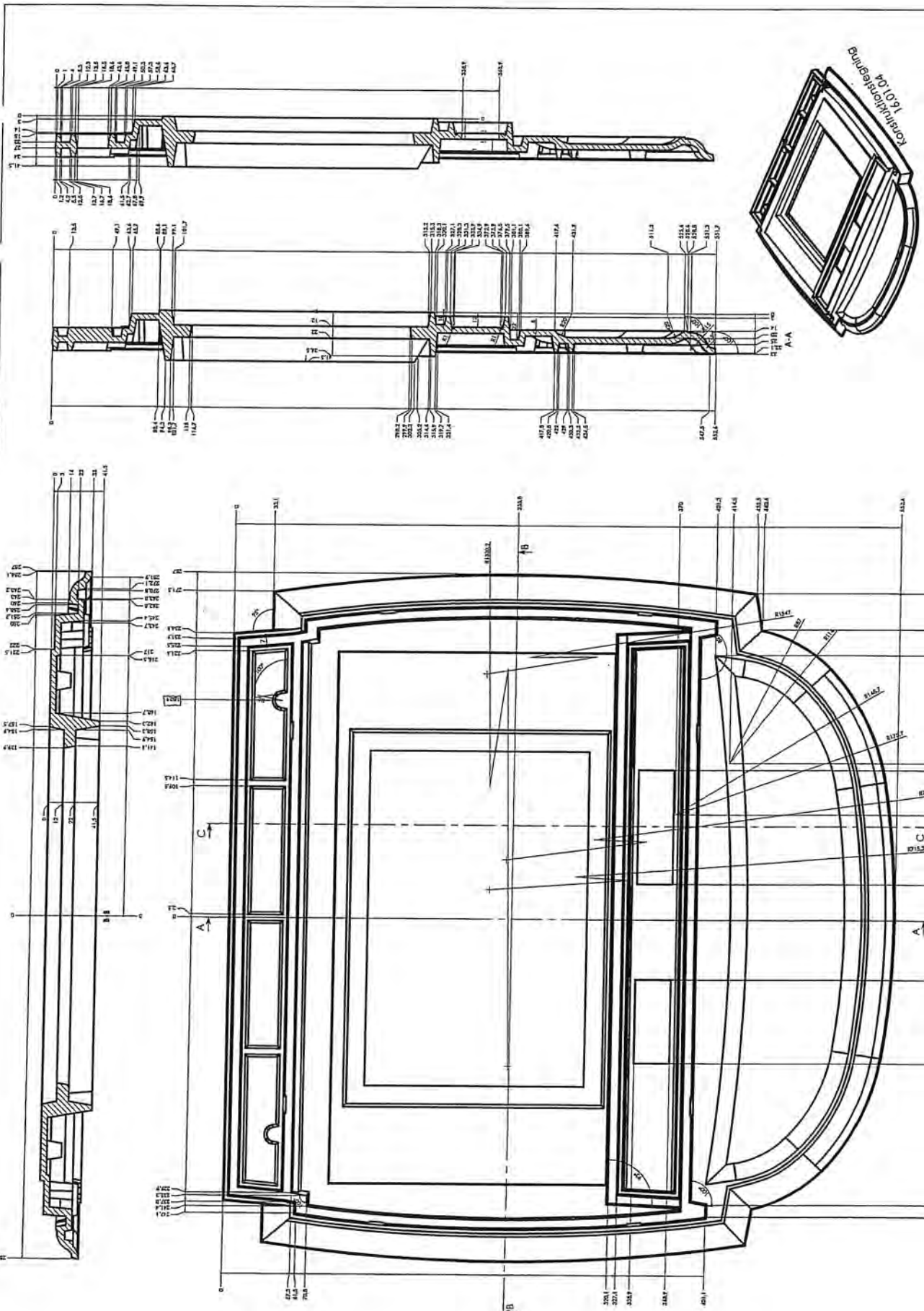
Morsø 7110 USA – Drawings and data

Parts	Drawingno.	Date
Base plate	7100-01	16.01.04
Front frame	7100-02	13.01.04
Door	7100-03	13.01.04
Side plate, right	7100-04	14.01.04
Side plate, left	7100-05	14.01.04
Rear plate	7100-06	16.01.04
Top plate	7100-07	16.10.03
Rear air duct	7100-08	13.01.04
Button air duct	7100-09	16.01.04
Front air duct	7100-10	13.01.04
Secondary air duct, right	7100-11	19.10.03
Secondary air duct, left	7100-12	19.10.03
Leg	7100-13	08.10.03
Frame for ash door	7100-14	14.01.04
Ash door	7100-15	14.01.04
Grate	7100-16	12.01.04
Locking device	7100-17	13.11.03
Baffle plate, cast iron	7100-18	01.10.03
Side plate, w. viking right	7100-19	14.01.04
Ceramic glass	7100-21	18.09.03
Brick, back	7100-22	19.11.03
Brick, side, right	7100-23	18.11.03
Brick, side, left	7100-24	18.11.03
Radiant shielding, rear	7100-25	10.11.03
Radiant shielding, bottom	7100-26	18.09.03
Ash tray	7100-27	13.01.04
Primary damper	7100-28	19.01.04
Handle	7100-29	06.11.03
Brick fitting	7100-30	18.09.03
Fitting for pin at ash tray	7100-31	18.09.03
Adaptor for handle	7100-32	06.11.03
Secondary tube, big	7100-33	19.01.04
Secondary tube, little	7100-34	19.01.04
Distance tube	7100-35	29.09.03
Side plate, w. viking left	7100-36	14.01.04
Primary handle	7100-37	19.01.04
Baffle plate, upper	7100-38	14.01.04
Stop fitting, left, for baffle plate	7100-39	14.01.04
Stop fitting, right, for baffle plate	7100-40	14.01.04
Fitting for baffle plate	7100-41	14.01.04
Målskitse 7110 USA	7100-42	19.01.04
Godk. Tegn. 7110 USA	7100-43	19.01.04
Air flow	7100-44	21.01.04
Insulation	7100-45	20.01.04
Tightening tape for Glass	7100-46	20.01.04
Parts drawing	7100-501	19.08.03

3-523-02

Data:

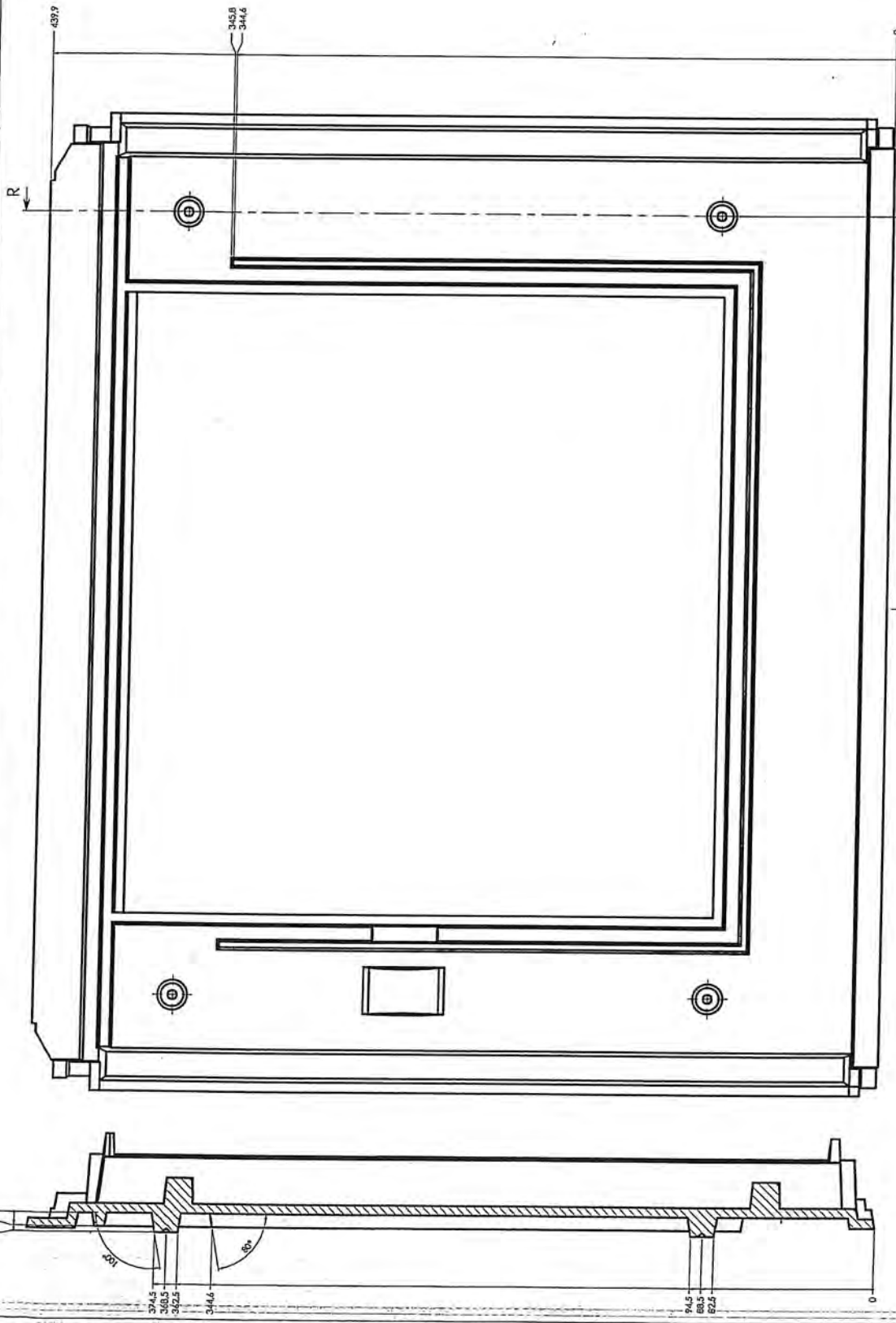
Skamolex V-1100 Vermiculite - Block Insulation
Refractory fiber products - Technical Datasheet
Glas fiber products - Technical Datasheet
Installation and Operating Instructions
Parts list



Kontakttelefon
 101014

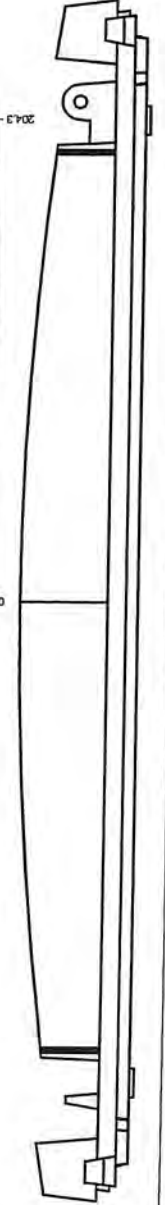
Date of issue: 01.01.81	
Project: 7110	Sheet: 11
Design: 7110	Scale: 1:1
TRUSS	
7100-01	

3-7-83-62



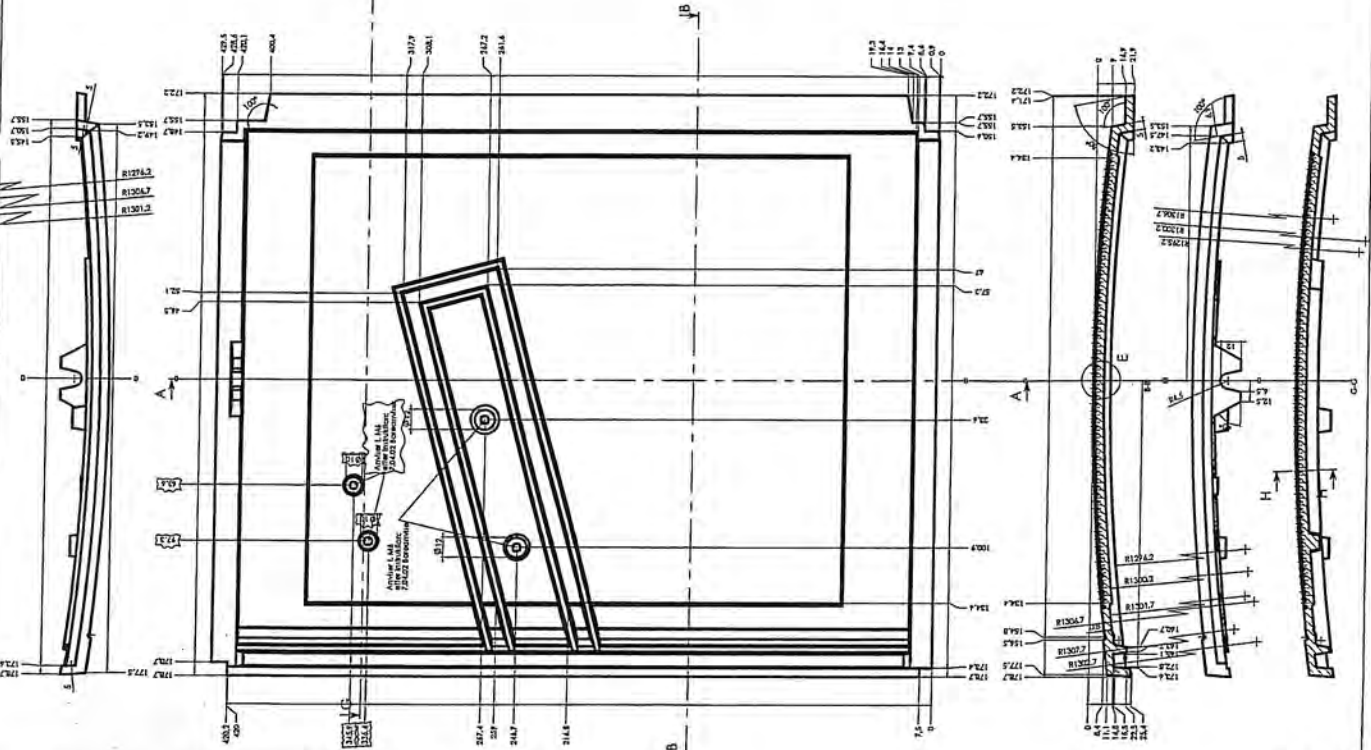
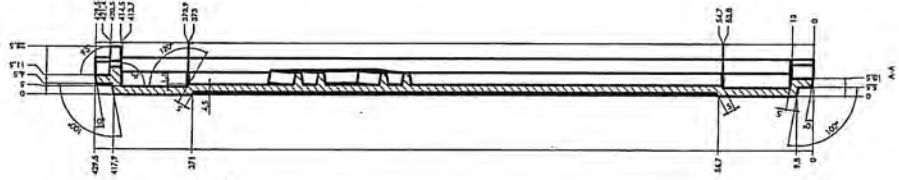
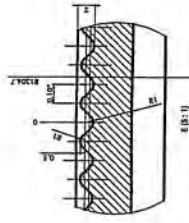
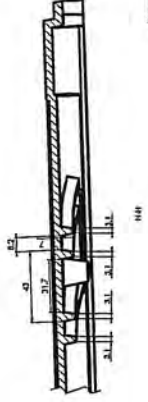
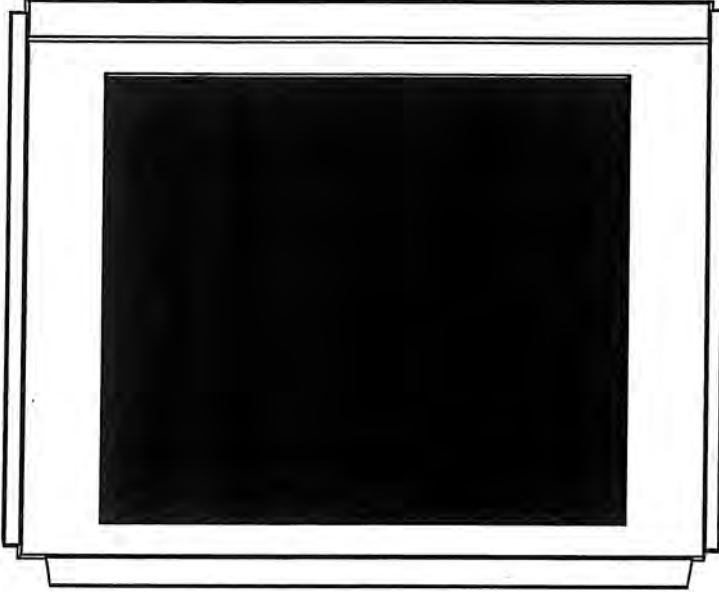
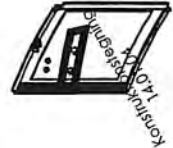
Konkretionsteigling
13.10.04

Projekt: Fenster 7110 Zeichnung: Manne 7110		Blatt: 1/1 Datum: 31.10.2000
Auftraggeber: MORSO Projektname: Fenster 7110 Zeichnungsart: Manne 7110	Blatt: 1/1 Datum: 31.10.2000	Blatt: 1/1 Datum: 31.10.2000

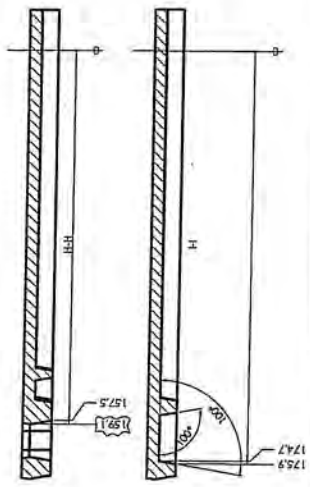
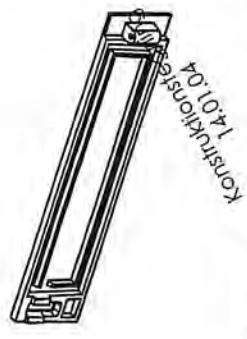
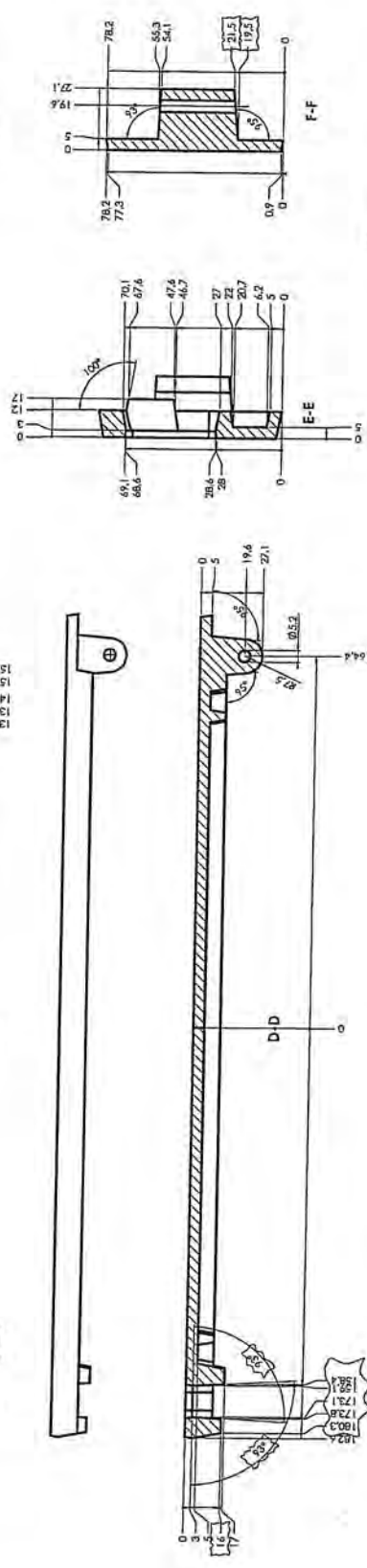
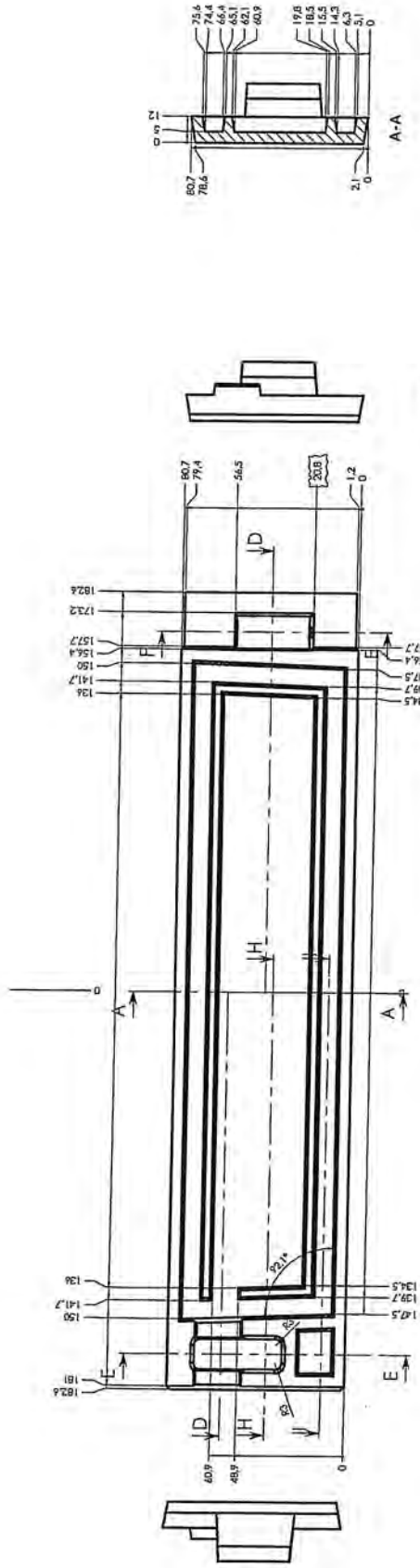


3-10-23-62

KOSTASIA		7100-04
Materi 7110		
Materi 7118		
Materi 7102		
Materi 7103		
Materi 7104		
Materi 7105		
Materi 7106		
Materi 7107		
Materi 7108		
Materi 7109		
Materi 7110		
Materi 7111		
Materi 7112		
Materi 7113		
Materi 7114		
Materi 7115		
Materi 7116		
Materi 7117		
Materi 7118		
Materi 7119		
Materi 7120		
Materi 7121		
Materi 7122		
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Materi 7144		
Materi 7145		
Materi 7146		
Materi 7147		
Materi 7148		
Materi 7149		
Materi 7150		



3-12-13-62



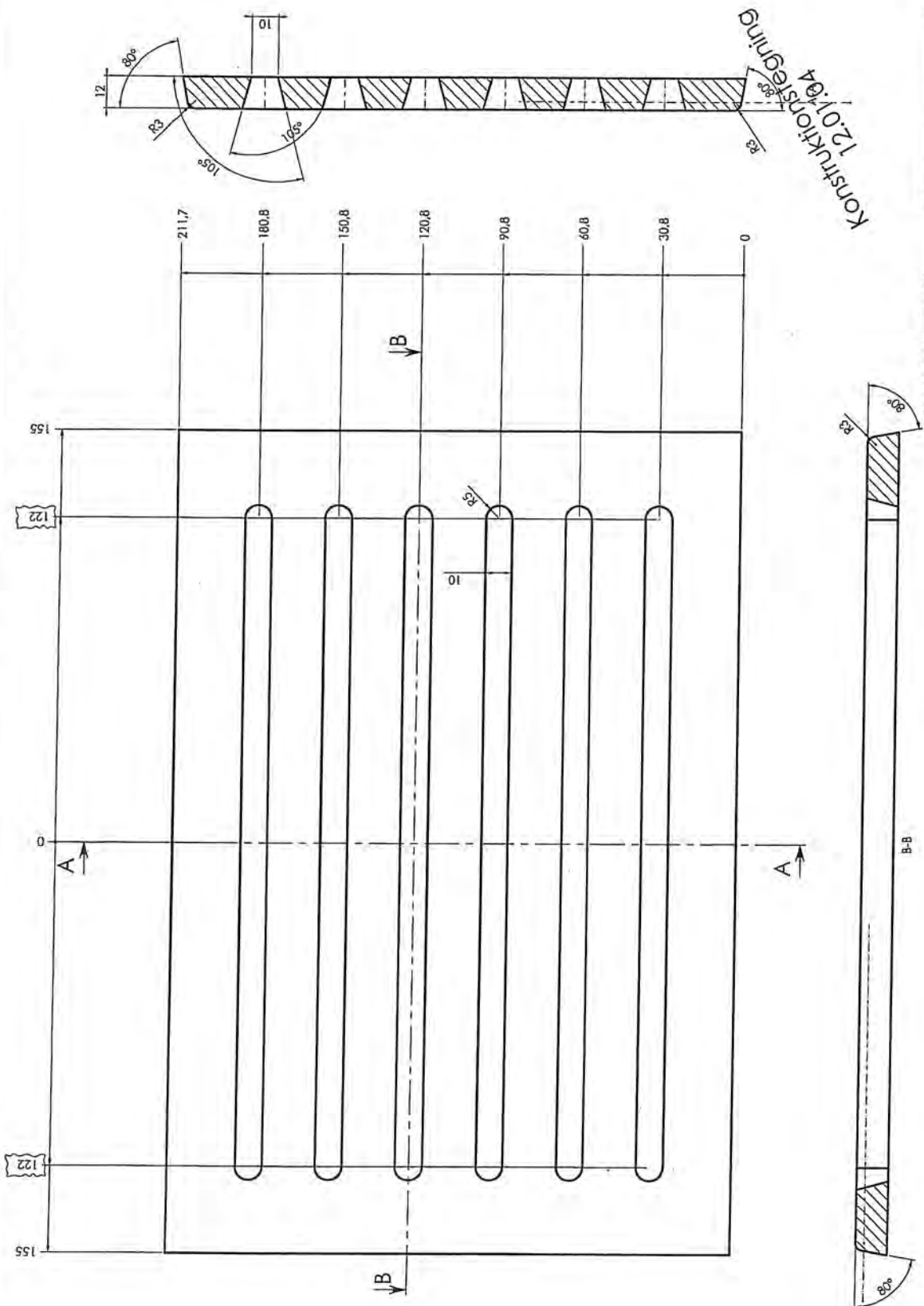
like engine rodler = R1

Model	7100-15
Year	2004
Manufacturer	MORSO
Part Number	34711800
Material	Al
Finish	1:1
Weight	0.13
Volume	0.0001
Surface Area	0.001

MORSO

1759 1747 1575 1803 1738 1521 1583 1622

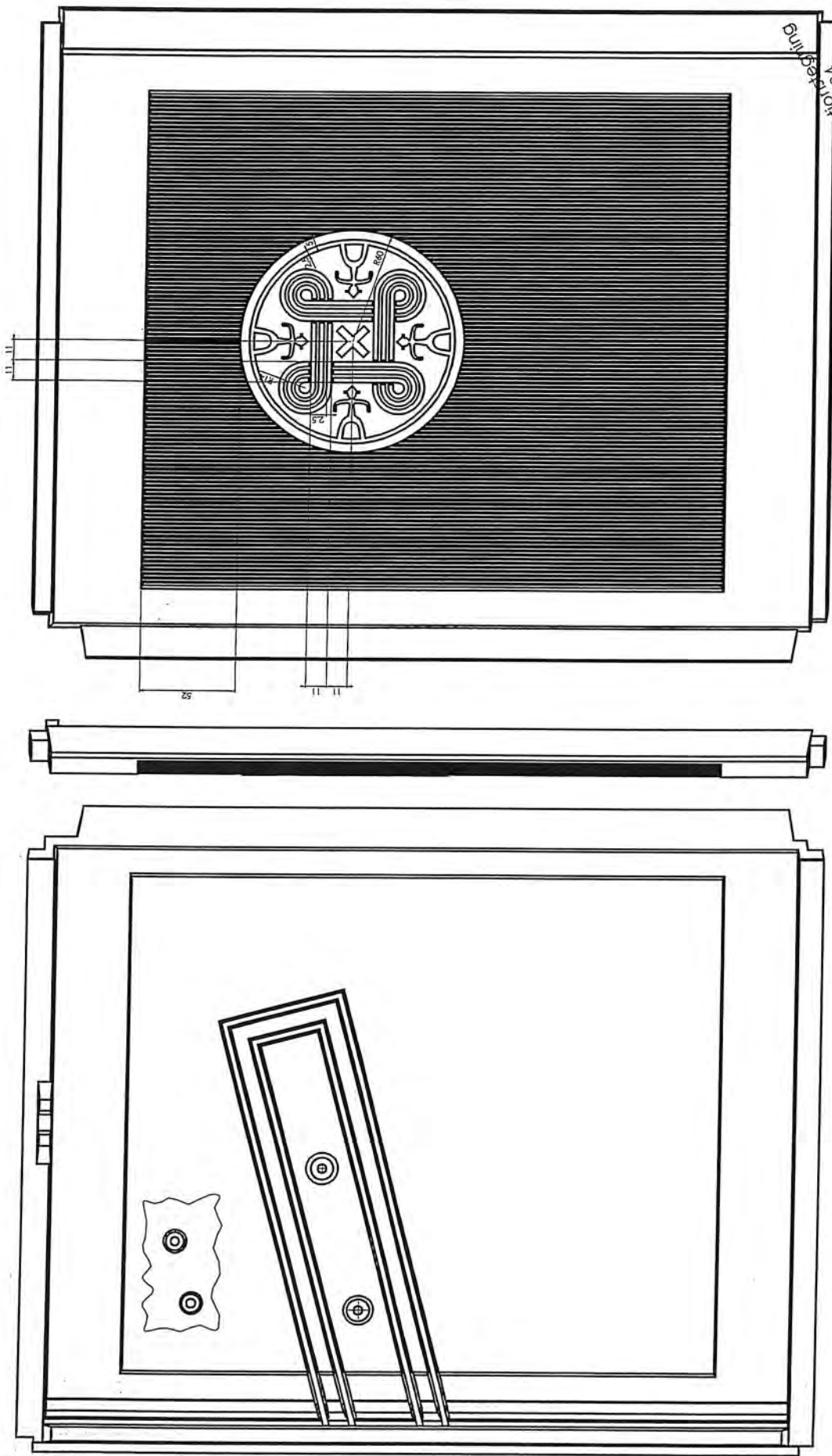
3-25013-62



Ikke angivne radler = R1		Sign: 1		Dato: 19.03.03	
Radler eller indviklet: 7202 Besemmer		Konstruktion: 101		19.03.03	
Mål uden toleranceangivelse (b.l. 100-norm): 6032 C17		Riset: R1st 7110		Revised: 1	
Materiale: Støbejern GG 18 Cr		Formst: AS		1	
Vægt: 382 kg		Morsø 7110		1:1	
Målest. no.: 7114		Item no.: 34711600		1	
Dokumenttype: Støbetegning		Drawing no.: 7100-16		1	
Løsningsfil: www.morsos.com		Drawing no.: 7100-16		1	

The drawing is Morse Armatured A7 property and shall not be sold, rented or copied without any written authorisation from the company.

3-26 of 3-62

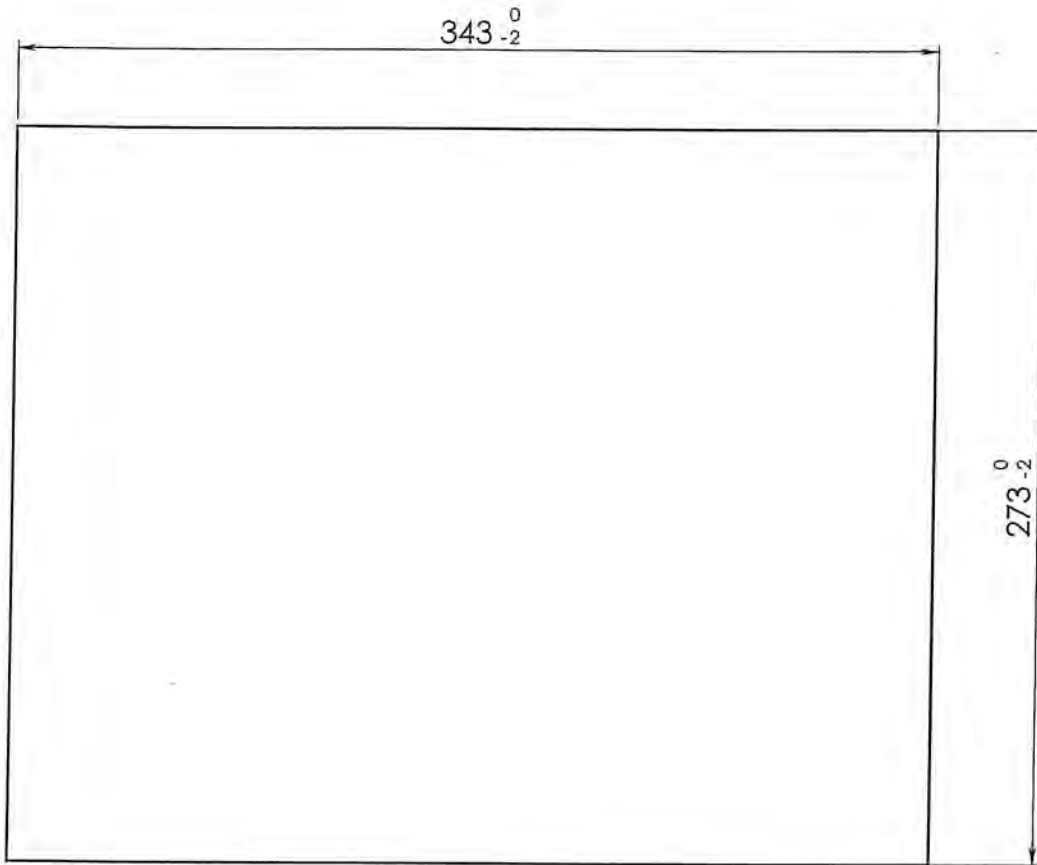


Konstruktørtegning
14.01.04

Øvrige mål se tegning 7100-04


Tilgængelige		Dato	
Navn	Titel	Udstedt	Revideret
Ståleplade højre Vinkel	Konstruktør	14.01.04	
Morsø 7110	Revisor	A1	
	Drøjet	1:1	
	Drøjet	347/11900	
morsø		7100-19	

3-29 R3-62



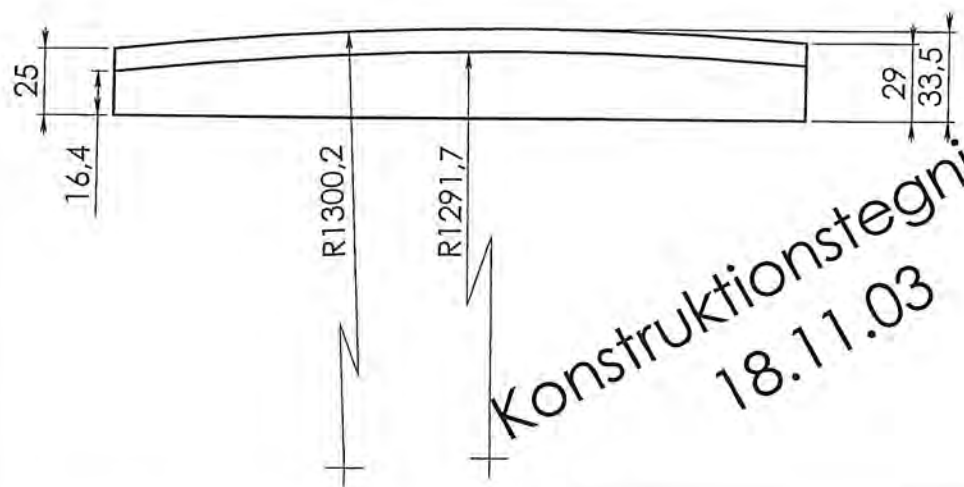
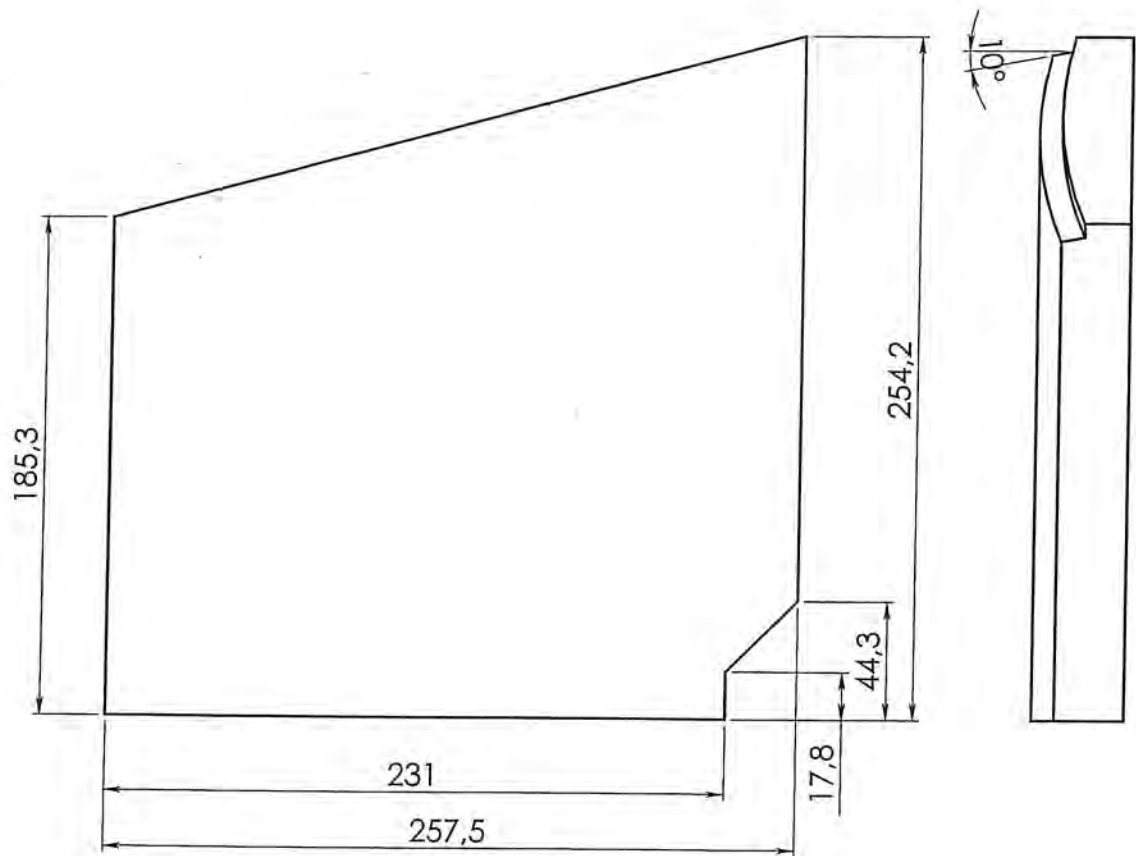
Konstruktionstegning
18.09.03

DTE of print: 19-01-20

Rev. Revisions		Sign.:	Date:
Title:		Construction:	KDU
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Released:	
Material:	Keramisk glas	Format:	A4
Weight:	1.17 kg	Scale:	1:2.5
Model no.:	-	Itemno.:	79710000
Drawingtype:	Emnetegning	Drawing no.:	
Location of file:	U:\10V\tegninger\7100\7100-21 Glas\21D\FR1		
Keramisk glas 7110 Morsø 7110 		7100-21	

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3-30 of 3-62

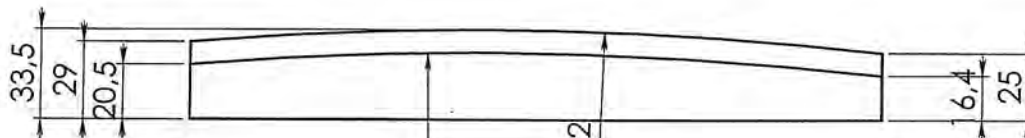
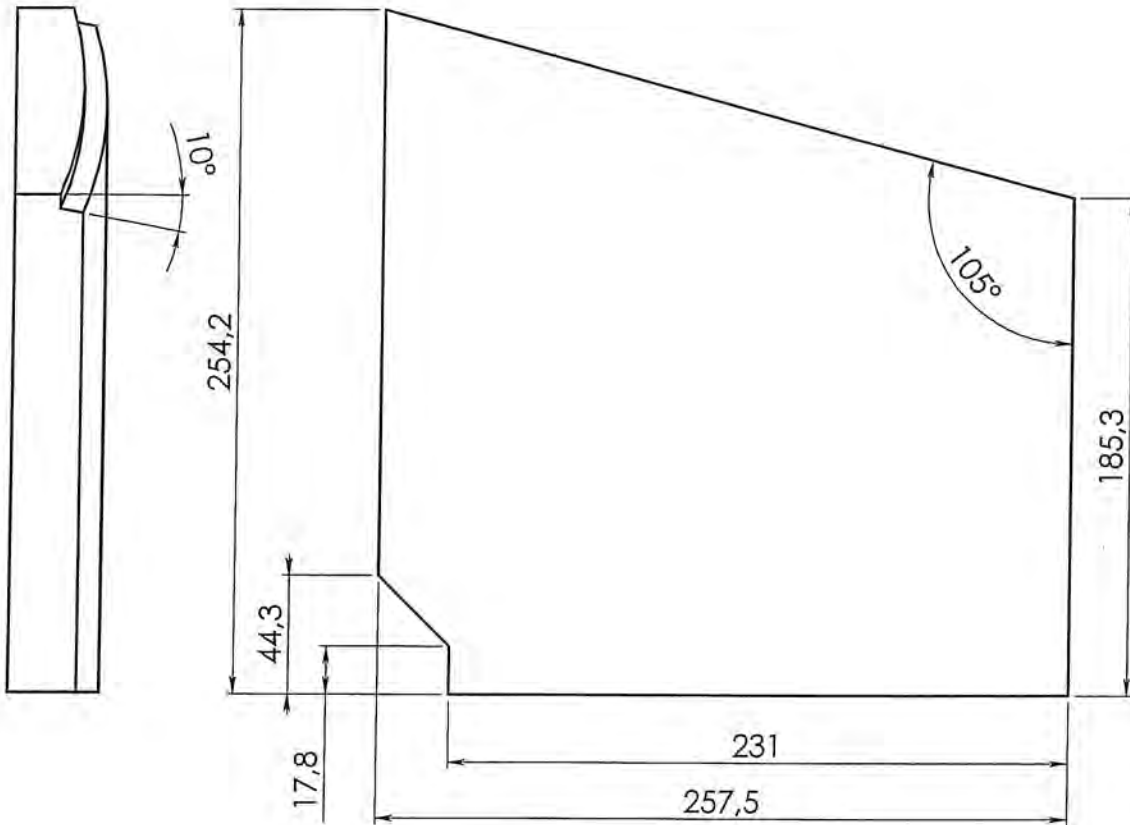


Konstruktionstegning
18.11.03

Rev. Revisions		Sign.:	Date:
Title:		Construction	KDU
General tolerance: +0mm -3mm		Released:	18.09.03
Material:	Vermiculite VIP-12	Format:	A4
Weight:	2.09 kg	Scale:	1:2.5
Model no.:	-	Itemno.:	79710200
Drawingtype:	Emnetegning	Drawing no.:	7100-23
Location of file:	U:\VUV\Weghøgen\7100-23 Sten - højre side.SLDPRT	morsø Byggetøj til alle projekter	

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3-3203-02

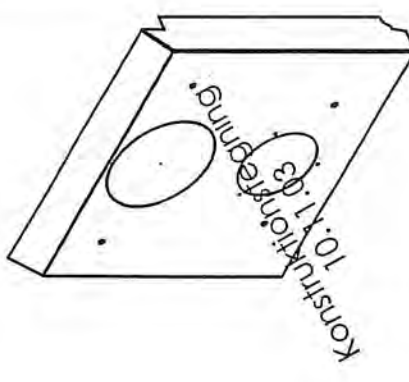
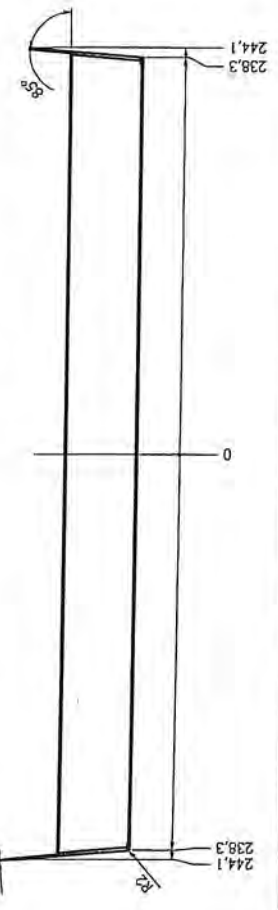
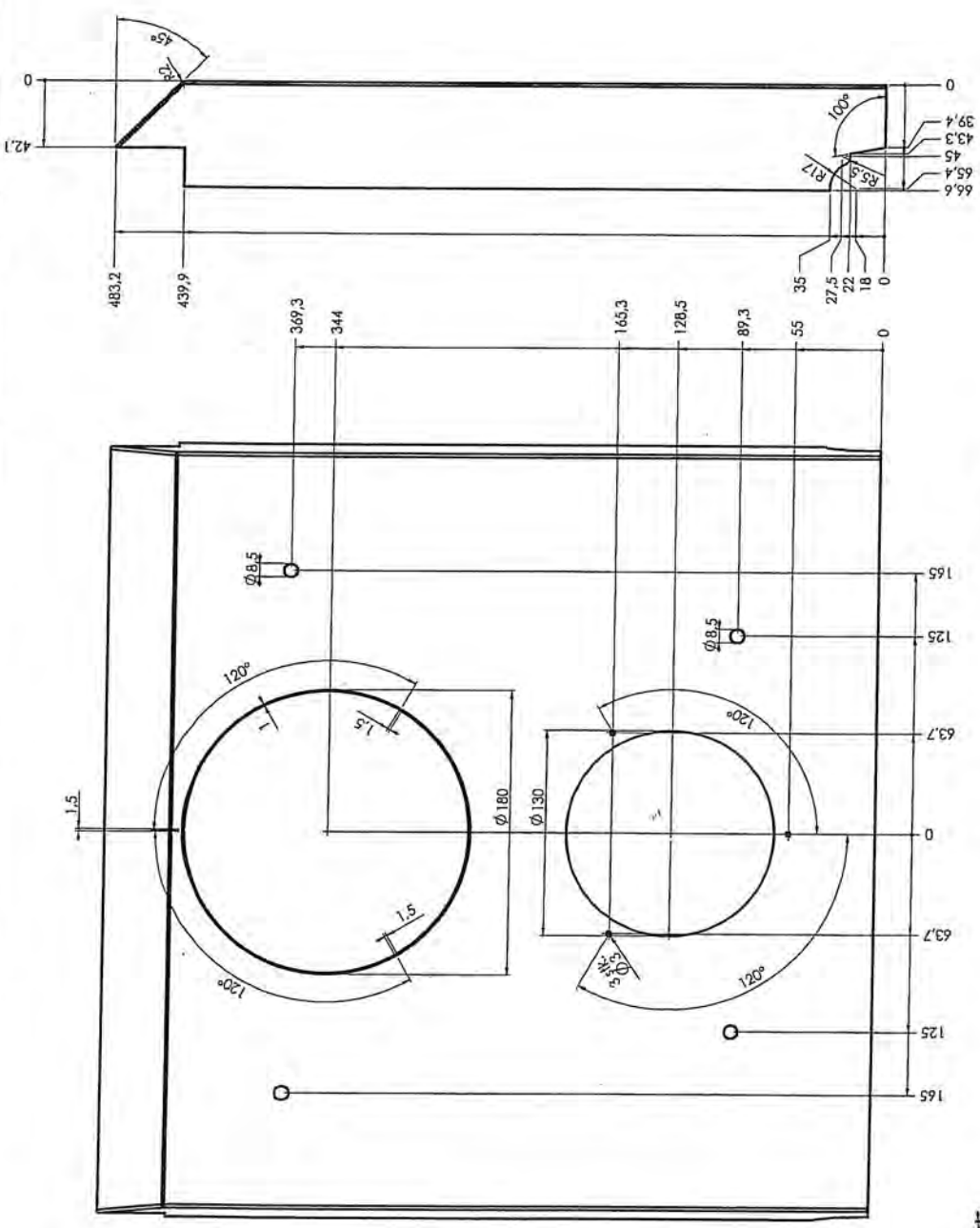


Konstruktionstegning
18.11.03

General tolerance: +0mm -3mm		Rev. Revisions	Sign.:	Date:
Material:	Vermiculite VIP-12	Title:	Construction	KDU
Weight:	2.07 kg	Sten side - venstre 7110	Released:	
Model no.:	-	Morsø 7100	Format:	A4
Drawingtype:	Ernetegning	morsø	Scale:	1:2.5
Location of file:	\\U:\Vejrings\7100\7100-24 Sten - venstre side.SLDPRT	By approved to:	Itemno.:	79710300
		Drawing no.:	7100-24	

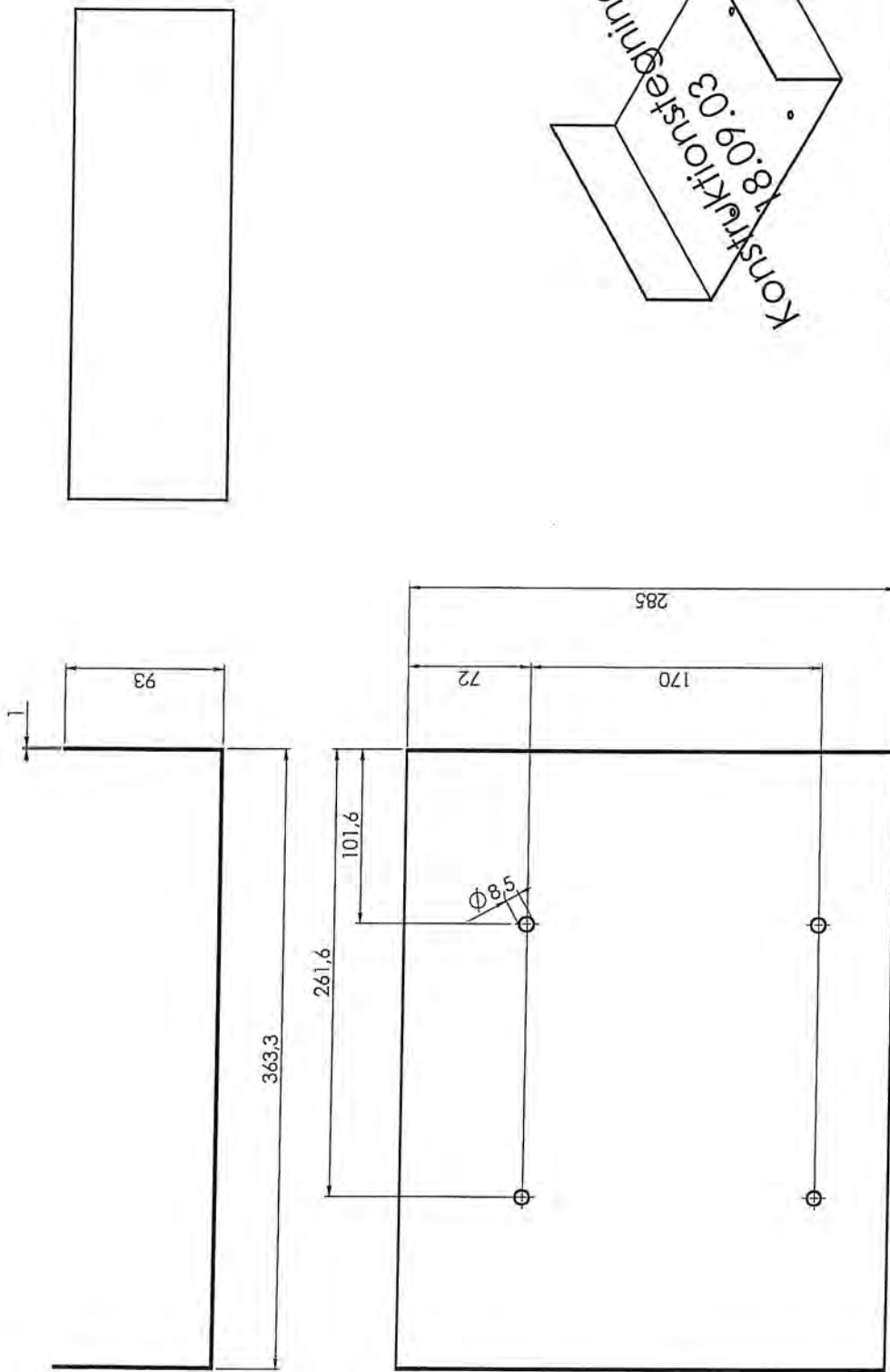
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorization from the company.

3-3303-62



Rev./Revision	Figur	Dato
	100	14.09.03
Titel		
Stråleskærm bag 7110		
Revision		
Format: A3		
Skala: 1:2		
Item no.: 711010100		
Drawing no.: 7100-25		
<small>This drawing is Morse Intellectual A/F property and must not be sold, lent, copied or copied without any written authorization from the company.</small>		
Måluden tilbræningsmåle (h.L. 01/10/2001 m		
Materiale: Gåvokasset plate		
Vægt: 222 kg		
Model no.		
Drawing type: Ebningstegning		
Location of file:		

3-3483-62



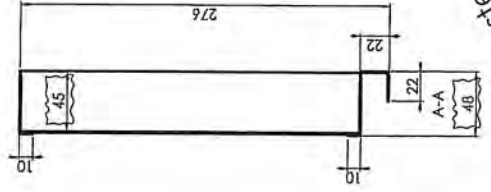
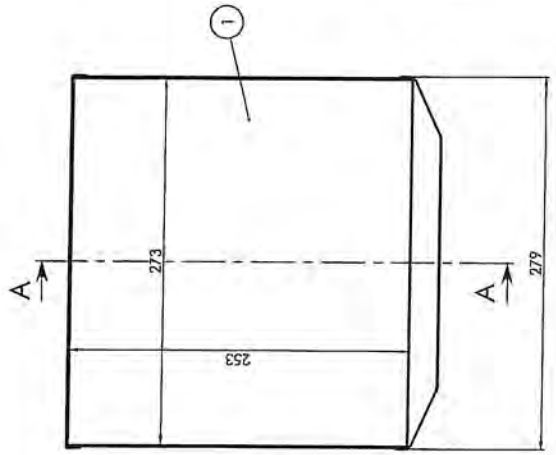
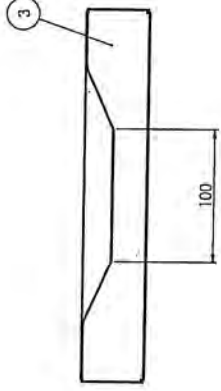
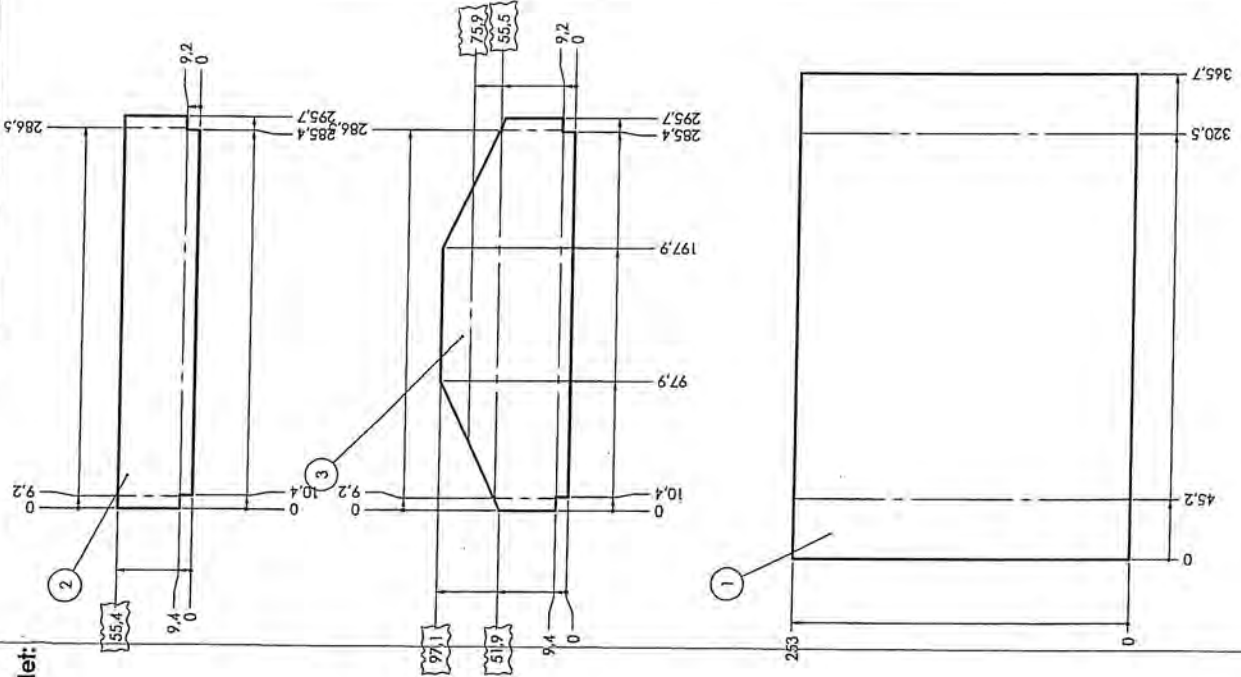
Konstruktionstechnische Zeichnung
 18.09.03

Mål uden tolerancesangivelse iht. I. DS/ISO 2768-1 m	Rev./ Revisions	Sign./	Date/
Materiale/ Galvaniseret plade	Constitution	KDU	18.09.03
Vægt/ 1,22 kg	Released:		
Model no. *	Format/	A3	
Drawing type/ Emnebetegnelse	Scale/	1:2.5	
Location of file/	Item no./	71710200	
Title/		Drawing no./	
Strøleskærm bund 7110		7100-26	
Morsø 7110		morsø	
		Hvideovre W. Hvideovre	

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3-35-A3-02

Udfoldet:



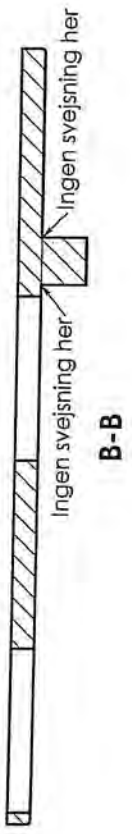
Konstruktions-tegning
1:3.01.04



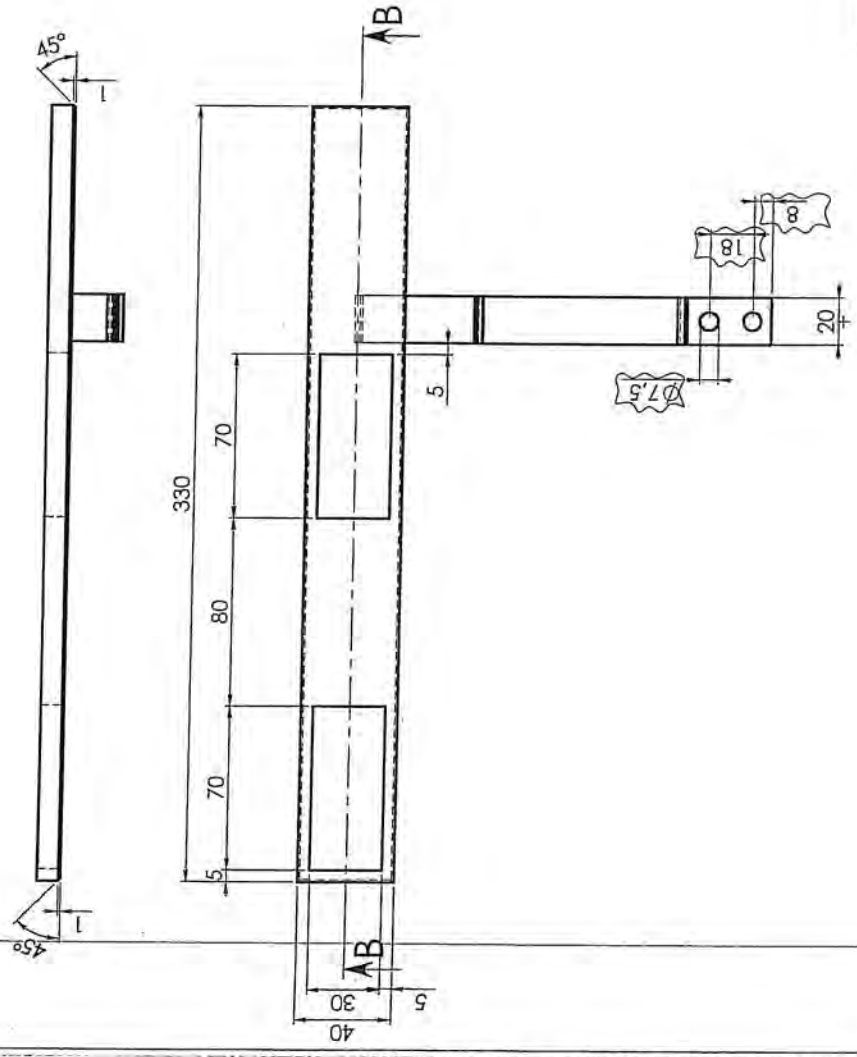
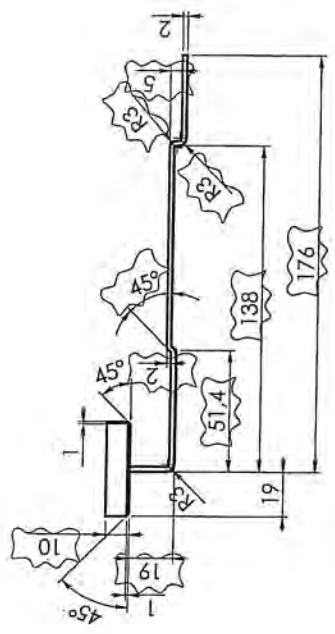
Mål (uden tolerancer) på basis af DTD 2766-1 m		Tilsk.		Dato:	
Materiale: Galv. plade		Konstruktion: ASKEKUFFE 7110		17/09/03	
Vægt: 1,04 kg		Reviser:		17/09/03	
Model no.:		Morsø 7110		A2	
Dokument: Forsigtigheds		Morsø 7110		1:2.5	
Løsningsnr.:		71710300		71710300	
Løsningsnr.:		7100-27		Side 1 of 1	

This drawing is Morsø Jernstøbej's property and must not be sold, leased or copied without any written authorization from the company.

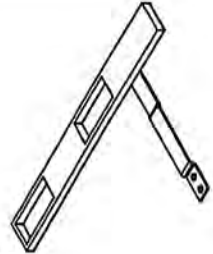
3-36af3-c2



B-B



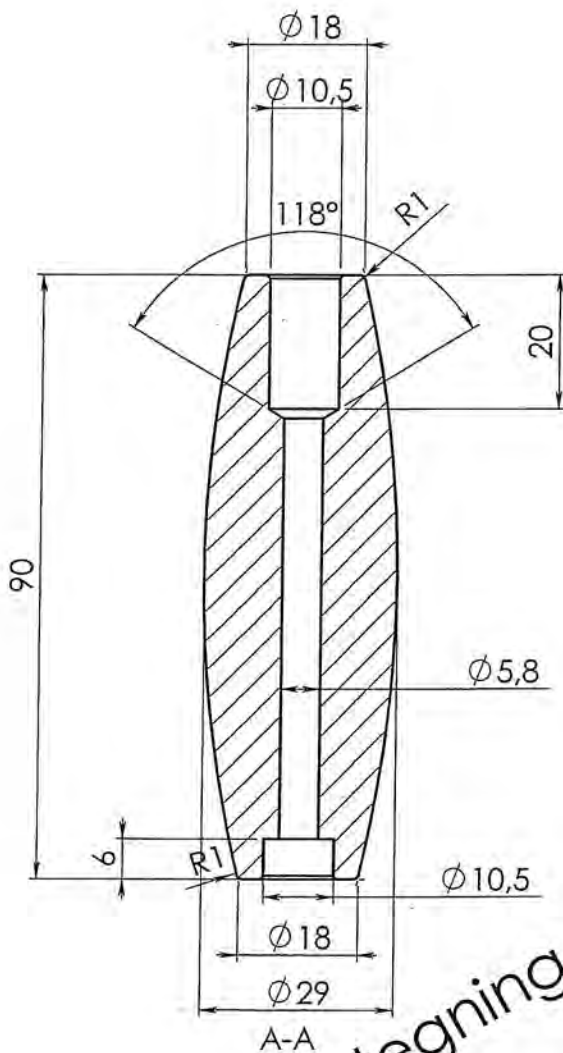
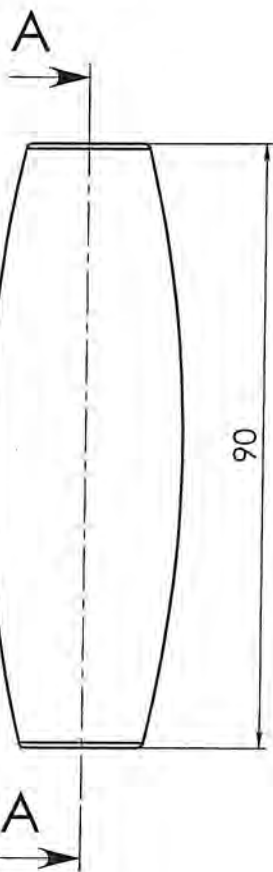
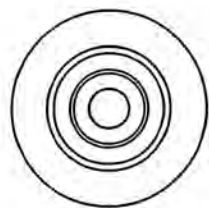
Konstruktionstejning
19.01.04



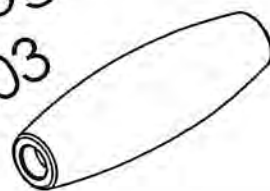
Mål uden tolerancesøjle i h.t. DS/ISO 2768-1 m	Rev/ Revisions	Sign.: KDU	Date: 18.09.03
Materiale: SPD Plade	Titel: Primær spjæld 7110		Construction: Released:
Vægt: 0,76 kg	Morsø 7110		Formel: A3
Model no.:	morsø		Scale: 1:2
Drawing type: Erstatning	7100-28		Item no.: 7110400
Location of file:	Drawing no.:		7100-28

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3-37A3-62



Konstruktionstegning
06.11.03



Rev.	Revisions	Sign.:	Date:
	Title:	Construction	KDU
	Greb 7110	Released:	17.09.03
	Morsø 7110	Format:	A4
	morsø	Scale:	1:1
	<small>By oplyst til: Det Kongelige Danske Landstingsforbund</small>	Itemno.:	71710500
		Drawing no.:	7100-29

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m

Material: Bakelitt

Weight: 0,34 kg

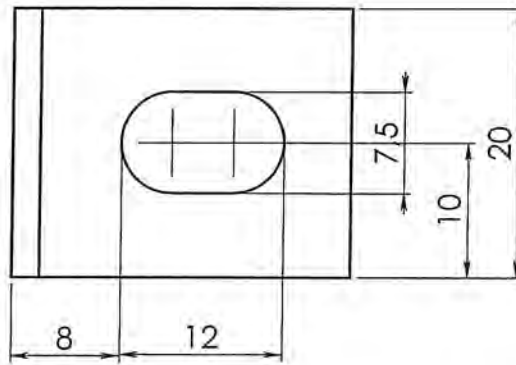
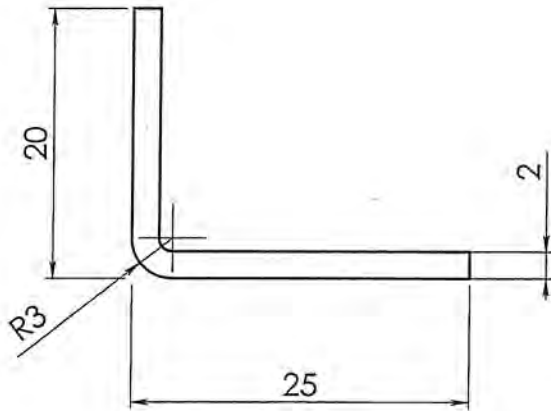
Model no. -

Drawingtype: Emnetegning

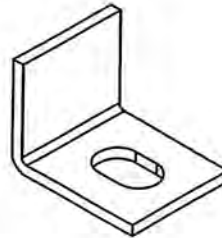
Location of file: U:\DVA\tegnings\7100\7100-29 Greb 1.M&S.hoga.B.DWG

3-382P3-62

Date of print: 19-01-20



Konstruktionstegning
18.09.03

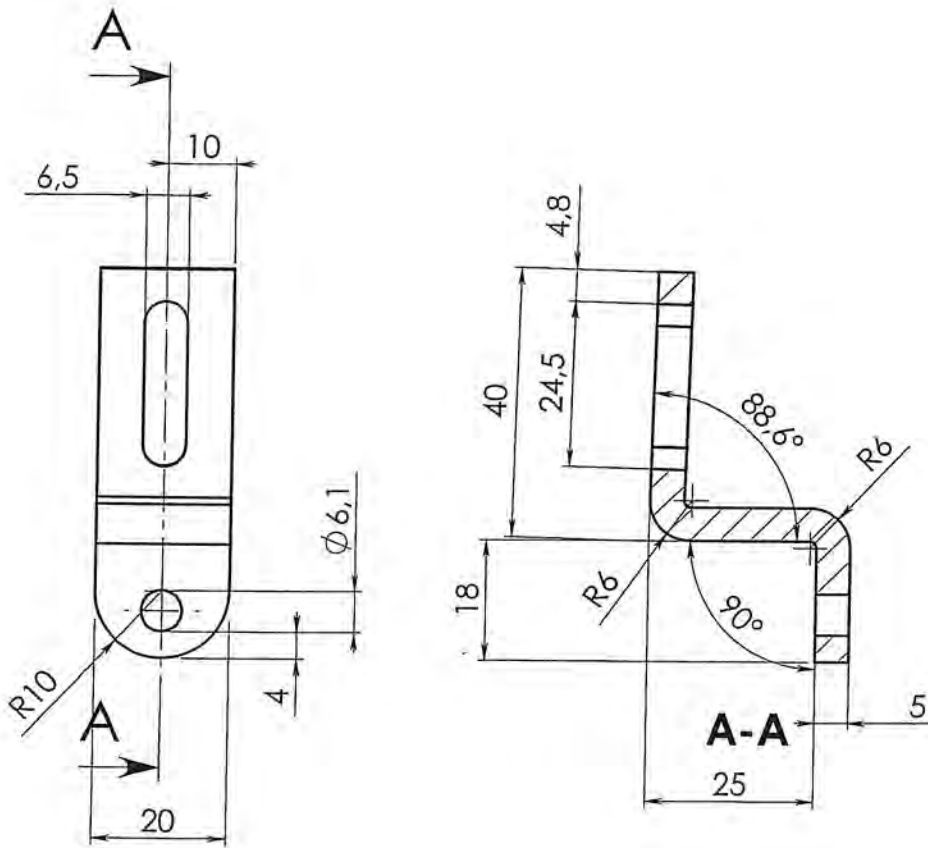


Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Rev.	Revisions	Sign.:	Date:
Material:	SPD Plade			Construction	KDU
Weight:	0,01 kg			Released:	
Model no.:	-			Format:	A4
Drawingtype:	Emnetegning			Scale:	2:1
Location of file:	IT\NIDV\tegninger\7100\7100-30 Holder for sten,SPDRET			Itemno.:	71710600
				Drawing no.:	7100-30

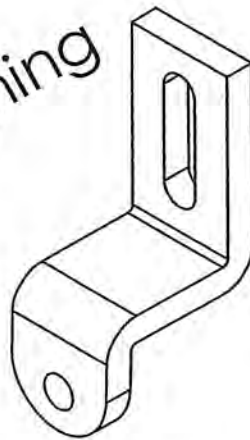
Holder for sten 7110

Morsø 7110





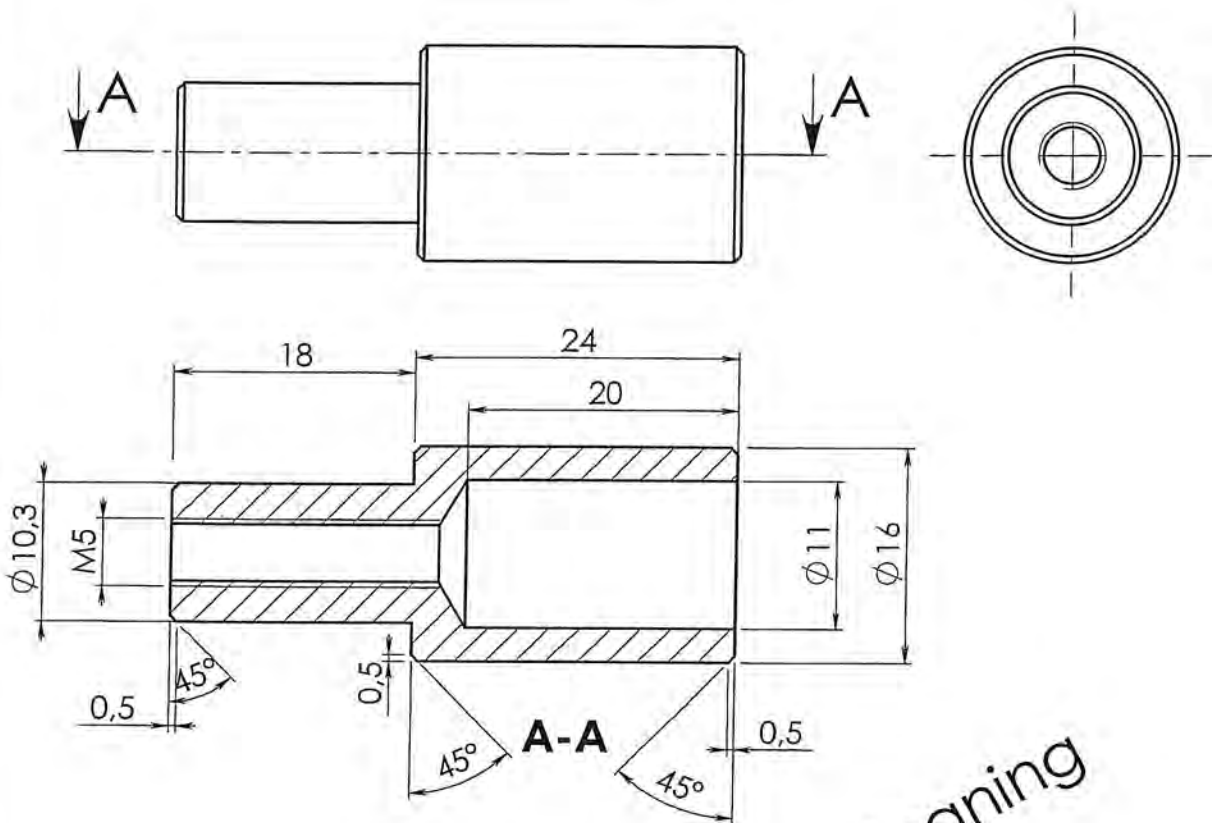
Konstruktionstegning
18.09.03



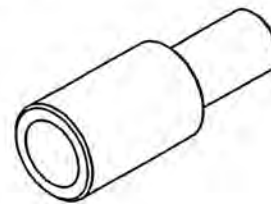
Rev. Revisions		Sign.:	Date:
Title:		Construction	KDU 18.09.03
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Released:	
Material:	SPD Plade	Format:	A4
Weight:	0,05 kg	Scale:	1:1
Model no.:	-	Itemno.:	71710700
Drawingtype:	Emnetegning	Drawing no.:	7100-31
Location of file:	0:\MDV\Ingeniør\7100\7100-31\Holder spændstift - Askedør.SLDPR	morsø Byggesystemer og Teknologier	

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3-4023/02

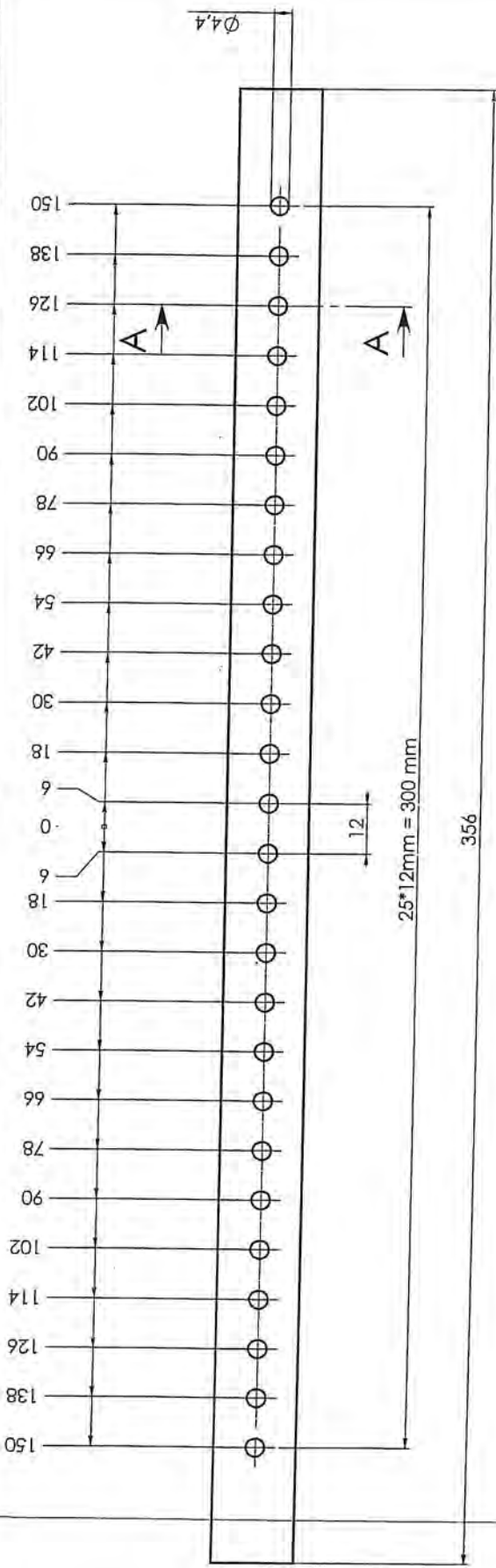


Konstruktionstegning
06.11.03

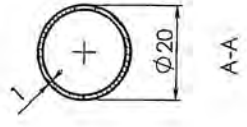


Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	
Material:	AISI 304
Weight:	0,03 kg
Model no.:	-
Drawingtype:	Ernnefegning
Location of file:	U:\101\Wegning\7100\7100-32 Overgangsstykke greb 7100\LDPEI

Rev. Revisions	Sign.:	Date:
Title: Overgangsstykke til greb	Construction: KDU	18.09.03
Morsø 7110	Released:	
	Format:	A4
	Scale:	2:1
	Itemno.:	71710800
Drawing no.:		7100-32



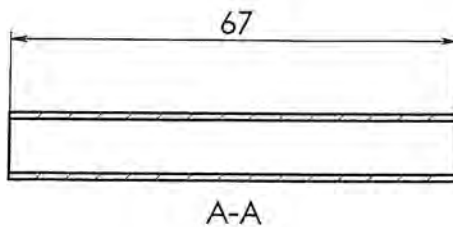
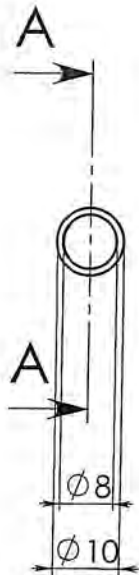
Konstruktions-tegning
1:9.01.04



Rev/ Revisions		Sign.: KDU	Date: 22.09.03
Title: Sekundær Rør 7110 - Lille		Construction: Lille	Formot: A3
Material: AISI 304		Scale: 1:1	Item no.: 7111000
Weight: 0,17 kg		Drawing no.: 7100-34	
Model no.:		Drawing no.: 7100-34	
Drawing type: Ermelegning		Drawing no.: 7100-34	
Location of file: C:\Users\KDU\Desktop\7100-34.dwg		Drawing no.: 7100-34	

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3-4303-02



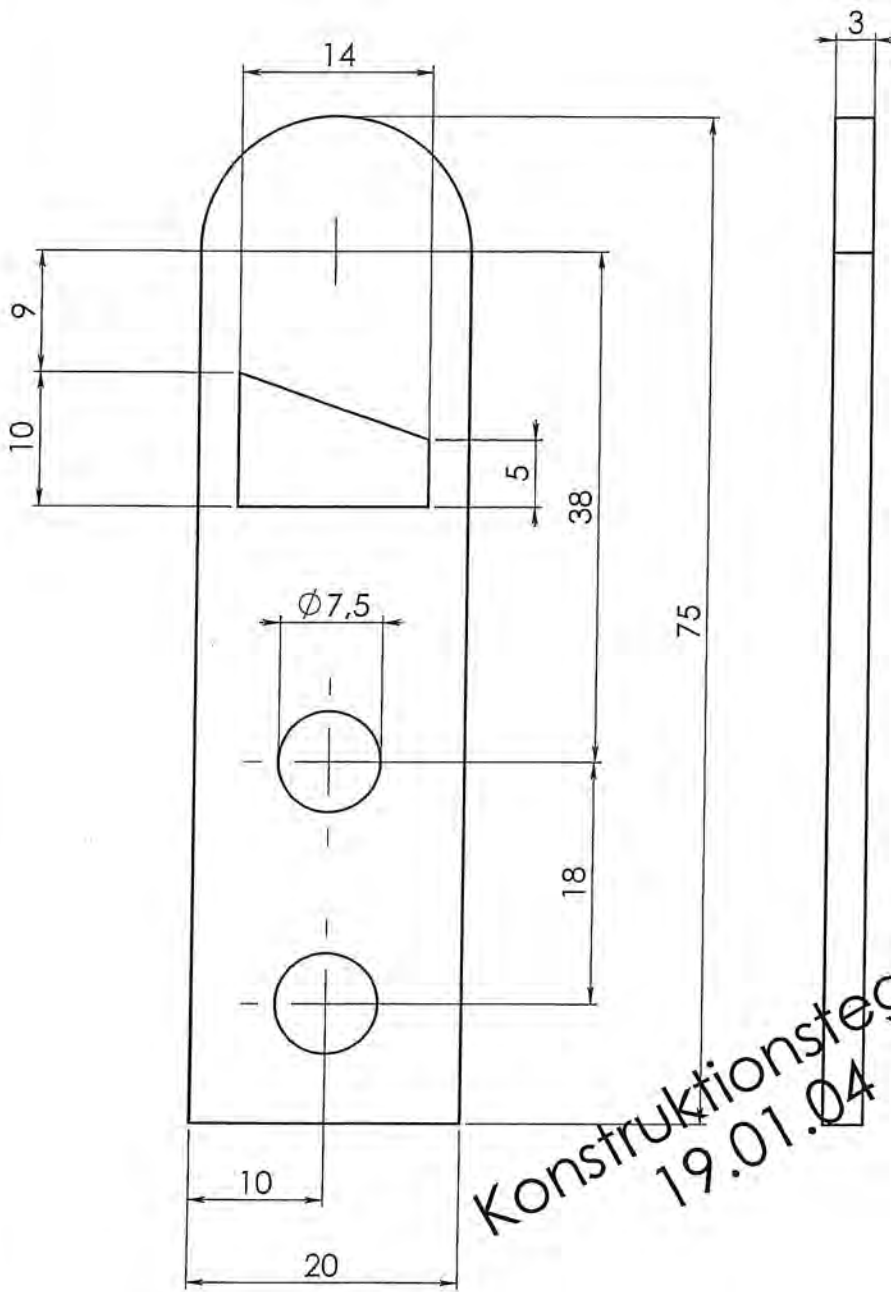
Konstruktionstegning
29.09.03

Rev.	Revisions	Sign.:	Date:
	Title:	Construction	KDU
	Afstandsrør $\varnothing 10 \times 1$ L=67	Released:	14.06.02
		Format:	A4
		Scale:	1:1
		Itemno.:	54710100
	morsø <small>Byggesystemer til den Røjløse Gulv</small>	Drawing no.:	7100-35

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	
Material:	galv
Weight:	0,01 kg
Model no.	-
Drawingtype:	Ernetegning
Location of file:	U:\udv\tegringer\afstandsrør\afstandsrør\afstandsrør ø10x1.DWG

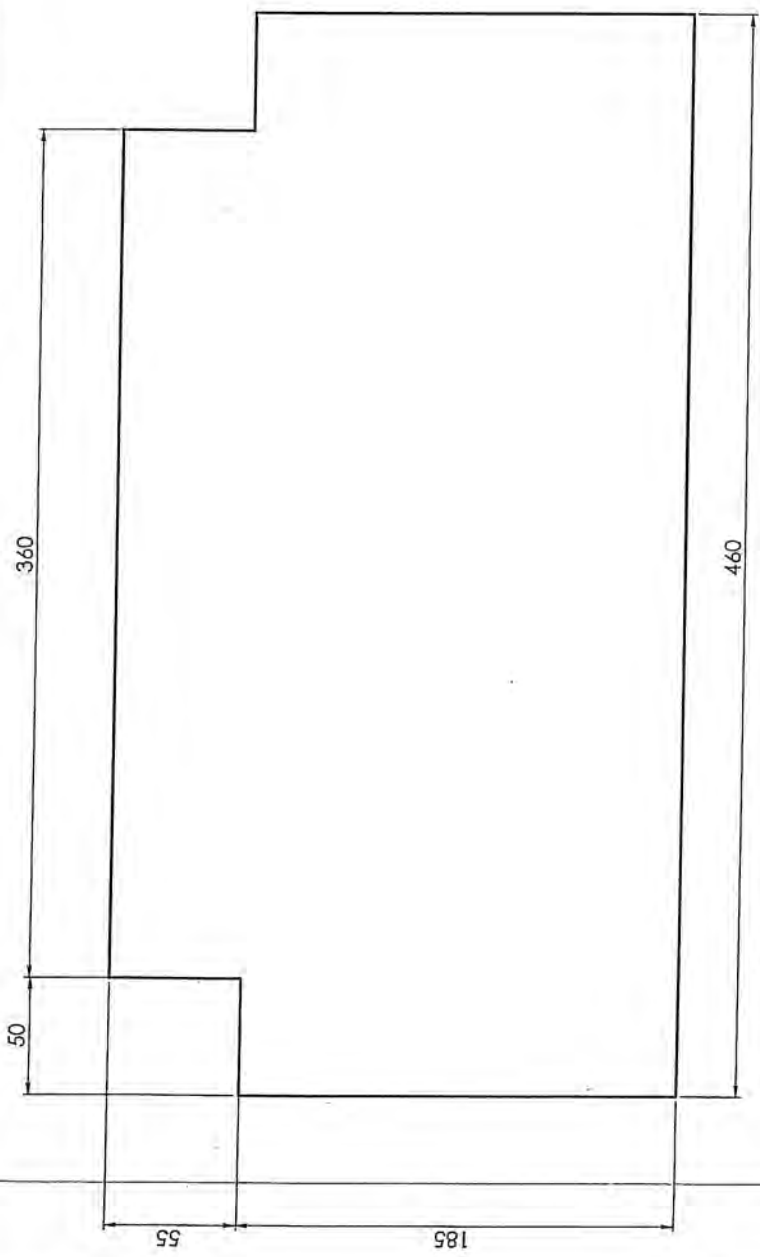
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3-4483-62



Konstruktionstegning
19.01.04

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Rev. Revisions	Sign.:	Date:
Material:	Rustfri stål	Title:	Construction	KDU
Weight:	0,03 kg	Primær greb 7100	Released:	13.01.04
Model no.:	-	Morsø 7110	Format:	A4
Drawingtype:	Emnetegning	morsø	Scale:	2:1
Location of file:	U:\MDV\Vejringer\7100\7100-37 Primær greb\LDPE	<small>Byggeteknik og Design</small>	Itemno.:	71711161
		Drawing no.:	7100-37	



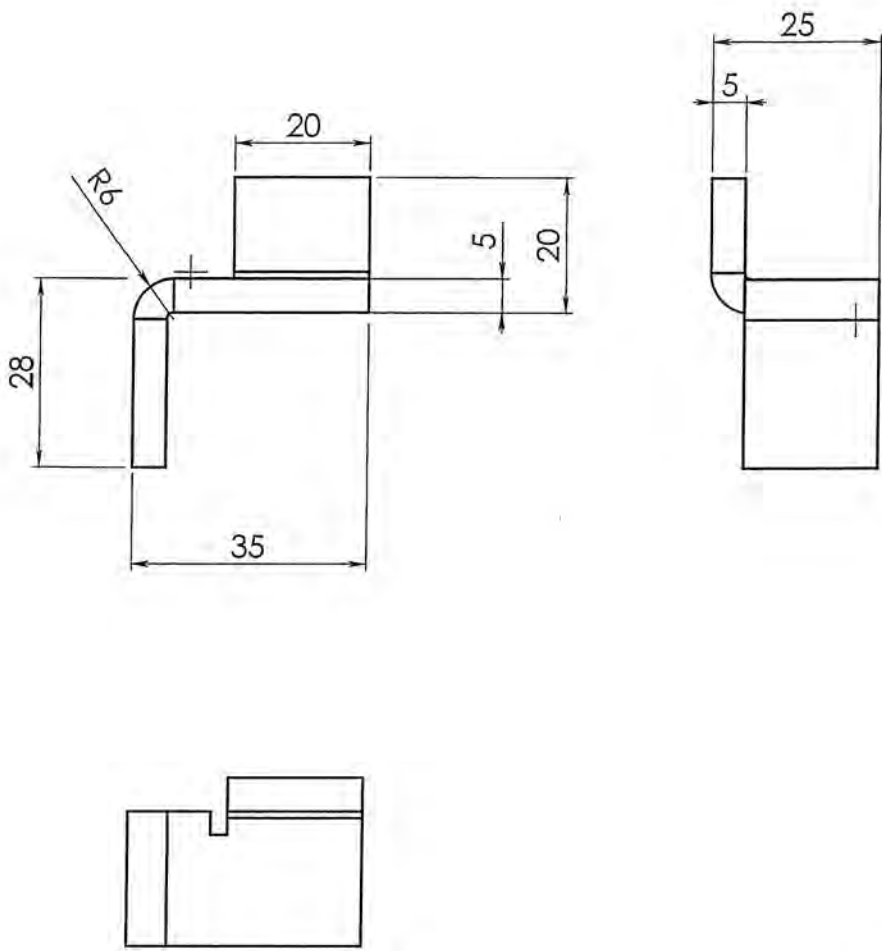
Konstruktørtegning
14.01.04

Rev. Revisions		Signs:	Date:
Tittel:		KDU	14.01.04
General tolerance: +0mm, -0.3mm		Construction Released:	
Material: Varmeskjold VIP-12		Format:	A3
Weight: 3.15 kg		Scale:	1:2
Model no. -		Item no.:	79710400
Drawing type: Ennelegning		Drawing no.:	7100-38
Location of file: <small>envoye\projet\2004\7100-38\7100-38.dwg</small>			

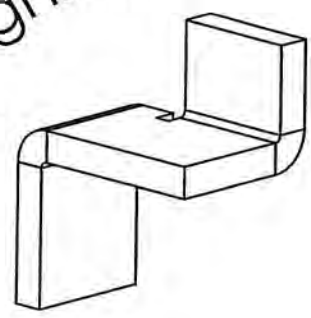


This drawing is Morsø Jernstøberi AS' property and must not be sold, lent or copied without any written authorization from the company.

3-4783-62



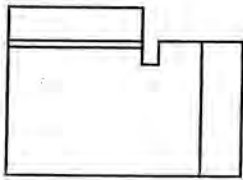
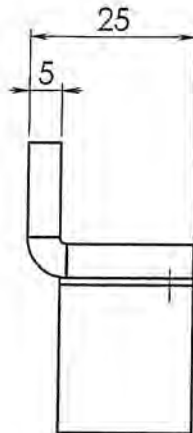
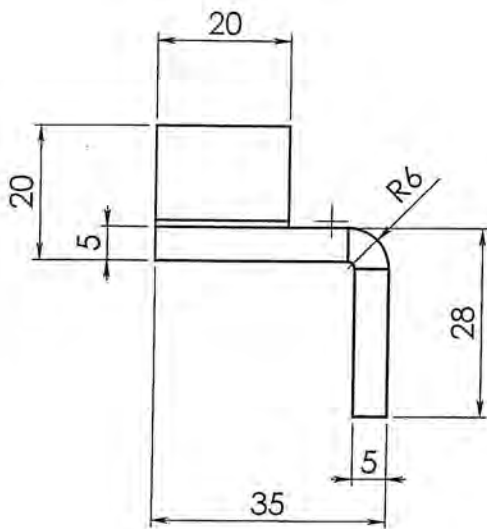
Konstruktionstegning
14.01.04



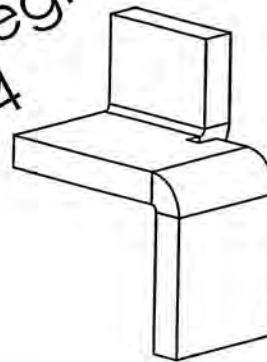
Rev. Revisions		Sign.:	Date:
Title:		Construction	KDU
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Released:	14.01.04
Material:	SPD Plade	Format:	A4
Weight:	0,07 kg	Scale:	1:1
Model no.:	-	Itemno.:	71711200
Drawingtype:	Emnetegning	Drawing no.:	7100-39
Location of file:	U:\100\tegnings\7100\7100-39 Stopbeslag varmeplade 7110.DWG	7100-39	

**Stopbeslag - venstre
for varmeskjold
Morsø 7110**





Konstruktionstegning
14.01.04

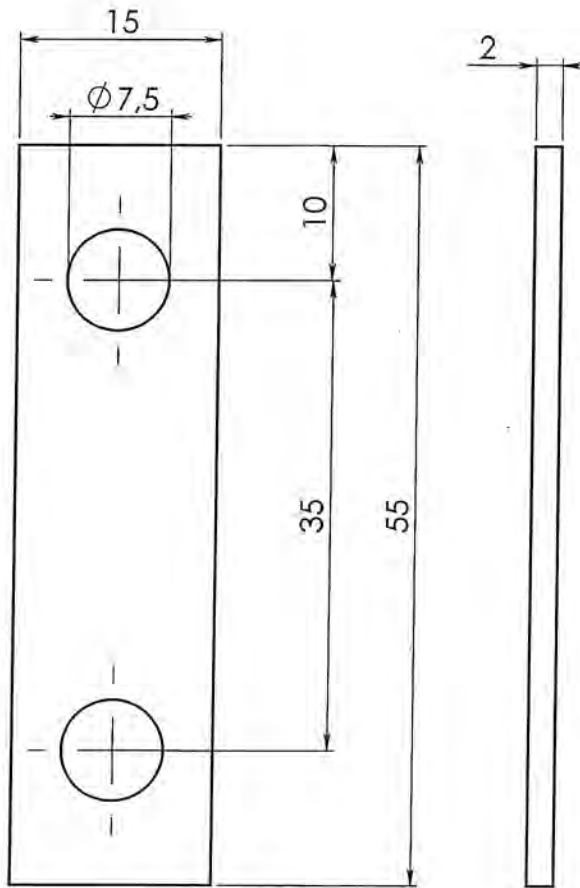


Mål uden toleranceangivelse i.h.f. DS/ISO 2768-1 m		Rev. Revisions	Sign.:	Date:
Material:	SPD Plade	Title:	Construction	KDU
Weight:	0,07 kg	Stopbeslag - højre	Released:	14.01.04
Model no.:	-	for varmeskjold	Format:	A4
Drawingtype:	Ernetegning	Morsø 7110	Scale:	1:1
Location of file:	\\A:\D\tegninger\7100\7100-40 stopbeslag varmeskjold - højre.SLDPRG	morsø <small>By appointment to the Royal Danish Court</small>	Itemno.:	71711300
		Drawing no.:	7100-40	

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Date of print: 19-01-2



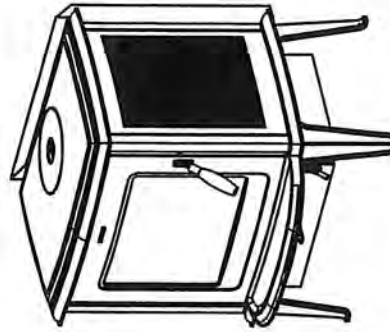
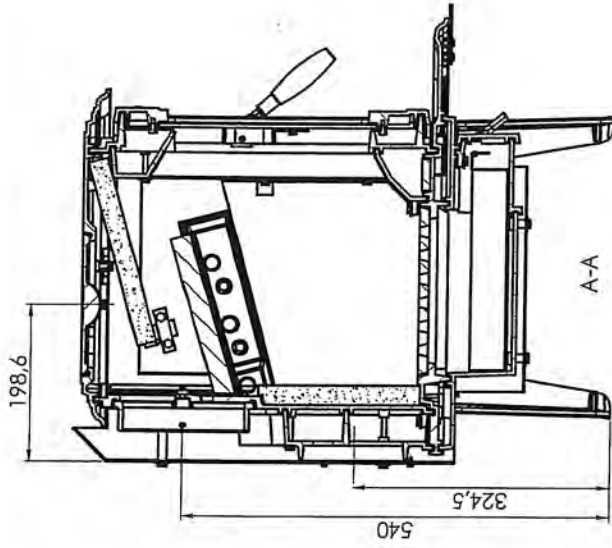
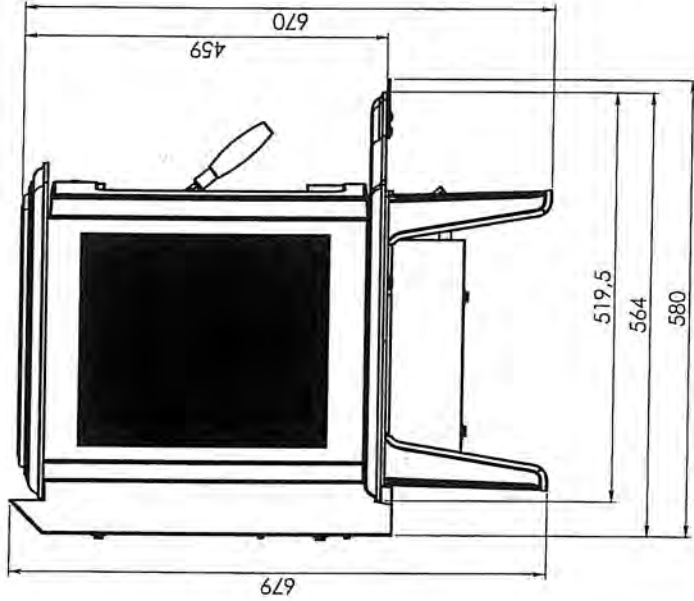
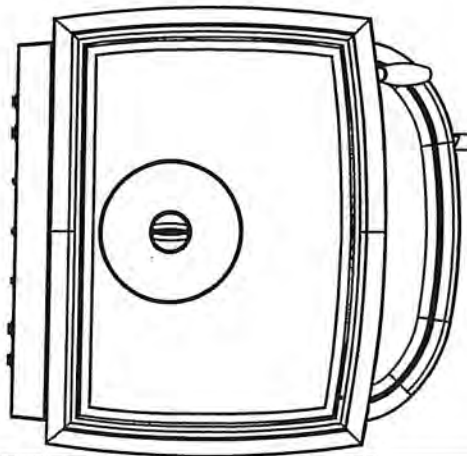
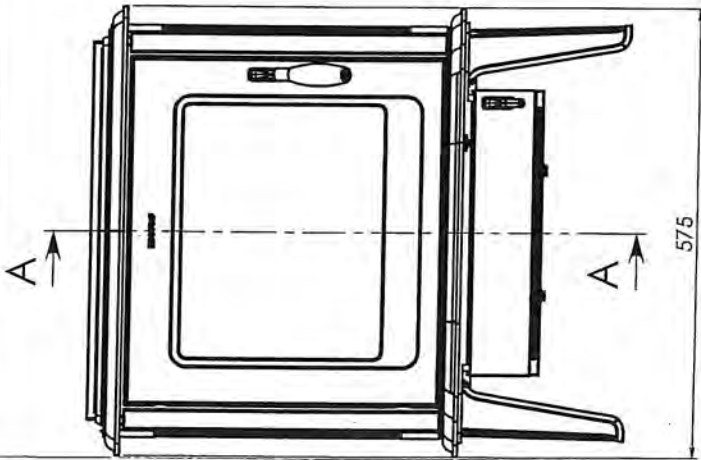
Konstruktionstegning
14.01.04

Zak 01 plinir. 17-01-2

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Rev. Revisions	Sign.:	Date:
Material:	SPD Plade	Title:	Construction	KDU
Weight:	0,01 kg	Fladjern for stopbeslag	Released:	
Model no.:	-	Morsø 7110	Format:	A4
Drawingtype:	Emnetegning	morsø <small>Byggesystemer til SPB - Jernstøberi A/S</small>	Scale:	2:1
Location of file:	u:\V0V\tegnings\7100\7100-41 Fladjern for stopbeslag.SP07		Itemno.:	71711400
			Drawing no.:	7100-41

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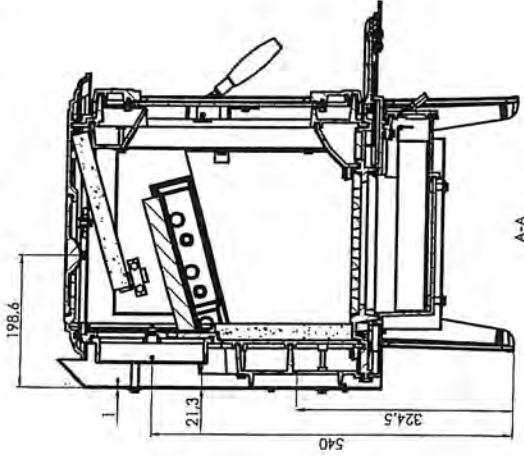
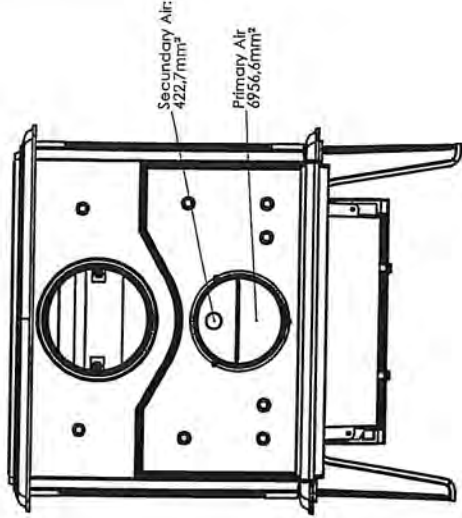
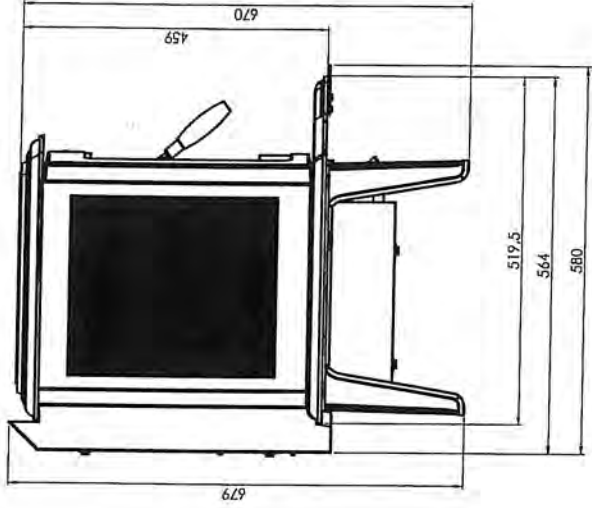
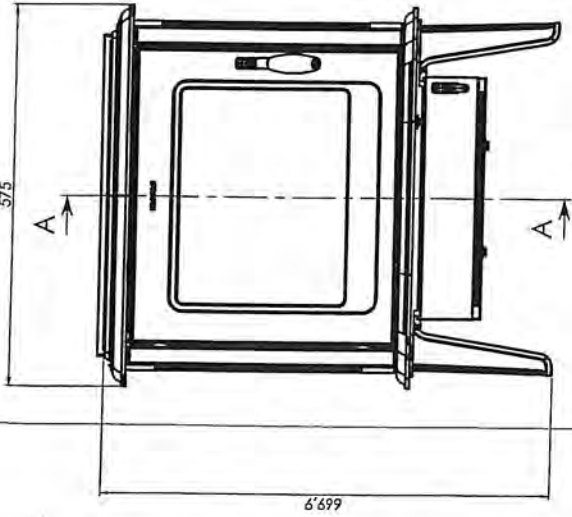
3-50.03-62



Rev. / Revisions		Sign.:	Date:
Title:		KDU	19.08.03
Målskitse 7110 USA		Construction	
Morsø 7110		Released:	
morsø		Format:	A3
København		Scale:	
København		Item no.:	
Location of fig.:		Drawing no.:	
		7100-42 a	
Material:			
Weight: 392,36 kg			
Model no.:			
Drawing type:			

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3-1083-62

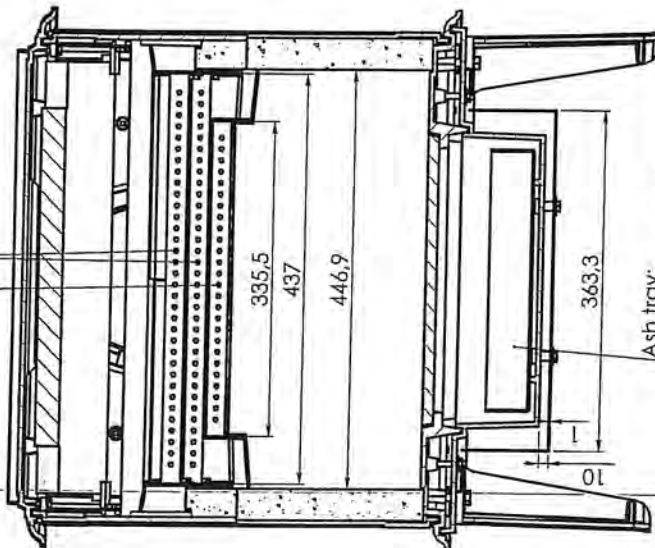


New revision		Sign.	Date
Title		Construction	KZU
Godkendelsetegning		Revision	19.03.03
7110 USA		Formål	A2
Morsø 7110		Skala	1:5
Morsø		Formål	
Drawing no.		Formål	
7110-43 a		Formål	
Side 1 of 2			

This drawing is Morsø Assembly's A/P property and must not be sold, lent, or copied without any written authorization from the company.

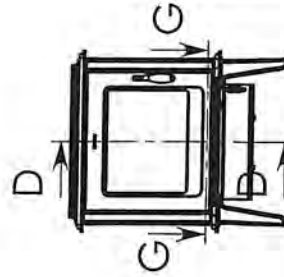
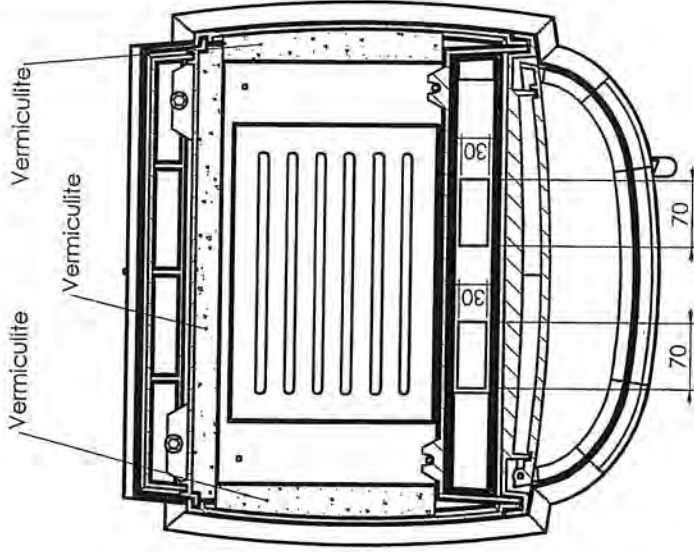
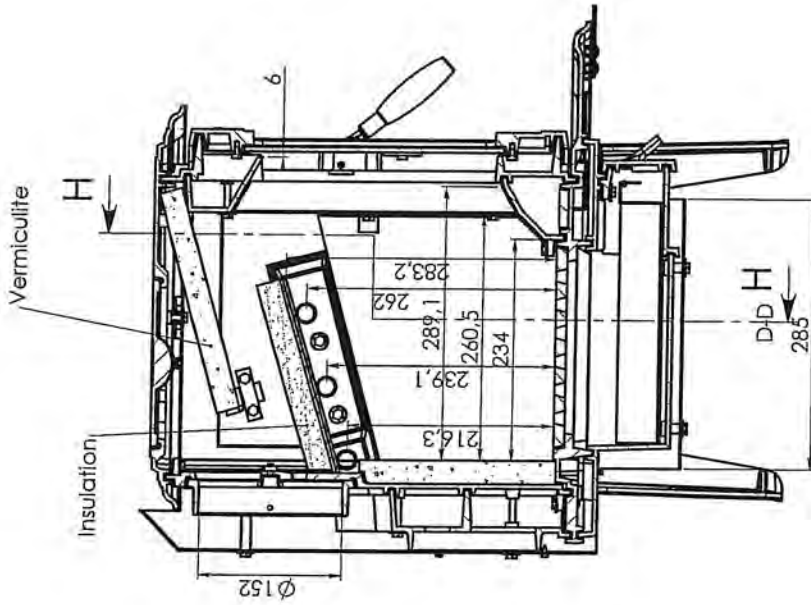
3-52RB-62

2 x 34 pcs. Ø4.4
26 pcs. Ø4.4

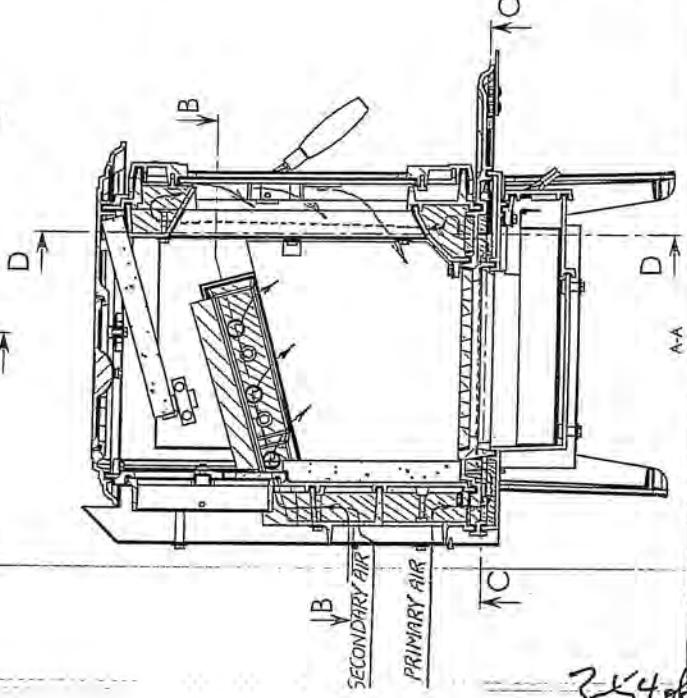
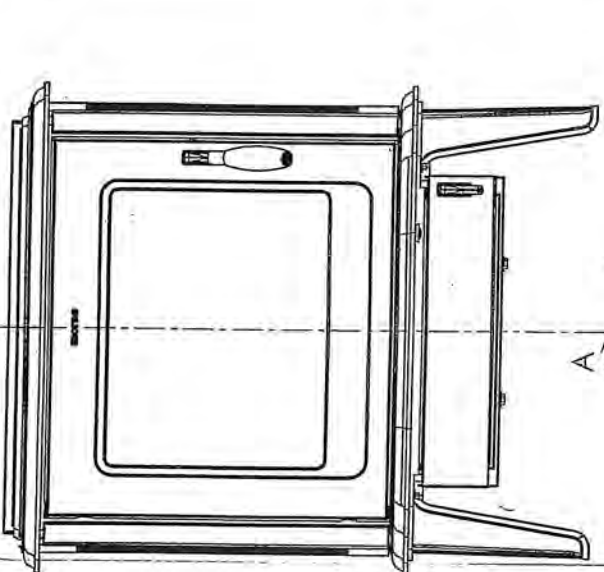
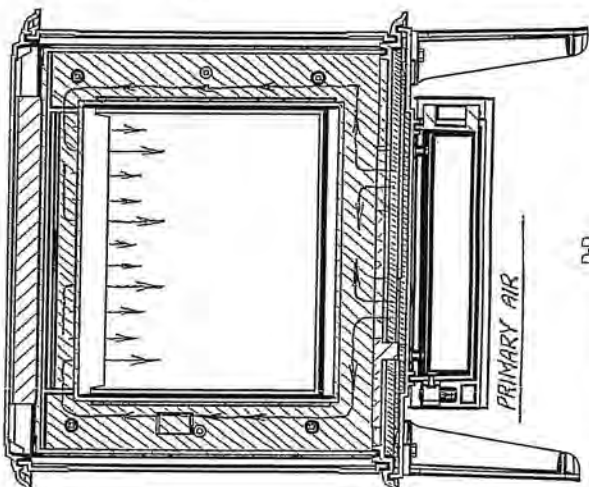
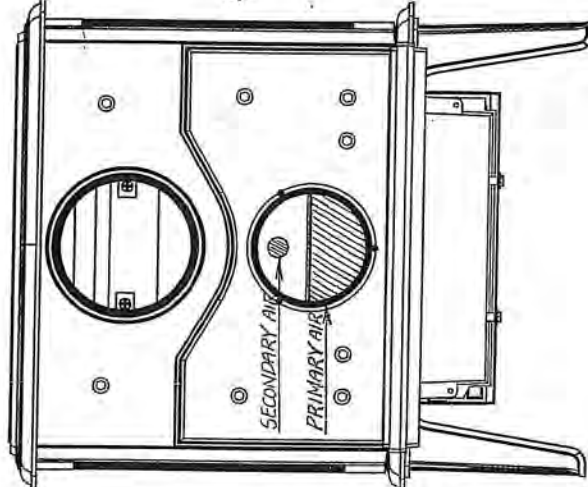
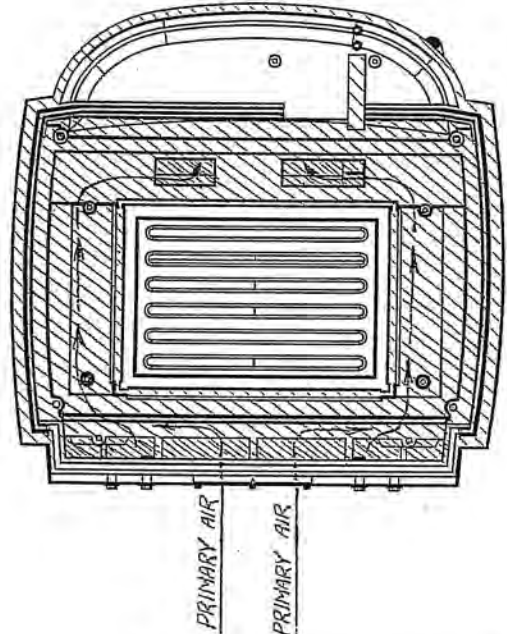
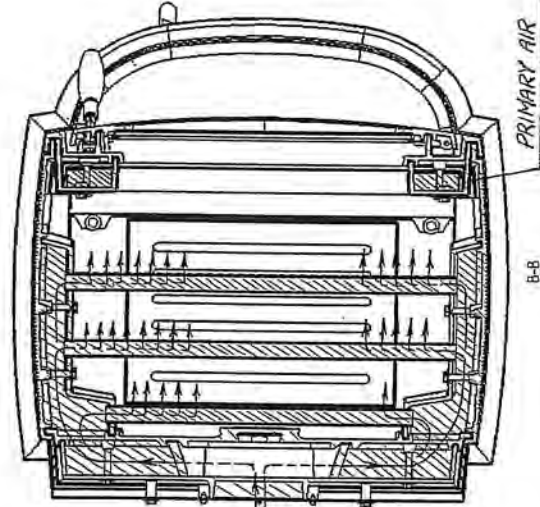


Ash tray:
Inside dim.: 253x273x45mm

H-H

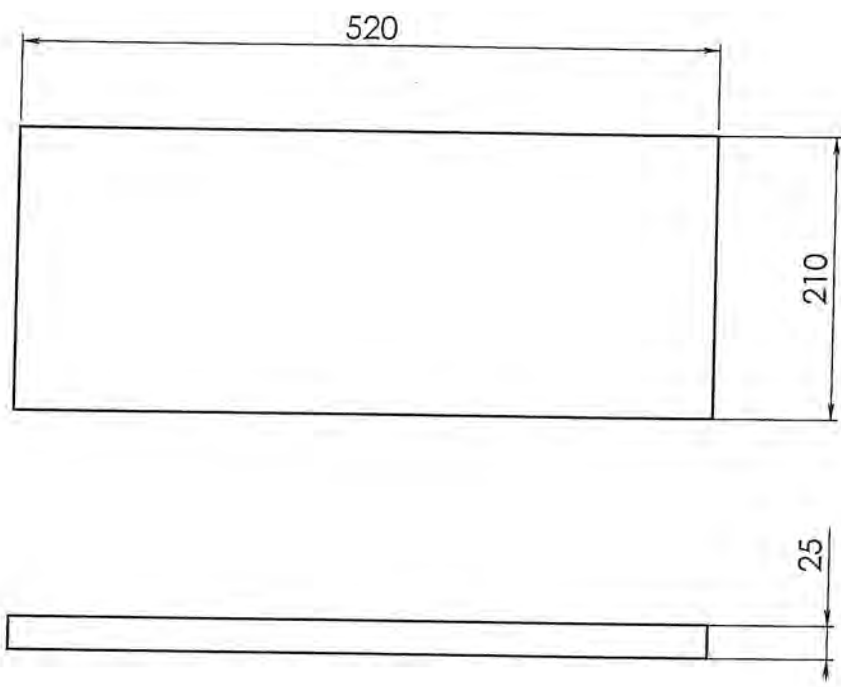


Title:		Construction		Sign.:	Date:
Godkendelsestegning		Released:		KDU	19.08.03
7110 USA		Format:		A3	
Morsø 7110		Scale:		1:5	
		Drawing no.:		7100-43 a	
		Drawing no.:		Side 2 of 2	
Material:		Drawing type:		morsø	
Weight: 392,35 kg		Location of file:		København	
Model no.:		This drawing is Morsø Jernstøberi A/S property and must not be sold, lent or copied without any written authorization from the company.			



Rev/Revision	Qty	Date
1	100	21.01.02
Title: Airflow 7110 USA		
Material	Release	A2
Scale	1:4	
Drawing no.	7100-44 a	
morsø Danish Stoves		
This drawing is Morsø Intellectual Property and must not be used, imitated or copied without any written authorization from the company.		

3-5483-62



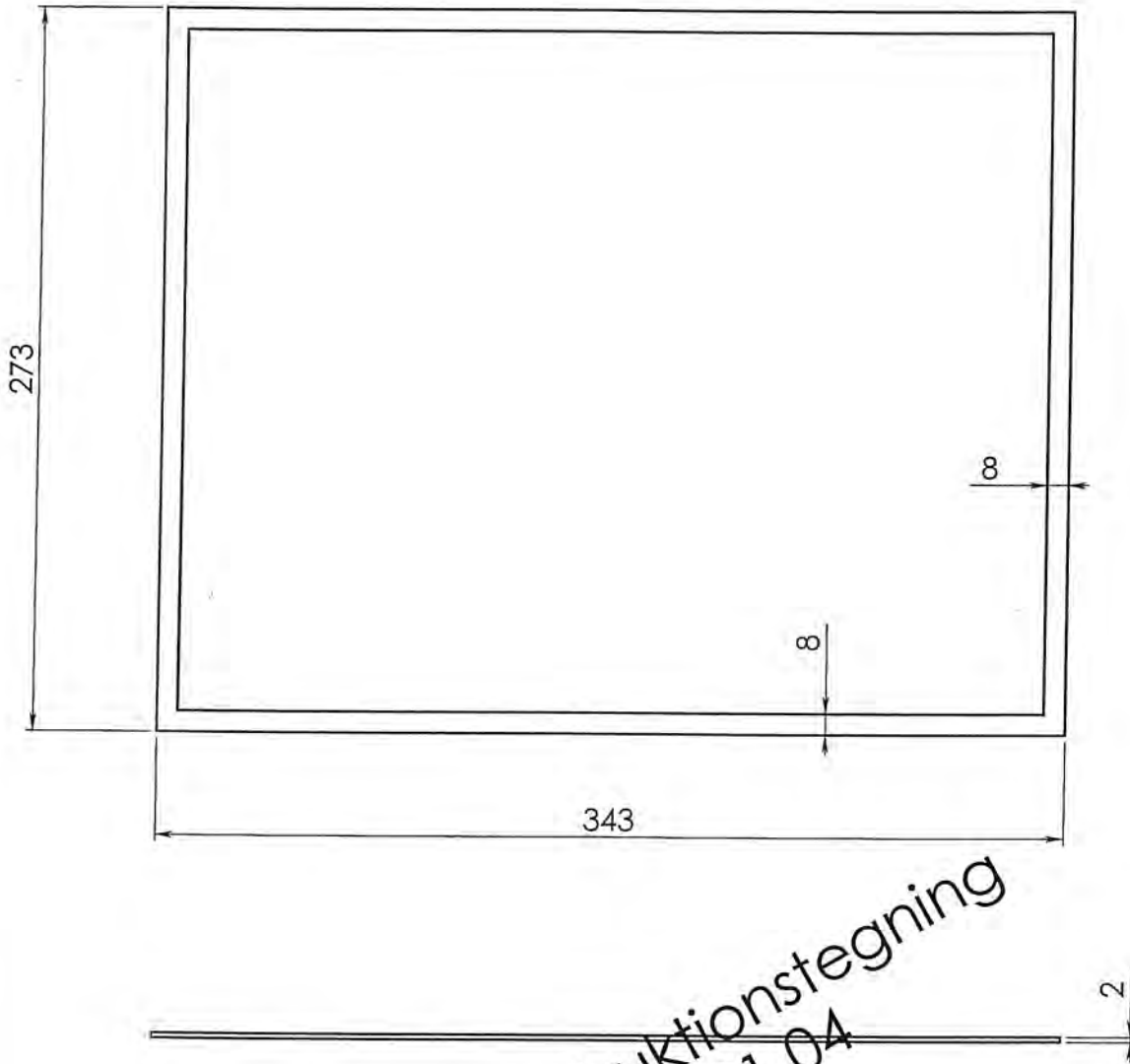
Konstruktionstegning
20.01.04

Rev. Revisions		Sign.:	Date:
Title:		Construction	KDU
Isoleringsmåtte 7110		Released:	
Material:	25mm isoleringsmåtte	Format:	A4
Weight:	-	Scale:	1:5
Model no.:	-	Itemno.:	79710500
Drawingtype:	Emnetegning	Drawing no.:	
Location of file:	U:\UDV\tegringer\7100\7100-45 isoleringsmåtte røgledeplade.SLDPRT		7100-45



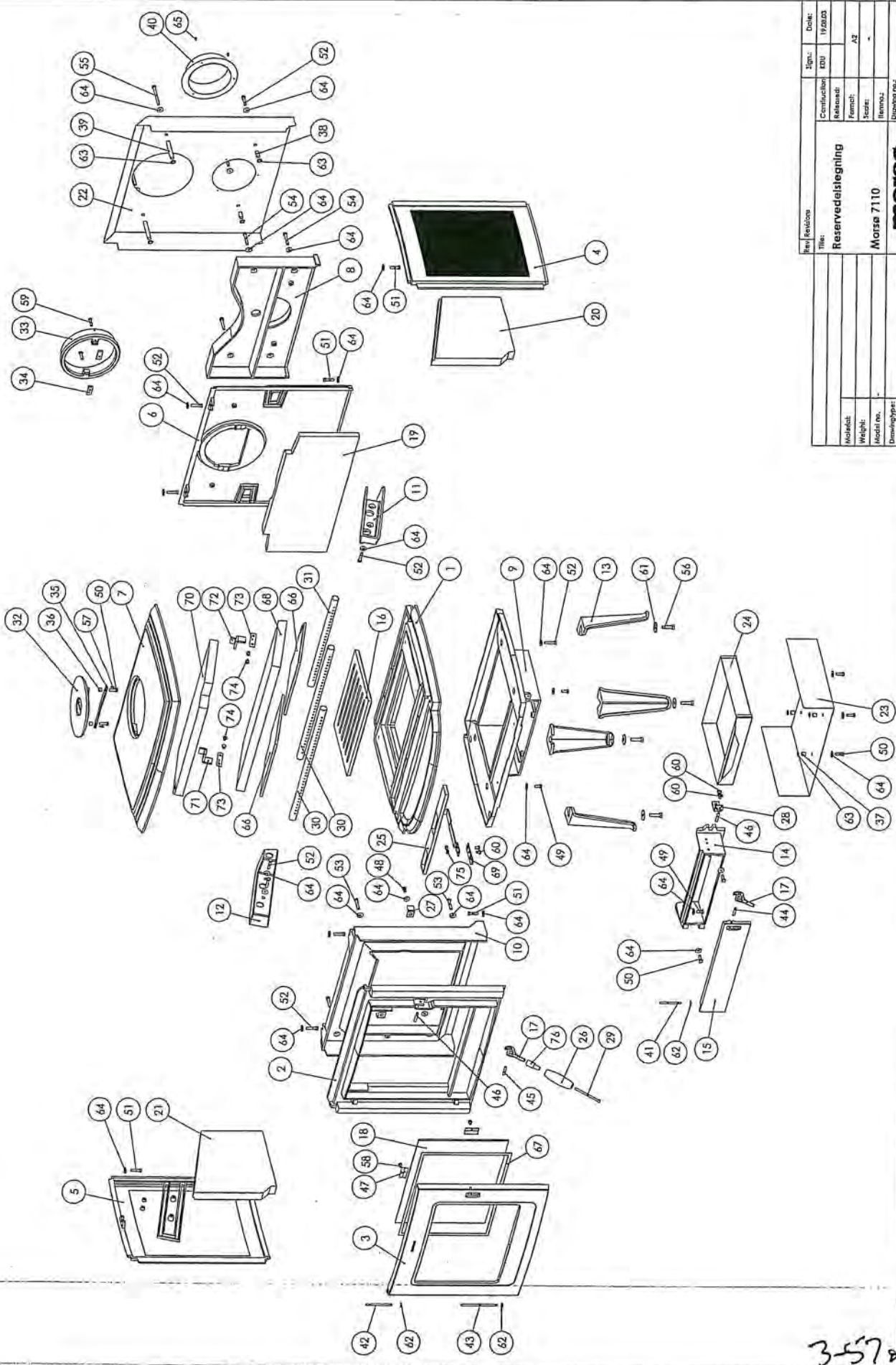
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3-55 of 3-62



Konstruktionstegning
20.01.04

Rev. Revisions		Sign.:	Date:
Title:		Construction	KDU
Glasbånd 8x2mm		Released:	20.01.04
m. tape		Format:	A4
Morsø 7110		Scale:	1:2.5
		Itemno.:	79074400
Drawingtype: Emnetegning		Drawing no.:	
Location of file: 0:\Udvalgte tegninger\7100\7100 Glasbånd.SLDPR		7100-46	

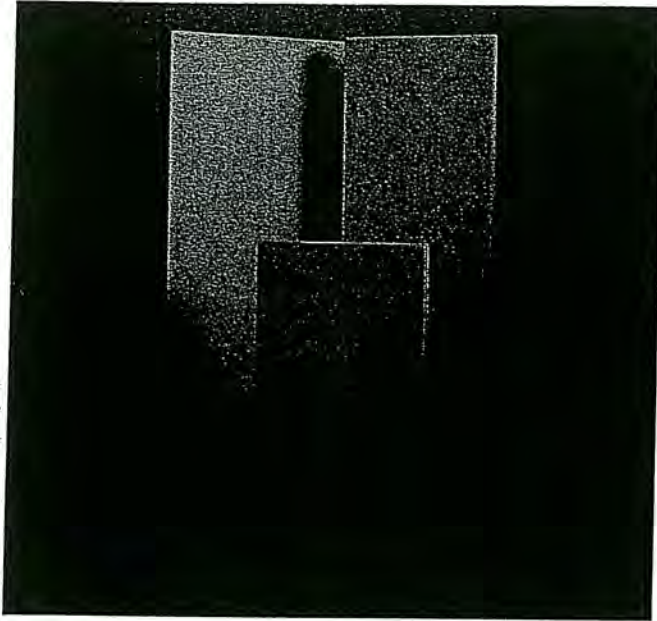


Rev. / Revision	Sign: / Date:
Title: Reserve deltegning	
Comituekt: / Released:	EDU / A2
Fornavn: / Form:	
Navn: / Item no.:	
Drøgningsnr.:	
Location file:	
Morse 7110 morsø Drawing no. 7100-501 a	

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3-57-83-62

SKAMOLEX V-1100 Vermiculite Block Insulation



Packing Colour Code:
GREEN

Grade: V-1100
Temp. limit: 1100°C (2012°F)
Vermiculite based, high-temperature Block Insulation for hot-face application or back-up insulation of all refractory constructions.

Characteristics

- Will not decompose even when subjected directly to flame
- Does not emit smoke
- Highly resistant to thermal shock
- Combines good strength with low thermal conductivity throughout its temperature range
- Exhibits good electrical resistivity
- Clean to handle and easy to install
- Resistant to carbon monoxide and hydrocarbons

- Satisfies the criteria of IMO Resolution A.472 (XIII) for classification as **non-combustible**

Block Sizes

Metric: 1000 mm x 610 mm and
1000 mm x 305 mm

US/British: 36"x 24" and 36"x 12"

Standard thicknesses:
25 mm through 100 mm (1"-4").

Derivatives cut from standards, or specially moulded shapes, can be supplied to customer specification.

Dimensional Tolerances

Length and width .. ± 2.5 mm (0.10")
Thickness ± 1.0 mm (0.04")

Note

The compression moulding system allows for supply of blocks to alternative densities, i.e. up to 600 kg/m³ (37 lbs/cu.ft.), to meet specific design requirements. For details see data sheet V-1100 Mk. 1 & Mk. 2.


skamol
insulation

Skamol a/s · Østergade 58-60 · DK-7900 Nykøbing Mors · Tel.: +45 97 72 15 33 · Fax: +45 97 72 49 75
Technoltherm GmbH & Co. KG · Postfach 10 14 37 · D-41414 Neuss · Tel.: +49 2131 10 64 0 · Fax: +49 2131 10 64 64
Skamol a/s, UK Sales Office · Aden Mount · Thorrington · Essex CO7 8JJ · Tel.: +44 1 (206) 302 330 · Fax: +44 1 (206) 304 576
Skamol Inc. · 2045 Niagara Falls Blvd. · Suite 16 · Niagara Falls · NY 14304 · Tel.: +1 (716) 298 4115 · Fax: +1 (716) 298 4118

Certified under DS/ISO 9001

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SKAMOLEX V-1100 Vermiculite Block Insulation

Chemical Analyses (typical)

SiO ₂	47%	CaO	2.0%
TiO ₂	0.5%	Na ₂ O	0.5%
Al ₂ O ₃	7%	K ₂ O	11%
Fe ₂ O ₃	4.0%	Loss on ignition (1025°)	7%
MgO	21%		

TECHNICAL PROPERTIES

Max. service temp.	°C	1100	Total porosity	%	86
	°F	2012			
Bulk density, dry	kg/m ³	350	Specific heat	kJ/(kg-K)	0.84
	lbs/cu.ft.	22		BTU/(lb-°F)	0.20
Compressive strength	MPa	1.1	Coefficient of reversible thermal expansion, 20°C-750°C (68°F-1382°F)	K ⁻¹	11x10 ⁻⁶
	lbs/sq.in.	160		°F ⁻¹	6.1x10 ⁻⁶
Modulus of rupture	MPa	0.5	Linear reheat shrinkage, 12 h at 1000°C (1832°F) (DIN 51066, Teil 2)	%	1.0
	lbs/sq.in.	73			
Pyrömetric cone equivalent	°C	1180			
	°F	2156			
			Thermal conductivity at mean temp. (ASTM C-201 supplemented by ASTM C-182)	W/(m-K)	
			200°C	0.11	
			400°C	0.14	
			600°C	0.17	
			BTU/(sq.ft.-h-°F/in)		
			392°F	0.76	
			752°F	0.97	
			1112°F	1.18	

The physical and chemical properties represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice.

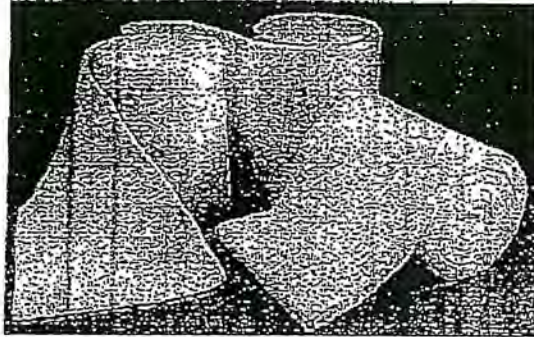
3-59 of 3-62

Keramab N.V.
 Havensteilaan 4
 B - 9140 Temse
 Belgium
 Telephone +32(0)3 711.02.78
 Telefax +32(0)3 711.08.56

REFRACTORY FIBER PRODUCTS

Technical Datasheet

INSULFRAX® BLANKET



KERAMAB's latest addition to its fibres product range, **INSULFRAX®**, is a revolutionary breakthrough in insulating materials technology.

This new product is based on a calcium-magnesium-silica chemistry, giving excellent thermal and physical stability up to its operational limit of 1100°C.

INSULFRAX® products can be used in a wide range of applications as thermal insulation, particularly in Fire Protection and in Domestic Appliances.

General Characteristics

INSULFRAX® Blanket offers users a number of important advantages over other man-made mineral fibres:

- Excellent thermal and physical stability up to 1100°C
- Light weight, flexibility and exceptional acoustic absorption properties
- Improved tensile strength of **INSULFRAX® Blanket** due to our specialist manufacturing technology
- **INSULFRAX®** needle felted Blanket contains no organic binders

Chemical Analysis (wt.%)		
SiO ₂	-	61.0 - 67.0
CaO	-	27.0 - 33.0
MgO	-	2.5 - 6.5
Al ₂ O ₃	-	< 1.0
Fe ₂ O ₃	-	< 0.6

Form: A1-050
 Effective: 29051998/MH/mvo
 Supercedes: 07041998/MH/mvo
 All Rights Reserved

Price List No.: III 016

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Page 1 of 3



Member of the International Refractory Association

KERAMAB
 REFRACTORY & CERAMIC INNOVATION

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 B - 9140 Temse
 Belgium
 Telephone +32(0)3 711.02.78
 Telefax -32(0)3 711.06.56

REFRACTORY FIBER PRODUCTS

Technical Datasheet

Typical Applications

Domestic Appliances

- Boiler insulation
- Fire seals
- Storage heater insulation
- Wood-burning stove seals
- Domestic cooker insulation
- Chimney fill

Fire Protection

- Offshore rig accommodation modules
- Building expansion joints
- Column and beam wrap
- Fire door in fill

Typical Physical Properties						
Colour	-	Bluish-white				
Classification Temperature	-	1100°C				
Melting Point	-	>1330°C				
Fibre Diameter	-	3.2 microns (mean)				
Tensile Strength	-	> 35 kPa (128 kg/m ³)				
Thermal Conductivity Data, W/m ² K						
(based on CEN draft method ASTM C-201)		64 kg/m ³	96 kg/m ³	128 kg/m ³	160 kg/m ³	192 kg/m ³
200°C Mean Temperature		0.07	0.06	0.05	-	-
400°C Mean Temperature		0.10	0.09	0.08	0.07	0.06
600°C Mean Temperature		0.18	0.14	0.12	0.11	0.10
800°C Mean Temperature		0.27	0.22	0.18	0.16	0.15
Permanent Linear Shrinkage		1000°C	1100°C			
24 hour soak		< 2.0 %	< 4.0%			

Where appropriate Physical Properties and Thermal Conductivity Data measured according to ENV 1094-7:1994

Fire Test Data

INSULFRAX® Blanket is non-combustible in accordance with BS476:Pt4 and is approved for use against cellulosic and hydrocarbon fires and for dry wrapping of structural steel. Certification details can be supplied on request.

Form A1-050
 Effective: 29051999/MJH/mvd
 Superseded: 070A1998/MJH/mvd
 All Rights Reserved

Price List No.: 111 015

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GLASFIBERPRODUKTER TEKNISKE DATA

Basismaterialet i STEFFCA glasfiberprodukter består af 6 - 9 mikron "E" glasfibertråde som kan volumineres, tekstureres, tvindes, forstærkes med ståltråde osv.
Produkterne er uorganiske, sterile, ildfaste, helt asbestfri, indeholder ingen giftstoffer eller tungmetaller, og forårsager ikke hudirritation.

"E" GLASFIBER - SAMMENSÆTNING

SiO ₂	53-55 %
Al ₂ O ₃	14-15,5 %
CaO - MgO	20-24 %
B ₂ O ₃	6,5-9 %
Fe ₂ O ₃ - TiO ₂	< 1 %
Na ₂ O-H ₂ O	< 1 %

"E" GLASFIBER - GENERELLE EGENSKABER

Farve:	HVID
Max. temperatur	550 °C
Smeltepunkt	1200 °C
Fiberdiameter	6-9 mikron
Trekstyrke - nyt filament	3400 MPa
Young's modul	74000 MPa
Varmeledningsevne	1,0 W/m °K
Reaktion på ild	ildfast
Glødetab	< 1,5%
Dielektrisk stivhed	60-100 kV/mm
Opløsningsmiddelægtighed	god
Basefasthed	god
Syrefasthed	god - bortset fra fluorbrintesyre

"E" GLASFIBERPRODUKTER - GENERELLE EGENSKABER

- stor mekanisk styrke
- gode elektriske egenskaber
- ildfaste
- lav varmeledningsevne
- god modstandsevne over for kemiske stoffer
- høj termisk modstand
- god fleksibilitet

MAX TEMPERATUR 550 °C

STEFFCA GLASFIBERPRODUKTER - SORTIMENT

Snoede pakning - omflettede pakning - isolerende bånd - flettede pakninger i runde, firkantede og rektangulære dimensioner - vævet bændl - selvklæbende bændl - bånd - selvklæbende bånd - stigebånd - dielektrisk tape - lodde puder - rå, silikoncoatede, HT-behandlede, aluminiserede, grafitiserede, karamelliserede, teflonbelagte, - glasklæder - afdækninger

VETRO-REF: GLASFIBERPRODUKTER MED SPECIEL HT-IMPRÆGNERING

Glasfiberprodukter kan imprægneres med speciel ildfast vermicullit for at øge deres resistens over for høje temperaturer og alle slags termisk chok op til 1000°C og for at reducere spild af glasfiber og pulver under håndteringen.

STEFFCA's "VETRO-REF" produkter er meget fleksible og modstandsdygtige over for gnister, svejsesprøjt og smeltet metal.

VETRO-REF produkternes farve

Imprægneringens max termiske fasthed ved kontinuerlig anvendelse
Imprægneringens max termiske fasthed ved kortvarige påvirkninger

guld
700 °C
1000 °C

www.kompass.net/d/steffcadk

STEFFCA A/S · FALSTERVEJ 10 H · DK-5800 NYBORG · A/S REG.NR. 24 44 93 · SE.NR. 20 76 85 09
TELEFON +45 6531 3102 · TELEFAX +45 6531 8502 · E-MAIL: info@steffca.dk · GIRO 2 45 16 46

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Section 4

Manufacturer Owner's Manual

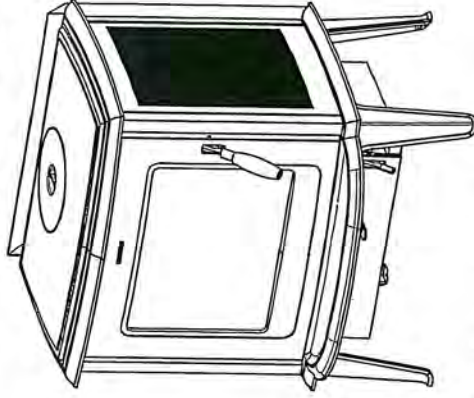
morsø

By appointment to  the Royal Danish Court

Installation and Operating Instructions

7110

For use in North America



Read this entire manual before you install and use your new room heater. If this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Failure to follow instructions may result in property damage, bodily injury, or even death.

Contact local building officials about restrictions and installation inspection-requirements in your area.

Save these instructions

MORSØ JERNSTØBERI A/S · DK-7900 NYKØBING MORS
E-Mail: stoves@morsoe.com · Website: www.morsoe.com

Distributed by: HEARTHLINK INTERNATIONAL
9 Maple St. - Randolph, Vermont - 05060 - USA

We congratulate you on your choice of a Morsø stove. Morsø has been producing some of the world's best stoves since 1853. If you follow this installation- and operating instruction carefully, we can assure you many years of warmth and pleasure.

Optional Accessories

A wide range of accessories (such as handling gloves, fireside tools, glass cleaner and heatproof paint) are available for use with your Morsø stove. They help with day-to-day running and maintenance. Contact your Morsø dealer for more information.

The Morsø 7110 meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after July 1, 1990

The Morsø 7110 have been tested by OMNI-Test Laboratories, Inc. The test standards are ANSI/UL-1482 for the United States and ULC S627 for Canada.

The stove is listed for burning wood only. Do not burn other fuels.

CONTENTS:

1.0	Installation of your Morsø stove	
1.1	Checking loose parts in the stove	4
1.2	The chimney /flue system	4
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1.4	Connection to existing chimney	6
1.5	Positioning the stove	8
2.0	Operation	
2.1	Before you start firing	10
2.2	Lighting and loading intervals	11
3.0	Maintenance	
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3.3	Cleaning the Stove and the Flue	14
3.4	Leaving the stove for extended periods	16
3.5	Parts diagram	17
3.6	Parts list	18

1.0 Installation of your Morsø stove

Installation of woodburning stoves must be safe and legal.

If your Morsø stove is not installed correctly, it may cause a house fire. To reduce the risk of fire, the installation instructions must be followed carefully. Contact the local building officials about restrictions and installation inspection in your area.

Before you start installing your stove, make sure that:

- The stove and chimney connection are placed far enough from combustible materials to meet all clearance requirements.
 - The floor protection must be adequate and must be made correctly according to the requirements.
- All necessary approvals are needed from the local building officials.

The data plate, which is located on the back of the stove, provides information regarding safety testing information, name of certified testing laboratory, and installation requirements.

Installation requirements vary in different districts, and the local building officials have the final authorization to approve your installation. You should discuss the installation with them before beginning. Please ask your dealer for further information.

Do not connect to any air distribution duct or system.

Important: If the installation instructions are not followed carefully, it may cause dangerous situations like chimney - and house fires. Follow the instructions carefully and do not deviate from them as it may cause injuries to people or property.

1.1 Checking loose parts in the stove

After unpacking, check that the fire bricks are firmly in position and have not shifted in transit. Check also that the air control works freely.

Standard Accessories

A Morsø glove and ceramic flue connection gasket are standard accessories that usually can be found in the ashpan or firebox area.

1.2 The chimney / flue system

Note that the flue system must be independently secured and must not rely on the stove for support.

The stove must not be connected to a chimney flue serving any other appliance. (Several flues may run up a single chimney stack; use one flueway per appliance).

Use a residential type masonry or listed type HT factory-built chimney.

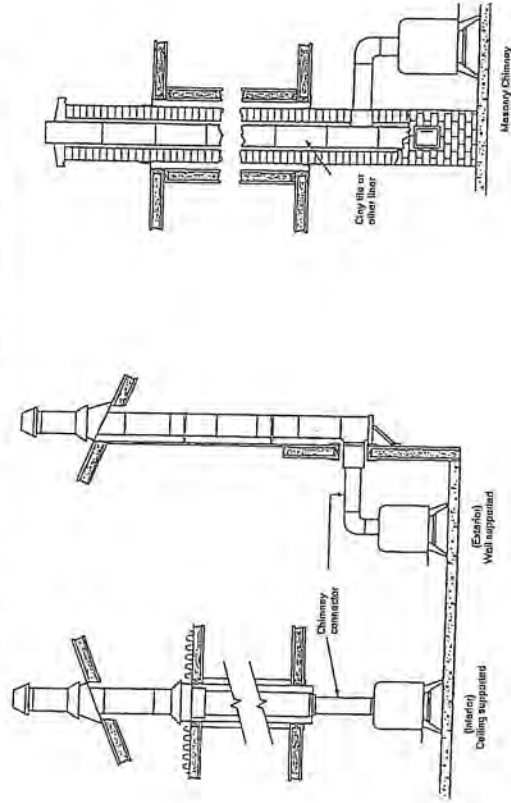
High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F) or a code-approved masonry chimney with flue liner for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

The internal dimensions of the chimney connector and chimney must not be less than 6 inches diameter (or equivalent cross section), and should not be significantly larger than this. Too large a section will tend to allow the flue gases to cool excessively, causing sluggishness or unpredictability in the stove's performance.

We recommend the length of the chimney system should be at least 16 feet (not required) above the stove in normal domestic situations, measured from the flue collar to the top of the chimney.

Local conditions like for example - roof constructions, large trees nearby and high altitude, may influence the chimney draft and height. Therefore, contact the local professional chimney sweep or your Morsø dealer.

Typical Factory-Built or Masonry Chimney Installations



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1.3 Flue Connection

The stove is supplied from the factory with a flue collar fitted to the top plate and a round blanking plate blocking off the rear flue exit (behind the rear shield plate).

Use a 24 MSG black or blue chimney connector or listed double wall chimney connector. Refer to local codes and the chimney manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Remember to secure the chimney connector with a minimum of three screws to the product and to each adjoining section. The collar can be fitted to the rear outlet. Simply knock out the round panel on the rear heat shield plate to reveal the cast iron plate. Untwist the blanking plate and the flue collar and swap their positions. Re-secure by pushing down and tighten the enclosed screws. Position the stove and connect to the flue system.

Wear gloves and protective eyewear when drilling, cutting or joining sections of chimney connector

1.4 Connection to the existing chimney

A chimney connector is the double-wall or single-wall pipe that connects the stove to the chimney. The chimney itself is the masonry or prefabricated structure that encloses the flue. Chimney connectors are used only to connect the stove to the chimney.

Double-wall connectors must be tested and listed for use with solid-fuel burning appliances. Single-wall connectors should be made of 24 gauge or heavier gauge steel. Do not use galvanized connector; it cannot withstand the high-temperatures that smoke and exhaust gases can reach, and may release toxic fumes under high heat. The connector must be 6 inches (150mm) in diameter.

If possible, do not pass the chimney connector through a combustible wall or ceiling. If passage through a combustible wall is unavoidable, refer to the sections on Wall Pass-Throughs. Do not pass the connector through an attic, a closet or similar concealed space when installing the chimney connectors.

It is important to keep the flue gases moving smoothly in the right direction. Do not vent into a large void at this location; rather form one continuous section all the way up. Use mild bends (e.g. 45° vs. 90°) rather than sharp angles where a change of direction is required. All parts of the venting must be accessible for cleaning purposes.

In horizontal runs of chimney, maintain a distance of 18 inches from the ceiling. Keep it as short and direct as possible, with no more than two 90 degree turns. Slope horizontal runs of connector upward 1/4" per foot (20 mm per metre) going from the stove toward the chimney. The recommended maximum length of a horizontal run is 3 feet (1 metre), and the total length should be no longer than 8 feet (2.5 metres).

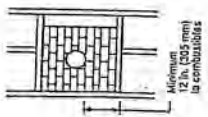
Information on assembling and installing connectors is provided by the manufacturer's instructions exactly as you assemble the connector and attach it to the stove and chimney.

Be sure the installed stove and chimney connector are correct distances from near by combustible materials. See the clearance paragraph page 8.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365.

Chimney Connector Systems and Clearances from Combustible Walls for Residential Heating Appliances

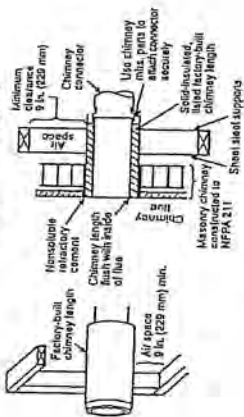
Minimum chimney clearance to back and combustibles 2 in. (51 mm)



A

Minimum 3.5-in thick brick masonry all framed into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney's flue liner and shall be firmly cemented in place.

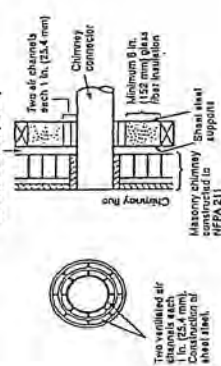
Minimum chimney clearance from masonry to chimney connector and combustibles 2 in. (51 mm)



B

Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1-in. or more of insulation with a minimum 9-in. air space between the outer wall of the chimney length and combustibles.

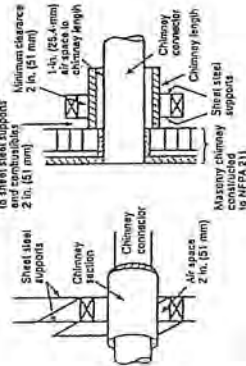
Minimum chimney clearance to sheet steel supports and combustibles 2 in. (51 mm)



C

Steel sheet chimney connector, minimum 24-gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1-in. air channels, separated from combustibles by a minimum of 6-in. of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

Minimum chimney clearance to sheet steel supports and combustibles 2 in. (51 mm)



D

Solid insulated, listed factory-built chimney length with an inside diameter 2-in. larger than the chimney connector and having 1-in. or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2-in. air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12-in. chimney section spaced 1-in. away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

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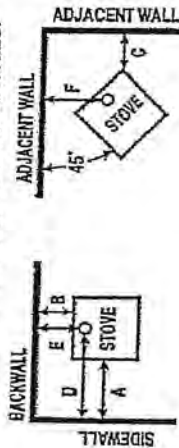
1.5 Positioning the stove Distance to walls and lintel

When the stove is positioned near combustible materials, observe all current local and national building regulations with regards to clearances. Whatever regulations apply to your area, do not in any case install the stove within 8 inches of combustible materials around the sides or 16 inches above the top of the stove (fireplace installations require greater clearances above the stove - see below in the clearance chart). These distances may need to be increased if the materials are sensitive to heat. Note also that wall paper and other decorative materials may fall towards the stove in such an event.

When the stove is positioned near non-combustible materials, a gap of 4 inches or more is recommended for cleaning purposes and to ensure that heat circulates around the stove and out into the room.

CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION (SINGLEWALL CONNECTOR):	
	USA	Canada
A. SIDEWALL TO UNIT	7.0"	10.0" (254mm)
B. BACKWALL TO UNIT	11.0"	14.0" (356mm)
C. CORNERWALL TO UNIT	6.0"	9.0" (229mm)
D. SIDEWALL TO CONNECTOR	13.5"	16.5" (419mm)
E. BACKWALL TO CONNECTOR	13.5"	16.5" (419mm)
F. CORNERWALL TO CONNECTOR	12.5"	N/A
G. UNIT TO CEILING	N/A	N/A
H. FLOOR TO CEILING	N/A	N/A

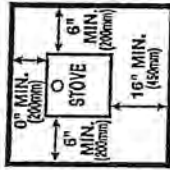
MINIMUM CLEARANCES TO COMBUSTIBLES:



CLEARANCE REQUIREMENTS:	WITH DOUBLEWALL CONNECTOR:	
	USA	Canada
A. SIDEWALL TO UNIT	6.0"	7.0" (178mm)
B. BACKWALL TO UNIT	10.0"	11.0" (279mm)
C. CORNERWALL TO UNIT	3.0"	5.0" (127mm)
D. SIDEWALL TO CONNECTOR	12.5"	13.5" (343mm)
E. BACKWALL TO CONNECTOR	12.5"	13.5" (343mm)
F. CORNERWALL TO CONNECTOR	N/A	N/A
G. UNIT TO CEILING	N/A	N/A
H. FLOOR TO CEILING	N/A	N/A

CLEARANCE REQUIREMENTS:	ALCOVE INSTALLATION WITH (DOUBLE WALL CONNECTOR):
A. SIDEWALL TO UNIT	7.0" (178mm)
B. BACKWALL TO UNIT	11.0" (279mm)
C. CORNERWALL TO UNIT	N/A
D. SIDEWALL TO CONNECTOR	13.5" (343mm)
E. BACKWALL TO CONNECTOR	13.5" (343mm)
F. CORNERWALL TO CONNECTOR	N/A
G. UNIT TO CEILING	24.5" (622mm)
H. FLOOR TO CEILING	60.0" (1524mm)

NON-COMBUSTIBLE FLOOR PROTECTOR

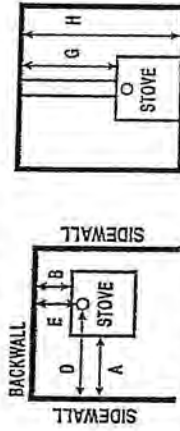


FLOOR PROTECTOR MUST BE NON-COMBUSTIBLE MATERIAL. IT MUST EXTEND BENEATH HEATER, AND TO THE FRONTSIDES/REAR AS INDICATED.

CLEARANCES IN () IN MM FOR CANADA FOR NON-COMBUSTIBLE FLOOR PROTECTOR

If using rear exit, the floor protection must extend beneath the chimney connector and 2-in beyond each side.

ALCOVE INSTALLATION



*Maximum alcove depth must be no more than 48" (1220mm):

Distance to furniture

The recommended minimum distance from stove to furniture is 30 inches. Note that some furniture is more easily affected by heat and may need to be moved to a greater distance. This is your responsibility.

In addition other combustible materials, away from the stove. In general, a distance of 30 inches must be maintained between the stove and moveable combustible item such as drying clothes, newspapers, firewood etc.

Note:

Acid Protection

If acid-washing the masonry around the stove, protect the stove surface with an acid-proof cover

Fresh Air Inlet

Unless there is deemed to be sufficient ambient leakage of air into the room via doorways, windows and the like, a dedicated fresh air inlet will be needed. This inlet should have 2 square inches (1250 square mm) of free air space. This is particularly important where the room is well sealed, or where an extractor hood or ventilation system disturbs the natural air pressure. Such an inlet should not be on a wall that is usually subject to negative pressure from normal wind pattern. Avoid placing the inlet directly across the room from the stove, thus causing a cold air draft.

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2.0 Operation

2.1 Before you start firing

For Use with Solid Wood Fuel Only. Do Not Overfire, if Heater or Chimney Connector Glows You Are Overfiring. Inspect and Clean Chimney Frequently. Under Certain Conditions of use creosote buildup may occur rapidly. Because of risk of smoke and flame spillage, operate only with door fully closed.

Caution:

Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.

Do not use chemicals or fluids to start the fire.

Do not burn garbage or flammable fluids.

Do not use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter or fluid or similar liquids to start or freshen up a fire in this heater. Keep all such liquids away from the heater while it is in use.

Choosing your fuel

All types of natural wood can be burned on your stove, but they must be well-seasoned and dry. Once the wood is cut to length, it should be split down middle - to suit the dimensions given below - to allow moisture to evaporate.

Cut the wood to a length of max. 16.5 inches (42 cm) and approx. 3 to 3.5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 1.0 kg. The maximum moisture content of the wood should be around 20%.

Store the logs under cover in a location where fresh air can move through the stack. Some soft woods may take as little as one good summer to season whereas harder woods such as oak, maple, and elm may require seasoning up to 18 months. Avoid overly dry wood that is gray in color as it can cause performance problems, such as backpuffing and sluggishness, under certain conditions. Well seasoned wood will be remarkably light to hold and will probably have radial cracking at the ends. If your wood splits or sizzles when burnt, and your stove's door glass persistently mists up, your wood is not properly seasoned. Never use drift wood (from the sea), whose salt content may cause corrosion, nor construction wood that may have been impregnated with chemicals.

Caution: Do not place fuel within the installation clearances for the stove or within the space required for loading fuel and ash removal.

Starting the First Fire

The initial fire should be small, so that the stove paint can cure and the main plates of the stove can settle into position. Some fumes will be given off by the paint. Ventilate the room during this phase.

The setting of the air control, lighting techniques and loading intervals will depend on chimney draft, the fuel used, the heat required and so on. Some basic techniques are outlined below.

In principle

Your stove is fitted with Primary and Secondary air inlets.

Primary Air is controlled using the lever situated under the ash lip of the stove. Moving the control lever to left position will open the air inlet and will allow a supply of preheated air to enter the firebox via the 'airwash' system situated inside the stove and the above glass.

Secondary Air is right to the firebox using the specially designed baffle at the back of the firebox. The secondary air is injected into the flue gases above the fire resulting in a cleaner, more efficient combustion process. The supply of secondary air is fixed open and is not adjustable.

For extra safety, your stove has been fitted with a removable handle.

2.2 Lighting and loading intervals

When first lighting the stove, a large volume of air is needed. When the stove is cold, you should leave the door open an inch or two for the first few minutes and open the primary air supply completely. While the door is open, do not leave the stove unattended.

The ash door should never be open while the stove is in operation.

To form a reasonable bed of ash on the floor of the stove, you should use 5-6 inches thickness (2-4 pound) of dry kindling at the initial lighting. Always maintain a 1-1.5 inch (2-3 cm) layer of ash on the floor of the combustion chamber at all other times.

Step-by-step procedure

1. The air supply must be fully open.
2. Light the fire. An ember bed will quickly be formed by lighting with firelighters, morsel kindling bags or 7-10 pieces of twisted paper under the dry kindling wood (see above).
3. After lighting, partially close the door, leaving it open an inch or two to allow in plenty of combustion air.
4. When the chimney is warmed through after 5-10 minutes, the door should be closed. A suitable ember bed will be formed after a further 15-20 minutes.
5. When ready to reload, use a poker to spread the ember across the firebox floor, bringing plenty towards the front of the stove.
6. Lay three pieces of wood (see dimensions above) onto the embers. Leave half an inch (1 cm) or more between each piece. When using 10 inches (25 cm) logs, place the ends of your logs towards the opening, but not too close to the front.



7. Close the door. Leave the primary air supply fully open.
8. After a few minutes, and adjust the primary air supply to suit your heating requirements.
9. Anticipate each refueling, remembering to add a modest layer of wood while there are still plenty of live embers. Repeat steps 5-8.

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Do not for any reason attempt to increase the firing of your heater by altering the air control adjustment range outlined in these directions.

Warning: Fireplace stoves must never be left unattended with doors open.

If doors are left partly open, gas and flame may be drawn out of the fireplace stove opening, creating risks from both fire and smoke. We recommend you to fit a smoke detector in the room where the stove is installed.

DO NOT OVERFIRE THIS HEATER. Overfiring may cause a house fire, or can result in permanent damage to the stove. If any part of the stove glows, you are overfiring.

Draft conditions

If smoke or fumes come out of your stove when lighting up and reloading, or if the fire simply will not respond, a poor draft is almost certainly to blame. (In a very few cases, there may be insufficient fresh air getting into the room - see installation advice above). Take advice from your stove supplier on how best to upgrade your flue system to improve draft.

Rules of woodburning

If you want less heat, put fewer logs on the stove and reduce the amount of air. It is still important to maintain a good layer of embers.

- Less heat - less wood - less air
- Greater heat - more wood - more air
- Soot deposits will settle on the glass if the stove is run too slowly or if your wood is not well seasoned.

3:0 MAINTENANCE

When performing maintenance on your stove, always protect yourself, using safety goggles or gloves

3.1 Exterior Maintenance

The stove surface is painted with heat-resistant Senotherm paint. It is best kept clean by vacuuming with a soft brush attachment or by wiping with a lint-free cloth. Over a period of time, the painted surface may become slightly grey. A can of Morsø touch-up spray paint should be available from your stove supplier. This can be applied - in accordance with the instructions - in just a few minutes. When first firing after touching up, the stove will give off a slight smell as the paint cures. Make sure to ventilate the room well during this phase.

3.2 Internal maintenance

Glass

If the stove is generally run at the correct temperatures, there should be little or no dirt on the glass. If dirt does settle during lighting, most will burn off as temperatures increase. For heavier deposits that will not burn off, use morsø glass cleaner, applied when the glass is cold, in accordance with the instructions. Never use abrasive cleaners on the glass surface.

Reasons for dirty glass

- Fuel too wet
- Logs too large or not split
- Combustion temperatures too low

Replace broken glass immediately.

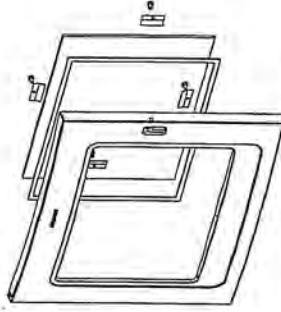
Do not operate your stove if the glass in the door is damaged.

If you need to replace the glass, it should be replaced with the high temperature ceramic glass supplied by Morsø, contact your Morsø dealer.

Installing the glass

Never install the glass when the stove is in function.

1. When you open the door, you will find two small M4 unbraco screws, one in each hinge. Unscrew the two screws, lift the door off the hinges and place it face down on a sheet of cardboard or other nonabrasive fabric.



2. Unscrew the 4 bolts that secure the glass. (In the event that a bolt sheers off when being unscrewed, remove the remaining body of the bolt by drilling down its centre with 1/8 inch high speed steel drill bit. Smaller drill bits may be successful, but do not use a lager bit. Make sure the bit stays away from the edges of the bolt - this may damage the thread in the cast iron).
3. Remove the old ceramic gaskets and clean up the surface underneath with wire wool or emery paper to remove loose particles.
4. Place the new gasket material in position around the perimeter of the window area, making sure to pinch them to the length in such a way that they make a continuous seal. Leave no gaps.
5. Place the new glass in position on the strips and screw home the fresh bolts and fitting by hand.
6. Finally, give each of the bolts an extra half turn or so. The glass should held tight enough that cleaning will not dislodge it. Do not over-tighten the bolts as this may put excessive pressure on the glass, resulting in cracking - important!

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To reduce the risk of breaking the glass, avoid striking the glass or slamming the door.

Internal service parts

The flame-path equipment - consisting of the ashpan, grate, firebricks, Cast iron fire plates, glass, baffle and flue collar - are subject to the extremes of heat produced by the fire. From time to time, one or other of these parts may need replacing as a matter of routine maintenance.

NOTE: The flame-path equipment, the ceramic rope and the paint finish are not covered by guarantee.

All of these service parts can be bought from your morsø dealer, and we recommend that damaged parts are replaced as soon as possible to avoid collateral damage. Should the baffle be distorted by an overfire, the stove will still function, although its efficiency may be compromised. Replace it as soon as possible.

Reasons for fast internal wear and tear

Persistent heavy firing
Soot and ashes left to accumulate

Gasket

The gasket around the perimeter of the doors may harden over a period of time. It should be replaced if it becomes difficult to close the doors or if air starts to leak in around the perimeter of the doors, causing the fire to become a little less controllable. A morsø rope gasket kit is available from your stove supplier.

3.3 Cleaning the Stove and the Flue

Check for soot above the baffle plate and around the flue outlet every month or so to start with. If the stove suddenly becomes sluggish, check for a soot fall around the flue collar or in the flue/chimney.

The chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

Clean the flue/chimney - all the way from the stove to the flue terminal point above the house. A good routine is to clean the flue after each heating season in any case, and inspect prior to the season to ensure that bird's nests or other blockages have not occurred during the off season.

Ash disposal

Empty the ashpan on a daily basis or as needed. Ash allowed to build up towards the underside of the grate will trap heat and could cause premature failure of the grate.

Empty the ashpan according to this procedure:

Open the front door, and use a shovel or poker to stir excess ash through the ash slots in the grate down into the ash pan. Then, open the ash door and take out the ash pan, making sure to keep it level to avoid spilling ash.

Dispose the ash in a metal container with a tight fitting lid.

The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

Return the ash pan to its original position in the stove, and close the ash door.

Caution:

**Never empty a stove in operation.
Never use your household or shop vacuum cleaner to remove ash from the stove; always remove and dispose of the ash properly.**

Creosote - formation and need for removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. When burning wood, inspect the chimney connector periodically to determine if a creosote buildup has occurred.

Chimney sweeping

Inspect the system regularly during the heating season as part of a regular maintenance schedule. To inspect the chimney, let the stove cool completely. Then, using a mirror, sight up through the flue collar into the chimney flue. If you cannot inspect the flue system in this fashion, the stove must be disconnected to provide better viewing access.

Clean the chimney using a brush the same size and shape as the flue liner. Run the brush up and down the liner, causing any deposits to fall to the bottom of the chimney where they can be removed through the clean-out door.

Clean the chimney connector disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connector sections after cleaning, being sure to secure the joints between individual sections with sheet metal screws. If you cannot inspect or clean the chimney yourself, contact your local Morsø Dealer or a professional chimney sweep.

If you do experience a chimney fire, act promptly and:

Close the air control.
Get everyone out of the house.
Call the Fire Department.

Annual maintenance

Before the heating season, perform a thorough cleaning, inspection and repair:
Thoroughly clean the chimney and chimney connector.

Inspect the chimney for damage and deterioration. Replace weak sections of prefabricated chimney. Have a mason make repairs to a masonry chimney.

Inspect the chimney connector and replace any damaged sections.
Check gasketing for wear or compression, and replace if necessary.

Check the glass for cracking; replace if needed.
Check door and handles for tightness. Adjust if needed.

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3.4 Leaving the stove for extended periods

Important:

If the stove is to be left unused for any period of time, clean it out thoroughly and leave the air control slightly open to allow airflow. Make sure that the flue does not allow rainwater to come anywhere near the stove; install a chimney cap, but do not block off the flue completely.

These measures should ensure there is a slight movement of air through the stove, and that the body of the stove remains dry, right into the corners.

Any ash left within an unfired stove can attract moisture like blotting paper. If moisture is allowed to settle within the stove, rust will form. Rust expands as it takes a grip. This can lead to undue pressure on the stove joints, and this in turn may result in damage to the stove.

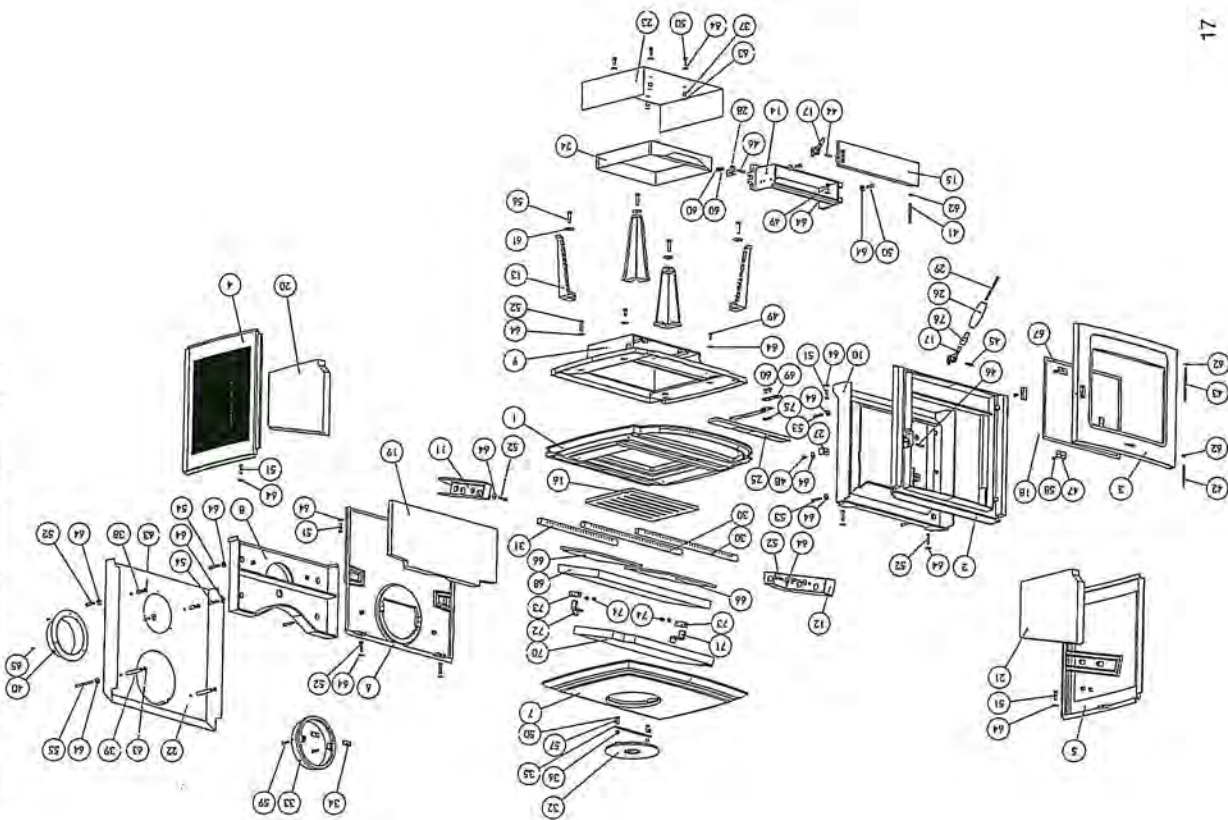
NOTE: It is best to thoroughly clean the stove after the heating season has concluded. Adding a desiccant, such as kitty litter, into the ash pan helps absorb moisture during the summer months. Be sure to remove this prior to the heating season.

Thank you for buying a morsø stove.

We hope you have many years of carefree warmth in its company. Some initial experimentation with loading and running techniques will decide your normal routine. If you have any problems after this short learning phase, please refer to your stove dealer. Should they be unable to help for any reason, please contact us in writing at the address on the front of this publication.

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3.5 Parts diagram for model Morsø 7110



3.6 Parts list for model Morsø 7110

Pos.No.	Parts		
1	Base plate	447101xx	Screw
2	Front frame	447102xx	Screw
3	Door	447103xx	Screw
4	Side plate, right	447104xx	Screw
5	Side plate, left	447105xx	Screw
6	Rear plate	447106xx	Screw
7	Top plate	447107xx	Screw
8	Rear air duct	447108xx	Screw
9	Button air duct	447109xx	Washer
10	Front air duct	447110xx	Washer
11	Secondary air duct, right	34711100	Washer
12	Secondary air duct, left	34711200	Screw
13	Leg	447113xx	Baffle plate, cast iron
14	Frame for ash door	447114xx	Tightening tape for glass
15	Ash door	447115xx	Insulation
16	Grate	34711600	Primary handle
17	Locking device	447117xx	Baffle plate, upper
18	Ceramic glass	79710000	Stop fitting, left, for baffle plate
19	Brick, back	79710100	Stop fitting, right, for baffle plate
20	Brick, side, right	79710200	Fitting for baffle plate
21	Brick, side, left	79710300	Screw
22	Radiant shielding, rear	71710100	Nuts
23	Radiant shielding, bottom	71710200	Adaptor for handle
24	Ash tray	71710300	
25	Primary damper	71710400	
26	Handle	71710500	
27	Brick fitting	71710600	
28	Fitting for pin at ash tray	71710700	
29	Screw		
30	Secondary tube, big	71710900	
31	Secondary tube, little	71711000	
32	Cover	44261000	
33	Flue collar	44344100	
34	Fitting w. thread for flue collar	44256700	
35	Fitting for baffle plate	545006	
36	Distance tube	545007	
37	Distance tube	541439	
38	Distance tube	542635	
39	Distance tube	54710100	
40	Air adaptor	71360600	
41	Hinge pin	53056600	
42	Hinge pin	545008	
43	Hinge pin	54501800	
44	Cotter pin	791870	
45	Cotter pin	791868	
46	Cotter pin		
47	Glass fitting		
48	Screw	54146361	
49	Screw		

4-11 of 4-12

2004.01.14.7271000. morso jensubert % 96 99 19 00

4-12-2004-12

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Section 5

Quality Assurance/Quality Control

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

QUALITY ASSURANCE/QUALITY CONTROL

O-TL follows the guidelines of ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories," and the quality assurance/quality control (QA/QC) procedures found in O-TL's Quality Assurance Manual.

O-TL's scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- to perform product safety testing by the International Approval Service (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- to perform product safety testing as a "Certification Organization" by the Standards Council of Canada (SCC).
- as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of O-TL's accreditation. Accreditation certificates are available upon request.

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Sample Analysis
Analysis Worksheets
Tared Filter and Beaker Data
Solvent Blank Data

5-3085-47

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
 Model: 7110 Woodstove
 Project #: 192-S-04-3 Tracking #: 575
 Date: ~~1-12-09-03~~ 1-09-04 Test Crew: K. MORGAN Run #: 1
 Sample Train #: _____ Train assembled by: K. MORGAN
 Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
 Audit weight ID #: OMNI - 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

13.2

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	1-12-04	08:45	.5737	.5001	5	71	K
Lab ID # _____	1-12-04	16:00	.5736	.5001	5	68	K
ID # <u>M444</u>							
Tare wt. <u>.5606</u>							
D/T in desiccator <u>1-09-04 13:15</u>							
Preliminary wt.: <u>.5738</u>							
Rear Filter	1-12-04	08:45	.5599	.5001	5	71	K
Lab ID # _____	1-12-04	16:00	.5600	.5001	5	68	K
ID # <u>M443</u>							
Tare wt. <u>.5596</u>							
D/T in desiccator: <u>1-09-04 13:15</u>							
Preliminary wt.: <u>.5604</u>							
Acetone Rinse	1-13-04	09:00	129.8178	.5001	5	67	K
Lab ID # _____	1-13-04	15:45	129.8180	.5001	4	72	K
Beaker # <u>175</u>							
Tare wt. <u>129.8186</u>							
Volume <u>100 ml</u>							
Cleaned by: <u>K</u>							
Solvent #: <u>SA07Z</u>							
D/T in desiccator: <u>1-12-04 08:45</u>							
Preliminary wt.: <u>129.8195</u>							

12.5

Technician signature: K. Morgan Date: 1-13-04

5425-47

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso

Model: 7110 Woodstove

Project #: 192-S-04-3 Tracking #: 575

Date: 1-09-04

Test Crew: K. Morgan

Run #: 2

Sample Train #:

Train assembled by: K. MORGAN

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI -

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	1-12-04	08:50	.6070	.5001	5	71	K
Lab ID # _____	1-12-04	16:00	.6071	.5001	5	68	K
ID # <u>M446</u>							
Tare wt. <u>.5831</u>							
D/T in desiccator <u>1-09-04 18:10</u>							
Preliminary wt.: <u>.6073</u>							
Rear Filter	1-12-04	08:50	.5624	.5001	5	71	K
Lab ID # _____	1-12-04	16:00	.5624	.5001	5	68	K
ID # <u>M445</u>							
Tare wt. <u>.5621</u>							
D/T in desiccator: <u>1-09-04 18:10</u>							
Preliminary wt.: <u>.5630</u>							
Acetone Rinse	1-13-04	09:00	145.6693	.5001	5	67	K
Lab ID # _____	1-13-04	15:45	145.6694	.5001	4	72	K
Beaker # <u>2128</u>							
Tare wt. <u>145.6687</u>							
Volume <u>100</u> ml							
Cleaned by: <u>K</u>							
Solvent #: <u>SA072</u>							
D/T in desiccator: <u>1-12-04 08:50</u>							
Preliminary wt.: <u>145.6708</u>							

24.7

Technician signature: K. Morgan Date: 1-13-04

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
 Model: 7110-Woodstove
 Project #: 192-S-04-3 Tracking #: 575
 Date: 1-10-04 Test Crew: K. MORGAN Run #: 3
 Sample Train #: _____ Train assembled by: K. MORGAN
 Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
 Audit weight ID #: OMNI - 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	1-12-04	08:45	.5981	.5001	5	71	IK
Lab ID # _____ ID # <u>M448</u> Tare wt. <u>.5811</u>	1-12-04	16:00	.5980	.5001	5	68	IK
D/T in desiccator <u>1-10-03</u> 16:00 <u>1-10-04</u>							
Preliminary wt.: <u>.5993</u>							
Rear Filter	1-12-04	08:45	.5771	.5001	5	71	IK
Lab ID # _____ ID # <u>M447</u> Tare wt. <u>.5764</u>	1-12-04	16:00	.5770	.5001	5	68	IK
D/T in desiccator: <u>1-10-04</u> 16:00							
Preliminary wt.: <u>.5785</u>							
Acetone Rinse	1-13-04	09:00	141.1503	.5001	5	67	IK
Lab ID # _____ Beaker # <u>2153</u> Tare wt. <u>141.1507</u> Volume <u>100</u> ml Cleaned by: <u>IK</u> Solvent #: <u>SA072</u>	1-13-04	15:45	141.1503	.5001	4	72	IK
D/T in desiccator: <u>1-12-04</u> 08:45							
Preliminary wt.: <u>141.1524</u>							

16.8 Technician signature: IK J. Morgan Date: 1-13-04

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
 Model: 7110 Woodstove
 Project #: 192-S-04-3 Tracking #: 575
 Date: ~~1-04-04~~ 1-12-04 Test Crew: K. Morgan Run #: 4
 Sample Train #: _____ Train assembled by: K. Morgan
 Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
 Audit weight ID #: OMNI - 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	1-13-04	15:30	.5973	.5001	4	72	K
Lab ID # _____	1-14-04	09:00	.5974	.5001	4	70	K
ID # <u>M450</u>							
Tare wt. <u>.5764</u>							
D/T in desiccator <u>1-12-04 13:00</u>							
Preliminary wt.: <u>.5979</u>							
Rear Filter	1-13-04	15:30	.5740	.5001	4	72	K
Lab ID # _____	1-14-04	09:00	.5740	.5001	4	70	K
ID # <u>M449</u>							
Tare wt. <u>.5748</u>							
D/T in desiccator: <u>1-12-04</u>							
Preliminary wt.: <u>.5744</u>							
Acetone Rinse	1-14-04	09:00	146.1975	.5001	4	70	K
Lab ID # _____	1-14-04	15:25	146.1971	.5001	4	72	K
Beaker # <u>2137</u>							
Tare wt. <u>146.1937</u>							
Volume <u>125</u> ml							
Cleaned by: <u>K</u>							
Solvent #: <u>SA022</u>							
D/T in desiccator: <u>1-13-04 09:00</u>							
Preliminary wt.: <u>146.1972</u>							

23.3

Technician signature: K. Morgan Date: 1-14-04

5-7-PC-47

Filter Tares

Filter Type A/E Glass Filter Size 10.2 mm Balance ID #: OMNI - 00023
 Date and Time Placed in Desiccator 12-03-03 13:10 Technician: /L Thermo/Hygro meter ID #: OMNI -
 Audit Weight ID #: OMNI - 131 (Balance audit mfr std.: OMNI-00131 500 ± 0.72 mg)

Filter ID #	Date: 12-04-03 Time: 14:30 R/H %: 3 T (F): 71 Initial: /L	Date: 12-05-03 Time: 08:30 R/H %: 4 T (F): 70 Initial: /L	Date: 12-05-03 Time: 08:30 R/H %: 4 T (F): 70 Initial: /L	Date: 12-05-03 Time: 08:30 R/H %: 4 T (F): 70 Initial: /L	Client	Project/Run #	Archived (Date/Initial)	Disposed (Date/Initial)
Balance Audit *	.5001	.5001	.5001	.5001				
M435	.5649	.5650	.5650	.5650	KROG IVERSEN SCAN 60	109-5-17-3 Run 2, Front		
M436	.5601	.5601	.5601	.5601	KROG IVERSEN SCAN 60	109-5-17-3 Run 3, Rear		
M437	.5669	.5668	.5668	.5668	KROG IVERSEN SCAN 60	109-5-17-3 Run 3, Front		
M438	.5649	.5650	.5650	.5650	KROG IVERSEN SCAN 60	109-5-17-3 Run 4, Rear		
M439	.5668	.5666	.5666	.5666	KROG IVERSEN SCAN 60	109-5-17-3 Run 4, Front		
M440	.5705	.5705	.5705	.5705				
M441	.5666	.5666	.5666	.5666	Tulikiwi	2450 020-5-13-3		
M442	.5666	.5667	.5667	.5667	Tulikiwi	2450 Back Oven 020-5-13-3		
M443	.5597	.5596	.5596	.5596	MORSO 7110	192-5-04-3 Run 1, Rear		
M444	.5606	.5606	.5606	.5606	MORSO 7110	192-5-04-3 Run 1, Front		
M445	.5622	.5621	.5621	.5621	MORSO 7110	192-5-04-3 Run 3, Rear		

Final Technician signature: K. J. May Date: 12-05-03

5805-41

Filter Tares

Filter Type AE Glass Filter Size 102 mm Balance ID #: OMNI - 00023

Date and Time Placed in Desiccator 1-7-04 09:15 Technician: BD Thermo/Hygro meter ID #: OMNI - 135

Audit Weight ID #: OMNI - 131 (Balance audit mfr std.: OMNI-00131 500 ± 0.72 mg)

Filter ID #	Date: 1-8-04 Time: 11:00 R/H %: 7 T (F): 68 Initial: 00	Date: 1-9-04 Time: 11:05 R/H %: 6 T (F): 69 Initial: 07	Date: Time: R/H %: T (F): Initial:	Client	Project/Run #	Archived (Date/Initial)	Disposed (Date/Initial)
Balance Audit *	.5001	.5001					
M 446	.5831	.5831		MORSO 7110	192-5-04-3 Run 2, Front		
M 447	.5764	.5764		MORSO 7110	192-5-04-3 Run 3, Rear		
M 448	.5811	.5811		MORSO 7110	192-5-04-3 Run 3, Front		
M 449	.5749	.5748		MORSO 7110	192-5-04-3 Run 4, Rear		
M 450	.5765	.5764		MORSO 7110	192-5-04-3 Run 4, Front		
M 451	.5749	.5746		Tulixivi	020-5-11-3		
M 452	.5815	.5815		Tulixivi TTU 2700	Run 1 TTU 2700 020-5-11-3 Run 1	Scrapped	
M 453	.5722	.5722					
M 454	.5766	.5762					
M 455	.5640	.5640					
M 456	.5590	.5586					

Final Technician signature: BD Date: 1-9-04

5-9025-47

Beaker Tares

Date/Time Placed in Desiccator: 12/30/03 Technician: DRB Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 175 Audit Weight ID #: OMNI - 00131 (Balance audit mfr. std.: 500 ± 0.72 mg)

Beaker Size/ID #	Date: 1-5-04 Time: 09:35 R/H %: 5 T (F): 64 Initial: K	Date: 1-8-04 Time: 11:00 R/H %: 7 T (F): 68 Initial: SD	Date: 11-9-04 Time: 11:25 R/H %: 7 T (F): 69 Initial: SA	Date:	Client	Project/Run #	Archived (Date/Initial)	Disposed (Date/Initial)
Balance Audit *	15001	5001	5001					
175	129.8205	129.8186	129.8186		MORSO 7110	192-5-04-3 Run 1		
499	136.2181	136.2185			woodmaster	4400 Run 2		
527	137.8167	137.8179	137.8182		TUKEVI	020-5-11-5 Run 1		
2153	141.1483	141.1504	141.1507		TU 2100 MORSO 7110	192-5-04-3 Run 3		
2142	143.8941	143.8945			woodmaster	5500 Run 1		
2137	146.1933	146.1937			MORSO 7110	192-5-04-3 Run 4		
2128	145.6673	145.6686	145.6687		MORSO 7110	192-5-04-3 Run 2		
2133	145.4209	not used						

Final Technician signature: DRB Date: 1/19/04

51202547

Comment: download large & extra large, bold, fonts

Acetone Solvent Blank Analysis Worksheet

Date: 6-9-03 By: B. Davis Balance ID #: OMNI - 00023
 Manuf. Lot #: 43091315 Solvent Bottle #: SA072 Audit Weight ID #: OMNI - 00131
 (Balance audit mfr. std.: 500 ± 0.72 mg)

Mls. Sample	ID No.	Tare Weight	Date & Time in Dessicator	Weighing Record				Initials	Calculations & Remarks
				Date	Time	Weight	Audit Weight		
150	2199	106.0303	6-10-03 8:21:15	6-11-03	12:20	106.0307	.5001		106.0304 106.0303 <u>.0001</u> 150 mg/mL .000667
					07:45	106.0304	.5001		
150	T-5	107.1466	6-10-03 7:05	6-11-03	12:20	107.1474	.5001		107.1473 107.1466 107.0007 <u>.150</u> mg/mL .004667
					07:45	107.1473	.5001		
									.005334 <u>2</u> .00267 mg/mL

Checked by: A. Smith Date: 8-28-03 Approved by: A. Meyer Date: 9-5-03
 Technician Signature: ASD Date: 8-28-03

5112147

Model: 7110
Morsø Jernstøberi A/S
DK-7900
Nykøbing Mors
Denmark

Calibrations

Method 28 and 5G

Test Series

Method 28:

ID #	Lab Name/Purpose	Log Name	Attachment Type
183	Moisture Meter	Moisture Meter – Delmhorst	Manual
214	Stopwatch	Stopwatch – Elite	Calibration Log

Method 5G:

ID #	Lab Name/Purpose	Log Name	Attachment Type
21	Dry Gas Meter	Control Module – Sierra Misco, Inc.	Post-Test Calibration Log
33	Manometer	Microtector – Dwyer	Manual

