



Certification Test Report

Morsø Jernstøberi A/S

**Freestanding Wood Stove
Model: 2B Classic**

Report Number 192-S-06-3

OMNI-Test Laboratories, Inc.
Product Testing & Certification

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Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Certification Test Report

Morsø Jernstøberi A/S

Freestanding Wood Stove

Model: 2B Classic

Prepared for: Morsø Jernstøberi A/S
Furvej 6 DK-7900
DENMARK

Prepared by: OMNI-Test Laboratories, Inc.
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Test Period: October 27, 2005 through October 31, 2005

Report Date: November 2005

OMNI-Test Project Number: 192-S-06-3

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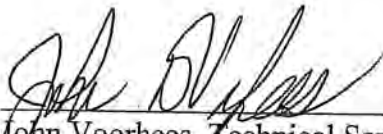
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AUTHORIZED SIGNATORIES

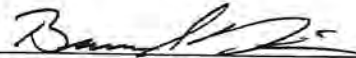
This report has been reviewed and approved by the following authorized signatories.



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



John Voorhees, Technical Services Director
OMNI-Test Laboratories, Inc.



Bruce Davis, Emissions Testing Supervisor
OMNI-Test Laboratories, Inc.

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Morsø Jernstøberi A/S
Model: 2B Classic
Test Dates: October 27, 2005 through October 31, 2005



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Section 1

Sampling Procedures and Test Results

Model: 2B Classic
Morsø Jernstøberi A/S
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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 2B Classic wood stove. The 2B Classic wood stove is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of cast iron with a hollow baffle made of stainless steel. The usable firebox volume was measured to be 0.82 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 altitude of the laboratory is 204 feet above sea level. The unit was received in good condition and logged in at the O-TL test facility on September 20, 2005; it was assigned and labeled with O-TL ID #785. O-TL representative Bruce Davis conducted the certification testing and completed all testing by October 31, 2005. The EPA was notified of the testing dates in a letter dated September 29, 2005. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Karsten Aargard of Morsø Jernstøberi A/S and is on file at O-TL.

The 2B Classic 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 3.9 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 2B Classic 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: 2B Classic
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Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	1.78	3.71
2	0.99	5.42
3	1.96	3.55
4	0.90	1.87
Weighted particulate emission average of four test runs: 3.9 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	70	70	29.62	29.62	<50	<50
2	68	68	29.82	29.78	<50	<50
3	76	73	29.78	29.78	<50	<50
4	69	67	30.08	30.08	<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	8.27	21.6	1.45
2	4.05	21.6	1.30
3	9.15	21.5	1.43
4	4.06	21.4	1.34

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lb)	Firebox Volume (ft ³)	Fuel Loading Density Wet Basis (lb/ft ³)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	6.2	0.82	7.56	20.2	16.0	3	0
2	5.7	0.82	6.95	19.9	16.0	3	0
3	6.0	0.82	7.32	19.3	15.75	3	0
4	5.6	0.82	6.83	20.5	15.0	3	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	80	13.46	140.42	104.1
2	130	12.75	140.15	79.4
3	70	12.82	132.69	111.9
4	140	13.76	152.63	79.3

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	445.7	363.1	83
2	321.7	290.5	31
3	440.8	377.3	64
4	352.9	285.9	67

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 (in)	Fuel Added	Fuel Removed	Time (min)
1	Fully Open *	8.27 lbs. at start; no addition; coal bed 1.45 lbs.	0	63
2	1 Full Turn from Fully Closed	4.05 lbs. at start; no addition; coal bed 1.30 lbs.	0	81
3	Fully Open *	9.15 lbs. at start; no addition; coal bed 1.43 lbs.	0	71
4	1 Full Turn from Fully Closed	4.06 lbs. at start; no addition; coal bed 1.34 lbs.	0	61

*Fully Open = 5 turns from fully closed

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (in H ₂ O)	Primary Air Setting (in)	Run Time (min)	Average Draft (in H ₂ O)
1	1.78	0	Fully Open *	80	-0.06
2	0.99	0	1 Full Turn from Fully Closed	130	-0.03
3	1.96	0	Fully Open *	70	-0.06
4	0.90	0	1 Full Turn from Fully Closed	140	-0.04

*Fully Open = 5 turns from fully closed

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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 52 seconds. <u>Door</u> : Closed at 70 seconds. <u>Primary Air</u> : Fully open full 5:00. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : N/A.	Fully Open *
2	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 47 seconds. <u>Door</u> : Closed at 4:15. <u>Primary Air</u> : Fully open until 4:15, then closed to test setting by 5:00. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : N/A.	1 Full Turn from Fully Closed
3	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 50 seconds. <u>Door</u> : Cracked open until 2:30, then closed. <u>Primary Air</u> : Fully open full 5:00. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : N/A.	Fully Open *
4	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 55 seconds. <u>Door</u> : Closed at 4:00. <u>Primary Air</u> : Fully open until 4:15, then closed to test setting by 5:00. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : N/A.	1 Full Turn from Fully Closed

*Fully Open = 5 turns from fully closed

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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 3.9 grams per hour.

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

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APPLIANCE DESCRIPTION

Appliance Manufacturer: Morsø Jernstøberi A/S

Wood Stove Model: 2B Classic

Type: Freestanding, radiant-type room heater

WOOD HEATER DESCRIPTION:

Materials of Construction: The unit is constructed of cast iron with a hollow baffle made of stainless steel. The firebox is lined with vermiculite that measures 204 mm by 191 mm on the back and 243 mm by 240 mm on the sides. The feed door has a 145 mm by 158 mm glass panel and one 870 mm by 8 mm glass fiber gasket. The ash door is sealed with one 570 mm by 8 mm glass fiber gasket.

Air Introduction System: Air enters the firebox through an opening located in the fuel-loading door. Secondary air enters the appliance through the bottom/back and is channeled to a hollow baffle supplying three rows of holes.

Combustion Control Mechanisms: The combustion air inlet is controlled by a spin draft on the fuel-loading door.

Combustor: N/A.

Internal Baffles: A stainless steel baffle with a ceramic blanket 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: N/A.

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.

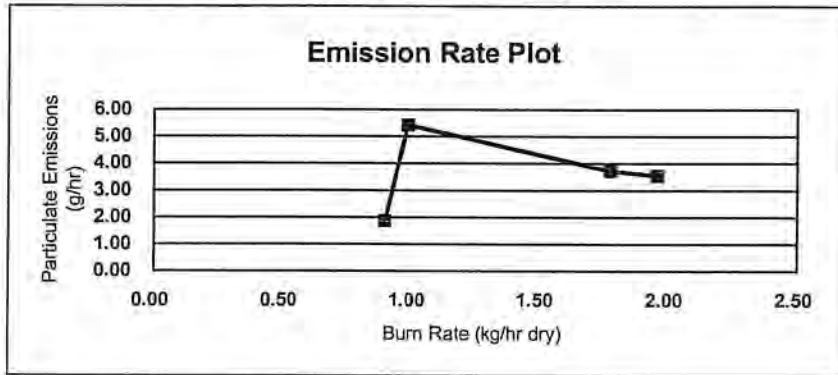
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Section 2

Test Data by Run

EPA Weighted Average Emissions EPA Method 28

Client: Morso	Status: Final
Stove Model: 2B Classic	Stove Type: Non-Catalytic Stove
Test Dates: October 27 through October 31, 2005	
Project Number: 192-S-06-3	
Tracking Number: 785	
Signature/Date: <i>B. De...</i> 11-7-05	Weighted Average (g/hr) 3.9



Run #	4	
Burn Rate (dry kg/hr)	0.90	
Catagory	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	1.87	
Cap (g/hr)	15	
Weighting Factor	0.370	23.00%
Heat Output (BTU/hr)	10875	

Run #	2	
Burn Rate (dry kg/hr)	0.99	
Catagory	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	5.42	
Cap (g/hr)	15	
Weighting Factor	0.568	35.33%
Heat Output (BTU/hr)	11963	

Run #	1	
Burn Rate (dry kg/hr)	1.78	
Catagory	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.71	
Cap (g/hr)	18	
Weighting Factor	0.538	33.45%
Heat Output (BTU/hr)	21509	

Run #	3	
Burn Rate (dry kg/hr)	1.96	
Catagory	4	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.55	
Cap (g/hr)	18	
Weighting Factor	0.132	8.23%
Heat Output (BTU/hr)	23684	

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Run 1

Test Run Information Monitor Pre-burn Test Run Table TEMPS GASES EMISSIONS RESULTS Fuel Data Calibrations

Run Number: 1 Tracking Number: 785

Manufacturer: Moyno Project Number: 192-5-06-3 Date: 10/27/05

Model: 2B Classic

	PL.1	PL.2	PL.3	PL.4	PL.5	PL.6	PL.7	PL.8
Initial dp	.038	.042	.042	.024	.04	.048	.044	.024
Initial Temp	107	107	107	107	106	106	106	106

Fuel Load (lbs): 6.20

Coal Bed Range: 1.24 to 1.55

Actual Coal Bed

Barometric Pressure: 29.62 Begin: 29.62 Middle: 29.62 End: 29.62 Avg: 29.62

PM Control Module: 289 Tunnel Velocity: 13.46 ft/sec

Dilution Tunnel MW(dry): 29 Initial Tunnel Flow: 139.1 scfm

Dilution Tunnel MW(wet): 28.56 Average Tunnel Flow: 140.42 scfm

Dilution Tunnel H2O: 4 Tunnel Area: .196 ft²

Dilution Tunnel Static: -.478 Post-Test Leak Check: .006@5 cfm@" Hg

Pitot Tube Cp: .99 Fuel Moisture (dry basis): 20.24 %

Meter Box "Y" Factor: 1.014 Fuel Consumed: 6.300 lbs

Avg Prop Rate: 100.757

Firebox Surface Temp Change: -82.6

Filter Holder #: A

Total Particulate: 11.4 mg

Run Time (Minutes): 80

Notes

Tab Control

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Test Run Information
Monitor
Pre-burn
Test Run Table
TEMPS
GASES
EMISSIONS RESULTS
Fuel Data
Calibrations

Burn Rate	1.78	kg/hr dry
Particulate Concentration(dry standard)	0.00028	grams/dscf
Particulate Emission Rate	2.37	grams/hour
Adjusted Emissions	3.72	grams/hour
Average Tunnel Temp	104	Degrees Fahrenheit
Average Delta p	0.038	Inches H2O
Total Sample Volume-Vm	40.744	Cubic Feet
Average Gas Meter Temperature	72.0	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	13.48	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8452.02	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	40.678	DSCF
Total Particulates- mn	11.4	Mg
Average Delta H	0.846	Inches H2O
Total Time	80	Minute

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n #:

Test Run Information	Monitor	Pre-burn	Test Run Table	TEMPS	GASES	EMISSIONS RESULTS	Fuel Data	Calibrations
Manufacturer: Model: 2B Classic FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.								Run Number: 1 OMNI EQUIPMENT ID #:
PRE-BURN FUEL CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ---- 12 CALIBRATION VALUE (2) = 22% ACTUAL READING ---- 22 MOISTURE-CONTENT (METER-DRY BASIS)				AVG PRE-BURN LOAD MOISTURE 21.55 %				
PIECE 1 2 3	LENGTH 8 ft 8 ft 0 ft	% MOISTURE READINGS 19.4 23.4 0	READINGS 20.2 22.5 0	FUEL TYPE 2X4 2X4 0	ROOM TEMPERATURE (F) 65	TIME (24 HR) 14:35	PIECE LENGTH NOTES:	
TEST FUEL FUEL TYPE - PIECE QUANTITY 3 2 X 4 PIECES 0 4 X 4 PIECES CALCULATED FUEL LOAD: 5.7 LBS 6.2 LBS				FUEL LOAD PIECE COUNT: 3 PIECES ACTUAL LOAD WEIGHT: 6.2 LBS				
MOISTURE-CONTENT (METER -- DRY BASIS)				AVERAGE FUEL LOAD MOISTURE: 20.24 %				
PIECE# 1 2 3 4 5	READINGS 19.4 20.5 20.3 0 0	TYPE 2X4 2X4 2X4 0 0	PIECE# 6 7 8 9 10	READINGS 0 0 0 0 0	TYPE 0 0 0 0 0	TIME (24 HR CLOCK) 14:45	ROOM TEMPERATURE (F) 65	

Tab Control

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MCC: MCR

Model #: 2B Classic

0 #:

Project #: 102-S-00-3
Run Date: 10/27/05

Time	ET Minutes	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Int	Avg Surface	Stack	AMB	Draift	Cat Temp	O2	CO2	CO	CO Ratio
3:00 PM	10	8.27	-0.862	420	176	299	335	372	3218	320.2	332	66	-0.054	3218	799.26	754.50	206.94	21.69
3:10 PM	20	6.92	-1.346	563	185	267	312	374	3218	340.1	418	66	-0.064	3218	762.11	759.45	205.41	21.29
3:20 PM	30	4.91	-2.013	904	194	262	340	409	3218	421.7	599	66	-0.075	3218	724.55	763.16	201.63	20.90
3:30 PM	40	3.15	-1.761	923	210	282	400	462	3218	455.6	592	70	-0.075	3218	685.89	765.42	197.60	20.52
3:40 PM	50	2.05	-1.089	765	229	342	437	486	3218	452.0	516	72	-0.069	3218	648.13	766.81	193.44	20.14
3:50 PM	60	1.45	-0.606	662	248	415	460	495	3218	456.3	452	72	-0.059	3218	611.92	767.48	189.20	19.78

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Signature/Date: B.D.

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Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dp	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
10/27/2000 5:34:56:33 PM	0	0.000	0.000	0.73	66	1.97	102	0.038	0.0	6.3	6.32	583	257	435	465	488	3218	445.7	404	66	61	70	-0.066
10/27/2000 5:41:06:31 PM	10	5.052	0.505	0.85	66	2.00	120	0.038	100.7	4.6	-1.77	817	260	425	447	464	3218	482.7	573	71	59	71	-0.071
10/27/2000 5:41:16:31 PM	20	10.038	0.499	0.86	68	2.16	120	0.038	99.8	2.9	-1.69	824	257	412	424	451	3218	473.8	575	73	58	70	-0.074
10/27/2000 5:42:26:31 PM	30	15.098	0.506	0.85	71	2.23	115	0.038	100.8	1.5	-1.33	784	252	410	424	458	3218	465.6	538	72	63	72	-0.070
10/27/2000 5:43:36:31 PM	40	20.184	0.508	0.87	73	2.22	105	0.038	100.8	0.8	-0.72	679	248	413	428	468	3218	447.1	474	73	51	72	-0.062
10/27/2000 5:44:46:31 PM	50	25.302	0.512	0.87	75	2.21	97	0.038	101.0	0.5	-0.29	564	245	416	424	465	3218	422.7	402	73	50	71	-0.057
10/27/2000 5:45:56:31 PM	60	30.427	0.512	0.85	76	2.20	94	0.038	100.8	0.3	-0.20	484	244	407	410	444	3218	397.7	351	73	50	71	-0.052
10/27/2000 5:50:06:31 PM	70	35.575	0.515	0.86	77	2.18	93	0.038	101.0	0.2	-0.18	436	244	400	393	421	3218	378.9	323	73	50	71	-0.047
10/27/2000 5:51:16:31 PM	80	40.744	0.517	0.87	78	2.16	91	0.038	101.2	0.0	-0.13	404	244	386	379	403	3218	363.1	302	73	50	70	-0.045
AVG	NA	NA	0.51	0.85	72.22	2.15	104.11	0.04	100.76	NA	NA	519.44	250.11	411.56	421.56	451.33	3218.00	430.81	436.00	71.89	53.33	70.89	-0.06

Run Notes

Client/Model: Morso

Model: 2B Classic

Project #: 192-S-06-3

Tracking Number: 785

Run #: 1 Date: 10-27-05

Test Crew: B DAUS

OMNI Equipment ID Numbers: _____

PREBURN

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

PRIMARY:

Fully open

 (5) Turns from
full closed

SECONDARY: fixed

TERTIARY: NA

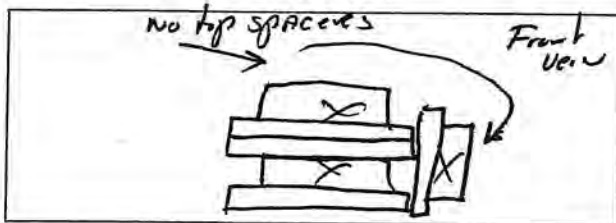
FAN: NA

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0 63	Test setting				x	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA

FUEL LOADING by 52 sec

DOOR: closed by 70 sec

PRIMARY AIR: fully open full 5:00

OTHER: NA

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

PRIMARY:

Same as Above

SECONDARY: fixed

TERTIARY: NA

FAN: NA

Technician signature: B Daus Date: 11-3-05

Supplemental Data EPA 5G/5H

Client: Morso

Model: 2B Classic

Project No.: 268-S-03-3

Tracking No.: 785

Date: 10-27-05

Run No.: 1 Booth: 1

Test Crew: B. DAVIS

Start Time: 15:50 Stop Time: 17:10

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: NR

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas CO₂: _____ 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
	<u>NR</u>						
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6'

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

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

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 @ 3.1 Post: 0.0 @ 3.4

Flue Pipe Cleaned Prior to First Test in Series: Date: 10-27-05 Initials: MD

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.62</u>	<u>29.62</u>	<u>29.62</u>
Room Temp (°F)	<u>71</u>	<u>72</u>	<u>70</u>

Technician signature: B. Davis Date: 11-3-05

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Run 2

Test Run Information | Monitor | Pre-burn | Test Run Table | TEMPS | GASES | EMISSIONS RESULTS | Fuel Data | Calibrations

Run Number: 2
 Manufacturer: Morso
 Model: 2B Classic
 Tracking Number: 785
 Project Number: 192-5-06-3
 Date: 10/28/05

Fuel Load (lbs): 5.70
 Coal Bed Range: 1.14 to 1.43
 Actual Coal Bed: []

Barometric Pressure: 29.82 | Begin: 29.80 | Middle: 29.78 | End: 29.16 | Avg: 29.16

	PL.1	PL.2	PL.3	PL.4	PL.5	PL.6	PL.7	PL.8
Initial dP	.03	.044	.046	.028	.026	.046	.04	.026
Initial Temp	75	75	75	75	75	75	75	75

PM Control Module: 289
 Dilution Tunnel MW(dry): 29
 Dilution Tunnel MW(wet): 28.56
 Dilution Tunnel H2O: 4
 Dilution Tunnel Static: -.42
 Pitot Tube Cp: .99
 Meter Box "y" Factor: 1.014

Tunnel Velocity: 12.75 ft/sec
 Initial Tunnel Flow: 139.7 scfm
 Average Tunnel Flow: 140.15 scfm
 Tunnel Area: 1.96 ft²
 Post-Test Leak Check: .010@8 cfm@" Hg
 Fuel Moisture (dry basis): 19.93 %
 Fuel Consumed: 5.700 lbs

Avg Prop Rate: 100.599
 Firebox Surface Temp Change: -31.2
 Filter Holder #: A
 Total Particulate: 29.2 mg
 Run Time (Minutes): 130

Notes: []

Tab Control

Burn Rate	0.99	kg/hr dry
Particulate Concentration(dry standard)	0.00044	grams/dscf
Particulate Emission Rate	3.74	grams/hour
Adjusted Emissions	5.44	grams/hour
Average Tunnel Temp	79.0	Degress Fahrenheit
Average Delta p	0.036	Inches H2O
Total Sample Volume-Vm	66.239	Cubic Feet
Average Gas Meter Temperature	77.0	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	12.79	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8441.38	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	65.915	DSCF
Total Particulates- mn	29.2	Mg
Average Delta H	0.856	Inches H2O
Total Time	130	Minute

Re-Save and Print Report
OFF

Tab Control

Test Run Information | Monitor | Pre-burn | Test Run Table | TEMPS | GASES | EMISSIONS RESULTS | Fuel Data | Calibrations

Manufacturer: Moirso | Model: 2B Classic | Run Number: 2 | OMNI EQUIPMENT ID #

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)
 CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
 CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 21.55 %

PIECE # LENGTH ft % MOISTURE READINGS FUEL TYPE PIECE LENGTH NOTES

1	8	ft	19.4	20.2	20.2	2X4	
2	8	ft	23.4	22.5	23.6	2X4	
3	0	ft	0	0	0		

TIME (24 HR) 14:35 ROOM TEMPERATURE (F) 65

TEST FUEL

FUEL TYPE - PIECE QUANTITY
 3 2 X 4 PIECES 0 4 X 4 PIECES
 5.7 LBS 0 LBS

FUEL LOAD PIECE COUNT: 3 PIECES
 ACTUAL LOAD WEIGHT: 5.7 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE #	READINGS	TYPE	PIECE #	READINGS	TYPE				
1	19	19.8	19.3	2X4	6	0	0	0	0
2	21.2	20.9	20.3	2X4	7	0	0	0	0
3	19.8	19.4	19.7	2X4	8	0	0	0	0
4	0	0	0		9	0	0	0	0
5	0	0	0		10	0	0	0	0

TIME (24 HR CLOCK) 14:45 ROOM TEMPERATURE (F) 65

AVERAGE FUEL LOAD MOISTURE 19.93 %

Time	ET Minutes	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Int	Avg Surface	Stack	AMB	Draft	Cat Temp	O2	CO2	CO	CO Ratio
10:50 AM	10	4.05	-1.237	811	209	276	363	437	3218	422.9	412	69	-0.058	3218	169.93	233.54	48.12	17.08
11:00 AM	20	3.22	-0.825	710	209	282	390	439	3218	406.0	362	70	-0.052	3218	168.14	232.71	47.76	17.03
11:10 AM	30	2.51	-0.719	689	212	299	391	442	3218	406.6	345	70	-0.047	3218	165.34	231.89	47.39	16.97
11:20 AM	40	1.96	-0.546	610	214	325	398	441	3218	397.6	305	70	-0.041	3218	161.47	231.06	47.01	16.91
11:30 AM	50	1.82	-0.139	480	213	363	388	423	3218	371.7	257	69	-0.036	3218	157.36	230.18	46.59	16.83
11:40 AM	60	1.71	-0.114	417	211	365	375	403	3218	364.2	227	68	-0.032	3218	153.50	229.29	46.16	16.78
11:50 AM	70	1.37	-0.339	374	208	367	364	383	3218	339.2	207	66	-0.030	3218	149.18	228.24	45.68	16.68
12:00 PM	80	1.30	-0.071	349	203	360	353	391	3218	325.3	192	67	-0.025	3218	145.11	227.26	45.20	16.59

MFC: MFC

Model #: 2B Classic

n #:

Project #: 102-S-00-3
Run Date: 10/28/05

Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tun dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	AVG Surf	Stack	Filter	Imping Exit	AMB	Draft
10/28/2000 5	12:03:02 PM	0.000	0.000	0.85	69	1.54	74	0.036	0.0	5.7	5.71	339	202	360	351	358	3218	321.7	196	67	64	68	-0.026
10/28/2000 5	12:12:59 PM	5.048	0.505	0.85	70	1.58	74	0.036	100.7	5.0	-0.71	387	197	328	331	341	3218	316.8	235	66	62	67	-0.037
10/28/2000 5	12:22:59 PM	10.094	0.505	0.86	72	1.59	78	0.036	100.5	4.1	-0.90	530	196	288	308	321	3218	328.5	300	67	66	66	-0.044
10/28/2000 5	12:32:59 PM	15.154	0.506	0.85	73	1.58	85	0.036	100.5	3.0	-1.12	663	194	270	319	342	3218	357.4	341	67	68	68	-0.050
10/28/2000 5	12:42:59 PM	20.211	0.506	0.85	75	1.58	89	0.036	100.3	1.9	-1.11	730	192	276	345	377	3218	384.2	357	69	68	70	-0.054
10/28/2000 5	12:52:59 PM	25.285	0.507	0.85	76	1.58	89	0.036	100.4	1.2	-0.72	665	191	301	366	405	3218	386.1	330	69	67	71	-0.046
10/28/2000 5	1:02:59 PM	30.371	0.509	0.85	78	1.56	84	0.036	100.5	0.8	-0.35	545	191	329	379	415	3218	372.1	288	69	68	71	-0.041
10/28/2000 5	1:12:59 PM	35.465	0.510	0.86	78	1.57	82	0.036	100.5	0.7	-0.12	450	190	346	375	398	3218	351.8	244	70	67	70	-0.034
10/28/2000 5	1:22:59 PM	40.579	0.511	0.86	79	1.58	80	0.036	100.7	0.6	-0.12	401	190	349	363	378	3218	336.3	220	70	66	70	-0.031
10/28/2000 5	1:32:59 PM	45.698	0.512	0.86	80	1.57	78	0.036	100.7	0.5	-0.10	372	189	344	354	365	3218	324.8	204	70	65	70	-0.029
10/28/2000 5	1:42:59 PM	50.828	0.513	0.86	80	1.57	77	0.036	100.8	0.4	-0.11	351	188	336	344	354	3218	314.5	193	69	59	69	-0.027
10/28/2000 5	1:52:59 PM	55.964	0.514	0.86	81	1.56	75	0.036	100.8	0.3	-0.11	334	188	327	333	344	3218	305.3	184	70	57	69	-0.025
10/28/2000 5	2:02:59 PM	61.103	0.514	0.86	81	1.57	74	0.036	100.8	0.2	-0.10	323	186	317	323	338	3218	296.9	178	70	56	68	-0.023
10/28/2000 5	2:12:59 PM	66.239	0.514	0.86	81	1.57	72	0.036	100.7	0.0	-0.14	313	184	310	315	330	3218	280.5	173	69	55	68	-0.021

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OMNI Testing Laboratories Inc.

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Signature/Date: B.R.
11/17/05

MFC: MFC-100

Model #: 2B Classic

n #:

Project #: 132-S-00-3
Run Date: 10/28/05

Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	DII Tun Temp	DII Tun dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int.	Avg Surf	Stack	Filter	Imping Ext	AMIS	Draft
AVG	NA	NA	0.51	0.88	76.64	1.57	79.36	0.04	100.61	NA	NA	457.50	191.29	320.07	343.29	361.79	3218.00	334.78	245.64	68.71	63.43	68.93	-0.03

OMNI Testing Laboratories Inc.

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Signature/Date: [Signature]
11/17/05

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Run Notes

Client/Model: Morso
 Model: 2B Classic
 Project #: 192-S-06-3
 Tracking Number: 785
 Run #: 2 Date: 10-28-05
 Test Crew: B. Davis
 OMNI Equipment ID Numbers: _____

PREBURN

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

PRIMARY: full
 SECONDARY: fixed
 TERTIARY: NA
 FAN: NA

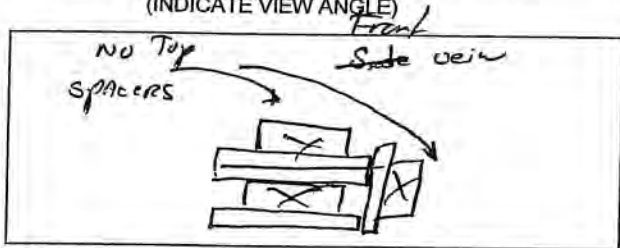
Turn open from
full closed

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					
81						

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
 FUEL LOADING: by 47 sec.
 DOOR: closed by 4:15 then closed
 PRIMARY AIR: fully open until 4:15 then slowly closed to test setting by 5:00
 OTHER: NA

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

PRIMARY: _____
 SECONDARY: NA fixed
 TERTIARY: NA
 FAN: NA

Same as Above

Technician signature: B. Davis Date: 11-3-05

Supplemental Data EPA 5G/5H

Client: Morso

Model: 2B Classic

Project No.: 268-S-03-3

Tracking No.: 785

Date: 10-28-05 Run No.: 2 Booth: 5

Test Crew: B.R. Start Time: 12:02 Stop Time: 14:12

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: NA

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas CO₂: _____ O₂: _____ CO: _____ CO₂(DT): _____

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

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: 250 ft/min Final: 250 ft/min

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

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 @ 3.4 Post: 0.0 @ 3.1

Flue Pipe Cleaned Prior to First Test in Series: Date: 10-27-05 Initials: BR

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.82</u>	<u>29.80</u>	<u>29.78</u>
Room Temp (°F)	<u>68</u>	<u>70</u>	<u>68</u>

Technician signature: BR Date: 11-3-05

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Run 3

Test Run Information | Monitor | Pre-burn | Test Run Table | TEMPS | GASES | EMISSIONS RESULTS | Fuel Data | Calibrations

Run Number: 3
 Tracking Number: 785
 Fuel Load (lbs): 0.00
 Coal Bed Range: 0.00 to 0.00
 Actual Coal Bed: []

Manufacturer: Morso
 Project Number: 192-S-06-3
 Date: 10/28/05

	PT.1	PT.2	PT.3	PT.4	PT.5	PT.6	PT.7	PT.8
Initial dp	.028	.04	.04	.028	.028	.042	.042	.024
Initial Temp	117	117	117	117	115	115	115	115

Barometric Pressure: 29.78 | Begin: 29.78 | Middle: 29.78 | End: 29.78 | Avg: 29.78

PMI Control Module: 298
 Tunnel Velocity: 12.82 ft/sec
 Avg Prop Rate: 100.398
 Firebox Surface Temp Change: -63.5
 Filter Holder #: A

Dilution Tunnel MW(dry): 29 | lb/lb-mole
 Initial Tunnel Flow: 131.5 scfm
 Firebox Surface Temp Change: -63.5

Dilution Tunnel MW(wet): 28.56 | lb/lb-mole
 Average Tunnel Flow: 132.69 scfm
 Filter Holder #: A

Dilution Tunnel H2O: 4 | percent
 Tunnel Area: .196 ft2
 Total Particulate: 9.9 mg

Dilution Tunnel Static: -.47 | in. H2O
 Post-Test Leak Check: .004@4 cfm@" Hg
 Run Time (Minutes): 70

Pitot Tube Cp: .99
 Fuel Moisture (dry basis): NaN %
 Fuel Consumed: 6.000 lbs

Meter Box "Y" Factor: 1.014
 Notes: []

Tab Control

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Test Run Information Monitor Pre-burn Test Run Table TEMPS GASES EMISSIONS RESULTS Fuel Data Calibrations

Burn Rate	1.96	kg/hr dry
Particulate Concentration(dry standard)	0.00028	grams/dscf
Particulate Emission Rate	2.23	grams/hour
Adjusted Emissions	3.55	grams/hour
Average Tunnel Temp	112	Degress Fahrenheit
Average Delta p	0.034	Inches H2O
Total Sample Volume-Vm	35.49	Cubic Feet
Average Gas Meter Temperature	77.0	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	12.81	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	7960.22	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	35.292	DSCF
Total Particulates- mn	9.9	Mg
Average Delta H	0.85	Inches H2O
Total Time	70	Minute

Re-Save and Print Report



Tab Control

2-22 + 2-35

Signature/Date: BR
11/17/05

Test Run Information | Monitor | Pre-burn | Test Run Table | TEMPS | GASES | EMISSIONS RESULTS | Fuel Data | Calibrations

Model: ZB Classic

Run Number: 3

OMNI EQUIPMENT ID #

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

PREBURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS):
 CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
 CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 21.5 %

PIECE	LENGTH	% MOISTURE READINGS	FUEL TYPE	PIECE LENGTH (NOTES)
1	8 ft	20.8	2X4	
2	0 ft	22.4		
3	0 ft	21.3		

TIME (24 HR): 14:50 ROOM TEMPERATURE (F): 70

TEST FUEL

FUEL TYPE - PIECE QUANTITY:
 3 2 X 4 PIECES 0 4 X 4 PIECES
 6 LBS 0 LBS

FUEL LOAD PIECE COUNT: 3 PIECES
 ACTUAL LOAD WEIGHT: 6 LBS

MOISTURE-CONTENT (METER-DRY BASIS):

PIECE#	READINGS	TYPE	PIECE#	READINGS	TYPE
1	19.5	19.7	6	0	
2	18.6	19.2	7	0	
3	18.6	19.3	8	0	
4	0	0	9	0	
5	0	0	10	0	

TIME (24 HR (CLOCK)): 15:05 ROOM TEMPERATURE (F): 70

AVERAGE FUEL LOAD MOISTURE: 19.27 %

Tab Control

MIL-1: MINREN

Model #: 2B Classic

Run #

Project #: 112-S-003

Run Date: 10/28/05

Time	ET Minutes	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Int	Avg Surface	Stack	AMB	Draft	Cat Temp	O2	CO2	CO	CO Ratio
3:11 PM	10	9.15	-0.953	565	176	259	304	340	3218	329.1	431	71	-0.053	3218	115.53	200.56	35.85	15.17
3:21 PM	20	7.60	-1.551	737	163	242	307	349	3218	363.6	512	71	-0.067	3218	126.40	196.53	36.60	15.21
3:31 PM	30	11.90	4.303	818	195	247	336	385	3218	396.3	551	74	-0.071	3218	137.99	196.95	35.56	15.29
3:41 PM	40	4.26	-7.642	852	209	269	372	428	3218	425.8	560	74	-0.072	3218	147.15	195.64	35.76	15.45
3:51 PM	50	3.07	-1.194	789	220	300	398	462	3218	435.9	539	76	-0.065	3218	146.66	194.66	35.98	15.60
4:01 PM	60	2.02	-1.047	770	231	341	428	484	3218	450.7	528	76	-0.066	3218	144.36	183.87	36.17	15.72
4:11 PM	70	1.43	-0.588	663	242	367	457	490	3218	447.8	460	77	-0.060	3218	140.72	192.95	36.27	15.82

OMNI Testing Laboratories Inc.

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Signature/Date: *[Signature]*

11/17/05

2-24 + 2-35

MEG: Moran

Model #: 2B Classic

IN #

Project #: 102-S-00-3
Run Date: 10/28/05

Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tun dp	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
4:14 PM	0	0.000	0.000	0.85	73	1.56	112	0.034	0.0	5.0	6.06	613	244	400	459	487	3218	440.8	480	71	66	76	-0.057
4:18 PM	5	2.546	0.509	0.88	73	1.62	121	0.034	100.8	5.2	-0.88	785	241	413	458	482	3218	475.8	553	73	58	76	-0.078
4:23 PM	10	5.093	0.510	0.86	74	1.60	124	0.034	100.7	4.2	-0.95	837	242	398	443	488	3218	477.5	569	74	56	75	-0.070
4:28 PM	15	7.627	0.507	0.86	75	1.60	126	0.034	100.3	3.3	-0.88	896	241	384	431	460	3218	470.4	573	75	56	75	-0.074
4:33 PM	20	10.156	0.508	0.85	75	1.61	126	0.034	100.1	2.5	-0.84	838	241	377	425	457	3218	467.5	574	75	57	76	-0.069
4:38 PM	25	12.682	0.505	0.84	76	1.63	126	0.034	100.0	1.8	-0.73	836	240	375	427	457	3218	467.1	571	75	57	76	-0.072
4:43 PM	30	15.189	0.503	0.84	77	1.61	120	0.034	99.8	1.3	-0.51	756	238	377	431	462	3218	453.0	523	75	58	79	-0.061
4:48 PM	35	17.714	0.503	0.84	77	1.61	116	0.034	99.7	0.9	-0.35	689	237	383	433	466	3218	441.6	485	76	59	79	-0.060
4:53 PM	40	20.229	0.503	0.82	78	1.60	111	0.034	99.8	0.7	-0.22	621	236	392	432	467	3218	429.6	443	76	59	78	-0.059
4:58 PM	45	22.756	0.505	0.85	79	1.63	107	0.034	100.2	0.6	-0.14	568	235	402	429	463	3218	419.3	411	76	60	78	-0.054
5:03 PM	50	25.297	0.508	0.85	79	1.63	103	0.034	100.6	0.4	-0.11	529	235	407	424	455	3218	410.0	386	76	60	77	-0.051
5:08 PM	55	27.844	0.510	0.85	80	1.61	100	0.034	100.8	0.3	-0.11	498	234	408	417	447	3218	400.8	366	76	61	76	-0.050
5:13 PM	60	30.389	0.509	0.85	80	1.61	97	0.034	100.5	0.2	-0.09	474	234	404	408	437	3218	391.4	350	75	61	75	-0.048
5:18 PM	65	32.937	0.510	0.86	81	1.61	96	0.034	100.7	0.1	-0.11	458	235	398	401	428	3218	383.8	339	75	62	74	-0.046
5:23 PM	70	35.490	0.510	0.85	81	1.60	94	0.034	100.7	0.0	-0.10	442	236	394	393	421	3218	377.3	329	75	62	73	-0.045
AVG	NA	NA	0.51	0.85	77.20	1.61	111.93	0.03	100.34	NA	NA	652.00	237.93	394.13	427.40	457.20	3218.00	433.73	460.13	74.87	59.47	76.20	-0.06

2-25 of 2-35

OMNI Testing Laboratories Inc.

5 of 5

Signature/Date: BRE
11/7/05

Run Notes

Client/Model: Morso

Model: 2B Classic

Project #: 192-S-06-3

Tracking Number: 785

Run #: 3 Date: 10-28-05

Test Crew: R. Davis

OMNI Equipment ID Numbers: _____

PREBURN

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

PRIMARY:

fully open (5 turns)

SECONDARY: fixed

TERTIARY: NA

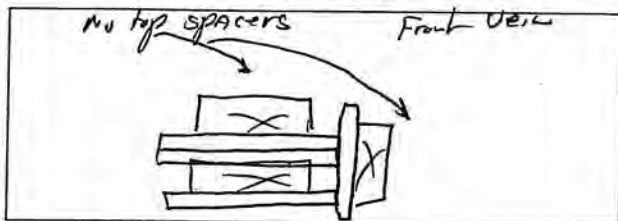
FAN: NA

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					
71					x	→

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
 FUEL LOADING: By 50 sec
 DOOR: Cracked open until 2:30 Then closed
 PRIMARY AIR: fully open Pull 5:00
 OTHER: NA

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

PRIMARY:

fully open

SECONDARY: fixed

TERTIARY: NA

FAN: NA

Technician signature: R. Davis Date: 11-3-05

Supplemental Data EPA 5G/5H

Client: Morso

Model: 2B Classic

Project No.: 268-S-03-3

Tracking No.: 785

Date: 10-28-05 Run No.: 3 Booth: 5

Test Crew: B Davis Start Time: 4:14 Stop Time: 5:23

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: NA

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas CO₂: _____ 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
	<u>NA</u>						
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: 250 ft/min Final: 250 ft/min

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

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 @ 3.4 Post: 0.0 @ 3.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 10-27-05 Initials: BD

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.78</u>	<u>29.78</u>	<u>29.78</u>
Room Temp (°F)	<u>76</u>	<u>79</u>	<u>73</u>

Technician signature: BD Date: 11-3-05

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Run 4

Run Number
4

Tracking Number
785

Fuel Load (lbs)
5.60

Manufacturer
Morso

Project Number
192-5-06-3

Coal Bed Range
1.12 to 1.40

Model
2B Classic

Date
10/31/05

Actual Coal Bed

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dp	.034	.048	.05	.034	.038	.048	.05	.034
Initial Temp	79	79	79	79	79	79	79	79

Barometric Pressure

Begin	Middle	End	Avg
30.08	30.08	30.08	30.08

PM Control Module 298
 Dilution Tunnel MW(dry) 29
 Dilution Tunnel MW(wet) 28.56
 Dilution Tunnel H2O 4
 Dilution Tunnel Static -.48
 Pitot Tube Cp .99
 Meter Box "y" Factor 1.014

Tunnel Velocity 18.76 ft/sec
 Initial Tunnel Flow 152.1 scfm
 Average Tunnel Flow 152.63 scfm
 Tunnel Area .196 ft²
 Post-Test Leak Check .004@8 cfm@" Hg
 Fuel Moisture(dry basis) 20.49 %
 Fuel Consumed 5.500 lbs

Avg Prop Rate 100.422
 Firebox Surface Temp Change -67
 Filter Holder # A
 Total Particulate 8.0 mg
 Run Time (Minutes) 140

Notes
 Delayed Start Time was due to a delayed input from the technician - Data collection started at 11:40 Am.

Tab Control

Burn Rate	0.89	kg/hr dry
Particulate Concentration(dry standard)	0.00011	grams/dscf
Particulate Emission Rate	1.03	grams/hour
Adjusted Emissions	1.87	grams/hour
Average Tunnel Temp	79.0	Degress Fahrenheit
Average Delta p	0.042	Inches H2O
Total Sample Volume-Vm	71.176	Cubic Feet
Average Gas Meter Temperature	80.0	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-ys	13.75	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	9159.84	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	71.095	DSCF
Total Particulates- mn	8	Mg
Average Delta H	0.857	Inches H2O
Total Time	140	Minute

Re-Save and Print Report 

Tab Control

Signature/Date: *[Signature]*
11/17/05

2-30 of 2-35

Test Run Information	Monitor	Pre-burn	Test Run Table	TEMPS	GASES	EMISSIONS RESULTS	Fuel Data	Calibrations
Manufacturer Morso			Model 2B Classic		Run Number 4		OMNI EQUIPMENT ID # 262	
FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.								
PRE-BURN FUEL			MOISTURE-CONTENT (METER-DRY BASIS)			AVG PRE-BURN LOAD MOISTURE		
CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12			CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22			21.4 %		
PIECE	LENGTH	% MOISTURE READINGS	FUEL TYPE	PIECE LENGTH NOTES:				
1	8 ft	21.8	2X4					
2	0 ft	20.3						
3	0 ft	0						
TIME (24 HR)		ROOM TEMPERATURE (F)		FUEL LOAD / PIECE COUNT 3 PIECES				
09:20		65		ACTUAL LOAD WEIGHT: 5.6 LBS				
TEST FUEL			FUEL TYPE - PIECE QUANTITY			AVERAGE FUEL LOAD MOISTURE		
FUEL PIECE LENGTH: 15 IN			2 X 4 PIECES 0 4 X 4 PIECES			20.49 %		
CALCULATED FUEL LOAD: 5.7 LBS			5.6 LBS 0 LBS					
MOISTURE-CONTENT (METER -- DRY BASIS)			PIECE #			TYPE		
PIECE #	READINGS	TYPE	READINGS					
1	21.4	2X4	6	0	0	0	0	0
2	20	2X4	7	0	0	0	0	0
3	19.7	2X4	8	0	0	0	0	0
4	0		9	0	0	0	0	0
5	0		10	0	0	0	0	0
TIME (24 HR, CLOCK)		ROOM TEMPERATURE (F)		AVERAGE FUEL LOAD MOISTURE				
09:25		65		20.49 %				

Tab Cont'd

OMNI Testing Laboratories Inc.

3 of 5

Signature/Date: BDP

11 / 7 / 05

2-31 of 2-35

Time	ET Minutes	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Int	AVG Surface	Stack	AMB	Draft	Cat Temp	O2	CO2	CO	CO Ratio
10:49 AM	10	4.06	-1.049	747	167	250	376	415	3218	390.8	394	71	-0.060	3218	83.10	61.45	13.68	18.20
10:58 AM	20	3.16	-0.899	709	177	261	381	425	3218	390.6	360	71	-0.054	3218	87.78	64.28	14.57	18.48
11:09 AM	30	2.45	-0.711	674	184	281	387	435	3218	392.1	336	68	-0.051	3218	90.79	67.20	15.45	18.69
11:19 AM	40	1.79	-0.555	662	191	311	396	443	3218	400.6	324	70	-0.048	3218	92.50	70.28	16.31	18.84
11:29 AM	50	1.48	-0.312	554	197	340	398	441	3218	386.0	283	68	-0.041	3218	93.19	73.45	17.13	18.91
11:39 AM	60	1.34	-0.140	457	200	360	387	425	3218	366.0	247	69	-0.037	3218	93.64	76.66	17.89	18.92

Signature/Date:  11/17/05

Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice (deg F)	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tun dp	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
11:43 AM	0	0.000	0.000	0.87	73	1.59	90	0.042	0.0	5.5	5.51	397	200	373	381	415	3218	352.9	287	70	65	69	-0.052
11:50 AM	10	5.060	0.506	0.87	74	1.58	82	0.042	100.7	4.8	-0.71	528	199	342	358	398	3218	365.2	304	71	63	68	-0.048
12:00 PM	20	10.125	0.507	0.87	75	1.61	83	0.042	100.6	3.9	-0.92	594	198	302	334	380	3218	361.8	319	71	62	69	-0.050
12:10 PM	30	15.188	0.508	0.86	77	1.61	87	0.042	100.3	2.8	-1.09	723	195	287	333	381	3218	363.8	361	71	61	70	-0.054
12:20 PM	40	20.242	0.505	0.85	78	1.57	88	0.042	100.1	1.7	-1.04	761	193	292	354	398	3218	389.6	374	72	60	70	-0.053
12:30 PM	50	25.305	0.506	0.85	80	1.59	83	0.042	100.1	1.1	-0.63	642	190	312	369	414	3218	385.2	333	72	60	71	-0.045
12:40 PM	60	30.384	0.508	0.86	81	1.59	80	0.042	100.4	0.9	-0.22	506	188	332	373	413	3218	362.5	278	72	60	71	-0.039
12:50 PM	70	35.473	0.509	0.85	81	1.58	79	0.042	100.4	0.8	-0.13	430	185	345	362	394	3218	343.3	242	72	61	69	-0.035
1:00 PM	80	40.565	0.509	0.86	82	1.57	77	0.042	100.4	0.7	-0.10	364	183	350	348	376	3218	328.0	219	72	61	69	-0.030
1:10 PM	90	45.657	0.509	0.85	83	1.57	75	0.042	100.4	0.6	-0.10	355	181	348	335	360	3218	315.8	203	72	62	69	-0.029
1:20 PM	100	50.761	0.510	0.85	83	1.58	74	0.042	100.5	0.5	-0.10	338	180	343	326	347	3218	306.7	192	72	63	68	-0.025
1:30 PM	110	55.853	0.510	0.86	83	1.58	74	0.042	100.5	0.3	-0.12	324	178	334	318	336	3218	298.2	185	72	63	67	-0.025
1:40 PM	120	60.957	0.510	0.84	83	1.57	73	0.042	100.5	0.3	-0.09	315	177	325	312	329	3218	291.6	180	72	64	67	-0.024
1:50 PM	130	66.074	0.511	0.86	84	1.57	73	0.042	100.5	0.1	-0.11	312	177	318	309	327	3218	288.5	177	72	64	67	-0.024
2:00 PM	140	71.176	0.510	0.86	84	1.59	72	0.042	100.4	0.0	-0.12	308	177	311	307	327	3218	285.9	175	71	65	67	-0.025
AVG	NA	NA	0.51	0.86	80.07	1.58	79.33	0.04	100.41	NA	NA	461.20	186.73	327.60	341.27	373.00	3218.00	337.92	255.27	71.60	62.27	66.73	-0.04

Signature/Date: BR

11/17/05

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Run Notes

Client/Model: Morso

Model: 2B Classic

Project #: 192-S-06-3

Tracking Number: 785

Run #: 4 Date: 10-31-05

Test Crew: B. Davis

OMNI Equipment ID Numbers: _____

PREBURN

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

PRIMARY: Full

1 turn open from
full closed

SECONDARY: Fixed

TERTIARY: NA

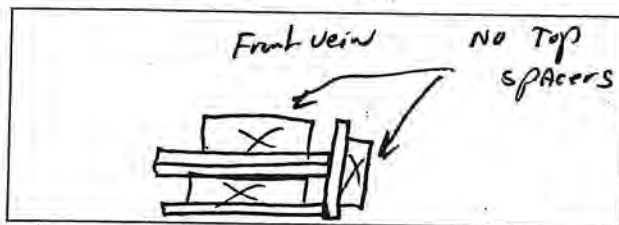
FAN: NA

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					
61					X	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA

FUEL LOADING: by 55 sec.

DOOR: closed by 4:00

PRIMARY AIR: fully open until 4:15
Then slowly set to test setting

@ 5' air

OTHER: NA

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

PRIMARY:

Same as Above

SECONDARY: Fixed

TERTIARY: NA

FAN: NA

Technician signature: B. Davis

Date: 11-3-05

Supplemental Data EPA 5G/5H

Client: Morso

Model: 2B Classic

Project No.: 268-S-03-3

Tracking No.: 785

Date: 10-31-05 Run No.: 4 Booth: 5

Test Crew: B. Davis Start Time: 11:43 Stop Time: 12:00
11:40

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: NA

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas CO₂: _____ 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
	<u>NA</u>						
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: 250 ft/min Final: 250 ft/min

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

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 @ 3.3 Post: 0.0 @ 3.1

Flue Pipe Cleaned Prior to First Test in Series: Date: 10-22-05 Initials: DE

	Initial	Middle	Ending
Pb (in. Hg)	<u>30.08</u>	<u>30.08</u>	<u>30.08</u>
Room Temp (°F)	<u>69</u>	<u>69</u>	<u>67</u>

Technician signature: [Signature] Date: 11-3-05

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Section 3

Drawings and Fuel Photographs

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Morsø Jernstøberi A/S
Model: 2B Classic

Run 1 - Fuel



Run 1 - Newly Loaded Stove



Run 2 - Fuel



Run 2 - Newly Loaded Stove



Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Morsø Jernstøberi A/S
Model: 2B Classic

Run 3 - Fuel



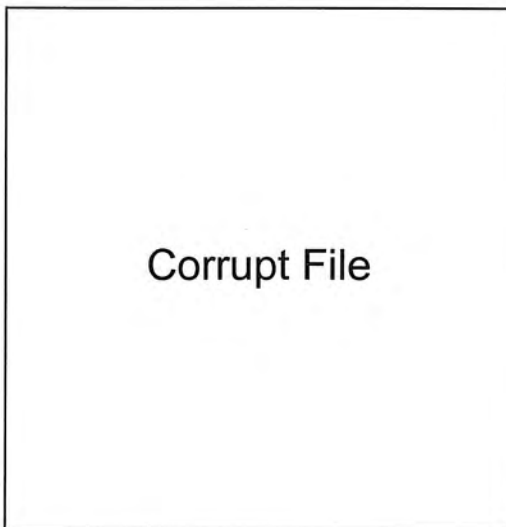
Run 3 – Newly Loaded Stove

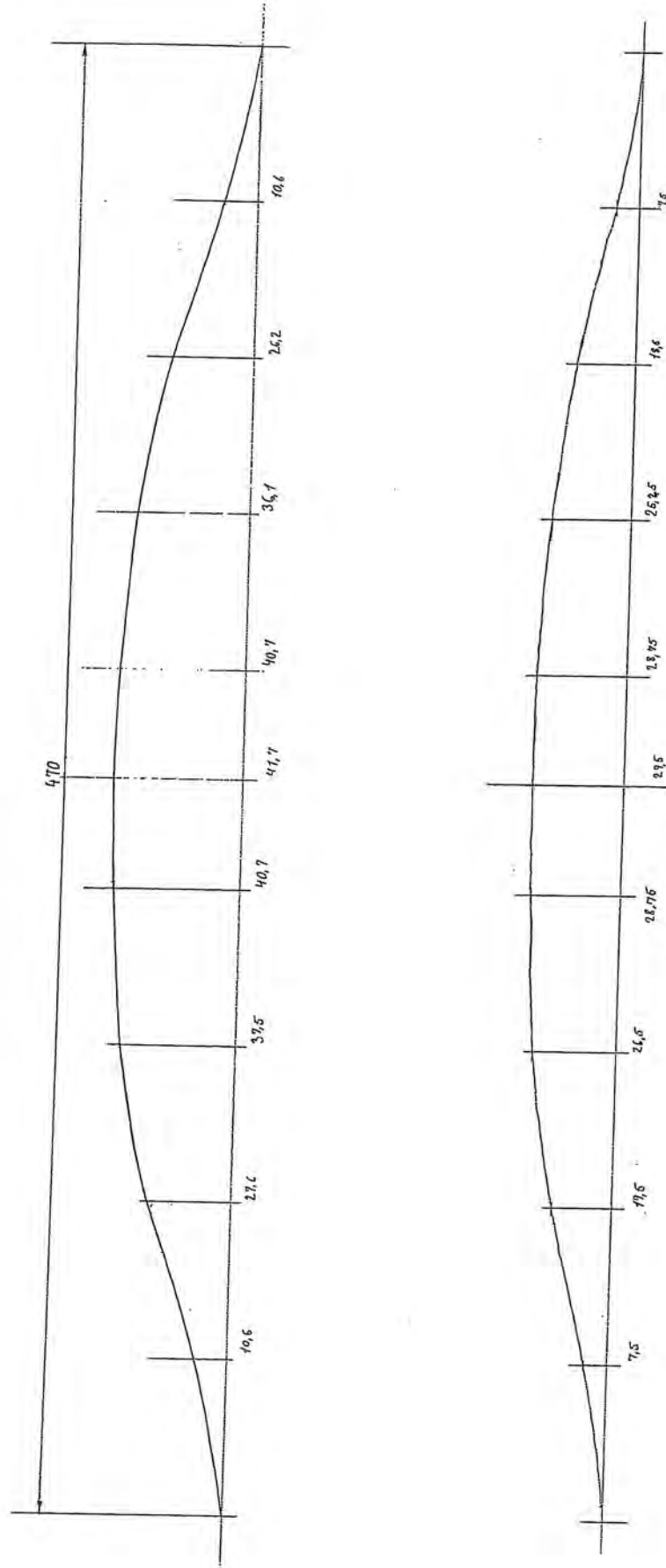


Run 4 - Fuel



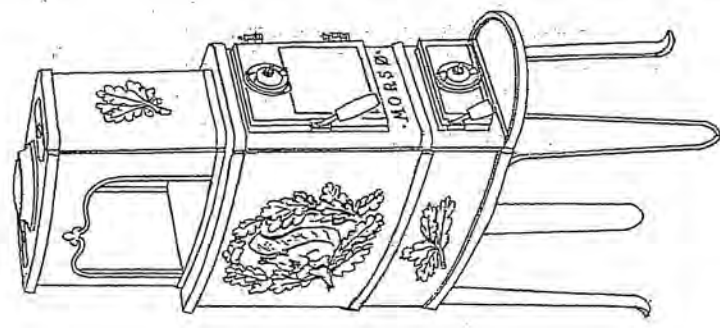
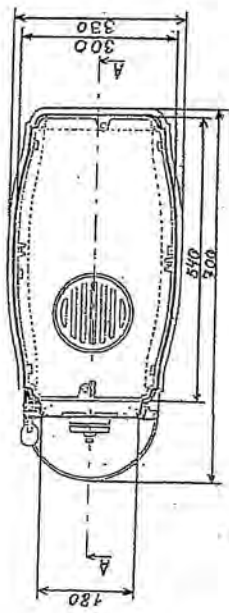
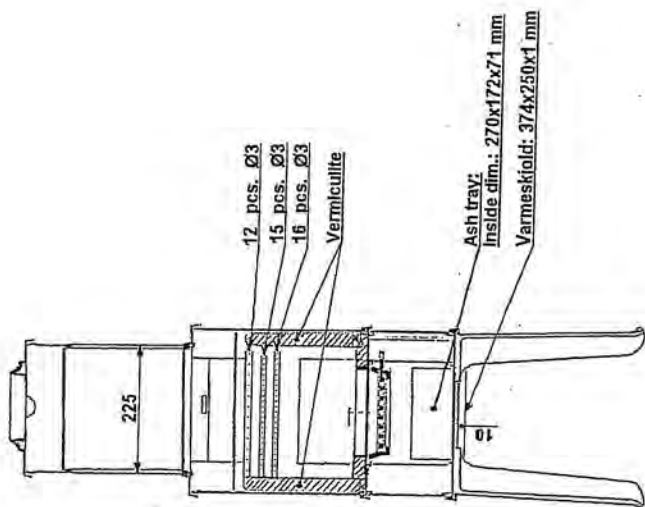
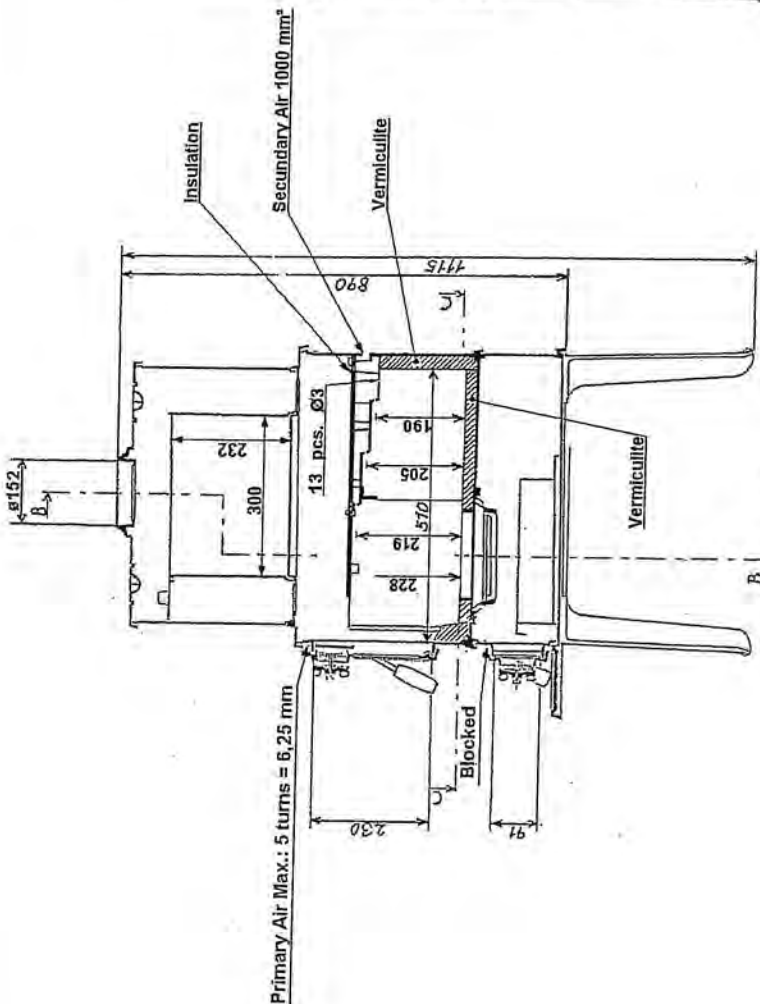
Run 4 – Newly Loaded Stove





Side 2B mm/radler
2B-21

A B C D E F G H J K L M



Rev.	Revision	Sign.	Dato	Titel:		Sign.	Dato:
				Godkendelsestegning		RSV	20.09.05
				Morsø 2B Classic NA		Tegn.form.: A3	Målforhold 1:10
				Filnavn: -		Varenummer:	
				MORSØ Jernstøberi A/S		Tegningsnummer:	2B -91 a

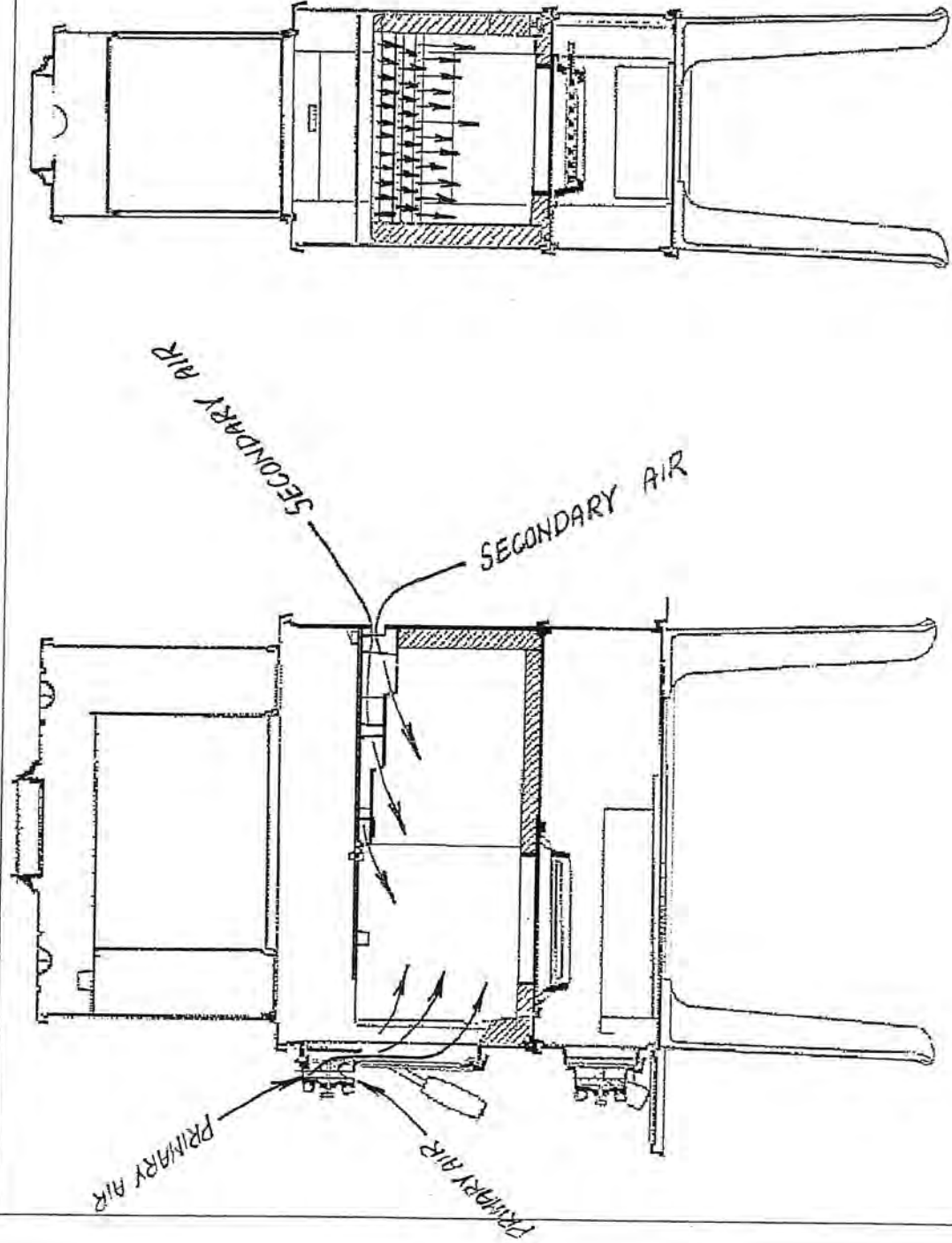
3543-69

Morsø 2B Classic NA - Drawings and data

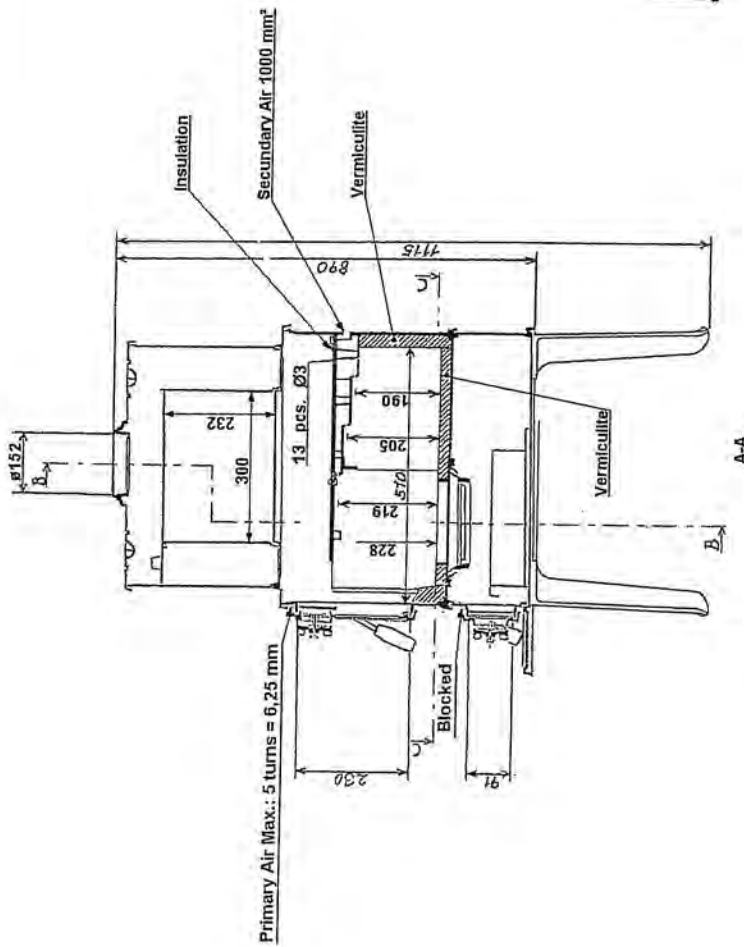
Nykøbing Mors d. 17.11.2005

PARTS:	DRAWINGS:	DATE:
Ash Door	2B-19	30.11.82
Front for Lower Part	2B-20	07.12.82
Rear Plate for Lower Part	2B-21	08.12.82
Side Panel for Upper Part	2B-22	09.12.82
Intermediate Grate Frame	2B-23	20.05.83
Inner Grate Frame	2B-25	12.02.83
Riddling Grate	2B-26	11.02.83
Front	2B-33	02.03.83
Base	2B-42	05.04.00
Riddling Handle	2B-44	26.05.03
Leg	2B-53	10.08.83
Ash Can	2B-58	06.01.88
Door	2B-59	25.10.05
Brick Securing Bracket	2B-61	20.12.96
Door Glass	2B-64	14.11.05
Radiation Shield - Base	2B-70	10.01.00
Squirrel Side Panel	2B-71	No date
Bolt - Ø5 360 mm	2B-76	14.06.05
Bolt M6x170	2B-77	20.11.03
Bolt M6x205	2B-78	20.11.03
Bolt M6x215	2B-79	20.11.03
Horizontal Baffle	2B-82	12.09.05
Rear Plate	2B-83	17.05.05
Vertical Baffle	2B-84	12.05.05
Baffle - standless steel	2B-85	12.09.05
Brick - Base	2B-86	09.11.05
Side Brick	2B-87	02.11.05
Rear Brick	2B-88	02.11.05
Top - upper part	2B-89	07.10.05
Insulation	2B-90	15.09.05
App. drawing 2B Classic	2B-91	20.09.05
Air flow	2B-92	14.11.05
Tightening tape	2B-94	14.11.05
Radiation Shield - Front	2B-95	04.11.05
Air Controle	2B-96	15.11.05
Frame	2B-97	16.11.05
Side Panel for Upper Part	2B-98	15.11.05
Rear Panel for Upper Part	2B-99	17.11.05
Inside rear panel upper part	2B-100	15.11.05
Inside top - upper part	2B-101	16.11.05
Smoke Valve	2B-102	16.11.05
Cover - upper part	2B-103	16.11.05
Access Door Upper Part	2B-104	16.11.05
Intermediate Grate	2B-105	16.11.05
Knop for riddling handle	1126-26	10.08.99
Riddling Handle	1126-42	30.06.87
Clasp	1400-42	apr-96
Bakelite Handle 36 mm	1400-194	02.08.00
Fitting w/o thread	1400-199	03.03.00
Fitting for Cover w. thread	1400-204	03.03.00
Glass Fittings	1400-205	14.03.01
Flue Collar	1400-219	24.09.01
Fitting for Handle	1400-227	23.03.04
Distance Tube	1400-300	13.01.97
Hinge Pin	2100-174	26.01.04
Poker	9000-05	11.06.99

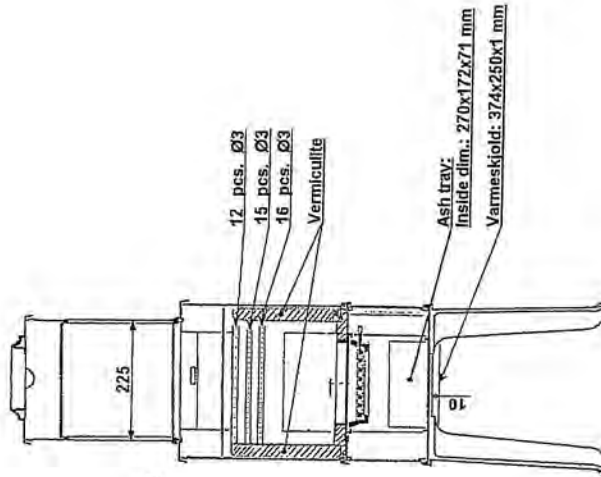
V-1100 (600) Vermiculite insulating slabs- Technical datas
Glas fiber products - Technical datas
Glas ceramics - Technical datas
Installation and Operating Instructions
Parts list 2B Classic



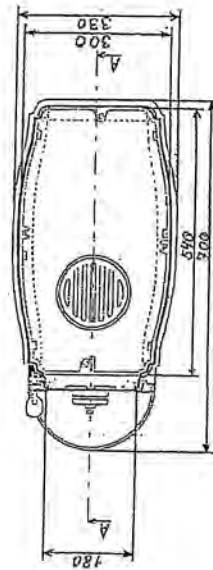
Rev.	Revision	Sign.	Date	Titel:		Sign.:	Date:
				Air Flow		RSV	14.11.05
				Morsø 2B Classic NA		Tegn.form.: A3	Målførlhold 1:10
				Filnavn: -		Varennummer:	
				MORSØ Jernstøberi A/S		Tegningsnummer:	2B-92 a



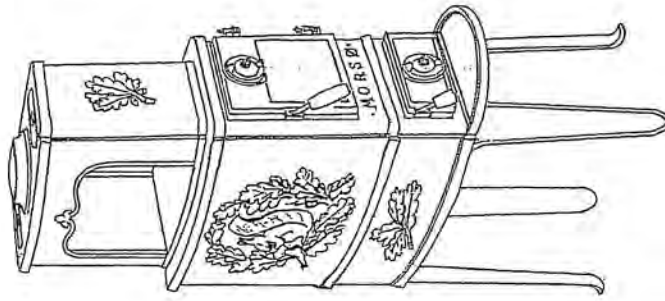
A-A



B-B

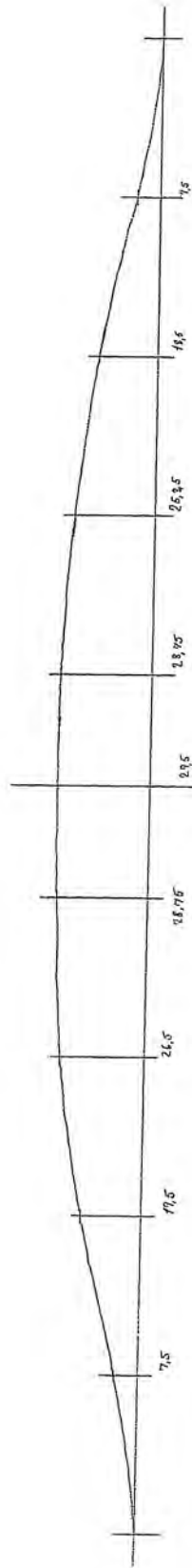
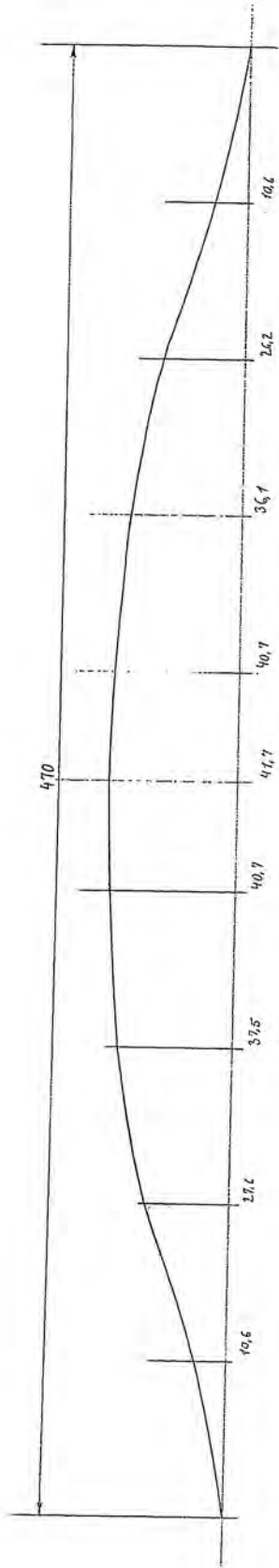


C-C



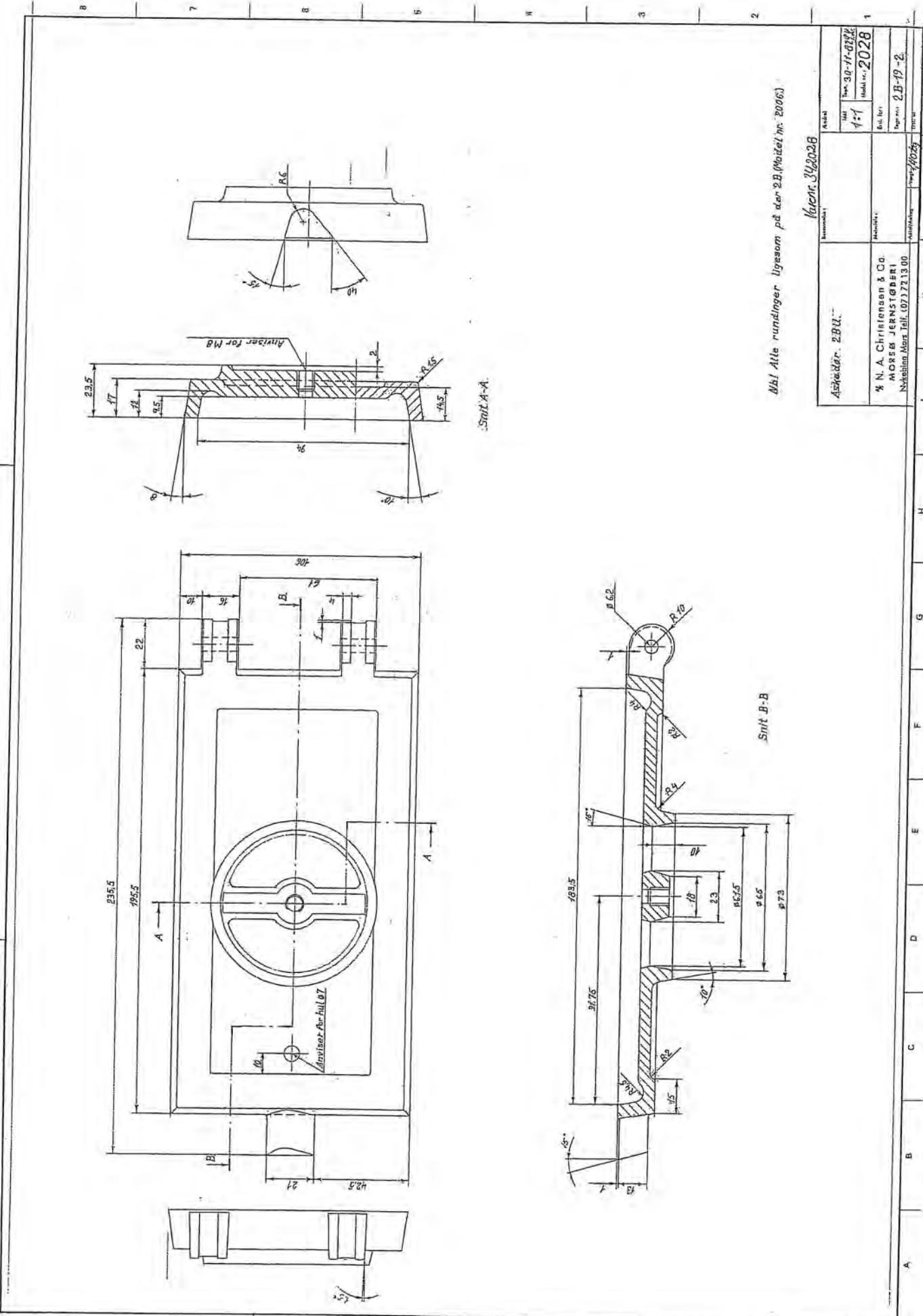
Rev.	Revision	Sign.	Dato	Titel:	Sign.	Dato:
				Godkendelsestegning	RSV	20.09.05
				Morsø 2B Classic NA	Tegn.form.: A3	Målforhold 1:10
				Filnavn: -	Varenummer:	
				morsø	Tegningsnummer:	2B -91 a
				Jernstøberi A/S		

B 7 6 5 4 3 2 1



Side 2B m/radler
2B-91

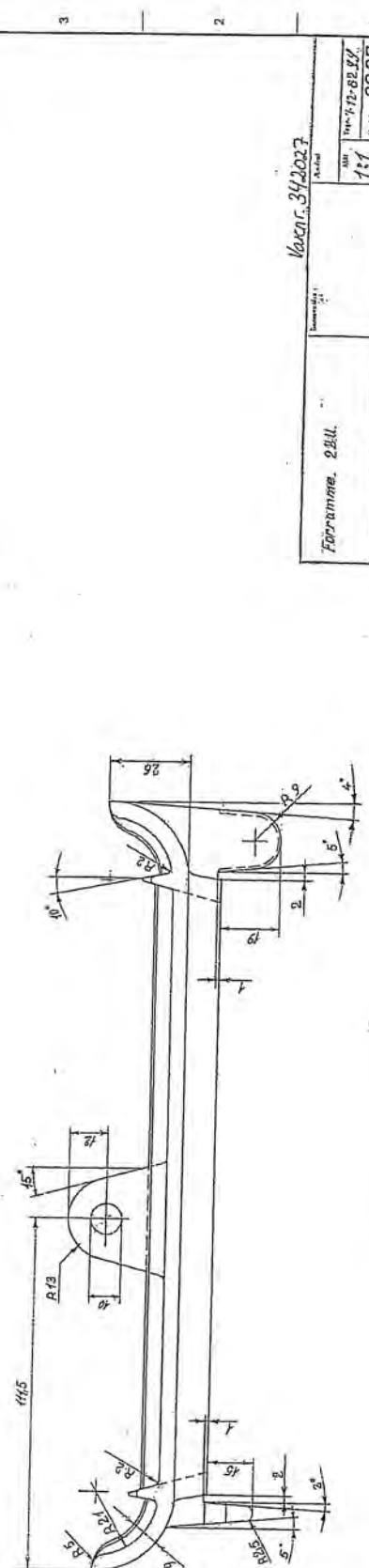
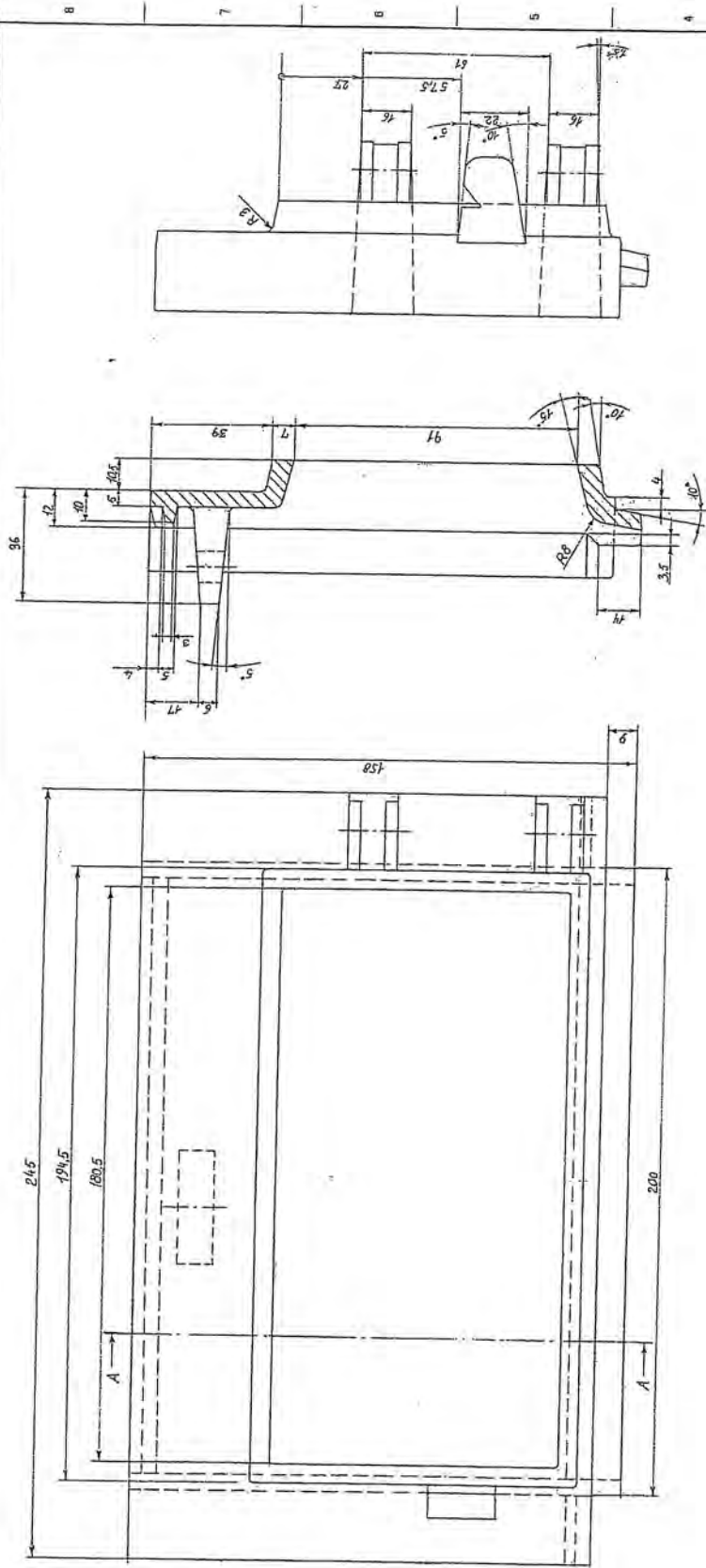
A B C D E F G H J K L M



Alle Alle rundinger ligesom på den 2.B. Model nr. 2006.

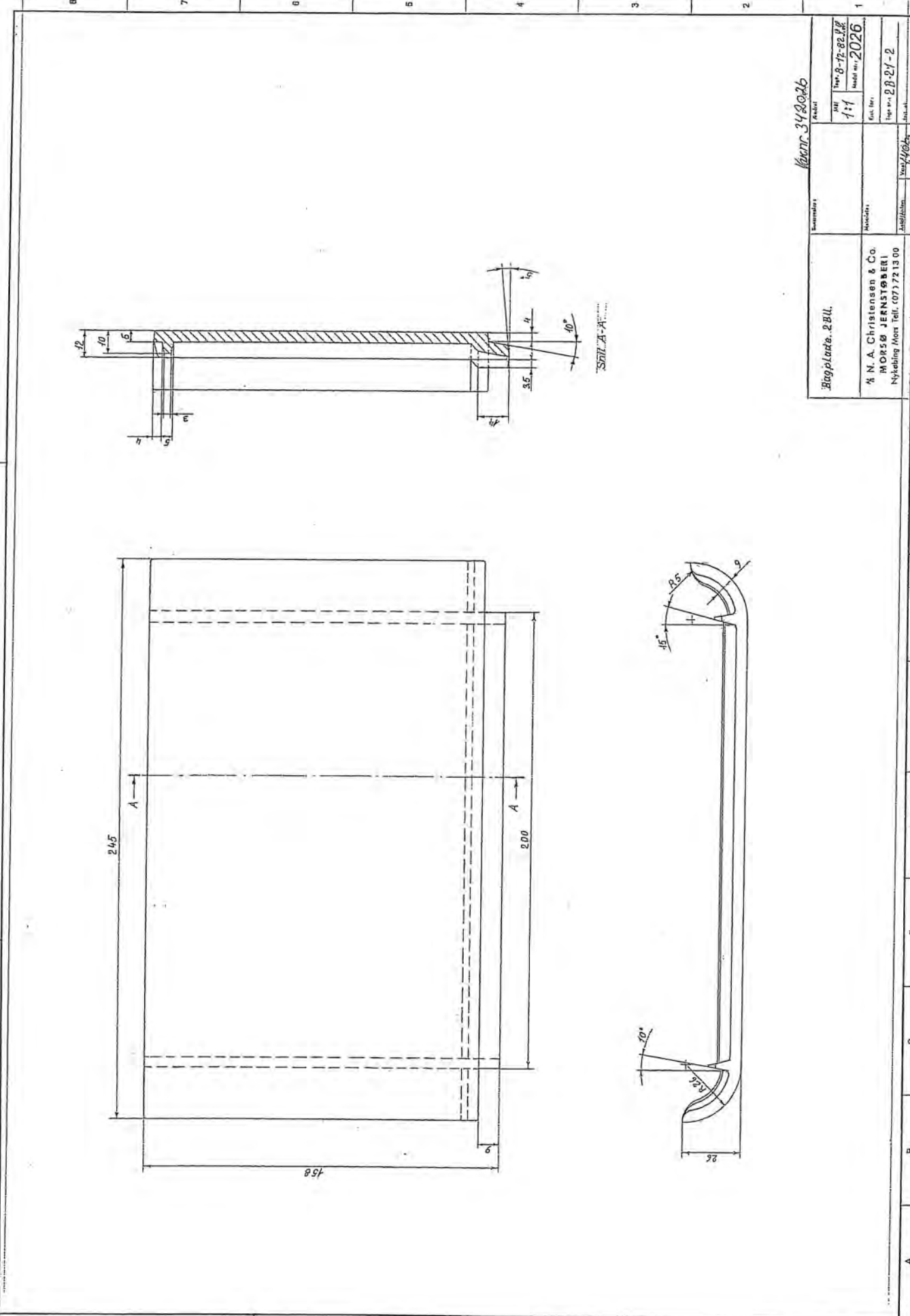
Figur 342028

Arbejder: ZBU... N. A. Christensen & Co. MORSB JERNSTØBERI Nykøbing Mors, Telf. (07) 7713 00	Beskrivelse: Materialer: Anvendelse:	Tegning: 342028	Målestok: 1:1	Tegning nr.: 30-11-8392
		Tegning: 342028	Tegning nr.: 2028	Tegning nr.: 2028
		Tegning: 342028	Tegning nr.: 2028	Tegning nr.: 2028
		Tegning: 342028	Tegning nr.: 2028	Tegning nr.: 2028



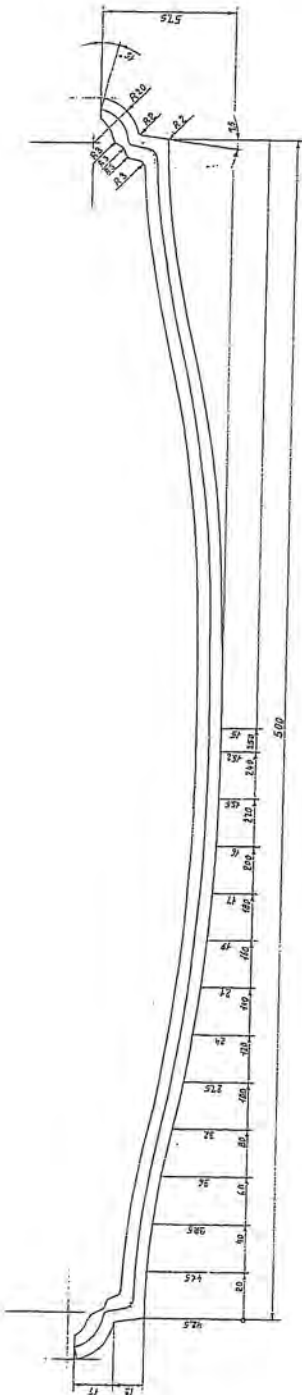
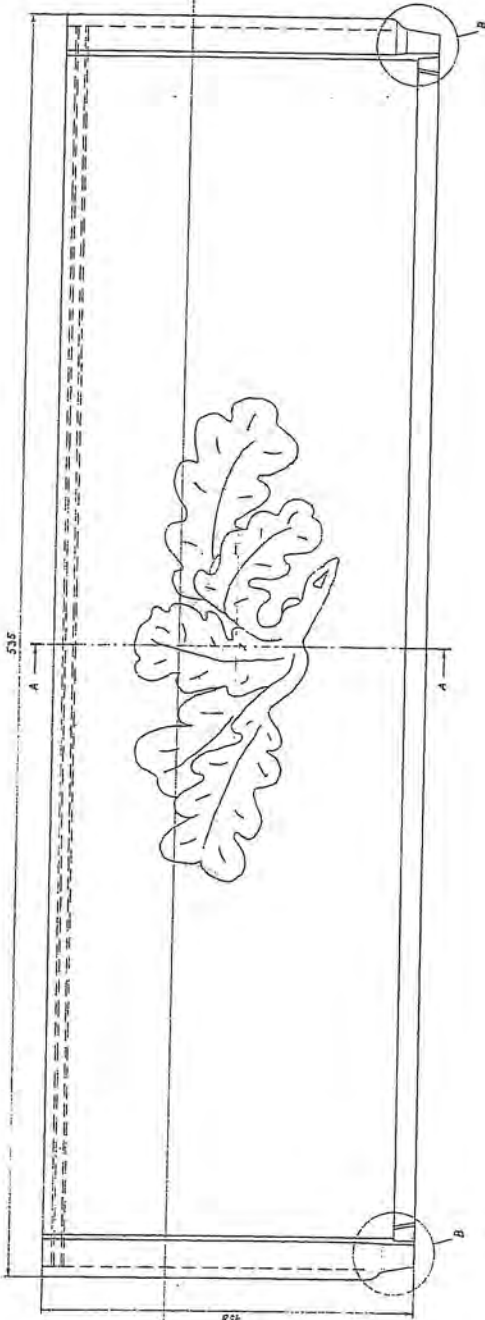
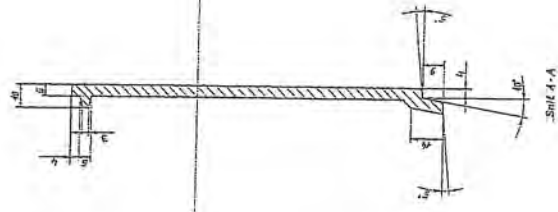
Version 342027

Förramne, 2.Bil.	Revisi 1:1	Revisi 1:1	Revisi 1:1
	Proj. 12-88 8/4	Revisi 1:1	Revisi 1:1
N. A. Christenson & Co. MORSÖ JERNSTÖBBERI Nybergsg. 10, Tel. (07) 7213 00		Proj. 12-88 8/4	
Mått 1:1		Mått 1:1	
Papper nr. 29-20-2		Papper nr. 29-20-2	
A		M	



Kontr. 342026

Bijplaatje 2.BII.		Kantoor	
Maat	1:1	Maat	1:1
Maat no.	2026	Maat no.	2026
N. A. Christensen & Co. MOESB JERNSTØBERI Nykebing Havn Telt. 07772 13 00		Mandato	
Afdeling		Afdeling	
Teg. no. 28-21-2		Teg. no. 28-21-2	
Afdeling		Afdeling	

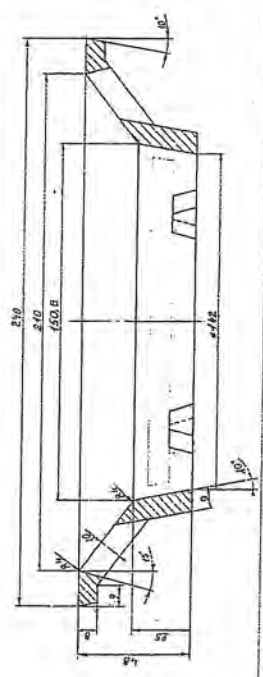


Hal. 2. Lenc. Ligesam. Sileplada III 28.

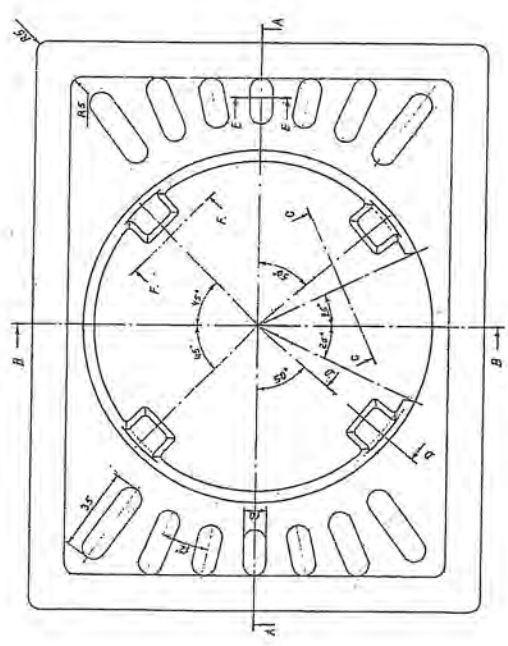
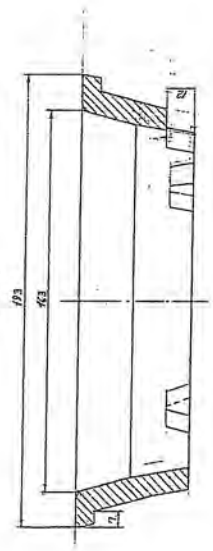
Hal. 2. Lenc. Ligesam. Sileplada III 28.

Hal. 2. Lenc. Ligesam. Sileplada III 28.	Hal. 2. Lenc. Ligesam. Sileplada III 28.
Hal. 2. Lenc. Ligesam. Sileplada III 28.	Hal. 2. Lenc. Ligesam. Sileplada III 28.
Hal. 2. Lenc. Ligesam. Sileplada III 28.	Hal. 2. Lenc. Ligesam. Sileplada III 28.

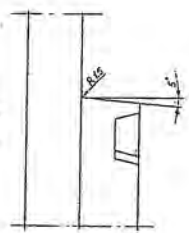
Shif 7-A-A



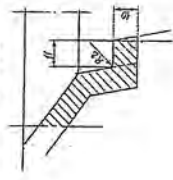
Shif 3-B-B



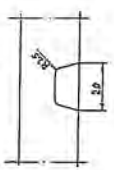
Shif 6-C-C



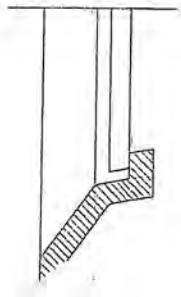
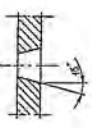
Shif 5-D



Shif 7-E-E

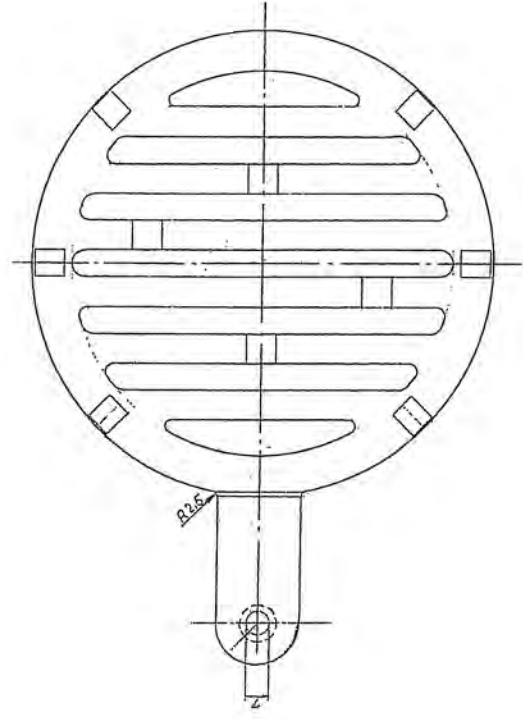
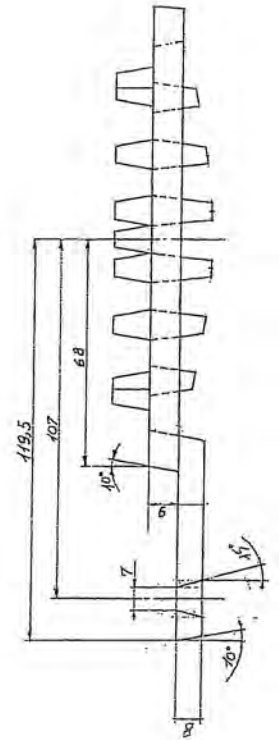
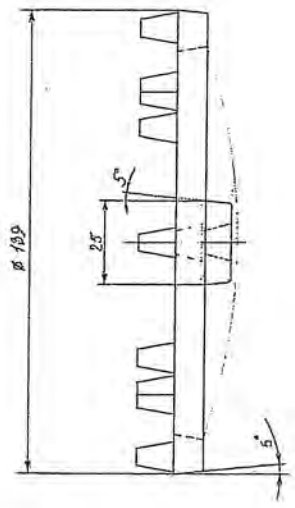


Shif 8-E-E



Rlatofury, EBU
 11/1
 2031
 28-15-1

N. A. CHRISTENSEN & CO.
 MORRIS JENSEN
 10772 13th St. N. S.E.
 Tukwila, Wash. 98148

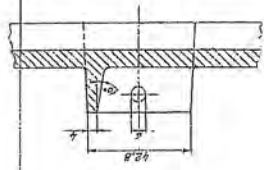


Rysteristen loaves . efter rysterist, model nr. 3213.

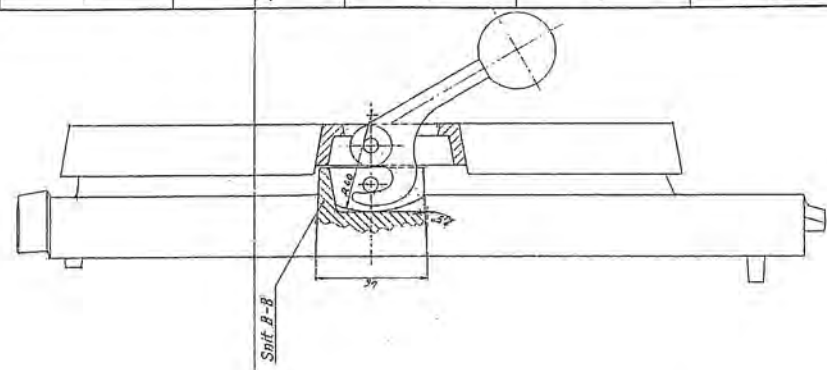
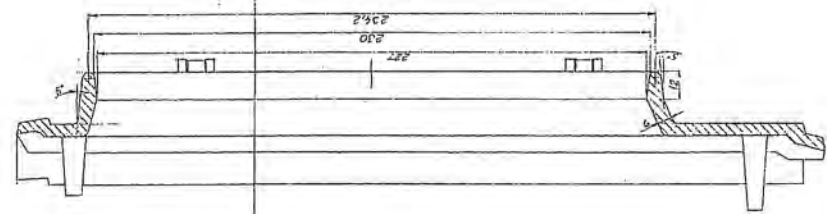
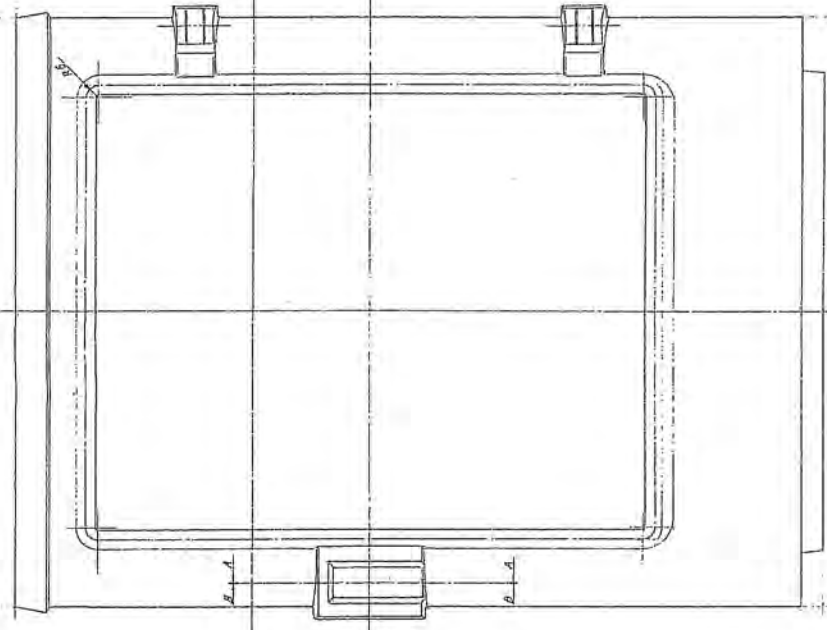
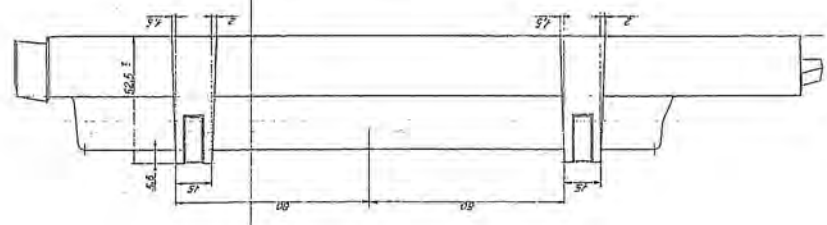
160 nr. 342030
 2111-87 E
 1*1
 23-12-82 LK
 2030
 2B-26-2

Material	Material	Material	Material
Rysterist. 2.B.U.			
N. A. Christensen & Co. MORSØ JERNSTØBERI Nykøbing Møns. Telf. (07) 71 13 00			

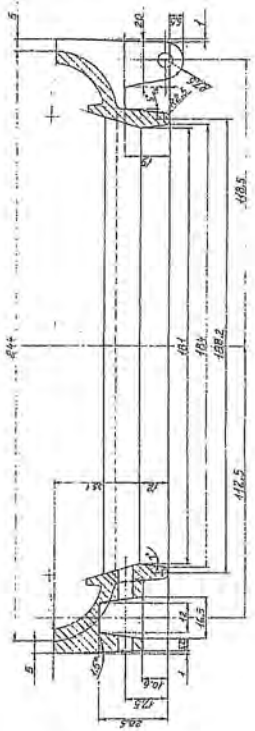
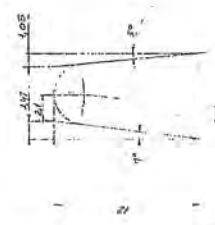
CRD Date 12-7-04



Snitt A-A



Snitt B-B



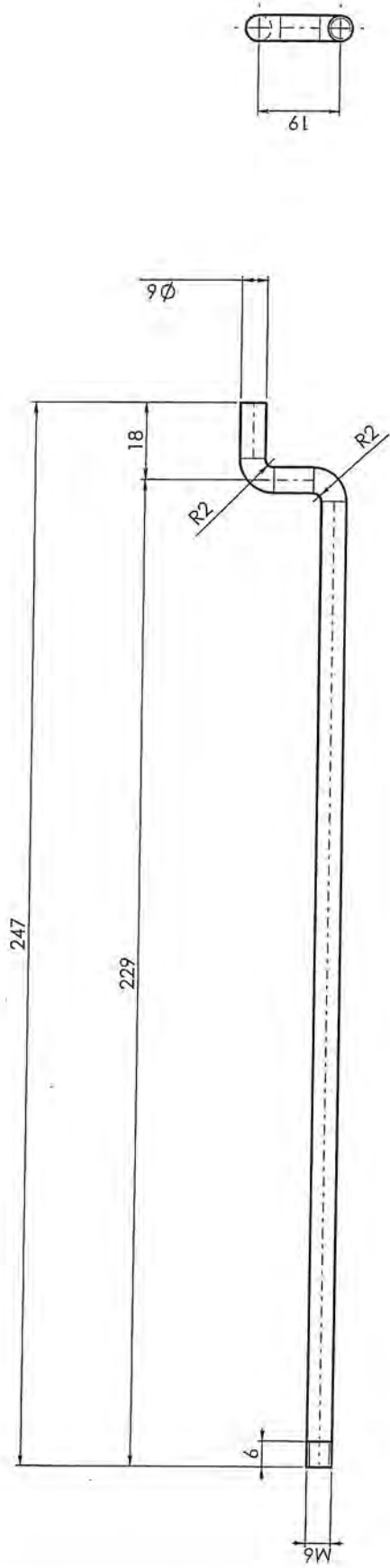
Snitt C-C

130
130
130

Modor-302015
28 forramte, till der
med pakning.
% N.A. Christensen & Co
MOR&C DESIGNER
Nyhavn 116, 1017113 DK

Proj. 12-7-04	Rev. 1
17	2015
17	2015

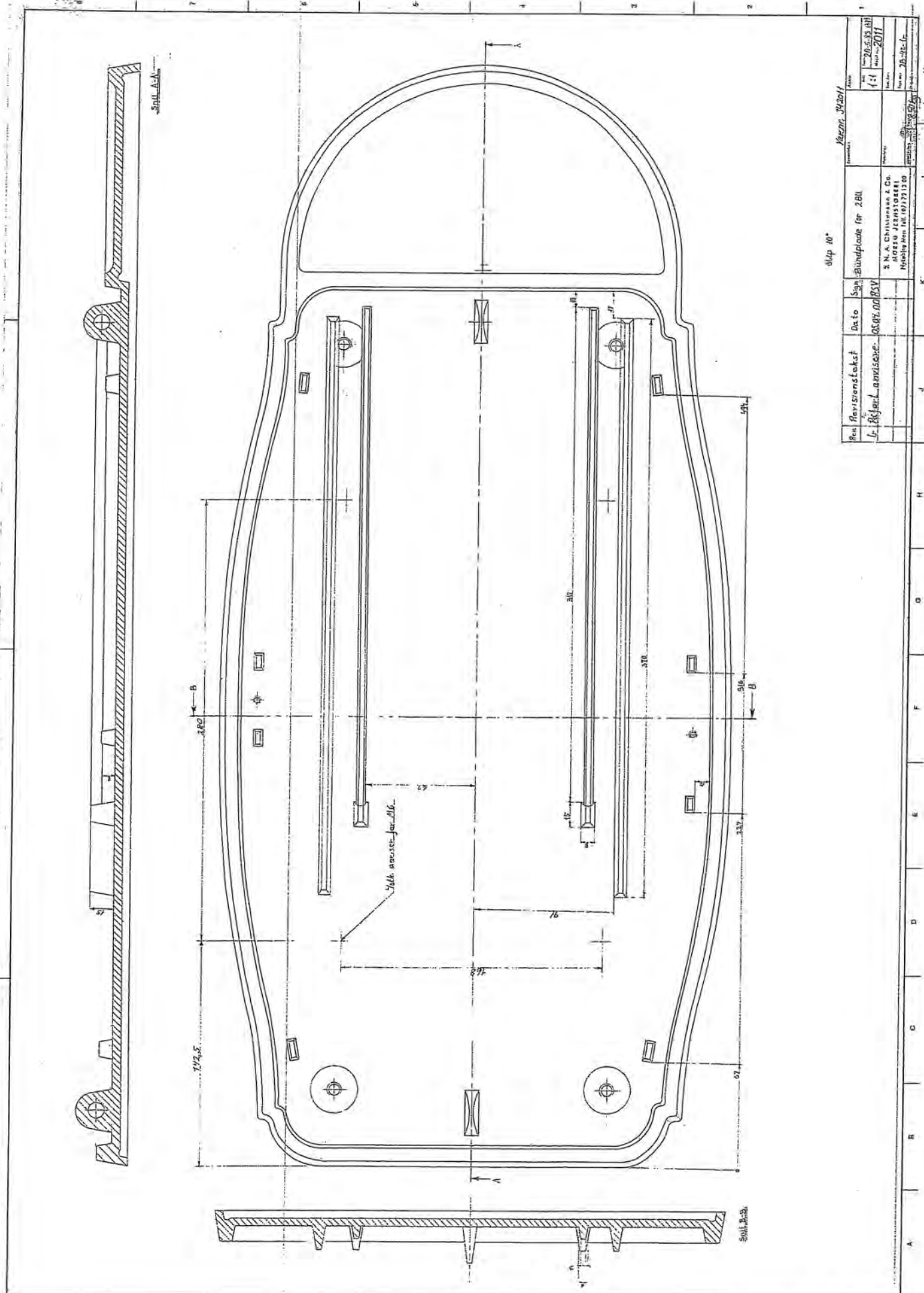
c30 of c45



Rev/	Revisjans	Sign.:	Date:
		RSV	26.05.09
Title:		Construction:	
Rystestang		Released:	
2 BU		Format:	A3
Morsø 2B		Scale:	1:1
		Item no.:	542052
		Drawing no.:	2B-44 a
			Side 1 of 1
morsø <small>Produktion og Distribution</small>			
Mål uden toleranceangivelse	Ih. i. DS/ISO 2768-1 m		
Materiale:	Automatislåd		
Weight:	0,06 kg		
Model no.:	-		
Drawing type:	Erneleghing		
Location of fil:	E:\working\mors\2B-44\2B-44.dwg		

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

3-18 of 3-69



slup 10'

Revisjonslekt Dato Sign. Emdplate for 2811

Revisjonslekt	Dato	Sign.	Emdplate for 2811
1	08.07.00	RSV	

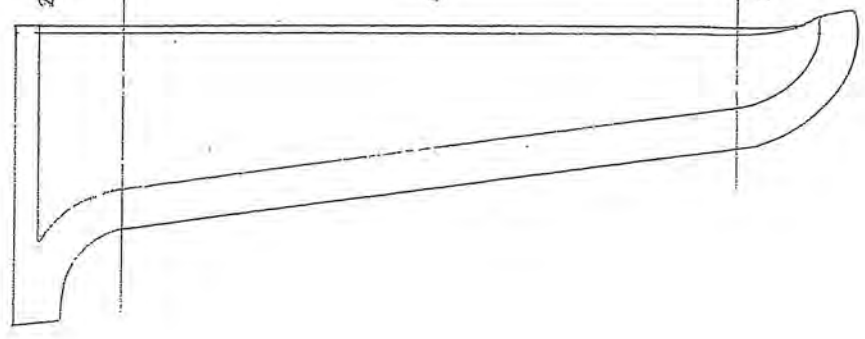
U. R. Hjeltner

Revisjonslekt Dato Sign. Emdplate for 2811

Revisjonslekt	Dato	Sign.	Emdplate for 2811
1	20.05.01	1-1	

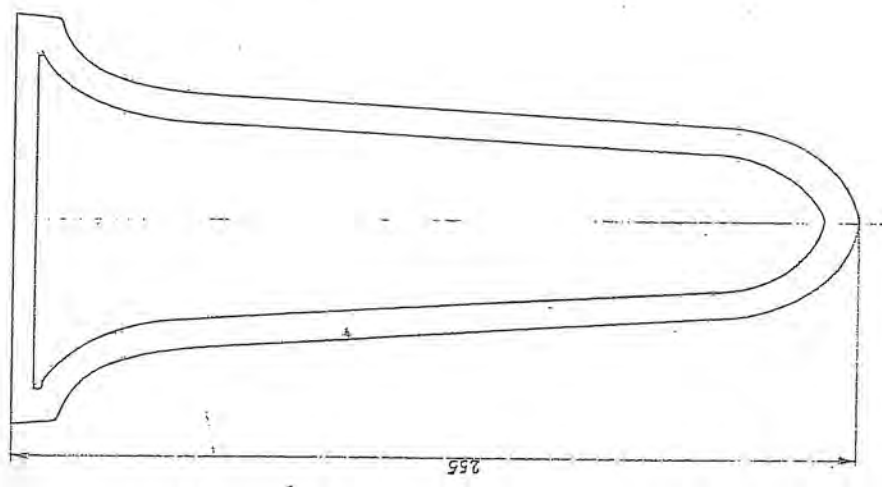
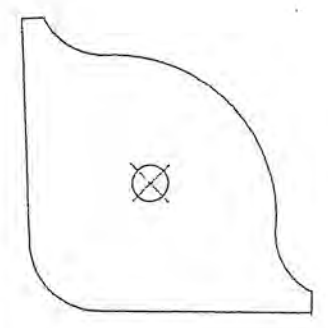
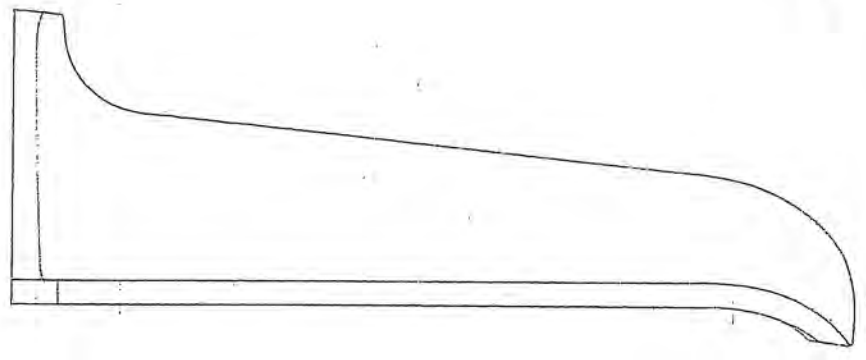
S. N. A. Christoffersen & Co.
HOFEN 12205104881
Nobels Min. NE. 10773100

2A. model nr 200f



nyf stykke

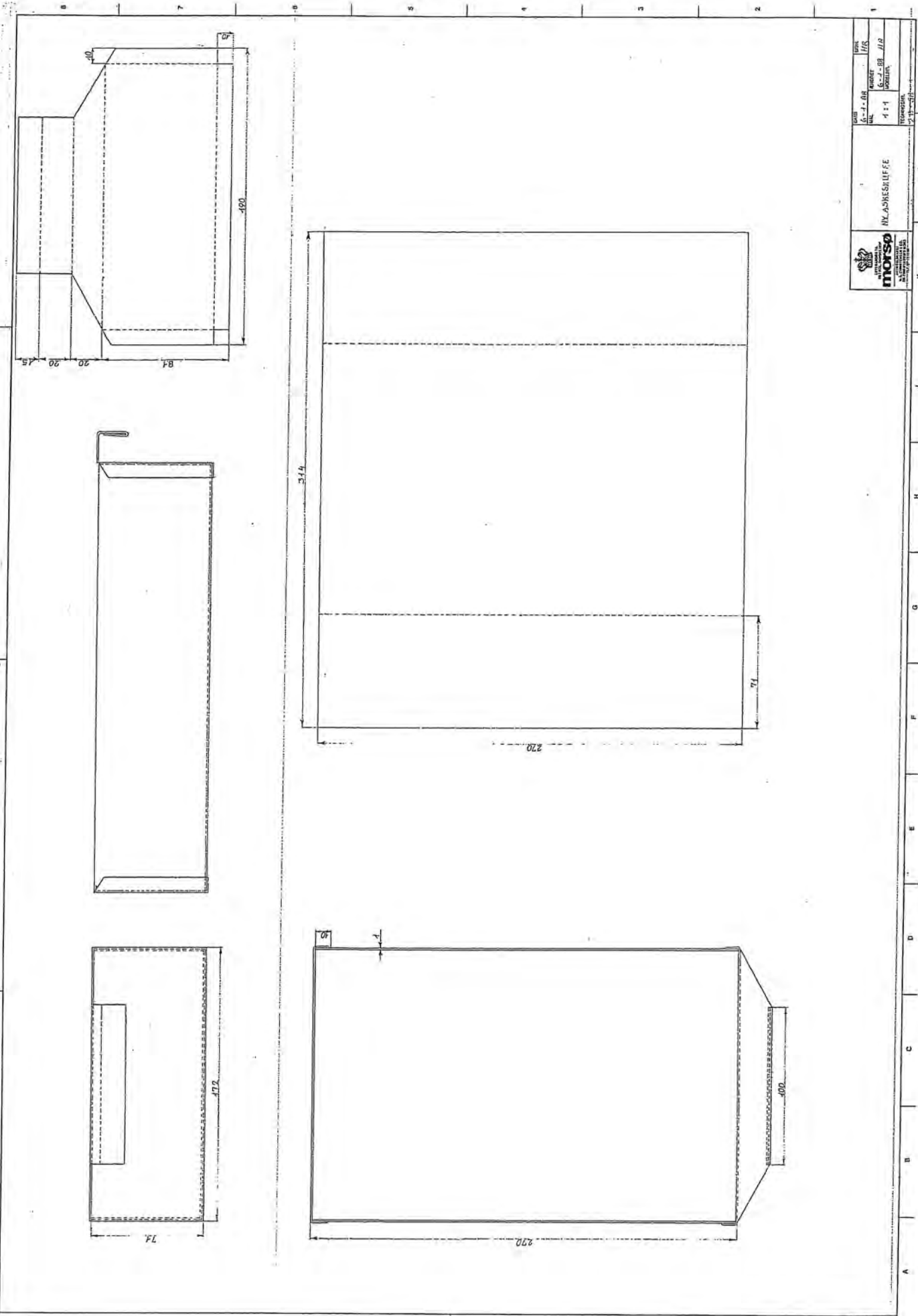
2B. model nr 200f



Model nr 342032

Ben. til 2.BU		Kontrolleret		M	
Mål	1:1	Dato	10.2.85	Model nr.	2032
% N. A. Christensen & Co. MORSBÆRNSTØBERI Nykebing Mors Indf. (07) 7113 00		Målestok		M	

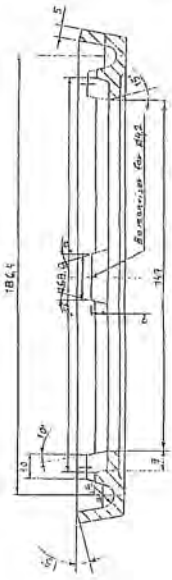
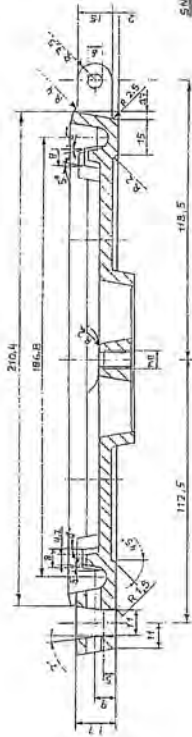
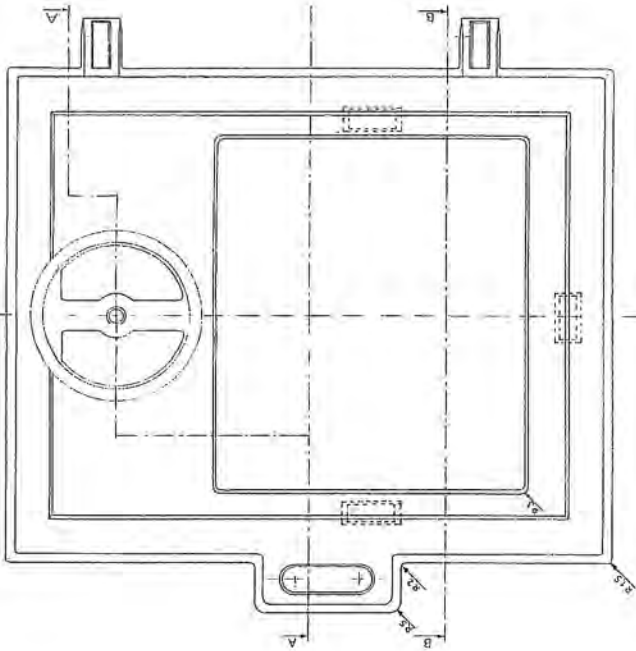
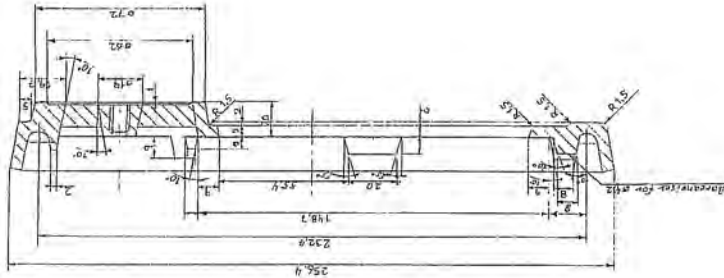
3-20 of 3-69



 MINISTARSTVO ODBRANE REPUBLIKE SRBIJE	RY ADRESA LUFTE	Datum: 1/12	Mesto: 1/12
		Skala: 1:1	Vrsta: 1/12

2B-59
Dør

C-15 of C-65



UVE-ABTEILUNG RUNDINGEB. B.1
Weg 202g
Weg 20034

SNIT B-B

2 B DÖRN GLAS
K-Entwurf of glass
model

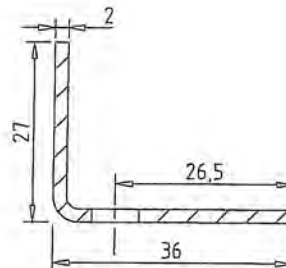
Rev:	Revisions:	Signat:	Subj:	Werk:	Obj. N.
U	Arbeit 3 Handl.	RSV	25.10.28	111	2004
				2004	2 B-59 G

Rev:	Revisions:	Signat:	Subj:	Werk:	Obj. N.
				111	2004
				2004	2 B-59 G

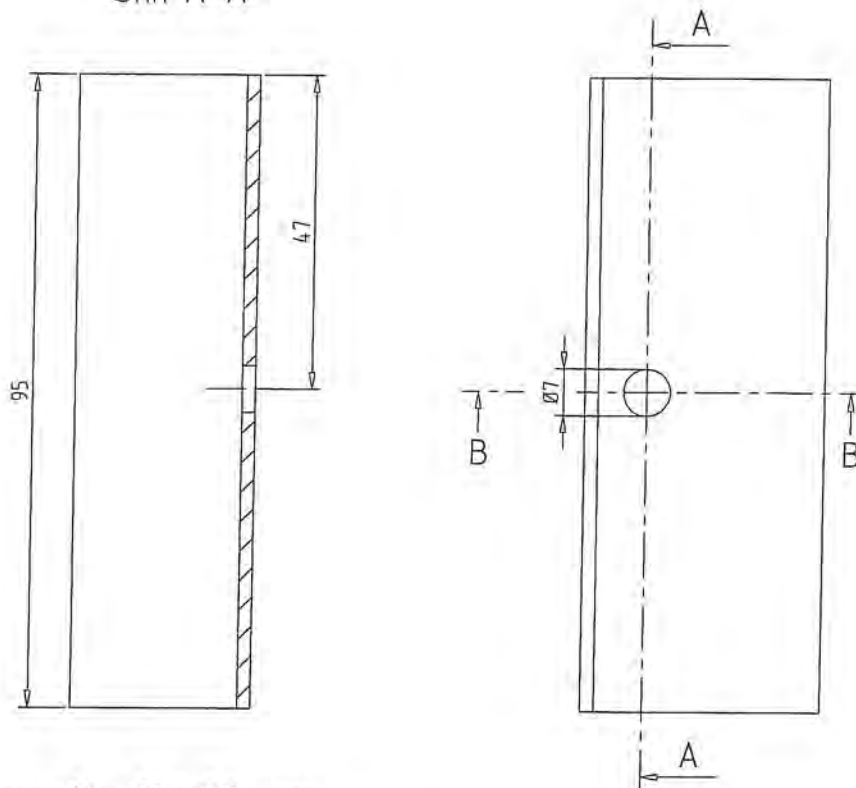
CK8 Date 12-7-05




Snit B-B

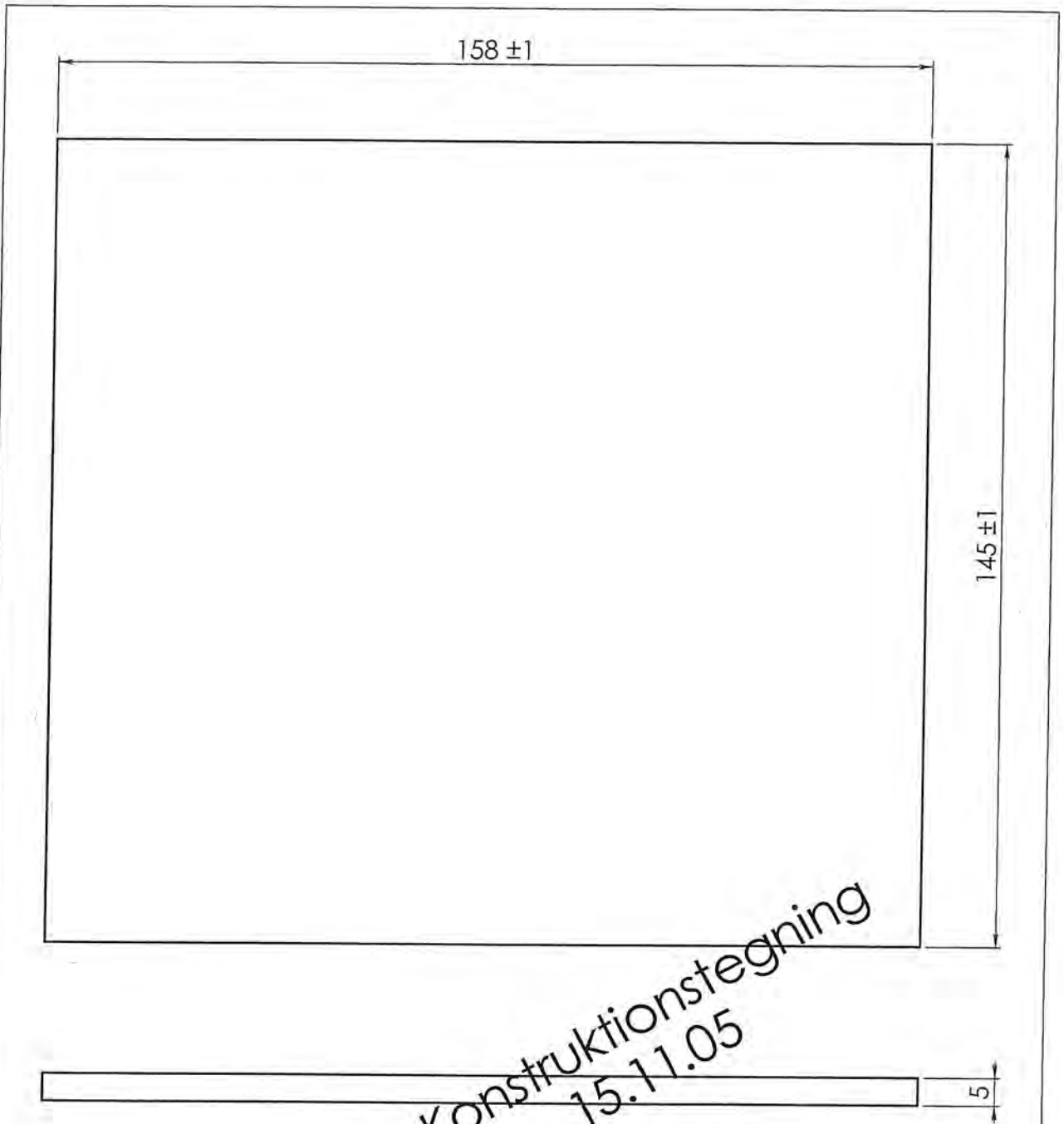


Snit A-A



Klippemål: 95x59 mm
 Matr.: 1,5 mm Rustfri plade

Titel: Stenholder for 2B	Sign.: HFJ	Dato:	Revision	Sign.	Dato
	Tegn.form.: A4	Målforhold 1:1	Gamdrup TegneTeknik	HCH	April 96
Tegningsnummer: 2B-61-4	Varenummer: 542059		Tilføje klippemål & matr.	KD	20.12.96
		Filnavn: 2B-61			



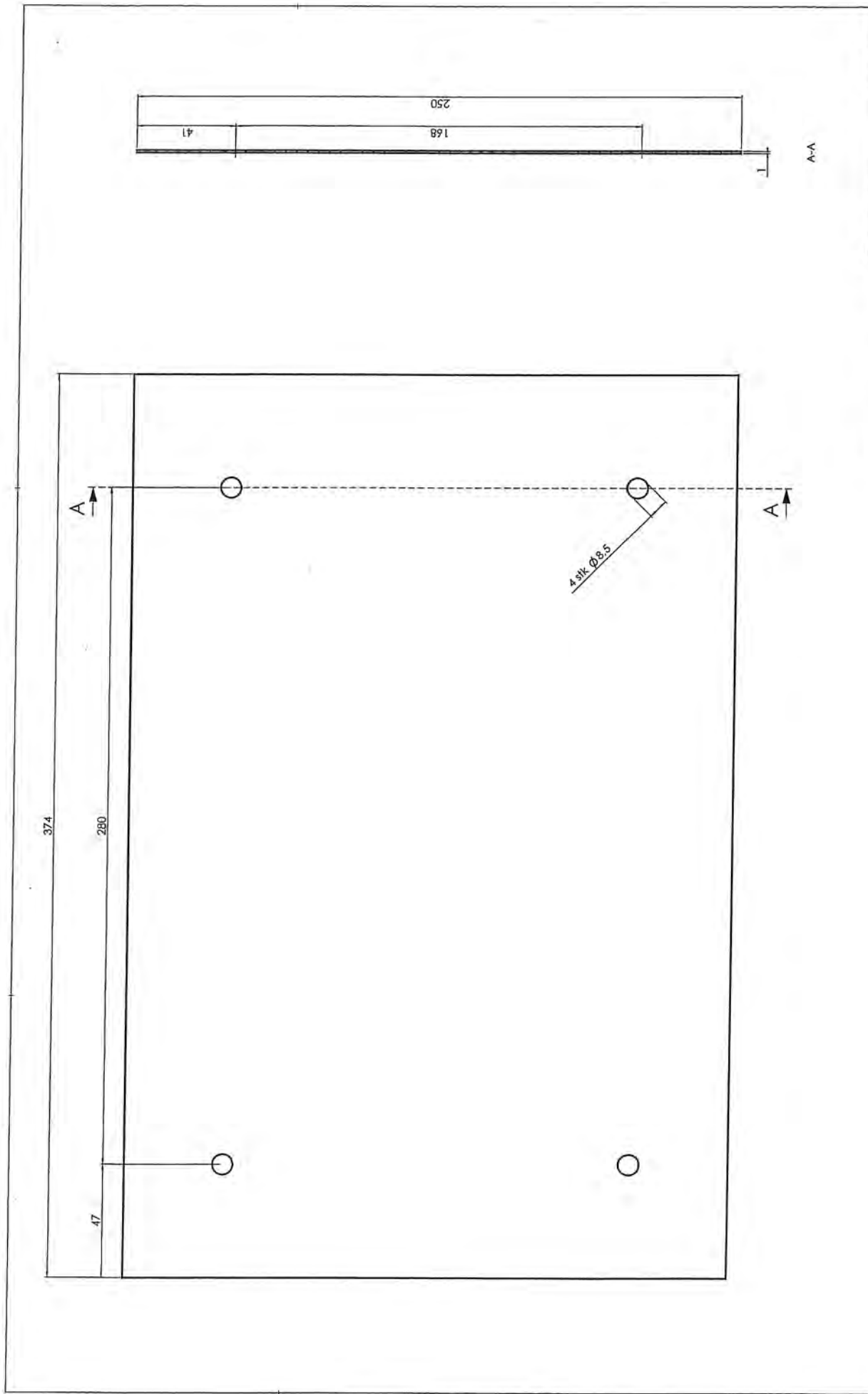
e	Ændret breddemålet for 2B Classic	RSV	15.11.05
d	Ændret tolerancer.	RSV	13.03.97
c	Filnavn rettet.	RSV	28.01.97
b	Gamdrup Tegne teknik	HCH	April 96
Rev.	Revisions	Sign.:	Date:

Mål uden toleranceangivelse i.h.f. DS/ISO 2768-1 m		Title:		Construction:	
Material:	Keramisk glas	Glas til		Aa.GJ 12.02.93	
Weight:	0,29 kg	2B Classic		Released:	
Model no.		Morsø 2B		Format: A4	
Drawingtype:	Emnetegning			Scale: 1:1	
Location of file:	U:\udv\Tegninger\18628\2B Glas\LDY97			Itemno.: 790715	
				Drawing no.: 2B-64 e	

Date of print: 15-11-2005

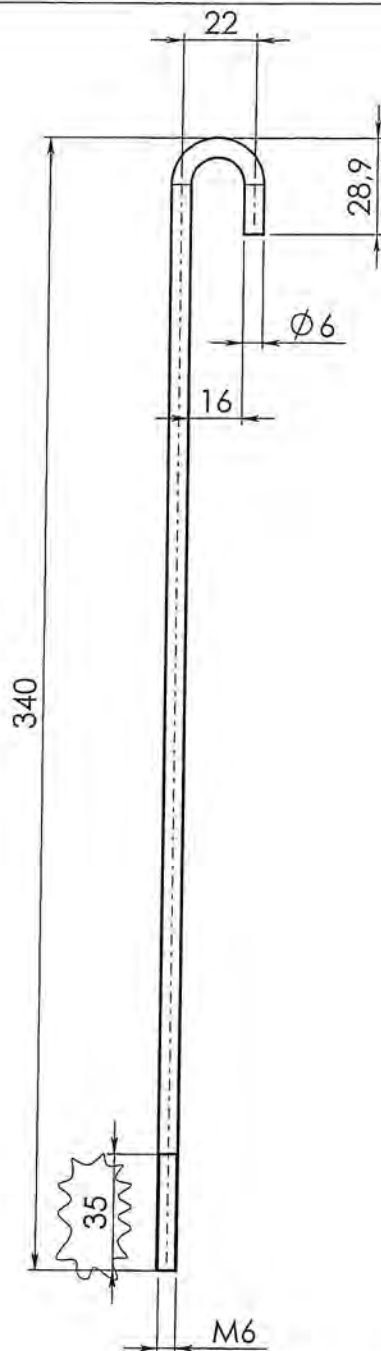
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lendet or copied without any written authorization from the company.

3-24 of 3-69



Måttabell		Egenskaper		Egenskaper		Dokumentation	
Material	1 mm vagnspåls-plåte	Form	Ströleplåte	Form	Form	Datum	10.01.2000
Vikt	0,2 kg	Material	Bund	Material	Material	Form	Form
Överlåtelse	Måttabell	Material	2B	Material	Material	Form	Form
Måttabell	0,280 m	Material	2B	Material	Material	Form	Form
Material	0,280 m	Material	2B	Material	Material	Form	Form
Material	0,280 m	Material	2B	Material	Material	Form	Form
Material	0,280 m	Material	2B	Material	Material	Form	Form
Material	0,280 m	Material	2B	Material	Material	Form	Form
Material	0,280 m	Material	2B	Material	Material	Form	Form
Material	0,280 m	Material	2B	Material	Material	Form	Form

Dröna Tegning (Baserat Motif Använda A2) og måttabell. Utdrags- eller kopieringsrettigheter tilhører Dröna.



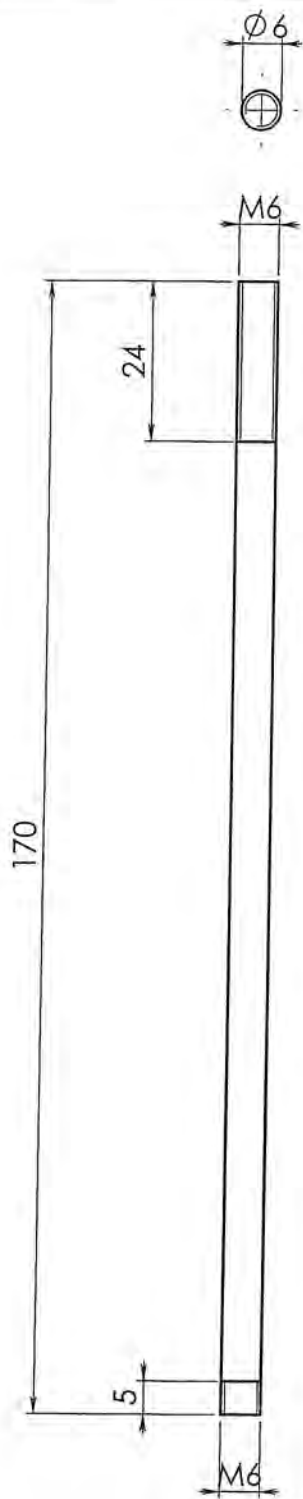
e	Ændret længde på gevindstykket.	RSV	14.06.05
d	Ændret total længde og længde på gevindstykket.	RSV	31.05.05
c	Ændret længde på gevindstykket.	RSV	27.05.05
b	Ændret tykkelse og øget længde.	RSV	13.05.05
Rev.	Revisions	Sign.:	Date:

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title:		Construction:	RSV	20.10.03
Material:	SVL. AUTO. STÅL 37.1	Krogbolt		Released:		
Weight:	0,08 kg	2 BO overdel		Format:	A4	
Model no.	-	Morsø 2B		Scale:	1:2	
Drawingtype:	Emnetegning	morsø <small>Byggeteknik og maskinfabrik</small>		Itemno.:	542146	
Location of file:	U:\vdr\Tegninger\16&2B-76 Krogbolt 2BO overdel.SLDPR			Drawing no.:	2B-76 e	

Date of print: 14-11-2005

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3-26 of 3-69

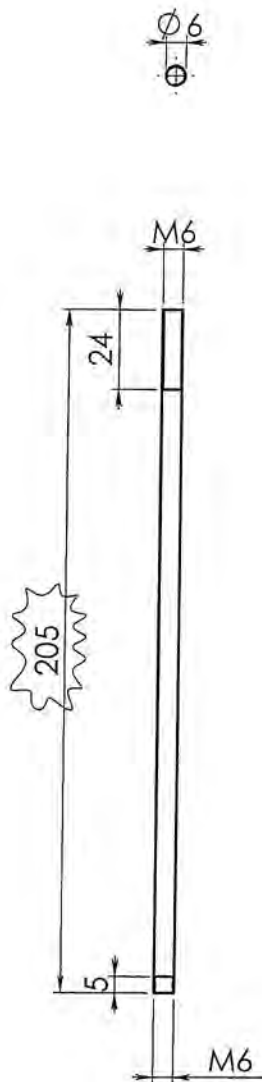


Date of print: 14-11-2005

		Rev. Revisions	Sign.:	Date:
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title:	Construction:	RSV
Material: Automatslål		Stagbolt	Released:	
Weight: 0,04 kg		Morsø 2B	Format:	A4
Model no. -		morsø	Scale:	1:1
Drawingtype: Ernetegning		<small>Byggeskema til brug ved Detail Gør</small>	Itemno.:	542053
Location of file: U:\ud\1\tegninger\168\2B\stagbolt6.SLDPRF			Drawing no.:	2B-77 a

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

3-27 of 3-69

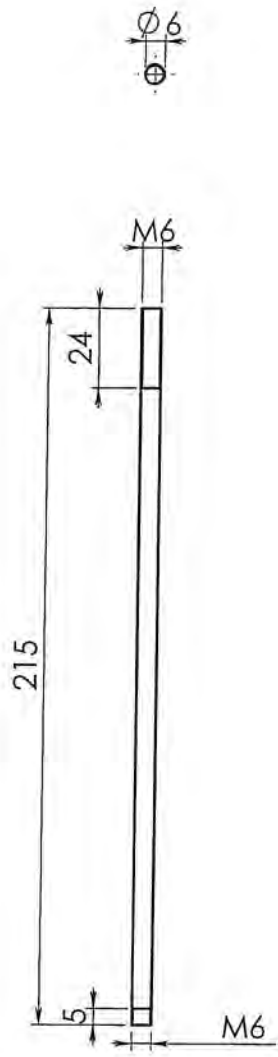


Date of print: 14-11-2005

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		b /Ændret længdemål		RSV	11.12.03
Material:	Automatstål	Rev. Revisions		Sign.:	Date:
Weight:	0,05 kg	Title:		Construction:	RSV
Model no.:	-	Stagbolt		Released:	
Drawingtype:	Emnetegning	Morsø 2B		Format:	A4
Location of file:	U:\u005cTegninger\18428\2B stagbolt.dwg	morsø <small>Byggeteknik A/S Højbjerg</small>		Scale:	1:2
				Itemno.:	542054
				Drawing no.:	2B-78 b

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

3-28 of 3-69

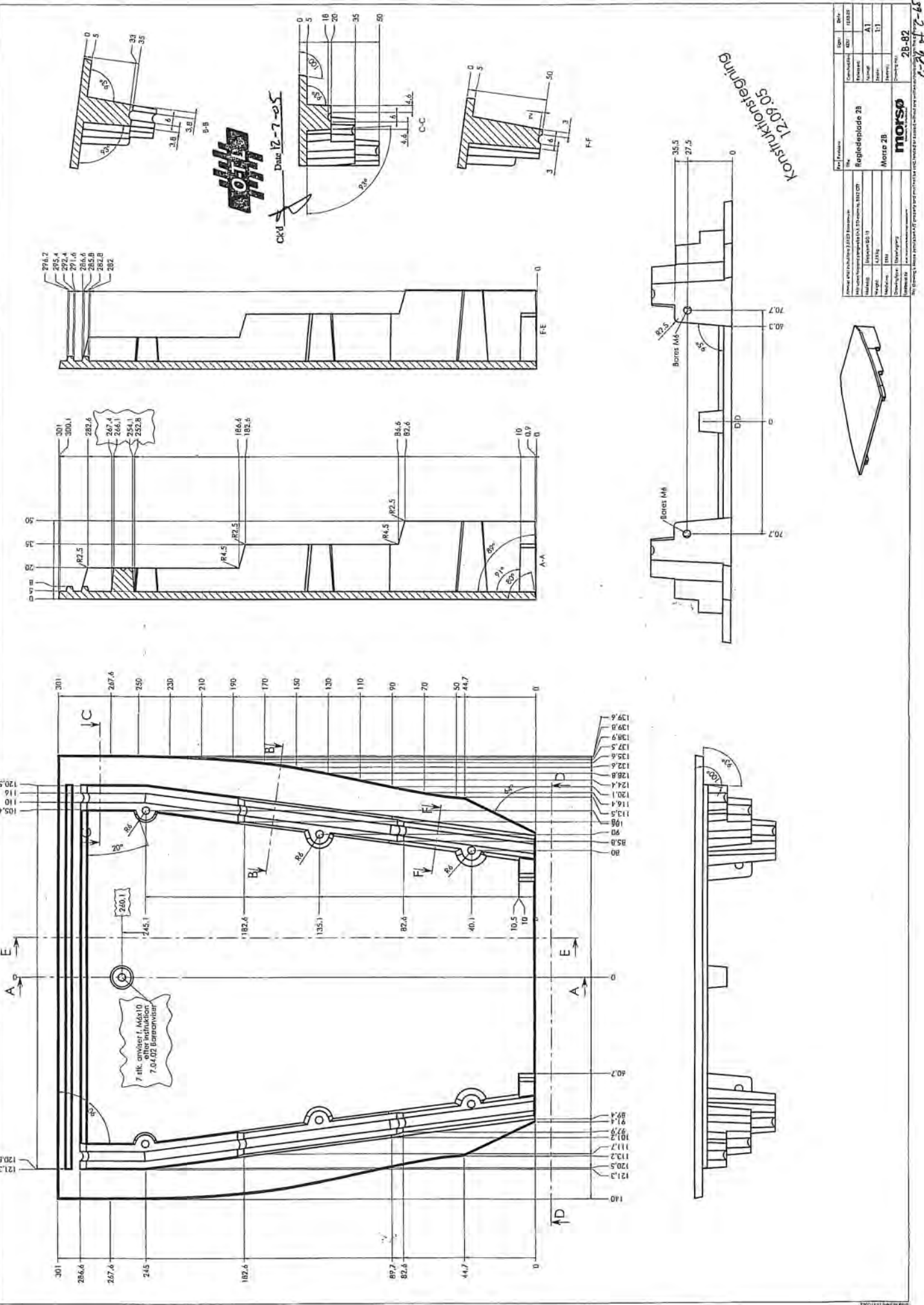


Date of print: 14-11-2005

		Rev. Revisions		Sign.:	Date:
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title:		Construction:	RSV 20.11.03
Material:	Automatstål	Stagbolt		Released:	
Weight:	0,05 kg	Morsø 2B		Format:	A4
Model no.:	-			Scale:	1:2
Drawingtype:	Ernetegning			Itemno.:	542055
Location of file:	U:\udv\Tegninger\18429\2B stagbolt.dwg			Drawing no.:	
				2B-79 a	

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

3-79 of 3-69



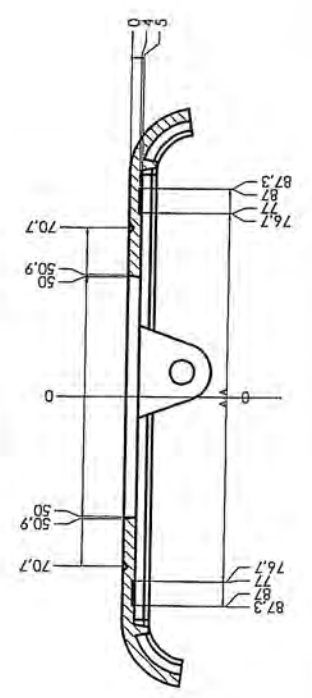
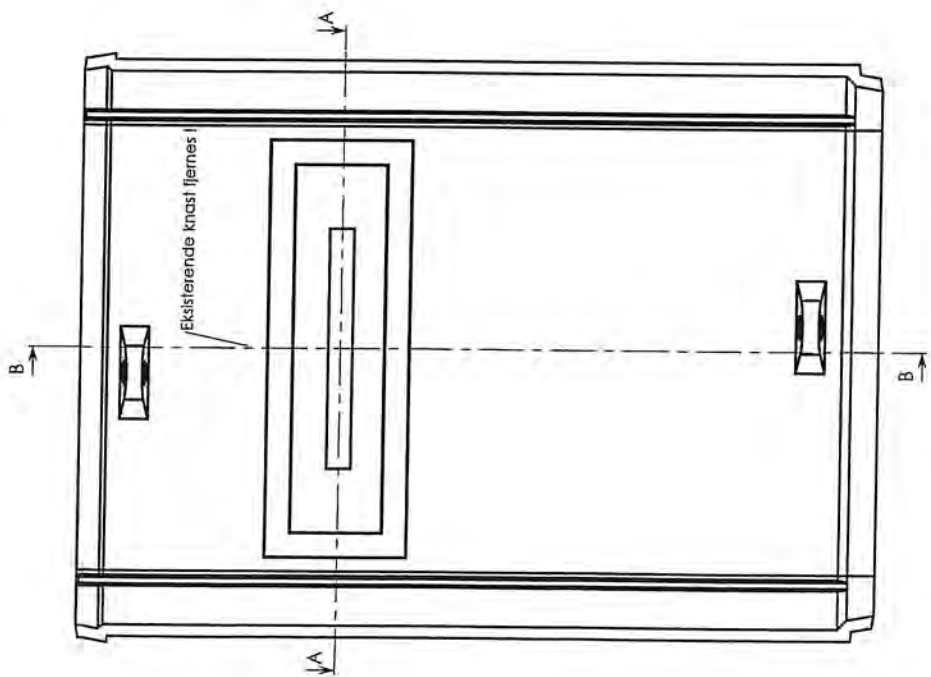
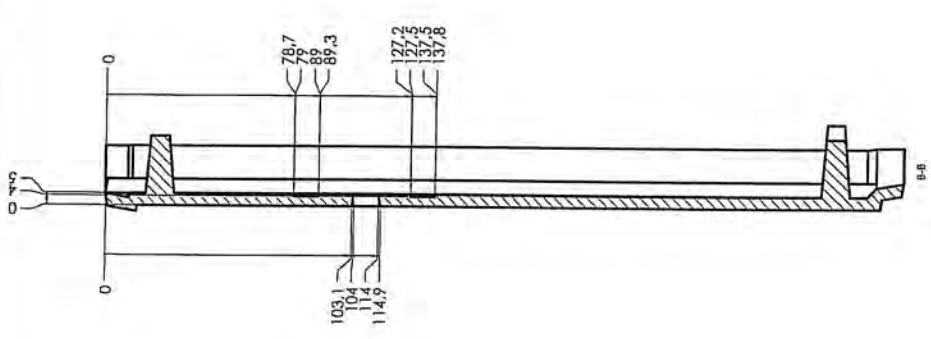
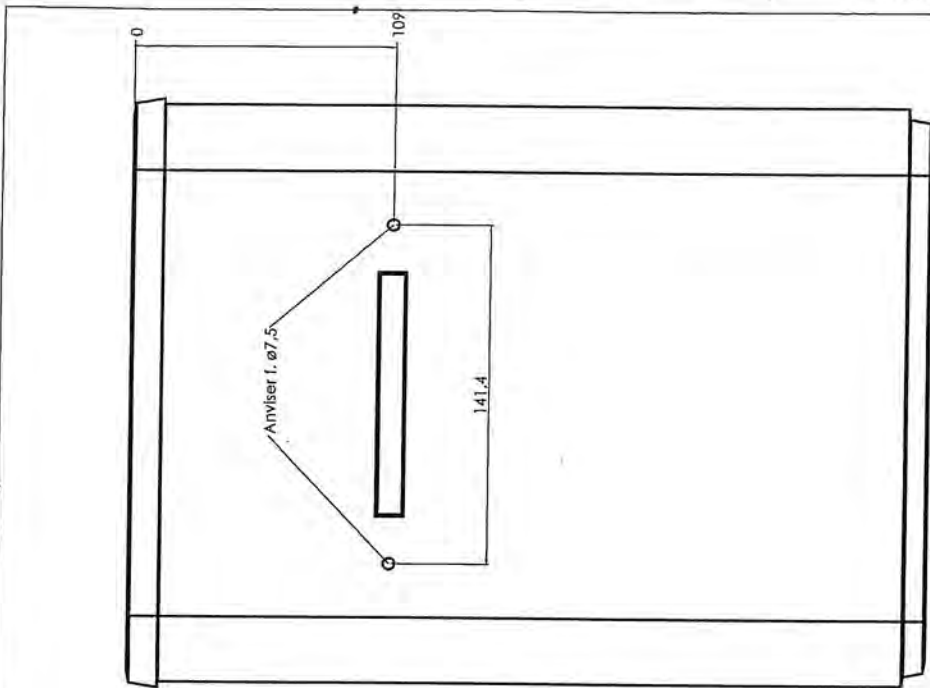
28-82

Prosjekt		Rolle	
Prosjekt: 121215	Prosjekt: 121215	Prosjekt: 121215	Prosjekt: 121215
Prosjekt: 121215	Prosjekt: 121215	Prosjekt: 121215	Prosjekt: 121215
Prosjekt: 121215	Prosjekt: 121215	Prosjekt: 121215	Prosjekt: 121215



Konstruksjonsteiling
12.09.05

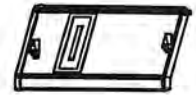
39-2-fu 05-9

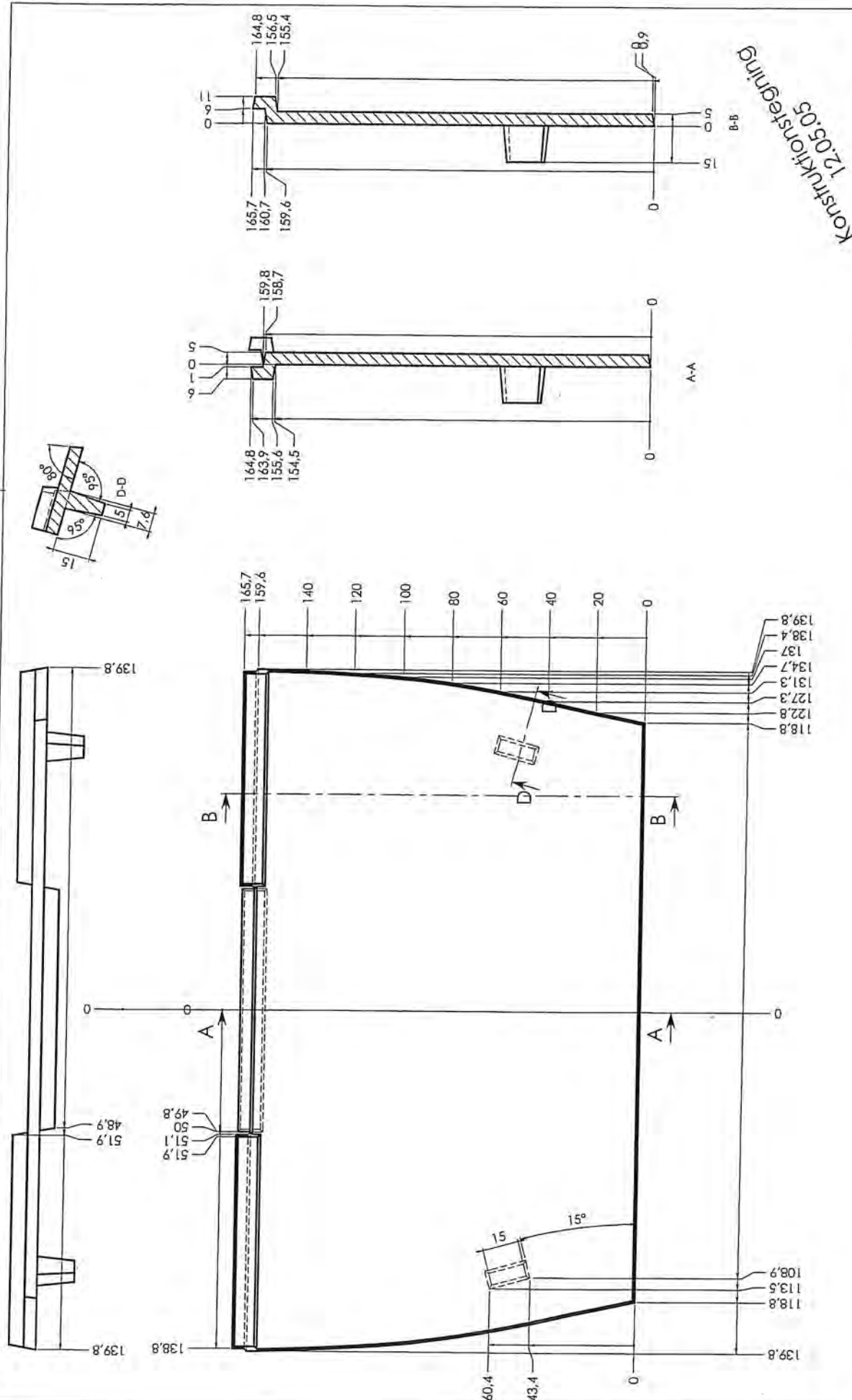


Konstruktørtegning
17.05.05

Afftryk af modelnr. 2004

Proj. nr.		Udgave	
Proj. nr.	Udgave	Udgave	Dato
17.05.05	1	1	17.05.05
Udgave		Udgave	
1		1	
2		2	
3		3	
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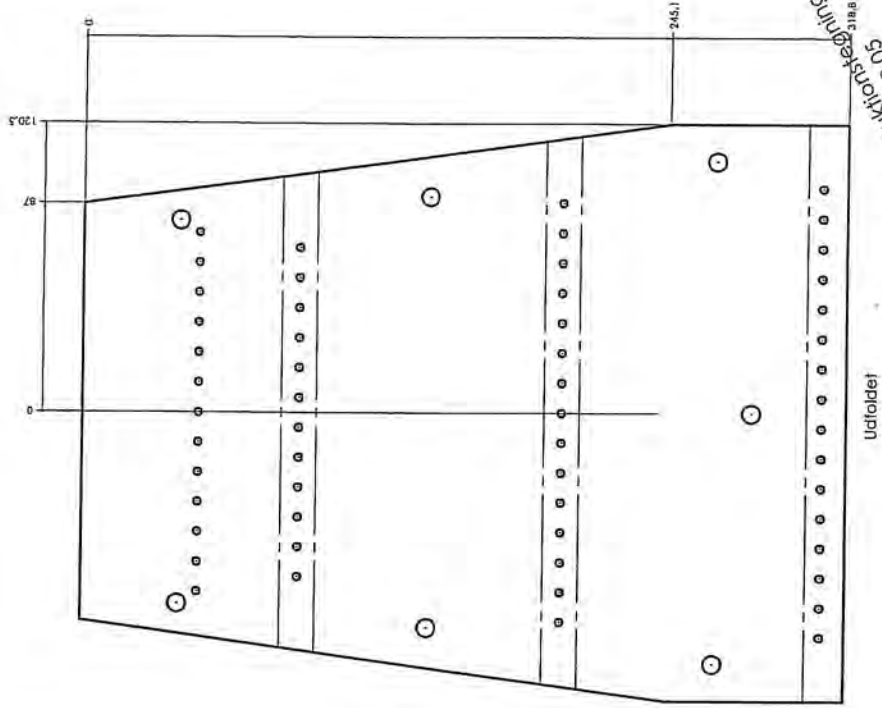
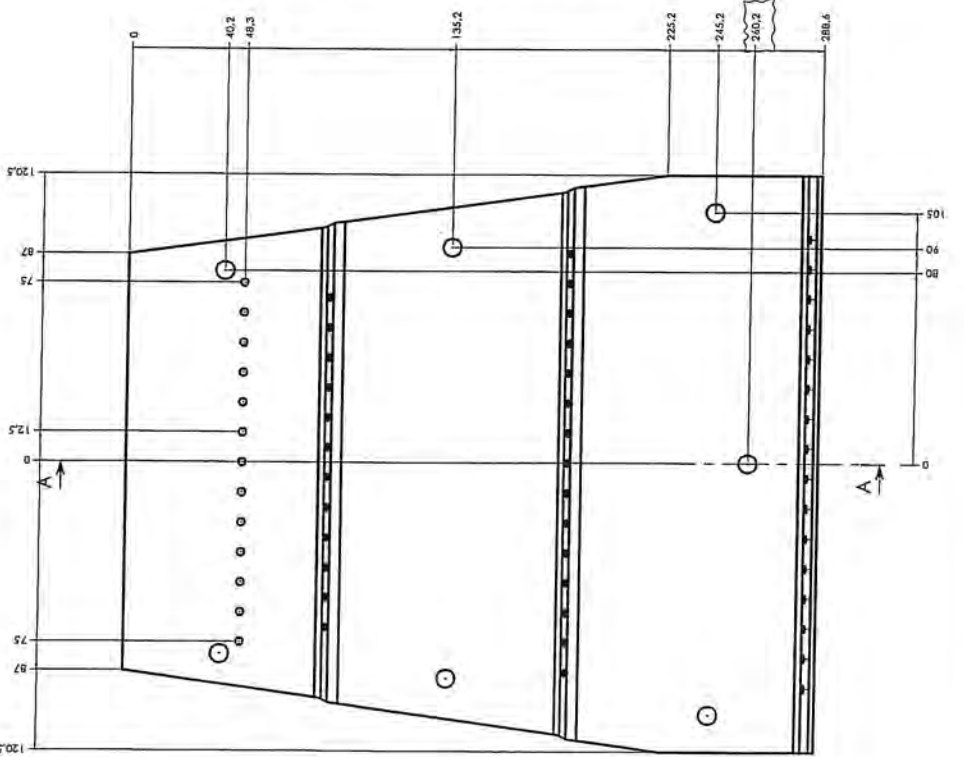
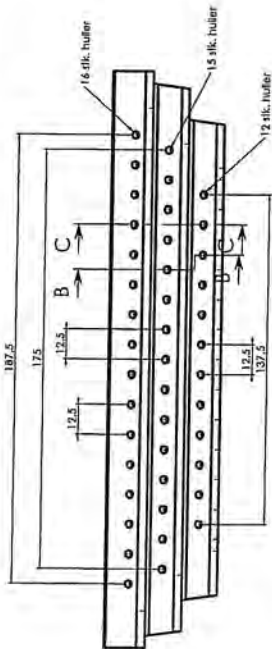
Konstruktörtegning
12.05.05

Projektnummer		Dokument	
Titel		Bladnummer	
Renseklop 2B		1202.03	
Material		Format	
Stål		A2	
Måttavla		Skala	
1:1		1:1	
Dokumenttyp		Dokument	
Stabilitet		2B-84	
Leverans		Morse 2B	



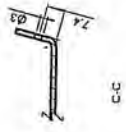
3-32 of 3-69

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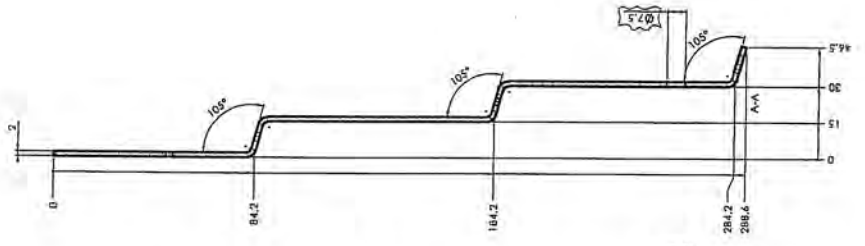
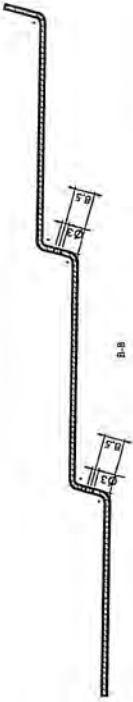


Udfoldet

12.09.05
Konstruktions
guldning

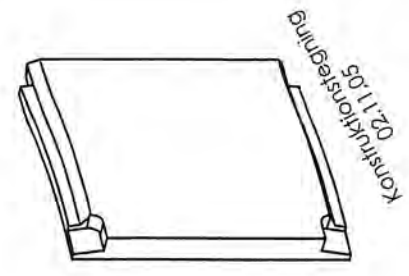
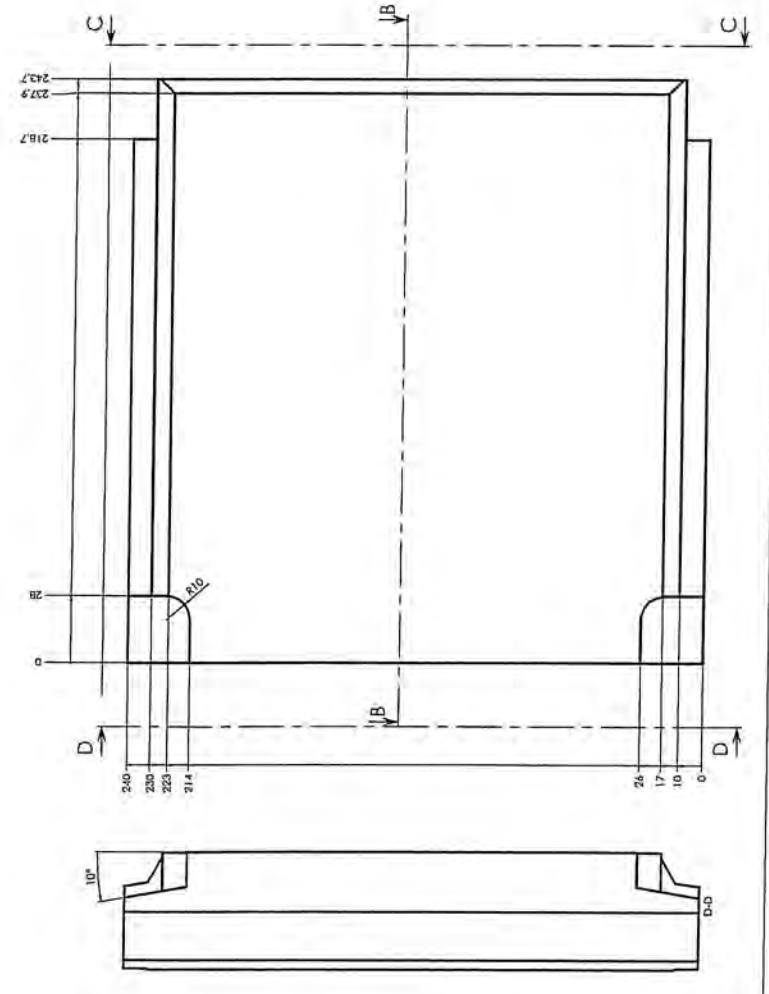
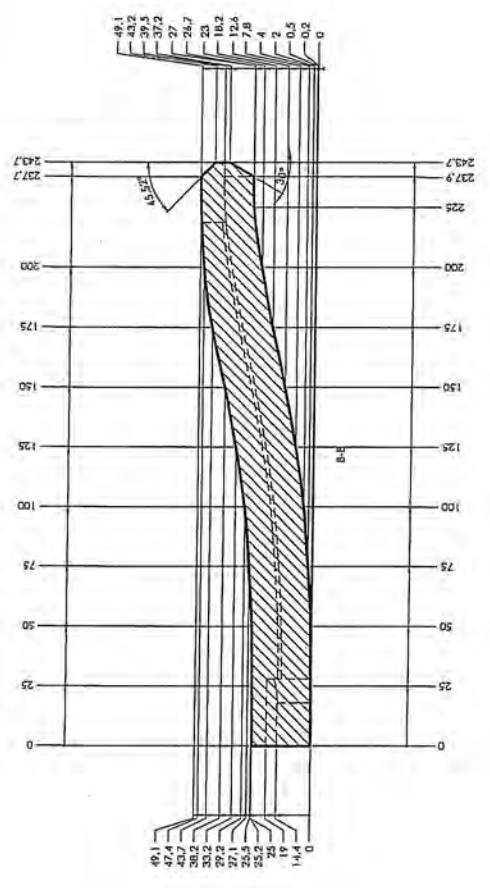


B-B



Lagt af: [Name]		Dato: [Date]	
Konstruktør: [Name]		Tilbyder: [Name]	
Kunde: [Name]		Projekt: [Name]	
Bladnr.: [Number]		Bladantal: [Number]	
Dato: [Date]		Lagt af: [Name]	
Kontrol: [Name]		Tilbyder: [Name]	
Projekt: [Name]		Bladnr.: [Number]	
Bladantal: [Number]		Bladnr.: [Number]	
Bladantal: [Number]		Bladnr.: [Number]	
Bladantal: [Number]		Bladnr.: [Number]	
Bladantal: [Number]		Bladnr.: [Number]	
Bladantal: [Number]		Bladnr.: [Number]	

3-83 of 3-69

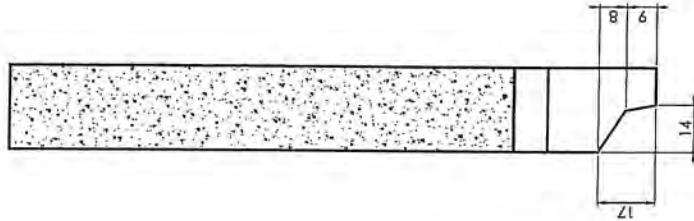
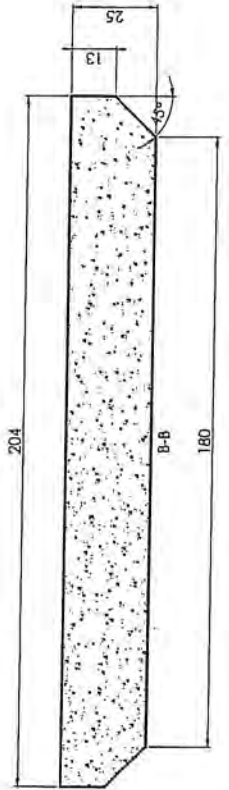
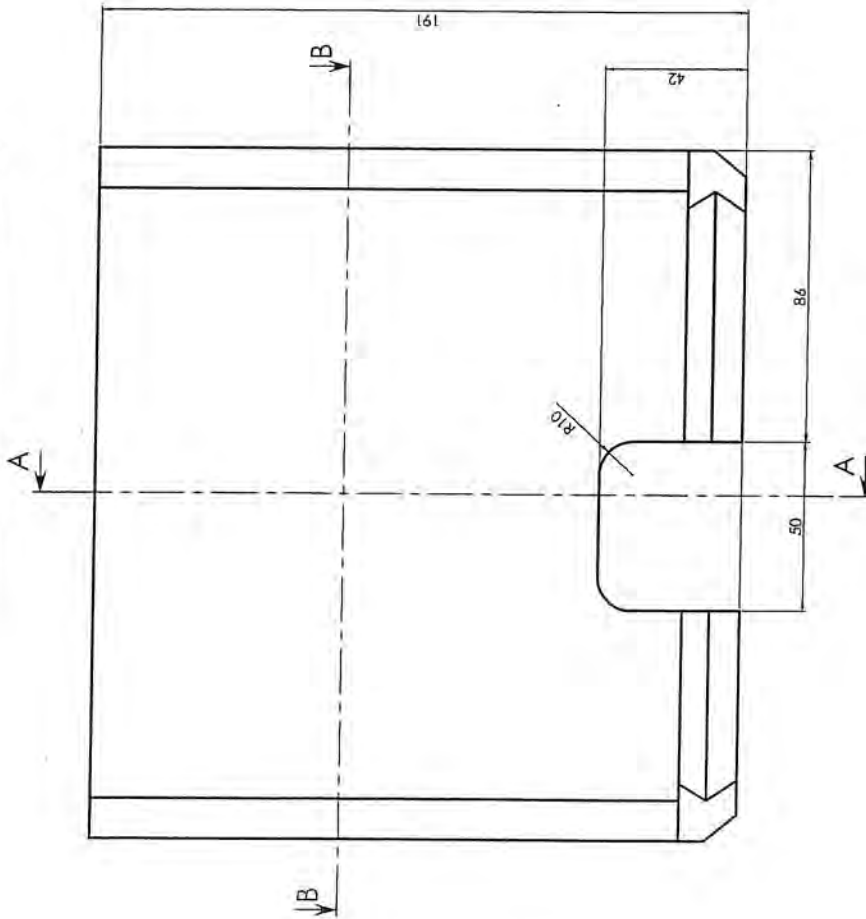
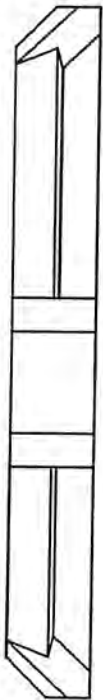


Item No.	Description	Unit	Quantity	Material			Drawing			
				Material No.	Description	Remarks	Sheet No.	Total Sheets	Date	
1	Item No. 28	mm	1		Vernichtung		02.1.105			
2	Item No. 23	mm	1		Material		02.1.105			
				Drawing No. 02.1.105			Date			

morsø
 Dronningensgade 72 · DK-4000 Roskilde · Denmark
 Tel. +45 4671 5500 · Fax +45 4671 5511
 E-mail: mors@morso.com · www.morso.com

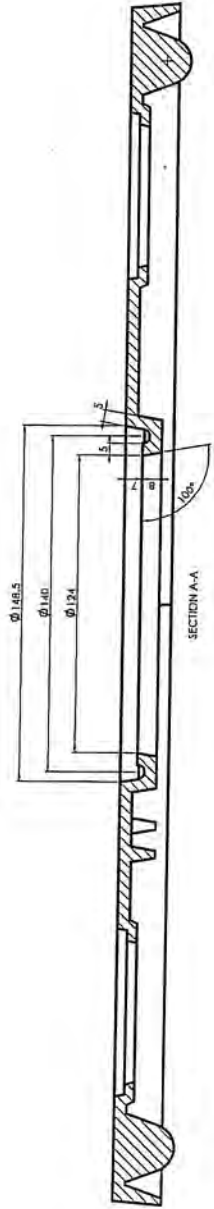
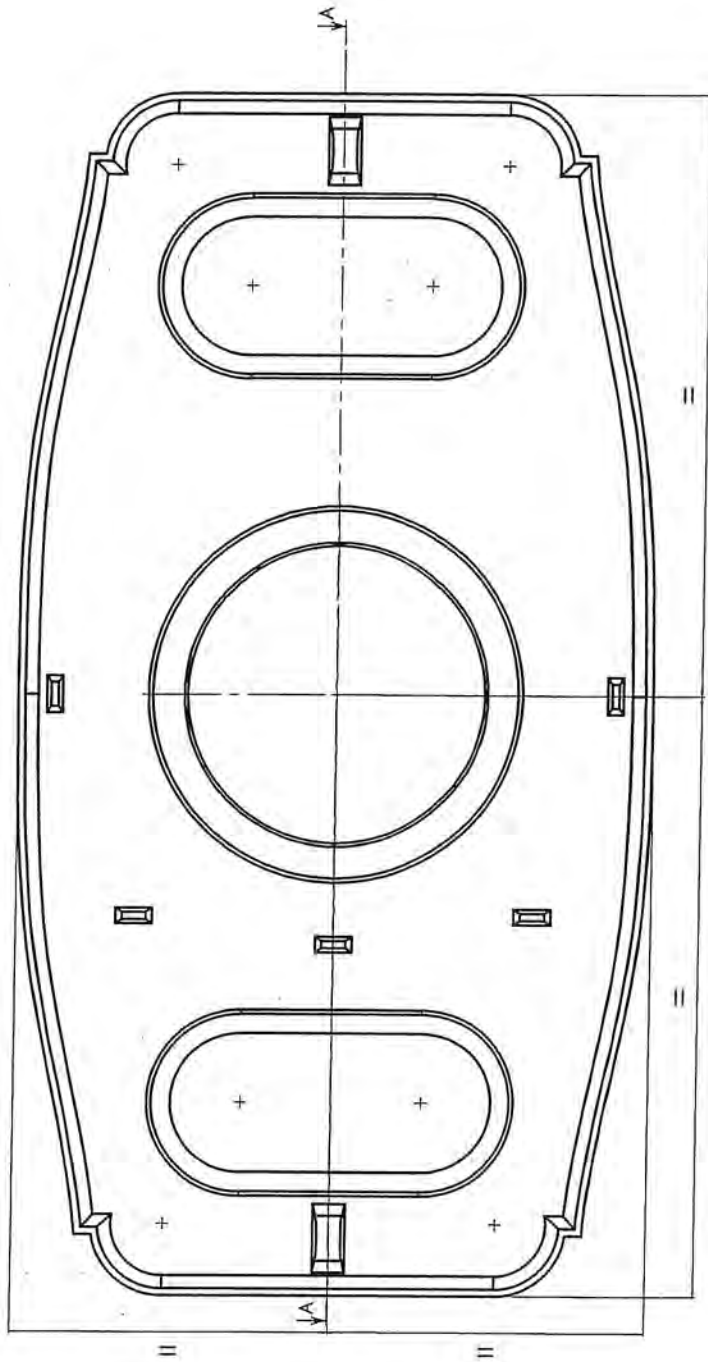
28-87

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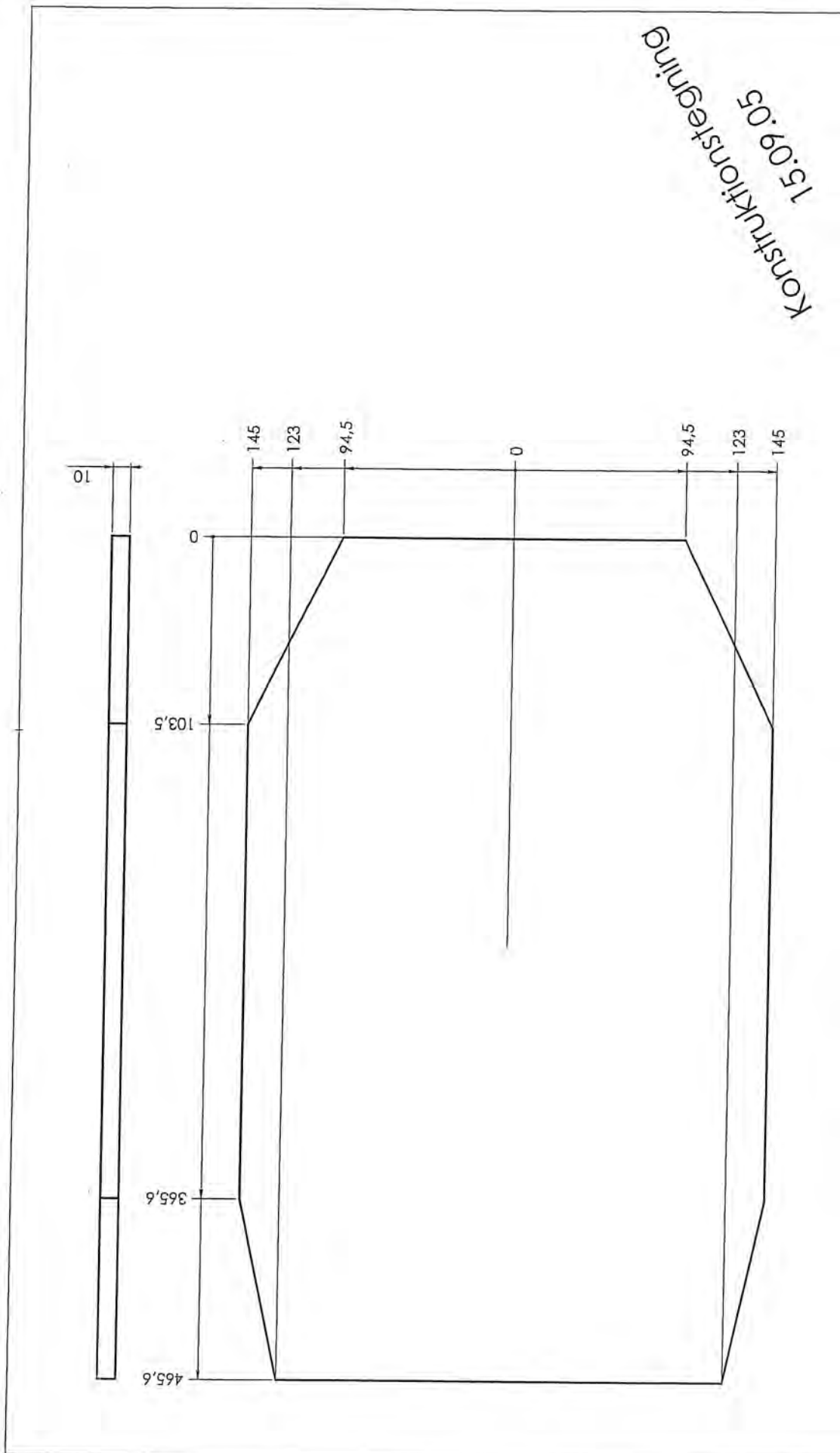
Konstruktions-tegning
02.1105

Titel		Konstruktör		Datum	
Sten bag 2B		R201		14.11.2005	
Vermiculite		Reviderad		A2	
Morsø 2B		Förändrad		1:1	
Morsø 2B		Sesad			
		Ämnets			
Dokumenttyp: Konstruktion		Dokument nr:		2B-88	
Morsø		Morsø		Morsø	



Revision af eksisterende modelnr. 2117
 Øvrige mdl, som eksisterende emne.

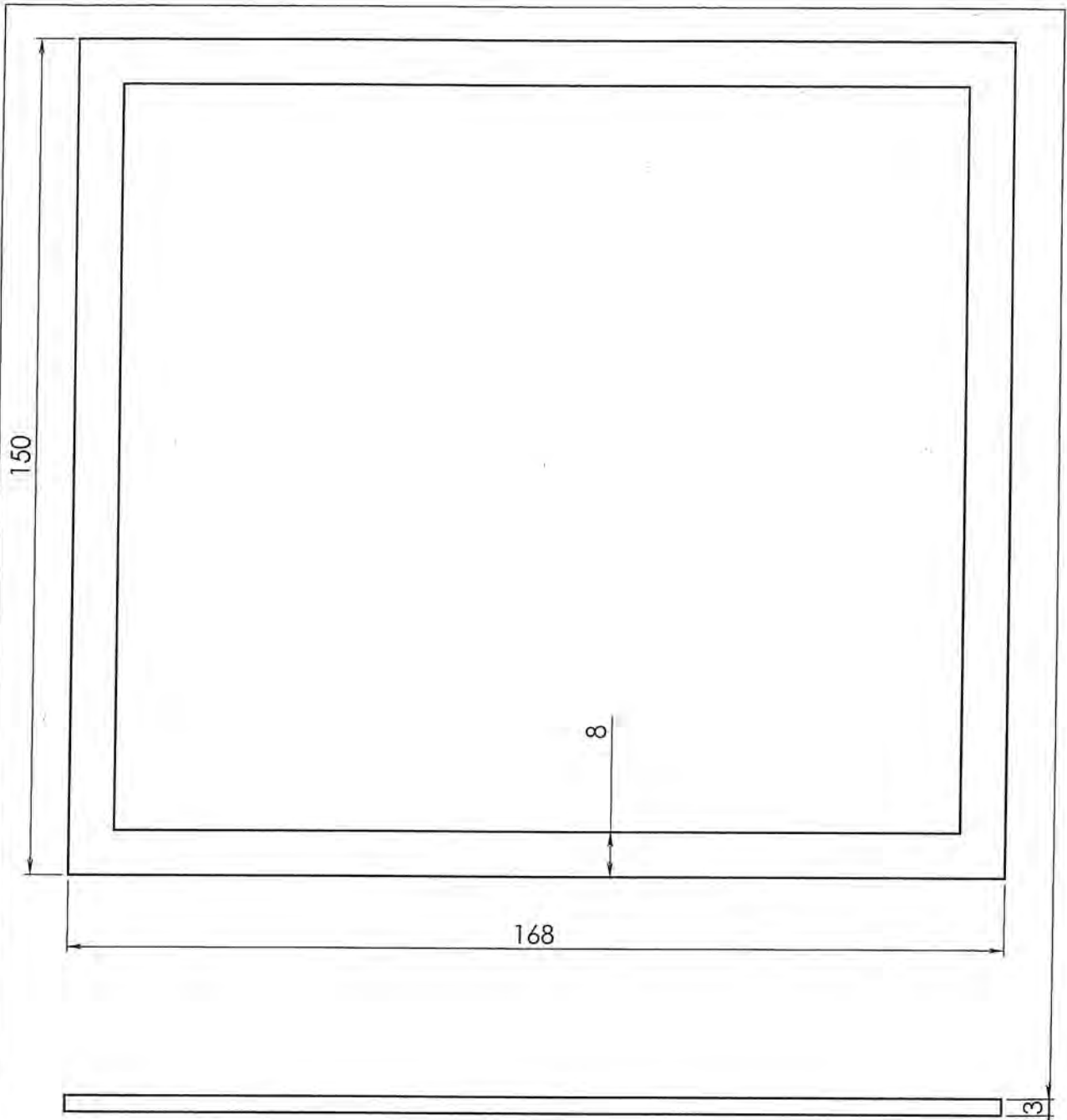
Projekt	Titel	Blade nr.	Dato	
Morskø Køllevej 280	Køllevej 280	A1	Revisi	28-89
			Udarbejdet af	3-81
			Revideret af	3-81
Udarbejdet af	Morskø			
Revideret af	3-81			
Udarbejdet af	3-81			
Revideret af	3-81			
<small> Tegningen er udarbejdet på PC. Projektet er udarbejdet i samarbejde med Morskø og Kyst & Søfart. </small>				



Rev.	Revisions	Sign.	Date:
		KDU	12.09.05
Title:			
Isoleringsmätte 2B Class			
Material:		Released:	
bo glas (herm)		Format: A3	
Weight:		Scale: 1:2	
Model no.:		Item no.: 79077100	
Drawing type: Emnelegning		Drawing no.: 2B-90	
Location of file:		morsø	

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3-38 of 3-01

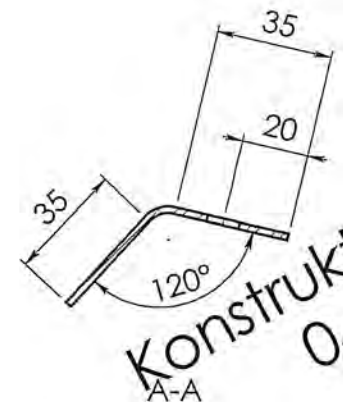
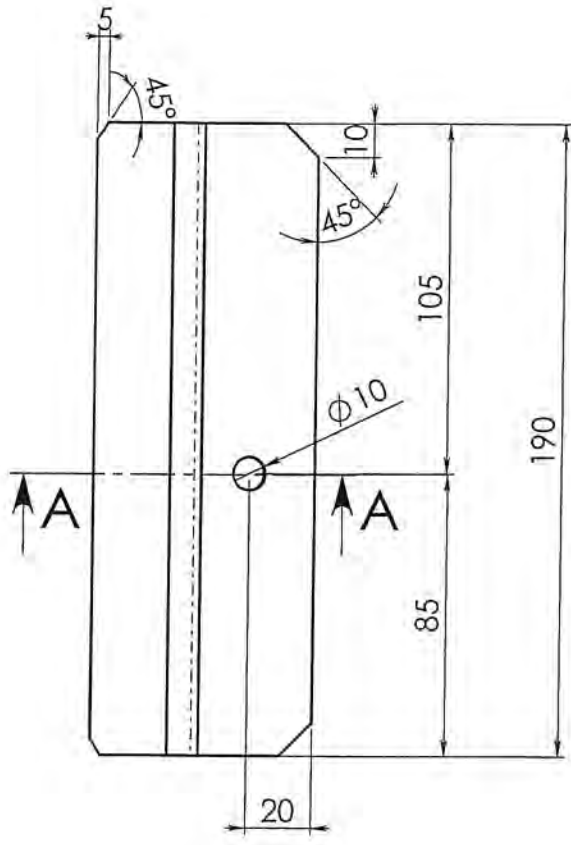


Date of print: 14-11-2005

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Rev. Revisions	Sign.:	Date:
Material:	8x4mm Glasbånd m. tape	Title:	Construction:	RSV
Weight:	0,15 kg	Glasbånd 2B	Released:	14.11.05
Model no.		Morsø 2B	Format:	A4
Drawingtype:	Ernetegning	morsø	Scale:	1:1
Location of file:	U:\udr\tegninger\18528\2B-94 Glasbånd 2B Claudio.SLDPR	<small>Byggerietten 2010</small>	Itemno.:	79074500
			Drawing no.:	2B-94 a

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

3-39 of 3-69



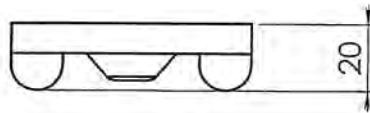
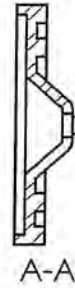
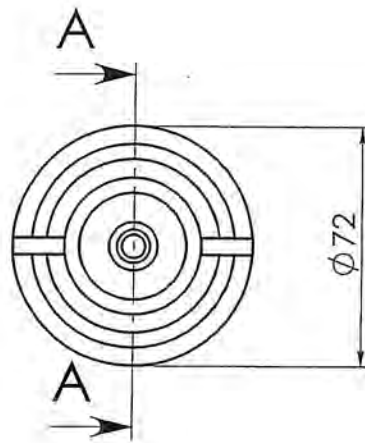
Konstruktionstegning
04.11.05

Date of print: 14-11-2005

		Rev. Revisions	Sign.:	Date:
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title:	Construction:	RSV
Material:		Varmeskjold front	Released:	
Weight:	0,22 kg	2B Classic	Format:	A4
Model no.		Morsø 2B	Scale:	1:2
Drawingtype:	Ernetegning	morsø	Itemno.:	
Location of file:	U:\vda\tegnings\18428\2B-95 Varmeskjold front 2B Classic.STD\DWG	<small>Byggesystemer til den fysiske Distribution</small>	Drawing no.:	2B-95

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3-40 of 3-69



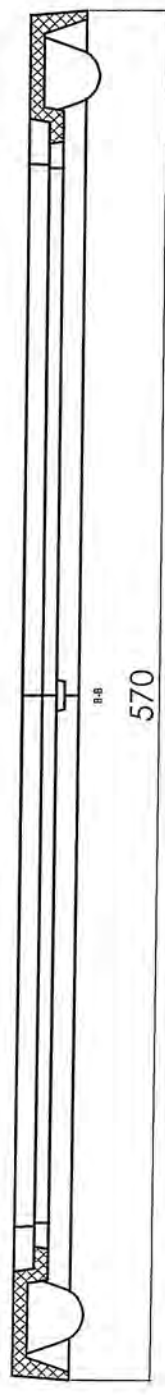
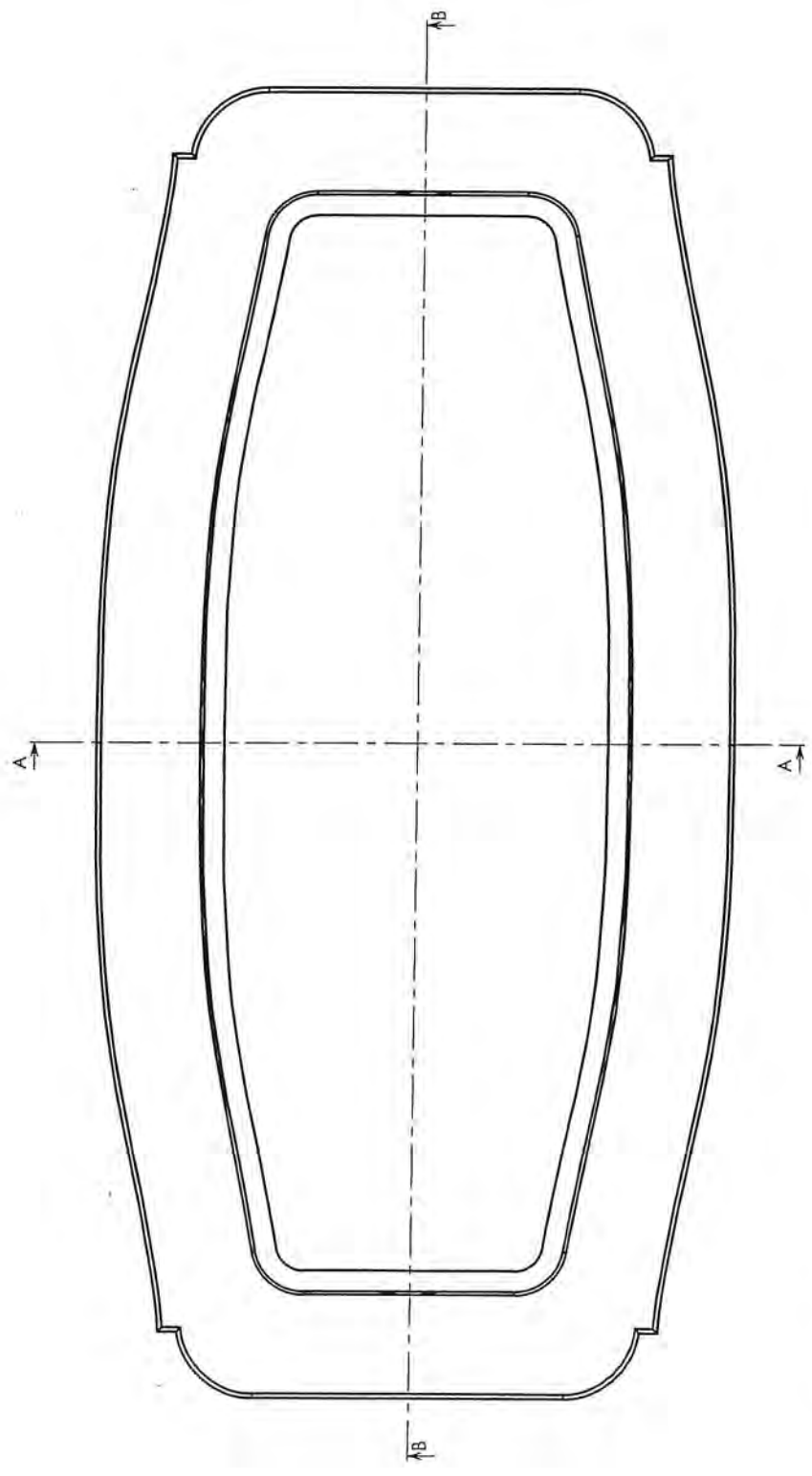
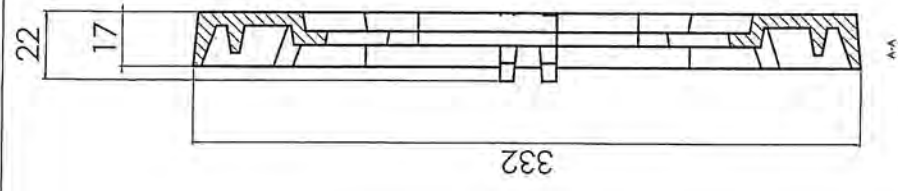
Konstruktionstegning
15.11.05

Date of print: 15-11-2005

		Rev. Revisions	Sign.:	Date:
Mål uden toleranceangivelse i.h.t. ISO-norm nr. 8062 CT9		Title:	Construction:	RSV
Material:	Cast iron GG15	Trækventil	Released:	
Weight:	0.17 kg	Morsø 2B	Format:	A4
Model no.:	2022	morsø	Scale:	1:2
Drawingtype:	Ernetegning	<small>Byggeteknik og Hydroteknik</small>	Itemno.:	342022
Location of file:	U:\usk\Tegninger\18428\2B-96 Trækventil\2B-96.DWG		Drawing no.:	2B-96

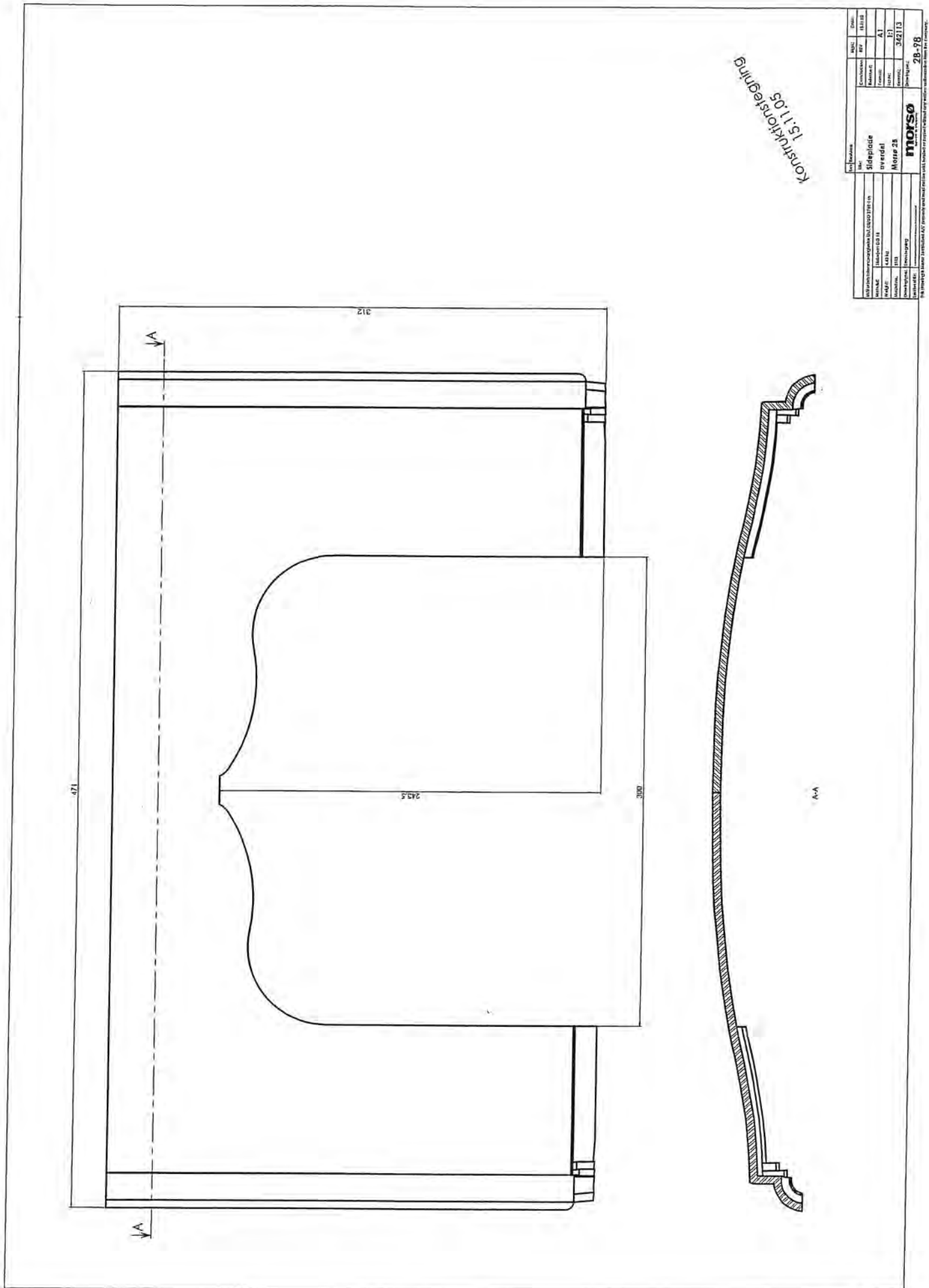
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lend or copied without any written authorization from the company.

3-41 of 3-69



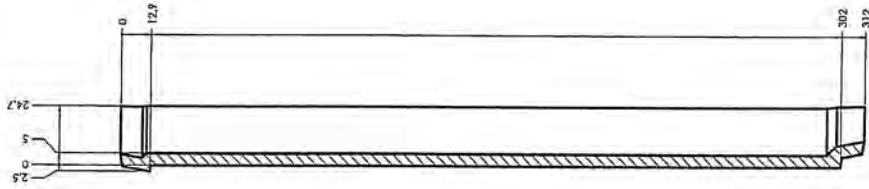
Konstruktionszeichnung
1:6.11.05

Projektdaten		Date:	
Objekt:	Objekt-Nr.:	Datum:	Blatt-Nr.:
Topplade 280			
WEGE ABHjg			
Architekt:	Proj. Nr.:	Blatt:	Blattzahl:
342111			
Druckgröße: 342111		Blattgröße: 28-97	
Zeichner:		Moxso	

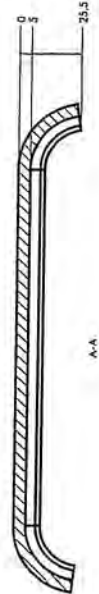
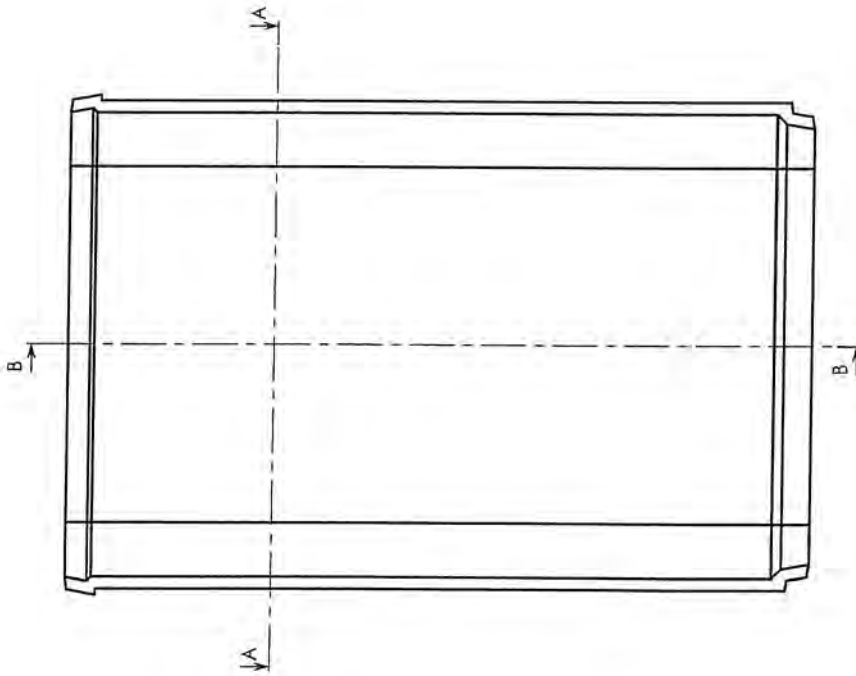


Konstruktörtegning
15.11.05

Proj. betegnelse	Sideplade	Proj. nr.	151105
Udarbejdet af	me erdel	Revideret af	A1
Grupperet af	Motort 28	Grupperet af	342113
Dokumentation	Motor 28	Grupperet af	28-98
morso			



B-B

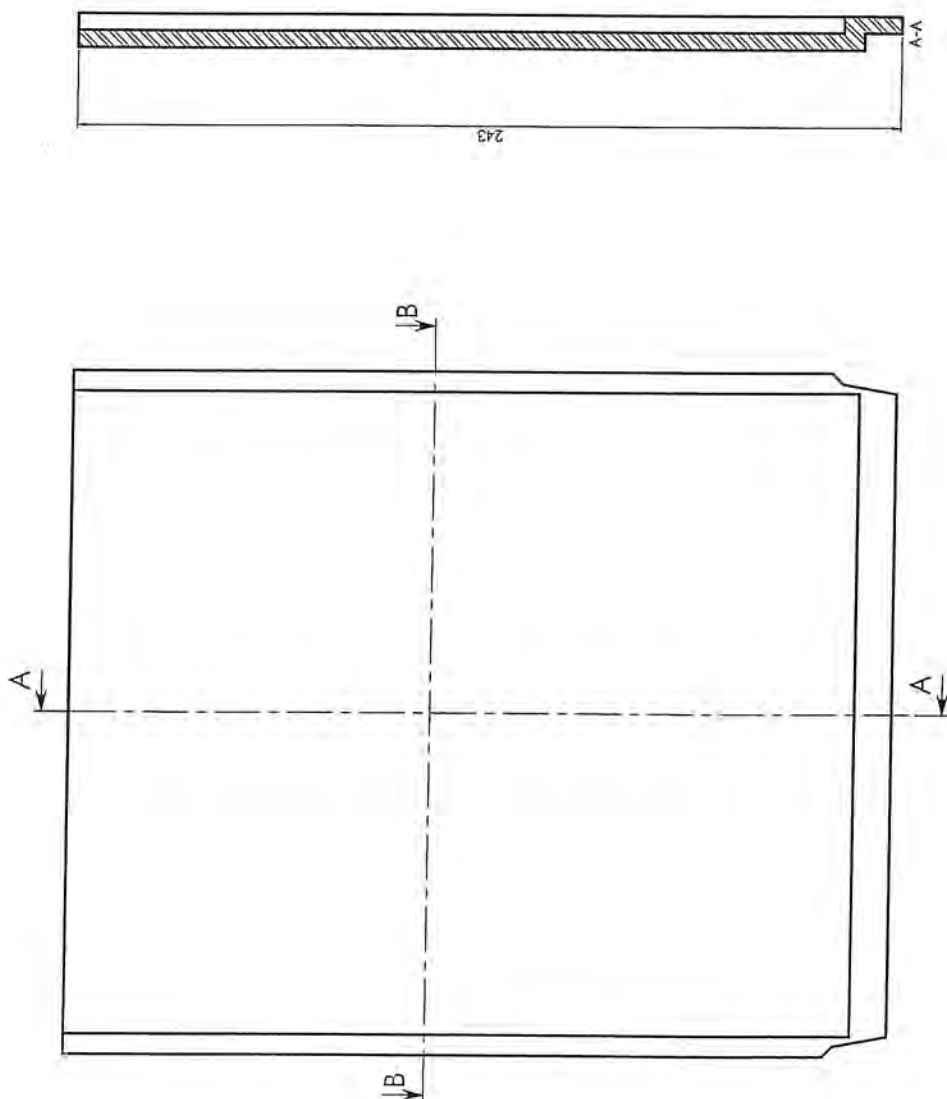


A-A

Konstruktionsteilung
17.11.05



Art. Nummer:	28-99
Zeichnungs-Nr.:	28-99
Material:	A1
Maßstab:	1:1
Bestell-Nr.:	44211400
Hersteller:	morsø
For op bopplade overside Morsø 28	
Morsø 28 Morsø 28 Morsø 28	

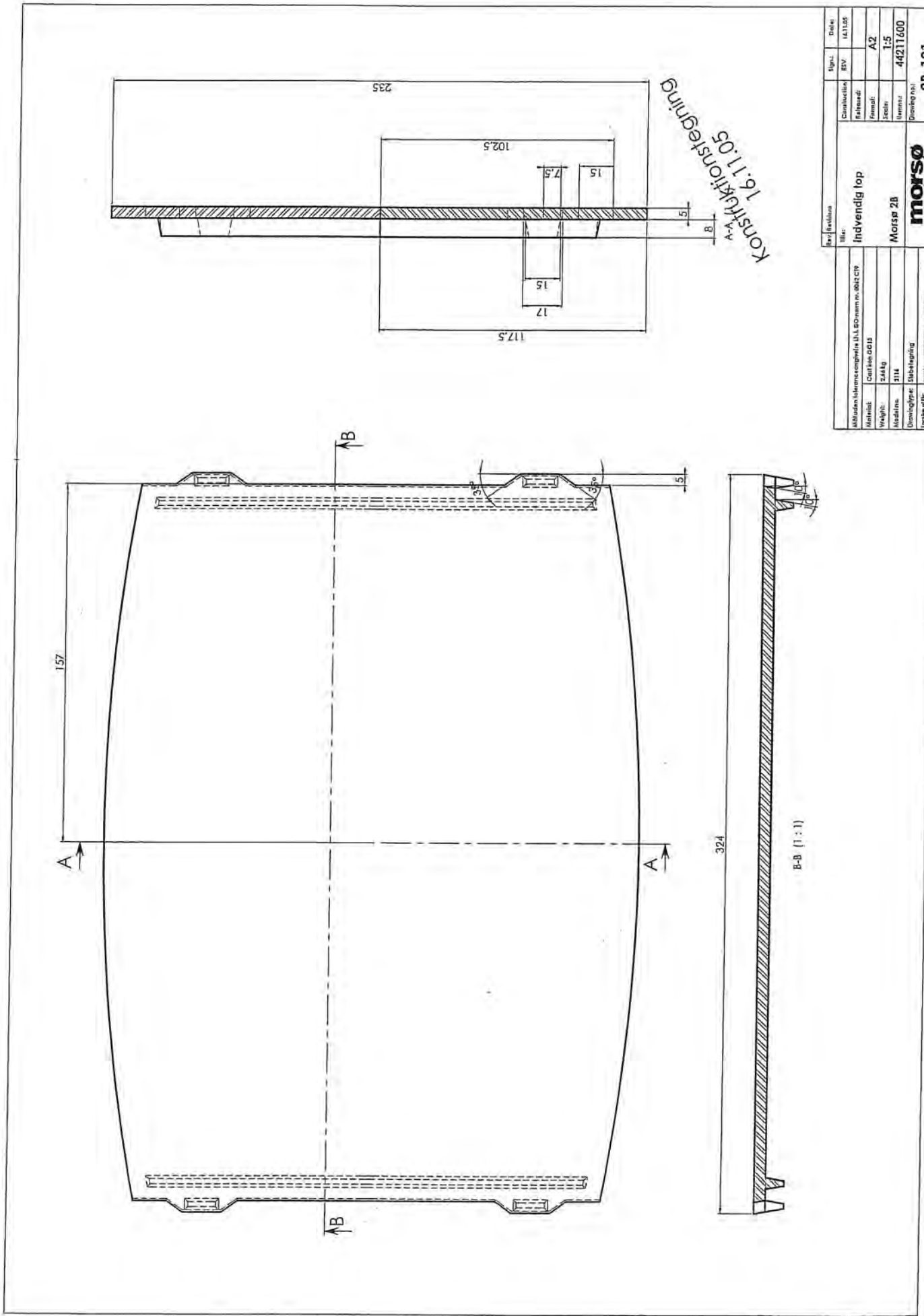


Konstruktionstejning
15.1.05

Bygning		Signat		Dato:	
Titel:		BY		15.11.02	
Indvendig gavli		Konstruktør		Referat	
overdel		A2		Formål	
Morsø 28		1:1		Skala	
Morsø 28		342115		Tegnenumr.	
morsø		2B-100		Dokument	
Madsen Betonbelegnings A/S, Dronningm. 2002, CTY		Cinikens GDS		Løst af:	
Vægt: 1,81 kg		Morsø 28		Dokument	
Morsø 28		342115		Dokument	
Dokument		342115		Dokument	

3-45 of 3-69

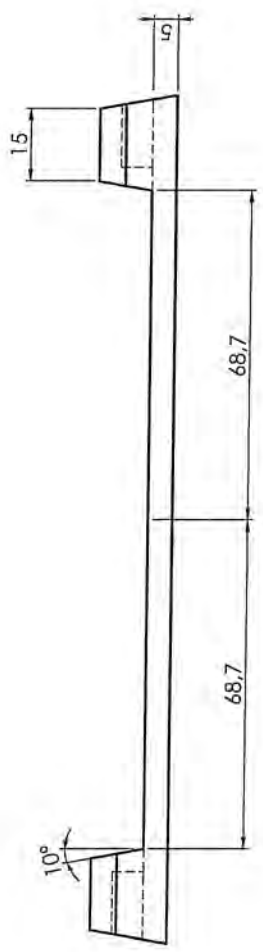
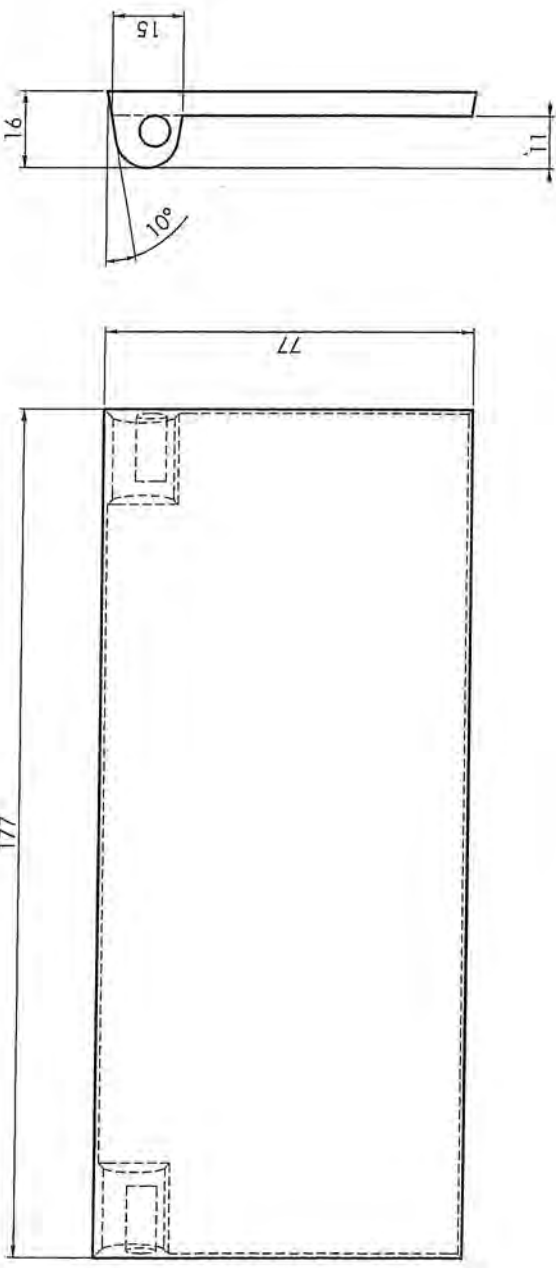
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Måltuden tekniske tegninger til L&O-mærkede og L&O-CP		Titel	
Mærkeset	Carlson GGD	Indvendig lopp	
Vægt	244 kg	Morsø 2B	
Modelnr.	2114	Dokument nr.	
Dokumenttype: Støbtægning		Dokument nr.	
Tegnede af: [unintelligible]		2B-101	
Tegnede af: [unintelligible]		44211600	
Tegnede af: [unintelligible]		1-5	
Tegnede af: [unintelligible]		A2	
Tegnede af: [unintelligible]		16.11.05	

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3-46 of 3-69

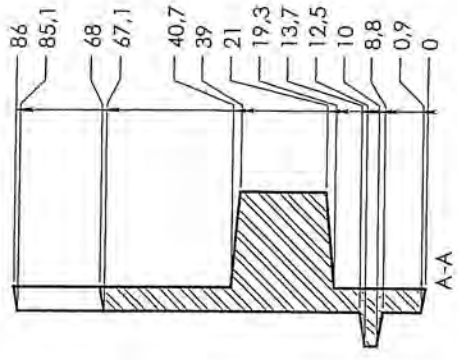
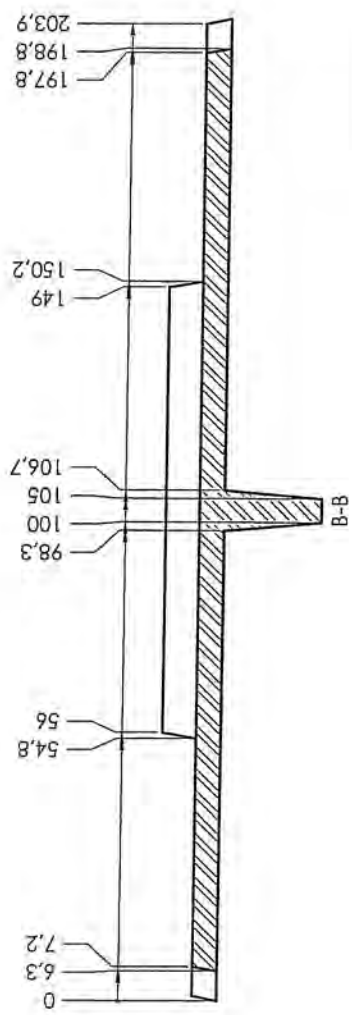
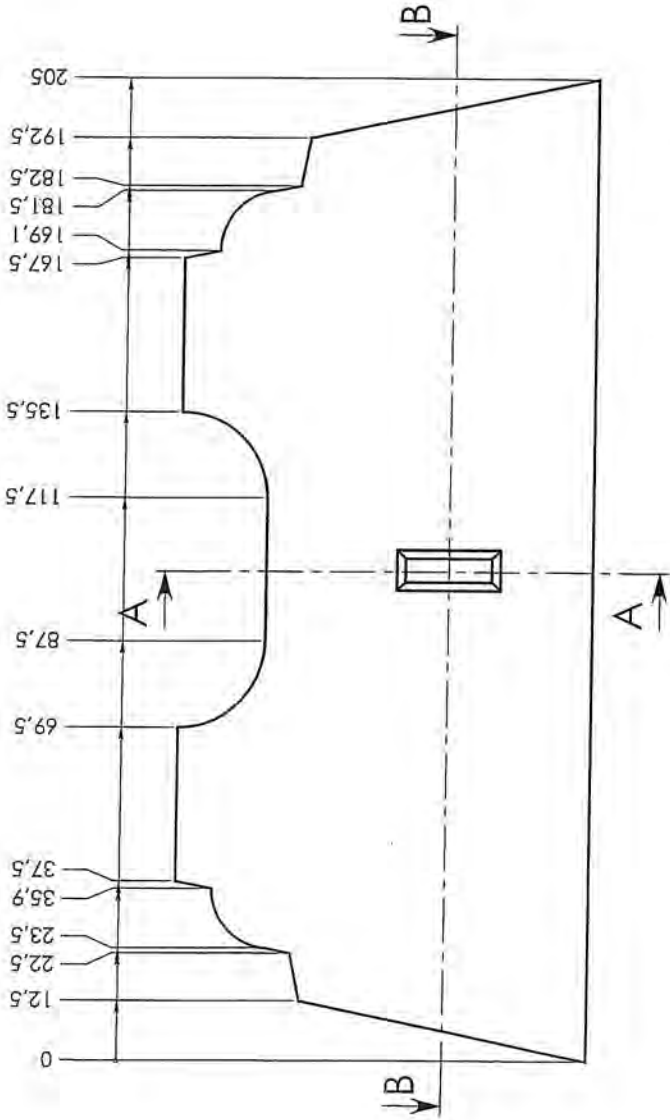


Konstruktions-tegning
16.11.05

Rev		Revisions		Sign.	Date:
Mål uden tolerancesangivelse iht. ISO-norm nr. 8042 C19		Titel: Klap til dør		RSV	16.11.05
Materiale: Cad Iron GG 15	Released:		Format: A3		
Weight: 0.51 kg	Morsø 2B		Scale: 1:1		
Model no. 2008	Drawing type: Støbetegning		Item no.: 342008		
Location of file: <small>Produktgruppen er arkiveret hos Morsø</small>	Drawing no.: 2B-102				

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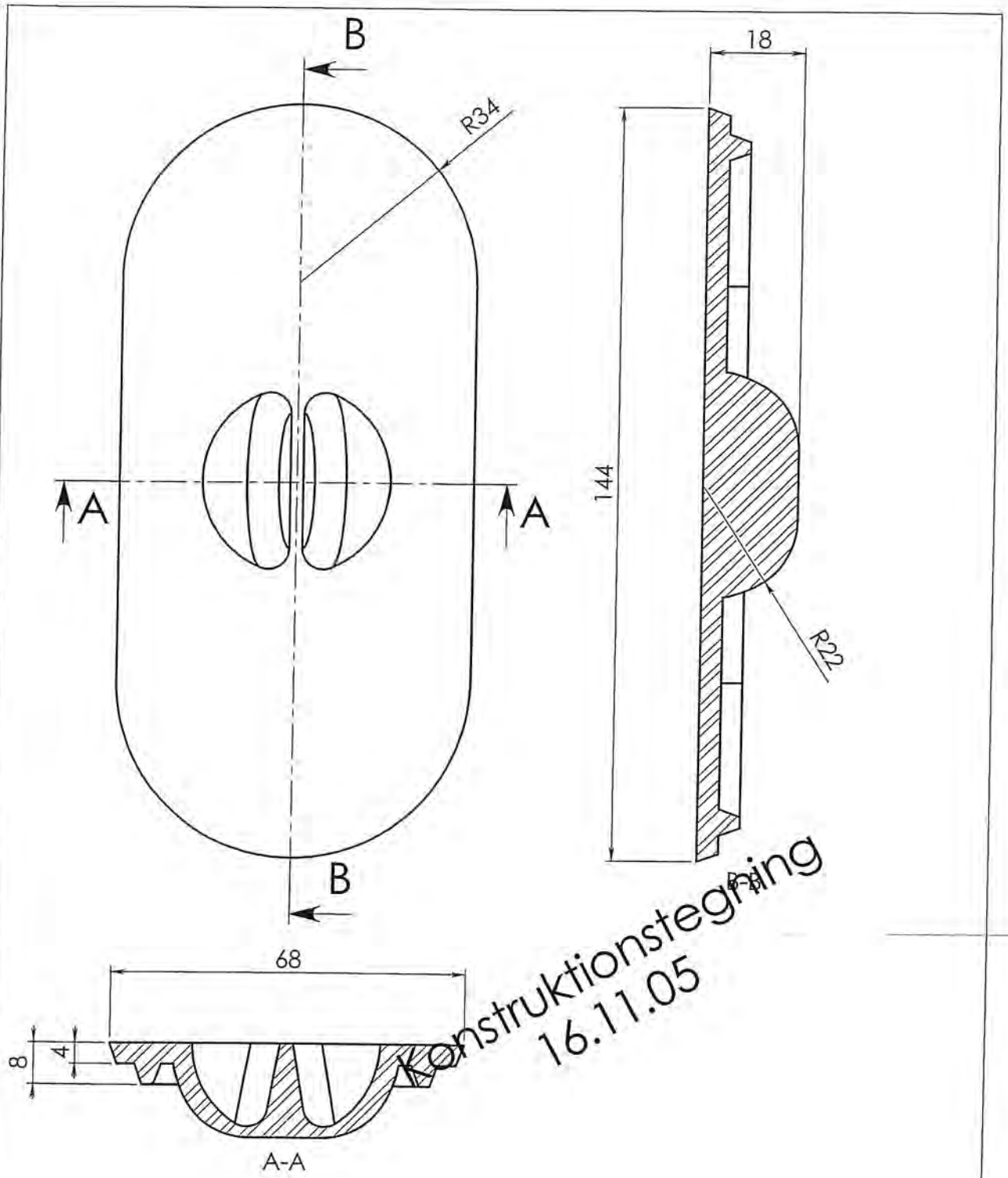
3-48 of 3-69



Konstruktions-tegning
16.11.05

Rev.	Revisions	Sign.	Date:
		RSV	16.11.05
Title:		Construction:	
Dæksel 2B overdel		Released:	
Material:		Format:	A3
Weight:		Scale:	1:1
Model no.:		Item no.:	44211800
Drawing type:		Drawing no.:	2B-103
Location of file:			
Drawing type: Støbelegning			
Midt uden tolerancengivelse I.h.t. ISO-norm nr. 8062 C1?			
Material: Cast iron GG 16			
Weight: 0,55 kg			
Model no. 2118			
Location of file:			

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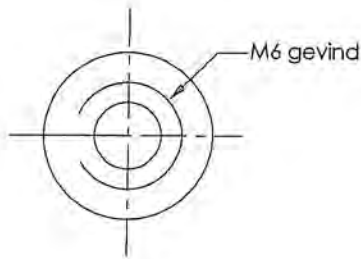
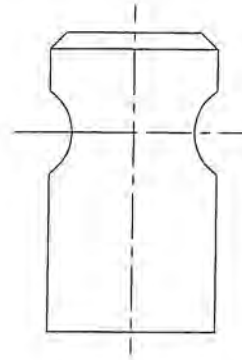
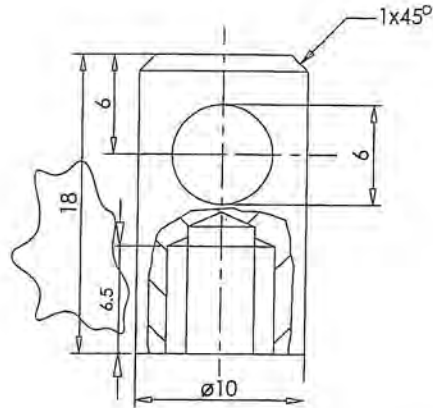
Date of print: 16-11-2005

Mål uden toleranceangivelse i.h.t. ISO-norm nr. 8062 CT9		Rev. Revisions	Sign.:	Date:
Material:	Cast iron GG15	Title:	Construction:	RSV
Weight:	0,32 kg	Rensdæksel	Released:	16.11.05
Model no.:	2119	Morsø 2B	Format:	A4
Drawingtype:	Støbetegning	morsø	Scale:	1:1
Location of file:	U:\udr\Tegninger\18A2B\3B-101 Dæksel overdel 2B-104.DWG	<small>Er autoriseret til brug af Morsø Jernstøberi</small>	Itemno.:	342119
			Drawing no.:	2B-104

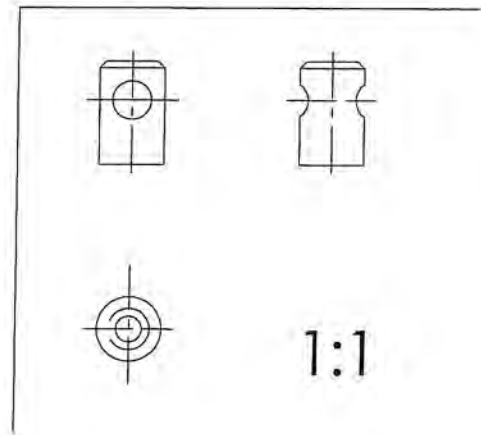
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lendet or copied without any written authorization from the company.

3-49 of 3-69

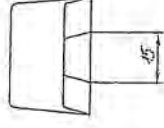
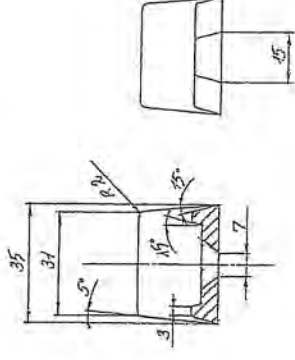
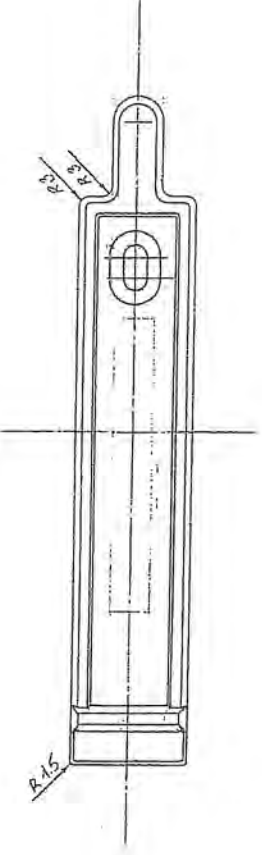
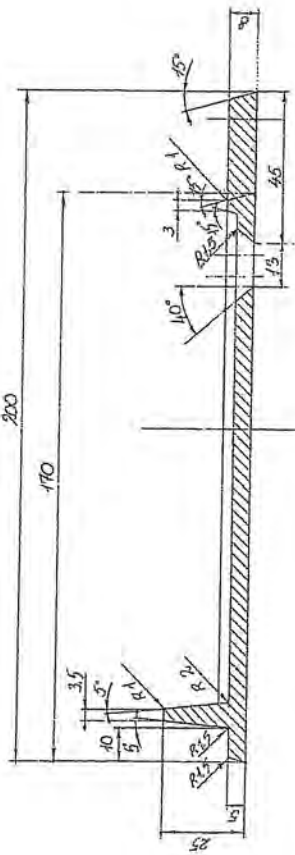
2,5:1




Matr.: Automatstål

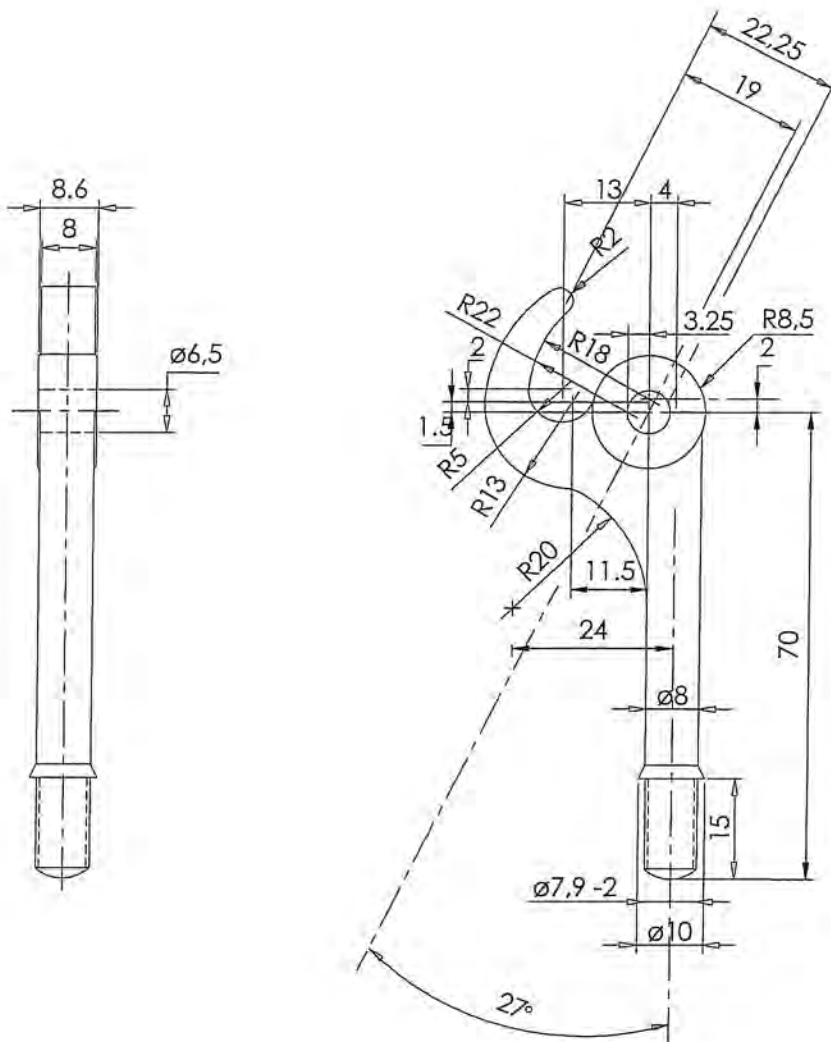


Rev:	Revision	Sign.	Dato	Titel: Knop til rystestang 1126	Sign.:	Dato:
b	Gamdrup TegneTeknik	HCH	April 96		ZZ	XXXXX
c	Tilføjet tegn.nr.	KD	20.12.96	Filnavn:	Tegn.form.:	Målforshold
d	Varenr. ændret fra 752620	KD	01.07.99	1126-26	A4	1:1/2.5:1
e	Længdemål ændret	KDU	10.08.99	 <small>Jernløber A/S</small>	Varenummer:	
					752619	Tegningsnummer:
					1126-26 e	



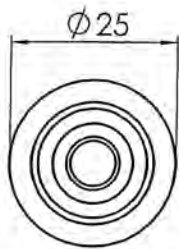
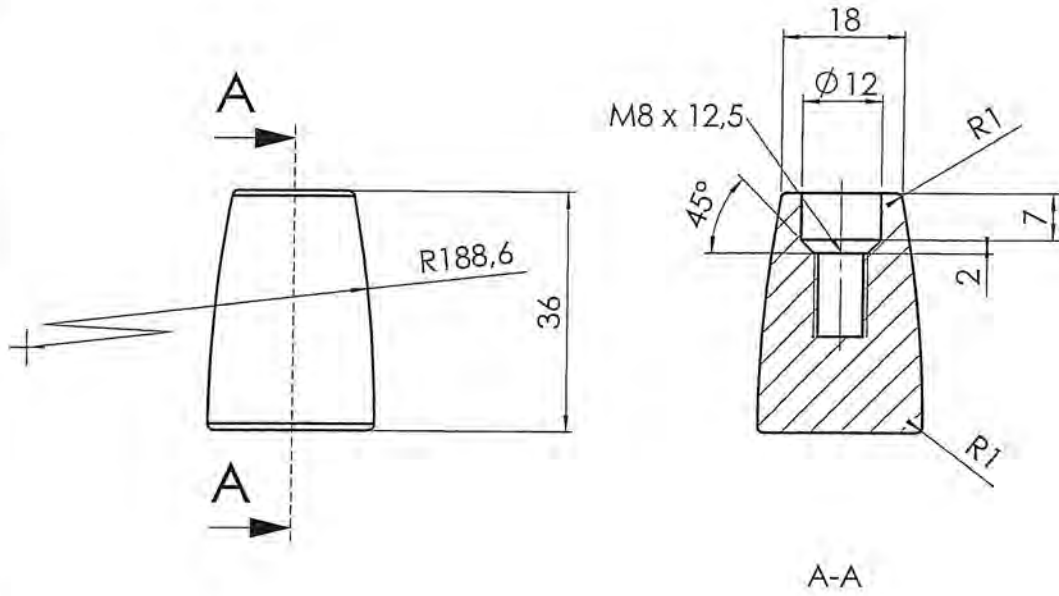
DATE	30 Jul - 1987	SIGN.	R
MAL	411	MODEL	411
MORSE H126 ARISTE-HANDTAG		TECHNISCH	H126-42-2
 morse ARTIF. SAKKATOP ANLEGGESATZ FÜR SCHIFFS KOMMUNIKATION			

A B C D E F G H J K L M



Afrettet, afgratet, kuglerenset.
 Matr.: DIN1680 Teil 2 GTA 1315

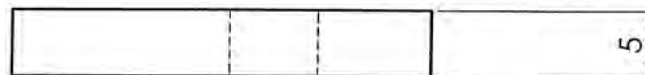
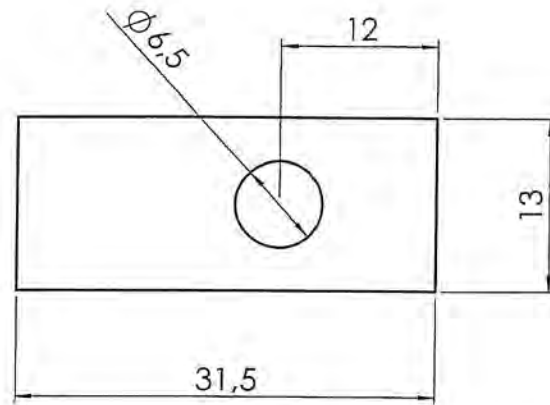
Titel: Lukkehage	Sign.: Aa.GJ	Dato: 04.02.93	Revision	Sign.	Dato
	Tegn.form.: A4	Målforhold 1:1	Gamdrup TegneTeknik	HCH	April 96
Tegningsnummer: 1400-42-4	Varenummer: 791271				
morsø <small>By appointment to the Royal Danish Court</small>	Filnavn: 1400-42				



1400-194 greb lille - Sheet 1

Materiale:		Bakelite		Rev.:	Revisionstekst:	Sign.:	Dato:
Vægt:	kg.	Bearbejdes:		Titel: Greb lille		Konstr.:	RSV 23.02.2000
Overfladebeh.:			m ²			Frigivet:	RSV 02.08.2000
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m			Morsø 1410		Tegn.format:	A4
Ruhedstolerance:						Målforshold:	1:1
Værktøjsnr.:						Varenr.:	79118200
Tegningstype:	Emnetegning					Tegningsnr.:	

Denne tegning tilhører Morsø Jernstøberi A/S og må ikke afhændes, udlånes eller kopieres uden firmaets skriftlige tilladelse

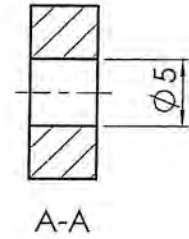
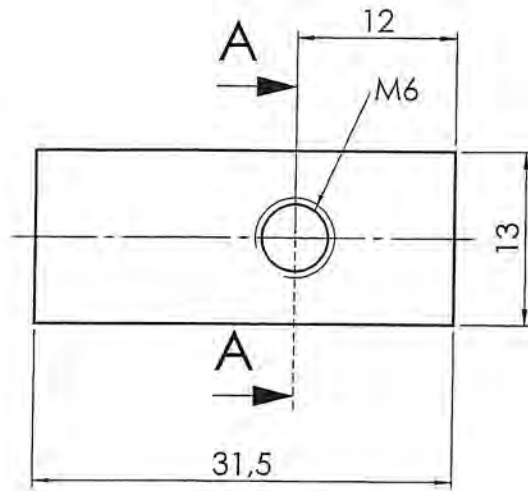


1400-199 Lus uden gevind - Sheet 1

Materiale:		Sort fladjern		Rev. Revisionstekst:		Sign.:		Dato:	
Vægt:		0,015 kg. Bearbejdes:		Lus uden gevind Morsø 1400 		Konstr.:		RSV 03.03.2000	
Overfladebeh.:		m ²				Frigivet:			
Måltolerance:		Mål uden toleranceangivelse DS/ISO 2768-1 m				Tegn.format:		A4	
Ruhedstolerance:						Målforhold:		2:1	
Værktøjsnr.:				Varenr.:		44256800		Tegningsnr.:	
Tegningstype:		Emnetegning						1400-199	

Denne tegning tilhører Morsø Jernstøberi A/S og må ikke afhændes, udlånes eller kopieres uden firmaets skriftlige tilladelse

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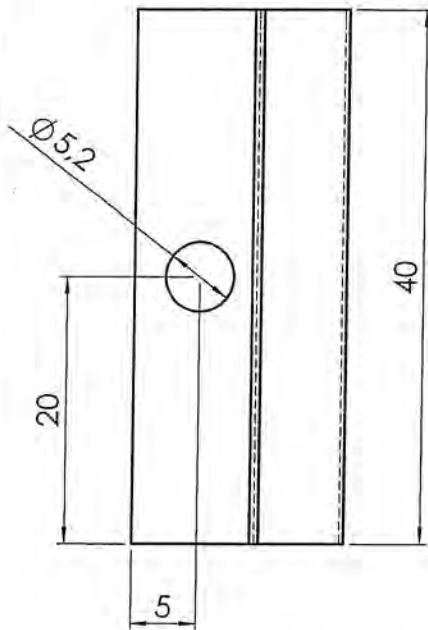
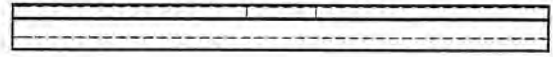
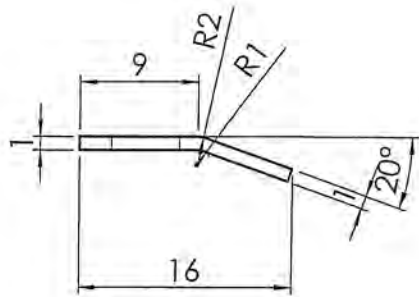


1400-204 lus med gevind - Sheet 1

Materiale:		Sort fladjern		Titel:		Konstr.:		RSV		Sign.:		Date:		03.03.2000	
Vægt:		0,015 kg		Bearbejdes:		Lus med gevind		Frigivet:							
Overfladebeh.:				m ²		Morsø 1400		Tegn.format:		A4					
Måltolerance:		Mål uden toleranceangivelse		DS/ISO 2768-1 m				Målforskel:		2:1					
Ruhedstolerance:								Varenr.:		44256700					
Værktøjsnr.:						morsø <small>Byggerier og Jernstøberi A/S</small>		Tegningsnr.:		1400-204					
Tegningstype:		Ernetegning													

Denne tegning tilhører Morsø Jernstøberi A/S og må ikke afhændes, udlånes eller kopieres uden firmaets skriftlige tilladelse.

3-56 of 3-69

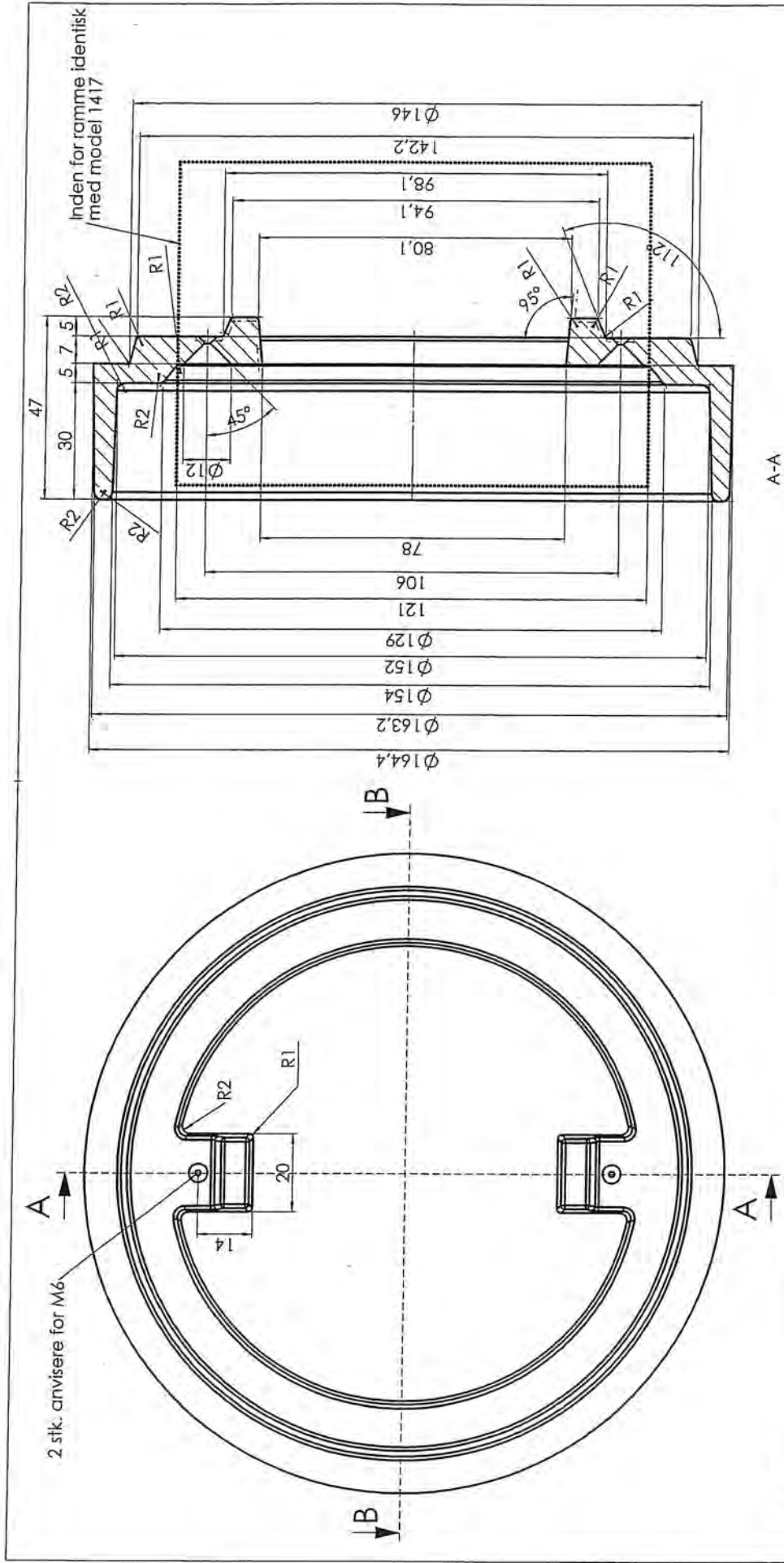


1400-205 glasbeslag 1 - Sheet 1

Materiale:		1 mm rustfri plade		Titel:		Konstr.:		RSV	14.03.2001	
Vægt:		0,005 kg.	Bearbejdes:	buk/bore	Glasbeslag 1		Frigivet:		KDU	10.08.00
Overfladebeh.:		-		Morsø 1400		Tegn.format:		A4		
Måltolerance:		Mål uden toleranceangivelse DS/ISO 2768-1 m		morsø <small>Byggeriets Tekniske Center</small>		Målforhold:		2:1		
Ruhedstolerance:						Varenr.:		54146261		
Værktøjsnr.:		-				Tegningsnr.:		1400-205 b		
Tegningstype:		Emnetegning								

Denne tegning tilhører Morsø Jernstøberi A/S og må ikke afhændes, udlånes eller kopieres uden firmaets skriftlige tilladelse

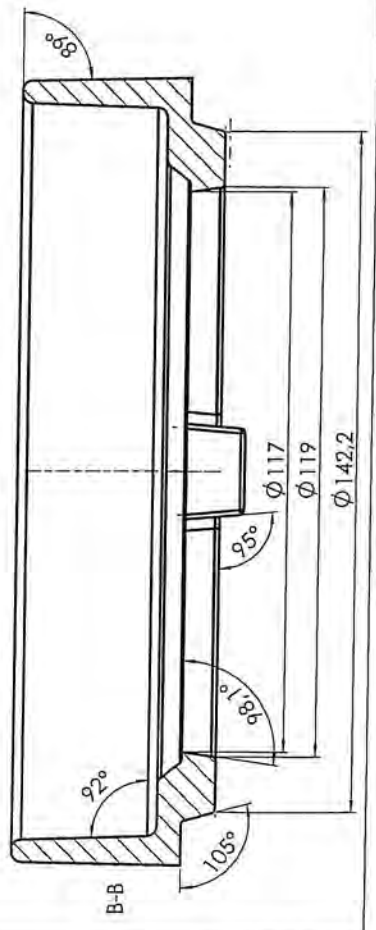
3-57 of 3-69



Inden for ramme identisk med model 1417

2 stk. anvise for M6

A-A

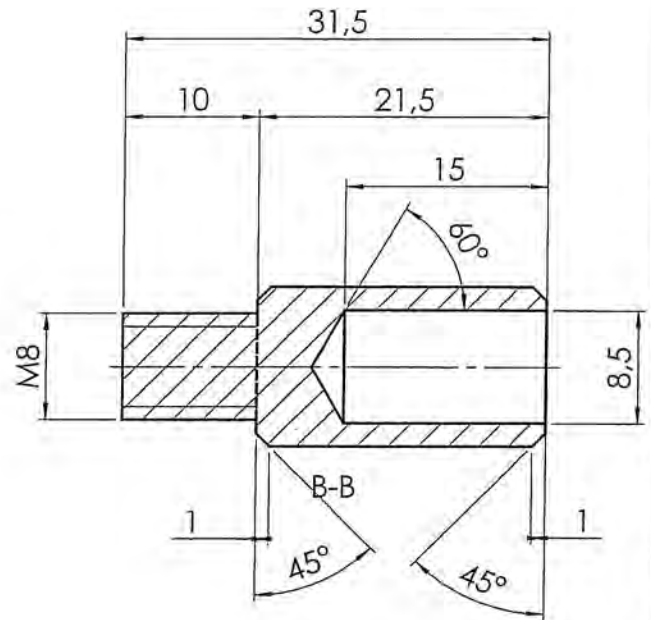
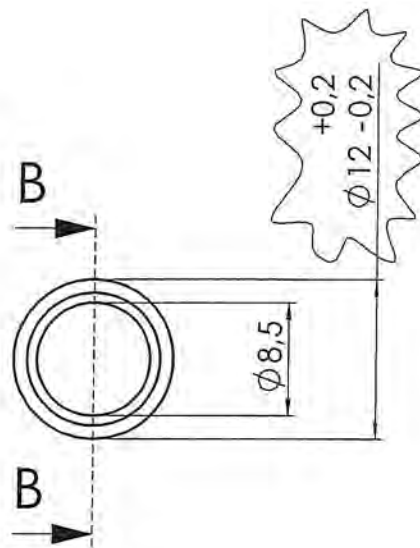


B-B

Material:	GG15	Rev. / revisionstakt:	Thot:	Sign.:	Date:
Vægt:	1,22 kg	Rev. / revisionstakt:	Røgtud USA	RSV	13.12.2000
Overfladebeh.:	1,22 kg	RSV	Morsø 1400	RSV	24.09.2001
Måltolerance:	Må uden tolerancemængsel	Tegn. format:			A3
Ruhedstolerance:	ISO 3147, IT 8, 7, 6, 5, 4, 3, 2, 1	Målestok:			1:1
Værktøjnr.:	Modelnr.: 1459	Varenr.:			34145900
Tegningstype:	Slebetejning	Tegningsnr.:			1400-219 a

morsø
Industri- og Maskinfabrik

Denne tegning illustrerer Morsø Jernstøberi A/S og må ikke offentliggøres uden Morsø Jernstøbels skriftlige tilladelse

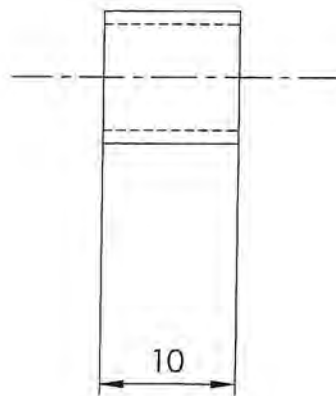
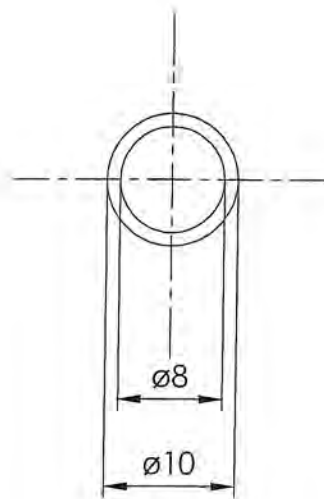


1400-227 overgangsstykke til greb m gevind - Sheet1


Materiale:		Rustfrit stål		Titel:		Konstr.:		RSV		23.03.04	
Vægt:		14,5 g		Bearbejdes:				Sign.:		Dato:	
Overfladebeh.:				m ²				RSV		30.04.2002	
Måltolerance:		Mål uden toleranceangivelse		DS/ISO 2768-1 m		Overgangsstykke					
Ruhedstolerance:						fil greb					
Værktøjsnr.:						Morsø 1400					
Tegningsstype:		Emnetegning						Tegningsnr.:		1400-227 b	
								Varenr.:		75140161	

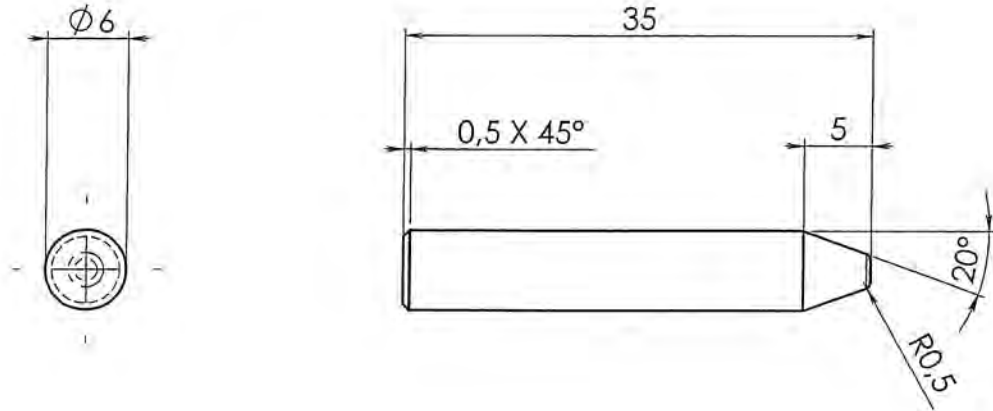
Denne tegning tilhører Morsø Jernstøberi A/S og må ikke afhændes, udlånes eller kopieres uden firmaets skriftlige tilladelse

3-59 + 3-69




Matr.10x1 Hydraulikrør galv. varenr.712602

Titel: Afstandsrør ø10x1 L=10	Sign.: RS	Dato: 970113	Revision	Sign.	Dato
	Tegn.form.: A4	Målforshold 2:1			
Tegningsnummer: 1400-300-4	Varenummer: 541439				
 <small>Jernstøberi A/S</small>	Filnavn: 1400-300				

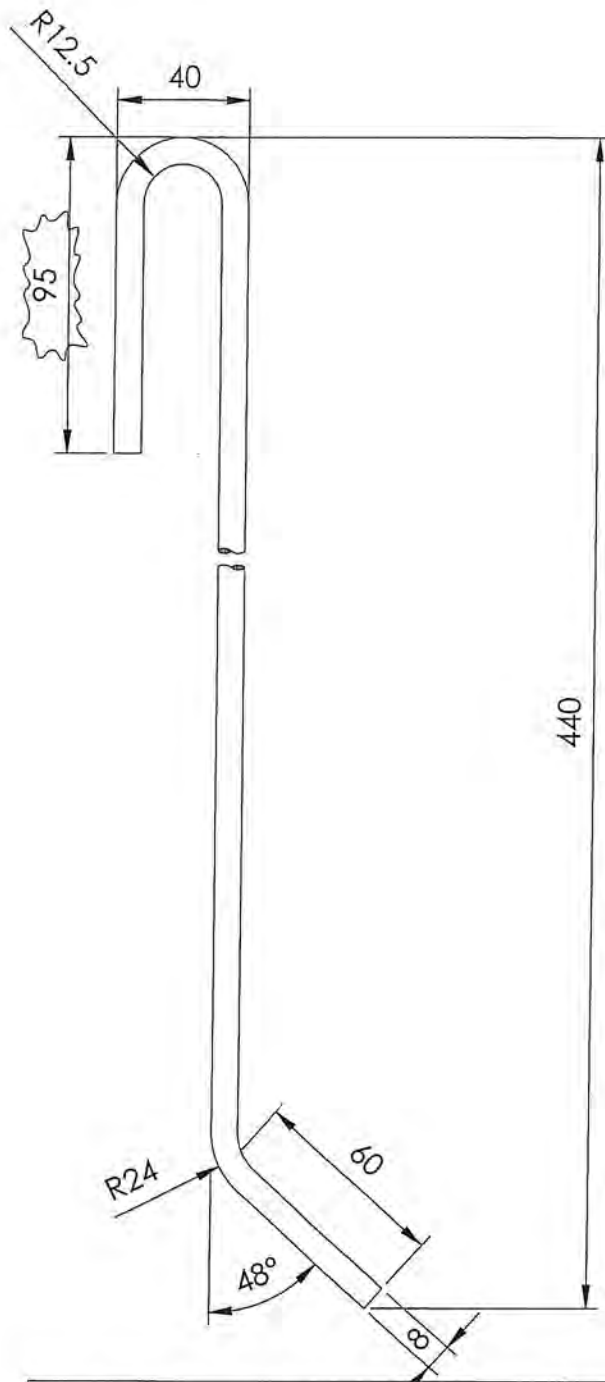


Date of print: 14-11-2005

		Rev.	Revisions	Sign.:	Date:
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title:		Construction:	RSV 26.01.04
Material:	Rustfrit stål	Ø6x45 Hængselsstift		Released:	
Weight:	0,05 kg	Morsø 2100		Format:	A4
Model no.:	-	morsø		Scale:	2:1
Drawingtype:	Emnetegning	Byggesystemet  er beskyttet. Dog		Itemno.:	541808
Location of file:	\\sve\tegninger\standard\stift\Ø6 Hængselsstift.DWG			Drawing no.:	2100-174 a

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

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				Matr.: ø8 mm automatstål		Vægt: 0,2 Kg	
Rev.	Revision	Sign.	Dato	Titel: Ildrager New Generation/Classic		Sign.:	Dato:
b	Ombuk forlænget 70 mm	KDU	11.06.99			KA	30.07.98
				Filnavn: 9000-05		Tegn.form.:	Målforhold
				 <small>Jernløber A/S</small>		A4	1:2
						Varenummer: 79900321	

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
Trækstyrke - 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
Opløsningsmiddelægthed	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 bændel - selvklebende bændel - bånd - selvklebende bånd - stigebånd - dielektrisk tape - lodde puder - rå, silikonecoatede, HT-behandlede, aluminiserede, grafitiserede, karamelliserede, teflonbelagte, - glasklæder - afdækninger

VETRO-REF:

GLASFIBERPRODUKTER MED SPECIEL HT-IMPRÆGNERING

Glasfiberprodukter kan imprægneres med speciel ildfast vermiculit 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, svejseprøjt og smeltet metal.

VETRO-REF produkternes farve	guld
Imprægneringens max termiske fasthed ved kontinuerlig anvendelse	700 °C
Imprægneringens max termiske fasthed ved kortvarige påvirkninger	1000 °C

Fra: Martin Steffensen [Martin@steffca.dk]
Sendt: 25. marts 2004 13:04
Til: kaa@morsoe.com
Emne: Data E-glas Eng.
Hermed data som aftalt.

GLASS FIBER TEXTILE PRODUCTS

The base material of STEFFCA Glass Fiber Textile Products consists of 6 - 9 microns "E" Glass Fiber Filament Yarns that can be voluminized, texturized, plied, reinforced with steel wire etc.

They are inorganic, steril, incombustible, totally Asbestos-Free, do not contain any toxic matter nor heavy metals and do not cause skin irritations.

BASIC COMPOSITIONS OF "E" GLASS FIBER

- SiO₂ 53-55 %
- Al₂O₃ 14-15,5 %
- CaO - MgO 20-24 %
- B₂O₃ 6,5-9 %
- Fe₂O₃-TiO₂ < 1%
- Na₂O-K₂O < 1%

GENERAL PROPERTIES OF "E" GLASS FIBER

- Max. Temperature 550°C
- Melting Point 1200 °C
- Diameter-filaments 6-9 micron
- Tensile strength-*virgin filament* 3400 MPa
- Young's modulus 74000 MPa
- Thermal conductivity 1,0 W/m °K
- Fire reaction incombustible
- Loss on ignition < 1,5 %
- Dielectric rigidity-*glass in bulk* 60-100 KV/mm
- Solvent resistance good
- Bases resistance good
- Acid resistance good - except fluoridric acid

GENERAL PROPERTIES OF "E" GLASS FIBER TEXTILE PRODUCTS

- - high mechanical strength - good electrical properties
- - incombustible - good dimensional stability
- - low thermal conductivity - good resistance to chemical agents
- - high thermal resistens - - good flexibility
- - max temperature 550°C

V-1100 (600) Vermiculite insulating slabs

for hot-face and back-up insulation - up to 1100°C (2012°F)



Maximum service temperature	°C	1100
	°F	2012
Bulk density, dry	kg/m ³	600
	lbs/cu.ft.	37.5
Compressive strength (EN 1094-5: 1995)		
@ room temperature	MPa	4.2
	lbs/sq.in.	609
Modulus of rupture (EN 993-6: 1995)		
	MPa	1.6
	lbs/sq.in.	232
Total porosity (EN 1094-4: 1995)	%	76
Specific heat		
	kJ/(kg·K)	0.94
	BTU/(lb·°F)	0.224
Coefficient of reversible thermal expansion (BS 1902: section 5.3: 1990)		
@ 20°C-750°C (68°F-1382°F)	K ⁻¹	11×10 ⁻⁶
	°F ⁻¹	6.1×10 ⁻⁶
Resistance to thermal shock (EN 993-11: 1998)		
heating to 950°C (1742°F)	cycles	>10
Linear reheat shrinkage (EN 1094-6: 1999)		
@ 1000°C	%	1.0
@ 1100°C	%	
Pyrometric cone equivalent (ASTM C24-89 ORTON cones)		
	°C	1300
	°F	2372
Thermal conductivity (ASTM C-182)		
mean temp. @ 200°C	W/(m·K)	0.15
mean temp. @ 400°C	W/(m·K)	0.16
mean temp. @ 600°C	W/(m·K)	0.19
mean temp. @ 800°C	W/(m·K)	-
mean temp. @ 392°F	BTU/(sq.ft.·h·°F/in.)	1.04
mean temp. @ 752°F	BTU/(sq.ft.·h·°F/in.)	1.11
mean temp. @ 1112°F	BTU/(sq.ft.·h·°F/in.)	1.32
mean temp. @ 1472°F	BTU/(sq.ft.·h·°F/in.)	-
Chemical analysis, typical	%	
Silica	SiO ₂	47
Titanium dioxide	TiO ₂	0.5
Ferric oxide	Fe ₂ O ₃	4
Alumina	Al ₂ O ₃	7
Magnesium oxide	MgO	21
Calcium oxide	CaO	2
Sodium oxide	Na ₂ O	0.5
Potassium oxide	K ₂ O	11
Loss on ignition 1025°C (1877°F)	LOI	7
Colour		sand

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Fax: 45 9772 4875
insulation@skamol.dk

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www.skamol.com

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

Skamol A/S is DS/EN ISO 9001 certified.

March 2004

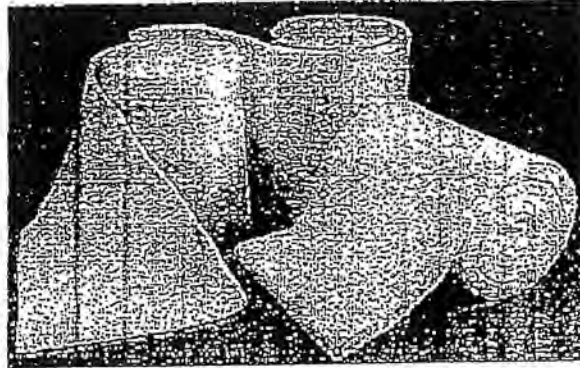
3-66 of 3-69

Keramab N.V.
 Havenheidslaan 4
 B - 9140 Tamse
 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: 2909/1998/MJH/mvo
 Supersedes: 0704/1998/MJH/mvo
 All Rights Reserved

Price List No. 1 (II) 016

Page 1 of 3

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Member of
 the BELGIAN ASSOCIATION

KERAMAB
 REFRACTORY & CERAMIC INNOVATION

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: 2905/99/MH/mvd
 Supersedes: 07/4199/MH/mvo
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Price List No. III 078

The information, recommendations and opinions set forth herein are offered solely for your consideration, inquiry and verification, and are not, in part or total, to be construed as constituting a warranty or representation for which we assume legal responsibility. Nothing contained herein is to be interpreted as authorization to practice a patented invention without a license.

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KERAMAB

REFRACTORY & CERAMIC INNOVATION

Glass ceramics NEOCERAM N-0

Technical datas

Thermal expansion

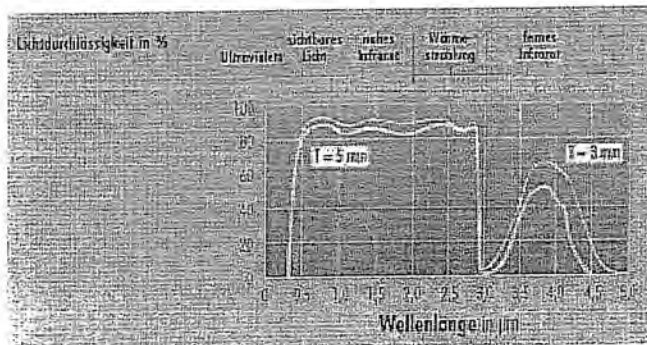
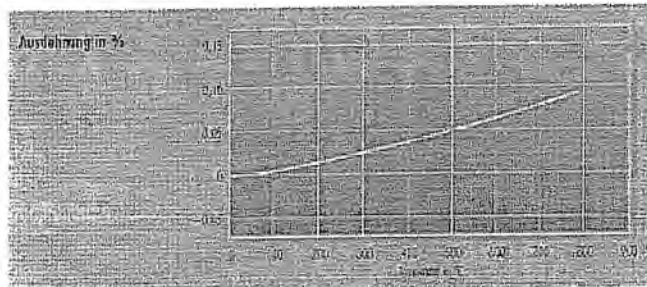
Light transmission

Surface character

Flat glasses/Coated glass ceramics/Installation instructions

Technical datas

Expansion coefficient	· 10 ⁻⁷ /K	(30 - 380° C) – 6 (30 - 750° C) – 3
Thermal shock resistance	°C	800
Maximum service temperature	°C	long term 700 short term 800
Thermal conductivity	W/m · K (25° C)	1,51
Specific heat	J/kg · K	712
Density	g/cm ³	2,51
Bending and impact strength	correspondent to the datas of casting glass	



Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Section 4

Manufacturer Owner's Manual

morsø

By appointment to  the Royal Danish Court

Installation and Operating Instructions 2B Classic

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@morseo.com · Website: www.morseo.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 2B Classic meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after July 1, 1990

The Morsø 2B Classic 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:

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1.2	The chimney / flue system	6
1.3	Flue Connection	7
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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.

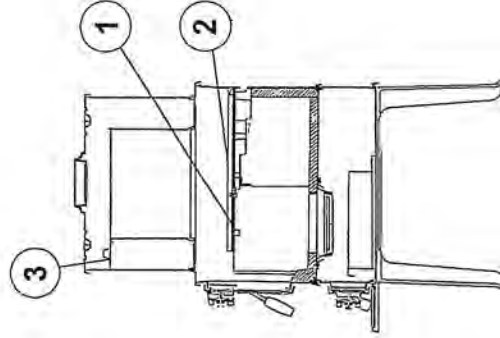
Do not connect to any air distribution duct or system.

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.

Before starting the initial fire, make sure that the baffle (1) and insulation (2) over the baffle are placed correctly, as shown on the images below. Also check that the cover (3) are placed correctly.



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.

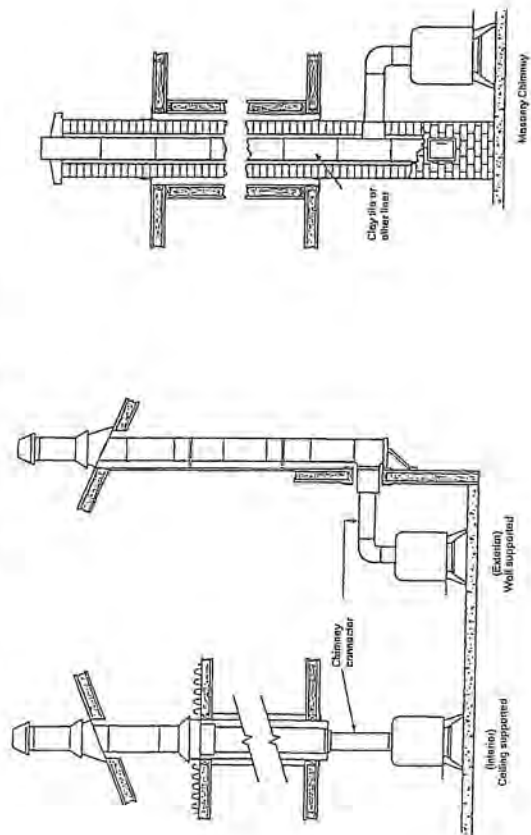
High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F.) or a code-approved masonry chimney with flue liner for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

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 Morse dealer.

Typical Factory-Built or Masonry Chimney Installations



1.3 Flue Connection

A flue collar are placed in the firebox area.

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).

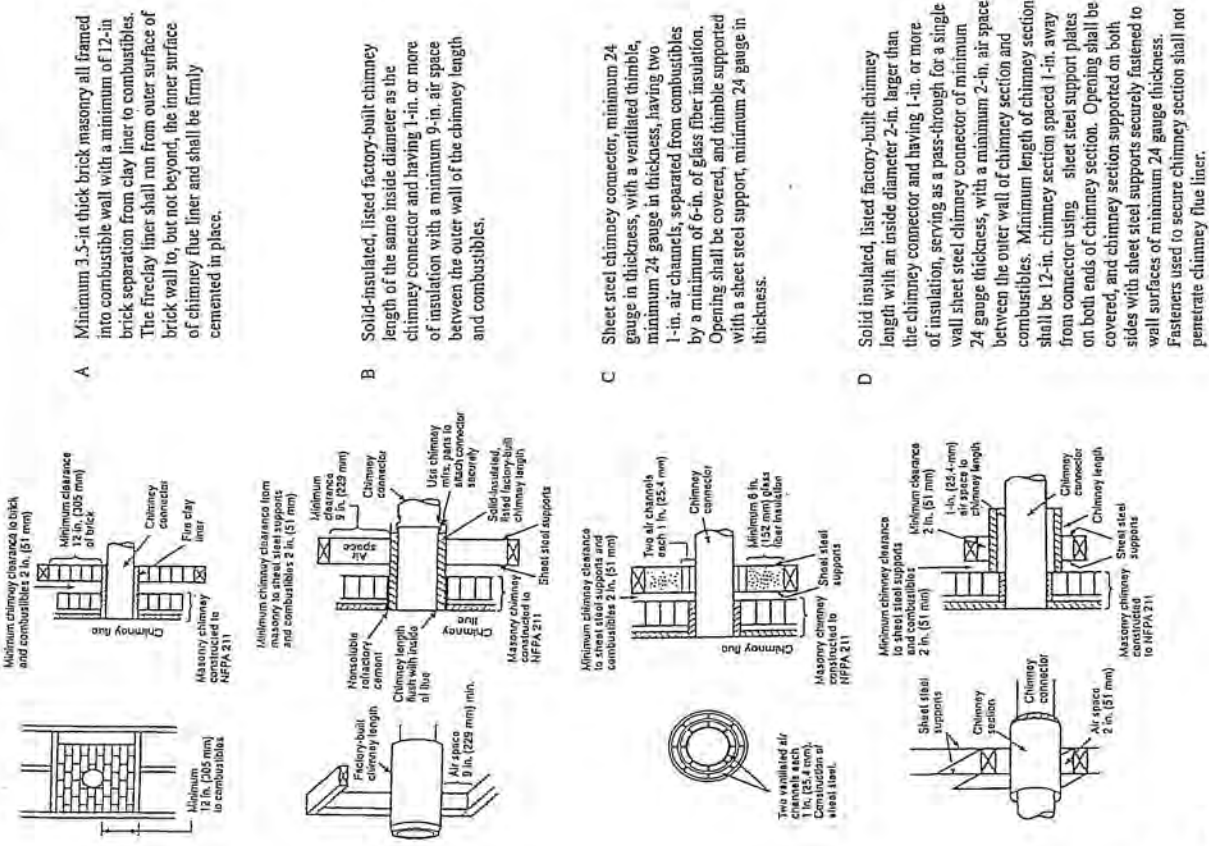
Information on assembling and installing connectors is provided by the manufacturer's instructions exactly as you assemble the connector and attach it to the stove and chimney.

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-E365.

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

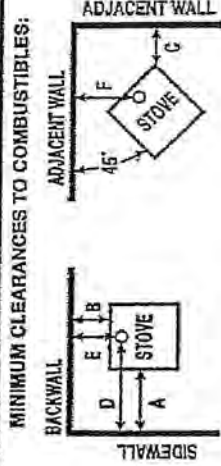


1.5 Positioning the stove Distance to walls and lintel

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 become detached with the effects of heat and care should be taken to ensure that they do not fall towards the stove in such an event.

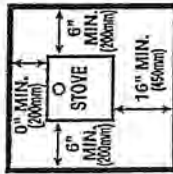
When the stove is positioned near *non-combustible* materials, a gap of 4 inches or more is recommended for cleaning purposes and to ensure that heat circulates around the stove and out into the room.

CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION (SINGLEWALL & DOUBLEWALL CONNECTOR):	
	USA	Canada
A. SIDEWALL TO UNIT	26" (660 mm)	26" (660 mm)
B. BACKWALL TO UNIT	16" (406 mm)	16" (406 mm)
C. CORNERWALL TO UNIT	22" (559 mm)	22" (559 mm)
D. SIDEWALL TO CONNECTOR	29" (737 mm)	29" (737 mm)
E. BACKWALL TO CONNECTOR	24" (610 mm)	24" (610 mm)
F. CORNERWALL TO CONNECTOR	29" (737 mm)	29" (737 mm)
G. UNIT TO CEILING		
H. FLOOR TO CEILING		



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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

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.

Do NOT install in a mobile home

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.

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 15 inches (38 cm) and approx. 3 to 3.5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 2 Lbs. 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 spinner on the door. Open the spinner will allow a supply of preheated air to enter the firebox via the 'airwash' system situated inside the stove and above the glass.

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 on the frontdoor.

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.

To form a reasonable bed of ash on the floor of the stove, you should use 2-4 pounds of dry kindling at the initial lighting. If possible, maintain a 1-1.5 inch (2-3 cm) layer of ash on the floor of the combustion chamber for added insulation.

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, marse kindling bags or 7-10 pieces of twisted paper under the dry kindling wood (see below).
3. After lighting, partially close the frontdoor, leaving it open an inch or two to allow in plenty of combustion air. The ashdoor must be closed during the firing.
4. When the chimney is warm after about 5-10 minutes, the frontdoor should be closed. A suitable layer of ember will be formed after a about 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 onto the embers. Leave half an inch (1 cm) or more between each piece.
7. Close the frontdoor. Leave the primary air supply fully open.
8. After a few minutes, adjust the primary air supply to suit your heating requirements.
9. For refueling, add a layer of wood while there are still plenty of live embers, Repeat steps 5-8.

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 the door open. The ashdoor must be closed during the firing.

If the door 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 Sanotherm 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

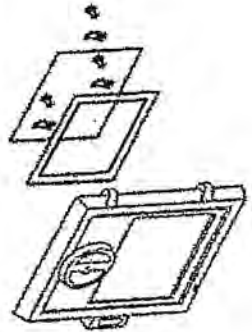
Replace broken glass immediately.

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. Lift the door off the hinges and place it face down on a sheet of cardboard or other nonabrasive fabric.

2. Unscrew the 3 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 larger 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!

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

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Gasket

The gasket around the perimeter of the door 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. 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 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, 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.

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 clear-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 handle for tightness. Adjust if needed.

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.

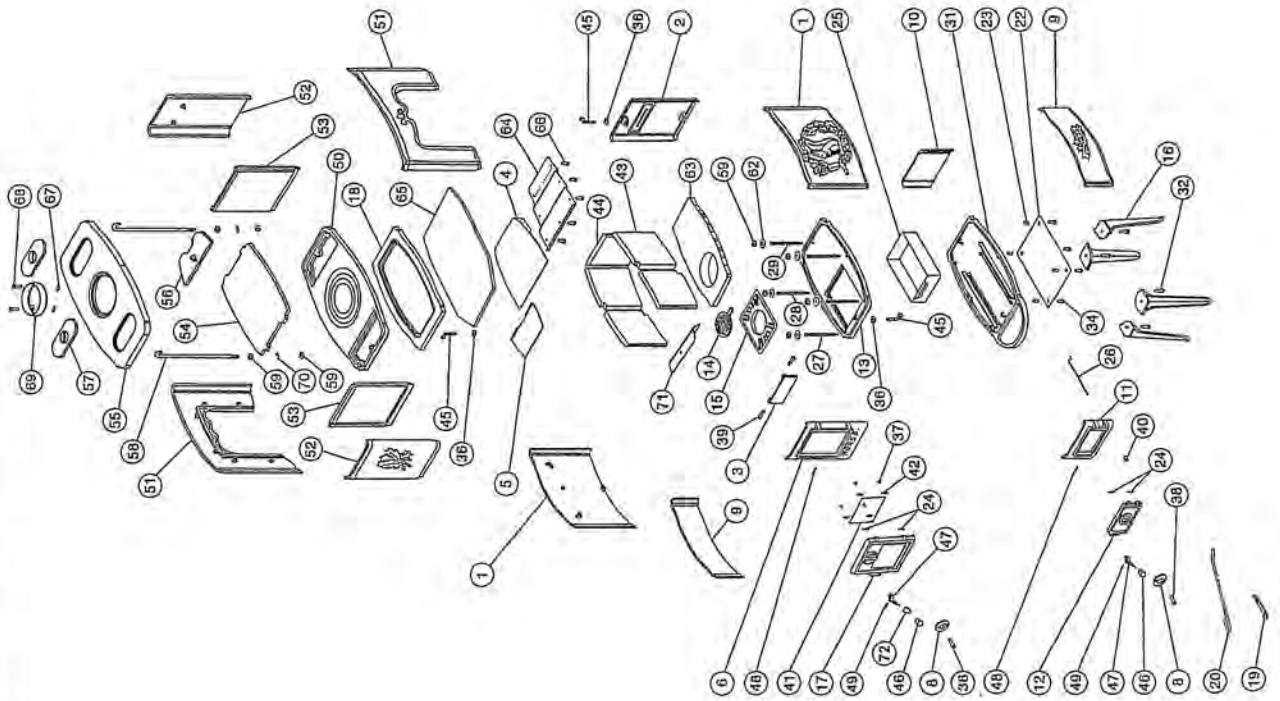
NOTE: It is best to thoroughly clean the stove after the heating season has concluded. Adding a desiccant, such as kitter litter, into the ash pan helps absorb moisture during the summer months. Be sure to remove this prior to the heating season.

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 2B Classic



3.6 Parts list for model Morsø 2B Classic

Pos.No.	Parts	2B Classic
1	Squirrel Side Panel	442003XX
2	Rear Plate	442037XX
3	Smoke Valve	44200800
4	Horizontal Baffle	44203600
5	Vertical Baffle	44203800
6	Front	442015XX
8	Air Controls	442022XX
9	Side Panel for Upper Part	442025XX
10	Rear Plate for Lower Part	442026XX
11	Front for Lower Part	442027XX
12	Ash Door	442028XX
13	Intermediate Grate Frame	442029XX
14	Riddling Grate	44203000
15	Inner Grate Frame	44203100
16	Leg	442032XX
17	Door	442034XX
18	Frame	442111XX
19	Riddling Handle	442620XX
20	Poker	541075
22	Reclation Shield - Base	54137000
23	Distance Tube	541439
24	Hinge Pin	541808
25	Ash Can	542051
26	Riddling Handle	542052
27	Bolt	-
28	Bolt	-
29	Bolt	-
31	Base	54209400
32	Black screw	-
34	Black screw	-
36	Black steel screw	-
37	Screw	-
38	Screw	-
39	Screw	-
40	Knop for riddling handle	752619
41	Door Glass	790715
42	Glass Clips	790743
43	Side Brick	790932
44	Rear Brick	790933
45	Bolt	-
46	Bakelite Handle 36 mm	79118200
47	Clasp	79127000
48	Pin	791868
49	Pin	791869
50	Intermediate Grate Frame	44211200
51	Side Panel for Upper Part	44211300
52	Rear Panel for Upper Part	44211400

3.6 Parts list for model Morsø 2B Classic

Pos.No.	Parts	2B Classic
53	Inside rear panel upper part	44211500
54	Inside top - upper part	44211600
55	Top - upper part	44211700
56	Cover - upper part	44211800
57	Access Door Upper Part	44211921
58	Bolt	-
59	Bolt	-
62	Washer	-
63	Brick - Base	79209200
64	Baffle - standless steel	71209061
65	Insulation	79077100
66	Screw	-
67	Fitting for Cover w. thread	44256700
68	Screw	-
69	Flue Collar	44140921
70	Fitting w/o thread	44256800
71	Radiation Shield - Front	71209161
72	Fitting for handle	75140161

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Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Section 5

Quality Assurance/Quality Control

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 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: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

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

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
 Model: 2B Classic
 Project #: 192-S-06-3 Tracking #: 785
 Date: 10-27-05 Test Crew: B. A. AUS Run #: 1
 Sample Train #: A Train assembled by: _____
 Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 291
 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							
Lab ID # _____	<u>10-28-05</u>	<u>1805</u>	<u>.5492</u>	<u>.5001</u>	<u>10</u>	<u>69</u>	<u>BA</u>
ID # <u>M 870</u>	<u>11-1-05</u>	<u>0925</u>	<u>.5490</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>.5436</u>							
D/T in desiccator <u>10-27-05 1730</u>							
Preliminary wt.: <u>.5495</u>							
Rear Filter							
Lab ID # <u>M 839</u>	<u>10-28-05</u>	<u>1805</u>	<u>.5401</u>	<u>.5001</u>	<u>10</u>	<u>69</u>	<u>BA</u>
ID # <u>5397</u>	<u>11-1-05</u>	<u>0925</u>	<u>.5397</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BA</u>
Tare wt. _____							
D/T in desiccator: <u>10-27-05 1730</u>							
Preliminary wt.: <u>.5406</u>							
Acetone Rinse							
Lab ID # _____	<u>11-1-05</u>	<u>0925</u>	<u>104.5062</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BA</u>
Beaker # <u>842</u>	<u>11-2-05</u>	<u>0805</u>	<u>104.5055</u>	<u>.5001</u>	<u>10</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>104.4998</u>	<u>11-3-05</u>	<u>0750</u>	<u>104.5059</u>	<u>.5001</u>	<u>12</u>	<u>68</u>	<u>BA</u>
Volume <u>105</u> ml							
Cleaned by: <u>BA</u>							
Solvent #: <u>SA075</u>							
D/T in desiccator: <u>10-31-05 0740</u>							
Preliminary wt.: <u>104.5070</u>							

Technician signature: BA Date: 11-3-05

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso

Model: 2B Classic

Project #: 192-S-06-3 Tracking #: 785

Date: 10-28-05 Test Crew: BADens Run #: 2

Sample Train #: A Train assembled by: BA

Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 291

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							
Lab ID # _____	<u>10-29-05</u>	<u>1810</u>	<u>.5480</u>	<u>.5001</u>	<u>12</u>	<u>67</u>	<u>BA</u>
ID # <u>M 842</u>	<u>11-1-05</u>	<u>0925</u>	<u>.5478</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>.5263</u>							
D/T in desiccator <u>10-28-05 1445</u>							
Preliminary wt.: <u>.5482</u>							
Rear Filter							
Lab ID # _____	<u>10-29-05</u>	<u>1810</u>	<u>.5325</u>	<u>.5001</u>	<u>12</u>	<u>69</u>	<u>BA</u>
ID # <u>M 841</u>	<u>11-1-05</u>	<u>0925</u>	<u>.5322</u>	<u>.5001</u>	<u>9</u>	<u>69</u>	<u>BA</u>
Tare wt. <u>.5314</u>							
D/T in desiccator: <u>10-28-05 1445</u>							
Preliminary wt.: <u>.5325</u>							
Acetone Rinse							
Lab ID # _____	<u>11-1-05</u>	<u>0925</u>	<u>117.1639</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BA</u>
Beaker # <u>2263</u>	<u>11-2-05</u>	<u>0805</u>	<u>117.1632</u>	<u>.5001</u>	<u>10</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>117.8567</u>	<u>11-3-05</u>	<u>0750</u>	<u>117.1637</u>	<u>.5001</u>	<u>12</u>	<u>68</u>	<u>BA</u>
Volume <u>95 ml</u>							
Cleaned by: <u>BA</u>							
Solvent #: <u>SA075</u>							
D/T in desiccator: <u>10-31-05 0740</u>							
Preliminary wt.: <u>117.1646</u>							

Technician signature: BA Date: 11-3-05

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
 Model: 2B Classic
 Project #: 192-S-06-3 Tracking #: 785
 Date: 10-28-05 Test Crew: BD Run #: 3
 Sample Train #: A Train assembled by: BD
 Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 291
 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							
Lab ID # _____	<u>10-29-05</u>	<u>1810</u>	<u>.5369</u>	<u>.5001</u>	<u>12</u>	<u>69</u>	<u>BD</u>
ID # <u>M844</u>	<u>11-1-05</u>	<u>0925</u>	<u>.5368</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BD</u>
Tare wt. <u>.5311</u>							
D/T in desiccator <u>10-28-05 1740</u>							
Preliminary wt.: <u>.5368</u>							
Rear Filter							
Lab ID # _____	<u>10-29-05</u>	<u>1810</u>	<u>.5321</u>	<u>.5001</u>	<u>12</u>	<u>69</u>	<u>BD</u>
ID # <u>M843</u>	<u>11-1-05</u>	<u>0925</u>	<u>.5320</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BD</u>
Tare wt. <u>.5320</u>							
D/T in desiccator: <u>10-28-05 1740</u>							
Preliminary wt.: <u>.5322</u>							
Acetone Rinse							
Lab ID # _____	<u>11-1-05</u>	<u>0925</u>	<u>102.4517</u>	<u>.5001</u>	<u>9</u>	<u>68</u>	<u>BD</u>
Beaker # <u>2175</u>							
Tare wt. <u>102.4470</u>	<u>11-2-05</u>	<u>0805</u>	<u>102.4509</u>	<u>.5001</u>	<u>10</u>	<u>68</u>	<u>BD</u>
Volume <u>75</u> ml							
Cleaned by: <u>BD</u>	<u>11-3-05</u>	<u>0750</u>	<u>102.4513</u>	<u>.5001</u>	<u>12</u>	<u>68</u>	<u>BD</u>
Solvent #: <u>SA075</u>							
D/T in desiccator: <u>10-31-05 0740</u>							
Preliminary wt.: <u>102.4526</u>							

Technician signature: BD Date: 11-3-05

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso

Model: 2B Classic

Project #: 192-S-06-3 Tracking #: 785

Date: 10-31-05 Test Crew: B. Davis Run #: 4

Sample Train #: A Train assembled by: BA

Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 291

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							
Lab ID # _____	<u>11-1-05</u>	<u>1515</u>	<u>.5495</u>	<u>.5001</u>	<u>12</u>	<u>69</u>	<u>BA</u>
ID # <u>M846</u>	<u>11-3-05</u>	<u>0750</u>	<u>.5494</u>	<u>.5001</u>	<u>12</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>.5449</u>							
D/T in desiccator <u>10-31-05 1420</u>							
Preliminary wt.: <u>.5508</u>							
Rear Filter							
Lab ID # _____	<u>11-1-05</u>	<u>1515</u>	<u>.5450</u>	<u>.5001</u>	<u>12</u>	<u>69</u>	<u>BA</u>
ID # <u>M845</u>	<u>11-3-05</u>	<u>0750</u>	<u>.5451</u>	<u>.5001</u>	<u>12</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>.5462</u>							
D/T in desiccator: <u>10-31-05 1420</u>							
Preliminary wt.: <u>.5462</u>							
Acetone Rinse							
Lab ID # _____	<u>11-2-05</u>	<u>0940</u>	<u>110.9072</u>	<u>.5001</u>	<u>11</u>	<u>69</u>	<u>BA</u>
Beaker # <u>1009</u>	<u>11-3-05</u>	<u>0750</u>	<u>110.9076</u>	<u>.5001</u>	<u>12</u>	<u>68</u>	<u>BA</u>
Tare wt. <u>110.9029</u>							
Volume <u>80</u> ml							
Cleaned by: <u>BA</u>							
Solvent #: <u>SA075</u>							
D/T in desiccator: <u>11-1-05 0925</u>							
Preliminary wt.: <u>110.9097</u>							

Technician signature: BA Date: 11-3-05

Date Placed in Desiccator

18-Aug-05

Balance ID Number

OMNI-00023

Time Placed in Desiccator

8:10 AM

Audit Weight ID Number

OMNI-00131

Technician

Morgan

Thermometer/Hygrometer ID Number

Date: 8/25/2005

8/26/2005

Time: 7:50 AM

9:50 AM

RH %: 4

6

T (F): 74

80

102 mm Filters

Davis

102 mm ID Number

0.5001

Manufacturer

0

Appliance

0

Project No.

0

Run

0

Train

0

M839

0.5397

0.5397

0

Moroso

2B Classic

192-S-06-3

1

A

M840

0.5436

0.5436

0

Moroso

2B Classic

192-S-06-3

1

A

Model: 2B Classic
 Morsø Jernstøberi A/S
 Furvej 6 DK-7900
 Nykøbing Mors
 DENMARK

Calibrations

Method 28 and 5G

Method 28 and 5G:

ID #	Lab Name/Purpose	Log Name	Attachment Type
1	Calibrator Dry Gas Meter	Standard Test Meter – Rockwell Int'l	Calibration Log
32	Vaneometer	Vaneometer, Air Velocity Meter – Dwyer	Calibration Log
131	500 mg Weight	Weight Standard, 500 mg – Ohaus	Calibration Log
183	Moisture Meter	Moisture Meter – Delmhorst	Manual
209	Barometer	Barometer – Princo	Manual Cover
274	10 lb Weight	Weight Standard, 10 lb.	Calibration Log
291	Relative Humidity Gauge	Digital Hygrometer/Thermometer – VWR	Calibration Log
298	Data Logger Temp. Readout	Temp. Readout – National Instruments	Calibration Log
298	Data Logger Manometer	Stack-Draft Manometer – Dwyer	Calibration Log
298	Data Logger Dry Gas Meter	Dry Gas Meter – National Instruments	Post-Test Calibration Log
306	Stopwatch	Stopwatch – Sportline	Calibration Log

Standard Gas Test Meter Calibration vs. Bubble Flowmeter

Date: 4/20/05
 Calibrated by: K. Morgan
 Standard Test Meter S/N: OMNI 00001
 Bubble Flow Meter S/N: OMNI 00134
 Barometric Pressure: 29.94 "Hg

Average Y Factor: 0.9823

(Volume: 1.000 liters = 0.035336 ft3, NIST traceable)

Signature/Date: K. Morgan 4-20-05

Flow Rate #1			
dH(pressure across meter, "H2O):		0.1	
	Run #1	Run #2	Run #3
Standard Test Meter			
Initial Volume (ft3):	941.687	942.593	943.237
Final Volume (ft3):	942.56	943.237	944.003
Initial Temperature (oF):	78	78	79
Final Temperature (oF):	79	79	79
Elapsed Time (minutes):	4	3	3
(seconds):	0	0	30
Flow rate, Q (cfm):	0.2182	0.2147	0.2189
Bubble Flowmeter			
Time 1:	9.91	9.87	9.83
Time 2:	9.83	9.92	9.83
Time 3:	9.9	9.92	9.83
Time 4:	9.84	10	9.91
Time 5:	9.94	9.88	9.9
Initial Temperature (oF):	78	79	79
Final Temperature (oF):	78	79	79
Vacuum ("H2O):	1	1	1
Flow rate, Q (cfm):	0.2145	0.2138	0.2150
Y factor:	0.9835	0.9946	0.9823

Deviation of Y factor is acceptable

Flow Rate #2			
dH(pressure across meter, "H2O):		0.23	
	Run #1	Run #2	Run #3
Standard Test Meter			
Initial Volume (ft3):	944.414	946.058	946.713
Final Volume (ft3):	946.058	946.713	947.52
Initial Temperature (oF):	79	81	81
Final Temperature (oF):	81	81	81
Elapsed Time (minutes):	5	2	2
(seconds):	0	0	30
Flow rate, Q (cfm):	0.3288	0.3275	0.3228
Bubble Flowmeter			
Time 1:	6.72	6.53	6.59
Time 2:	6.56	6.62	6.63
Time 3:	6.64	6.59	6.59
Time 4:	6.54	6.63	6.61
Time 5:	6.65	6.59	6.67
Initial Temperature (oF):	79	81	81
Final Temperature (oF):	81	81	81
Vacuum ("H2O):	1	1	1
Flow rate, Q (cfm):	0.3202	0.3216	0.3204
Y factor:	0.9735	0.9818	0.9922

Deviation of Y factor is acceptable

Flow Rate #3			
dH(pressure across meter, "H2O):		0.3	
	Run #1	Run #2	Run #3
Standard Test Meter			
Initial Volume (ft3):	948.092	949.054	950.2
Final Volume (ft3):	949.054	950.2	951.143
Initial Temperature (oF):	81	81	82
Final Temperature (oF):	81	82	83
Elapsed Time (minutes):	2	3	2
(seconds):	30	0	30
Flow rate, Q (cfm):	0.3848	0.3820	0.3772
Bubble Flowmeter			
Time 1:	5.66	5.66	5.74
Time 2:	5.74	5.56	5.74
Time 3:	5.6	5.64	5.72
Time 4:	5.56	5.74	5.66
Time 5:	5.61	5.72	5.7
Initial Temperature (oF):	81	82	83
Final Temperature (oF):	81	82	83
Vacuum ("H2O):	1	1	1
Flow rate, Q (cfm):	0.3763	0.3743	0.3712
Y factor:	0.9777	0.9788	0.9829

Deviation of Y factor is acceptable

Flow Rate #4			
dH(pressure across meter, "H2O):		0.38	
	Run #1	Run #2	Run #3
Standard Test Meter			
Initial Volume (ft3):	951.791	952.636	953.487
Final Volume (ft3):	952.636	953.487	954.335
Initial Temperature (oF):	82	82	82
Final Temperature (oF):	82	82	83
Elapsed Time (minutes):	2	2	2
(seconds):	0	0	0
Flow rate, Q (cfm):	0.4225	0.4255	0.4240
Bubble Flowmeter			
Time 1:	5	5.08	4.86
Time 2:	5.1	5.06	4.94
Time 3:	5.1	4.98	5
Time 4:	5.11	5	4.99
Time 5:	5	5.02	4.96
Initial Temperature (oF):	82	82	82
Final Temperature (oF):	82	82	83
Vacuum ("H2O):	1	1	1
Flow rate, Q (cfm):	0.4188	0.4217	0.4283
Y factor:	0.9911	0.9908	1.0099

Deviation of Y factor is acceptable

Standard Gas Test Meter Calibration vs. Bubble Flowmeter

Date: 4/20/05
 Calibrated by: K. Morgan
 Standard Test Meter S/N: OMNI 00001
 Bubble Flow Meter S/N: OMNI 00134
 Barometric Pressure: 29.94 "Hg

Average Y Factor: 0.9823

(Volume: 1.000 liters = 0.035336 ft3, NIST traceable)

Signature/Date: _____

Flow Rate #5			
dH(pressure across meter, "H2O):	0.58		
	Run #1	Run #2	Run #3
Standard Test Meter			
Initial Volume (ft3):	956.397	957.689	958.711
Final Volume (ft3):	957.689	958.711	959.725
Initial Temperature (oF):	83	83	84
Final Temperature (oF):	84	84	85
Elapsed Time (minutes):	2	2	2
(seconds):	30	0	0
Flow rate, Q (cfm):	0.5168	0.5110	0.5070
Bubble Flowmeter			
Time 1:	4.34	4.26	4.34
Time 2:	4.26	4.26	4.36
Time 3:	4.34	4.29	4.26
Time 4:	4.3	4.28	4.26
Time 5:	4.34	4.28	4.24
Initial Temperature (oF):	83	83	84
Final Temperature (oF):	84	84	85
Vacuum ("H2O):	1	1	1
Flow rate, Q (cfm):	0.4912	0.4961	0.4940
Y factor:	0.9503	0.9705	0.9741
Deviation of Y factor is acceptable			

Acceptance criteria, Method 5 section 16.1.1.5

- The difference between the maximum and minimum values at each flow rate should be no greater than 0.030.
- The meter coefficients (Y) should be between 0.95 and 1.05.

CALIBRATION RECORD

Vaneometer Air Velocity Meter – OMNI-00032

CALIBRATION/SERVICE RECORD			
DATE	BY	RESULTS	DATE OF NEXT CALIBRATION
3/10/98	BD	Installed new vane from factory	9/10/98
9/3/98	BD	Installed new vane from factory	3/3/99
3/8/99	JS	Installed new vane from factory	9/8/99
9/10/99	BD	Installed new vane from factory	3/10/00
3/10/00	BD	Installed new vane from factory	9/10/00
9/13/00	BD	Installed new vane from factory	3/13/01
5/4/01	BD	Installed new vane from factory	11/4/01
11/30/01	BD	Installed new vane from factory	5/30/02
3/20/02	BD	Installed new vane from factory	9/20/02
9/14/02	BD	Installed new vane from factory	3/14/03 ✓
3/14/03	BD	Installed new vane from factory	9/14/03
1-19-04	BD	Installed new vane from factory	7-19-04
7-16-04	BD	Installed new vane from factory	1-16-05
1-16-05	BD	Installed new vane from factory	7-16-05
7-14-05	BD	Installed new vane from factory	1-14-06
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	

Certificate of Calibration

Certificate # 286629

Page #1 of 1

Order Date: 13Nov2003

For: OMNI-TEST LABORATORIES

56

Department: NO

PO#: PAM BLACKBURN



JJ Calibrations, Inc.



#0723.01

Instrument Identification

Property #: OMNI-00131

Serial #: 27503

Make: OHAUS

User:

Model: 500mg

Noun: 500mg WEIGHT

Accuracy: CLASS F

Certification Information

As Found: Within Tolerance

Calibration Date: 19Nov2003

As Left: Within Tolerance

*Client Specified Due Date: 19Nov2004

Adjustments: None

Repairs: None

Seals: N/A

Environment: 20°C 33% RH

Procedure: CP 16

Technician: 34

Remarks

SEE DATA SHEET FOR MEASUREMENT RESULTS.

*Any number of factors may cause this item to drift out of calibration before the recommended due date has expired.

Standards Used

ID#	Manufacturer	Model#	Nomenclature	Due Date	Trace ID
432	SARTORIUS	C-44	MICROBALANCE 5.1g	19Nov2004	285515

JJ Calibrations, Inc., certifies that this instrument has been compared in accordance with the above referenced procedure using standards with accuracies traceable to the National Institute of Standards and Technology, derived from accepted values of physical constants, derived from ratio measurements, or compared to consensus standards. The results contained herein relate only to the item calibrated. This certificate is in compliance with the applicable requirements of; ISO 17025, ANSI/NC SL Z540-1, MIL-STD-45662A, ISO 10012-1, ISO-9002 and QS-9000.

A Test Accuracy Ratio (TAR) of at least 4:1, if achievable, is maintained unless otherwise stated.

This uncertainty expression is expanded at approximately the 95% confidence level, coverage factor (k=2).

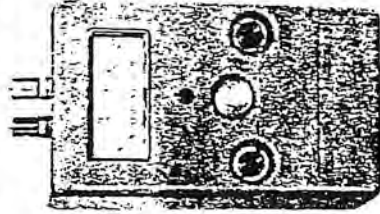
Technical Reviewer

Quality Assurance

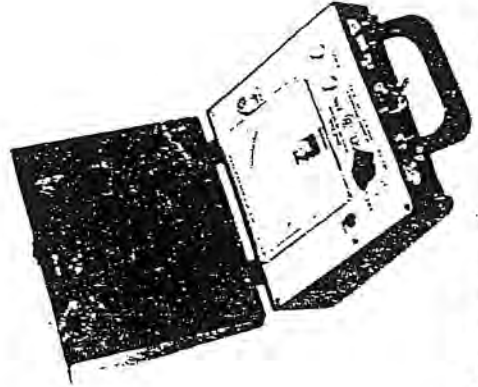
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Issued 19Nov2003
Rev # 11

OWNER'S MANUAL



MOISTURE DETECTORS FOR WOOD



DELMHORST INSTRUMENT COMPANY

DELMHORST INSTRUMENT COMPANY
BOONTON, N. J. 07005

5074-578

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MOISTURE DETECTORS

HOW TO MAKE THE BEST USE OF THEM

The Moisture Detector models of the RC, G-2 and J Series (Pocket Tester) are portable, battery powered instruments designed to measure the moisture content in wood. Meters are calibrated so that wood moisture content is read directly on the meter dial. The standard calibration is made on Douglas Fir at a temperature of 70°F. Contact between meter and wood is made by means of an Electrode. Electrode(s) should be selected primarily on the basis of wood thickness to be tested.

ACCURACY OF MOISTURE DETECTORS

Moisture Detectors will give most satisfactory service if properly kept, and used in accordance with operating instructions.

The Delmhorst Moisture Meters utilize the principle that a definite relation exists between moisture content and electric resistance in wood. A "resistance" moisture meter actually measures the electric resistance in wood as a function of the moisture content. In order to measure the electric resistance of a board we drive two pins into the wood (or 2 sets of pins in the case of multiple-pins electrode), and have a current flow between them. The higher the moisture content, the lower the resistance. The meter "reads" moisture in that area of the board which is in contact with the electrode pins, and it tends to read the highest moisture content in that area.

Significant differences in moisture content may exist in the same board, especially during drying. Such differences largely depend on the species of the wood and on the range of moisture present in it. Generally, the lower the moisture content the more uniform is the moisture distribution; the higher the moisture content, greater are the variations in moisture from one point to the other. When the oven test is used for determining the moisture content of a board, the result is the average moisture content of the sample tested, which may or may not be equal to the average moisture content of the rest of the board, because of the differences that frequently occur, especially during the drying process.

On the other hand, if measurements are made with a moisture meter on the same sample, various tests may yield different readings and

even an average of these readings may not agree with the average obtained in the oven test.

Moisture meter readings and oven tests are in closest agreement if moisture content in a board has a very uniform distribution. Since it is well known that distribution of moisture content becomes more uniform at lower moisture range, meter readings may be expected to fall within the following tolerances:

0.5% on range of	5 - 12%
1.0% "	12 - 20%
2.0% "	20 - Saturation point.

AVERAGE MOISTURE CONTENT

When wood is in the process of drying and all of it has been dried below the fibre saturation point, the fibres located at 1/5th of the thickness from the surface have the same moisture content as the average of the section. Therefore, driving the contact pins of the electrode to a depth of 1/5th of the thickness of the wood will indicate a moisture content close to the average of the section.

Tests should be made at least one-foot from the end and 1 inch from the edge and at three diagonal points across the width of the board. The average of the various readings should be the correct answer.

As it has been stated before, the average moisture content as determined by an oven test and the average moisture content as measured by the moisture meter may not agree, unless the wood is well seasoned and has a uniform moisture distribution.

The question often asked is "which one of the two is the more reliable method for accurate measurements"? The two methods are not actually exclusive of each other. Oven tests, properly run by expert personnel with efficient and accurate equipment, are very accurate, but their results can be safely applied only to the specific sample(s) tested. Furthermore, the oven method is not practical if a considerable number of tests are to be made - it is time consuming and is a "destructive" test (in order to obtain a sample, a board has to be cut).

Electric meters' tests are also very accurate, if we consider the moisture content in the area which is in contact with the electrode pins. In addition many "non-destructive" tests can be made in a very short time so that not only an "average" moisture content can be determined, but also variations of moisture are detected.

When measuring moisture content it is not only important to measure the average but also the range of moisture content. A few high moisture content pieces may have only a small effect on the average moisture content but will result in rejections when associated with wood having a lower average moisture content. Both determinations and their accuracy, must be considered in relation to the ultimate use of the wood. For example, wood to be used indoors will generally attain its equilibrium moisture content between 4 and 10% with a usual average of 6 to 7% in most parts of the U.S.A. The amount of variation that can be tolerated depends on the product to be manufactured from it.

Lumber used in the production of fine furniture must not only be dried to an average of 6 to 7% but there must be little difference (usually less than 2%) among the pieces, and between the shell and core.

The meter is calibrated for use with a 4-pin electrode. When using an electrode with two insulated pins slightly lower readings are obtained. A correction of .5% to 1.5% should be added, according to the range of moisture content (See pg. 12).

EFFECT OF WOOD SPECIES ON METER READINGS

Different species of wood have different electrical properties and, as a result read differently for the same moisture content. The Moisture Detector is calibrated so as to read the moisture content of Douglas fir directly. See species corrections table, for other species of wood. The correction below 10% for many species, is so small that it can be disregarded and the meter read directly.

EFFECTS OF TEMPERATURE

As the temperature of wood increases, the electrical resistance decreases and vice-versa. The rate of change is not constant and, for accurate correction factor the temperature correction tables must be consulted. In the range 7 to 12%, the correction is approximately 1% for every 20°, which is subtracted from the meter reading if the temperature of the wood is higher than 70°F, and added if it is lower than 70°F. Most accurate tests are made when the temperature of the wood is approximately the same as the surroundings as it is difficult to measure the temperature of wood whose temperature is changing; as for example, wood just removed from a dry kiln and tested outside.

NUMBER OF MEASUREMENTS

Whatever the method used in measuring moisture content of lumber they are all intended to provide the most accurate information regarding the moisture condition of an entire board. Such accuracy does not only depend on the accuracy of the procedure or of the equipment used, but also on how "representative" the samples are in relation to the load. Theoretically, if one can be certain that all the boards of a load have the same moisture content, and that the moisture distribution is quite uniform in each board, one meter reading only, or 1 only oven test should be sufficient.

Such "ideal" condition does not occur very frequently. On the contrary, variations do occur in almost every board. If the lumber is properly seasoned the variations are contained within "safe" limits. However, it should be clear that the greater the number of tests the more accurate the final-determination.

The end use of the lumber should indicate how accurate an evaluation of the moisture content is required. For critical use, 5% or even 10% of the load should be tested. It is advisable that a large percentage of pieces be tested when starting to test for moisture. If it is apparent that the lumber is well dried, because of the small difference between readings, the number of tests can be reduced. However, it is important that some tests be made on boards that come from all parts of a load.

SELECTION OF THE ELECTRODE

A standard 4 pin Electrode (Delmhorst Type 4-E) having a 5/16" penetration can be used on most lumber up to 1 1/2" thick. Satisfactory tests can be made with the 4-E Electrode even on wood 2" thick provided the lumber has a low moisture content, normally associated with uniform moisture distribution. Thicker lumber should be tested with electrodes having deeper penetration, such as the Delmhorst Type 26-E and 18-E.

The 26-E has a penetration of 1", the 18-E a penetration of 3". The contact pins of these electrodes are insulated except for approximately 1/8" at their points so that they measure only the moisture of the wood in contact with the uncoated points. These electrodes are generally used for making shell and core tests without cutting the sample.

Thin wood, such as veneer, is tested by using contact pins with very shallow penetration, such as Delmhorst Type 18-E.

When making tests, contact pins should be driven into sound wood. If poor contact is made the moisture content will be understated. Uncoated pins should be driven into the wood to their full length, coated pins to the desired depth.

GRAIN DIRECTION

As the resistance of wood is greater across the grain than with the grain, the electrode should be applied so that current flows parallel to the grain. The effect due to the current flowing across the grain is very small when the moisture content is less than 10% and can be disregarded. At 20% the meter will read about 2% lower when the electrode is placed so that the current flows across the grain.

EFFECTS OF PRESERVATIVES

Organic treatments, such as creosote and pentachlorophenol, have little effect on the accuracy of moisture meter readings. On the other hand, inorganic salts such as zinc chloride and fire retardant compounds electrify rapidly and affect the readings by indicating a higher moisture content than is actually present.

TESTING PLYWOOD

Most of the animal and vegetable glues have no effect on moisture meter readings. Therefore, when the contact pins penetrate a glue line, if it is dry the moisture content of the wood is accurately measured. In fact, the moisture meter is frequently used to determine when a glue joint is dry.

Many of the resin glues do affect the meter readings because they have a lower electrical resistance than the wood. The effect will be greater at a high moisture content than at a low moisture content.

The moisture meter can be used to show whether or not the glue affects the accuracy of the meter. Drive the contact pins through not more than one half the thickness of the first ply and read the meter.

Then, drive the pins so that they just pass through the first glue line. If there is no appreciable increase in moisture meter reading as the pins make contact with the glue line, the glue may be considered to have no effect and the readings will be correct. The pins should then be driven to their full length and the moisture content read on the meter.

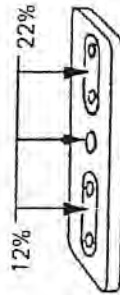
CALIBRATION MOISTURE STANDARDS

Moisture Detectors are accurately calibrated at the factory and they generally hold the calibration indefinitely. If there is doubt as to the accuracy of the Moisture Detector, the calibration is easily checked by use of the Moisture Content Standards which are available for 12% and 22% moisture content.

HOW TO USE MOISTURE STANDARDS

The Moisture Meter (with the electrode not connected to it) should be adjusted in accordance with the operating instructions. After the electrode is connected to the Detector, there should be no appreciable change in the meter reading.

The electrode pins are then applied against the plates on the face of the standard; one pin to the center point, the other pin to one of the plates. The meter is considered to be in calibration if the reading is within one half of 1 percent of the standard (12% or 22%).



TESTS ON LUMBER THAT IS WET ON THE SURFACE

Lumber exposed to rain, fog or high relative humidity, is likely to have a higher surface moisture than the core. When the surface moisture is only a very thin film, it will dissipate quickly, without affecting the soundness of the lumber.

However, if it must be tested when surface moisture is present, insulated pins should be used (Electrode 26E with #496 pins).

DECAY OF WOOD

When wood has a moisture content in excess of 20% and is exposed to air it will support fungus growth, cause of decay and rot. The Delmhorst Moisture Detector is very useful in determining whether or not a wood structure or part thereof is subject to decay while it is still in good condition. For instance, a joint between two wood members may collect storm water and hold it there for considerable periods of time, thus causing decay. The Delmhorst Moisture Detector will reveal this condition and show that treated wood should be used or some metal protection or waterproofing be provided to prevent the retention of water in joints of this nature.

READINGS ABOVE FIBER SATURATION POINT

The meter scale features readings above 30%, (fiber saturation point). They are marked in green to indicate that the lumber still has free water, and should not be taken as an accurate, quantitative measurement of the moisture content. They lag far behind the actual moisture content and should only be used for the following purposes:

1. to indicate that the wood still has free water,
2. to allow dry kiln operators to make "Hot" board readings as the boards are removed from the kiln, when the temperature effect causes the meter readings to rise.

A reading of 40% on a board with a temperature of 160°F. indicates that, after the appropriate temperature correction is applied, the actual moisture content is 24%, which is a reliable indication, since the moisture content is below fiber saturation point.

TESTING WOOD FLOORING AND SUB-FLOORING

Moisture detectors are indispensable for the proper installation of wood flooring. For best results wood should have, at the time of installation, a moisture content close to the average between the high and low moisture content value it will attain in use. If wood is too wet when it is put in place, it will eventually dry to a moisture content in equilibrium with the environment conditions of prevailing relative humidity. The drying will obviously result in shrinkage, and cracks will develop.

On the other hand, if flooring with a very low moisture content were laid in an area when high relative humidity prevails, it will pick up

5-25 + 5-38

moisture and swell. The recommended moisture content for wood flooring as follows (based on information shown in Forest Products Laboratory Bulletin No. 1066 entitled "Moisture Content of Wood in Use"):

	Average	Indiv. Pieces
Dry Southwestern States	6%	6-8%
Damp Southern Coastal States	10%	9-12%
Remainder of the United States	7%	6-9%

When flooring is installed on concrete slabs, it is important that the concrete be thoroughly dry at the time of installation, if it is not, the floor will pick up moisture from the slab and, even though it had absorb the recommended moisture content at the time of installation, will be followed by shrinkage which will result in "compression set" which normal moisture content.

MAINTENANCE OF MOISTURE DETECTOR

Your Delmhorst Moisture Detector is a fine quality precision instrument. Given reasonably good care it will last indefinitely with only an occasional replacement of batteries.

When it is necessary to replace the batteries, the screws holding the panel in the case must be removed in order to remove the panel. In more recent models, the battery compartment is easily accessible through its own door or cover, thus eliminating the need to remove the panel.

THE EFFECT OF HIGH RELATIVE HUMIDITY

If a moisture detector is used in areas of high relative humidity, moisture may set on some of the components or on parts of the electrode, creating an electrical leakage. This will cause the meter to "read" as soon as it is turned on. In such areas, the instrument should be stored in a dry office or warehouse, when not in use. If a dry office is not available, it may be stored in a small closet cabinet, heated with a 40-watt bulb. This will raise the temperature sufficiently to lower the level of humidity in the cabinet. Normally, moisture by condensation will collect on the meter or on the electrode and it will affect the meter readings when the instrument is brought from a cool storage area into a warm, humid environment. For this reason, operating a moisture meter inside a kiln is a practice to be discouraged.

Following are some comments concerning the possible malfunctions:

1. The meter cannot be adjusted. In such case, the batteries are usually weak or they are not making good contacts with battery terminals in the holders.
2. The meter pointer moves to the right as soon as the meter is turned on, even though the electrode is not in contact with any material. This is due to a current leakage, generally caused by dirt or moisture between the two poles of the electrode. The electrode insulation should be cleaned.
3. The meter gives no readings after the pins are driven into the wood and the meter is turned on. This is normally due to a broken wire in the electrode cable. The Moisture Detector and its electrode are in good working order if, upon placing the fingers across the contact pins, the meter reads between 20 and 30. If it had been possible to adjust the meter according to instructions, a failure to obtain a reading when touching the contact pins would indicate that the trouble is in the electrode and not in the instrument.
4. Whenever it appears necessary that a panel meter or a vacuum tube is to be replaced, the instrument should be returned to the factory for repair.
5. Such Models as the J-1, J-2, and RC-1C and RC-2, feature printed circuits on boards which can be easily unplugged and returned to the factory for repair, replacement or recalibration.

USING THE MOISTURE METER ON MATERIAL OTHER THAN WOOD

It is possible that the moisture detectors may find a useful application to indicate the moisture content of material other than wood. In such cases, after an initial evaluation, a calibration should be developed for the material in question. Ask for Bulletin "Procedure for Moisture Meter Calibration", PIB #87.

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TYPE 26E ELECTRODE

The 26E electrode is an original Delmhorst design for — non-destructive shell and core tests, — detection of moisture gradient, — testing lumber with wet surface.

The contact pins of this electrode are insulated except for the tip so that the depth at which measurements are taken is clearly identified. Readings taken with the 26E electrode are slightly lower than those taken with the 4-pin (4E) electrode which is used in the basic calibration of the instrument.

When using the 26E Electrode with insulated pins, the meter readings should be corrected according to the following table:

		Meter Reading							
7	8	10	12	14	16	18	20	22	24
7.3	8.4	10.6	12.8	14.9	17.0	19.2	21.4	23.7	26.0

The above correction should be disregarded when the insulation of the pins has worn off, or the uninsulated pins (A-111) are used.

TYPE 4E — To test boards, ¼" to 1½" thick. Pins penetration is 5/16". A hammer extractor for driving and extracting pins from lumber is available as optional equipment. Weight 2½ lbs.

TYPE 4E-H — Hammer style version of the 4E. To be used on softwoods only. Excellent for measuring moisture content on "dry chain". Weight 1½ lbs.

TYPE 18E — Similar to the 26E electrode. Pins penetration up to 3¼". Weight 2½ lbs.

TYPE 15E — Eight-pin electrode for veneer. Pins penetration is 1/8". Electrode can be used for checking veneer m.c. at end of dryer, at time of gluing and for incoming inspection. Weight ½ lb.

BATTERIES USED IN VARIOUS DELMHORST MOISTURE DETECTORS

INSTRUMENT MODEL	NO. BATTERIES	BATTERY TYPES
RC-1	3	1.5V "D" Flashlight Eveready #950
	4	22.5V Burgess K-15 or Eveready #420
RC-1B with Serial Nos. up to #6444	1	1.5V "D" Flashlight Eveready #950
	4	22.5V Burgess Y-15 or Eveready #505
RC-1B with Serial Nos. 6445 to #6699	1	1.5V Alkaline Energizer Ever.
	4	22.5V Burgess Y-15 or Eveready #E-91 #505
RC-1B with Serial Nos. 6700 & up	1	1.5V Alk. Energizer Eveready #E-91
	3	22.5V Burgess Y-15 or Eveready #505
RC-1C	3	9V Eveready #216
RC-2	2	9V Eveready #216
G-2	1	45V Eveready #455
	1	1.5V "D" Flashlight Eveready #950
G-2B	1	1.5V "D" Flashlight Eveready #950
	2	22.5V Burgess Y-15 or Eveready #505
G-2C & G-2D	1	1.5V Alk. Energizer Eveready #E-91
	1	22.5V Burgess Y-15 or Eveready #505
G-2E/G-22	2	9V Eveready #216
J & J (A)	1	1.5V Alk. Energizer Eveready #E-91
	1	22.5V Burgess Y-15 or Eveready #505
J-1 & J-2	2	9V Eveready #216



OTHER INSTRUMENTS AVAILABLE

Electronic THERMOMETER Model TM-2

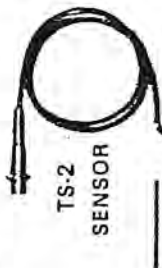
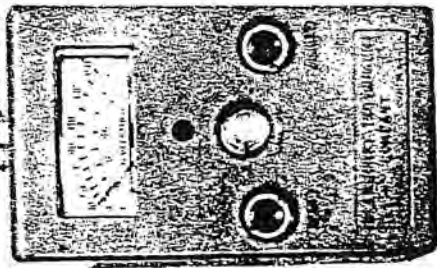
The TM-2 is a solid-state, portable battery operated instrument.

Remote sensing is possible up to 1000' or more. Probe extensions available in 3' rigid sections.

RANGES

- TM-2 (30°-150°F / 0-66° C.)
- TM-3 (-20°-110°F)
- TM-4 (100°-250°F)
- TM-5 (-20°-200°F)

The TS-2 Sensor is used to measure the temperature of liquids, gases or solids.



TS-2
SENSOR

THE DELMHORST KIL-MO-TROL

The kiln keeps operating — You stay outside and measure moisture content of lumber while it is drying. There is no need to enter a hot kiln or to shut it down.

Saves Lumber — No need for sample boards. Tests are made on the lumber in the charge.

Saves Time — Shows exactly when lumber is dry.

Saves Labor — Twenty moisture tests, shell and core, in all parts of the charge can be made in less than two minutes.

Send sketch showing your kilns and control panel for a free Kil-Mo-Trol layout and cost of installation.

Appendix 2

MOISTURE CONTENT SCALES

There are two common ways of reporting moisture content in wood. In this book, and in most technical writings, moisture content is always based upon the oven-dry weight of the wood:

$$\text{Moisture content (oven-dry wood basis)} = \frac{\text{weight of moisture removed in oven drying}}{\text{weight of oven-dry wood}}$$

Using this scale, wood which is half water by weight has a moisture content of 100 percent.

A second way to report moisture contents is based on

the weight of the moist wood:

$$\text{Moisture content (moist wood basis)} = \frac{\text{weight of moisture removed in oven drying}}{\text{initial weight of wood, including its moisture}}$$

Using this scale, wood which is half water by weight has a moisture content of 50 percent.

These different scales for reporting moisture contents are another possible cause for discrepancies among lists of energy contents. 20 percent moisture content on an oven-dry wood basis is the same as 25 percent moisture content on a moist wood basis. To facilitate comparisons between writings using the two conventions, Table A2-1 gives conversions.

MOISTURE CONTENT ON AN OVEN-DRY-WOOD BASIS PERCENT	MOISTURE CONTENT IN EITHER SCALE PERCENT	MOISTURE CONTENT ON A MOIST-WOOD BASIS PERCENT
0%	0%	0%
5.3	5	4.8
11.1	10	9.1
17.6	15	13.0
25.0	20	16.7
33.3	25	20.0
42.9	30	23.1
53.8	35	25.9
66.7	40	28.6
100.0	50	33.3
150.0	60	37.5
233.0	70	41.2
Infinite	100	50.0
--	150	60.0
--	200	66.7
--	250	71.4

TABLE A2-1. Conversions between moisture contents as expressed in the moist wood and oven-dry wood scales. To use the table for either conversion, find the value to be converted in the center column. Then to convert from dry to moist basis read to adjacent number in the right column. To convert from moist to dry, read the adjacent number in the left column. If m and d represent the moisture contents on the moist-wood and dry-wood bases respectively, then $m = d/(1+d)$, and $d = m/(1-m)$.

OMNI 00209

Instruction Booklet

for use with

PRINCO

Fortin type mercurial

Barometers

Manufactured by

PRINCO INSTRUMENTS, INC.
1020 Industrial Blvd.
Southampton, Pa. 18966-4095
U.S.A.

Phone: 215 355-1500
Fax: 215 355-7766



453
National
Weather
Service
Type



469
NOVA™
Economy
Model

SCALE WEIGHT CALIBRATION DATA SHEET

Weight to be calibrated: 10 lb

ID Number: OMNI-00274

Standard Calibration Weight: 10 lb

ID Number: OMNI-00255

Scale Used: WEIGH-TRONIX

ID Number: OMNI-00185

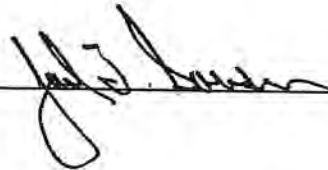
Date: 12-31-02

By: Jared Sorenson

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10	10	∅	∅

*Acceptable tolerance is 1%.

This calibration is traceable to NIST using calibrated standard weights.

Technician signature:  Date: 12-31-02

Certificate of Calibration

Certificate # **315146** Page # 1 of 1 Order Date: 27Jan2005
For: OMNI-TEST LABORATORIES
Department: NO PO#: OTL-05-007



JJ Calibrations, Inc.

Instrument Identification

Property #: OMNI-00291 Serial #: 9190156
Make: OMEGA User:
Model: RH82
Noun: THERMO HYGROMETER
Accuracy: Refer to Specifications



#0723.01

Certification Information

As Found: Within Tolerance Calibration Date: 31Jan2005
As Left: Within Tolerance *Client Specified Due Date: 31Jan2006
Adjustments: None Repairs: None Seals: Intact
Procedure: CP 11

Environment: 23°C 35% RH
Technician: 40

Remarks

Refer data sheet.

*Any number of factors may cause this item to drift out of calibration before the recommended due date has expired.

Standards Used

ID#	Manufacturer	Model#	Nomenclature	Due Date	Trace ID
464A	GENERAL EASTERN	M4-RH/D2	HUMIDITY STANDARD	10Dec2005	312016
497A	HART SCIENTIFIC	1502A	TWEENER THERMOMETER	09Aug2005	302848
498A	BURNS ENGR.	200G05B085	INDUSTRIAL PRT	29Dec2005	312022

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A Test Accuracy Ratio (TAR) of at least 4:1, if achievable, is maintained unless otherwise stated.

This uncertainty expression is expanded at approximately the 95% confidence level, coverage factor (k=2).

Technical Reviewer

Quality Assurance

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Issued 01Feb2005
Rev# 11

JJ Calibrations, Inc.

Manufacturer: Omega
Model: RH82
Nomenclature: Thermo Hygrometer
Serial: 9190156

Certificate #: 315146
Date: 31Jan2005
Technician: 40
Calibration Interval: 12 Months

Parameter	Reference Standard	UUT Before	UUT After	UUT ± Limit	Uncertainty ±
Humidity Accuracy	30.1%	31.2%	31.2%	3.0%	N/A
	70.1%	69.5%	69.5%	3.0%	N/A
Temperature Accuracy	74.9°F	75.6°F	75.6°F	1.8°F	N/A

Thermal Metering System Calibration

Y and dH@

Manufacturer: National Instruments
 Model: FP-1000
 Serial Number: NA
 OMNI Tracking No.: 298

**Average Orifice
Meter dH@
1.815**

**Average Gas
Meter y Factor
1.014**

Calibration Date: 10/27/05
 Calibrated by: B. Davis
 Calibration Frequency: Six month
 Next Calibration Due: 04/27/06
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 oF
 Standard Press.: 29.92 "Hg
 Barometric Press.: 29.76 "Hg
 Signature/Date: *B. Davis* = 11-1-05

Previous Calibration Comparison

Date	NA	Acceptable	
dH@ Value		Deviation (5%)	Deviation
y Factor		0	1.014
Acceptance	Out of Limits		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.009
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.052
Acceptance	Acceptable

Reference Standard *

	Model	Standard Test Meter
Standard Calibrator	S/N	1
	Calib. Date	20-Apr-05
	Calib. Value	0.9823 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	1.60	0.86	0.45
Initial Reference Meter	194.843	205.13	210.33
Final Reference Meter	201.887	210.25	215.968
Initial DGM	0	0	0
Final DGM	6.986	5.041	5.566
Temp. Ref. Meter (°F), Tr	71.0	55.0	54.0
Temperature DGM (°F), Td	81.0	66.0	67.0
Time (Minutes)	10.0	10.0	15.0
Net Volume Ref. Meter, Vr	7.044	5.120	5.638
Net Volume DGM, Vd	6.986	5.041	5.566
Gas Meter y Factor =	1.005	1.017	1.019
Gas Meter y Factor Deviation (from avg.)	0.009	0.003	0.005
Orifice dH@	1.86	1.83	1.76
Orifice dH@ Deviation (from avg.)	0.041	0.011	0.052

where:

1. Deviation = |Average value for all runs - current run value|
2. $y = [Vr \times (y \text{ factor (ref)}) \times (Pb) \times (Td + 460)] / [Vd \times (Pb + (dH / 13.6)) \times (Tr + 460)]$
3. $dH@ = 0.0317 \times dH / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr \wedge 2$

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Thermal Metering System Calibration Y and dH@

Manufacturer: National Instruments
 Model: FP-1000
 Serial Number: NA
 OMNI Tracking No.: 298

Previous Calibration Comparison

Date	10/27/2005	Acceptable	
dH@ Value	1.815	Deviation (5%)	Deviation
y Factor	1.014	0.0507	0.015
Acceptance	Acceptable		

**Average Orifice
Meter dH@
1.875**

**Average Gas
Meter y Factor
0.999**

Calibration Date: 11/01/05
 Calibrated by: B. Davis
 Calibration Frequency: 2B Classic post test
 Next Calibration Due: 05/02/06
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 oF
 Standard Press.: 29.92 "Hg
 Barometric Press.: 29.82 "Hg
 Signature/Date: *B. Davis* 11-1-05

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.004
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.022
Acceptance	Acceptable

Reference Standard *

Standard Calibrator	Model	Standard Test Meter
	S/N	1
	Calib. Date	20-Apr-05
	Calib. Value	0.9823 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.85	0.85	0.85
Initial Reference Meter	222.1	229.278	237.422
Final Reference Meter	229.278	237.422	248.572
Initial DGM	0	0	0
Final DGM	7.079	8.084	11.143
Temp. Ref. Meter (°F), Tr	65.0	66.0	67.0
Temperature DGM (°F), Td	70.0	72.0	75.0
Time (Minutes)	14.0	16.0	22.0
Net Volume Ref. Meter, Vr	7.178	8.144	11.150
Net Volume DGM, Vd	7.079	8.084	11.143
Gas Meter y Factor =	1.003	0.999	0.996
Gas Meter y Factor Deviation (from avg.)	0.004	0.001	0.004
Orifice dH@	1.85	1.88	1.89
Orifice dH@ Deviation (from avg.)	0.022	0.005	0.018

where:

1. Deviation = |Average value for all runs - current run value|
2. $y = [V_r \times (y \text{ factor (ref)}) \times (P_b) \times (T_d + 460) / [V_d \times (P_b + (dH / 13.6)) \times (T_r + 460)]$
3. $dH@ = 0.0317 \times dH / (P_b (T_d + 460)) \times [(T_r + 460) \times \text{time}] / V_r]^2$

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET Digital Manometer

Instrument to be calibrated: 2896 via 298 Stack draft

Range: 0 - .20 ID Number: 298

Calibration Instrument: Liquid Manometer ID Number: 315

Date: 10-27-05 By: B Davis

<i>digital</i> Liquid Manometer (A) (inches of H ₂ O)	<i>spreadsheet readout</i> Digital Manometer (B) (inches of H ₂ O)	Difference (A - B)	% Error of Full Span*
.175	.177	.002	1.0
.102	.107	.005	2.5
.018	.021	.003	1.5

*Acceptable tolerance is 4%.

This calibration is traceable to NIST through the Dwyer Liquid Manometer, NIST Test #MAS 822/254143-94.

Technician signature: B Davis Date: 10-27-05

Temperature Calibration EPA Method 28 and 5G						
BOOTH:	TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:	
Emissions	National Instruments				298	
REFERENCE TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:		
OMEGA Calibrator Model CL300				Serial Number 506		
CALIBRATION PERFORMED BY:		DATE:	AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:	
B. DAVIS		10-27-05	65		29.76	
Reference Point Source	Temperature Monitor (°F)					
	Method 28 Room	Method 5G Dilution Tunnel				DB
Meter (Tm)		Filters (Tf)	Tunnel (Tt)	Dryer (Ts)		
OMEGA Thermocouple Simulator Serial #506						
0	-3	-2	-3	-3	-3	-3
100	99	99	99	99	99	99
300	300	299	299	298	299	299
500	500	499	499	499	499	500
700	700	700	699	699	699	700

Technician signature: B. Davis Date: 10-27-05

NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 11/12/04 User/Technician: B. Davis Pass Fail

NIST traceable stop watch OMNI Tracking Number: 292 Last Cal: 1-30-04

Stopwatch to be tested for time proficiency OMNI Tracking Number: 306

1. Start the NIST traceable stopwatch; at a predetermined time (i.e., 1.00 minutes), the technician shall start the watch being tested. When 15.00 seconds have passed (i.e., the NIST traceable stopwatch reads 1 minute, 15 seconds), the technician shall stop the watch being tested. Record the target time interval (i.e., 15.00 seconds). Repeat this step twice and record the data.
2. Repeat step #1 for each of the following target time intervals: 30.00 seconds, 10.00 minutes, and 30 minutes.
3. If the delta between the target time and measured time is less than 5% of the target time interval or 2.00 seconds (whichever is less), then the technician has demonstrated proficiency with the specific instrument utilized in the proficiency test. The proficiency is valid for a period of twelve months.
4. Archive the proficiency test data and information, including the effective date and expiration date of the proficiency, in the equipment record for the instrument involved.

Target time: 15.00 seconds #1 Measured time: 15.15 #2 Measured time: 15.18 #3 Measured time: 14.96
Target time: 30.00 seconds #1 Measured time: 30.09 #2 Measured time: 30.12 #3 Measured time: 30.12
Target time: 10.00 minutes #1 Measured time: 10:00.06 #2 Measured time: 09:59.94 #3 Measured time: 10:00.12
Target time: 30.00 minutes #1 Measured time: 30:00.00 #2 Measured time: 30:00:10 #3 Measured time: 30:00.06

Technician Signature: B. Davis Date: 11-15-04

Model: 2B Classic
Morsø Jernstøberi A/S
Furvej 6 DK-7900
Nykøbing Mors
DENMARK

Section 6

Example Calculations

Note: OMNI-Test Laboratories, Inc. uses the Excel computer program for all Method 5G and 5H calculations. The program automatically carries 14 decimal points in all calculations. The numbers on the printouts have been rounded for display only.

Equations and Sample Calculations - Method 5G

Equations used to calculate the parameters listed below are described in this appendix. Sample calculations are provided for each equation. The raw data and printout results from a sample run are also provided for comparison to the sample calculations.

BR	Dry burn rate, kg/hr
m_n	Total particulate matter collected, mg
$V_{m(std)}$	Volume of gas sampled corrected to standard conditions, dscf
v_s	Average dilution tunnel gas velocity, ft/sec
C_s	Particulate concentration, g/dscf
Q_{sd}	Average dilution tunnel gas flow rate, dscf/min
E	Particulate emission rate, lbs/hr
PR	Proportional rate variation, %

Dry Burn Rate

Using equation 28-3:

$$BR = \frac{60 \times W_{wd}}{\theta} \times \frac{100 - \%M_w}{100}$$

Where,

- BR = Dry burn rate, lb/hr
- W_{wd} = Mass of wood burned (wet basis) during test run, lb
- θ = Total time of test run, minutes
- $\%M_w$ = Average moisture content of test fuel charge, wet basis percent

Sample Calculation:

Dry basis moisture of fuel = 20.03%

Using the equation 28-2 for converting dry basis moisture to wet basis moisture,

$$\%M_w = \frac{20.03 \times 100}{20.03 + 100}$$

$$\%M_w = 16.69\%$$

The wet weight of the fuel charge was 7.8 pounds. Converting pounds to kilograms yields a weight of 3.538 kg. The run time for this run was 180 minutes. Therefore, the burn rate equation appears thus:

$$BR = \frac{60 \times 3.538 \times (100 - 16.69)}{180 \times 100}$$

$$BR = 0.98 \text{ kg/hr} = 2.17 \text{ lb/hr}$$

Total Particulate Matter Collected

$$m_n = F_1 + F_2 + R - (V_a \times B_a)$$

Where:

- m_n = Total particulate matter collected, mg
- F_1 = Particulate matter collected on front filter, mg
- F_2 = Particulate matter collected on rear filter, mg
- R = Residue from evaporated probe and filter holder acetone rinse, mg
- V_a = Volume of acetone evaporated probe and filter holder acetone rinse, ml
- B_a = Acetone blank value, mg/ml

Sample Calculation:

$$m_n = 12.6 - 0.4 + 4.7 - (180 \times 0.0040)$$

$$m_n = 16.2 \text{ mg}$$

Volume of Gas Sampled Corrected to Dry Standard Conditions

Using equation 5-1:

$$V_{m(std)} = V_m \times Y \times \left(\frac{T_{std}}{P_{std}} \right) \times \frac{\left(P_b + \frac{\Delta H}{13.6} \right)}{T_m}$$

Where:

- K = 17.64 °R/in. Hg
- T_{std} = 528 °R
- P_{std} = 29.92 in. Hg
- V_m = Volume of gas sample measured at the dry gas meter, dcf
- Y = Dry gas meter calibration factor, dimensionless
- P_b = Barometric pressure at the testing site, in. Hg
- ΔH = Average pressure differential across the orifice meter, in. H₂O
- T_m = Absolute average dry gas meter temperature, °R

Sample Calculation:

$$V_{m(std)} = 98.434 \times 1.01 \times \left(\frac{528}{29.92} \right) \times \frac{30.03 + \frac{0.7}{13.6}}{532.5}$$

$$V_{m(std)} = 99.116 \text{ ft}^3$$

Dilution Tunnel Gas Velocity

Using equations 2-7 and 2-6, calculated at each recorded interval:

$$v_s = k_p \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

$$M_s = M_d \times (1 - B_{ws}) + 18.0 \times B_{ws}$$

Where:

- v_s = Average dilution tunnel gas velocity, ft/sec
- k_p = Pitot tube constant: $85.49 \frac{ft}{sec} \left[\frac{(lb/lb-mole) \times (inches\ Hg)}{(^{\circ}R) \times (inches\ H_2O)} \right]^{\frac{1}{2}}$
- C_p = Pitot tube coefficient (0.99 for standard pitot tube; 0.84 may be used for S-type pitot tubes constructed according to Method 2 procedures), unitless
- ΔP = ΔP measured during the pre-test flow traverse of the dilution tunnel; the square root of the ΔP values are averaged for this calculation, in. H_2O
- P_b = Barometric pressure at test site, in. Hg
- P_g = Static Pressure of tunnel, in. Hg
- P_s = Absolute tunnel pressure, = $P_b + P_g$
- M_s = Molecular weight of tunnel gas; assume $M_d = 29$ lb/lb-mole (per method 5G)
- B_{ws} = Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)
- T_s = Dilution tunnel temperature, $^{\circ}R$; ($^{\circ}R = ^{\circ}F + 460$)

Sample calculation:

$$M_s = 29 \times (1 - 0.04) + 18.0 \times 0.04 = 28.56$$

$$v_s = 85.49 \times 0.99 \times \sqrt{0.0351} \times \sqrt{\frac{(548)}{(30.03 + \frac{-0.45}{13.6}) \times (28.56)}}$$

$$v_s = 12.69 \frac{ft}{sec}$$

Particulate Concentration

Using equation 5G-2:

$$C_s = 0.001 \frac{g}{mg} \times \frac{m_n}{V_{m(std)}}$$

Where:

- C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscf
- m_n = Total mass of particulate matter collected in the sampling train, mg
- $V_{m(std)}$ = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

$$C_s = \frac{0.001 \times 16.2}{99.116}$$

$$C_s = 0.000163 \text{ g/dscf}$$

Average Dilution Tunnel Gas Flow Rate

Using equation 2-8, calculated at each recorded interval:

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_{s(avg)}} \times \frac{P_s}{P_{std}}$$

Where:

- Q_{sd} = Gas flow rate corrected to dry, standard conditions, dscf/hr
- 3600 = Conversion from seconds to hours
- B_{ws} = Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)
- v_s = Average dilution tunnel gas velocity, ft/sec
- A = Cross sectional area of dilution tunnel, ft²
- T_{std} = Standard absolute temperature, 538°R
- $T_{s(avg)}$ = Average absolute dilution tunnel temperature, °R, (°R = °F + 460)
- P_b = Barometric pressure at test site, in. Hg
- P_g = Dilution tunnel static pressure, in. Hg
- P_s = Absolute dilution tunnel gas pressure, in Hg, (Hg = $P_b + P_g$)
- P_{std} = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.04) \times 12.69 \times \frac{(\pi \times 3^2)}{144} \times \frac{528}{548} \times \frac{30.03 + \frac{-0.45}{13.6}}{29.92}$$

$$Q_{sd} = 8313.36 \text{ dscf/hr} = 138.56 \text{ dscf/min}$$

Particulate Emission Rate

Using equation 5G-3 and 5G-4:

$$E = C_s \times Q_{sd}$$

$$E_{adj} = K_3 \times E^{0.83}$$

Where:

E = Particulate emission rate, g/hr

E_{adj} = Particulate emission rate, adjusted, g/hr

C_s = Concentration of particulate matter in the stack, corrected to dry, standard conditions, g/dscf

Q_{sd} = Average dilution tunnel gas flow rate, dscf/hr

K_3 = Constant, 1.82 for metric units, 0.643 for English units

Sample calculation:

$$E = 0.000163 \times 8313.36 \times 60$$

$$E = 1.36 \text{ g/hr}$$

$$E_{adj} = 1.82 \times 1.36^{0.83}$$

$$E = 2.35 \text{ g/hr}$$

Proportional Rate Variation

Using equation 5H-9, calculated at each recorded interval:

$$PR = \frac{\theta \times (V_{mi} \times V_s \times T_m \times T_{si})}{10 \times (V_m \times V_{si} \times T_s \times T_{mi})} \times 100$$

Where:

- PR = Percent proportional rate
- θ = Time of test, min
- S_i = Measured tracer gas concentration for the "ith" interval, in this case, the inverse of the calculated flow in the stack based on CO₂ concentrations in the stack and in the dilution tunnel
- $V_{mi(\text{std})}$ = Volume of gas sample measured by the dry gas meter during the "ith" 10 minute interval, dscf
- V_m = Volume of gas sample as measured by dry gas meter, dscf
- V_{si} = Average gas velocity in the dilution tunnel during each 10 minute interval, i, of the test run, m/sec
- V_s = Average gas velocity in the dilution tunnel, m/sec
- T_{mi} = Absolute average dry gas meter temperature during each 10 minute interval, i, of the test run, °R
- T_m = Absolute average dry gas meter temperature, °R
- T_{si} = Absolute average gas temperature in the dilution tunnel during each 10 minute interval, i, of the test run, °R
- T_s = Absolute average gas temperature in the dilution tunnel, °R

Sample calculation (for the reading at 50 minutes into test run 1):

$$PR = \frac{180 \times 5.6 \times 12.69 \times 533 \times 552}{10 \times 98.434 \times 12.63 \times 548 \times 532} \times 100$$

$$PR = 103.8\%$$

6-10 + 6-10

