Certification Test Report

Morsø Jernstøberi A/S

Freestanding Wood Stove
Model: 3112

Report Number: 192-S-10-3

OMNI-Test Laboratories Inc.
Product Testing & Certification

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Fax: (503) 643-3799

Certification Test Report

Morsø Jernstøberi A/S

Freestanding Wood Stove

Model: 3112

Prepared for:	Morsø Jernstøberi A/S Furvej 6 7900 Nykøbing Mors Denmark
Prepared by:	OMNI-Test Laboratories, Inc. 5465 SW Western Avenue, Suite G Beaverton, Oregon 97005 (503) 643-3788
Test Period:	December 18, 2006 through December 20, 2006
Report Date:	January 2007
Report Number:	192-S-10-3

AUTHORIZED SIGNATORIES

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

Alana Smith, Senior Manager
OMNI-Test Laboratories, Inc.

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

Ken Morgan, Emissions Testing Technician
OMNI-Test Laboratories, Inc.

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Section 1

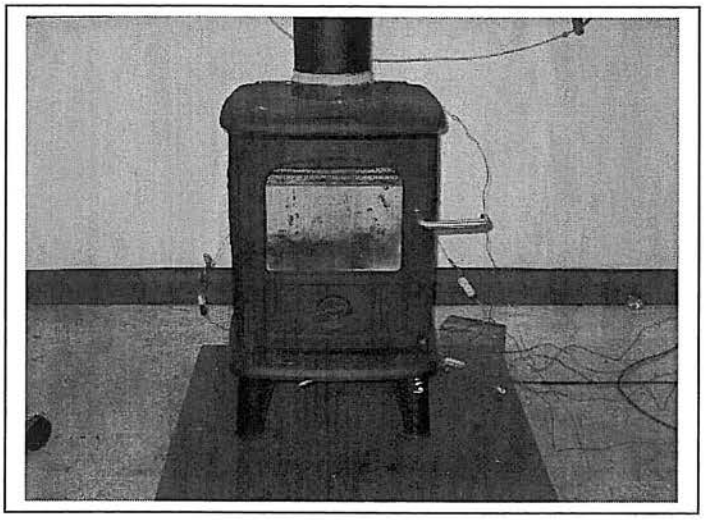
Fuel Photographs/Appliance Description/Drawings

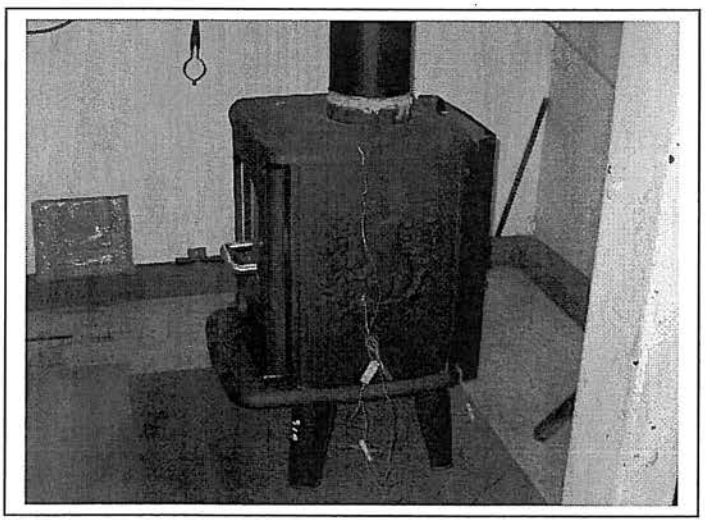
Model: 3112
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Morsø Jernstøberi A/S

3112

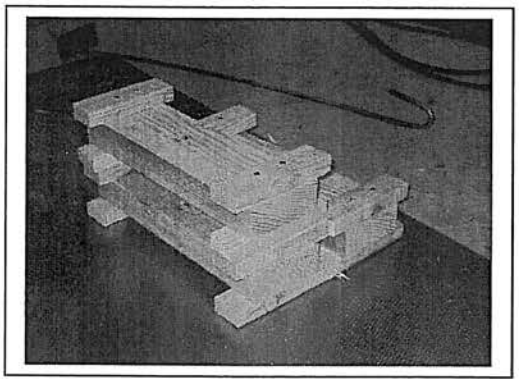
Test Dates: December 18, 2006 through December 20, 2006



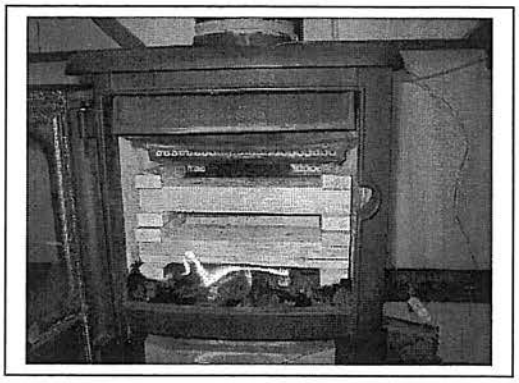


Morsø Jernstøberi A/S
3112

Run 1 – Fuel



Run 1 - Newly Loaded Stove



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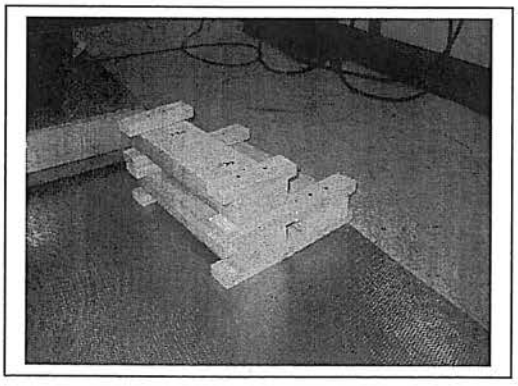

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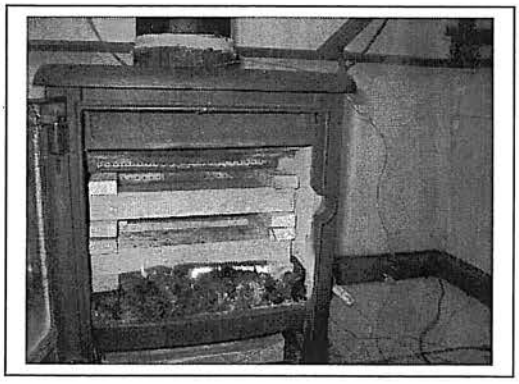
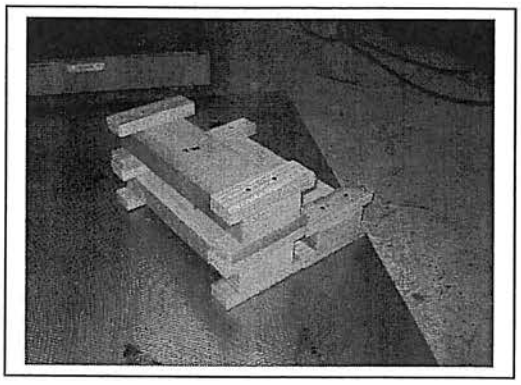
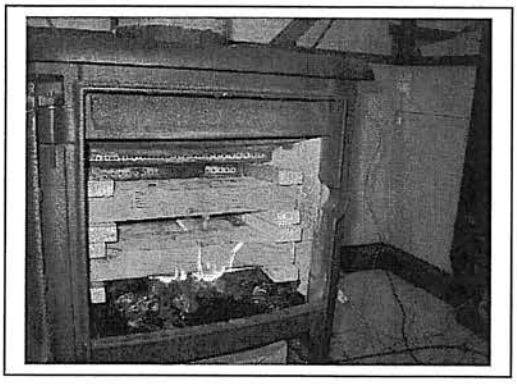


Morsø Jernstøberi A/S
3112

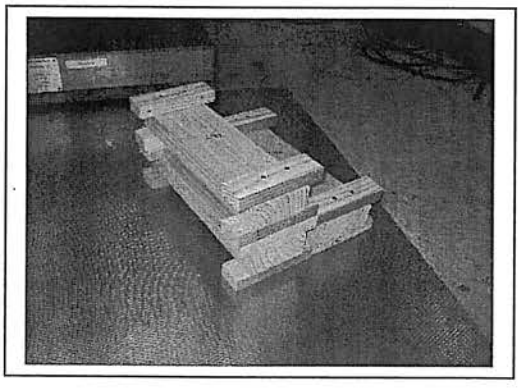
Run 3 – Fuel



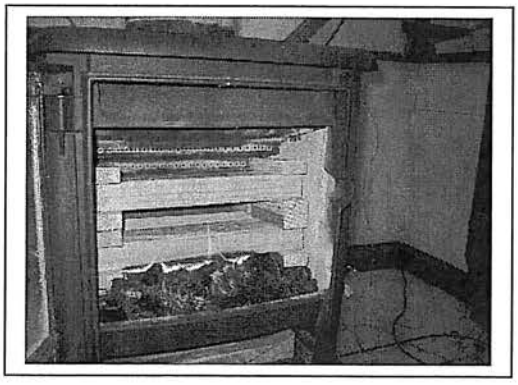
Run 3 - Newly Loaded Stove



Run 4 – Fuel



Run 4 - Newly Loaded Stove



WOOD HEATER DESCRIPTION

Appliance Manufacturer: Morsø Jernstøberi A/S

Wood Stove Model: 3112

Type: Freestanding, radiant-type room heater

WOOD HEATER INFORMATION

Materials of Construction: The unit is constructed primarily of cast iron. The firebox is lined with vermiculite and the feed door has a high-temperature ceramic glass panel and a ceramic rope gasket.

Air Introduction System: Air enters the firebox through an opening located at the back/bottom of the appliance. Secondary air enters the appliance through the bottom/back and is channeled internally to both sides of a hollow-tiered baffle with two rows of holes.

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

Combustor: N/A.

Internal Baffles: A hollow steel baffle is mounted in the upper portion of the firebox with a cast iron extension at the front. The flame path is forced to the front of the firebox where it travels up through the opening between the baffle and primary air manifold.

Other Features: None.

Flue Outlet: The 6-inch diameter flue outlet is located at the top of the unit.

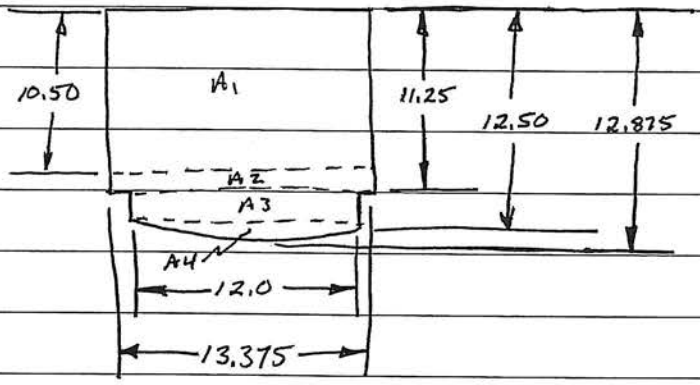
WOOD HEATER OPERATING INSTRUCTIONS

Specific written instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

Engineering Drawings/Blueprints (K List)

NOTES

Firebox Volume Calculation



$A_1 = 10.5 \times 13.375 = 140.4375$

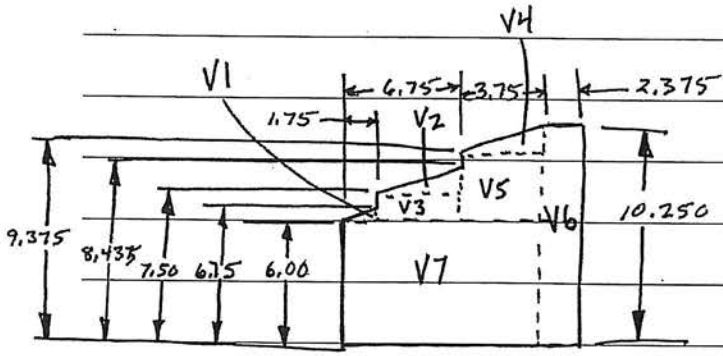
$A_2 = (11.25 - 10.5) \times 13.375 = 10.03125$

$A_3 = (12.5 - 11.25) \times 12.0 = 15.0$

A_4 (CAD Querry) $= 3.002$

IN^2

PLAN VIEW



SIDE VIEW

$V1 = \frac{1}{2}(.75 \times 1.75) \times 13.375 = 8.777$

$V_2 = \frac{1}{2}(5.0 \times 0.935) \times 13.375 = \cancel{6.253}^{12}\ 31.348$

$V_3 = 1.50 \times 5.0 \times 13.375 = 100.3125$

$V_4 = \frac{1}{2}(0.875 \times 3.75) \times 13.375 = 21.943$

$V_5 = 3.375 \times 3.75 \times 13.375 = 169.277$

$V_6 = \cancel{2.375}^{12} \times (A2 + A3 + A4) \times 10.25 = 287.341$

$V7 = 6 \times 10.5 \times 13.375 = 842.625$

$V_{TOTAL} = \cancel{1436.5285}\ 1461.6235\ IN^3$

$= \cancel{0.831\ Ft^3}$

$= 0.85\ Ft^3$

5.95

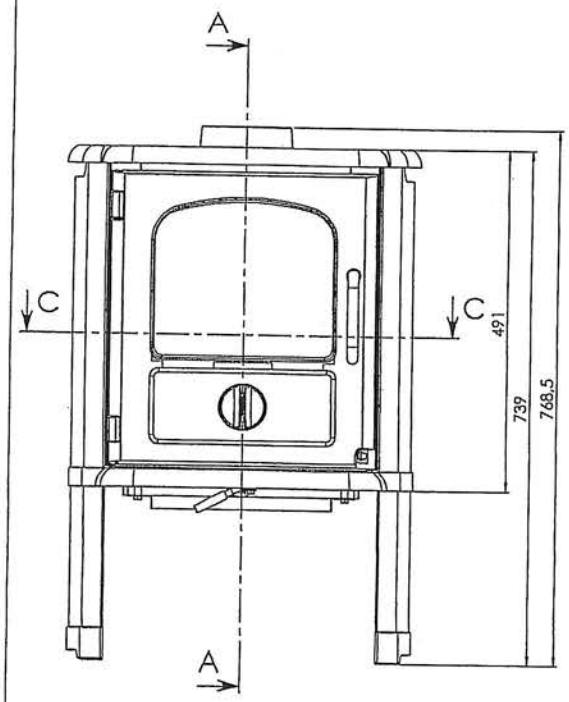
5.4 - 6.5

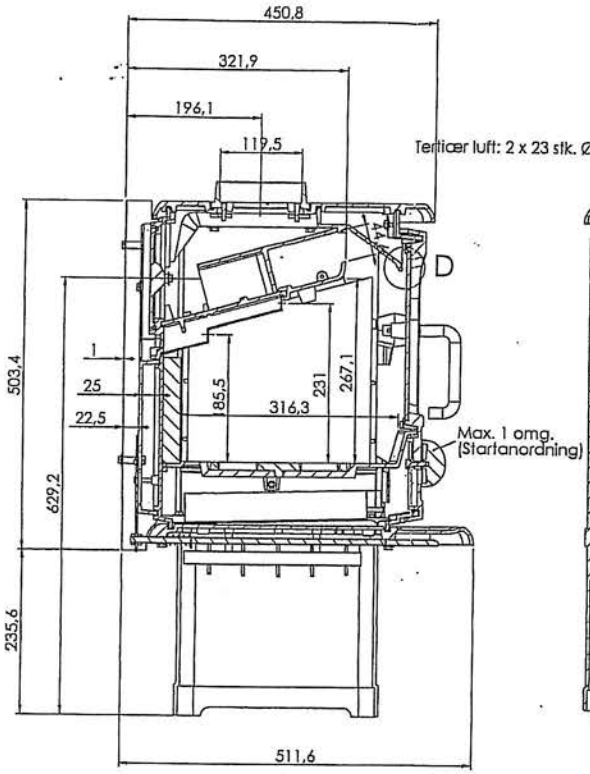
Project Number: 192-S-10-3

Technician Initialed: K. J. Morgan

Date: 12-18-06

OMNI ID: 921





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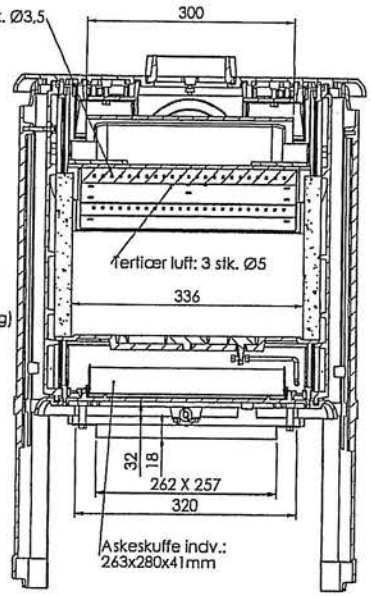

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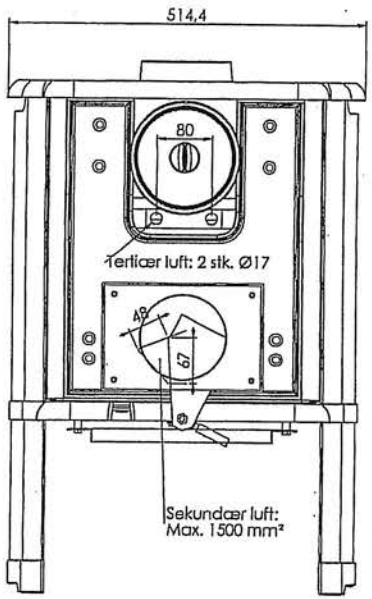
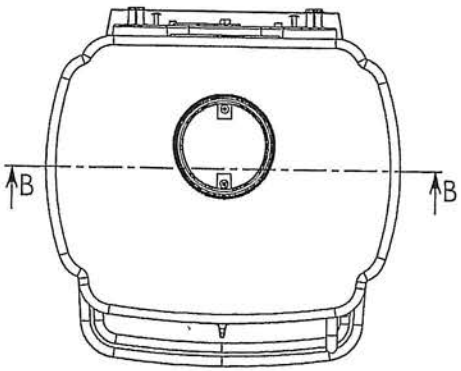
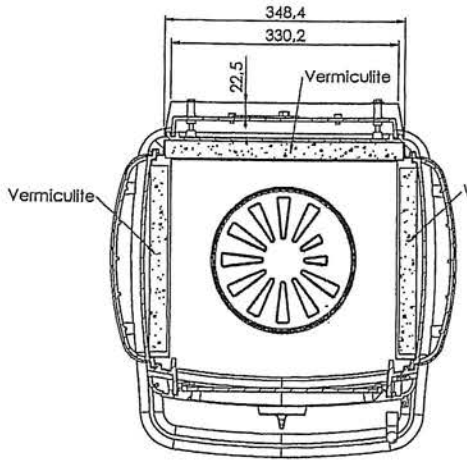
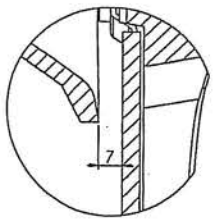






C-C



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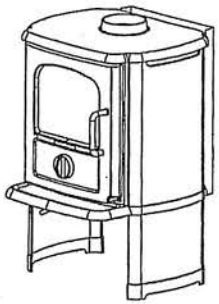

SINTEF
Norges branntekniske laboratorium as
Norwegian fire research laboratory
Task no.: 102041.20B
Appendix no.: V Page 1 of 2
Date/Sign.: 27/1-05 H. Østrem

		Rev.	Revisions		Sign.:	Date:
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Model no.			Morsø 3140 EN	Itemno.:	643149xx/643150xx	
Drawingtype:	Godkendelsestegning		morsø	Drawing no.:	3100-79 a	
Location of file:						

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

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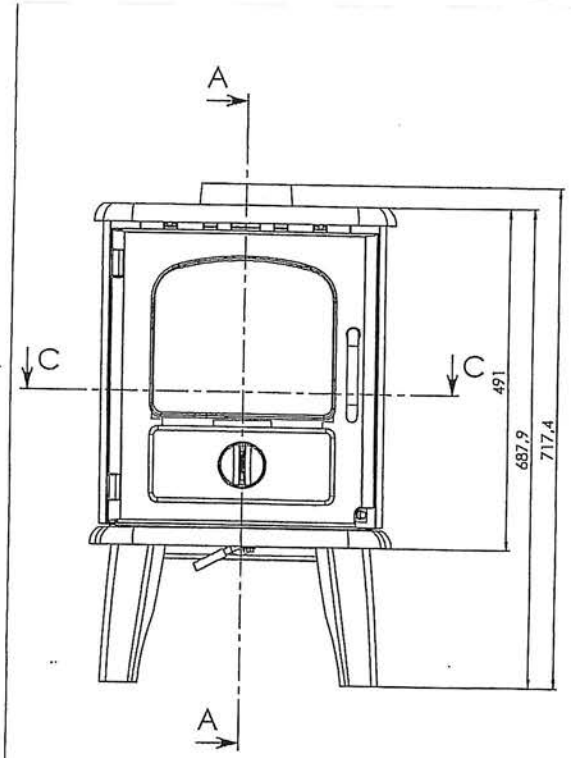
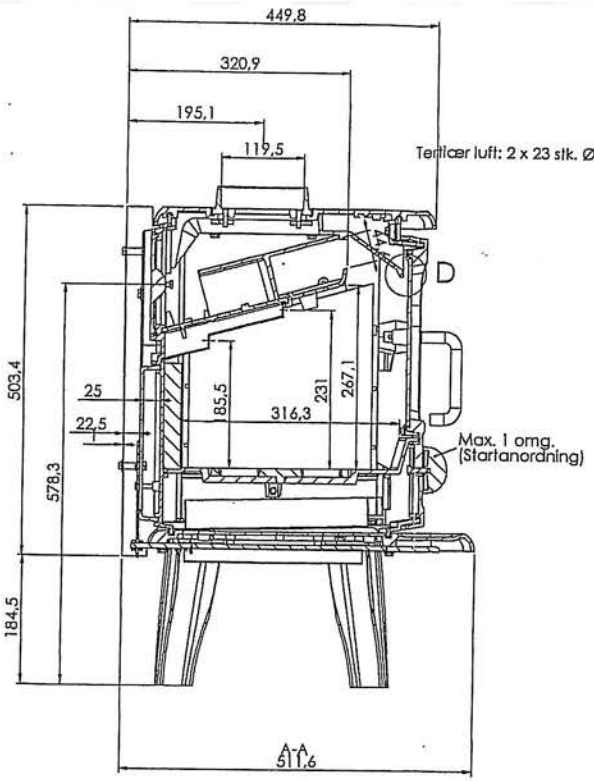
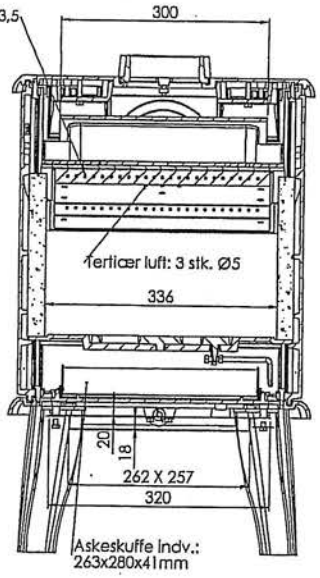
Date of print: 11-07-2005







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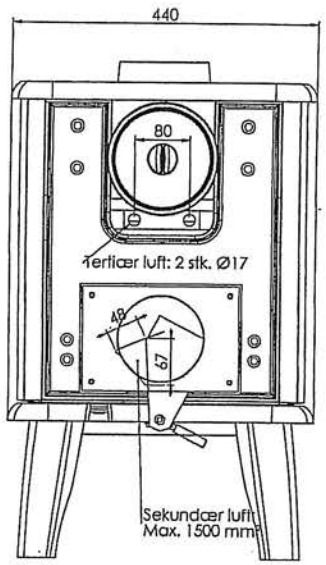

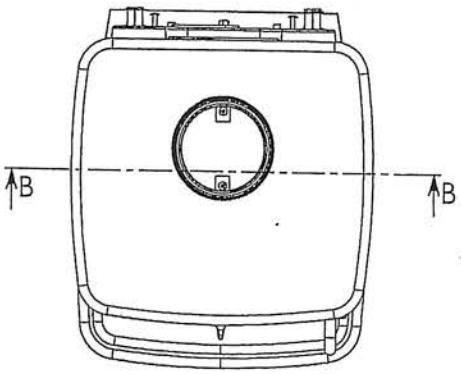

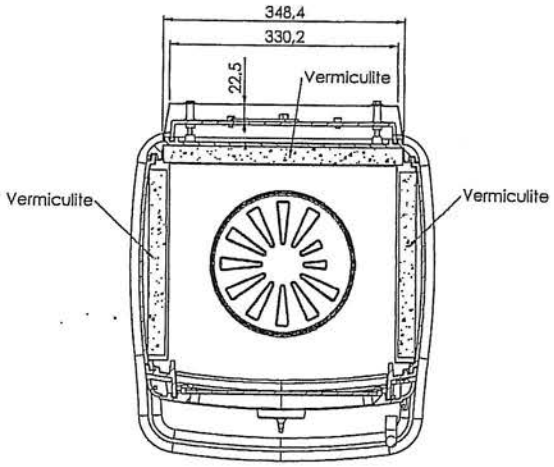

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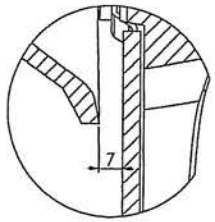
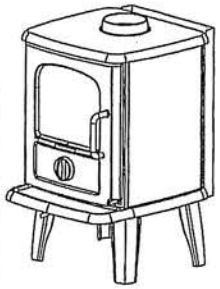


D (1 : 1)

SINTEF
Norges branntekniske laboratorium as
Norwegian fire research laboratory
Task no.: 102041.20 B
Appendix no.: V Page 2 of 2
Date/Sign.: 21/1-05 Kl Ustum



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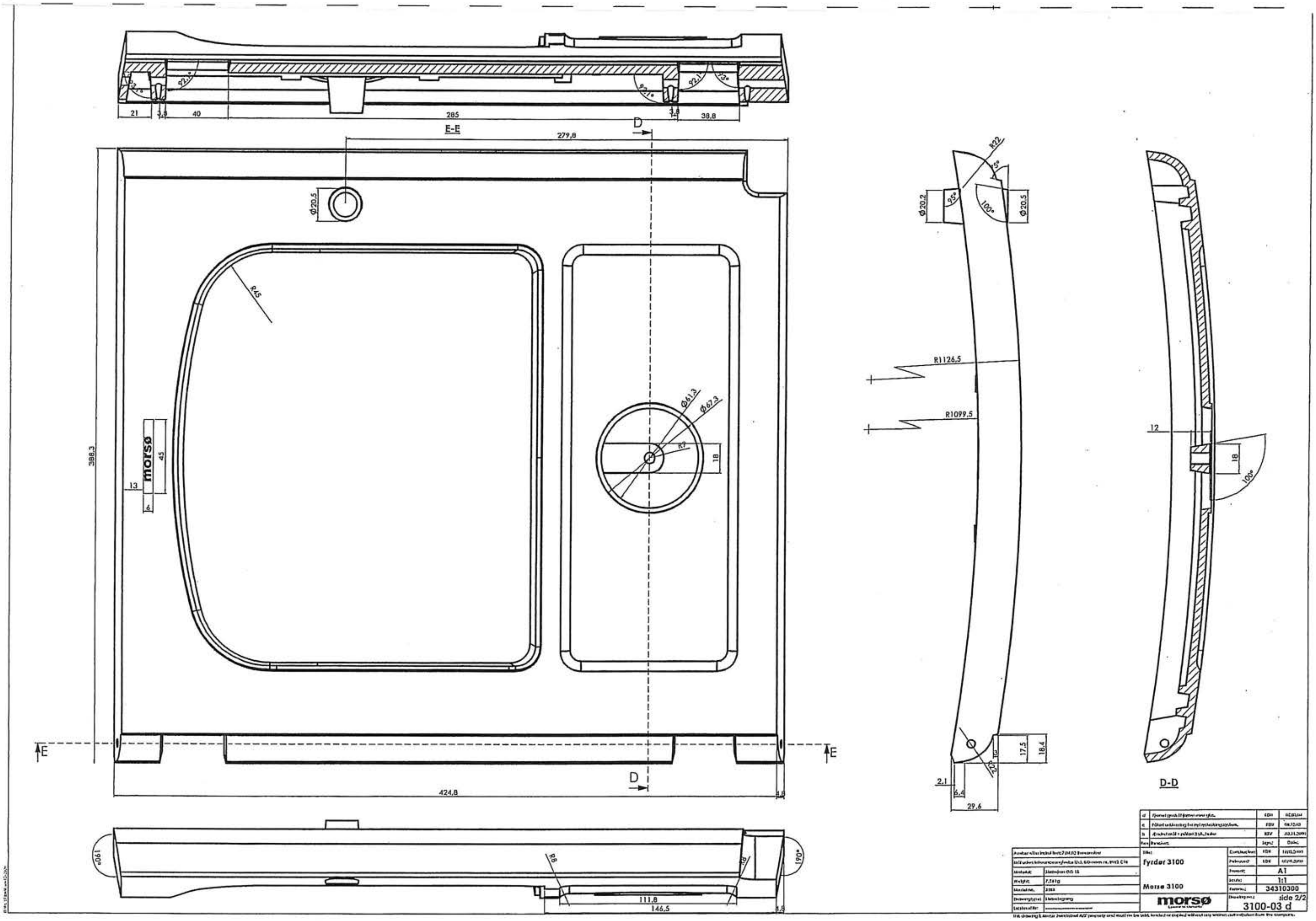
E-E
D-D
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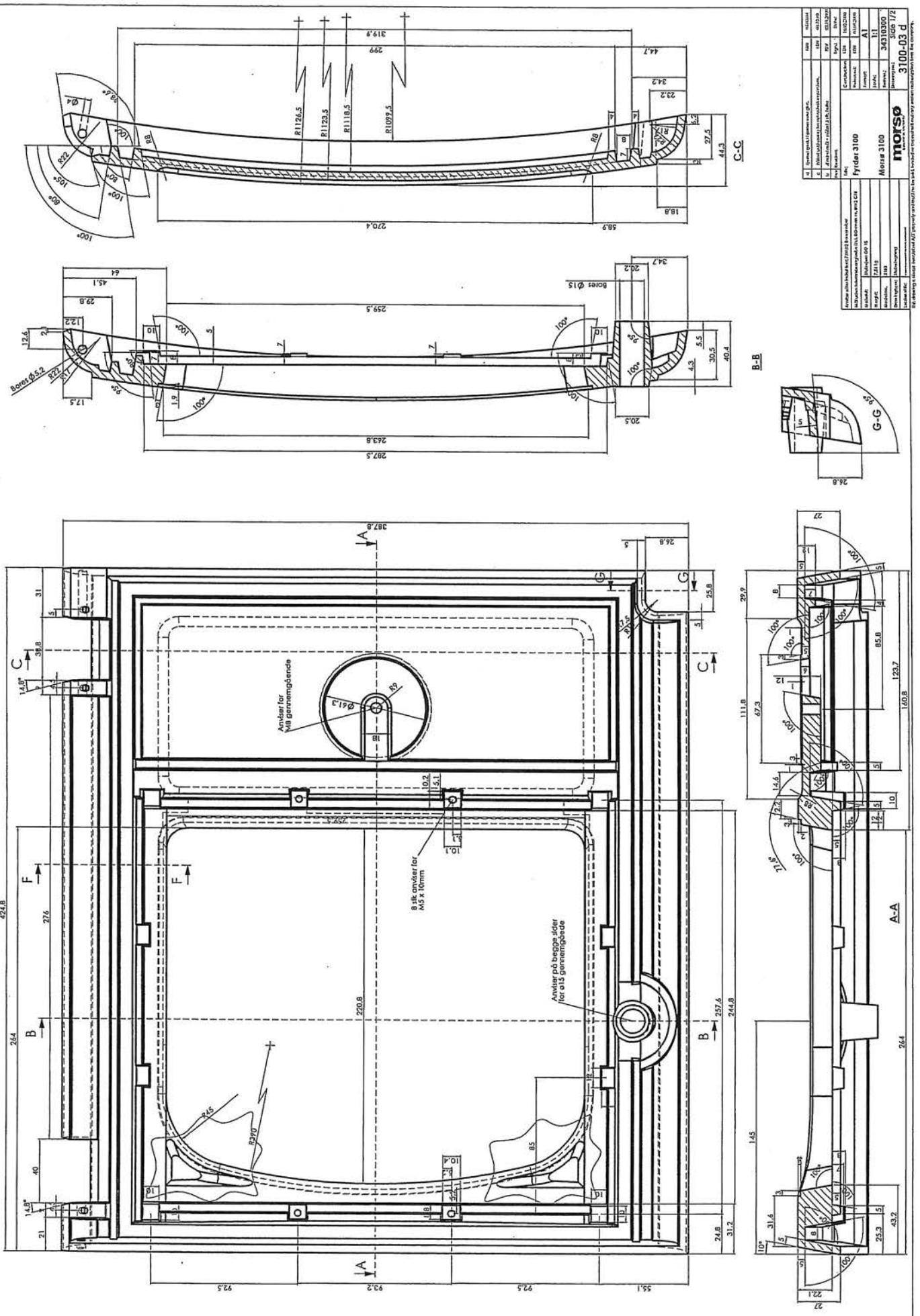
C-C
B-B
G-G
A-A
Fyrder 3100
Morsø 3100
morsø
3100-03 d
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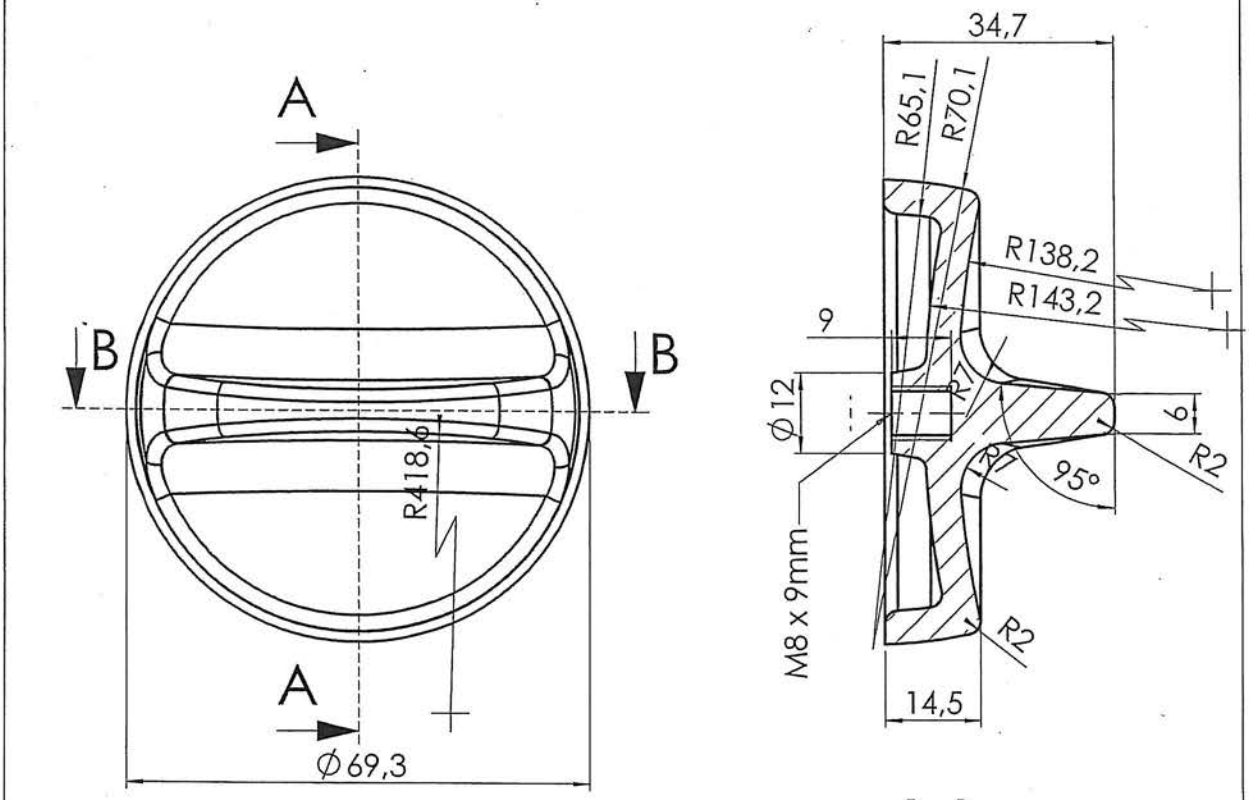
Anviser på begge sider for ø15 gennemgående
B-tik anviser for M5 x 10mm
Boret Ø5.2
Boret Ø15



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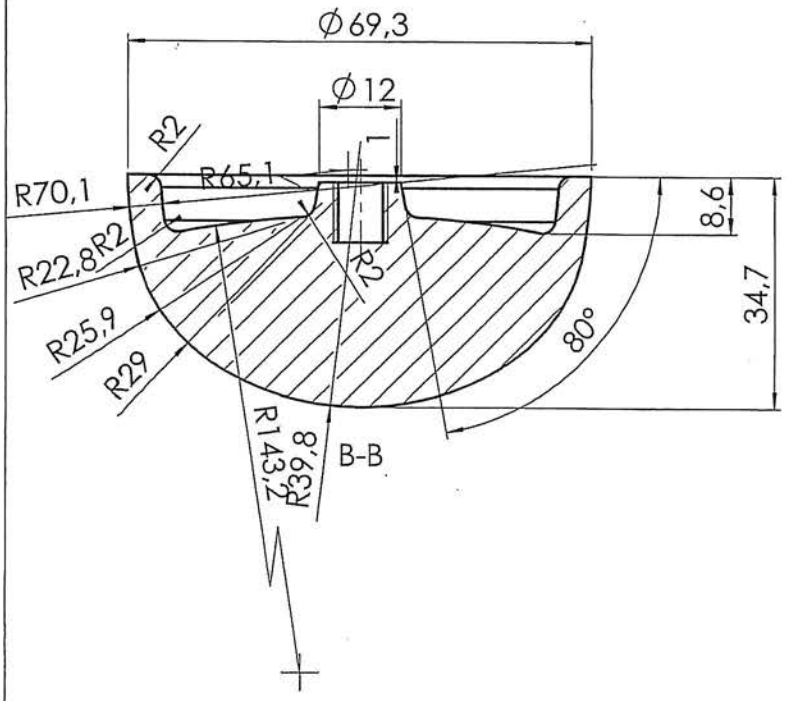

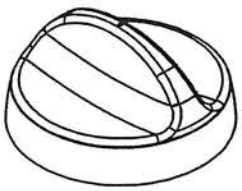

Rev.	Revisionstekst:	Sign.:	Dato:

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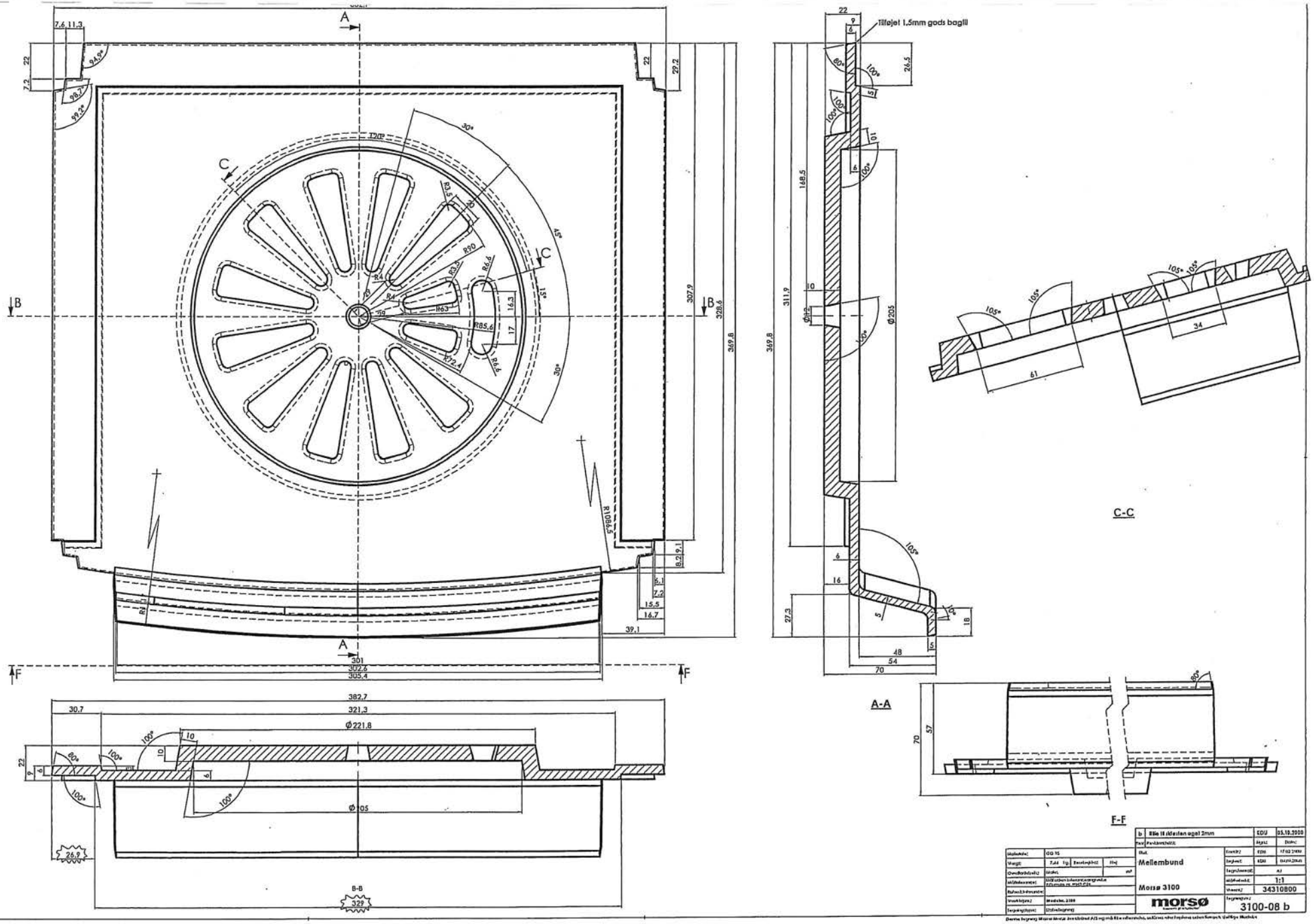
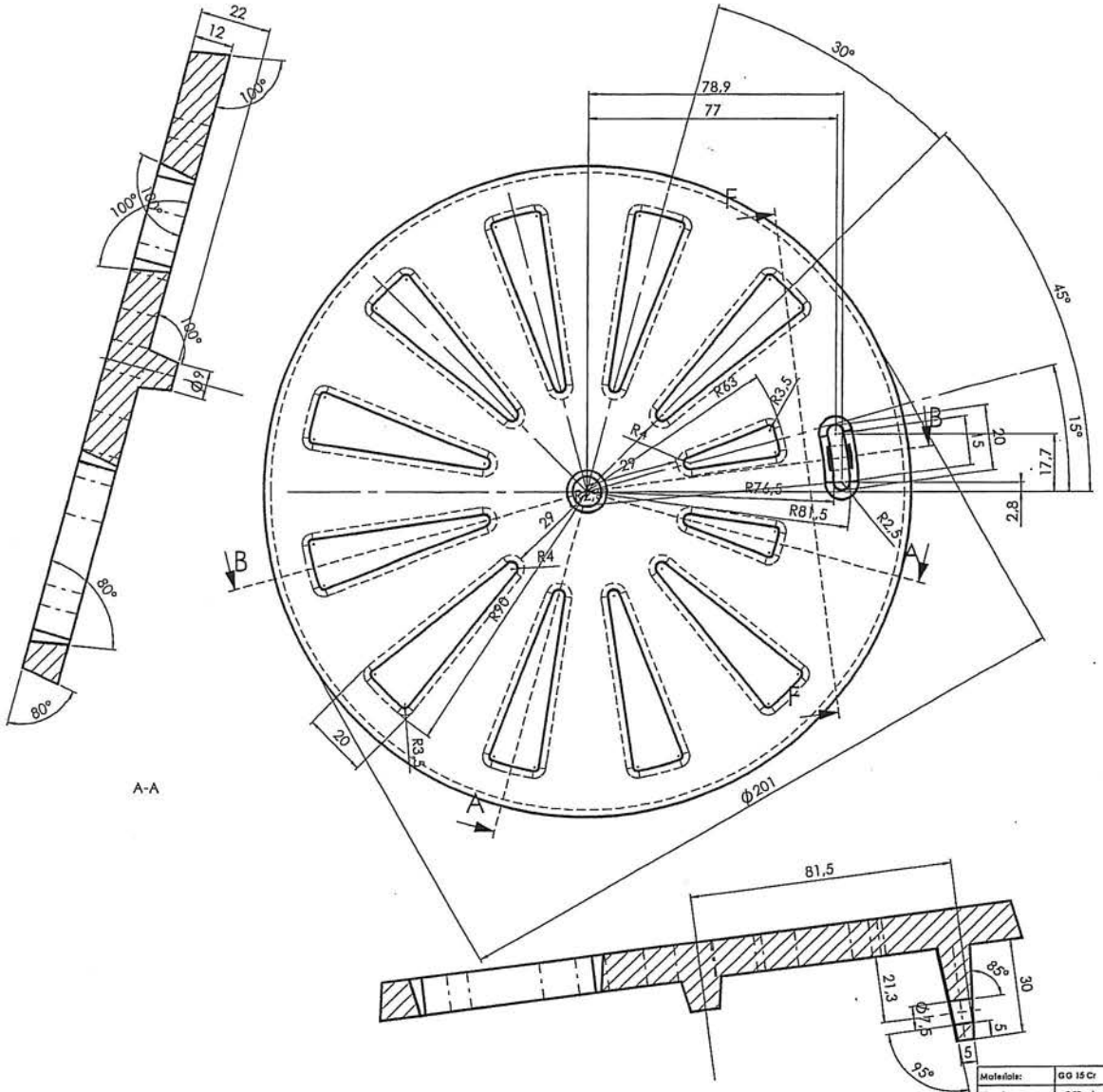
Vægt:	0,28 kg.	Bearbejdes:	Bores	**Trækventil**	Frigivet:	KDU 01.09.2000
Overfladebeh.:	Males		0,013 m²		Tegn.format:	A4
Måltolerance:	Mål uden toleranceangivelse ISO-norm nr. 8062 CT8				Målforhold:	1:1
Ruhedstolerance:				**Morsø 3100**	Varenr.:	34310400
Værktøjsnr.:	**Modelnr. 3104**			morsø By appointment to the Royal Danish Court	Tegningsnr.:	**3100-04 a**
Tegningstype:	Støbetegning					

3100-04 Trækventil - Sheet1

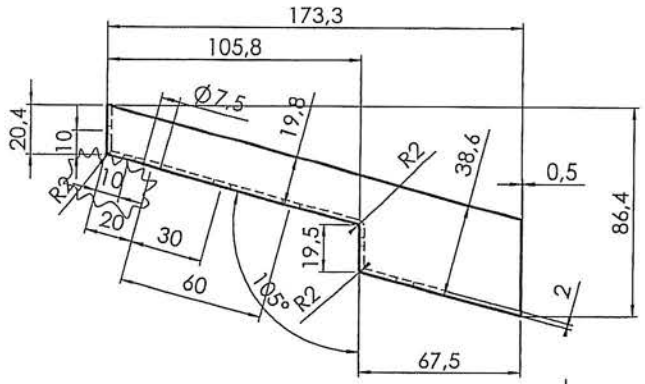

Tilføjet 1.5mm gods bagtil
C-C
A-A
F-F
B-B
Mellembund
Morsø 3100
morsø
3100-08 b
34310800

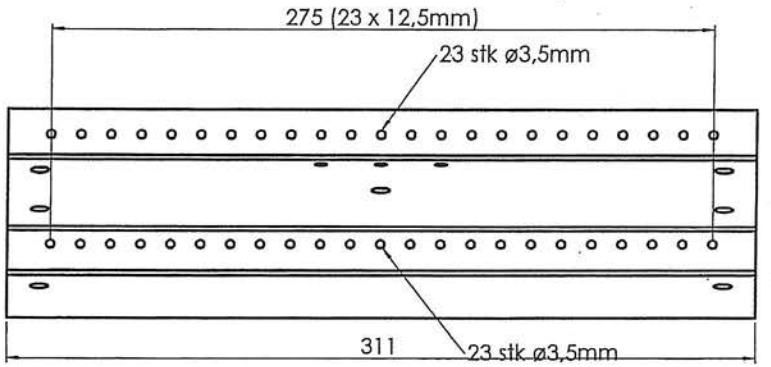
1 - 13 OF 1 - 70

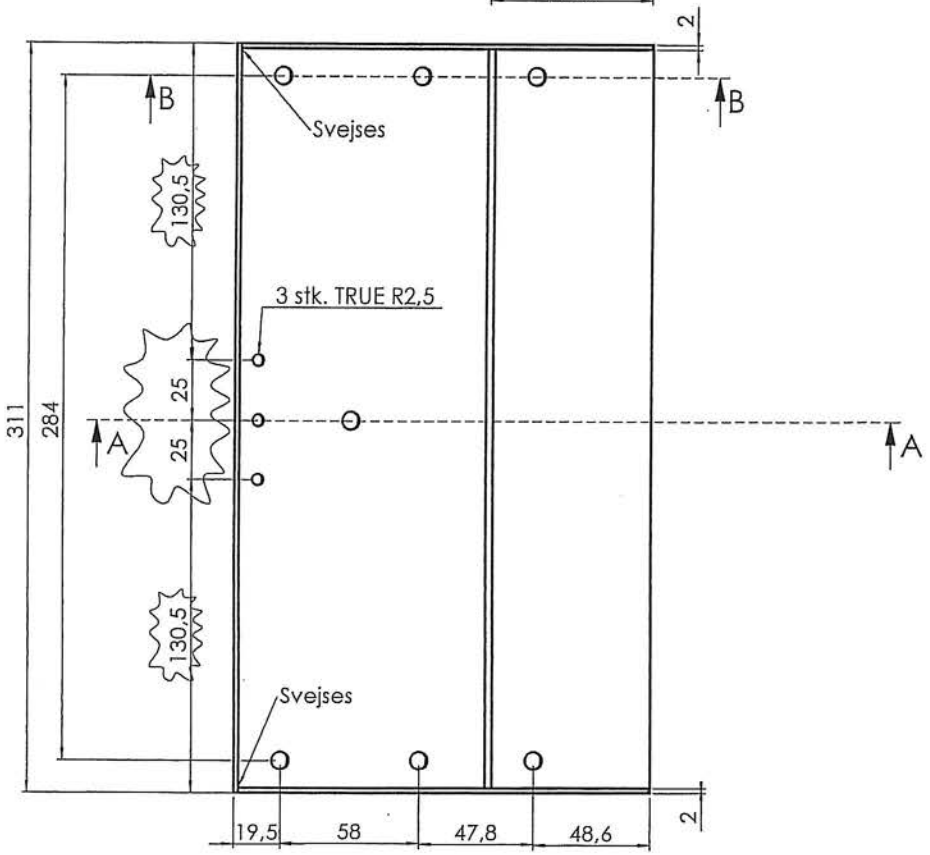


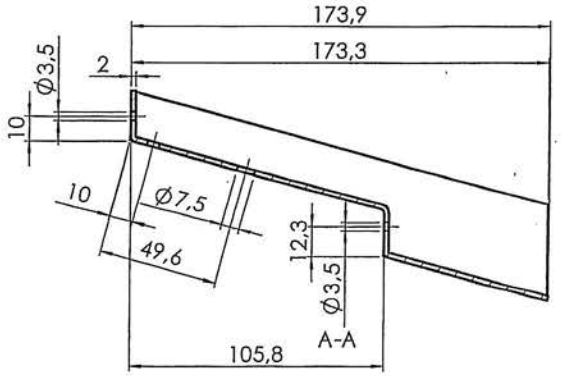
Rev.	Revisionstekst:			Sign.:	Dato:
Tilæt:			Konstr.:	KDU	18.02.2000
Rysterist			Kigtvet:	KDU	05.09.2000
			Tegn.format:	A2	
			Målforhold:	1:1	
Morsø 3100			Varenr.:	34310900	
morsø			Tegningsnr.:	3100-09 a	

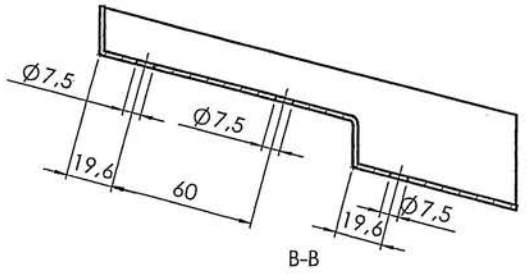
Materiale:	GG 15 Cr		
Vægt:	2,03 kg.	Bearbejdes:	Bores
Overfladebeh.:	Ubehandlet		m²
Måltolerance:	Mål uden tolerance angivelse ISO-norm nr. 8062 CT8		
Ruhedstolerance:			
Værktøjsnr.:	Modelnr. 3109		
Tegningstype:	Støbetegning		











Rev.	Revisionstekst:	Sign.:	Dato:

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Overfladebeh.:	Ubehandlet		m²
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m		
Ruhedstolerance:			
Værkløjsnr.:			
Tegningstype:	Emnetegning		

Titel: **Røgledeplade rustfri**

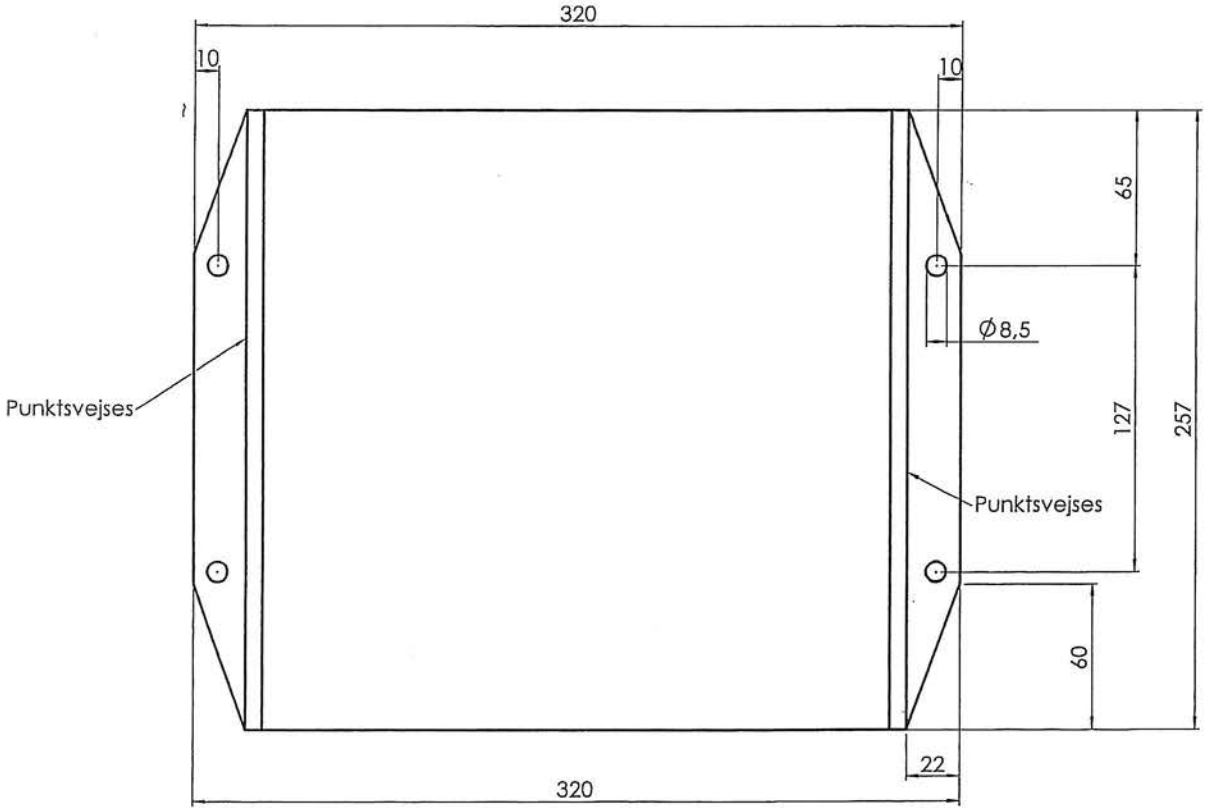
N

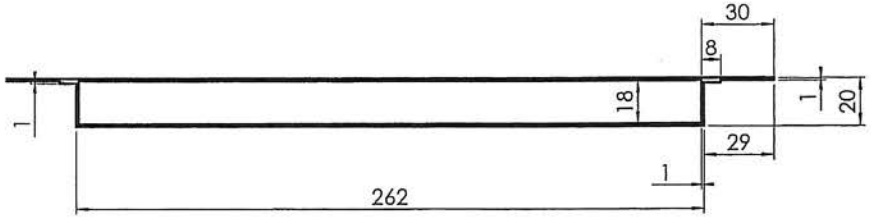
Morsø 3100

morsø

Konstr.:	KDU 31.03.2000
Frigivet:	
Tegn.format:	A3
Målforhold:	1:2
Varenr.:	71312300
Tegningsnr.:	3100-19 a

3100-19 Regledeplade rustfri - Sheet1





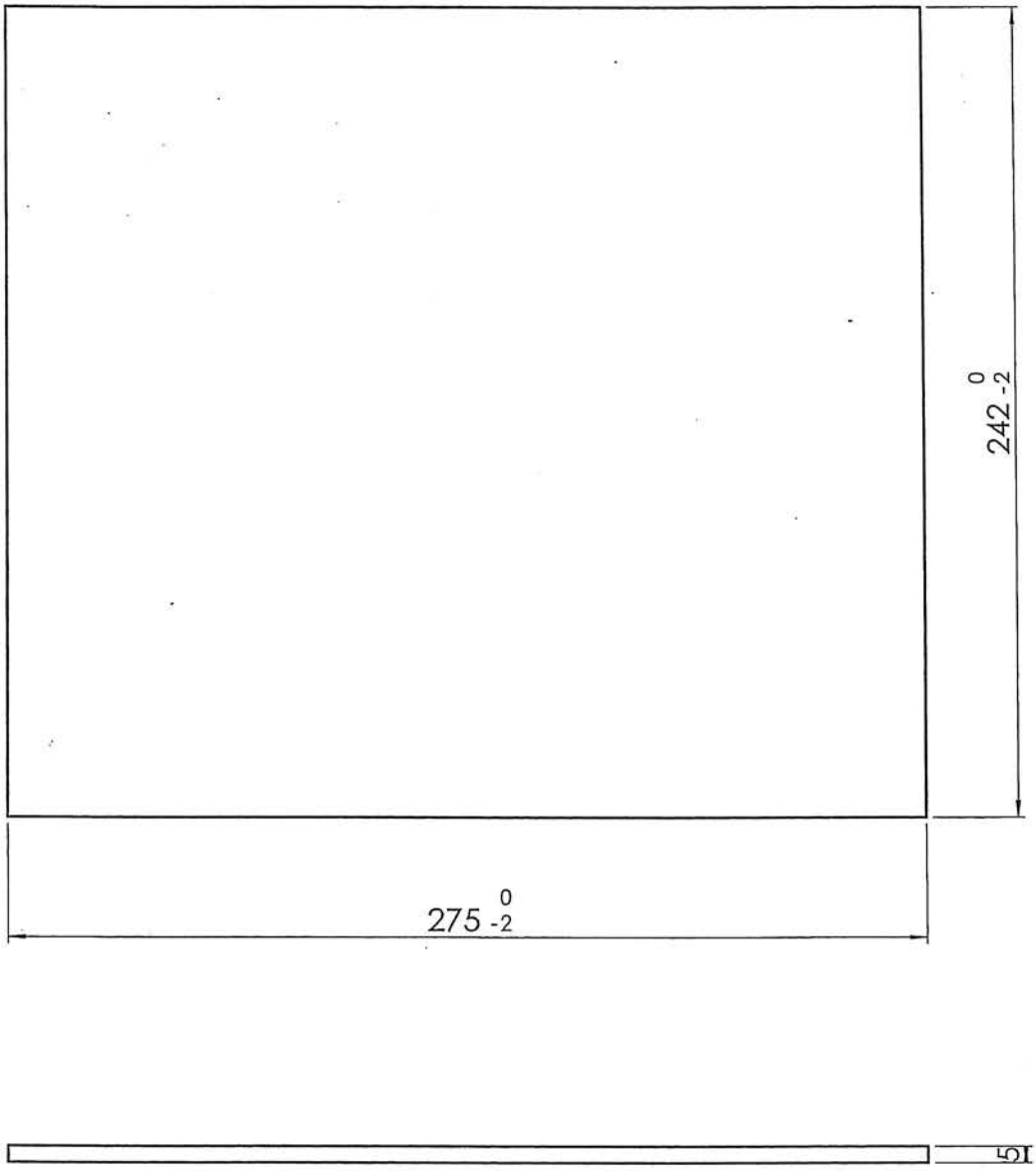
Klippemål:
257 x 320 mm
257 x 308 mm

Rev.	Revisionstekst:	Sign.:	Dato:
d	Klippemål ændret fra 312mm	KDU	25.09.2000
c	Ændret til galv. plade	KDU	04.08.2000
b	Klippemål tilføjet	KDU	02.08.2000

Materiale:	1mm varmgalv. plade		
Vægt:	1,3 kg.	Bearbejdes:	Lokkes
Overfladebeh.:	Ubehandlet		m²
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m		
Ruhedstolerance:			
Værktøjsnr.:			
Tegningstype:	Emnetegning		

Titel:	Konstr.:	KDU	27.03.2000
Stråleskærm bund	Frigivet:	KDU	08.06.2000
	Tegn.format:	A3	
	Målforhold:	1:2	
Morsø 3100	Varenr.:	54312700	
morsø	Tegningsnr.:	3100-23 d	

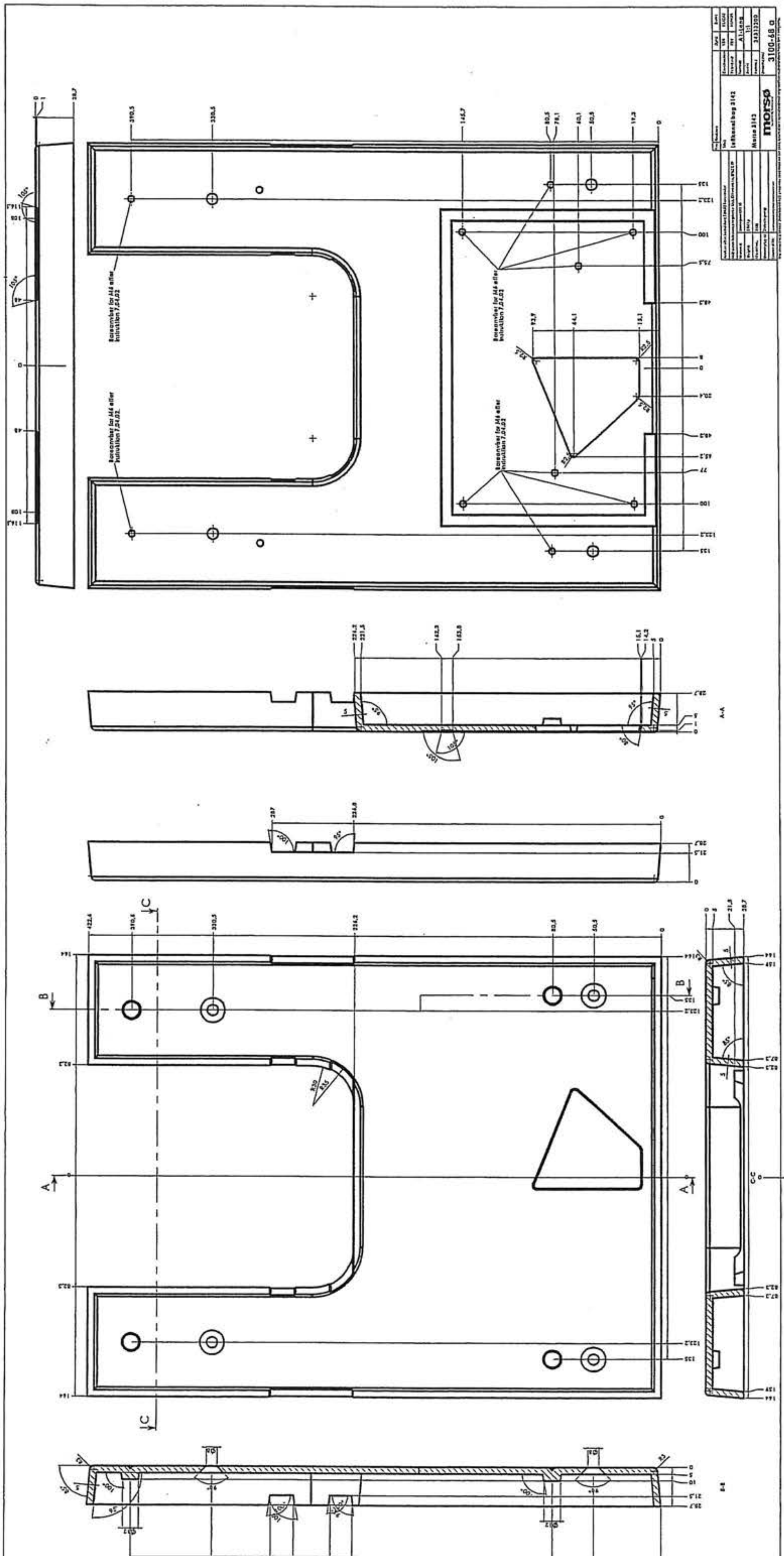
3100-23 Stråleplade bund - Sheet1

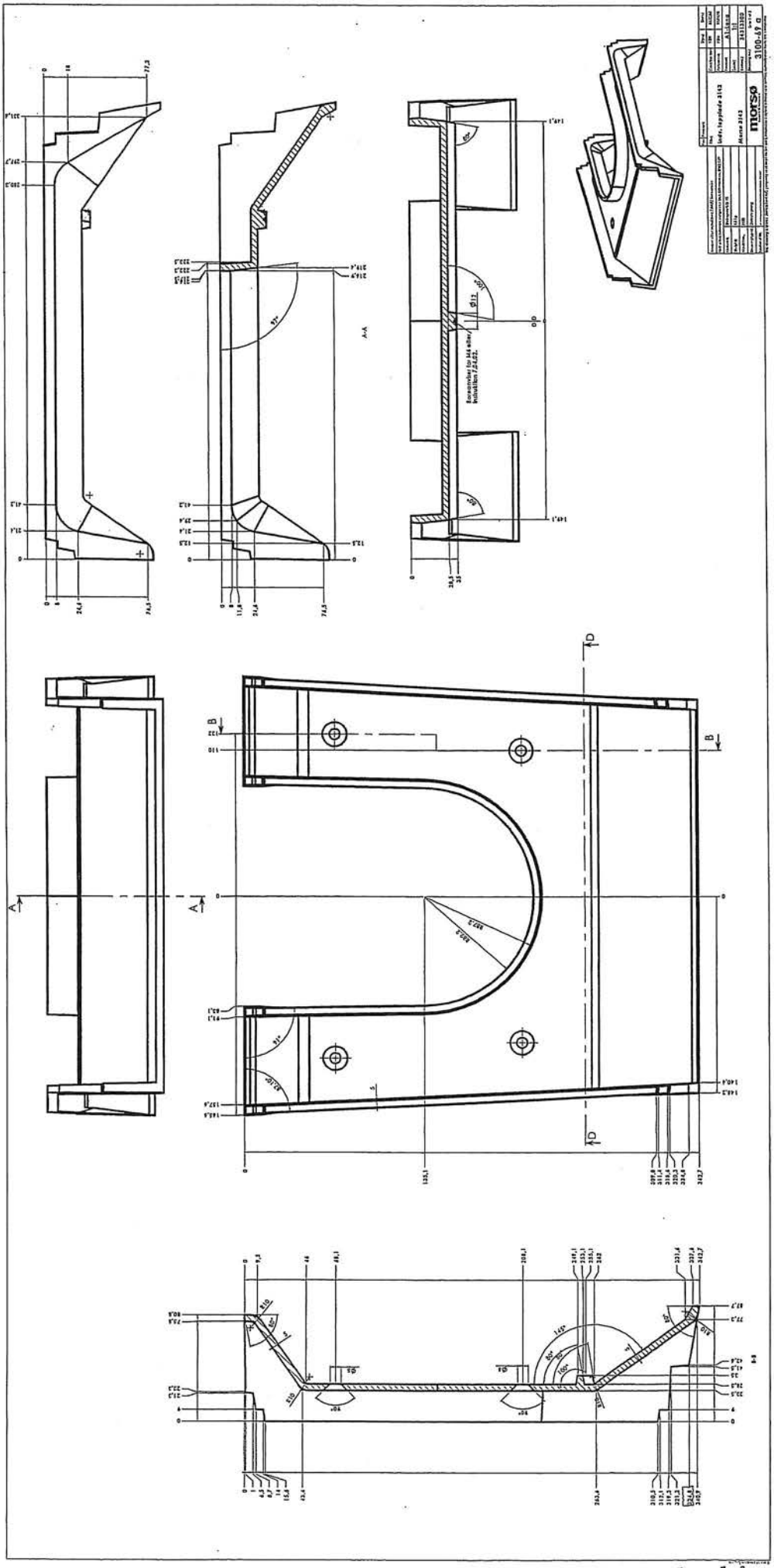


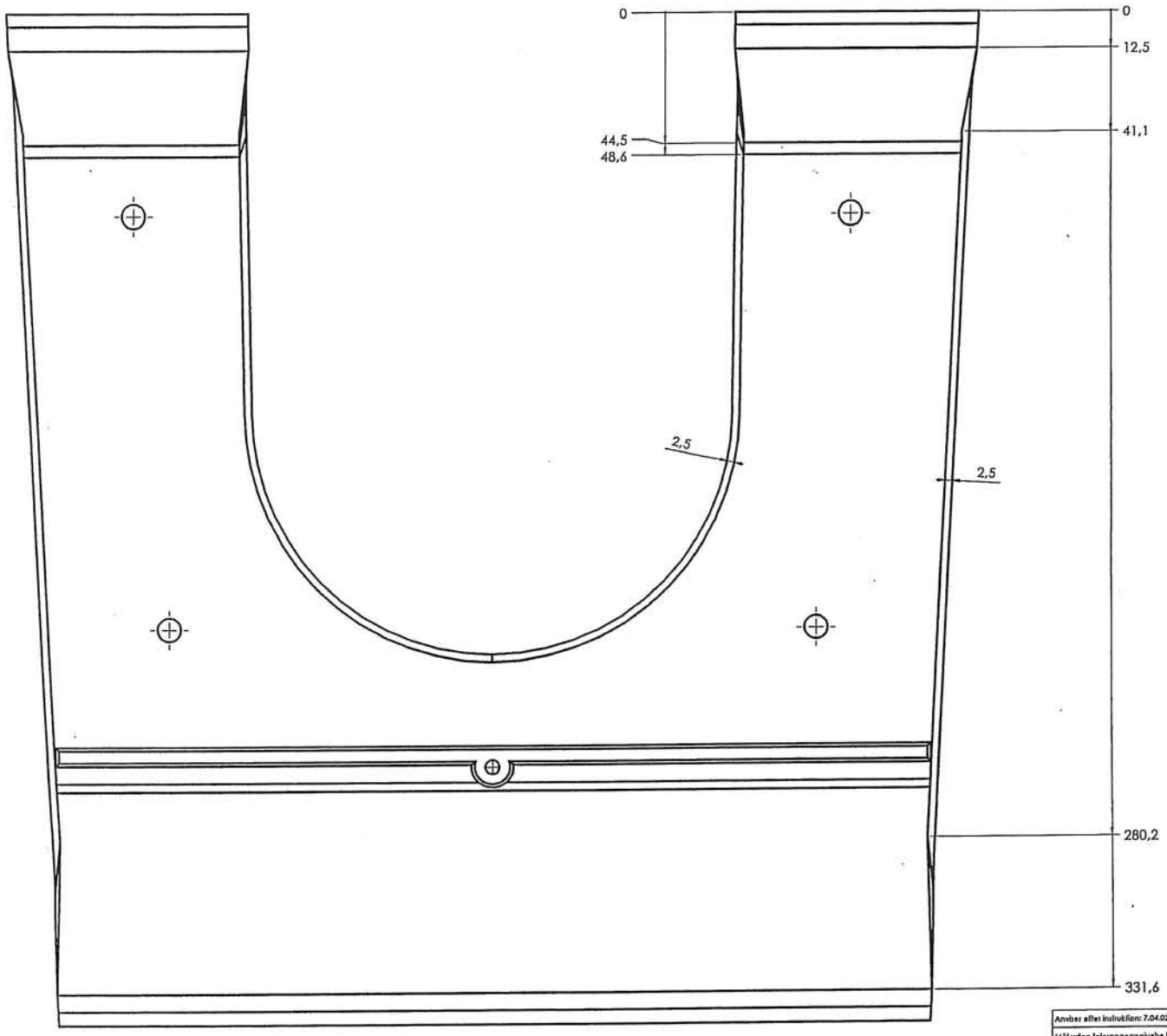
Rev.	Revisionstekst:	Sign.:	Dato:

Materiale:	5mm Keramisk glas			Titel:	Konstr.:	KDU	28.03.2000
Vægt:	kg.	Bearbejdes:		**Glas keramisk**	Frigivet:	KDU	31.05.2000
Overfladebeh.:			m²		Tegn.format:	A4	
Måltolerance:	Mål uden toleranceangivelse se tegning				Målforhold:	**1:2**	
Ruhedstolerance:				**Morsø 3100**	Varenr.:	**79310000**	
Værktøjsnr.:				morsø By appointment to HM the Royal Danish Court	Tegningsnr.:	**3100-24 a**	
Tegningstype:	Emnetegning						

3100-24 Glas - Sheet1


morsø
3100-48 a

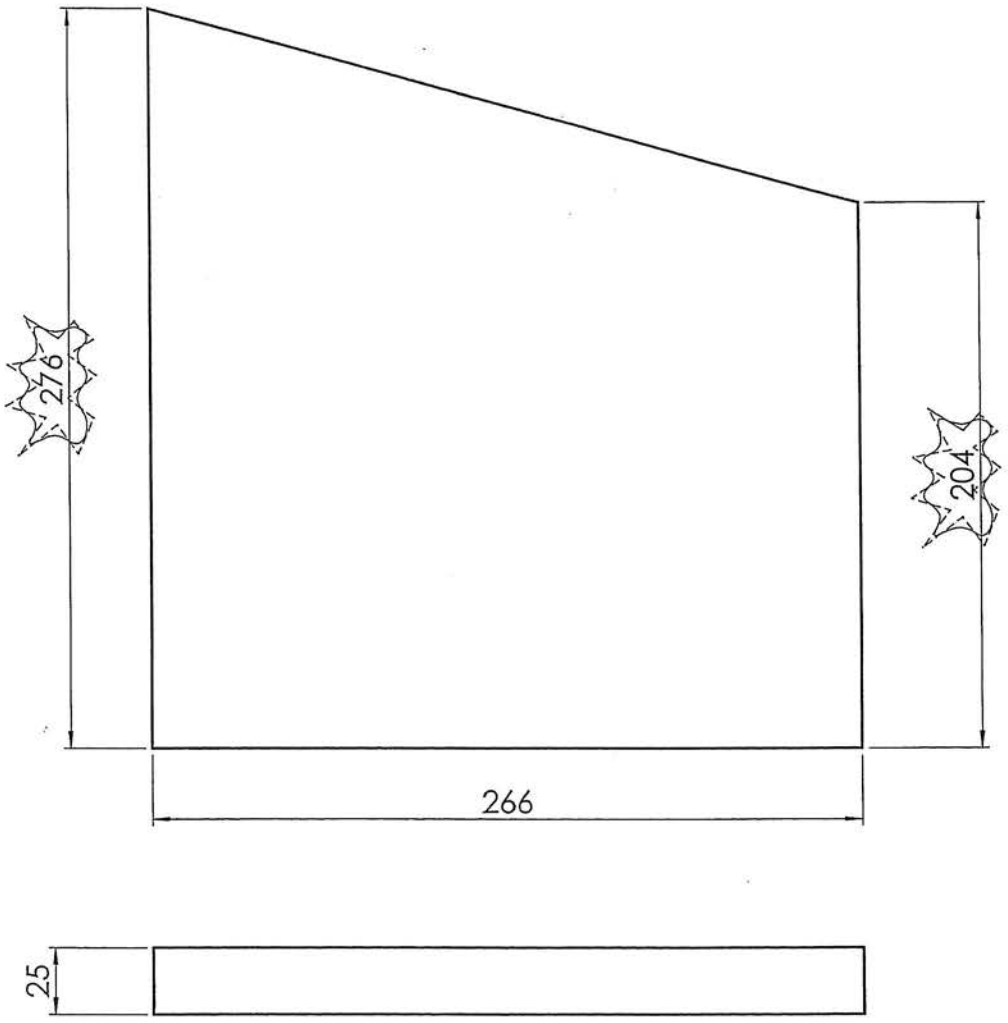




Anviser efter instruktion: 7.04.02 Boreanvier	
Mål uden toleranceangivelse i h.t. ISO-norm nr. 8062 CT9	
Materiale:	Støbejern GG 15
Weight:	4,5 kg
Model no.	3133
Drawingtype:	Støbetegning
Location of file:	

Rev.	Revideret	Sign.:	Dato:
Title: Indv. toppladе 3142	Construction:	KDU	03.12.03
	Released:	KDU	01.04.05
	Format:	A2	
	Scale:	1:1	
Morsø 3142	Item no.:	34313300	
morsø	Drawing no.:	Side 2 af 2	
		3100-69 a	

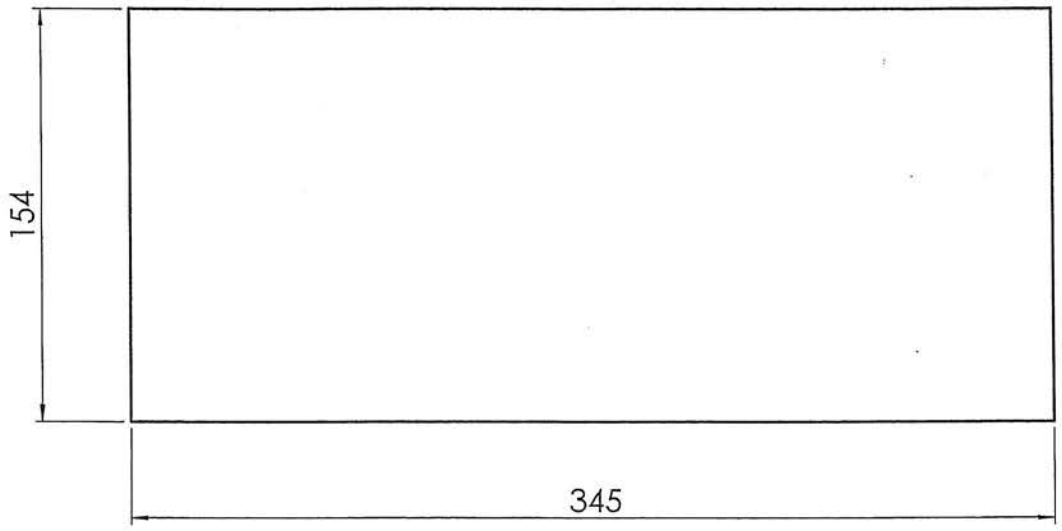
Dato af print: 06-12-2006

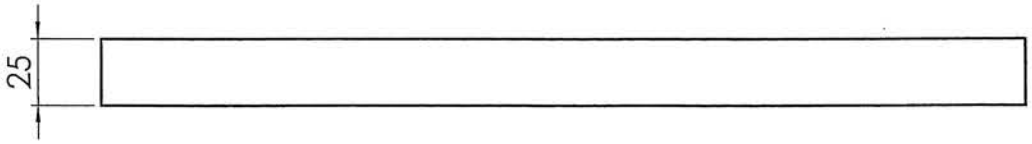


Rev.	Revisions	Sign.:	Date:
d	Mål ændret.	RSV	01.07.05
c	Mål ændret.	RSV	22.06.05
b	Mål ændret.	KDU	29.04.05

Generel tolerance -1 mm +2 mm		Title: **Sten side** **3142** **Morsø 3142**	Construction:	RSV 22.11.04
			Released:	
Material:	Vermiculite v-1100 Mk.2		Format:	A4
Weight:	0,96 kg		Scale:	1:2.5
Model no.			Itemno.:	79311300
Drawingtype:	Emnetegning	morsø	Drawing no.:	3100-85 d
Location of file:	U:\udv\Tegninger\3100\3100-25 Sten side.SLDPRT			

Date of print: 06-12-2006

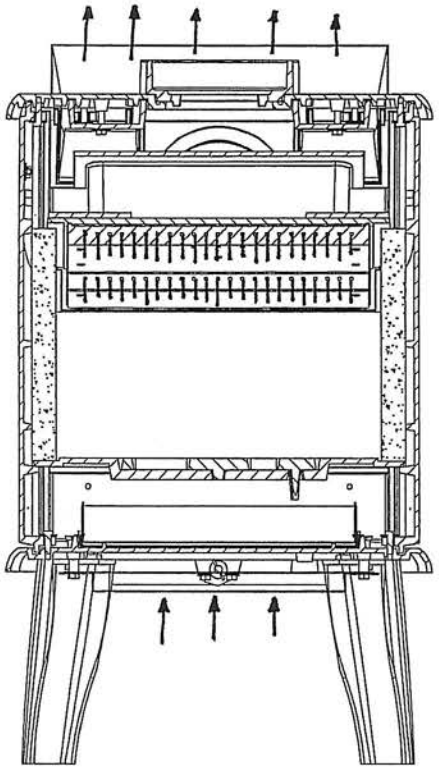


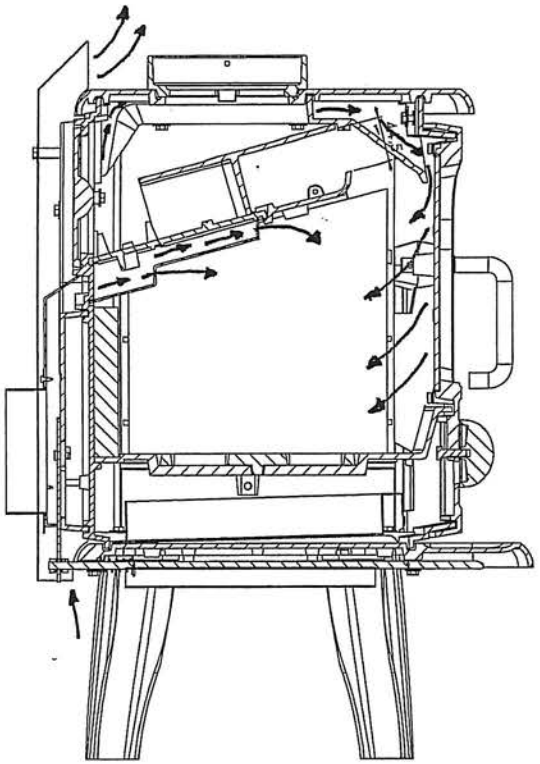


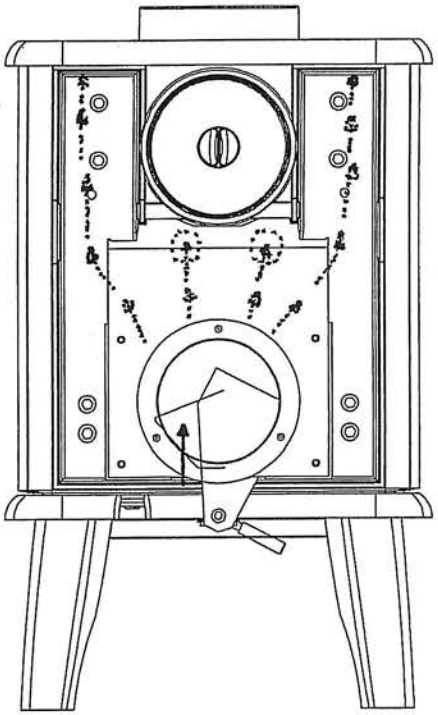
Rev.	Revisions	Sign.:	Date:

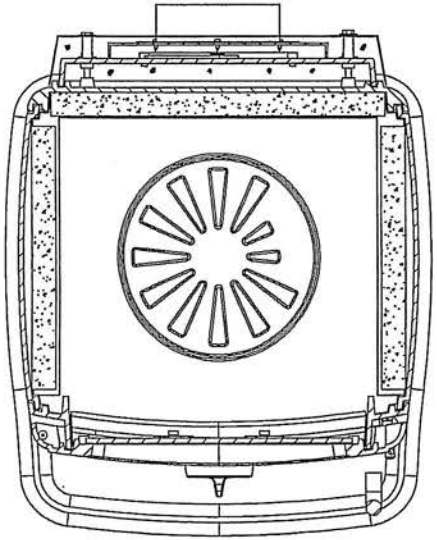
	Title:	Construction:	RSV	22.11.04
Generel tolerance +1 mm, -2 mm	**Sten bag**	Released:		
Material: Vermiculite v-1100 Mk.2	**3142**	Format:	A4	
Weight: 0,8 kg		Scale:	1:2.5	
Model no.	**Morsø 3142**	Itemno.:	79311400	
Drawingtype: Emnetegning	morsø	Drawing no.:		
Location of file: U:\UDV\Tegninger\3100\3100-26 Sten bag.SLDPRT			**3100-86 a**	

Date of print: 06-12-2006



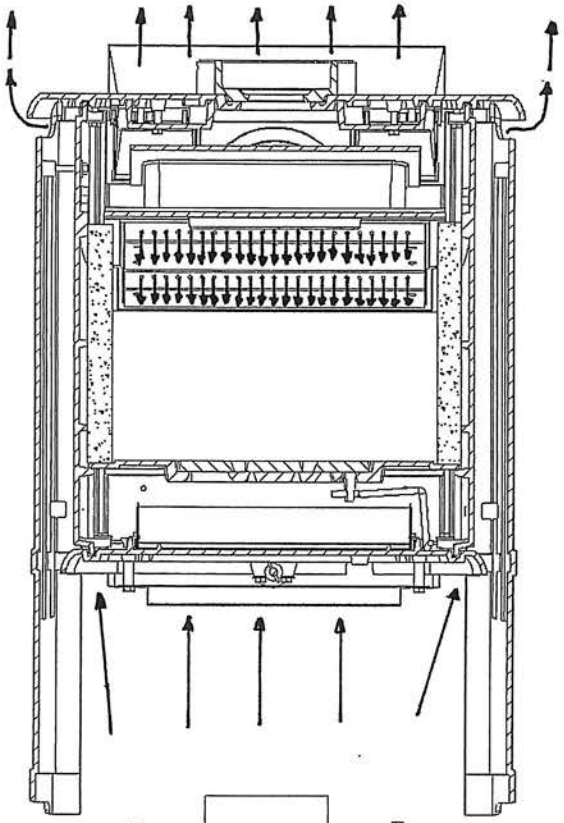


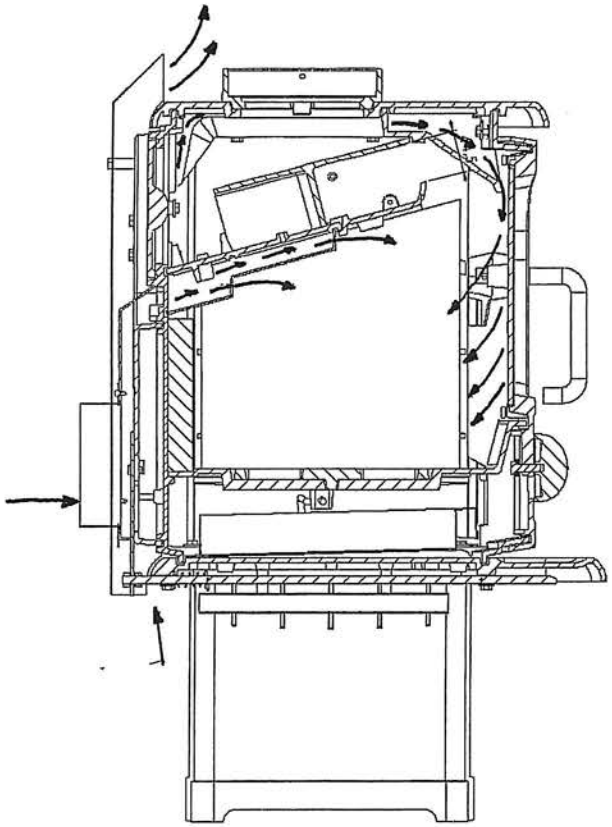


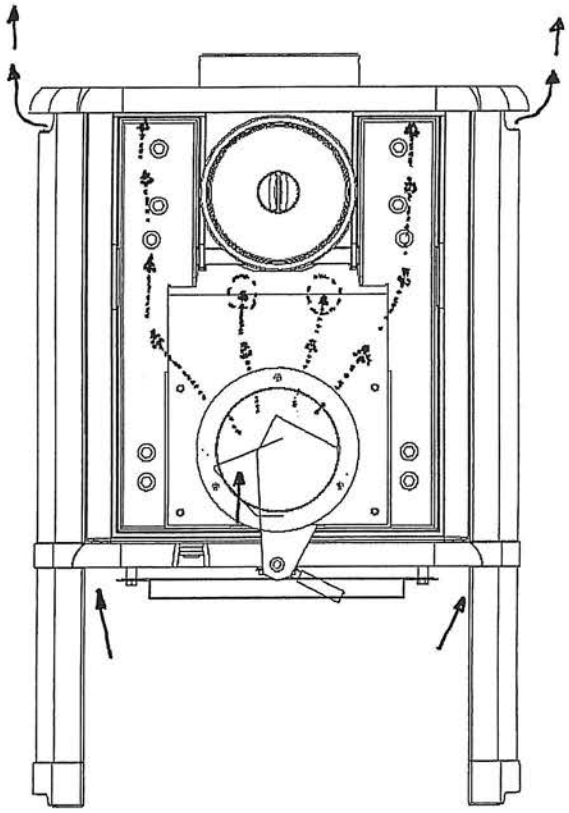


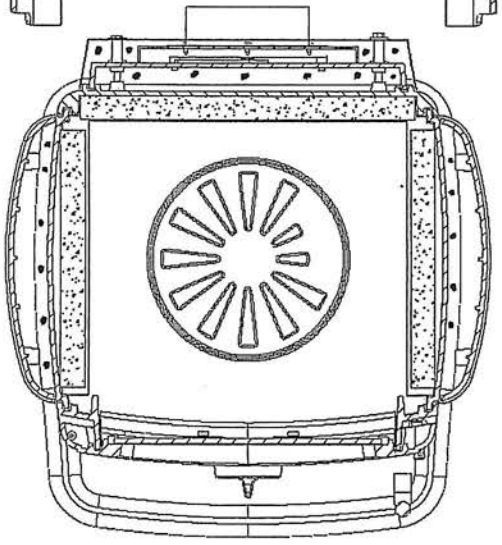
SECONDARY AIR
CONVECTIONARY AIR

		Rev.	Revision:		Sign.:	Date:
			Title:	Construction:	RSV	06.12.06
			Airflow diagram	Released:		
Material:			3112 NA	Format:	A2	
Weight:	104.32 kg			Scale:	1:3.5	
Model no.:				Item no.:		
Drawingtype:			morsø	Drawing no.:	3100-103 a	
Location of file:						



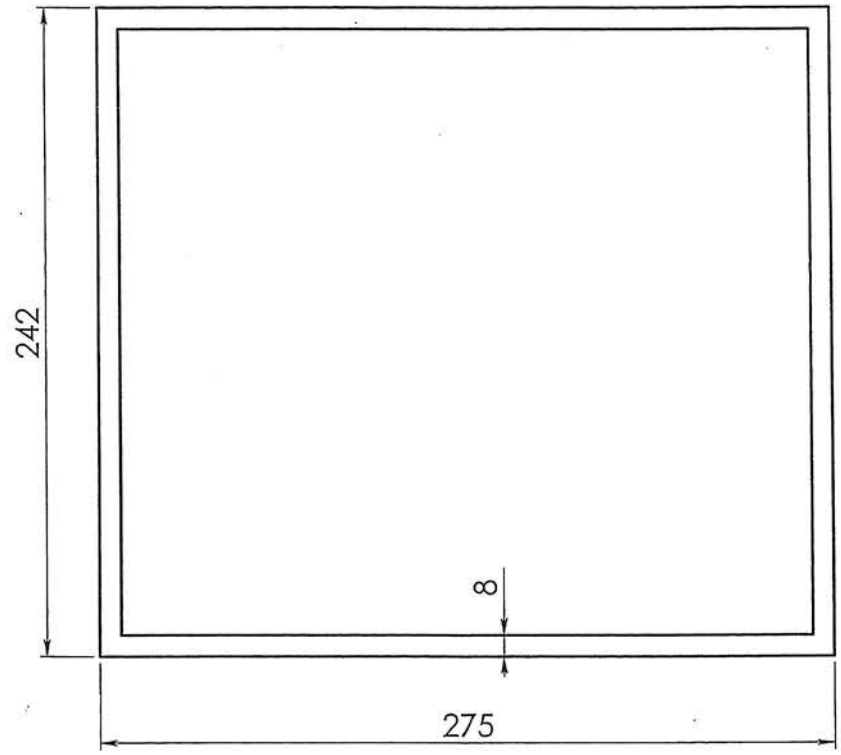


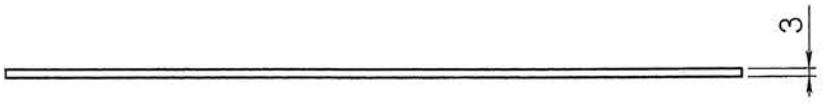




SECONDARY AIR
CONVECTIONARY AIR

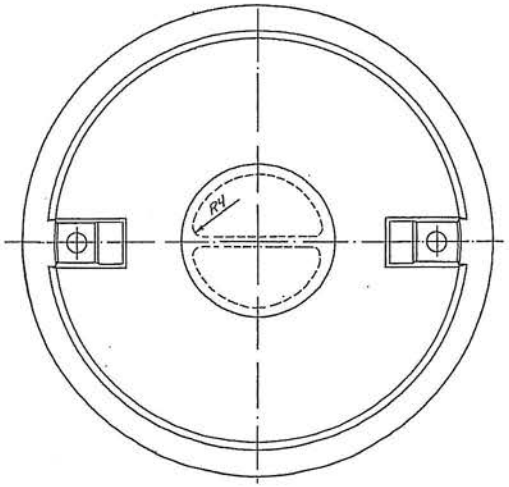
		Rev.	Revisions		Sign.:	Date:
			Title: Airflow diagram	Construction:	RSV	06.12.2006
				Released:		
Material:			3142 NA	Format:	A2	
Weight:	106,32 kg			Scale:	1:3.5	
Model no.			Morsø 3100	Item no.:		
Drawingtype:				Drawing no.:		
Location of file:			morsø	3100-104 a		





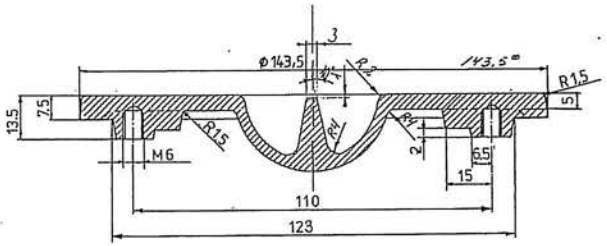
		Rev.	Revisions		Sign.:	Date:
			Title:	Construction:	RSV	07.12.2006
Dim. without indication of margin acc. to DS/ISO 2768-1 m			**Glasbånd 3100**	Released:		
Material:	8x4mm Glasbånd m. tape			Format:	A4	
Weight:	0,25 kg			Scale:	1:2.5	
Model no.			**Morsø 3100**	Itemno.:	79074200	
Drawingtype:	Emnetegning		morsø By appointment to the Royal Danish Court	Drawing no.:	3100-105 a	
Location of file:	U:\vedr\Tegninger\3100\3100-105 Glasbånd.SLDPRT					

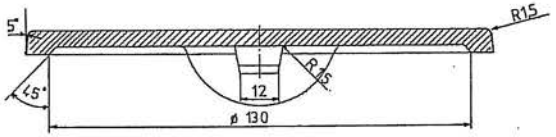
Date of print: 07-12-2006



Slip 10° hvor ikke andet er vist

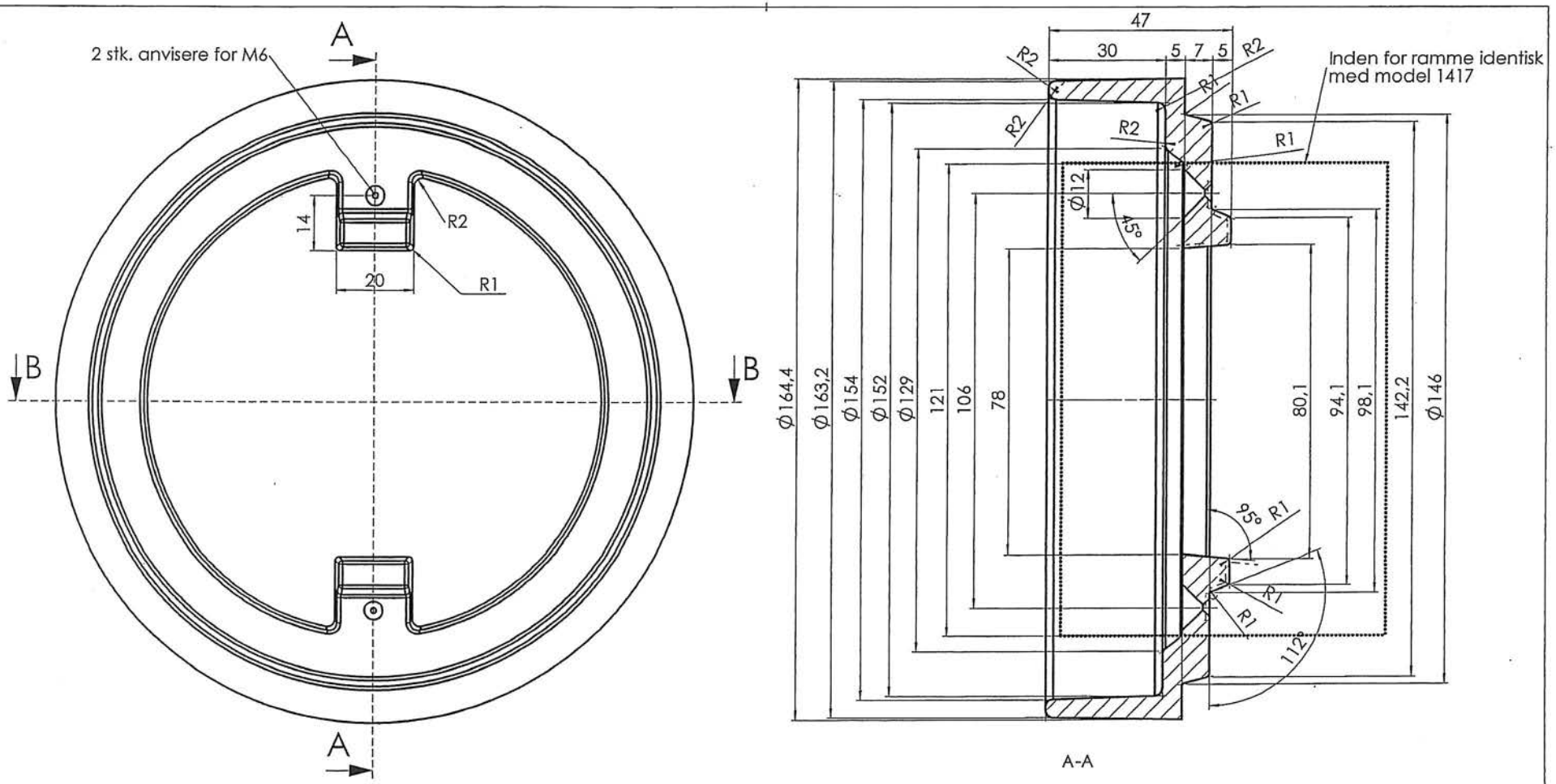
ikke viste rundinger R1





Dæksel/varmeplade Morsø 1400 Universalovn	Varenr. 341410	319-91 P.M.U. 1:1 5-3-84 R.T. Model Nr. 1410 Ændret 2-12-92 RR 1400-10-2 Vægt. 0,80 kg

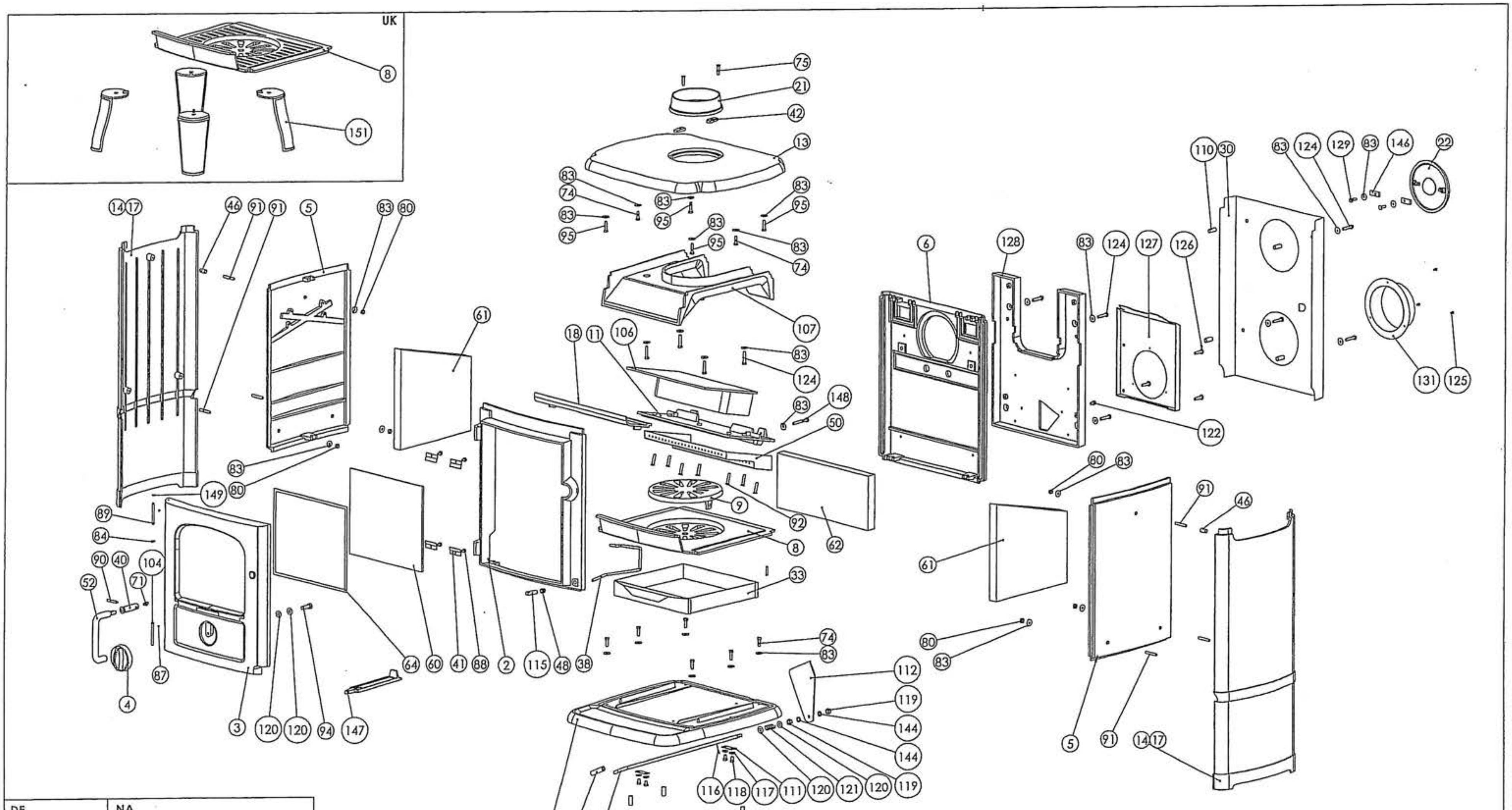
1-26 OF 1-70



Rev.	Revisionstekst:		Sign.:	Dato:

Materiale:	GG15		
Vægt:	1.22 kg	Bearbejdes:	
Overfladebeh.:			m²
Måltolerance:	Mål uden toleranceangivelse ISO-norm nr. 8062 CT8		
Ruhedstolerance:			
Værktøjsnr.:	Modelnr.: 1459		
Tegningstype:	Støbetegning		

Titel:	Konstr.:	RSV	13.12.2000
Røgtud USA	Frigivet:	RSV	24.09.2001
	Tegn.format:	A3	
	Målforhold:	1:1	
Morsø 1400	Varenr.:	34145900	
morsø	Tegningsnr.:	1400-219 a	



Rev.	Revisions	Sign.:	Date:
i	Påført NA dele.	RSV	07.12.2006
h	Påført ben til UK.	RSV	25.08.2006
g	Tilføjet 3112 EH.	RSV	29.05.2006
f	Tilføjet låsering pos. 124 Ændret hængselstift til jernstift pos. 104.	RSV	25.01.06
e	Fjernet stenholder samt skruer.	KDU	05.10.05
d	Påført skruer for befæstigelse af røgledeplade.	KDU	01.08.05
c	Påført 2 stk. skiver v. bundventil.	RSV	17.06.05

Title: 3142 - 3112 EN	Construction:	RSV	26.05.05
Reservedelstegning	Released:		
Morsø 3142	Format:	A2	
	Scale:	1:7	
	Itemno.:	-	
morsø	Drawing no.:	3100-502 i	

Material:	
Weight:	130,15 kg
Model no.	
Drawingtype:	Eksplodered tegning
Location of file:	

Date of print: 07-12-2006

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
Coefficent 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_2O_3	4
Alumina	Al_2O_3	7
Magnesium oxide	MgO	21
Calcium oxide	CaO	2
Sodium oxide	Na_2O	0.5
Potassium oxide	K_2O	11
Loss on ignition 1025°C (1877°F)	LOI	7
Colour		sand

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

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Fax: +1 (704) 544-1239

www.skamol.com

STEFFCA TEXTILGLAS TEKNOLOGI - TEKNISK ISOLERING

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_2O_3 ..... 14-15,5 %
CaO - MgO ..... 20-24 %
B_2O_3 ..... 6,5-9 %
Fe_2O_3 - TiO_2 ..... < 1 %
Na_2O-H_2O ..... < 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 - selvklæbende bændel - bånd - selvklæbende 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, svejsesprøjt 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

Steffca A/S – Falstervej 10 H – 5800 Nyborg – A/S Reg. Nr. 24 44 93 – CVR. Nr. 20 76 85 09
Telefon +45 6531 3102 – Telefax +45 6531 8502 · E-mail info@steffca.dk – www steffca.dk

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, plyed, 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 conducivity 1,0 W/m °K
- Fire reaction incombustible
- Loss on ignition < 1,5 %
- Dielectric rigidity-*glass in bulk* 60-100 KV/mm
- Solvent resistence good
- Bases resistence good
- Acid resistence good - except fluoridric acid

GENERAL PROPERTIES OF "E" GLASS FIBER TEXTILE PRODUCTS

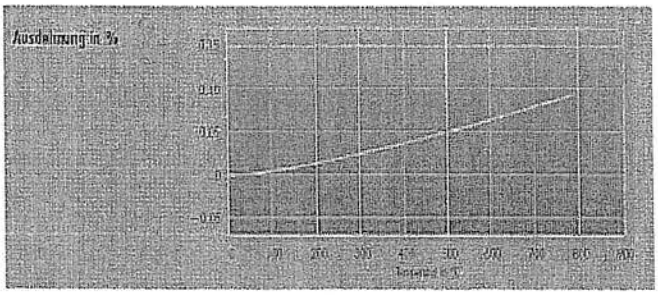
- - high mechanical strength - good electrical properties
- - incombustible - good dimensional stability
- - low thermal conducivity - good resistence to chemical agents
- - high thermal resistencs - - good flexibility
- - max temperature 550°C

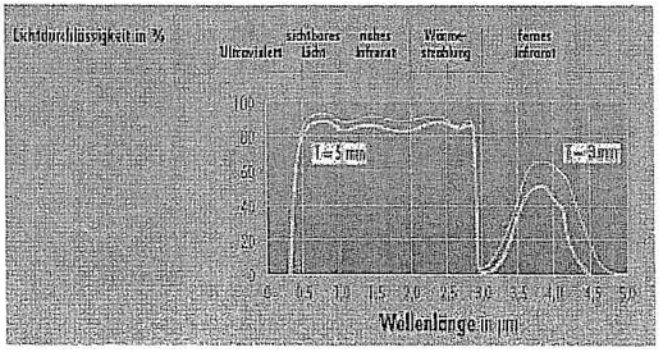
Glaskeramik NEOCERAM N-0
Technische Daten
Wärmeausdehnung
Lichtdurchlässigkeit

Oberflächenbeschaffenheit
Flache Scheiben/Beschichtete Glaskeramik/Einbaurichtlinien

Technische Daten

Ausdehnungs-koeffizient	· 10-7/K	(30 - 380° C) – 6 (30 - 750° C) – 3
Temperatur-wechselbeständigkeit	°C	800
Maximale Betriebstemperatur	°C	kontinuierlich 700 kurzzeitig 800
Wärmeleitfähigkeit	W/m · K (25° C)	1,51
Spezifische Wärme	J/kg · K	712
Dichte	g/cm3	2,51
Biege- und Schlagfestigkeit	entsprechen den Eigenschaften von Gussglas	





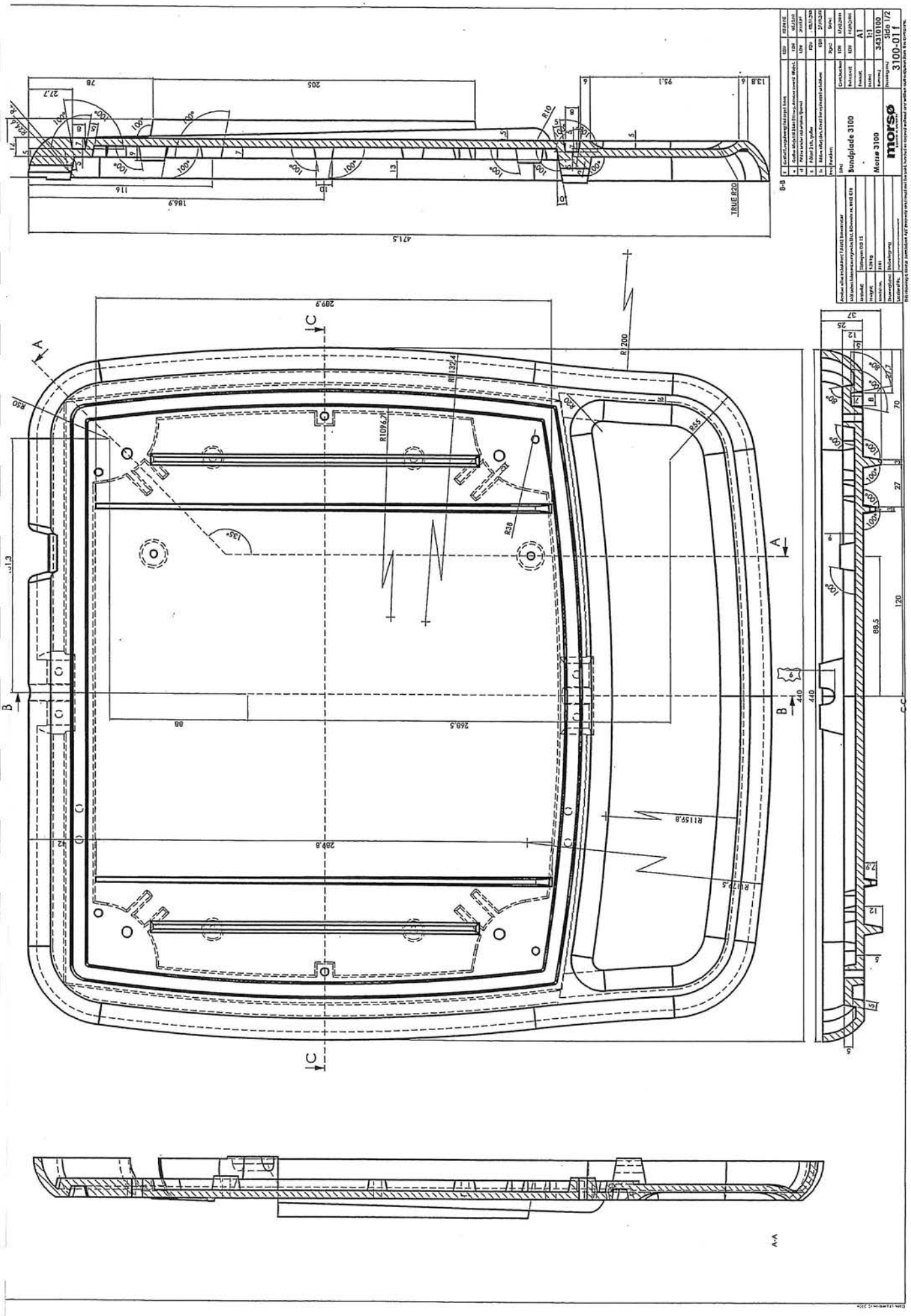
Engineering Drawings/Blueprints (Remainder)

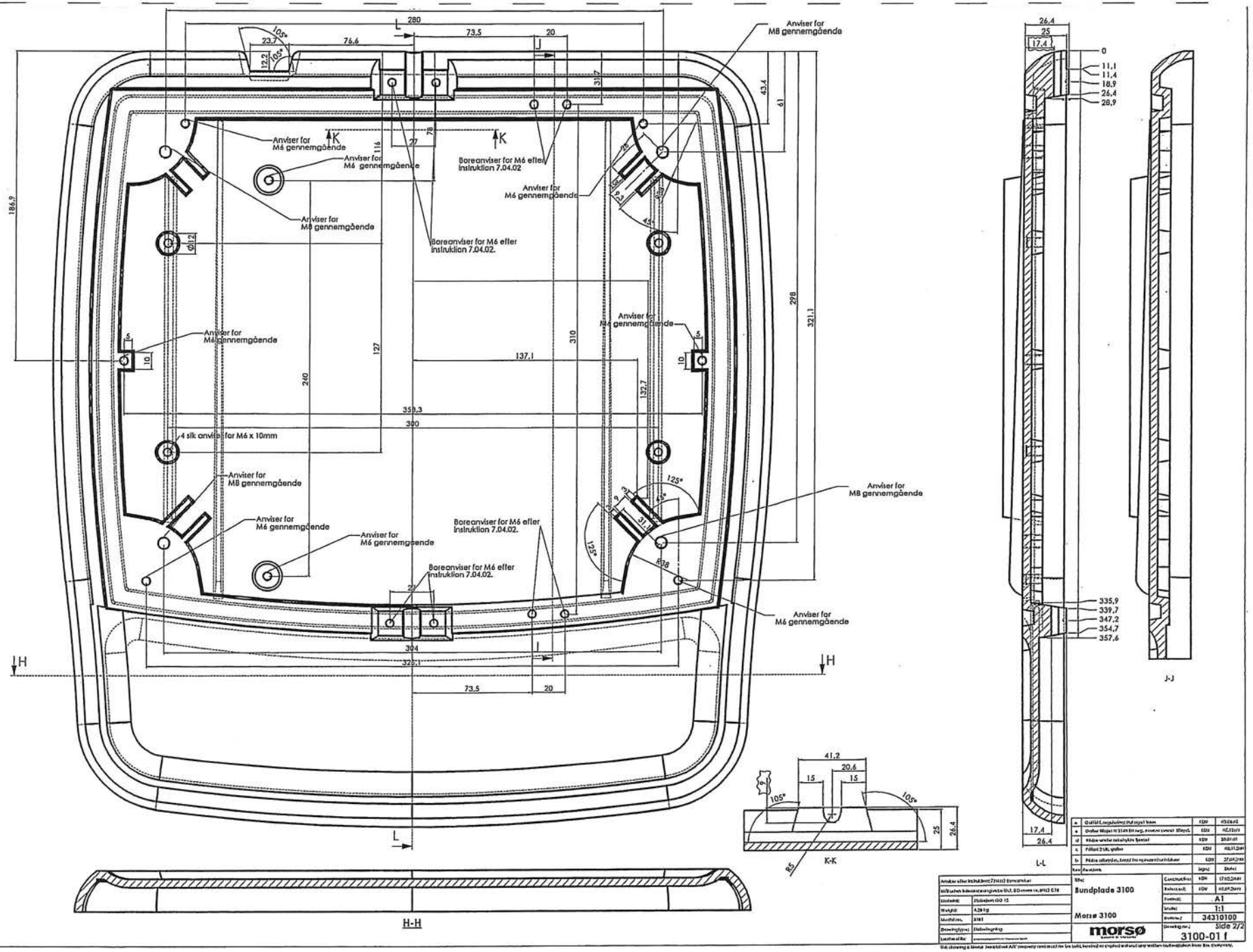
Morsø 3112, 3142 NA - Drawings and data

Nykøbing Mors d. 06.12.2006

PARTS:	DRAWINGS:	DATE:
Base plate	3100-01	03.08.2005
Door	3100-03	05.03.2004
Draught valve	3100-04	01.09.2000
Side plate	3100-05	14.11.2000
Intermediate frame	3100-08	05.10.2000
Riddling grate	3100-09	05.09.2000
Conv. side plate	3100-14	07.03.2000
Baffle plate, stainless	3100-19	31.03.2000
Radiant shielding, bottom	3100-23	25.09.2000
Ceramic glass	3100-24	31.05.2000
Ash tray	3100-37	05.08.2004
Rear plate	3100-66	01.04.2005
Top plate	3100-07	04.09.2000
Air canal, rear	3100-68	01.04.2005
Top plate, inside	3100-69 side 1-2	01.04.2005
Baffle plate, top	3100-70	01.04.2005
Riddling bar	3100-75	02.11.2006
Baffle plate	3100-81	28.08.2006
Access baffle	3100-82	01.04.2005
Front frame	3100-83	01.04.2005
Brick, side	3100-85	01.07.2005
Brick, back	3100-86	22.11.2004
Top plate	3100-90	27.02.2006
Airtightbox	3100-91	03.11.2006
App. drawing 3112	3100-100	06.12.2006
App. drawing 3142	3100-101	06.12.2006
Radiant shielding, rear	3100-102	06.12.2006
Air flow diagram 3112	3100-103	06.12.2006
Air flow diagram 3142	3100-104	06.12.2006
Tightening tape	3100-105	07.12.2006
Cover	1400-10	02.12.1992
Distance tube	1400-148	21.11.2003
Log for plate - not threaded	1400-199	03.03.2000
Glass fitting	1400-206	14.03.2001
Log for plate - threaded	1400-204	03.03.2000
Flue collar	1400-219	24.09.2001
Leg	3400-07	26.06.1998
Draught Control	3400-16	11.11.1999
Bar f. draught control	3400-17	25.10.1999
Mounting plate, bar f. draught control	3400-18	10.11.1998
Handle f. draught control	3400-41	10.10.2000
Bush	1126-27	02.07.2001
Hinge pin	1126-38	20.12.1996
Riddling handle	1126-42	30.06.1987
Distance tube	5000-18	21.11.2003
Knob f. riddling bar	5000-60	20.02.2003
Hinge pin	5000-85	31.07.2003
Stainless Steel Handle	2100-158	29.05.2001
Stainless Steel Handle	2100-159	26.01.2001
Air adaptor	3600-28	10.10.2006
Door axle	4600-12	07.03.2002
Parts drawing	3100-502	07.12.2006

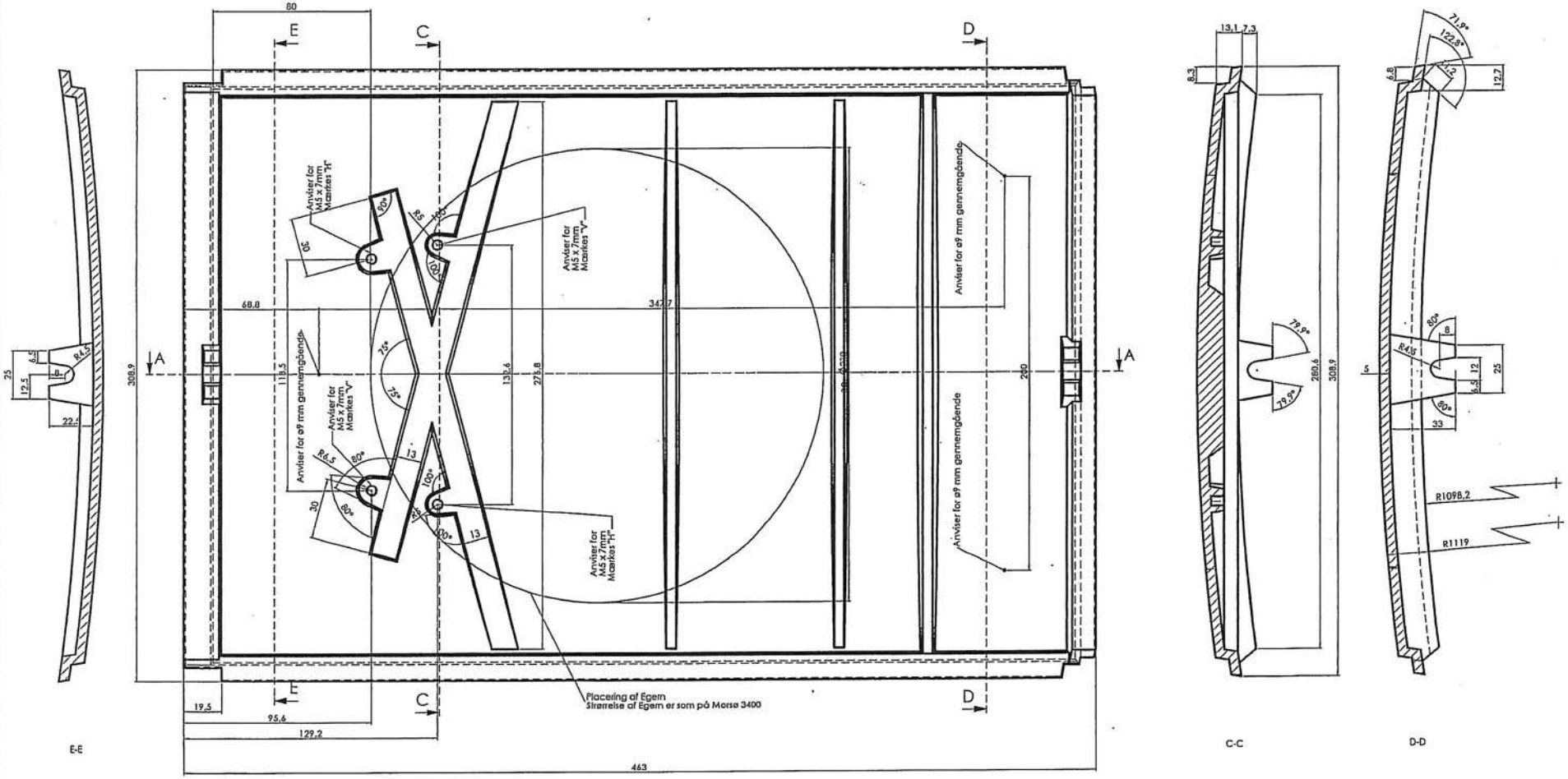
V-1100 (600) Vermiculite insulating slabs- Technical datas
Glas fiber products – Technical datas
Glass ceramics - Technical datas
Installation and Operating Instructions
Parts list 3112, 3142


Bundplade 3100
Morse 3100
morsø
34310100
Side 1/2
3100-01 f
A1
1:1
B-B
A-A
C-C
TRUE R20

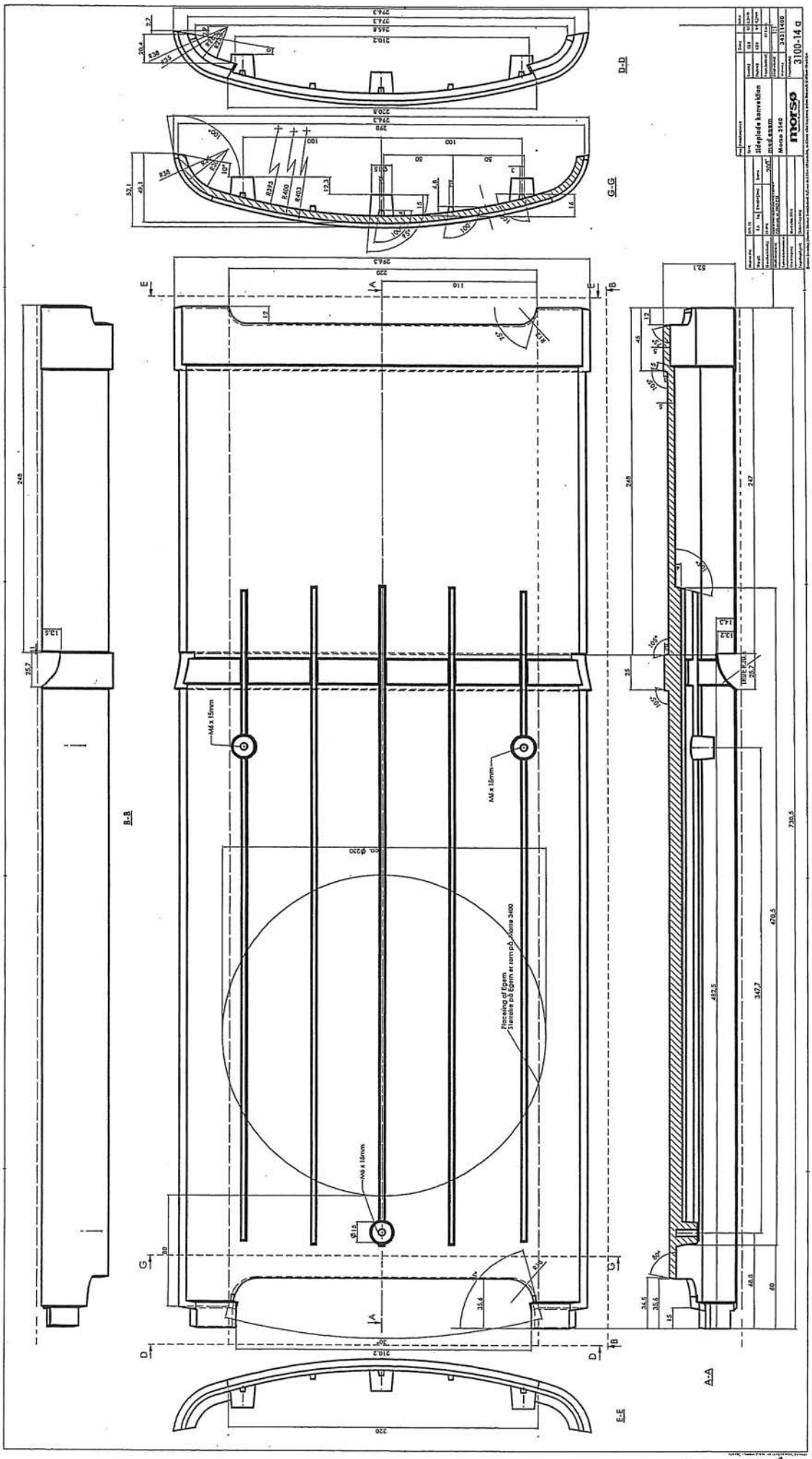


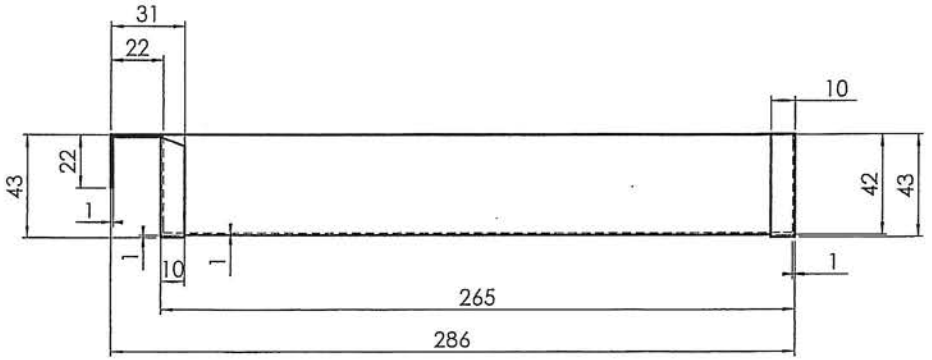
Bundplade 3100	Construction:	KDV	17.05.2010
	Released:	KDV	17.05.2010
	Format:		A1
Morsø 3100	Scale:		1:1
	Drawing no.:		34310100
morsø	Drawing no.:		Side 2/2
			3100-01 f

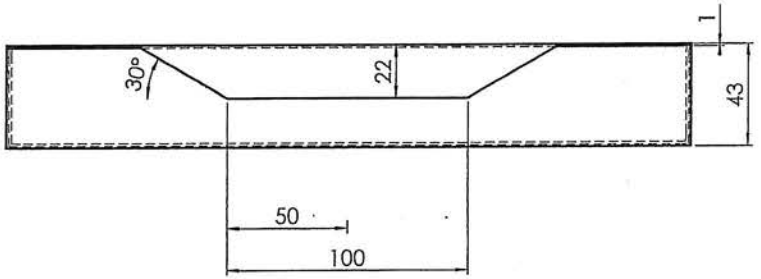
1-37 OF 1-70

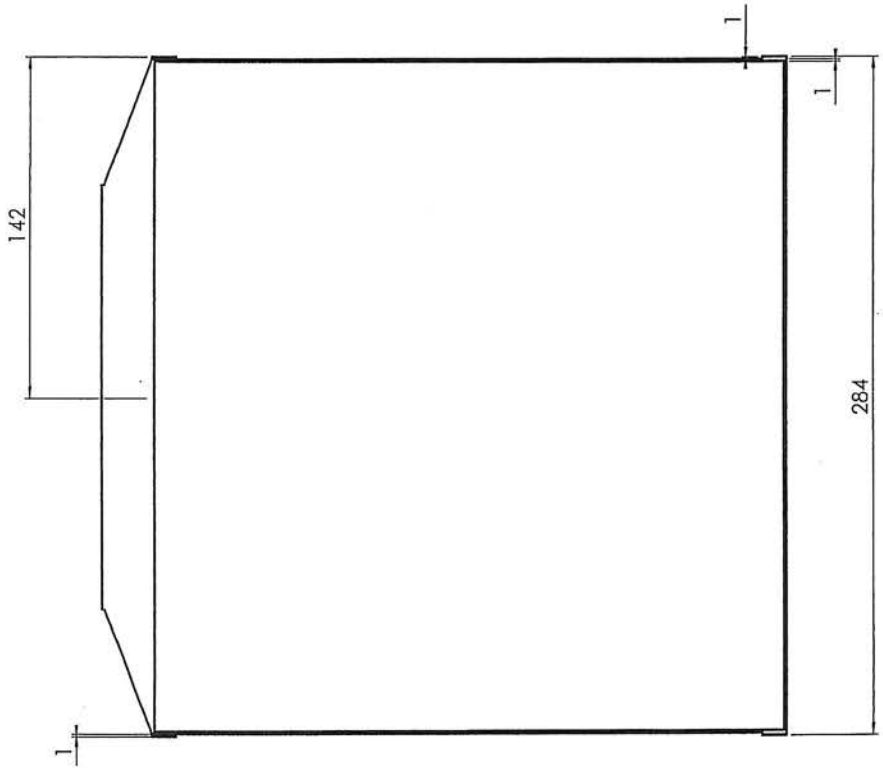


Sideplade stråleovn med egern Morsø 3100	Kontrol:	EDn	16.02.2018
	Tegnet:	RSV	14.11.2017
	Tegnformat:		A3
	Målestok:		1:1
	Varenr.:		34310500
morsø	Tegningsnr.:		3100-05 a


D-D
G-G
B-B
A-A
E-E
Sidepiede konvektion
med esam.
Mene 3140
3100-14 a
M4 x 15mm
M6 x 15mm
Placering af Epam
Stenelse på Epam er som på Mene 3400







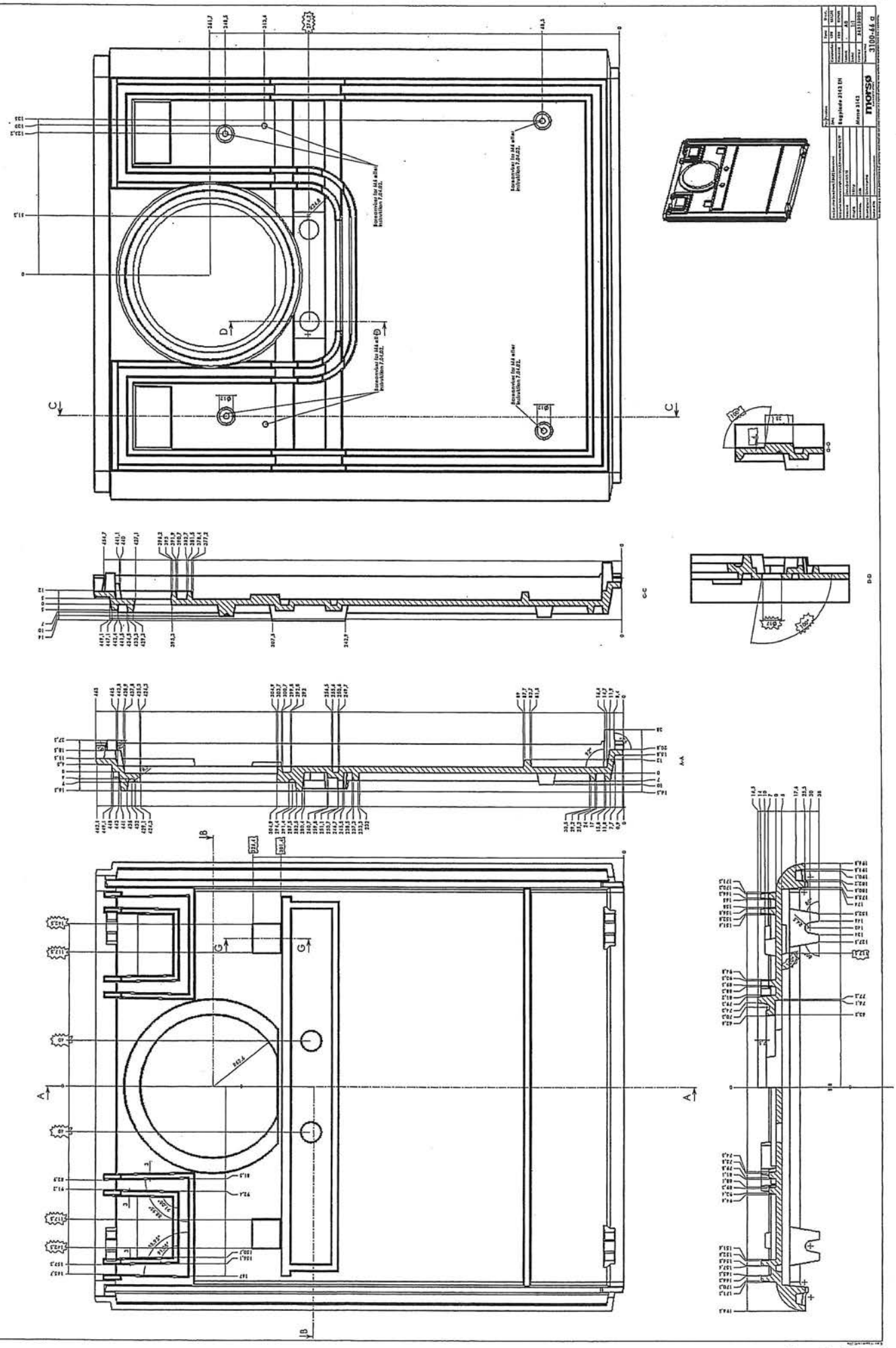
Indvendig mål:
263 x 282 mm, højde = 41mm
Volume = 3,2 dm³

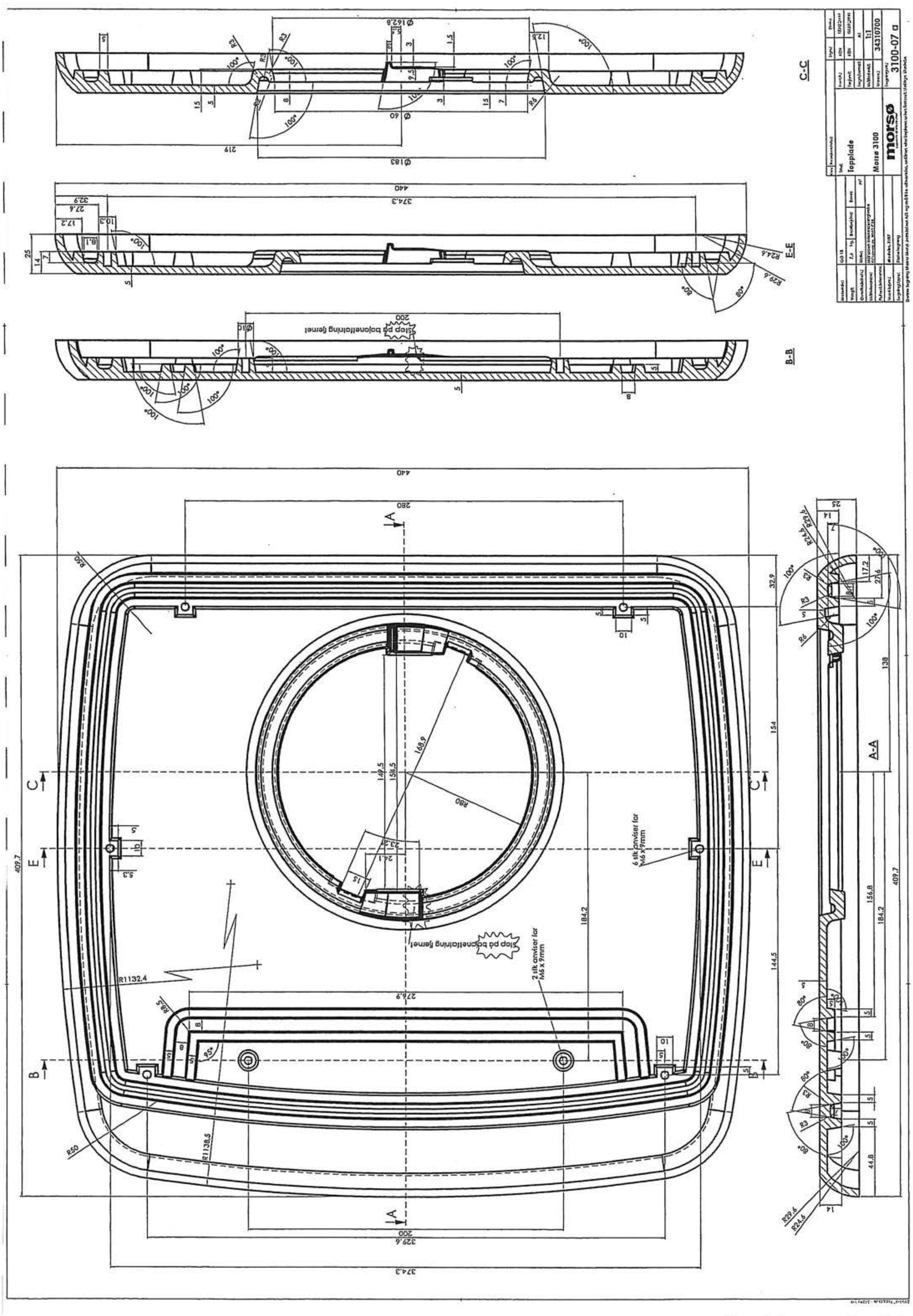
Klippemål:
svøb: 362 x 263 mm
bagpl.: 300 x 51 mm
frontpl.: 300 x 91 mm

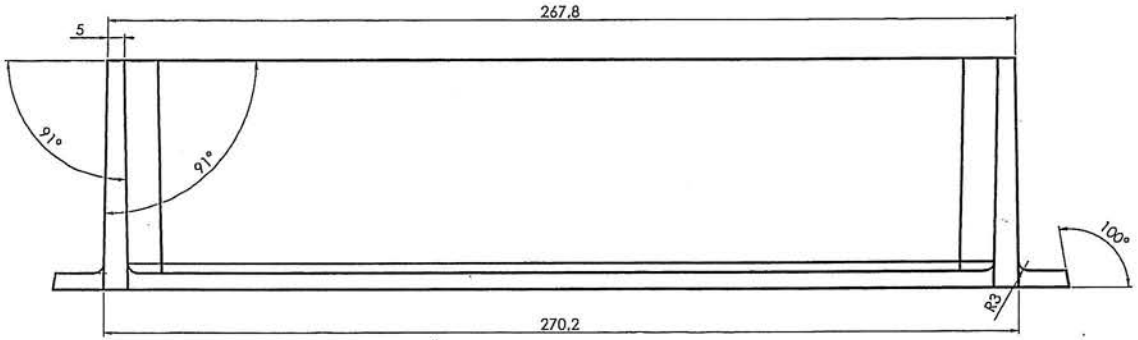
Rev.	Revisionstekst:	Sign.:	Dato:
b	Ændret materiale	RSV	05.08.04

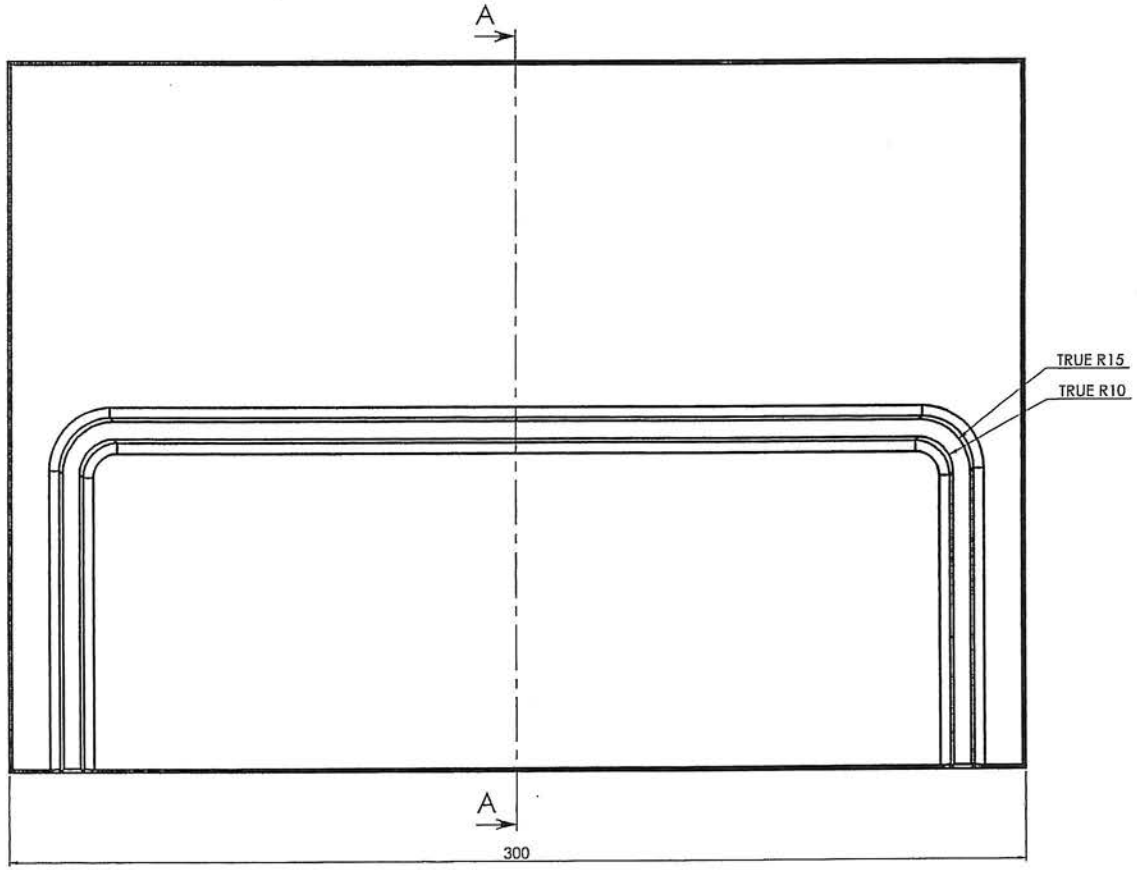
Materiale:	Elgalv. pl		
Vægt:	1055 g	Bearbejdes:	Klippes/Bukkes/Svejses
Overfladebeh.:			m²
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m		
Ruhedstolerance:			
Værktøjsnr.:			
Tegningstype:	Emnetegning		

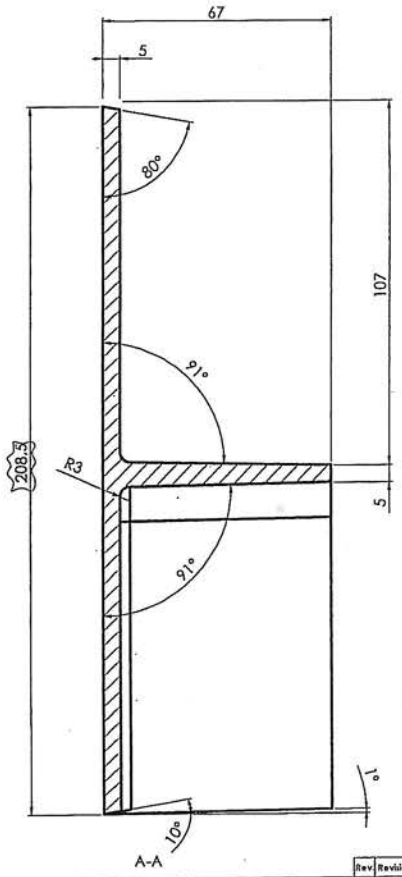
Titel:	Askeskuffe	Konstr.:	KDU 15.06.2000
		Frigivet:	RSV 19.06.2001
		Tegn.format:	A3
	Morsø 3100	Målforhold:	1:2
		Varenr.:	54310100
morsø		Tegningsnr.:	3100-37 b


morse
3100-66 a


Topplade
Morsø 3100
34310700
1:1
3100-07 a
C-C
E-E
B-B
A-A
Stop på bajonetlåsning fjernet
6 stk anviser for M6 x 9mm
2 stk anviser for M6 x 9mm



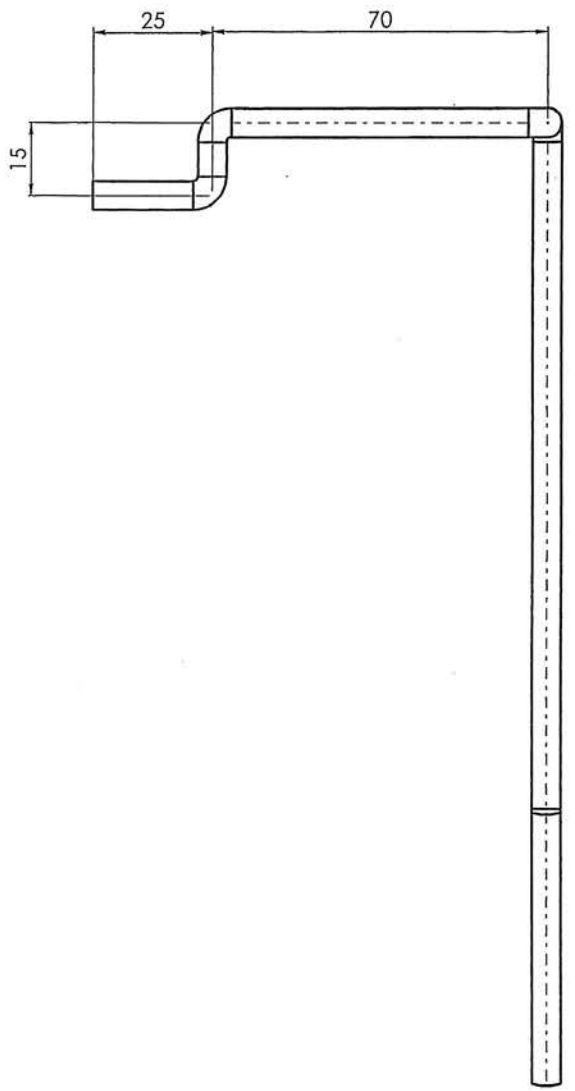


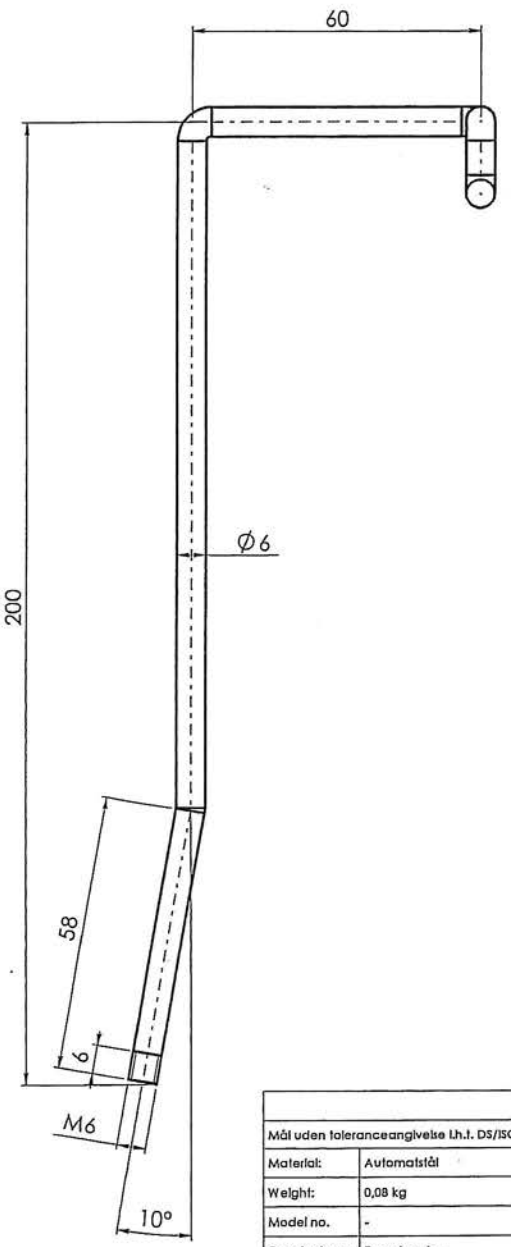


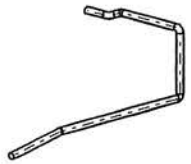
Rev	Revisions		Sign.:	Date:
	Title:	Construction:	KDU	01.12.03
	Røgledeplade øverst	Released:	KDU	01.04.05
	3142	Format:	A2	
	Morsø 3142	Scale:	1:1	
		Itemno.:	34313400	
	morsø	Drawing no.:	3100-70 a	

Mål uden toleranceangivelse i h.t. ISO-norm nr. 8062 CT9	
Material:	Støbejern GG 15 Cr
Weight:	3,5 kg
Model no.	3134
Drawingtype:	Støbelegning
Location of file:	

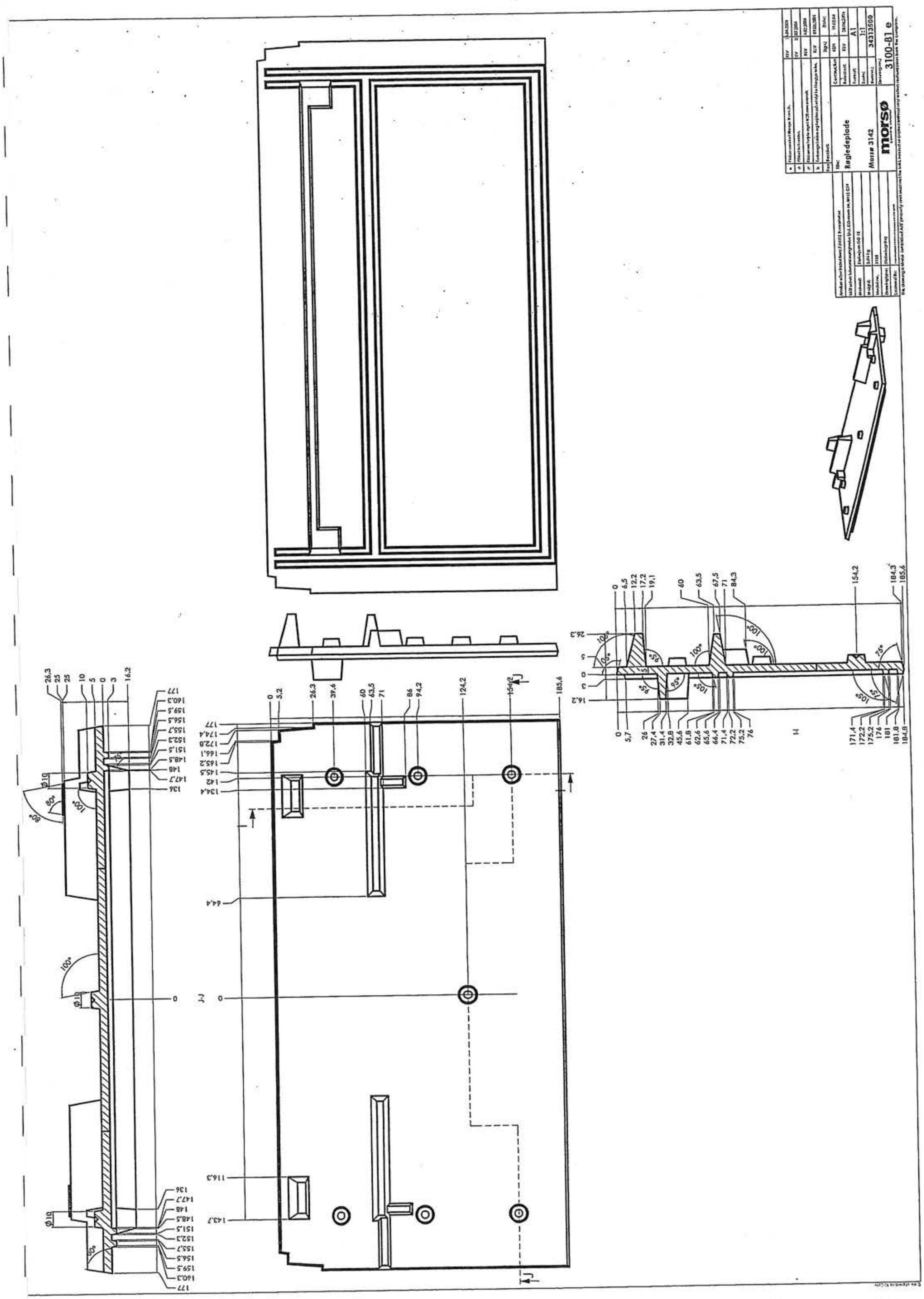
Date of print: 06-12-2006

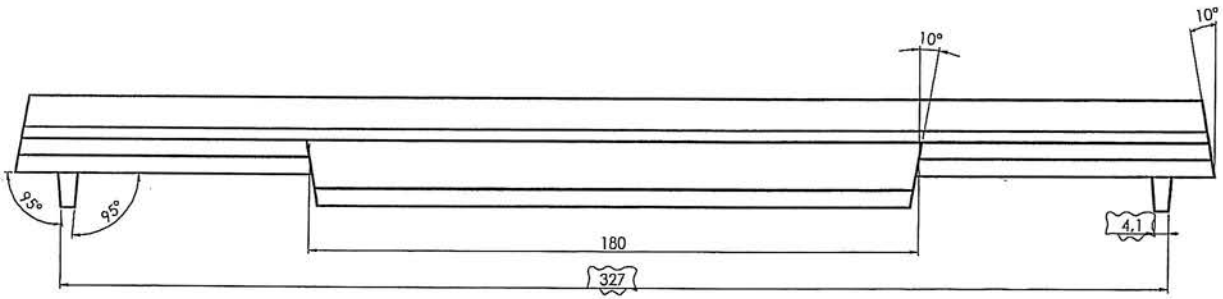


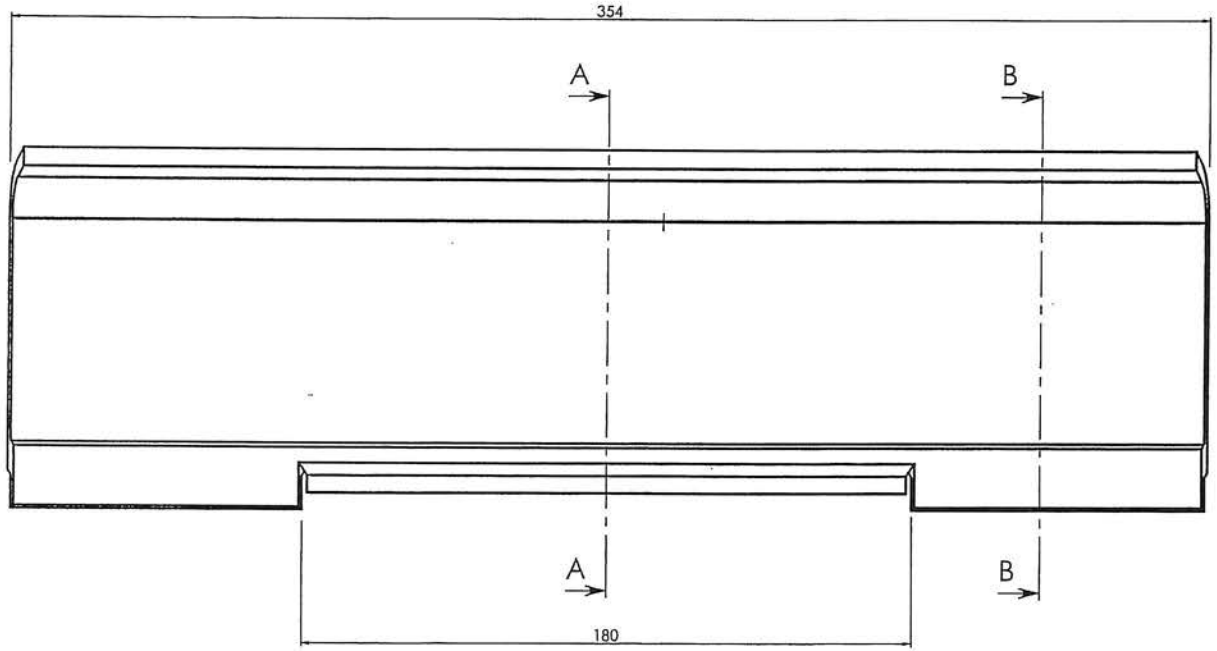


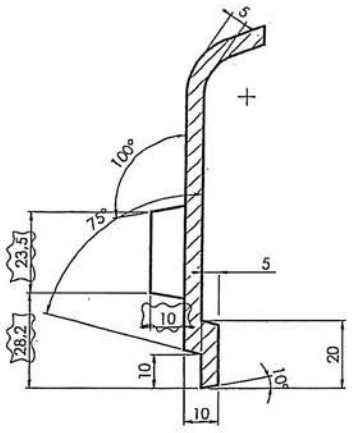


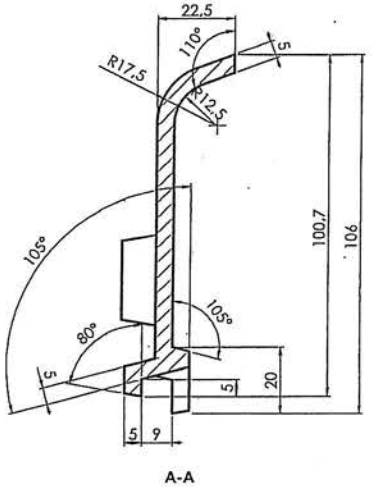
b	Påført 1 stk. 10° bukning.		RSV	02.11.2006
Rev.	Revisions		Sign.:	Date:
		Title:	Construction:	KDU 03.12.03
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Rystestang 3142	Released:	KDU 27.04.05
Material:	Automatstål		Format:	A3
Weight:	0,08 kg		Scale:	1:1
Model no.	-	Morsø 3142	Itemno.:	71313900
Drawingtype:	Emnetegning	morsø	Drawing no.:	3100-75 b
Location of file:				


Røgledeplade
Morsø 3142
morsø
A1
1:1
34313500
3100-81 e

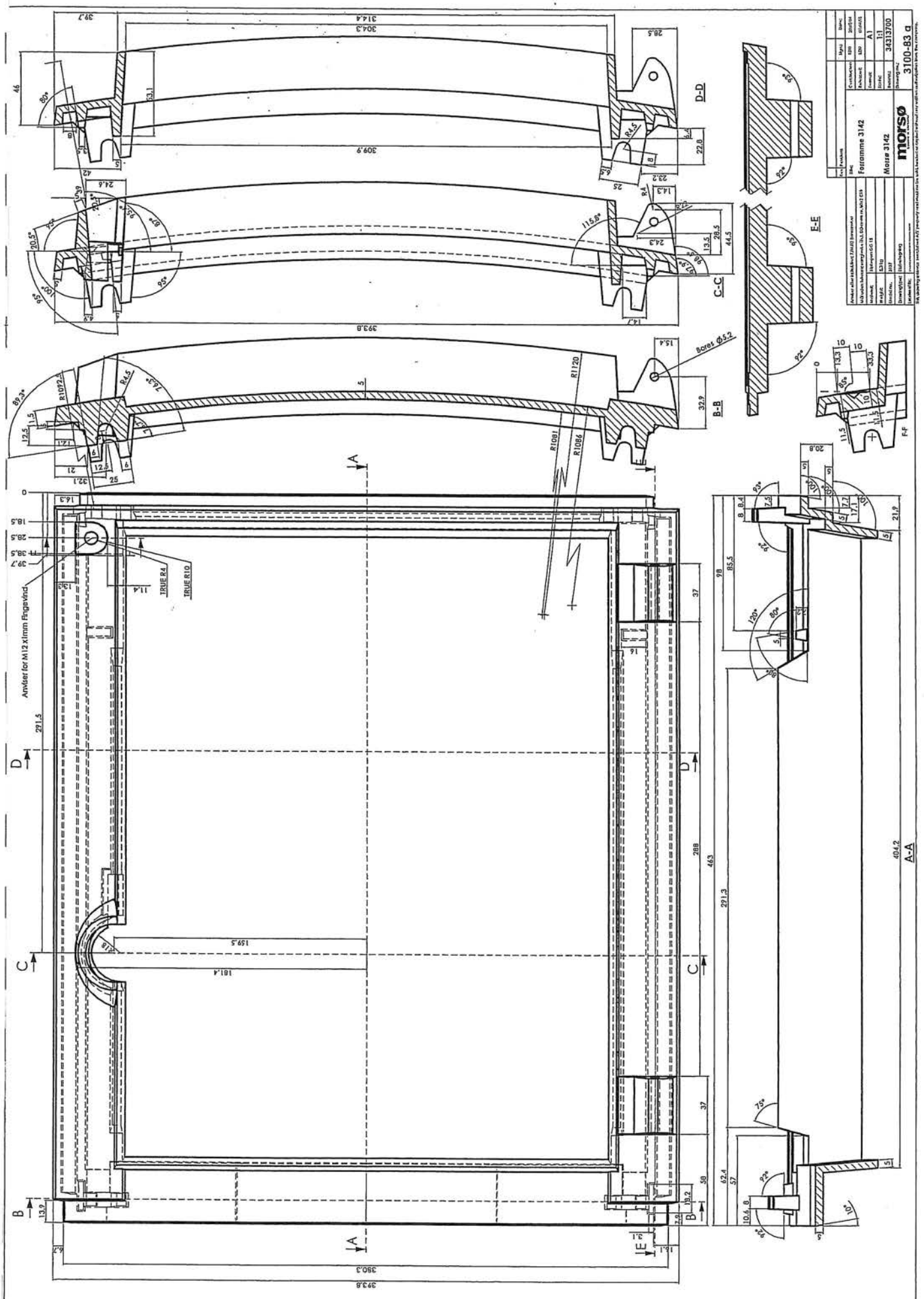


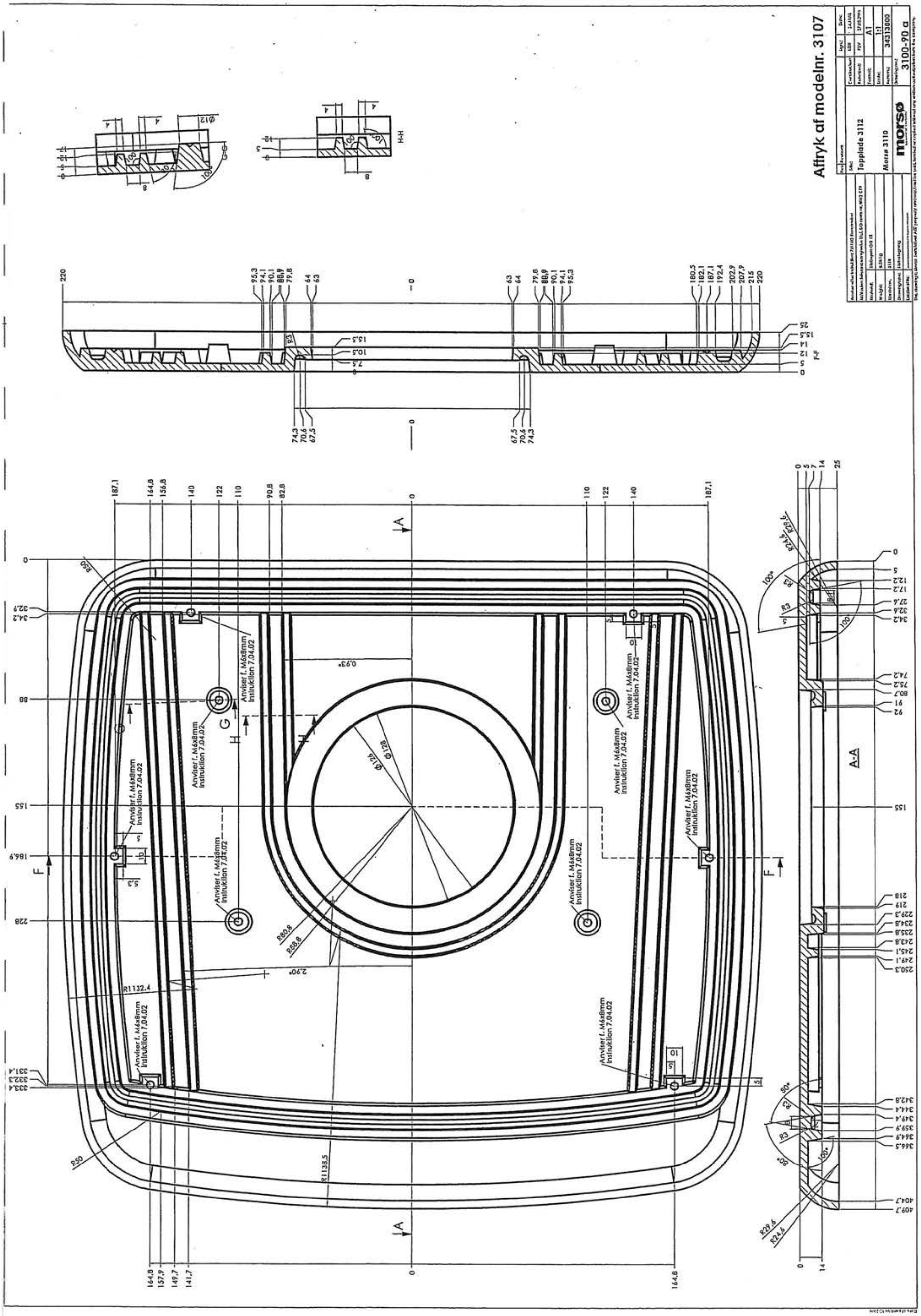


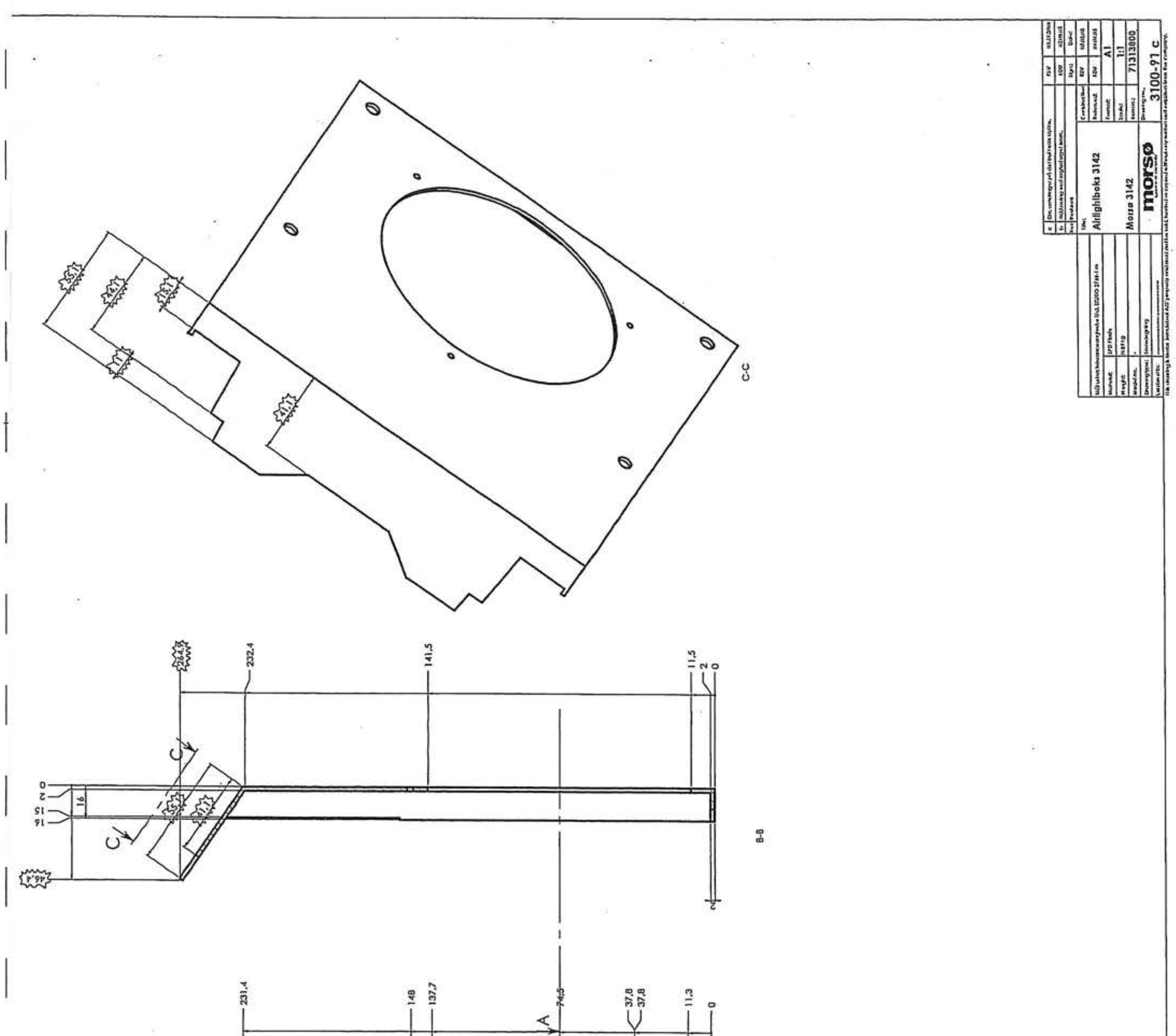


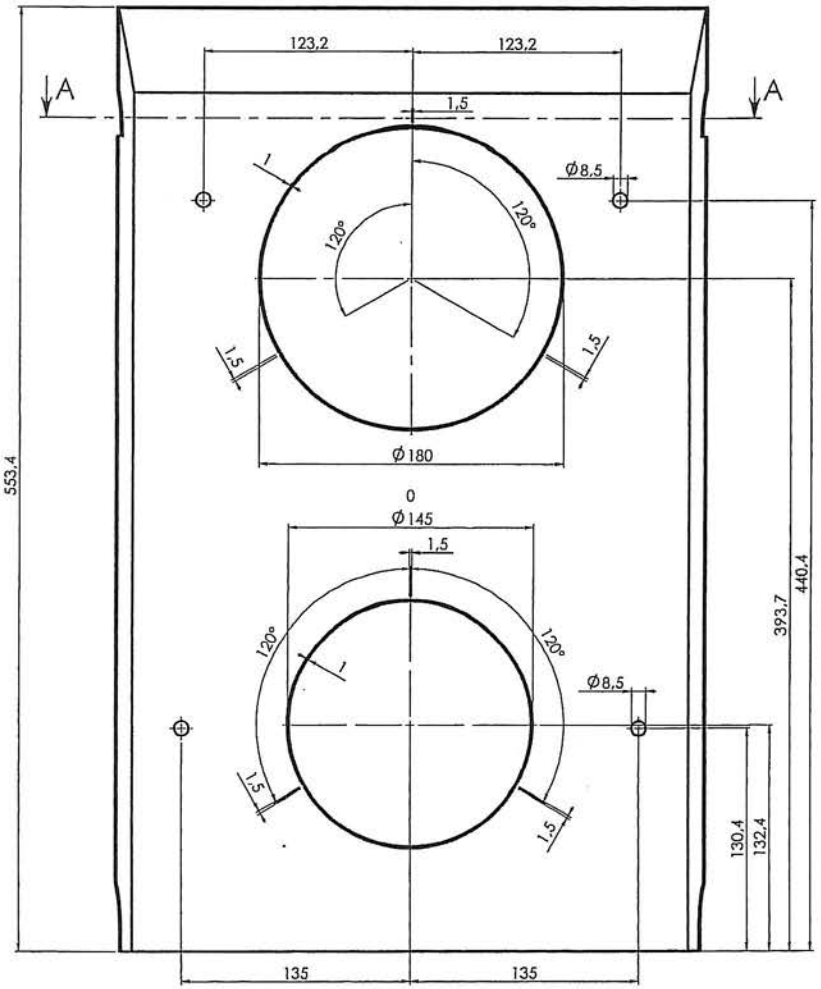


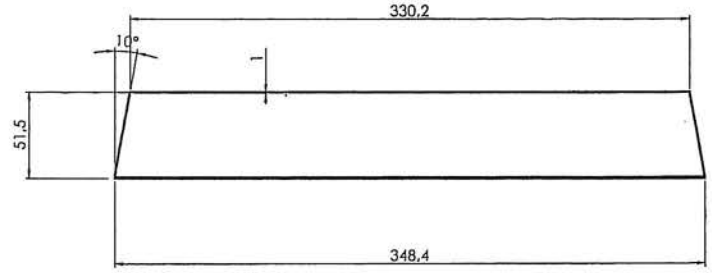
		Rev.	Revision:		Sign.:	Date:
			Title:	Construction:	KDU	19.02.04
Mål uden tolerance angivelse i h.t. ISO-norm nr. 8062 CT9			Renseklap 3142	Released:	KDU	01.04.05
Material:	Støbejern GG 15 Cr			Format:	A2	
Weight:	1,58 kg			Scale:	1:1	
Model no.	3134		Morsø 3142	Item no.:	34313600	
Drawing type:	Støbetegning		morsø	Drawing no.:	3100-82 a	
Location of file:						

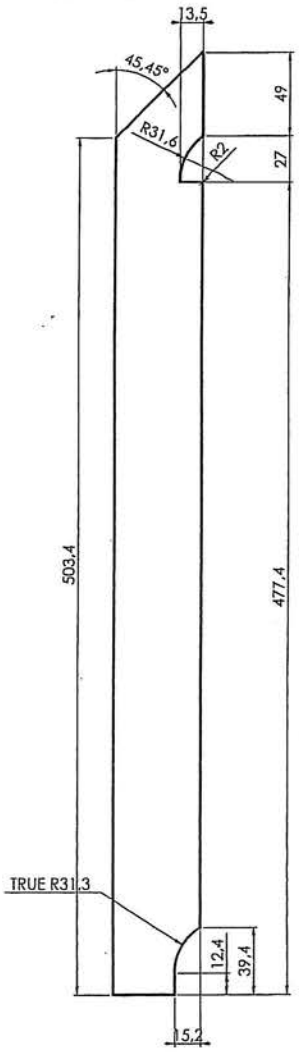

D-D
C-C
B-B
E-E
F-F
A-A
Anviser for M12 x1mm Fingevind
TRUE R4
TRUE R10
Bores Ø5.2
Morsø 3142
Forsamme 3142
morsø
3100-83 a
34313700

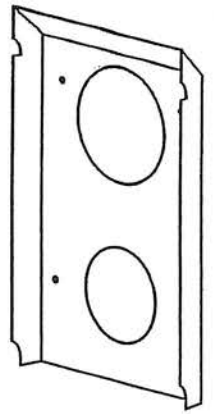

Aftryk af modelnr. 3107
Topplade 3112
Morsø 3110
morsø
A1
1:1
34313800
3100-90 a
A-A
F-F
H-H
G-G
Anviser f. M6x8mm
Instruktion 7.04.02


Airlightboks 3142
Morsø 3142
morsø
A1
1:1
71313000
3100-91 c
A-A
B-B
C-C
Ø130
Ø7,5
3 stk. Ø3
120°
200
226,5
161,5







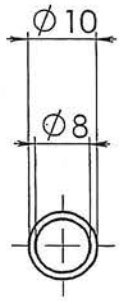


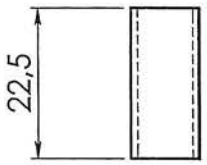
Konstruktionstegning
06.12.2006

A-A

Rev.	Revision		Sign.:	Date:
	Title:	Construction:	RSV	06.12.2006
Måleden toleranceangivelse i h.t. DS/ISO 2768-1 m	Stråleplade bag	Released:		
Material:	Galvaniseret plade	Format:	A2	
Weight:	1,9 kg	Scale:	1:2	
Model no.:	-	Item no.:	71313600	
Drawingtype:	Emnetegning	Drawing no.:	3100-102	
Location of file:	3112-3142 NA Morsø 3100	morsø		

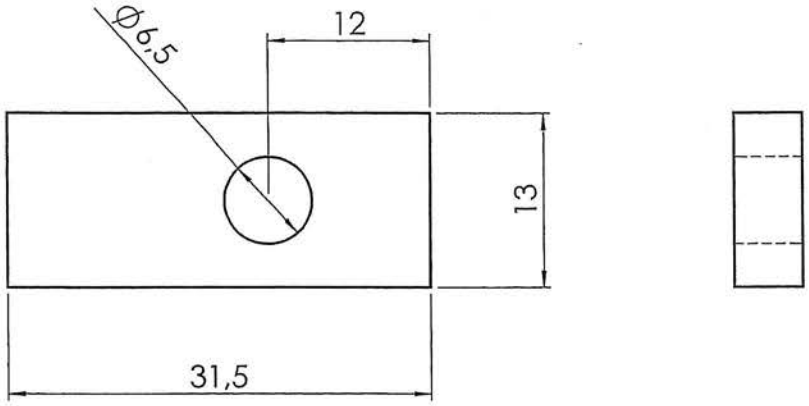
Date of print: 06-12-2006

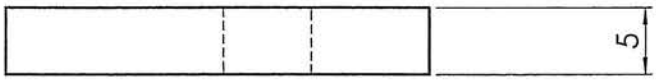




		Rev.	Revisions		Sign.:	Date:
		Title:		Construction:	RSV	21.11.03
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		**Afstandsrør ø10x1 L=22,5**		Released:		
Material:	galv.hydraulikrør	**ø10x1 L=22,5**		Format:	A4	
Weight:	0. kg	**Morsø 4600**		Scale:	1:1	
Model no.	-			Itemno.:	54345500	
Drawingtype:	Emnetegning	morsø		Drawing no.:	**4600-148 a**	
Location of file:	U:\udv\Tegninger\standardbibliotek\Afstandsrør\Afstandsrør ø10x1.SLDPRT					

Date of print: 06-12-2006

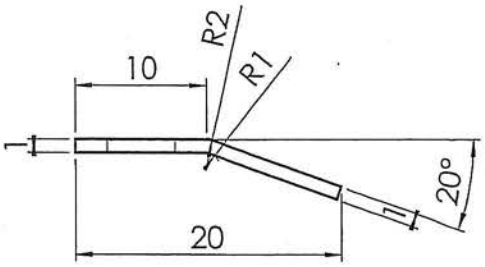


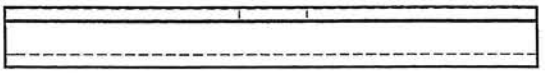


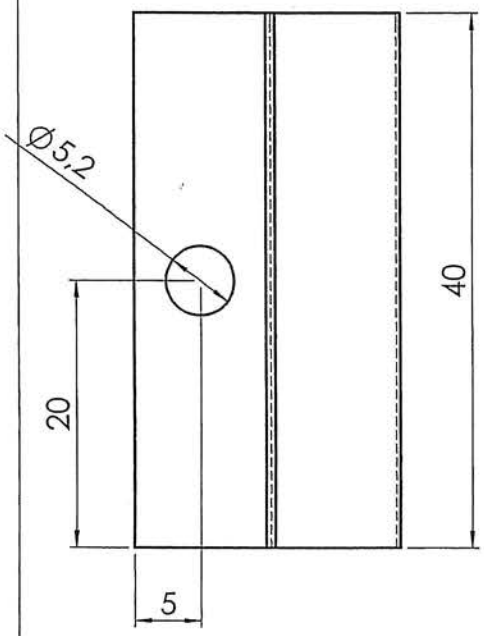
Rev.	Revisionstekst:	Sign.:	Dato:

Materiale:	Sort fladjern			Titel:	Konstr.:	RSV	03.03.2000
Vægt:	0,015 kg.	Bearbejdes:		**Lus uden gevind**	Frigivet:		
Overfladebeh.:			m²		Tegn.format:	A4	
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m				Målforhold:	2:1	
Ruhedstolerance:				**Morsø 1400**	Varenr.:	44256800	
Værktøjsnr.:				morsø By appointment to the Royal Danish Court	Tegningsnr.:	1400-199	
Tegningstype:	Emnetegning						

1400-199 lus uden gevind - Sheet1



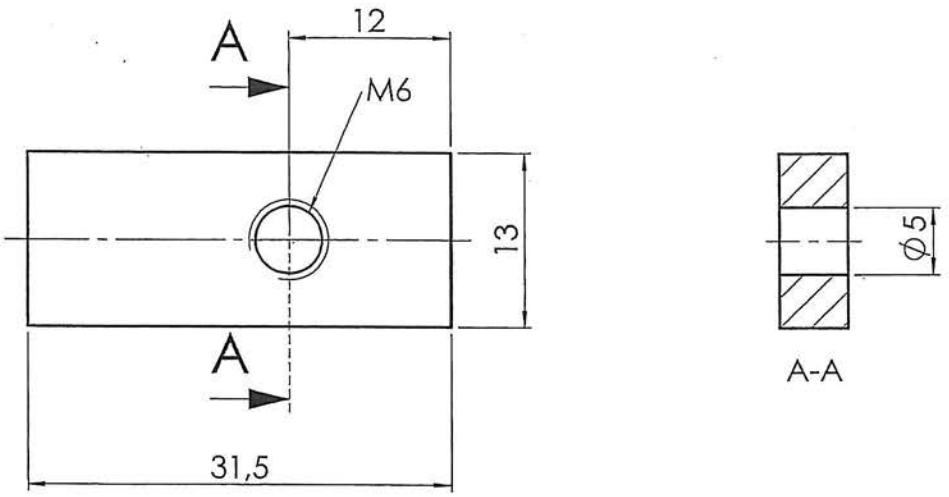


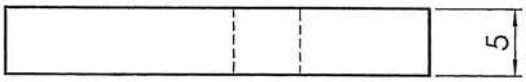


Rev.	Revisionstekst:	Sign.:	Dato:
c	Ændret varenummer	RSV	14.03.2001
b	Ændret mål	RSV	06.09.2000

Materiale:	1 mm rustfri plade		Titel:	Konstr.:	RSV 07.03.2000
Vægt:	0,006 kg.	Bearbejdes:	**Glasbeslag 2**	Frigivet:	RSV 30.06.2000
Overfladebeh.:		m²		Tegn.format:	A4
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m			Målforhold:	2:1
Ruhedstolerance:			**Morsø 1400**	Varenr.:	54146361
Værktøjsnr.:			morsø	Tegningsnr.:	1400-206 c
Tegningstype:	Emnetegning				

1400-206 glasbeslag 2 - Sheet1

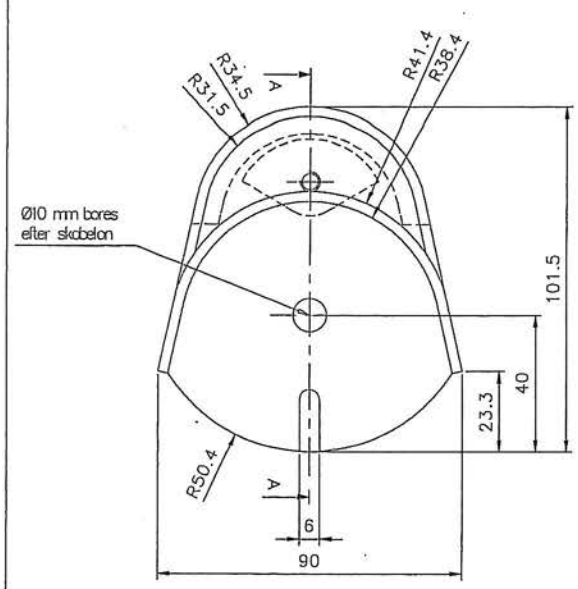


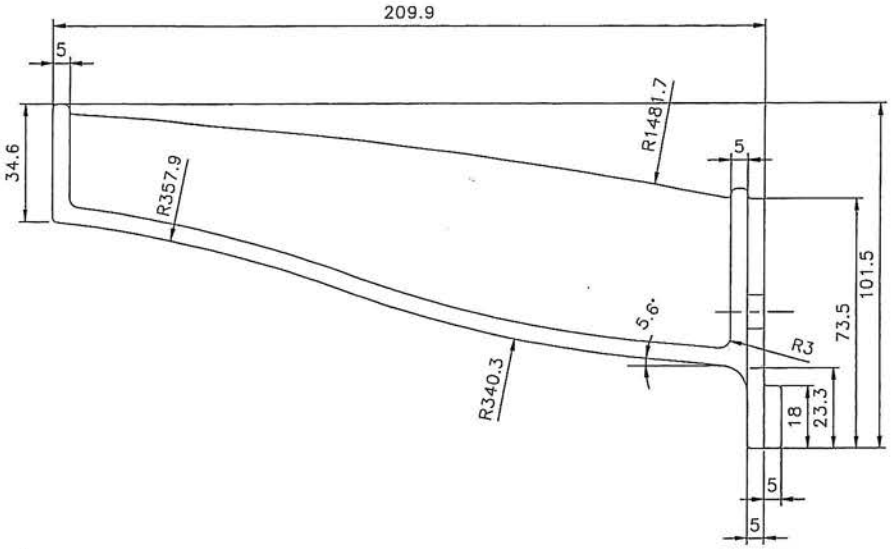


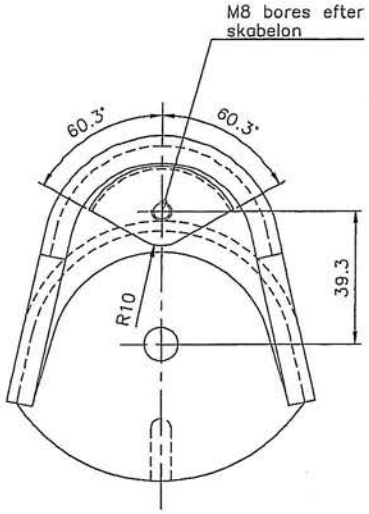
Rev.	Revisionstekst:	Sign.:	Dato:

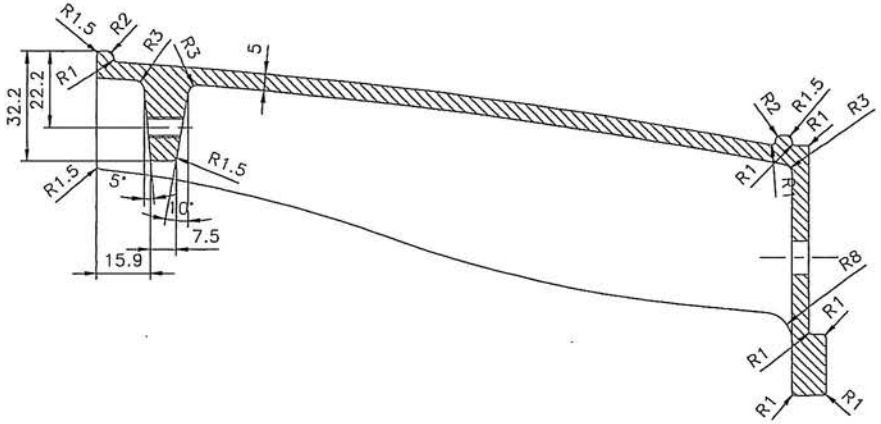
Materiale:	Sort fladjern			Titel:	Konstr.:	RSV	03.03.2000
Vægt:	0,015 kg.	Bearbejdes:		**Lus med gevind**	Frigivet:		
Overfladebeh.:			m²		Tegn.format:	A4	
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m				Målforhold:	2:1	
Ruhedstolerance:				**Morsø 1400**	Varenr.:	44256700	
Værktøjsnr.:				morsø	Tegningsnr.:		
Tegningstype:	Emnetegning					**1400-204**	

1400-204 lus med gevind - Sheet1







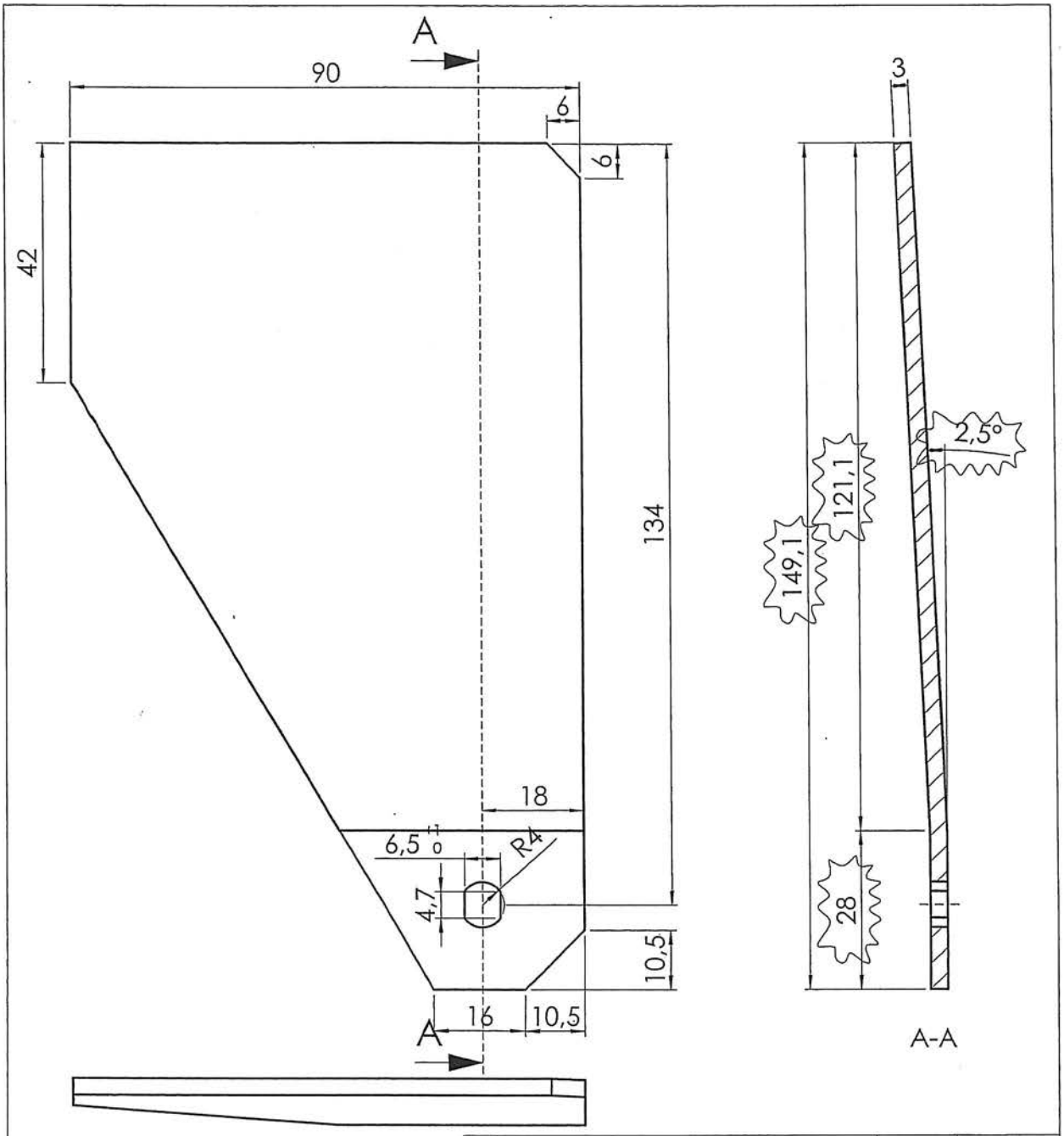


Ikke angivne radier: R=1,5

Revision	Sign.	Date

Modelnr.: 3407	Matr.: GG 15	Vægt: 1,1kg.	
Titel: Ben Morsø 3400		Sign.: KDU	Dato: 26.05.98
		Tegn.form.: A2	Målforhold 1:1
Filnavn: 3400-07		Varenummer: 34340700	
morsø Jernstøberi A/S		Tegningsnummer: 3400-07 a	

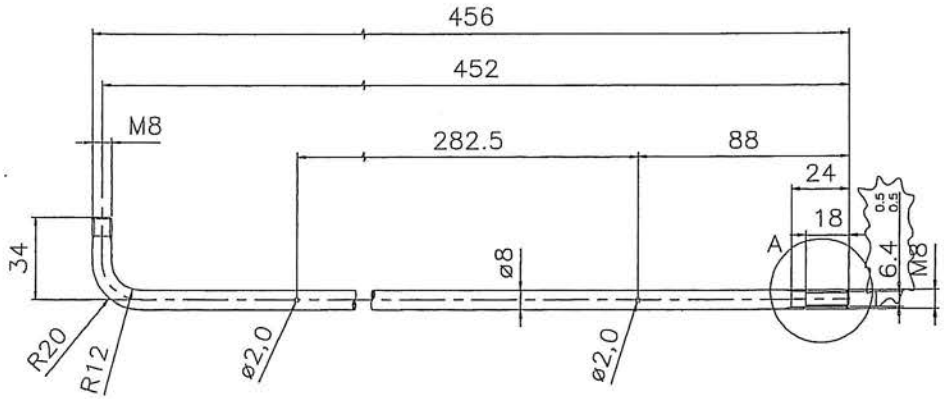
1 - 55 OF 1 - 70

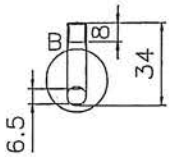


g	Påført en 2,5° bukning.	RSV	07.12.2006
f	Fjernet rundinger	RSV	11.11.1999
e	Påført rundinger	RSV	09.11.1999
d	Påført tolerance	RSV	22.10.1999
c	Ændring af hjørne	RSV	15.01.1999
Rev.	Revisionstekst:	Sign.:	Dato:

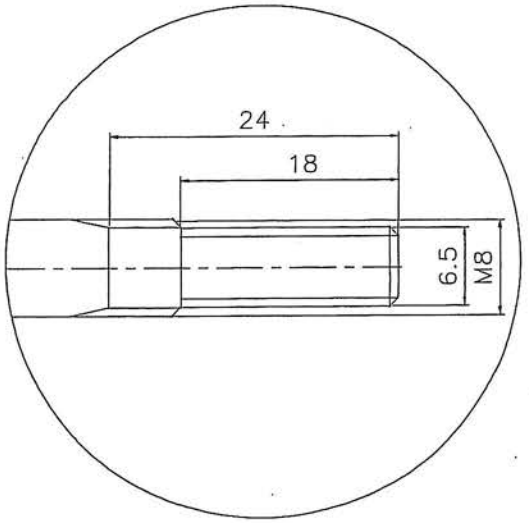
Materiale:	3 mm SPD plade		Titel:	Konstr.: RSV	11.11.1999
Vægt:	0,23 kg.	Bearbejdes:	**Spjæld**	Frigivet:	
Overfladebeh.:		m²		Tegn.format:	A4
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m			Målforhold:	1:1
Ruhedstolerance:			**Morsø 3400**	Varenr.:	71346300
Værktøjsnr.:			morsø By appointment to HM the Royal Danish Court	Tegningsnr.:	**3400-16 g**
Tegningstype:	Emnetegning				

3400-16 spjæld - Sheet1

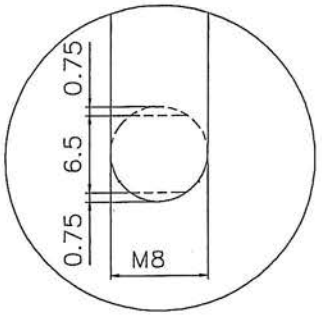




A (5:1)



B (5:1)



Rev.	Revision	Sign.	Dato
c	Ændring af mål	RSV	05.01.99
d	Ændring af mål	RSV	08.01.99
e	Påført andet mål	RSV	09.02.99
f	Ændret mål + udsnit B	RSV	09.02.99
g	Ændret mål	RSV	25.10.99

Matr.: ø8 mm automatstål | Vægt: 0,2 Kg.

Titel:
Reguleringsstang
Morsø 3400

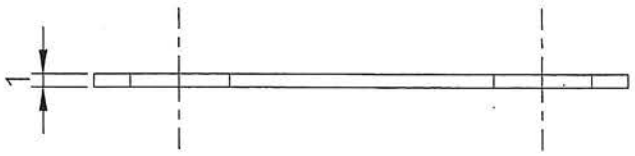
Sign.:	Dato:
KDU	28.07.98
Tegn.form.:	Målforhold
A3	1:2

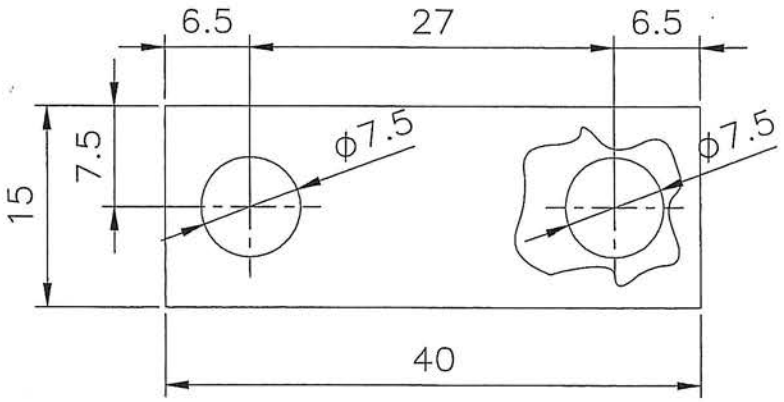
Filnavn: 3400–17

Varenummer: 71346400

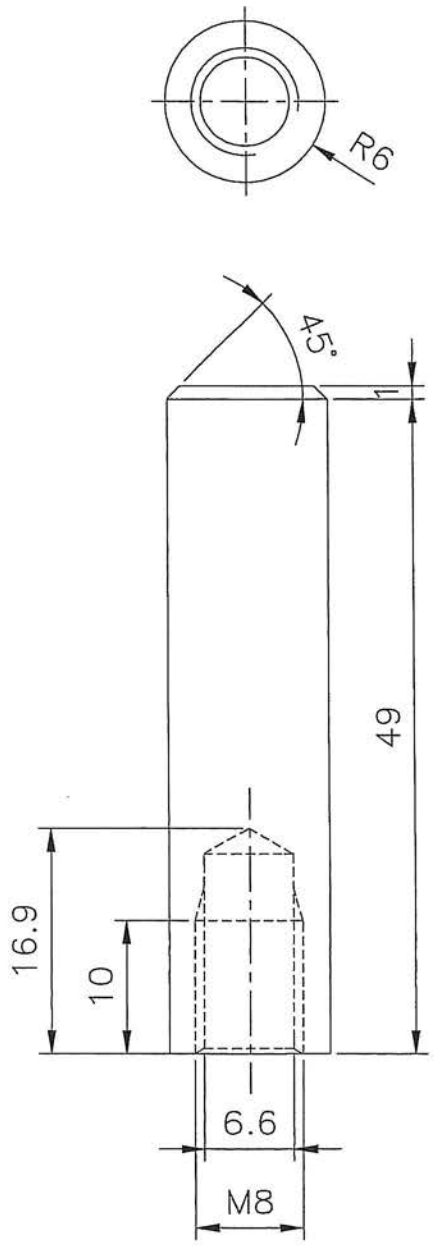
morsø Jernstøberi A/S

Tegningsnummer: 3400–17 g



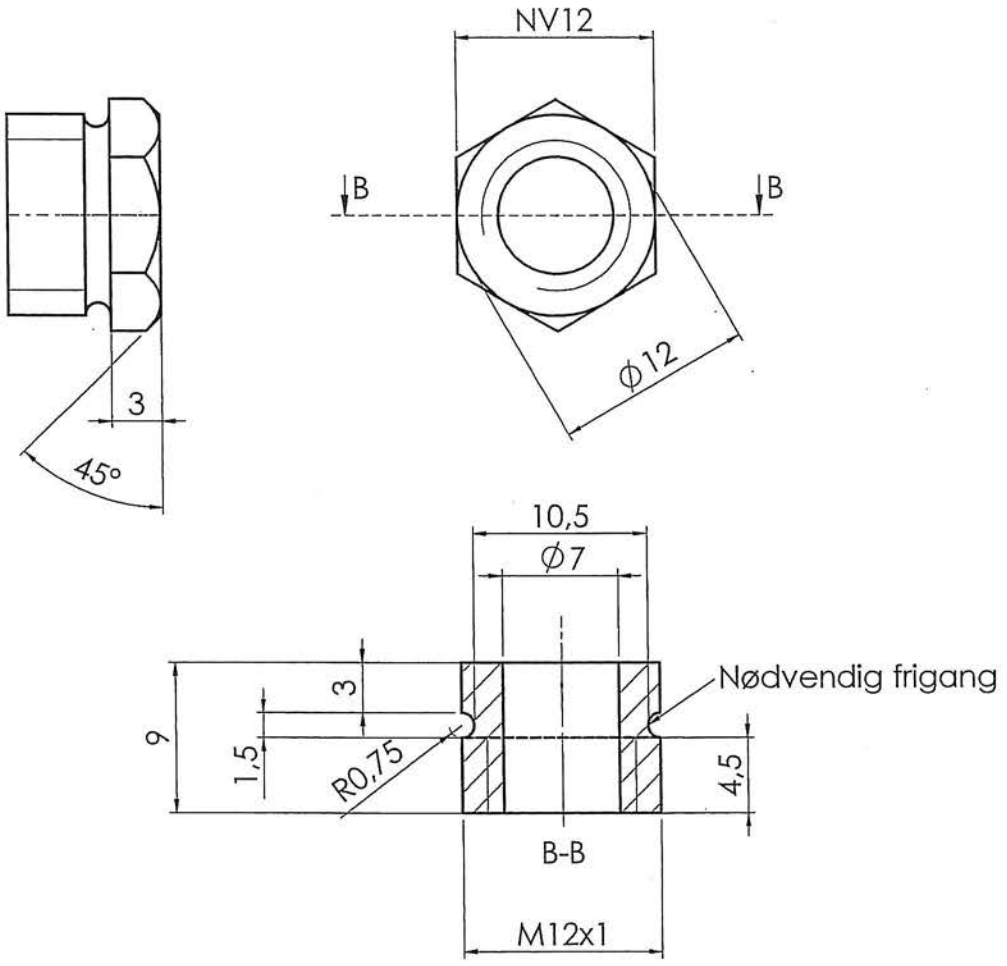


				Matr.: 15x1 mm Båndstål uhærdet		Vægt: 0,01 Kg.
Rev.	Revision	Sign.	Dato	Titel:	Sign.:	Dato:
b	Hul påført	AØS	10.11.98	Mont.stål f. reg.stang	KDU	28.07.98
				Morsø 3400	Tegn.form.: A4	Målforhold 2:1
				Filnavn: 3400-18	Varenummer: 71346500	
				morsø Jernstøberi A/S	Tegningsnummer: 3400-18 b	



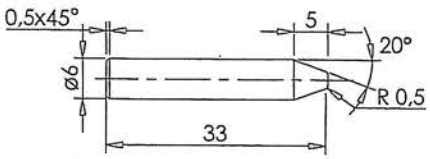
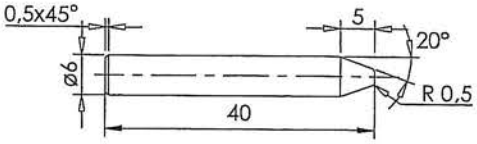
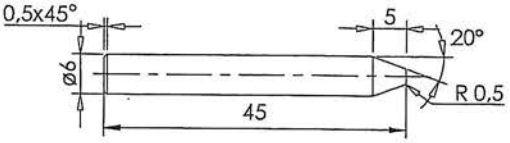
Matr.: Rustfri stål

Rev.	Revision	Sign.	Dato	Titel: MORSØ 3400 Greb til Reguleringsstang	Sign.: AØS	Dato: 30.10.98
b	Påført matr.	RSV	10.10.00		Tegn.form.: A4	Målforhold 2:1
				Filnavn: 3400−41	Varenummer: 75180400	
				morsø Jernstøberi A/S	Tegningsnummer: 3400−41 b	



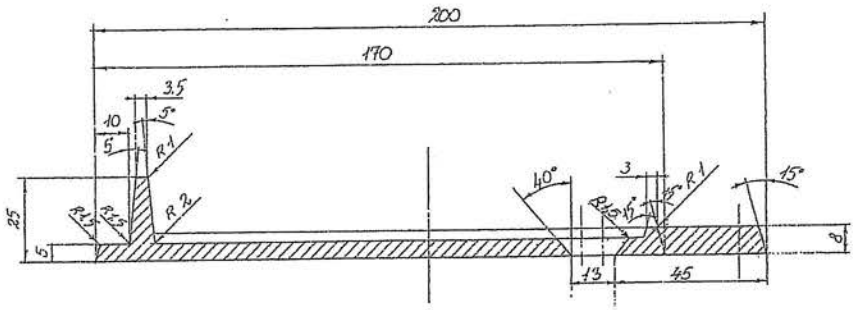
				a	Emne optegning i SolidWorks	KDU	02.07.01
				Rev.	Revisionstekst:	Sign.:	Dato:
Materiale:	Messing			Titel:		Konstr.:	N.Aa 28.07.87
Vægt:	0,006 kg.	Bearbejdes:	Drejes	**Bøsning for rystestang**		Frigivet:	
Overfladebeh.:	Ubehandlet		- m²			Tegn.format:	A4
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m					Målforhold:	2.5:1
Ruhedstolerance:				**Morsø 1126**		Varenr.:	752621
Værktøjsnr.:	-			morsø		Tegningsnr.:	**1126-27 a**
Tegningstype:	Emnetegning						

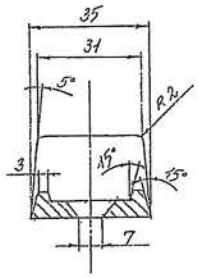
1126-27 messingbøsning - Sheet1

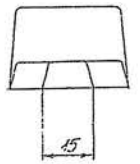
	Anvendes til:
EDB nr. 541403  	1410
EDB nr. 542056  	1B 2B 1126
EDB nr. 541082  	1610 1710

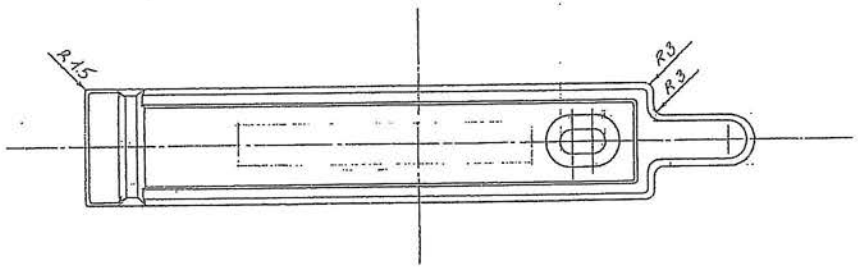
Mart.: ø6 Rf. automatstål
EDB nr. 714005

Titel:	Sign.:	Dato:	Revision	Sign.	Dato
Ø6 hængselstifter	N.Aa.	06.10.87			
	Tegn.form.:	Målforhold	Gamdrup TegneTeknik	HCH	April 96
	A4	1:1	Tilføjet grader	KDU	20.12.96
Tegningsnummer: 1126-38-4	Varenummer: se teg.				
morsø By appointment to the Royal Danish Court	Filnavn: 1126-38				









LEVERANDØR TIL DET KGL. SAKSISKE HOF
morsø
AKTIESELSKABET N.A. CHRISTENSEN & CO. DK-7900 NYKØBING MORS TLF. 97-721300

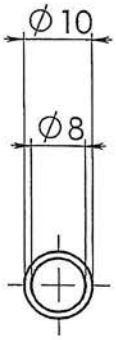
HORSØ 1126
RYSTEHÅNDTAG

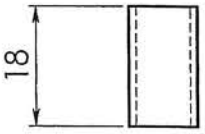
DATO 30 JUNI 1987	SIGN. K
MÅL 1:1	ÆNDRET 7/10-26 U.LA. + Hul
	MODELNR.
	TEGNINGSNR. 1126-42-2.

1-62 OF 1-70

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

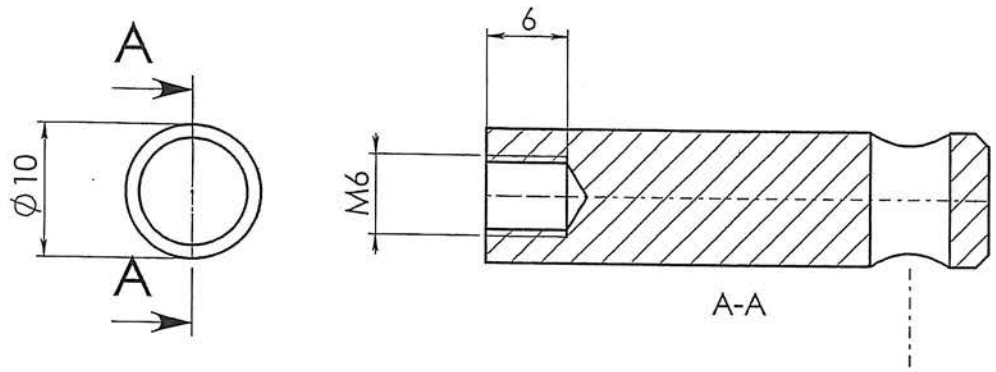
1 2 3 4 5 6 7

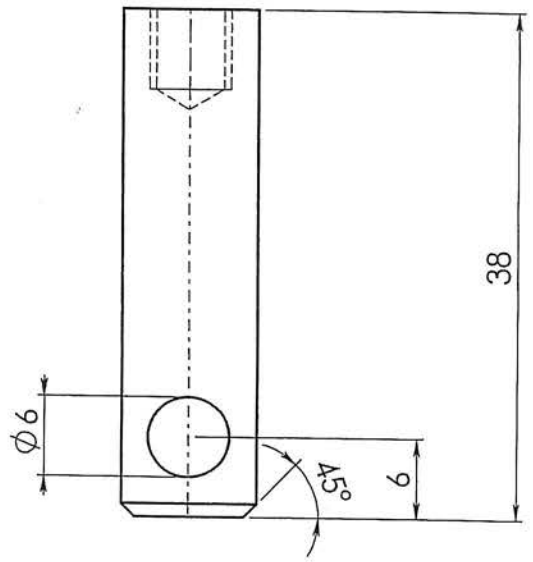




Rev.	Revisions		Sign.:	Date:
	Title:	Construction:	RSV	21.11.03
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	**Afstandsrør ø10x1 L=18**	Released:		
Material: galv.hydraulikrør	**ø10x1 L=18**	Format:	A4	
Weight: 0, kg		Scale:	1:1	
Model no. -	**Morsø 5000**	Itemno.:	545003	
Drawingtype: Emnetegning	morsø	Drawing no.:	5000-18 a	
Location of file:				

Date of print: 06-12-2006

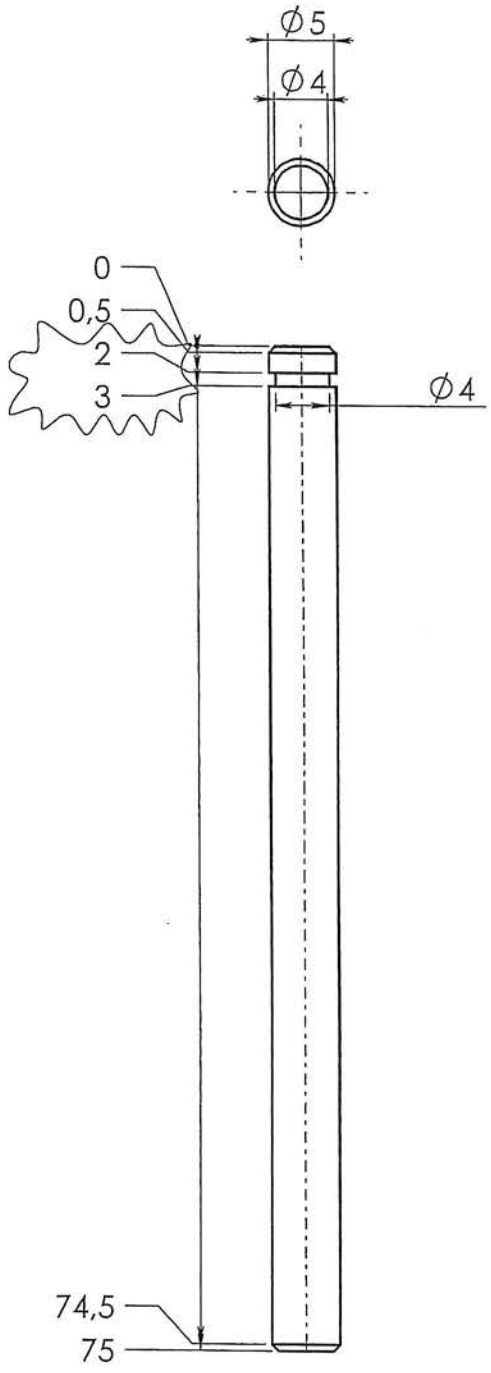




e	Ændret matr.		RSV	20.02.2003
d	Ændret længde		RSV	19.06.1997
c	Tilføjet tegn. nr.		KDU	20.12.1996
b	Gamdrup Tegne Teknik		HCH	04.1996
Rev.	Revisionstekst:		Sign.:	Dato:
	Titel:	Konstr.:		
	Knob for rystestang 5000	Frigivet:		
Materiale:	Rustfri stål	Tegn.format:	A4	
Vægt:	0,02 kg	Målforhold:	**2:1**	
Modelnr.	-	Varenr.:	**752620**	
Tegningstype:	Emnetegning	Tegningsnr.:	Side 1 af 1	
Filplacering:	U:\UDV\Tegninger\5000\TEGNING\5000-60 Knob for rystestang.SLDPRT	**5000-60**		

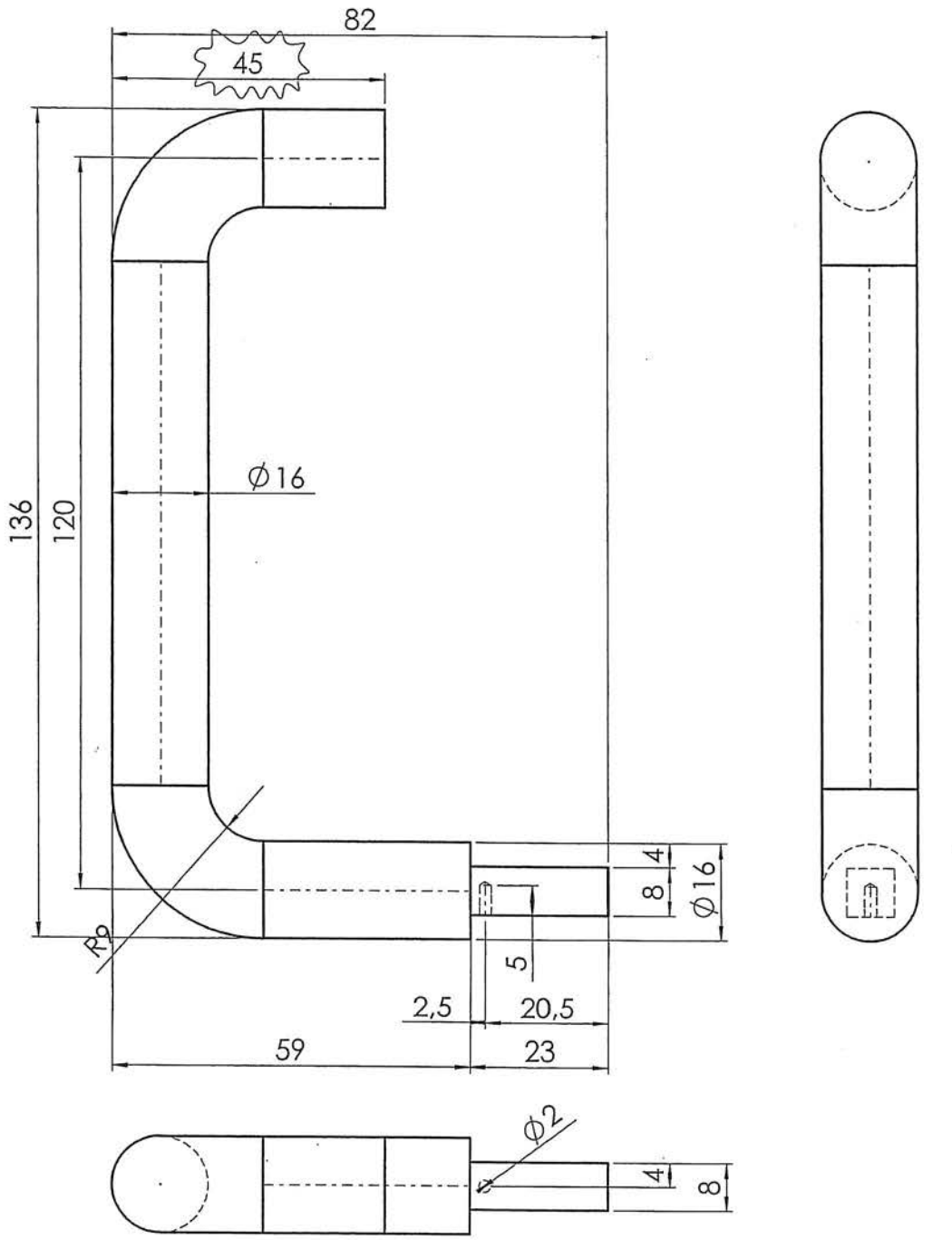
morsø
Byggeservice

Udskriftsdato:06-12-2006



Rev.				
b	Ændret rille.		RSV	22.11.05
Rev.	Revisions		Sign.:	Date:
		Construction:	RSV	31.07.03
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	Title: Hængselsstift ø5x75	Released:		
Material: Automatstål		Format:	A4	
Weight: 0,01 kg		Scale:	2:1	
Model no. -	Morsø 5000	Itemno.:	545008	
Drawingtype: Emnetegning	morsø Bygsportsvirke Casting Design Cast	Drawing no.:	5000-85 b	
Location of file: U:\udv\Tegninger\standardbibliotek\Haengselstift.SLDPRT				

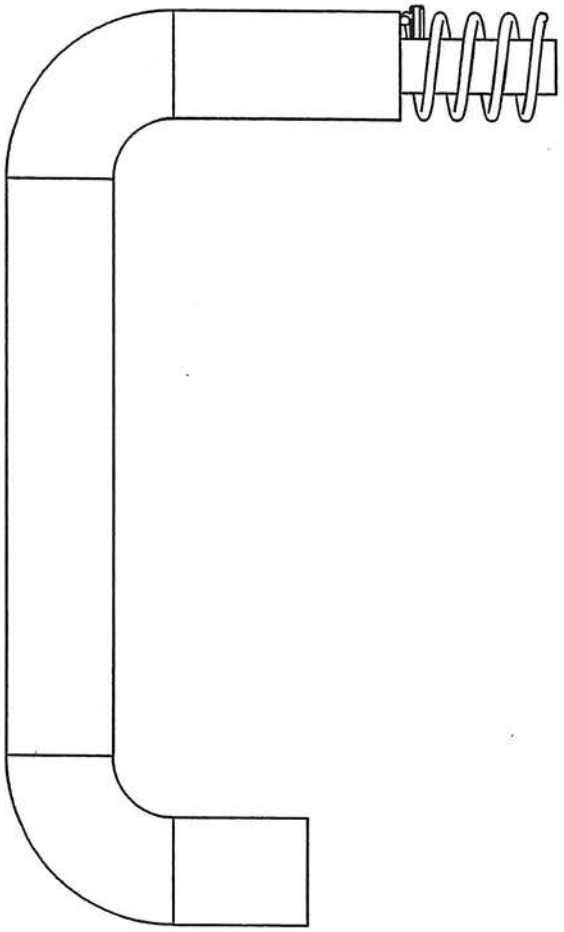
Date of print: 06-12-2006

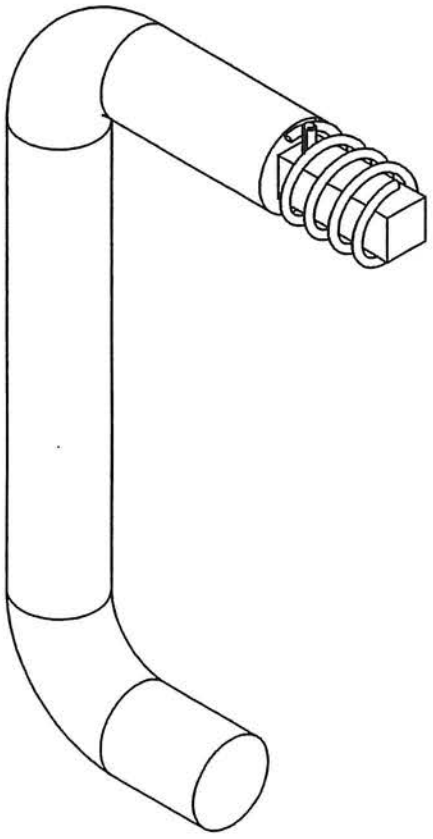


Rev.	Revisionstekst:	Sign.:	Dato:
c	Ændret mål	RSV	29.05.2001
b	Ændret mål	RSV	27.02.2001

Materiale:	Rustfast stål			Titel:	Konstr.:	RSV	22.01.2001
Vægt:	317	Bearbejdes:	Bores	**Håndtag 2110 USA**	Frigivet:	RSV	22.01.2001
Overfladebeh.:			m²		Tegn.format:	A4	
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m				Målforhold:	1:1	
Ruhedstolerance:				**Morsø 2100**	Varenr.:	75262400	
Værktøjsnr.:				morsø By appointment to The Royal Danish Court	Tegningsnr.:	**2100-158 c**	
Tegningstype:	Emnetegning						

2100-158 Håndtag 2110 USA - Sheet1

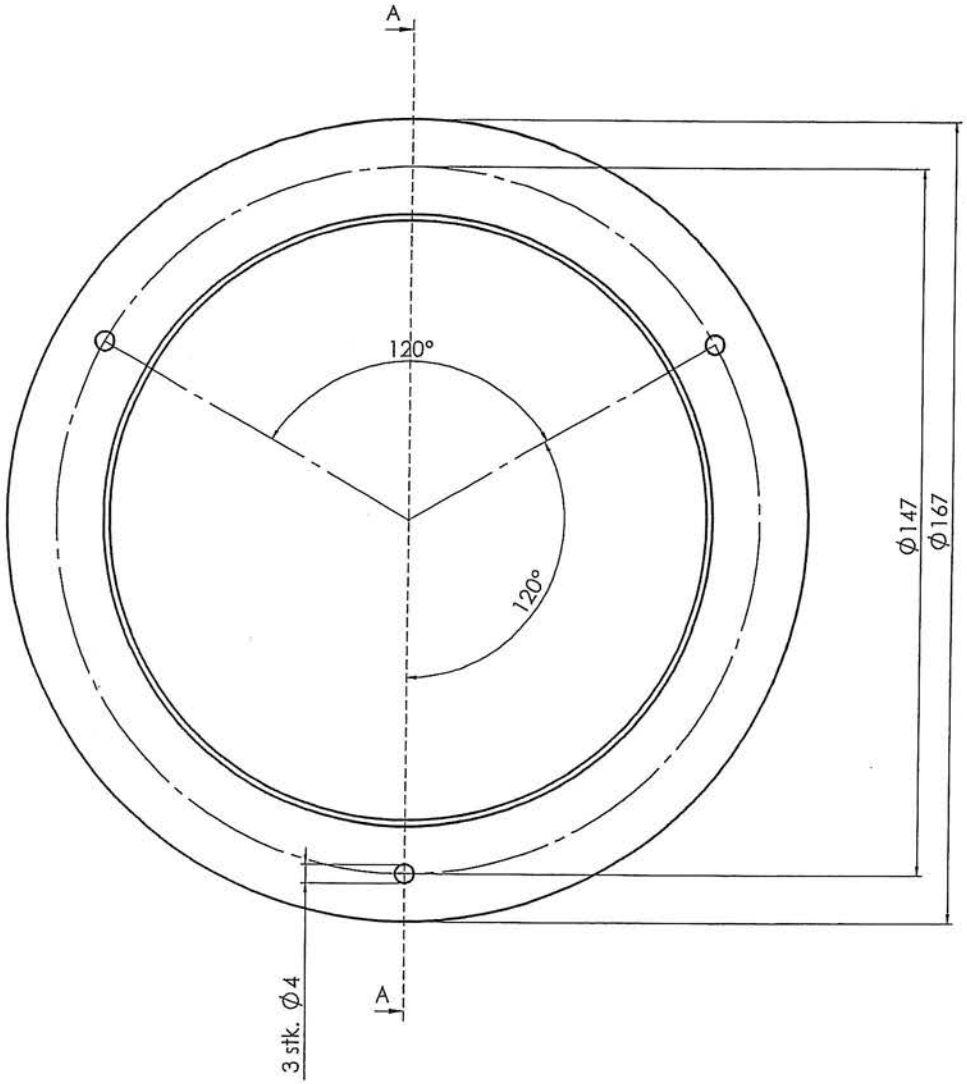


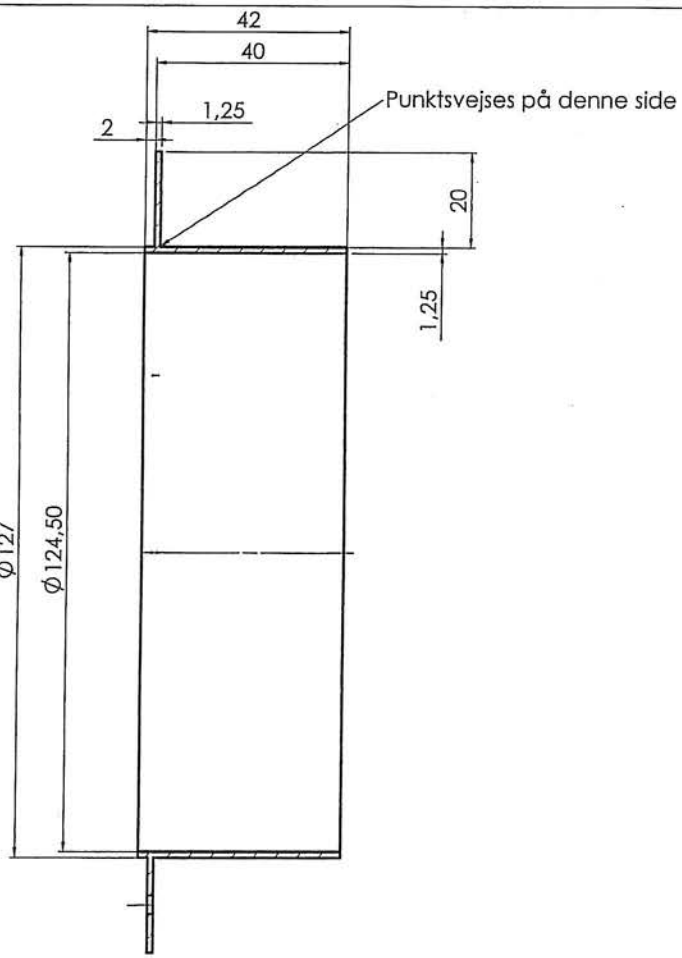


Rev.	Revisionstekst:	Sign.:	Dato:

Materiale:		Titel:	Konstr.:	RSV	26.01.2001
Vægt:	kg. Bearbejdes:	**Håndtag komplet USA**	Frigivet:		
Overfladebeh.:	m²		Tegn.format:	A4	
Måltolerance:	Mål uden toleranceangivelse		Målforhold:	1:1	
Ruhedstolerance:		**Morsø 2100**	Varenr.:		
Værktøjsnr.:		morsø	Tegningsnr.:	**2100-159 a**	
Tegningstype:	Samlingstegning				

2100-159 Håndtag komplet USA - Sheet1

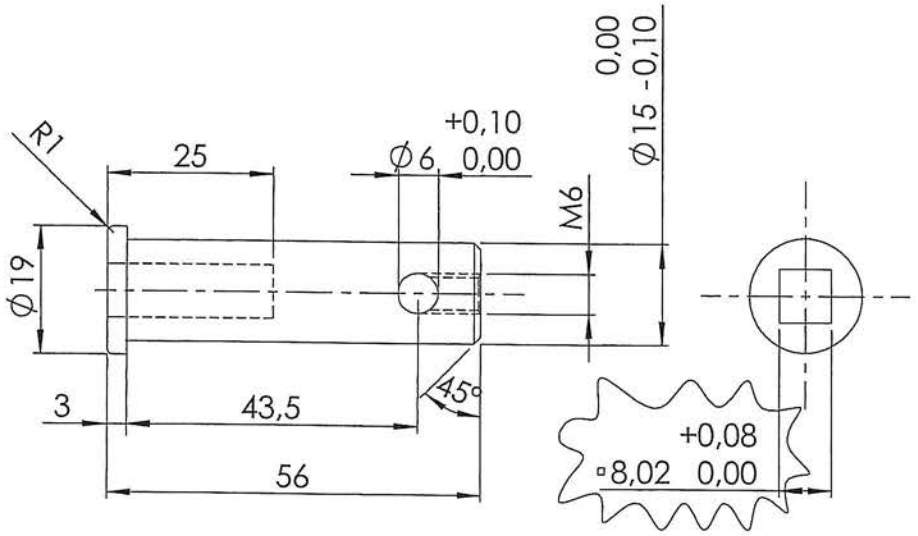




A-A

Rev.	Revisions	Sign.:	Date:
c	3 stk. ø7mm huller fjernet.	RSV	10.10.2006
b	3 stk. ø7mm huller tilføjet for mont. ved B100.	KDU	04.07.05

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title: Airtightstuds	Construction: KDU 26.06.2001
Material:	SPD Plade		Released: RSV 08.10.2001
Weight:	0,25 kg		Format: A3
Model no.		Morsø 3600	Scale: 1:1
Drawingtype:	Emnetegning		Item no.: 71360600
Location of file:		morsø	Drawing no.: 3600-28 c



Matr. Rustfast stål

Rev	Revision	Sign.	Dato
c	Varenr. tilføjet	KDU	20.11.97
d	Ændret mål	RSV	22.12.98
e	Mål ændret fra 43	KDU	17.06.99
f	Mål ændret fra 43,3	RSV	11.11.99
g	Ændret mål	RSV	07.03.02

Titel:
Døraksel for 4600
Rund dør

Filnavn:
4600-12

morsø
Jernstøberi A/S

Sign.:	Dato:
RS	22.05.97
Tegn.form.:	Målforhold
A4	1:1

Varenummer:
75462700

Tegningsnummer:
4600-12 g

Morsø 3112 & 3142

Revideret: 07.12.2006 RSV

Pos:	Parts:	3142 NA Egern 6431xxxx Glat 6431xxxx	3112 NA Egern 6431xxxx Små ribber 6431xxxx
1	Base plate	443145xx	443145xx
2	Front frame	443146xx	443146xx
3	Door	443103xx	443103xx
4	Air valve	443104xx	443104xx
5	Side plate	443154XX	Små ribber 443116xx
		—	Egern 443151xx
6	Rear plate, cast iron	443141xx	443141xx
8	Intermediate frame	34310800	34310800
9	Riddling grate	44310900	44310900
11	Baffle plate, cast iron	44313500	44313500
13	Top plate konv.	443142xx	443142xx
14	Side plate konv. - w. squirrel	Egern 443114xx	—
17	Side plate konv. - plane	Glat 443117xx	—
18	Access Door	34313600	34313600
21	Flue collar	441459xx	441459xx
22	Cover	441410xx	441410xx
23	Handle	54186100	54186100
30	Rear plate	543147xx	543147xx
32	Radiant shielding, bottom	54312700	54312700
33	Ash tray	54310100	54310100
38	Riddling arm	71313900	71313900
40	Axis for handle	75462700	75462700
41	Glass fitting	54146381	54146381
42	Fitting for flue collar	44256700	44256700
46	Distance tube	545003	545003
48	Bush, brass	752621	752621
50	Baffle plate, stainless	71312300	71312300
52	Door handle	752625	752625
60	Ceramic glass	79310000	79310000
61	Stone, side	79311300	79311300
63	Stone, back	79311400	79311400
64	Tightening tape	79074500	79074500
71	Black steel set screw	731608	731608
74	Black steel set screw	731620	731620
75	Screw	743625	743625
80	Steel box nut	735006	735006
83	Washer	791891	791891
84	Washer	746006	746006
87	Pinol screw	739405	739405
88	Screw	742508	742508
89	Hinge pin	545008	545008
90	Hinge pin	542056	542056
91	Pinol screw	739640	739640
92	Screw	74353000	74353000
94	Black steel set screw	731625	731625
95	Black steel set screw	731625	731625
96	Washer	79189300	79189300
104	Hinge pin	74701000	74701000
106	Baffle plate, upper	34313400	34313400
107	Inside top plate	34313300	34313300
108	Radiant shielding, top	71314000	71314000
109	Distance tube	54345500	54345500
110	Distance tube	54345500	54345500
111	Fitting for reg.	71346500	71346500
112	Draught Control	71346300	71346300
113	Air inlet arm	71346400	71346400
114	Handle for air inlet arm	75180400	75180400
115	Knob for riddling grate	752620	752620
116	Cotter pin	74202000	74202000
117	Washer	736108	736108
118	Screw	731610	731610
119	Steel box nut	735008	735008
120	Washer	79189400	79189400
121	Stainless pressure spring	79048600	79048600
122	Screw	73960800	73960800
123	Screw	731635	731635
124	Screw	731630	731630
125	Screw	791835	791835
126	Screw	73861700	73861700
127	Airtightbox	71313800	71313800
128	Air Duct, back	443143xx	443143xx
129	Screw	731616	731616
130	Fitting without thread	44256600	44256600
131	Air Tight Adapter	71360600	71360600
144	Washer	79190000	79190000
146	Fitting without thread f. cover	44256800	44256800
147	Handle for riddling grate	442620xx	442620xx
148	Screw	731650	731650
149	Locking ring	791824	791824
150	Black steel set screw	—	731620
151	Leg	—	443407xx
153	Spring	79048800	79048800

Door, complete	543103xx	543103xx
Topplate, complete	543142xx	543155xx
Air Tight Adapter, complete	543620xx	543620xx

FARVEKODE: xx

21 Black

22 Gray

Section 2

Quality Assurance/Quality Control

QUALITY ASSURANCE/QUALITY CONTROL

OMNI 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 *OMNI*'s Quality Assurance Manual.

OMNI'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).
- Serving 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 *OMNI*'s accreditation. Accreditation certificates are available upon request.

Sample Analysis

Analysis Worksheets
Tared Filter and Beaker Data
Solvent Blank Data

OMNI-Test Laboratories, Inc.
Beaverton, OR

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-18-06 Test Crew: K. Morgan Run #: 1
Sample Train #: _____ Train assembled by: K. Morgan
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	12-20-06	07:30	.6005	.5001	29	71	IK
Lab ID # _____	12-21-06	08:00	.6005	.5001	29	70	IK
ID # N236							
Tare wt. .5857							
D/T in desiccator 12-18-06 17:50							
Preliminary wt.: .6006							
Rear Filter	12-20-06	07:30	.5861	.5001	29	71	IK
Lab ID # _____	12-21-06	08:00	.5861	.5001	29	70	IK
ID # N235							
Tare wt. .5862							
D/T in desiccator: 12-18-06 17:50							
Preliminary wt.: .5865							
Acetone Rinse	12-21-06	08:00	116.9447	.5001	29	70	IK
Lab ID # _____	12-21-06	16:00	116.9443	.5001	18	76	IK
Beaker # 2242							
Tare wt. 116.9423							
Volume 100 ml							
Cleaned by: IK							
Solvent #: SA078							
D/T in desiccator: 12-19-06 13:30							
Preliminary wt.: 116.9458							

Technician signature: K. J. Morgan Date: 12-21-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-19-06 Test Crew: K. Morgan Run #: 2
Sample Train #: _____ Train assembled by: K. Morgan
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab ID # _____ ID # N238 Tare wt. .5714 D/T in desiccator 12-19-06 13:30 Preliminary wt.: .5863	12-21-06	08:00	.5861	.5001	29	70	IL
	12-21-06	16:00	.5860	.5001	18	76	IL
Rear Filter Lab ID # _____ ID # N237 Tare wt. .5814 D/T in desiccator: 12-19-06 13:30 Preliminary wt.: .5820	12-21-06	08:00	.5820	.5001	29	70	IL
	12-21-06	16:00	.5819	.5001	18	76	IL
Acetone Rinse Lab ID # _____ Beaker # 247 Tare wt. 93.8077 Volume 100 ml Cleaned by: IL Solvent #: SA078 D/T in desiccator: 12-20-06 07:30 Preliminary wt.: 93.8121	12-21-06	08:00	93.8115	.5001	29	70	IL
	12-21-06	16:00	93.8113	.5001	18	76	IL

Technician signature: K. Morgan Date: 12-21-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-19-06 Test Crew: K. Morgan Run #: 3
Sample Train #: _____ Train assembled by: K. Morgan
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab ID # _____ ID # N240 ✓ Tare wt. .5777 D/T in desiccator 12-19-06 16:40 Preliminary wt.: .5849	12-21-06	08:00	.5846	.5001	29	70	IC
	12-21-06	16:00	.5845	.5001	18	76	IC
Rear Filter Lab ID # _____ ID # N239 ✓ Tare wt. .5788 D/T in desiccator: 12-19-06 16:40 Preliminary wt.: .5784	12-21-06	08:00	.5784	.5001	29	70	IC
	12-21-06	16:00	.5784	.5001	18	76	IC
Acetone Rinse Lab ID # _____ Beaker # 256 ✓ Tare wt. 112.9706 Volume 75 ml Cleaned by: IC Solvent #: SA078 D/T in desiccator: 12-20-06 07:30 Preliminary wt.: 112.9748	12-21-06	08:00	112.9742	.5001	29	70	IC
	12-21-06	16:00	112.9743	.5001	18	76	IC

Technician signature: K. J. Morgan Date: 12-21-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-20-06 Test Crew: K. Morgan Run #: 4
Sample Train #: _____ Train assembled by: K. Morgan
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab ID # _____ ID # N242 ✓ Tare wt. .5772 D/T in desiccator 12-20-06 12:05 Preliminary wt.: .5823	12-21-06	16:00	.5821	.5001	18	76	IC
	12-22-06	08:00	.5824	.5001	21	71	IC
Rear Filter Lab ID # _____ ID # N241 ✓ Tare wt. .5770 D/T in desiccator: 12-20-06 12:05 Preliminary wt.: .5767	12-21-06	16:00	.5765	.5001	18	76	IC
	12-22-06	08:00	.5765	.5001	21	71	IC
Acetone Rinse Lab ID # _____ Beaker # Z3 ✓ Tare wt. 108.6796 Volume 100 ml Cleaned by: IC Solvent #: SA 078 D/T in desiccator: 12-21-06 08:00 Preliminary wt.: 108.6844	12-22-06	08:00	108.6820	.5001	21	71	IC
	12-29-06	10:45	108.6821	.5001	22	75	JDV ✓

Technician signature: IC J. Morg Date: 1-05-07

Date Placed in Desiccator	12-Oct-06		Balance ID Number	OMNI-00023	
Time Placed in Desiccator	9:51 AM		Audit Weight ID Number	OMNI-00131	
Technician	Morgan		Thermometer/Hygrometer ID Number		

AE Glass 102 mm Filter Tares

OMNI-Test Laboratories, Inc

102 mm Filters ID Number													
	Date:	10/13/2006	10/16/2006										
	Time:	1:01 PM	8:50 AM										
	RH %:	23	29		0		0						
	T (F):	75	74		0		0						
	Tech.:	Morgan	Morgan										
	Audit:	0.5001	0.5001		0		0		Manufacturer	Appliance	Project No.	Run	Train
N235		0.5861	0.5862	X	0		0		Morso	3142	192-S-10-3	1	
N236		0.5857	0.5857	X	0		0		Morso	3142	192-S-10-3	1	
N237		0.5813	0.5814	X	0		0		Morso	3142	192-S-10-3	2	
N238		0.5712	0.5714	X	0		0		Morso	3142	192-S-10-3	2	
N239		0.5787	0.5788	X	0		0		Morso	3142	192-S-10-3	3	
N240		0.5778	0.5777	X	0		0		Morso	3142	192-S-10-3	3	
N241		0.5768	0.577	X	0		0		Morso	3142	192-S-10-3	4	
N242		0.5774	0.5772	X	0		0		Morso	3142	192-S-10-3	4	

Date Placed in Desiccator	15-Dec-06		Balance ID Number	OMNI-00023	
Time Placed in Desiccator	8:00 AM		Audit Weight ID Number	OMNI-00131	
Technician	Morgan		Thermometer/Hygrometer ID Number		

250 ml Beaker Tares

OMNI-Test Laboratories, Inc

250 ml Beakers ID Number													
	Date:	12/16/2006	12/18/2006		12/18/2006								
	Time:	4:00 PM	8:00 AM		4:50 PM								
	RH %:	26	25		25		0						
	T (F):	71	65		68		0						
	Tech.:	Morgan	Morgan		Morgan								
	Audit:	0.5001	0.5001		0.5001		0		Manufacturer	Appliance	Project No.	Run	Train
256		112.9713	112.9703		112.9706	X	0		Morso	3142	192-S-10-3	3	
Z3		108.6805	108.6792		108.6796	X	0		Morso	3142	192-S-10-3.	4	
2242		116.9432	116.942		116.9423	X	0		Morso	3142	192-S-10-3	1	
247		93.8082	93.8076		93.8077	X	0		Morso	3142	192-S-10-3	2	

...I Environmental Services, Inc.
OMNI-Test Laboratories, Inc.
Beaverton, OR Phone (503) 643-3788

Acetone Solvent Blank Analysis Worksheet

Date: 3-1-06 By: B. Davis Balance ID #: OMNI – 00023

Manuf. Lot #: C180103SP Solvent Bottle #: SA078 Audit Weight ID #: OMNI – 00131
(Balance audit mfr. std.: 500 ± 0.72 mg)

Mls. Sample	ID No.	Tare Weight	Date & Time in Dessicator	Weighing Record				Initials	Calculations & Remarks
				Date	Time	Weight	Audit Weight		
150	2195	104.4236	3-03-06 & 09:00 104.4266	3-4-06 3-7-06	0920 0807	~~104.8377~~ 104.4239 104.4243	.5001 .5001	BR BR	0.7/150 .0047
150	2000	102.8382	3-3-06 & 09:00 102.8402	3-4-06 3-7-06	0920 0807	102.8377 102.8378	.5001 .5001	BR BR	-0.4/150 -.0027 Ø
			&						.0047/2 = .0024 mg/mL

Technician Signature: [signature] Date: 6-30-06

Checked by: [signature] Date: 6/30/06 Approved by: [signature] Date: 6/30/06

2-10 OF 2-47

Calibrations

Method 28 and 5G

ID #	Lab Name/Purpose	Log Name	Attachment Type
21	Dry Gas Meter/Incline Manometer	Control Module – Sierra Misco Inc.	Post-Test Calibration Log
23	Scale/Analytical Balance	Analytical Balance – Mettler Instrument	Calibration Certificate
32	Vaneometer	Vaneometer/Air Velocity Meter – Dwyer	Calibration Log
112	Thermometer	Temperature Controller Meter – Omega	Calibration Log
126	Draft Gauge	Magnehelic, 0-0.25" H_2O – Dwyer	Calibration Log
131	500 mg Weight	Standard Weight, 500 mg – Ohaus	Calibration Log
141	Dry Gas Meter	Dry Gas Meter – Singer	Calibration Certificate
156	Incline Manometer	Incline Manometer, 0-10" – Dwyer	Calibration Log
183	Moisture Meter	Moisture Meter – Delmhorst	Manual
185	Platform Scale	Weight Indicator – Weigh-Tronix	Calibration Log
209	Barometer	Barometer – Princo	Manual Cover
255	10 lb. Weight	Standard Weight, 10 lb.	Calibration Log
287	Manometer	Microtector – Dwyer	Calibration Log
300	Stopwatch	Stopwatch – Sportline	Calibration Log

Thermal Metering System Calibration
Y and dH@

Manufacturer:	Sierra-Misco
Model:	7200
Serial Number:	
OMNI Tracking No.:	21

Average Orifice Meter dH@	Average Gas Meter y Factor
1.636	0.986

Calibration Date:	12/20/06
Calibrated by:	Ken Morgan
Calibration Frequency:	Post Series
Next Calibration Due:	06/20/07
Instrument Range:	1.000 cfm
Standard Temp.:	68 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.01 "Hg
Signature/Date:	K. J. Morgan 1-05-07

Previous Calibration Comparision

Date	11/27/2006	Acceptable	
dH@ Value	1.598	Deviation (5%)	Deviation
y Factor	1.001	0.05005	0.015
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.000
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.003
Acceptance	Acceptable

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	141	
	Calib. Date	19-Jun-06	
	Calib. Value	0.9980	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	1.00	1.00	1.00
dH ("H2O)	0.75	0.75	0.75
Initial Reference Meter	488.252	493.215	498.185
Final Reference Meter	493.215	498.185	503.15
Initial DGM	208.402	213.672	218.947
Final DGM	213.672	218.947	224.216
Temp. Ref. Meter (°F), Tr	73.0	73.0	73.0
Temperature DGM (°F), Td	100.0	100.0	100.0
Time (Minutes)	10.0	10.0	10.0
Net Volume Ref. Meter, Vr	4.963	4.970	4.965
Net Volume DGM, Vd	5.27	5.275	5.269
Gas Meter y Factor =	**0.986**	**0.986**	**0.986**
Gas Meter y Factor Deviation (from avg.)	0.000	0.000	0.000
Orifice dH@	**1.64**	**1.63**	**1.64**
Orifice dH@ Deviation (from avg.)	0.002	0.003	0.001

where:

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

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

Thermal Metering System Calibration
Y and dH@

Manufacturer: Sierra-Misco
Model: 7200
Serial Number:
OMNI Tracking No.: 21

Average Orifice Meter dH@	Average Gas Meter y Factor
1.598	1.001

Calibration Date: 11/27/06
Calibrated by: Ken Morgan
Calibration Frequency: Six Month
Next Calibration Due: 05/28/07
Instrument Range: 1.000 cfm
Standard Temp.: 68 oF
Standard Press.: 29.92 "Hg
Barometric Press.: 29.64 "Hg
Signature/Date: K.J. Morgan 11-27-06

Previous Calibration Comparision

Date	5/17/06	Acceptable	
dH@ Value	1.526	Deviation (5%)	Deviation
y Factor	0.991	0.04955	0.010
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.010
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.069
Acceptance	Acceptable

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	141	
	Calib. Date	19-Jun-06	
	Calib. Value	0.9980	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	1.00	1.00	1.00
dH ("H2O)	0.45	0.75	1.50
Initial Reference Meter	333.501	339.4	347.468
Final Reference Meter	338.871	346.833	352.489
Initial DGM	650.186	656.396	664.907
Final DGM	655.843	664.233	670.206
Temp. Ref. Meter (°F), Tr	64.0	64.0	64.0
Temperature DGM (°F), Td	89.0	95.0	102.0
Time (Minutes)	14.0	15.0	7.0
Net Volume Ref. Meter, Vr	5.370	7.433	5.021
Net Volume DGM, Vd	5.657	7.837	5.299
Gas Meter y Factor =	**0.991**	**1.001**	**1.010**
Gas Meter y Factor Deviation (from avg.)	0.009	0.000	0.010
Orifice dH@	**1.64**	**1.62**	**1.53**
Orifice dH@ Deviation (from avg.)	0.044	0.024	0.069

where:

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

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

Certificate of Calibration 360456

Omni-Test Laboratories
5465 SW Western
Suite G
Beaverton, OR 97005

Cust ID: 56
OnSite
PO: OTL-06-127
Authorized By:

JJ Calibrations, Inc.

ACCREDITED 0723.01

Make: Mettler
Model: AE200
Noun: SCALE
Serial #: 010644
Property #: OMNI-00023
Department: NO
User:
Procedure: CP 27
Accuracy: ±0.01% OF APPLIED WEIGHT

Order Date: 11/08/2006
Calibrated on: 11/08/2006
***Recommended Due:** 05/08/2007
Environment: 17°C 49% RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 92
ID Barcode: CVUH

Remarks
Refer to attachment for measurement results.

* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
256A	Rice Lake	W0133K	WEIGHT SET	08/11/2008	326425
503A	Rice Lake	1mg-200g TYPE O	O CLASS WEIGHT SET	09/28/2007	353816

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-1999, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

Reviewer

Inspector

4 Issued 11/09/2006 Rev # 12

7007 SE Lake Rd Portland, OR 97267-2105 Phone 503.786.3005 FAX 503.786.2994 www.jjcalibrations.com

JJ Calibrations, Inc.

Manufacturer: Mettler
Model: AE200
Nomenclature: 200g Scale
Serial: 010644

Certificate #: 360456
Date: 08Nov2006
Technician: 92
Calibration Interval: 6 Months

Parameter		Reference Standard	UUT Before	UUT After	UUT ± Limit	Uncertainty ±
Mass						
		01 g	1.0000g	1.0000g	0.0001 g	N/A
		10 g	10.0001g	10.0001g	0.001 g	N/A
		50 g	50.0002g	50.0002g	0.005 g	N/A
		100 g	100.0004g	100.0004g	0.010 g	N/A
		200 g	200.0011g	200.0011g	0.020 g	N/A

Supplement Data Sheet
Bold Italics indicates Out of Tolerance Value.

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 BD
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
1-14-06	BD	Installed new vane from factory	7-14-06
7-10-06	BD	Installed new vane from factory	1-10-07
		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	

Temperature Calibration
EPA Method 28 and 5G

BOOTH:	TEMPERATURE MONITOR TYPE:	IDENTIFICATION NUMBER:
Emissions	OMEGA 115 KF	112

REFERENCE TEMPERATURE MONITOR TYPE:	IDENTIFICATION NUMBER:
OMEGA Calibrator Model CL300 00117	Serial Number 506

CALIBRATION PERFORMED BY:	DATE:	AMBIENT TEMPERATURE:	BAROMETRIC PRESSURE:
KEN MORGAN	11-27-06	63	29.68

Reference Point Source	Temperature Monitor (°F)					
		Method 5G Dilution Tunnel				
OMEGA Thermocouple Simulator Serial #506	Method 28 Room	Meter (Tm)	Filters (Tf)	Tunnel (Tt)	Dryer (Ts)	DB
0	1	1	1	1	1	1
100	98	98	98	98	98	98
300	301	301	301	301	301	301
500	500	500	500	500	500	506
700	699	699	699	699	699	699

Technician signature: K J. Morg Date: 11-27-06

OMNI Environmental Servic[illegible] Inc.
OMNI-Test Laboratories, Inc.
Beaverton, OR Phone (503) 643-3788

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
Magnehelic Gauge

Instrument to be calibrated: MAGNAHELIC

Range: 0 - 0.25 ID Number: 126

Calibration Instrument: Digital Manometer ID Number: 315

Date: 12-07-06 By: K. Morgan

Only two data points for a between calibration check

Digital Manometer (A) (inches of H_20)	Magnehelic Gauge (B) (inches of H_20)	Difference (A - B)	% Error of Full Span*
.251	.248	.003	1.2%
.173	.175	.002	0.8%
.117	.113	.004	1.6%
.030	.028	.002	0.8%

*Acceptable tolerance is 4%.

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

Technician signature: K. J. Morgan Date: 12-07-06

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/NCSL 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

Issued 19Nov2003

Rev # 11

7007 SE Lake Rd. • Portland, OR 97267-2105 • Telephone (503) 786-3005 • Fax (503) 786-2994 • www.jjcalibrations.com

JJ Calibrations, Inc.

Manufacturer: Ohaus
Model: 500mg
Nomenclature: 500mg Weight
Serial: 27503

Certificate #: 286629
Date: 19Nov2003
Technician: 34
Calibration Interval: 12 Months

Parameter	Referance Standard	Nominal	UUT Before	UUT After	UUT ± Limit	Uncertainty ±
Mass	N/A	500.00mg	500.11mg		0.72mg	N/A

Supplement Data Sheet
Bold Italics indicates Out of Tolerance Value.

DICK MUNNS COMPANY

Liquid and Gas - Flowmeter Calibration Service
10572 Calle Lee - 138 • Los Alamitos, California 90720
Telephone (714) 827-1215 • Telefax (714) 827-0823

CERTIFICATE OF CALIBRATION

Client Name:	OMNI-TEST LABS	Calibration Date:	06-19-2006
Reference Number:	PO# OTL-06-057	Calibration Due:	06-19-2007
Instrument Manufacturer:	AMERICAN METER CO.	Procedure:	NAVAIR-17-20MG-02
Instrument Description:	P.D. METER	Calibration Fluid:	Air @14.7PSIA 70F.
Model Number:	DTM-200A	Standard(s) Used:	A4 DUE 2-2007
Serial Number:	95W492393	NIST Traceability Per:	322ENW,737/3096,37720
Rated Uncertainty:	+/- .5% RD	Ambient Conditions:	761 mmHGA, 46% RH
Uncertainty Given:	As rec.Within Specs.	Certificate/File:	423862

	IND. SCFM	ACT. SCFM	C. FACTOR
1	0.250	0.250	1.00001
2	0.501	0.500	0.99801
3	0.751	0.750	0.99868
4	1.002	1.000	0.99801
5	1.503	1.500	0.99801
6	2.004	2.000	0.99801
7	2.507	2.500	0.99722
8	3.009	3.000	0.99702

** ID# 00141 **

All instruments used in the performance of the above calibration have direct traceability to the National Institute of Standards and Technology (NIST). The accuracy ratio between the calibration standards used and the unit under test is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the above listed procedure number, in accordance with ISO 10012-1,17025, ANSI/NCSL-Z-540-1, and/or MIL-STD-45662A. CONDITION AS: RECEIVED (X) AS LEFT ( ) WITHIN SPECS. (X) YES ( ) NO.

Calibration Performed By:

PABLO ACOSTA

Approved By:

R.L. Munns

Form CERT

www.dickmunns.com

OMNI-Environmental Service, Inc.
OMNI-Test Laboratories, Inc.
Beaverton, OR Phone (503) 643-3788

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
Magnehelic Gauge

Instrument to be calibrated: Liquid INCLINE MANOMETER

Range: 0-10 "w.c. ID Number: 156

Calibration Instrument: Digital Manometer ID Number: 315

Date: 12-07-06 By: K. Morgan

Only two data points for a between calibration check

Digital Manometer (A) (inches of H_20)	Magnehelic Gauge (B) (inches of H_20)	Difference (A - B)	% Error of Full Span*
1.900	1.90	0	0
1.000	1.00	0	0
0.719	~~0.70~~ 0.720	.001	0.1%
0.319	0.320	.001	0.1%

*Acceptable tolerance is 4%.

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

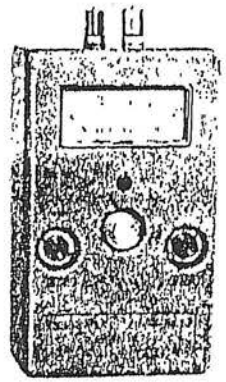
Technician signature: K. Morgan Date: 12-07-06

2 - 23 OF 2 - 47

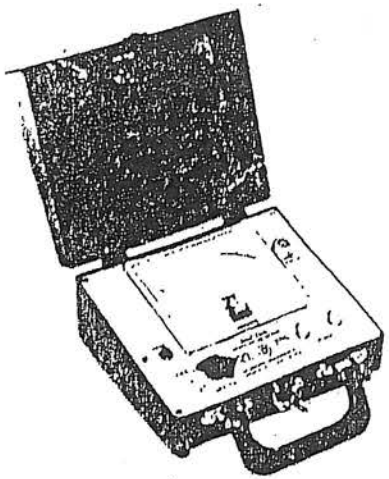
DELMHORST INSTRUMENT COMPANY
BOONTON, N.J. 07005

5074-578

OWNER'S MANUAL



MOISTURE DETECTORS FOR WOOD



DELMHORST INSTRUMENT COMPANY

INDEX

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 equilibium 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 1½" 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 underestimated. 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 electrolize 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 flue 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.

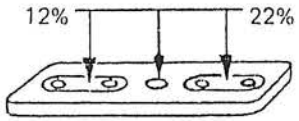
CALIBRATION MOISTURE STANDARDS

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

moisture and swell. The recommended moisture content for wood flooring as follows (based on information shown in Forest Products Laboratory Bulletin No. 1055 entitled "Moisture Content of Wood in Use"):

	Average	Indiv. Pieces
Dry Southwestern States	6%	5-8%
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 the recommended moisture content at the time of installation, will absorb the moisture which will result in "compression set" which will be followed by shrinkage when the wood finally dries to the 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 closed 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.

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:

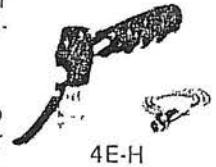
26E

Meter Reading									
7	8	10	12	14	16	18	20	22	24
Correct Reading									
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.

4E

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.



4E-H

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.

15E

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.	#E-91
	4	22.5V Burgess Y-15 or Eveready	#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

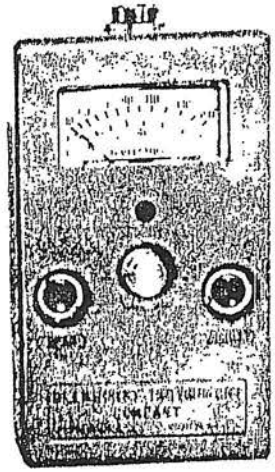
The TM-2 is a solid-state, portable battery operated instrument.

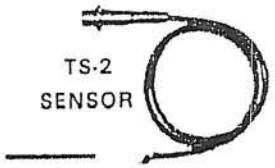
Remote sensing is possible up to 1000' or more. Probe extensions available in 3' rigid sections.

RANGES

TM-2 (30°-150°F / 0-65°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 ovendry weight of the wood:

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

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 ovendry 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 OVENDRY-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).

HJ: BRUCE DAVIS

Weigh-Tronix, Inc.
7933 SW Nimbus Ave. #28
Beaverton, OR 97005
503-626-3008
1-800-878-3008

WEIGH-TRONIX

SERVICE WORK ORDER

SHIP TO
NAME OMNI ENVIRONMENTAL SERVICES
ADDRESS 5465 SW WESTERN AVE
CITY BEAVERTON STATE OR ZIP 97075
PHONE 503 - 643-3788
FAX
CONTACT Bruce or Richard

JOB No. 111491
CUSTOMER No.
Order Date / /
Start Date / /
Complete Date 1 / 11 / 99

BILL TO
NAME
ADDRESS PO BOX 743
CITY STATE ZIP
ATTN:

P.O. No. 99-007

EQUIPMENT:

S/N	Location	Type	Cap.	Recommendations and Remarks
5547		WI-127	1K	10,000 DIV
21676		3030	1K	

COMMENTS:

Rental 1 Month

Set up calibrated 1000 x 0.1 LB per. order tested. good.

PARTS:

2.5

Qty.	Description	Price	Total

ZONE _____ VEHICLE _____
TECHNICIAN LD

SERVICE SUMMARY

Reg.	Agree.	Pref.	Inst.
		Hrs. @	
		Mileage	
		Parts	
		Shop Supplies	
		Other	
		TOTAL	

THIS IS NOT AN INVOICE

I acknowledge all service has been performed satisfactorily, as stated above. All parts installed are warranted for thirty days from this date.

Authorized Signature Bruce Davis

WEIGH-TRONIX
Rental / Sales / Service

Print Name Bruce Davis

DAMAGE TO RENTAL/DEMO EQUIPMENT IS SOLELY THE RESPONSIBILITY OF THE USER WHILE IN THEIR POSSESSION!

DISTRIBUTION: WHITE – OFFICE YELLOW – FILE PINK – CUSTOMER

OMNI 00209

Instruction Booklet

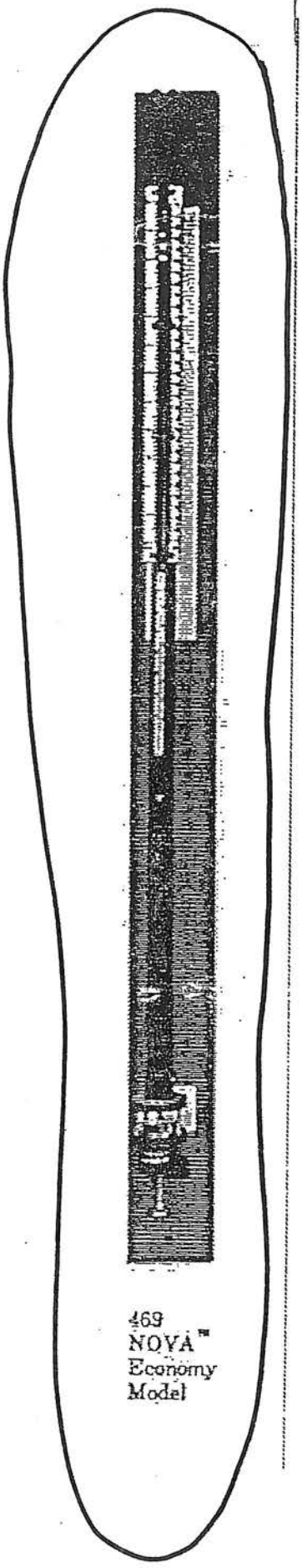
for use with

PRINCO

Fortin type mercurial

Barometers

453
National
Weather
Service
Type



469
NOVA™
Economy
Model

Manufactured by

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

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

Certificate of Calibration

Certificate # **283508** Page # 1 of 1 Order Date: 09Oct2003

For: OMNI-TEST LABORATORIES 56

Department: NO PO#: OTL-03-093

JJ Calibrations, Inc.

#0723.01

Instrument Identification

Property #: OMNI 00255 Serial #: OMNI00255

Make: UNKNOWN User:

Model: 10 lb

Noun: WEIGHT

Accuracy: RAW DATA

Certification Information

As Found: Other - See Comments Calibration Date: 13Oct2003

As Left: Return As Is *Client Specified Due Date: 13Oct2004

Adjustments: None Repairs: None Seals: N/A Environment: 21°C 38% RH

Procedure: CP 16 Technician: 54

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
550	AND (A&D) CO.	HP-30K	30k GRAM BALANCE	12Feb2004	267090

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/NCSL 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

Issued 13Oct2003

Rev # 11

7007 SE Lake Rd. • Portland, OR 97267-2105 • Telephone (503) 786-3005 • Fax (503) 786-2994 • www.jjcalibrations.com

JJ Calibrations, Inc.

Manufacturer: Unknown
Model: 10 lbs.
Nomenclature: Weight
Serial: OMNI00255

Certificate #: 283508
Date: 13Oct2003
Technician: 54
Calibration Interval: 12 Months

Parameter		Nominal	UUT Before	UUT After	UUT ± Limit	Uncertainty ±
Weight Accuracy	N/A	10 lbs	10.0015lbs		N/A	N/A

Supplement Data Sheet
Bold Italics indicates Out of Tolerance Value.

OMNI Environmental Servic(Inc.
OMNI-Test Laboratories, Inc.
Beaverton, OR Phone (503) 643-3788

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
Liquid Manometer Gauge

Instrument to be calibrated: Dwyer Microtector

Range: 0-2" ID Number: OMNI- 00287

Calibration Instrument: ~~Liquid~~ Digital Manometer ID Number: OMNI - 00275

Date: 9-25-03 By: B DAVIS

digital New liquid 9-25-03

~~Liquid~~ Manometer (A) REF. (inches of H_20)	Liquid Manometer (B) (inches of H_20)	Difference (A - B)	% Error of Full Span*
1.80	1.82	0.02	1.0
0.98	0.99	0.01	0.5
0.29	0.30	0.01	0.5
0.11	0.12	0.01	0.5

*Acceptable tolerance is 4%.

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

Technician signature: [signature] Date: 9-25-03

OMNI Environmental, Inc.
OMNI-Test Laboratories, Inc.
Beaverton, OR (503) 643-3788

NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 10/10/06 User/Technician: B Davis ☒ Pass ☐ Fail

NIST traceable stop watch OMNI Tracking Number: 292 Last Cal: 2-7-06

Stopwatch to be tested for time proficiency OMNI Tracking Number: 300

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: 15.09 #2 Measured time: 15.13 #3 Measured time: 15.00

Target time: 30.00 seconds #1 Measured time: 30.07 #2 Measured time: 30.03 #3 Measured time: 29.97

Target time: 10.00 minutes #1 Measured time: 10.00.06 #2 Measured time: 10.00.10 #3 Measured time: 9:59.53

Target time: 30.00 minutes #1 Measured time: 30:00 #2 Measured time: 30.00 #3 Measured time: 30.00

Technician Signature: [signature] Date: 10-11-06

Example Calculations

Note: OMNI uses the Lotus 1-2-3 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:

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

$$BR = 0.98\ kg/hr = 2.17\ lb/hr$$

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 actone rinse, ml
B_a	=	Acetone blank value, mg/ml

Sample Calculation:

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

$m_n = 16.2$ 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. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

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

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

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: $85.49 \frac{ft}{\text{sec}} \left[\frac{(lb/lb\text{-}mole) \times (inches\ Hg)}{(^\circ R) \times (inches\ H_2O)}\right]^{\frac{1}{2}}$

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, °R; (°R = °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:

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

$$C_s = 0.000163 \ g/dscf$$

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, ft^2
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:

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

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

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:

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

$$E = 1.36\ g/hr$$

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

$$E = 2.35\ g/hr$$

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 "i^{th}" interval, in this case, the inverse of the calculated flow in the stack based on CO_2 concentrations in the stack and in the dilution tunnel
$V_{mi(std)}$	=	Volume of gas sample measured by the dry gas meter during the "i^{th}" 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):

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

$$PR = 103.8\%$$

Section 3

Owner's Manual

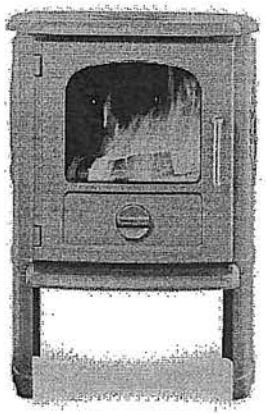
morsø

By appointment to the Royal Danish Court

Installation and Operating Instructions

3112 & 3142

For use in North America



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

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

Save these instructions

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

Distributed by: MORSO US LLC
1011 HIGHWAY 52 WEST PORTLAND TN 37148 USA

3 - 2 OF 3 - 12

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 3112 & 3142 meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after July 1, 1990

The Morsø 3112 & 3142 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.

Under specific test conditions this heater has been shown to deliver heat at rates ranging from xx,xxx to xx,xxx Btu's.

3 - 3 OF 3 - 12

CONTENTS:

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 neccessary 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 center grate (in the centre of the fire bed) and the fire bricks are firmly in position and have not shifted in transit. Check also that the air control works freely.

Standard Accessories

Poker, ceramic flue connection gasket and riddling tool are standard accessories, and can usually be found in the ashpan or firebox area.

3 - 4 OF 3 - 12

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).

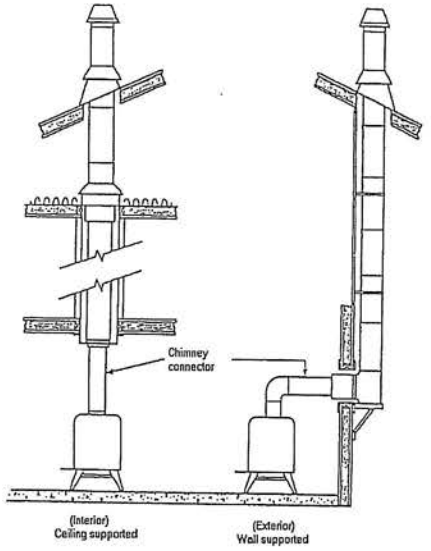
Use a residential type masonry or listed type HT factory-built chimney.

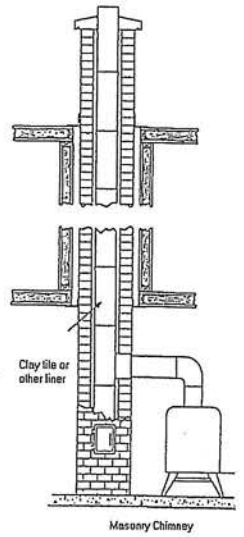
High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F.) for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

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

We recommend the length of the chimney system should be at least 16 feet (not required) above the stove in normal domestic situations, measured from the flue collar to the top of the chimney.
Local conditions like for example - roof constructions, large trees nearby and high altitude, may influence the chimney draft and height. Therefore, contact the local professional chimney sweep or your Morsø dealer.

Typical Factory-Built or Masonry Chimney Installations





1.3 Flue Connection

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

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

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

1.4 Connection to the existing chimney

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

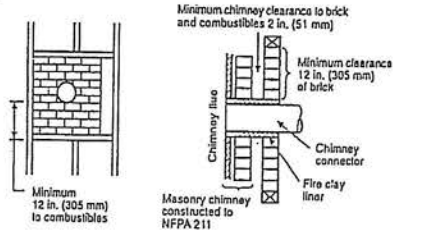
Double-wall connectors must be tested and listed for use with solid-fuel burning appliances. Single-wall connectors should be made of 24 gauge or heavier gauge steel. Do not use galvanized connector; it cannot withstand the high-temperatures that smoke and exhaust gases can reach, and may release toxic furnes 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.

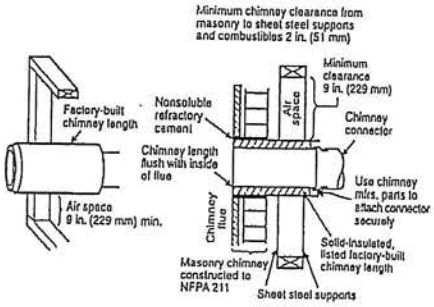
It is important to keep the flue gases moving smoothly in the right direction. Do not vent into a large void at this location; rather form one continuous section all the way up. Use mild bends (e.g. 45° vs. 90°) rather than sharp angles where a change of direction is required. All parts of the venting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

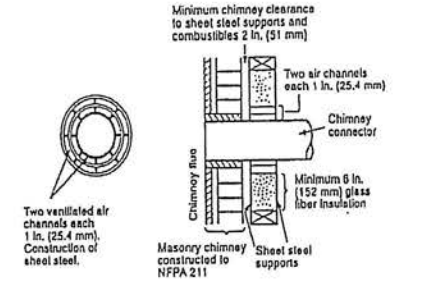
Chimney Connector Systems and Clearances from Combustible Walls for Residential Heating Appliances



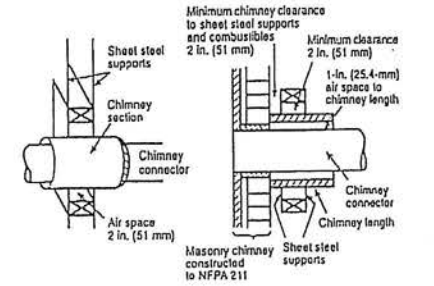
A Minimum 3.5-in thick brick masonry all framed into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.



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



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



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

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. 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.

Appliance Clearances 3112 & 3142

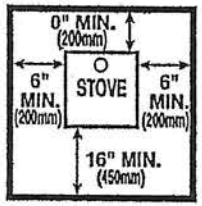
	Parallel		Corner
Freestanding Installation	Side	Rear	
Single or double-wall chimney connector			
Minimum alcove width			
Maximum alcove depth			
Alcove ceiling above stove top			
Fireplace Hearth Installation			

Flooring requirements

Combustible floor must be protected with non-combustible material beneath the unit and extending 16-in (450-mm Canada) to the front and 6-in (153-mm Canada) beyond each side of the fuel/ash removal opening. For horizontal cimney connectors, non-combustible material must be place beneath the connector and 2-in to each side.

You must ensure that the floor can hold the weight of the stove comfortably.

NON-COMBUSTIBLE FLOOR PROTECTOR



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

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

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.

1.6 Mobile Home Installation

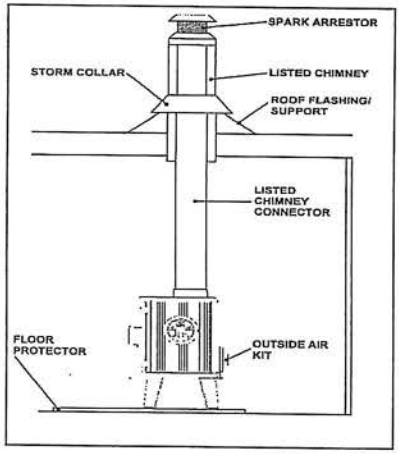
The Morsø 3112 & 3142 can be installed in a mobile home if equipped with an outside combustion air kit, a terminal cap with a spark arrestor, and if it meets the following installation requirements:

- The stove must be secured to the mobile home structure by bolting through the hearth pad and into flooring.
- The stove must be installed with a listed Type HT chimney connector, HT Chimney, and terminal cap with spark arrestor. Never use a single wall connector (stovepipe) in a mobile home installation.
- Floor protection requirements in section 1.5 must be followed precisely.
- In Canada, this appliance must be connected to a 6" (152 mm) factory-built chimney conforming to CAN/ULC-629M, STANDARD FOR FACTORY BUILT CHIMNEYS. Floor protection as referenced in section 1.5 must be followed, as well as use of Canadian Floor Protector.

- Follow the chimney and chimney connector manufacturer's instructions when installing the flue system for use in a mobile home.
- Outside air kit should be installed according to installation guide in the kit.
- Intake air piping can be installed through the floor into a vented crawl space or through the wall of the residence to obtain outside air.
- Install in accordance with 24 CFR, Part 3280 (HUD).
- NOTE: Top sections of chimney must be removable to allow maximum clearance of 13.5' from ground level for transportation purposes.

WARNING:
NEVER DRAW COMBUSTION AIR FROM A WALL, FLOOR OR CEILING CAVITY OR FROM ANY ENCLOSED SPACE SUCH AS AN ATTIC OR GARAGE.
DO NOT INSTALL IN A SLEEPING ROOM.

CAUTION:
THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ ROOF MUST BE MAINTAINED (I.E., DO NOT CUT THROUGH FLOOR JOIST, WALL STUD, CEILING TRUSS, ETC.) DO NOT USE A GRATE TO ELEVATE FIRE - BUID FIRE DIRECTLY ON HEARTH.



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 15 inches (37 cm) and approx. 3 to 3,5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 0,7 kg.
The maximum moisture content of the wood should be around 20%.
Store the logs under cover in a location where fresh air can move through the stack. Some soft woods may take as little as one good summer to season, where some harder woods may take a couple of years or more. Well seasoned wood will be remarkably light to hold and will probably have radial cracking at the ends. If your wood spits 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.

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 valve, lighting techniques and loading intervals will depend on chimney draft, the fuel used, the heat required and so on. Some basic techniques are outlined below.

In principle

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

Secondary Air is delivered to the firebox using the specially designed baffle at the back of

the firebox. The secondary air is injected into the flue gases both above and in front of the fire resulting in a cleaner, more efficient combustion process. The supply of secondary air is fixed open and is not adjustable. The lower air controler on the door is fixed, and only for decoration purposes.
For extra safety, your stove has been fitted with a removable handle. When not in use the handle can be stored using the lug behind the right leg of the stove.

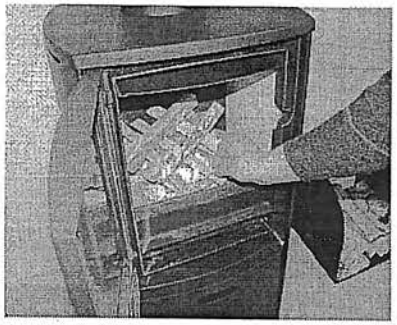
2.2 Lighting and loading intervals

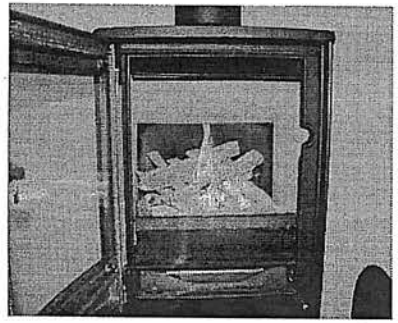
When first lighting the stove, a large volume of air is needed. When the stove is cold, you should leave the door open an inch or two for the first few minutes and open the primary air supply completely. While the door is open, do not leave the stove unattended.

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

Step-by-step procedure

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





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

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

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

If the door is left partly open, gas and flame may be drawn out of the fireplace stove opening, creating risks from both fire and smoke. We recommend that you 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 lightning 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 perfoming maintenance on your stove, always protect yourself, using safety goggles and gloves

3.1 Exterior Maintenance

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

3.2 Internal maintenance

Glass

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

Reasons for dirty glass

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

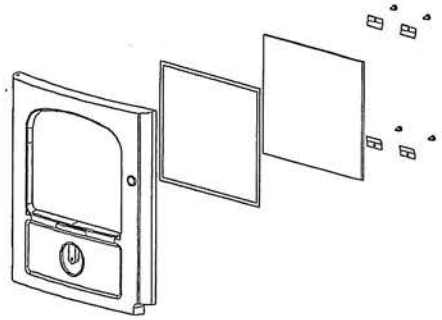
Replace broken glass immediately.
Do not operate your stove if the glass in the door is damaged.

If you need to replace the glass, it should be replaced with the high temperature ceramic class 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 its hinges an place face-down on a sheet of cardboards or other non-abrasieve fabric. The door is removed by loosening the 2 screws with a hexagon box wrench by the hinges.



2. Unscrew the 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 cnetre with 1/8 inch high speed steel drill bit. Smaller drill bits may be successful, but do not use a lager bit. Make sure the bit stays away from the edges of the bolt - this may damage the thread in the cast iron).

3. Remove the old ceramic gaskets and clean up the surface underneath with wire wool or emery paper to remove loose particles.

4. Place the new gasket material in position around the perimeter of the window area, making sure to pinch them to the length in such a way that they make a continuous seal. Leave no gaps.

5. Place the new glass in position on the strips and screw home the fresh bolts and fitting by hand.

6. Finally, give each of the bolts an extra half turn or so. The glass should held tight enough by 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, 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.

The grate may be replaced by lifting it by its left hand edge and twisting it backwards. Dislocate the riddling arm from the grate by feel from beneath the floor of the firebox. If you find this difficult for any reason, raising the rectangular grate surround casting may help.

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. The rear casing is removed (four bolts). Remove these and withdraw the baffle from the firebox (this may be easier if the firebricks are first removed).
Before replacing the baffle, scrape out the old fire furnace and replace with new to make an effective seal.

Reasons for fast internal wear and tear
Persistent heavy firing
Soot and ashes left to accumulate

Ceramic 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 door or if air starts to leak in around the perimeter of the door, 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. - at least once a year. Inspect every month.
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 ocurred 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:
When the door is closed, the grate can be operated by means of the riddling bar. 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. Remove the ash pan, making sure to keep it level.
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 disperded, 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.

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

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

Chimney sweeping
Inspect the system regularly during the heating season as part of a regular maintenance schedule. To inspect the chimney, let the stove cool completely. Then, using a mirror, sight up through the flue collar into the chimney flue. If you cannot inspect the flue system in this fashion, the stove must be disconnected to provide better viewing access.
Clean the chimney using a brush the same size and shape as the flue liner. Run the brush up and down the liner, causing any deposits to fall to the bottom of the chimney where they can be removed through the clean-out door.
Clean the chimney connector disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connetor 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 Deler or a professional chimney sweep.

If you do experience a chimney fire, act promptly and:
Close the air control.
Get everyone out of the house.
Call the Fire Department.

Annual maintenance
Before the heating season, perform a thorough cleaning, inspection and repair:
Thoroughly clean the chimney and chimney connector.
Inspect the chimney for damage and deterioration. Replace weak sections of prefabricated chimney. Have a mason make repairs to a masonry chimney.
Inspect the chimney connector and replace any damaged sections.
Check gasketing for wear or compression, and replace if necessary.
Check the glass for cracking; replace if needed.
Check door and handles for tightness. Adjust if needed.

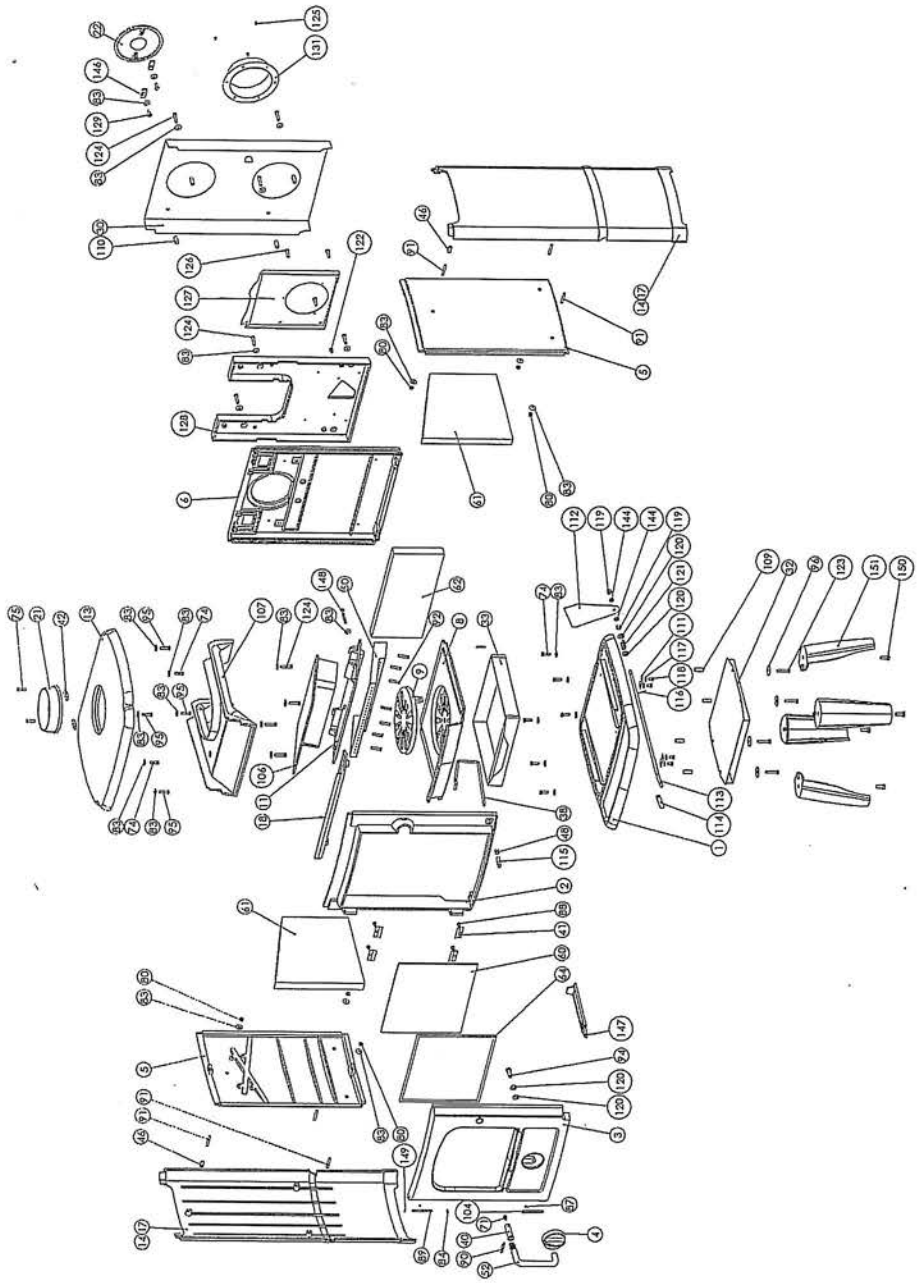
3.4 Leaving the stove for extended periods

Important:
If the stove is to be left unused for any period of time, clean it out thoroughly and leave the spinner 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 dessicant, 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.

3.5 Parts diagram for the model Morsø 3112 & 3142



3.6 Parts list for the model Morsø 3112 & 3142

Pos.No.	Parts	3142	3112
1	Base plate	443145xx	443145xx
2	Front frame	443146xx	443146xx
3	Door	443103xx	443103xx
4	Air valve	443104xx	443104xx
5	Side plate	443154XX	plane 443118xx squirrel 443151xx
6	Rear plate, cast iron	443141xx	443141xx
8	Intermediate frame	34310800	34310800
9	Riddling grate	44310900	44310900
11	Baffle plate, cast iron	44313500	44313500
13	Top plate konv.	443142xx	443142xx
14	Side plate konv. - w. squirrel	Egern 443114xx	
17	Side plate konv. - plane	Glat 443117xx	
18	Access Door	34313600	34313600
21	Flue collar	441459xx	441459xx
22	Cover	441410xx	441410xx
23	Handle	54186100	54186100
30	Rear plate	543147xx	543147xx
32	Radiant shielding, bottom	54312700	54312700
33	Ash tray	54310100	54310100
38	Riddling arm	71313900	71313900
40	Axis for handle	75462700	75462700
41	Glass fitting	54146361	54146361
42	Fitting for flue collar	44256700	44256700
46	Distance tube	545003	545003
48	Bush, brass	752621	752621
50	Baffle plate, stainless	71312300	71312300
52	Door handle	752625	752625
60	Ceramic glass	79310000	79310000
61	Stone, side	79311300	79311300
63	Stone, back	79311400	79311400
64	Tightening tape	79074500	79074500
71	Black steel set screw		
74	Black steel set screw		
75	Screw		
80	Steel box nut		
83	Washer		
84	Washer		
87	Pinol screw		
88	Screw		
89	Hinge pin	545008	545008
90	Hinge pin	542056	542056
91	Pinol screw		
92	Screw		
94	Black steel set screw		
95	Black steel set screw		
96	Washer		

104	Hinge pin	74701000	74701000
106	Baffle plate, upper	34313400	34313400
107	Inside top plate	34313300	34313300
108	Radiant shielding, top	71314000	71314000
109	Distance tube	54345500	54345500
110	Distance tube	54345500	54345500
111	Fitting for reg.	71346500	71346500
112	Draught Control	71346300	71346300
113	Air inlet arm	71346400	71346400
114	Handle for air inlet arm	75180400	75180400
115	Knob for riddling grate	752620	752620
116	Cotter pin	74202000	74202000
117	Washer		
118	Screw		
119	Steel box nut		
120	Washer		
121	Stainless pressure spring		
122	Screw		
123	Screw		
124	Screw		
125	Screw		
126	Screw		
127	Airtightbox	71313800	71313800
128	Air Duct, back	443143xx	443143xx
129	Screw		
130	Fitting without thread	44256800	44256800
131	Air Tight Adapter	71360600	71360600
144	Washer		
146	Fitting without thread f. cover	44256800	44256800
147	Handle for riddling grate	442620xx	442620xx
148	Screw		
149	Locking ring		
150	Black steel set screw		
151	Leg		443407xx

Morsø Jernstøberi A/S - 24.10.2006 - 72311600

Section 4

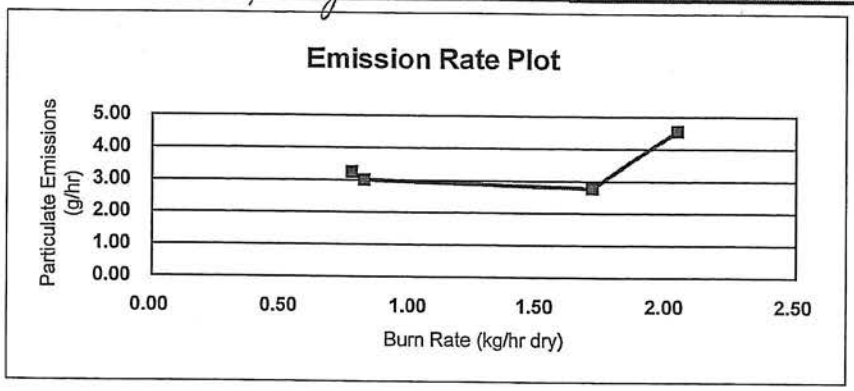
Test Data by Run

EPA Weighted Average Emissions
EPA Method 28

Client: Morso Jernstoberi A/
Stove Model: 3142
Test Dates: 12/18/06 - 12/20/06
Project Number: 192-S-10-3
Tracking Number: 921
Signature/Date: M. J. Morgan 1-05-07

Status: FINAL
Stove Type: Non-Catalytic Stove

Weighted Average (g/hr)
3.1



Run #	2	
Burn Rate (dry kg/hr)	0.77	
Catagory	1	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.24	
Cap (g/hr)	15	
Weighting Factor	0.234	13.59%
Heat Output (BTU/hr)	9304	

Run #	1	
Burn Rate (dry kg/hr)	0.82	
Catagory	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.01	
Cap (g/hr)	15	
Weighting Factor	0.644	37.48%
Heat Output (BTU/hr)	9908	

Run #	4	
Burn Rate (dry kg/hr)	1.71	
Catagory	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	2.78	
Cap (g/hr)	18	
Weighting Factor	0.685	39.83%
Heat Output (BTU/hr)	20663	

Run #	3	
Burn Rate (dry kg/hr)	2.04	
Catagory	4	
Overall Efficiency (%)	63%	
Emissions (g/hr)	4.55	
Cap (g/hr)	18	
Weighting Factor	0.157	9.11%
Heat Output (BTU/hr)	24650	

Run 1

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run:	1
Manufacturer:	Morso
Model:	3142
Tracking No.:	921
Project No.:	192-S-10-3
Test Date:	18-Dec-06
Beginning Clock Time:	15:07
Recording Interval:	10 min.
Total Sampling Time:	150 min.

OMNI Equipment Numbers:

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.034	0.034	0.042	0.038	0.032	0.036	0.034	0.034	"H2O
Initial Temp.	93	93	93	93	93	93	93	93	oF

PM Control Module:	21	
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	percent
Dilution Tunnel Static:	-0.520	"H2O
Pitot Tube Cp:	0.99	
Meter Box Y Factor:	1.001	

Barometric Pressure:	Begin	Middle	End	Average
	30.27	30.25	30.24	30.25 "Hg

Signature/Date: M.J. Morse 1-29-07

Tunnel Velocity:	12.72	ft/sec.
Intial Tunnel Flow:	138.8	scfm
Average Tunnel Flow:	139.4	scfm
Tunnel Area:	0.196	ft2
Post-Test Leak Check:	.008 @ 3	cfm@"Hg
Fuel Moisture (dry basis):	19.44	%
Total Particulate:	16.5	mg
Filter Holder No.:		

Elapsed Time	Particulate Sampling Data								Fuel Weight, lb		Wood Heater Temperature Data, oF											Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H2O	Catalyst Temp.
0	967.200		0.00	68	0	93	0.036		5.4		468	320	202	372	362		344.8	277	70	60	66	-0.053	
10	972.315	0.51	0.75	76	1	99	0.036	103	4.5	-0.9	437	313	191	351	344		327.2	306	71	47	67	-0.060	
20	977.425	0.51	0.75	84	1	96	0.036	102	3.6	-0.9	444	302	185	325	319		315.0	332	71	43	67	-0.063	
30	982.550	0.51	0.75	90	1	96	0.036	101	2.6	-1	539	288	180	322	312		328.2	366	72	41	67	-0.065	
40	987.690	0.51	0.75	93	1	98	0.036	101	1.6	-1	636	275	182	341	331		353.0	388	77	41	68	-0.068	
50	992.865	0.52	0.75	95	1	96	0.036	101	1.0	-0.6	656	270	189	366	357		367.6	343	73	41	68	-0.063	
60	998.070	0.52	0.75	97	1	93	0.036	101	0.8	-0.2	570	269	196	375	369		355.8	294	73	41	67	-0.055	
70	1003.270	0.52	0.75	98	1	89	0.036	100	0.7	-0.1	481	270	200	365	364		336.0	265	72	41	67	-0.050	
80	1008.450	0.52	0.75	99	1	86	0.036	99	0.5	-0.2	418	265	200	350	350		316.6	240	71	41	65	-0.048	
90	1013.675	0.52	0.75	99	1	84	0.036	100	0.4	-0.1	389	261	198	342	339		305.8	229	70	41	66	-0.045	
100	1018.890	0.52	0.75	99	1	83	0.036	100	0.4	0	370	256	196	335	331		297.6	221	69	41	67	-0.043	
110	1024.120	0.52	0.75	99	1	82	0.036	100	0.3	-0.1	352	249	192	323	320		287.2	214	68	41	67	-0.043	
120	1029.360	0.52	0.75	97	1	83	0.036	100	0.2	-0.1	327	232	183	308	305		271.0	204	68	41	67	-0.040	
130	1034.580	0.52	0.75	98	1	83	0.036	100	0.2	0	315	227	180	301	300		264.6	199	68	41	66	-0.038	
140	1039.805	0.52	0.75	98	1	82	0.036	100	0.1	-0.1	304	222	176	287	292		256.2	192	67	41	67	-0.038	
150	1045.027	0.52	0.75	99	1	83	0.036	100	0.0	-0.1	290	215	173	274	282		246.8	184	68	42	67	-0.038	
Avg/Total	77.827	0.52	0.70	93.06		89.13	0.036	100.44									98		70.50	42.75		-0.051	#DIV/0!

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 3142
Project No.: 921
Tracking No.: 192-S-10-3
Run: 1
Test Date: 12/18/06

Burn Rate	0.82	kg/hr dry
Particulate Concentration (dry-standard)	0.00022	grams/dscf
Particulate Emission Rate	1.83	grams/hour
Adjusted Emissions	3.01	grams/hour
Average Tunnel Temperature	89	degrees Fahrenheit
Average Delta p	0.036	inches H20
Total Sample Volume - Vm	77.83	cubic feet
Average Gas Meter Temperature	93	degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	12.72	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8366.89	dscf/hour
Total Sample Volume (Standard Conditions) - Vms	75.33	dscf
Total Particulates - mn	16.5	mg
Average Delta H	0.70	inches H20
Total Time of Test	150	minutes

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S
Model: 3142
Project No.: 192-S-10-3
Tracking No.: 921
Equipment Numbers:
Run #: 1
Date: 12/18/06

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N236	600.5	585.7		14.8
B. Rear filter catch	Filter	N235	586.1	586.2		-0.1
C. Rinse of probe and filter assembly	Acetone	100	116944.3	116942.3	0.0024	1.8

Total Particulate, mg :	16.5

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: [signature] Date: 1-05-07

Wood Heater Test Data - EPA Method 5G Preburn

Run: 1

Manufacturer: Morso
Model: 3112
Tracking No.: 921
Project No.: 192-S-10-3
Preburn Date: 12/18/2006

Recording Interval: 10 min.

Coal Bed Range: 1.1 - 1.3
Actual Coal Bed: 1.3

Signature/Date: M.J. Morgan 3-14-07

OMNI Equipment Numbers: 0
0
0

Elapsed Time	Fuel Weight, lb		Wood Heater Temperature Data, oF									Stack	
	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Ambient	Draft In. H2O	Catalyst Temp.
0	6.6		529	529	179	385	381	0	382.2	570	66	-0.078	NA
10	5.7	-0.9	454	386	199	366	373	0	355.6	370	67	-0.060	NA
20	5	-0.7	436	367	196	342	346	0	337.4	315	66	-0.060	NA
30	4.1	-0.9	474	343	189	333	327	0	333.2	329	65	-0.063	NA
40	3.2	-0.9	549	321	184	342	331	0	345.4	358	67	-0.065	NA
50	2.4	-0.8	599	303	185	369	356	0	362.4	334	67	-0.060	NA
60	1.9	-0.5	592	301	188	376	365	0	364.4	330	66	-0.060	NA
70	1.5	-0.4	572	305	193	378	373	0	364.2	305	66	-0.058	NA
80	1.3	-0.2	505	316	198	375	370	0	352.8	272	67	-0.053	NA
Avg/Total										0			

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OMNI-Test Laboratories, I
Beaverton, OR

FUEL DATA

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-18-06 Test Crew: K. Morgan Run #: 1
OMNI Equipment ID #:
FUEL LOAD PREPARED BY: K. Morgan
FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE CONTENT (METER – – DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12.0
Cal Value (2) = 22% Actual Reading 22.0

Piece	Length	Readings			Type
1	8 ft	21.6	23.8	23.4	2x4
2	ft				
3	ft				

Length of cut pieces: 7@11 inches Pre-Burn Fuel Average Moisture: 22.93 %

Time (clock): 12:30 Room Temperature (F): 64 Initials: LC

TEST FUEL

FUEL TYPE AND AMOUNT: 2 × 4 3 4 × 4 0
CALCULATED LOAD WEIGHT: 5.95 ACTUAL LOAD WEIGHT: 5.4 (2 × 4)
0 (4 × 4)
5.4 Total

FUEL PIECE LENGTH: 12.0"

MOISTURE CONTENT (METER – – DRY BASIS)

PIECE	READINGS			TYPE
1	19.8	20.1	18.8	2x4
2	19.3	19.5	18.9	2x4
3	19.8	19.9	18.9	2x4
4				
5				
6				
7				
8				
9				
10				

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 19.44%

Time (clock): 13:00 Room Temperature (F): 64 Initials: LC

Technician signature: K. Morgan Date: 12-18-06

OMNI-Test Laboratori Inc.
Beaverton, OR

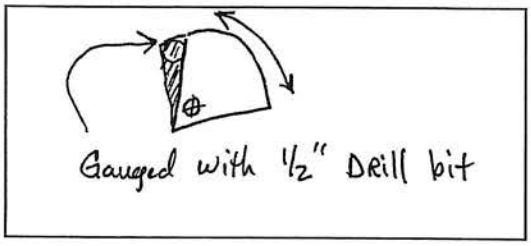
Run Notes

Client/Model: Morso Jernstoberi A/S
Model: ~~3412~~ 3142 CT
Project #: 192-S-10-3
Tracking Number: 921
Run #: 1 Date: 12-18-06
Test Crew: K. Morgan
OMNI Equipment ID Numbers:

PREBURN

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

PRIMARY:



SECONDARY: FIXED

TERTIARY: NONE

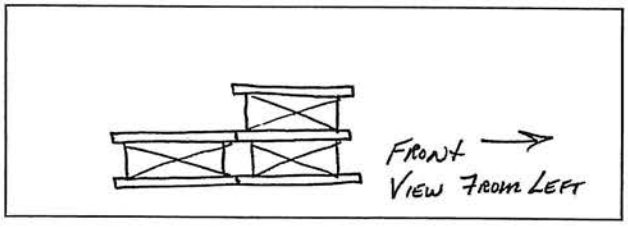
FAN: NONE - N/A

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					
80					X	Level bed

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 45 sec.
DOOR: AJAR until 3.0 min
PRIMARY AIR: Fully open until 4:45 min - Slowly adjusted to test setting from 4:45 - 5:0 min.
OTHER: NONE

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

SAME AS ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: NONE - N/A

Technician signature: K. J. Morgan Date: 12-18-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 3142

Project No.: 192-S-10-3 Tracking No.: 921

Date: 12-18-06 Run No.: 1 Booth: 1

Test Crew: K. Morgan Start Time: ~~16:07~~ 15:07 (12) Stop Time: ~~18:37~~ 17:37 (12)

OMNI Equipment #'s:

Gas Analyzer Train Leak Check:

Stack: Initial: ____ Final: N/A

Dilution Tunnel (Method 5G Only): Initial: ____ Final: N/A

Calibrations: Span Gas CO_2: N/A O_2: N/A CO: N/A CO_2(DT): N/A

Time	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
O_2			N/A				
CO_2							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6.0

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

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

Induced Draft: Ø %Smoke Capture: 100

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

Flue Pipe Cleaned Prior to First Test in Series: Date: 12-15-06 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	30.27	30.25	30.24
Room Temp (°F)	66	67	67

Technician signature: K. Morgan Date: 12-18-06

Run 2

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run:	**2**
Manufacturer:	Morso
Model:	3142
Tracking No.:	921
Project No.:	192-S-10-3
Test Date:	19-Dec-06
Beginning Clock Time:	10:30
Recording Interval:	10 min.
Total Sampling Time:	160 min.

OMNI Equipment Numbers:

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.040	0.042	0.038	0.028	0.038	0.038	0.042	0.042	"H2O
Initial Temp.	94	94	94	94	94	94	94	94	oF

PM Control Module:	21	
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.56	lb/lb-mole
Dilution Tunnel H2O:	4.00	percent
Dilution Tunnel Static:	-0.500	"H2O
Pitot Tube Cp:	0.99	
Meter Box Y Factor:	1.001	

Barometric Pressure:	Begin	Middle	End	Average	
	30.18	30.16	30.12	30.15	"Hg

Signature/Date: M.J. Morgan 1-29-07

Tunnel Velocity:	13.30	ft/sec.
Intial Tunnel Flow:	144.1	scfm
Average Tunnel Flow:	144.7	scfm
Tunnel Area:	0.196	ft2
Post-Test Leak Check:	.012 @ 3	cfm@"Hg
Fuel Moisture (dry basis):	20.83	%
Total Particulate:	18.5	mg
Filter Holder No.:		

Elapsed Time	Particulate Sampling Data								Fuel Weight, lb		Wood Heater Temperature Data, oF											Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H2O	Catalyst Temp.
0	45.400		0.00	69	0	94	0.039		5.5		502	328	204	382	381		359.4	308	70	62	67	-0.055	
10	50.530	0.51	0.75	80	1	97	0.039	103	4.5	-1	469	326	196	357	357		341.0	311	72	46	67	-0.060	
20	55.660	0.51	0.75	86	1	97	0.039	102	3.6	-0.9	481	318	192	343	339		334.6	351	73	43	68	-0.065	
30	60.815	0.52	0.75	92	1	100	0.039	101	2.5	-1.1	600	303	188	344	334		353.8	386	75	41	67	-0.068	
40	66.000	0.52	0.75	96	1	100	0.039	101	1.6	-0.9	684	292	190	370	354		378.0	370	76	41	68	-0.065	
50	71.180	0.52	0.75	98	1	98	0.039	100	1.2	-0.4	648	289	196	383	368		376.8	333	76	41	69	-0.063	
60	76.440	0.53	0.75	100	1	94	0.039	101	0.9	-0.3	581	288	204	388	378		367.8	302	76	41	68	-0.058	
70	81.650	0.52	0.75	101	1	93	0.039	100	0.8	-0.1	518	288	207	383	375		354.2	278	75	41	68	-0.053	
80	86.875	0.52	0.75	102	1	90	0.039	100	0.7	-0.1	453	287	204	365	360		333.8	251	75	42	68	-0.050	
90	92.115	0.52	0.75	102	1	89	0.039	100	0.6	-0.1	406	283	197	346	341		314.6	234	74	42	67	-0.048	
100	97.355	0.52	0.75	103	1	88	0.039	100	0.5	-0.1	383	280	192	334	330		303.8	223	74	42	67	-0.045	
110	102.650	0.53	0.75	103	1	87	0.039	101	0.4	-0.1	348	276	185	316	316		288.2	211	74	43	69	-0.043	
120	107.880	0.52	0.75	103	1	87	0.039	99	0.3	-0.1	331	273	180	307	307		279.6	201	74	43	69	-0.040	
130	113.150	0.53	0.75	104	1	86	0.039	100	0.2	-0.1	313	268	175	297	297		270.0	193	74	44	69	-0.040	
140	118.415	0.53	0.75	104	1	86	0.039	100	0.2	0	297	261	172	287	287		260.8	184	74	44	69	-0.038	
150	123.690	0.53	0.75	105	1	85	0.039	100	0.1	-0.1	284	252	169	276	279		252.0	179	73	44	69	-0.038	
160	128.961	0.53	0.75	105	1	85	0.039	100	0.0	-0.1	272	242	167	266	271		243.6	173	73	45	69	-0.035	
Avg/Total	83.561	0.52	0.71	97.24		91.53	0.039	100.44									116		74.00	43.82		-0.051	#DIV/0!

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 3142
Project No.: 921
Tracking No.: 192-S-10-3
Run: 2
Test Date: 12/19/06

Burn Rate	0.77 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00023 grams/dscf 2.01 grams/hour 3.24 grams/hour
Average Tunnel Temperature	92 degrees Fahrenheit
Average Delta p	0.039 inches H20
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	83.56 cubic feet 97 degrees Fahrenheit 13.30 feet/second 8680.05 dscf/hour 80.01 dscf
Total Particulates - mn Average Delta H Total Time of Test	18.5 mg 0.71 inches H20 160 minutes

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S
Model: 3142
Project No.: 192-S-10-3
Tracking No.: 921

Equipment Numbers:

Run #: 2
Date: 12/19/06

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N238	586.0	571.4		14.6
B. Rear filter catch	Filter	N237	581.9	581.4		0.5
C. Rinse of probe and filter assembly	Acetone	100	93811.3	93807.7	0.0024	3.4

Total Particulate, mg :	18.5

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: K. J. Morgan Date: 1-05-07

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G Preburn

Run: 2

Manufacturer: Morso
Model: 3112
Tracking No.: 921
Project No.: 192-S-10-3
Preburn Date: 12/19/06

Recording Interval: 10 min.

Coal Bed Range: 1.1 - 1.3
Actual Coal Bed: 1.3

Signature/Date: K.J. Morgan 3-19-07

OMNI Equipment Numbers: 0
0
0

Elapsed Time	Fuel Weight, lb		Wood Heater Temperature Data, oF								Stack	
	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Ambient	Draft In. H2O	Catalyst Temp.
0	6.4		529	529	138	292	286	0	290.2	519	67	-0.078	NA
10	5.4	-1	476	278	156	325	318	0	310.6	322	66	-0.060	NA
20	4.5	-0.9	450	280	165	312	315	0	304.4	327	66	-0.063	NA
30	3.5	-1	552	280	170	320	337	0	331.8	355	68	-0.065	NA
40	2.6	-0.9	602	282	174	338	355	0	350.2	356	67	-0.063	NA
50	1.9	-0.7	613	291	183	362	376	0	365.0	333	67	-0.063	NA
60	1.5	-0.4	583	307	192	377	384	0	368.6	314	67	-0.060	NA
70	1.3	-0.2	537	322	199	383	384	0	365.0	285	67	-0.055	NA
Avg/Total													

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OMNI-Test Laboratories, I
Beaverton, OR

FUEL DATA

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-19-06 Test Crew: K. MorgAN Run #: 2
OMNI Equipment ID #:
FUEL LOAD PREPARED BY: K. Morgan
FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE CONTENT (METER – – DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12.0
Cal Value (2) = 22% Actual Reading 22.0

Piece	Length	Readings			Type
1	8 ft	23.6	24.1	23.1	2x4
2	ft				
3	ft				

Length of cut pieces: 7@11 inches Pre-Burn Fuel Average Moisture: 23.6 %

Time (clock): 09:60 Room Temperature (F): 65 Initials: JL

TEST FUEL

FUEL TYPE AND AMOUNT: 2 × 4 3 4 × 4 0
CALCULATED LOAD WEIGHT: 5.95 ACTUAL LOAD WEIGHT: 5.5 (2 × 4)
0 (4 × 4)
5.5 Total

FUEL PIECE LENGTH: 12.0"

MOISTURE CONTENT (METER – – DRY BASIS)

PIECE	READINGS			TYPE
1	22.4	19.0	18.7	2x4
2	19.5	20.9	20.2	2x4
3	23.0	22.6	21.2	2x4
4				
5				
6				
7				
8				
9				
10				

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 20.83

Time (clock): 09:00 Room Temperature (F): 65 Initials: JL

Technician signature: JL J. Morgan Date: 12-19-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Run Notes

Client/Model: Morso Jernstoberi A/S
Model: ~~3412~~ 3142 CT
Project #: 192-S-10-3
Tracking Number: 921
Run #: 2 Date: 12-19-06
Test Crew: K. Morgan
OMNI Equipment ID Numbers:

PREBURN

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

PRIMARY:

open (Gauged) 1/2"

SECONDARY: FIXED

TERTIARY: NONE

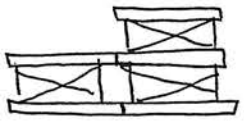
FAN: NONE

PREBURN SETTINGS AND ACTIVITIES

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

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES
BYPASS: N/A
FUEL LOADING Loaded by 60 seconds
DOOR: ASAR until 2.25 minutes
PRIMARY AIR: Fully open until 5.0 min.
OTHER: NONE

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

SAME AS ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: NONE

Technician signature: K. J. Morgan Date: 12-19-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 3142

Project No.: 192-S-10-3 Tracking No.: 921

Date: 12-19-06 Run No.: 2 Booth: 1

Test Crew: K. Morgan Start Time: 10:30 Stop Time: 13:10

OMNI Equipment #'s:

Gas Analyzer Train Leak Check:

Stack: Dilution Tunnel (Method 5G Only):

Initial: Initial:

Final: N/A Final: N/A

Calibrations: Span Gas CO_2: N/A O_2: N/A CO: N/A CO_2(DT): N/A

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time							
O_2							
CO_2			N/A				
CO							
CO_2 (DT)							

Stack Diameter (inches): 6.0

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

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

Induced Draft: Ø %Smoke Capture: 100

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

Flue Pipe Cleaned Prior to First Test in Series: Date: 12-15-06 Initials: IC

	Initial	Middle	Ending
Pb (in. Hg)	30.18	30.16	30.12
Room Temp (°F)	67	68	69

Technician signature: K. J. Morgan Date: 12-19-06

Run 3

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run: 3

Manufacturer:	Morso	
Model:	3142	
Tracking No.:	921	
Project No.:	192-S-10-3	
Test Date:	19-Dec-06	
Beginning Clock Time:	16:30	
Recording Interval:	10	min.
Total Sampling Time:	60	min.

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.044	0.048	0.044	0.044	0.042	0.042	0.050	0.050	"H2O
Initial Temp.	125	125	125	125	125	125	125	125	oF

OMNI Equipment Numbers:

PM Control Module:	21				
Dilution Tunnel MW(dry):	29.00	lb/lb-mole			
Dilution Tunnel MW(wet):	28.56	lb/lb-mole			
Dilution Tunnel H2O:	4.00	percent			
Dilution Tunnel Static:	-0.580	"H2O			
Pitot Tube Cp:	0.99				
Meter Box Y Factor:	1.001				
Barometric Pressure:	Begin	Middle	End	Average	
	30.07	30.07	30.07	30.07	"Hg

Signature/Date: K.J. Morga 1-29-07

Tunnel Velocity:	14.91	ft/sec.
Intial Tunnel Flow:	152.4	scfm
Average Tunnel Flow:	152.4	scfm
Tunnel Area:	0.196	ft2
Post-Test Leak Check:	.006 @ 3	cfm@"Hg
Fuel Moisture (dry basis):	22.39	%
Total Particulate:	9.9	mg
Filter Holder No.:		

Elapsed Time	Particulate Sampling Data								Fuel Weight, lb		Wood Heater Temperature Data, oF											Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H2O	Catalyst Temp.
0	129.500		0.00	74	0	125	0.046		5.5		584	422	206	454	442		421.6	440	77	65	74	-0.077	
10	134.670	0.52	0.75	85	1	133	0.046	102	3.7	-1.8	651	406	196	426	419		419.6	609	81	46	72	-0.093	
20	139.850	0.52	0.75	92	1	135	0.046	101	2.1	-1.6	743	386	194	423	422		433.6	629	83	44	74	-0.095	
30	145.050	0.52	0.75	98	1	131	0.046	100	1.0	-1.1	795	369	203	442	443		450.4	580	85	43	74	-0.093	
40	150.275	0.52	0.75	101	1	123	0.046	100	0.5	-0.5	700	364	211	451	453		435.8	517	84	42	73	-0.088	
50	155.515	0.52	0.75	103	1	118	0.046	99	0.2	-0.3	598	370	207	445	452		414.4	458	83	42	72	-0.080	
60	160.770	0.53	0.75	104	1	112	0.046	99	0.0	-0.2	517	380	196	428	423		388.8	411	82	42	71	-0.075	
Avg/Total	31.270	0.52	0.64	93.86		125.29	0.046	100.18									33		82.14	46.29		-0.086	#DIV/0!

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 3142
Project No.: 921
Tracking No.: 192-S-10-3
Run: 3
Test Date: 12/19/06

Burn Rate	2.04	kg/hr dry
Particulate Concentration (dry-standard)	0.00033	grams/dscf
Particulate Emission Rate	3.01	grams/hour
Adjusted Emissions	4.55	grams/hour
Average Tunnel Temperature	125	degrees Fahrenheit
Average Delta p	0.046	inches H20
Total Sample Volume - Vm	31.27	cubic feet
Average Gas Meter Temperature	94	degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	14.91	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9146.48	dscf/hour
Total Sample Volume (Standard Conditions) - Vmst	30.04	dscf
Total Particulates - mn	9.9	mg
Average Delta H	0.64	inches H20
Total Time of Test	60	minutes

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S
Model: 3142
Project No.: 192-S-10-3
Tracking No.: 921
Equipment Numbers:
Run #: 3
Date: 12/19/06

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N240	584.5	577.7		6.8
B. Rear filter catch	Filter	N239	578.4	578.8		-0.4
C. Rinse of probe and filter assembly	Acetone	75	112974.3	112970.6	0.0024	3.5

Total Particulate, mg :	9.9

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: L. J. Morg Date: 1-05-07

Wood Heater Test Data - EPA Method 5G Preburn

Run: 3

Manufacturer: Morso
Model: 3112
Tracking No.: 921
Project No.: 192-S-10-3
Preburn Date: 12/19/06

Recording Interval: 10 min.

Coal Bed Range: 1.1 - 1.3
Actual Coal Bed: 1.3

Signature/Date: 5-19-07

OMNI Equipment Numbers: 2.8 Pounds of fuel added at 40 minutes
0
0

Elapsed Time	Fuel Weight, lb		Wood Heater Temperature Data, oF									Stack	
	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Ambient	Draft In. H2O	Catalyst Temp.
0	9.9		529	529	149	313	316	0	306.4	362	71	-0.063	NA
10	8.7	-1.2	456	278	158	330	334	0	311.2	554	72	-0.088	NA
20	5.9	-2.8	670	304	158	356	369	0	371.4	688	73	-0.098	NA
30	3.9	-2	761	334	174	423	424	0	423.2	649	72	-0.095	NA
40	2.2	-1.7	841	364	191	461	460	0	463.4	672	73	-0.095	NA
50	3.8	1.6	832	403	209	479	476	0	479.8	618	72	-0.093	NA
60	2.7	-1.1	728	410	212	458	546	0	470.8	547	72	-0.088	NA
70	1.9	-0.8	663	411	208	451	453	0	437.2	516	73	-0.085	NA
80	1.3	-0.6	603	420	204	454	444	0	425.0	469	72	-0.080	NA
Avg/Total													

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FUEL DATA

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-19-06 Test Crew: K. Morgan Run #: 3
OMNI Equipment ID #:
FUEL LOAD PREPARED BY: K. Morgan
FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE CONTENT (METER -- DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12.0
Cal Value (2) = 22% Actual Reading 22.0

Piece	Length	Readings			Type
1	8 ft	23.4	24.6	23.8	2x4
2	ft				
3	ft				

Length of cut pieces: 8@11 inches Pre-Burn Fuel Average Moisture: 23.93 %

Time (clock): 13:00 Room Temperature (F): 68 Initials: JK

TEST FUEL

FUEL TYPE AND AMOUNT: 2 × 4 3. 4 × 4 0 JK
CALCULATED LOAD WEIGHT: 5.95 ACTUAL LOAD WEIGHT: 5.5 (2 × 4)
0 (4 × 4)
FUEL PIECE LENGTH: 12.0" 5.5 Total

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE	READINGS			TYPE
1	24.5	23.1	20.2	2x4
2	21.5	20.8	19.7	2x4
3	23.4	24.9	23.4	2x4
4				
5				
6				
7				
8				
9				
10				

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 22.39 %

Time (clock): 16:00 Room Temperature (F): 69 Initials: JK

Technician signature: JK J. Morgan Date: 12-19-06

OMNI-Test Laboratori Inc.
Beaverton, OR

Run Notes

Client/Model: Morso Jernstoberi A/S
Model: ~~3412~~ 3142 CT
Project #: 192-S-10-3
Tracking Number: 921
Run #: 3 Date: 12-19-06
Test Crew: K. Morgan
OMNI Equipment ID Numbers:

PREBURN

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

PRIMARY:

Full open

SECONDARY: Fixed

TERTIARY: None

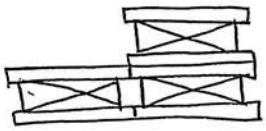
FAN: None

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0	Test setting					
40					X	RAKED
40			2.8			3-11" PC's
80					X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 32 sec.
DOOR: Closed at 43 sec.
PRIMARY AIR: Full open DURATION OF test (HIGH-BURN)
OTHER: None

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

Full Open

SECONDARY: Fixed

TERTIARY: None

FAN: None

Technician signature: K. T. Morgan Date: 12-19-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 3142

Project No.: 192-S-10-3 Tracking No.: 921

Date: 12-19-06 Run No.: 3 Booth: 1

Test Crew: K. Morgan Start Time: 16:30 Stop Time: 17:30

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Initial: _____

Final: N/A

Dilution Tunnel (Method 5G Only):

Initial: _____

Final: N/A

Calibrations: Span Gas CO_2: N/A O_2: N/A CO: N/A CO_2(DT): N/A

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time							
O_2							
CO_2			N/A				
CO							
CO_2 (DT)							

Stack Diameter (inches): 6.0

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

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

Induced Draft: Ø %Smoke Capture: 100

Pitot Tube Leak Test: Pre: Ø @ 3.0" w.c. Post: Ø @ 3.2" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 12-15-06 Initials: JL

	Initial	Middle	Ending
Pb (in. Hg)	30.07	30.07	30.07
Room Temp (°F)	74	74	71

Technician signature: K. Morgan Date: 12-19-06

Run 4

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run: 4

Manufacturer:	Morso
Model:	3142
Tracking No.:	921
Project No.:	192-S-10-3
Test Date:	20-Dec-06
Beginning Clock Time:	10:38
Recording Interval:	10 min.
Total Sampling Time:	70 min.

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.036	0.038	0.038	0.034	0.040	0.040	0.036	0.036	"H2O
Initial Temp.	116	116	115	115	115	115	114	114	oF

OMNI Equipment Numbers:

PM Control Module:	21				
Dilution Tunnel MW(dry):	29.00	lb/lb-mole			
Dilution Tunnel MW(wet):	28.56	lb/lb-mole			
Dilution Tunnel H2O:	4.00	percent			
Dilution Tunnel Static:	-0.520	"H2O			
Pitot Tube Cp:	0.99				
Meter Box Y Factor:	1.001				
Barometric Pressure:	Begin	Middle	End	Average	
	30.05	30.02	30.01	30.03	"Hg

Signature/Date: M. Morgan 1-29-07

Tunnel Velocity:	13.34	ft/sec.
Intial Tunnel Flow:	139.0	scfm
Average Tunnel Flow:	139.5	scfm
Tunnel Area:	0.196	ft2
Post-Test Leak Check:	.01 @ 3	cfm@"Hg
Fuel Moisture (dry basis	22.73	%
Total Particulate:	7.0	mg
Filter Holder No.:		

Elapsed Time	Particulate Sampling Data								Fuel Weight, lb		Wood Heater Temperature Data, oF											Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter oF	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H2O	Catalyst Temp.
0	161.100		0.00	70	0	115	0.037		5.4		518	470	216	421	432		411.4	379	74	63	68	-0.070	
10	166.245	0.51	0.75	77	1	115	0.037	103	3.9	-1.5	527	453	207	398	410		399.0	506	74	48	68	-0.083	
20	171.390	0.51	0.75	87	1	118	0.037	101	2.4	-1.5	655	409	197	401	401		412.6	532	77	45	67	-0.085	
30	176.570	0.52	0.75	92	1	118	0.037	101	1.3	-1.1	705	381	197	420	415		423.6	520	78	44	68	-0.083	
40	181.760	0.52	0.75	96	1	113	0.037	100	0.7	-0.6	656	367	201	432	428		416.8	464	78	43	68	-0.078	
50	186.990	0.52	0.75	98	1	109	0.037	100	0.4	-0.3	582	364	203	427	426		400.4	419	78	43	68	-0.073	
60	192.225	0.52	0.75	100	1	103	0.037	99	0.2	-0.2	500	361	200	411	413		377.0	372	77	44	67	-0.068	
70	197.477	0.53	0.75	101	1	100	0.037	99	0.0	-0.2	438	360	192	388	391		353.8	339	76	44	67	-0.063	
Avg/Total	36.377	0.52	0.66	90.13		111.38	0.037	100.21									58		76.50	46.75		-0.075	#DIV/0!

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer:	Morso
Model:	3142
Project No.:	921
Tracking No.:	192-S-10-3
Run:	4
Test Date:	12/20/06

Burn Rate	1.71	kg/hr dry
Particulate Concentration (dry-standard)	0.00020	grams/dscf
Particulate Emission Rate	1.67	grams/hour
Adjusted Emissions	2.78	grams/hour
Average Tunnel Temperature	111	degrees Fahrenheit
Average Delta p	0.037	inches H20
Total Sample Volume - Vm	36.38	cubic feet
Average Gas Meter Temperature	90	degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	13.34	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8370.53	dscf/hour
Total Sample Volume (Standard Conditions) - Vms	35.13	dscf
Total Particulates - mn	7	mg
Average Delta H	0.66	inches H20
Total Time of Test	70	minutes

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S
Model: 3142
Project No.: 192-S-10-3
Tracking No.: 921
Equipment Numbers:
Run #: 4
Date: 12/20/06

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N242	582.4	577.2		5.2
B. Rear filter catch	Filter	N241	576.5	577.0		-0.5
C. Rinse of probe and filter assembly	Acetone	100	108682.1	108679.6	0.0024	2.3

Total Particulate, mg :	7.0

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: Ch J. Morgan Date: 1-05-07

Wood Heater Test Data - EPA Method 5G Preburn

Run: 4

Manufacturer: Morso
Model: 3112
Tracking No.: 921
Project No.: 192-S-10-3
Preburn Date: 12/20/06

Recording Interval: 10 min.

Coal Bed Range: 1.1 - 1.3
Actual Coal Bed: 1.3

Signature/Date: K. J. Mog 3-12-07

OMNI Equipment Numbers: 0
0
0

Elapsed Time	Fuel Weight, lb		Wood Heater Temperature Data, oF								Stack	
	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Ambient	Draft In. H2O	Catalyst Temp.
0	10.6		529	529	178	369	357	0	335.0	318	68	-0.058	NA
10	10.4	-0.2	342	332	176	334	324	0	301.6	243	68	-0.048	NA
20	9.8	-0.6	265	291	151	253	256	0	243.2	274	67	-0.053	NA
30	9.2	-0.6	277	280	142	239	247	0	237.0	319	67	-0.060	NA
40	8	-1.2	353	263	130	241	244	0	246.2	367	67	-0.065	NA
50	6.3	-1.7	501	254	124	265	263	0	281.4	534	67	-0.083	NA
60	4.4	-1.9	727	270	136	331	331	0	359.0	610	67	-0.090	NA
70	2.9	-1.5	795	317	161	396	396	0	413.0	575	67	-0.088	NA
80	2	-0.9	740	390	191	438	433	0	438.4	514	67	-0.083	NA
90	1.6	-0.4	622	448	210	442	444	0	433.2	431	66	-0.073	NA
100	1.3	-0.3	538	464	214	425	435	0	415.2	395	67	-0.070	NA
Avg/Total													

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OMNI-Test Laboratories, Inc.
Beaverton, OR

FUEL DATA

Client: Morso Jernstoberi A/S
Model: 3142
Project #: 192-S-10-3 Tracking #: 921
Date: 12-20-06 Test Crew: K. Morgan Run #: 4
OMNI Equipment ID #:
FUEL LOAD PREPARED BY: K. Morgan
FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE CONTENT (METER – – DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12.0
Cal Value (2) = 22% Actual Reading 22.0

Piece	Length	Readings			Type
1	8 ft	23.6	24.8	23.8	2x4
2	ft				
3	ft				

Length of cut pieces: 8@11 2@6 inches Pre-Burn Fuel Average Moisture: 24.07 %

Time (clock): 08:30 Room Temperature (F): 69 Initials: IL

TEST FUEL

FUEL TYPE AND AMOUNT: 2 × 4 3 4 × 4 0
CALCULATED LOAD WEIGHT: 5.95 ACTUAL LOAD WEIGHT: 5.4 (2 × 4)
0 (4 × 4)
5.4 Total

FUEL PIECE LENGTH: 12.0 "

MOISTURE CONTENT (METER – – DRY BASIS)

PIECE	READINGS			TYPE
1	20.4	24.8	22.7	2x4
2	24.8	22.1	22.6	2x4
3	21.3	24.5	21.4	2x4
4				
5				
6				
7				
8				
9				
10				

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 22.73%

Time (clock): 08:40 Room Temperature (F): 69 Initials: IL

Technician signature: IL K. Morgan Date: 12-20-06

OMNI-Test Laboratori(Inc.
Beaverton, OR

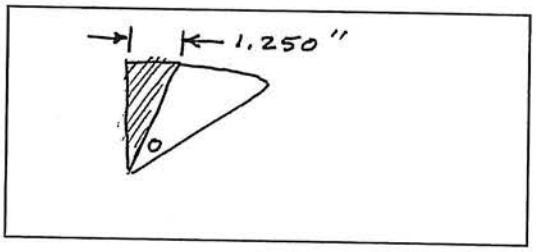
Run Notes

Client/Model: Morso Jernstoberi A/S
Model: ~~3412~~ 3142 CS
Project #: 192-S-10-3
Tracking Number: 921
Run #: 4 Date: 12-20-06
Test Crew: K. Morgan
OMNI Equipment ID Numbers:

PREBURN

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: None

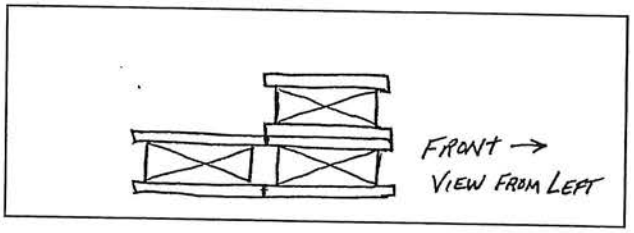
FAN: None

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0	Test Setting					
10	Door Ajar for 2 minutes					Hesitant start!
100					X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 30 sec.
DOOR: Closed at 45 sec.
PRIMARY AIR: Fully OPEN 3.0 min
Test Setting at 3.0 min.
OTHER:

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

Same As Above

SECONDARY: Fixed

TERTIARY: None

FAN: None

Technician signature: K. J. Morgan Date: 12-20-06

OMNI-Test Laboratories, Inc.
Beaverton, OR

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 3142

Project No.: 192-S-10-3 Tracking No.: 921

Date: 12-20-06 Run No.: 4 Booth: 1

Test Crew: K. Morgan Start Time: 10:38 Stop Time: 11:48

OMNI Equipment #'s:

Gas Analyzer Train Leak Check:

Stack:

Initial: /

Final: N/A

Dilution Tunnel (Method 5G Only):

Initial: /

Final: N/A

Calibrations: Span Gas CO_2: N/A ~~O_2:~~ ~~CO:~~ ~~CO_2(DT):~~

Time	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
O_2							
CO_2			N/A				
CO							
CO_2 (DT)							

Stack Diameter (inches): 6.0

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

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

Induced Draft: Ø %Smoke Capture: 100

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

Flue Pipe Cleaned Prior to First Test in Series: Date: 12-15-06 Initials: JL

	Initial	Middle	Ending
Pb (in. Hg)	30.05	30.02	30.01
Room Temp (°F)	68	68	67

Technician signature: K. J. Morgan Date: 12-20-06

Section 5

Sampling Procedures and Test Results

INTRODUCTION

Morsø Jernstøberi A/S retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the 3112 wood stove. The 3112 is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of cast iron. The usable firebox volume was measured to be 0.9 cubic feet. The stove is vented through a 6-inch diameter flue collar located at the top of the unit.

The testing was performed at *OMNI*'s testing facility in Beaverton, Oregon. The altitude of the laboratory is 204 feet above sea level. The unit was received in good condition and logged in on December 11, 2006, then assigned and labeled with *OMNI* ID #921. *OMNI* representative Ken Morgan conducted the certification testing and completed all testing by December 20, 2006. The EPA was notified of the testing dates in a letter dated December 18, 2006. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Karsten Aagaard of Morsø Jernstøberi A/S and is on file at *OMNI*'s testing facility.

The 3112 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 included in the results indicate a particulate emission level of 3.1 grams per hour. Test runs were conducted in each of four burn rate categories (<0.80 kg/hr, 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 3112 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 on 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.
- "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.

Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	0.82	3.01
2	0.77	3.24
3	2.04	4.55
4	1.71	2.78
Weighted particulate emission average of four test runs: **3.1** grams per hour.		

Table 1.2 – Test Facility Conditions

Run	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	66	67	30.27	30.24	<50	<50
2	67	69	30.18	30.12	<50	<50
3	74	71	30.07	30.07	<50	<50
4	68	67	30.05	30.01	<50	<50

Table 1.3.1 – Fuel Measurement and Crib Description Summary – PRETEST

Run	Pretest Fuel Weight (Starting weight in lbs)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lbs)
1	6.6	22.9	1.3
2	6.4	23.6	1.3
3	9.9	23.9	1.3
4	10.6	24.1	1.3

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lbs)	Firebox Volume (ft^3)	Fuel Loading Density Wet Basis (lbs/ft^3)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	5.4	0.9	6.00	19.4	12	3	0
2	5.5	0.9	6.11	20.8	12	3	0
3	5.5	0.9	6.11	22.4	12	3	0
4	5.4	0.9	6.00	22.7	12	3	0

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)	Temperature (°F)
1	150	12.72	139.4	89.1
2	160	13.30	144.7	91.5
3	60	14.91	152.4	125.3
4	70	13.34	139.5	111.4

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average[a]	Ending Surface Temperature Average[a]	Surface Delta T[b]
1	344.8	246.8	98
2	359.4	243.6	116
3	421.6	388.8	33
4	411.4	353.8	58
a. All temperatures are in degrees F.			
b. Represents the difference between beginning and ending average surface temperatures.			

Table 1.6 – Pretest Configuration

Run	Combustion Air (in)	Fuel Added	Fuel Removed	Time (min)
1	Open 0.5"	6.6 lbs at start; no addition; coal bed 1.3 lbs	N/A	80
2	Open 0.5"	6.4 lbs at start; no addition; coal bed 1.3 lbs	N/A	70
3	Fully Open	9.9 lbs at start; 2.8 lbs added; coal bed 1.3 lbs	N/A	80
4	Open 1.25"	10.6 lbs at start; no addition; coal bed 1.3 lbs	N/A	100

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (H_2O)	Primary Air Setting (in)	Run Time (min)	Average Draft (H_2O)
1	0.82	0	Open 0.5"	150	-0.051
2	0.77	0	Open 0.5"	160	-0.051
3	2.04	0	Fully Open	60	-0.086
4	1.71	0	Open 1.25"	70	-0.075

Table 1.8 – Test Configurations

Run	Five-Minute Startup	Combustion Air
1	Bypass: N/A. Fuel Loading: Loaded by 45 seconds. Door: Closed at 3 minutes. Primary Air: Fully open for 4 minutes 45 seconds; adjusted to test setting by 5 minutes. Other: None. Secondary: Fixed. Tertiary: None. Fan: None.	Open 0.5"
2	Bypass: N/A. Fuel Loading: Loaded by 60 seconds. Door: Closed at 2 minutes 25 seconds. Primary Air: Fully open for 5 minutes, then adjusted to test setting. Other: None. Secondary: Fixed. Tertiary: None. Fan: None.	Open 0.5"
3	Bypass: N/A. Fuel Loading: Loaded by 32 seconds. Door: Closed at 43 seconds. Primary Air: Fully open for duration of test (high burn). Other: None. Secondary: Fixed. Tertiary: None. Fan: None.	Fully Open
4	Bypass: N/A. Fuel Loading: Loaded by 30 seconds. Door: Closed at 45 seconds. Primary Air: Fully open for 3 minutes, then adjusted to test setting. Other: None. Secondary: Fixed. Tertiary: None. Fan: None.	Open 1.25"

TEST RESULTS AND DISCUSSION

A total of four test runs were performed on the 3112 wood stove. Four test runs were conducted in the following categories and included in the weighted average emission level results: one in the <0.80 kg/hr dry category; one 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 **3.1 g/hr**.

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.