Certification Test Report

Morso Jernstoberi A/S
Freestanding Wood Stove

Model: 7600 Series

Report Number: 192-S-18-3

OMNI-Test Laboratories, Inc.
Product Testing & Certification

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Certification Test Report

Morsø Jernstøberi A/S

Freestanding Wood Stove

Model: 7600 Series

Prepared for:	Morsø Jernstøberi A/S Furvej 6 7900 Nykøbing Mors Denmark
Prepared by:	OMNI-Test Laboratories, Inc. 13327 NE Airport Way Portland, OR 97230 (503) 643-3788
Test Period:	November 13, 2008 through November 17, 2008
Report Date:	December 2008
Report Number:	192-S-18-3

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AUTHORIZED SIGNATORIES

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

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OMNI-Test Laboratories, Inc.

Rebecca Searcy, Technical Services Director
OMNI-Test Laboratories, Inc.

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OMNI-Test Laboratories, Inc.

Section 1

Fuel Photographs/Appliance Description/Drawings

Model: 7600 Series
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Morsø Jernstøberi A/S

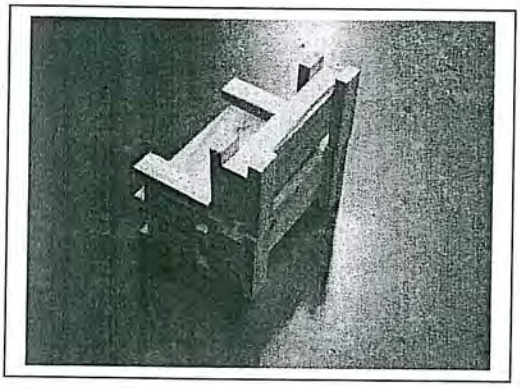
7600 Series

Test Dates: November 13, 2008 through November 17, 2008

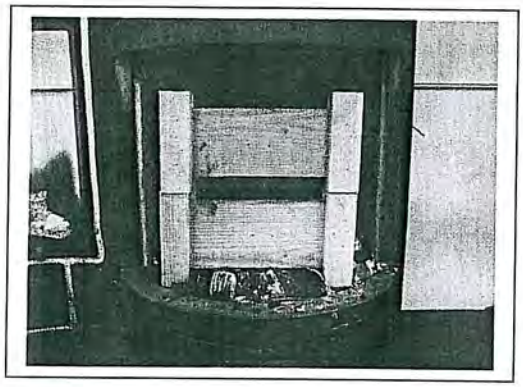
Model: 7600 Series
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Morsø Jernstøberi A/S
7600 Series

Run 1 – Fuel



Run 1 – Newly Loaded Stove



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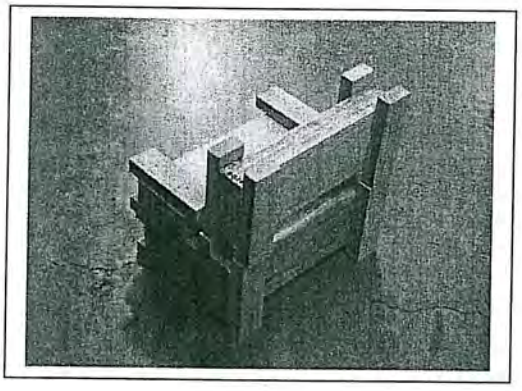
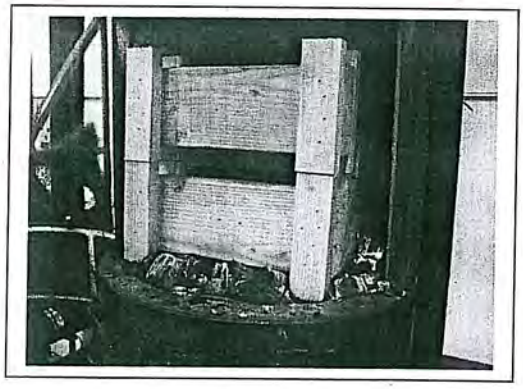


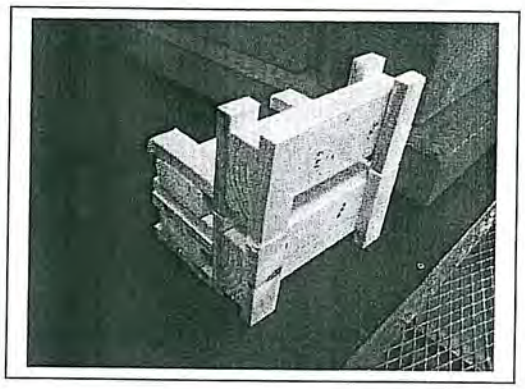
Run 2 – Newly Loaded Stove



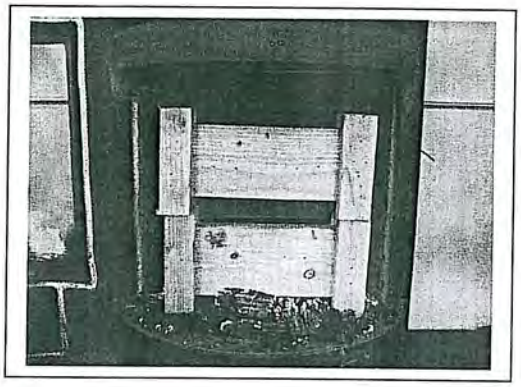
Model: 7600 Series
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Morsø Jernstøberi A/S
7600 Series

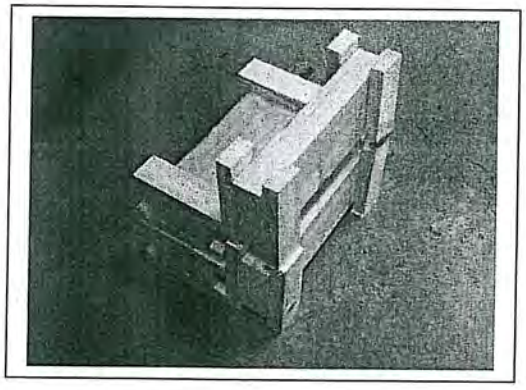
Run 3 – Fuel



Run 3 – Newly Loaded Stove



Run 4 – Fuel

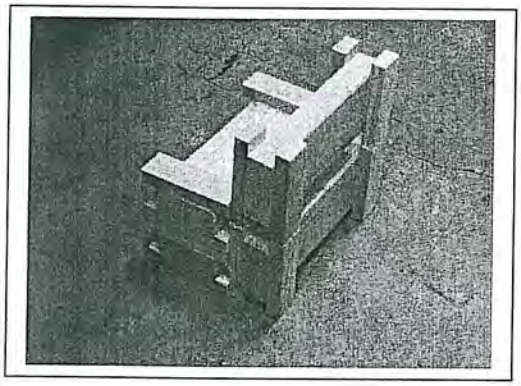


Run 4 – Newly Loaded Stove

File lost

Morsø Jernstøberi A/S
7600 Series

Run 5 – Fuel



Run 5 – Newly Loaded Stove

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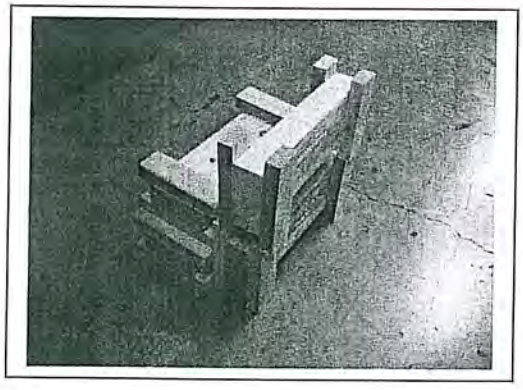
Run 6 – Fuel



Run 6 – Newly Loaded Stove

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WOOD HEATER DESCRIPTION

Appliance Manufacturer: Morsø Jernstøberi A/S

Wood Stove Model: 7600 Series

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.

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 back and is channeled internally to a hollow, tiered baffle with four rows of holes.

Combustion Control Mechanisms: The combustion air inlet is controlled by a handle located above the fuel-loading door in the center of the appliance.

Combustor: N/A.

Internal Baffles: A hollow, tiered baffle is mounted in the upper portion of the firebox. The flame path is forced to the front of the firebox where it travels up through the opening between the baffle and primary air manifold.

Other Features: None.

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

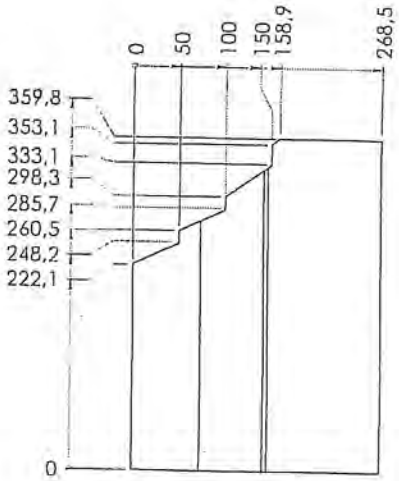
WOOD HEATER OPERATING INSTRUCTIONS

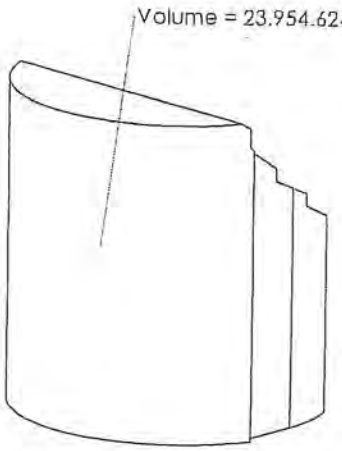
Specific Written Instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

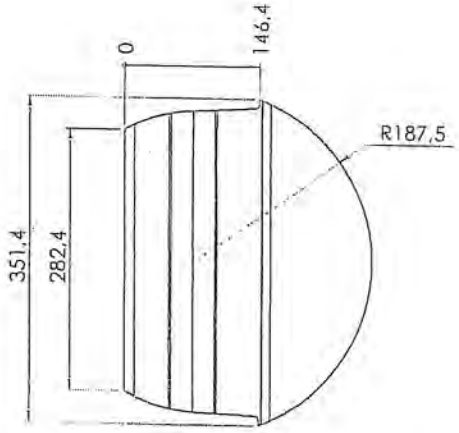
Engineering Drawings/Blueprints (K List)

FIRE BOX Volume

Ck'd _____ Date 10-22-08





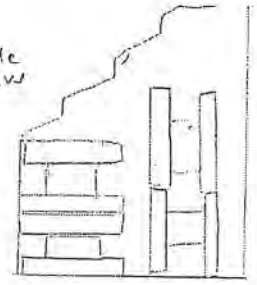


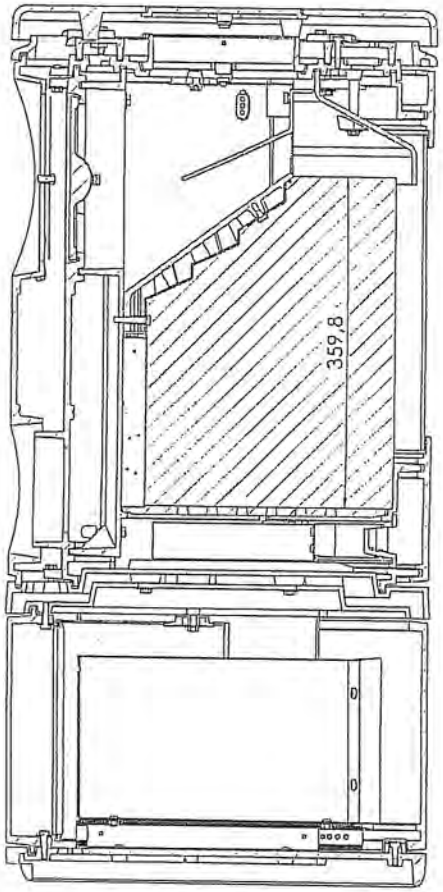
$V = 23\,954\,624\ mm^3$

$= 0.84595\ ft^3$

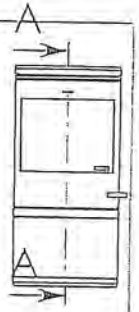
$\Rightarrow$ fuel load = 5.33 lb. – 6.51 lb.

The only way that I could have the fuel load fitted inside the burn chamber, it was very full! 4 pieces was needed.





A-A (1 : 5)



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Drawingtype:	
Location of file:	

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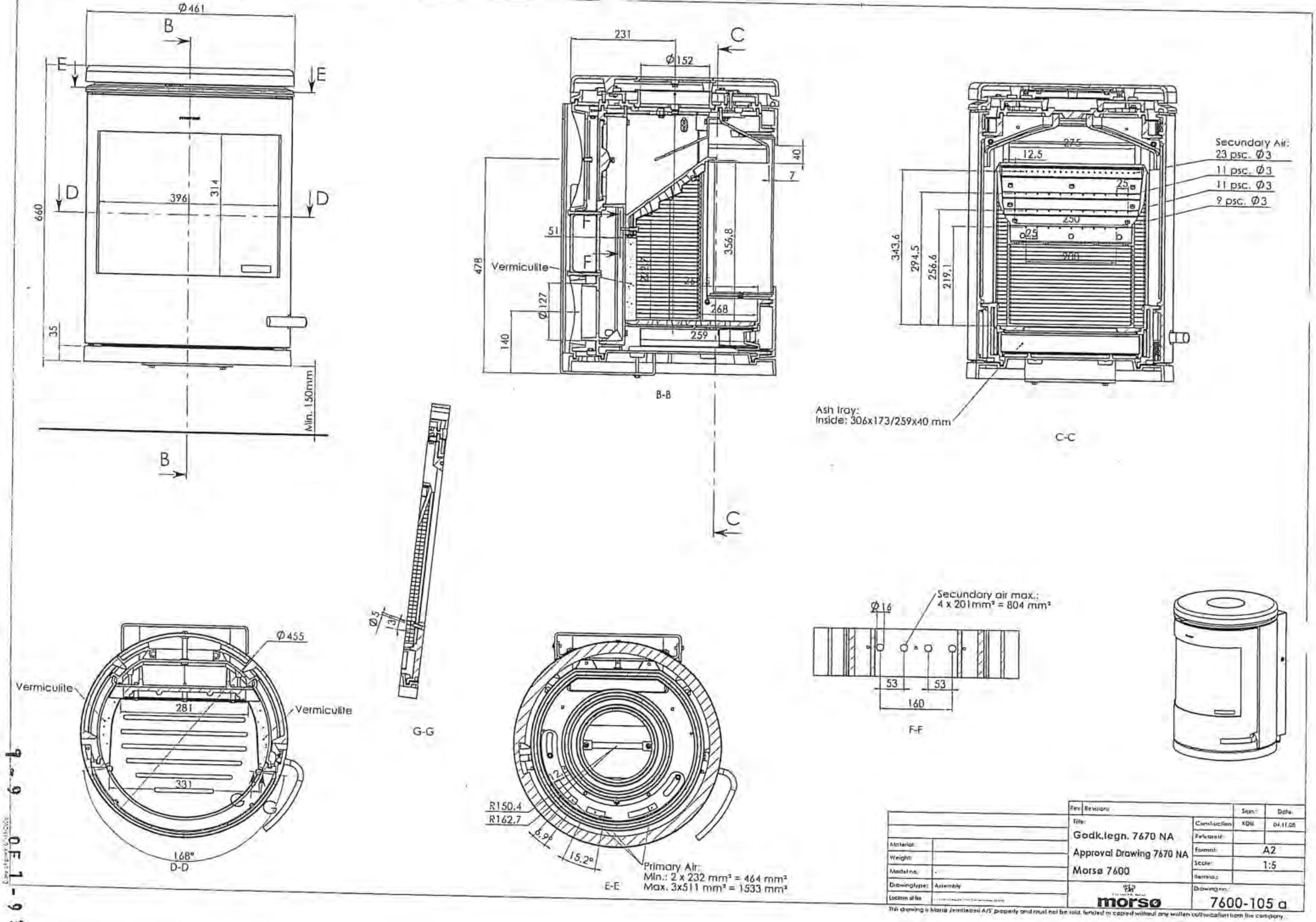
	Format:	A3	
	Scale:	1:5	
Morsø 7600	Itemno.:	-	
morsø	Drawing no.:	7600-100 a	


Ø461
B
E
E
D
D
396
314
660
35
Min. 150mm
B
231
Ø152
C
40
7
51
F
F
356,8
478
Vermiculite
Ø127
268
259
140
B-B
C
Secundary Air:
23 psc. Ø3
11 psc. Ø3
11 psc. Ø3
9 psc. Ø3
275
12,5
25
250
25
200
343,6
294,5
256,6
219,1
Ash tray:
Inside: 306x173/259x40 mm
C-C
Ø5
13
G-G
Secundary air max.:
4 x 201mm² = 804 mm²
Ø16
53
53
160
F-F
Ø455
Vermiculite
Vermiculite
281
331
168°
D-D
R150,4
R162,7
6,9
15,2°
Primary Air:
Min.: 2 x 232 mm² = 464 mm²
Max. 3x511 mm² = 1533 mm²
E-E
Rev Revisions
Sign: Date:
Title:
Construction KDU 04.11.05
Godk.legn. 7670 NA
Released:
Approval Drawing 7670 NA
Format: A2
Morsø 7600
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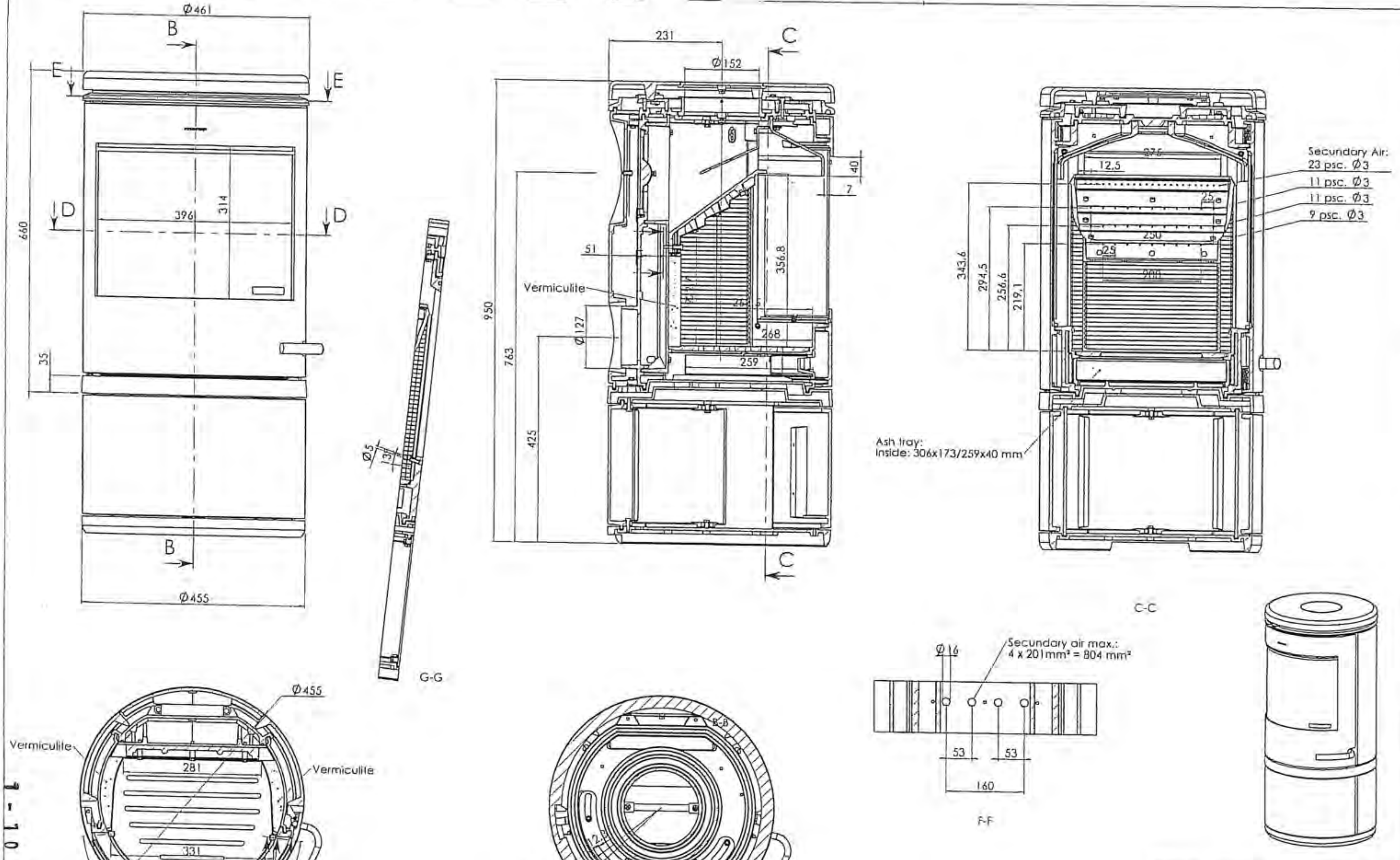
Model no.:
Drawingtype: Assembly
Drawing no.:
morsø
7600-105 a

9-9 OF 1-93



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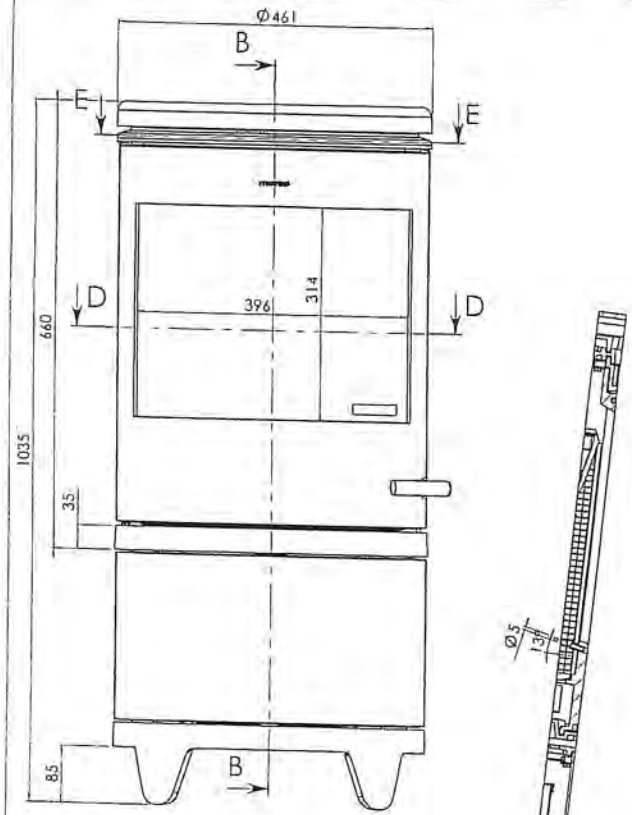

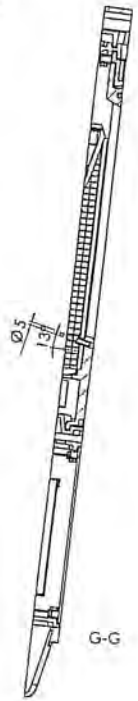

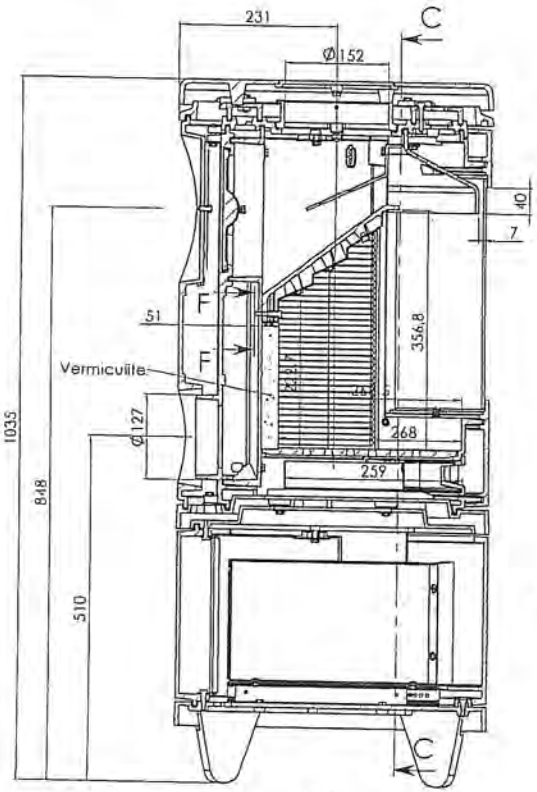

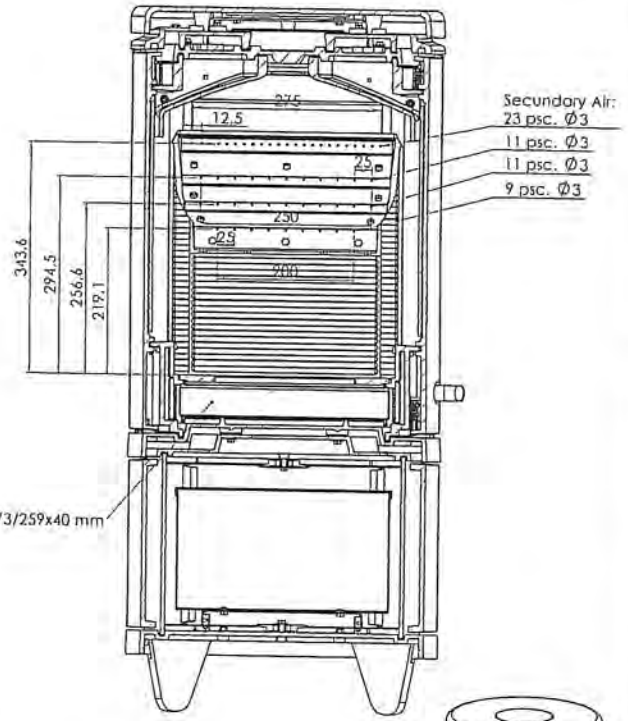

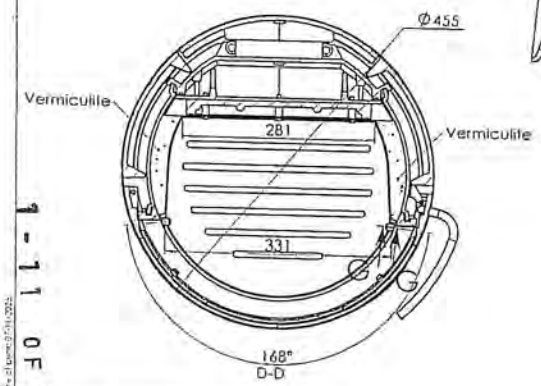

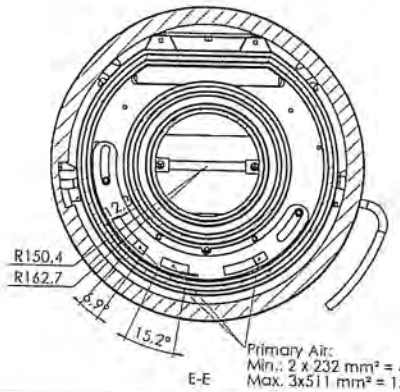

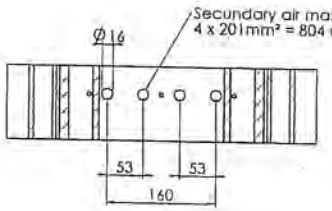

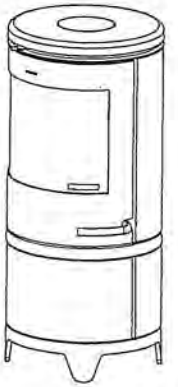

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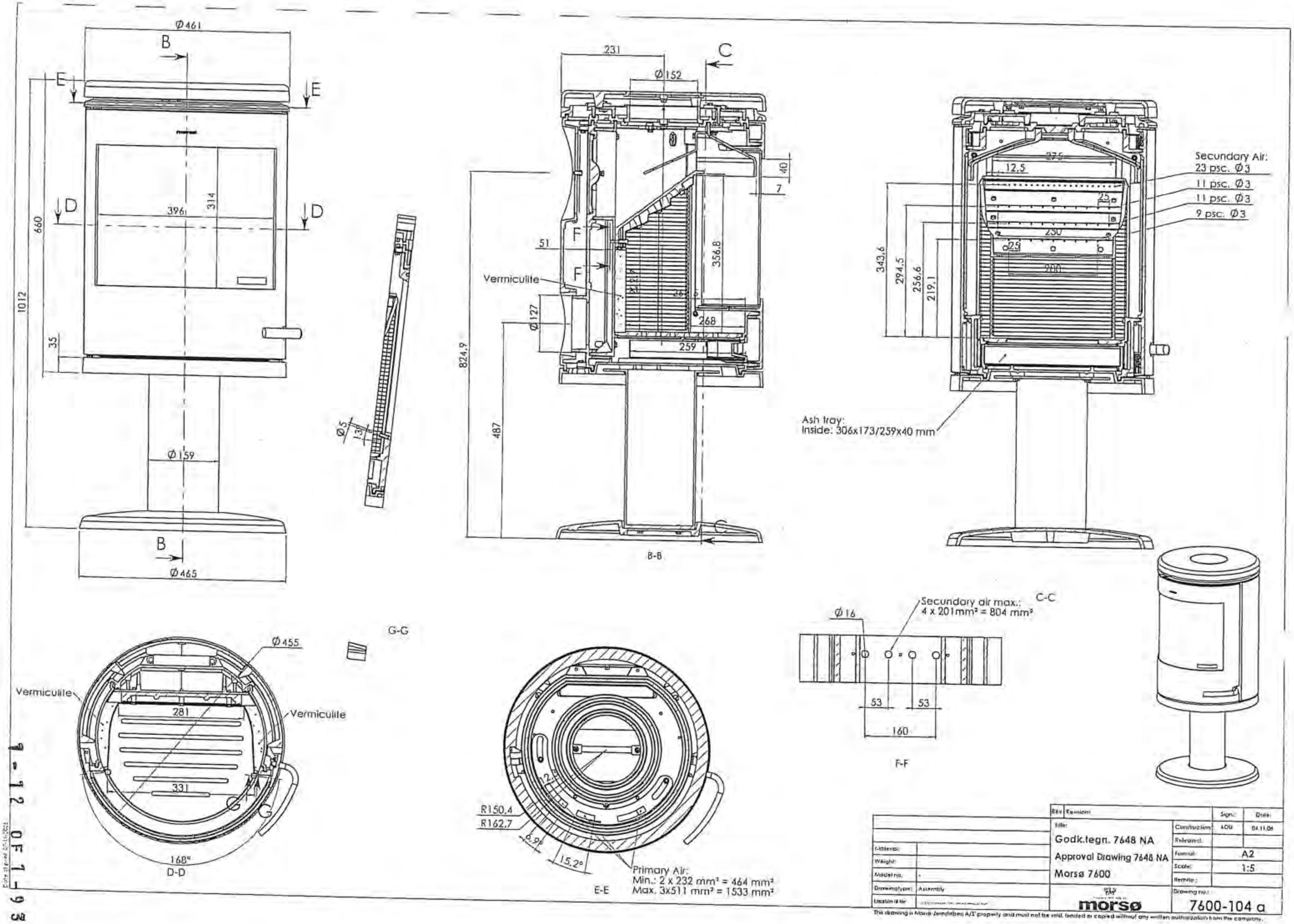
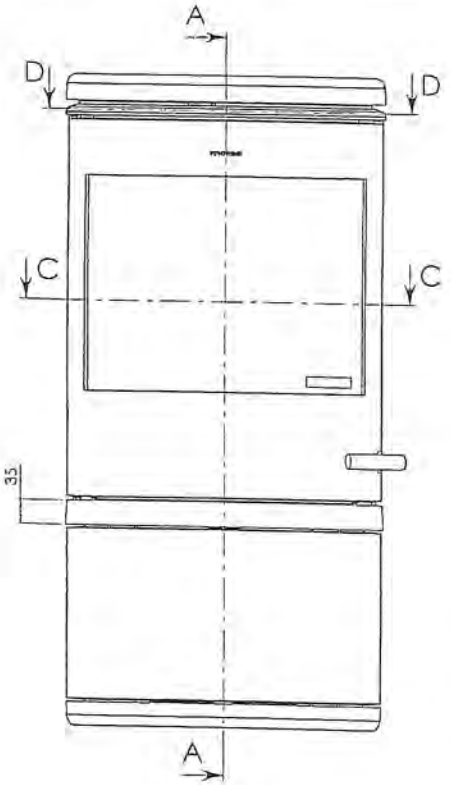
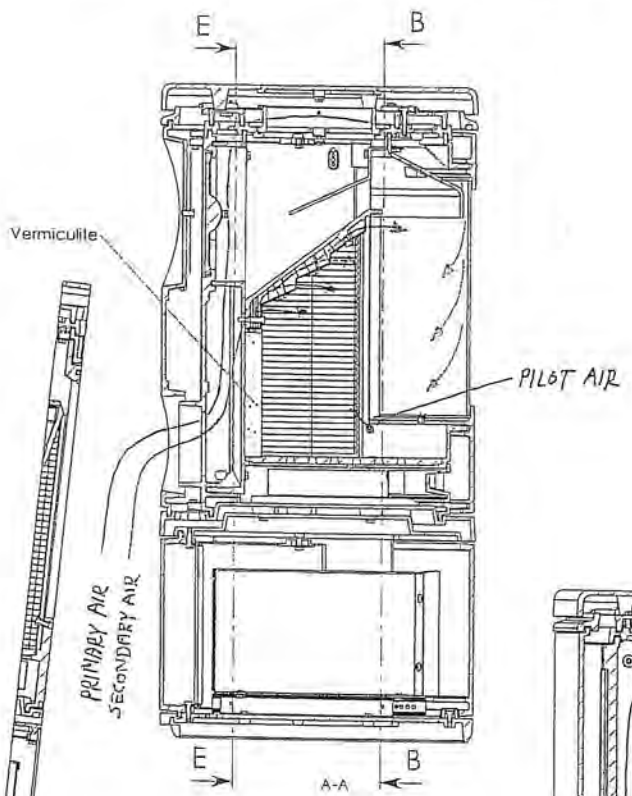
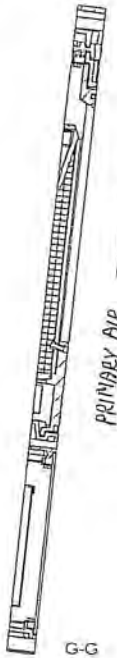
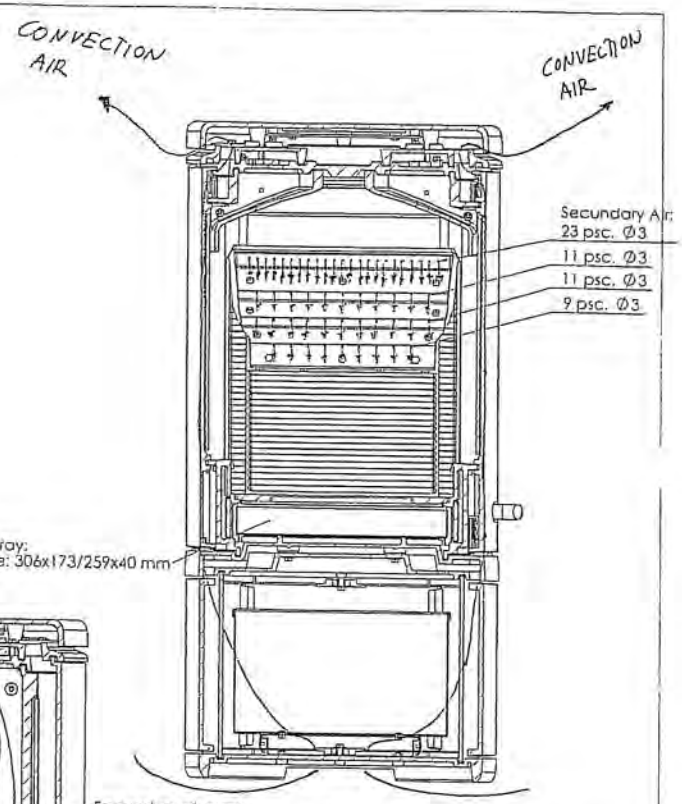
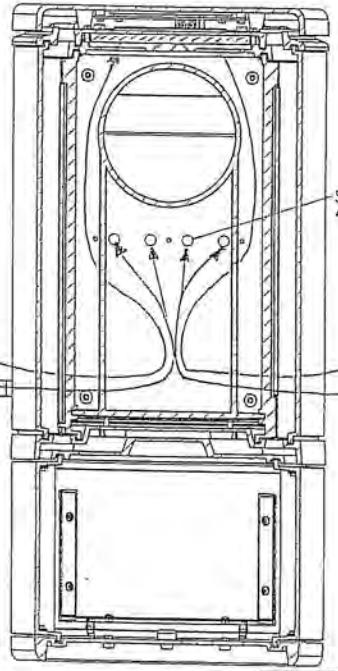

Ø461
B
E
E
D
D
396
314
660
1012
35
Ø159
B
Ø465
231
C
Ø152
40
7
51
F
F
Vermiculite
356,8
Ø127
268
259
824,9
487
B-B
Ø5
13
12,5
275
25
250
25
b
200
343,6
294,5
256,6
219,1
Secundary Air:
23 psc. Ø3
11 psc. Ø3
11 psc. Ø3
9 psc. Ø3
Ash tray:
Inside: 306x173/259x40 mm
Secundary air max.:
4 x 201mm² = 804 mm²
C-C
Ø16
53
53
160
F-F
G-G
Ø455
Vermiculite
Vermiculite
281
331
168°
D-D
R150,4
R162,7
15,2°
Primary Air:
Min.: 2 x 232 mm² = 464 mm²
Max. 3x511 mm² = 1533 mm²
E-E
Godk.tegn. 7648 NA
Approval Drawing 7648 NA
Morsø 7600
A2
1:5
morsø
7600-104 a

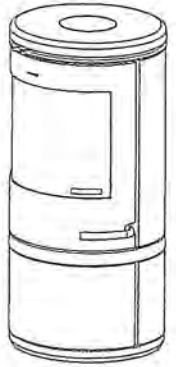


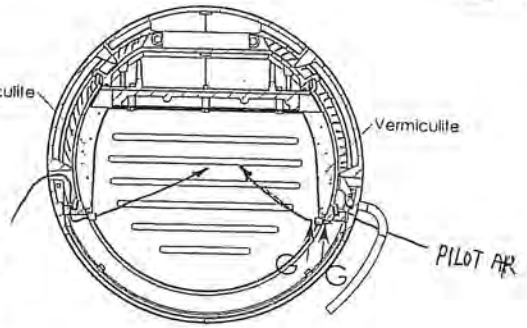


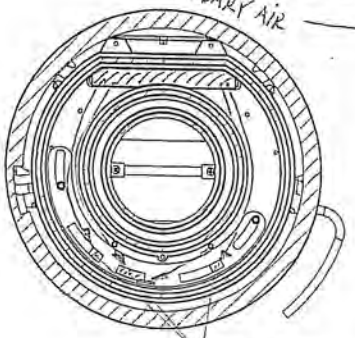












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Morsø 7600		Format:	A2		
		Scale:	1:5		
		Items:			
morsø		Drawing no.:	7600-107 a		

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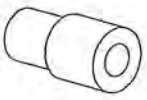
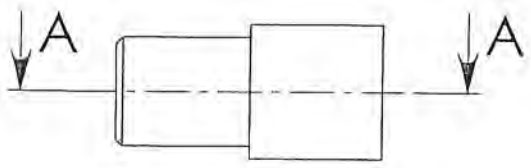
Weight:	
Model no:	-
Drawing type:	Assembly
Enclosed file:	

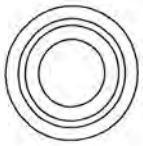
Date of print: 10-11-2008

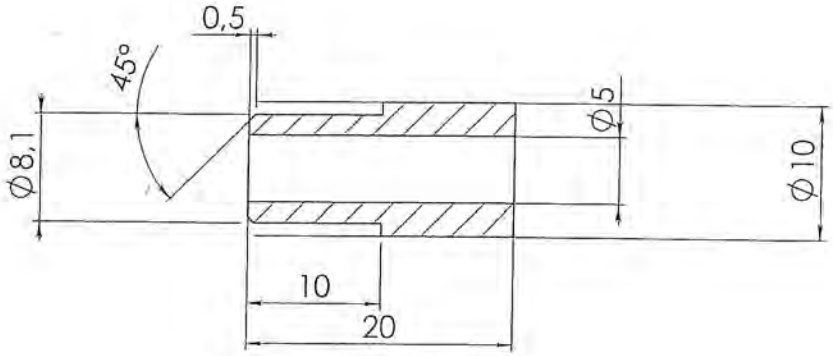
9 - 13 PILOT AIR

9 - 93









A-A

Constructional Drawing
10.10.08

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Weight:	0,01 kg			Scale:	2:1	
Model no.	-		Morsø 5400	Itemno.:	71762300	
Drawingtype:	Product Drawing			Drawing no.:		
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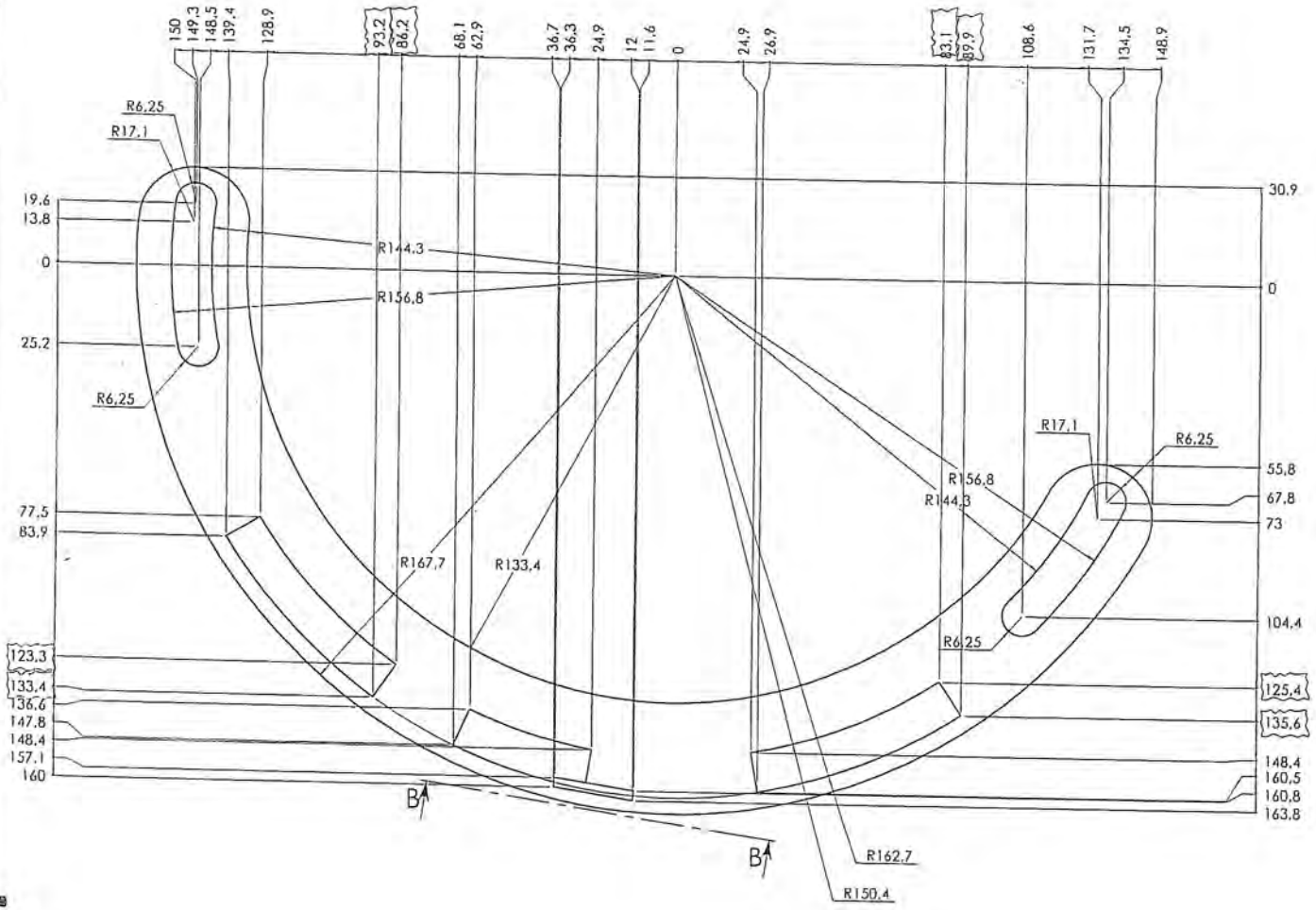
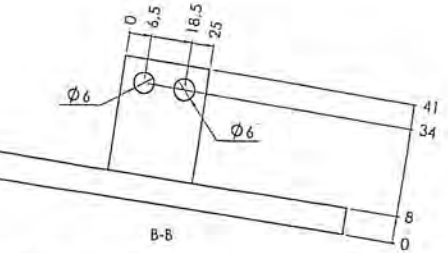
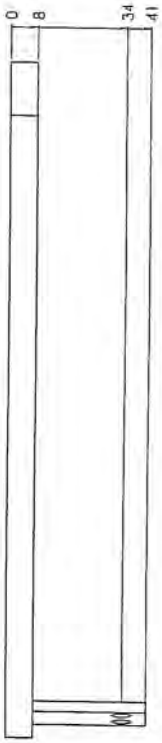
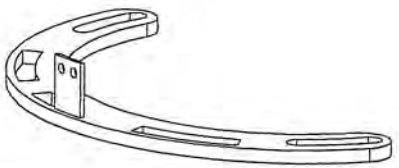
Date of print: 07-11-2008

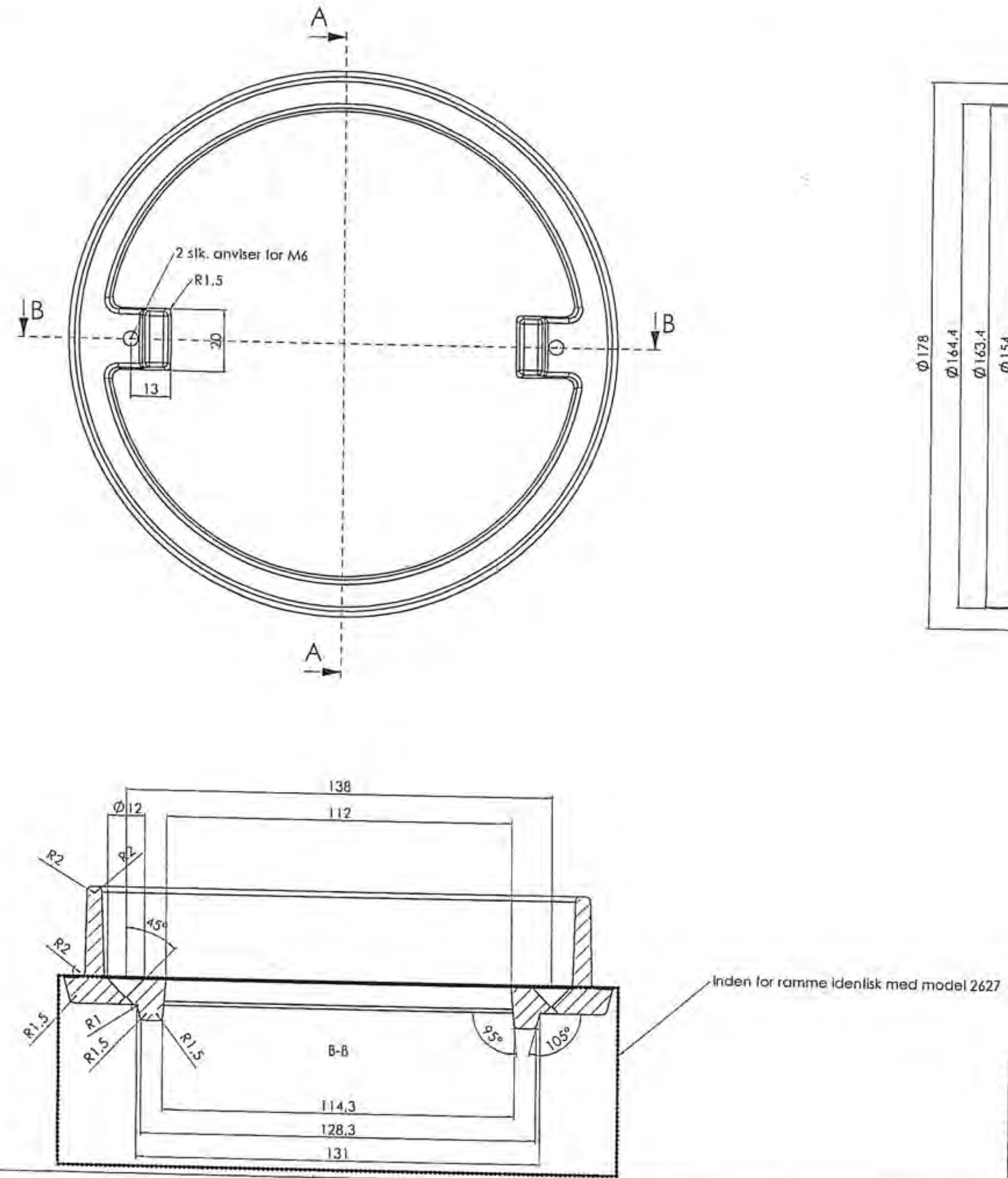


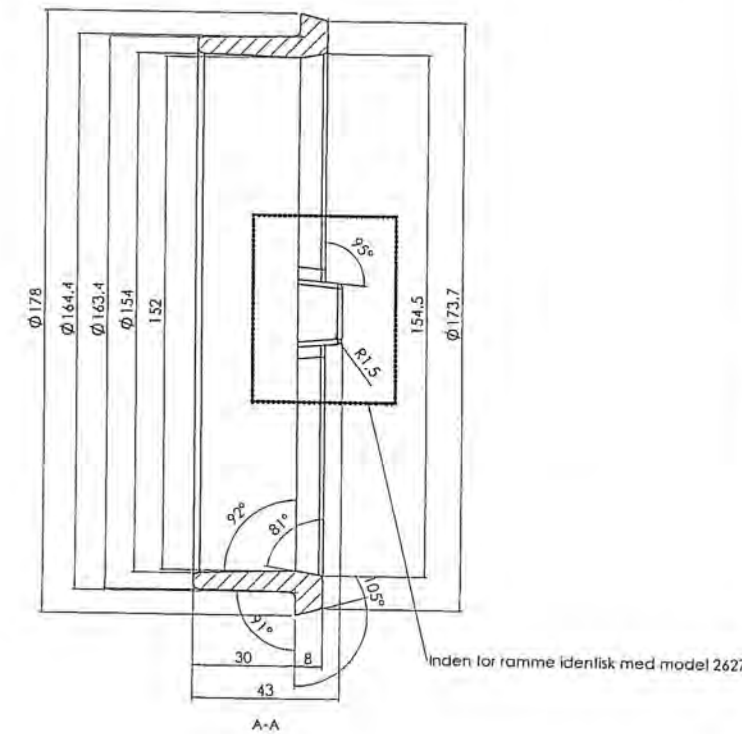






b	Tilføjet hvangiatbning af spjæld.			KDU	08.10.08
Rev.	Revisions			Sign:	Date:
Grater fjernes		Title: Sek. spjæld 7600	Construction	KDU	11.03.08
Dim. without indication of margin acc. to DS/ISO 2768-1 m			Released:	KDU	07.07.08
Material:	SPD Plade		Format:	A2	
Weight:	0,73 kg		Scale:	1:1	
Model no.	-	Morsø 7600	Termo.:	71760100	
Drawingtype:	Product Drawing	morsø	Drawing no.:	7600-27 b	
Location of file					

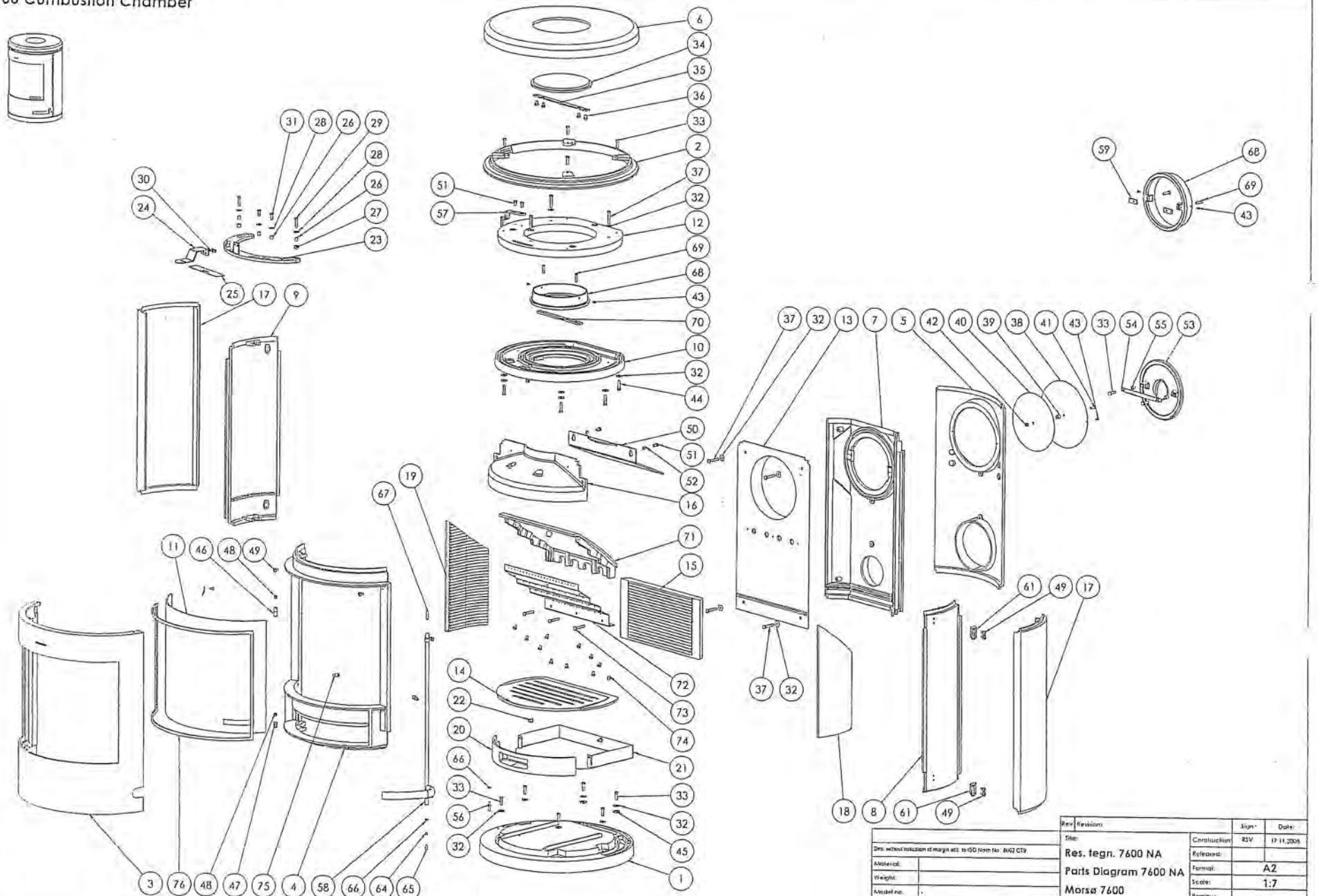




Materiale:	GG15			Rev. Revisionstekst:		Sign.:	Dato:
Vægt:	0,976 kg	Bearbejdes:		Titel: Røgtud USA	Konstr.:	RSV	13.12.2000
Overfladebeh.:			m²		Frigivet:	RSV +	21.06.2001
Måltolerance:	Mål uden toleranceangivelse ISO-norm nr. 8062 C18				Tegn.format:	A2	
Retvedtolerance:				Morsø 3400	Målforhold:	1:1	
Vare-/tegnr.:	Modelnr.: 3441			morsø	Varenr.:	34344100	
Tegningstype:	Støbetegning				Tegningsnr.:	3400-97 a	

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

7600 Cumbustion Chamber



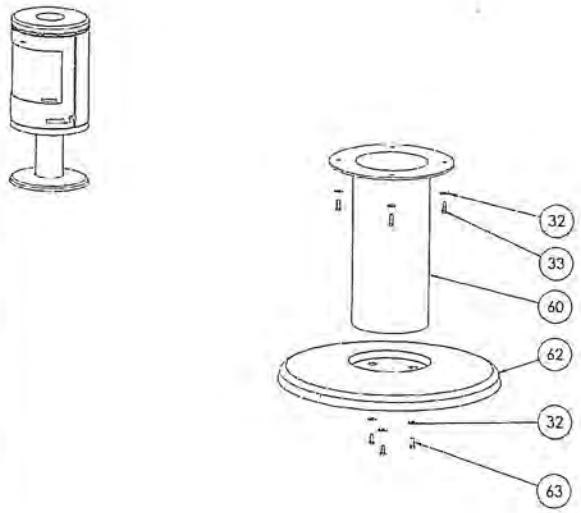
Rev	Revision:		Sign:	Date:
Title: Res. tegn. 7600 NA Parts Diagram 7600 NA Morsø 7600		Construction:	RSV	17.11.2005
		Released:		
		Format:	A2	
		Scale:	1:7	
		Remind:		
Dim. without indication of margin acc. to ISO Norm No.: 8402 CT9		Drawing no.:	Side 1 of 2	
Material:		7600-500 a		
Weight:				
Model no.:	-			
Drawingtype:	Assembly			
Location of file:				

morsø

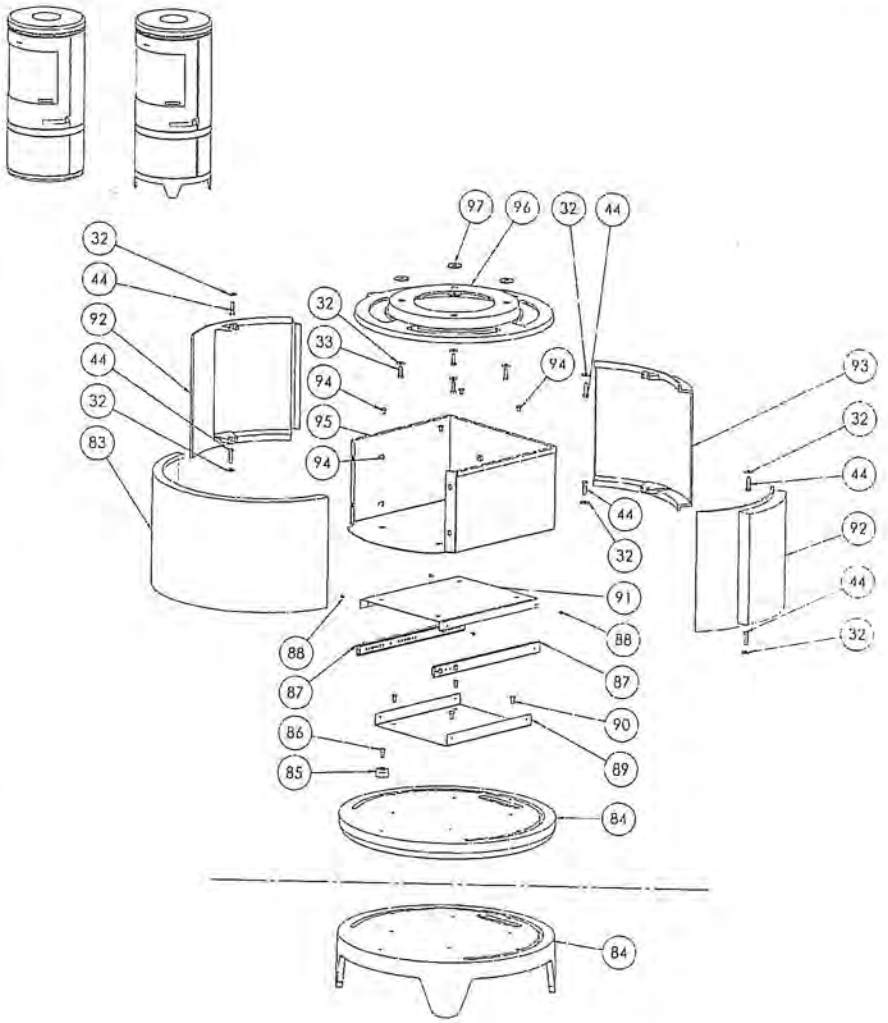
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lended or copied without any written authorization from the company.

9-17 OF 1-93

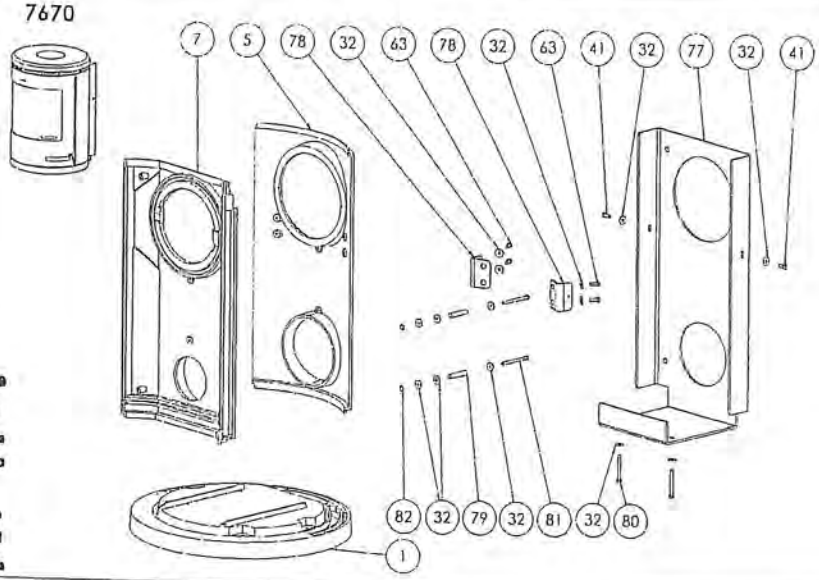
7648



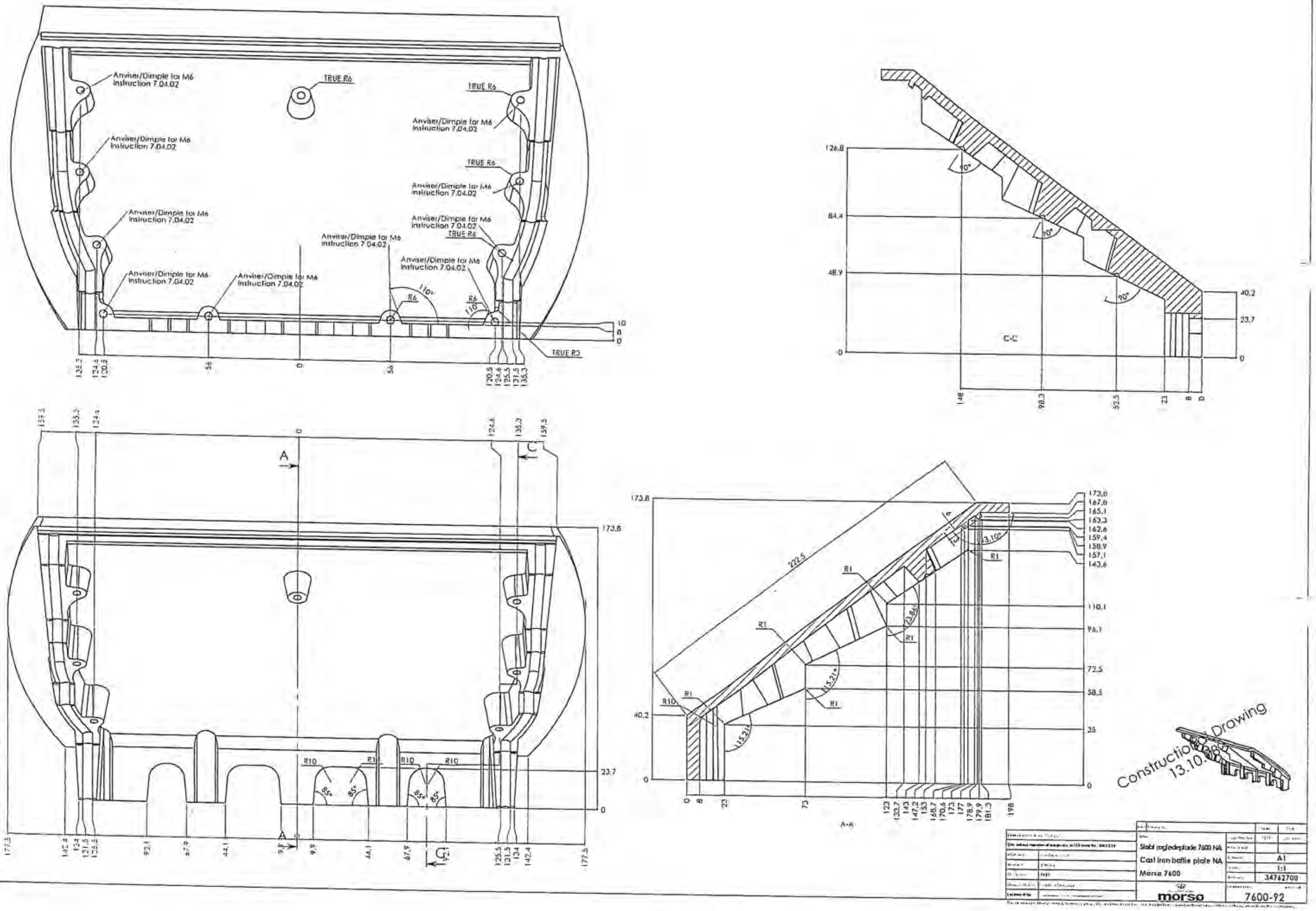
7642/7644

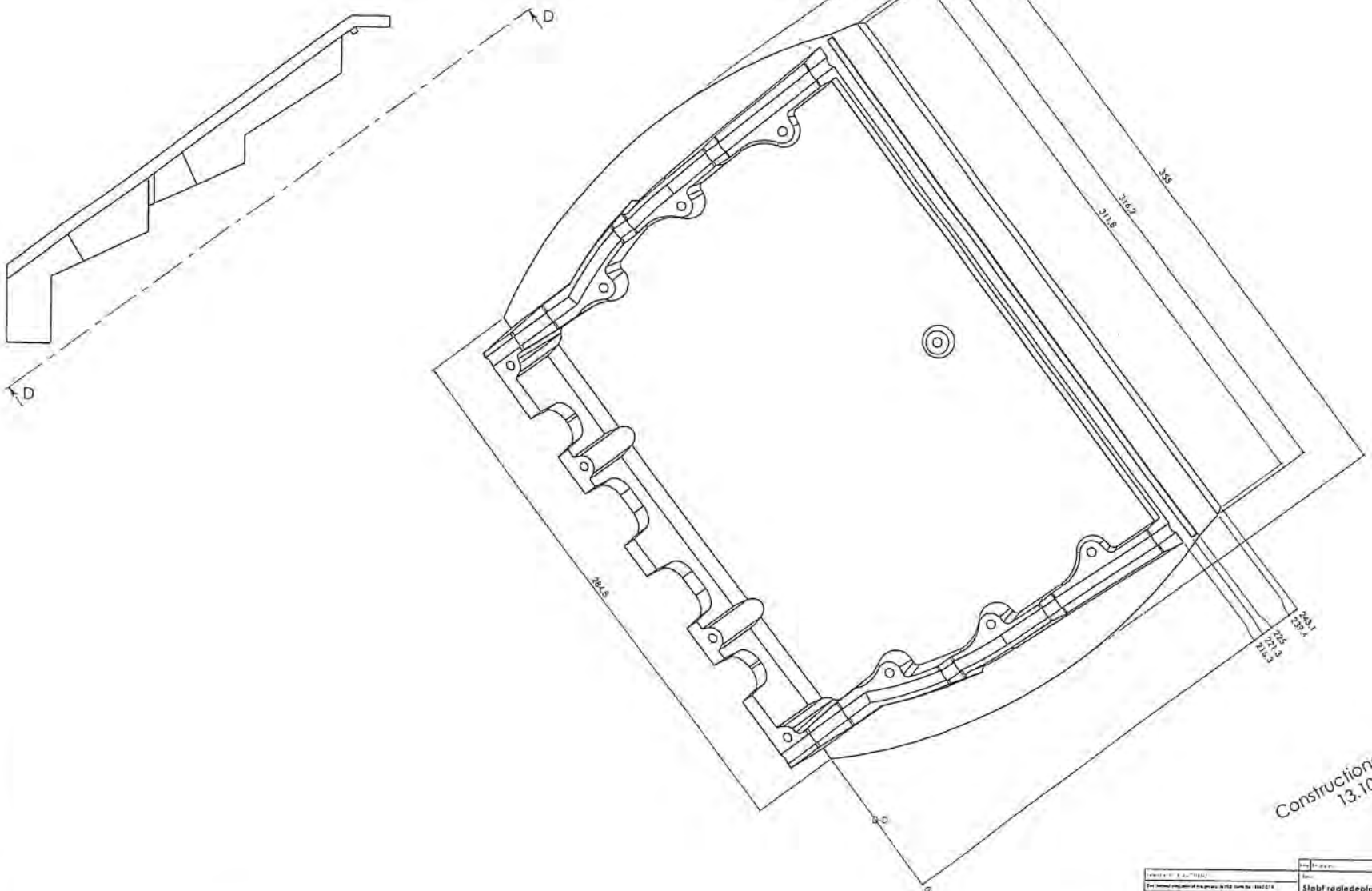


7670



		Rev.	Revisions	Sign:	Date:
Material:		Title: Res. legn 7600 NA	Construction:	REV:	17.[illegible].2008
Weight:		Parts Diagram 7600 NA	Print out:		
Model no.:	-	Morsø 7600	Format:	A2	
Drawingtype:	Assembly		Scale:	1:7	
Location of file:			Remark:		
		morsø	Drawing no.:	Side 2 of 7	
			7600-500 a		


Anviser/Dimple for M6
Instruction 7.04.02
TRUE R6
TRUE R3
C-C
A-A
Construction Drawing
13.10.08
Stabl røgledeplade 7600 NA
Cast iron baffle plate NA
Morsø 7600
morsø
A1
1:1
34762700
7600-92

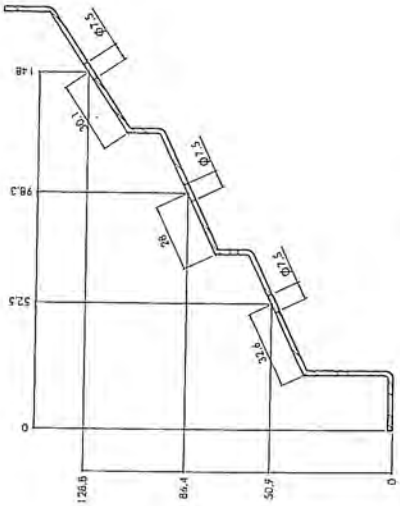


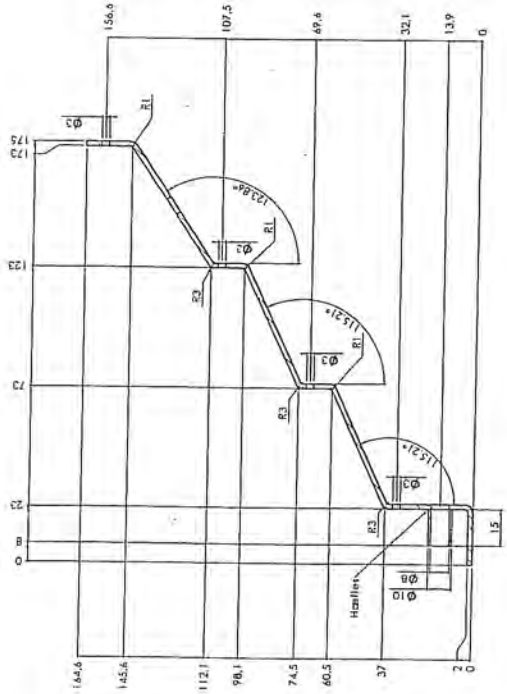
Constructional Drawing
13.10.08

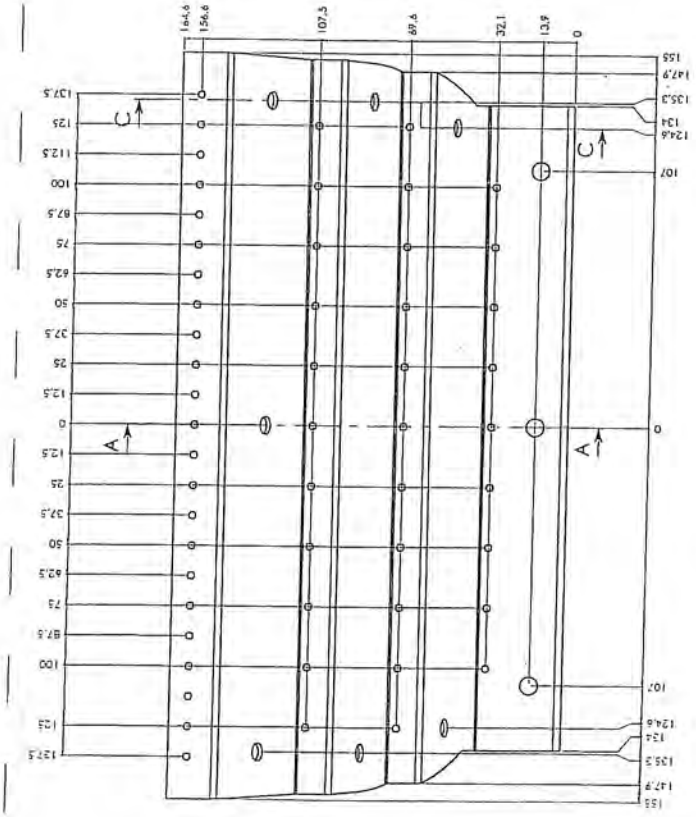
	Stabf regledeplade 7600-NA		
	Cast iron baffle plate NA		A1
	Morso 7600		1:1
	morso		34762700
			7600-92

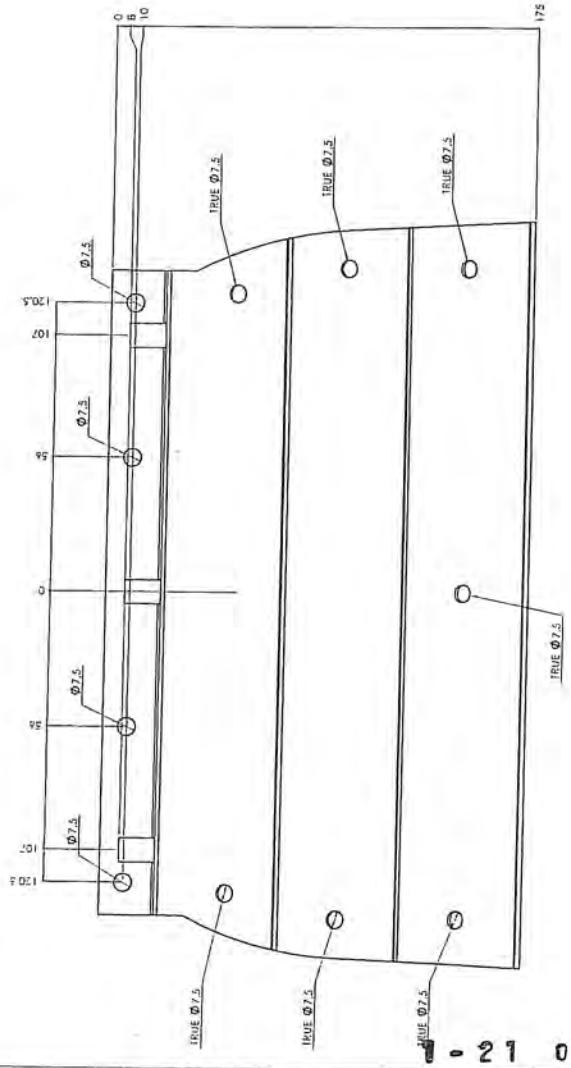
Constructional Drawing 10.10.08

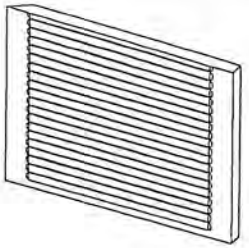
Rustfri Regledeplade 7600 INA		A1	
Morse 7600		1:1	71742200
morso		7600-93	

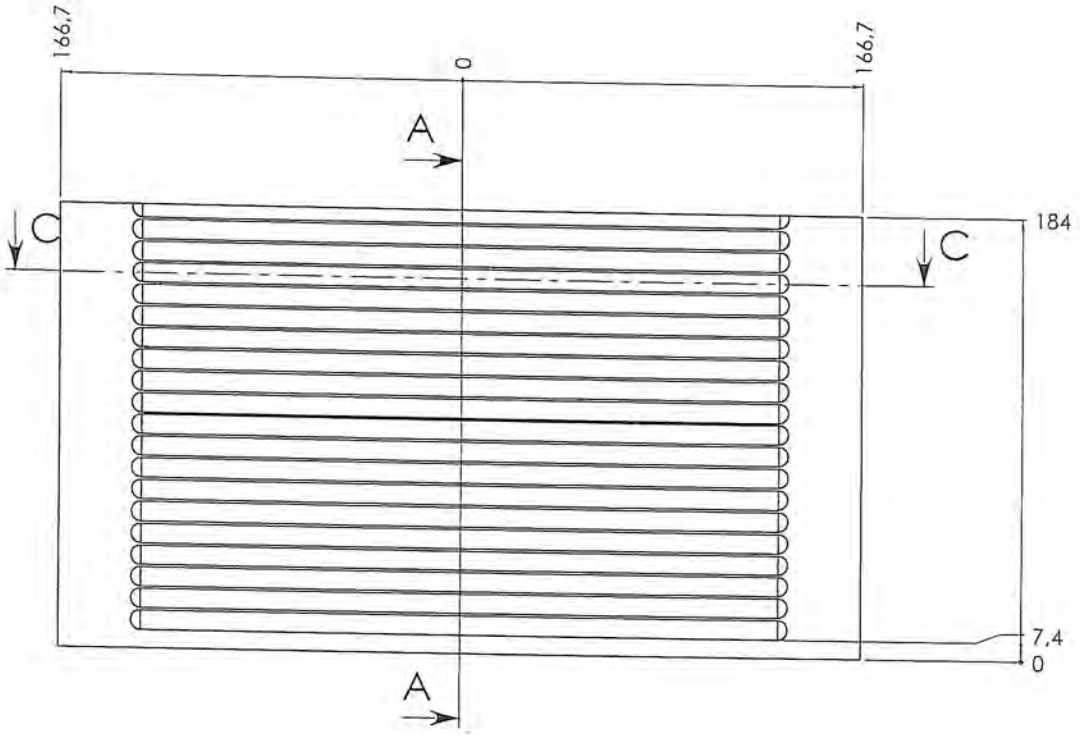


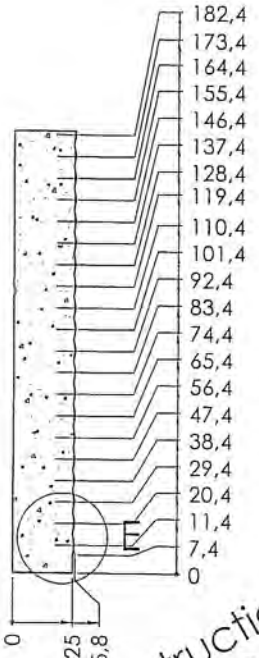


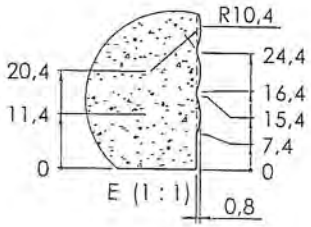




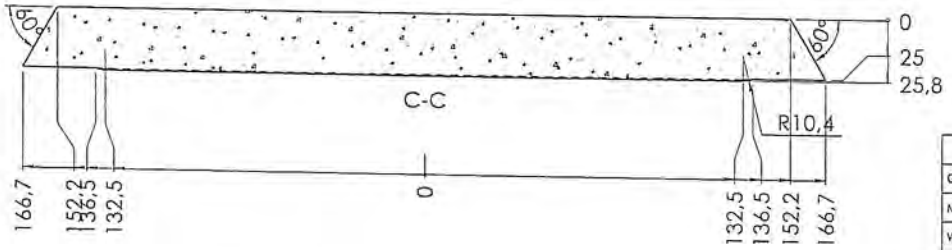








Constructional Drawing
20.08.08



Rev.	Revisions	Sign.:	Date:
		KDU	14.08.08

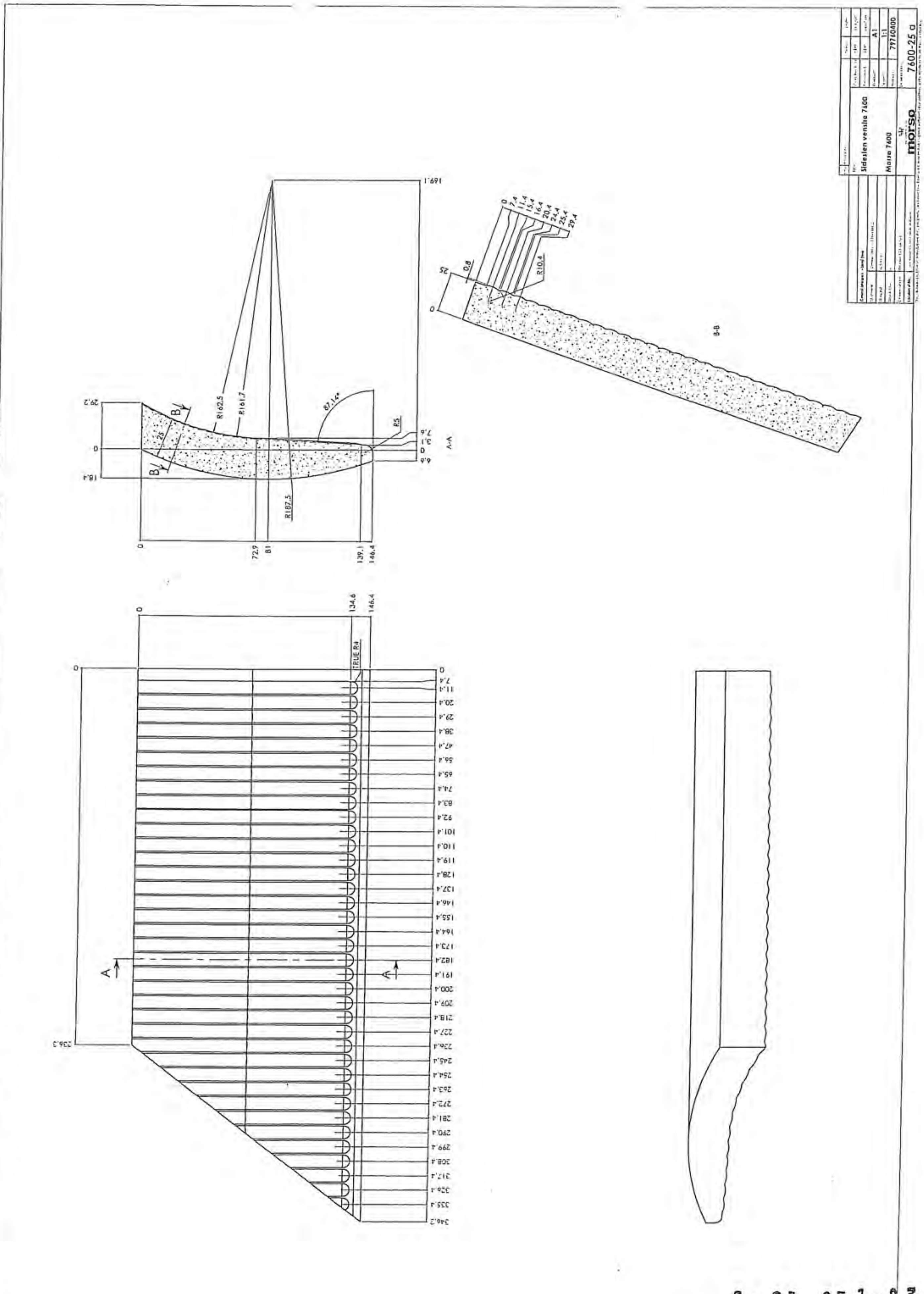
General tolerance: +1mm/-2mm	
Material:	Vermiculite v-1100 Mk.2
Weight:	0.89 kg
Model no.	-
Drawingtype:	Product Drawing
Location of file:	

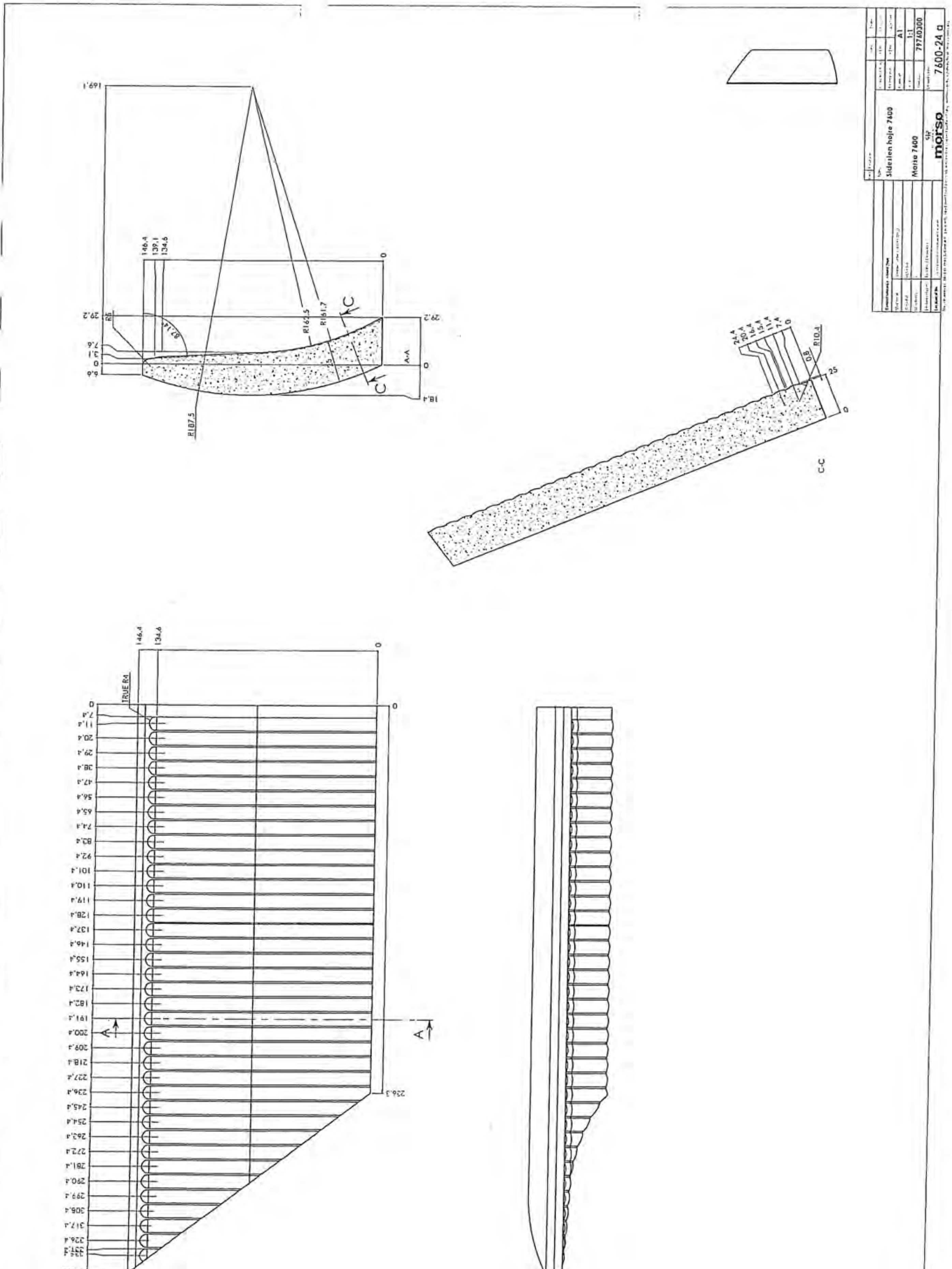
Title: Bagsten 7600 NA

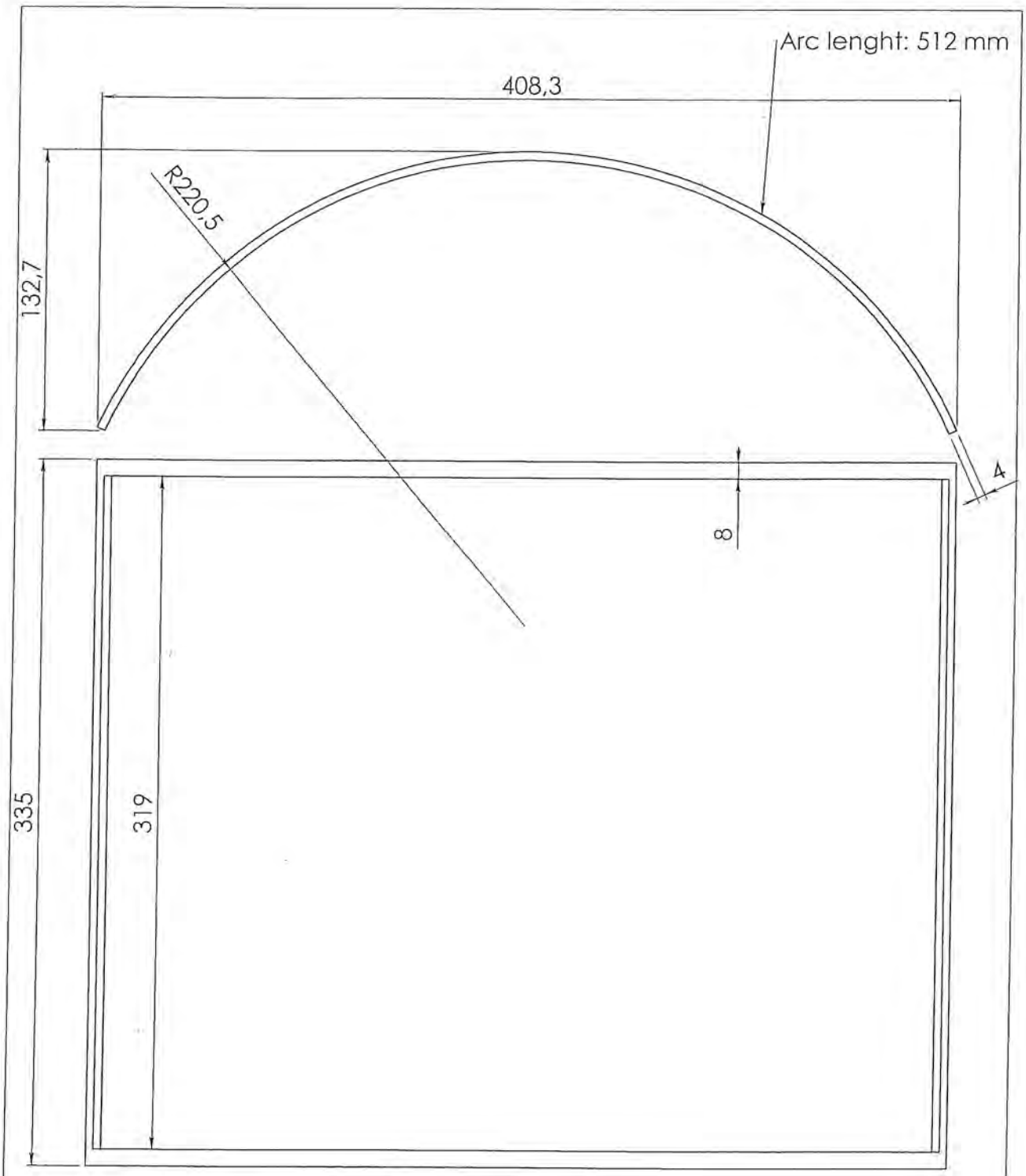
Morsø 7600

Construction:	KDU 14.08.08
Released:	
Format:	A3
Scale:	1:2
Itemno.:	
Drawing no.:	7600-94

morsø


Sidesten venstre 7600
Morso 7600
morsø
A1
1:1
79760400
7600-25 a
A-A
B-B
R162,5
R161,7
R187,5
87,14°
R5
R10,4
TRUE R4
29,2
18,4
72,9
81
139,1
146,4
134,6
336,3
346,3


Sidesten højre 7600
Morsø 7600
morsø
7600-24 a
79760300
A1
1:1
A-A
C-C
R187.5
R163.5
R161.7
R10.4
TRUE R4

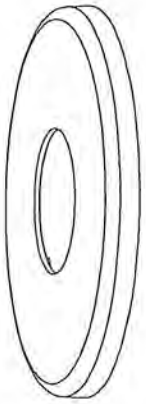


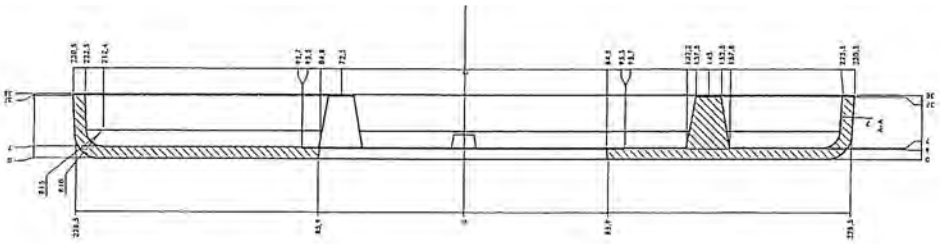
Total lenght: 1695 mm

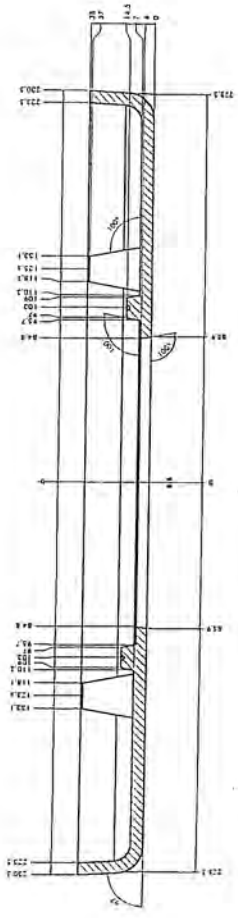
Rev.	Revisions	Sign.:	Date:

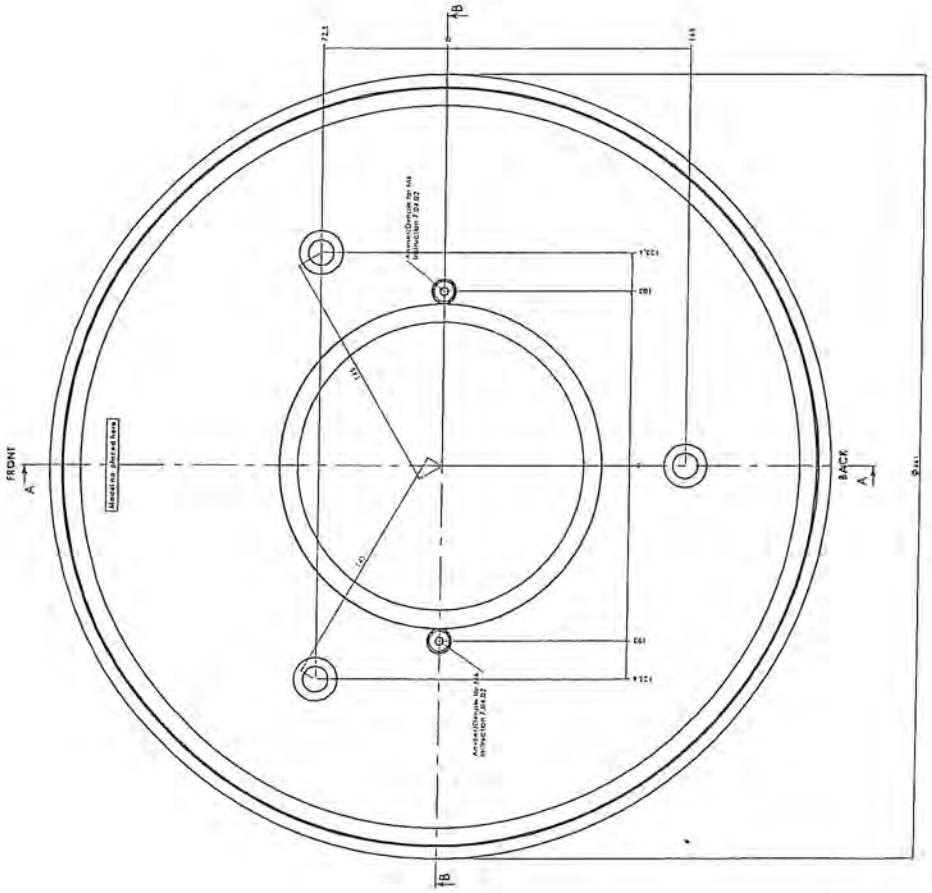
Dim. without indication of margin acc. to DS/ISO 2768-1 m	Title: Glasbånd m. tape / Glass gasket tape / Morsø 7600	Construction:	RSV	07.11.2008
		Released:		
Material: 8x4mm Glasbånd m. tape		Format:	A4	
Weight: 0.35 kg		Scale:	1:2.5	
Model no.		Itemno.:	79074200	
Drawingtype: Product Drawing	morsø	Drawing no.:	7600-106 a	
Location of file:				

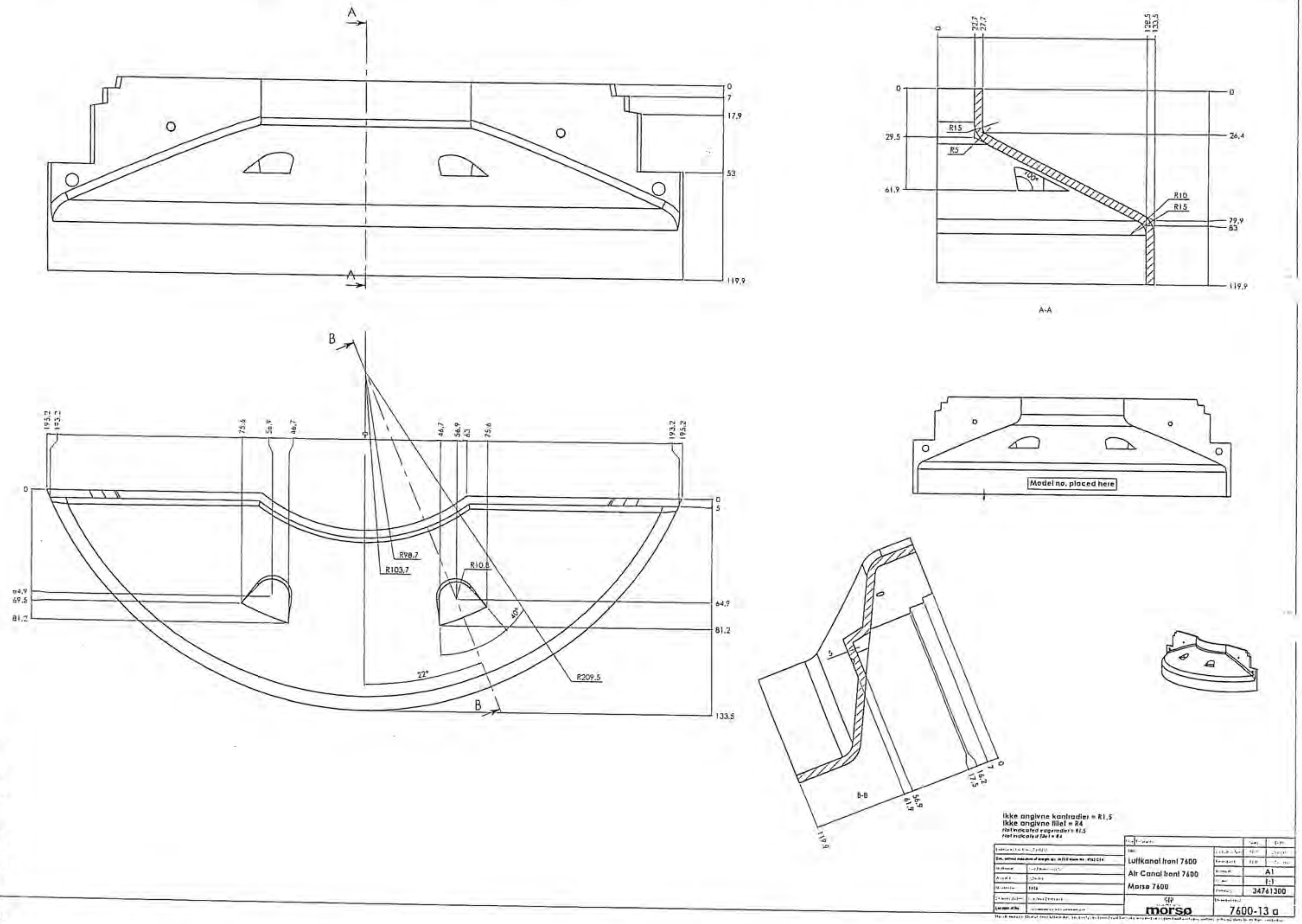
Date of print: 07-11-2008

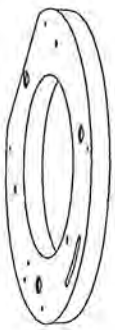


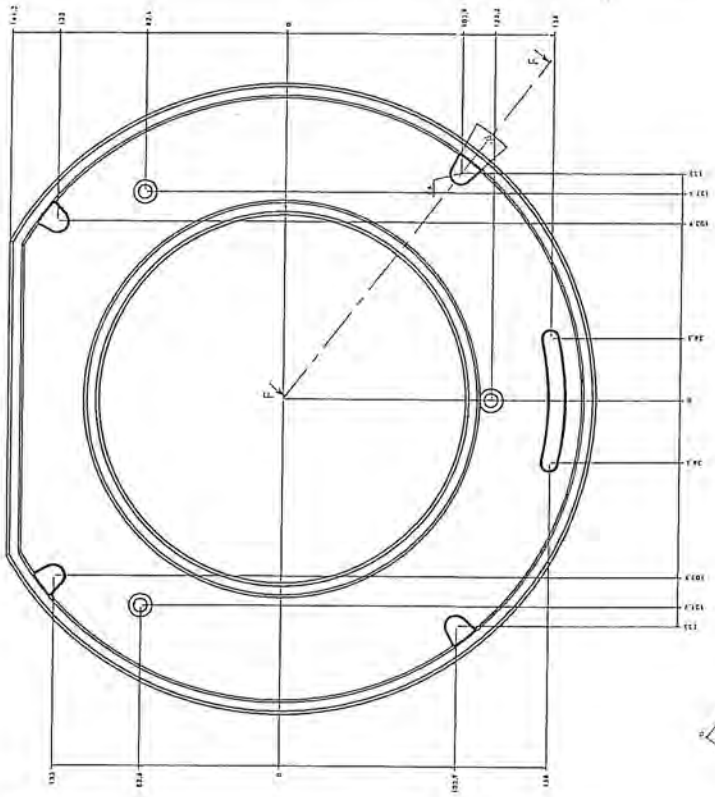


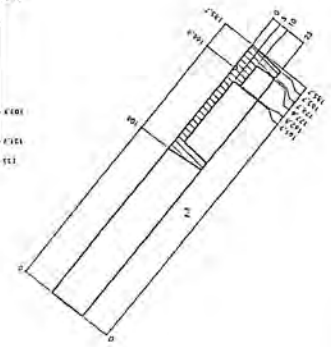


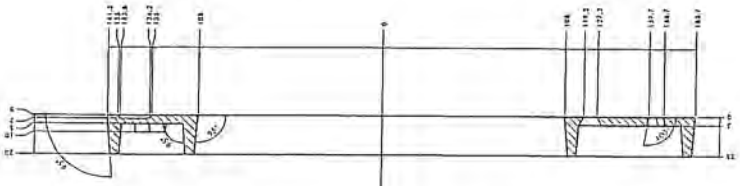

FRONT
BACK
A
B

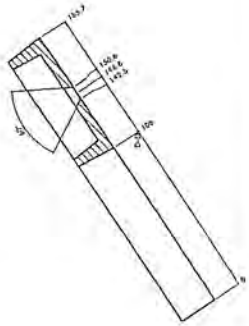

A-A
B-B
Model no. placed here
R15
R5
R10
R15
R98,7
R103,7
R10,8
R209,5
40°
22°
100°
Ikke angivne kantradier = R1,5
Ikke angivne fillet = R4
Not indicated edgeradier = R1,5
Not indicated fillet = R4
Luftkanal front 7600
Air Canal front 7600
Morsø 7600
A1
1:1
34761300
morsø
7600-13 a

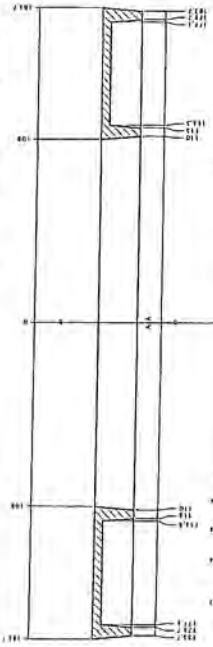


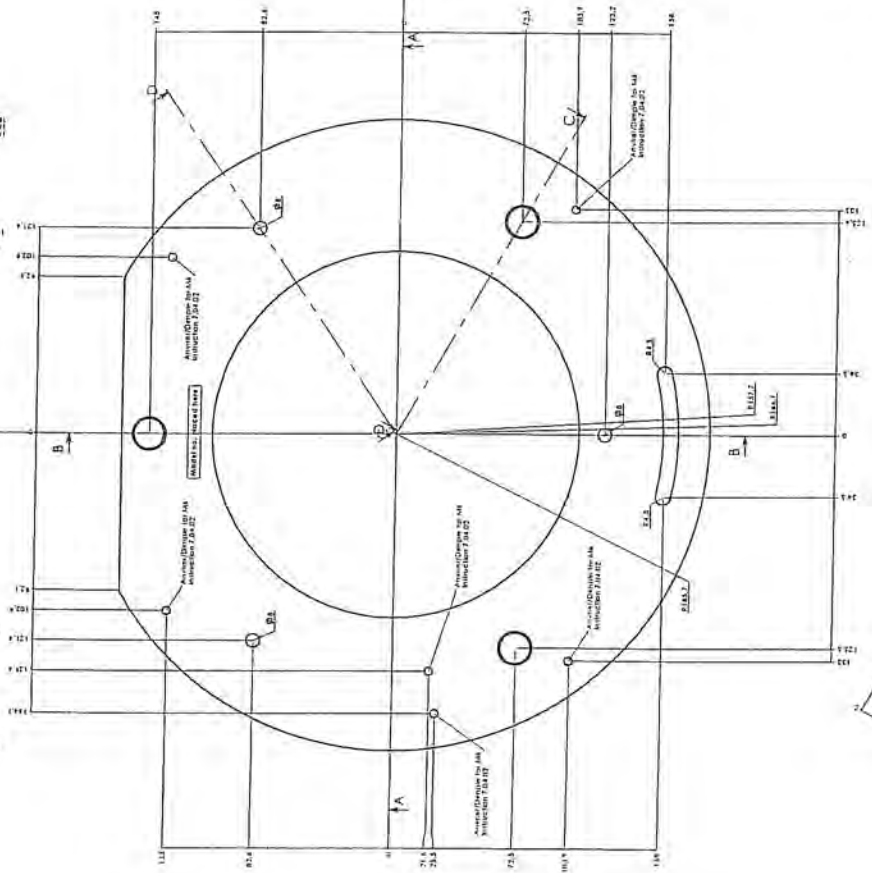


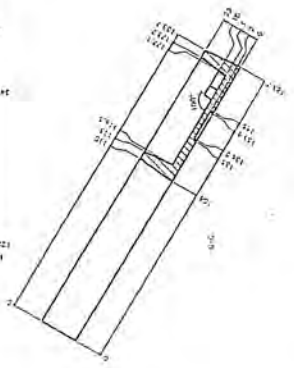


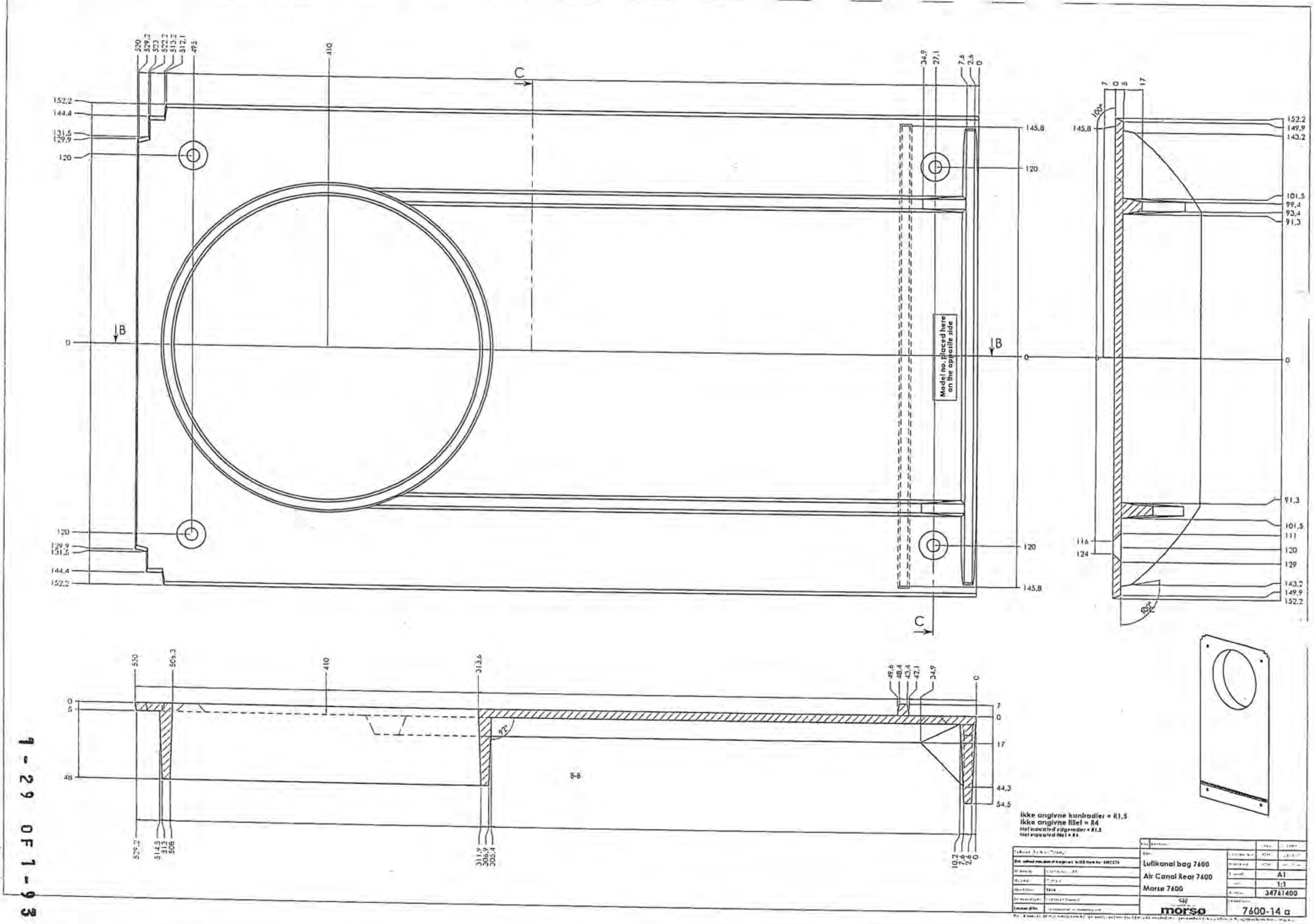


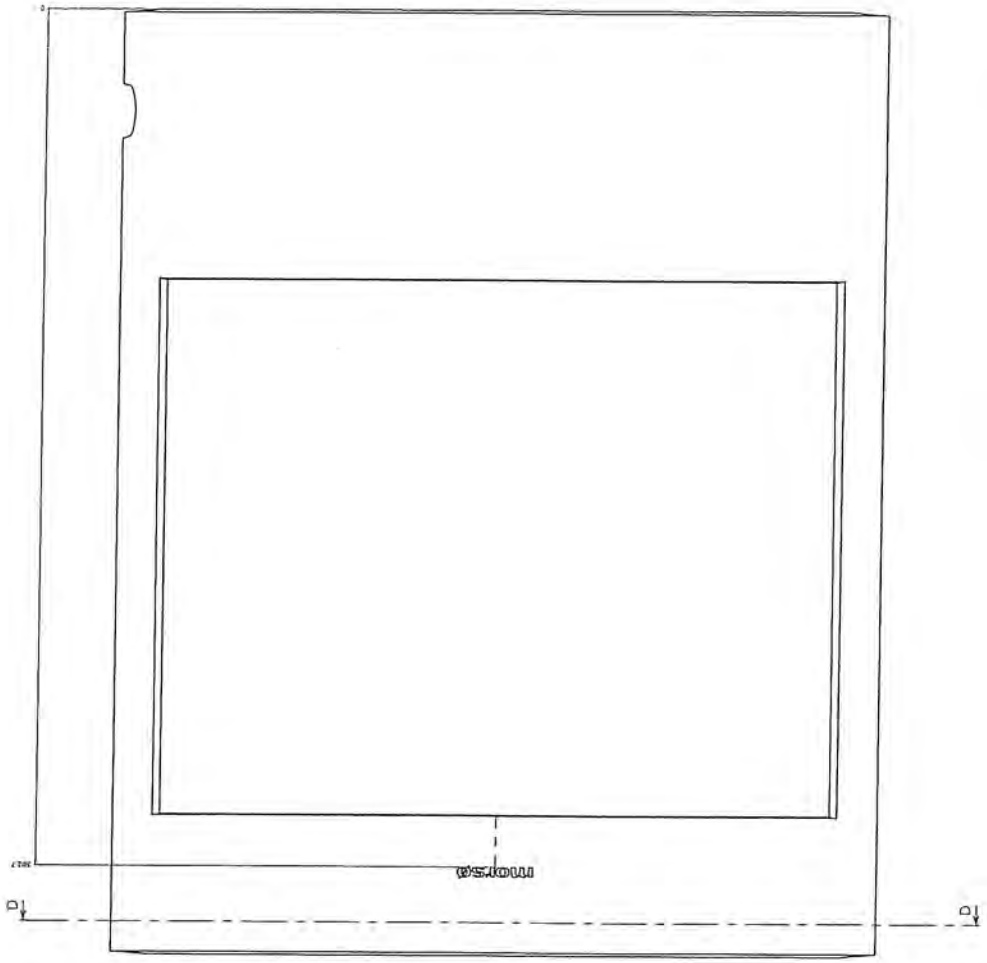


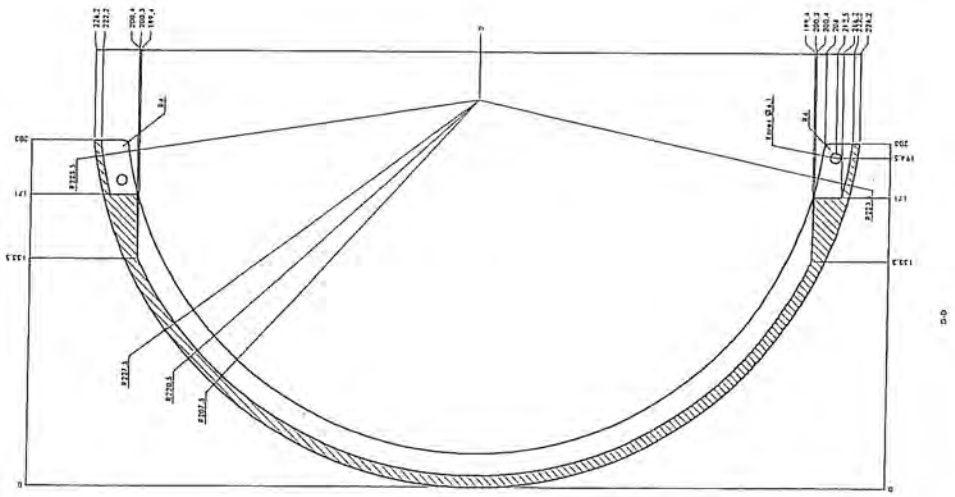


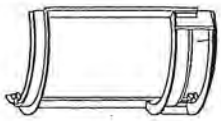


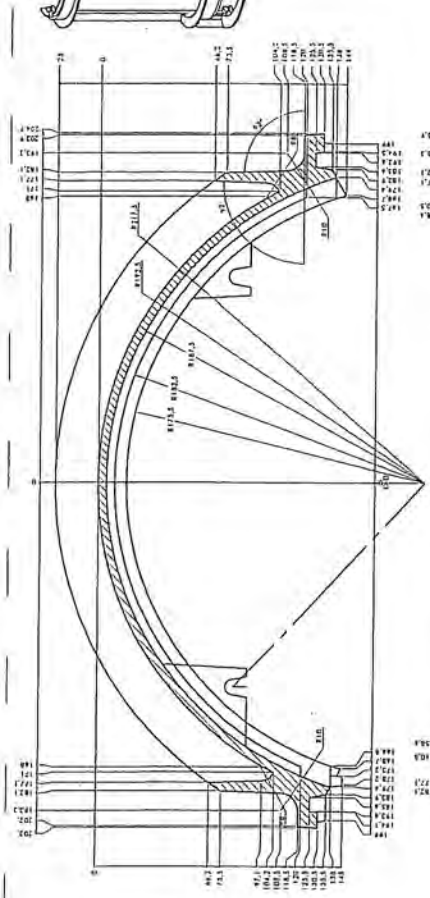


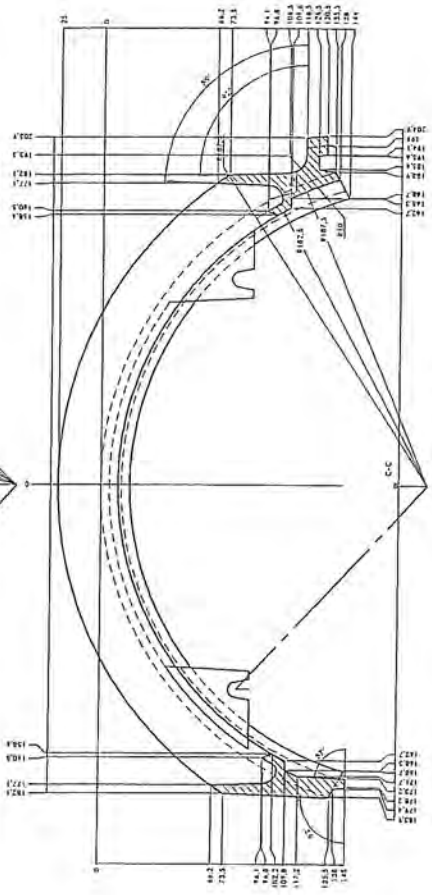

Model no. placed here on the opposite side
B-B
Ikke angivne kantradier = R1,5
Ikke angivne fillet = R4
Lufikanal bag 7600
Air Canal Rear 7600
Morsø 7600
morsø
A1
1:1
34761400
7600-14 a

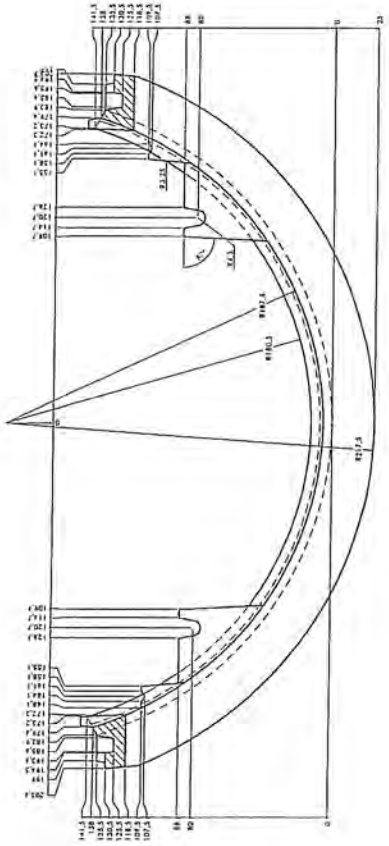


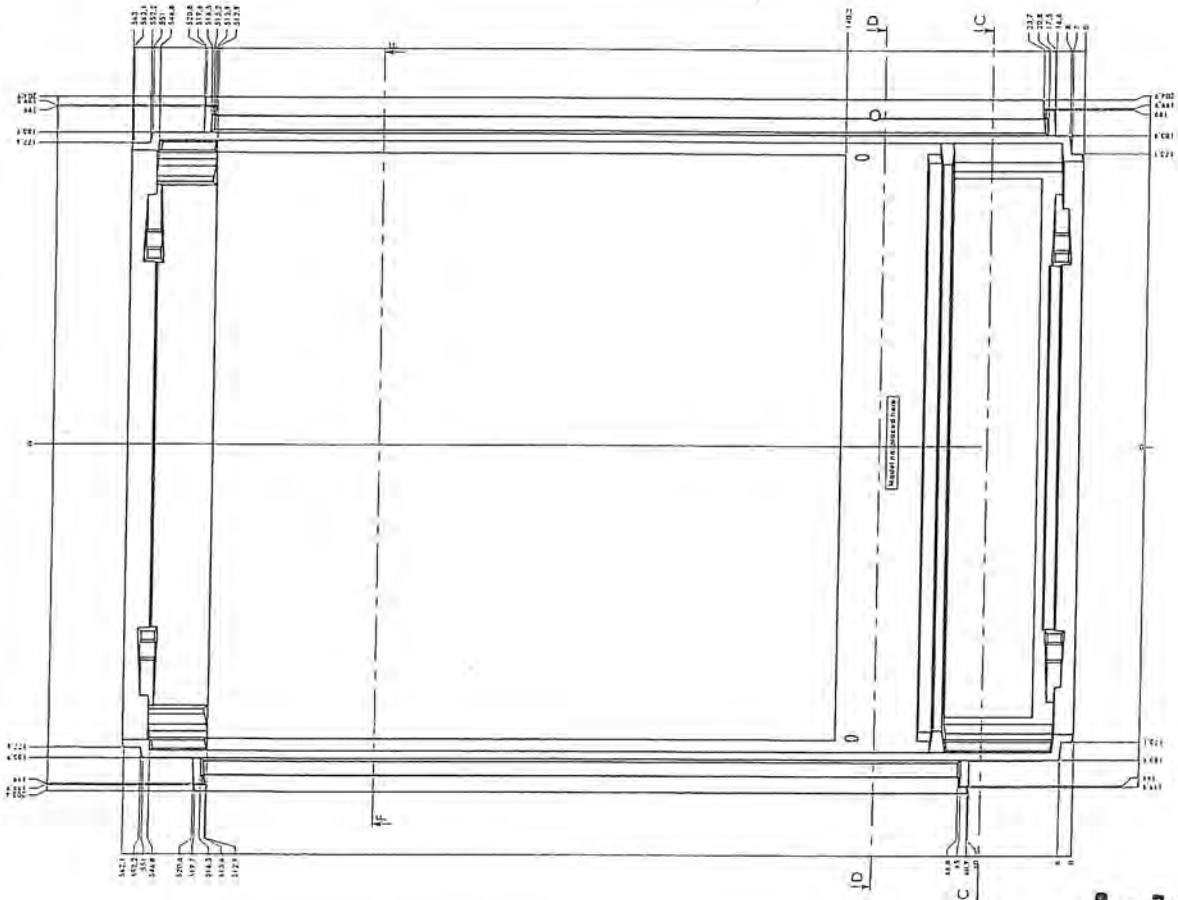


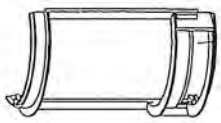


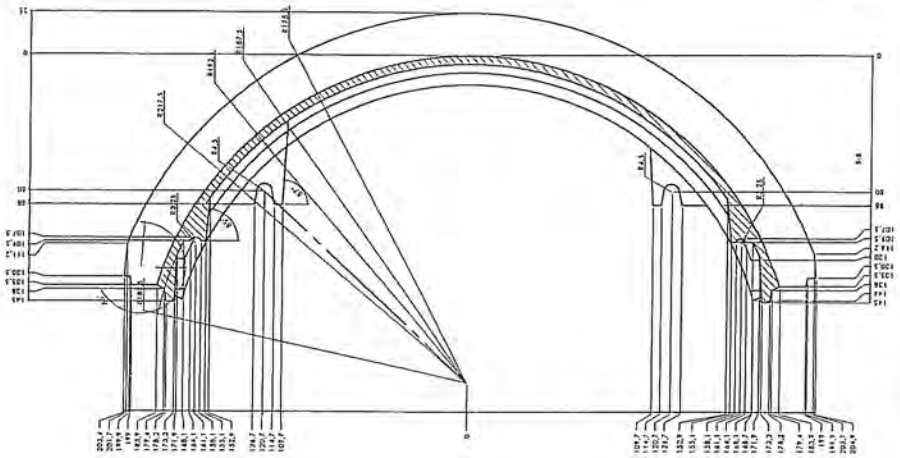


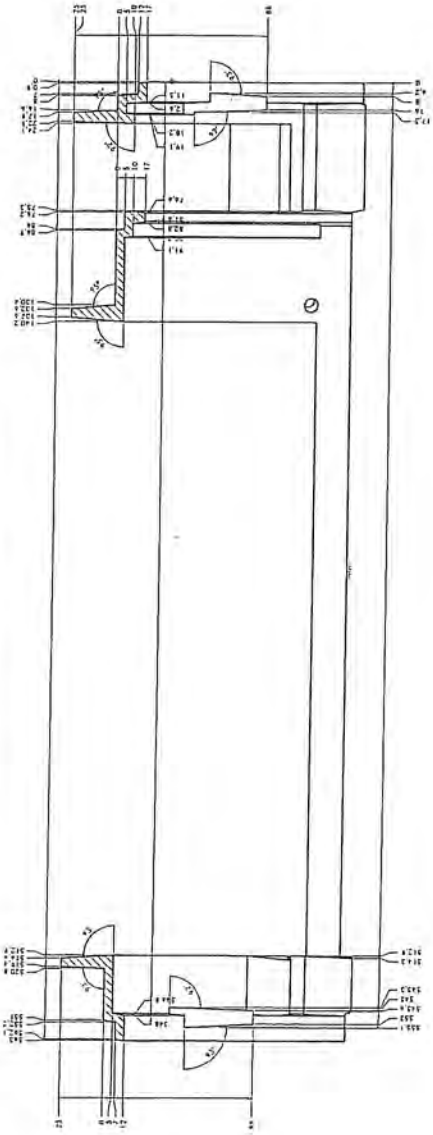


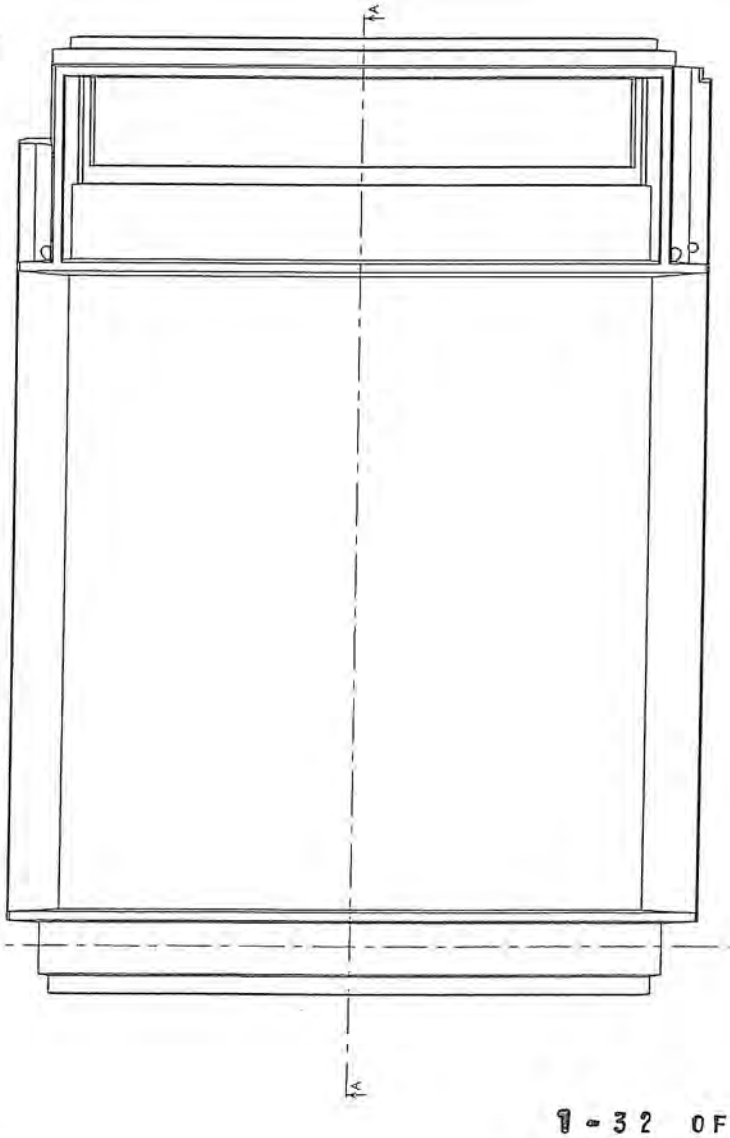


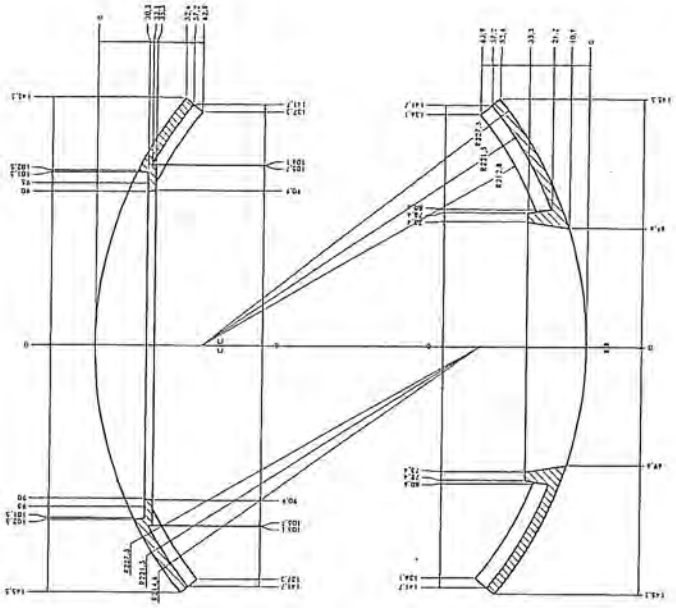


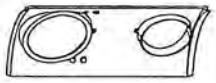


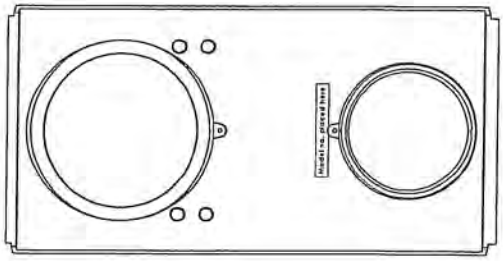


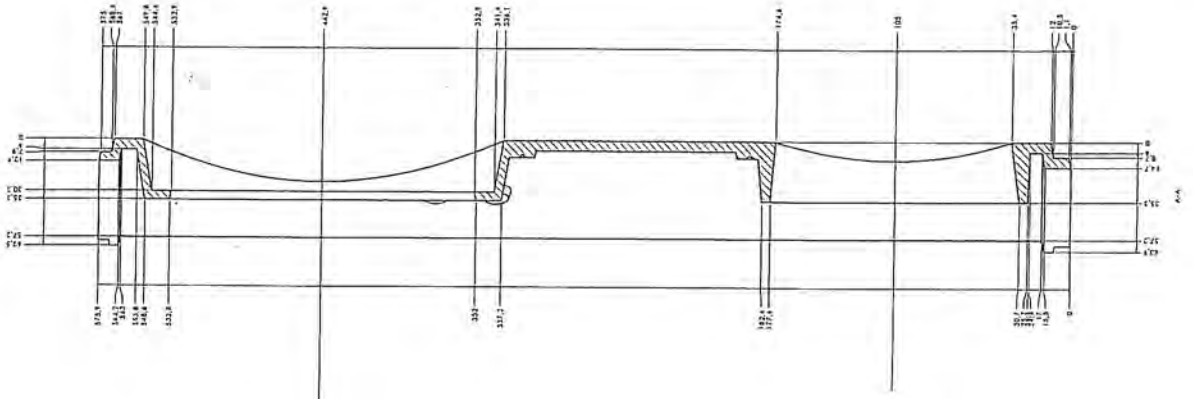


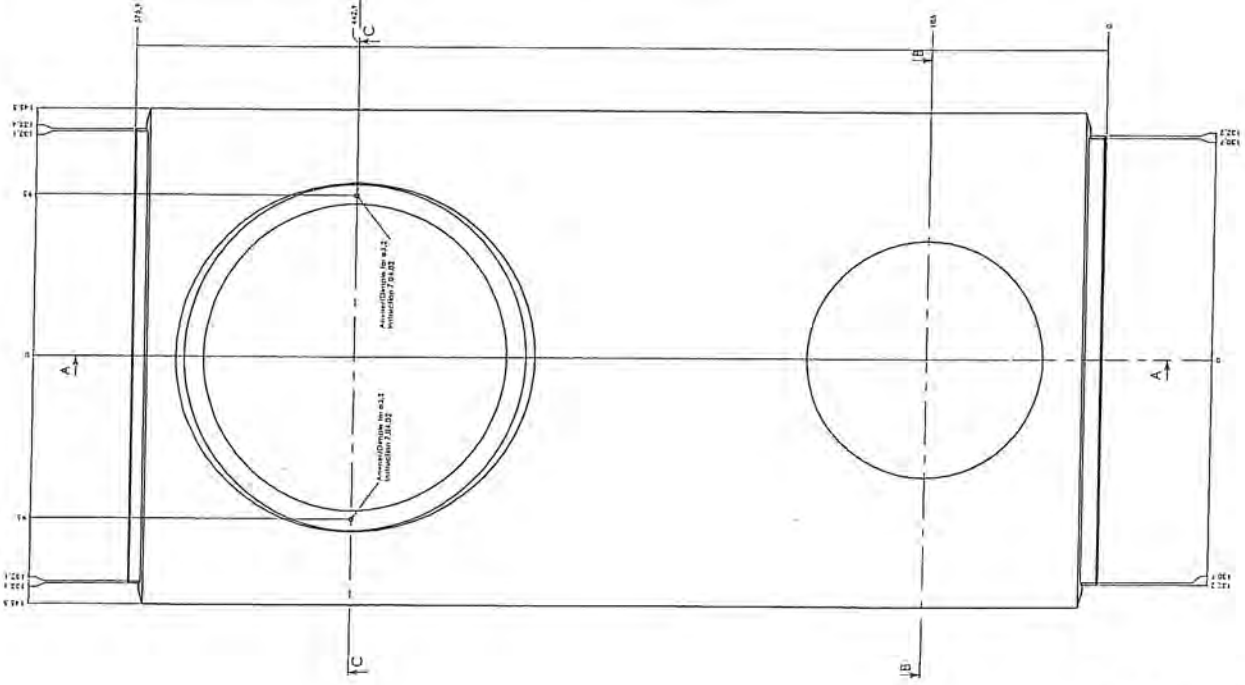


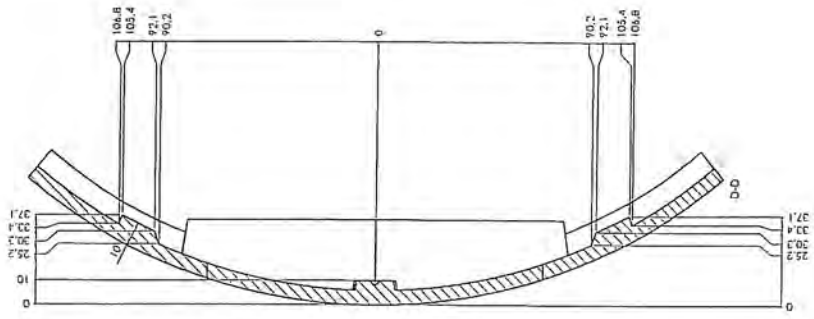


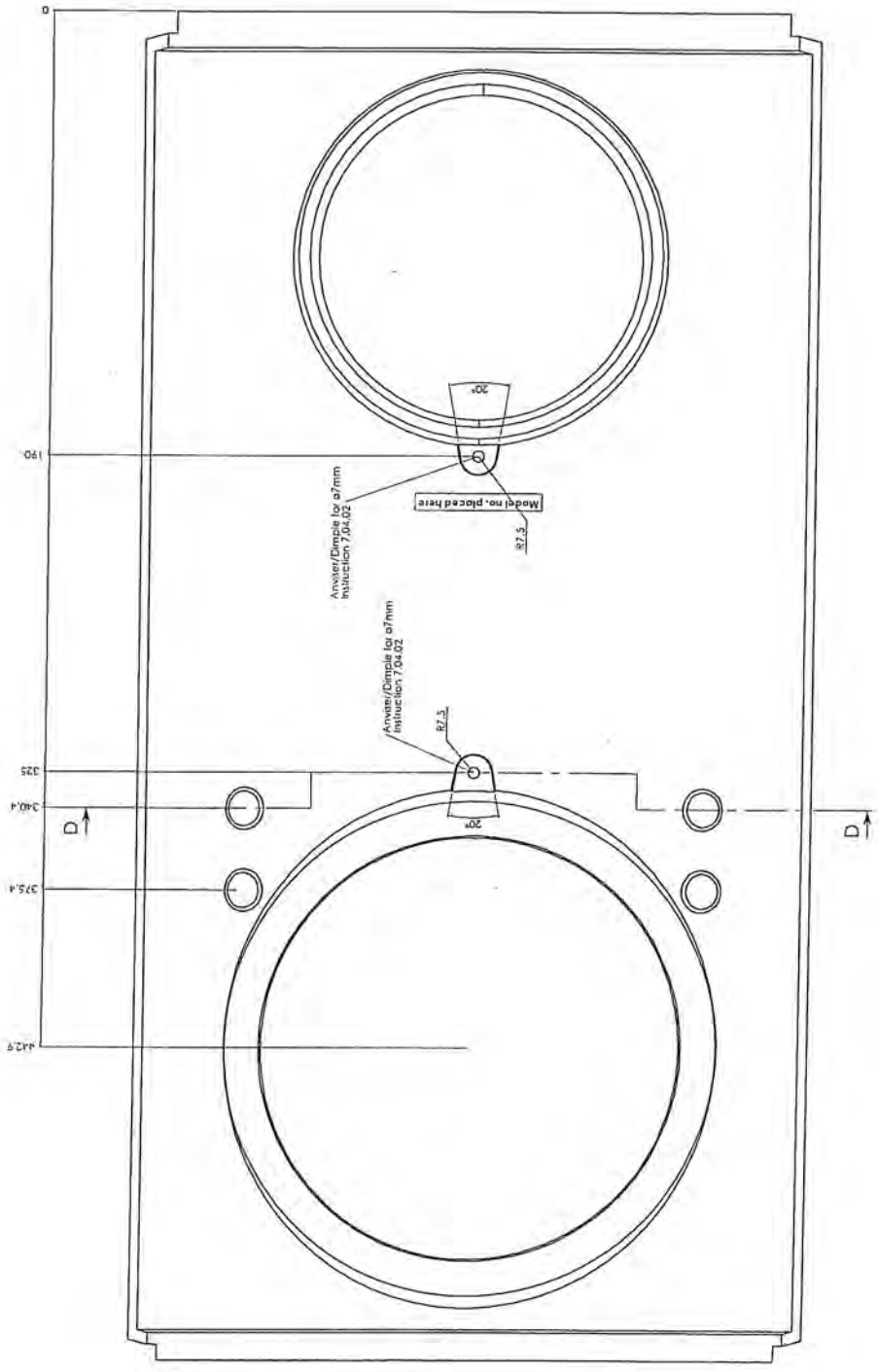




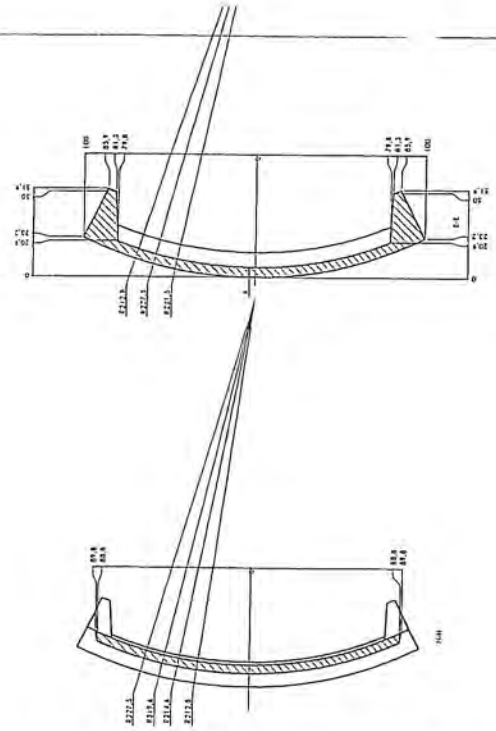


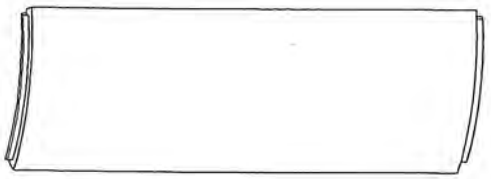


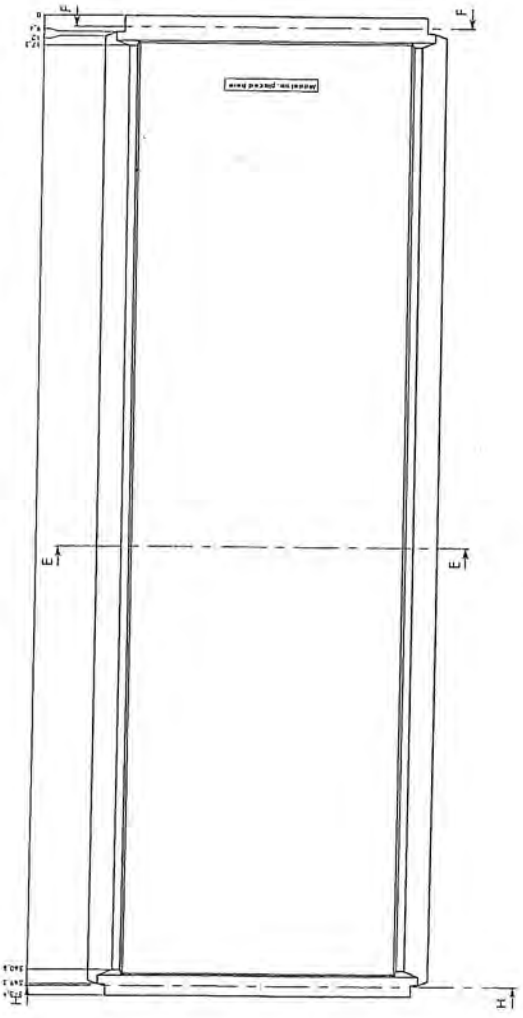


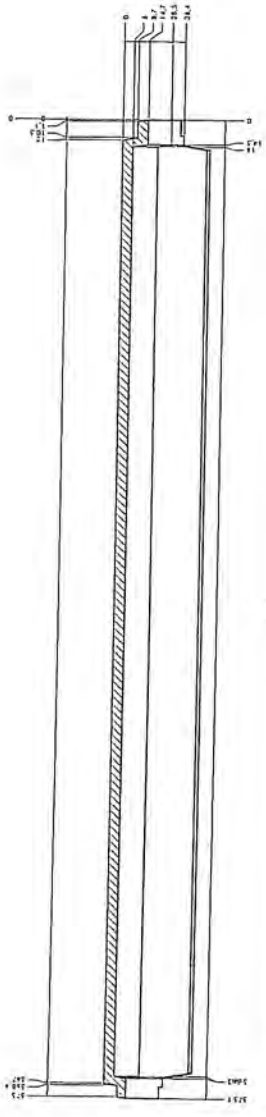


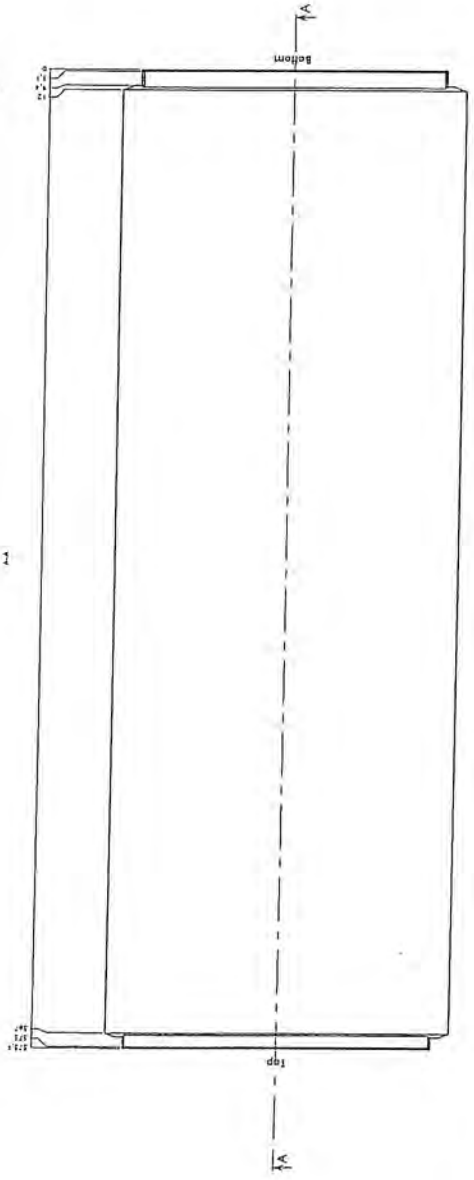
Bagplade udv. 7600		A1	
Rear Plate outside 7600		1:1	
Masse 7600		34761000	
morso		7600-10 a	

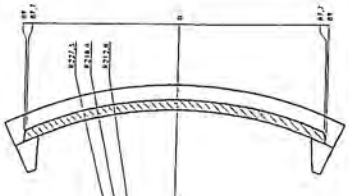


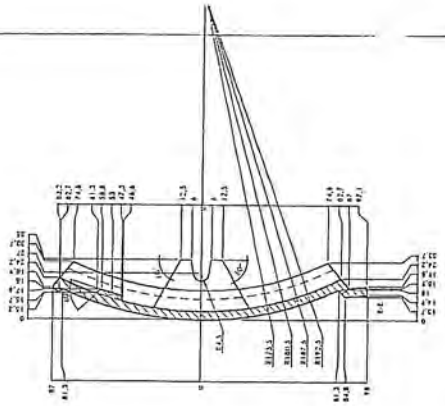


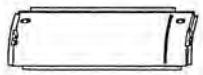


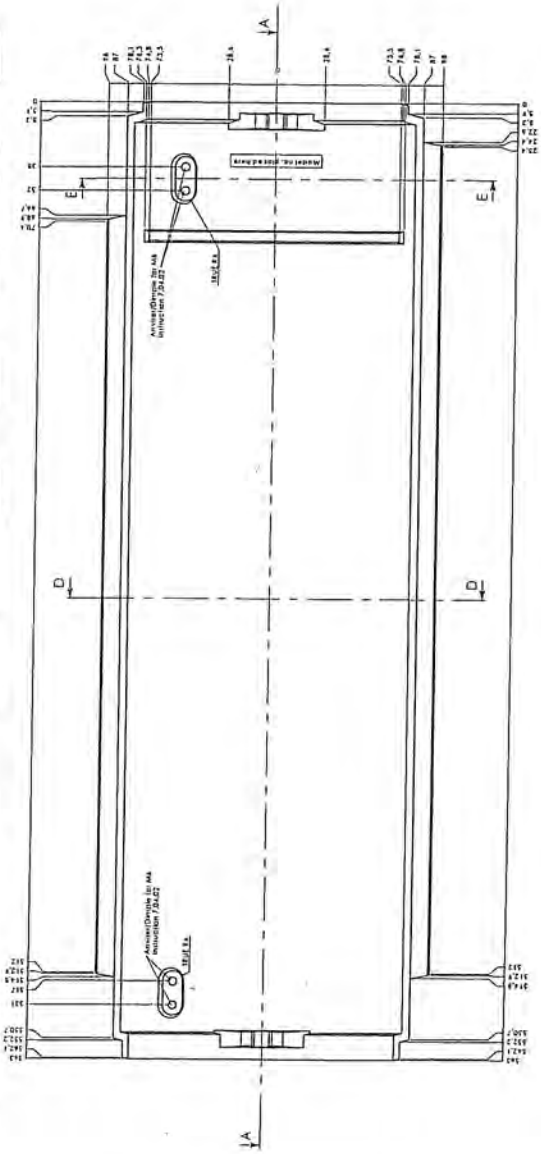


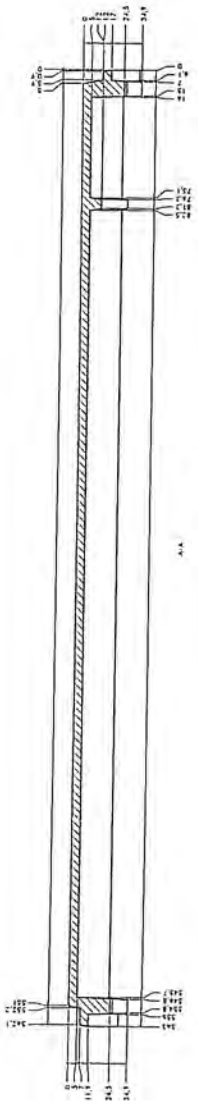


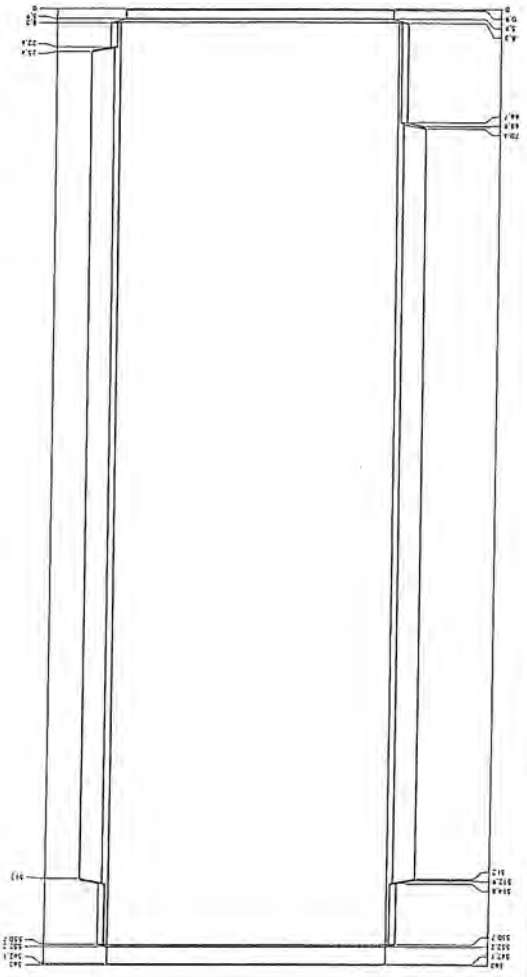


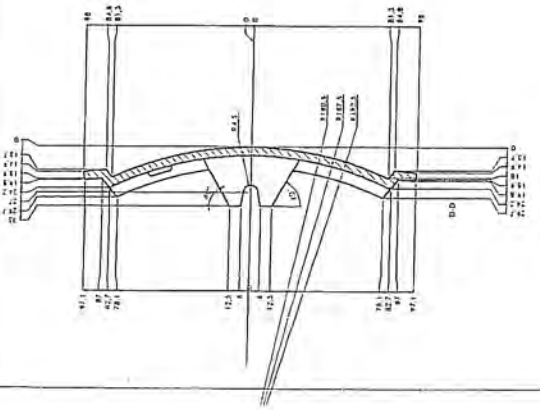


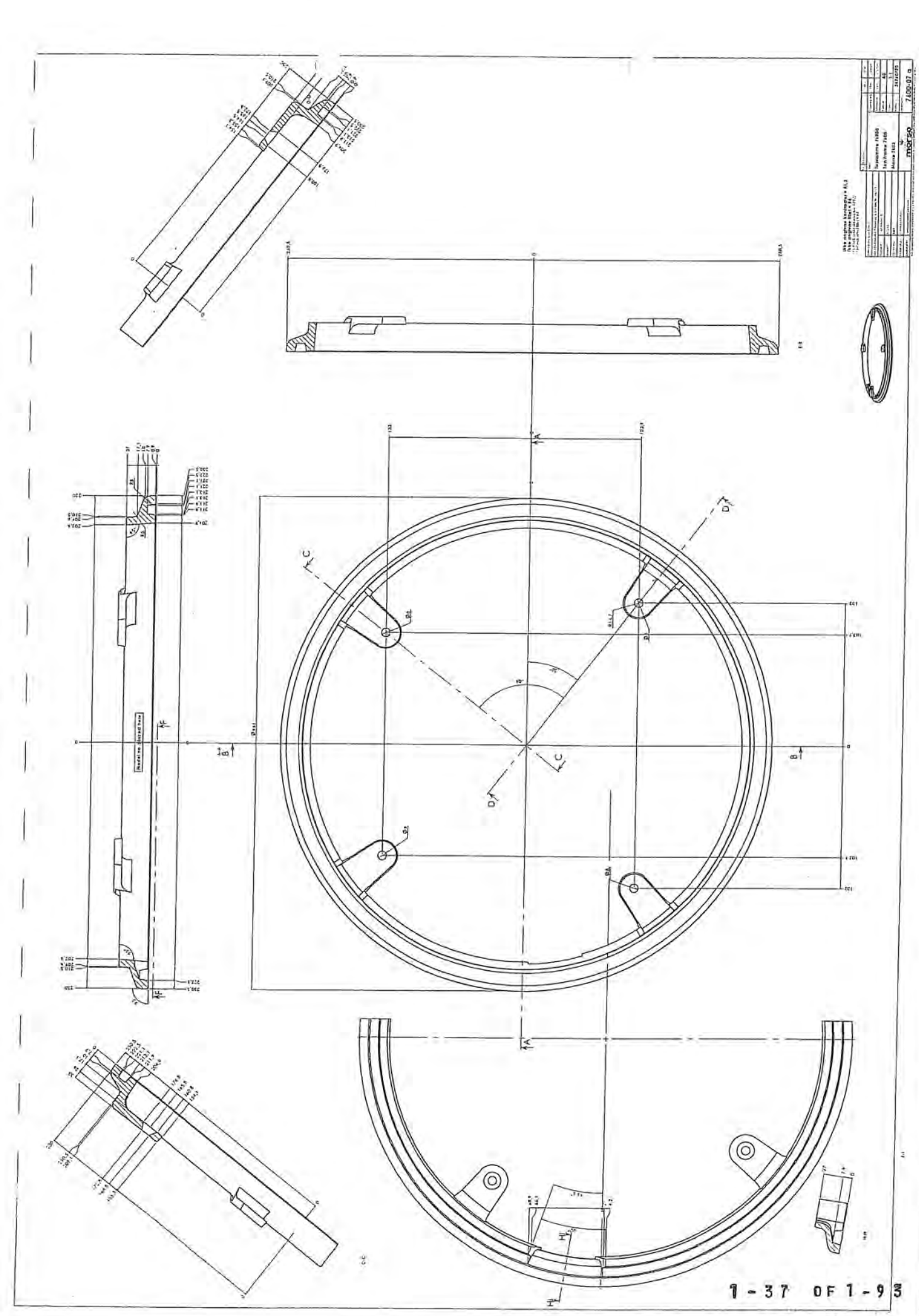


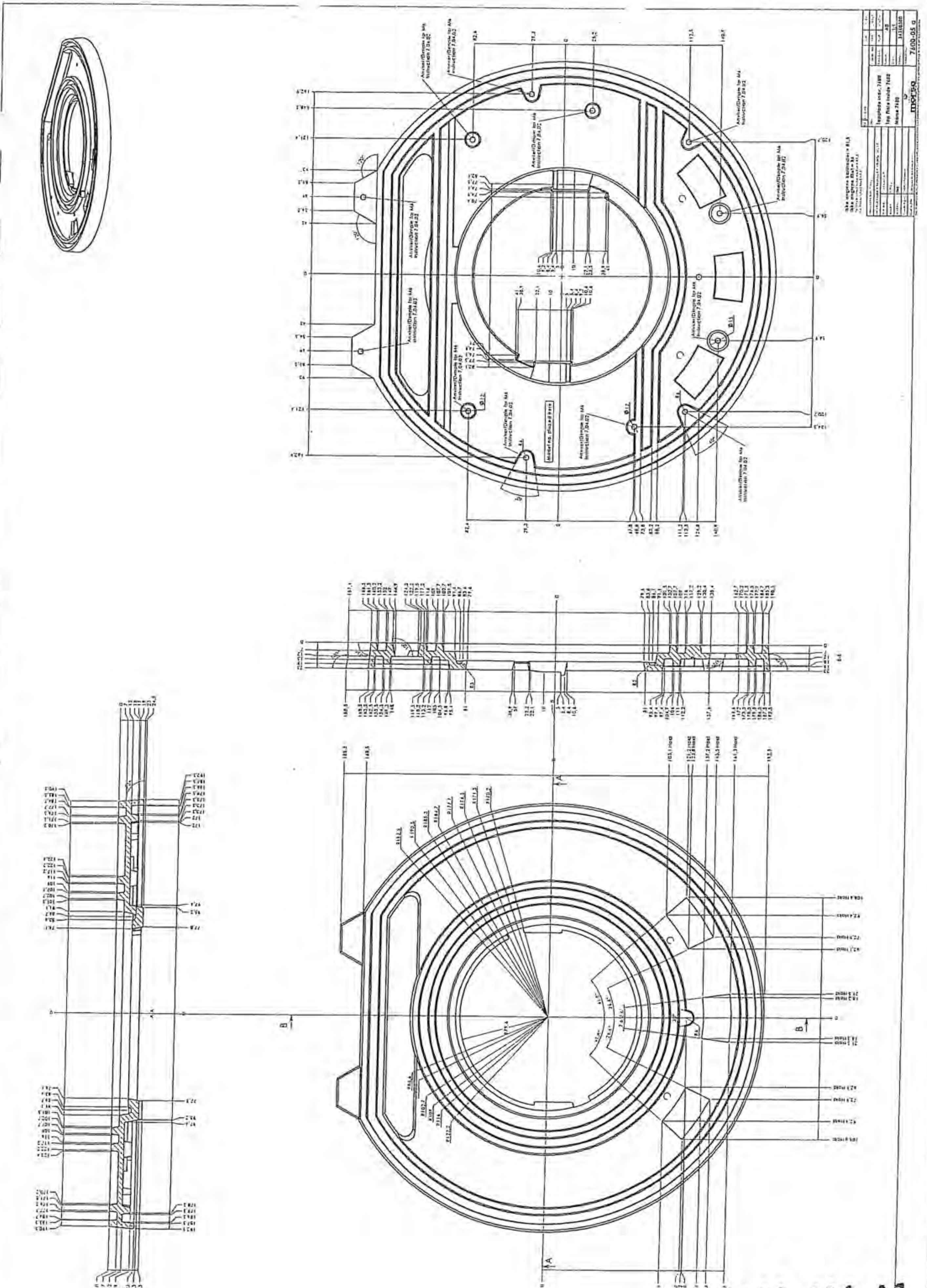


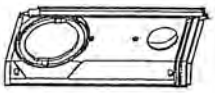


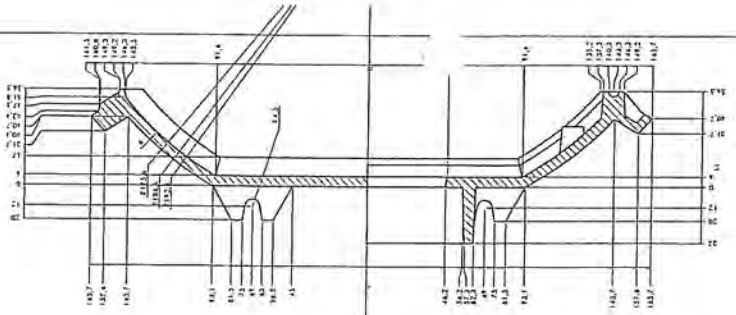


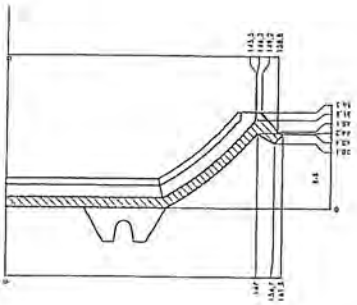


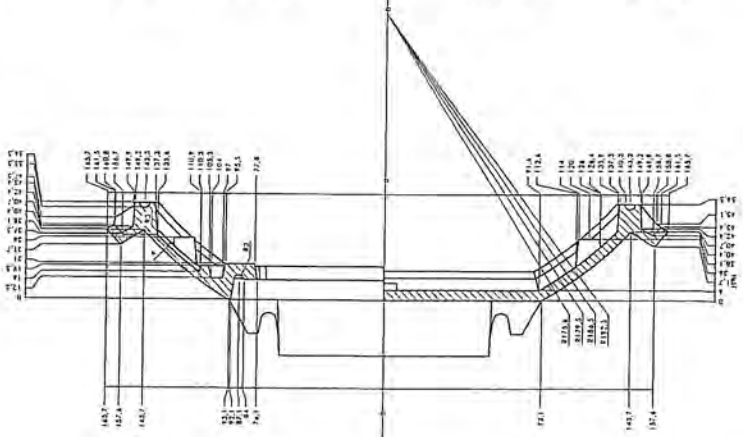


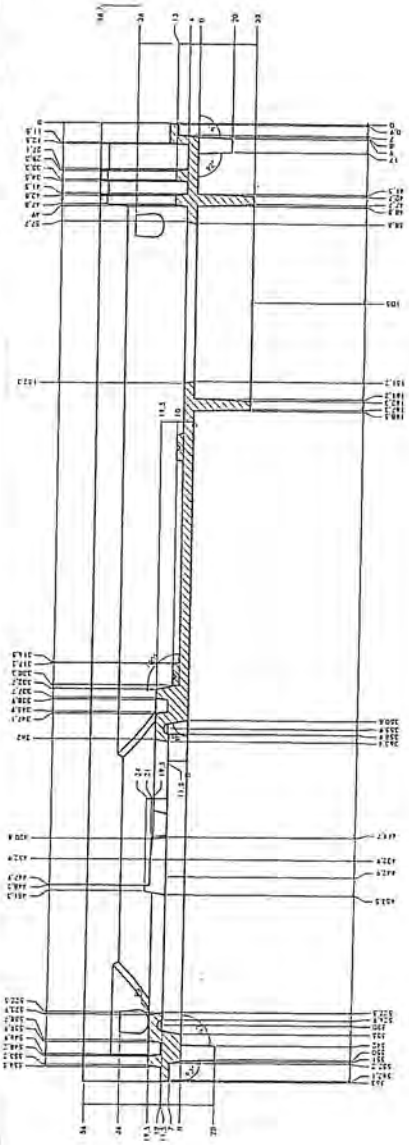


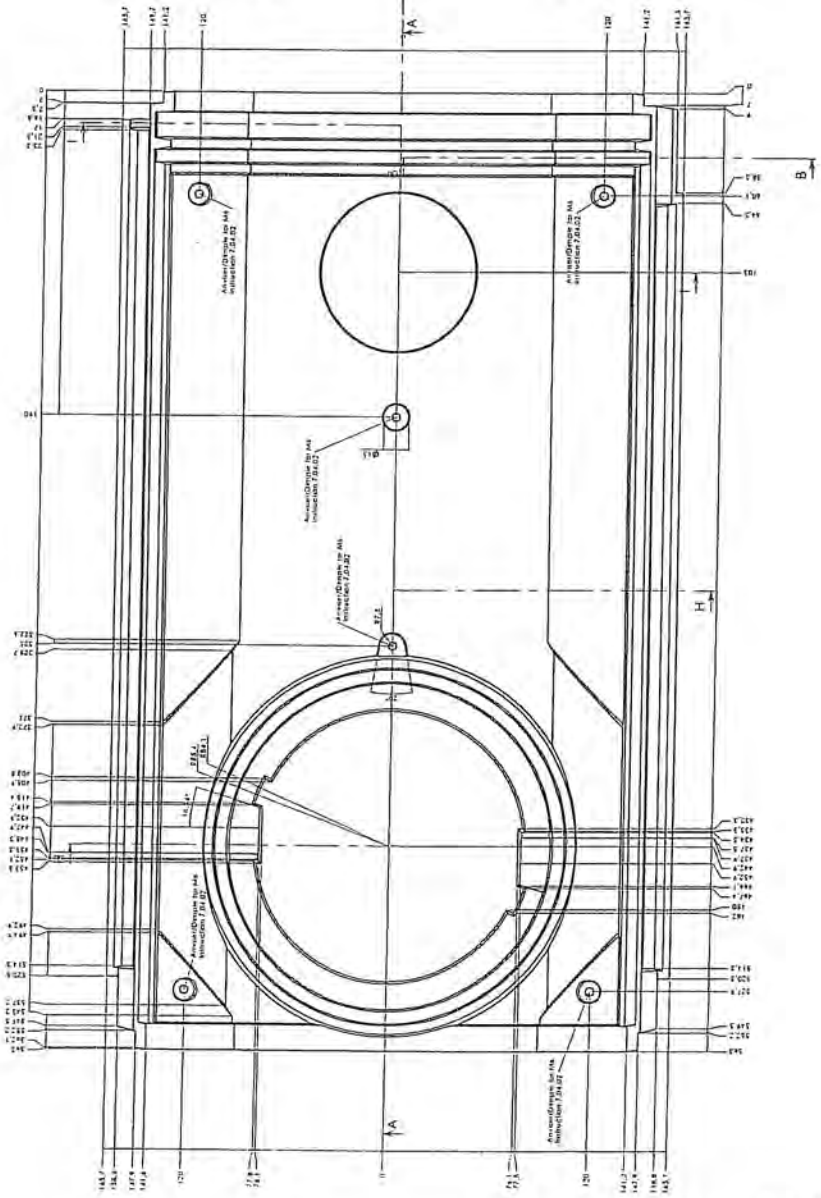


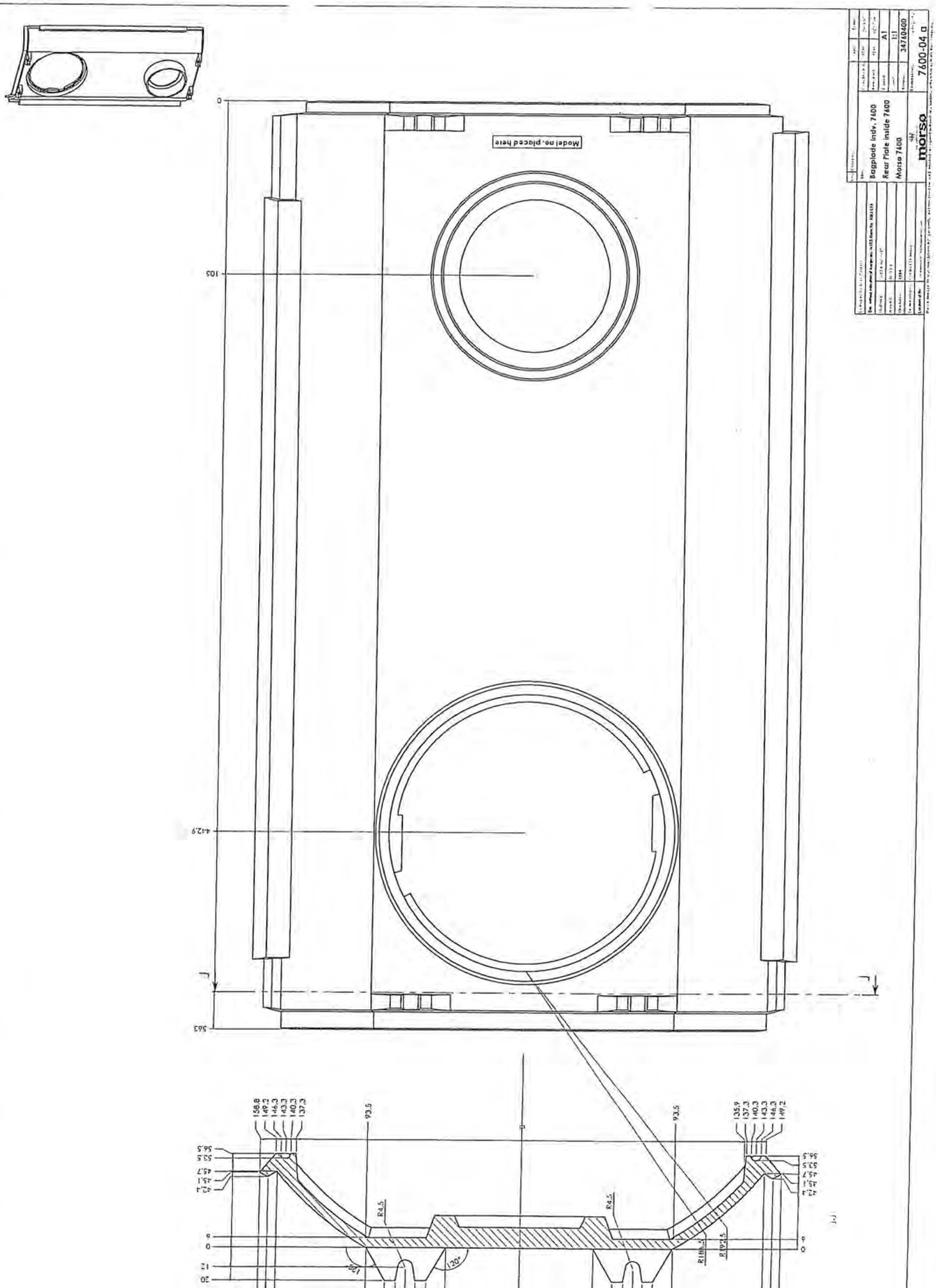











Model no. placed here
Bagplade indv. 7600
Rear Plate inside 7600
Morsø 7600
morsø
7600-04 a
34760400
A1
1:1
105
412,9
563
J-J
R4,5
120°

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 %

Door Gasket
10", 3/8" Diameter

"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

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

2. Technical Features

2.1 General Remarks

All data stated in this technical delivery specification are to be seen as guideline values.

Those values, for which no generally valid measuring method exist or which are not generally defined (e.g. by a technical standard), are specified and explained.

2.2 Appearance

- Transparent, slightly coloured due to the material composition and production process
- Surface appearance: plane, slightly textured due to the production process

2.3 Mechanical Characteristics

2.3.1 Density

ρ	approx. 2.6 g / cm^3

2.3.2 Modulus of Elasticity

E	approx. 93×10^3 MPa

2.3.3 Poisson's Ratio

μ	approx. 0.25

2.3.4 Bending Strength

The bending strength testing is to be accomplished according to DIN EN 1288 part 5 (R45).

$\overline{\sigma}_{bB}$	approx. 35 MPa

2.3.5 Impact Resistance

The impact resistance of ROBAX® depends on the kind of installation, the size and thickness of the panel, the kind of impact, the geometry of the panel and especially here on the drilled holes and their position on the ROBAX® panel.

Therefore information regarding the impact resistance can only be given with knowledge of the respective application (especially in combination with the technical standards regarding impact resistance that have to be met for single applications). Corresponding guideline values on request.

2.4 Thermal Characteristics

2.4.1 Coefficient of Mean Linear Expansion

$\alpha_{(20-700°C)}$ $(0 \pm 0.5) \times 10^{-6}$ /K

2.4.2 Mean Specific Thermal Capacity

$c_{p(20-100°C)}$ approx. 0.8×10^{3} J / (kg · K)

2.4.3 Thermal Conductivity

$\lambda_{(90°C)}$ approx. 1.6 W / (m · K)

2.4.4 Resistance to Temperature Differences (RTD)

Resistance of the panel to temperature differences between heated zone and cold panel edge (room temperature).

No cracking due to thermal stress at $T_{es,\,max}$ [1)] ≤ 700°C

2.4.5 Thermal Shock Resistance

Resistance of the panel to thermal shock when the hot panel is quenched with cold water (room temperature).

No cracking due to thermal stress at $T_{es,\,max}$ [1)] ≤ 700°C

2.4.6 Temperature / Time Load Capacity (under consideration of items 2.4.4 and 2.4.5)

The temperature / time load capacity specifies the maximum permissible temperature for given load times for the fireplace panels, below which no cracking due to thermal stress occurs.

The value pairs specified in the following table 2.1 are relevant to the practical use of the glass ceramic material as fireplace panel. The temperature values refer to the hottest point on the exterior side of the panel ($T_{es,\,max}$) because this temperature can be measured more easily and more reliably.

[1)] $T_{es,\,max}$: Maximum temperature on the exterior side of the panel, that means the reverse side of the heat source, at the hottest point

Load temperature $T_{es, max}$ [1]	Load time
560°C (1040°F)	5000 hr
610°C (1130°F)	1000 hr
660°C (1220°F)	100 hr
710°C (1310°F)	10 hr
760°C (1400°F)	5 hr

Table 2.1: Temperature / time load capacity for ROBAX® panels

Note:

For ROBAX® fireplace panels the temperature / time load capacity specified in table 2.1 must be maintained. It must be ensured that this temperature / time load capacity is not exceeded during use, to prevent cracking due to thermal stress.

The temperature / time load data for even temperature distributions within an entire glass ceramic panel (e.g. homogeneous heating conditions in a testing furnace) are given in table 2.2. This data is to be seen purely as characteristic data for the glass ceramic material itself. It is not typical for use of the glass ceramic material as fireplace panels, which have a temperature distribution totally different from evenness. The temperatures refer to the homogeneous heating of the ROBAX® panel (T_{hom}).

Load temperature T_{hom} [2]	Load time
700°C (1292°F)	6000 hr
750°C (1382°F)	750 hr
775°C (1427°F)	275 hr
800°C (1472°F)	100 hr
825°C (1517°F)	35 hr

Table 2.2: Temperature / time load capacity for uniformly heated ROBAX® panels

[1] $T_{es, max}$: Maximum temperature on the exterior side of the panel, that means the reverse side of the heat source, at the hottest point

[2] T_{hom}: Homogenous temperature, i.e. material temperature under homogeneous heating conditions

2.5 Chemical Characteristics of Base Material

2.5.1 Acid Resistance

DIN 12116	at least class S3

2.5.2 Alkaline Resistance

based on ISO 695	at least class A2

2.5.3 Hydrolytic Class

DIN ISO 719	class HGB 1

2.5.4 Change of Surface due to Use

ROBAX® has a good resistance against chemical surface attack. In isolated cases and under special critical conditions, e.g. aggressive exhaust gases (acidification at high temperatures) changes of the surface may occur. For such applications practice tests have to be carried out before being used.

Table 6.2 contains the permissible overall torsion values of round bent panels.

	Panel Size A		
	$A \leq 20$ dm²	20 dm² < $A \leq 40$ dm²	40 dm² < A
Permissible overall torsion s_T [mm]	2.5	4	5

Table 6.2: Permissible overall torsion of round bent panels (see also fig. 6.1)

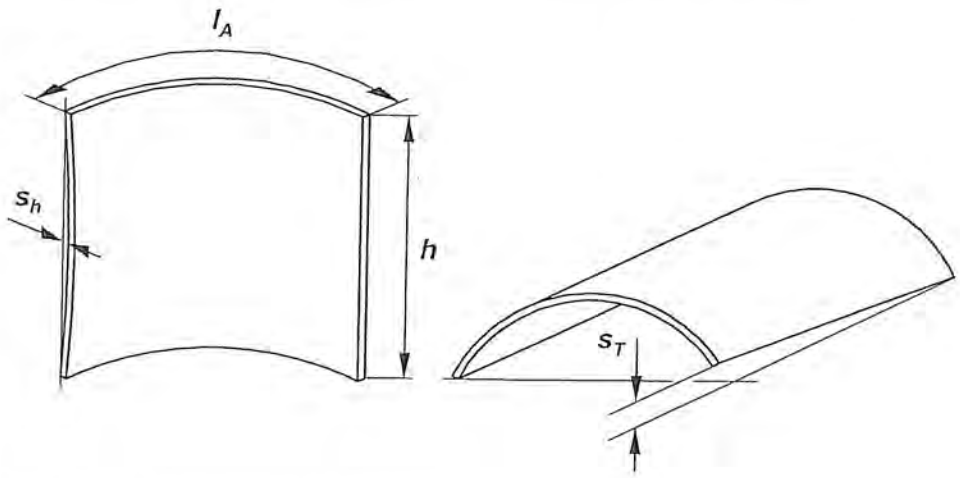


Fig. 6.1: Round bent ROBAX® panels

All geometric tolerances are specified by means of a two-dimensional enveloping contour. For testing the geometric tolerances a flat plastic gauge with a defined contour slot is used. The geometry of the contour slot is determined by the radius of curvature of the panel R_{soll}, by the arc length l_A and by the tolerance of the contour slot widths s_i, s_a (see fig. 6.2). If required the drawing of the contour slot gauge can be provided for the customer.

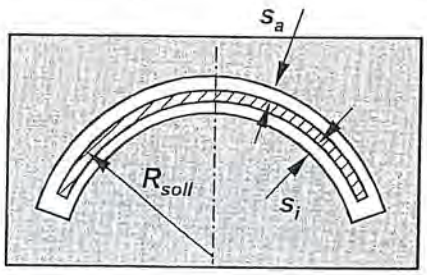


Fig. 6.2: Contour slot gauge geometry for round bent ROBAX® panels

The tolerances of the contour slot widths for round bent panels are given in table 6.3.

Aperture angle α_B	Arc length l_A					
	185 mm < l_A ≤ 400 mm		400 mm < l_A ≤ 600 mm		600 mm < l_A ≤ 1100 mm	
	s_i	s_a	s_i	s_a	s_i	s_a
α_B ≤ 130°	1.0 mm	1.0 mm	1.25 mm	1.25 mm	1.25 mm	1.25 mm
130° < α_B ≤ 180°	1.25 mm	1.25 mm	1.5 mm	1.5 mm	1.5 mm	1.5 mm

Table 6.3: Tolerances of the contour slot widths s_i, s_a for round bent panels

The glass ceramic panel must easily fit into the contour slot gauge.

6.2 Material Characteristics

The material characteristics comply with the specifications of item 3.2, incl. subitems.

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/m³	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.

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www.skamol.com

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

March 2004

Engineering Drawings/Blueprints (Remainder)

7600 - Reservedelsliste

* Revideret: 09.05.2008 RSV

POS.NR.	PARTS	BESKRIVELSE	7642 NA 647609xx	7644 NA 647610xx	7648 NA 647611xx	7670 NA 647612xx
1	Base plate	Bundplade	447601xx	---	---	447150xx
2	Top frame	Topramme	447607xx	447607xx	447607xx	447607xx
3	Door	Fyrdør	447603xx	447603xx	447603xx	447603xx
4	Front frame	Forramme	447656xx	447656xx	447656xx	447656xx
5	Rear plate, outside	Bagplade udv.	447610xx	447610xx	447610xx	447652xx
6	Top plate, outside	Topplade udv.	447611xx	447611xx	447611xx	447611xx
7	Rear plate, inside	Bagplade indv.	44760400	44760400	44760400	44765100
8	Side plate, inside, right	Sideplade indv. højre	447606xx	447606xx	447606xx	447606xx
9	Side plate, inside, left	Sideplade indv. venstre	447630xx	447630xx	447630xx	447630xx
10	Top plate, inside	Topplade indv.	447605xx	447605xx	447605xx	447605xx
11	Glass	Glas	79760100	79760100	79760100	79760100
12	Air Canal, top	Luftkanal top	44761500	44761500	44761500	44761500
13	Air Canal, rear	Luftkanal bag	44765400	44765400	44765400	44765400
14	Intermediate plate	Mellembund	34761200	34761200	34761200	34761200
15	Brick, back	Bagsten	79760700	79760700	79760700	79760700
16	Air Canal, front	Luftkanal front	447613xx	447613xx	447613xx	447613xx
17	Side plate, outside	Sideplade udv. - Glat	447609xx	447609xx	447609xx	447609xx
18	Brick, side, right	Sidesten højre	79760300	79760300	79760300	79760300
19	Brick, side, left	Sidesten venstre	79760400	79760400	79760400	79760400
20	Ash tray, front	Askeskuffefront	447617xx	447617xx	447617xx	447617xx
21	Ash tray	Askeskuffesvøb	71760400	71760400	71760400	71760400
22	Screw	M6x12 Buttonhead - sort	73861800	73861800	73861800	73861800
23	Secondary Damper	Sek. spjæld	71760100	71760100	71760100	71760100
24	Secondary Handle	Sek. greb	71760200	71760200	71760200	71760200
25	Close plate, sec. Damper	Lukkepl. sek. spjæld	71760300	71760300	71760300	71760300
26	Distance tube	Afstandsstykke ø8x1 L=10mm	71810200	71810200	71810200	71810200
27	Distance tube	Afst.rør ø12x1,5	71810300	71810300	71810300	71810300
28	Washer	6mm Din522C - sort	736106	736106	736106	736106
29	Screw	M6x20 Din933 - A2	74162000	74162000	74162000	74162000
30	Screw	M5x10 Iso7380	73851100	73851100	73851100	73851100
31	Screw	M6x16 Buttonhead - A2	73861300	73861300	73861300	73861300
32	Washer	6mm Din9021 - fzb	791891	791891	791891	791891
33	Screw	M6x20 Din933 -sort	731620	731620	731620	731620
34	Cover	Dæksel	448120xx	448120xx	448120xx	448120xx
35	Fitting for Cover	Lus f. dæksel	71813200	71813200	71813200	71813200
36	Screw	M6X08 Din933 - sort	731608	731608	731608	731608
37	Screw	M6x35 Din933 - sort	731635	731635	731635	731635
38	Rondelle, rear, outside	Rundel bagafgang - Yder	71762100	71762100	71762100	71762100
39	Distance tube	Afstandsrør ø10x1 L=10	541439	541439	541439	541439
40	Rondelle, rear, inside	Rundel bagafgang - Indre	542633	542633	542633	542633
41	Screw	M6x16 iso 7380	73861400	73861400	73861400	73861400
42	Nut	M6 Din934 - sort	735006	735006	735006	735006
43	Screw	3,5 x 9,5 Din7981 pladeskrue - fzb	791835	791835	791835	791835
44	Screw	M6x25 Din933 - sort	731625	731625	731625	731625
45	Washer	10x20x3 mm Specialskive - sort	736210	736210	736210	736210
46	Glass fitting	Glasclips 8100	71814561	71814561	71814561	71814561
47	Glass fitting	Glasclips 1124	790743	790743	790743	790743
48	Screw	M5x08 Din7985 - fzb	742508	742508	742508	742508
49	Screw	M6x12 Buttonhead - A2	73860900	73860900	73860900	73860900
50	Baffle plate, top	Røgledeplade øverst 7600	71761700	71761700	71761700	71761700
51	Screw	M6X12 Din933 - A2	74161200	74161200	74161200	74161200
52	Distance tube	Afstandsrør ø8x1 L=6	54143700	54143700	54143700	54143700
53	Cover	Dæksel 1126	442610xx	442610xx	442610xx	442610xx
54	Bar	Bøjle til røgdæksel	545006	545006	545006	545006
55	Distance tube	Afstandsrør ø10x1 L=8,5	545007	545007	545007	545007
56	Plug f. Door	Tap f. fyrdør bund	71760700	71760700	71760700	71760700
57	Fittig f. Door	Fyrdørsbeslag top	71760600	71760600	71760600	71760600
58	Handle	Lukkemekanisme	71761100	71761100	71761100	71761100
59	Fitting for Flue Collar	Beslag, røgtud	44256700	44256700	44256700	44256700
60	Pedestal	Piedestal	---	---	717605xx	---
61	Fittig f. Door	Beslag tap lukkehage	71761200	71761200	71761200	71761200

7600 - Reservedelsliste

* Revideret: 09.05.2008 RSV

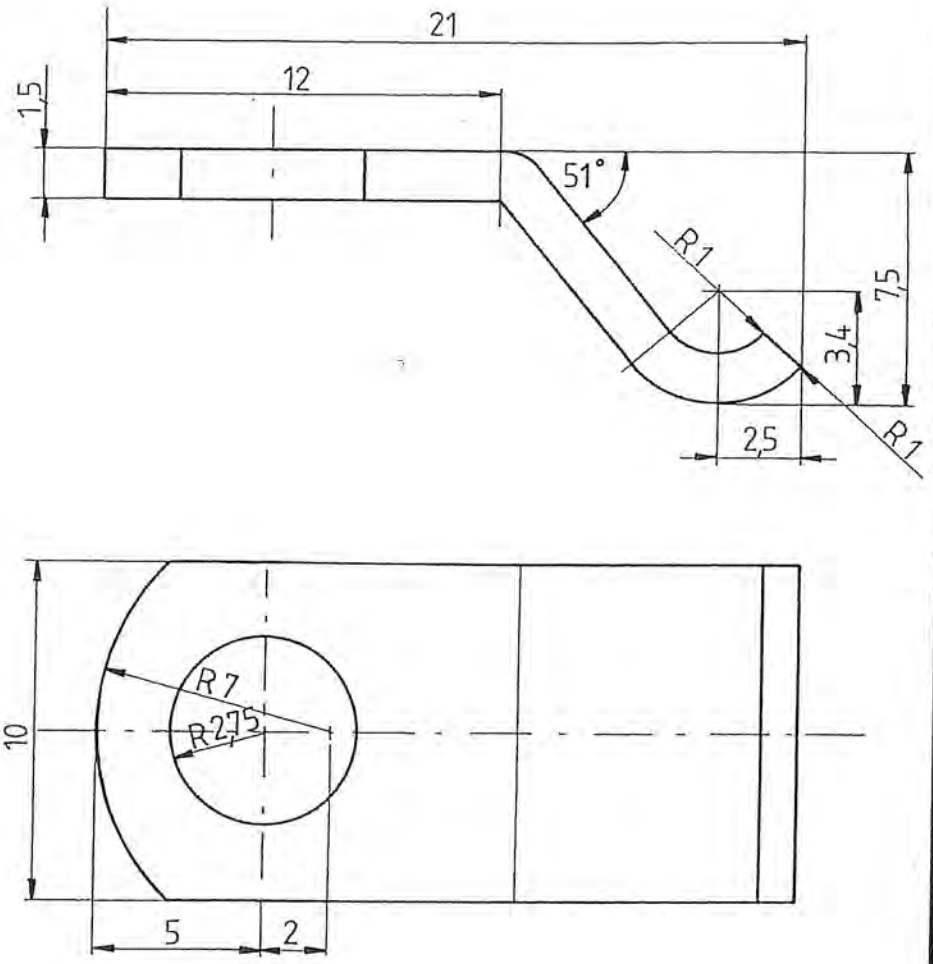
POS.NR.	PARTS	BESKRIVELSE	7642 NA 647609xx	7644 NA 647610xx	7648 NA 647611xx	7670 NA 647612xx
62	Foot, f. Pedestal	Piedestalfod	---	---	447658xx	---
63	Screw	M6x16 Din933 - sort	---	---	731616	731616
64	Screw	M6X06 Din916-45H	739606	739606	739606	739606
65	Screw	M6X16 Din913-45H	73961700	73961700	73961700	73961700
66	Washer	6mm Din125A - messing	746006	746006	746006	746006
67	Screw	M6x25 Din916-45H	739625	739625	739625	739625
68	Flue Collar	Røgtud USA - Fixerbar	443441xx	443441xx	443441xx	443441xx
69	Screw	M6x25 Din965A - fzb	743625	743625	743625	743625
70	Stop Bar	Kuglespærre 4500	544541	544541	544541	544541
71	Baffle plate, cast iron	Støbt røgledeplade 7600 NA	34762700	34762700	34762700	34762700
72	Baffle plate, stainless	Rustfri Røgledeplade 7600 NA	71762200	71762200	71762200	71762200
73	Screw	M6x35 Din933 - A2	74163504	74163504	74163504	74163504
74	Screw	M6X08 Din933 - A2	74160804	74160804	74160804	74160804
75	Jet, pilot air	Dyse Pilotluft 7600 NA	71762300	71762300	71762300	71762300
76	Tightening tape, f. glass	Glasbånd m. tape	79074200	79074200	79074200	79074200
77	Fitting, f. Wall	Vægbeslag	---	---	---	717615xx
78	Fitting, f. fitting f. Wall	Beslag f. vægbeslag	---	---	---	71761600
79	Distance tube	Afstandsrør ø10x1 L=48	---	---	---	54761000
80	Screw	M6x65 Din933 - sort	---	---	---	731665
81	Screw	M6x70 Din933 - sort	---	---	---	731670
82	Washer	06 mm vistop klemskive	---	---	---	746206
83	Door bottum part	Låge underdel	447624xx	447624xx	---	---
84	Base plate, bottom section	Bundplade underdel	447621xx	447626xx	---	---
85	Rubber Stop	Gummistopklods	79082007	79082007	---	---
86	Screw	06 x 12 mask.skr. poz. ph fzb din 7985	742612	742612	---	---
87	Ball track	Kugleløb	79082006	79082006	---	---
88	Pop rivet	04 x 08 popnitte rh din 7337	74700300	74700300	---	---
89	Plate f. Drawer	Mont.plade f. skuffesektion	71760900	71760900	---	---
90	Screw	06 x 12 sort stålsætskrue din 933	731612	731612	---	---
91	Distance plate, Drawer	Afstandsplade skuffe	71761000	71761000	---	---
92	Side plate, bottom	Sideplade underdel	447623xx	447623xx	---	---
93	Rear plate, bottom	Bagplade underdel	447625xx	447625xx	---	---
94	Screw	06 x 08 buttonhead m/flange bn11252/301	73860800	73860800	---	---
95	Drawer Box	Skuffekasse	71760800	71760800	---	---
96	Top plate, bottom	Topplade underdel	44762200	44762200	---	---
97	Washer	10 mm skærmskive ø30/ø10,5/2,5 din9021	79189800	79189800	---	---

	Door complete	Fyrdør komplet	547603xx	547603xx	547603xx	547603xx

Farvekode: xx

21	Black	Sort
22	Gray	Grå

Dato	Kg. 10 stk.



NB! Findes som solidworkspart
1124 / 1124-29 glasclips.prt.
24/7-00 / kou.

edbnr. 790743

LEVERANDØR TIL
DET KGL. DANSKE HOF
morsø
AKTIESELSKABET
N. A. CHRISTENSEN & CO
7900 NYKØBING MORS
TLF. 97 72 13 00

GLASKLIPS.

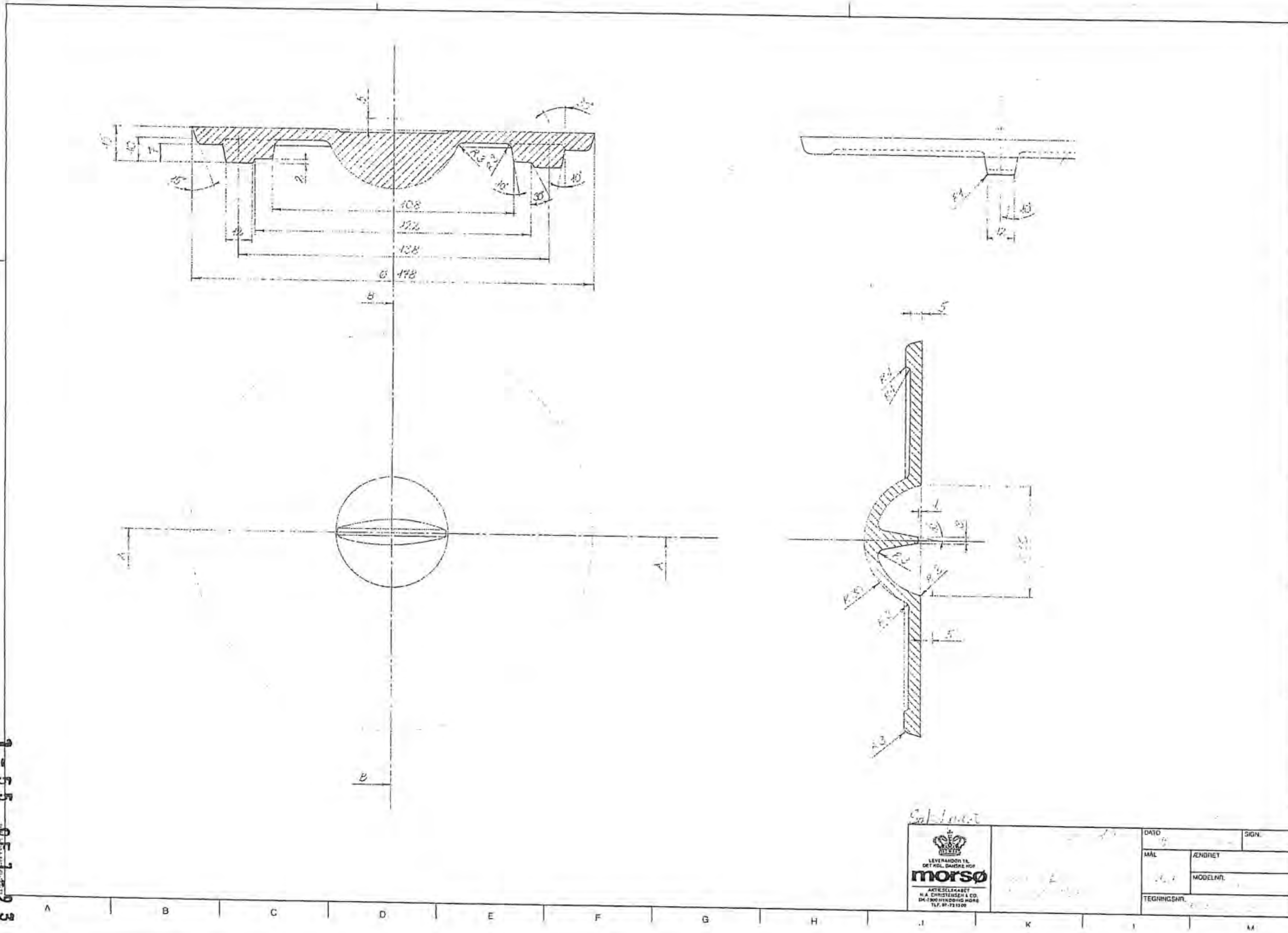
1,5mm rf.plade

werkstoff nr. 14301

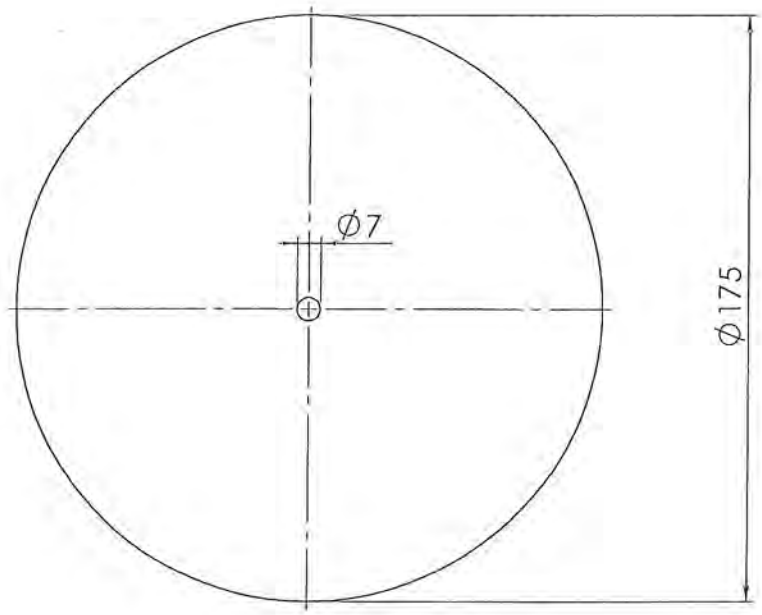
DATO 23-2-93		SIGN. AaGJ	
MÅL 5:1	ÆNDRET 5-12-84		
	MODELNR.		
TEGNINGSNR. 1124-29-4			

RESTO 5526 - MI 8080

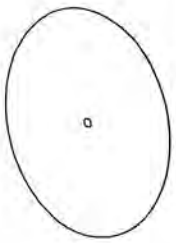
1 - 54 af 7 - 93


108
122
128
Ø 178
15°
10°
30°
LEVERANDØR TIL DET KGL. DANSKE HOF
morsø
AKTIESELSKABET H.A. CHRISTENSEN & CO.
DATO
SIGN.
MÅL
ÆNDRET
MODELNR.
TEGNINGSNR.

1 - 55 OF 7 93



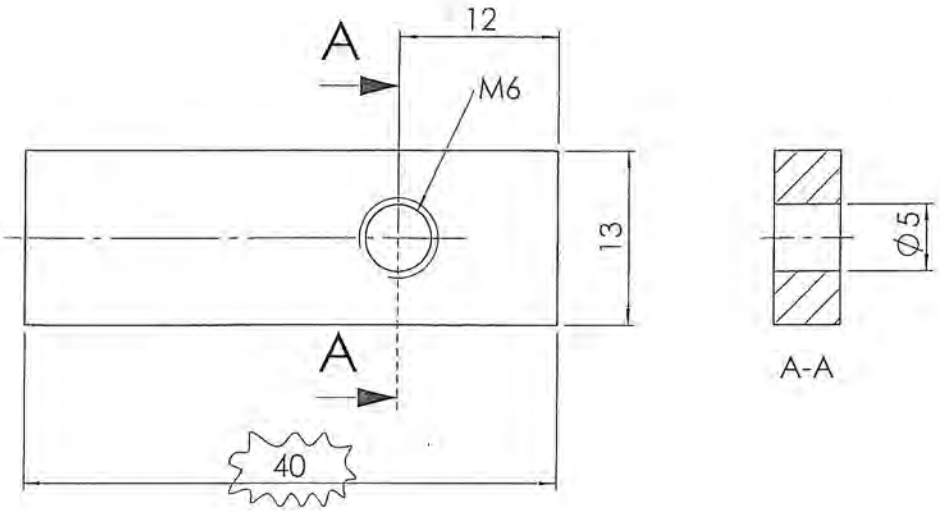
Constructional Drawing
06.08.08



Rev.	Revisions	Sign.:	Date:

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title: Rundel bagafgang - Indre	Construction:	KDU 06.08.08
			Released:	
Material:	Galvaniseret plade		Format:	A4
Weight:	0,09 kg		Scale:	1:2
Model no.	-	Morsø 1126	Itemno.:	542633
Drawingtype:	Emnetegning	morsø	Drawing no.:	1126-107
Location of file:	C:\MDV\tegninger\1126\1126-107 Rundel bagafgang - Indre SLDPRT			

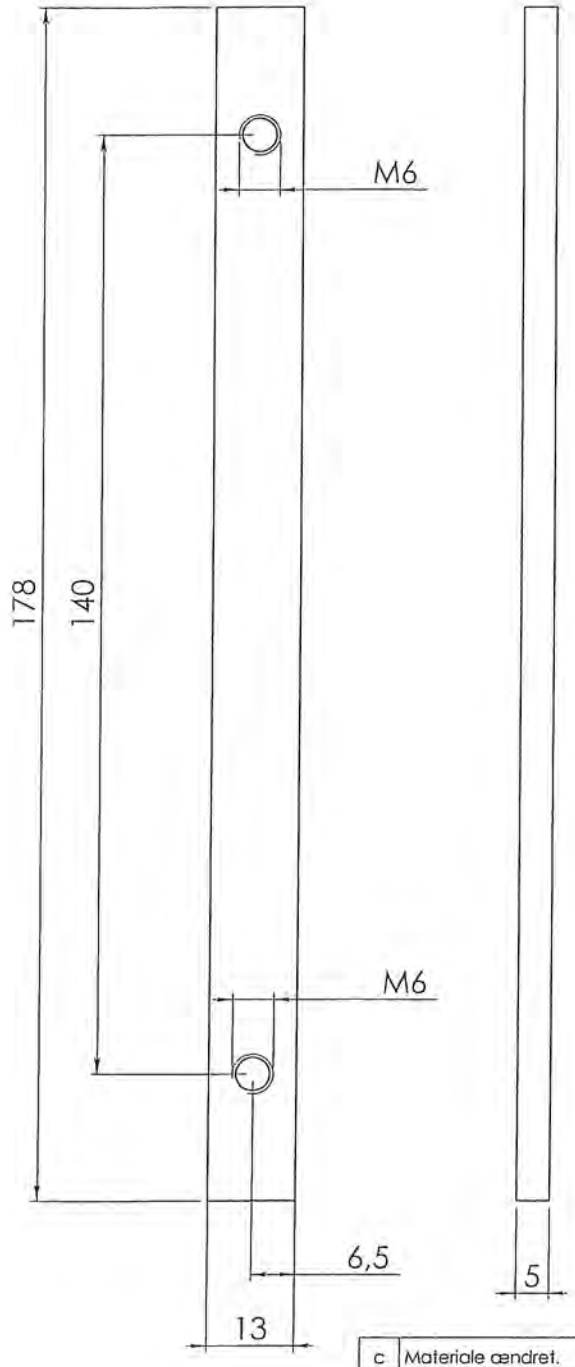
Date of print: 10-11-2008



b	Øget længde.	RSV	11.04.2008
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.:	1400-204 b	
Tegningstype:	Emnetegning						

1400-204 lus med gevind - Sheet1

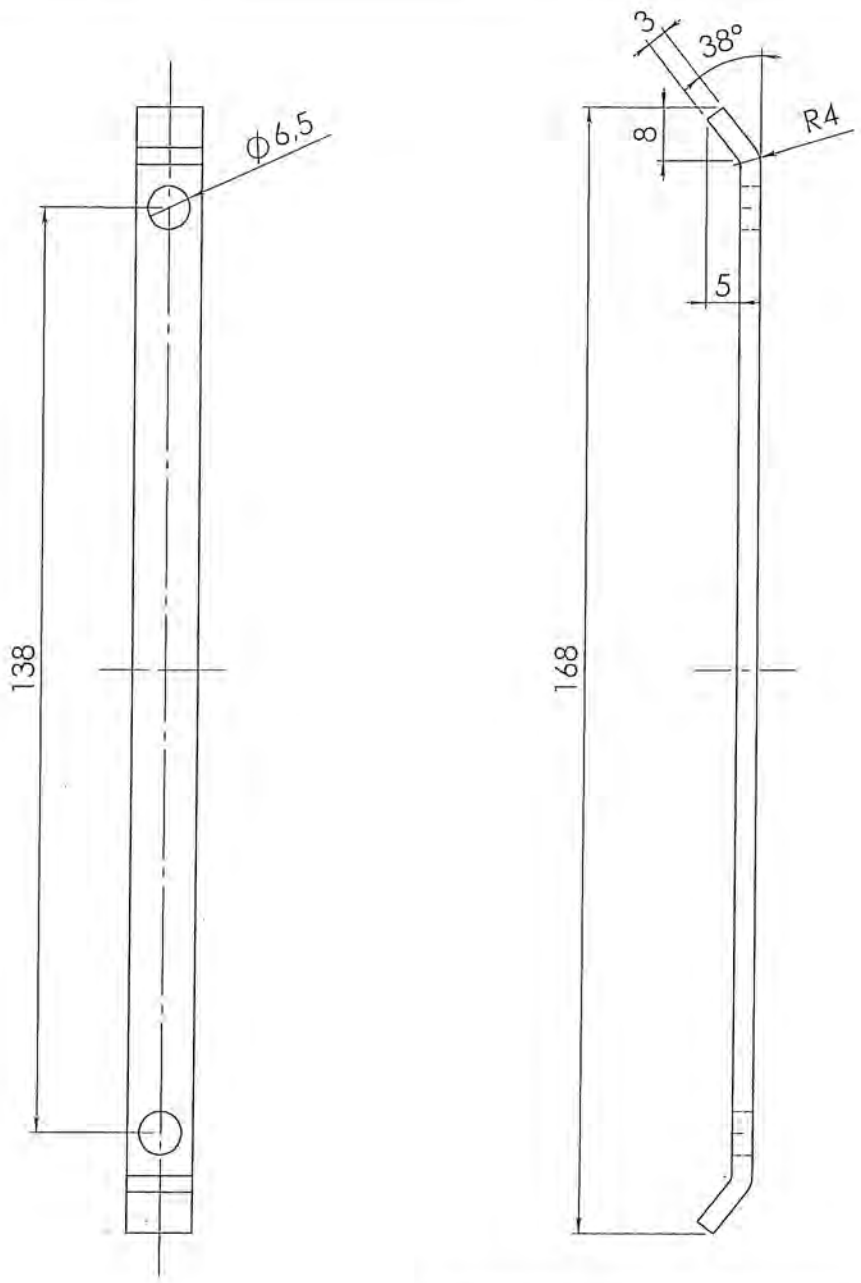


Rev.	Revisions	Sign.:	Date:
c	Materiale ændret.	KDU	16.09.05
b	Kuglespærre ændret udseende.	KDU	18.08.05

Material:	Båndstål sort, varmt valset	Title: Kuglespærre 4500	Construction: RS 14.02.97
Weight:	0,1 kg		Released:
Model no.	-		Format: A4
Drawingtype:	Emnetegning	Morsø 4500	Scale: 1:1
Location of file:	U:\UDV\Tegninger\4500\Tegning\4500-51 kuglespærre 4500 SLDPRT	morsø	Itemno.: 544541
			Drawing no.: 4500-51 c

Date of print: 10-11-2008

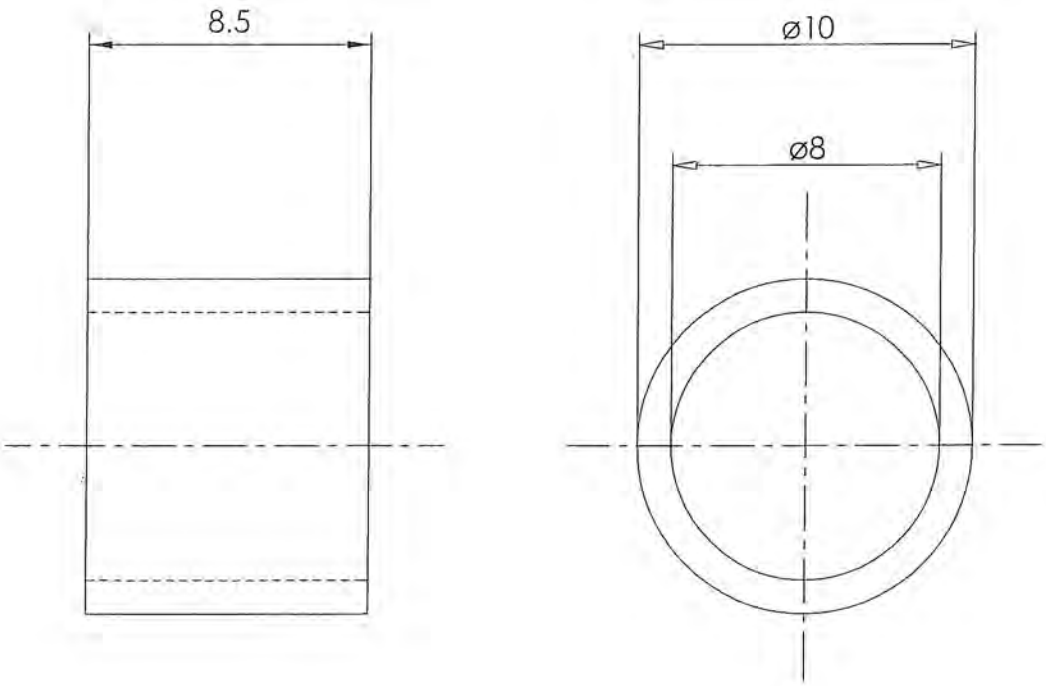
1-58 OF 1-93



Rev.	Revisions	Sign.:	Date:
f	Fjernet gevindhuller og bukket begge ender.	RSV	05.09.05
e	Ændret mål.	RSV	14.12.2001
d	Ændret mål.	RSV	05.03.1999
c	Varenr. + mål cændret.	RSV.	14.02.1997
b	-	KAA.	26.09.1995

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title: Bøjle til røgdæksel	Construction:	CHK 21.11.1994
			Released:	
Material:	Båndstål sort, varmt valset		Format:	A4
Weight:	0,04 kg		Scale:	1:1
Model no.		Morsø 5000	Itemno.:	545006
Drawingtype:	Emnetegning	morsø	Drawing no.:	5000-63 f
Location of file:				

Date of print: 10-11-2008



Ø10x1 Hydraulikrør galv.

Titel: Afstandsrør Til bøjle på røgdæksel	Sign.: RS	Dato: 970214	Revision	Sign.	Dato
	Tegn.form.: A4	Målforhold 5:1			
Tegningsnummer: 5000-64-4	Varenummer: 545007				
morsø Jernstøberi A/S	Filnavn: 5000-64				

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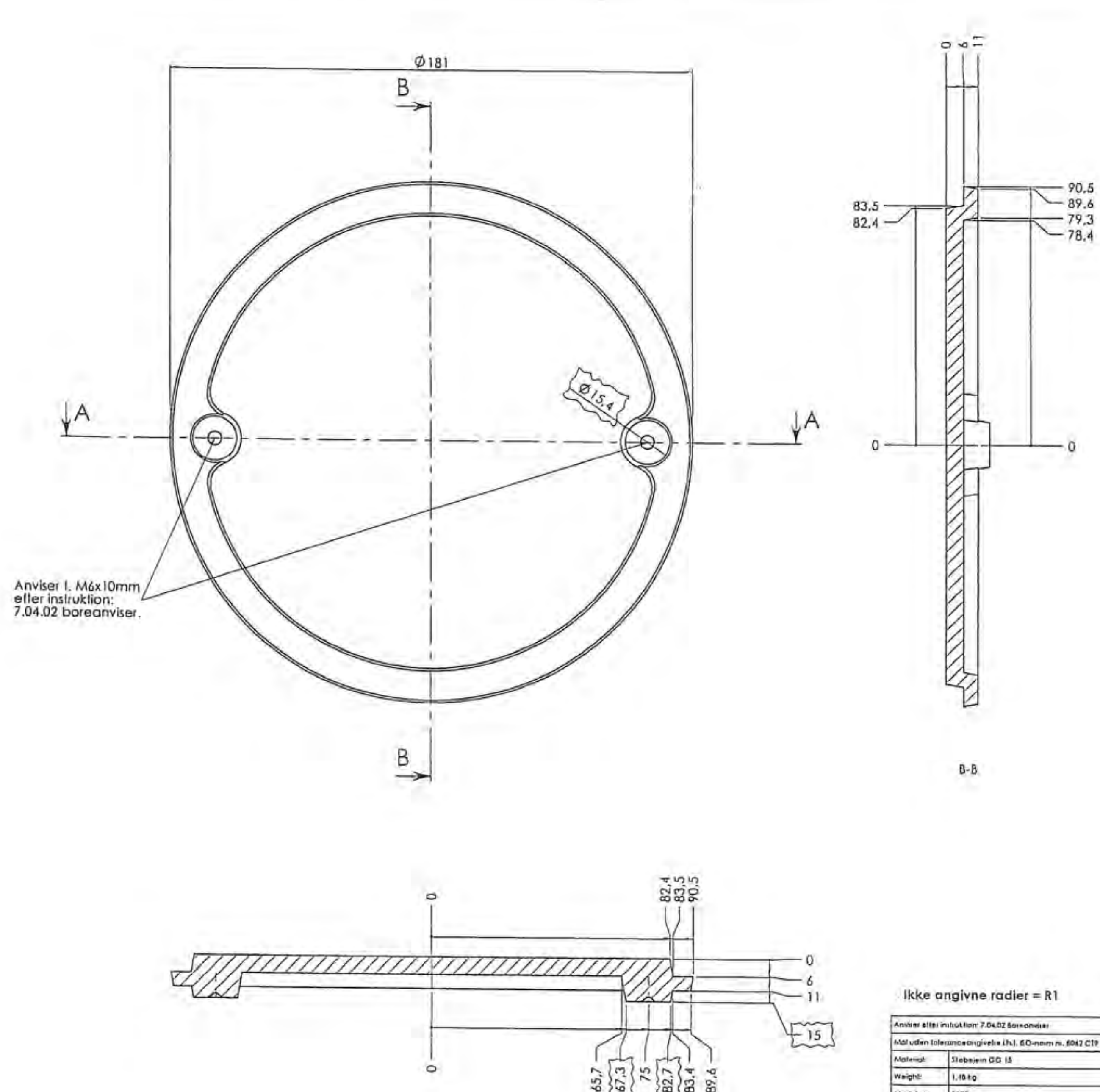
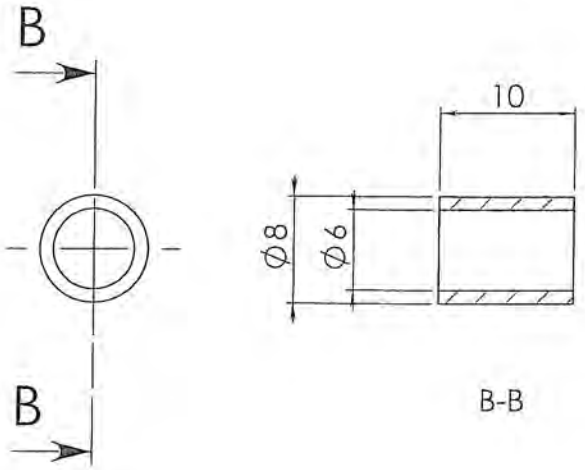


Ikke angivne radier = R1

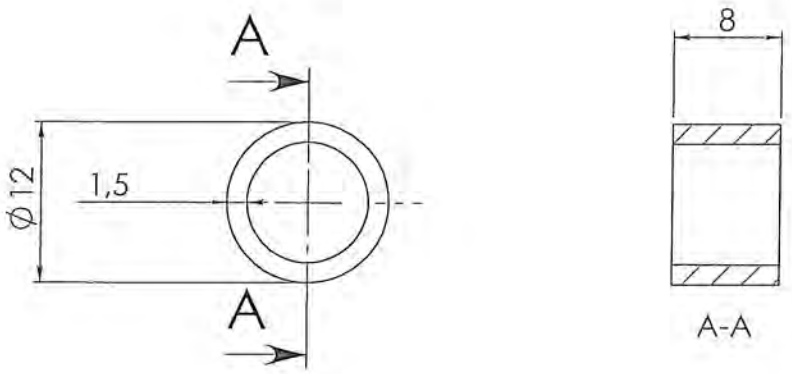
b	Taget trim af knasterne.			KDU	25.04.05
Rev.	Revision:			Sign.:	Date:
Anviser efter instruktion 7.04.02 Boreanviser		Titel: Dæksel 8100	Construction:	KDU	25.11.04
Mål uden toleranceangivelse (h), 6O-norm nr. 6062 C19			Released:	KDU	07.07.05
Material:	Støbejern GG 15		Format:	A2	
Weight:	1,18 kg		Scale:	1:1	
Model no.:	8120	Morsø 8100	Remno.:	34812000	
Drawingtype:	Støbetegning	morsø	Drawing no.:	8100-20 b	
Location of file	[illegible]				

9-61 OF 1-93



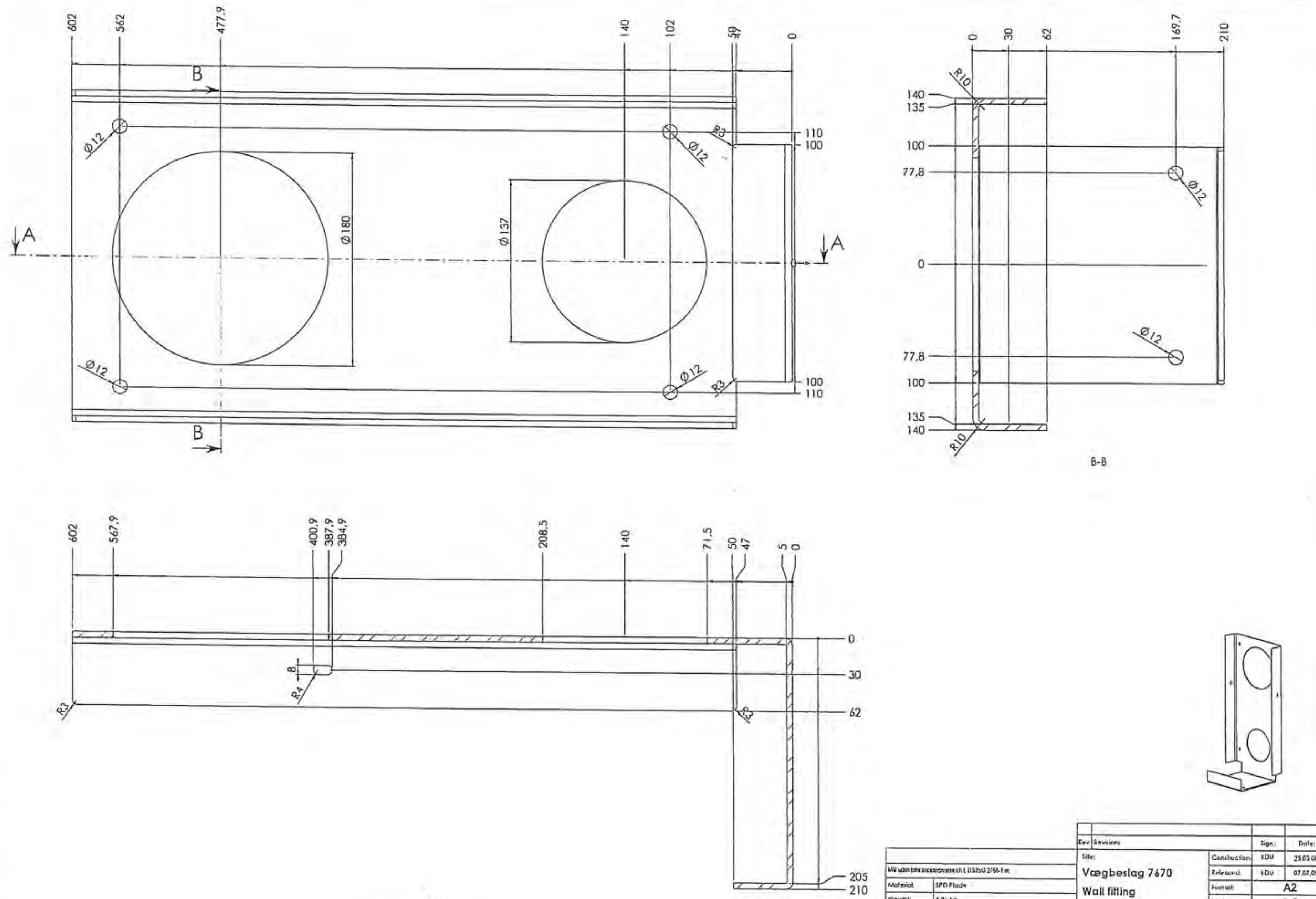
	b	Ændret længde fra 9 mm til 10 mm		RSV	13.01.2006
	Rev.	Revisions		Sign.:	Date:
	Title:		Construction:	KDU	18.01.05
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	**Afstandsstykke ø8x1 L=10mm**		Approved:	KDU	29.09.05
Material: Galv	**Hydraulikrør galv.**		Format:	A4	
Weight: 0, kg	**Morsø 3400**		Scale:	2:1	
Model no.			Itemno.:	71810200	
Drawingtype: Emnetegning	morsø		Drawing no.:	8100-31 b	
Location of file:					

Date of print: 10-11-2008



		Rev.	Revisions		Sign.:	Date:
		Title:		Construction:	KDU	18.01.05
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Afst.rør ø12x1,5		Released:	KDU	29.09.05
Material:				Format:	A4	
Weight:	0. kg			Scale:	2:1	
Model no.	-	Morsø 8100		Itemno.:	71810300	
Drawingtype:	Emnetegning	morsø		Drawing no.:	8100-32 a	
Location of file:	I:\ud\Tegninger\Standardbibliotek\Afstandsrør\Afstandsrør ø12x1,5.IDW					

Date of print: 10-11-2008



Rev	Revisions		Sign.:	Date:
Title:		Construction:	KDU	25.03.08
Vægbeslag 7670		Released:	KDU	07.07.08
Wall fitting		Format:	A2	
Morsø 7600		Scale:	1:2	
		Itemno.:	71761500	
morsø		Drawing no.:	7600-72 a	

Material:	SPD Plade
Weight:	8,76 kg
Model no.:	-
Drawingtype:	Product Drawing

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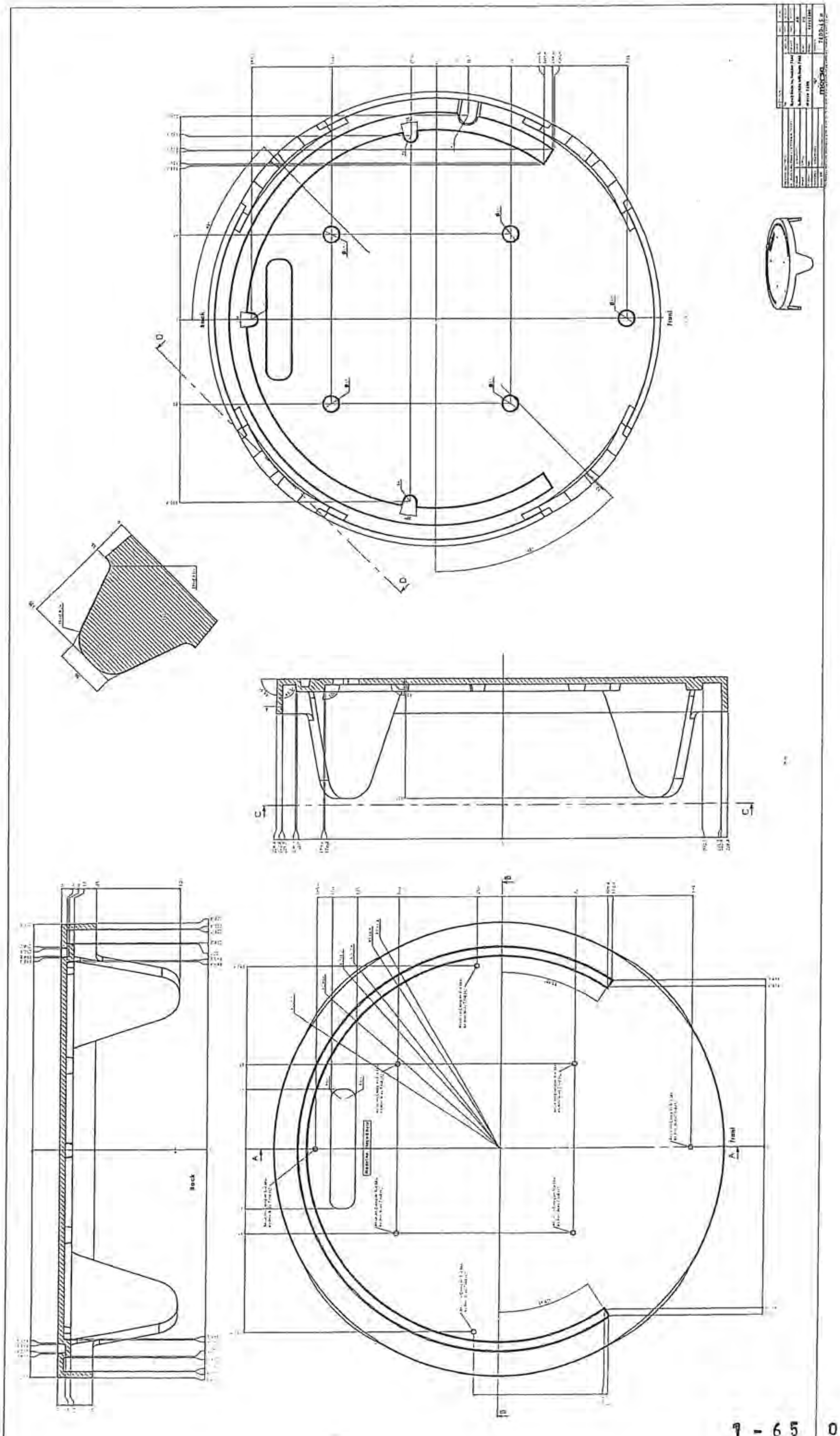
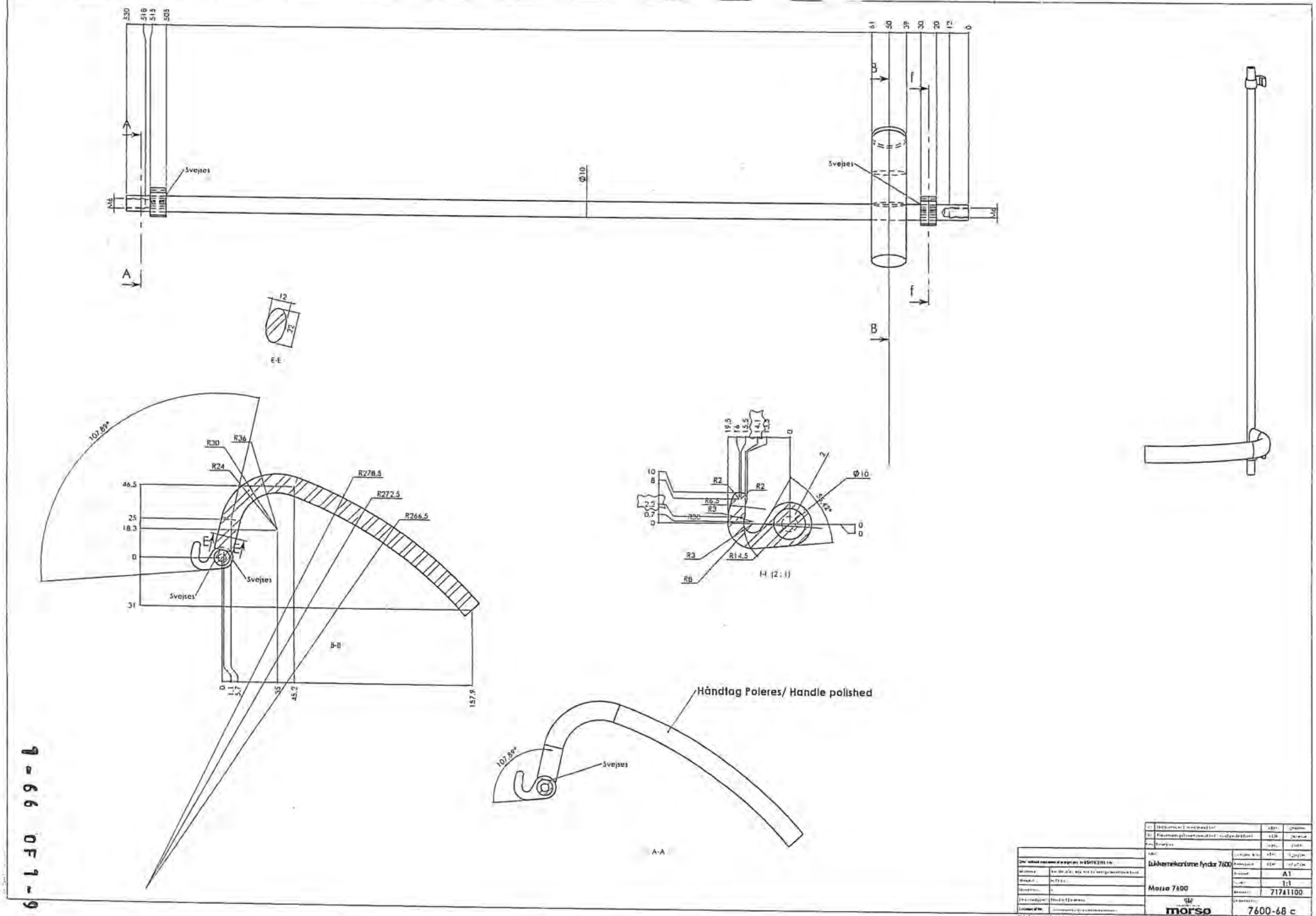
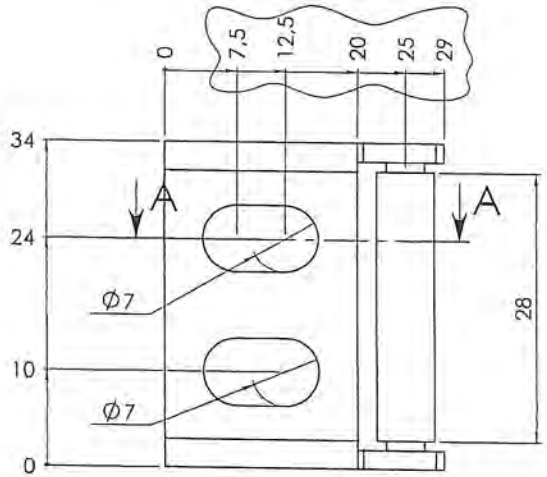
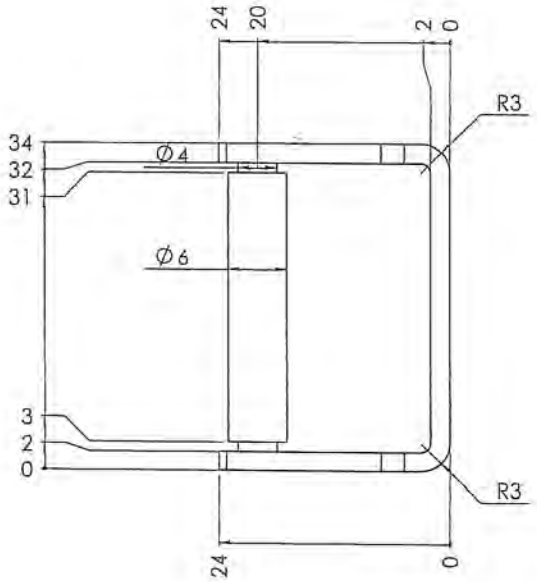
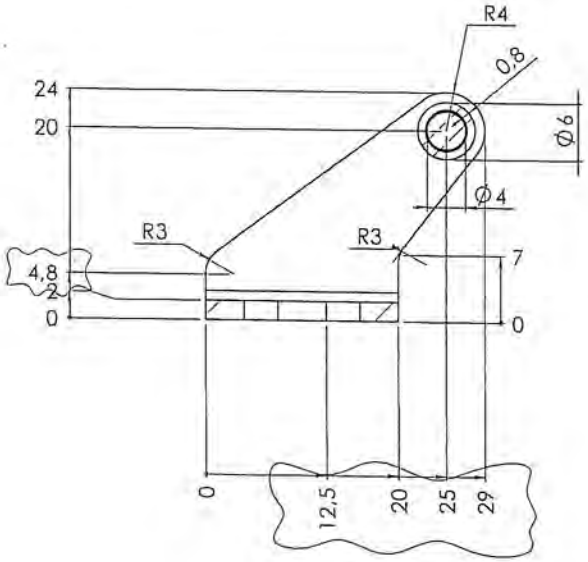

Back
Front


Svejses
Ø10
A
B
f
E-E
B-B
A-A
f-f (2:1)
107,89°
R30
R36
R24
R278,5
R272,5
R266,5
Håndtag Poleres/ Handle polished
Lukkemekanisme fyrdør 7600
Morsø 7600
A1
1:1
71741100
morsø
7600-68 c

9 - 66 OF 9 - 93

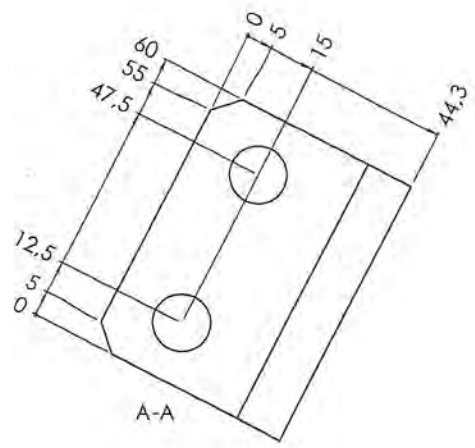


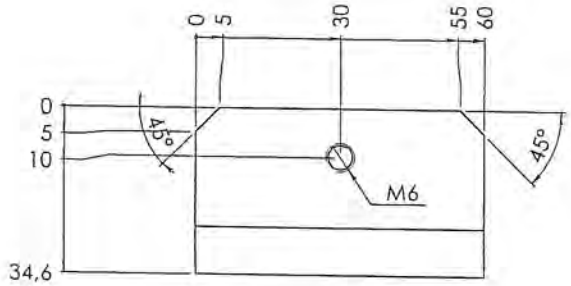


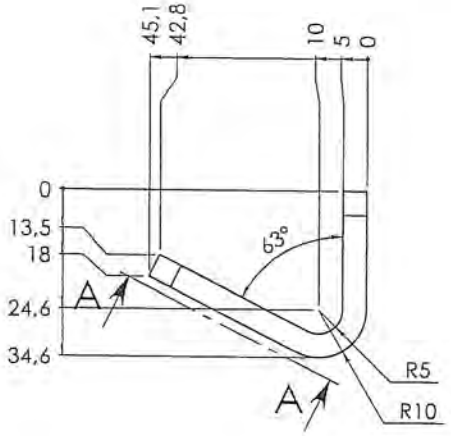


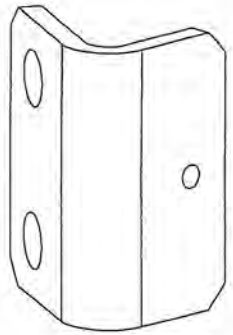
A-A

b	Beslag øget 2mm samt huller øget 2mm.			KDU	28.10.08
Rev.	Revisions			Sign.:	Date:
Grater fjernes		Title:	Construction:	KDU	12.03.08
Dim. without indication of margin acc. to DS/ISO 2768-1 m		Beslag f. lukkehage	Released:	KDU	07.07.08
Material:	SPD plade		Format:	A3	
Weight:	0,02 kg		Scale:	2:1	
Model no.	-	Morsø 7600	Itemno.:	71761200	
Drawingtype:	Product Drawing		Drawing no.:		
Location of file:		morsø	7600-69 b		









		Rev.	Revisions		Sign.:	Date:
			Title:	Construction:	KDU	25.03.08
Dim. without indication of margin acc. to DS/ISO 2768-1 m			Vinkel f. vægbeslag 7670	Released:	KDU	07.07.08
Material:	SPD Plade		Fitting f. wall fitting 7670	Format:	A3	
Weight:	0.16 kg			Scale:	1:1	
Model no.			Morsø 7600	Itemno.:	71761600	
Drawingtype:	Product Drawing		morsø	Drawing no.:	7600-73 a	
Location of file:						

Date of print: 07-11-2008

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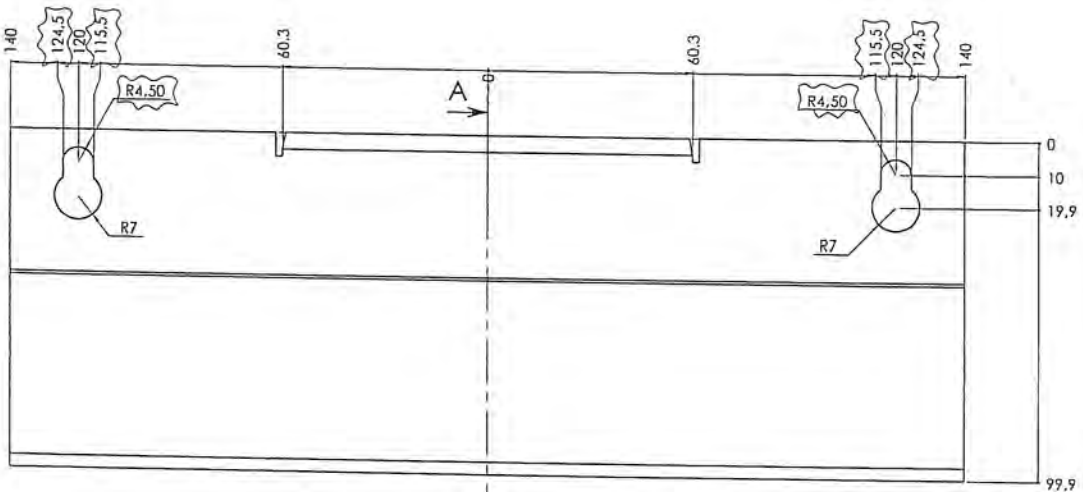
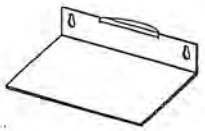
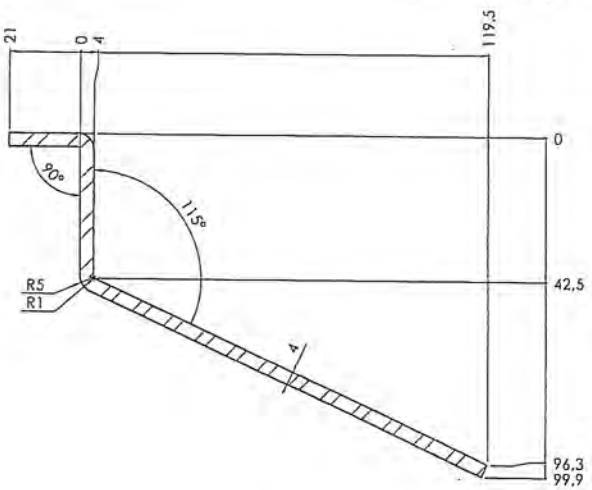
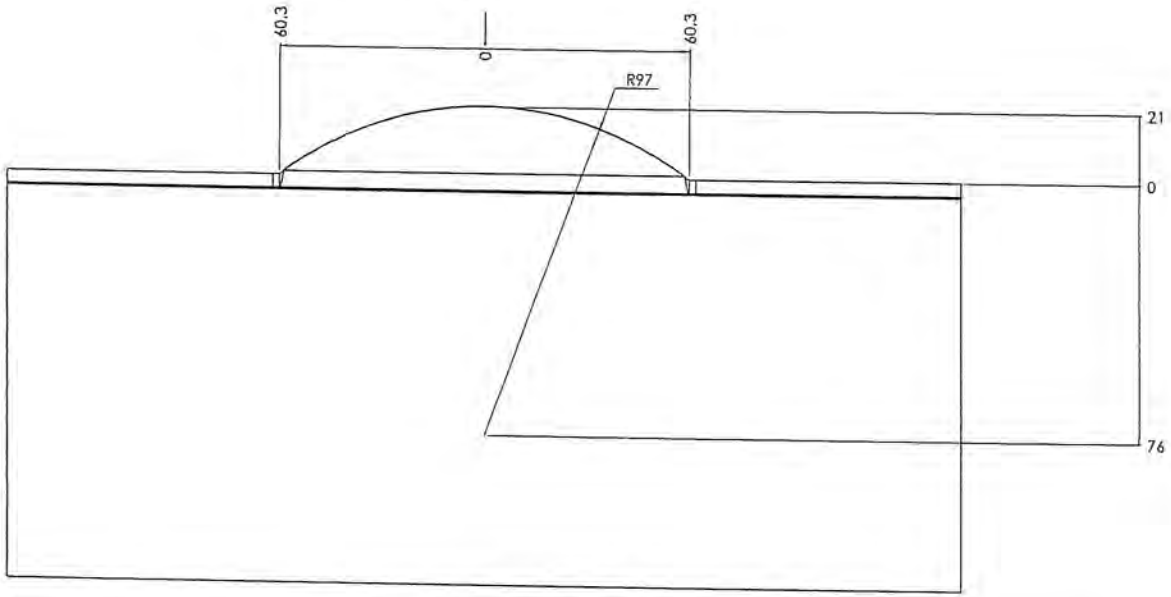






A-A



Rev.	Revisions	Sign:	Date:

Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	Rustfri stål - Aisi 304
Weight:	3,58 kg
Model no.:	-
Drawingtype:	Product Drawing
Location of file:	

Title:	Construction:	KDU	24.03.06
Røgledeplade øverst 7600	Released:	KDU	07.07.06
	Format:	A2	
Morsø 7600	Scale:	1:1	
	Itemno.:	71761700	
morsø	Drawing no.:	7600-76 a	

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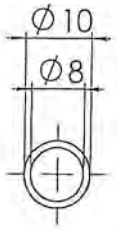
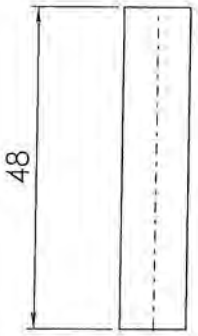
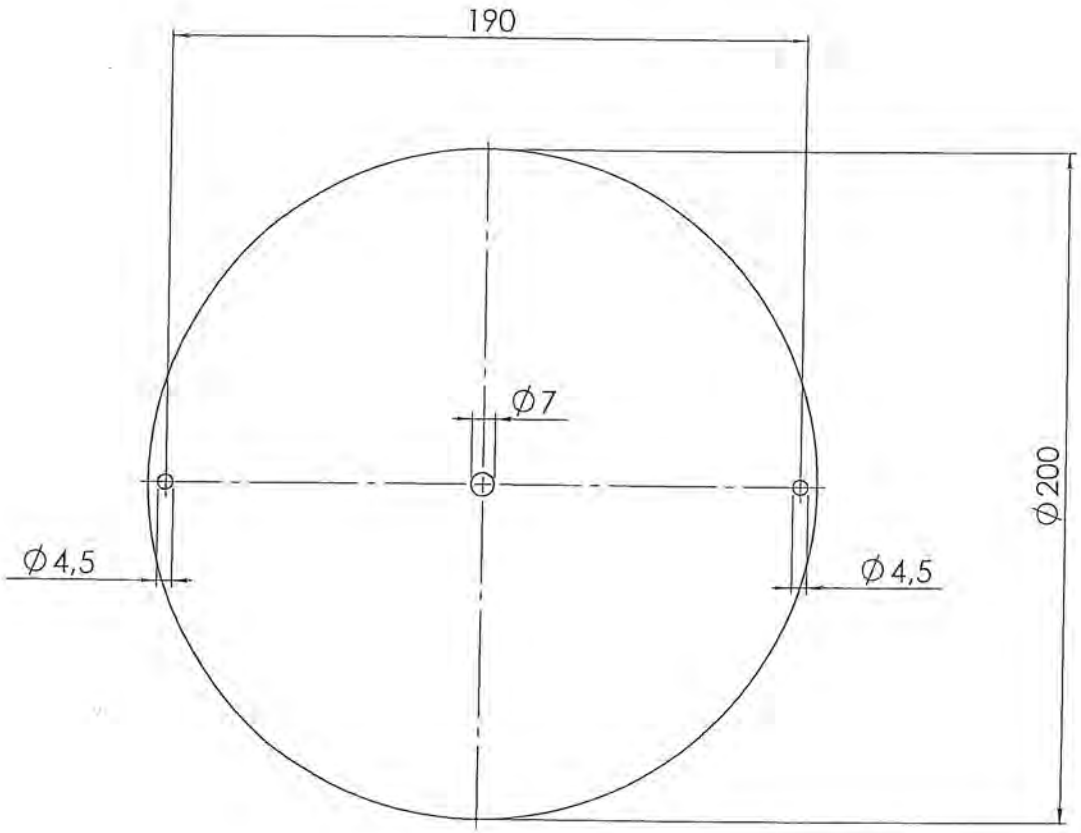




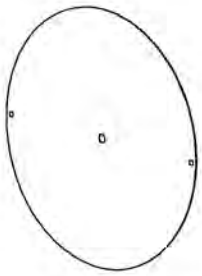
Rev.	Revisions	Sign.:	Date:
b	Tilføjet emne ved væghængt.	KDU	09.10.08
b	Emne udgået.	KDU	01.10.08

Mål uden toleranceangivelse i.h.f. DS/ISO 2768-1 m	Title: Afstandsrør ø10x1 L=48	Construction:	KDU	25.04.08
		Released:	KDU	07.07.08
Material: galv		Format:	A4	
Weight: 0,01 kg		Scale:	1:1	
Model no. -	Morsø 7600	Itemno.:	54761000	
Drawingtype: Emnetegning	morsø	Drawing no.:	7600-77 C	
Location of file: C:\SDW\Tegninger\Standardbibliotek\Afstandsrør ø10x1.SLDPRT				

Date of print: 07-11-2008



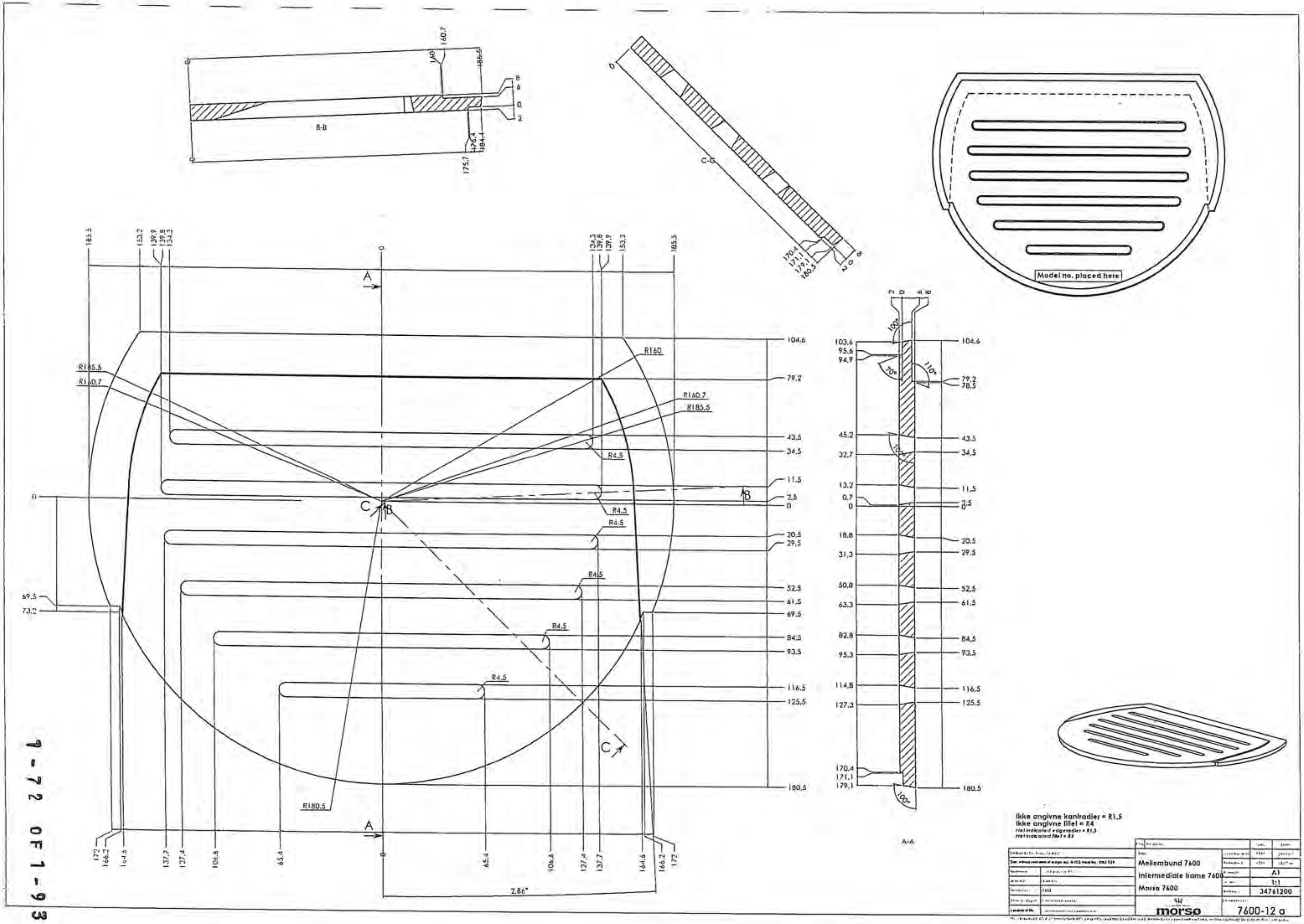
Constructional Drawing
06.08.08



Rev.	Revisions	Sign.:	Date:

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	Title: Rundel bagafgang - Yder	Construction:	KDU	06.08.08
Material: SPD Plade		Released:		
Weight: 0.25 kg		Format:	A4	
Model no. -	Morsø 7600	Scale:	1:2	
Drawingtype: Emnetegning		Itemno.:	71762100	
Location of file: C:\UDV\Tegninger\7600\7600-91 Rundel yder - bagafgang SLDPRT	morsø	Drawing no.:	7600-91	

Date of print: 07-11-2008


B-B
C-C
A-A
Model no. placed here
R160
R160,7
R185,5
R180,5
R4,5
2,86°
Ikke angivne kantradier = R1,5
Ikke angivne fillet = R4
Not indicated edgeradius = R1,5
Not indicated fillet = R4
Mellembund 7600
Intermediate frame 7600
Morsø 7600
morsø
A1
1:1
34761200
7600-12 a

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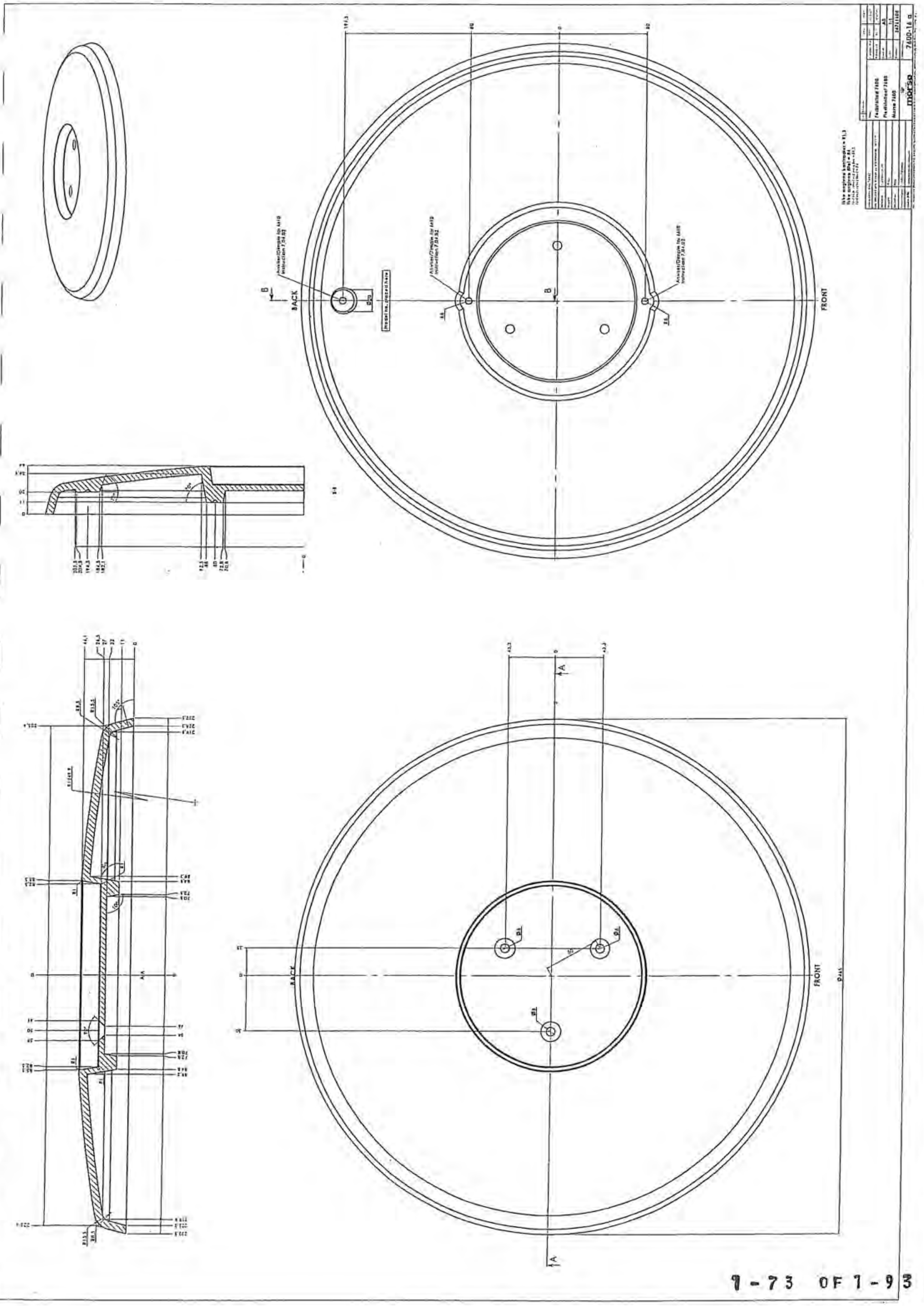
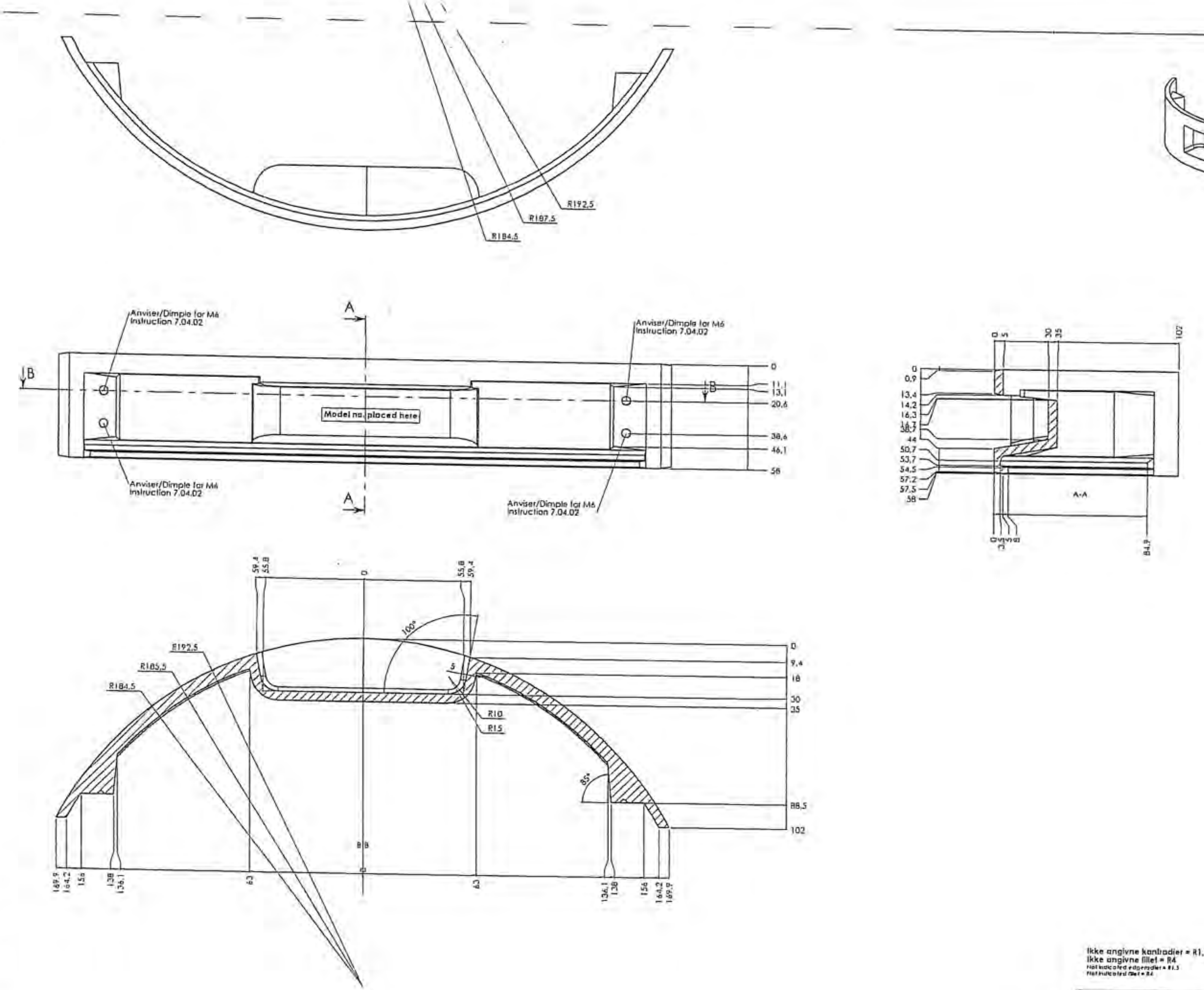
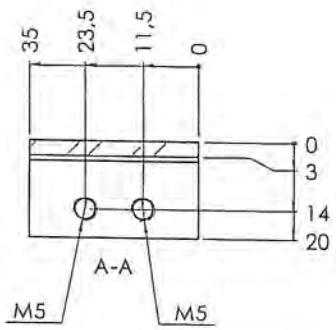
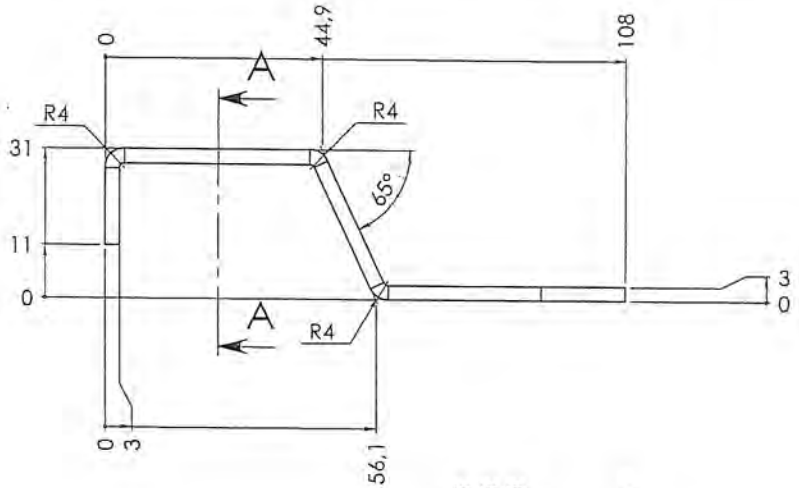

BACK
FRONT
BACK
FRONT
7600-16 a

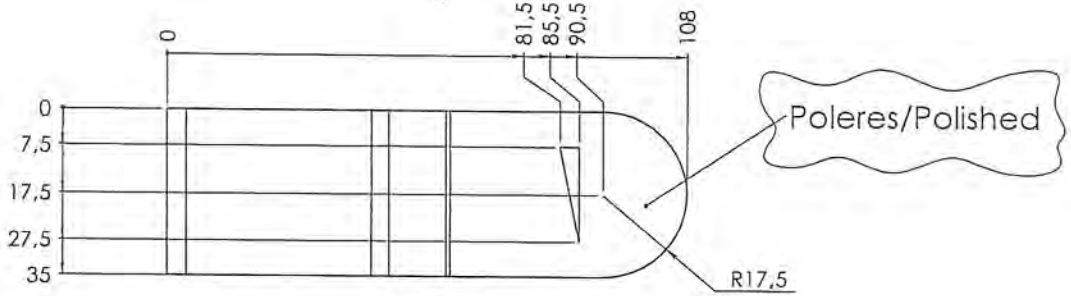


Ikke angivne kantradier = R1,5
Ikke angivne fillet = R4
Not indicated edgeradier = R1,5
Not indicated fillet = R4

Askeskuffefront 7600
Ash Tray front 7600
Morsø 7600
A1
1:1
34761700
morsø
7600-17 a







Ingen grater på kanterne		Rev.	Revisions	Sign.:	Date:
Dim. without indication of margin acc. to DS/ISO 2768-1 m		Title: Sek. greb 7600	Construction:	KDU	11.03.08
Material:	Rustfri stål - Aisi 304 - Polered/Polished		Released:	KDU	07.07.08
Weight:	0,11 kg		Format:	A3	
Model no.	-	Morsø 7600	Scale:	1:1	
Drawingtype:	Product Drawing		Itemno.:	71760200	
Location of file:		morsø	Drawing no.:	7600-28 a	

Date of print: 07-11-2008

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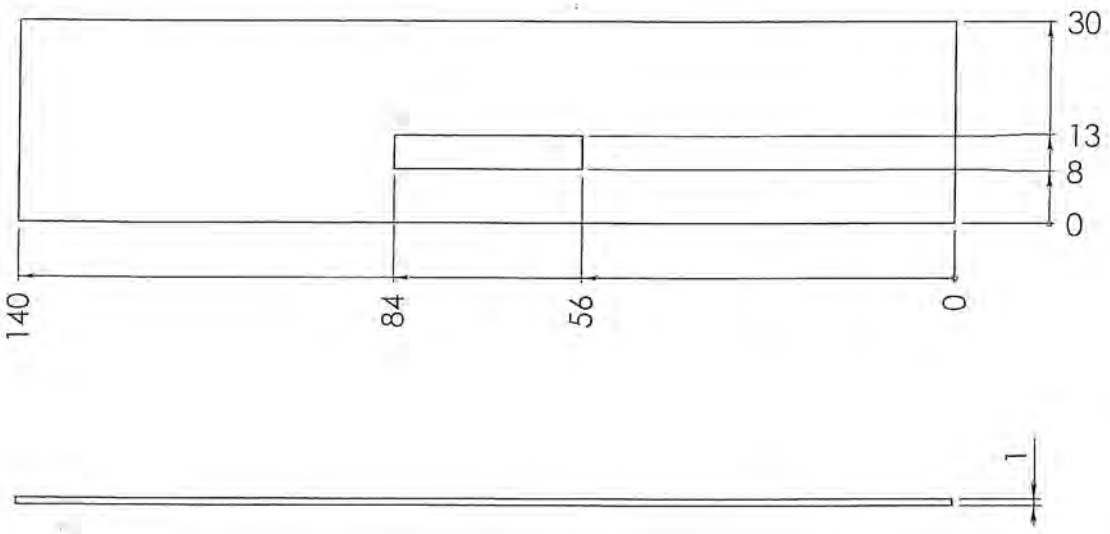
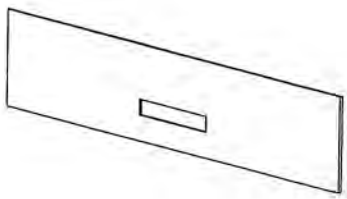
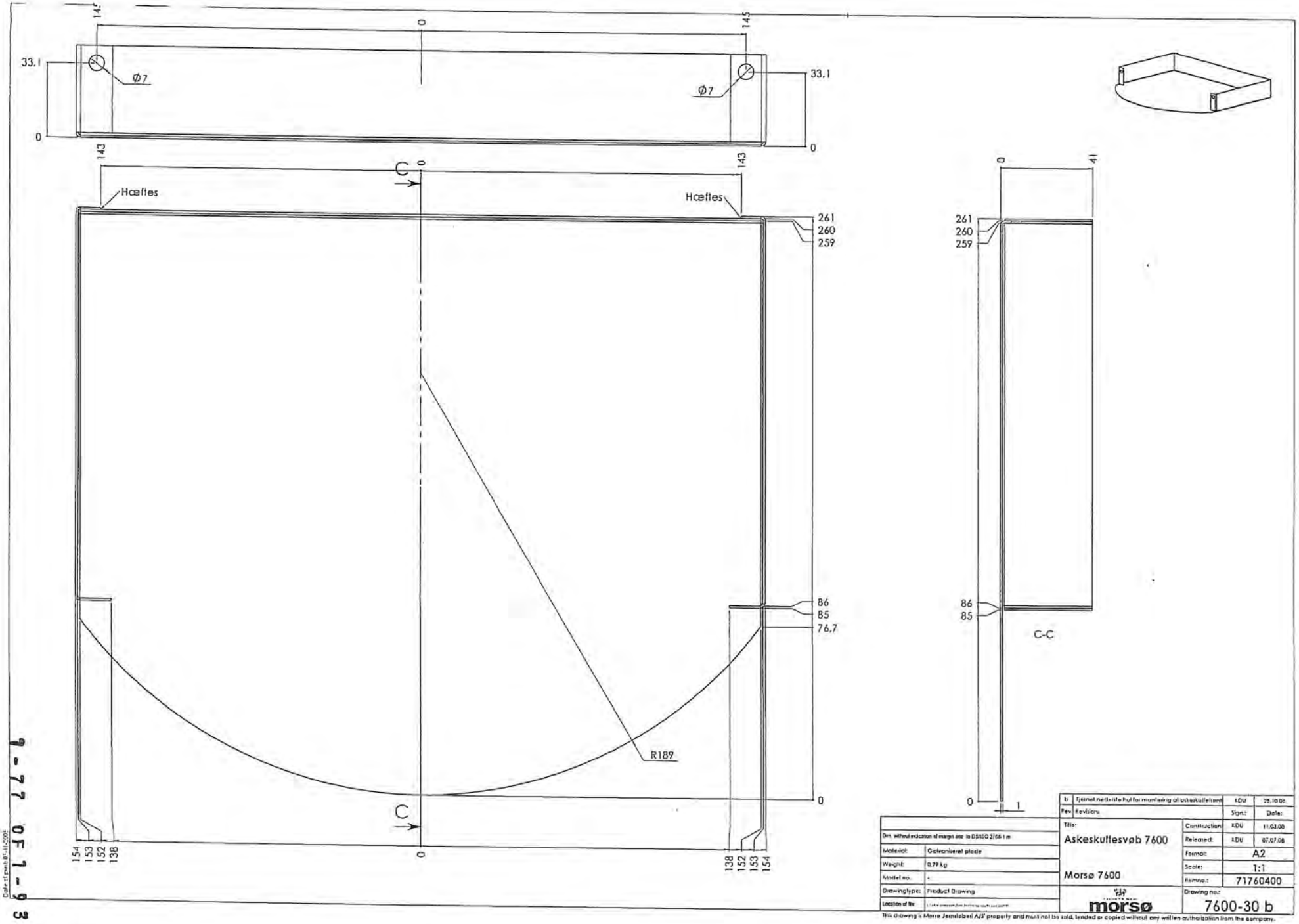




Rev.	Revisions	Sign.:	Date:

Dim. without indication of margin acc. to DS/ISO 2768-1 m	Title: Lukkepl. sek. spjæld 7600	Construction:	KDU	11.03.08
		Released:	KDU	07.07.08
Material: SPD Plade		Format:	A4	
Weight: 0.03 kg		Scale:	1:1	
Model no. -	Morsø 7600	Itemno.:	71760300	
Drawingtype: Emnetegning		Drawing no.:	7600-29 a	
Location of file: C:\SDV\tegninger\7600\7600-29 lukkepl sek spjæld.SLDPRT	morsø			

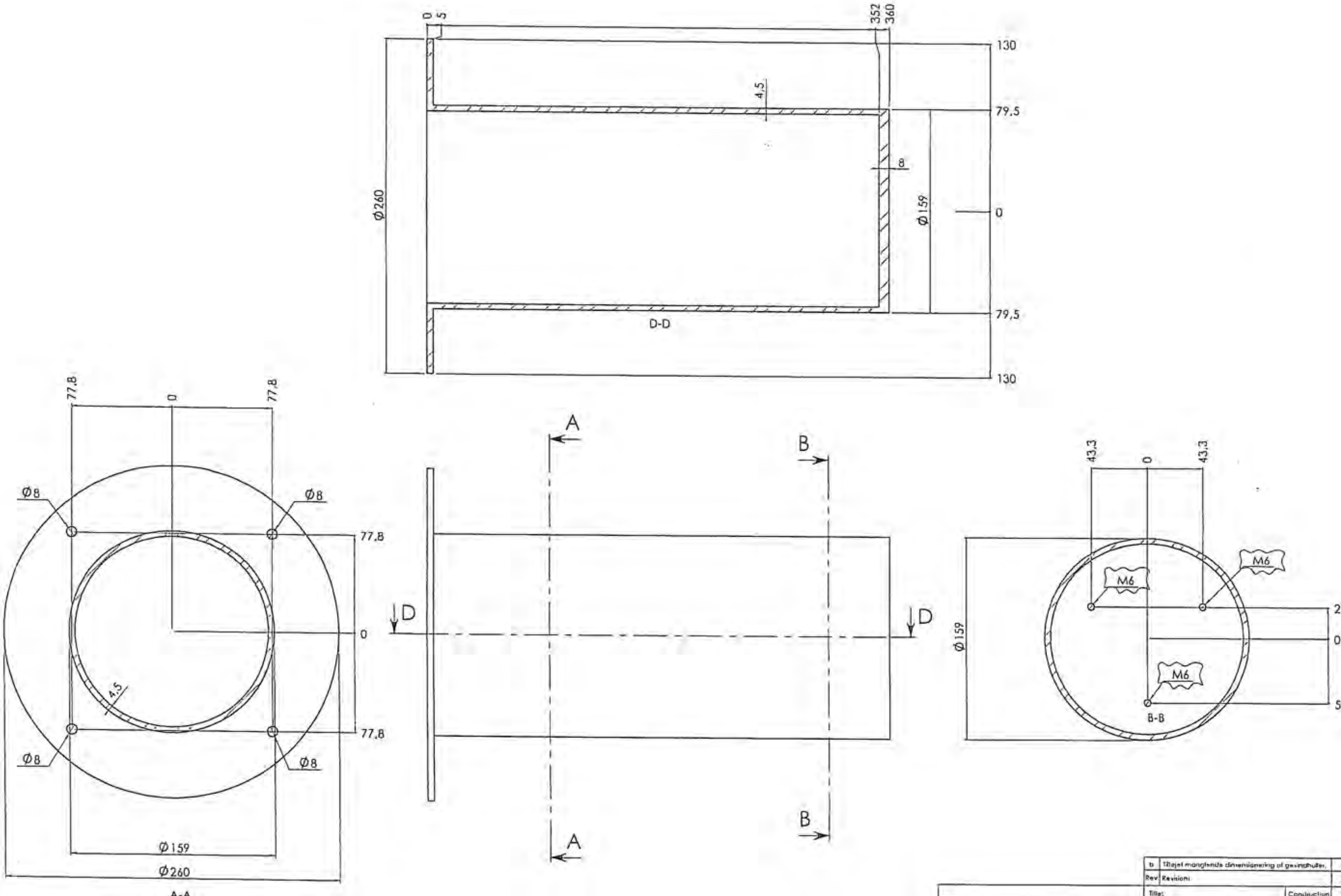
Date of print: 07-11-2008



b	Fjernet nedderste hul for montering af askeskuffefront	KDU	28.10.08
Rev.	Revision	Sign.:	Date:

Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	Galvaniseret plade
Weight:	0,79 kg
Model no.:	-
Drawingtype:	Product Drawing
Location of file:	

Title:	Construction:	KDU 11.03.08
Askeskuffesvøb 7600	Released:	KDU 07.07.08
	Format:	A2
	Scale:	1:1
Morsø 7600	Reimno.:	71760400
morsø	Drawing no.:	7600-30 b



b	Tilføjet manglende dimensionering af gevindhuller.	KDU	06.10.08
Rev	Revision:	Sign.:	Date:

Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	SPD Plade/Samlet kedeløs
Weight:	8.41 kg
Model no:	-
Drawingtype:	Product Drawing
Location of file:	[illegible]

Title: Pedistalrør 7600	Construction:	KDU	12.03.08
	Released:	KDU	07.07.08
	Format:	A2	
	Scale:	1:2	
Morsø 7600	Remno.:	71760500	
morsø	Drawing no.:	7600-32 b	

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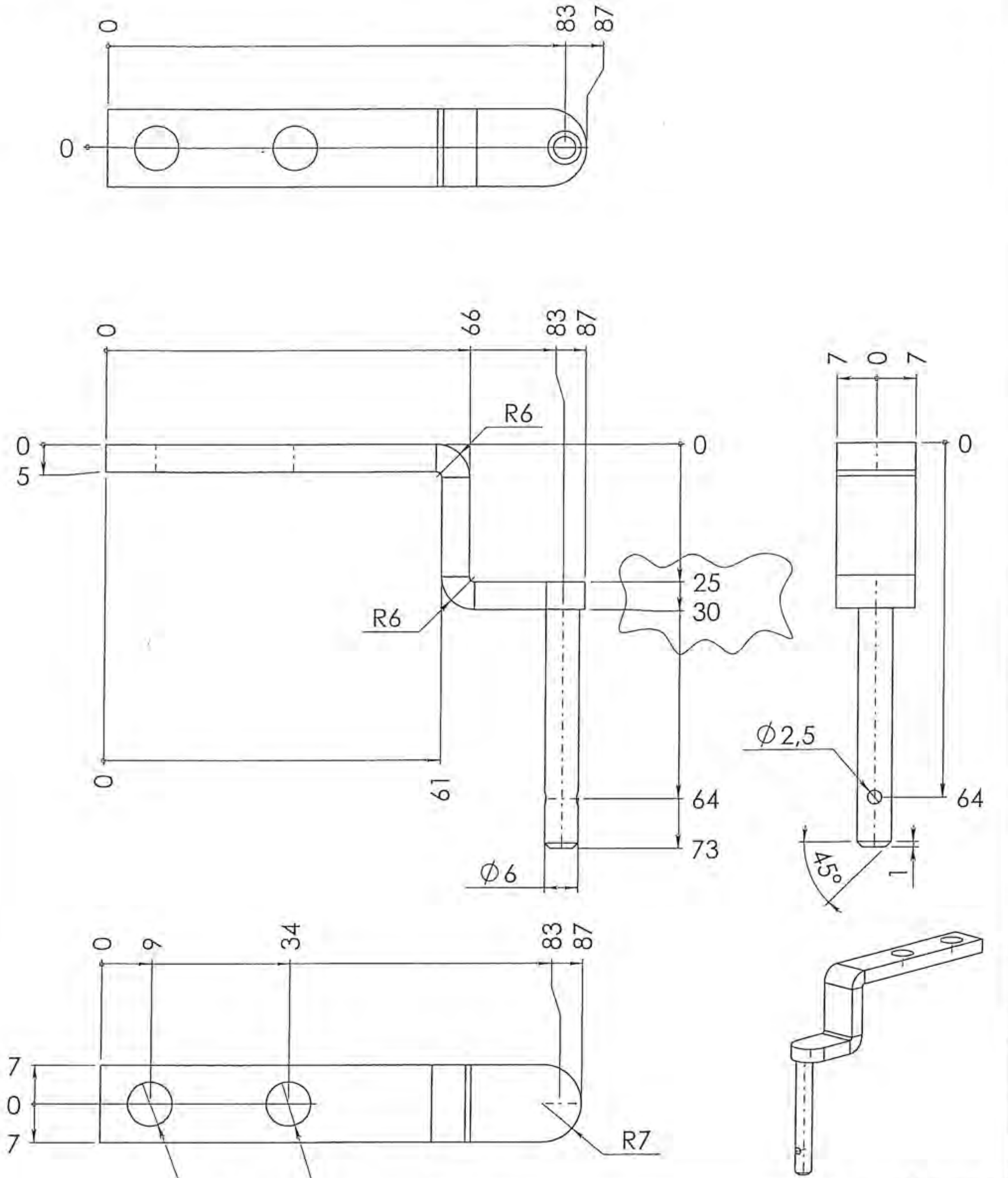
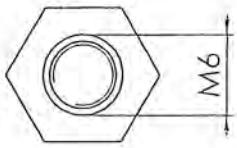


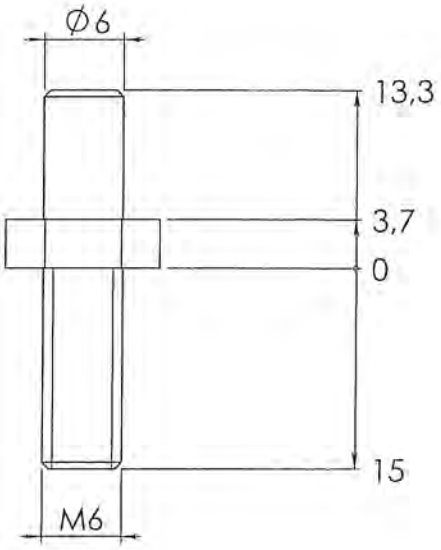
Rev.	Revisions	Sign.:	Date:
c	Højde mindsket 3 mm.	KDU	03.10.08
b	Buk ændret. Tap øget samt hul tilføjet f. fjedersystem.	KDU	11.09.08

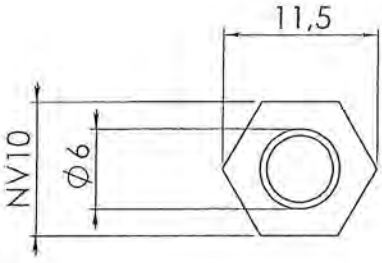
Title:	Fyrdørsbeslag top 7600	Construction:	KDU 12.03.08
		Released:	KDU 07.07.08
		Format:	A4
	Morsø 8100	Scale:	1:1
		Itemno.:	71760600
	morsø	Drawing no.:	7600-42 C

Dim. without indication of margin acc. to DS/ISO 2768-1 m

Material:	SPD Plade
Weight:	0,06 kg
Model no.	-
Drawingtype:	Product Drawing
Location of file:	C:\UDV\tegninger\7600\7600-42 Fyrdørsbeslag top.SLDPRT



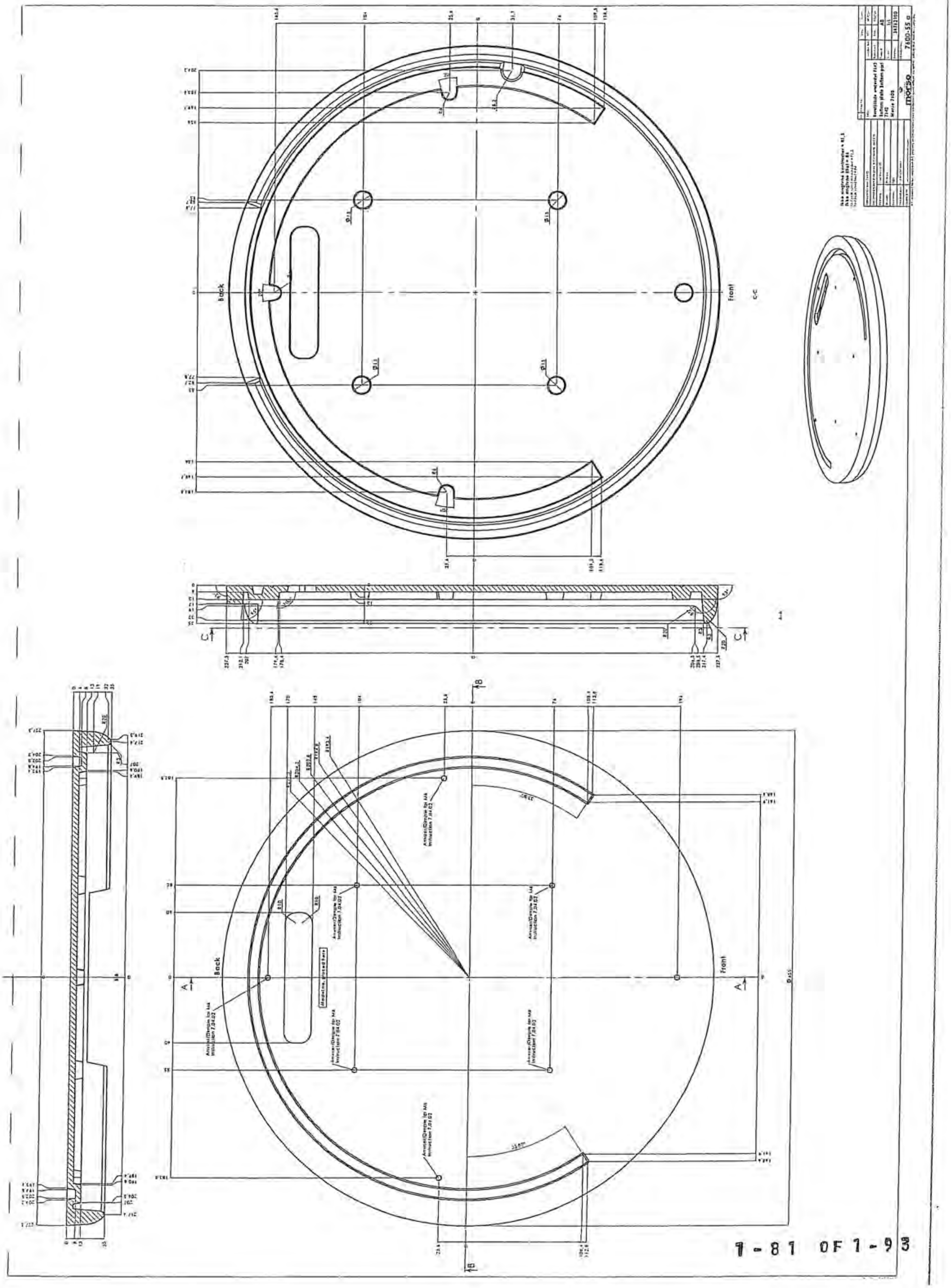


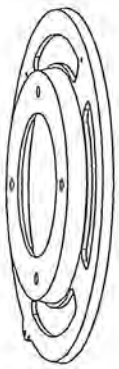


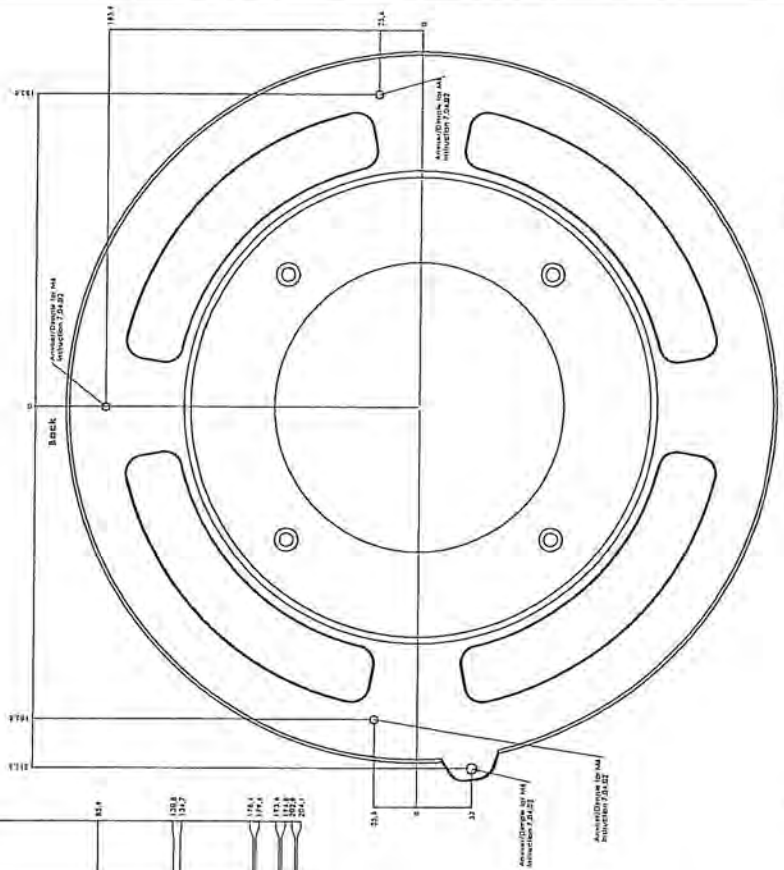
Rev.	Revisions	Sign.:	Date:

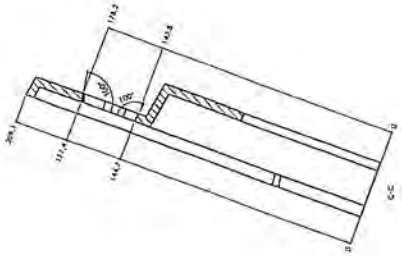
Dim. without indication of margin acc. to DS/ISO 2768-1 m	Title: Tap f. fyrdør bund 7600	Construction:	KDU	12.03.08
		Released:	KDU	07.07.08
Material: Automatstål		Format:	A4	
Weight: 0,01 kg		Scale:	2:1	
Model no. -	Morsø 7600	Itemno.:	71760700	
Drawingtype: Product Drawing	morsø	Drawing no.:	7600-48 a	
Location of file: C:\SIDV\tegninger\7600\7600-48 Tap for fyrdør.SLDPRT				

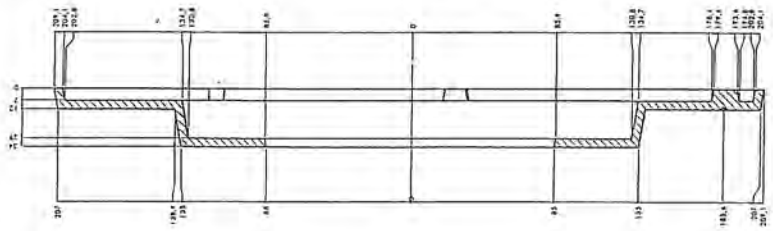
Date of print: 07-11-2008

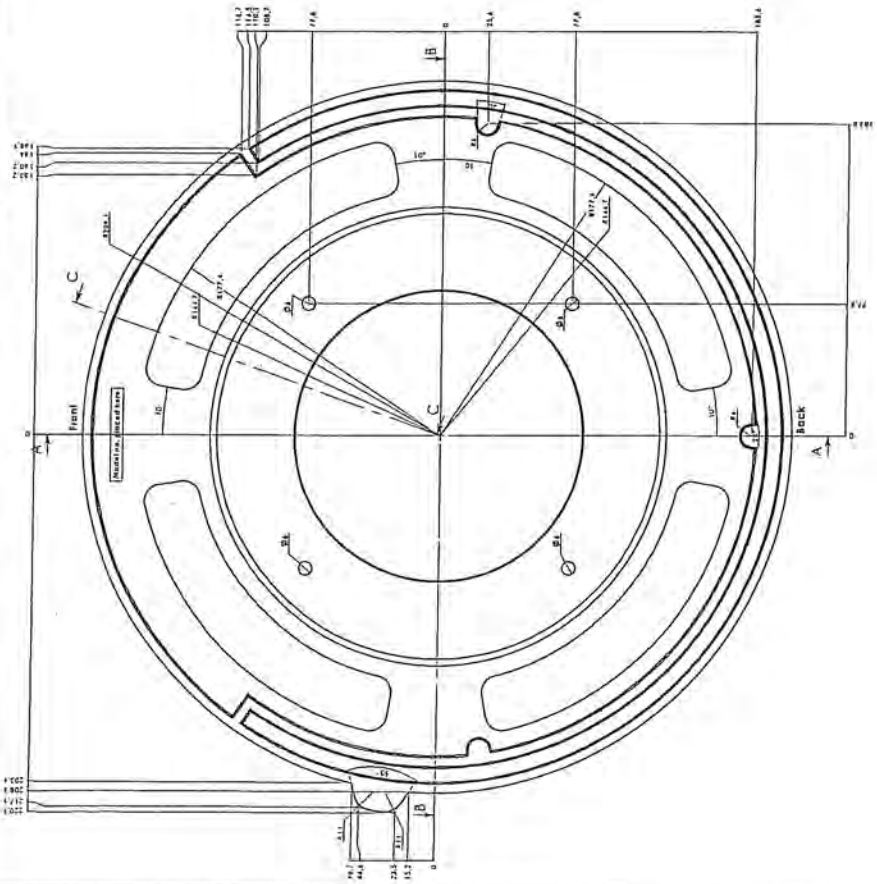

Back
Front
C-C

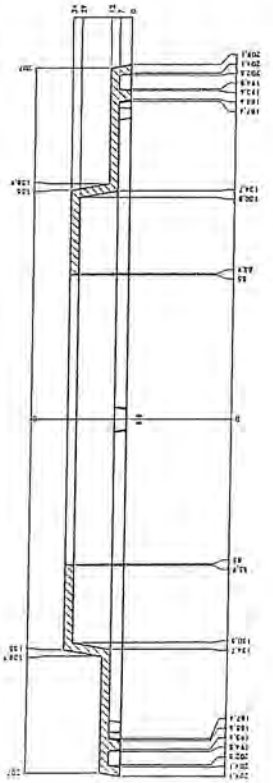


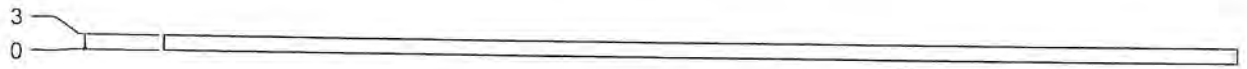

Back
Front

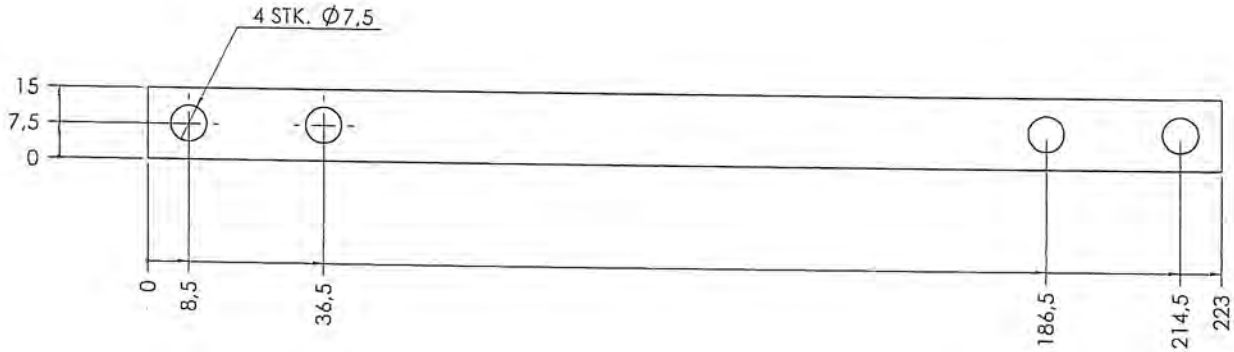





Front
Back







Rev.	Revisions		Sign.:	Date:
	Title: Lus f. dæksel	Construction:	KDU	02.02.05
		Released:	KDU	29.09.05
		Format:	A3	
		Scale:	1:1	
	Morsø 8100	Itemno.:	71813200	
	morsø	Drawing no.:	8100-73 a	

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	
Material:	SPD Plade
Weight:	0.07 kg
Model no.	-
Drawingtype:	Emnetegning
Location of file:	

Date of print: 10-11-2008

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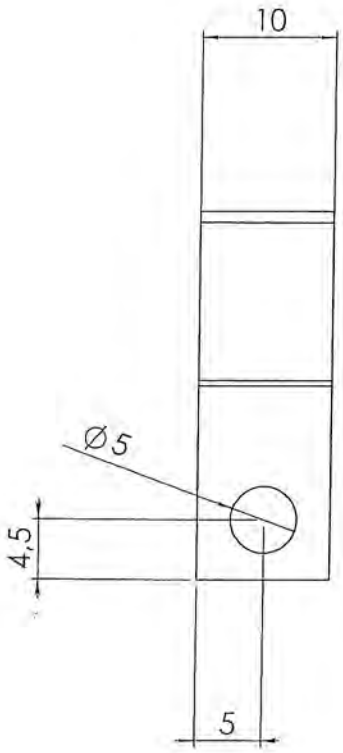
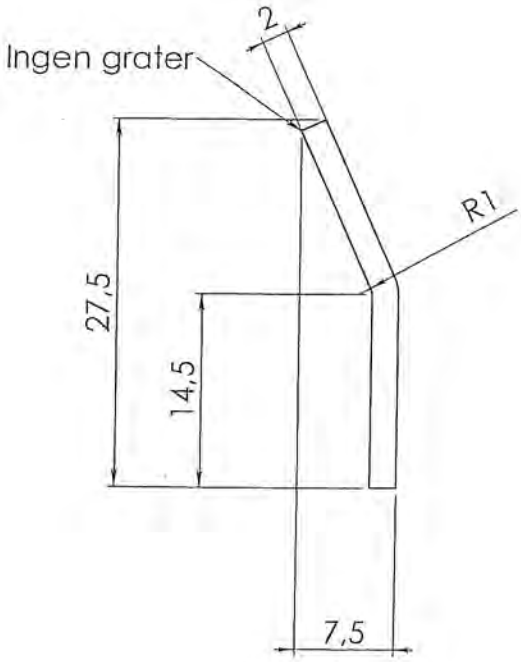
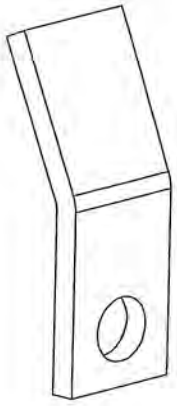


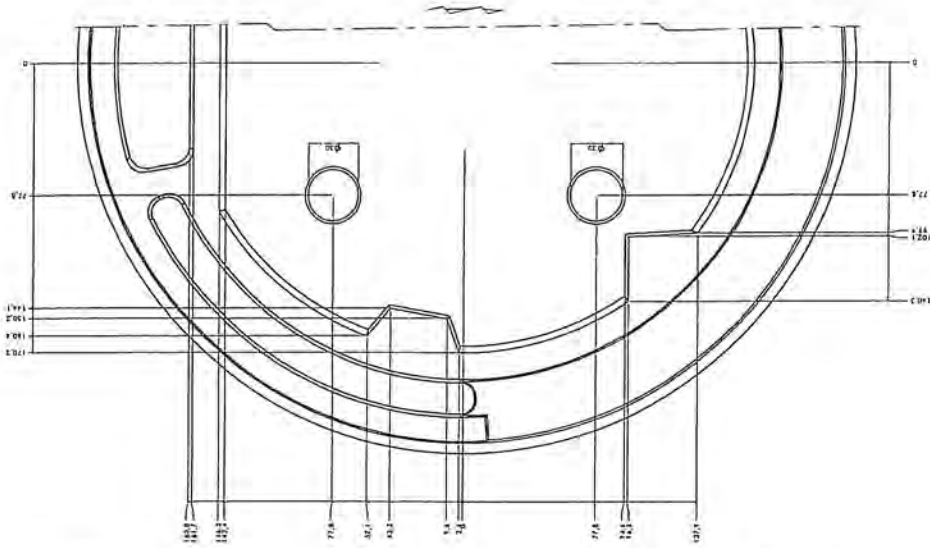


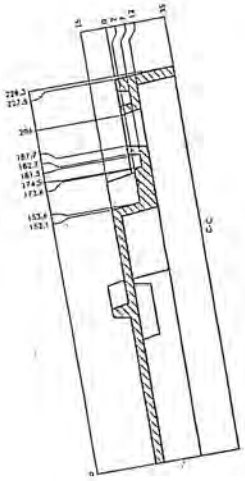


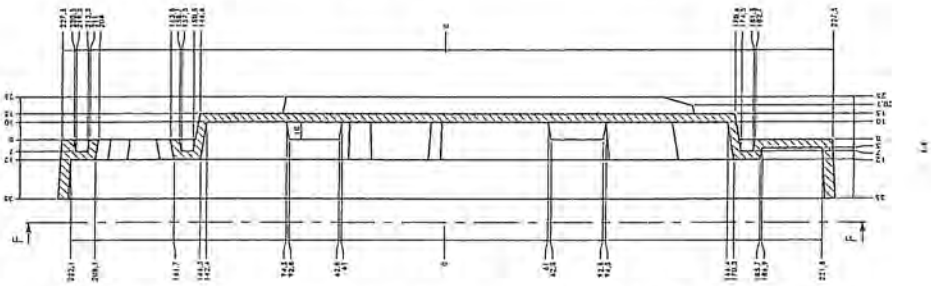
Rev.	Revisions	Sign.:	Date:

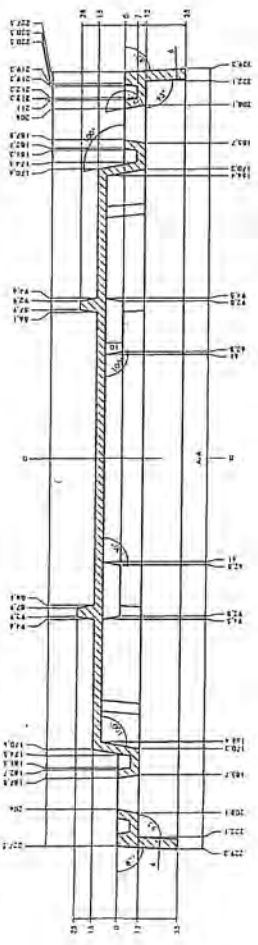
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	Title: Glasclips 8100	Construction:	RSV	21.11.05
		Released:	KDU	06.03.06
Material: Rustfri stål		Format:	A4	
Weight: 0. kg		Scale:	2:1	
Model no.	Morsø 8100	Itemno.:	71814561	
Drawingtype: Emnetegning	morsø	Drawing no.:	8100-132 a	
Location of file:				

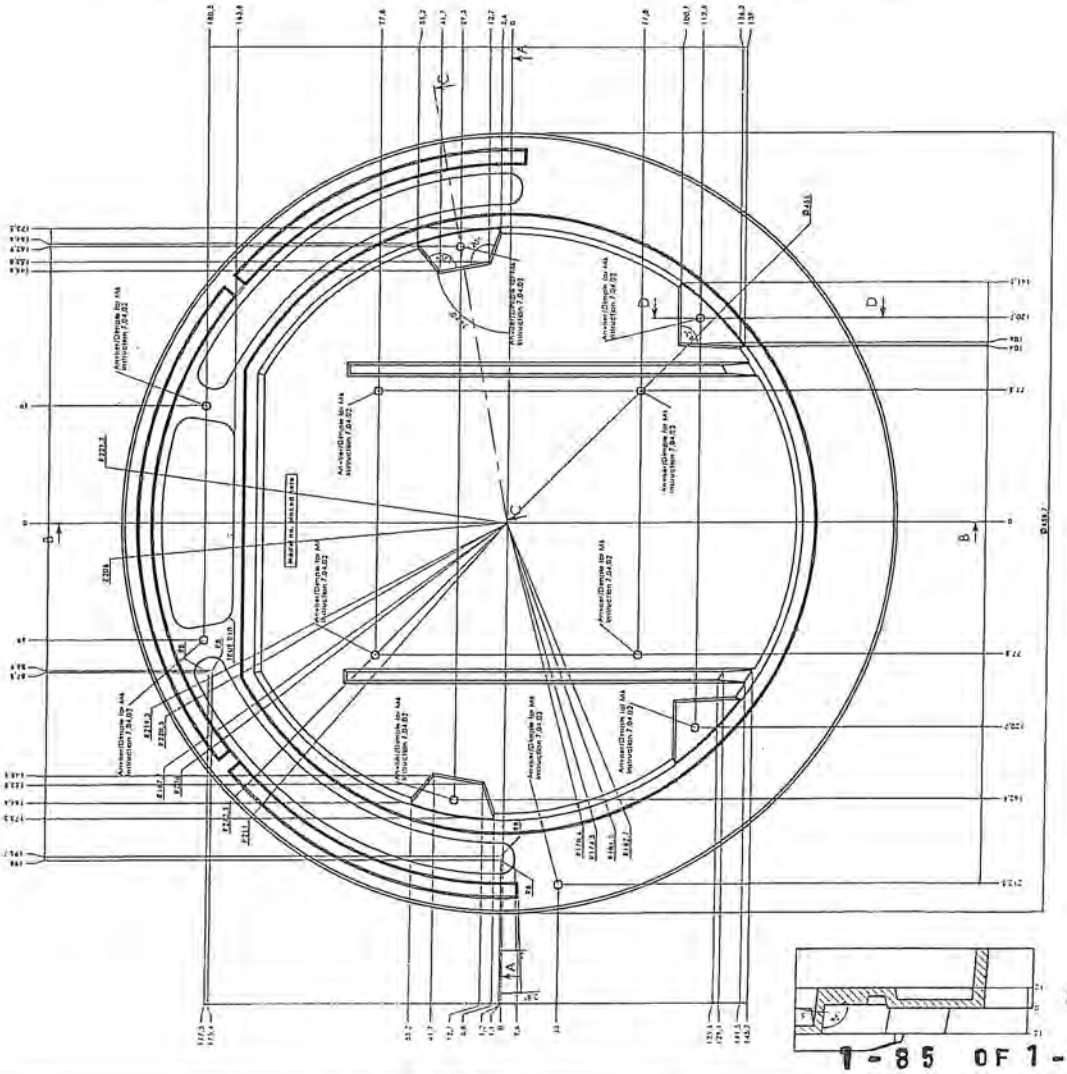
Date of print: 10-11-2008

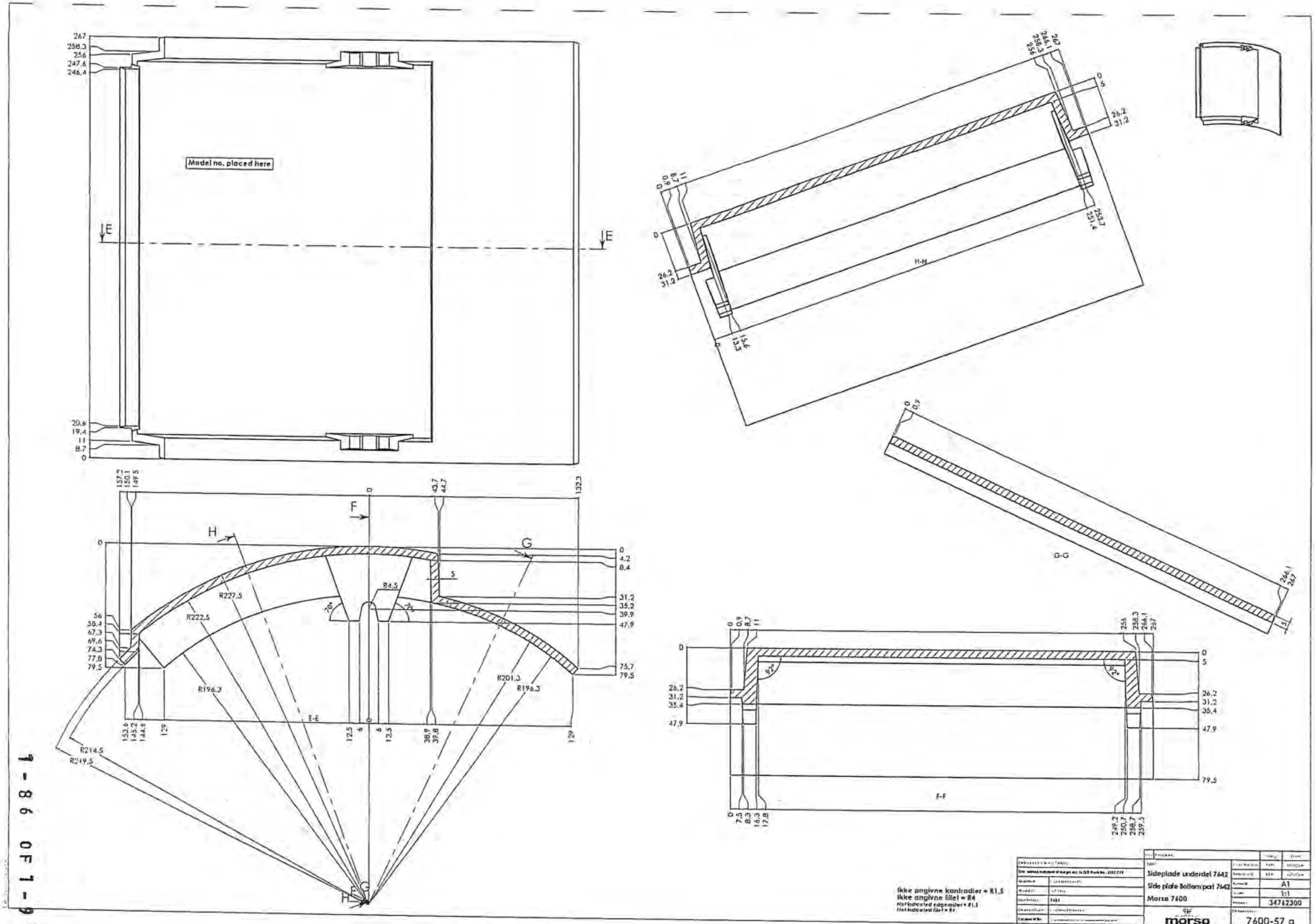


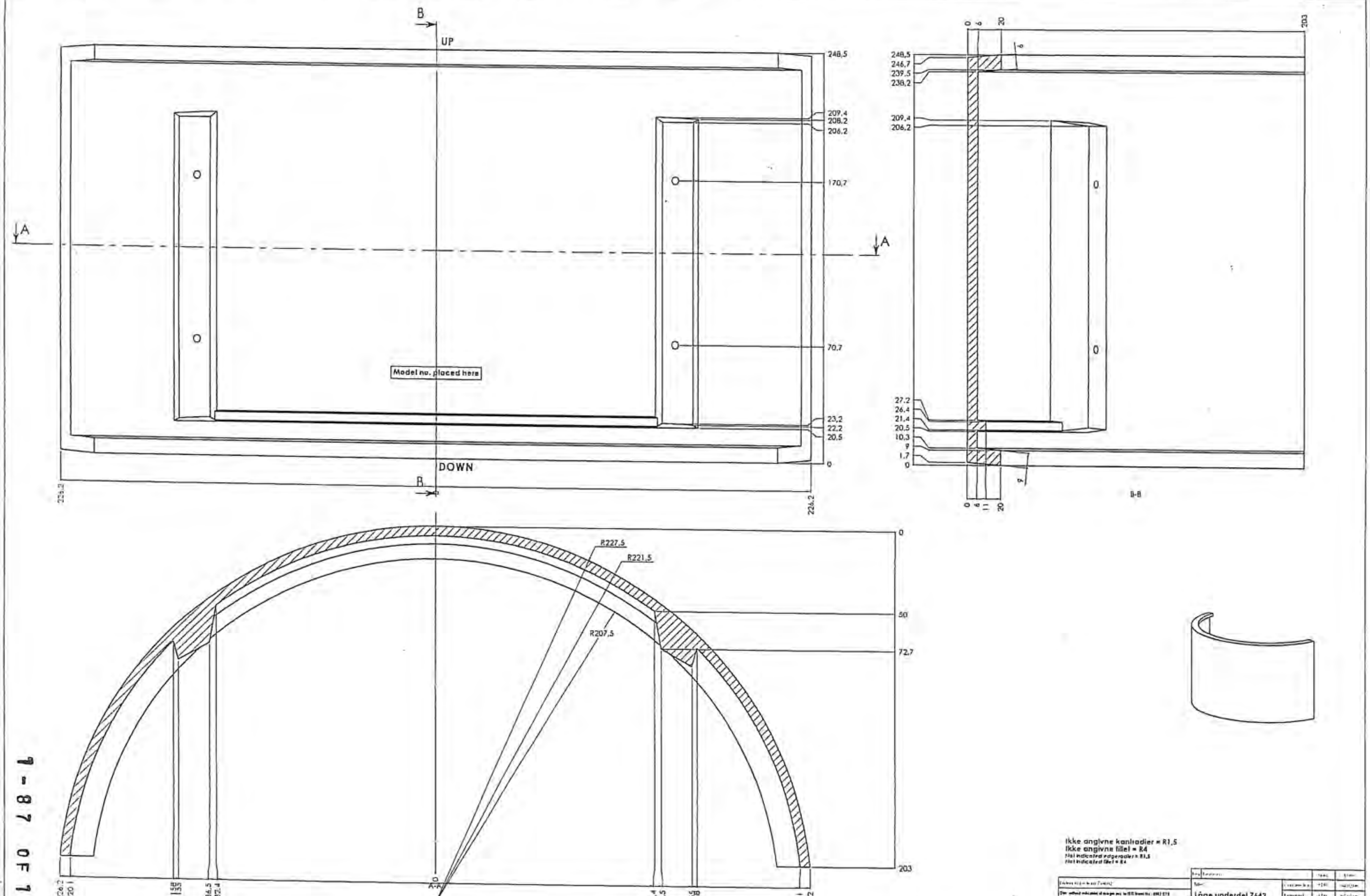






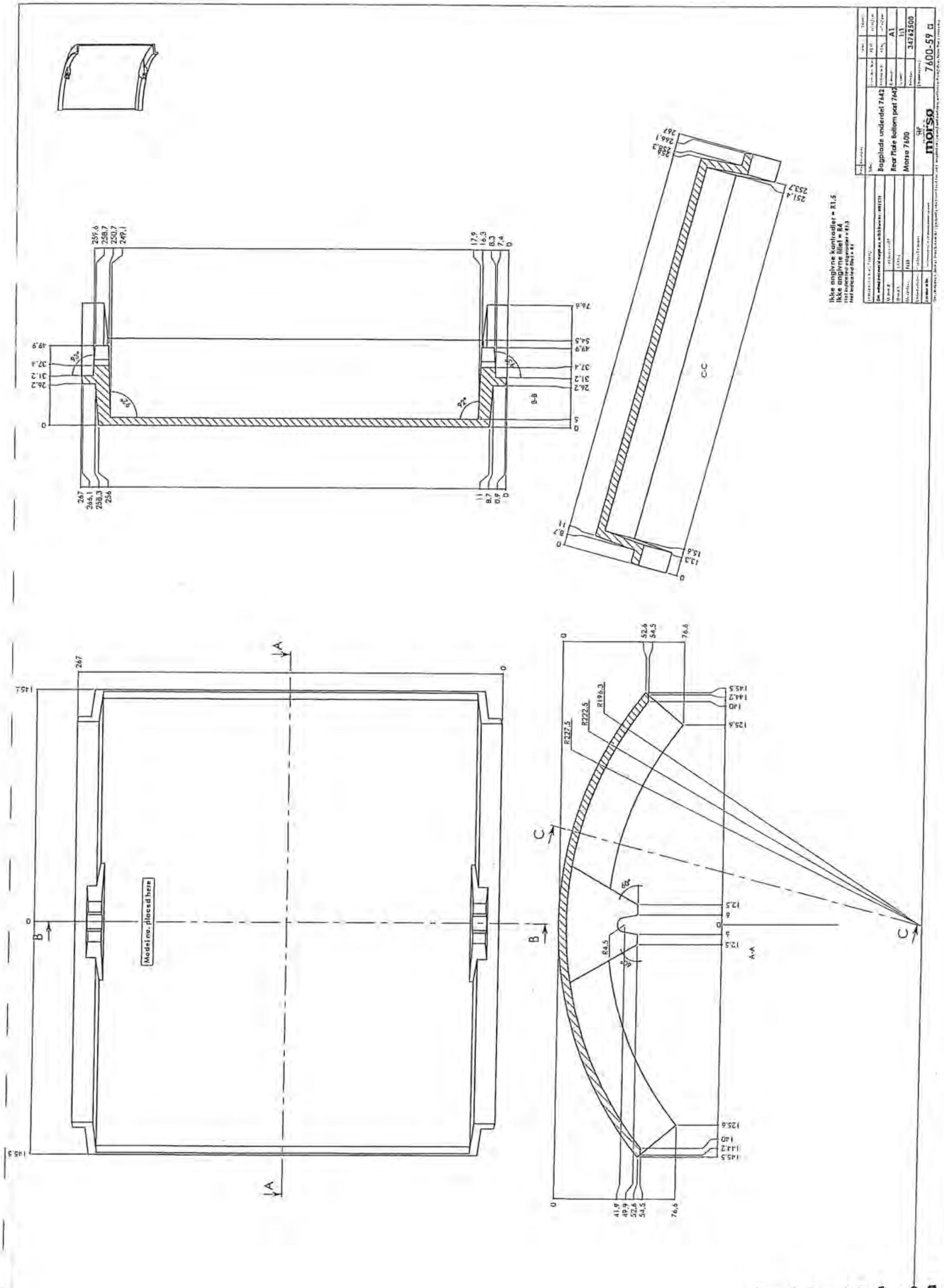


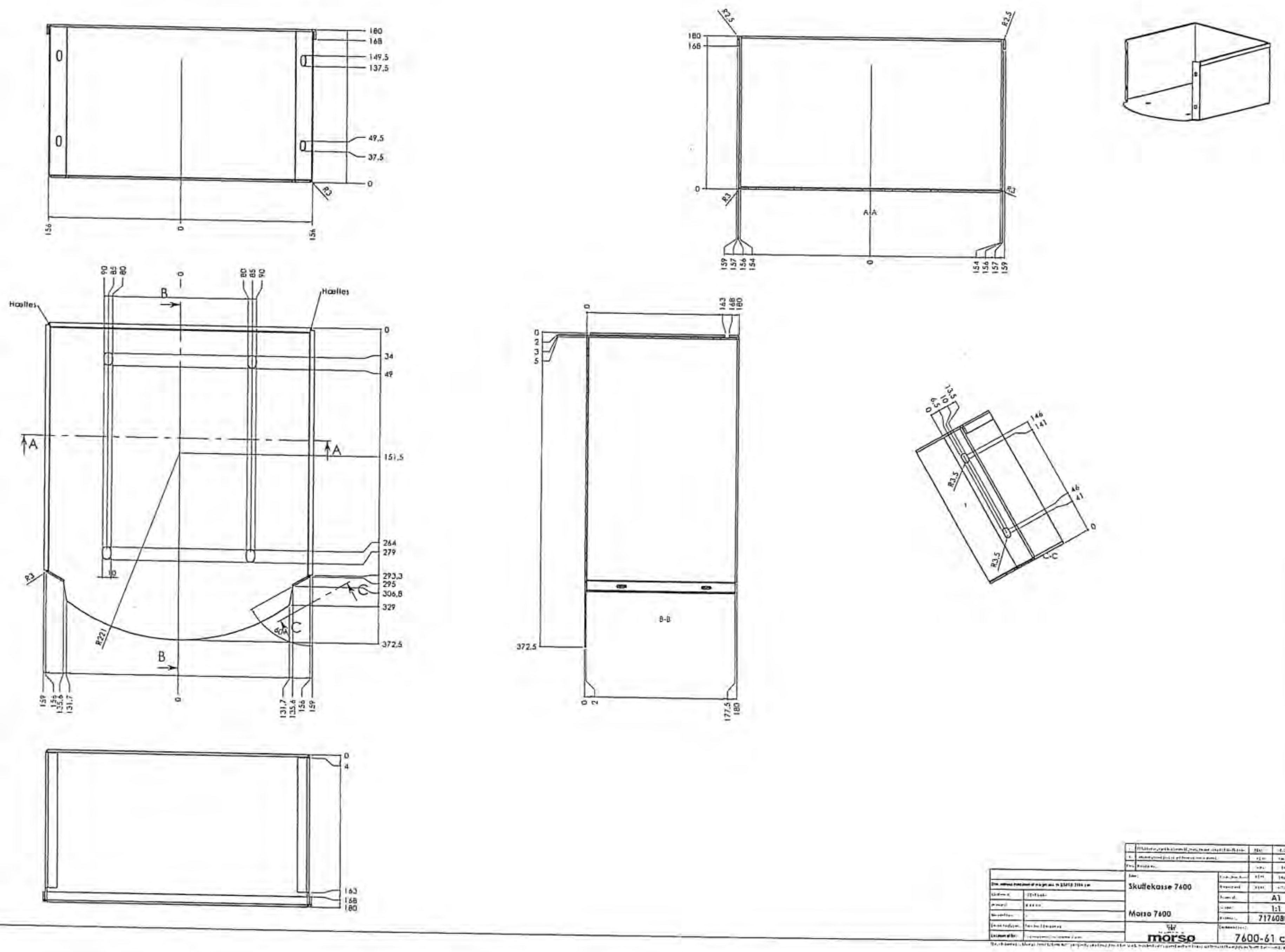

Model no. placed here
E-E
H-H
G-G
F-F
Ikke angivne kantradier = R1,5
Ikke angivne fillet = R4
Not indicated edgeradier = R1,5
Not indicated fillet = R4
Sideplade underdel 7642
Side plate Bottom part 7642
Morsø 7600
A1
1:1
34742300
morsø
7600-57 a

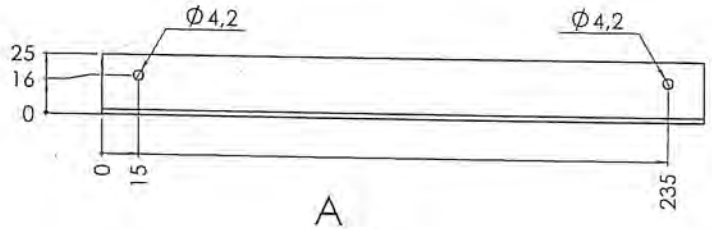


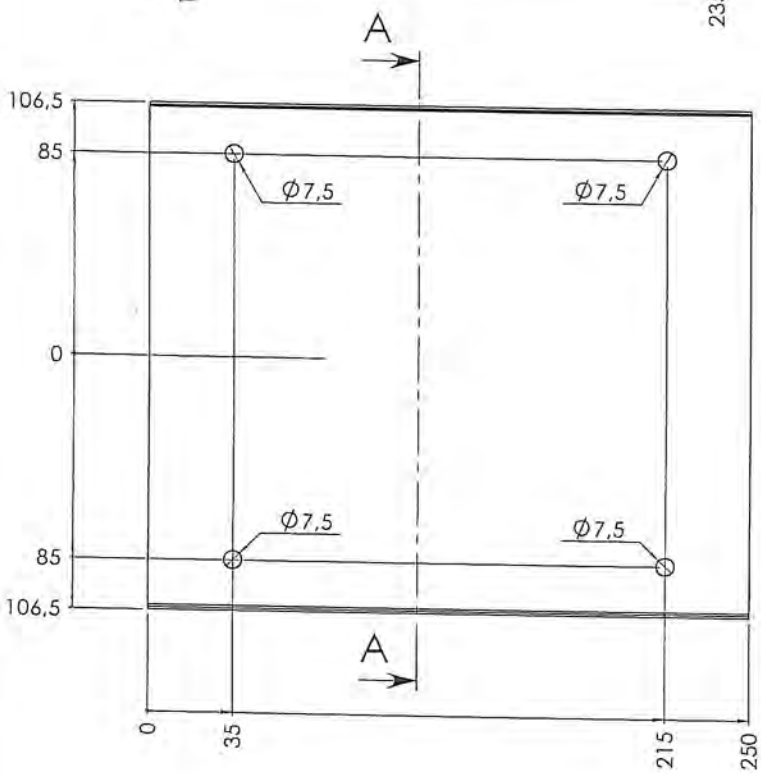
Ikke angivne kantradier = R1,5
Ikke angivne fillet = R4
Not indicated edgeradier = R1,5
Not indicated fillet = R4

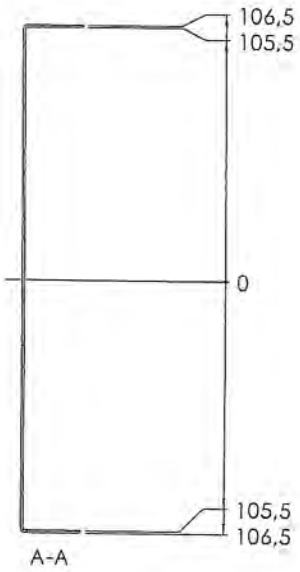
Låge underdel 7642	A1
Door bottom part 7642	1:1
Morsø 7600	34762400
SH morsø	7600-58 a

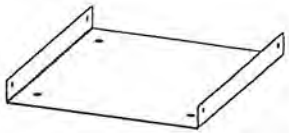

Model no. placed here
A-A
B-B
C-C
R227,5
R222,5
R196,3
R4,5
Ikke angivne kantradier = R1,5
Ikke angivne lillet = R4
Bagplade underdel 7642
Rear Plate Bottom part 7642
Morsø 7600
A1
1:1
34762500
morsø
7600-59 a

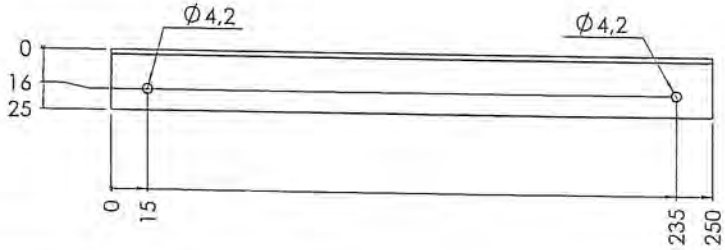

Haelles
A-A
B-B
C-C
Skuffekasse 7600
Morsø 7600
morsø
A1
1:1
71760800
7600-61 c







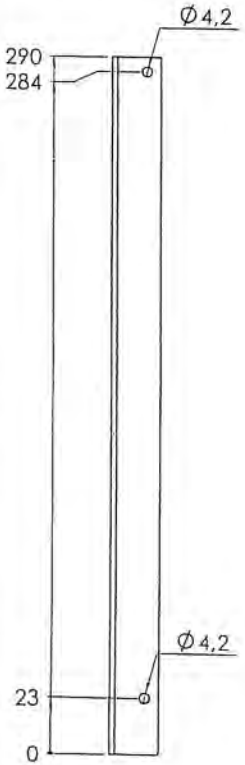


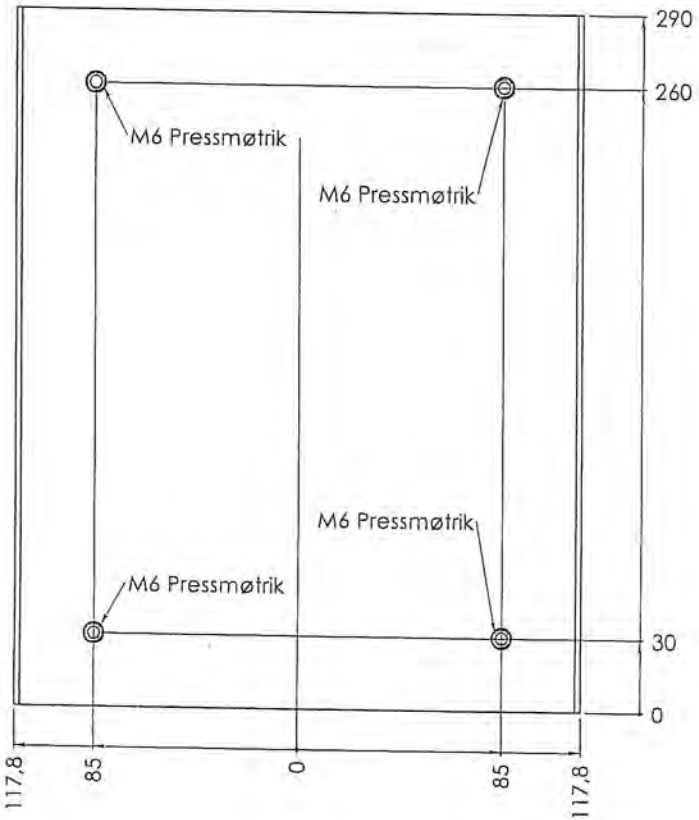


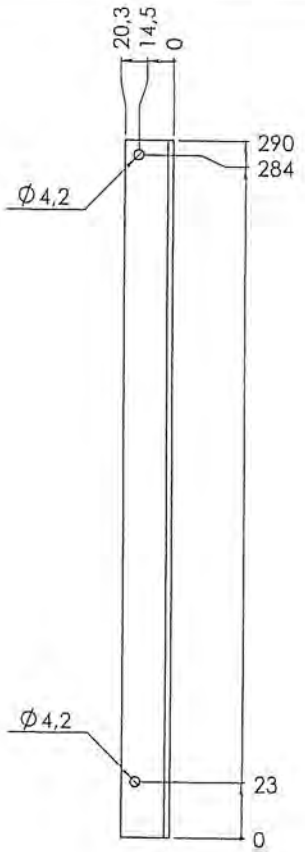
		Rev.	Revisions		Sign.:	Date:
		Title:	Mont.plade f. skuffesektion 7600	Construction:	KDU	06.03.08
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m				Released:	KDU	07.07.08
Material:	SPD Plade			Format:	A3	
Weight:	0,5 kg			Scale:	1:2	
Model no.	-		Morsø 7600	Itemno.:	71760900	
Drawingtype:	Emnelegning		morsø	Drawing no.:	7600-62 a	
Location of file:						

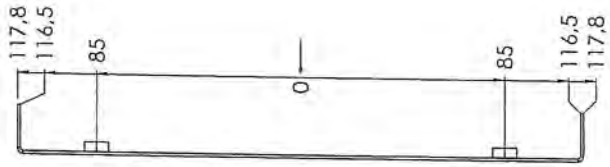
Date of print: 07-11-2008

1 - 90 OF 1 - 93









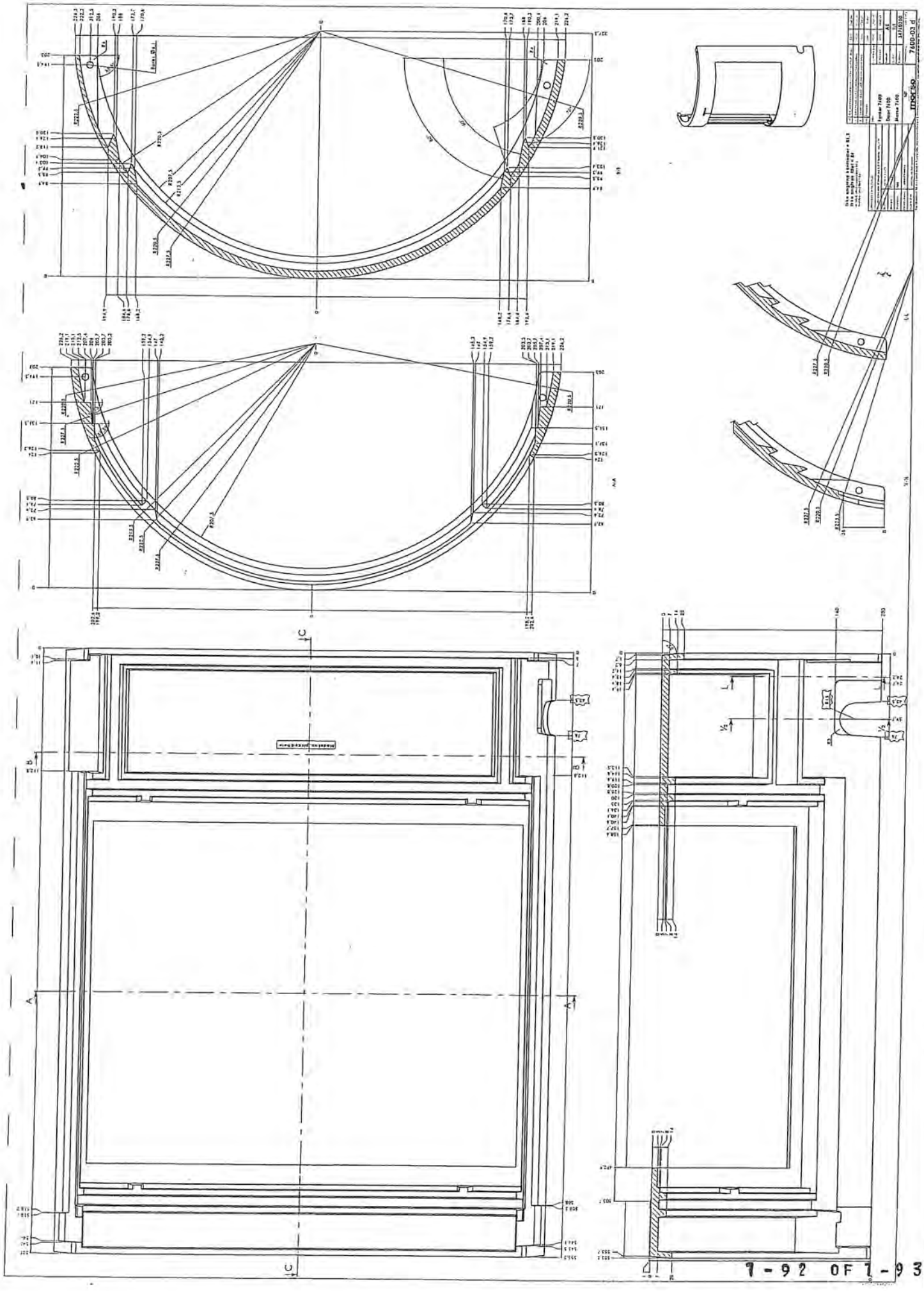
Rev.	Revisions	Sign.:	Date:

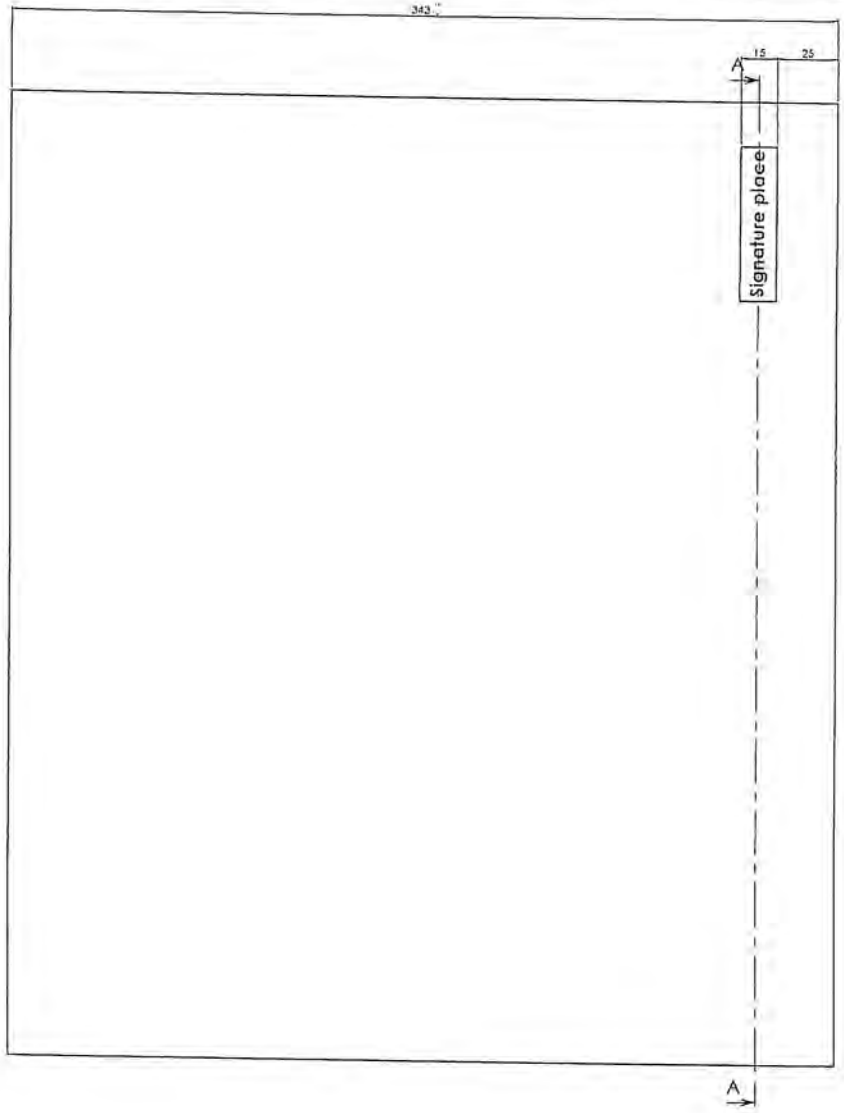
Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	SPD Plade
Weight:	0,77 kg
Model no.	-
Drawingtype:	Product Drawing
Location of file:	

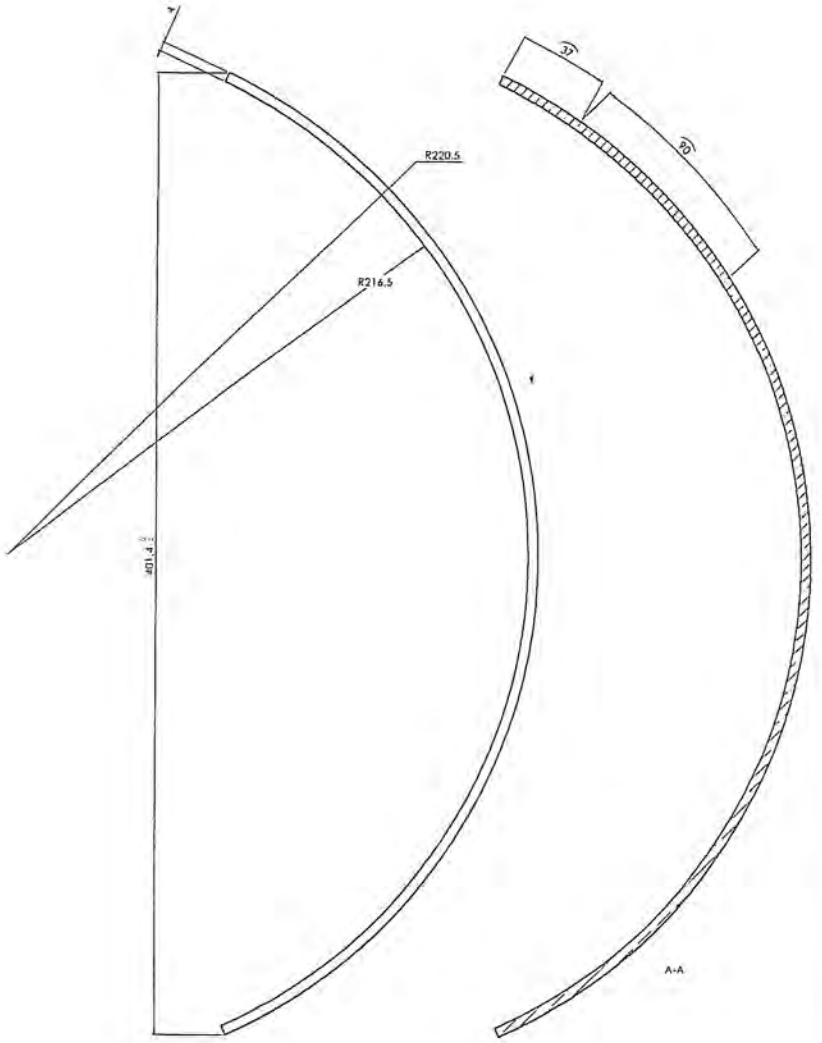
Title: Afstandsplade skuffe 7642	Construction:	KDU	20.01.05
	Released:	KDU	07.07.08
	Format:	A3	
	Scale:	1:2	
Morsø 7600	Itemno.:	71761000	
morsø	Drawing no.:	7600-63 a	

Date of print: 07-11-2006

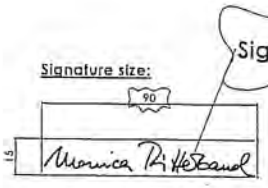
1-91 OF 1-93







Signature size:



Signature with black letters

Glas 7600			A1
Glass 7600			1:1
Morso 7600			79760100
		morso	7600-22 a

7 - 93 OF 1 - 93

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 Accreditation Service, Inc. (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

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3 Tracking #: 1293
Date: 11-13-08 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	11-17-08	07:20	.6125	.5001	21	71	JL
Lab ID # _____	11-18-08	07:40	.6123	.5001	18	71	JL
ID # N773							
✓ Tare wt. JL .5730 5729							
D/T in desiccator 11-13-08 12:00							
Preliminary wt.: .6152							
Rear Filter	11-17-08	07:20	.5750	.5001	21	71	JL
Lab ID # _____	11-18-08	07:40	.5748	.5001	18	71	JL
ID # N772							
✓ Tare wt. .5736							
D/T in desiccator: 11-13-08 12:00							
Preliminary wt.: .5756							
Acetone Rinse	11-18-08	07:40	111.8795	.5001	18	71	JL
Lab ID # _____	11-19-08	07:00	111.8793	.5001	18	72	JL
Beaker # 1020							
✓ Tare wt. 111.8764							
Volume 75 ml							
Cleaned by: JL							
Solvent #: SA 081							
D/T in desiccator: 11-17-08 07:30							
Preliminary wt.: 111.8795							

Technician signature: K. Morgan Date: 11-19-08

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OMNI-Test Laboratories, Inc

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3 Tracking #: 1293
Date: 11-13-08 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 # N775 ✓ Tare wt. .5659 D/T in desiccator 11-13-08 14:40 Preliminary wt.: .5767	11-17-08	07:20	.5763	.5001	21	71	IL
	11-18-08	07:40	.5760	.5001	18	71	IL
Rear Filter Lab ID # _____ ID # N774 ✓ Tare wt. .5705 D/T in desiccator: 11-13-08 14:40 Preliminary wt.: .5707	11-17-08	07:20	.5703	.5001	21	71	IL
	11-18-08	07:40	.5700	.5001	18	71	IL
Acetone Rinse Lab ID # _____ Beaker # 256 ✓ Tare wt. 112.9713 Volume 75 ml Cleaned by: IL Solvent #: SA-081 D/T in desiccator: 11-17-08 07:30 Preliminary wt.: 112.9745	11-18-08	07:40	112.9745	.5001	18	71	IL
	11-19-08	07:00	112.9741	.5001	18	72	IL

Technician signature: K. J. Morgan Date: 11-19-08

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OMNI-Test Laboratories, Inc

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3 Tracking #: 1293
Date: 11-14-08 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 # N777 Tare wt. .5678 D/T in desiccator 11-14-08 Preliminary wt.: .5808 12:45	11-17-08	07:20	.5803	.5001	21	71	JK
	11-18-08	07:40	.5801	.5001	18	71	JK
Rear Filter Lab ID # _____ ID # N776 Tare wt. .5719 D/T in desiccator: 11-14-08 12:45 Preliminary wt.: .5728	11-17-08	07:20	.5722	.5001	21	71	JK
	11-18-08	07:40	.5721	.5001	18	71	JK
Acetone Rinse Lab ID # _____ Beaker # 2116 Tare wt. 109.2993 Volume 100 ml Cleaned by: JK Solvent #: SA 081 D/T in desiccator: 11-17-08 07:30 Preliminary wt.: 109.3025	11-18-08	07:40	109.3024	.5001	18	71	JK
	11-19-08	07:00	109.3021	.5001	18	72	JK

Technician signature: J. Morgan Date: 11-19-08

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OMNI-Test Laboratories, Inc

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3 Tracking #: 1293
Date: 11-14-08 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	11-17-08	07:20	.5528	.5001	21	~~71~~ 71	JL
Lab ID # _____	11-18-08	07:40	.5526	.5001	18	71	JL
ID # N779							
✓ Tare wt. .5384							
D/T in desiccator 11-14-08 15:25							
Preliminary wt.: .5530							
Rear Filter	11-17-08	07:20	.5435	.5001	21	71	JL
Lab ID # _____	11-18-08	07:40	.5432	.5001	18	71	JL
ID # N778							
✓ Tare wt. .5429							
D/T in desiccator: 11-14-08 15:25							
Preliminary wt.: .5436							
Acetone Rinse	11-18-08	07:40	108.4311	.5001	18	71	JL
Lab ID # _____							
Beaker # 10	11-19-08	07:00	108.4309	.5001	18	72	JL
✓ Tare wt. 108.4277							
Volume 100 ml							
Cleaned by: JL							
Solvent #: _____							
D/T in desiccator: 11-17-08 07:30							
Preliminary wt.: 108.4310							

Technician signature: JL J. Morg Date: 11-19-08

~~19.4~~ 19.7
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OMNI-Test Laboratories, Inc

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3 Tracking #: 1293
Date: 11-17-08 Test Crew: K. Morgan Run #: 5
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	11-19-08	07:00	.5593	.5001	18	72	K
Lab ID # ____ ID # N781	11-20-08	07:00	.5589	.5001	14	71	K
✓ Tare wt. .5408							
D/T in desiccator 11-17-08 12:55							
Preliminary wt.: .5599							
Rear Filter	11-19-08	07:00	.5368	.5001	18	72	K
Lab ID # ____ ✓ ID # N780	11-20-08	07:00	5364	.5001	14	71	K
Tare wt. .5359							
D/T in desiccator: 11-17-08 12:55							
Preliminary wt.: .5379							
Acetone Rinse	11-19-08	07:00	94.5500	.5001	18	72	K
Lab ID # ____ Beaker # 274							
4.5485 ✓ Tare wt. ~~94.5484~~ K	11-20-08	07:00	94.5495	.5001	14	71	K
Volume 100 ml Cleaned by: K							
Solvent #: SA-081 D/T in desiccator: 11-18-08 07:40							
Preliminary wt.: 94.5507							

Technician signature: K. Morgan Date: 11-20-08

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Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3 Tracking #: 1293
Date: 11-17-08 Test Crew: K. Morgan Run #: 6
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 # N783 Tare wt. .5275 D/T in desiccator 11-17-08 16:30 Preliminary wt.: .5596	11-19-08	07:00	.5587	.5001	18	72	JL
	11-20-08	07:00	5582	.5001	14	71	JL
Rear Filter Lab ID # _____ ID # N782 Tare wt. .5334 D/T in desiccator: 11-17-08 16:30 Preliminary wt.: 5356	11-19-08	07:00	.5345	.5001	18	72	JL
	11-20-08	07:00	.5340	.5061	14	71	JL
Acetone Rinse Lab ID # _____ Beaker # 2208 Tare wt. 99.6885 Volume 100 ml Cleaned by: JL Solvent #: SM-081 D/T in desiccator: 11-18-08 07:40 Preliminary wt.: 99.6905	11-19-08	07:00	99.6900	.5001	18	72	JL
	11-20-08	07:00	99.6896	.5001	14	71	JL

Technician signature: K. Morgan Date: 11-20-08

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Date Placed in Desiccator	06-Nov-08					Balance ID Number	OMNI-00023					
Time Placed in Desiccator	8:50 AM					Audit Weight ID Number	OMNI-00131					
Technician	Davis					Thermometer/Hygrometer ID Number						

AE Glass 102 mm Filter Tares

OMNI-Test Laboratories, Inc

102 mm Filters ID Number	Date: / Time: / RH %: / T (F): / Tech.: / Audit:							Manufacturer	Appliance	Project No.	Run	Train
	11/7/2008 / 9:30 AM / 10 / 71 / Davis / 0.5001	11/10/2008 / 9:15 AM / 9 / 72 / Davis / 0.5001										
N772	0.5741	0.5736	X	0		0		Morso	7600 Series	192-S-18-3	1	
N773	0.573	0.5729	X	0		0		Morso	7600 Series	192-S-18-3	1	
N774	0.571	0.5705	X	0		0		Morso	7600 Series	192-S-18-3	2	
N775	0.5663	0.5659	X	0		0		Morso	7600 Series	192-S-18-3	2	
N776	0.5723	0.5719	X	0		0		Morso	7600 Series	192-S-18-3	3	
N777	0.5679	0.5678	X	0		0		Morso	7600 Series	192-S-18-3	3	
N778	0.5434	0.5429	X	0		0		Morso	7600 Series	192-S-18-3	4	
N779	0.5388	0.5384	X	0		0		Morso	7600 Series	192-S-18-3	4	
N780	0.5362	0.5359	X	0		0		Morso	7600 Series	192-S-18-3	5	
N781	0.5412	0.5408	X	0		0		Morso	7600 Series	192-S-18-3	5	
N782	0.5338	0.5334	X	0		0		Morso	7600 Series	192-S-18-3	6	
N783	0.528	0.5275	X	0		0		Morso	7600 Series	192-S-18-3	6	

Date Placed in Desiccator	17-Oct-08		Balance ID Number	OMNI-00023	
Time Placed in Desiccator	3:15 PM		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:	10/18/2008	10/22/2008		10/23/2008								
	Time:	3:50 PM	9:20 AM		2:35 PM								
	RH %:	13	18		17		0						
	T (F):	70	72		72		0						
	Tech.:	Morgan	Davis		Davis								
	Audit:	0.5001	0.5001		0.5001		0		Manufacturer	Appliance	Project No.	Run	Train
1020		111.878	111.8766		111.8764	X	0		Morso	7600 Series	192-S-18-3	1	

Date Placed in Desiccator	05-Oct-08				Balance ID Number	OMNI-00023						
Time Placed in Desiccator	8:45 AM				Audit Weight ID Number	OMNI-00131						
Technician	Davis				Thermometer/Hygrometer ID Number							

250 ml Beaker Tares

OMNI-Test Laboratories, Inc

250 ml Beakers ID Number	Date:	Time:	RH %:	T (F):	Tech.:	Audit:					Manufacturer	Appliance	Project No.	Run	Train
	10/6/2008	9:24 AM	18	74	Davis	0.5001									
	10/7/2008	10:22 AM	23	74	Davis	0.5001									
	10/8/2008	10:09 AM	16	72	Davis	0.5001									
			0	0		0									
256	112.9717		112.9713	X	0		0				Morso	7600 Series	192-S-18-3	2	

Date Placed in Desiccator	11-Nov-08	Balance ID Number	OMNI-00023
Time Placed in Desiccator	11:00 AM	Audit Weight ID Number	OMNI-00131
Technician	Davis	Thermometer/Hygrometer ID Number	

250 ml Beaker Tares

OMNI-Test Laboratories, Inc

250 ml Beakers ID Number									Manufacturer	Appliance	Project No.	Run	Train
Date:	11/13/2008	11/14/2008		11/14/2008									
Time:	8:00 AM	8:30 AM		3:30 PM									
RH %:	10	8		9		0							
T (F):	73	71		73		0							
Tech.:	R. Smith	R. Smith		R. Smith									
Audit:	0.5001	0.5001		0.5001		0							
2208	99.6888	99.6882		99.6885	X	0			Morso	7600 Series	192-S-18-3	6	
274	94.5516	94.5484		94.5485	X	0			Morso	7600 Series	192-S-18-3	5	
2116	109.2992	109.2993	X	0		0			Morso	7600 Series	192-S-18-3	3	
10	108.4278	108.4277	X	0		0			Morso	7600 Series	192-S-18-3	4	

Acetone Solvent Blank Analysis Worksheet

Date: 9-24-08 By: K. Morgan Balance ID #: OMNI – 00023

Manuf. Lot #: E1809045P Solvent Bottle #: SA-081 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	2005	100.5015	9-25-08 & 07:15	9-26-08	07:15	100.5010	.5001	IL	100.5014 - 100.5015 = -0.1 mg = ϕ mg/ml
				9-26-08	14:15	100.5014	.5001	IL	
150	2169	107.4986	9-25-08 & 07:15	9-26-08	07:15	107.4987	.5001	IL	107.4991 - 107.4986 = 0.5 mg / 150 ml = .0033 mg/ml
				9-26-08	14:15	107.4991	.5001	IL	
			___ & ___						ϕ + .0033 / 2 = .0017 mg/ml

Technician Signature: IL J. Morgan Date: 9-26-08

Checked by: [signature] Date: 9-26-08 Approved by: [signature] Date: 9-29-08

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Calibrations

Methods 28 and 5G

ID #	Lab Name/Purpose	Log Name	Attachment Type
131	500 mg Weight	Standard Weight, 500 mg – Ohaus	Calibration Certificate
141	Dry Gas Meter	Dry Gas Meter – Singer	Calibration Log
209	Barometer	Barometer – Princo	Manual Cover
265	Vaneometer	Vaneometer/Air Velocity Meter – Dwyer	Calibration Log
274	10 lb Weight	Standard Weight, 10 lb	Calibration Certificate
288	Scale	Platform Scale – Weigh-Tronix	Examination Report
289	Source Sampler	Control Module – Apex	Calibration Log
340	Moisture Meter	Moisture Meter – Delmhorst	Manual
343	Hygrometer	Hygrometer/Thermometer – Omega	Calibration Certificate

Certificate of Calibration

Certificate Number: **413631**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: **OTL-08-490**
Order Date: 11/04/2008

ACCREDITED
0723.01

Property #: OMNI-00131
User:
Department:
Make: Ohaus
Model: 500mg
Serial #: 27503
Description: 500mg WEIGHT
Procedure: DCN 500901
Accuracy: CLASS F

Calibrated on: 11/05/2008
*Recommended Due: 11/05/2009
Environment: 18 °C 43 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 92

Remarks:
Refer to attachment for measurement results.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
256A	Rice Lake	W0133K	WEIGHT SET	02/08/2010	406054
432A	Sartorius	C-44	Microbalance 5.1g	11/13/2008	384448

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

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, 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 prior written consent of JJ Calibrations, Inc. JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer

Inspector

5 Issued 11/05/2008 Rev # 13

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Supplemental Calibration Report

Certificate Number: **413631**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Customer:	Omni-Test Laboratories		
Property ID:	OMNI-00131	PO:	OTL-08-490
Make:	Ohaus	Order Date:	11/04/2008
Model:	500mg	Procedure:	DCN 500901
Serial #:	27503	Calibrated on:	11/05/2008
Description:	500mg WEIGHT	Technician:	92

Parameter Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	
Before/After									Accredited = ✓
Mass									
		mg	500.0000	500.123	-0.1230	499.28	500.72	0.00011	✓

2-17 OF 2-49

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:	01-21-2008
Reference Number:	PO# OTL-08-354	Calibration Due:	01-21-2009
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 2-2011
Serial Number:	95W492393	NIST Traceability Per:	MS131414,MS13431
Rated Uncertainty:	+/- .5% RD	Ambient Conditions:	763 mmHGA, 49% RH
Uncertainty Given:	As rec.Within Specs.	Certificate/File:	423862.08

	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	1.001	1.000	0.99901
5	1.503	1.500	0.99801
6	2.004	2.000	0.99801
7	2.505	2.500	0.99801
8	3.006	3.000	0.99801

(Average) y = .1998 K x-14-08

** 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(X). MUST BE USED WITH ATTACHED DATA SHEET ( )YES, (X)NO

Calibration Performed By:

PABLO ACOSTA PA

Approved By:

R. D. Munns

OMNI 00209

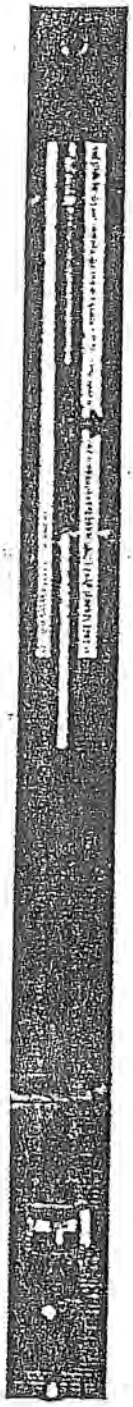
Instruction Booklet

for use with

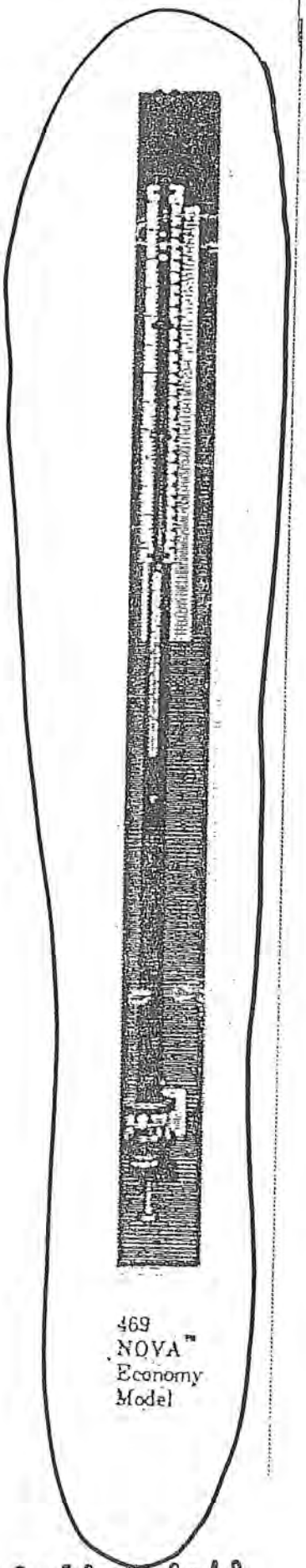
PRINCO

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

CALIBRATION RECORD

Vaneometer Air Velocity Meter – OMNI-00~~032~~ 265 ak

CALIBRATION/SERVICE RECORD			
DATE	BY	RESULTS	DATE OF NEXT CALIBRATION
10-18-02	Jared S	Installed new vane from factory	4-18-03
4-15-03	K	Installed new vane from factory	10-15-03
10-26-03	BQ	Installed new vane from factory	4-26-04
4-26-04	BQ	Installed new vane from factory	10-26-04
11-4-04	BQ	Installed new vane from factory	5-4-05
5-3-05	BQ	Installed new vane from factory	11-3-05
11-3-05	BQ	Installed new vane from factory	5-3-06
6-1-06	JTS	Installed new vane from factory ✓	12-1-06
11-28-06	BD	Installed new vane from factory	~~5-28-07~~ ↓
		Installed new vane from factory	5.28.07 MD
5-29-07	Jared S.	Installed new vane from factory	11-28-07
11-7-07	Jared S	Installed new vane from factory	5-7-08
5-28-08	K	Installed new vane from factory	11-28-08
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	

Certificate of Calibration

Certificate Number: **391820**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

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

PO: OTL-08-360
Order Date: 01/24/2008

ACCREDITED
0723.01

Property #: OMNI-00274
User:
Department:
Make: Rice Lake
Model: 10 lb.
Serial #: OMNI-00274
Description: WEIGHT
Procedure: CP 16
Accuracy: CLASS F

Calibrated on: 01/31/2008
*Recommended Due: 01/31/2009
Environment: 20 °C 34 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 92

Remarks:
Refer to attachment for measurement results.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
432A	Sartorius	C-44	MICROBALANCE 5.1g	11/13/2008	384448
484A	Rice Lake	1kg - 10kg SET	WEIGHTS ASTM 1	12/31/2008	360668
550A	And (A&D) Co.	HP-30K	BALANCE 30 Kg	03/27/2008	367807

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

Carolyn Johansen
Reviewer

Inspector

5 Issued Rev # 13

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Supplemental Calibration Report

Certificate Number: **391820**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Customer:	Omni-Test Laboratories		
Property ID:	OMNI-00274	PO:	OTL-08-360
Make:	Rice Lake	Order Date:	01/24/2008
Model:	10 lb.	Procedure:	CP 16
Serial #:	OMNI-00274	Calibrated on:	01/31/2008
Description:	WEIGHT	Technician:	92

Parameter Measurement Description	Range	Unit	Reference	UUT	Variance	Minimum	Maximum	Uncertainty	
Before/After								Accredited = ✓	
Mass									
Mass		mg	4535924	4535860	64.5	4535524	4536324	7.9E-5	✓

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STATE OF OREGON
Department of Agriculture
MEASUREMENT STANDARDS DIVISION
635 Capitol Street NE
Salem, Oregon 97301-2532

SCALE EXAMINATION REPORT

LA | COL | Retest

Date: 11 19 03	Time: 1:00 AM/PM	Duration: .3	
License Status:	Number Issued:	Number Required: 0B	Number Tested: 0B
Firm Number:	License Number(s):		
Operator / Corporation Name: John Vanquees			
Previous Firm Name:			
Seasonal Months: ____ to ____	Phone Number: 503-643-3788		

Firm Name: OMNI Tec Laboratories

Mailing Address: SAME

City / State / Zip Code: County No.

Device Location: 5415 SW Weston Ave

City / State / Zip Code: Beaverton OR 97075 County No. 34

Direct: # Indirect: # Class Exempt: # Packaging: # Postal: #Scanners:

DESCRIPTION OF EQUIPMENT			LICENSE / IDENTIFICATION INFORMATION				ACTION TAKEN		
SCALE MAKE	SCALE TYPE	SCALE LOCATION	MFR'S RATED CAP'Y	ORE. LIC. TYPE	SERIAL NUMBER	ZERO BAL. COND.	OK *Rejected	REPAIR TAG or NNC NUMBER(S)	# DAYS FOR REPAIR
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.		TEST							
12.									
13.									
14.									
15.	NO								
16.									
17.									
18.									
19.									
20.									

* REJECTION CODES ON REVERSE SIDE

REMARKS

Non-Commercial Application - For lab testing of
Eelgrass [illegible] - No certification by MSD required

DEPARTMENT REPRESENTATIVE: [signature]

OPERATOR COPY RECEIVED BY: [signature]

Posted ☐ Insp. Type: 1

For Information By Phone: SALEM (503) 986-4670 / FAX: (503) 986-4784 / Hearing Impaired: (503) 986-4762

White Report = OFFICE Yellow Report = INSPECTOR Pink Report = OPERATOR Form 2059 Rev. 9/01

Thermal Metering System Calibration
Y and dH@

Manufacturer:	Apex Instruments
Model:	563
Serial Number:	289
OMNI Tracking No.:	289

Average Orifice Meter dH@	Average Gas Meter y Factor
2.243	1.002

Calibration Date:	11/24/08
Calibrated by:	Ken Morgan
Calibration Frequency:	Post Seires
Next Calibration Due:	05/25/09
Instrument Range:	1.000 cfm
Standard Temp.:	68 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.21 "Hg
Signature/Date:	11-24-08

Previous Calibration Comparision

Date	10/9/2008	Acceptable	
dH@ Value	NA	Deviation (5%)	Deviation
y Factor	1.001	0.05005	0.001
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.000
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.012
Acceptance	Acceptable

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	00141	
	Calib. Date	21-Jan-08	
	Calib. Value	0.9980	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	1.20	1.20	1.20
dH ("H2O)	1.15	1.15	1.15
Initial Reference Meter	102.35	109.847	115.175
Final Reference Meter	109.832	115.175	120.487
Initial DGM	0	0	0
Final DGM	7.443	5.311	5.302
Temp. Ref. Meter (°F), Tr	67.0	68.0	68.0
Temperature DGM (°F), Td	68.0	70.0	71.0
Time (Minutes)	14.0	10.0	10.0
Net Volume Ref. Meter, Vr	7.482	5.328	5.312
Net Volume DGM, Vd	7.443	5.311	5.302
Gas Meter y Factor =	**1.002**	**1.002**	**1.003**
Gas Meter y Factor Deviation (from avg.)	0.000	0.000	0.000
Orifice dH@	**2.23**	**2.24**	**2.25**
Orifice dH@ Deviation (from avg.)	0.012	0.001	0.011

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

DELMHORST®
INSTRUMENT CO.
WHEN ACCURACY IS THE POINT.™
51 Indian Lane East
Towaco, NJ 07082

1-877-DELMHORST
www.delmhorst.com
e-mail - info@delmhorst.com

REV. 8/05

J-2000

owners manual

DELMHORST®
INSTRUMENT CO.
WHEN ACCURACY IS THE POINT.™
1-877-DELMHORST
www.delmhorst.com
e-mail - info@delmhorst.com

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3 Before You Begin

3 Check Calibration

4 Set Species

5 Species Code Chart

6 Set Temperature

7 Set Pin Calibration

7 Taking a Reading

8 Information About Your Readings

8 To Check Accumulated Readings

8 To Reset Meter

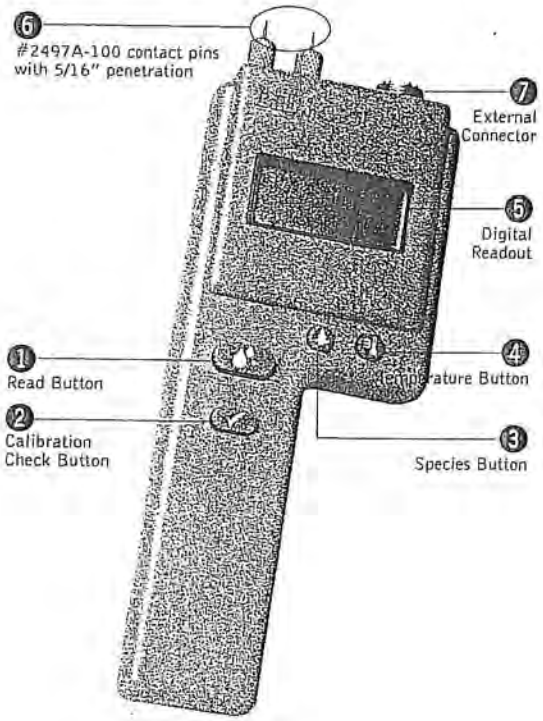
9 Pin Talk

9 Care of Your Meter

10 Service For Your Meter

11 Warranty

DELMHORST J-2000



J-2000 FEATURES

- Resistance technology recognized worldwide as the most accurate method for measuring moisture
- 6% to 40% moisture range
- Digital readout
- Averages up to 100 accumulated readings
- Built-in correction for 48 different species
- Built-in temperature compensation both Fahrenheit and Celsius
- Proven microcontroller circuit for increased reliability and accuracy
- Easy one-hand operation
- Includes (1) 9-Volt Battery
- Includes sturdy carrying case
- One-year warranty
- Over fifty years of proven quality, accuracy and service

BEFORE YOU BEGIN

Button Functions

1. READ BUTTON - Reads the Percent Moisture Content value (%MC), corrected for temperature and species.

2. CALIBRATION CHECK BUTTON - Checks meter calibration. It also displays the average of up to 100 accumulated readings; displays the maximum stored reading; erases the readings.

3. SPECIES BUTTON - Sets the species code for the wood you are using. Species are numbered from 1 to 48 and are listed on the Species Code Chart. This button also acts as a scroll key, depending on the function.

4. TEMPERATURE BUTTON - Sets the wood temperature and changes the temperature mode (Fahrenheit or Celsius). This button also acts as a scroll key, depending on the function.

CHECK CALIBRATION ✓

Press the calibration check button 2 and read button 1 simultaneously. Meter is in calibration if it displays 12% (+ or - .2).

If you check the calibration and the meter does not display 12% it is likely an indication of a low battery. If this occurs, change the battery immediately. Continued use with a low battery may cause the meter to go out of calibration. If you have a fresh battery and the instrument still does not indicate a proper calibration, return it to DELMHORST for service. See **Service for your Meter** section.

When the battery is removed and then reconnected, the meter displays its software version for one second and then turns itself off. After replacing the battery, you must reset the meter as described in **Resetting the Meter** section.

SET SPECIES

The J-2000 defaults to Species Code #1 - Douglas Fir - the USDA standard and basis for all calibrations. Because the electrical characteristics of different species vary, all species read differently at the same moisture content. For this reason you need to adjust for species. If you are working with a species other than Douglas Fir, set the species code using the species button ③, and the meter will make the necessary corrections.

- ▶ To change species press the species button ③. The meter will display the current species code for one second.
- ▶ To scroll forward through the species list hold the species button ③ while the current species code is displayed and scroll to the species number desired.
- ▶ To scroll backward through the species list, press and release the species button ③. Within one second, press and hold the temperature button ④. Continue to hold the temperature button ④ and the species number will decrease.
- ▶ When scrolling in either direction, release the button to stop at your desired species.

The J-2000 can be used to test more than just wood. It will also give a relative reading on plywood, OSB, particleboard and MDF or can be fitted with a 26-ES slide hammer for specific applications. Call Delmhorst at 1-877-DELMHORST or e-mail info@delmhorst.com for information on how to interpret the readings for other materials.

Species Code Chart

CODE	SPECIES	CODE	SPECIES
1	Fir, Douglas	25	Magnolia
2	Pine, Southern	26	Mahogany, African (also Khaya)
3	SPF	27	Mahogany, Honduras
4	Alder	28	Mahogany, Philippine
5	Apitong	29	Maple, Hard/Soft
6	Aspen	30	Meranti, Dark Red
7	Ash, White	31	Oak, Red
8	Basswood	32	Oak, White
9	Birch	33	Pecan
10	Cedar, Eastern Red	34	Pine, Longleaf
11	Cedar, Incense	35	Pine, Ponderosa
12	Cherry	36	Pine, Shortleaf
13	Cottonwood	37	Pine, Sugar
14	Cypress	38	Pine, White
15	Elm, American	39	Poplar, Yellow
16	Fir, Red	40	Ramin
17	Fir, White	41	Radiata Pine
18	Gum, Black	42	Redwood
19	Gum, Red	43	Spruce, Sitka
20	Hemlock, Western	44	SPF, COFI*
21	Hackberry	45	Teak
22	Hickory	46	Virola
23	Keruing	47	Walnut, Black
24	Larch	48	Western Hemlock - COFI*

*Species and temperature correction data for both Western Hemlock-COFI (code #48) and SPF-COFI (code #44) were developed by COFI.

When comparing readings between the model RDM-2/COFI or the RDM-2S/COFI, used with type 26-E electrode with insulated pins, and the J-2000, be sure both meters are set to 2-pin electrode (insulated pins).

SET TEMPERATURE

The J-2000 defaults to a temperature of 70°F. As wood temperature increases, its electrical resistance decreases and indicated moisture content rises. Lower wood temperatures result in lower indicated moisture content. A correction is necessary if the wood temperature is outside the range of 50°F (10°C) to 90°F (32°C). Set the temperature accordingly and the meter will make the correction.

- To change temperature press and release the temperature button ④. The meter will display the current temperature for one second.
- To scroll forward through the temperature settings, press and hold the temperature button ④ while the current temperature is displayed.
- To scroll backward press and release the temperature button ④. Within one second, press and hold the species button ③. Continue to hold the species button ③ and the temperature will decrease.
- When scrolling in either direction, release the button to stop at the desired temperature.

Set Temperature Mode

- To change from Fahrenheit to Celsius mode or Celsius to Fahrenheit mode press the temperature button ④.
- Press the calibration check button ② within one second and release when you are in the mode needed.
- The meter will display the current temperature setting in the new mode and will wait one more second until shutting off so that you may change the temperature value as described above.

If the meter is in Fahrenheit mode, the letter "F" will display in the left-hand corner. If it is in Celsius mode, no letter will appear in the display.

In the Fahrenheit mode, the temperature will change in increments of 5°F. In Celsius, the temperature will change in increments of either 2°C or 3°C depending on its conversion from Fahrenheit.

In the Fahrenheit mode, the temperature value will display in whole numbers. In the Celsius mode, positive values will display in whole numbers; negative values will display with a decimal point and a "-" sign in the left-hand corner. (i.e.: -17.0)

SET PIN CALIBRATION

The basic factory calibration of the J-2000 is for use with uninsulated pins – either the integral pins ⑥ or with an optional external electrode, such as the #4-E. The difference in readings between insulated and uninsulated pins is small below 10% moisture content. The difference increases as moisture content increases above 10%. When using an electrode with insulated pins, such as the 26-ES, you can change the calibration to compensate for this difference.

- ▶ To change the pin setting, press and release the species button ③, then press the calibration check button ② within one second.
- ▶ The meter will display the current pin calibration as either 222 for insulated or 444 for uninsulated pins.
- ▶ If you continue to hold the calibration check button ②, the meter will change pin calibration. The new calibration will remain in "memory" until you change it again, or you remove the battery.

TAKING A READING

The contact pins ⑥ provided are best for stock up to 6/4. On stock over 6/4 or for hardwoods over 4/4 we recommend using a remote probe such as the 26-ES ram-type electrode. Mount the 26-ES directly to the external connector ⑦. See additional information under the **Pin Talk** section.

- ▶ Remove the protective cover to expose the pins. Check that the contact pins ⑥ are firmly hand tightened.
- ▶ To take a reading, align the contact pins ⑥ parallel to the grain and push them to their full penetration into the wood, if possible. Insulated pins read only at the tip and can be driven to the desired depth.
- ▶ Press the read button ① and read the moisture content on the meter scale. The meter displays the %MC for two seconds.
- ▶ To add a reading to the sum of all the previously stored readings, release the read button ① within 2 seconds.

INFORMATION ABOUT YOUR READINGS

Readings below 6% will be displayed as a numeric value, (-##.#), and will not be added to accumulation. A reading below 6% which is due to temperature and species adjustments will be shown as a numeric value with no minus sign and this reading will be added to the accumulation.

Readings above 40% are always displayed as 999 and are not added to the accumulation.

The meter will accumulate up to 100 readings. After all 100 readings are stored it will not add new readings until the memory has been cleared. It will also continue to display the average of all 100 readings as a reminder that the memory is full.

When taking and storing readings for a specific wood species, be sure to "clear" the meter before moving on to the next species if you do not want to group all of the readings together.

TO CHECK ACCUMULATED READINGS

This feature allows you to view the total number of all accumulated readings, the average of those readings, and the highest stored reading.

- ▶ To view the readings press and release the calibration check button ❷. First the meter displays the number of accumulated readings for one second, then the average of those readings for two seconds. Then it displays the highest stored reading for two seconds. The total "cycle" time is five seconds.
- ▶ To erase readings hold the calibration check button ❷ down for 5 seconds. All accumulated readings will be erased and the meter will display "0".

TO RESET METER

- ▶ Press and release the calibration check button ❷.
- ▶ Within one second press the species button ❸.
- ▶ The meter will reset itself and display "170" to indicated Species #1 (Douglas Fir) at 70°F. All of the readings in memory will be cleared.

PIN TALK

There are two types of contact pins - uninsulated, which were provided with your meter, and insulated. When using uninsulated pins, push them in to the wood to their full length, if possible. This will give you the highest measured reading. Insulated pins read only at the tip and can be driven to a desired depth to gather shell and core (gradient) information. Additional types and lengths of both the insulated and uninsulated pins are available for specific applications.

CARE OF YOUR METER

To keep your meter in good working order:

- ▶ Store your meter in a clean, dry place. The protective carrying case provided is an ideal storage place when the meter is not in use.
- ▶ Change the 9-Volt battery as needed. Continued use with a low battery may cause the meter to go out of calibration.
- ▶ Change contact pins as needed. Keep contact pins hand tightened.
- ▶ Clean the meter and contact pins with any biodegradable cleaner. Use the cleaner sparingly and on external parts only. Keep cleaner out of the external connector ⑦.
- ▶ Remove the battery if the meter will not be used for one month or longer.

SERVICE FOR YOUR METER

- **Before sending in your meter we recommend you give one of our trained technicians a call. Many times troubleshooting can be taken care of over the phone. Call us at 1-877-DELMHORST.**
- Pack your meter securely. Enclose a purchase order or letter with a brief description of the problem.
- There is no need to call us for a return authorization number if you are within the U.S. Customers outside the U.S. must contact us for more specific instructions prior to returning a meter.
- Include your name, address, daytime phone and fax numbers or e-mail address. If you believe the meter is under warranty, please provide the original sales slip or invoice.
- Ship via UPS, Express Mail, Priority Mail, or any overnight courier who provides prompt service. Do not use standard parcel post.
- Insure your instrument for its full value and ship prepaid. We are not responsible for damage in transit.
- We do not accept COD shipments or cover any incoming freight or duty charges on returned merchandise
- Turnaround time on repairs is approximately two weeks.
- We will call you with an estimate if you specifically request one, or if we determine that the meter may be too costly to repair.
- Non-warranty repairs will be returned via UPS/COD unless you have already established other payment terms. There is no COD service outside the U.S. To pay by credit card, include the card number and expiration date with your repair. We accept Visa/MasterCard and American Express.
- Warranty repairs will be returned at no charge if shipped within the U.S. via UPS Ground Service. Freight charges for expedited services (i.e., Federal Express, UPS/2 Day, UPS/1 Day, etc.) are the customer's responsibility and will be charged as per the above terms.

WARRANTY

Delmhorst Instrument Co., referred to hereafter as Delmhorst, guarantees its J-2000 meter for one year from date of purchase and any optional electrodes against defects in material or workmanship for 90 days. If, within the warranty period, you find any defect in material or workmanship return the meter following the instructions in the **Service for Your Meter** section. This limited warranty does not cover abuse, alteration, misuse, damage during shipment, improper service, unauthorized or unreasonable use of the meter or electrodes. This warranty does not cover batteries or contact pins. If the meter or any optional electrodes have been tampered with, the warranty shall be void. At our option we may replace or repair the meter.

Delmhorst shall not be liable for incidental or consequential damages for the breach of any express or implied warranty with respect to this product or its calibration. With proper care and maintenance the meter should stay in calibration; follow the instructions in the **Care of Your Meter** section.

Under no circumstances shall Delmhorst be liable for any incidental, indirect, special, or consequential damages of any type whatsoever, including, but not limited to, lost profits or downtime arising out of or related in any respect to its meters or electrodes and no other warranty, written, oral or implied applies. Delmhorst shall in no event be liable for any breach of warranty or defect in this product that exceeds the amount of purchase of this product.

The express warranty set forth above constitutes the entire warranty with respect to Delmhorst meters and electrodes and no other warranty, written, oral, or implied applies. This warranty is personal to the customer purchasing the product and is not transferable.

For more detailed information about using a wood moisture meter, call us toll-free at 1-877-DELMHORST. Ask for your free copy of "Measuring Wood Moisture Content: Straight Talk from Delmhorst". Or find it on our web site at www.delmhorst.com.

For over 60 years, Delmhorst has been the leading manufacturer of high-quality moisture meters and thermo-hygrometers. Today we offer the innovative KIL-MO-TROL® in-kiln monitoring system. We also offer a wide range of meters for a variety of applications including woodworking/lumber, agriculture, construction, paper, restoration, IAQ and flooring.

Certificate of Calibration

Certificate Number: **409759**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: otl-08-465
Order Date: 09/12/2008

ACCREDITED
0723.01

Property #: OMNI-00343
User:
Department:
Make: Omega
Model: RH81
Serial #: 9480216
Description: THERMO HYGROMETER
Procedure: DCN 401013 /CP 11
Accuracy: RH +/-3% TEMP ±1°C(±1.8°F)

Calibrated on: 09/16/2008
*Recommended Due: 09/16/2009
Environment: 25 °C 42 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 112

Remarks:
Refer to attachment for measurement results.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
464A	General Eastern	M4-RH/D2	HUMIDITY STANDARD	04/17/2009	398017
497A	Hart Scientific	1502A	TWEENER THERMOMETER	09/27/2008	392473
601A	Burns Engineering	200G05B085	INDUSTRIAL PRT	02/20/2010	392474

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

Reviewer

Inspector

5 Issued Rev # 13

Supplemental Calibration Report

Certificate Number: **409759**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Customer:	Omni-Test Laboratories		
Property ID:	OMNI-00343	PO:	otl-08-465
Make:	Omega	Order Date:	09/12/2008
Model:	RH81	Procedure:	DCN 401013 /CP 11
Serial #:	9480216	Calibrated on:	09/16/2008
Description:	THERMO HYGROMETER	Technician:	112

Parameter / Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	
Before/After									Accredited = ✓
Relative Humidity									
		%	25.00	23.7	1.30	22	28	0.25	✓
		%	50.10	49.4	0.70	47.1	53.1	0.25	✓
		%	80.40	79.4	1.00	77.4	83.4	0.25	✓
Temperature									
		°F	56.90	56.4	0.50	55.1	58.7	0.2	✓
Temperature / Ambient									
		°F	72.80	73.2	-0.40	71	74.6	0.2	✓
Temperature									
		°F	97.50	98.0	-0.50	95.7	99.3	0.2	✓

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:

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

$m_n = 16.2$ 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: $85.49 \frac{ft}{\text{sec}} \left[\frac{(lb/lb\text{-}mole) \times (inches\ Hg)}{(^oR) \times (inches\ H_2O)}\right]^{\frac{1}{2}}$

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 Manuals

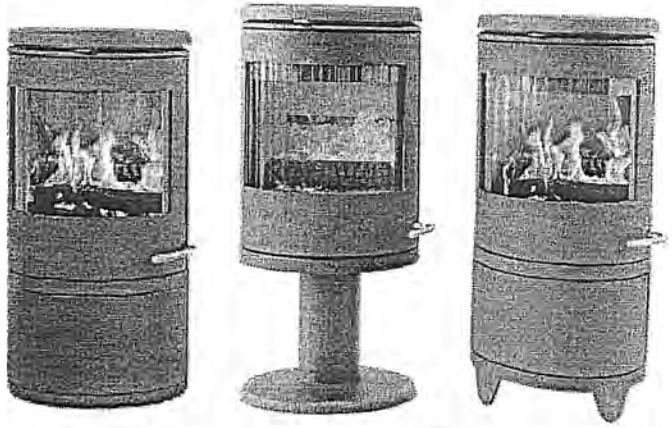
By appointment to The Royal Danish Court

morsø

Installation and Operating Instructions

7600 series

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

3-12 0331-26

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 7600 series meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after July 1, 1990

The Morsø 7600 series 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/hr..

NATIONAL FIREPLACE INSTITUTE NFI CERTIFIED www.nficertified.org

We recommend that our pellet hearth products be installed and serviced by professionals who are certified in the U.S. by the National Fireplace Institute® (NFI) as NFI Pellet Specialists or who are certified in Canada by Wood Energy Technical Training (WETT).

Wood Energy Technical Training

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1.0 Installation of your Morsø stove

Installation of woodburning stoves must be safe and legal.

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

Before you start installing your stove, make sure that:

- The stove and chimney connection are placed far enough from combustible materials to meet all clearance requirements.
- The floor protection must be adequate and must be made correctly according to 'the requirements.

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

Before starting the initial fire, make sure that the baffle is placed correctly.

Standard Accessories

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

3184 OF 3-29

1.2 The chimney / flue system

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

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

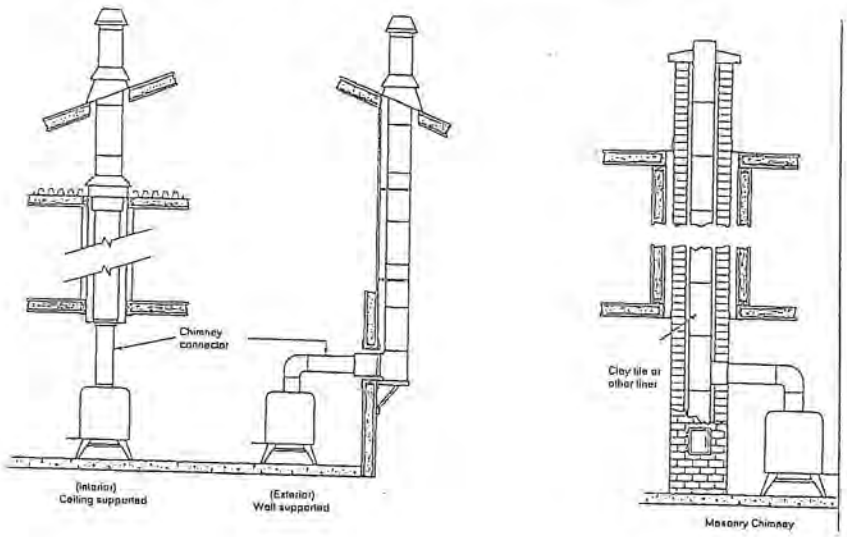
Use a residential type masonry or listed type HT factory-built chimney.

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

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

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

Typical Factory-Built or Masonry Chimney Installations



1.3 Flue Connection

The stove is supplied from the factory with a round blanking plate blocking off the top and rear flue exit (behind the rear shield plate). A flue collar are placed in the firebox area.

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

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

1.4 Connection to the existing chimney

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

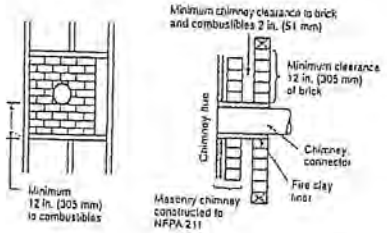
Double-wall connectors must be tested and listed for use with solid-fuel burning appliances. Single-wall connectors should be made of 24 gauge or heavier gauge steel. Do not use galvanized connector; it cannot withstand the high-temperatures that smoke and exhaust gases can reach, and may release toxic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

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

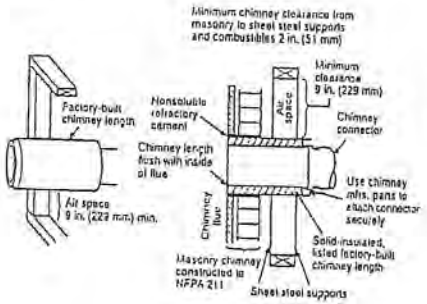
It is important to keep the flue gases moving smoothly in the right direction. Do not vent into a large void at this location; rather form one continuous section all the way up. Use mild bends (e.g. 45° vs. 90°) rather than sharp angles where a change of direction is required. All parts of the venting must be accessible for cleaning purposes.
In horizontal runs of chimney, maintain a distance of 18 inches from the ceiling. Keep it as short and direct as possible, with no more than two 90 degree turns. Slope horizontal runs of connector upward 1/4 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.

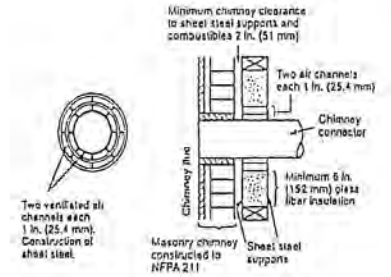
Where passage through a wall or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365.



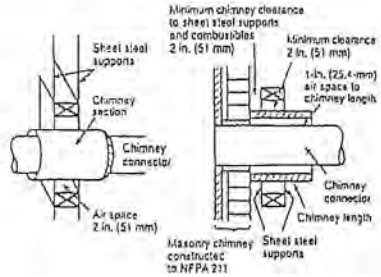
A Minimum 3.5-in thick brick masonry all framed into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.



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

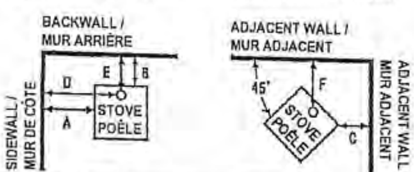
When the stove is positioned near <u>combustible</u> materials, observe all current local and national building regulations with regards to clearances. Whatever regulations apply to your area, do not in any case install the stove within 8 inches of combustible materials around the sides or 16 inches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

When the stove is positioned near <u>non-combustible</u> 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.

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

CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION SINGLEWALL CONNECTOR: USA	Canada
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clearances	

MINIMUM CLEARANCES TO COMBUSTIBLES:
DEGAGEMENTS MINIMAUX AUX MATERIAUX COMBUSTIBLES:

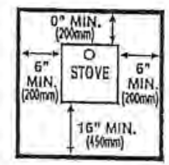


CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION (DOUBLEWALL CONNECTOR): USA	Canada
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clearances	

CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION REAR VENT OUT BACK WALL SINGLEWALL CONNECTOR: USA	Canada
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clearances	

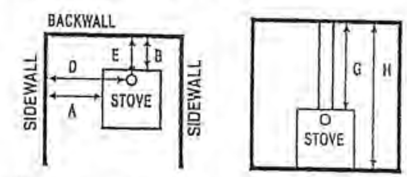
CLEARANCE REQUIREMENTS:	ALCOVE INSTALLATION WITH (SINGLEWALL WALL CONNECTOR):
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clearances

NON-COMBUSTIBLE FLOOR PROTECTOR



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

ALCOVE INSTALLATION



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

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

CLEARANCE REQUIREMENTS:	ALCOVE INSTALLATION WITH (DOUBLE WALL CONNECTOR):
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clearances

Distance to furniture

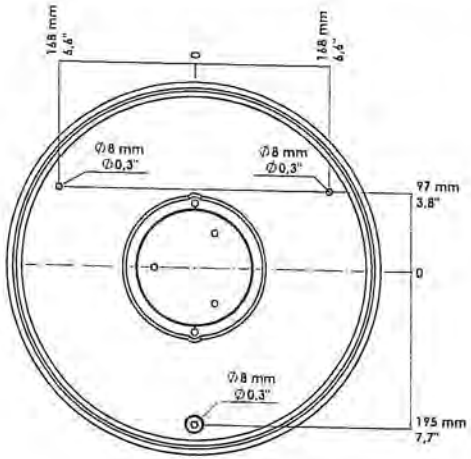
The recommended minimum distance from stove to furniture is 30 inches. Note that some furniture is more easily affected by heat and may need to be moved to a greater distance. This is your responsibility.

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

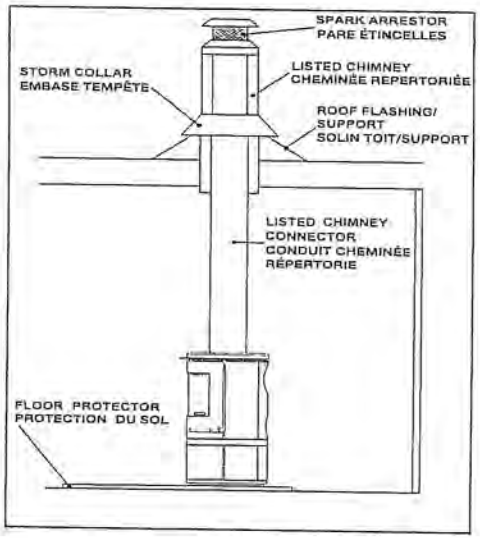
The Morsø 7600 can be installed in a mobile home if equipped with an outside combustion air kit, a terminal cap with a spark arrestor, and if it meets the following installation requirements:

- The stove must be secured to the mobile home structure by bolting through the hearth pad and into flooring.
  7642 & 7644 are prepared for securing.
  At 7648 You have to drill tree holes as showing in the fig. below.
- 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.
- 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 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 - BUILD 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 max 10 inches (25 cm) and approx. 3 to 3.5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 2 lbs. For correct combustion and heat output, wood fuel should contain no more than 20% moisture; this can easily be checked by using the Morsø Moisture Meter (part # 62929900)

To naturally season wood fuel, stack and store it under cover in an airy location where fresh air can move through each piece. Some soft woods may take as little as one good summer to season whereas harder woods such as oak, maple, and elm may require seasoning up to 18 months. Avoid overly dry wood that is gray in color as under certain conditions it can cause performance problems, such as back-puffing and sluggishness. Well seasoned wood will be light to hold and will show signs of cracking from the center-out in 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.

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

Starting the First Fire
The initial fire should be small, so that the stove paint can cure and the main plates of the stove can settle into position. Some fumes will be given off by the paint. Ventilate the room during this phase.
The setting of the air control, lighting techniques and loading intervals will depend on chimney draft, the fuel used, the heat required and so on. Some basic techniques are outlined below.

In principle
Your stove should be with Primary and Secondary air and Pilot air inlets.

Primary Air is controlled using the lever situated over the door. Moving the control lever to right 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 above the glass.
The secondary air is injected into the flue gases above the fire resulting in a cleaner, more efficient combustion process. The supply of secondary air and Pilot air is fixed open and is not adjustable.
For extra safety, your stove should be with a removable handle.

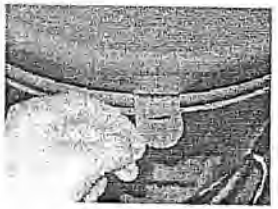
2.2 Lighting and loading intervals

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

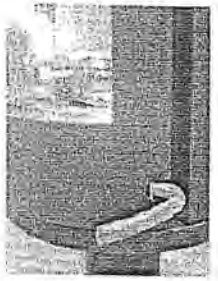
To form a reasonable bed of ash on the floor of the stove, you should use 2-3 pounds of dry kindling at the initial lighting. If possible, maintain a 1-1.5 inch (2-3 cm) layer of ash on the floor of the combustion chamber for added insulation.

1. A layer of embers will form rapidly if the stove is lit with 2 - 4 fuel tablets or 7 - 10 rolled up sheets of newspaper underneath 1-2 kg of dry kindling.

2. Open the air supply as much as possible. This is done using the handle above the door.



3. After the paper/solid alcohol tablets have caught fire, leave the fire door ajar about 5 - 10 cm, so that the chimney draws well.



4. When you can see that the chimney is hot enough to draw (after 5 - 10 minutes), close the door. If all the necessary conditions are met, a thick layer of embers will have been formed in the combustion chamber after another 15 - 20 minutes, and there will be a high temperature in the combustion chamber, which is necessary in order to be able to continue the combustion.

5. If the condition in step 4 is met, place max. 2 pieces of wood with a total weight of 1.5-2 kg and a length of 25-30 cm over the embers in a single layer, with a distance of approximately 1 cm.

6. Open the air supply to maximum, and close the door. The fresh wood will be lit within 2-3 minutes.

   If it does not light, open the door slightly to allow in enough air to ignite the wood.

   Close the door again once the wood has caught.

7. Reduce the amount of combustion air to the desired position, and the optimal combustion will continue. Make sure that there is always enough air (oxygen) to maintain clear, lasting flames when, and after, reducing the amount of combustion air.
   During the official test, the stoking interval was 70-80 minutes.

8. Once the fire has been reduced to a thick layer of embers, a new portion of wood can be added by repeating steps 5 & 7.

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

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

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.

The maximum recommended weight of wood fuel per load is 1.5 kg/h/3.3lbs (approx 2 split logs).

Under normal firing, the average flue temperature in the stove pipe, measured 20 cm above the stove, is approx. 300° C (550°F). The maximum flue temperature in the stove pipe must not exceed 450° C (750°F). If the flue temperature exceeds 450°C (750°F), it is considered as over firing and may cause premature wear and tear of the stove.

To help gauge the correct running temperature of your stove, we recommend you use the Morsø Flue Gas Thermometer (part # 62901200). The Flue Gas Thermometer magnetically attaches onto the stove pipe approx 20 cm (8") above the stove's top plate and measures the surface temperature of the stove pipe. Please see your authorized Morsø Dealer for availability.

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.

We would strongly recommend that you do not leave your stove alit at night. It harms the environment, and constitutes very poor use of the wood, as the gases in the wood do not ignite at the low temperature, but settle as soot (unburned gases) in the chimney and stove instead.

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.

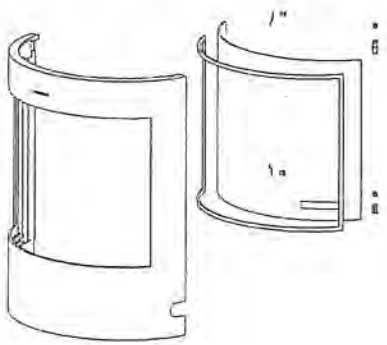
If you need to replace the glass, it should be replaced with the high temperature ceramic class supplied by Morsø, contact your Morsø dealer.

Installing the glass

Never install the glass when the stove is in function.

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

2. Unscrew the 4 bolts that secure the glass. (In the event that a bolt sheers off when being unscrewed, remove the remaining body of the bolt by drilling down its centre with 1/8 inch high speed steel drill bit. Smaller drill bits may be successful, but do not use a lager bit. Make sure the bit stays away from the edges of the bolt as 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, Cast iron fire plates, glass, baffle and flue collar - are subject to the extremes of heat produced by the fire. From time to time, one or other of these parts may need replacing as a matter of routine maintenance.

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

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

Reasons for fast internal wear and tear

Persistent heavy firing
Soot and ashes left to accumulate

Gasket

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

3.3 Cleaning the Stove and the Flue

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

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

Clean the flue/chimney - all the way from the stove to the flue terminal point above the house.
A good routine is to clean the flue after each heating season in any case, and inspect prior

to the season to ensure that bird's nests or other blockages have not occurred during the off season.

Ash disposal

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

Empty the ashpan according to this procedure:

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

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

The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally 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 the door.

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

Creosote - formation and need for removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. When burning wood, the chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

Chimney sweeping

Inspect the system regularly during the heating season as part of a regular maintenance schedule. To inspect the chimney, let the stove cool completely. Then, using a mirror, sight up through the flue collar into the chimney flue. If you cannot inspect the flue system in this fashion, the stove must be disconnected to provide better viewing access.
Clean the chimney using a brush the same size and shape as the flue liner. Run the brush up and down the liner, causing any deposits to fall to the bottom of the chimney where they can be removed through the clean-out door.
Clean the chimney connector disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connector sections after cleaning, being sure to secure the joints between individual sections with sheet metal screws.
If you cannot inspect or clean the chimney yourself, contact your local Morsø Dealer or a professional chimney sweep.

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

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

Annual maintenance

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

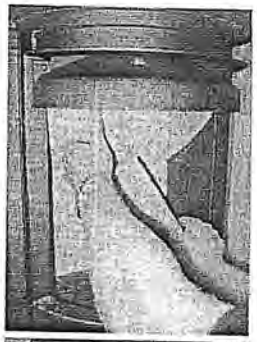
How to clean the inside parts of Morsø 7600

When cleaning the inside parts of the stove in connection with the annual visits from your local chimney sweep we recommend that you remove the inside parts from the fire chamber. Please be careful as the vermiculite parts are porous. Cleaning of the stove must be done when the stove is cold.

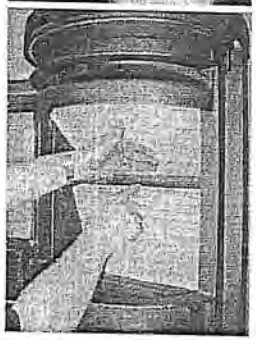
1. Raise the bottom baffle slightly, and hold it in that position. This loosens the braick panels in the side.

2. Tilt one of the side brick panels and remove it.

3. Tilt the other side brick panel and remove it.



4. Once the side brick panels have been removed, lower the bottom baffle and lift it out.



5. Lift the upper baffle out of its holder and tilt it out.

6. Make sure that the baffles and bricks are correctly reassembled before lighting the stove after cleaning.

3.4 Leaving the stove for extended periods

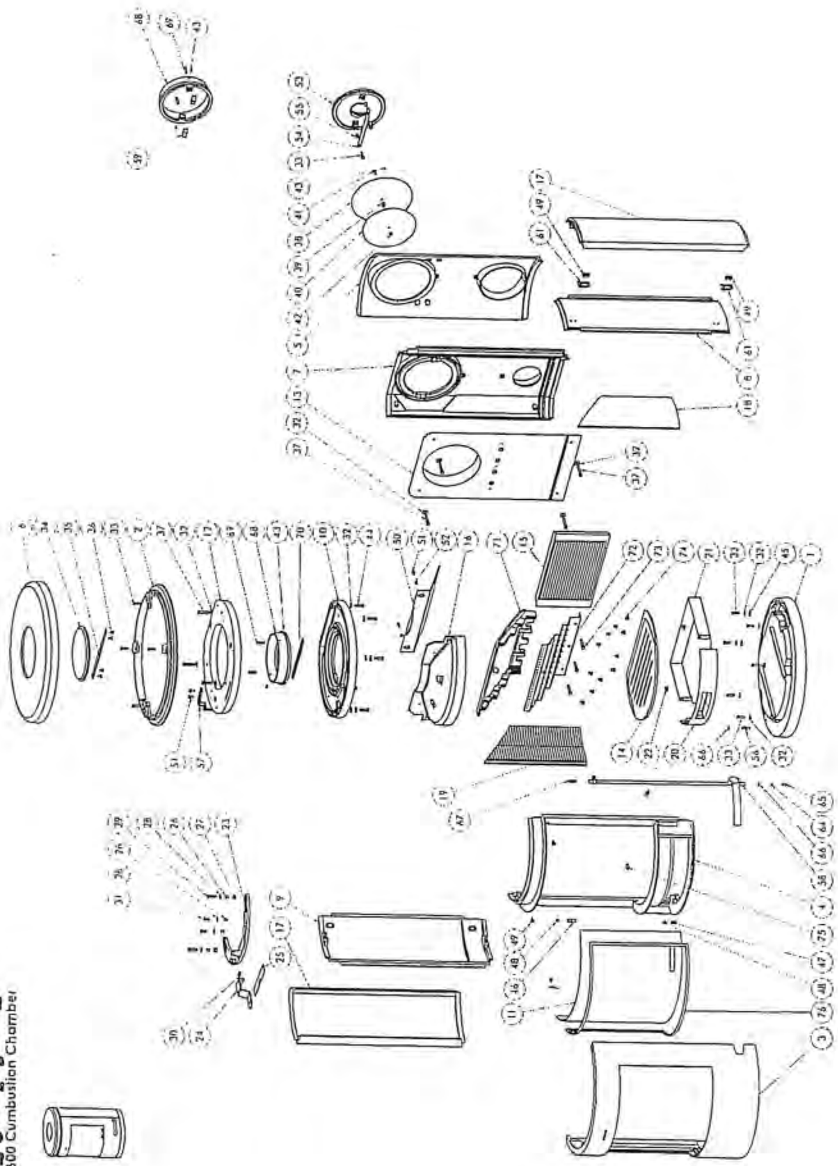
Important:

If the stove is to be left unused for any period of time, clean it out thoroughly and leave the air control slightly open to allow airflow. Make sure that the flue does not allow rainwater to come anywhere near the stove; install a chimney cap, but do not block off the flue completely.
These measures should ensure there is a slight movement of air through the stove, and that the body of the stove remains dry, right into the corners.
Any ash left within an unfired stove can attract moisture like blotting paper. If moisture is allowed to settle within the stove, rust will form. Rust expands as it takes a grip. This can lead to undue pressure on the stove joints, and this in turn may result in damage to the stove.

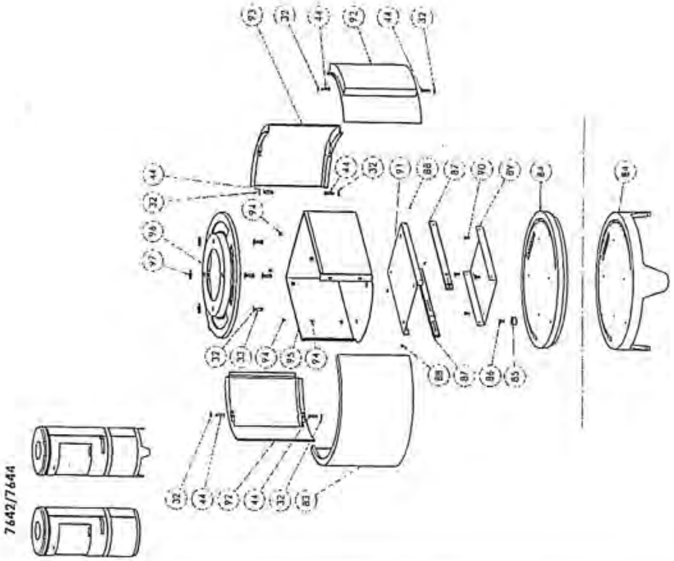
NOTE: It is best to thoroughly clean the stove after the heating season has concluded. Adding a dessicant, such as kitter litter, into the ash pan helps absorb moisture during the summer months. Be sure to remove this prior to the heating season.

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.

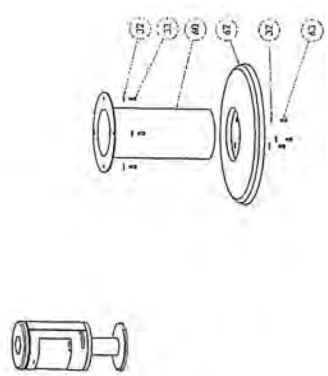
3.5 Parts diagram for model Morsø 7600



7600 Cumbustion Chamber



7642/7644



7648

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3.6 Parts list for model Morsø 7600

POS.NR.:	Parts:	7642 NA	7644 NA	7648 NA
1	Base plate	447601xx	---	---
2	Top frame	447607xx	447607xx	447607xx
3	Door	447603xx	447603xx	447603xx
4	Front frame	447656xx	447656xx	447656xx
5	Rear plate, outside	447610xx	447610xx	447610xx
6	Top plate, outside	447611xx	447611xx	447611xx
7	Rear plate, inside	44760400	44760400	44760400
8	Side plate, inside, right	447606xx	447606xx	447606xx
9	Side plate, inside, left	447630xx	447630xx	447630xx
10	Top plate, inside	447605xx	447605xx	447605xx
11	Glass	79760100	79760100	79760100
12	Air Canal, top	44761500	44761500	44761500
13	Air Canal, rear	44765400	44765400	44765400
14	Intermediate plate	34761200	34761200	34761200
15	Brick, back	79760700	79760700	79760700
16	Air Canal, front	447613xx	447613xx	447613xx
17	Side plate, outside	447609xx	447609xx	447609xx
18	Brick, side, right	79760300	79760300	79760300
19	Brick, side, left	79760400	79760400	79760400
20	Ash tray, front	447617xx	447617xx	447617xx
21	Ash tray	71760400	71760400	71760400
22	Screw	73861800	73861800	73861800
23	Secondary Damper	71760100	71760100	71760100
24	Secondary Handle	71760200	71760200	71760200
25	Close plate, sec. Damper	71760300	71760300	71760300
26	Distance tube	71810200	71810200	71810200
27	Distance tube	71810300	71810300	71810300
28	Washer	736106	736106	736106
29	Screw	74162000	74162000	74162000
30	Screw	73851100	73851100	73851100
31	Screw	73861300	73861300	73861300
32	Washer	791891	791891	791891
33	Screw	731620	731620	731620
34	Cover	448120xx	448120xx	448120xx
35	Fitting for Cover	71813200	71813200	71813200
36	Screw	731608	731608	731608
37	Screw	731635	731635	731635
38	Rondelle, rear, outside	71762100	71762100	71762100
39	Distance tube	541439	541439	541439
40	Rondelle, rear, inside	542633	542633	542633
41	Screw	73861400	73861400	73861400
42	Nut	735006	735006	735006
43	Screw	791835	791835	791835
44	Screw	731625	731625	731625
45	Washer	736210	736210	736210
46	Glass fitting	71814561	71814561	71814561
47	Glass fitting	790743	790743	790743
48	Screw	742508	742508	742508
49	Screw	73860900	73860900	73860900
50	Baffle plate, top	71761700	71761700	71761700
51	Screw	74161200	74161200	74161200
52	Distance tube	54143700	54143700	54143700

POS.NR.:	Parts:	7642 NA	7644 NA	7648 NA
53	Cover	442610xx	442610xx	442610xx
54	Bar	545006	545006	545006
55	Distance tube	545007	545007	545007
56	Plug f. Door	71760700	71760700	71760700
57	Fittig f. Door	71760600	71760600	71760600
58	Handle	71761100	71761100	71761100
59	Fitting for Flue Collar	44256700	44256700	44256700
60	Pedestal	---	---	717605xx
61	Fittig f. Door	71761200	71761200	71761200
62	Foot, f. Pedestal	---	---	447658xx
63	Screw	---	---	731616
64	Screw	739606	739606	739606
65	Screw	73961700	73961700	73961700
66	Washer	746006	746006	746006
67	Screw	739625	739625	739625
68	Flue Collar	443441xx	443441xx	443441xx
69	Screw	743625	743625	743625
70	Stop Bar	544541	544541	544541
71	Baffle plate, cast iron	34762700	34762700	34762700
72	Baffle plate, stainless	71762200	71762200	71762200
73	Screw	74163504	74163504	74163504
74	Screw	74160804	74160804	74160804
75	Jet, pilot air	71762300	71762300	71762300
76	Tightening tape, f. glass	79074200	79074200	79074200
77	Fitting, f. Wall	---	---	---
78	Fitting, f. fitting f. Wall	---	---	---
79	Distance tube	---	---	---
80	Screw	---	---	---
81	Screw	---	---	---
82	Washer	---	---	---
83	Door bottum part	447624xx	447624xx	---
84	Base plate, bottom section	447629xx	447628xx	---
85	Rubber Stop	79082007	79082007	---
86	Screw	742612	742612	---
87	Ball track	79082006	79082006	---
88	Pop rivet	74700300	74700300	---
89	Plate f. Drawer	71760900	71760900	---
90	Screw	731612	731612	---
91	Distance plate, Drawer	71761000	71761000	---
92	Side plate, bottom	447623xx	447623xx	---
93	Rear plate, bottom	447625xx	447625xx	---
94	Screw	73860800	73860800	---
95	Drawer Box	71760800	71760800	---
96	Top plate, bottom	44762200	44762200	---
97	Washer	79189800	79189800	---

Morsø Jernstøberi A/S - 20.11.2008 - 72761500

By appointment to The Royal Danish Court

morsø

Installation and Operating Instructions

7670

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

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 7670 meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after July 1, 1990.

NATIONAL FIREPLACE INSTITUTE NFI CERTIFIED www.nficertified.org

We recommend that our pellet hearth products be installed and serviced by professionals who are certified in the U.S. by the National Fireplace Institute® (NFI) as NFI Pellet Specialists or who are certified in Canada by Wood Energy Technical Training (WETT).

Wood Energy Technical Training

The Morsø 7670 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.

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1.0 Installation of your Morsø stove

Installation of woodburning stoves must be safe and legal.

Consult with a structural engineer for the installation.

The stove must be installed on a non-combustible wall.

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

Before starting the initial fire, make sure that the baffles is placed correctly.

Standard Accessories

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

1.2 The chimney / flue system

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

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

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

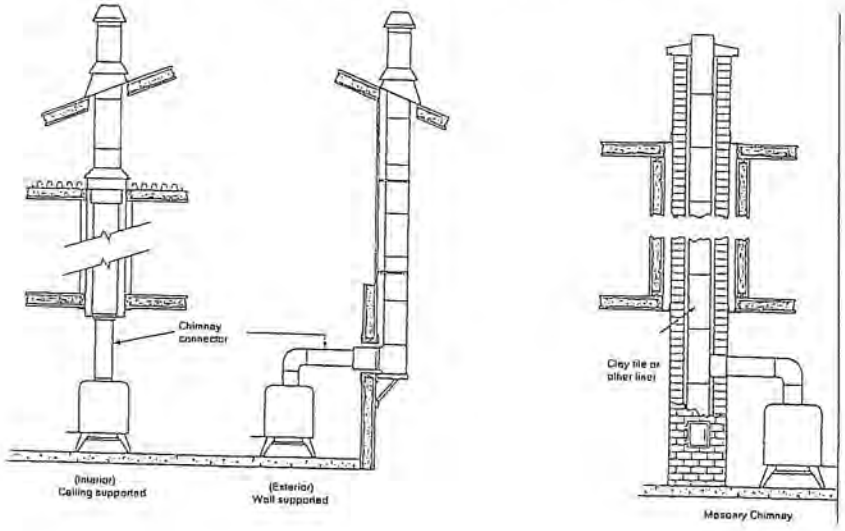
High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F.) or a code-approved masonry chimney with flue liner for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

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

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

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

Typical Factory-Built or Masonry Chimney Installations



1.3 Flue Connection

The stove is supplied from the factory with a round blanking plate blocking off the top and rear flue exit (behind the rear shield plate). A flue collar are placed in the firebox area.

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

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

1.4 Connection to the existing chimney

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

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

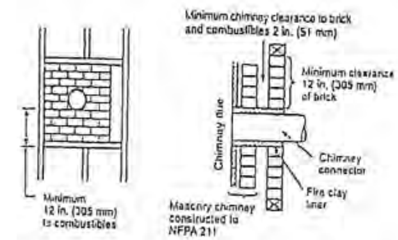
If possible, do not pass the chimney connector through a combustible wall or ceiling. If passage through a combustible wall is unavoidable, refer to the sections on Wall Pass-Throughs. Do not pass the connector through an attic, a closet or similar concealed space when installing the chimney connectors.

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.

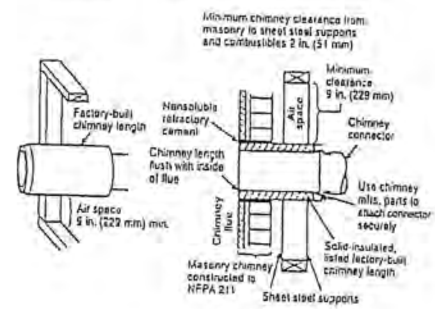
Be sure the installed stove and chimney connector are correct distances from near by combustible materials. See the clearance paragraph page 8.

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

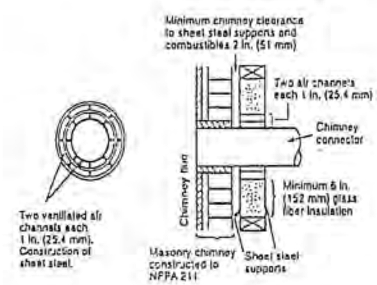
Chimney Connector Systems and Clearances from Combustible Walls for Residential Heating Appliances



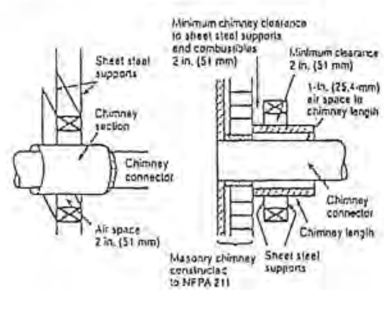
A Minimum 3.5-in thick brick masonry all framed into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.



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.

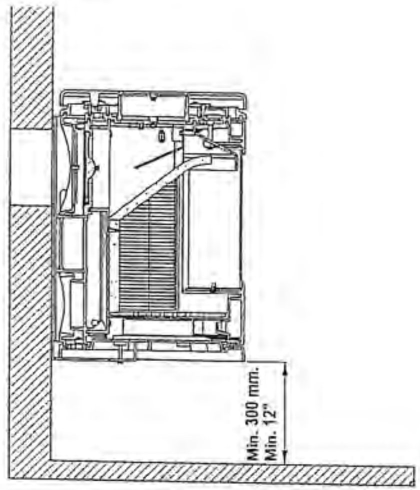


D Solid insulated, listed factory-built chimney length with an inside diameter 2-in. larger than the chimney connector and having 1-in. or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2-in. air space between 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

The stove must be installed on a non-combustible wall.

The wall-mounting fixture is provided with four holes for mounting expansion bolts in the wall. The bolts must be sized to secure that the wall and the materials it is made from are capable of supporting the stove. If in doubt, contact an expert. The weight of the empty stove is 128 kg (282 lbs.). The wall-mounting fixture may be used as drilling template.



Mount the wall-mounting fixture on the wall. If the flue exit is wanted to the rear, build a wall bushing correctly into the wall (see illustration).

Lift the wood stove in place so that it rests on the bottom part of the wall-mounting fixture, and secure it again to the fixture by means of the screws included.

Distance to walls and lintel

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

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

CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION SINGLEWALL CONNECTOR: USA	Canada
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clea	rances

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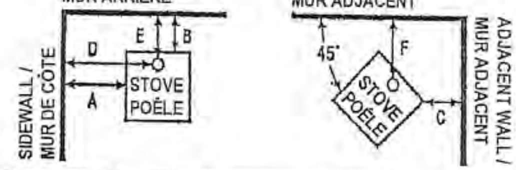
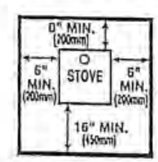
MINIMUM CLEARANCES TO COMBUSTIBLES:
DEGAGEMENTS MINIMAUX AUX MATERIAUX COMBUSTIBLES:



CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION (DOUBLEWALL CONNECTOR): USA	Canada
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clea	rances

CLEARANCE REQUIREMENTS:	STANDARD RESIDENTIAL INSTALLATION REAR VENT OUT BACK WALL SINGLEWALL CONNECTOR: USA	Canada
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clea	rances

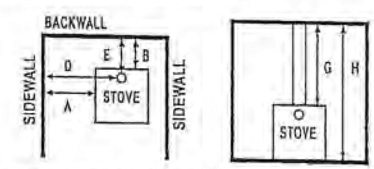
NON-COMBUSTIBLE FLOOR PROTECTOR



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

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

ALCOVE INSTALLATION



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

CLEARANCE REQUIREMENTS:	ALCOVE INSTALLATION WITH (DOUBLE WALL CONNECTOR):
A. SIDEWALL TO UNIT B. BACKWALL TO UNIT C. CORNERWALL TO UNIT D. SIDEWALL TO CONNECTOR E. BACKWALL TO CONNECTOR F. CORNERWALL TO CONNECTOR G. UNIT TO CEILING H. FLOOR TO CEILING	replace clearances

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.

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 SLEEPING ROOM.

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

Cut the wood to a length of max 12 inches (30 cm) and approx. 3 to 3.5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 2 lbs. For correct combustion and heat output, wood fuel should contain no more than 20% moisture; this can easily be checked by using the Morsø Moisture Meter (part # 62929900)

To naturally season wood fuel, stack and store it under cover in an airy location where fresh air can move through each piece. Some soft woods may take as little as one good summer to season whereas harder woods such as oak, maple, and elm may require seasoning up to 18 months. Avoid overly dry wood that is gray in color as under certain conditions it can cause performance problems, such as back-puffing and sluggishness. Well seasoned wood will be light to hold and will show signs of cracking from the center-out in 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.

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

Starting the First Fire

The initial fire should be small, so that the stove paint can cure and the main plates of the stove can settle into position. Some fumes will be given off by the paint. Ventilate the room during this phase.
The setting of the air control, lighting techniques and loading intervals will depend on chimney draft, the fuel used, the heat required and so on. Some basic techniques are outlined below.

In principle

Your stove should be with Primary and Secondary air and Pilot air inlets.
Primary Air is controlled using the lever situated over the door. Moving the control lever to right 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 above the glass.

The secondary air is injected into the flue gases above the fire resulting in a cleaner, more efficient combustion process. The supply of secondary air and Pilot air is fixed open and is not adjustable. For extra safety, your stove should be with a removable handle.

2.2 Lighting and loading intervals

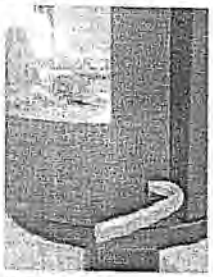
When first lighting the stove, a large volume of air is needed. When the stove is cold, you should leave the door open an inch or two for the first few minutes and open the primary air supply completely. While the door is open, do not leave the stove unattended.

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

1. A layer of embers will form rapidly if the stove is lit with 2 - 4 fuel tablets or 7 - 10 rolled up sheets of newspaper underneath 1-2 kg of dry kindling.

2. Open the air supply as much as possible. This is done using the handle above the door.

3. After the paper/solid alcohol tablets have caught fire, leave the fire door ajar about 5 - 10 cm, so that the chimney draws well.



4. When you can see that the chimney is hot enough to draw (after 5 - 10 minutes), close the door. If all the necessary conditions are met, a thick layer of embers will have been formed in the combustion chamber after another 15 - 20 minutes, and there will be a high temperature in the combustion chamber, which is necessary in order to be able to continue the combustion.

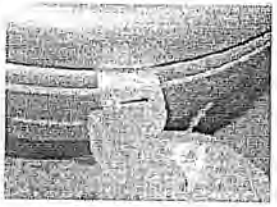
5. If the condition in step 4 is met, place max. 2 pieces of wood with a total weight of 1.5-2 kg and a length of 25-30 cm over the embers in a single layer, with a distance of approximately 1 cm.

6. Open the air supply to maximum, and close the door. The fresh wood will be lit within 2-3 minutes.

   If it does not light, open the door slightly to allow in enough air to ignite the wood.

   Close the door again once the wood has caught.

7. Reduce the amount of combustion air to the desired position, and the optimal combustion will continue. Make sure that there is always enough air (oxygen) to maintain clear, lasting flames when, and after, reducing the amount of combustion air.
   During the official test, the stoking interval was 70-80 minutes.



8. Once the fire has been reduced to a thick layer of embers, a new portion of wood can be added by repeating steps 5 & 7.

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

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

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.

The maximum recommended weight of wood fuel per load is 2.0 kg/h/4.0lbs (approx 3 split logs).

Under normal firing, the average flue temperature in the stove pipe, measured 20 cm above the stove, is approx. 300° C (550°F). The maximum flue temperature in the stove pipe must not exceed 450° C (750°F). If the flue temperature exceeds 450°C (750°F), it is considered as over firing and may cause premature wear and tear of the stove.

To help gauge the correct running temperature of your stove, we recommend you use the Morsø Flue Gas Thermometer (part # 62901200). The Flue Gas Thermometer magnetically attaches onto the stove pipe approx 20 cm (8") above the stove's top plate and measures the surface temperature of the stove pipe. Please see your authorized Morsø Dealer for availability.

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.

We would strongly recommend that you do not leave your stove alit at night. It harms the environment, and constitutes very poor use of the wood, as the gases in the wood do not ignite at the low temperature, but settle as soot (unburned gases) in the chimney and stove instead.

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

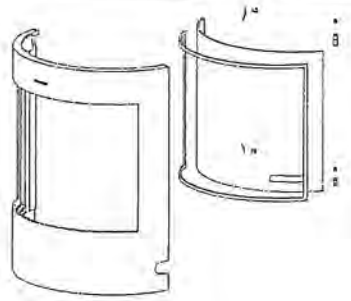
- Fuel too wet
- Logs too large or not split
- Combustion temperatures too low

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. When you open the door, you will find two hinge pins, one in each hinge. Remove the two hinge pins, lift the door off the hinges and place it face down on a sheet of cardboard or other nonabrasive fabric.

2. Unscrew the 4 bolts that secure the glass. (In the event that a bolt sheers off when being unscrewed, remove the remaining body of the bolt by drilling down its centre with 1/8 inch high speed steel drill bit. Smaller drill bits may be successful, but do not use a lager bit. Make sure the bit stays away from the edges of the bolt - this may damage the thread in the cast iron).

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

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

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

6. Finally, give each of the bolts an extra half turn or so. The glass should held tight enough 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, Cast iron fire plates, glass, baffle and flue collar - are subject to the extremes of heat produced by the fire. From time to time, one or other of these parts may need replacing as a matter of routine maintenance.

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

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

Reasons for fast internal wear and tear

Persistent heavy firing
Soot and ashes left to accumulate

Gasket

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

3.3 Cleaning the Stove and the Flue

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

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

Clean the flue/chimney - all the way from the stove to the flue terminal point above the house.

A good routine is to clean the flue after each heating season in any case, and inspect prior to the season to ensure that bird's nests or other blockages have not occurred during the off season.

Ash disposal

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

Empty the ashpan according to this procedure:

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

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

The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of

by burial in soil or otherwise locally 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 the door.

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

Creosote - formation and need for removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. When burning wood, the chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

Chimney sweeping

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

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

Clean the chimney connector disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connector sections after cleaning, being sure to secure the joints between individual sections with sheet metal screws.

If you cannot inspect or clean the chimney yourself, contact your local Morsø Dealer or a professional chimney sweep.

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

Close the air control.

Get everyone out of the house.

Call the Fire Department.

Annual maintenance

Before the heating season, perform a thorough cleaning, inspection and repair:

Thoroughly clean the chimney and chimney connector.

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

Inspect the chimney connector and replace any damaged sections.

Check gasketing for wear or compression, and replace if necessary.

Check the glass for cracking; replace if needed.

Check door and handle for tightness. Adjust if needed.

How to clean the inside parts of Morsø 7670

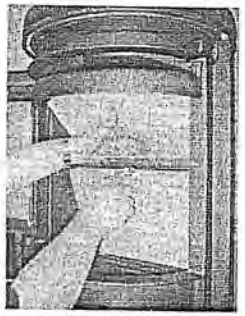
When cleaning the inside parts of the stove in connection with the annual visits from your local chimney sweep we recommend that you remove the inside parts from the fire chamber. Please be careful as the vermiculite parts are porous. Cleaning of the stove must be done when the stove is cold.

1. Raise the bottom baffle slightly, and hold it in that position. This loosens the braick panels in the side.

2. Tilt one of the side brick panels and remove it.

3. Tilt the other side brick panel and remove it.

4. Once the side brick panels have been removed, lower the bottom baffle and lift it out.



5. Lift the upper baffle out of its holder and tilt it out.

6. Make sure that the baffles and bricks are correctly reassembled before lighting the stove after cleaning.

3.4 Leaving the stove for extended periods

Important:

If the stove is to be left unused for any period of time, clean it out thoroughly and leave the air control slightly open to allow airflow. Make sure that the flue does not allow rainwater to come anywhere near the stove; install a chimney cap, but do not block off the flue completely. These measures should ensure there is a slight movement of air through the stove, and that the body of the stove remains dry, right into the corners.

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

NOTE: It is best to thoroughly clean the stove after the heating season has concluded. Adding a 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.

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

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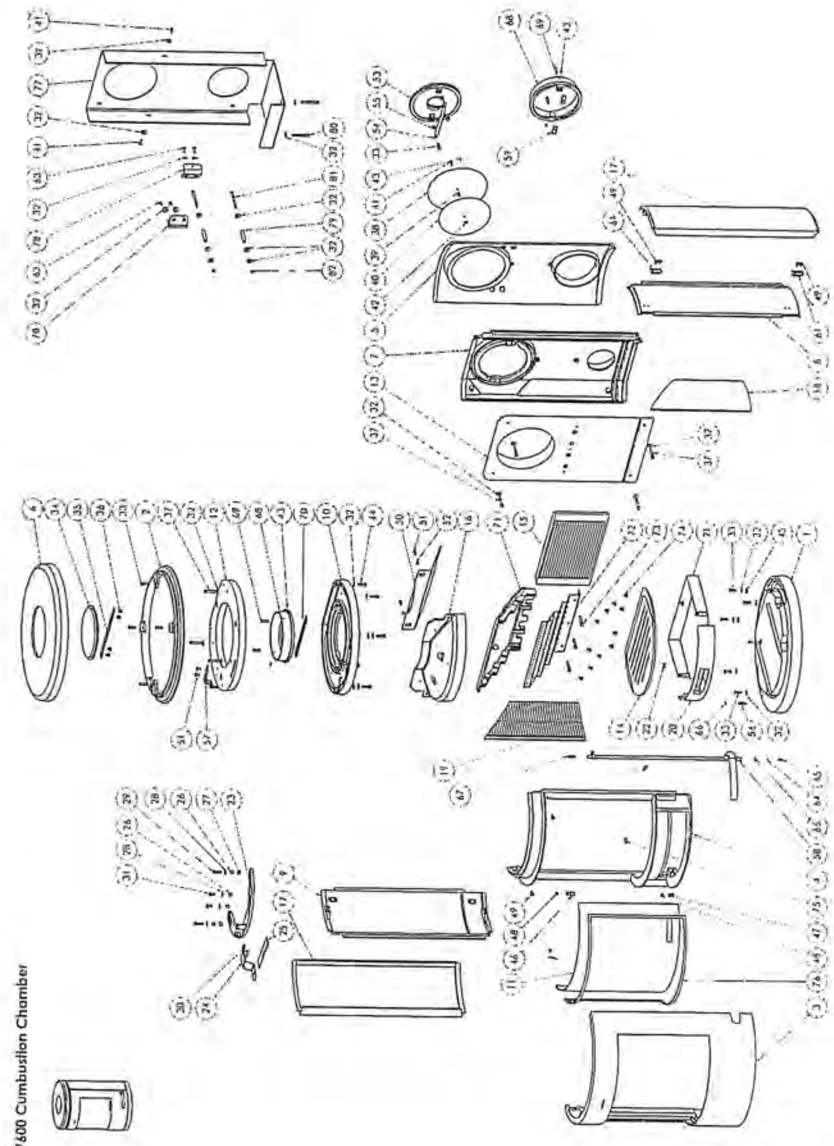
3.5 Parts diagram for model Morsø 7670



3.6 Parts list for model Morsø 7670

Pos.Nr.:	Parts:	7670 NA
1	Base plate	447150xx
2	Top frame	447607xx
3	Door	447603xx
4	Front frame	447656xx
5	Rear plate, outside	447652xx
6	Top plate, outside	447611xx
7	Rear plate, inside	44765100
8	Side plate, inside, right	447606xx
9	Side plate, inside, left	447630xx
10	Top plate, inside	447605xx
11	Glass	79760100
12	Air Canal, top	44761500
13	Air Canal, rear	44765400
14	Intermediate plate	34761200
15	Brick, back	79760700
16	Air Canal, front	447613xx
17	Side plate, outside	447609xx
18	Brick, side, right	79760300
19	Brick, side, left	79760400
20	Ash tray, front	447617xx
21	Ash tray	71760400
22	Screw	73861800
23	Secondary Damper	71760100
24	Secondary Handle	71760200
25	Close plate, sec. Damper	71760300
26	Distance tube	71810200
27	Distance tube	71810300
28	Washer	736106
29	Screw	74162000
30	Screw	73851100
31	Screw	73861300
32	Washer	791891
33	Screw	731620
34	Cover	448120xx
35	Fitting for Cover	71813200
36	Screw	731608
37	Screw	731635
38	Rondelle, rear, outside	71762100
39	Distance tube	541439
40	Rondelle, rear, inside	542633
41	Screw	73861400
42	Nut	735006
43	Screw	791835
44	Screw	731625
45	Washer	736210
46	Glass fitting	71814561
47	Glass fitting	790743
48	Screw	742508
22		

Pos.Nr.:	Parts:	7670 NA
49	Screw	73860900
50	Baffle plate, top	71761700
51	Screw	74161200
52	Distance tube	54143700
53	Cover	442610xx
54	Bar	545006
55	Distance tube	545007
56	Plug f. Door	71760700
57	Fittig f. Door	71760600
58	Handle	71761100
59	Fitting for Flue Collar	44256700
60	Pedestal	---
61	Fittig f. Door	71761200
62	Foot, f. Pedestal	---
63	Screw	731616
64	Screw	739606
65	Screw	73961700
66	Washer	746006
67	Screw	739625
68	Flue Collar	443441xx
69	Screw	743625
70	Stop Bar	544541
71	Baffle plate, cast iron	34762700
72	Baffle plate, stainless	71762200
73	Screw	74163504
74	Screw	74160804
75	Jet, pilot air	71762300
76	Tightening tape, f. glass	79074200
77	Fitting, f. Wall	717615xx
78	Fitting, f. fitting f. Wall	71761600
79	Distance tube	54761000
80	Screw	731665
81	Screw	731670
82	Washer	746206
83	Door bottum part	---
84	Base plate, bottom section	---
85	Rubber Stop	---
86	Screw	---
87	Ball track	---
88	Pop rivet	---
89	Plate f. Drawer	---
90	Screw	---
91	Distance plate, Drawer	---
92	Side plate, bottom	---
93	Rear plate, bottom	---
94	Screw	---
95	Drawer Box	---
96	Top plate, bottom	---
97	Washer	---

Morsø Jernstøberi A/S - 20.11.2008 - 72761600

Section 4

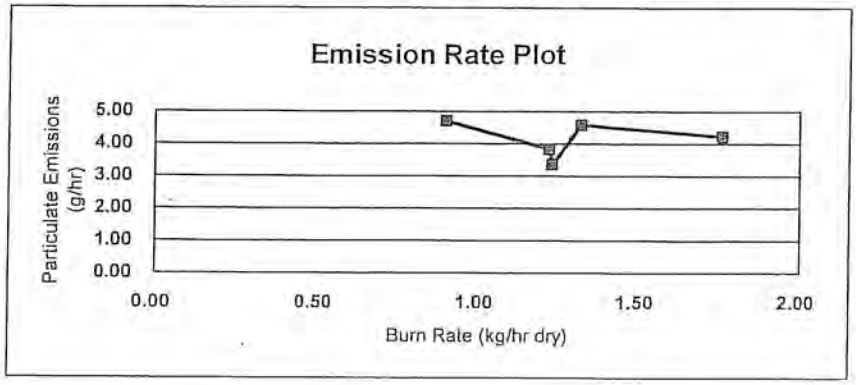
Test Data by Run

EPA Weighted Average Emissions
EPA Method 28

Client: Morso
Stove Model: 7600 Series
Test Dates: 11/13/08 - 11/17/08
Project Number: 192-S-18-3
Tracking Number: 1293
Signature/Date: 1-14-09

Status: Final
Stove Type: Non-Catalytic Stove

Weighted Average (g/hr)
4.4



Run #	6	
Burn Rate (dry kg/hr)	0.90	
Catagory	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	4.7	
Cap (g/hr)	15	
Weighting Factor	0.559	35.81%
Heat Output (BTU/hr)	10875	

Run #	2	
Burn Rate (dry kg/hr)	1.76	
Catagory	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	4.23	
Cap (g/hr)	18	
Weighting Factor	0.366	23.48%
Heat Output (BTU/hr)	21267	

Run #	4	
Burn Rate (dry kg/hr)	1.22	
Catagory	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.83	
Cap (g/hr)	15	
Weighting Factor	0.263	16.87%
Heat Output (BTU/hr)	14742	

Run #	3	
Burn Rate (dry kg/hr)	1.23	
Catagory	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.35	
Cap (g/hr)	15	
Weighting Factor	0.075	4.79%
Heat Output (BTU/hr)	14863	

Run #	5	
Burn Rate (dry kg/hr)	1.32	
Catagory	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	4.58	
Cap (g/hr)	15	
Weighting Factor	0.297	19.06%
Heat Output (BTU/hr)	15950	

Run 1

MFG: Morso
Model # :7600 Series

Run #: 1

Project #: 192-S-18-3
Run Date:11/13/08

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
1	11/13/08	1293	5.40

Manufacturer	Project Number	Coal Bed Range (lbs)	
Morso	192-S-18-3	1.08 to 1.35	FINAL

Model	Technician	Actual Coal Bed (lbs)
7600 Series	K. Morgan	

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.022	.034	.041	.048	.025	.032	.034	.035	In-H2O
Intitial Temp	93	92	92	92	91	91	91	91	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.44	30.46	30.48	30.46	In-Hg

PM Control Module	289		Tunnel Velocity	12.69	ft/sec	Avg Prop Rate	100.618	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	135.5	scfm	Firebox Surface Temp Change	-30.8	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	140.13	scfm			
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #		
Dilution Tunnel Static	-.4	in. H2O	Post-Test Leak Check	.004 @ 6.82	cfm@" Hg	Total Particulate	43.4	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.26	%			
Meter Box "Y" Factor	1.001		Fuel Consumed	5.400	lbs	Run Time	130	Minutes

Notes

4-4 OF 4-56

Signature/Date: K. J. Morgan 11/21/08

MFG: Morso
Model # :7600 Series

Run #: 1

Project #: 192-S-18-3
Run Date:11/13/08

Emissions Results

Burn Rate	0.93	kg/hr dry	Adjusted Emissions	7.09	grams/hour

Particulate Concentration(dry standard)	0.00062	grams/dscf
Particulate Emission Rate	5.14	grams/hour
Average Tunnel Temp	90	Degrees Fahrenheit
Average Delta p	0.035	Inches H2O
Total Sample Volume-Vm	69.698	Cubic Feet
Average Gas Meter Temperature	75	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	12.6	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8330.7	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	70.282	DSCF
Total Particulates- mn	43.4	Mg
Average Delta H	1.09	Inches H2O
Total Time	130	Minutes

4-56 OF 4-56

Signature/Date: K. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 1

Project #: 192-S-18-3
Run Date:11/13/08

Fuel Data

OMNI EQUIPMENT ID #

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 19.6 %

PIECE	LENGTH		% MOISTURE READINGS			FUEL TYPE
1	8	ft	18.8	20.9	19.1	2X4
2	0	ft	0	0	0	
3	0	ft	0	0	0	

PIECE LENGTH NOTES: 2@8, 4@10, 2@6

TIME (24 HR) 07:30 ROOM TEMPERATURE (F) 67

TEST FUEL

FUEL TYPE - PIECE QUANTITY

4	2 X 4 PIECES	0	4 X 4 PIECES
5.4	LBS	0	LBS

FUEL PIECE LENGTH: 10 IN
CALCULATED FUEL LOAD: 0 LBS
FUEL LOAD PIECE COUNT 4 PIECES
ACTUAL LOAD WEIGHT: 5.4 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	22.3	20.5	19.6	2X4	6	0	0	0	
2	19.6	22.5	21.6	2X4	7	0	0	0	
3	22.4	21.4	23.6	2X4	8	0	0	0	
4	19.4	22.1	20.1	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 08:10 ROOM TEMPERATURE (F) 68

AVERAGE FUEL LOAD MOISTURE 21.26 %

4-6 OF 4-56

Signature/Date: M. L. Morse 11/21/08

MFG: Morso
Model # :7600 Series

Run #: 1

Project #: 192-S-18-3
Run Date:11/13/08

TIME	Preburn ET (min)	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
0811	0	5.0	0.000	358	393	188	386	388	3218	342.6	387	69	-0.052	3218	79.08	65.22	16.27	19.97
0821	10	4.4	-0.590	368	374	199	359	383	3218	336.5	282	67	-0.038	3218	79.08	65.22	16.27	19.97
0831	20	3.9	-0.558	364	353	201	336	377	3218	326.1	312	67	-0.046	3218	79.08	65.22	16.27	19.97
0841	30	3.0	-0.893	389	334	201	351	400	3218	334.9	369	67	-0.048	3218	79.08	65.22	16.27	19.97
0851	40	2.2	-0.727	431	325	207	384	424	3218	354.4	348	68	-0.045	3218	79.08	65.22	16.27	19.97
0901	50	1.8	-0.473	442	323	215	399	431	3218	362.2	314	68	-0.036	3218	79.08	65.22	16.27	19.97
0911	60	1.5	-0.271	433	336	221	401	420	3218	362.3	282	68	-0.035	3218	79.08	65.22	16.27	19.97
0921	70	1.4	-0.127	411	337	223	390	404	3218	352.7	255	67	-0.031	3218	79.08	65.22	16.27	19.97
0924	73	1.3	-0.060	402	339	223	385	398	3218	349.3	249	68	-0.030	3218	79.08	65.22	16.27	19.97

A-7 OF 4-56

Signature/Date: K. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 1

Project #: 192-S-18-3
Run Date:11/13/08

TIME	ET (min)	Gas Meter-A (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
0926	0	0.000	0.000	-0.00	71	-0.03	96	0.033	0.0	5.4	5.44	397	344	224	384	395	3218	348.7	258	69	63	68	-0.030
0936	10	5.316	0.532	1.17	72	1.72	94	0.035	102.5	4.5	-0.98	359	342	215	362	363	3218	328.3	297	72	48	68	-0.044
0946	20	10.651	0.533	1.16	72	1.69	93	0.036	99.0	3.7	-0.80	360	358	210	335	351	3218	322.8	321	72	44	67	-0.045
0956	30	15.960	0.531	1.18	73	1.68	94	0.033	98.2	2.8	-0.89	385	354	207	337	361	3218	328.9	355	72	43	67	-0.048
1006	40	21.272	0.531	1.13	73	1.68	97	0.035	102.3	1.8	-0.96	427	345	210	366	384	3218	346.2	365	73	43	69	-0.048
1016	50	26.618	0.535	1.13	74	1.71	94	0.040	100.7	1.1	-0.68	463	330	216	393	412	3218	362.7	333	74	44	70	-0.045
1026	60	31.968	0.535	1.17	75	1.68	91	0.036	95.0	0.9	-0.26	465	320	225	413	428	3218	370.4	277	74	44	71	-0.035
1036	70	37.326	0.536	1.23	76	1.66	88	0.040	100.1	0.7	-0.14	443	325	232	416	424	3218	368.4	243	74	45	70	-0.030
1046	80	42.692	0.537	1.19	77	1.71	87	0.032	95.7	0.6	-0.14	415	339	234	405	411	3218	360.7	230	74	45	70	-0.027
1056	90	48.065	0.537	1.16	77	1.72	86	0.038	106.9	0.5	-0.12	389	346	231	387	396	3218	349.9	219	74	45	71	-0.026
1106	100	53.473	0.541	1.16	77	1.67	85	0.039	98.5	0.3	-0.12	367	353	226	372	381	3218	340.0	215	74	45	71	-0.024
1116	110	58.882	0.541	1.18	77	1.71	85	0.032	97.3	0.2	-0.11	349	357	222	362	371	3218	332.2	208	74	46	72	-0.023
1126	120	64.292	0.541	1.20	78	1.72	84	0.033	106.4	0.1	-0.12	334	358	217	354	361	3216	324.9	203	74	45	72	-0.022
1136	130	69.698	0.541	1.17	78	1.71	84	0.033	105.3	-0.0	-0.12	322	357	213	347	351	3218	317.9	199	74	45	71	-0.021
AVG	NA	NA	0.536	1.088	75.000	1.574	89.857	0.035	100.608	NA	NA	391.071	344.857	220.143	373.929	384.929	3218.000	NA	265.929	73.143	46.071	69.786	-0.033

4-8 OF 4-56

OMNI Test Laboratories Inc.

Signature/Date: K. T. Morgan
11/21/08

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso
Model: 7600 Series
Project No.: 192-S-18-3
Tracking No.: 1293

Equipment Numbers:

Run #: 1
Date: 11/13/08

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N773	612.3	572.9		39.4
B. Rear filter catch	Filter	N772	574.8	573.6		1.2
C. Rinse of probe and filter assembly	Acetone	75	111879.3	111876.4	0.0017	2.8

Total Particulate, mg :	43.4

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: M. Morgan Date: 11-18-08

PRelim: 0.93 @ 7.30
FINAL: 0.93 @ 7.09

Run Notes

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3
Tracking #: 1293
Run #: 1 Date: 11-13-08
Test Crew: K. Morgan
OMNI Equipment ID #(s):

PREBURN

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

PRIMARY:

OPEN 13 mm

SECONDARY: FIXED

TERTIARY: NONE

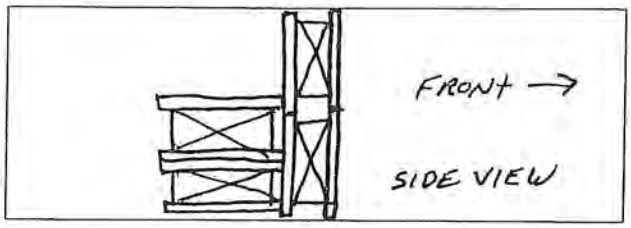
FAN: No FAN

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					
73					x	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 40 sec.
DOOR: AJAR until 3.0 min.
PRIMARY AIR: Fully open 5.0 min.
Test setting at 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: No Fan

Technician signature: K. Morgan Date: 11-13-08

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7600 Series

Project #: 192-S-18-3 Tracking #: 1293

Date: 11-13-08 Run #: 1 Booth: ~~E1~~ K E2

Test Crew: K. Morgan Start Time: 09:26 Stop Time: 11:36

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			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 @ 3.2" W.C. Post: Ø @ 3.1" W.C.

Flue Pipe Cleaned Prior to First Test in Series: Date: 11-12-08 Initials: K

	Initial	Middle	Ending
Pb (in/Hg)	30.44	30.46	30.48
Room Temp (°F)	68	71	71

Technician signature: K. Morgan Date: 11-13-08

Run 2

MFG: Morso
Model # :7600 Series

Run #: 2

Project #: 192-S-18-3
Run Date:11/13/08

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
2	11/13/08	1293	5.50

Manufacturer	Project Number	Coal Bed Range (lbs)	
Morso	192-5-18-3	1.10 to 1.37	FINAL

Model	Technician	Actual Coal Bed (lbs)
7600 Series	K. Morgan	1.1

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.024	.036	.032	.03	.034	.034	.038	.036	In-H20
Intitial Temp	130	130	129	129	127	125	124	123	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.48	30.48	30.48	30.48	In-Hg

PM Control Module	289		Tunnel Velocity	13.53	ft/sec	Avg Prop Rate 99.968
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	130.3	scfm	Firebox Surface Temp Change -56.2
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	139.96	scfm	
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #
Dilution Tunnel Static	-.38	in. H2O	Post-Test Leak Check	.005 @ 6.56	cfm@" Hg	Total Particulate 12.3 mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.22	%	
Meter Box "Y" Factor	1.001		Fuel Consumed	5.500	lbs	Run Time 70 Minutes

Notes

4-13 OF 4-56

Signature/Date: K. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 2

Project #: 192-S-18-3
Run Date:11/13/08

Emissions Results

Burn Rate	1.76	kg/hr dry	Adjusted Emissions	4.23	grams/hour

Particulate Concentration(dry standard)	0.00033	grams/dscf
Particulate Emission Rate	2.76	grams/hour
Average Tunnel Temp	123	Degrees Fahrenheit
Average Delta p	0.038	Inches H20
Total Sample Volume-Vm	37.583	Cubic Feet
Average Gas Meter Temperature	80	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	13.51	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8434.11	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	37.565	DSCF
Total Particulates- mn	12.3	Mg
Average Delta H	1.02	Inches H20
Total Time	70	Minutes

4-14 OF 4-56

Signature/Date: M. Morse
11/21/08

Fuel Data

OMNI EQUIPMENT ID #

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 0
CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 0

AVG PRE-BURN LOAD MOISTURE: 21 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	23.1	19.6	20.3	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES: 2@8, 4@10, 4@6

TIME (24 HR): 12:05 ROOM TEMPERATURE (F): 68

TEST FUEL

FUEL PIECE LENGTH: 10 IN
CALCULATED FUEL LOAD: 0 LBS

FUEL TYPE - PIECE QUANTITY

2 X 4 PIECES	4 X 4 PIECES
4	0
5.5 LBS	0 LBS

FUEL LOAD PIECE COUNT: 4 PIECES
ACTUAL LOAD WEIGHT: 5.5 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	22.1	19.5	20.1	2X4	6	0	0	0	
2	19.9	22.5	22.5	2X4	7	0	0	0	
3	22.7	20.8	21.5	2X4	8	0	0	0	
4	21.3	21.7	20	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK): 12:15 ROOM TEMPERATURE (F): 68

AVERAGE FUEL LOAD MOISTURE: 21.22 %

4-15 OF 4-56

Signature/Date: K. L. Morgan 11/21/08

MFG: Morso
Model # :7600 Series

Run #: 2

Project #: 192-S-18-3
Run Date:11/13/08

TIME	Preburn ET (min)	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1209	0	7.6	0.000	284	307	198	352	364	3218	301.0	262	72	-0.035	3218	79.08	65.22	16.27	19.97
1219	10	7.0	-0.548	267	364	200	331	345	3218	301.3	302	71	-0.043	3218	79.08	65.22	16.27	19.97
1229	20	5.8	-1.225	270	378	199	321	324	3218	298.3	530	72	-0.064	3218	79.08	65.22	16.27	19.97
1239	30	4.2	-1.635	338	405	201	391	372	3218	341.4	585	73	-0.068	3218	79.08	65.22	16.27	19.97
1249	40	2.6	-1.532	424	446	215	458	452	3218	398.9	628	72	-0.070	3218	79.08	65.22	16.27	19.97
1259	50	1.6	-1.090	495	484	236	503	512	3218	445.9	559	74	-0.066	3218	79.08	65.22	16.27	19.97
1309	60	1.2	-0.347	485	548	253	507	515	3218	461.6	465	74	-0.054	3218	79.08	65.22	16.27	19.97
1313	64	1.1	-0.095	468	569	258	502	507	3218	460.8	446	74	-0.054	3218	79.08	65.22	16.27	19.97
1313	64	1.1	0.000	468	569	258	502	507	3218	460.8	446	74	-0.053	3218	79.08	65.22	16.27	19.97

4-16 OF 4-56

Signature/Date: K. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 2

Project #: 192-S-18-3
Run Date:11/13/08

TIME	ET (min)	Gas Meter-A (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1315	0	0.000	0.000	0.00	78	-0.02	126	0.040	0.0	5.5	5.46	462	572	262	501	504	3218	460.1	395	74	66	74	-0.051
1325	10	5.354	0.535	1.15	78	1.71	127	0.037	91.2	4.4	-1.11	411	474	262	447	442	3218	407.1	570	78	49	73	-0.069
1335	20	10.720	0.537	1.15	79	1.78	139	0.039	102.8	2.6	-1.74	452	476	250	467	445	3218	418.0	658	81	47	74	-0.071
1345	30	16.062	0.534	1.14	80	1.77	141	0.034	100.1	1.2	-1.46	521	474	251	511	483	3218	448.0	654	83	47	75	-0.070
1355	40	21.432	0.537	1.23	81	1.72	122	0.038	106.3	0.5	-0.62	541	454	261	535	520	3218	462.3	503	84	46	75	-0.058
1405	50	26.811	0.538	1.12	82	1.74	114	0.038	100.6	0.3	-0.21	487	488	264	523	507	3218	453.5	436	83	47	75	-0.053
1415	60	32.197	0.539	1.18	82	1.69	109	0.040	100.6	0.1	-0.20	431	492	255	490	473	3218	428.1	404	82	47	75	-0.049
1425	70	37.583	0.539	1.20	82	1.73	105	0.040	96.2	0.0	-0.15	387	486	244	460	443	3218	403.9	383	81	47	74	-0.047
AVG	NA	NA	0.537	1.021	80.250	1.515	122.875	0.038	99.971	NA	NA	461.500	489.500	256.125	491.750	477.125	3218.000	NA	500.375	80.750	49.500	74.375	-0.059

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Signature/Date: 11/21/08

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso
Model: 7600 Series
Project No.: 192-S-18-3
Tracking No.: 1293

Equipment Numbers:

Run #: 2
Date: 11/13/08

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N775	576.0	565.9		10.1
B. Rear filter catch	Filter	N774	570.0	570.5		-0.5
C. Rinse of probe and filter assembly	Acetone	75	112974.1	112971.3	0.0017	2.7

Total Particulate, mg :	12.3

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: M. Morgan Date: 11-18-08

Prelim: 1.76 @ 4.72
FINAL: 1.76 @ 4.23

Run Notes

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3
Tracking #: 1293
Run #: 2 Date: 11-13-08
Test Crew: K. Morgan
OMNI Equipment ID #(s):

PREBURN

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

PRIMARY:

Full open

SECONDARY: FIXED

TERTIARY: NONE

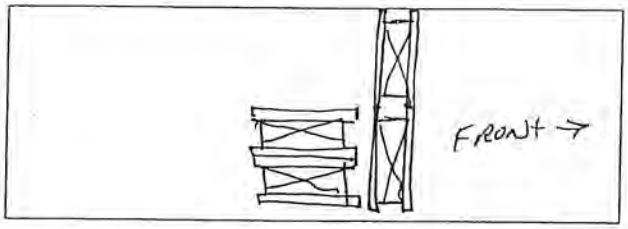
FAN: NO FAN

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					
64					X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 50 sec.
DOOR: ~~Closed at 55 sec.~~ K
PRIMARY AIR: AJAR for 3.0 min.
Full-open Duration of test.
OTHER: NONE

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

SAME As ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: NO FAN

Technician signature: K. Morgan Date: 11-13-08

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7600 Series

Project #: 192-S-18-3 Tracking #: 1293

Date: 11-13-08 Run #: 2 Booth: E2

Test Crew: K. Morgan Start Time: 13:15 Stop Time: 14:25

OMNI Equipment #(s): _____

Gas Analyzer Train Leak Check:

Stack: Initial: N/A 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): _____

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time							
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: 0 at 3.3" W.C.

Flue Pipe Cleaned Prior to First Test in Series: Date: 11-12-08 Initials: JC

	Initial	Middle	Ending
Pb (in/Hg)	30.48	30.48	30.48
Room Temp (°F)	74	75	74

Technician signature: K. Morgan Date: 11-13-08

Run 3

MFG: Morso
Model # :7600 Series

Run #: 3

Project #: 192-S-18-3
Run Date:11/14/08

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
3	11/14/08	1293	6.00

Manufacturer	Project Number	Coal Bed Range (lbs)	
Morso	192-S-18-3	1.20 to 1.50	FINAL

Model	Technician	Actual Coal Bed (lbs)
7600 Series	K. Morgan	1.3 CT

Test Booth	Data Collection Program
E2	EG_Logger_07_31_07 vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.028	.034	.036	.032	.028	.036	.038	.038	In-H2O
Initial Temp	100	100	100	99	99	99	98	98	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.62	30.62	30.62	30.62	In-Hg

PM Control Module	289		Tunnel Velocity	12.38	ft/sec	Avg Prop Rate	93.713	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	135.4	scfm	Firebox Surface Temp Change	-52.9	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	137.69	scfm			
Dilution Tunnel H2O	2	percent	Tunnel Area	.196	ft2	Filter Holder #		
Dilution Tunnel Static	-.4	in. H2O	Post-Test Leak Check	.008 @ 6.74	cfm@" Hg	Total Particulate	15.1	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	20.57	%			
Meter Box "Y" Factor	1.001		Fuel Consumed	6.000	lbs	Run Time	110	Minutes

Notes

4-22 OF 4-56

Signature/Date: K. Morgan 11/21/08

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 7600 Series
Project No.: 1293
Tracking No.: 192-S-18-3
Run: 3
Test Date: 11/14/08

Burn Rate	1.23 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00025 grams/dscf 2.08 grams/hour 3.35 grams/hour
Average Tunnel Temperature	89 degrees Fahrenheit
Average Delta p	0.034 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) - Vmst	58.45 cubic feet 71 degrees Fahrenheit 12.38 feet/second 8236.75 dscf/hour 59.71 dscf
Total Particulates - mn Average Delta H Total Time of Test	15.1 mg 1.07 inches H20 110 minutes

Fuel Data

OMNI EQUIPMENT ID #

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION — CALIBRATION VALUE (1) = 12% — ACTUAL READING ----- 12

CALIBRATION VALUE (2) = 22% — ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 22.67 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE	FIECE LENGTH NOTES
1	8 ft	21.1	23.:	23.8	2X4	2@8, 4@10. 3@5
2	0 ft	0	0	0		
3	0 ft	0	0	0		

TIME (24 HR) 07:40 — ROOM TEMPERATURE (F) 66

TEST FUEL

FUEL TYPE - PIECE QUANTITY

FUEL PIECE LENGTH: 10 IN — 4 2 X 4 PIECES — 0 4 X 4 PIECES — FUEL LOAD PIECE COUNT 4 PIECES

CALCULATED FUEL LOAD: 0 LBS — 6 LBS — 0 LBS — ACTUAL LOAD WEIGHT: 6 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	FIECE#	READINGS			TYPE
1	23.2	21.5	22.6	2X4	6	0	0	0	
2	19.3	22.:	19.3	2X4	7	0	0	0	
3	19.7	19.6	20.3	2X4	8	0	0	0	
4	19.3	19.9	20	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 08:20 — ROOM TEMPERATURE (F) 66 — AVERAGE FUEL LOAD MOISTURE 20.57 %

4-24 OF 4-56

Signature/Date: M. Morgan 11/21/08

MFG: Morso
Model # :7600 Series

Run #: 3

Project #: 192-S-18-3
Run Date:11/14/08

TIME	Preburn ET (min)	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
0831	0	5.6	0.000	359	417	197	383	387	3218	348.5	539	65	-0.068	3218	79.08	61.93	16.27	20.81
0841	10	4.6	-0.917	398	422	209	371	402	3218	360.4	380	66	-0.062	3218	79.08	64.98	16.27	20.03
0851	20	3.6	-1.043	424	413	215	375	416	3218	368.6	406	66	-0.054	3218	79.08	65.22	16.27	19.97
0901	30	2.6	-0.949	455	399	221	404	440	3218	384.0	399	66	-0.056	3218	79.08	65.22	16.27	19.97
0911	40	1.9	-0.704	472	392	228	432	448	3218	394.4	367	66	-0.048	3218	79.08	65.22	16.27	19.97
0921	50	1.5	-0.417	464	410.	234	435	443	3218	397.4	331	66	-0.046	3218	79.08	65.22	16.27	19.97
0931	60	1.3	-0.238	442	430	237	427	428	3218	392.9	291	66	-0.039	3218	79.08	65.22	16.27	19.97

4-25 OF 4-56

Signature/Date: 11/21/08

MFG: Morso
Model # :7600 Series

Run #: 3

Project #: 192-S-18-3
Run Date:11/14/08

TIME	ET (min)	Gas Meter-A (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
0934	0	0.000	0.000	-0.00	68	-0.04	99	0.034	0.0	6.0	6.03	434	407	242	427	425	3218	386.9	282	67	61	66	-0.037
0944	10	5.270	0.527	1.16	69	1.70	96	0.033	102	4.8	-1.25	394	373	234	396	394	3218	358.4	367	70	49	66	-0.054
0954	20	10.591	0.532	1.15	69	1.73	96	0.033	103	3.6	-1.16	412	408	230	380	402	3218	366.4	429	70	47	64	-0.058
1004	30	15.901	0.531	1.15	70	1.73	98	0.037	98	2.4	-1.23	462	401	229	404	430	3218	385.3	457	71	46	65	-0.057
1014	40	21.208	0.531	1.14	71	1.73	94	0.033	103	1.4	-1.03	507	378	235	432	462	3218	402.7	434	71	45	65	-0.055
1024	50	26.516	0.531	1.17	71	1.75	88	0.035	99	0.9	-0.48	512	366	243	456	476	3218	410.6	357	71	45	66	-0.046
1034	60	31.828	0.531	1.15	72	1.68	87	0.032	103	0.7	-0.18	481	361	249	454	468	3218	402.6	314	71	45	65	-0.041
1044	70	37.150	0.532	1.17	72	1.68	86	0.034	100	0.5	-0.16	442	354	247	436	450	3218	386.0	290	71	45	65	-0.038
1054	80	42.478	0.533	1.19	72	1.74	82	0.036	97	0.4	-0.14	408	353	240	416	430	3218	369.3	274	70	45	65	-0.036
1104	90	47.805	0.533	1.25	72	1.73	83	0.029	109	0.3	-0.15	380	355	233	397	409	3218	354.6	265	70	45	65	-0.034
1114	100	53.131	0.533	1.14	72	1.70	82	0.032	103	0.1	-0.13	357	380	224	378	391	3218	346.1	255	70	45	66	-0.033
1124	110	58.454	0.532	1.14	72	1.70	82	0.041	91	0.0	-0.14	338	377	216	363	376	3218	334.0	245	70	45	65	-0.031
AVG	NA	NA	0.531	1.067	70.833	1.569	89.417	0.034	100.727	NA	NA	427.250	376.083	235.167	411.583	426.083	3218.000	NA	330.750	70.167	46.917	65.250	-0.043

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Signature/Date: M. Morgan
11/21/08

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso
Model: 7600 Series
Project No.: 192-S-18-3
Tracking No.: 1293

Equipment Numbers:

Run #: 3
Date: 11/14/08

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N777	580.1	567.8		12.3
B. Rear filter catch	Filter	N776	572.1	571.9		0.2
C. Rinse of probe and filter assembly	Acetone	100	109302.1	109299.3	0.0017	2.6

Total Particulate, mg :	15.1

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: 11-18-08

OMNI-Test Laboratories,

PRELIM: 1.23 @ 3.26
FINAL: 1.23 @ 3.39

Run Notes

CBR: 1.3-1.5

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3
Tracking #: 1293
Run #: 3 Date: 11-14-08
Test Crew: K. Morgan
OMNI Equipment ID #(s):

PREBURN

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

PRIMARY:

Open 16 mm

SECONDARY: FIXED

TERTIARY: NONE

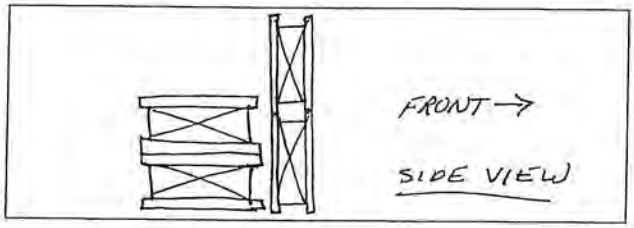
FAN: NO FAN

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					
60					4	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 50 sec
DOOR: AJAR until 4.5 min
PRIMARY AIR: Full open 5.0 min.
Test setting at 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: NO FAN

Technician signature: K. Morgan Date: 11-14-08

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7600 Series

Project #: 192-S-18-3 Tracking #: 1293

Date: 11-14-08 Run #: 3 Booth: E2

Test Crew: K. Morgan Start Time: 09:34 Stop Time: 11:24

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 @ 3.2" w.c. Post: Ø @ 3.2" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 11-12-08 Initials: JC

	Initial	Middle	Ending
Pb (in/Hg)	30.62	30.62	30.62
Room Temp (°F)	66	66	65

Technician signature: K. Morgan Date: 11-14-08

Run 4

MFG: Morso
Model # :7600 Series

Run #: 4

Project #: 192-S-18-3
Run Date:11/14/08

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
4	11/14/08	1293	6.00

Manufacturer	Project Number	Coal Bed Range (lbs)	
Morso	192-S-18-3	1.20 to 1.50	FINAL

Model	Technician	Actual Coal Bed (lbs)
7600 Series	K. Morgan	1.2

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.028	.033	.04	.04	.027	.03	.042	.036	In-H20
Intitial Temp	94	92	91	91	90	90	90	90	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.6	30.58	30.56	30.58	In-Hg

PM Control Module	289		Tunnel Velocity	12.73	ft/sec	Avg Prop Rate	101.112	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	137.6	scfm	Firebox Surface Temp Change	-47.2	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	140.85	scfm			
Dilution Tunnel H20	4	percent	Tunnel Area	.196	ft2	Filter Holder #		
Dilution Tunnel Static	-.4	in. H20	Post-Test Leak Check	.008 @ 6.8	cfm@" Hg	Total Particulate	17.5	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.68	%			
Meter Box "Y" Factor	1.001		Fuel Consumed	6.000	lbs	Run Time	110	Minutes

Notes

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Signature/Date: K. J. Morgan 11/21/08

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 7600 Series
Project No.: 1293
Tracking No.: 192-S-18-3
Run: 4
Test Date: 11/14/08

Burn Rate	1.22 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00030 grams/dscf 2.45 grams/hour 3.83 grams/hour
Average Tunnel Temperature	94 degrees Fahrenheit
Average Delta p	0.035 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) - Vmst	58.58 cubic feet 75 degrees Fahrenheit 12.62 feet/second 8316.30 dscf/hour 59.32 dscf
Total Particulates - mn Average Delta H Total Time of Test	17.5 mg 1.07 inches H20 110 minutes

MFG: Morso
Model # :7600 Series

Run #: 4

Project #: 192-S-18-3
Run Date:11/14/08

Fuel Data

OMNI EQUIPMENT ID #

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 20.03 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	21.1	19.6	19.4	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES: 2@8, 4@10, 3@6

TIME (24 HR): 12:00 ROOM TEMPERATURE (F): 68

TEST FUEL

FUEL PIECE LENGTH: 10 IN
CALCULATED FUEL LOAD: 0 LBS

FUEL TYPE - PIECE QUANTITY

4	2 X 4 PIECES	0	4 X 4 PIECES
6	LBS	0	LBS

FUEL LOAD PIECE COUNT: 4 PIECES
ACTUAL LOAD WEIGHT: 6 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	20.8	22.6	23.2	2X4	6	0	0	0	
2	18.6	19.3	19.9	2X4	7	0	0	0	
3	23	22.6	21.4	2X4	8	0	0	0	
4	22.4	22.5	23.9	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK): 12:30 ROOM TEMPERATURE (F): 68

AVERAGE FUEL LOAD MOISTURE: 21.68 %

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Signature/Date: H. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 4

Project #: 192-S-18-3
Run Date:11/14/08

TIME	Preburn ET (min)	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1208	0	6.4	0.000	254	331	188	306	314	3218	278.4	390	66	-0.048	3218	79.08	65.22	16.27	19.97
1218	10	5.6	-0.824	267	360	190	303	326	3218	289.1	275	66	-0.041	3218	79.08	65.22	16.27	19.97
1228	20	4.5	-1.089	294	375	190	310	348	3218	303.3	407	66	-0.052	3218	79.08	65.22	16.27	19.97
1238	30	3.4	-1.110	355	371	194	359	397	3218	335.2	431	67	-0.055	3218	79.08	65.22	16.27	19.97
1248	40	2.4	-0.978	419	359	205	405	435	3218	364.6	421	67	-0.054	3218	79.08	65.22	16.27	19.97
1258	50	1.8	-0.621	455	354	219	432	455	3218	382.9	374	68	-0.048	3218	79.08	65.22	16.27	19.97
1308	60	1.5	-0.306	452	366	228	437	447	3218	386.1	332	68	-0.043	3218	79.08	65.22	16.27	19.97
1318	70	1.3	-0.163	428	388	232	423	433	3218	380.8	299	68	-0.039	3218	79.08	65.22	16.27	19.97
1324	76	1.2	-0.095	409	402	234	412	425	3218	376.2	288	68	-0.036	3218	79.08	65.22	16.27	19.97

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Signature/Date: K. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 4

Project #: 192-S-18-3
Run Date:11/14/08

TIME	ET (min)	Gas Meter-A (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1327	0	0.000	0.000	-0.00	72	-0.03	97	0.036	0.0	6.0	5.96	403	415	236	411	423	3218	377.5	286	69	63	69	-0.035
1337	10	5.309	0.531	1.17	72	1.75	101	0.039	99.2	4.7	-1.29	370	399	230	394	392	3218	357.1	398	74	51	68	-0.053
1347	20	10.649	0.534	1.16	73	1.77	104	0.033	98.4	3.4	-1.28	407	415	229	395	401	3218	369.4	460	74	48	68	-0.058
1357	30	15.976	0.533	1.17	74	1.76	103	0.036	105.3	2.2	-1.19	470	404	234	419	444	3218	394.4	461	75	48	68	-0.064
1417	50	26.603	0.531	1.18	76	1.72	96	0.037	102.0	0.8	-0.40	511	375	242	449	480	3218	414.6	426	76	48	69	-0.055
1427	60	31.925	0.532	1.20	76	1.69	92	0.032	98.5	0.7	-0.18	477	372	251	454	468	3218	404.5	314	75	47	69	-0.047
1437	70	37.254	0.533	1.18	76	1.70	90	0.038	105.1	0.5	-0.14	436	374	246	429	441	3218	385.0	290	74	47	69	-0.041
1447	80	42.585	0.533	1.14	76	1.74	87	0.038	98.2	0.3	-0.16	400	372	238	404	420	3218	366.8	277	74	47	69	-0.037
1457	90	47.916	0.533	1.15	76	1.70	87	0.035	97.5	0.2	-0.13	372	373	229	386	404	3218	353.0	266	74	47	68	-0.035
1507	100	53.247	0.533	1.17	76	1.74	86	0.032	102.2	0.1	-0.12	349	374	222	369	390	3218	340.7	255	73	47	68	-0.033
1517	110	58.580	0.533	1.13	76	1.69	85	0.036	105.8	-0.0	-0.10	330	375	216	355	376	3218	330.3	246	73	47	68	-0.029
AVG	NA	NA	0.532	1.066	74.833	1.580	94.083	0.035	101.100	NA	NA	420.000	386.250	235.250	410.917	427.167	3218.000	NA	336.917	73.917	48.917	68.417	-0.043

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Signature/Date: K. J. Morg
11/21/08

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso
Model: 7600 Series
Project No.: 192-S-18-3
Tracking No.: 1293

Equipment Numbers:

Run #: 4
Date: 11/14/08

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N779	552.6	538.4		14.2
B. Rear filter catch	Filter	N778	543.2	542.9		0.3
C. Rinse of probe and filter assembly	Acetone	100	108430.9	108427.7	0.0017	3.0

Total Particulate, mg :	17.5

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: Ian T. Morg Date: 11-18-08

OMNI-Test Laboratories,

Prelim: 1.22@ 3.68
Final: 1.22@ 3.88

Run Notes

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3
Tracking #: 1293
Run #: 4 Date: 11-14-08
Test Crew: K. Morgan
OMNI Equipment ID #(s):

PREBURN

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

PRIMARY:

Open 17 mm

SECONDARY: Fixed

TERTIARY: None

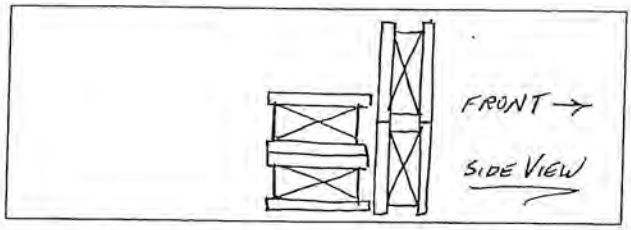
FAN: No Fan

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					
76					x	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING Loaded by 45 sec.
DOOR: 1" ~~Close~~ AJAR until 3.75 min.
PRIMARY AIR: Full Open until 5.0 min, Test setting at 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: No Fan

Technician signature: K. Morgan Date: 11-14-08

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7600 Series

Project #: 192-S-18-3 Tracking #: 1293

Date: 11-14-08 Run #: 4 Booth: E2

Test Crew: K. Morgan Start Time: 13:27 Stop Time: 15:17

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			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: 0 %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: 11-13-08 Initials: K

	Initial	Middle	Ending
Pb (in/Hg)	30.60	30.58	30.56
Room Temp (°F)	69	69	68

Technician signature: K. Morgan Date: 11-14-08

Run 5

MFG: Morso
Model # :7600 Series

Run #: 5

Project #: 192-S-18-3
Run Date:11/17/08

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
5	11/17/08	1293	5.80

Manufacturer	Project Number	Coal Bed Range (lbs)
Morso	192-S-18-3	1.16 to 1.45

Model	Technician	Actual Coal Bed (lbs)
7600 Series	K. Morgan	1.3

FINAL

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.031	.037	039	.037	.032	.04	.042	.044	In-H2O
Intitial Temp	95	94	93	9:	88	88	88	87	Deg F

Test Booth	Data Collection Program
E2	EG_Logger_07_31_07 vi

	Begin	Middle	End	Avg	
Barometric Pressure	30.21	30.20	30.20	30.203	In-Hg

PM Control Module	289		Tunnel Velocity	13.00	ft/sec	Avg Prop Rate	100.174	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	143.3	scfm	Firebox Surface Temp Change	-53	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	141.71	scfm			
Dilution Tunnel H2O	<	percent	Tunnel Area	.196	ft2	Filter Holder #		
Dilution Tunnel Static	-.43	in. H2O	Post-Test Leak Check	.008 @ 7.3	cfm@" Hg	Total Particulate	19.4	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	19.43	%			
Meter Box "Y" Factor	1.001		Fuel Consumed	5.800	lbs	Run Time	100	Minutes

Notes

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Signature/Date: K. Morgan 11/21/08

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 7600 Series
Project No.: 1293
Tracking No.: 192-S-18-3
Run: 5
Test Date: 11/17/08

Burn Rate	1.32 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00036 grams/dscf 3.04 grams/hour 4.58 grams/hour
Average Tunnel Temperature	92 degrees Fahrenheit
Average Delta p	0.037 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	53.84 cubic feet 70 degrees Fahrenheit 13.03 feet/second 8512.73 dscf/hour 54.33 dscf
Total Particulates - mn Average Delta H Total Time of Test	19.4 mg 1.06 inches H20 100 minutes

MFG: Morso
Model # :7600 Series

Run #: 5

Project #: 192-S-18-3
Run Date:11/17/08

Fuel Data

OMNI EQUIPMENT ID #:

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION — CALIBRATION VALUE (1) = 12% — ACTUAL READING ----- 12
CALIBRATION VALUE (2) = 22% — ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 20.17 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE	PIECE LENGTH NOTES
1	8 ft	19.5	21.2	15.8	2X4	2@8", 4@10", 3@6"
2	0 ft	0	0	0		
3	0 ft	0	0	0		

TIME (24 HR): 08:45 — ROOM TEMPERATURE (F): 65

TEST FUEL

FUEL PIECE LENGTH: 10 IN
CALCULATED FUEL LOAD: 0 LBS

FUEL TYPE - PIECE QUANTITY

2 X 4 PIECES	4 X 4 PIECES
4	0
5.8 LBS	0 LBS

FUEL LOAD PIECE COUNT: 4 PIECES
ACTUAL LOAD WEIGHT: 5.8 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	21	19.7	18.7	2X4	6	0	0	0	
2	19.1	19.2	19.1	2X4	7	0	0	0	
3	19.8	19.5	19.1	2X4	8	0	0	0	
4	19.8	19.:	19.1	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK): 08:45 — ROOM TEMPERATURE (F): 65 — AVERAGE FUEL LOAD MOISTURE: 19.43 %

4-42 OF 4-56

Signature/Date: M. T. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 5

Project #: 192-S-18-3
Run Date:11/17/08

TIME	Preburn ET (min)	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
0931	0	6.0	0.000	332	371	180	355	365	3218	320.7	423	65	-0.740	3218	78.38	43.34	14.24	24.74
0941	10	5.2	-0.836	339	389	187	348	373	3218	327.0	393	65	-0.740	3218	79.08	46.94	14.37	23.44
0951	20	4.0	-1.162	366	374	192	365	397	3218	338.9	454	66	-0.740	3218	79.08	51.31	14.62	22.17
1001	30	2.8	-1.193	418	361	199	402	432	3218	362.4	500	66	-0.064	3218	79.08	56.43	15.08	21.09
1011	40	1.8	-1.020	478	363	212	447	461	3218	392.1	455	67	-0.060	3218	79.08	61.73	15.70	20.28
1021	50	1.4	-0.384	479	388	225	464	463	3218	403.7	374	66	-0.050	3218	79.08	65.22	16.27	19.97
1031	60	1.3	-0.166	444	417	230	443	442	3218	395.4	322	66	-0.044	3218	79.08	65.22	16.27	19.97

4-43 OF 4-56

Signature/Date: M. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 5

Project #: 192-S-18-3
Run Date:11/17/08

TIME	ET (min)	Gas Meter-A (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1033	0	0.000	0.000	-0.00	67	-0.03	102	0.035	0.0	5.8	5.76	435	427	234	439	437	3218	394.2	307	66	60	66	-0.042
1043	10	5.336	0.534	1.13	67	1.82	93	0.034	103.9	4.7	-1.03	382	409	228	398	396	3218	362.4	368	69	50	65	-0.051
1053	20	10.707	0.537	1.12	68	1.81	103	0.037	102.2	3.3	-1.46	413	406	222	391	405	3218	367.5	513	70	47	66	-0.066
1103	30	16.072	0.537	1.16	69	1.80	100	0.035	98.4	2.0	-1.31	484	397	227	421	449	3218	395.5	513	71	46	67	-0.065
1113	40	21.445	0.537	1.18	70	1.83	99	0.039	101.0	1.0	-0.94	526	377	236	459	481	3218	415.8	453	71	45	67	-0.056
1123	50	26.831	0.539	1.23	71	1.78	91	0.038	97.3	0.7	-0.31	509	362	247	478	484	3218	416.0	369	71	45	69	-0.049
1133	60	32.224	0.539	1.20	71	1.80	88	0.038	99.1	0.5	-0.17	468	354	250	469	468	3218	401.8	338	71	45	68	-0.044
1143	70	37.621	0.540	1.18	72	1.79	85	0.041	99.2	0.4	-0.17	429	350	246	448	450	3218	384.3	317	70	45	69	-0.041
1153	80	43.025	0.540	1.18	72	1.77	85	0.036	96.4	0.2	-0.16	398	356	237	426	433	3218	369.8	306	70	45	68	-0.039
1203	90	48.429	0.540	1.18	72	1.78	84	0.036	101.8	0.1	-0.16	372	355	228	406	412	3218	354.7	295	70	45	67	-0.038
1213	100	53.837	0.541	1.12	72	1.82	83	0.033	102.6	-0.0	-0.07	351	353	219	390	393	3218	341.2	284	69	45	68	-0.036
AVG	NA	NA	0.538	1.062	70.091	1.634	92.091	0.037	100.190	NA	NA	433.364	376.909	234.000	429.545	437.091	3218.000	NA	369.364	69.818	47.091	67.273	-0.048

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OMNI Test Laboratories Inc.

Signature/Date: H. J. Morgan
11/21/08

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso
Model: 7600 Series
Project No.: 192-S-18-3
Tracking No.: 1293

Equipment Numbers:

Run #: 5
Date: 11/17/08

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N781	558.9	540.8		18.1
B. Rear filter catch	Filter	N780	536.4	535.9		0.5
C. Rinse of probe and filter assembly	Acetone	100	94549.5	94548.5	0.0017	0.8

Total Particulate, mg :	19.4

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: M. Morgan Date: 11-20-08

PRELIM: 1.32 @ 4.85
5.03
FINAL: 1.32 @ 4.55

Run Notes

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3
Tracking #: 1293
Run #: 5 Date: 11-17-08
Test Crew: K. MORGAN
OMNI Equipment ID #(s):

PREBURN

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

PRIMARY:

OPEN 20 mm

SECONDARY: FIXED

TERTIARY: NONE

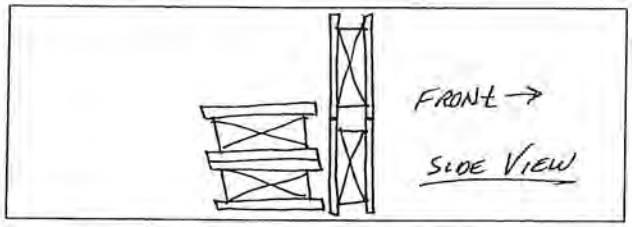
FAN: NO FAN

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					
60					X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded for 50 sec.
DOOR: AJAR UNTIL 4.25 min
PRIMARY AIR: Full open until 5.0 MIN.
Test setting at 5.0 min
OTHER:

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

SAME AS ABOVE

SECONDARY: FIXED

TERTIARY: NONE

FAN: No fan

Technician signature: K. Morgan Date: 11-17-08

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7600 Series

Project #: 192-S-18-3 Tracking #: 1293

Date: 11-17-08 Run #: 5 Booth: E2

Test Crew: K. Morgan Start Time: 10:33 Stop Time: 12:13

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			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 @ 3.2" w.c. Post: Ø @ 3.2" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 11-12-08 Initials: JC

	Initial	Middle	Ending
Pb (in/Hg)	30.21	30.20	30.20
Room Temp (°F)	66	69	68

Technician signature: K. Morgan Date: 11-17-08

Run 6

MFG: Morso
Model # :7600 Series

Run #: 6

Project #: 192-S-18-3
Run Date:11/17/08

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
6	11/17/08	1293	6.30

Manufacturer	Project Number	Coal Bed Range (lbs)	
Morso	192-5-18-3	1.26 to 1.57	FINAL

Model	Technician	Actual Coal Bed (lbs)
7600 Series	K. Morgan	1.4

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.028	.032	.038	.038	.038	.032	.04	.04	In-H20
Intitial Temp	90	90	88	88	87	87	87	86	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.2	30.2	30.19	30.196	In-Hg

PM Control Module	289		Tunnel Velocity	12.79	ft/sec	Avg Prop Rate	101.932	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	139.7	scfm	Firebox Surface Temp Change	-80.6	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	142.09	scfm			
Dilution Tunnel H20	4	percent	Tunnel Area	.196	ft2	Filter Holder #		
Dilution Tunnel Static	-.4	in. H20	Post-Test Leak Check	.004 @ 7.04	cfm@" Hg	Total Particulate	32.2	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	19.64	%			
Meter Box "Y" Factor	1.001		Fuel Consumed	6.300	lbs	Run Time	160	Minutes

Notes

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Signature/Date: H. J. Morgan 11/21/08

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso
Model: 7600 Series
Project No.: 1293
Tracking No.: 192-S-18-3
Run: 6
Test Date: 11/17/08

Burn Rate	0.90 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00037 grams/dscf 3.13 grams/hour 4.70 grams/hour
Average Tunnel Temperature	83 degrees Fahrenheit
Average Delta p	0.036 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) - Vmst	86.47 cubic feet 71 degrees Fahrenheit 12.75 feet/second 8466.74 dscf/hour 87.02 dscf
Total Particulates - mn Average Delta H Total Time of Test	32.2 mg 1.11 inches H20 160 minutes

Fuel Data

OMNI EQUIPMENT ID #

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

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE: 21.83 %

PIECE	LENGTH		% MOISTURE READINGS			FUEL TYPE
1	8	ft	21.6	22.3	21.6	2X4
2	0	ft	0	0	0	
3	0	ft	0	0	0	

PIECE LENGTH NOTES: 2@8", 4@10", 2@6"

TIME (24 HR): 12:00 ROOM TEMPERATURE (F): 67

TEST FUEL

FUEL TYPE - PIECE QUANTITY

FUEL PIECE LENGTH: 10 IN
CALCULATED FUEL LOAD: 0 LBS

2 X 4 PIECES	4 X 4 PIECES
4	0
6.3 LBS	0 LBS

FUEL LOAD PIECE COUNT: 4 PIECES
ACTUAL LOAD WEIGHT: 6.3 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	19.3	19.9	19.4	2X4	6	0	0	0	
2	19.9	19	18.9	2X4	7	0	0	0	
3	22.1	19.2	20.1	2X4	8	0	0	0	
4	19.4	19.3	19.2	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK): 12:40 ROOM TEMPERATURE (F): 67

AVERAGE FUEL LOAD MOISTURE: 19.64 %

4-51 OF 4-56

Signature/Date: M. Morg 11/21/08

MFG: Morso
Model # :7600 Series

Run #: 6

Project #: 192-S-18-3
Run Date:11/17/08

TIME	Preburn ET (min)	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1235	0	5.1	0.000	324	370	197	374	360	3218	325.0	509	65	-0.068	3218	79.08	65.22	16.27	19.97
1245	10	4.3	-0.842	376	366	204	388	386	3218	344.2	368	64	-0.056	3218	79.08	65.22	16.27	19.97
1255	20	3.3	-0.975	412	362	211	397	403	3218	357.1	399	65	-0.056	3218	79.08	65.22	16.27	19.97
1305	30	2.4	-0.951	456	349	217	419	428	3218	374.3	378	65	-0.048	3218	79.08	65.22	16.27	19.97
1315	40	1.7	-0.638	472	339	225	430	436	3218	380.2	354	65	-0.046	3218	79.08	65.22	16.27	19.97
1325	50	1.5	-0.217	461	339	230	425	428	3218	376.7	289	65	-0.038	3218	79.08	65.22	16.27	19.97
1335	60	1.4	-0.130	427	348	228	401	407	3218	362.3	254	64	-0.031	3218	79.08	65.22	16.27	19.97

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Signature/Date: K. J. Morgan
11/21/08

MFG: Morso
Model # :7600 Series

Run #: 6

Project #: 192-S-18-3
Run Date:11/17/08

TIME	ET (min)	Gas Meter-A (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1338	0	0.000	0.000	-0.00	70	-0.03	98	0.036	0.0	6.3	6.32	417	365	230	396	402	3218	362.2	258	67	61	65	-0.032
1348	10	5.370	0.537	1.25	70	1.78	90	0.038	100.1	5.3	-0.99	368	350	219	363	367	3218	333.2	308	70	48	65	-0.049
1358	20	10.746	0.538	1.26	70	1.77	86	0.040	99.5	4.6	-0.75	356	358	210	331	348	3218	320.5	305	70	47	65	-0.043
1408	30	16.133	0.539	1.12	70	1.79	88	0.036	98.8	3.6	-0.96	376	347	203	326	358	3218	322.0	365	70	46	65	-0.049
1418	40	21.506	0.537	1.17	71	1.81	92	0.035	102.7	2.6	-1.06	425	328	204	357	380	3218	338.7	393	70	46	66	-0.052
1428	50	26.889	0.538	1.20	72	1.76	90	0.036	102.9	1.6	-1.00	479	315	210	393	414	3218	362.2	365	70	46	66	-0.051
1438	60	32.282	0.539	1.14	72	1.78	84	0.033	102.4	1.2	-0.37	490	302	220	412	427	3218	370.3	294	70	46	67	-0.038
1448	70	37.683	0.540	1.14	72	1.79	82	0.041	105.6	1.0	-0.17	467	294	227	409	423	3218	363.7	257	70	46	66	-0.033
1458	80	43.087	0.540	1.23	72	1.76	81	0.039	95.9	0.9	-0.13	434	287	229	398	415	3218	352.5	238	70	46	66	-0.029
1508	90	48.512	0.542	1.20	72	1.78	80	0.034	98.6	0.8	-0.12	402	284	226	383	402	3218	339.3	227	70	46	65	-0.028
1518	100	53.936	0.542	1.18	72	1.74	79	0.037	104.6	0.7	-0.11	375	282	221	369	391	3218	327.3	219	69	46	65	-0.026
1528	110	59.360	0.542	1.18	72	1.79	78	0.037	100.7	0.6	-0.12	353	279	215	356	381	3218	317.0	214	69	46	65	-0.025
1538	120	64.783	0.542	1.18	72	1.74	77	0.036	101.0	0.4	-0.13	336	278	210	346	373	3218	308.3	207	69	46	65	-0.024
1548	130	70.203	0.542	1.15	72	1.78	77	0.032	102.7	0.3	-0.09	323	279	205	339	363	3218	301.6	201	69	46	65	-0.023
1558	140	75.625	0.542	1.15	72	1.76	77	0.037	107.4	0.2	-0.10	311	280	200	330	352	3218	294.8	196	68	46	65	-0.022
1608	150	81.048	0.542	1.19	72	1.80	76	0.032	100.7	0.1	-0.10	301	281	196	321	341	3218	288.0	193	68	46	65	-0.021
1618	160	86.468	0.542	1.17	72	1.75	75	0.040	107.4	0.0	-0.09	292	281	192	313	330	3218	281.6	189	68	47	65	-0.021
AVG	NA	NA	0.540	1.112	71.471	1.668	82.941	0.036	101.937	NA	NA	382.647	305.294	212.765	361.294	380.412	3218.000	NA	260.529	69.235	47.118	65.353	-0.033

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OMNI Test Laboratories Inc.

Signature/Date: K. J. Morgan
11/21/08

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Morso
Model: 7600 Series
Project No.: 192-S-18-3
Tracking No.: 1293

Equipment Numbers:

Run #: 6
Date: 11/17/08

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N783	558.2	527.5		30.7
B. Rear filter catch	Filter	N782	534.0	533.4		0.6
C. Rinse of probe and filter assembly	Acetone	100	99689.6	99688.5	0.0017	0.9

Total Particulate, mg :	32.2

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. Morse Date: 11-20-08

Run Notes

PRELIM: 0,90@ 5,18
FINAL: 0.90@ 4.69

Client: Morso
Model: 7600 Series
Project #: 192-S-18-3
Tracking #: 1293
Run #: 6 Date: 11-17-08
Test Crew: K. Morgan
OMNI Equipment ID #(s):

PREBURN

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

PRIMARY:

Open 13 mm

SECONDARY: FIXED

TERTIARY: NONE

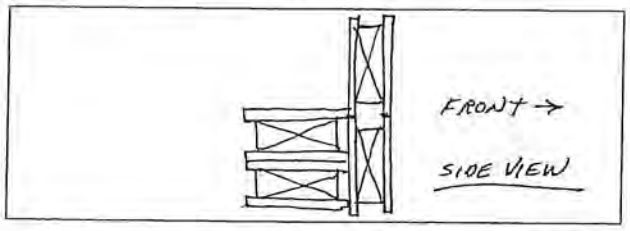
FAN: No FAN

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					
60					x	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Loaded by 55 sec.
DOOR: AJAR until 4.0 min.
PRIMARY AIR: Full Open Until 5.0 min.
Test setting at 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: No FAN

Technician signature: K. Morgan Date: 11-17-08

Supplemental Data EPA 5G/5H

Client: Morso

Model: 7600 Series

Project #: 192-S-18-3 Tracking #: 1293

Date: 11-17-08 Run #: 6 Booth: E2

Test Crew: K. Morgan Start Time: 13:38 Stop Time: 16:

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							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6.0

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

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

Induced Draft: 0 %Smoke Capture: 100

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

Flue Pipe Cleaned Prior to First Test in Series: Date: 11-12-08 Initials: JL

	Initial	Middle	Ending
Pb (in/Hg)	30.20	30.20	30.19
Room Temp (°F)	65	66	65

Technician signature: K. Morgan Date: 11-17-08

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 7600 Series wood stove. The 7600 Series wood stove is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of cast iron. The usable firebox volume was measured to be 0.8 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 Portland, Oregon. The altitude of the laboratory is 30 feet above sea level. The unit was received in good condition and logged in on October 15, 2008, then assigned and labeled with *OMNI* ID #1293. *OMNI* representative Ken Morgan conducted the certification testing and completed all testing by November 17, 2008. The EPA was notified of the testing dates in a letter dated November 11, 2008. 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 7600 Series 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 five test runs included in the results indicate a particulate emission level of 4.4 grams per hour. Run #1 was exempted from the weighted average emissions results on a two-for-one basis. Test runs were conducted in each of three burn rate categories (0.80-1.25 kg/hr, 1.25-1.90 kg/hr, and maximum). Emissions for each of their individual test runs did not exceed the cap. The 7600 Series 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. The results in this report are limited to the item submitted.

Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
2	1.76	4.23
3	1.23	3.35
4	1.22	3.83
5	1.32	4.58
6	0.90	4.70
Weighted particulate emission average of five test runs: 4.4 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
2	74	74	30.48	30.48	<50	<50
3	66	65	30.62	30.62	<50	<50
4	69	68	30.60	30.56	<50	<50
5	66	68	30.21	30.20	<50	<50
6	65	65	30.20	30.19	<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)
2	7.6	21.0	1.1
3	5.6	22.7	1.3
4	6.4	20.0	1.2
5	6.0	20.2	1.3
6	5.1	21.8	1.4

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
2	5.5	0.8	6.88	21.2	10	4	0
3	6.0	0.8	7.50	20.6	10	4	0
4	6.0	0.8	7.50	21.7	10	4	0
5	5.8	0.8	7.25	19.4	10	4	0
6	6.3	0.8	7.88	19.6	10	4	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)
2	70	13.51	140.0	122.9
3	110	12.38	137.7	89.4
4	110	12.62	140.9	94.1
5	100	13.03	141.7	92.1
6	160	12.75	142.1	82.9

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average[a]	Ending Surface Temperature Average[a]	Surface Delta T[b]
2	460.1	403.9	56
3	386.9	334.0	53
4	377.5	330.3	47
5	394.2	341.2	53
6	362.2	281.6	81
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)
2	Fully Open	7.6 lbs at start; no addition; coal bed 1.1 lbs	0.0	64
3	Open 16 mm	5.6 lbs at start; no addition; coal bed 1.3 lbs	0.0	60
4	Open 17 mm	6.4 lbs at start; no addition; coal bed 1.2 lbs	0.0	76
5	Open 20 mm	6.0 lbs at start; no addition; coal bed 1.3 lbs	0.0	60
6	Open 13 mm	5.1 lbs at start; no addition; coal bed 1.4 lbs	0.0	60

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)
2	1.76	0	Fully Open	70	-0.059
3	1.23	0	Open 16 mm	110	-0.043
4	1.22	0	Open 17 mm	110	-0.043
5	1.32	0	Open 20 mm	100	-0.048
6	0.90	0	Open 13 mm	160	-0.033

Table 1.8 – Test Configurations

Run	Five-Minute Startup	Combustion Air
2	Bypass: N/A. Fuel Loading: Loaded by 50 seconds. Door: Ajar for 3.0 minutes. Primary Air: Fully open for duration of test. Other: None. Secondary: Fixed. Tertiary: N/A. Fan: None.	Fully Open
3	Bypass: N/A. Fuel Loading: Loaded by 50 seconds. Door: Ajar for 4.5 minutes. Primary Air: Fully open for 5.0 minutes, then set to test setting. Other: None. Secondary: Fixed. Tertiary: N/A. Fan: None.	Open 16 mm
4	Bypass: N/A. Fuel Loading: Loaded by 45 seconds. Door: Ajar for 3.75 minutes. Primary Air: Fully open for 5.0 minutes, then set to test setting. Other: None. Secondary: Fixed. Tertiary: N/A. Fan: None.	Open 17 mm
5	Bypass: N/A. Fuel Loading: Loaded by 50 seconds. Door: Ajar for 4.25 minutes. Primary Air: Fully open for 5.0 minutes, then set to test setting. Other: None. Secondary: Fixed. Tertiary: N/A. Fan: None.	Open 20 mm
6	Bypass: N/A. Fuel Loading: Loaded by 55 seconds. Door: Ajar for 4.0 minutes. Primary Air: Fully open for 5.0 minutes, then set to test setting. Other: None. Secondary: Fixed. Tertiary: N/A. Fan: None.	Open 13 mm

TEST RESULTS AND DISCUSSION

A total of six test runs were performed on the 7600 Series wood stove. Five test runs were conducted in the following categories and included in the weighted average emission level results: three in the 0.80 to 1.25 kg/hr dry category; one in the 1.25 to 1.90 kg/hr dry category; and one at maximum.

The weighted particulate emission level was measured to be **4.4 g/hr**.

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