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## Ignitability of upholstered furniture according to EN 1021-1 (6 appendices)

### Introduction

SP has by request of Lammhults Möbel AB performed fire tests according to EN 1021-1. The purpose of the tests is basis for technical fire classification.

### Products

According to the client:

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
X75-2	Black wool fabric CMHR foam (RG45195)	530 -	- -	- Carpenter
S70-4	Fabric yellow cord Polyurethane foam Polyester wadding	530 - 95	- 38 -	- Recticel AB -
Karmstol 77	Gaja wool fabric CMHR foam (RG45195)	530 -	- -	Kvadrat Carpenter
Chicago	Gaja wool fabric CMHR foam (RG45195)	530 -	- -	Kvadrat Carpenter
Addit seat	Gaja wool fabric red Polyurethane foam Polyester wadding	530 - 100	- 54 -	Kvadrat Bramming Plastindustri AB -
Addit back	Gaja wool fabric red Polyurethane foam Polyester wadding	530 - 100	- 30 -	Kvadrat Bramming Plastindustri AB -

### Sampling

The samples were delivered by the client. It is not known to SP Fire Technology if the products received are representative of the mean production characteristics.

The samples were received on March 13, 2012 at SP Fire Technology.

### Test results

The upholstery combination was tested with cigarette (EN 1021-1) as ignition source.

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The ignition source was applied in a position along the junction between seat and back. Special care was taken to note any progressive smouldering and/or flaming combustion in the combination.

No progressive smouldering and/or flaming occurred within the 60 minute test time (non-ignition). The test results are given in appendix 1 - 6.

The test results relate only to the ignitability of the combination of upholstery composites under the particular conditions of the test; they are not intended as a means of assessing the potential fire hazard of the materials or products in use.

### Criteria

Section 3 in EN 1021-1, 2006 describing "Criteria of ignition" with regards to "Progressive smouldering ignition" (3.1) and "Flaming ignition" (3.2).

### Deviation from standard

The materials were delivered as complete seats and backs of a chair or as original sized seats and backs separate. In most tests it was not possible to use the test rig according to the standard. The deviations are described more in appendix 1-6.

### Assessment

The tested furniture upholstery combinations called "X75-2", "S70-4", "Karmstol 77", "Chicago", "Addit seat" and "Addit back" meet the technical fire requirements according to EN 1021-1.

## SP Technical Research Institute of Sweden Fire Technology - Fire Dynamics

Performed by



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Examined by



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### Appendices

1. Test results – X75-2
2. Test results – S70-4
3. Test results – Karmstol 77
4. Test results – Chicago
5. Test results – Addit seat
6. Test results – Addit back

## Appendix 1

## Test results - EN 1021-1, 2006

### Product

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
X75-2	Black wool fabric CMHR foam (RG45195)	530 -	- -	- Carpenter

The upholstery combination consisted of two seating pieces and one was used as seat and one was used as back. The cigarettes were positioned along the junction between seat and back.

### Observations, EN 1021-1, ignition source cigarette

**Table 1. Observations during the cigarette tests.**

Test no	1	2
The cigarette was applied in a position along the junction between seat and back, min:s	00:00	00:00
Cover ignited, min:s	_*	_*
Filling ignited, min:s	_*	_*
The cigarette died out, min:s	24:07	24:27
The test was finished, min:s	60:00	60:00

\* Ignition/Flaming ignition of the materials was not observed.

**Table 2. Test criteria and assessment, cigarette test.**

	Test no	
	1	2
<i>"Smouldering criteria"</i>	Yes/No	
Unsafe escalating combustion (3.1 a)	No	No
Test assembly consumed (3.1 b)	No	No
Smoulders to extremities (3.1 c)	No	No
Smoulders through thickness (3.1 c)	No	No
Smoulders more than 1 h (3.1 d)	No	No
In final examination, presence of active smouldering (3.1 e)	No	No
<i>"Flaming criteria"</i>		
Occurrence of flames (3.2)	No	No

### Measured data of tested product

	Thickness, mm	Area weight, g/m <sup>2</sup>	Density kg/m <sup>3</sup>
Cover material	1.1 - 1.2	550	-
Filling	29 - 32	-	23 - 26

## Appendix 1

**Pre treatment**

According to the client, the cover material has not been chemically treated to reduce ignitability. The cover material has therefore not been subjected to the water soaking and drying procedure described in Annex D before testing.

**Conditioning**

The tested product was conditioned for a minimum of 24 h at a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  %.

**Date of test**

April 17 and 18, 2012.



## Appendix 2

**Test results - EN 1021-1, 2006**
**Product**

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
S70-4	Fabric yellow cord	530	-	-
	Polyurethane foam	-	38	Recticel AB
	Polyester wadding	95	-	-

The upholstery combination was cut in half and one part was used as seat and one part as back. The cigarettes were positioned along the junction between seat and back.

**Observations, EN 1021-1, ignition source cigarette**
**Table 1. Observations during the cigarette tests.**

Test no	1	2
The cigarette was applied in a position along the junction between seat and back, min:s	00:00	00:00
Cover ignited, min:s	_*	_*
Filling ignited, min:s	_*	_*
The cigarette died out, min:s	20:20	19:57
The test was finished, min:s	60:00	60:00

\* Ignition/Flaming ignition of the materials was not observed.

**Table 2. Test criteria and assessment, cigarette test.**

	Test no	
	1	2
<i>"Smouldering criteria"</i>	Yes/No	
Unsafe escalating combustion (3.1 a)	No	No
Test assembly consumed (3.1 b)	No	No
Smoulders to extremities (3.1 c)	No	No
Smoulders through thickness (3.1 c)	No	No
Smoulders more than 1 h (3.1 d)	No	No
In final examination, presence of active smouldering (3.1 e)	No	No
<i>"Flaming criteria"</i>		
Occurrence of flames (3.2)	No	No

**Measured data of tested product**

	Thickness, mm	Area weight, g/m <sup>2</sup>	Density kg/m <sup>3</sup>
Cover material	1.5 - 1.6	560	-
Filling + wadding	120 - 130	-	28

## Appendix 2

**Pre treatment**

According to the client, the cover material has not been chemically treated to reduce ignitability. The cover material has therefore not been subjected to the water soaking and drying procedure described in Annex D before testing.

**Conditioning**

The tested product was conditioned for a minimum of 24 h at a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  %.

**Date of test**

April 17 and 18, 2012.

Appendix 3

**Test results - EN 1021-1, 2006**

**Product**

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
Karmstol 77	Gaja wool fabric CMHR foam (RG45195)	530 -	- -	Kvadrat Carpenter

The upholstery combination was cut in half and one part was used as seat and one part as back. The cigarettes were positioned along the junction between seat and back.

**Observations, EN 1021-1, ignition source cigarette**

**Table 1. Observations during the cigarette tests.**

Test no	1	2
The cigarette was applied in a position along the junction between seat and back, min:s	00:00	00:00
Cover ignited, min:s	-*	-*
Filling ignited, min:s	-*	-*
The cigarette died out, min:s	30:21	32:17
The test was finished, min:s	60:00	60:00

\* Ignition/Flaming ignition of the materials was not observed.

**Table 2. Test criteria and assessment, cigarette test.**

	Test no	
	1	2
<i>"Smouldering criteria"</i>	Yes/No	
Unsafe escalating combustion (3.1 a)	No	No
Test assembly consumed (3.1 b)	No	No
Smoulders to extremities (3.1 c)	No	No
Smoulders through thickness (3.1 c)	No	No
Smoulders more than 1 h (3.1 d)	No	No
In final examination, presence of active smouldering (3.1 e)	No	No
<i>"Flaming criteria"</i>		
Occurrence of flames (3.2)	No	No

**Measured data of tested product**

	Thickness, mm	Area weight, g/m <sup>2</sup>	Density kg/m <sup>3</sup>
Cover material	1.0	382 - 388	-
Filling	18 - 20	-	51 - 53

## Appendix 3

**Pre treatment**

According to the client, the cover material has not been chemically treated to reduce ignitability. The cover material has therefore not been subjected to the water soaking and drying procedure described in Annex D before testing.

**Conditioning**

The tested product was conditioned for a minimum of 24 h at a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  %.

**Date of test**

April 17 and 18, 2012.



Appendix 4

**Test results - EN 1021-1, 2006**

**Product**

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
Chicago	Gaja wool fabric CMHR foam (RG45195)	530 -	- -	Kvadrat Carpenter

The upholstery combination was cut in half and one part was used as seat and one part as back. The cigarettes were positioned along the junction between seat and back.

**Observations, EN 1021-1, ignition source cigarette**

**Table 1. Observations during the cigarette tests.**

Test no	1	2
The cigarette was applied in a position along the junction between seat and back, min:s	00:00	00:00
Cover ignited, min:s	_*	_*
Filling ignited, min:s	_*	_*
The cigarette died out, min:s	31:01	27:03
The test was finished, min:s	60:00	60:00

\* Ignition/Flaming ignition of the materials was not observed.

**Table 2. Test criteria and assessment, cigarette test.**

	Test no	
	1	2
<i>"Smouldering criteria"</i>	Yes/No	
Unsafe escalating combustion (3.1 a)	No	No
Test assembly consumed (3.1 b)	No	No
Smoulders to extremities (3.1 c)	No	No
Smoulders through thickness (3.1 c)	No	No
Smoulders more than 1 h (3.1 d)	No	No
In final examination, presence of active smouldering (3.1 e)	No	No
<i>"Flaming criteria"</i>		
Occurrence of flames (3.2)	No	No

**Measured data of tested product**

	Thickness, mm	Area weight, g/m <sup>2</sup>	Density kg/m <sup>3</sup>
Cover material + Filling and wooden backing	37 – 73	-	290 - 300

## Appendix 4

**Pre treatment**

According to the client, the cover material has not been chemically treated to reduce ignitability. The cover material has therefore not been subjected to the water soaking and drying procedure described in Annex D before testing.

**Conditioning**

The tested product was conditioned for a minimum of 24 h at a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  %.

**Date of test**

April 18, 2012.

Appendix 5

**Test results - EN 1021-1, 2006**

**Product**

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
Addit seat	Gaja wool fabric red	530	-	Kvadrat
	Polyurethane foam	-	54	Bramming Plastindustri AB
	Polyester wadding	100	-	-

The seat filling as well as the fabric and wadding were cut into the right dimension to fit in the test rig. The cigarettes were positioned along the junction between seat and back.

**Observations, EN 1021-1, ignition source cigarette**

**Table 1. Observations during the cigarette tests.**

Test no	1	2
The cigarette was applied in a position along the junction between seat and back, min:s	00:00	00:00
Cover ignited, min:s	_*	_*
Filling ignited, min:s	_*	_*
The cigarette died out, min:s	23:07	17:39
The test was finished, min:s	60:00	60:00

\* Ignition/Flaming ignition of the materials was not observed.

**Table 2. Test criteria and assessment, cigarette test.**

	Test no	
	1	2
<i>"Smouldering criteria"</i>	Yes/No	
Unsafe escalating combustion (3.1 a)	No	No
Test assembly consumed (3.1 b)	No	No
Smoulders to extremities (3.1 c)	No	No
Smoulders through thickness (3.1 c)	No	No
Smoulders more than 1 h (3.1 d)	No	No
In final examination, presence of active smouldering (3.1 e)	No	No
<i>"Flaming criteria"</i>		
Occurrence of flames (3.2)	No	No

**Measured data of tested product**

	Thickness, mm	Area weight, g/m <sup>2</sup>	Density kg/m <sup>3</sup>
Cover material	1.0 – 1.1	379 - 388	-
Filling + Wadding	58 – 74	-	43 – 48

## Appendix 5

**Pre treatment**

According to the client, the cover material has not been chemically treated to reduce ignitability. The cover material has therefore not been subjected to the water soaking and drying procedure described in Annex D before testing.

**Conditioning**

The tested product was conditioned for a minimum of 24 h at a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  %.

**Date of test**

April 17 and 18, 2012.

Appendix 6

**Test results - EN 1021-1, 2006**

**Product**

Name	Components	Area weight (g/m <sup>2</sup> )	Density (kg/m <sup>3</sup> )	Manufacturer
Addit back	Gaja wool fabric red	530	-	Kvadrat
	Polyurethane foam	-	30	Bramming Plastindustri AB
	Polyester wadding	100	-	-

The back filling as well as the fabric and wadding were cut into the right dimension to fit in the test rig. The cigarettes were positioned along the junction between seat and back.

**Observations, EN 1021-1, ignition source cigarette**

**Table 1. Observations during the cigarette tests.**

Test no	1	2
The cigarette was applied in a position along the junction between seat and back, min:s	00:00	00:00
Cover ignited, min:s	_*	_*
Filling ignited, min:s	_*	_*
The cigarette died out, min:s	20:14	19:18
The test was finished, min:s	60:00	60:00

\* Ignition/Flaming ignition of the materials was not observed.

**Table 2. Test criteria and assessment, cigarette test.**

	Test no	
	1	2
<i>"Smouldering criteria"</i>	Yes/No	
Unsafe escalating combustion (3.1 a)	No	No
Test assembly consumed (3.1 b)	No	No
Smoulders to extremities (3.1 c)	No	No
Smoulders through thickness (3.1 c)	No	No
Smoulders more than 1 h (3.1 d)	No	No
In final examination, presence of active smouldering (3.1 e)	No	No
<i>"Flaming criteria"</i>		
Occurrence of flames (3.2)	No	No

**Measured data of tested product**

	Thickness, mm	Area weight, g/m <sup>2</sup>	Density kg/m <sup>3</sup>
Cover material	1.0 – 1.1	379 - 388	-
Filling + Wadding	73 – 75	-	28 - 30



## Appendix 6

**Pre treatment**

According to the client, the cover material has not been chemically treated to reduce ignitability. The cover material has therefore not been subjected to the water soaking and drying procedure described in Annex D before testing.

**Conditioning**

The tested product was conditioned for a minimum of 24 h at a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  %.

**Date of test**

April 17 and 18, 2012.