

CMX-DET Cable Markers

Metal detectable for food beverage and pharma industries

TECHNICAL DATA SHEET

Revision Number. 1.4

Last Edited 13. jan. 2021



Cable Markers extruded from Polyether based TPU compound. Optimised to the operation of the most usual metal detectors and x-ray detectors. The compounds meets requirements for food contact compliant with EU and FDA requirements. Compound is hydrolysis " No break down in water" and micro organism resistant.

In food production with open production processes it is advisable to use materials that are easily detectable. Link Solutions offers products that are simple to detect. They make an important contribution to quality management for the food industry, particularly when following the HACCP approach.

The labels are fixed to the cable or wire using detectable cable ties at both ends. The product is supplied as an all-in-one construction, where the extruded material also functions as the carrier.

The markers are partially perforated for easy picking after printing and supplied on rolls for thermal transfer printing.

Industry



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



Electrical installations



Petrochemical



Telecom



Food Industry

STANDARD COLOR



RAL 5012 -

MATERIAL

Polyether based TPU.

CONTINUOUS OPERATING TEMPERATURE

-25°C up to +105°C
(-13°F to 221°F)

COMPLIANCES

Mark Permanence external lab Test by Novadan
Ribbon : FTI-HX & FTI-X-CO-110x300-WE

RESISTANCE TO SOLVENTS

Customer Tests on-Site
Novadan Fluid Test Report
Ribbon : FTI-HX

RECOMMENDED BLACK RIBBON

FTI-HX

RECOMMENDED WHITE RIBBON

FTI-X-CO-110x300-WE

FLAMMABILITY STANDARD

Class HB - UL94

STANDARDS

FDA "Food & Drug" 21 CFR -

GRAS

"generally accepted as safe"

Regulation (EU) No 10/2011

Plastics intended to come into contact with food.

AP 89 1 - European Resolution

Pigments used for coloration

STORAGE

Cool and dry in original packaging. Recommended temperature at +10°C to +25°C and 45-55% relative humidity.

APPLICATIONS

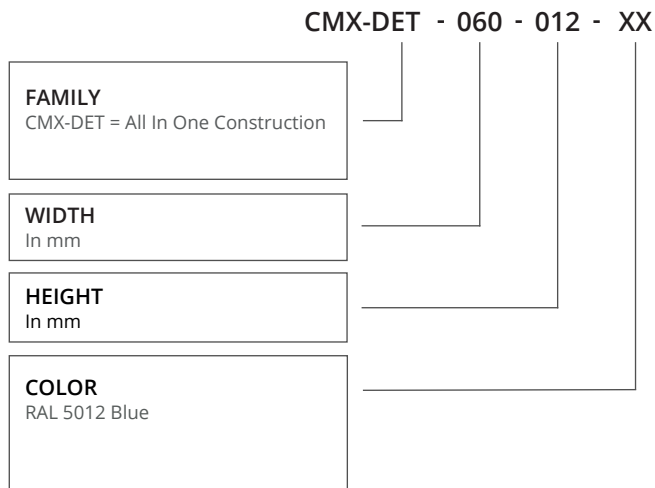
Developed to be used in Food Industry and other Industries requiring detection through metal detectors or X-ray equipment.

Ordering Info

PART NUMBER EXAMPLES

PART NUMBER	COLOUR	SIZE	TEXT AREA DIMENSION	MATERIAL	QTY	UOM
CMX-DET-060x012-BE	Blue	60x12mm	40x12mm	PE-TPU	1000	Roll
CMX-DET-075x015-BE	Blue	75x15mm	55x15mm	PE-TPU	1000	Roll
CMX-DET-075x025-BE	Blue	75x25mm	55x25mm	PE-TPU	500	Roll

Product code Example

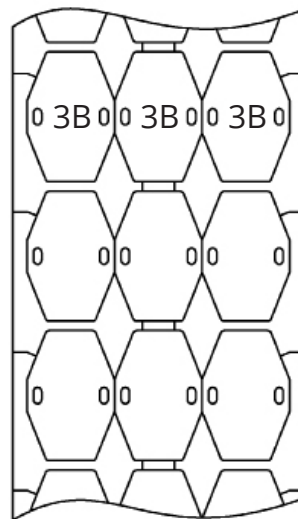
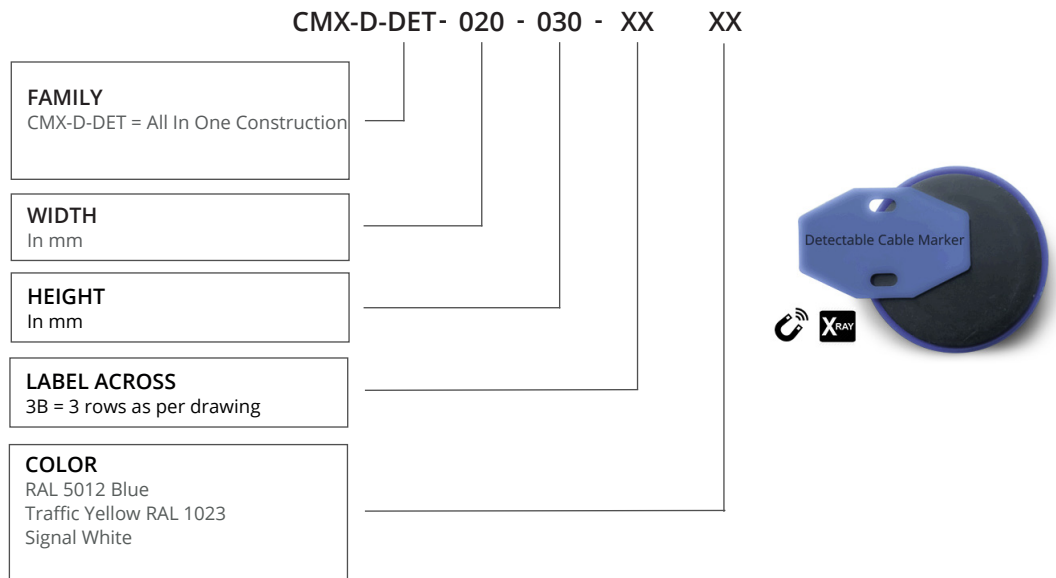


Ordering Info Blue Detectable Diamond Marker

PART NUMBER EXAMPLES

PART NUMBER	COLOUR	SIZE	TEXT AREA DIMENSION	MATERIAL	QTY	UOM
CMX-D-DET-20x30-BE	Blue	20x30mm	30x10mm	PE-TPU	1000	Roll

Product code Example 20x30 Blue



General Values for TPU Identification Products

PHYSICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Stress at 20 % strain	DIN 53504	12 MPa
Stress at 100 % elongation	DIN 53504	16 MPa
Stress at 300% elongation	DIN 53504	34 MPa
Density	DIN 53479	1,52 g/cm ³
Tensile Strength	DIN 53504	36 MPa - Using standardized test specimen
Elongation @ break	DIN 53504	450 %
Charpy notched impact strength, -30°C	DIN EN ISO 179	No break
Charpy notched impact strength, 23°C	DIN EN ISO 179	No break
Tensile Strength after storage in water at 80°C for 42 days	DIN 53504	20MPa
Compression set at room temperature, 24h	DIN EN ISO 815	30%
Compression set at 70°C, 24h	DIN EN ISO 815	50 %
Tear Strength	DIN 53515	110 N/mm
Abrasion resistance	DIN 53516	30mm ³
Shorehardness	DIN 53505	Shore D 55

THERMAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Glass transition temperature, 10°C/min	ISO 11357-1/-2	-30°C
Burning behaviour at 0.75 mm nom thickness	UL94	Class HB
Melting temperature 10°C/min	ISO 11357-1/-3	137°C
Short Max working temperature		105°C

ENVIRONMENTAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
UV-A 340 nm 1000 hours Light 60 ° irradiation 0.76 W/m ² power duration 8 hours - Spray duration 15 min. - Condensation 50 ° duration 3,45 hour.	Visual Inspection Mark Adherence	No creasing or cracking - NOT TESTED Good contrast and visibility - NOT TESTED NO UV TEST - NOT TESTED

SVHC	TEST METHOD	TYPICAL VALUE
Substances Of Very High Concern. DEHP (Bis(2-ethyl(hexyl)phtalat).	Article 57(f) of Regulation (EC) No 1907/2006	No content.

CHEMICAL PROPERTIES

CHEMICAL RESISTANCE

SOLVENTS RESISTANCE

No degradation of the CMX TPU products occurs, however, according to the solvent class a variable degree of swelling and consequent reduction in tensile strength (after evaporation of the solvents, the tensile strength recovers approx. its original value).

Methanol should be considered more as a chemical reagent than as a solvent. TPU is soluble in some solvents. As test procedure, 5A test rods (DIN EN ISO 527-2) were immersed in the solvent for three weeks at 23° C, and tested for tensile strength are rounded values.

CODE	TEST FLUID	SWELLING	REDUCTION OF TENSILE STRENGTH %	
Aliphatic Hydrocarbons	Pentan	10	20	
	Cyclohexan	22	10	
	Isooctan	7.5	none	
CMX PUR behave similarly in other aliphatic and cyclo-aliphatic hydrocarbons such as methane, ethane, propane, butane, hexane, octane, petroleum ether, paraffin oil, diesel oil and kerosine (although additives can present problems).				
Aromatic Hydrocarbons	Toulene	65	50	
Other aromatic hydrocarbons such as benzene and xylene have a similar affect.				
Aliphatic Esters	Ethyl Acetate	70	75	
Other short-chained esters such as butyl acetate and amy acetate have a similar affect				
Aliphatic Ketones	Methyl Ethyl Ketone	130	90	
Other short-chained aliphatic ketones such as acetone and methyl isobutyl ketone = MIBK have a similar affect.				
Aliphatic Halogenated Hydrocarbons, 1 C-atom	MethylEthyle Chloride	190	95	
	Chloroform		Practically dissolved	
	Tetrachloroethylene	75	54	
1 C-atom and higher	Trichloroethane*			
*Other aliphatic halogenated hydrocarbons with 2 C-atoms and higher have a similar affect.				
Aromatic Halogenated Hydrocarbons	Chlorobenzene	110	60	
Other aromatic halogenated hydrocarbons have a similar affect.				
ASTM-Oils acc. to ASTM D 471-06**	IRM 901 at 100 °C	500 h	1	6
	IRM 901 at 100 °C	1000 h	1	14
	IRM 902 at 100 °C	500 h	9	4
	IRM 902 at 100 °C	1000 h	10	5
	IRM 903 at 100 °C	500 h	18	8
	IRM 903 at 100 °C	1000 h	20	30
Agents Dissolving TPU	Tetrahydrofurane	dissolved	dissolved	
	Dimethyl Formamide (DMF)	dissolved	dissolved	
	Dimethyl Acetamide	dissolved	dissolved	
N-Methyl Pyrrolidone (NMP)	dissolved	dissolved		
Dimethyl Sulphoxide (DMSO)	dissolved	dissolved		
Pyridine	dissolved	dissolved		

CHEMICAL PROPERTIES

CHEMICAL RESISTANCE

SOLVENTS RESISTANCE

CODE	TEST FLUID	SWELLING	REDUCTION OF TENSILE STRENGTH %
Alcohols and Fuels	Methanol	28	6
	Ethanol	33	14
	Iso-Propanol	30	4
	Benzyl Alcohol	not measureable	partly dissolved
	Ethylen Glycol	4	15
	Glycerine	none	none
FAM Test Fluids acc. to DIN 51 604*	Test Fluid A	67	60
	Test Fluid B	68	74
	Test Fluid C	43	70
Diesel Fuel Biodiesel Fuel RME @ 60°C	Diesel Fuel	11	none
	Biodiesel Fuel	27	21
Fuel Types ASTM D 471	Fuel A = Iso-Octane	7.5	none
	Fuel B = Iso-Octane Touene 70% / 30%	25	36
	Fuel C=Iso-Octane Toluene 50% / 50%	38	44
	Fuel D=Iso-Octane Toluene 60% / 40%	31	44

* DIN 51 604, 03.1984, is the standard, established by FAM to assess the resistance of plastic materials to automotive fuels.

** The IRM reference oils are mineral oils with different paraffin and aromatics contents. The formerly used ASTM oils 1, 2 and 3 were replaced by the IRM oils 1, 2 and 3 owing to health risks, and are no longer available. The IRM oils 1, 2 and 3 are very similar in terms of their characteristics, but not identical.

(FAM = Fachausschuß Mineral- und Brennstoffnormung-Professional committee for standardization of fuel stuffs)

(ASTM = American Society for Testing and Materials)

Test fluid A consists of:

50.0 % by volume toluene
30.0 % by volume iso-octane
15.0 % by volume di-isobutylene
5.0 % by volume ethanol

Test fluid B consists of:

42.0 % by volume toluene
25.5 % by volume iso-octane
13.0 % by volume di-isobutylene
15.0 % by volume methanol
4.0 % by volume ethanol
0.5 % by volume water

Test fluid C consists of:

20.0 % by volume toluene
12.0 % by volume iso-octane
6.0 % by volume di-isobutylene
58.0 % by volume methanol
2.0 % by volume ethanol
2.0 % by volume water

Information on EU No. 10/2011

PLASTICS MATERIALS AND ARTICLES INTENDED TO COME IN CONTACT WITH FOOD

Based on our investigations, experiences and the information provided to us by our raw material suppliers, the polymer compound
CMX-DET Light Blue

complies with EU regulations related to plastic materials intended to come into contact with food EU Regulations:

Regulation 1935/2004 of 27th of October, Commission Directive 2002/72/EC of 6th of August, corrected on 13th February and further amendments: 2004/1/EC of 6th January, 2004/19/EC of 1st March, 2005/79/EC of 18th November, 2007/19/EC of 30th March, 2008/39/EC of 6th March, 975/2009/EC of 19th October and 10/2011/EC of 1st of May.

All raw materials and additives used to produce the grade are included in the positive lists (Annex II and III). Concerning SML (specific migration limit) and dual-use additives, referred to Annex VI, point (5), migration tests have to be made at the end parts by the distributor of the parts, in order to guarantee the specific and total migration limit values. The global migration limit is established in 10 mg/dm².

This information does not cover the ulterior changes in the composition of the material by adding other substances.

This information does not exonerate the end user of the material to make sure that the final product obtained is in accordance to the legal migration levels and the regulation EU No.10/2011

The information given above has been compiled carefully and represents the state of our knowledge at issue date. If not otherwise stated, this information is valid for two years after the issue date.

Information on FDA 21 CFR - GRAS (Generally accepted as safe)

PLASTICS MATERIALS AND ARTICLES INTENDED TO COME IN CONTACT WITH FOOD

Based on our investigations, experiences and the information provided to us by our raw material suppliers, the polymer compound
CMX-DET Light Blue

complies with FDA 21 CFR regulations related to plastic materials intended to come into contact with food EU Regulations:

All raw materials and additives used to produce the grade are used in accordance with FDA 21 CFR or are listed as GRAS (generally accepted as safe).
The corresponding sections are §§

175.105
177.1680
177.2600
186.1374
178.3297
174.5
174.6
175.105
176.170

This information does not cover the ulterior changes in the composition of the material by adding other substances.

This information does not exime the end user of the material to make sure that the final product obtained is in accordance to the legal migration levels and the regulation EU No.10/2011

The information given above has been compiled carefully and represents the state of our knowledge at issue date. If not otherwise stated, this information is valid for two years after the issue date.

Information on AP 89/1 EU regulation -

COLORANTS USED IN THE MANUFACTURE OF MATERIALS AND ARTICLES INTENDED FOR FOOD CONTACT APPLICATIONS IN THE EUROPEAN UNION (EU)

Link Solutions manufactures cable identification products made of detectable polyether based TPU. These products are intended for use for cable identification on food processing, packing equipment, electrical control panels, found in contiguity of food processing and packing operations.

Based on our investigations, experiences and the information provided to us by our raw material suppliers, the polymer compound CMX-DET Light Blue

complies with AP89 regulations related to plastic materials intended to come into contact with food EU Regulations:

Since conditions of use and application of the products are outside link Solutions control, Link Solutions gives no guarantees, warranties and assumes no liability whatsoever for any loss, damage or expense arising from or in connection with the use of this information.

The information given above was compiled carefully and represents the state of Link Solutions knowlegde and results of our investigation at issue date. The information are based on the data given by our raw material suppliers. Some substances This information does not cover the ulterior changes in the composition of the material by adding other substances.

Information examination detectability by metaldetectors & X-ray

Based on our investigations, experiences and the information provided to us by our testing lab.

CMX-DET Light Blue.

Study results by means of a metal detector system, the amplitude and phase signals of the present samples were measured. The following figure shows an example of the amplitude and phase signals of a metal ball made of non-ferrous metal (brass) with a diameter of 4mm.

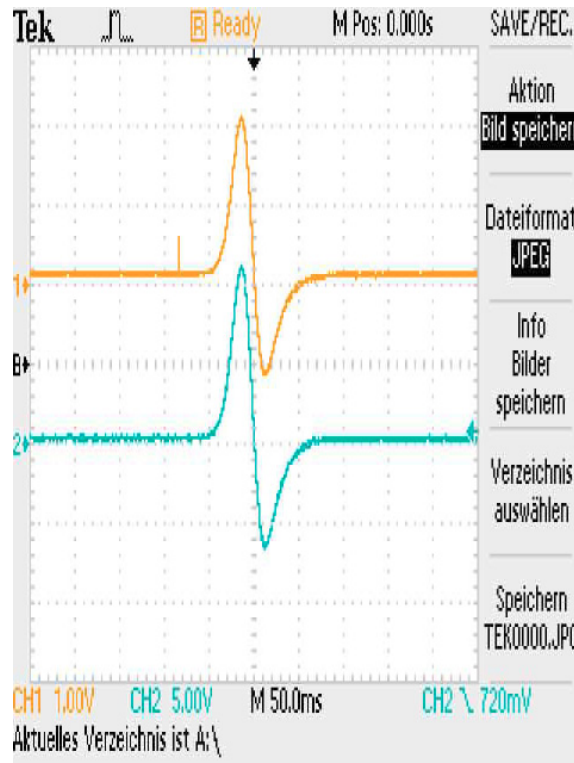


Figure 1 amplitude and phase signal of a metal ball 4mm Non-Ferrous. roughly corresponds to the behavior that the respective parts produce in a metal detector (300Khz) without product compensation.

The following table lists the results of the measurements. Each sample was assigned an equivalent metal ball, i.e. this sphere roughly corresponds to the behavior that the respective parts produce in a metal detector (300Khz) without product compensation. A high product effect by e.g. a high intrinsic conductivity of the food can change the situation greatly. The determined aluminum spheres correspond to the behavior of the test specimens in the X-ray beam at 60 KV. The following table lists the results of the measurements. Each sample was assigned an equivalent metal ball, i.e. this sphere

Sample Description	Equivalent Non-FE sphere metal detector for the tested sample	Equivalent aluminium sphere X-ray detector for the tested sample
Foil grey d=0,7mm 6x6x6 mm movement across	ca. 1,7mm	
Foil grey d=0,7mm 10x10x10 mm movement across	ca. 2,2 mm	ca. 0,5-0,7mm

Related Standards & Test Methods

Document	Description
FDA " Food & Drug" Code of Federal Regulations (21 CFR, 182-186) - GRAS " General Recognised As Safe"	Substances generally recognized as safe (GRAS) can be safely used as components of articles that contact food under conditions of good manufacturing practice. A list of GRAS notices with FDA's response can be searched in SCOGS data base. Please note that not all substances that are GRAS are listed in 21 CFR or covered by a GRAS notification.
Regulation (EU) No. 10/2011	Regulation (EU) No. 10/2011 - The monomers as well as the other starting substances, additives and polymer production aids used in the manufacture of these products are listed in annex I (Union List) with the following specific restrictions. 2,6-Di - tet-butyl-p-cresol (BHT) : SML = 3mg/kg food, dual use additive. No Content
Specific Migration Limit	The specific migration limit (SML) is the maximum permitted quantity of a specific substance that can migrate from a food packaging material or food container into food. It is a safety limit derived from toxicological studies. Reliable analytical methods are needed to identify the presence of these substances in food (or food simulants). It is usually expressed as mg/kg food. The annex I of Regulation (EU) No 10/2011 on Plastic Materials and Articles has set out SMLs. If no SML is set, default limit 60 mg/kg food can be used for individual substances. Sometimes, total specific migration limit (SMLT) can be set for a group of similar substances. Its unit is also mg/kg food.
AP 89 1 - European Resolution BFR Federal Institute for Risk Assessment	The pigments used for pigments used for coloration comply with the requirements of the European Resolution AP (89) 1 or the German recommendation IX of BFR (Federal Institute for Risk Assessment). The printed surfaces shall not come into direct contact with food.
Regulation (EC) No 2023/2006	The product follows good manufacturing principles (gmp) according to Regulation (EC) No 2023/2006 when manufacturing these products
Regulation (EC) No 1935/2004	Having regard to Regulation (EC) No 1935/2004 of the European Parliament and the Council of 27 October 2004 on materials and articles intended to come into contact with food (1), and in particular Article 5(1)
HACCP approach Hazard analysis and critical control points	A systematic preventive approach to food safety from biological, chemical, physical hazards and more recently radiological hazards in production processes that can cause the finished product to be unsafe and designs measures to reduce these risks to a safe level. In this manner, HACCP attempts to avoid hazards rather than attempting to inspect finished products for the effects of those hazards. The HACCP system can be used at all stages of a food chain, from food production and preparation processes including packaging, distribution, etc. HACCP is focused only on the health safety issues of a product and not the quality of the product, yet HACCP principles are the basis of most food quality and safety assurance systems.

Extended tensile strength test after immersion test

THE TEST RESULTS BELOW REFLECTS THE TENSILE STRENGTH AFTER THE FLUID IMMERSION

Link Solutions manufactures cable identification products made of detectable polyether based TPU. These products are intended for use for cable identification on food processing, packing equipment, electrical control panels, found in contiguity of food processing and packing operations.

Based on our investigations, experiences and the information provided to us by our raw material suppliers, the polymer compound

CMX-DET Light Blue gives us following tensile strength results after immersion and test done by Novadan Denmark. Storage tests with the different chemicals have no influence on the mechanical characteristics and leave the value equal.

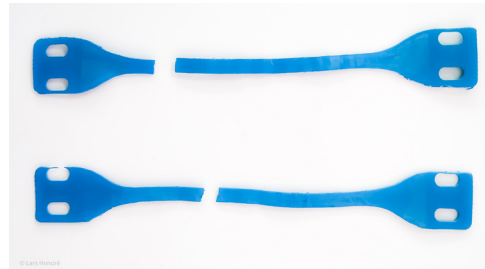
Full immersion report available upon request.

This information does not cover the ulterior changes in the composition of the material by adding other substances.

BEFORE



AFTER



	CABLE MARKER NUMBER	TENSILE STRENGTH MPA	ELONGATION AT BREAK %	AVERAGE TENSILE STRENGTH MPA	ELONGATION AT BREAK %
BEFORE IMMERSION					
		41,7	380	41,7	380
AFTER IMMERSION					
Cip Alka 60	White 1.1	44,2	390	43,2	390
	White 1.2	43,6	400		
	Black 1.1	43,9	400		
	Black 1.2	41,3	370		
FOAM 30	White 2.1	43,4	390	43,2	390
	White 2.2	43,8	390		
	Black 2.1	40,9	360		
	Black 2.2	44,4	400		
Cip Alka CL	White 3.1	45,3	370	44,8	360
	White 3.2	46,1	370		
	Black 3.1	43,1	350		
	Black 3.2	44,6	370		

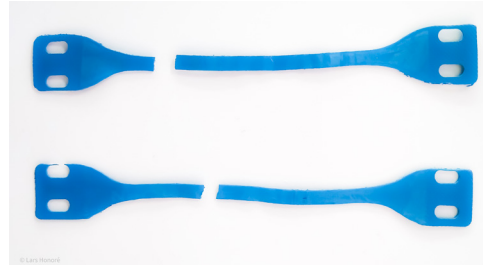
Extended tensile strength test after fluid immersion

THE TEST RESULTS BELOW REFLECTS THE TENSILE STRENGTH AFTER THE IMMERSION

BEFORE



AFTER



	CABLE MARKER NUMBER	TENSILE STRENGTH MPA	ELONGATION AT BREAK %	AVERAGE TENSILE STRENGTH MPA	ELONGATION AT BREAK %
BEFORE IMMERSION					
		41,7	380	41,7	380
AFTER IMMERSION					
DES FOAM PAA	White 4.1	39,1	360	39,3	360
	White 4.2	39,7	360		
	Black 4.1	38,6	350		
	Black 4.2	39,9	360		
FOAM 13	White 5.1	38,7	360	39,5	370
	White 5.2	40,5	370		
	Black 5.1	40,1	390		
	Black 5.2	38,7	370		
IPA	White 7.1	44,4	390	44,0	380
	White 7.2	43,4	380		
	Black 7.1	43,1	380		
	Black 7.2	45,2	370		
Ethanol / IPA	White 8.1	42,7	370	44,0	370
	White 8.2	42,6	360		
	Black 8.1	44,4	380		
	Black 8.2	46,4	390		
RAPESEED OIL	White 9.1	45,4	360	45,5	360
	White 9.2	45,5	340		
	Black 9.1	46,6	370		
	Black 9.2	43,3	360		