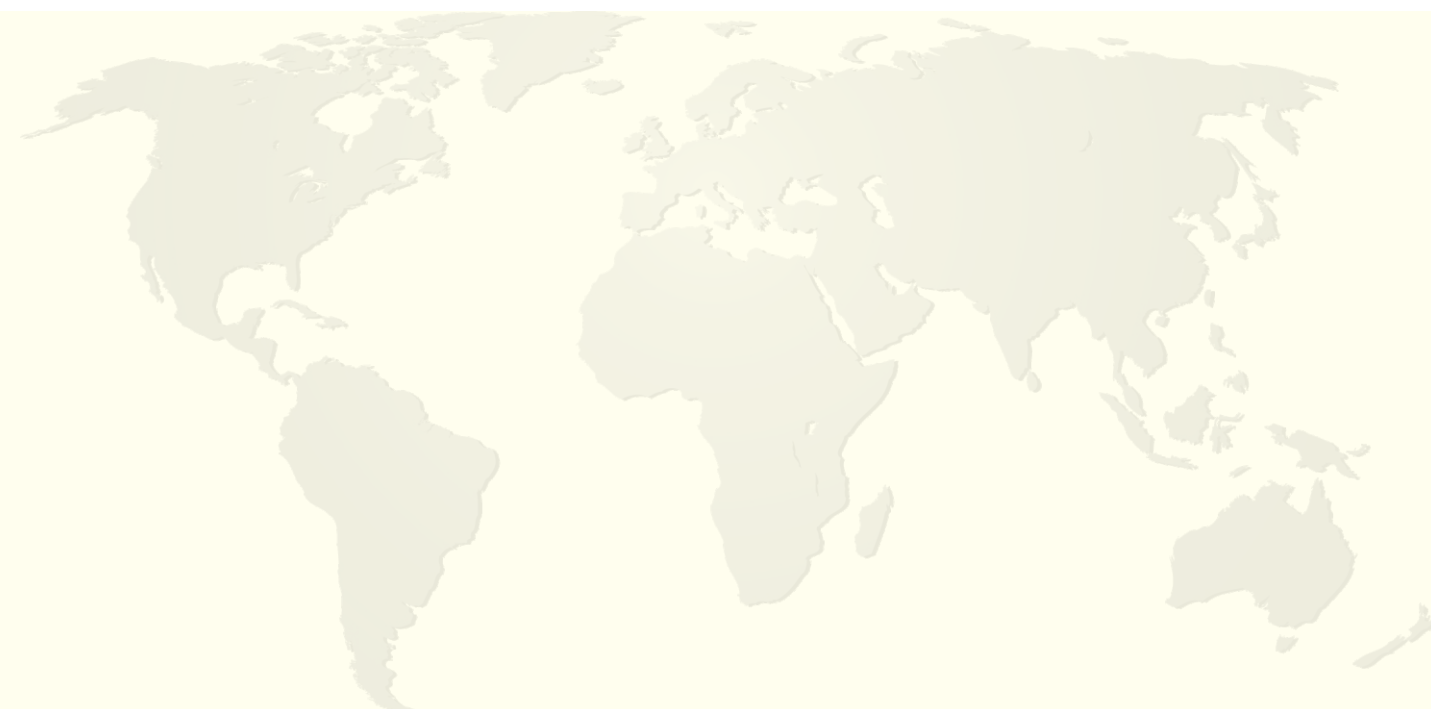




PULIM Sealing Materials 普力高性能密封材料

POLYURETHANES/ PLMPUR series
聚氨酯/PLMPUR系列



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Sealing Materials

密封材料

In sealing technology, mainly two groups of macromolecular (polymer) substances are used: elastomers and thermoplastics. Macromolecular substances are organic compounds, its molecules consist of several thousands, often even millions of atoms, known as macro, giant, string or chain molecules. They can be created either by modification of highly molecular natural materials (e.g. natural rubber) or by depositing low-molecular elements (so called monomers) through various chemical reactions (synthetic materials, plastics).

在密封领域，主要使用两组大分子（聚合物）材料：弹性体和热塑性塑料。大分子物质是一种有机化合物，其分子由数千个，甚至数百万个原子组成，称为大分子、巨分子、弦分子或链分子。它们可以通过改性高分子天然材料（如天然橡胶）或通过各种化学反应（合成材料、塑料）沉积低分子元素（所谓单体）来产生。

Elastomers

弹性材料

Elastomers are materials that can be highly expanded by exerting relatively little power. Because of their structure, elastomers have a high retractibility, which means the compression set is very limited. There are two main groups of elastomers; rubber materials and thermoplastic elastomers. The rubber materials are polymers, which are formed by chemically cross-linked macromolecules with various vulcanization additives. Due to their chemical bonds they do not melt but rather begin to decompose at high temperatures. The cross-links also results in that the rubber materials don't dissolve or, depending on the medium, swell or shrink.

弹性材料是一种可以通过施加相对较小的力而高度膨胀的材料。由于其结构，弹性体具有较高的伸缩性，这意味着压缩永久变形非常有限。有两大类弹性体：橡胶材料和热塑性弹性体。橡胶材料是聚合物，由化学交联大分子和各种硫化添加剂组成。由于它们的化学键，它们不会熔化，而是在高温下开始分解。交联还导致橡胶材料不溶解，或根据介质的不同而膨胀或收缩。



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Polyurethanes

聚氨酯

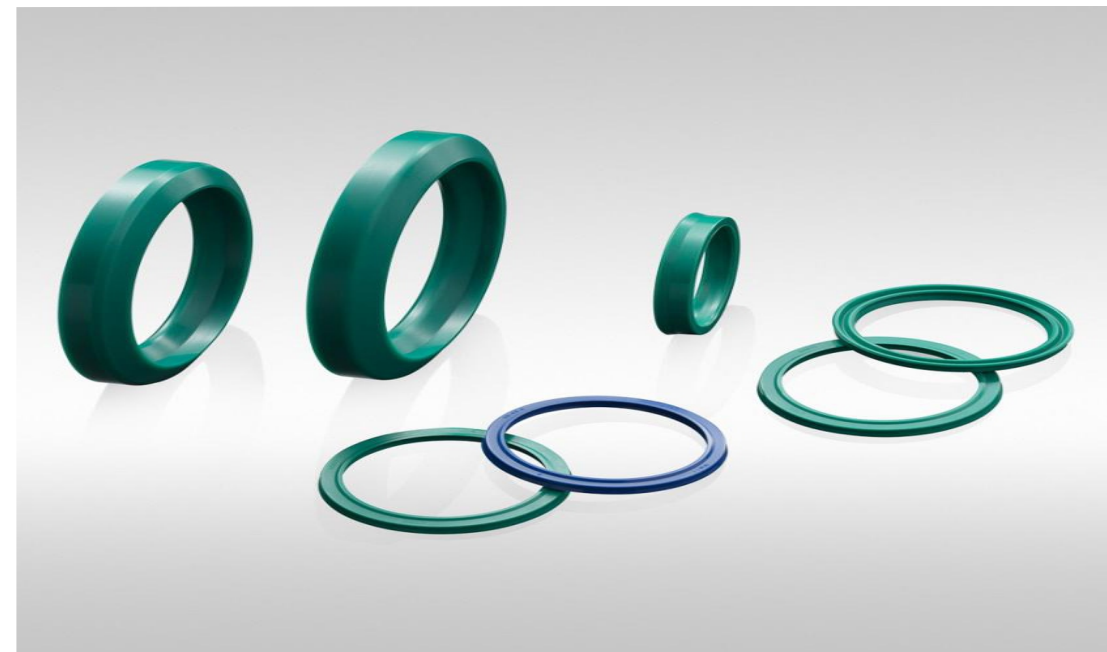
Polyurethanes play an important role in today's sealing technology. They have gained an important market share in the global seal market and are mainly used as piston and rod seals (U-cups), wipers and primary sealing element in composite seals.

聚氨酯在当今的密封技术中扮演着重要的角色。它们在全球密封市场上占有重要的市场份额，主要用作活塞和活塞杆密封（Y形圈）、防尘圈和组合密封的主密封元件。

PULIM Sealing Technology is able to offer our customers a wide range of polyurethane compounds. Our manufacturing technology guarantees the development of excellent physical properties during polymerization, which results in outstanding material quality.

普利密封技术能够为我们的客户提供广泛的聚氨酯化合物。我们的制造技术保证在聚合过程中开发出优异的物理性能，从而获得优异的材料质量。

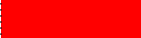
PLMPUR (TPU) | PLMPUR-H (TPU) | PLMPUR-SL (TPU) | PLMPUR-LT (TPU) |
PLMPUR-X (TPU) | PLMPUR-XH (TPU) | PLMPUR-XSL (TPU) | PLMPUR-G (CPU)



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Materials overview

材料概述

Elastomers, polyurethanes 弹性材料，聚氨酯	Material colour 材料颜色	Shore A/D hardness 材料硬度 邵氏A/D	Operating temperature, °C 使用温度	
			min.	max.
PLMPUR (TPU)		95/48	-30	110
PLMPUR-H (TPU)		95/48	-20	115
PLMPUR-SL (TPU)		95/48	-20	115
PLMPUR-LT (TPU)		95/48	-50	110
PLMPUR-X (TPU)		97/57	-30	110
PLMPUR-XH (TPU)		97/59	-20	115
PLMPUR-XSL (TPU)		97/57	-20	115
PLMPUR-G (CPU)		95/48	-30	110



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 **PLMPUR (TPU) green 绿**

PLMPUR is a thermoplastic polyurethane elastomer, with an excellent abrasion resistance, low compression set, outstanding tensile properties and tear strength. PLMPUR is mostly used for U-cup seals, lip seals, wipers and chevron packings, but it may also be used for dampers and other machined parts. It has a very good resistance against hydraulic fluids based on mineral oils, however in applications with water-based fluids (e.g. HFA, HFB) and native liquids (vegetable oils) a temperature of 60°C should not be exceeded.

PLMPUR is produced by injection moulding and shows a very good machinability.

PLMPUR 是一种热塑性聚氨酯弹性材料，具有优异的耐磨性、低压缩永久变形、优异的拉伸性能和撕裂强度。PLMPUR 主要用于 U 形密封件、唇形密封件、防尘圈和 V 形密封件，但也可用于减振器和其他机加工零件。它对基于矿物油的液压油具有很好的抵抗力，但是在水基液体（例如 HFA、HFB）和天然液体（植物油）的应用中，温度不应超过 60°C。

PLMPUR 是通过注射成型生产的，具有很好的可加工性。



 **PLMPUR-H (TPU) red 红**

PLMPUR-H is a hydrolysis-resistant thermoplastic polyurethane elastomer. It combines the engineering properties of PLMPUR (outstanding physical properties) with a high chemical resistance against a broad range of fluids. It is resistant against hydrolysis (degradation in water) which is otherwise rare when it comes to polyurethane's. E.g. it is stable in water up to +90 °C and has an outstanding stability in mineral oil as well. Because of its resistance to hydrolysis PLMPUR-H can be used for water hydraulic and for applications in mining, tunnelling and manufacturing of presses. PLMPUR-H is particularly recommended for the use in pure and seawater, for HFA and HFB fluids and biologically degradable hydraulic fluids (vegetable oils and synthetic esters) and food articles. PLMPUR-H is in conformance with various food regulations and can be used for many food-, beverage- and healthcare applications.

PLMPUR-H is produced by injection moulding and shows also a very good machinability

PLMPUR-H 是一种耐水解的热塑性聚氨酯弹性材料。它结合了 PLMPUR 的工程特性（卓越的物理特性）和对各种流体的高耐化学性。它能抵抗水解（在水中降解），这在聚氨酯中是罕见的。例如，它在高达 +90° C 的水中稳定，在矿物油中也具有出色的稳定性。由于其抗水解性，PLMPUR-H 可用于水液压以及采矿、隧道掘进和压力机制造中的应用。PLMPUR-H 特别推荐用于纯净水和海水、HFA 和 HFB 流体以及生物降解液压流体（植物油和合成酯）和食品。PLMPUR-H 符合各种食品法规，可用于许多食品、饮料和医疗保健应用。

PLMPUR-H 是通过注射成型生产的，并且显示出非常好的可加工性

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 **PLMPUR-SL (TPU) grey 灰**

PLMPUR-SL (TPU) has been optimised in regard of the tribological characteristics (friction and wear), achieved by an addition of a synergetic combination of solid lubricants. Compared to PLMPUR-H, PLMPUR-SL has superior sliding properties. This special material is therefore best suited for most severe applications in the water hydraulics as well as in the non-lubricated pneumatics.

PLMPUR-SL (TPU) 在摩擦学特性（摩擦和磨损）方面进行了优化，通过添加固体润滑剂的协同组合实现。与 PLMPUR-H 相比，PLMPUR-SL 具有优越的滑动性能。因此，这种特殊材料最适合于水液压以及非润滑气动系统中最恶劣的应用。



 **PLMPUR-LT (TPU) blue 蓝色**

PLMPUR-LT is a thermoplastic polyurethane elastomer, that has been developed for low temperature applications. The physical and chemical properties of PLMPUR-LT are similar to those of PLMPUR, but the minimum service temperature is extended to -50°C . For that reason PLMPUR-LT should be used under severe climatic conditions and for applications in freezing plants.

PLMPUR-LT 是一种热塑性聚氨酯弹性材料，专为低温应用而开发。PLMPUR-LT 的物理和化学性质与 PLMPUR 相似，但最低使用温度延长至 -50°C 。因此，PLMPUR-LT 应在恶劣气候条件下使用，并应用于冷冻厂。

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 **PLMPUR-X (TPU) dark green 深绿**

PLMPUR-X is a thermoplastic polyurethane elastomere and has a significantly higher hardness compared to the standard PLMPUR grade. The composition of the material provides outstanding friction and wear properties as well as high pressure resistance. Therefore the material is well suited for the use as a composite seal, for wipers working in heavy-duty applications as well as for engineered plastic parts that need high elasticity and superior resilience behaviour. Due to the exceptional extrusion resistance seals made of this material are working at higher pressure levels and larger clearances than those made of standard polyurethanes and PTFE compounds.

PLMPUR-X 是一种热塑性聚氨酯弹性材料，与标准 PLMPUR 等级相比具有更高的硬度。该材料的组成提供了优异的摩擦磨损性能以及耐高压性。因此，该材料非常适合用作组合密封件，用于重型应用中的防尘圈，以及需要高弹性和优异回弹性能的工程塑料零件。由于该材料具有优异的抗挤压性能，因此与标准聚氨酯和 PTFE 化合物制成的密封相比，该材料制成的密封件在更高的压力水平和更大的间隙下工作。



 **PLMPUR-XH (TPU) dark red 深红**

Compared to the standard grade PLMPUR-H, PLMPUR-XH has a significantly higher hardness. The composition of the material based on special raw material provides outstanding friction and wear characteristics as well as pressure resistance.

与标准级 PLMPUR-H 相比，PLMPUR-XH 具有显著更高的硬度。基于特殊原材料的材料成分提供了卓越的摩擦和磨损特性以及耐压性。

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 PLMPUR-XSL (TPU) dark grey 深灰



Compared to the PLMPUR-SL standard material, PLMPUR-XSL has a higher hardness and therefore further improved sliding properties. PLMPUR-XSL has a better extrusion resistance than the standard material and therefore sealing elements of this material can be used at higher pressures.

与 PLMPUR-SL 标准材料相比，PLMPUR-XSL 具有更高的硬度，因此进一步改善了滑动性能。PLMPUR-XSL 具有比标准材料更好的抗挤压性，因此这种材料的密封元件可以在更高的压力下使用。

 PLMPUR-G (CPU) red 红色

PLMPUR-G is a cast hydrolysis-resistant polyurethane elastomer with similar properties to PLMPUR-H especially regarding its chemical stability. Therefore PLMPUR-G can be used in the same hydraulic fluids as PLMPUR-H.

PLMPUR-G 是一种浇铸型的抗水解聚氨酯弹性体，具有与 PLMPUR-H 相似的性能，尤其是其化学稳定性。因此，PLMPUR-G 可用于与 PLMPUR-H 相同的液压油中。



PLM Polyurethanes Material Datasheet 普力高性能聚氨酯物性表					
Physical properties 物性	Test Method 测试方法	Unit 单位	PLMPUR (TPU)	PLMPUR-H (TPU)	PLMPUR-G (CPU)
Hardness at 20°: 硬度	DIN 53505	Shore A	95 +/-2	95 +/-2	95 +/-2
Hardness at 20°: 硬度	DIN 53505	Shore D	48 +/-3	48 +/-3	47 +/-3
Density: 密度	EN ISO1183	g/cm3	1.2	1.2	1.19
100% Modulus: 模数	DIN 53504	N/mm2	≥12	≥13	≥11
Tensile strength: 抗拉强度	DIN 53504/53455	N/mm2	≥50	≥50	≥45
Elongation at break: 断裂伸长	DIN 53504/53455	%	≥450	≥330	≥330
Tear strength: 撕裂强度	ISO 34-1	K N/m	≥100	≥100	≥80
Abrasion: 磨损	DIN ISO 4649	mm3	18	17	25
Compression set 压缩变形: 24 h 70 °C 20% deflection	ISO 815	%	≤27	≤27	≤30
Compression set 压缩变形: 24 h 70 °C 20% deflection	ISO 815	%	≤33	≤33	≤35
Min. service temperature: 最低使用温度		°C	-30	-20	-30
Max. service temperature: 最高使用温度		°C	110	115	110
* 24 h 70 °C 20% deflection/** 24 h 100 °C 20% deflection/					

PLM Polyurethanes Material Datasheet 普力高性能聚氨酯物性表

Physical properties 物性	Test Method 测试方法	Unit 单位	PLMPUR-LT (TPU)	PLMPUR-SL (TPU)	PLMPUR-X (TPU)
Hardness at 20°: 硬度	DIN 53505	Shore A	95 +/-2	95 +/-2	97 +/-2
Hardness at 20°: 硬度	DIN 53505	Shore D	48 +/-3	48 +/-3	57 +/-3
Density: 密度	EN ISO1183	g/cm3	1.17	1.23	1.21
100% Modulus: 模数	DIN 53504	N/mm2	≥12	≥17	≥18
Tensile strength: 抗拉强度	DIN 53504/53455	N/mm2	≥50	≥45	≥45
Elongation at break: 断裂伸长	DIN 53504/53455	%	≥450	≥400	≥400
Tear strength: 撕裂强度	ISO 34-1	K N/m	≥80	≥120	≥110
Abrasion: 磨损	DIN ISO 4649	mm3	20	21	18
Compression set 压缩变形: 24 h 70 °C 20% deflection	ISO 815	%	≤27	≤27	≤30
Compression set 压缩变形: 24 h 70 °C 20% deflection	ISO 815	%	≤33	≤33	≤35
Min. service temperature: 最低使用温度		°C	-50	-20	-30
Max. service temperature: 最高使用温度		°C	110	115	110
* 24 h 70 °C 20% deflection/** 24 h 100 °C 20% deflection/					

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PLM Polyurethanes Material Datasheet 普力高性能聚氨酯物性表

Physical properties 物性	Test Method 测试方法	Unit 单位	PLMPUR-XH (TPU)	PLMPUR-XSL (TPU)
Hardness at 20°: 硬度	DIN 53505	Shore A	97 +/-2	97 +/-2
Hardness at 20°: 硬度	DIN 53505	Shore D	59 +/-3	57 +/-3
Density: 密度	EN ISO1183	g/cm3	1.22	1.23
100% Modulus: 模数	DIN 53504	N/mm2	≥22	≥22
Tensile strength: 抗拉强度	DIN 53504/53455	N/mm2	≥50	≥43
Elongation at break: 断裂伸长	DIN 53504/53455	%	≥350	≥350
Tear strength: 撕裂强度	ISO 34-1	K N/m	≥140	≥130
Abrasion: 磨损	DIN ISO 4649	mm3	20	29
Compression set 压缩变形: 24 h 70 °C 20% deflection	ISO 815	%	≤30	≤33
Compression set 压缩变形: 24 h 70 °C 20% deflection	ISO 815	%	≤35	≤37
Min. service temperature: 最低使用温度		°C	-20	-20
Max. service temperature: 最高使用温度		°C	115	115
* 24 h 70 °C 20% deflection/** 24 h 100 °C 20% deflection/				

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PULIM Polyurethanes Size List

普力聚氨酯半成品材料规格表

ID	OD	H	ID	OD	H	ID	OD	H	ID	OD	H
0	25	155	30	55	155	51	94	155	82	114	155
0	33	155	30	62	155	54	87	155	82	118	155
0	46	155	30	65	155	56	75	155	82	126	155
0	55	155	30	76	155	56	79	155	86	107	155
0	65	155	37	55	155	56	82	155	86	114	155
13	33	155	37	59	155	56	85	155	86	118	155
13	42	155	37	62	155	56	87	155	86	122	155
13	46	155	37	65	155	56	94	155	86	133	155
15	55	155	37	68	155	56	103	155	90	118	155
22	42	155	37	70	155	59	85	155	94	114	155
22	46	155	37	72	155	59	94	155	94	124	155
22	49	155	37	75	155	63	82	155	94	133	155
22	55	155	37	80	155	63	96	155	96	118	155
22	62	155	39	75	155	64	84	155	96	134	155
22	65	155	40	62	155	64	104	155	105	126	155
25	42	155	40	68	155	64	107	155	105	134	155
25	46	155	40	70	155	66	87	155	105	146	155
25	49	155	40	85	155	67	84	155	105	164	155
25	55	155	44	65	155	67	94	155	106	142	155
25	59	155	44	70	155	67	104	155	114	134	155

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ID	OD	H	ID	OD	H	ID	OD	H	ID	OD	H
25	65	155	44	75	155	67	107	155	114	142	155
25	70	155	44	79	155	74	94	155	114	146	155
25	75	155	44	84	155	74	103	155	114	150	155
27	46	155	47	65	155	74	118	155	114	154	155
27	49	155	47	70	155	74	134	155	116	164	155
27	52	155	47	72	155	75	107	155	122	142	155
27	55	155	47	75	155	75	114	155	122	150	155
27	59	155	47	79	155	75	122	155	128	155	155
27	62	155	47	84	155	79	112	155	128	165	155
27	65	155	48	68	155	82	103	155	128	175	155
27	70	155	51	84	155	82	110	155	138	165	155
138	175	155	270	320	155	350	430	155	380	468	155
138	185	155	273	324	155	355	390	155	385	420	155
148	175	155	276	319	155	355	400	155	385	430	155
148	185	155	282	320	155	355	410	155	385	440	155
148	195	155	282	330	155	355	420	155	385	450	155
158	185	155	285	324	155	355	430	155	385	458	155
158	195	155	290	330	155	360	400	155	390	430	155
158	206	155	290	340	140	360	410	155	390	440	155
168	206	155	302	340	155	360	420	155	390	450	155
168	216	155	302	350	135	360	430	155	390	458	155
178	216	155	312	350	155	360	440	155	390	468	155
178	226	155	312	360	125	365	400	155	395	430	155
187	225	155	322	360	155	365	410	155	395	440	155
187	235	155	322	370	120	365	420	155	395	450	155
195	235	155	332	370	145	365	430	155	395	458	155
195	245	155	332	380	115	365	440	155	395	468	155
207	245	155	342	380	140	370	410	155	400	440	155
207	255	155	342	390	110	370	420	155	400	450	155
213	256	155	350	390	130	370	430	155	400	468	155
213	266	155	350	400	105	370	440	155	400	478	155

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ID	OD	H	ID	OD	H	ID	OD	H	ID	OD	H
225	275	155	362	400	125	370	450	155	405	440	155
225	285	155	305	371	155	375	410	155	405	450	155
228	267	155	315	380	155	375	420	155	405	458	155
235	285	155	340	400	155	375	430	155	405	468	155
235	292	155	340	410	155	375	440	155	405	478	155
238	277	155	340	420	155	375	450	155	410	450	155
246	292	155	345	400	155	380	420	155	410	458	155
256	307	155	345	410	155	380	430	155	410	468	155
258	295	155	345	420	155	380	440	155	410	478	155
265	308	155	350	410	155	380	450	155	410	488	155
265	317	155	350	420	155	380	458	155	415	450	155
415	458	155	440	517	155	470	527	155	505	563	155
415	468	155	445	478	155	470	536	155	505	580	155
415	478	155	445	488	155	470	545	155	510	545	155
415	488	155	445	497	155	475	507	155	510	563	155
415	497	155	445	507	155	475	517	155	510	580	155
420	458	155	445	517	155	475	527	155	515	563	155
420	468	155	445	527	155	475	536	155	515	580	155
420	478	155	450	488	155	475	545	155	515	593	155
420	488	155	450	497	155	480	517	155	520	563	155
420	497	155	450	507	155	480	527	155	520	580	155
425	458	155	450	517	155	480	536	155	520	593	155
425	468	155	450	527	155	480	545	155	525	563	155
425	478	155	455	488	155	485	517	155	525	580	155
425	488	155	455	497	155	485	527	155	525	593	155
425	497	155	455	507	155	485	536	155	525	603	155
425	507	155	455	517	155	485	545	155			
430	468	155	455	527	155	485	563	155			
430	478	155	455	536	155	490	527	155			
430	488	155	460	497	155	490	536	155			
430	497	155	460	507	155	490	545	155			

ID	OD	H	ID	OD	H	ID	OD	H	ID	OD	H
430	507	155	460	517	155	490	563	155			
435	468	155	460	527	155	495	527	155			
435	478	155	460	536	155	495	536	155			
435	488	155	465	497	155	495	545	155			
435	497	155	465	507	155	495	563	155			
435	507	155	465	517	155	500	536	155			
435	517	155	465	527	155	500	545	155			
440	478	155	465	536	155	500	563	155			
440	488	155	465	545	155	500	580	155			
440	497	155	470	507	155	505	536	155			
440	507	155	470	517	155	505	545	155			

