

Herbie Clip Fact Sheets



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Fact Sheet 001 - Electrical and Mechanical Properties

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Herbie Clips are made out of Heat and UV Stabilised Nylon 6.6. An engineering polymer that gives the Herbie Clip the properties it needs.

Nylon resins are widely used in electromechanical parts because of their excellent mechanical properties, chemical resistance, heat resistance and self - extinguishing characteristics. This combination of properties permits nylon to be used in coil forms, connectors, strain relief grommets, terminal blocks and tough over-coatings on wire insulation, but is also ideal for the Herbie Clip. Parts made of nylon are generally used in electrical applications requiring up to 600 volts and of 400 Hz. Power losses increase with increasing temperature, frequency and moisture. Some electronic applications, such as large microwave transmitters, experience high electrical losses because of the high frequencies and high temperatures sometimes encountered.

Moisture and temperature affect the volume resistivity, dielectric strength and dissipation factor of nylon.

The short - time dielectric strength, as measured by ASTM D. 149, changes with thickness, moisture content and temperature. As the thickness and moisture content increases, the dielectric strength decreases. As the temperature increases, the dielectric strength decreases.

Volume resistivity is affected by both temperature and moisture content. When temperature increases, volume resistivity decreases. Increasing moisture content causes decreased volume resistivity. Volume resistivity measurements were made according to ASTM D-257. The dielectric constant increases rapidly with increasing temperature or moisture content. The dissipation factor increases with increasing temperature and moisture. Measurements of change were made using ASTM D. 150. Many compositions of nylon have been rated by Underwriters Laboratories (UL) in its Component Recognition Program for Polymeric materials.

Properties of Nylon 6.6.

Property	Test Conditions	ISO Specification	Units	Nylon	
				Dry as Moulded	50% RH
General					
Density			g/ml	1.14	1.14
Flammability	1.6 mm	UL 94		V-2	V-2
Water Absorption	23°C, Equilibrium 23°C, Saturation	62	%	2.9 8.5	
Rockwell Hardness	Scale M Scale R	2039/2		79 121	59 108
Ball Indentation Hardness		2039	MPa	160 H 961/30	85 H 358/30
Mechanical					
Tensile Strength at Yield	50 mm/min	527	MPa	87	59
Elongation at Yield	50 mm/min	527	%	4.4	26
Flexural Strength		178	MPa	120	55
Flexural Modulus		178	GPa	2.8	1.2
Youngs Modulus	1 mm/min		MPa	2800	1400
Izod Impact Strength (Notched)	23°C -30°C	180	KJ/m ²	5.5 2.8	10.6 3.1
Thermal					
Melting Point		1218	°C	255	255
Heat Deflection Temperature	Method A; 1.8 MPa Method B; 0.45 MPa	75	°C	80 235	
Vicat B50 Softening Point	50 N		°C	238	
Coefficient of Linear Thermal Expansion	Flow Transverse		mm/mm 10 ⁻⁴ / K	1.17 1.14	1.17 1.14
Electrical					
Comparative Tracking Index		IEC 112	V	525	
Dielectric Strength		IEC 243	KV/mm	31	28
Surface Resistivity		IEC 93	ohm	4E14	1E13
Volume Resistivity		IEC 93	ohm cm	1E15	2E11
Dielectric Constant	10 ² 10 ³ 10 ⁶	IEC 250		4.0 3.9 3.6	8.0 7.0 4.6
Dissipation Factor	50 Hz 1 MHz	IEC 250	10 ⁻⁴	75 240	5800 700

Fact Sheet 001a - Explanation of Definitions

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Mechanical Properties

Density	Units g/ml = g/cm ³
Flammability	= V-2 rating permits flaming particles on ignition and has a longer flame extinguishing time than the V-1 rating.
Water Absorption	23°C Equilibrium 2.9% Equilibrium equals the amount of moisture uptake in air. 23°C Saturation 8.5% Maximum amount of moisture uptake possible.
Rockwell Hardness	This is the measure of surface penetration with a 12.5 mm (½ in.) diameter ball under a specified load.
Ball Indentation Hardness	This is similar to Rockwell Hardness and is the indentation with a hardened steel indenter. MPa is the pressure required to give a specific indentation.
Tensile Strength at Yield	MPa = Mega Pascal's = Nm ² = the stress/force per area required to yield the nylon, i.e. a measure of strength.
Elongation at yield	This is the % increase in length of a specific length of nylon at the yield point when the material is being stretched at a rate of 50 mm per minute
Flexural Strength	Or bending strength is the stress (Mpa) required to break the material under bending.
Flexural Modulus	This is that value calculated from a measurement of beam stiffness in three point flexure. Where E = Flexural Modulus $E = \frac{(F/d)}{l^3} \cdot (I/l)$ (F/d) = Stiffness l = Span (I/l) = 2nd moment of area (i.e. dimensions of beam section) Flexural modulus is obtained for a specific test speed (or time under load).
Young's Modulus	Measured in Mega Pascal's = the value of stress over strain when the nylon is being stretched at 1 mm per minute.
Izod Impact Strength	Equals the energy to break a specimen in which a notch with a 0.25 mm radius has been machined.

Thermal Properties

Melting Point	Melting point of Nylon 6.6.
Heat Deflection Temp	This is the temperature at which a standard test bar deflects 0.25 mm under a stated stress level of either 0.45 or 1.82 N/mm ² (66 or 264 psi).
Vicat B50 Softening Point	This is a measure of deflection of a test bar under heat and load. The test bar has a known force applied to the end of it in a cantilever position. The bar is then heated up until a certain deflection is reached.
Coefficient of Linear Thermal Expansion	Coefficient to determine the amount the material is going to expand when the temperature is raised.

Electrical Properties

General	Parts made of Nylon 6.6. are generally used in electrical applications requiring 600 volts or less and frequencies of 400 cycles per second or lower.
Comparative Tracking Index	Also known as 'Tracking Resistance'. Tracking is the current flowing on the surface of an insulator between two electrodes caused either through pollution or degradation of the insulator. Therefore Tracking Resistance is the ability of an insulator to prevent such currents.
Dielectric Strength	Defined as the Potential Difference between the opposite sides of a sheet of solid insulating material necessary to break the material down. The potential gradient necessary to cause breakdown of an insulating medium is termed its 'dielectric strength'. Units are Kilo Volts per mm. Dielectric strength decreases (volts per mm.) with increasing thickness and moisture content.
Surface Resistivity	This is the resistance to leakage of a charge across a square area of surface. The size of the square is immaterial.
Volume Resistivity	Is the internal resistance of an insulating material to current flow.
Dielectric constant	This is the ratio of the permittivity of an insulator to the permittivity of vacuum. High values of this indicate that the material is particularly good for use in a capacitor
Dissipation Factor	This is the tangent of the loss angle of an insulator, where the loss angle for an insulator is the angular change in the current (I), voltage (V) relation induced by the insulator in a capacitor versus an ideal capacitor. It is used to calculate power losses in an insulator.

Fact Sheet 002 - Chemical Resistance Data A-F

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The information below is a guide to the resistance of the Nylon 6.6. to the specific reagents shown.

Ratings of Excellent, Satisfactory or Unsatisfactory are based upon property retention for test bars exposed to the specified concentrations of the chemicals for the indicated time periods and temperatures.

In the concentration (CONC) column, the word 'Conc' means the maximum concentration that is allowed to be sold. The word 'Satur' means the maximum saturation that is obtainable at this time.

It should be noted that the table below can only be used as a guide, and the only decisive test is to evaluate a clip 'in situ' if it is thought that the operating environment will be detrimental to the clip material

In general nylon 6.6. is very resistant to most alkalis and neutral chemicals but not very resistant to strong acids. It should also be noted that nylon 6.6. is very resistant to fuels such as petrol and also food products including fruit juices. Indeed the Herbie clip is used widely in these environments.

Chemical Resistance

CHEMICAL	CONC	EXPOSURE TEMP. °C	TIME DAYS	CHEMICAL RESISTANCE	CHEMICAL	CONC %	EXPOSURE TEMP. °C	TIME DAYS	CHEMICAL RESISTANCE
ACETALDEHYDE	90%	52		SATISFACTORY	CALCIUM HYPOCHLORITE	SATUR	35	77	UNSATISFACTORY
ACETIC ACID	5%	23	30	SATISFACTORY	CALCIUM THIOCYANATE	50%			UNSATISFACTORY
ACETONE	100%	50	365	EXCELLENT	CARBON TETRACHLORIDE	100%	50	365	EXCELLENT
ALUM. AMMONIUM	10%	24		UNSATISFACTORY	CARBONIC ACID	10%	24		EXCELLENT
ALUM. SALTS OF MINERAL ACIDS	10%	23		SATISFACTORY	CETANE	100%	23	365	EXCELLENT
AMMONIA, LIQUID	100%	24	200	SATISFACTORY	CHOLRINE WATER	DILUTE	23		SATISFACTORY
AMMONIUM CARBONATE	10%	23		SATISFACTORY	CHLOROACETIC ACID	10%	24		UNSATISFACTORY
AMMONIUM CHLORIDE	10%	52		UNSATISFACTORY	CHLOROFORM	100%	23	56	EXCELLENT
AMMONIUM HYDROXIDE	10%	23	365	EXCELLENT	CHLOROSULFONIC ACID	10%	24		UNSATISFACTORY
N-AMYL ACETATE	100%	98	45	UNSATISFACTORY	CHLOROX	100%	23	10	EXCELLENT
ANTIMONY TRICHLORIDE	10%	24		UNSATISFACTORY	CHROMIC ACID	10%	24		UNSATISFACTORY
AROCLOR 1242	100%	23	30	EXCELLENT	CITRIC ACID	10%	35	77	SATISFACTORY
BARIUM CHLORIDE	10%	24		UNSATISFACTORY	COPPER CHLORIDE	10%	24		UNSATISFACTORY
BARIUM SULFATE	10%	24		EXCELLENT	COPPER SULPHIDE	10%	24		UNSATISFACTORY
BARIUM SULFIDE	10%	24		SATISFACTORY	M-CRESOL	100%	24		UNSATISFACTORY
BENZENE	100%	23		EXCELLENT	DIETHYLENE GLYCOL	90%	24		EXCELLENT
BENZOIC ACID	10%	24		UNSATISFACTORY	ETHANOL	95%	50	365	EXCELLENT
BORIC ACID	7%	35	316	UNSATISFACTORY	ETHYLACETATE	95%	50	365	EXCELLENT
BROMINE	100%	24		UNSATISFACTORY	ETHYLENE DIBROMIDE	100%	50	45	SATISFACTORY
BROMINE WATER	25%	23	30	EXCELLENT	ETHYLENE DICHLORIDE	100%	66	7	EXCELLENT
BUFFER SOLUTION PH7	100%	70	365	EXCELLENT	ETHYLENE GLYCOL	100%	23	56	EXCELLENT
BUFFER SOLUTION PH10	100%	70	365	UNSATISFACTORY	FORMALIN	38%	23	14	EXCELLENT
BUTYRIC ACID	10%	24		UNSATISFACTORY	FORMIC ACID	90%	23		UNSATISFACTORY
CALCIUM CHLORIDE	5%	60		UNSATISFACTORY	FREON 11	100%	23	365	EXCELLENT

Fact Sheet 002a - Chemical Resistance Data F-Z

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The information below is a guide to the resistance of the Nylon 6.6. to the specific reagents shown.

Ratings of Excellent, Satisfactory or Unsatisfactory are based upon property retention for test bars exposed to the specified concentrations of the chemicals for the indicated time periods and temperatures.

In the concentration (CONC) column, the word 'Conc' means the maximum concentration that is allowed to be sold. The word 'Satur' means the maximum saturation that is obtainable at this time.

It should be noted that the table below can only be used as a guide, and the only decisive test is to evaluate a clip 'in situ' if it is thought that the operating environment will be detrimental to the clip material

In general nylon 6.6. is very resistant to most alkalis and neutral chemicals but not very resistant to strong acids. It should also be noted that nylon 6.6. is very resistant to fuels such as petrol and also food products including fruit juices. Indeed the Herbie clip is used widely in these environments.

Chemical Resistance

CHEMICAL	CONC	EXPOSURE TEMP. °C	TIME DAYS	CHEMICAL RESISTANCE	CHEMICAL	CONC %	EXPOSURE TEMP. °C	TIME DAYS	CHEMICAL RESISTANCE
FREON 12	100%	23	365	EXCELLENT	POTASSIUM BICARBONATE	60%	23		EXCELLENT
FREON 21	100%	23	365	EXCELLENT	POTASSIUM CARBONATE	20%	98	45	EXCELLENT
FREON 22	100%	23	365	EXCELLENT	POTASSIUM CHLORIDE	90%	23		EXCELLENT
FREON TE	100%	23	8	EXCELLENT	POTASSIUM HYDROXIDE	30%	98	8	SATISFACTORY
GLYCOLIC ACID	70%		200	UNSATISFACTORY	POTASSIUM PERMANGANATE	5%	23	10	UNSATISFACTORY
HEXAFLUROISOPROPANOL	100%	23		UNSATISFACTORY	POTASSIUM THIOCYANATE	CONC			UNSATISFACTORY
HYDROCHLORIC ACID	10%	25	60	UNSATISFACTORY	SODIUM ACETATE	60%	38		EXCELLENT
HYDROGEN PEROXIDE	5%	43	30	UNSATISFACTORY	SODIUM BICARBONATE	50%	24		EXCELLENT
HYDROGEN SULPHIDE	CONC	23		UNSATISFACTORY	SODIUM CARBONATE	25%	35	77	EXCELLENT
HYLENET	100%	23	10	EXCELLENT	SODIUM CHLORIDE	10%	23	365	EXCELLENT
LACTIC ACID	10%	35	316	EXCELLENT	SODIUM HYDROXIDE	10%	70	30	EXCELLENT
LANOLIN SUSPENSION	10%	35	77	EXCELLENT	SODIUM HYPOCHLORITE	5%	23	10	SATISFACTORY
LINSEED OIL (RAW)	100%	82	30	EXCELLENT	SODIUM NITRATE	5%	24	10	EXCELLENT
METHANOL	100%	23	56	EXCELLENT	SODIUM SULPHATE	90%	24		EXCELLENT
METHYL CHLOROFORM	100%	72	4	EXCELLENT	SODIUM SULPHIDE	90%	24		EXCELLENT
METHYL ISOBUTYL ETONE	100%	23	14	EXCELLENT	STANNIC CHLORIDE	10%	24		UNSATISFACTORY
METHYLENE CHLORIDE	100%	23	28	SATISFACTORY	STANNIC SULFATE	10%	24		UNSATISFACTORY
NAPHTHA (VMP)	100%	98	45	EXCELLENT	SULPHUR DIOXIDE		38	100	UNSATISFACTORY
NITRIC ACID	10%	23	60	UNSATISFACTORY	SULPHURIC ACID	30%	23	30	UNSATISFACTORY
NITROMETHANE	100%	23	30	EXCELLENT	SULPHUROUS ACID	10%	23		UNSATISFACTORY
2-NITROPROPANE	100%	72	30	EXCELLENT	2,2,3,3 TETRAFLUOROPROPANE	100%			UNSATISFACTORY
NUJOL	100%	70	365	EXCELLENT	TOLUENE	100%	50	365	EXCELLENT
PERCHLORIC ACID	10%	24		UNSATISFACTORY	TRICRESYL PHOSPHATE	100%	66	7	EXCELLENT
PHENOL	90%	23		UNSATISFACTORY	XYLENE	100%			EXCELLENT
PHOSPHORIC ACID	5%	98		UNSATISFACTORY	ZEREX ANTIFREEZE	40%	104	92	SATISFACTORY

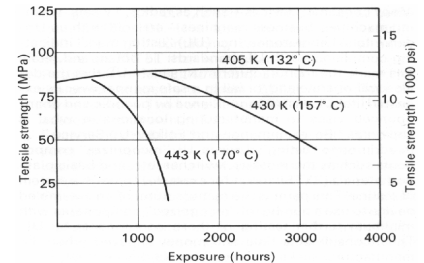
Fact Sheet 003 - Performance and Reliability

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Herbie Clips are made out of heat and UV stabilised Nylon 6.6 giving very good strength properties and high temperature characteristics.

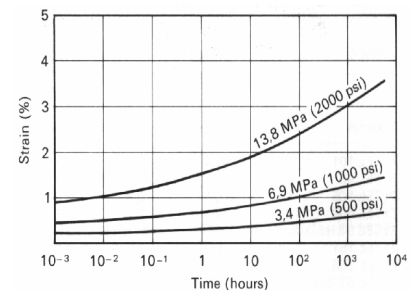
Strength at High Temperatures

The graph to the right shows how heat stabilised Nylon 6.6. performs in high temperature applications. This shows the effect of air oven ageing of Heat Stabilised Nylon 6.6 on tensile strength. Note that at 132° C there is no real degradation of tensile strength, even after 4000 hours at this high temperature. (approx. 170 days)



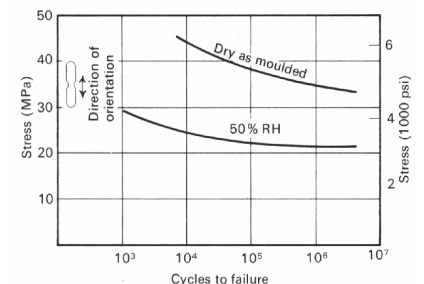
Creep and Relaxation

As with all plastics nylon is characterised by a long term behaviour known as creep. The Herbie Clip has been designed in such a way as to virtually eliminate creep or slackening of the clip. The creep flexure graph to the right gives the general creep characteristics of the nylon used in the Herbie Clip. This shows creep in flexure of Heat Stabilised Nylon 6.6, at 296° K (23° C), & 50% RH. As can be seen even with 1000 psi stress on the clip, the strain only gets to a maximum of 2% after about 10 years of service. The tensile strength of Nylon is approximately 12000 psi. Tightening the Herbie Clip at a slightly higher level at initial fitting can easily compensate for any subsequent creep.



Fatigue

When materials are stressed cyclically they may be affected by fatigue. In the case of the Herbie Clip this is not really an issue as the clip is not subjected to rapid stress cycling in application, and in any case nylon has very good resistance to fatigue. The graph to the right shows axial fatigue for Heat Stabilised Nylon 6.6. with alternate tension and compression, at 1,800 cycles per minute. This shows Sonntag axial failure with alternate tension and compression of 1,800 cycles per minute. Tests were at 296K (23° C) with longitudinal orientation of the test bars. Note that the fatigue stress is well below the graph lines. This means that fatigue should never be a problem with the Herbie Clip.

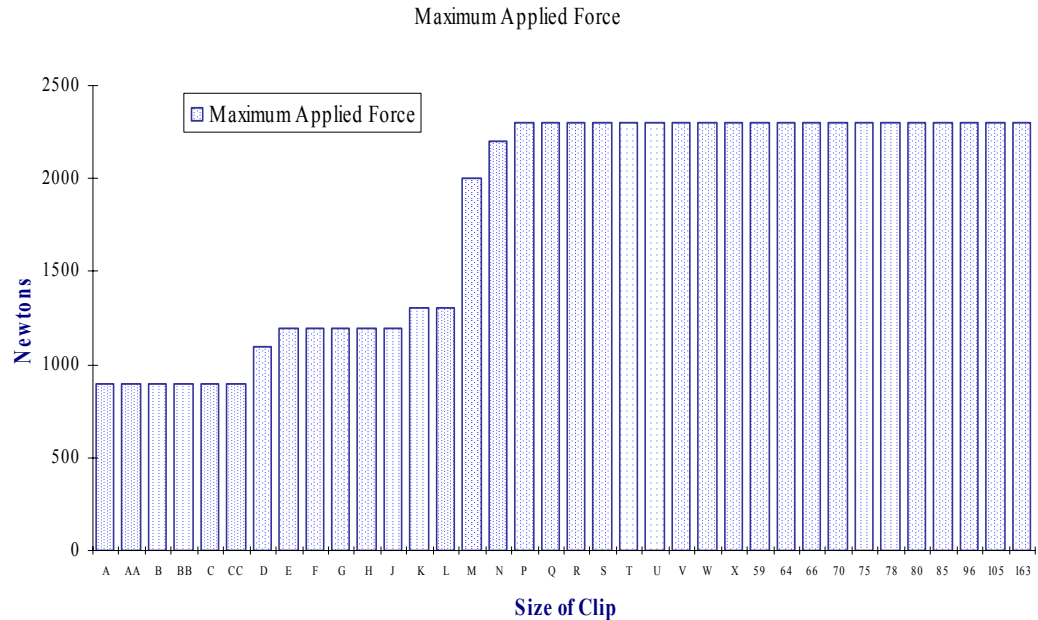


Weathering and Environment

- i) UV Stabilisation: - Herbie Clips are primarily made in black Heat Stabilised Nylon 6.6. The carbon black colouring acts as a very good UV stabiliser.
- ii) Corrosion: - This is never a problem; indeed any moisture present in the environment helps to condition the nylon and keep it supple.
- iii) Chemical resistance - Please refer to HCL Fact Sheet 002. If the Herbie Clip is to be used in a chemical environment then tests should be carried out. Note that strong acids will attack Nylon. In some cases different polymers can be used to improve chemical resistance.

Fact Sheet 004 - Tightening Forces

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Graph Explanation

The Herbie Clip applies a sealing force between the fitting and the hose. As with all types of clips the integrity of the joint will be affected by the compression of the hose and other factors e.g. the surface integrity of the fitting.

The graph above illustrates the maximum force that can be applied to each size of clip without deforming it. **If this force is exceeded deformation of the Herbie Clip will occur.**

Note that every situation is different. The force applied to each Herbie Clip should be determined by experimenting in each case. In most cases, less than half of the 'Maximum Applied Force' will be needed to tighten the Herbie Clip.

Fact Sheet 008 shows that The pneumatic tools apply a maximum force of around 1200 Newton's which should be more than enough for every situation. Smaller Herbie Clips will need less force to tighten than larger Herbie Clips. Therefore when determining the force needed to tighten, start off at a lower pressure and build up until you are satisfied that the Herbie Clip has been tightened enough.

The tighter the clip is applied, the greater the pressure resistance of the hose/clip assembly.

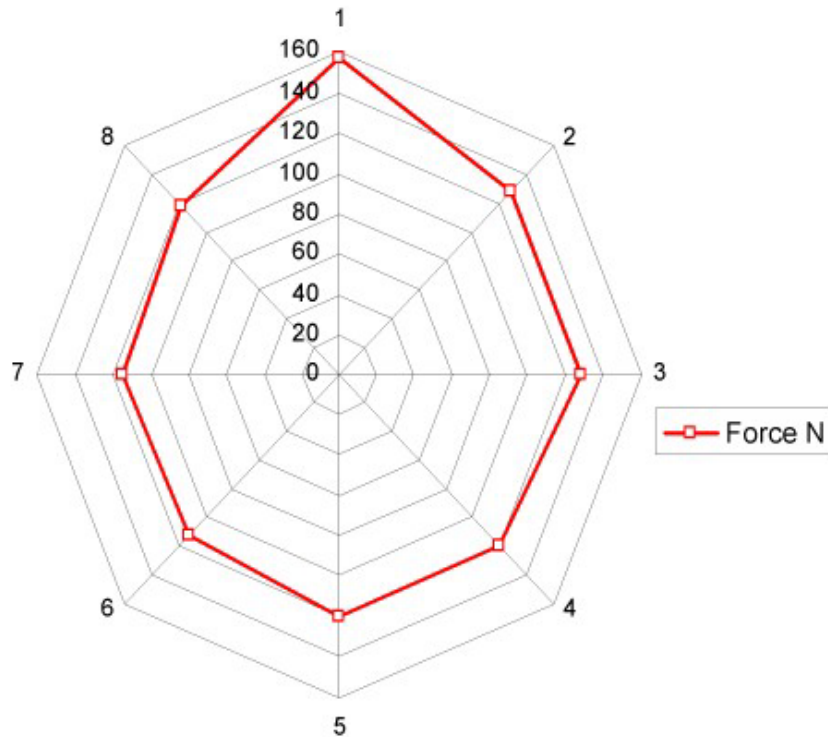
Care should be taken to ensure not to apply forces to a clip above the

Fact Sheet 005 - Clamping Forces

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Clamping Forces On Rubber Hose

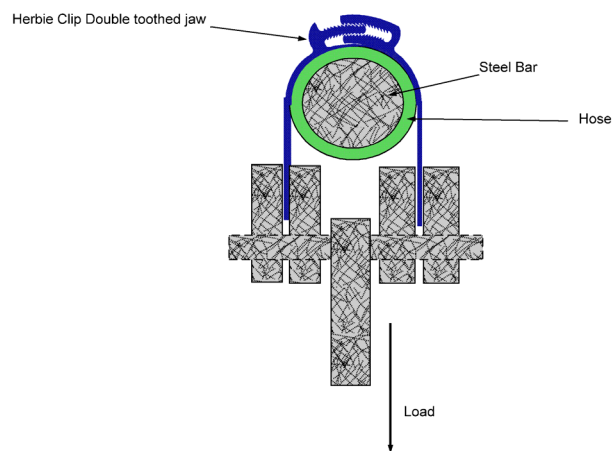
Position No	Position °	Force N
1	0	157
2	45	128
3	90	128
4	135	120
5	180	120
6	225	112
7	270	115
8	315	119



Explanation of Graph

The chart shows the results of a test carried out with strain gauges at eight points on a 38 mm diameter (nominal) rubber hose, using a size Q Herbie Clip with all eight teeth engaged. The forces are relatively uniform around the hose with a modest 20% increase underneath the Herbie Clip head.

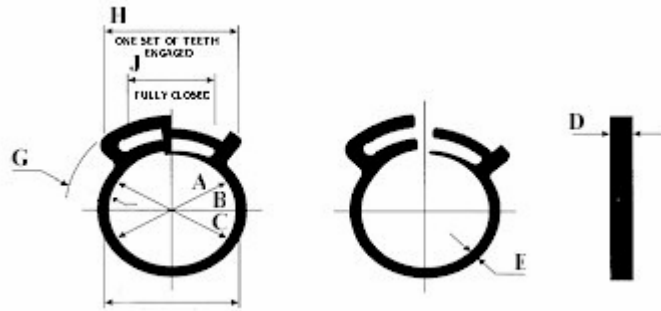
Figure 2 : Arrangement for circumferential loading of Herbie Clip double toothed jaw



A special purpose test rig was also constructed to permit tests of the absolute strength of the Herbie Clip toothed jaw and band. A requirement of the tests was the need to know the magnitude of the circumferential load on the clip band. The design of the test rig facilitated a circumferential loading of the toothed jaw in a manner representative of the conditions which exist when a clip is fitted to an internally pressurised hose as shown in figure 2 above.

Fact Sheet 007 - Clip Measurements in mms

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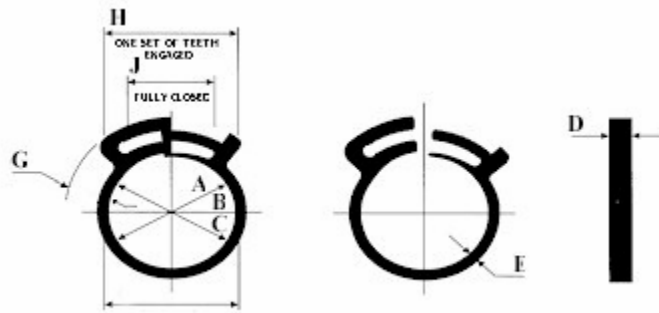


Dimensions in mms
Weight in gms

Clamp Size	A Min Dia	B Max Dia	C 3 teeth Engaged	D Band width	E Band Thickness	G Head Height	H Max Head Width	J Min Head Width	Weight Gms'
Ident	mm	mm	mm	mm	mm	mm	mm	mm	gms
A	5.6	6.8	6.5	4.2	1.4	8.3	17.5	12.4	0.53
AA	6.5	8.1	7.9	4.5	1.6	9.9	20.9	14.8	0.82
B	7.9	9.6	9.2	4.4	1.6	9.3	20.7	14.7	0.90
BB	9.2	10.8	10.3	4.5	1.7	10.9	22.2	17.0	1.11
C	10.2	12.3	11.8	5.8	1.7	12.2	27.9	20.1	1.73
CC	11.1	13.4	12.9	6.1	1.7	12.3	28.7	20.0	1.94
D	12.0	14.5	13.8	6.1	1.7	12.9	28.9	19.0	1.95
E	13.1	15.7	15.1	7.2	2.0	13.6	32.7	21.0	3.26
F	15.0	17.8	17.1	7.1	2.0	12.9	34.8	23.9	3.18
G	16.9	19.9	19.1	6.9	2.1	12.5	32.4	21.3	2.00
H	18.1	21.4	20.6	7.1	2.1	12.7	35.7	23.3	3.23
J	20.3	23.7	23.0	6.4	2.1	14.2	39.0	25.8	1.08
K	22.2	25.8	24.9	7.0	2.0	13.0	37.0	26.0	3.61
L	24.5	28.4	27.6	7.1	2.1	12.5	37.3	25.7	3.43
M	26.5	30.4	29.5	7.4	2.2	13.4	40.0	27.0	4.80
N	28.8	33.0	32.2	9.0	2.0	13.4	42.0	29.0	5.60
P	32.0	35.6	34.8	9.1	1.9	13.8	40.0	27.5	6.15
Q	34.3	38.7	37.9	8.9	2.1	13.5	42.0	28.8	7.05
R	38.0	42	41	9.2	2.1	14.1	44	29.7	6.48
S	40.1	45.1	44.2	9.0	2.2	13.4	42.2	29.7	6.60
T	43.2	47.0	46.2	8.9	2.1	12.8	42.5	28.9	6.81
U	46.0	52.0	50.5	9.0	2.1	14.4	46.0	31.0	7.31
V	48.5	54.8	53.8	9.0	2.1	14.4	48.0	33.0	8.17
W	53.0	58.0	56.5	9.0	2.1	15.0	49.0	33.5	7.61
X	55.0	61.0	60.5	9.4	2.4	15.5	54.0	35.7	9.95
59	59.0	65.7	64.7	9.3	2.5	17.0	58.6	38.9	11.40
64	63.0	68.4	67.4	9.4	2.0	15.6	45.8	31.7	9.94
65	65.0	70.0	69.0	9.5	2.6	16.0	50.0	34.7	10.90
66	65.8	72.1	71.7	9.2	2.6	15.7	57.3	37.8	10.90
70	70.0	76.4	75.4	9.1	2.6	15.5	58.3	39.3	11.50
75	74.7	81.5	80.5	9.1	2.6	16.5	61.3	40.3	12.20
78	77.7	82.2	81.2	9.0	3.2	16.7	47.9	33.5	10.80
80	79.8	86.0	85.0	9.0	2.6	17.7	55.2	37.0	12.90
85	85.1	91.6	90.6	8.9	2.6	17.2	55.2	37.1	11.90
96	97.7	104.0	102.1	8.5	2.6	17.4	66.0	42.9	14.20
105	105.3	113.3	111.8	8.9	2.6	16.2	66.2	42.7	15.00
163	163.0	171.0	169.0	9.5	2.5	16.0	79.0	50.4	19.00

Fact Sheet 007a - Clip Measurements in inches

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Dimensions in
Inches
Weight in
ounces

Clamp Size	A Min. Dia.	B Max. Dia.	C 3 Teeth Engaged	D Band Width	E Band Thickness	F Head Style	G Head Height	H Max Head Width	J Min Head Width	Mass In	Sets Of Teeth	Clamp Size
Ident.	Inches	Inches	Inches	Inches	Inches		Inches	Inches	Inches	'Oz'		Ident.
A	0.220	0.268	0.256	0.165	0.055	1	0.327	0.689	0.488	0.01870	8	A
AA	0.256	0.319	0.311	0.177	0.063	1	0.390	0.823	0.583	0.02892	8	AA
B	0.311	0.378	0.362	0.173	0.063	1	0.366	0.815	0.579	0.03175	8	B
BB	0.362	0.425	0.406	0.177	0.067	1	0.429	0.874	0.669	0.03915	9	BB
C	0.402	0.484	0.465	0.228	0.067	3	0.480	1.098	0.791	0.06102	9	C
CC	0.437	0.528	0.508	0.240	0.067	1	0.484	1.130	0.787	0.06843	9	CC
D	0.472	0.571	0.543	0.240	0.067	3	0.508	1.138	0.748	0.06878	9	D
E	0.516	0.618	0.594	0.283	0.079	1	0.535	1.287	0.827	0.11499	11	E
F	0.591	0.701	0.673	0.280	0.079	2	0.508	1.370	0.941	0.11217	11	F
G	0.665	0.783	0.752	0.272	0.083	1	0.492	1.276	0.839	0.07055	11	G
H	0.713	0.843	0.811	0.280	0.083	1	0.500	1.406	0.917	0.11394	11	H
J	0.799	0.933	0.906	0.252	0.083	1	0.559	1.535	1.016	0.03810	11	J
K	0.874	1.016	0.980	0.276	0.079	1	0.512	1.457	1.024	0.12734	11	K
L	0.965	1.118	1.087	0.280	0.083	1	0.492	1.469	1.012	0.12099	11	L
M	1.043	1.197	1.161	0.291	0.087	3	0.528	1.575	1.063	0.16932	11	M
N	1.134	1.299	1.268	0.354	0.079	3	0.528	1.654	1.142	0.19753	11	N
P	1.260	1.402	1.370	0.358	0.075	3	0.543	1.575	1.083	0.21694	11	P
Q	1.350	1.524	1.492	0.350	0.083	3	0.531	1.654	1.134	0.24868	12	Q
R	1.496	1.654	1.614	0.362	0.083	3	0.555	1.732	1.169	0.22858	12	R
S	1.579	1.776	1.740	0.354	0.087	3	0.528	1.661	1.169	0.23281	12	S
T	1.701	1.850	1.819	0.350	0.083	3	0.504	1.673	1.138	0.24022	12	T
U	1.811	2.047	1.988	0.354	0.083	2	0.567	1.811	1.220	0.25785	12	U
V	1.909	2.157	2.118	0.354	0.083	2	0.567	1.890	1.299	0.28819	12	V
W	2.087	2.283	2.224	0.354	0.083	2	0.591	1.929	1.319	0.26844	12	W
X	2.165	2.402	2.382	0.370	0.094	2	0.610	2.126	1.406	0.35098	14	X
59	2.323	2.587	2.547	0.366	0.098	2	0.669	2.307	1.531	0.40212	14	59
64	2.480	2.693	2.654	0.370	0.079	2	0.614	1.803	1.248	0.35062	10	64
65	2.559	2.756	2.717	0.374	0.102	2	0.630	1.969	1.366	0.38449	11	65
66	2.591	2.839	2.823	0.362	0.102	2	0.618	2.256	1.488	0.38449	14	66
70	2.756	3.008	2.969	0.358	0.102	2	0.610	2.295	1.547	0.40565	14	70
75	2.941	3.209	3.169	0.358	0.102	1	0.650	2.413	1.587	0.43034	14	75
78	3.059	3.236	3.197	0.354	0.126	1	0.657	1.886	1.319	0.38096	10	78
80	3.142	3.386	3.346	0.354	0.102	1	0.697	2.173	1.457	0.45503	12	80
85	3.350	3.606	3.567	0.350	0.102	1	0.677	2.173	1.461	0.41976	12	85
96	3.846	4.094	4.020	0.335	0.102	2	0.685	2.598	1.689	0.50089	15	96
105	4.146	4.461	4.402	0.350	0.102	2	0.638	2.606	1.681	0.52911	15	105
163	6.417	6.732	6.654	0.374	0.098	1	0.630	3.110	1.984	0.67021	20	163

Fact Sheet 008 - Quality Assurance

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Quality Policy

The objective of every one at HCL Fasteners Ltd is to provide its products in a manner which conforms to the specified requirements of the company, customers and all applicable regulating authorities. In order to achieve this objective, it is the policy of HCL Fasteners to maintain an effective quality system based on the requirements of:
BS EN ISO 9002

The Quality Manager is responsible for monitoring and measuring the system and reporting any deviation directly to the Managing Director. Management will ensure that all personnel are fully conversant with the company objectives through relevant training and education programmes. Meeting HCL Fasteners quality standards and constantly improving them is the responsibility of every single person in HCL Fasteners.

Quality Control Procedures

GOODS RECEIVED INSPECTION	Herbie Clips are made from Nylon 66 which is inspected on receipt from our suppliers by the quality controller. The material is inspected for:- a) Quality b) Type c) Satisfactory packaging The Goods Inwards inspection information is logged and retained by the Quality Control Department. If the material passes this inspection satisfactorily it is transferred to raw material stores.
INJECTION MOULDING CONTROL.	All of the Herbie Clip product range is manufactured to the highest standard using some of the latest equipment and techniques. The moulding machines are computer controlled and all the settings for each moulding tool are recorded on disk for optimum performance. In any production run, first off components are checked against specification. Once these are approved production begins. Machine setters are not authorised to change the controlling software. Should a parameter require adjustment, the setters will notify the production manager who, after consultation with the quality control department & engineering, will decide on any change.
STATISTICAL PROCESS CONTROL.	SPC data relating to each batch manufactured is available to customers upon request. This data is entered into a computer for dimensional verification and weight checks. The information is then transferred to hard copy and is stored for reference and product traceability.
ROUTINE PRODUCTION CHECKS	Clips found to be outside specification are rejected, and the batch concerned isolated. Settings are adjusted until satisfactory yield is achieved and the suspect batch subject to 100% inspection.
FINAL INSPECTION	At this station all product is given a final visual and physical inspection. Finally during packaging operations, quality is confirmed by:- a) An inspection ticket packed with the goods. b) A Q. A. label attached on the external surface of the packaging. If required, a certificate of conformity to HCL's product specification can be issued.
QUALITY POLICY	HCL is committed to the highest possible quality standards. Quality control systems are subject to review at appropriate intervals in consideration of the following:- a) Changes in technology b) Changes to markets c) Changes in legislation d) External assessors' reports e) Overall company facilities & policies

Fact Sheet 009 - Questions and Answers 1**14****Q Will the Herbie clip save me money?**

Definitely. The ease of fitting, the strength and performance all guarantee you a cost savings.

Q What makes the Herbie clip quick to fit?

The Herbie is fitted after the Hose is in place. This means that the operator can concentrate on securing the clip and is not struggling to hold the hose, clip and tooling.

Q How can I identify the size of Herbie clip?

Each clip is easily identified. There is a code moulded onto the side of each clip.

Q Where is the Herbie clip used?

Anywhere a hose or wire needs to be tightly secured. To name a few the Herbie is currently used in the automotive industry, white goods, pools, spas, marine, medical, vending, food, fencing and general factory maintenance.

Q Does the Herbie clip need to be maintained?

No. The Herbie clip is non-corrosive and is ideally suited for low maintenance areas. It is a Fit and Forget device.

Q Can I obtain the Herbie clip in different colours?

Yes. There is a wide range of colours available. We can match the colour to meet your requirements. As we manufacture the Herbie in house, we can control how the clip is produced. If you have a special requirement talk to us and we can discuss your needs.

Q How high a temperature can the Herbie withstand?

The Herbie has a temperature range from -40C to +150C. This is more than sufficient for the majority of situations, however we can achieve higher temperatures by using glass filled Nylon.

Fact Sheet 009a - Questions and Answers 2**15****Q What are the advantages of Nylon 6.6.?**

Nylon 66 is much stronger and more resistant than the commonly used acetal materials. It is also heat stabilized and non toxic.

Q How High a pressure can the Herbie clip withstand?

The Herbie is capable of being used in applications with pressures up to 200 psi (14bar). This was determined by tests undertaken by the University of Manchester.

Q Why is the Herbie clip safer to fit?

No sharp edges. This removes the possibility of cutting the hose or the operator.

Q What is the range of sizes?

The Herbie range covers diameters from 6.5mm through to 169mm (0.25 inch through to 6.65 in). Sizes greater than this are covered by the Smart Band.

Q Is there sufficient dynamic range?

Yes. Once you have determined the correct size Herbie, there is enough adjustment to allow for variation in hose diameter.

Q Can the Herbie clip be produced in other types of material?

Yes. As we manufacture the Herbie in house, we can control how the clip is produced. If you have a special requirement – talk to us and we can discuss your needs.

Q What is the leak path?

All clips have a leak path. The Herbie is designed to apply an even pressure around the hose therefore keeping leakage to a minimum. Other Clips can distort when pressure is applied.

Q Is the Herbie clip affected by Gasoline or diesel?

No. The Herbie is perfectly safe to be used in these chemicals. In fact some applications require the clip to spend its complete life submerged in gasoline or diesel.

Fact Sheet 009b - Questions and Answers 3**16****Q Does the Herbie clip require special tooling?**

No. A pair of pliers is sufficient to tighten the clip.

Q Is production tooling available?

Yes. For large volume uses a range of pneumatic tooling is readily available that can easily be adopted to your application. Also a manual fitting tool provides quick fitting

Q Can the Herbie clip be removed and re-used?

Yes. The Herbie is quickly remove by simply holding the back portion of the top jaw and twisting the teeth apart. This can be achieved in the most difficult of spaces. The clip can be re-fitted.

Q Do chemicals affect the Herbie?

As with most clips certain chemicals can have an affect. A full list can be found in the Fact Sheet 002 'Chemical Resistance Data'. As we manufacture the Herbie in house, we can control how the clip is produced. If you have a special requirement – talk to us and we can discuss your needs.

Q Can the Herbie clip be used in the medical industry?

Yes. The material used in the manufacture of the Herbie is Nylon 66, which is non-toxic and ideally suited to a sterile environment.

Q Is the Herbie clip a suitable alternative to metal clips?

Yes. In the vast majority of applications a Herbie will out perform, as it is quick to fit, non-corrosive and safe to use. We welcome the opportunity to discuss your requirement.

Q Will the Herbie clip seize up?

No. Being made from a single moulded Nylon component with no moving parts means that the Herbie will always function correctly and be removable.

Q Can the Herbie clip be used on electrical cables?

Yes. Being made of nylon makes the Herbie non-conductive and non-magnetic.