



# CyberFacts

# Cyberbond



Cyberbond Europe in Wunstorf/Hannover

## Your Source for Industrial Adhesives



Cyberbond L.L.C. in Batavia/Chicago

Cyberbond manufactures and markets a wide range of high performance, high technology specialty adhesives for industrial product assembly and other manufacturing applications. Our wealth of knowledge and entrepreneurial spirit has allowed us to become a leader in the adhesive marketplace since our inception in 1997.

A world-class team of sales and technical professionals is waiting to assist you with making the right adhesive choice. Cyberbond's commitment to quality, value, and customer service has allowed us to succeed in this highly competitive market – we look forward to working with you!

### CyberBook



The Vade Mecum on Adhesives

Cyberbond's global diversity allows us to offer quality products at an outstanding value, with sales offices and manufacturing facilities throughout the United States, Europe, and Asia. With our network of professional distributor partners, Cyberbond also maintains the local presence necessary to provide our customers with the high level of service they expect – wherever they may be.

The CyberBook explains adhesives in general and reactive adhesives in particular and its aim is to give you a guideline for a better understanding of the world of adhesives. The reading matter is not a scientific essay and the subject of bonding is not treated to its full extent as this would go beyond the scope of it. The CyberBook is also meant to be a kind of reminder, placed on your bookshelf and ready to use. For technically inclined people for instance, it offers important tips for a good design. For commercially oriented staff this could be a good guidebook for purchasing.

Cyberbond has a unique product offering with specialties in: anaerobics and UV/light curable adhesives as well as suitable dosing and curing equipment. Responding quickly to your applications is our strength. Our worldwide technical and manufacturing resources ensure consistent results.



Productdevelopment and Production

As a TS16949 & ISO9001 certified company we are constantly working to develop and produce the highest quality and most reliable adhesives possible. Our innovative products set the quality standard for the industry. We are dedicated to providing a beneficial choice to the adhesive marketplace. Cyberbond is focused on lowering risk while increasing profitability for our customers.



from left to right: Dieter Rademacher (Technical Director CB Europe), Petr Zalud (Managing Director CB Czech), Holger Bleich (Financial Director CB Europe), Philippe Fridrick (Managing Director CB France), Joe Silvestro (Vice President CB USA), Uli Lipper (Managing Director CB Europe), Jim East (President), missing Gerry Lamb (Managing Director CB UK)





## Innovations



These products perform very well on acidic surfaces such as wood, leather, cardboard etc. without the use of an activator.

Cyberbond also offers Cyanoacrylates already dyed or containing fluorescent without having shelf life problems. These special features become more and more interesting for the electronics industry in order to detect with special cameras, if the adhesive was applied. Also customers no longer have to mix products themselves.

### Development of new soft bottles and accurate Pin Caps for Cyanoacrylate Adhesives

There are two main versions of CA bottles available in Europe and the USA. These are the oval and round bottles. The disadvantage of both is that in order to protect the adhesive from humidity they are manufactured from extremely hard plastic, which in turn increases the shelf life of the adhesive. The type of bottle used depends on the supplier and of course on which bottle the user prefers.

Cyberbond has successfully found a soft plastic which allows the user to apply adhesive from the bottle without getting fatigue. A further advantage is, that even if low or high viscosity adhesives are used the flow can be controlled very easily. Cyberbond has kept with tradition in supplying the new soft plastic bottle in the round bottle design.

Cyberbond has also been innovative in the design of a new accurate Pin Cap with the following features:

- ▼ accurate nozzle
- ▼ bottle already open, ready for use
- ▼ clog-free
- ▼ possibility to click on an extra, extended dosing tip
- ▼ non-slip nozzle
- ▼ unique
- ▼ easy disposal (all plastic, no plastic/metal combination)

The solution: The new innovative cap design consists of 2 parts; the nozzle and the top cap with plastic pin. The nozzle is screwed directly onto the thread of the bottle. Therefore the nozzle cannot slip out from the bottle and makes for much safer use.

Also the new nozzle design is already open and ready for dispensing, and a plastic pin inside the top cap seals the nozzle against leaking. In addition to that the pin also prevents clogging of the nozzle.

On the top of the nozzle there is a moulded small ring. This ring is there to hold the newly designed dosing tips, called LINOP DS S (small) and LINOP DS M (medium).

The new soft bottle with the new accurate Pin Cap combines in the best possible way, traditional design in terms of the bottle shape, and in particular, Cyberbond innovation by using superior materials as well as a progressive cap design.

### Use of an Innovative Dispenser for Anaerobic Threadlockers

The use of a dispenser for high thixotropic gel products is not really anything new. But what is new is to innovatively use a cosmetic type package for anaerobic threadlockers. The idea behind this is easy to explain. Most threadlockers are relatively thin and drip from the thread when applied and spill around the work area. The new Cyberbond gel threadlockers TT 44 Pump Gel, TT 62 and TT 69 Pump Gel stay exactly where they are applied. But such a non-drip product is almost impossible to squeeze out of a standard tube. For this reason Cyberbond has decided to use the very innovative one-hand dispenser. The advantages include, effortless dispensing of the Cyberbond Gel without any dripping of the product, keeping the work area and toolbox free from contamination. Also another big advantage of the innovative use of this dispenser is the enormous efficiency that is achieved. The dispenser can be completely emptied to the last drop. Leaving no waste whatsoever.

### LINOP Equipment

The LINOP Equipment represents two different state of the art electronic devices:

- ▼ Exact dosing of one component reactive adhesives
- ▼ Curing of UV or light curable adhesives by means of advanced LED technology

All LINOP systems can be used as simple table units as well as be integrated in a PLC driven process.

Today, more than the past, you have to establish very precisely where marketing and research resources are to be used. We are not only talking about Adhesive Development, but also resources with regards to customer designed packages. Here we want to introduce to you just a few innovative ideas among many developed over the last few years by Cyberbond.

### Adhesive Development

In terms of Cyanoacrylates we offer today the „xtraflex“ Series of partly flexible adhesives. With this range of products you are able to now successfully bond parts which were not able to be bonded just a few years ago. These are the main features:

- ▼ relatively high temperature resistant (up to 140 °C)
- ▼ good ageing properties even under difficult temperature and weather conditions
- ▼ In comparison to the standard brittle Cyanoacrylates xtraflex offers partly flexible performance

Another new development is the use of the so called “Neomer Technology” in special Cyanoacrylates.

## Cyanoacrylate Adhesives



Cyanoacrylate Adhesives are also known as Super Glues and due to their extraordinary adhesion profile – one component, solvent free, very fast setting – Cyanoacrylates today still reflect the users needs. Cyberbond is developing its Cyanoacrylates continuously to guarantee the best results for industrial users. This means that the products are not only designed for specific applications, but that the storage conditions e.g. shelf life is also improved. Parts bonded with Cyberbond will give the user reliable mechanical strength, good overall strength properties on most non porous materials, sufficient temperature resistant figures, improved elasticity figures, good ageing and climatic properties as well as a resistance against Ozone.

Cyanoacrylates polymerise within seconds due to humidity (optimum: 40 to 70 % rel. humidity at 20 to 25 °C). One factor that is very important to consider is; the PH-value. If the surface is acidic, the setting time slows down. On the other hand the set speed increases when the surface is alkaline. The latter can provoke a shock polymerisation, which results in bad ageing properties

The chemical base is the most important item to differentiate Cyanoacrylates. We distinguish in different Ester groups in which the Ethylester is by far the most important and most popular one. But also other groups like Methyl-, Butyl- and Alkoxyesters do have certain advantages and benefits. Also when choosing a Cyanoacrylate adhesive viscosity cannot be ignored. Cyberbond varies from liquid like water up to thixotropic gels.

Cyanoacrylates reach very high adhesion figures on most materials, including smooth surfaces. This is the reason why the user does not really have to bother about shear- and tensile strength. That said you should bear in mind that the adhesive layer normally remains brittle. Therefore, peel loads should be avoided. To help combat this Cyberbond has developed its "xtraflex" line, which does not only give you partly flexible adhesive layers, but also a high temperature resistance (up to 140 °C). Due to the fact that increasing automation demands 100% supervision Cyberbond has developed fluorescent products which can be optically recognised by UV-radiation.

Initially Cyanoacrylates seem to be relatively expensive compared to other adhesive systems. But users quickly realise that by using Cyanoacrylates enormous savings can be made. For example: depending on viscosity 1 gm of Cyanoacrylates contains approximately 80 drops of adhesive.

**Cyberbond has established a product range that is as follows:**

- ▼ Powerdrop® series: for hobby and DIY applications
- ▼ Elastomer and plastic series: fast setting industrial Cyanoacrylates
- ▼ Neomer series: surface insensitive Cyanoacrylates (wood, leather etc.)
- ▼ xtraflex series: partly flexible, heat and impact resistant
- ▼ Metal series: high performance on metal to rubber or metal to plastic
- ▼ Low odour series: low odour and low blooming characteristics
- ▼ Medical series: skin bonding in medical industry
- ▼ Frame Fast® series: for fast bonding of screens (Plastic or stainless steel) on frames (alu, stainless steel, wood).

**Furthermore Cyberbond holds medical approvals for the following:**

- ▼ ISO 10993-5: Test for in vitro cytotoxicity
- ▼ ISO 10993-10: Tests for irritation and delayed-type hypersensitivity
- ▼ ISO 10993-11: Tests for systematic toxicity
- ▼ USP Class VI: USP 25, NF 20: Biological Reactivity Tests in vivo

Products with these approvals are used for bonding single-use medical products.

Cyanoacrylates from the physiological point of view are harmless; they are used extensively in human and veterinary medical applications to bond skin or to treat wounds. But for these applications special products are required.

From a health & safety point of view industrial application of cyanoacrylate adhesives should take place in well ventilated areas. On the packaging label the products are declared as following: "Cyanoacrylate. Bonds skin and eyelids within seconds. Keep out of the reach of children." Additionally, most grades have the "Xi-irritant" or with regards to the GHS standard the "Caution" sign.

### Cyberbond Cyanoacrylat Adhesives

Application	Product	Appearance	Viscosity [mPa*s]	Setting Time				Shear Str. Steel	Temperature Range [°C]	ISO 10993 Medical Approval	Comment
				Metal	Rubber	Plastic	Wood				
Powerdrop® Ethylerster	2004	colourless	7 - 11	30 - 50	3 - 6	2 - 4	> 50	12 - 22	- 55 / + 95	10993-5	Carefully stabilised, fast bonding Cyanoacrylates for Hobby and DIY applications
	2605	colourless	45 - 65	10 - 25	1 - 2	1 - 3	> 35	11 - 20	- 55 / + 95		
	2003	colourless	55 - 85	45 - 70	6 - 10	5 - 7	> 70	12 - 22	- 55 / + 95	10993-5	
Elastomer and Plastic Ethylerster	2800	colourless	3 - 7	18 - 28	1 - 3	2 - 4	> 60	11 - 20	- 55 / + 95	10993-5; -10; -11	Very fast Rubber to Rubber Adhesives with extremely good ageing properties. Reliable Plastic to Plastic applications and best choice for Rubber to Plastic combinations. Fluorescent properties are optional.
	2008	colourless	12 - 18	18 - 28	1 - 3	2 - 4	> 60	11 - 20	- 55 / + 95	10993-5; -10; -11	
	2006	colourless	15 - 30	20 - 35	1 - 3	3 - 5	> 60	11 - 20	- 55 / + 95		
	2011	colourless	80 - 120	20 - 35	2 - 4	2 - 4	> 60	12 - 22	- 55 / + 95	10993-5; -10; -11	
	2028	colourless	160 - 240	20 - 35	2 - 4	2 - 4	> 60	12 - 22	- 55 / + 95	10993-5; -10; -11	
	2077	colourless	800 - 1.200	25 - 45	3 - 5	5 - 7	> 60	12 - 22	- 55 / + 95	10993-5; -10; -11	
1603	colourless	1.500 - 2.000	25 - 45	4 - 6	6 - 8	> 60	12 - 22	- 55 / + 95	10993-5; -10; -11		
Neomer Technology modified Ethylerster	2600	colourless	3 - 7	10 - 25	1 - 3	1 - 3	> 45	11 - 20	- 55 / + 80		The Neomer Cyanoacrylates are representing the so called surface insensitive grades. Very good results on acidic surfaces like wood, leather, cardboard etc. The higher viscosities are also very suitable for porous materials like ceramic, china etc.
	2610	colourless	90 - 140	13 - 25	1 - 3	1 - 3	> 40	12 - 22	- 55 / + 80		
	2150	colourless	2.100 - 3.300	30 - 50	6 - 10	6 - 9	> 60	12 - 22	- 55 / + 95		
	2999	colourless	8.000 - 15.000 tx	50 - 90	10 - 14	13 - 19	> 80	8 - 17	- 55 / + 95		
xtraflex (rubber toughened) modified Ethylerster	2244	opaque	130 - 180	40 - 65	3 - 6	5 - 9	> 60	12 - 22	- 55 / + 120	10993-5	Partly flexible respectively rubber toughened Cyanoacrylates, for dynamic and temperature loaded bonds. These xtraflex grades also guarantee a certain shock resistance. Very good results for Metal to Plastic and Metal to Rubber combinations.
	2243	black	240 - 360	40 - 65	4 - 8	5 - 9	> 60	12 - 22	- 55 / + 130		
	2245	opaque	400 - 600	35 - 70	3 - 6	5 - 9	> 80	14 - 25	- 55 / + 120		
	2241	black	1.900 - 2.900	50 - 80	9 - 12	7 - 13	> 40	16 - 28	- 55 / + 140	10993-5	
	2240	opaque	2.000 - 3.000	45 - 70	7 - 11	7 - 13	> 40	16 - 28	- 55 / + 140		
Metal modified Ethylerster	1008	colourless	9 - 15	20 - 35	3 - 6	4 - 6	-	10 - 22	- 55 / + 95		Metal to metal, metal to rubber and metal to plastic bonding
	1070	colourless	70 - 110	20 - 35	3 - 6	4 - 6	-	14 - 24	- 55 / + 95		
	1699	colourless	1.800 - 2.200	20 - 35	3 - 6	4 - 6	-	14 - 24	- 55 / + 95		
Low Odour Alkoxyester	5005	colourless	3 - 7	10 - 25	4 - 7	9 - 12	> 60	8 - 18	- 30 / + 70	10993-5	Low odour, low blooming, low out-gassing characteristics. Due to its chemistry unfortunately lower strength properties than e.g. Ethylersters.
	5008	colourless	45 - 80	35 - 70	4 - 7	14 - 17	> 60	8 - 18	- 30 / + 70		
	5100	colourless	800 - 1.200	45 - 70	13 - 20	19 - 22	> 70	8 - 18	- 30 / + 70		
Medical Butylerster	7000	colourless	3 - 7	-	5 - 7	14 - 17	-	6 - 15	- 30 / + 70		Very pure Butylersters for surgery. Also good properties on tension cracking sensitive plastics.

blue printed grades are considered as best standards out of their range  
 Viscosity measured with cone / plate method at 20° C; with regards to newtonian fluids measured with cone Ø 75 mm at 30 rev/min; in terms of thixotropic fluids (tx) measured with cone Ø 50 mm at 5 rev/min  
 Setting time in seconds at Steel, EPDM, ABS, Beech  
 Shear strength at Steel, measured in N/mm², with the other materials – such as EPDM, ABS, Beech – you normally reach substrate failure

### Cyberbond Cyanoacrylat Adhesives: Frame Fast® Series

Application	Product	Appearance	Viscosity [mPa*s]	Setting Time				Shear Str. Steel	Temperature Range [°C]	Comment
				Metal	Rubber	Plastic	Wood			
Frame Fast® Ethylerster	FF 106	colourless	20 - 40	20 - 45	3 - 7	3 - 7	-	10 - 23	- 55 / + 95	to bond plastic and metal mesh onto alu or steel frames
	FF 115	colourless	70 - 100	25 - 40	3 - 7	4 - 8	-	11 - 23	- 55 / + 95	special Cyanoacrylate to bond plastic and stainless steel mesh onto stainless steel frames
	FF 270	colourless	10 - 30	20 - 35	2 - 4	2 - 4	-	10 - 20	- 55 / + 95	low viscosity, fast setting standard to bond plastic and metal mesh onto alu or steel frames
	FF 280	colourless	110 - 170	15 - 30	6 - 10	2 - 4	> 40	11 - 22	- 55 / + 95	medium viscosity, fast setting Cyanoacrylate to bond plastic or metal mesh onto steel or wooden frames
	FF 297	blue	2.000 - 4.000 tx	35 - 70	3 - 7	6 - 9	> 60	11 - 22	- 55 / + 95	high viscosity, thixotropic Cyanoacrylate, standard setting to bond especially wide mesh onto alu or steel frames
	G 2000	colourless	3 - 7	8 - 20	3 - 5	3 - 5	> 40	11 - 22	- 55 / + 95	low viscosity, fast setting grade to be used in screen printing applications (metal or plastic mesh onto metal frame)

blue printed grades are considered as best standards out of their range  
 Viscosity measured with cone / plate method at 20° C; with regards to newtonian fluids measured with cone Ø 75 mm at 30 rev/min; in terms of thixotropic fluids (tx) measured with cone Ø 50 mm at 5 rev/min  
 Setting time in seconds at Steel, EPDM, ABS, Beech  
 Shear strength at Steel, measured in N/mm², with the other materials – such as EPDM, ABS, Beech – you normally reach substrate failure



## Anaerobic Adhesives and Sealants



The Cyberbond range of Anaerobic Adhesives and Sealants are solvent free and are a one-component system. These products are relatively unique due to their different strength properties and can be put into groups of, low, medium and high strength grades, making selection of the right product simple. The products cure at room temperature by means of contact with metal and the absence of air. Different types of metals give different strengths and setting times. The products e.g. cure extremely fast on active metals such as copper or brass, but only reach strength values of approximately 40% of the given values of construction steel [Fig. 1]. Generally Cyberbond Anaerobic Adhesives and Sealants are used to lock and seal threads, retain threads, shafts, bearings, studs, flanges, etc. The shelf life of Cyberbond anaerobics is one year at room temperature.

### T – Threadlocking

Vibration may cause such problems as, self-loosening of threads. By applying the Cyberbond 'T' series, this problem is solved. Cyberbond maintains the on-torque given on a thread, which prevents the self-loosening process. At the same time Cyberbond fills the voids in the threads, seals the threads and prevents corrosion. Liquid Cyberbond is simply applied out of the bottle or tube. After assembly it will cure completely and fix the mating parts. The complete thread should be wetted to ensure the load is distributed along the total length of the thread. A slight thixotropic nature of the products helps prevent the product flowing away and is responsible for optimal coverage of the thread. By selecting the correct Cyberbond grade, use of mechanical aids may not be necessary. When choosing a product, consideration should be made to the various strength classes available, together with the material of the thread itself, and its design.

If threads need to be disassembled e.g. a nut is positioned in a difficult to reach area, but has to be re-opened later, then no more than a medium strength grade should be used.

### R – Retaining of Threads, Shafts and Bearings [Fig. 2]

Cyberbond durably and reliably retains threads, shafts & bearings. Generally the need to dismantle these joints easily is not required. Therefore the high strength retainers of the Cyberbond 'R' series range meet the requirements of these types of joints. When Cyberbond is used a uniform stress distribution throughout the joint is achieved, which means dynamical and statical loads can easily be withstood. In contrast to the benefits of these modern liquid retainers, traditional cylindrical assembly methods do have the following disadvantages:

- ▶ In the case of press fits or shrink fits high machinery costs are involved and the parts have to be designed very accurately and become very expensive joints.
- ▶ In common drive assemblies, pins, splines or adjusting springs are often used which have the disadvantage of fretting corrosion and high punctual stress.
- ▶ Due to various elongation figures in different metals a welding or soldering process is quite often limited.

When Cyberbond retainers are selected all these disadvantages disappear. Even when the retainers cure at room temperature, multiple strength values can be achieved, compared to assembly methods where adhesives have not been used. When Cyberbond retainers are used the following advantages are gained:

- ▶ Small gaps can be bridged which allows for less costly designed mating parts.
- ▶ Friction corrosion is avoided.
- ▶ Assembly of parts having different elongation figures is possible.

### S – Sealing of Threads

Besides sealing fine threads Cyberbond 'S' series can also seal pipefittings due to its ability to resist most chemicals. As with threadlocking the space between the threads is completely filled with adhesive and this seals the fitting.

Depending on which sealant has been selected, initial leak tests may be carried out immediately as the liquid sealant cures relatively quickly. Early testing should not exceed 1 bar. After complete polymerisation of the sealant, pressure can be maximised until complete destruction of the joint.

Like any anaerobic adhesive and sealant the selected metals and design of the parts have a huge influence when choosing a Cyberbond sealant. E.g. a larger thread needs more adhesive to fill the space and will give higher torque values when cured. In this instance a low strength Cyberbond sealant should be selected, especially if easy disassembly is required.

### S – Sealing of Flanges

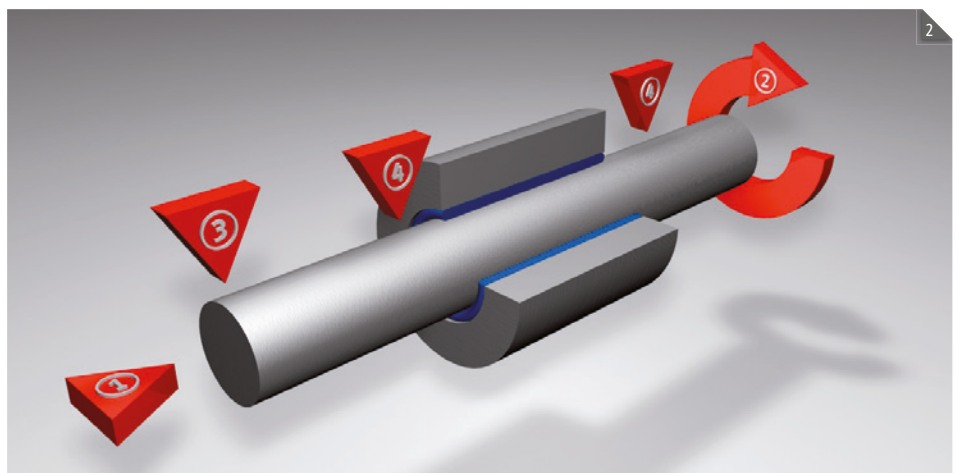
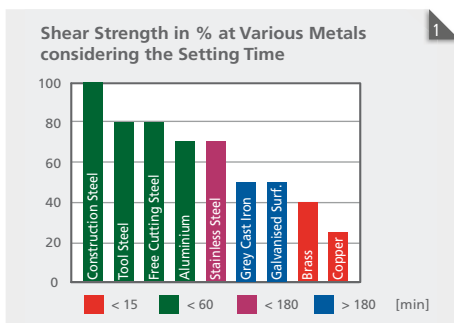
In many cases Cyberbond 'S' series products are able to replace traditional rigid joint faces. When used to seal a flange Cyberbond offers the advantage of protecting the joint against corrosion. Due to the various strength classes available a designer has the possibility to design different types of joints. E.g. a joint that is easy to disassemble, or the choice to improve the mechanical resistance of the total construction of the joint by selecting a higher strength product. Cyberbond flange sealants are resistant to the more popular oils and gases. Also sealing tests up to 1 bar can be carried out immediately when parts have been fully assembled. Another great advantage of the Cyberbond sealant 'S' series is that no joint settlement will take place. Compared to traditional rigid flanges there is no need to re-tighten the flange bolts. The storage of just one liquid gasket compared to many solid types offers further benefits.

The application of Cyberbond is simple and very quick. If on a large and fast production line then normally robots or silkscreen methods are used. On smaller production lines or in the case of maintenance then Cyberbond can be applied simply from the bottle or tube. A brush can also be used to distribute the product. Complicated designs and joints are easily sealed using the Cyberbond 'S' series of products, but a certain overlap width must be granted (about 5 mm min; about 3 mm min. around bolt holes).

### Cyberbond Anaerobic Adhesives and Sealants

Main Application	Product	Str. Class a. Colour	Viskosität [mPa*s]	Setting Time [min]	Shear Strength [N/mm²]	Breakloose Torque [M <sub>LB</sub> in Nm]	Prevailing Torque [ $> / < M_{LB}$ ]	Gap Filling Capacity		Temperature Range [°C]	Comment	
								max. Thread	Gap [mm]			
T – Threadlocking Nuts and Bolts	TM 11	low violet	250 - 400	30 - 60	4 - 8	4 - 12	$> M_{LB}$	M 12	0,04 - 0,13	- 50 / + 150	easy to dismantle screwlock; for precision screws	
	TM 44	middle blue	600 - 1.200 tx	15 - 30	10 - 16	10 - 20	$< M_{LB}$	M 20	0,06 - 0,18	- 50 / + 150	general purpose nutloc; releasable with ordinary tools	
	TH 62	high red	1.000 - 2.000 tx	20 - 40	18 - 30	17 - 28	$> M_{LB}$	R 3"	0,10 - 0,25	- 50 / + 150	high viscosity, high strength threadlocker with gap filling properties	
	TM 66	high green	500 - 800	20 - 40	18 - 28	20 - 30	$> M_{LB}$	M 20	0,05 - 0,15	- 50 / + 150	for permanently locked screws, studs etc.	
	Pump Gel	TT 44 Gel	middle blue	20.000 - 30.000 tx	15 - 30	9 - 15	13 - 22	$< M_{LB}$	M 50	0,10 - 0,30	- 50 / + 150	high viscosity threadlocker with gap filling properties; self dispenser
TT 62 Gel		high red	15.000 - 25.000 tx	15 - 30	15 - 25	20 - 35	$< M_{LB}$	M 50	0,10 - 0,30	- 50 / + 150	high viscosity threadlocker with gap filling properties; self dispenser	
R – Retaining Cylindrical Parts	RL 65	high green	8 - 15	20 - 40	16 - 24	12 - 24	$> M_{LB}$	-	0,01 - 0,05	- 50 / + 150	for post application; cylindrical parts e.g. bearings; very low viscosity wicking grade	
	RL 67	high green	60 - 150	15 - 30	21 - 38	25 - 43	$> M_{LB}$	M 12	0,04 - 0,13	- 50 / + 150	for cylindrical parts like bearings, shafts, bushes, rotors, studs etc.; low viscosity	
	RM 82	high green	400 - 700 tx	15 - 30	25 - 44	21 - 33	$> M_{LB}$	M 20	0,02 - 0,10	- 50 / + 200	low viscosity; wicking properties for high strength and temperature loaded joints	
	RM 88	high green	400 - 800 tx	15 - 30	25 - 44	25 - 43	$> M_{LB}$	M 20	0,05 - 0,15	- 50 / + 200	temp. resistant; for cylindrical parts like bearings, bushes etc.	
	RH 98	high green	2.200 - 3.400 tx	20 - 40	26 - 45	28 - 48	$> M_{LB}$	M 36	0,10 - 0,30	- 50 / + 200	temp. resistant; gap filling; for dynamic loaded parts and high resist. threadlocking	
	RH 99	high green	1.600 - 2.200 tx	20 - 40	22 - 38	22 - 38	$> M_{LB}$	R 3"	0,10 - 0,25	- 50 / + 150	for dynamic loaded parts	
S – Sealing Threads Gaskets	SH 22	low white	6,000 - 9,000 tx	90 - 180	5 - 10	6 - 10	$< M_{LB}$	R 3"	0,10 - 0,30	- 50 / + 150	easy to dismantle pipe- and flange sealant and instant gasket	
	SH 27	middle yellow	20.000 - 30.000 tx	15 - 30	6 - 12	6 - 10	$< M_{LB}$	R 2"	0,10 - 0,40	- 50 / + 150	pipe- and flange sealing; DVGW approved (DIN EN 751-1 (01.05.1997) for gas	
	SM 40	middle brown	200 - 400 tx	30 - 60	10 - 16	14 - 22	$< M_{LB}$	M 20	0,05 - 0,15	- 50 / + 150	for hydraulic and pneumatic fine threads	
	SM 77	high green	1.300 - 2.100 tx	15 - 30	26 - 45	26 - 45	$< M_{LB}$	M 36	0,05 - 0,20	- 50 / + 200	sealing retainer; high temperature resistant	
	Gaskets	SH 55	middle red	12.000 - 18.000 tx	30 - 60	6 - 12	12 - 20	$> M_{LB}$	-	0,10 - 0,30	- 50 / + 200	high temperature resistant flange sealant
		SH 58	high red	30.000 - 50.000 tx	80 - 160	6 - 13	6 - 13	$> M_{LB}$	-	0,10 - 0,50	- 50 / + 150	very high viscosity instant gasket; gap filling
Pump Gel	TT 69 -4in1-	high green	4,000 - 8,000 tx	60 - 80	10 - 20	6 - 10	$< M_{LB}$	R 1"	0,10 - 0,20	- 50 / + 150	4 applications in 1! Locking, Retaining, Pipe Sealing, Flange Sealing; self dispenser	

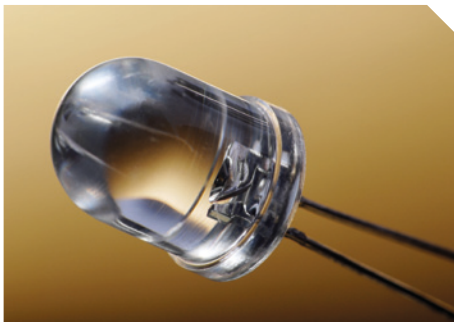
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 All set time and strength measurements related to Steel  
 Shear Strength in N/mm² following DIN 54452 pin/sleeve specimen  
 Breakloose Torque in Nm according to DIN 54454, free swimming without On-Torque



Different Loading Conditions: 1 - Axial Load, 2 - Torsional Load, 3 - Bending Load, 4 - Radial Load



## UV and Light Curing Adhesives



### The systems

UV curing adhesives are one component, solvent free and mainly cold curing systems. These products cure quickly by means of UV-light. Generally the whole system functions in the following way. The liquid adhesive, called monomer, is filled with photo-initiators. When these initiators are activated by light they turn into so-called radicals and the polymerisation process starts. The basis for most UV adhesives are acrylics or epoxies.

#### There are three main systems:

- ▼ The product is applied to one of the mating parts. The two parts are assembled and then illuminated by UV light. Advantages of this radical system are a) Self determined open time, b) Very fast setting time after illumination and c) High final shear strength. A limitation of this system is that at least one mating part must be transparent and should not block UV rays.

▼ The second system is called, cationic bonding. The adhesive is applied and activated sufficiently by UV light. The parts are then positioned and the final strength will be reached later without the need for any further light, at room temperature. An advantage of this system is that the parts do not have to be transparent. A disadvantage is that the open time after illumination becomes short and the total polymerisation time is longer than described previously.

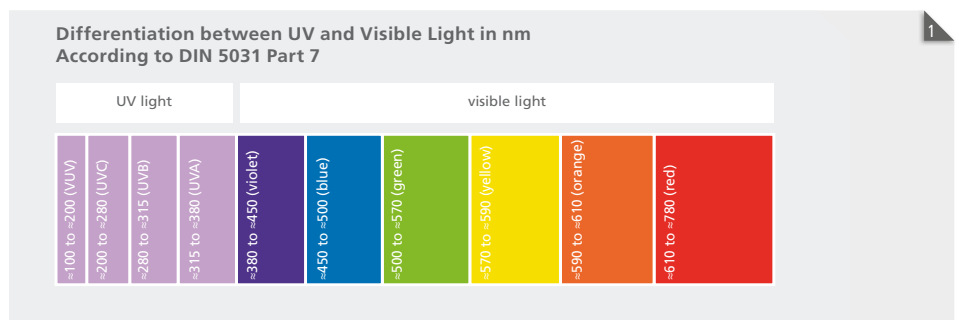
▼ Thirdly and also popular are, UV adhesives which are combined with secondary adhesion systems. From the Cyberbond range we can offer two different combinations; firstly there is a UV/anaerobic system, where the visible parts are polymerised by UV light, and the parts not exposed to UV light cure due to the absence of air and metal contact. Secondly for areas that are in shadow another system that allows for complete polymerisation is by introducing heat after exposure to light.

For these reasons, UV products are absolutely predestined for glass to glass or glass to metal applications. With anaerobic adhesives threads are fixed, but the surplus adhesive outside the joint always remains liquid. By using a UV/Anaerobic product the fixing process will be achieved in the same way, but the excess of the Anaerobic product which may purposely cover or mark the head of a screw can be cured with light. Another typical application for UV adhesives is the sealing of switches and relays.

### UV light, lamps and equipment

The UV light and visible light spectrum is explained in the figure below. [Fig. 1]

The wavelength decreases from VUV to visible light constantly. From an environmental and health point of view UVA is preferred to UVB. Most UV adhesives contain photo initiators that perform best in the wavelength between 200 to 500 nm. Filters can be used to absorb the wavelengths that are not needed or wanted. For this reason it is very important to work with the most suitable and correctly adjusted machines. Also, good hygiene of the working environment is of the utmost importance.



### ranges of wavelength

Type of radiation	harmless range of wavelength
X-Rays, Gammarays	< 100 nm
UVC V(acuum) UV F(ar) UV	100 – 200 nm 200 – 280 nm
UVB	280 – 315 nm
UVA	315 – 380 nm
Visible light	380 – 780 nm
Infrared, Microwaves, Radiowaves	> 780 nm



## Cyberbond UV and Light Curing Adhesives

Application	Product	Viscosity <sup>(1)</sup> [mPa*s]	Fluorescent	Tack-free surface	Wavelength Range [nm]	Set Speed [s] 50 mW/cm <sup>2</sup> <sup>(2)</sup>	Recommended for use on					ISO 10993 Med. Appr.	Elongat.	Shore-Hardness	
							PC	PMMA	Glass	PETG	Metal			A	D
Medical	U 303	2.500 - 3.500 tx	yes	yes	300 - 420	< 4	●	⊖	⊖	●	⊖	10993-5	400 %	86	57
	U 305	650 - 1.050	no	yes	320 - 420	< 8	●	⊖	⊖	⊖	400 %		70	34	
	U 306	17.000 - 23.000 tx	no	yes	300 - 420	< 4	⊖	○	●	⊖	●	10993-5	25 %	91	75
PETG Bondor	U 325	2.000 - 4.000 tx	yes	yes	300 - 420	< 4	●	⊖	⊖	●	○		400 %	85	55
Polycarbonate Bondor	U 331	200 - 300	no	yes	300 - 420	< 4	●	○	⊖	⊖	⊖		200 %	72	50
	U 333	650 - 1.050	no	yes	320 - 425	< 8	●	⊖	⊖	⊖	⊖		400 %	73	36
	U 334	1.000 - 3.000	no	yes	300 - 420	< 3	●	⊖	●	●	⊖		400 %	70	32
PMMA Bondor	U 340	200 - 300	no	no	300 - 420	< 4	●	●	⊖	⊖	⊖		200 %	72	50
	U 343	700 - 1.500	no	no	300 - 420	< 8	⊖	●	⊖	●	○		450 %	68	15
	U 345	1.500 - 2.500	no	no	300 - 420	< 6	●	●	●	●	●		275 %	70	32
Glass Bondor	U 350	200 - 400	yes	yes	300 - 420	< 6	○	○	●	○	●		45 %	82	35
	U 351	200 - 300	yes	no	300 - 420	< 6	⊖	○	●	⊖	⊖		75 %	78	45
	U 356	15.000 - 25.000 tx	yes	yes	300 - 420	< 4	⊖	○	●	⊖	●		25 %	90	75

Temperature Range: -55 / + 120 °C, Color after Curing: clear

● = Highly Recommended, ⊖ = Moderately Recommended, ○ = Not Recommended

<sup>(1)</sup> ASTM D1084

<sup>(2)</sup> Polymerized with Cyberlite 4 LED lamp, 395 nm

## Traditional UV lamps

With regards to traditional UV lamps they are distinguished between;

### Iron doped lamp (F-lamp)

This lamp represents the largest spectrum of the three traditional versions.

- ▶ Gallium doped lamp (G-lamp)
- ▶ Mercury doped lamp (H-lamp)

## LED Technology

In terms of curing adhesives with UV respectively visible light, within LED technology the wavelength range is much more focussed than the more common lamps. Cyberbond has decided to work with the 395 wave length due to various reasons. One is that we operate in the visible light area, which allows the light to penetrate even UV light absorbing parts. The advantages of LED technology are as follows:

- ▶ extraordinary long service life of the lamp
- ▶ switching the lamp on and off does not negatively influence it's long life expectancy
- ▶ instant UV light emission at the rated value when switched on
- ▶ light does not generate heat or ozone / air ionization
- ▶ minimal power consumption
- ▶ very small in dimension, but extremely powerful in performance

LED lights emit cold light only and they do not generate heat. Therefore, they are predestined for use on thermo sensitive parts.

## The bonding process

Besides the kind of lamp respectively light intensity, the polymerisation process is influenced by:

- ▶ Distance of the lamp to the adhesive
- ▶ Adhesive layer thickness
- ▶ Time of illumination
- ▶ Transparency of parts
- ▶ UV light absorbtion, the characteristics of the parts
- ▶ Age of the lamp

Various applications are possible: Bonding, Retaining, Fixing, Sealing, Potting and encapsulating, Coating and marking.

The selection of adhesive depends very much on obviously what is needed. Viscosity and the flowing behaviour become very important. Some questions that need to be asked are:

- ▶ Should the adhesive penetrate or should it stay where applied?
- ▶ The optical impression, is this crucial?
- ▶ Is it necessary to get a completely colourless and transparent product?
- ▶ Or is an adhesive coating or marking required?
- ▶ Is the production process fast and demands a quick system or will a slower system fit better?
- ▶ Is it necessary that the surface be tack free?
- ▶ Should the adhesive layer be hard or more flexible?
- ▶ Are medical approvals required? etc.

## Single-use-Medical Products

UV- and light-curing adhesives are commonly used in the assembly of medical instruments. For instance, they are used for the bonding of needles into plastic syringes. Cyberbond has developed U 303 and U 306, which are two UV products from the medical range. These are approved as follows: ISO 10993-5: Test for in vitro cytotoxicity. In an Agar diffusion test it is checked to see if the product destroys a cell culture.



## Additional Programme



### CB 9056 Primer for Cyanoacrylates

The Primer Cyberbond 9056 enables you to bond unpolare materials such as e. g. Polyethylene (PE), Polypropylene (PP), Polyoxymethylene (POM) as well as modern Thermoplastic Elastomere (TPE) by means of Cyberbond Cyanoacrylate Adhesive. Cyberbond 9056 changes the surface tension. The advantages are:

- ▼ high strength bonding of materials which could not be bonded before,
- ▼ a fast and easy to use method to support bonding,
- ▼ a higher flexibility of choosing materials.

Cyberbond 9056 can be brushed onto the mating parts. After evaporation application of Cyberbond Cyanoacrylate Adhesive can start immediately. The primed parts can also be temporarily stored for 24 h.

### CB 9060 D-Bonder for Cyanoacrylates

Cyberbond 9060 dissolves and removes Cyanoacrylate Adhesives. From its chemical basis point of view Cyberbond 9060 is an organic ester. In contrast to traditional solvents Cyberbond 9060 is notable for its almost non combustibility (flashpoint 109°C). Cyberbond 9060 is especially suitable for:

- ▼ dissolving and removing Cyanoacrylate Adhesive,
- ▼ cleaning of dosing equipment with the advantage of avoiding to leave any condensation, moisture inside the system. Cyberbond 9060 prevents possible pre-polymerisation within the dosing system,
- ▼ cleaning of dosing tips, tools etc. which have been in contact with Cyanoacrylate Adhesives.

### CB 9090, 9096 Activator for Cyanoacrylates

Cyberbond Activator accelerates the polymerisation of Cyanoacrylate Adhesives. The use of Cyberbond Activator is necessary when:

- ▼ adverse environmental conditions (dry air, cold),
- ▼ bridging of bigger gaps,
- ▼ in case inactive materials are involved (does not replace Cyberbond Primer 9056).

Cyberbond Activator can be applied in two different ways:

- ▼ Pre-application: Apply Cyberbond Activator on one part and allow to evaporate. Put Cyberbond Cyanoacrylate Adhesive on the other mating part, assemble quickly and let the adhesive polymerise.
- ▼ Post-application: This application is made possible by using a suitable spray valve. Spray small amount onto the surface of the remaining and non cured adhesive, and allow to polymerise completely.

To achieve a smooth adhesive surface, ensure Cyberbond Activator is sprayed from a suitable distance (about 30 cm).

All Activators are available liquid. CB 9090 is also sold as a 200 ml Aerosol spray can.

### CB FF 303 EU liquid and CB FF 304 EU Aerosol

These Activators are especially designed for the polymerisation of Frame Fast® Cyanoacrylates in the milling and screen graphic industry. The Activator is applied on the liquid, uncured Cyanoacrylate. The adhesive polymerises very quickly so that you can trim the excess fabric and the stretching machine can be used for the next screen, giving the advantage of speeding up assembly considerably.

### CB Conditioner Pen for Cyanoacrylates

Cyberbond offers Primer/Activator combination in a Felt Pen. Simply apply the Conditioner before using the Cyanoacrylates (see previous primer & activator description). The main advantage of the Cyberbond Felt Pen Conditioner is that the surface to be bonded is also cleaned, equating to perfect surface cleaning and conditioning.

Also, these Pens are not considered as dangerous goods according to the European Chemical Law.

### CB 9191 Activator for Anaerobic Adhesives and Sealants

Cyberbond 9191 Activator accelerates the polymerisation of Anaerobic Adhesives and Sealants. The use of Cyberbond Activator is necessary when:

- ▼ adverse environmental conditions (cold),
- ▼ bridging of bigger gaps,
- ▼ in case inactive materials are involved.

Apply Cyberbond 9191 on one part. Put Cyberbond Anaerobic Adhesive on the other mating part, assemble quickly and let the adhesive polymerise. CB 9191 is available as a liquid.

### CB 9999 Cleaner and Degreaser

Cyberbond 9999 is an ozone friendly universal Cleaner for metals. Oil, grease and dirt quite often prevent perfect bonding. For this reason metal parts which have to be bonded should be cleaned and degreased beforehand. To clean simply spray Cyberbond 9999 onto the dirty parts, let the product be effective and wipe it away. Cyberbond 9999 is also suitable to remove residues of adhesives and sealants. Additionally it is also a very good brake cleaner. Quite often plastics are dissolved by solvent based cleaners. Therefore make sure before application that Cyberbond 9999 is suitable for your cleaning process. Should not be applied on varnish or leather. CB 9999 is available as a liquid and as a 500 ml Aerosol.

### LINOP DT Dosing Tips

Cyberbond offers a variety of different metal and plastic dosing tips. Here you can see the plastic dosing tips used on Cyanoacrylate bottles. These dosing tips support a very accurate drop by drop application. We distinguish between:

Yellow dosing tips for the new nozzle:  
LINOP DT s (small)  
LINOP DT m (medium)



## LINOP Equipment



### Dosing

#### LINOP M 1500 and LINOP M 2000 Dosing Units

The microprocessor controlled LINOP M 1500 and LINOP M 2000 dosing units are the most important parts in the dosing system for Cyberbond cyanoacrylates, anaerobics and light cured adhesives. As compact table top units they are suitable for any place of work where exact and reproducible dosing amounts are required. The electronics can also be used to integrate the dosing systems in serial production lines. The control units are designed to apply the smallest drops as well as programmed lines. The units can practically be called "maintenance free".



The difference between the two units is that the LINOP M 1500 controls the pneumatic valves LINOP VCA (Cyanoacrylate) or LINOP VAN (anaerobic) and the LINOP M 2000 unit works with the electrical controlled LINOP EM 24 valve.

The LINOP M 2000 is a dosing unit for Cyberbond reactive adhesives and has been developed with the most up to date knowledge available in microelectronics. The features are:

- ▼ Microprocessors for every control step
- ▼ Operating modes single / permanent impulse available
- ▼ Low voltage 24 V, external power pack ~ 230 V
- ▼ Empty alarm when using a pressure pot with level control
- ▼ Start impulse electric potential free processed
- ▼ Extended dosing time range (from 0.01 to 99.99 s)
- ▼ Extended electronic pressure control (0,01 to 2,00 bar)
- ▼ 5 possibilities to store individual pressure and time regulation
- ▼ Integrated flexible valve holder

A complete dosing system would therefore contain the following:

- ▼ Basic unit
- ▼ Pressure pot with empty alarm
- ▼ Dosing valve
- ▼ Impulse device (footswitch, electrical hand pen or externally controlled)



### Curing by LED

#### LINOP U 400

The LINOP U 400 is the base unit to run the Cyberlite4 or the Cyberlite4 S LED lamps. Up to 4 Cyberlites in parallel can be connected with this device. Each light can be adjusted individually depending on the intensity required. Should 4 positions not be enough, then a LINOP Splitter can be introduced allowing for 3 lights to be connected per exit. This means that with the aid of one device, control of up to 12 Cyberlite4 or Cyberlite4 S lamps is made possible. However, direct activation of each lamp is not possible. Of course this unit can be integrated in a PLC driven process.

#### LINOP Cyberlite4

The Cyberlite4 UV LED light is a very powerful and compact LED curing lamp. Cyberlite4 works best at 395 nm wavelength and can illuminate an area of approx 30 x 30 mm from a distance of around 50 mm. For safety reasons Cyberlite4 is equipped with a temperature sensor that interrupts the flow of electricity as soon as the temperature of the lamp gets above 60 °C. Cyberlite4 can easily penetrate transparent plastics as well as UV opaque plastics. A successful and very fast bond is achieved when the adhesive corresponds with the wavelength of 395 nm.

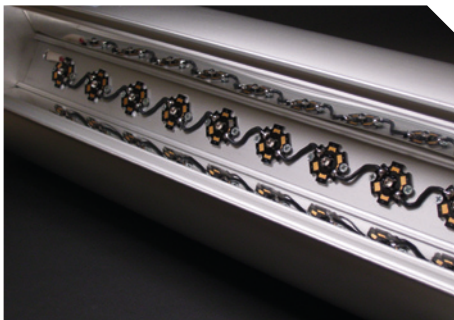
#### LINOP Cyberlite4 S

Additionally, Cyberbond has introduced Cyberlite4 S. The 'S' stands for sensor technique. This sensor technique is especially suitable when used within a PLC controlled process, as monitoring electronics have been increased, compared to the basic version. There is a constant control indicating whether the LED lamps that are connected to the LINOP U 400 unit are actually working and if the lamps are emitting sufficient light. This ensures greater safety in production.

Furthermore, Cyberlite4 and Cyberlite4 S are equipped with a lens system (LINOP Lens) to focus the light. As an option, an extension attachment (LINOP Light Guide 100) is available.

#### CyberFlood 10

The CyberFlood 10 is a LED based floodlight, which illuminates an area of about 40 x 20 cm. It is equipped with 10 LED Lamps based on 395 nm wavelength. Due to the fact that the lamp emits cold light, temperature sensitive parts can be effectively illuminated.



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