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1 Anaerobic Adhesives and Sealants

1.1 Description and Packaging

Anaerobic Adhesives and Sealants cure by means of metal contact and/or due to the absence of air. Due to these facts they are only suitable for bonding and sealing metals. Therefore, as such they are not traditional adhesives as commonly known, but are specifically good for the bonding of metal cylindrical parts where torsion-load and shearing-load play an important part. Furthermore, Anaerobics are excellent sealants for threads and flanges.

Cyberbond products are delivered in thin sided polyethylene bottles or tubes. These allow certain air diffusion. The air in the bottle or tube is needed as a stabilizer. Without air the products would cure. For these reasons the packages are half filled.

Lower and medium viscosities are filled in bottles, higher viscosities are offered in tubes, syringes or dispensers. These packages guarantee the user an easy handling and easy application of the products.

All packages are ergonomically designed. Very good flow control of the products is achievable due to a slight suck-back effect.

1.2 Systematic Series of Products

Cyberbond Anaerobic Adhesives and Sealants are solvent free and one-component systems. These adhesives are relatively unique due to the fact that the strength properties can be adjusted in to:

- ▼ low strength (product groups 10 and 20)
- ▼ medium strength (product groups 30, 40 and 50)
- ▼ high strength (product groups 60, 70, 80, 90)

The selection of the strength class depends on the particular application. Different metals result in different strengths and different setting times. Thus, the product cures on active metals such as brass or copper extremely fast, but then barely reach the strength values gained, approx only 40 %, when construction steel is used. (See chapter 2.1.1). Inactive materials like high-alloyed steel; chrome or nickel plated steel or even electroplated surfaces lead to much longer setting times. This makes the total application possibilities relatively complex.

A further differing criterion is viscosity. Almost all Cyberbond products show, more or less, strong thixotropic nature. This characteristic stops the product flowing away. That said, optimum wetting, even on vertical surfaces is still achieved. Viscosities are differentiated as follows:

- ▼ **L = low viscous (up to about 150 mPa*s)**
- ▼ **M = medium viscous (from about 200 to 2,000 mPa*s)**
- ▼ **H = high viscous (> 2,000 mPa*s)**

Generally, Cyberbond Anaerobic Adhesives and Sealants are used for:

- ▼ **locking of threads (T = Thread locking)**
- ▼ **retaining of threads, shafts, hubs, bearings etc. (R = Retaining)**
- ▼ **sealing of threads (S = Sealing)**
- ▼ **sealing of flanges and surfaces (S = Sealing)**

This means that e.g. the product TM 11 is a thread locker of medium viscosity with low strength. RH 99 is a highly viscous retaining product with high strength.

The colour identification of an adhesive has technically no meaning. Though, the manufacturer generally produces according to the following pattern: Most purple products are low in viscosity, the blue type are of medium viscosity and the red as well as the green ones are of high viscosity. The advantage is that the user can differentiate easily and quickly. However, there are no official set rules regarding these colours.

The classification “thread locking-adhesive and sealant” is supposed to make it easier for the user to choose the most suitable adhesive. Naturally, a thread locker also seals a thread and a sealing product also locks a thread. Overall, an Anaerobic product protects the material from rust.

Cyberbond Anaerobic Adhesives and Sealants distinguish themselves by:

- ▼ **ease of application**
- ▼ **fast curing**
- ▼ **good temperature resistance**
(-55 °C up to 150 °C, “xtra”-products up to +200 °C)
- ▼ **good gap filling ability**
- ▼ **high mechanical strength**
- ▼ **good vibration resistance**
- ▼ **good resistance against many chemicals**

1.3 Application of Adhesive

Generally, Cyberbond products are applied manually and straight out of the bottle or tube. A brush or a foam roller can also apply these products. An automatic or semi-automatic application can easily be realised when a large number of items have to be bonded/sealed. This is achieved by the use of our practical LINOP dosing unit (see special chapter in this book or on our website www.cyberbond.eu)

1.4 Pre-treatment of Surfaces

Generally, Cyberbond Anaerobic Adhesives and Sealants can accommodate small quantities of oil. But to achieve best and re-producible strengths it is necessary to clean contaminated surfaces from grease, oil and dust before bonding. This can be easily achieved by using the universal cleaner CB 9999. This high quality aerosol cleaner achieves good pressure when in use and easily removes contamination from the surface of materials requiring cleaning. The solvent evaporates extremely fast, leaving a clean, dry surface.

Another common degreasing method is treatment with a bath of cold water-based cleaner. Of great importance with this method, is that the bath of water does not get too dirty and that possible oxide layers generated are removed. As these will delay the curing process of the adhesive. Also, any water residue needs to be removed by an adequate drying process.

The following common cleaning methods can be recommended:

- ▼ sand-blasting
- ▼ brushing
- ▼ sandpaper
- ▼ grinding
- ▼ filing

The time between cleaning and adhesive application should be kept as short as is possible, in order to avoid corrosion or repeated pollution of the bonding surfaces.

1.5 Dissolving Bonded Joints

After the use of high strength Cyberbond products there are only two practical methods for dissolving bonded joints due to their high chemical resistance:

- ▼ mechanical with appropriate tools
- ▼ thermal by heating up the bonded joint > 300 °C.

That said, both these procedures might not be achievable if:

E.g. nuts and bolts are in difficult to reach areas and therefore insufficient power can be used to break the joint. In such areas, a medium strength product initially selected may be a better choice.

Successful thermal treatment above 300 °C is really dependant on the whole joint design/construction.

2 Influencing Factors

2.1 Strengths

2.1.1 Relationship of Strength and Cure Speed

There are ...

Active metals:

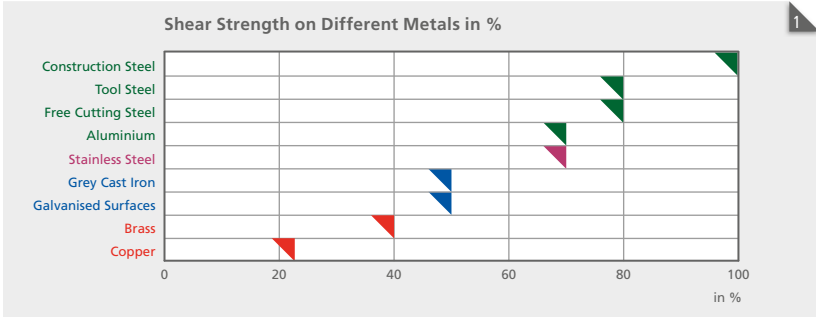
construction steel
tool steel
free cutting steel
brass
copper

Inactive metals:

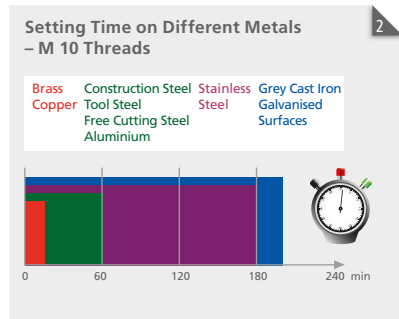
high alloyed steel
aluminium
electroplated surfaces
cast iron

While products used on active metals cure very fast, these same products when used on inactive materials need longer times to cure. But this does not influence the intended strength.

These circumstances are documented briefly in the following drawing [Fig. 1]. The strength values of structural steel represent 100% values. These are mentioned in any table and on any data sheet etc. But if a brass bolt has to be fixed, only 40% of the construction steel value can be reached, albeit very fast.



The drawing [Fig. 2] shows the curing speed of various metals. When using construction steel sufficient time remains to allow adjustment of the bond, but on copper and brass the adhesives cure very fast.



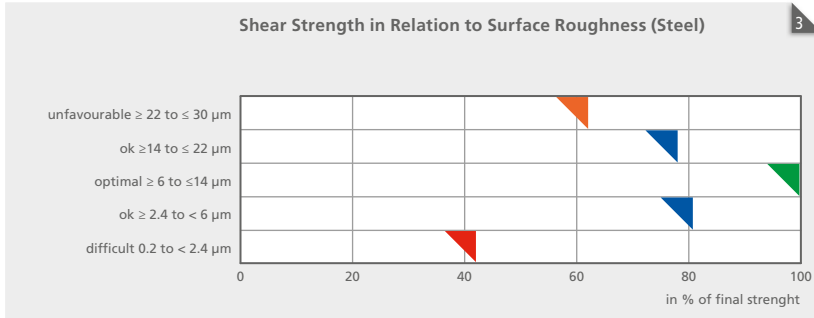
Curing time in minutes of a M 10 thread

- < 15 min brass, copper and their alloy
- < 60 min construction & tool steel, free cutting steel, aluminium (and its alloy)
- < 180 min VY steel resp. high alloyed steel
- > 180 min electroplated surfaces (galvanized, chromed, nickel-plated) grey cast iron

Firstly, from these facts it can be concluded that it is very important to know exactly what is required from thread locking, retaining and sealing applications. For example: we would recommend using a medium strength product on brass, to achieve low strengths.

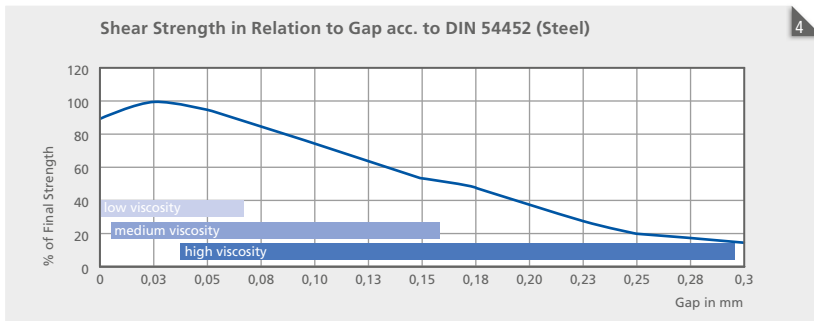
2.1.2 Relation Strength and Surface Roughness

The final strength of an application is influenced greatly by the roughness of the materials involved. The surface should neither be too plain nor too rough. Optimum results can be achieved with a surface roughness of 6 to 14 μm . But the right choice of adhesive is the deciding factor [Fig. 3].



2.1.3 Relationship of Strength and Gap

The following graph [Fig. 4] clearly shows the influence of viscosity with regards to gap filling ability. It is obvious that a gap of more than 0.30 mm can hardly be handled with Anaerobic sealants.



2.2 Chemical Resistance

Cyberbond Anaerobic Adhesives and Sealants are resistant to a great variety of chemicals. But they should not be used with fluids or gases showing a ‘-’ mark.

Liquids

+ acetaldehyde	+ castor oil
+ acetate of lead	+ chloracetic acid
+ acetic acid, cold	- chlorine
+ acetic anhydride	+ chloroform
+ acetone	+ chromic acid
+ acid of ants, cold	+ citric acid
+ acrylonitrile	+ cresol
+ alum, a.s.	+ cutting oil
+ aluminium potassium sulphate	+ dichloromethane
+ ammonium chloride	+ diesel oil
- ammonium hydroxide	+ diethylene glycol
+ ammonium perchlorid	+ distilled water
+ ammonium persulphate	+ ethanol
+ amyl acetate	+ ether
+ amyl alcohol	+ ethereal oils
+ aniline	+ ethyl acetate
- aqua regia	+ ethyl acrylate
+ aviation fuel, kerosene	+ ethylene bromide
- barium hydroxide	+ ethylene chloride
+ benzaldehyde	+ ethylene glycol
+ benzene	+ ethelene glycol ether
+ benzoic acid	+ fermentation lactic acid, cold
+ benzoic benzyl ester	+ freon
+ benzol chloride	+ formaldehyde acid, cold
+ boric acid	+ furfur alcohol
+ brake fluid	+ glycerine
- bromine	+ heptane
+ bunker fuel	+ hexane alcohol
+ butter acid	+ hydrolic oil
+ butyl alcohol	- hydriodic acid
+ butyl aldehyde	- hydrobromic acid
- butyl amine	- hydroflouric acid
+ butyl ether	+ hydrogen cyanide
+ butylene glycol	- hydrogen flouride
+ carbolineum	+ hydrogen peroxide
+ carbon tetrachloride	+ hydrogen sulphide

- + iodine, a.s.
- + iron–II–sulphate, a.s.
- + isopropyl alcohol
- + lead tetraethyl
- + linseed oil
- lithium hydroxid
- + magnesium chloride
- + maleic acid
- + maleic anhydride
- + maleic diethylester
- + malonic acid
- + malonic nitril
- + maltose, a.s.
- + methanol
- + methylethylketone
- + mineral oil
- + nitrobenzol
- nitrating acid
- nitric acid
- + octane
- + oleic acid
- oleum
- oxygen
- + palmitic acid
- + paraffin, liquid
- + pentane
- + perchlorethylene
- perchloric acid
- + petroleum
- + petroleum ether
- phosphoric acid
- + picric acid
- + pit water

- + polyethylene glycol
- potassium dichromate
- potassium hydroxide
- + potassium permanganate
- + propanol
- + propathene glycol
- + propylene glycol
- + pyridine
- + sewage
- + shellac
- + silicon fluid
- + sodium carbonate
- + sodium chloride
- sodium hydroxide
- + sodium thiosulphate
- + styrene
- sulphoric acid
- + sulphur dioxide
- + tall oil
- + tartaric acid
- + tetrahydrofuran
- + toluol
- + trichlorethylene
- + tricresyl phosphate, TCP
- triethanolamine
- + turpentine oil
- + urea, a.s.
- + vaseline
- + water
- + wax
- + xylol
- + zinkosite, a.s.

Gas

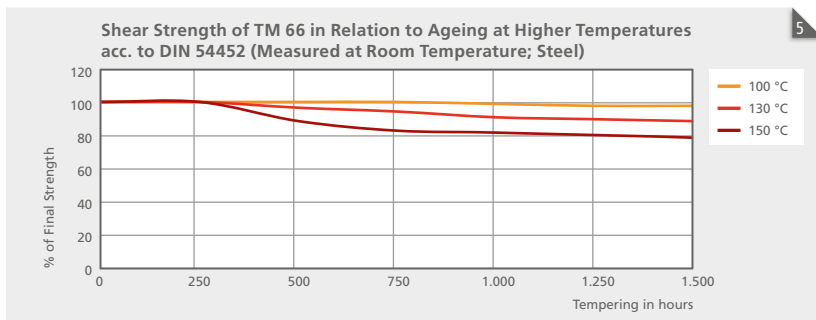
- + acetylene
- ammonia
- + argon
- + butane
- + carbon dioxyde
- + ethane
- + ethylene
- + exhaust gas
- freon gas

- + methane
- + natural gas
- + nitrogen
- + nitrous oxide
- + oxygen (up to 30 bar, 60 °C)
- ozone
- + propane
- water steam

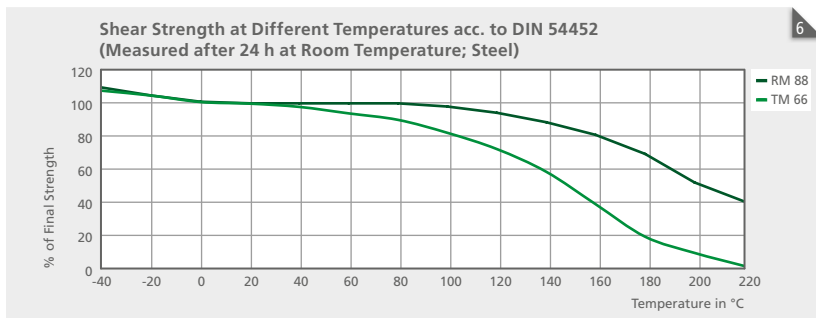
2.3 Temperature Resistance

Cyberbond products are not only very resistant to chemicals but also to temperatures. Generally, good results can be achieved in the range of -30 °C to +150 °C. Using special grades such as RM 88, RH 98 and SM 77 good, long-term stress values can be reached up to 200 °C.

The following graph [Fig. 5] shows the exemplary long-term behaviour of a joint made with the standard product CB TM 66. The measurement of strength is always carried out after the adhesive has cooled down to room temperature. The good ageing values indicate that products cure with little tension and do not tend to have high shrinkage. They can resist even higher temperatures without problems when the extended temperature pressure is very brief.



The next graph [Fig. 6] shows the retained strength of the high temperature-resistant grade CB RM 88 as compared to CB TM66. The shear strength is measured at the relevant temperatures. As the cured layer of adhesive is a type of thermoplastic, the values of the shear strength go down at higher temperatures. However, CB RM88 is superior. At a temperature of 200 °C one still achieves approx 50% of the absolute strength values.



The user needs to carefully decide what sort of percentage of the retained strength is sufficient to achieve a satisfactory bond.

2.4 Quantity of Adhesive Required

When using Cyberbond adhesives it should always be considered that, when applying the adhesive just enough is dispensed and not too much. When observing this advice the adhesive will cure within the gap and no excess fluid will lead to pollution. It should also be considered that 1ml of adhesive corresponds to approximately 20 – 25 drops which is sufficient enough to wet approx 200 – 300 cm².

2.5 Conclusion for the User

Anaerobic bonding and sealing applications are considered as construction joints. They have a direct influence on the reliable functionality of the mating parts. Therefore, it is of great importance that the systematic selection/use of these adhesives is understood.

The strength on copper only achieves 20 to 30% of the strength on construction steel. In order to achieve sufficient strength values on e.g. copper then higher strength products such as CB TM66 should be selected.

If a gear box is not only to be sealed, but an improvement in stiffness against torsion is required, then a higher strength product like CB SH 55 or CB SH 58 should be used; If an improvement in stiffness is not required then a low strength adhesive can be used.

A similar behaviour can be seen when sealing threads. If time is required to adjust the mating parts, then a selection of a slower curing sealant such as CB SH 22 should be made. When larger surfaces are involved, more adhesive is applied, which results in higher strength figures. In this case even a medium strength product such as CB SH 27 will achieve high strength values.

Classifications such as, faster, tighter, stronger etc are relative. They are always dependant on the special application, but due to the vast variety and complexity of Cyberbond anaerobic adhesives available, a solution for almost every problem can be achieved.

3 Application Fields of Anaerobic Adhesives

Cyberbond uses the abbreviations

“T” for Thread locking, “R” for Retaining and “S” for Sealing

3.1 “T” – Locking of Threads (Thread locking)

3.1.1 General Description

Vibration may cause problems such as the self-loosening of threads. By applying the Cyberbond “T” series grades, 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, which seals them and prevents corrosion. Liquid Cyberbond is simply applied straight from the bottle or tube.

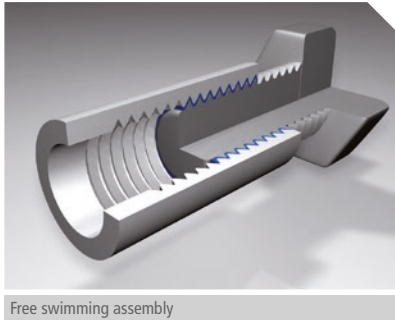


After assembly the product will cure completely and fix the mating parts. The complete thread should be wetted to ensure the load is distributed along the total length of the thread. A slight thixotropic nature of the products helps to prevent the product flowing away and is also responsible for optimal coverage of the thread. By selecting the correct Cyberbond grade, use of mechanical aids may not be necessary at all.

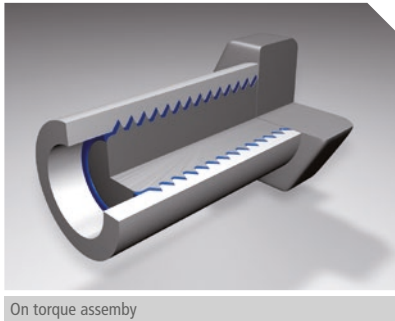
3.1.2 Strength Categories

When choosing a product, consideration should be given 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 undone later, then none other than a medium strength grade such as CB TM 11 or CB TM 44 should be used.

In connection with thread locking, friction values play a special role. The friction value of Anaerobic Cyberbond adhesives is between 0.2 and 0.3. For special applications requiring lower friction values we recommend Cyberbond TM 44.



Free swimming assembly



On torque assembly

3.1.3 Break loose- and Prevailing Torque

The interpretation of the final strength values reached is not always easy. On one hand, the break loose torque in terms of strength is measured in Nm. According to DIN 54454 this value is measured without putting any on-torque on the joint. This is called a 'free swimming' application. In this way the real strength of the adhesive is measured. In practice however, this value is not so relevant as generally on-torques are worked with. In terms of its strength value, the adhesive will reach the 'free swimming' value factor 1,1 to 1,3 in addition to the on-torque value.

When dismantling and the break loose torque reached, the prevailing torque is of certain importance. This is the value you measure after the adhesive film has been broken. Dependent on the different chemicals within the adhesive the prevailing torque value can be higher or lower than the break loose torque. Once the adhesive film is broken there is no defined security left, no matter how high the prevailing torque finally is.

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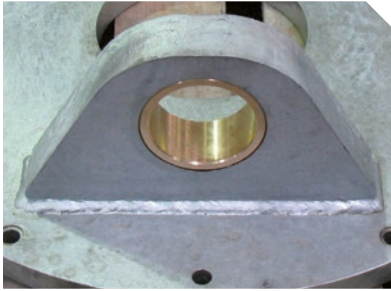
3.2 "R" – Retaining Threads, Shafts, Hubs, Bearings (Retaining)

3.2.1 General Description

Threads, shafts and bearings can be retained durably and reliably. Generally the need to dismantle these joints easily is not required. Therefore, the high strength retainers of the Cyberbond "R" series grades 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 be withstood easily. In contrast to the benefits of these modern liquid retainers, traditional cylindrical assembly methods 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 or even impossible.

When Cyberbond retainers are selected all these disadvantages are overcome. By using a room temperature cured Anaerobic Adhesive, higher strength values can be achieved compared to assembly methods such as; a press-fit where no adhesive is used. When Cyberbond retainers are used the following advantages are gained:



Retaining of bearings

- ▶ small gaps can be bridged, which allows for less costly designed mating parts,
- ▶ friction corrosion is avoided,
- ▶ different elongation figures of mating parts can be balanced.

3.2.2 Different Loading Conditions (see also chapter II 3.2)

1 Axial Load

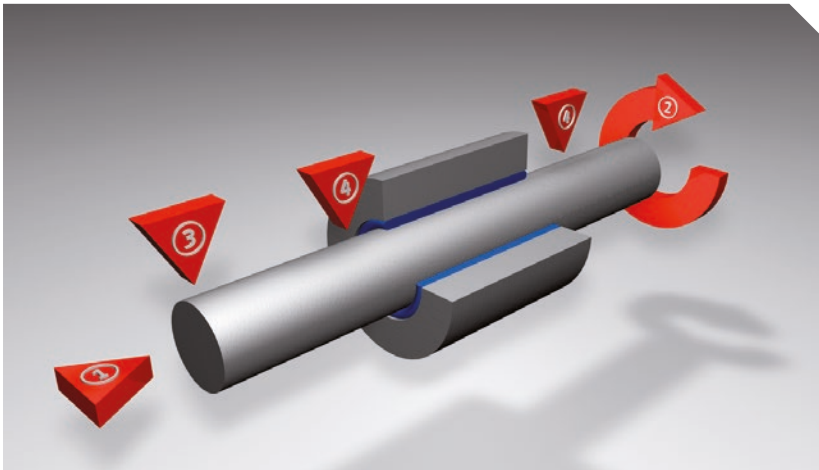
shear strength measured in N/mm^2

2 Torsional Load

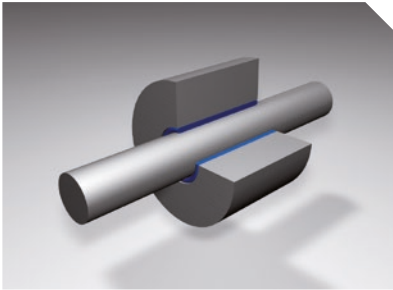
break loose and prevailing torques measured in Nm

3 Bending Load

4 Radial Load



Different Loading Conditions

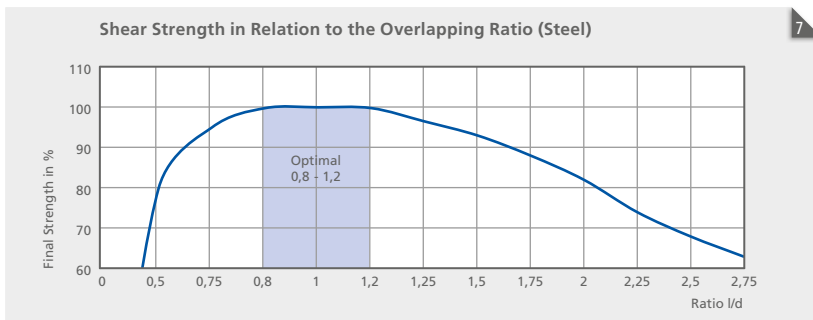


Bonded Cylindrical Assembly

3.2.3 Design of Bonded Cylindrical Assembly

For inserted joints the size of the bonded surface is in relation to torque transfer. The surface relation (l/d) is defined as the ratio of the overlapping length (l) and diameter (d). An optimum tension per mm^2 is achievable with a surface relation of between $l/d = 0.8 - 1.2$. Smaller relations lead to tension peaks. By increasing the length over the optimum range the torque can be increased

even more, but this causes a decrease in strength in relation to the surface. The relation $l/d = 3$ should not be exceeded. The following graph hopefully helps to make this clearer. Also other influencing factors such as material, product etc. should not be disregarded [Fig. 7].



3.3 “S – Sealing Threads” – Sealing

3.3.1 General Description

Other than sealing fine threads, the Cyberbond “S” series can also seal pipe fittings due to their ability to resist most chemicals. Cyberbond products offer outstanding stability against/in chemicals. As with thread locking the space between the threads is completely filled with adhesive/sealant and this seals the fitting. Depending on what 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 polymerization 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 has a huge influence when choosing a Cyberbond sealant. For example, larger threads need more adhesive to fill the space and will give higher torque values when cured. In this case a low strength Cyberbond sealant should be selected, especially if easy disassembly is required.



Sealing Threads

3.3.2 Use on Building Sites and Household Applications

Anaerobic sealants are recommended for industrial applications. Their use in the building industry should be avoided as leaks are provoked by undefined temperatures, re-adjustments and in many cases dirty sealing surfaces.

Craftsmen who want to seal defined and clean threads quite often prefer using Cyberbond Anaerobic Sealant, realising the benefits and advantages they have over traditional methods of sealing, such as Teflon tape or hemp. But consideration should be given to local laws as in each country there are many national gas and tap water approvals that quite often stringently limit the use of an Anaerobic sealant.

3.3.3 Gas- and Drinking Water Approvals

To reach a contemporary new gas-or drinking water approval within the European Union is relatively difficult or simply impossible in some cases. Again, every country has its own laws & regulations. To our mind such an approval may not be crucial for component producers.

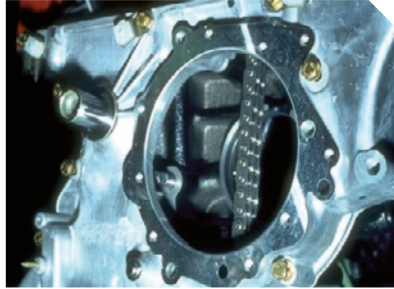
If for example, a gas heater producer needs to seal a component, an approval will be sought on the whole device, which will already incorporate an anaerobic sealant. Therefore, a separate approval of the particular sealant is not necessary. For this reason the producer can work with a tailor made sealant of which can be specified for this application internally.

That said, Cyberbond offers CB SH 27, a product that holds the German DVGW EN 751-1 gas approval. But within Germany such an approval does not allow the use of the product in house installations.

3.4 “S – Flange sealing” (Sealing)

3.4.1 General Description

In many cases Cyberbond “S” series products can be used to replace traditional rigid joint faces. When used to seal a flange, Cyberbond offers the advantage of protecting the joint against corrosion. Within the range there are different strength classes available and the designer has a choice of either allowing the mating parts to be disassembled easily by choosing a lower strength grade or having the ability of improving the mechanical resistance of the whole construction by selecting a higher strength product.



Sealing flanges

3.4.2 Resistance against Oil and Gas

Cyberbond is resistant against most common oils and gases. Also sealing tests below 1 bar can be carried out immediately when parts have been fully assembled. To check the properties fully, respectively before filling the component with a medium, the sealant should have been polymerized by at least 70 % to ensure infiltration is avoided. Another great advantage of the Cyberbond sealant “S” series is that no joint settlement is observed. 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.

3.4.3 Application of Instant Gaskets

Application of the Cyberbond product is achieved in a very fast and efficient manner. In production lines the application can be carried out by a robot or by using silk-screen methods. For smaller applications or in the maintenance of machines etc, Cyberbond can be applied directly from the bottle or tube. A brush can also be used to spread the product. Cyberbond “S” series grades easily seal complicated designs and joints, but it is important that there is a certain overlap width granted (approx 3-5mm minimum around flange holes).

4 Use of Activator

An activator should not be generally used to accelerate the curing of anaerobic adhesives, due to the fact that if cured too quickly there is a decrease in adhesion power. But activators should be used for Anaerobic Adhesives and Sealants when it is necessary to apply thicker adhesive layers e.g. when parts do not fit together very well. Use of CB 9191 activator can also be helpful if less active materials such as, cast iron or electroplated surfaces are involved. The use of CB 9191 is also required at temperatures < 5 °C. Generally the activator should be applied before the adhesive. This leads to surface activation, resulting in a fast and safe polymerization, even if the conditions are not optimal.

5 Dosing of Anaerobics

5.1 Manual Application

Anaerobic adhesives and sealants are very easy to apply manually. Due to a vast viscosity range, Cyberbond offers various product packages. Good emptying properties from ergonomically designed packages are supplied.

5.2 Automatic Application (LINOP programme)

(see also chapter VIII)



Cyberbond offers the LINOP dosing equipment programme in a modular system to meet customers' requirements. Cyberbond's programme starts with simple mobile applicators, semi-automatic units, right up to full automatic dosing systems that are used in serial production processes. It is advisable that before selection of dosing equipment customers should contact Cyberbond specialists for advice. More information can be found on the Cyberbond website and in the chapter LINOP in this book.

6 Rationalization measures

Initially, Anaerobic Adhesives and Sealants seem to be expensive in comparison to other connecting techniques, but on the other hand considerable rationalization measures can be realised:

- ▶ Anaerobic Adhesives and Sealants are used sparingly and can be applied automatically,
- ▶ Anaerobic Adhesives and Sealants are one-component and do not require mixing,
- ▶ Anaerobic Adhesives and Sealants cure without additional energy (heat, pressure, etc.),
- ▶ Anaerobic Adhesives and Sealants are easy to store and transport, as they are solvent-free and therefore not classified as dangerous goods,
- ▶ Anaerobic Adhesives and Sealants replace mechanical fixing elements and therefore reduce the need to stock many different types of traditional fixing parts,
- ▶ Only a small range of products may be required rather than a wide stock holding as a product that seals can also tighten threads and vice versa.

7 The Use of Anaerobics and Potential Dangers

7.1 Processing, storage and disposal

Anaerobics will only cure by means of metal contact and in the absence of air. Long experience with this product group has shown us that there are no dangers when using Anaerobics if typical work place hygiene is implemented. If the skin does come into contact with Anaerobics then the area should be washed as soon as is possible after contact, with soap and water and then ideally a protective skin cream should be applied. Permanent skin contact with Anaerobics must be avoided.

The typical odour of an Anaerobic adhesive and sealant requires that there ideally be sufficient ventilation of the working environment. If working conditions are not optimal then we recommend the installation of an integrated exhaust system directly at the workplace.

Due to the products not curing within the bottles etc completely, consideration should be given to the disposal requirements and ensure that disposal of the remains is carried out in the correct and proper fashion. Packaging must be disposed off in accordance with legal regulations (See regional laws).

Storage of Anaerobics is very easy as the products are solvent-free. They should be stored in a cool and dry place.

7.2 Potential Dangers of Anaerobic Adhesives

7.2.1 Composition of Anaerobic Adhesives

Anaerobics are one component and solvent free adhesives. These products consist of a relatively high amount of differing raw materials (up to 15 chemicals and even more). For this reason, individual products provoke their own different dangers. In Europe, classification of products with hazard potential is carried out via the Material Safety Data Sheet (MSDS). See also chapter "What to consider when bonding?" in this book.

Sections 2 and 3 of a MSDS list all of the chemicals that are of a hazardous nature in a product. Relevant to the particular Anaerobic product is section 15. Here classification of the whole formulated product is listed.

When a producer is using hazardous materials in their products, rules of the MSDS allow certain limits that if possible, are better not to be exceeded; otherwise a worse classification category cannot be avoided. But, this also shows that producers have such a narrow scope to work with in order to get a product classified as "Xi irritant" or "Xn harmful", or to avoid classification completely. However, there are products that neither need to be classified as "Xi" or as "Xn" that contain endangering substances in such low amounts that a determination is not necessary. However, one should not ignore that these products are chemicals.

We would like to emphasise again that the marking of the different precaution sentences will probably change from the year 2011 on. For a transition period both precaution systems are going to be kept valid.

7.2.2 Precautions

Generally speaking Anaerobic Adhesives and Sealants can irritate or sensitize the skin. It is important to keep the workplace clean and;

- ▶ use in well ventilated areas only
- ▶ install suitable exhaust system at the workplace
- ▶ apply as small amount of material as possible and where appropriate use a LINOP dosing system (see LINOP programme in this book or on our website www.cyberbond.de)
- ▶ wear suitable safety glasses and gloves