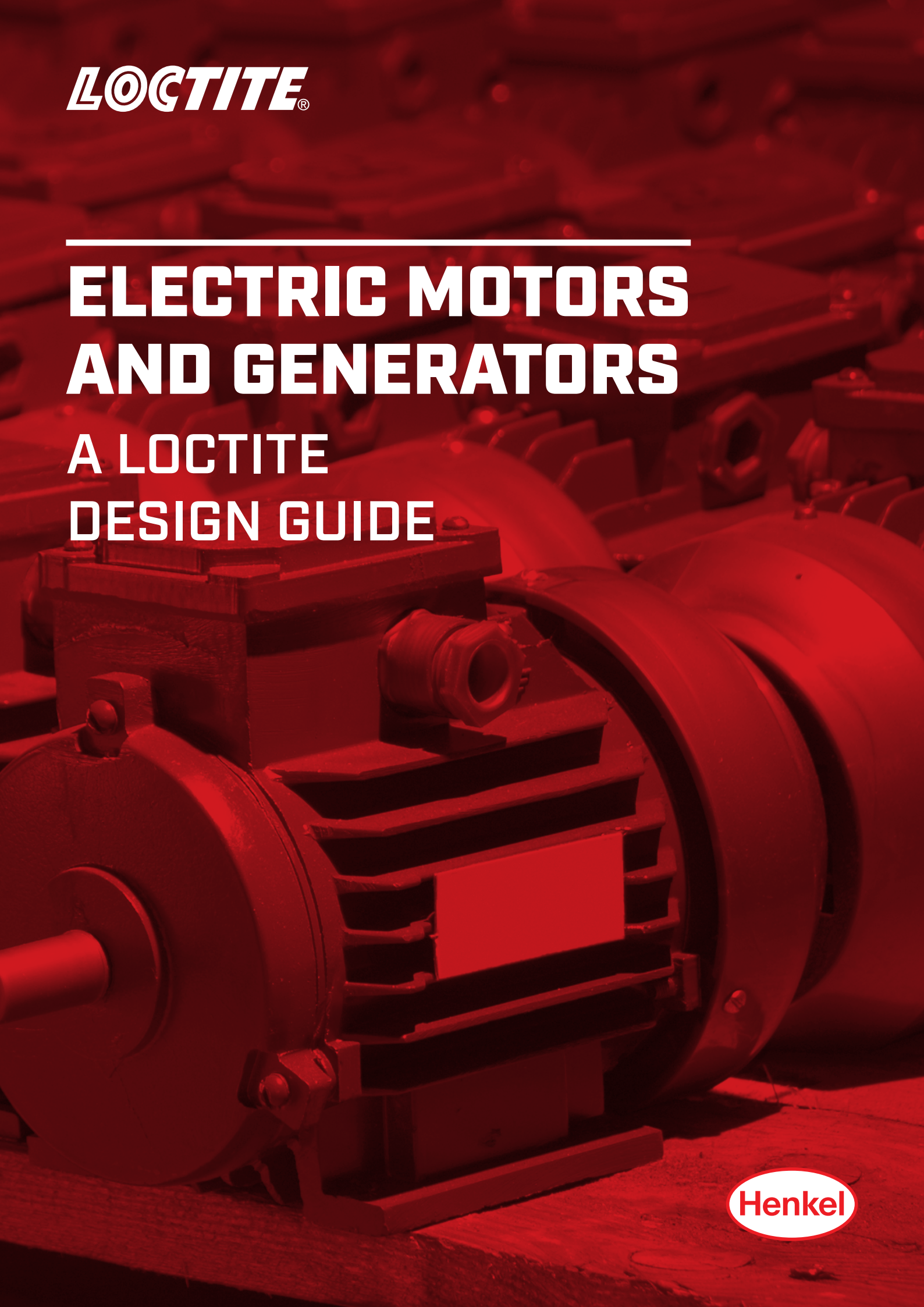
LOCTITE®

ELECTRIC MOTORS AND GENERATORS

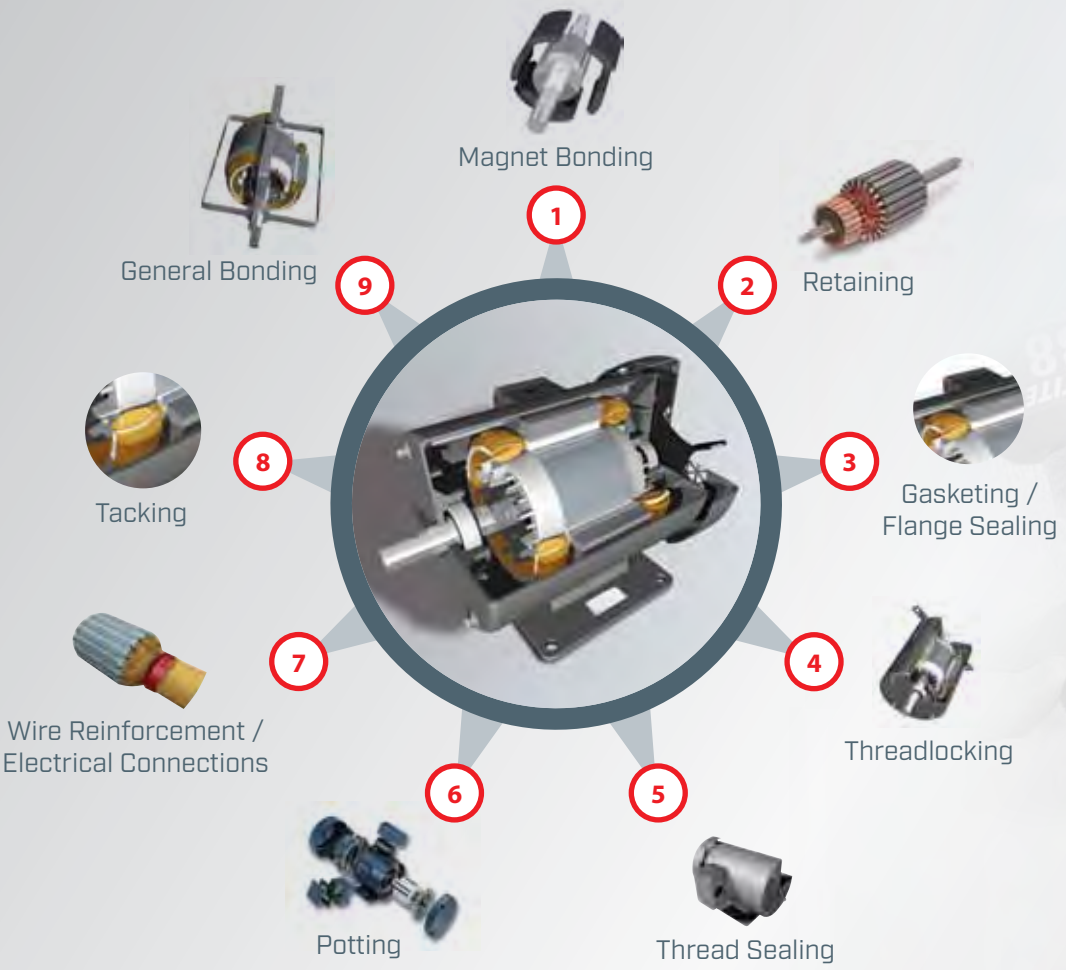
A LOCTITE DESIGN GUIDE



Henkel

LOCTITE®

As an electric motors manufacturer, you face demanding market requirements for increased product durability, greater motor efficiency and lower production costs. Henkel, the leading solution provider for adhesives, sealants and functional coatings, offers expertise throughout the value chain, as well as innovative solutions and dispensing options that provide maximum reliability and cost-effective production.



CUSTOMER PARTNERSHIP

From design and product development to the final manufacturing process, Henkel adhesive specialists provide you with technical support and recommendations to meet your design challenges.

TECHNOLOGY LEADERSHIP

Complete product portfolio recognized in manufacturing and maintenance for delivering exceptional performance.

INDUSTRY KNOW-HOW

We bring a wealth of expertise and experience to our customers to improve efficiency, product reliability and overall costs.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

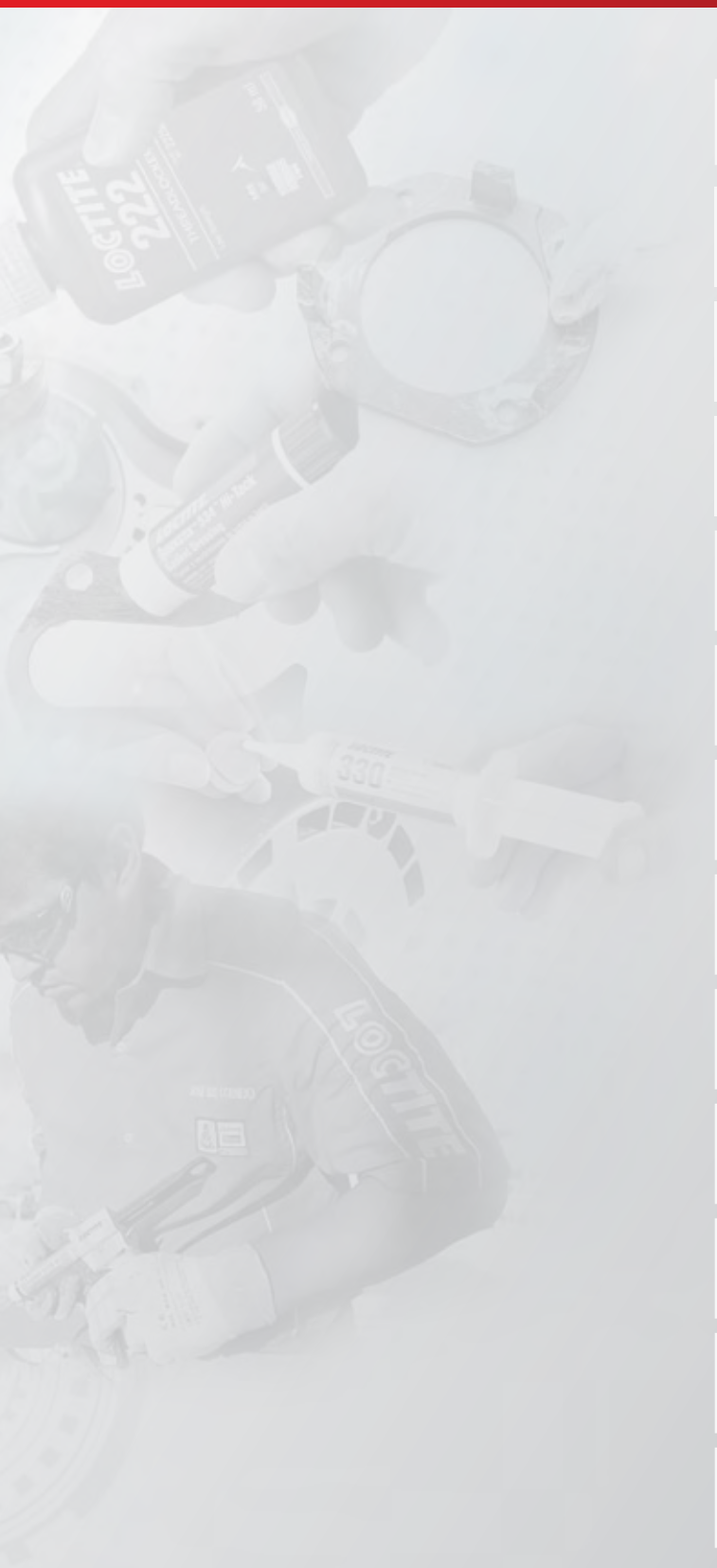
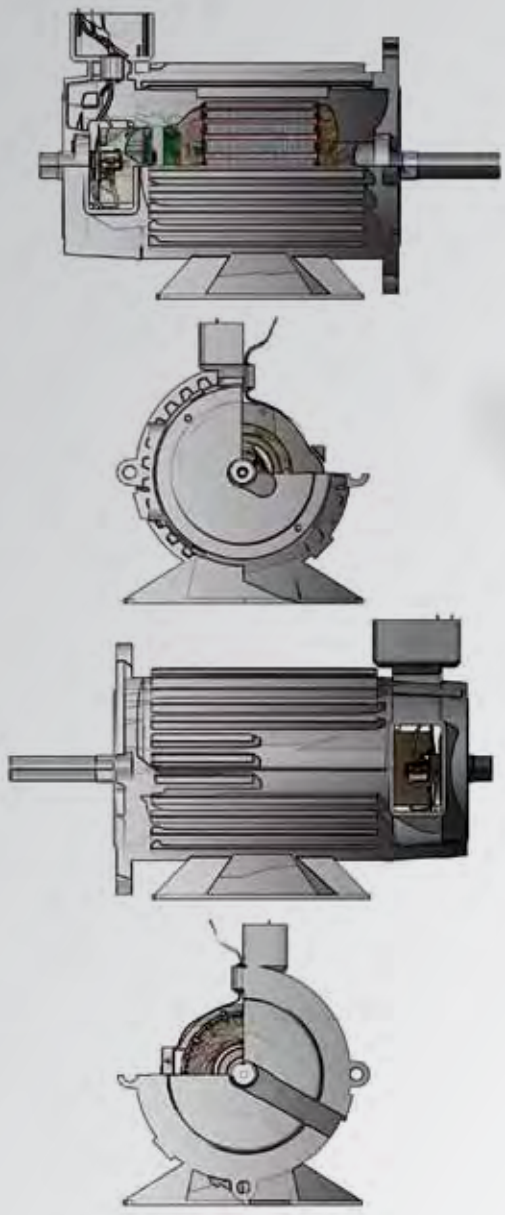


TABLE OF CONTENTS

DC MOTOR CUTAWAY



CONDUIT OR
JUNCTION BOX

WIRE
CONNECTOR

END PLATE

COMMUTATOR

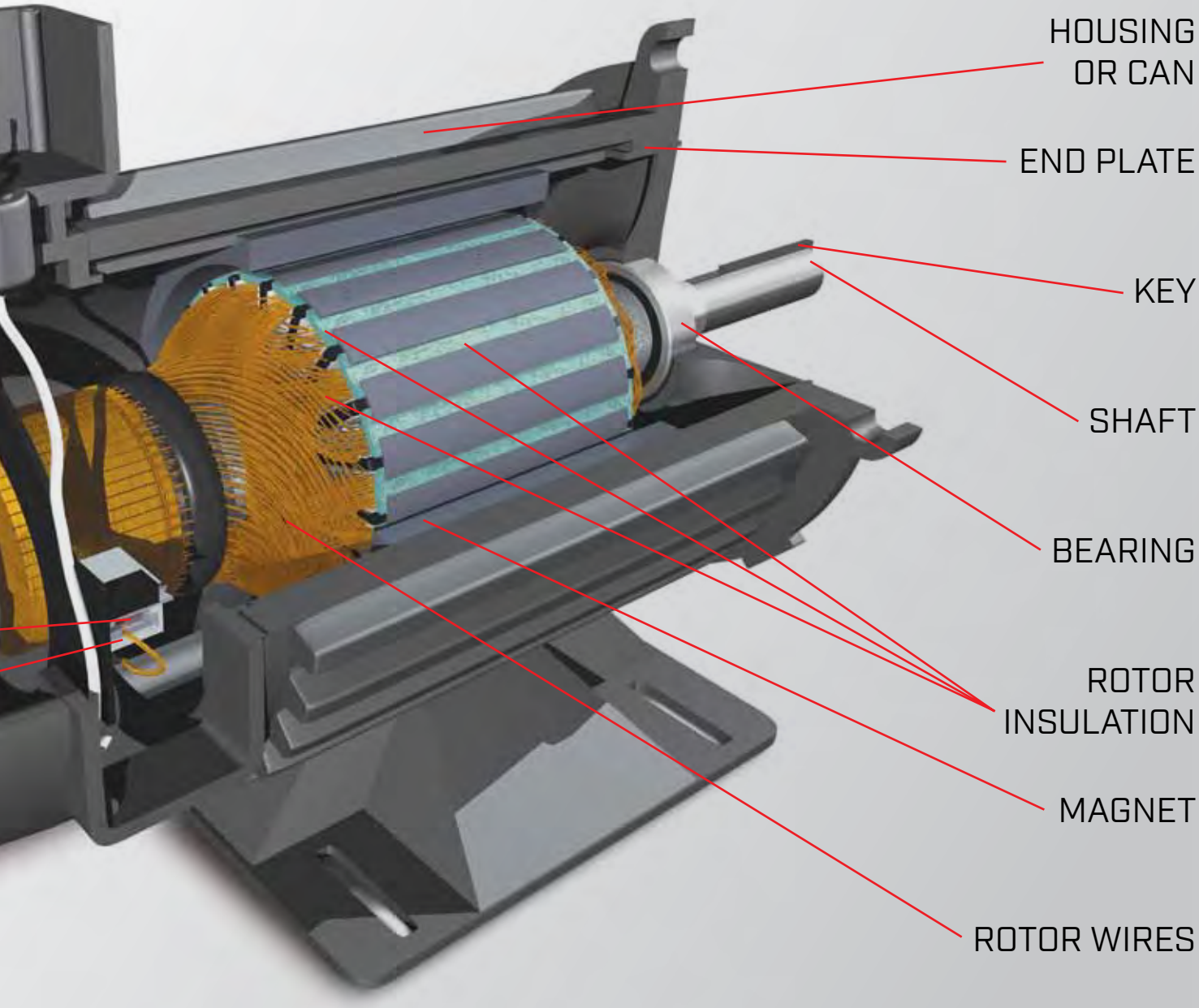
BEARING

BRUSH

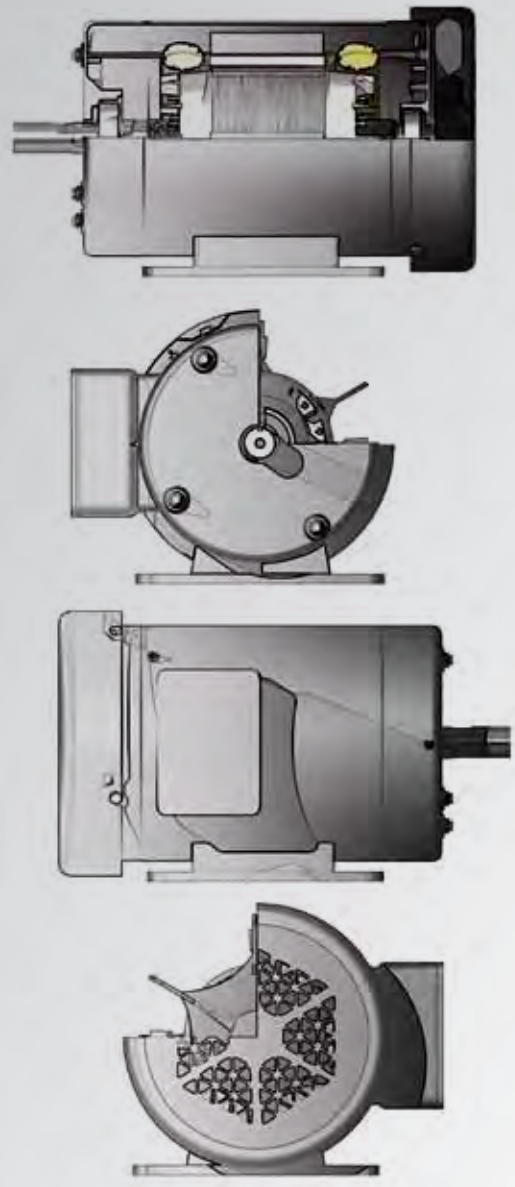
BRUSH
HOLDER

THROUGH BOLT

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in


HOUSING
OR CAN
END PLATE
KEY
SHAFT
BEARING
ROTOR
INSULATION
MAGNET
ROTOR WIRES

AC MOTOR CUTAWAY



STATOR WINDING

STATOR WIRE INSULATION

THROUGH BOLT

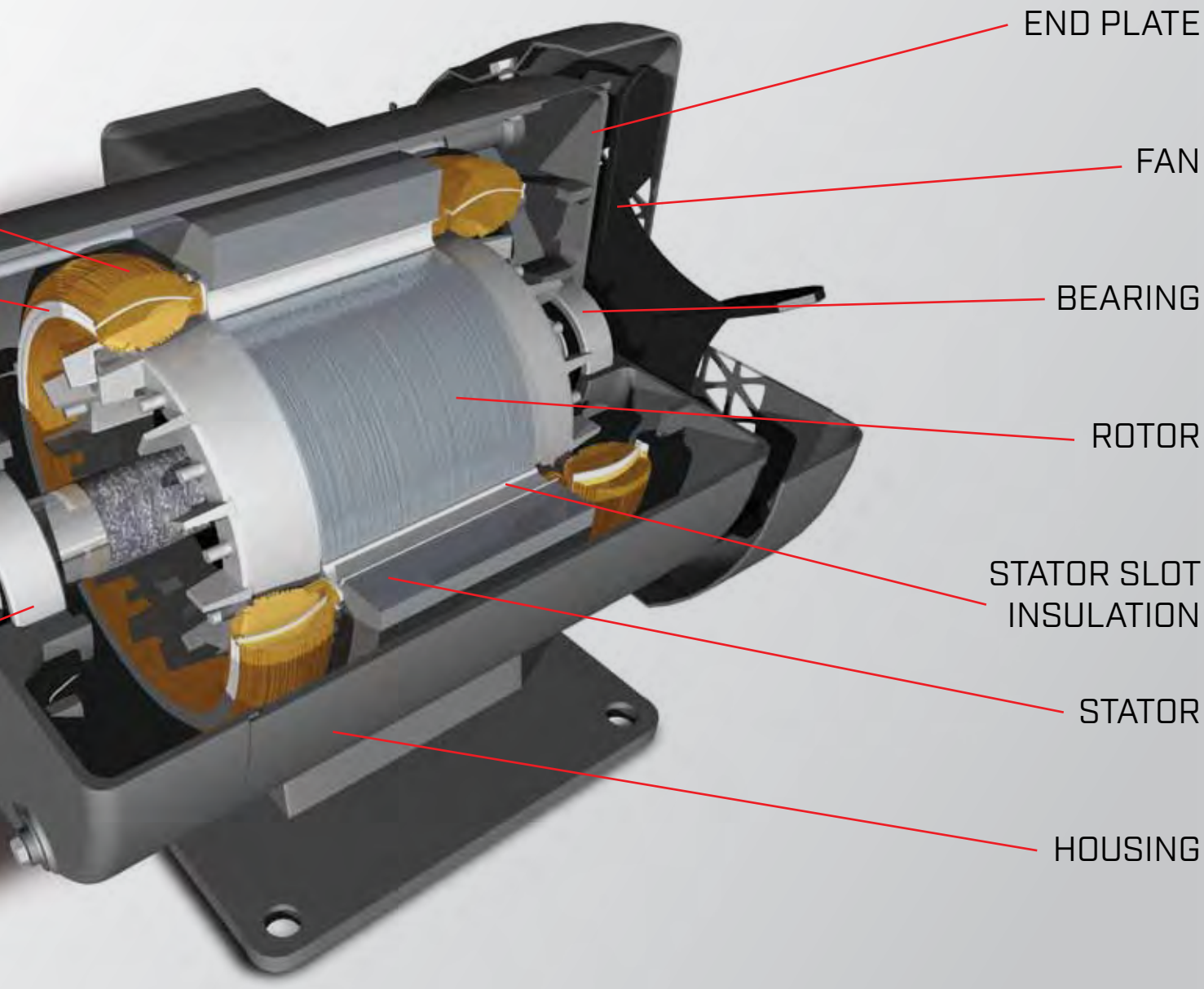
END PLATE

KEY

SHAFT

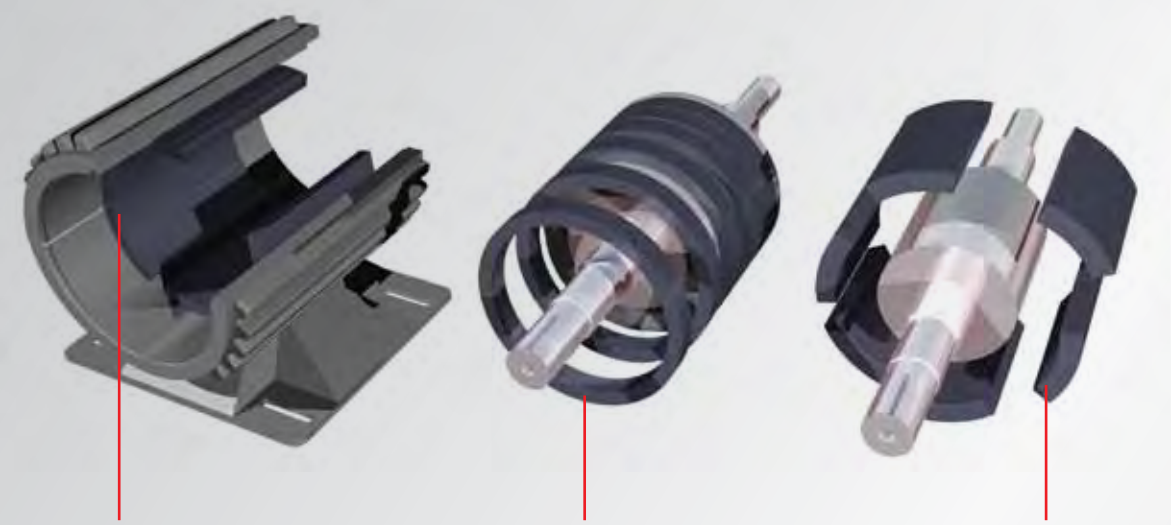
BEARING

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in


END PLATE
FAN
BEARING
ROTOR
STATOR SLOT
INSULATION
STATOR
HOUSING

MAGNET BONDING APPLICATIONS

TYPICAL APPLICATIONS



MAGNET SEGMENTS TO HOUSING

RING MAGNETS TO ROTOR

MAGNET SEGMENTS TO ROTOR

OVERVIEW

Magnets in electric motors are almost exclusively assembled today using adhesives. While a handful of different adhesive technologies are employed to meet the unique challenges of each specific motor's performance and processing requirements, it is widely accepted that adhesives create a higher quality joint at a lower cost than mechanical fasteners such as clips and bolts.

The key benefits of adhesives over clips and bolts are:

- Lower cost components
- Decreased inventory cost
- Easier to automate
- Will not chip magnets
- Prevent vibrational noise
- Prevent corrosion

ADHESIVE TYPE COMPARISON

In general, any of these adhesives can achieve bond strengths that exceed the tensile or compressive strength of the magnet.

As a result, the key performance attributes that typically differentiate these adhesive types are:

- Cure speed
- Gap fill
- Temperature resistance
- Impact strength

Table 1 compares and contrasts the four most commonly used types of adhesives for magnet bonding.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 1 - COMPARISON OF ADHESIVE TYPES FOR BONDING MAGNETS

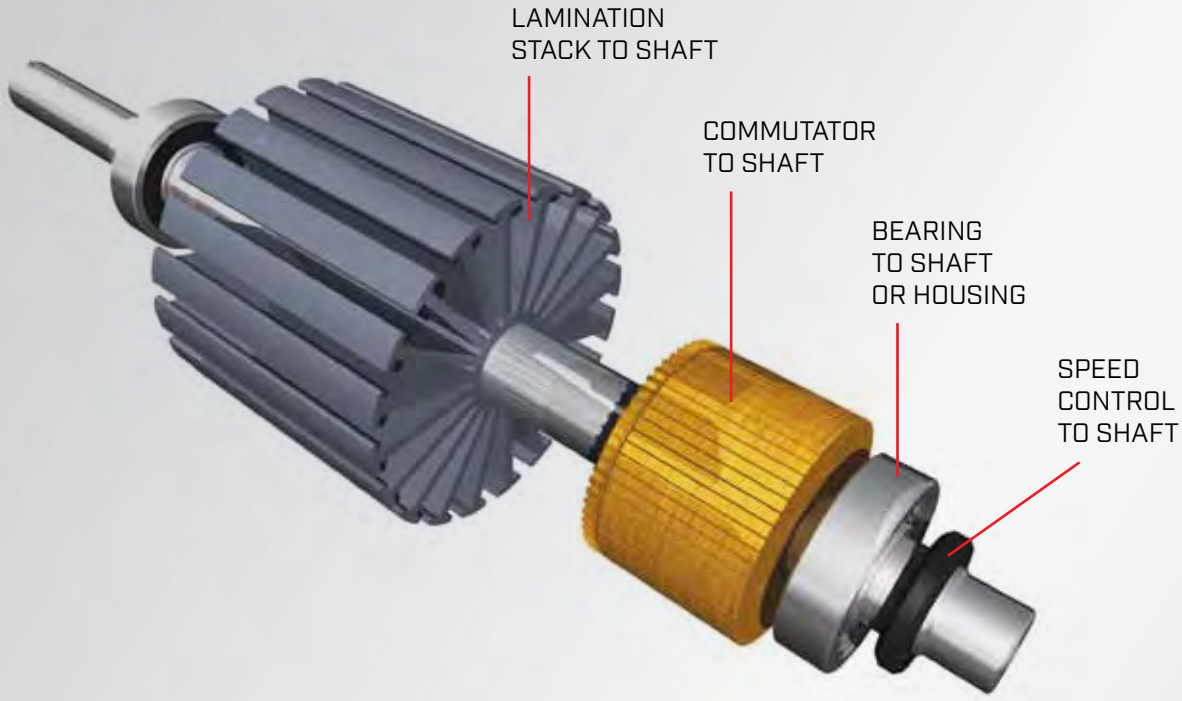
CHEMISTRY		ACRYLIC, TWO-STEP	CYANOACRYLATE	EPOXY, ONE-PART HEAT CURE	EPOXY, TWO-PART
PRODUCTS		• 324 – General purpose • 326 – Fast cure • 334 – High temperature & impact • 3920 – Light cure • A671 – Gap filling	• 480 – Toughened • 4205 – High temperature • 4307 – Light cure • 4090 – Hybrid	• 9542 – General purpose • 9544 – General purpose • 7121 – Toughened • 9423NA – General purpose • 3984 – Fast cure	• E-20NS – General purpose • E-40FL – Flexible • E-20HP – High impact
KEY BENEFITS		• Fast fixture speed • No mixing • High impact strength • Light cure available	• Fast fixture speed • High adhesion to plastics and elastomers • Light cure available	• High gap fill • Excellent temperature resistance • Fully cured in one hour	• Room temperature cure • High gap fill • Excellent temperature resistance • Wide variety of formulations

PERFORMANCE CHARACTERISTICS

GAP FILL	Ideal	0.05 - 0.1 mm	0.02 - 0.07 mm	0.1 - 0.15 mm	0.1 - 0.15 mm
	Maximum	1 mm	0.2 mm	>12.7 mm	>12.7 mm
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 82°C	-53 to 177°C	-53 to 149°C
	Maximum	204°C	121°C	204°C	204°C
IMPACT STRENGTH (STEEL)		Excellent	Fair	Good	Good
FIXTURE TIME	Average	1 - 2 min	20 - 30 sec	30 - 45 min	20 - 30 min
	Fastest	15 - 30 sec	5 - 10 sec	15 - 30 min	3 - 5 min
FULL CURE		24 hours	24 hours	1 hour	24 hours

RETAINING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

Retaining is the structural joining of close-fitting cylindrical parts. Thus, it should be no surprise that most of the retaining applications in electric motors involve bonding rotor components onto the motor shaft. Adhesives have been used in electric motors for decades to augment or replace frictional methods, such as press and shrink fits, and mechanical methods, such as splines, keys, and locking pins.

The key benefits of adhesives over alternative methods are:

- Lower cost components
- Lower energy costs
- Easier to automate
- Eliminates wallowing and backlash of mechanical fits
- Eliminates run-out and warping of shaft
- Prevents fretting corrosion
- Prevents galvanic corrosion

ADHESIVE TYPE COMPARISON

Anaerobic adhesives are the dominant adhesive chemistry for metal-to-metal retaining applications. Anaerobics are single component, high strength, and cure rapidly at room temperature. When used with primers, they can achieve fixture times of less than 10 seconds.

When plastic components require retaining, cyanoacrylate adhesives are often used.

Table 2 compares and contrasts anaerobics and cyanoacrylates for retaining.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 2 - COMPARISON OF ADHESIVE TYPES FOR RETAINING

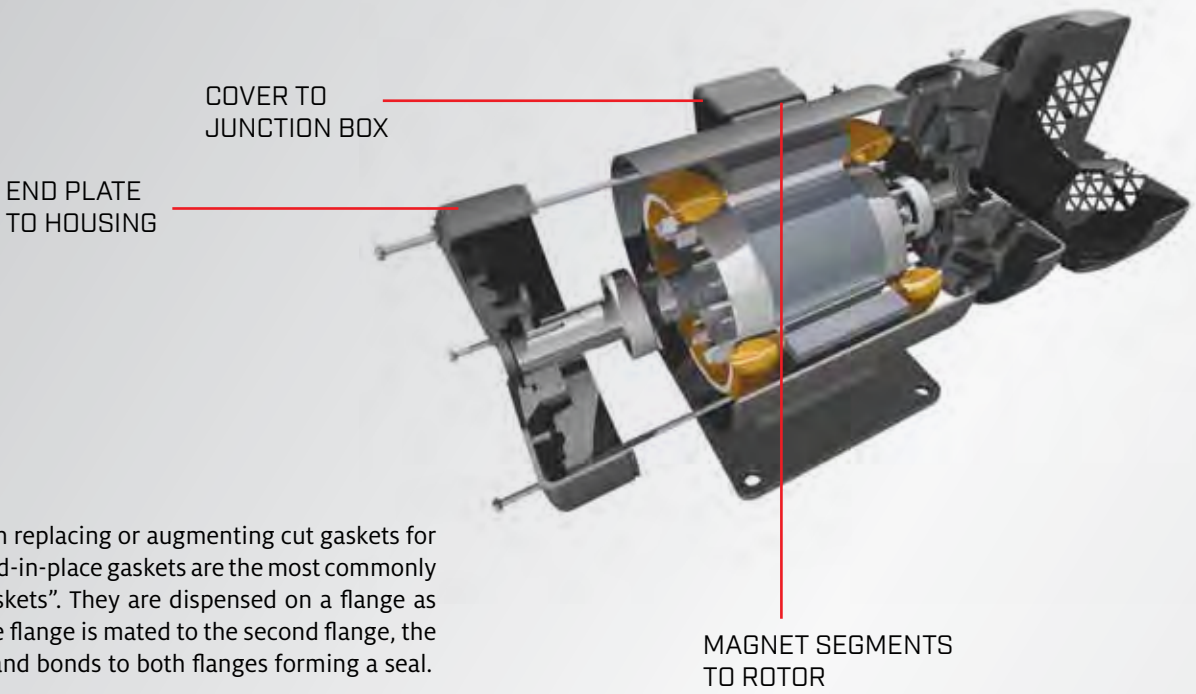
CHEMISTRY	ANAEROBIC	CYANOACRYLATE
	LIQUID	
PRODUCTS	• 603 – General purpose • 648 – Fast cure • 620 – High temperature • 638 – High strength • 290 – Wicking grade	• 480 – General purpose • 4205 – High temperature • 4307 – Light cure
KEY BENEFITS	• High strength • Excellent chemical resistance • High temperature resistance	• Fast cure • High adhesion to plastics and elastomers • Light cure available • Compatible with plastics

PERFORMANCE CHARACTERISTICS

SHEAR STRENGTH (STEEL)		3000 - 4000 psi	2500 - 4000 psi
SUITABLE FOR USE WITH	Metals	Yes	Yes
	Plastics	No	Yes
GAP FILL	Ideal	0.02 - 0.07 mm	0.02 - 0.07 mm
	Maximum	0.2 mm	0.2 mm
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 82°C
	Maximum	204°C	121°C
FIXTURE TIME	Average	5 - 10 min	20 - 30 sec
	Fastest	5 min - Unprimed < 10 sec - Primed	5 - 10 sec
FULL CURE		24 hours	24 hours

GASKETING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

Henkel has been replacing or augmenting cut gaskets for decades. Formed-in-place gaskets are the most commonly used "liquid gaskets". They are dispensed on a flange as liquid. When the flange is mated to the second flange, the liquid hardens and bonds to both flanges forming a seal.

They offer the following benefits over cut gaskets, molded gaskets and o-rings:

- Easy to automate
- No misaligned gaskets
- One adhesive can seal many different flange configurations
- Lower inventory costs
- Lower labor costs
- Lower machining costs
- No gasket creep
- No gasket compression set

When it is necessary to service the gasketed assembly, cured-in-place gaskets can be used. They are robotically dispensed on a flange as a liquid and cured with light or heat. The cured gasket forms a compression gasket that is bonded to one flange. Cured-in-place gaskets share all the same benefits as formed-in-place gaskets with the exception that cured-in-place gaskets are susceptible to compression set.

ADHESIVE TYPE COMPARISON

Formed-in-place gaskets can be created with anaerobic or silicone adhesives and are well suited for manual, semi-automated and fully automated processes. Anaerobic gaskets are generally used on rigid metal flanges. Silicones are better suited for flexible joints with higher gaps. When comparing the light cure and heat cure silicones for cured-in-place gaskets, the light cure silicones have the shortest cure time and the least work-in-process while the heat cure silicones offer higher adhesion, better thermal and chemical resistance, and lower volumetric cost.

Table 3 compares and contrasts the three most commonly used types of adhesives for gasketing.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 3 - COMPARISON OF ADHESIVE TYPES FOR GASKETING

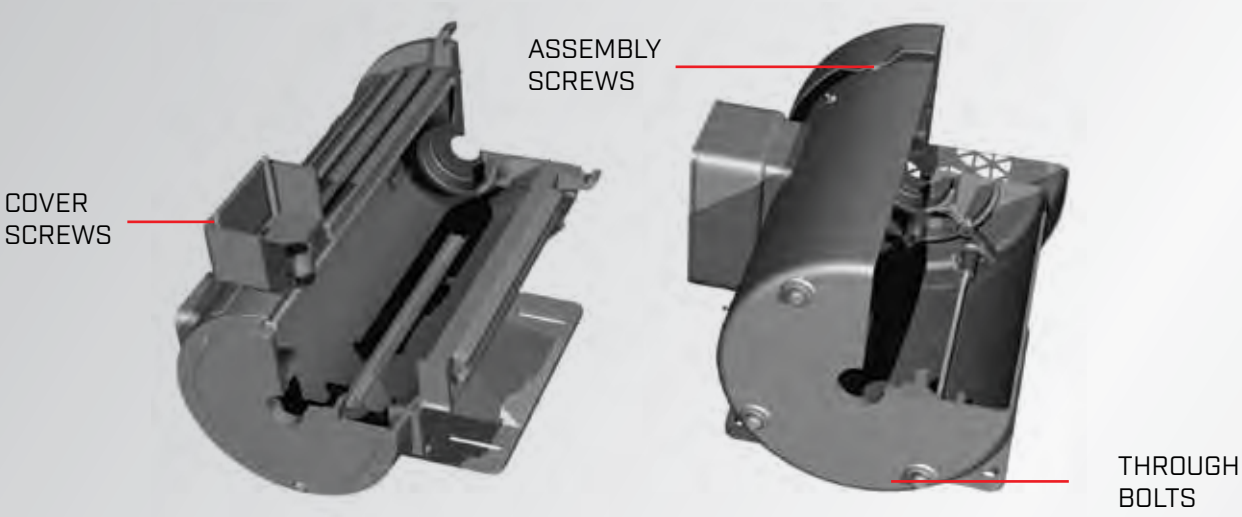
CHEMISTRY		FORMED-IN-PLACE		CURED-IN-PLACE
		ANAEROBIC	SILICONE, RTV	SILICONE, LIGHT CURE
PRODUCTS		• 518 - General purpose • 510 – High temperature • 5188 – Flexible • 574 – High gap	• 5910 – General purpose • 5900 – Instant seal • 5699 – High durometer • 5920 – High temperature	• 5088 – General purpose • 5091 – Highly flexible
KEY BENEFITS		• No compression set • Adds structural strength • High pressure seal	• No compression set • High joint movement • High gap fill • High temperature resistance	• Serviceable • Fastest cure time • Immediate properties • High gap fill

PERFORMANCE CHARACTERISTICS

FLANGE TYPE		Rigid	Rigid or Flexible	Rigid or Flexible
SUITABLE FOR USE WITH	Metals	Yes	Yes	Yes
	Plastics	No	Yes	Yes
GAP FILL	Ideal	0.02 - 0.12 mm	0.1 - 0.15 mm	0.05 - 1.5 mm
	Maximum	0.5 mm	0.6 mm	3.2 mm
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 204°C	-53 to 177°C
	Maximum	204°C	315°C	204°C
CURE SPEED	Initial Cure	15 - 30 min	15 - 30 min	15 - 30 sec
	Full Cure	24 hours	24 hours - 7 days	24 hours - 7 days
MANUAL DISPENSING		Yes	Yes	No

THREADLOCKING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

Threadlockers prevent the loosening of threaded fasteners by completely filling the space between the threads, hardening to a strong polymer and bonding to both sides. Various viscosities and strengths are available to accommodate all fastener sizes. Threadlockers have a long history of improving the performance and reliability of threaded assemblies versus other frictional methods such as lock washers or stop nuts.

The key benefits threadlockers offer are:

- Lower cost
- More effective at preventing loosening
- Simple processing
- Controlled strengths
- Prevent corrosion

ADHESIVE TYPE COMPARISON

Liquid anaerobic threadlockers are the most widely used method to prevent vibrational loosening of metal fasteners. There is a large line of LOCTITE® brand threadlockers that offer a variety of viscosities, colors, strengths, and cure speeds.

When threadlocking plastic fasteners or tamper proofing the heads of screws, cyanoacrylate liquids are normally used. They rapidly cure in plastic joints and will not stress crack most plastics.

Table 4 compares and contrasts the two most commonly used types of threadlocking adhesives.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 4 - COMPARISON OF ADHESIVE TYPES FOR THREADLOCKING

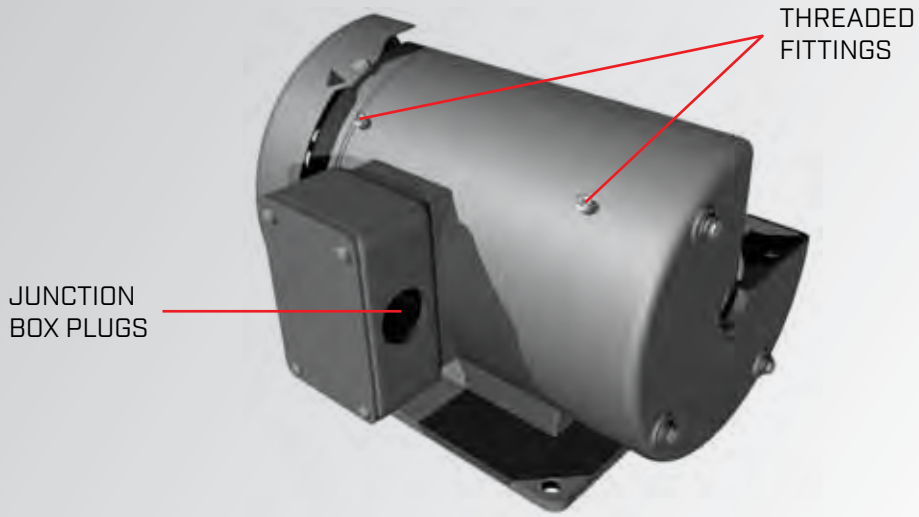
CHEMISTRY	ANAEROBIC	CYANOACRYLATE
	LIQUID	
PRODUCTS	• 243 – General purpose • 222 – Low strength • 263 – High strength • 290 – Wicking grade • 272 – High temperature	• 425 – General purpose
KEY BENEFITS	• Controlled strengths • Variety of viscosities • Color coded by strength • High thermal and chemical resistance • Can post-apply wicking grade products • Wide variety of products available	• Compatible with plastics • Fast cure

PERFORMANCE CHARACTERISTICS

SUITABLE FOR USE WITH	Metals	Yes	Yes
	Plastics	No	Yes
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 82°C
	Maximum	232°C	82°C
CURE SPEED	Fixture	5 - 10 min	1 - 2 min
	Full Cure	24 hours	24 hours

THREAD SEALING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

Anaerobic thread sealants seal and secure metal pipes and fittings by completely filling the space between the threads and hardening to prevent leakage. They have additives that facilitate assembly and maintain controlled strength to allow for easy removal with basic hand tools. The cured product has excellent temperature and chemical resistance that is compatible with many of the most severe operating environments.

Anaerobic thread sealants have been replacing alternatives such as PTFE tape, pipe dope and specialty fittings like dry seal fittings, flared fittings, compression fittings and confined o-rings for decades.

The advantages of anaerobic thread sealants over these methods are:

- Lower cost fittings
- Easy to automate
- No solvents
- Will not shred and contaminate systems
- Easy assembly
- Corrosion protection

ADHESIVE TYPE COMPARISON

Anaerobic thread sealants are the most widely used liquid products for sealing pipe fittings. There is a large line of LOCTITE® brand thread sealants that offer a variety of viscosities, colors, strengths and cure speeds.

When thread sealing plastic fittings, use LOCTITE® No More Leaks, a solvent-based product, or LOCTITE® 55 Pipe Sealing Cord.

Table 5 compares and contrasts the two most commonly used types of thread sealants.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 5 - COMPARISON OF ADHESIVE TYPES FOR THREAD SEALING

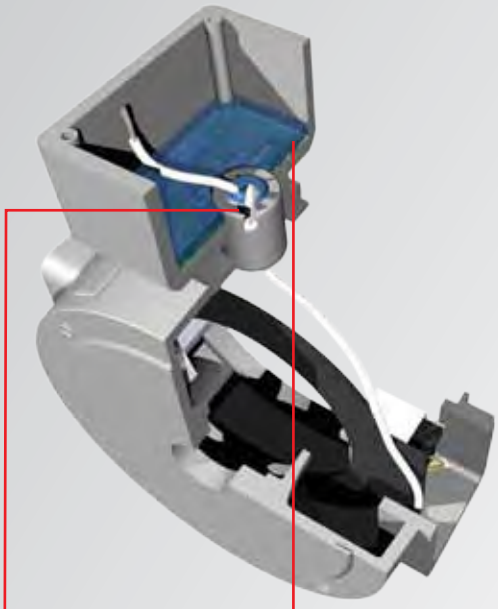
CHEMISTRY	ANAEROBIC	NON-REACTIVE
	LIQUID	
PRODUCTS	• 577 – General purpose • 545 – Hydraulic/Pneumatic • 554 – Refrigerant • 567 – High temperature	• 55 – Sealing cord • No More Leaks – Solvent-based adhesive
KEY BENEFITS	• Controlled strengths • Variety of viscosities • High thermal and chemical resistance • Wide variety of products available	• Compatible with plastics

PERFORMANCE CHARACTERISTICS

SUITABLE FOR USE WITH	Metals	Yes	Yes
	Plastics	No	Yes
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 149°C
	Maximum	204°C	204°C
SEALS OPERATING PRESSURE		4 hours	Instant

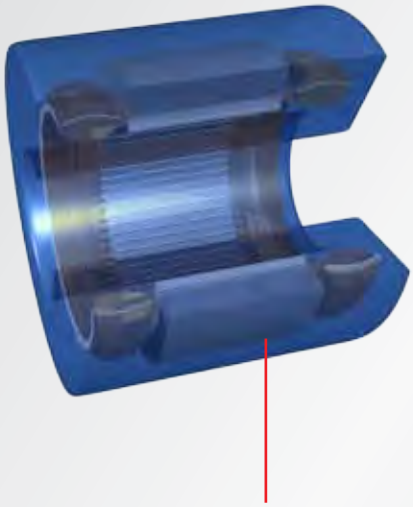
POTTING APPLICATIONS

TYPICAL APPLICATIONS



SEAL WIRE CONNECTORS

PROTECT CONTROLLER BOARDS



ENCAPSULATE STATORS

OVERVIEW

Potting is used to seal motors from solvent and moisture ingress and to protect critical components, such as controller boards, from mechanical damage and degradation caused by thermal cycling, vibration, and impact. To accomplish this, an enclosure is normally filled with adhesive completely encapsulating critical components and sealing the aperture. Potting is essential in explosion-proof motors and wash down motors.

ADHESIVE TYPE COMPARISON

Two-part polyurethanes and epoxies are economical solutions which offer room temperature curing with unlimited cure through depths. As a result, they are often used when potting large volumes. Epoxies generally offer better thermal and solvent resistance than urethanes, while urethanes are lower in cost and have higher flexibility. One-part heat-cure epoxies perform similarly to two-part epoxies but typically have better adhesion to plastics and are fully cured in an hour.

Light curing acrylics and light curing silicones are normally used for shallow potting applications. These chemistries offer much faster processing speeds, but at a higher volumetric cost.

Table 6 compares and contrasts the five most commonly used types of adhesives for potting applications.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 6 - COMPARISON OF ADHESIVE TYPES FOR POTTING

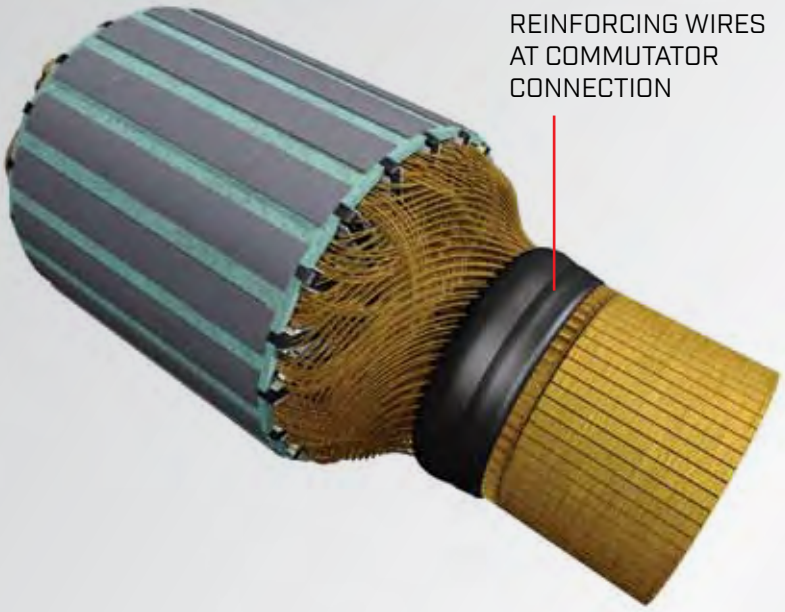
CHEMISTRY	ACRYLIC, LIGHT CURE	EPOXY, ONE-PART HEAT CURE	EPOXY, TWO-PART	SILICONE, LIGHT CURE	URETHANE, TWO-PART
PRODUCTS	• 3972 – General purpose • 3971 – Low viscosity • 3944 – High adhesion to metals • 3926 – High adhesion to plastics	• 3981 – General purpose • 3982 – Medium viscosity • 3985 – High viscosity	• E-60NC – General purpose • 3140/3164 – UL 1446 & UL 94HB • 3144/3162 – UL 94 V-0	• 5031 – General purpose • 5088 – Non-corrosive	• 3173/3183 – General purpose • 3173/3182 – Fast cure • 3173/3184 – UL 94 V-0
KEY BENEFITS	• Fast fixture speed • Fast full cure • Good adhesion	• High gap fill • Excellent temperature resistance • Fully cured in one hour	• High thermal resistance • High chemical resistance • Excellent adhesion • UL 1446 recognized	• Fast fixture speed • Flexible • Excellent chemical resistance to polar solvents • Good temperature resistance	• Low cost • Flexible • Excellent UV resistance

PERFORMANCE CHARACTERISTICS

ADHESIVE TO SUBSTRATES	Metals	Good	Excellent	Excellent	Good	Good
	Plastics	Excellent	Good	Good	Fair	Very Good
	Paper	Excellent	Excellent	Excellent	Good	Good
GAP FILL	Ideal	0.5 - 3.17 mm	1.2 - 6.4 mm	1.2 - 6.4 mm	0.5 - 3.17 mm	1.2 - 6.4 mm
	Maximum	6.4 mm	12.7 mm	12.7 mm	6.4 mm	12.7 mm
Tg		30 - 80°C	50 - 90°C	50 - 90°C	< -40°C	-10 - 50°C
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 149°C	-53 to 149°C	-53 to 177°C	-53 to 121°C
	Maximum	177°C	204°C	204°C	204°C	149°C
FIXTURE TIME	Average	30 sec	30 - 45 min	30 min	45 sec	30 min
	Fastest	5 - 10 sec	15 - 30 min	5 - 10 min	30 sec	5 - 10 min
FULL CURE		30 sec	1 hour	24 hours	24 - 72 hours	24 hours
EQUIPMENT REQUIRED		Light Source	Cure Oven	Two-Part Dispense Equipment	Light Source	Two-Part Dispense Equipment

POTTING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

The wires in a motor or generator are critical to its operation. One broken or loose wire will keep the motor or generator from functioning. To protect against wire breaks, manufacturers normally unitize the wires in rotors and stators with varnish. The solvent based varnishes that are used may be sufficient for many applications, but do not offer enough protection for all applications. For example, it is very common to reinforce the wires that connect to the commutator in DC motors when the motor will be in service in high impact or vibration service environments such as in power tools or in sink garbage disposals. In these applications, the thin coating of varnish on the wires that connect to the commutator do not offer sufficient reinforcement to prevent the flexing fatigue that can lead to failure. To reinforce these wires, a medium viscosity epoxy coating is applied that is thin enough to surround the wires, but thick enough to build up a rigid coating.

ADHESIVE TYPE COMPARISON

For high volume production, one-part heat cure epoxies are often the optimum method for reinforcing wires. They are easy to process, have excellent electrical properties, and can normally be dispensed and cured in the varnish trickle cure oven. Since the epoxy coating is being cured in the varnish cure oven, it does not add any work-in-process or time to manufacture to the process and the equipment and maintenance costs are very low.

Two-part epoxies are generally used in work cells where it is desired to dispense the adhesive manually and allow it to cure at room temperature.

Table 7 compares and contrasts the two most commonly used types of adhesives for wire reinforcement.

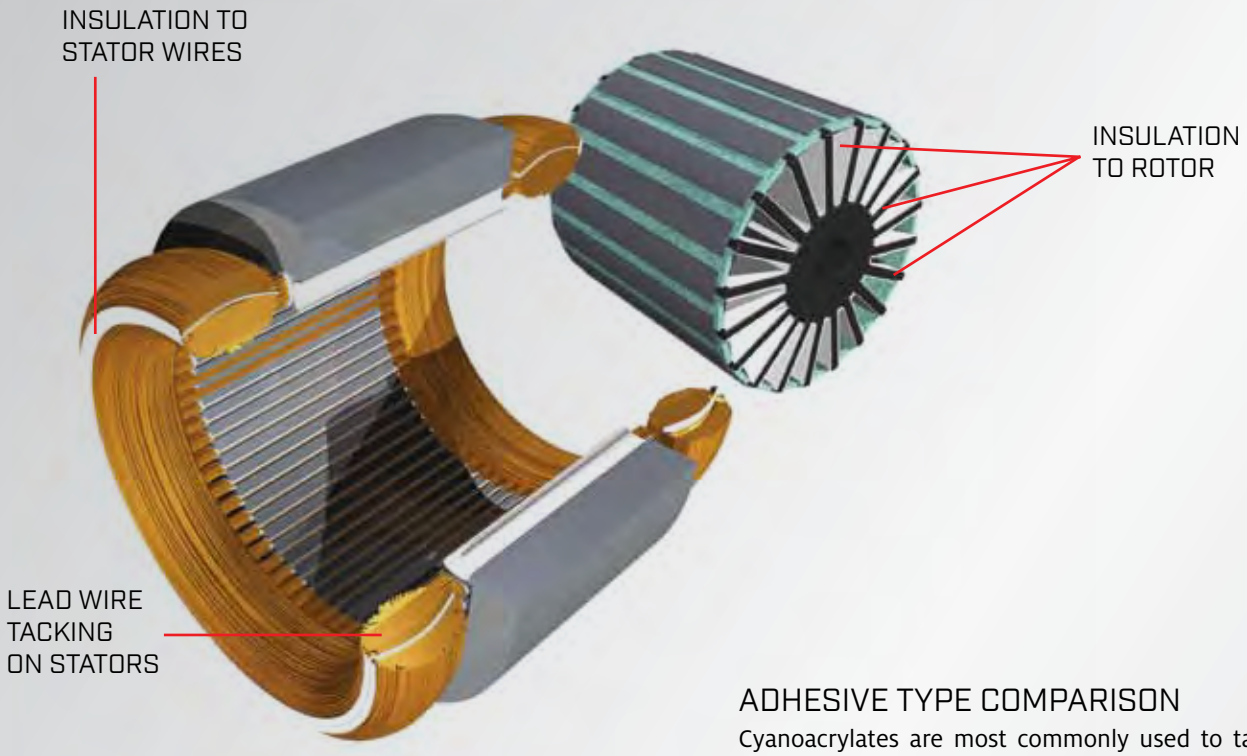
1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 7 - COMPARISON OF ADHESIVE TYPES FOR WIRE REINFORCEMENT

CHEMISTRY		EPOXY, ONE-PART HEAT CURE	EPOXY, TWO-PART
PRODUCTS		• 3985 – General purpose	• E-40FL – General purpose • E-20HP – High impact
KEY BENEFITS		• Can cure adhesive in varnish cure oven • No mixing required	• Room temperature cure • Can accelerate cure with heat
PERFORMANCE CHARACTERISTICS			
ADHESIVE TO SUBSTRATES	Metals	Excellent	Excellent
	Plastics	Good	Good
	Paper	Excellent	Excellent
GAP FILL	Ideal	1.27 - 2.54 mm	1.27 - 2.54 mm
	Maximum	>12.7 mm	>12.7 mm
TEMPERATURE RESISTANCE	Typical Range	-53 to 177°C	-53 to 149°C
	Maximum	204°C	204°C
FIXTURE TIME		30 - 60 min	20 - 30 min
FULL CURE		1 hour	24 hours

TACKING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

Tacking applications are bonding applications where the adhesive is used to fixture the assembly very quickly. Adhesives are commonly used to tack lead wires, individual wires and insulation in electric motors. It is very common to tack lead wires and individual wires into position to reinforce them. Tacking is also used as a processing aid to ensure that the insulation on a motor or generator remains in the correct position until the entire assembly is unitized with varnish. This prevents electrical shorts caused by the insulation moving during subsequent operations such as mechanical shaping of the stator wires in large motors and generators.

ADHESIVE TYPE COMPARISON

Cyanoacrylates are most commonly used to tack small parts. They require no equipment, cure rapidly at room temperature, achieve very high strengths to most substrates and any excess can be quickly cured with accelerator or light.

Hot melt adhesives are normally used on larger parts due to their low volumetric cost. They have fast cure speed, good adhesion to most substrates and can be sprayed from hand held applicators.

Light cure acrylic adhesives offer virtually unlimited positioning time with cure-on-command capability. If light can reach the joint, such as when wire tacking or through insulation paper, light cure is often the most user friendly process.

Table 8 compares and contrasts the two most commonly used types of adhesives for tacking applications.

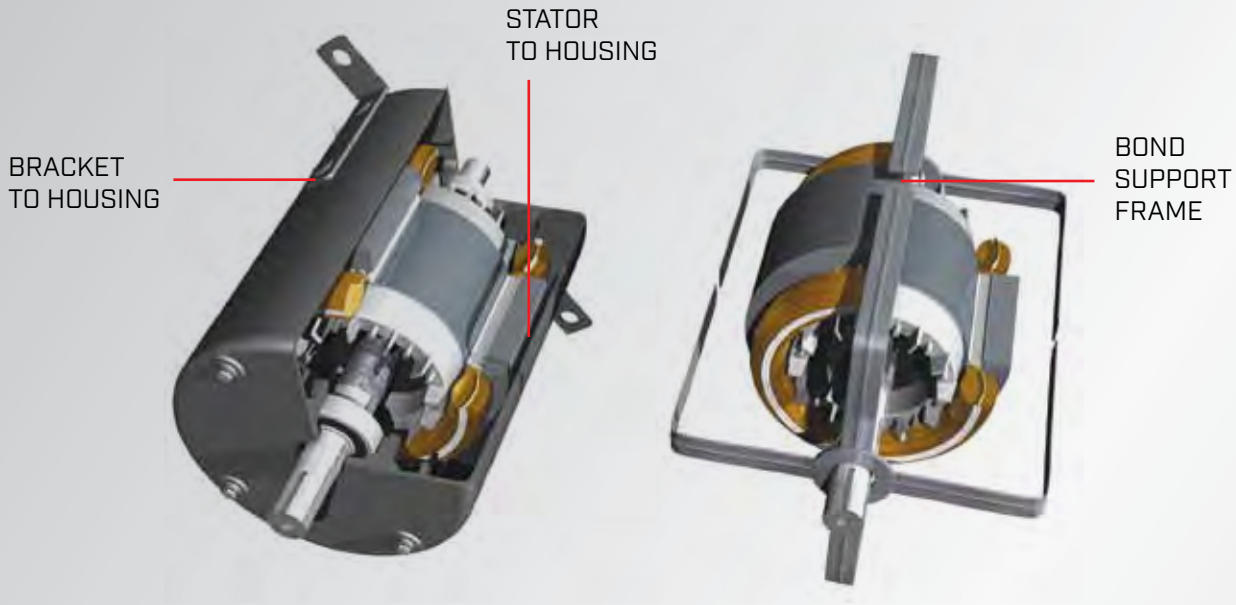
1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 8 - COMPARISON OF ADHESIVE TYPES FOR TACKING

CHEMISTRY		ACRYLIC, LIGHT CURE	CYANOACRYLATE
PRODUCTS		• 3972 – General purpose • 3971 – Low viscosity • 3944 – High adhesion to metals • 3926 – High adhesion to plastics • 3526 – Activator cure	• 480 – General purpose • 4205 – High temperature • 4307 – Light cure
KEY BENEFITS		• Fast fixture speed • Fast full cure • Good adhesion to metals, plastics and paper	• Fast fixture speed • High adhesion to most substrates • No equipment required • Light cure available
PERFORMANCE CHARACTERISTICS			
ADHESIVE TO SUBSTRATES	Metals	Good	Very Good
	Plastics	Excellent	Excellent
	Paper	Excellent	Excellent
GAP FILL	Ideal	0.05 - 0.25 mm	0.02 - 0.07 mm
	Maximum	6.35 mm	0.25 mm
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 82°C
	Maximum	177°C	121°C
FIXTURE TIME	Average	30 sec	20 sec
	Fastest	5 - 10 sec	5 - 10 sec
FULL CURE		30 sec	24 hours
EQUIPMENT REQUIRED		Light Source	No

GENERAL BONDING APPLICATIONS

TYPICAL APPLICATIONS



OVERVIEW

General bonding applications are usually characterized by the use of an adhesive as the sole means of structurally joining two parts that have a relatively small gap between them, typically 0.002" to 0.10". Adhesives are widely used for bonding applications instead of welding, soldering, ultrasonic welding, riveting, mechanical fasteners, and tapes.

The key benefits of adhesives over these alternative methods are:

- Lower cost
- Easily automated
- Distribute stresses evenly
- Better cosmetic appearance
- Bond dissimilar substrates

ADHESIVE TYPE COMPARISON

There are a wide variety of adhesives that can be used for general bonding applications.

The key selection criteria involves, but is not limited to, the following adhesive properties:

- Cure speed
- Temperature/environmental resistance
- Cost
- Adhesion to substrates
- Processing requirements (dispensing and curing)

Table 9 compares and contrasts the four most commonly used types of adhesives for bonding.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

TABLE 9 - COMPARISON OF ADHESIVE TYPES FOR GENERAL BONDING

CHEMISTRY		ACRYLIC, TWO-STEP	ACRYLIC, TWO-PART	CYANOACRYLATE	EPOXY, TWO-PART
PRODUCTS		• 324 – General purpose • 326 – Fast fixture • 334 – High temperature & impact • 3920 – Light cure • A671 – Light cure	• H3000 – General purpose • H3151 – Metal bonding • H8000 – High impact • H8600 – Severe Environment	• 480 – General purpose • 4205 – High temperature • 4307 – Light cure • 4090 – Hybrid	• E-20NS – General purpose • E-40FL – Flexible • E-20HP – High impact
KEY BENEFITS		• Fast fixture speed • No mixing • Good adhesion to metals and ceramics • Excellent toughness • Light cure available	• High gap fill • Structural strengths • High impact strength • Able to cut through surface contaminants	• Fast fixture speed • High adhesion to most materials • Light cure available	• Room temperature cure • High gap fill • Excellent temperature resistance • Wide variety of formulations
PERFORMANCE CHARACTERISTICS					
ADHESIVE TO SUBSTRATES	Metals	Excellent	Excellent	Very Good	Excellent
	Plastics	Fair	Very Good	Excellent	Fair
	Paper	Excellent	Excellent	Excellent	Excellent
GAP FILL	Ideal	0.05 - 0.1 mm	0.1 - 0.15 mm	0.02 - 0.07 mm	0.1 - 0.15 mm
	Maximum	1 mm	>12.7 mm	0.25 mm	>12.7 mm
TEMPERATURE RESISTANCE	Typical Range	-53 to 149°C	-53 to 149°C	-53 to 82°C	-53 to 149°C
	Maximum	204°C	204°C	121°C	204°C
FIXTURE TIME	Average	1 - 2 min	15 - 30 min	20 - 30 sec	20 - 30 min
	Fastest	15 - 30 sec	3 - 5 min	5 - 10 sec	3 - 5 min
FULL CURE		24 hours	24 hours	24 hours	24 hours
EQUIPMENT REQUIRED		No	Two-Part Dispensing	No	Two-Part Dispensing

PRODUCT INFORMATION

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

LOCTITE®

Introducing LOCTITE
Universal Structural Bonders.

Limitless Bonding.
For Limitless Design.

1800 2333 562 | marketing.acmindia@henkel.com | www.henkel-adhesives.com/in

Henkel

LOCTITE®
BONDERITE®
TECHNOMELT®
TEROSON®
AQUENCE®

Henkel Adhesives Technologies India Private Limited

Mumbai
Corporate Office

L & T Seawoods, Grand Central,
401, B Wing, 4th Floor, Tower 1,
Seawoods, Navi Mumbai - 400 706,
Maharashtra, India.
Phone : +91 22 7130 1300

Chennai

Arunodayam, No. 14 & 16,
Raman Street, North Boag Road,
T. Nagar, Chennai - 600 017,
Tamil Nadu, India.
Phone : +91 44 7199 7000

Pune

Survey No. 234, 235 and 245,
India Land Global Industrial Park,
Phase 1, Hinjewadi, Pune - 411 057,
Maharashtra, India.
Phone : +91 20 7199 7000

Delhi

74, Industrial Corporation,
Mehrauli Gurgaon road,
Gurgaon - 122 001,
Haryana, India.
Phone : +91 0124 509 7000

Factory

D3/D4, MIDC Industrial Estate,
Jejuri, Purandhar, Pune - 412 303,
Maharashtra, India.
Phone : +91 2115 718 000

www.henkel.in

www.henkel-adhesives.com/in

www.linkedin.com/company/henkel-adhesives