



COVID-19 Treatment / Devices

Henkel Adhesive Solutions Pandemic COVID-19

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Intro - Intention of this slide collection

We all are eager to contribute to the world's efforts to protect people and save lives against the COVID-19 virus. Masks, respirators and ventilators are broadly discussed as needed, but availability is limited. Agile companies switch their production or develop new devices. Henkel wants to contribute to the efforts with our know-how and potential solutions.

The following content explains

- Different PPE protection devices (variety is high) and devices for patient treatment
- The medical class of the device (as higher the class as higher the regulations for this device, as more complex to create a new design)
- Volumes indicated in public discussions
- Materials and the potential Henkel solutions

Disclaimer: The slides presents the author's understanding; no claim for correctness or completeness.

› COVID-19 Treatment / Devices

PPE-Protection Devices

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Face Masks

Simple masks, Surgical Masks (no filter)

Protect others from speaking/breathing/coughing spillage

- **Discussed needs:** Multiple Billions
- **Medical class:** Class 1 for surgical masks, none for others
- **Manufacturer:** Plenty, e.g. fabric companies
- **Materials:** Fabrics
- **Connection method:** sewed

Henkel potential solution: None



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Protection Masks

Filter Masks with filter – FFP2 – Filter Face Piece class2

Protect the user against virus – for medical personnel

- **Discussed needs:** Hundreds of millions
- **Medical Class:** Class3
- **Manufacturers:** Medical Device Manufacturers (+ support)
- **Materials:** Fabrics + Plastics + Filter
- **Connection method:** sewed, bonded

Henkel potential solution: Hotmelts, Cyanoacrylates, Light Cure Acrylics

Note: Adhesives tested to ISO 10993 biocompatibility required



Bonding filter into PP fabrics:

- CA, e.g. Loctite 4011 + Primer
Loctite SF 7701
- LC-CA, e.g. Loctite 4311 + Primer
Loctite SF 7701
- LCA: Plasma-treat the PP + bond with Loctite AA 3963 cured with Loctite CL30

Bonding parts inside filter:

- Hotmelts, CA, LC-CA, LCA

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Protection Shield

Transparent shield to protect eyes and face

Protect the user against virus – for medical, dentist or counter personnel

- **Discussed needs:** Hundreds of millions
- **Medical Class:** None
- **Manufacturers:** Plenty, Industrial
- **Materials:** Plastic shield on foam / plastic / fabrics
- **Connection method:** Bonding

Henkel potential solution: Cyanoacrylates, Light Cure Acrylics, Light Cure Cyanoacrylates, Hotmelts, Spray adhesives, industrial or medical grades.

Note: Adhesives tested to ISO 10993 biocompatibility may be required



Bonding visor to PP foam:

- Spray adhesive VR 5000
- CA, e.g. Loctite 4541 + Primer Loctite SF 7701
- LC-CA, e.g. Loctite 4311 + Primer Loctite SF 7701

Bonding visor into PP head cover:

- Primer LC-CA, LCA
- Hotmelt, Loctite PA 6951

› COVID-19 Treatment / Devices Patient Care



COVID-19 Treatment / Devices

Oxygen supply – for Respiratory / Ventilators

Oxygen regulators, humidifier, flow control ...

Provide oxygen-rich air for respiratory or ventilation systems

- **Discussed needs:** Hundred thousands (non-disposable)
- **Medical Class:** 1 (maybe2)
- **Manufacturers:** Medical Device manufacturer
- **Materials:** Metal threads, tube, housings
- **Connection method:** Sealing, Bonding

Henkel potential solution: 2k-Epoxies,

Light Cure Acrylics, Cyanoacrylates,

Note: Adhesives tested to ISO 10993 biocompatibility required



Sealing threaded joints:

- Loctite EA M-31CL
- Loctite HY 4090
- Loctite 4601

Bonding and Sealing of plastic parts:

- Loctite AA 3926
- Loctite 4081

Bonding plastic parts in pressure control units:

- LC-CA, e.g. Loctite 4311 + Primer Loctite SF 7701
- LCA, e.g. Loctite AA 3961

Note: All our adhesives are compatible with pure oxygen at RT atmospheric pressure conditions. For conditions >1.5 bar, or >50°C please contact us.

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Respiratory – Breathing tubes

Breathing tubes, simple breathing masks

Provide oxygen rich breath to the patient

- **Discussed needs:** Millions (disposables)
- **Medical Class:** 1 (maybe 2)
- **Manufacturers:** Medical Device manufacturer (+support)
- **Materials:** Tube/connector
- **Connection method:** Solvent Welding or Bonding

Henkel potential solution:

Light Cure Acrylics, Cyanoacrylates

Note: Adhesives tested to ISO 10993 biocompatibility required



TPE or PP tubes into PC or PVC connector:

- CA, e.g. Loctite 4011 + Primer Loctite SF 7701 (applied on TPE or PP)
- LC-CA, e.g. Loctite 4310 + Primer Loctite SF 7701 (applied on TPE or PP)

Note: Tight fitting PVC-tubes can be bonded, but also solvent welded. PVC-Tubes with a gap are hard to be solvent-welded. Contact us for an adhesive solution.

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Respiratory / Ventilators

Mechanical ventilation of the patient

Provide oxygen rich air to patients, no longer able to breath by themselves

- **Non-invasive ventilation**
 - Breathing masks
- **Invasive ventilation by tracheal tubes**
 - Resuscitator
 - Tracheal tubes
 - Ventilators
 - Controller, Monitor, ...



To see more about the variety of respiratory system, look to the respective websites of respiratory suppliers

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Respiratory / Ventilators – Subcomponent Resuscitator

Resuscitator

**Mechanical ventilation of the patient
(in combination with a mask or
tracheal tubes)**

- **Discussed needs:** Hundreds of thousands
- **Medical Class:** 1 (maybe 2)
- **Manufacturers:** Medical Device manufacturer (+support)
- **Materials:** Tube/connector; Connector balloon; Mask
- **Connection method:** Solvent Welding or Bonding



Henkel potential solution: Light Cure Acrylics, Light Cure Silicones, Cyanoacrylates.

Note: Adhesives tested to ISO 10993 biocompatibility required

Tube to valve, tube to bag, tube to reservoir bag:

- CA, e.g. Loctite 4011
- LC-CA, e.g. Loctite 4310
- LCA, e.g. Loctite AA 3951

Mask dome to cushion:

- LCA, e.g. Loctite AA 3953
- LC-Si, e.g. Loctite SI 5055

Note: Tight fitting PVC-tubes can be bonded, but also solvent welded.

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Respiratory / Ventilators – Tracheal tubes

Tracheal Tubes

Provide breath to the patient (directly into the lung)

- **Discussed needs:** Hundreds of thousands
- **Medical Class:** 2 (maybe 3)
- **Manufacturers:** Medical Device manufacturer
- **Materials:** multi-lumen tube, balloon
- **Connections:** Balloon/connector, lumen closure, lumen/connector
- **Connection method:** Heat shrink, Solvent Welding, Bonding

Henkel potential solution: Light Cure Acrylics, Cyanoacrylates

Note: Adhesives tested to ISO 10993 biocompatibility required



Balloon onto lumen:

- Note: This is a high-risk application. Severe testing needed. Contact us for proper product selection

Lumen closure:

- Loctite AA 3341

Note: Tracheal tubes are high risk devices, medical class2 / class 3.

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Respiratory / Ventilators – Mechanical Elements

Mechanical “Oscillating” Element

Movement for breathing (oscillating)

- **Discussed needs:** Hundreds of thousands
- **Medical Class:** 1 (maybe 2)
- **Manufacturers:** Medical Device manufacturer (+support)
- **Materials:** Metals, bolts, ...
- **Solutions:** Bonding, Bolting, Welding, ...

<https://www.fierceelectronics.com/electronics/what-trade-offs-to-make-a-low-cost-ventilator-design-ask-doctor>

Henkel potential solution: Medical two-component epoxies, machinery adhesives.

Note: Adhesives tested to ISO 10993 biocompatibility may not be required

Treadlocking:

- Loctite 243
- Loctite EA M-31CL

Bonding pin into bore:

- Loctite 638
- Loctite EA M-121HP

Fixation of bearings:

- Loctite 648
- Loctite EA M-21HP

Note: If you use machinery adhesives you should clean off excess.

Using Med 2k epoxies, you gain same function + excess cure + ISO 10993 testing

Respiratory / Ventilators – Electronic Devices

Monitor, Controller

Mechanical Ventilation to patient (into the lung)

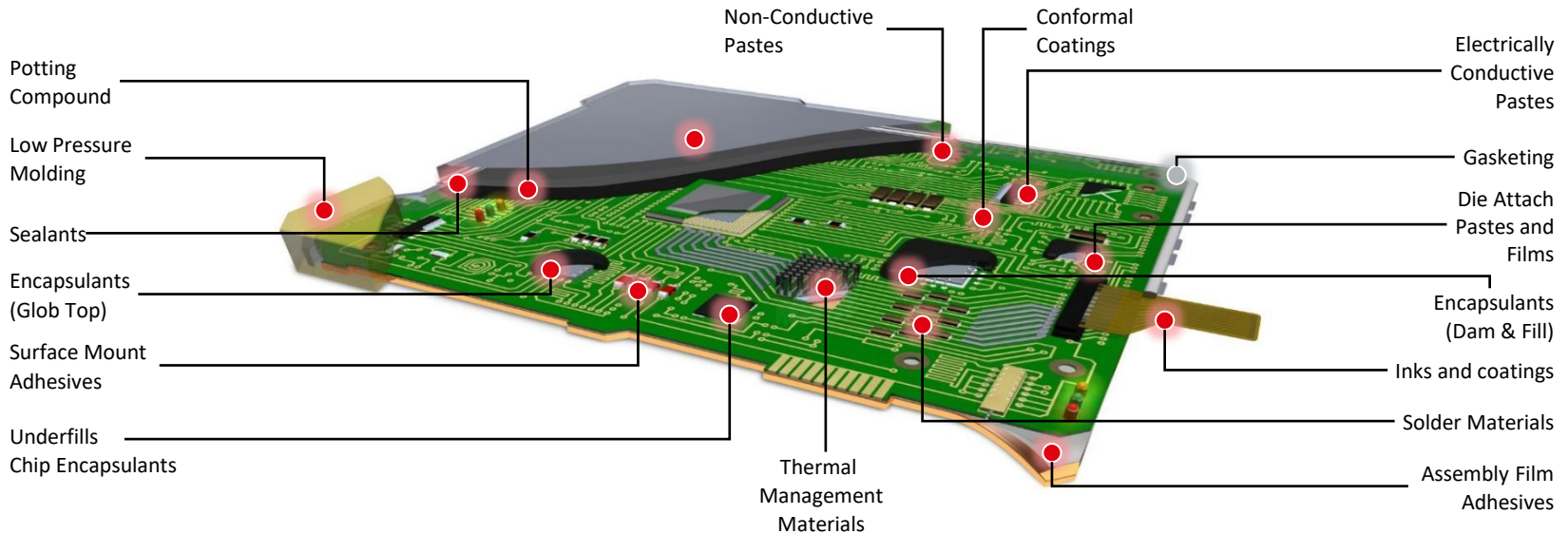
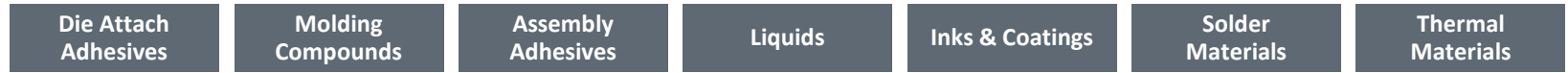
- **Discussed needs:** Hundred thousands
- **Medical Class:** 1 (maybe 2)
- **Manufacturers:** Medical Device manufacturer (+support)
- **Materials:** Electronic components and substrates
- **Solutions:** see next slide

Henkel potential solution: Electronic Device Assembly products across the board

Note: Products tested to ISO 10993 biocompatibility may not be required, but electronic device typically needs market approval



Electronic Devices – Henkel Solutions Across the Board



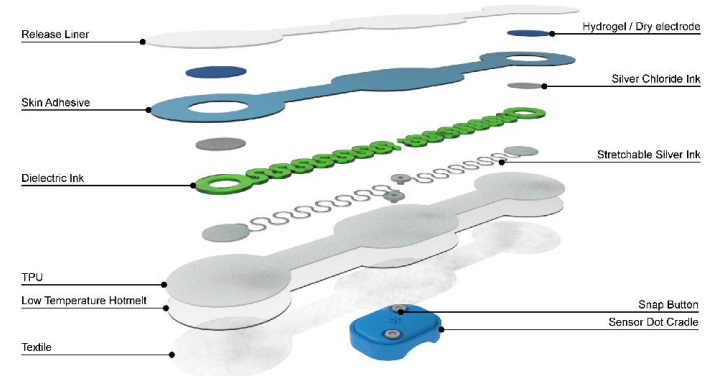
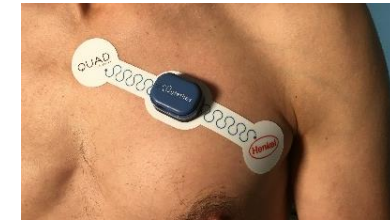
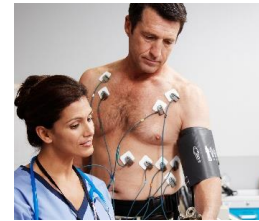
Note: For any assistance, please contact us

ECG Electrodes, Smart Wearable Health Patch

Body Sensing Applications:

- **Discussed needs:** e.g. for standard ECG electrodes by ca. 20-25%; Increased need of smart wearable health patches for remote patient monitoring and measurement of Covid-19 typical symptoms: body temperature, ECG heart rate and respiration
- **Manufacturers:** Medical Device manufacturer
- **Materials:** TPU substrates, fabric
- **Solutions:** Printed electronics application

Henkel potential solution: Conductive Inks (silver, silver chloride), diverse adhesives, dry electrode
Contact us: printed.electronics@henkel.com



COVID-19 Treatment / Devices

Patient Care- Skin contact Adhesives

LOCTITE
TECHNOMELT
AQUENCE

Pressure Sensitive Adhesives for ECG Electrodes, Wound care, Medical tapes

Various technologies available to fulfill medical skin contact applications such as: traditional & advanced wound care, ECG, medical tapes, bandages, surgical drapes, transdermal patches ...

- **Discussed needs:** Millions (disposables)
- **Manufacturers / Users:** Converters for Medical companies or medical device manufacturers
- **Materials / facestocks:** PET, polyamide, PE, PVC, PU films, Non-woven fabrics
- **Key factors to consider:** Length of wear, Breathability, Skin contact/regulations, Sterilization

Henkel potential solution: please contact us psa@henkel.com to get best adhesive recommendation to fulfill your needs



Different technologies :

- Hotmelt adhesives
- UV Acrylics
- Solution Acrylic
- Water Base Adhesives

Grades:

- Technomelt PSM 1540 / 8673
- Loctite Duro-tak UV 26105 / 4040
- Loctite Duro-tak AH 115 / 235A / 222A / 737/788
- Aquence PS 6084-33

All Skin contact adhesives are certified with Biocompatibility ISO 10993 (own testing facilities)

COVID-19 Treatment / Devices

Alternative Production Method - 3D Printed Parts

Headband, Fixtures, Jigs, ...

Various parts for PPE, Jigs and Fixtures for enhanced application of adhesives, production and prototype parts for fast, low volume manufacturing

- **Discussed needs:** Hundreds of thousands
- **Medical Class:** Typically not classified
- **Manufacturers / Users:** Medical Device manufacturer (+support)
- **Materials:** Thermoplastics
- **Build method:** 3DP ... a design file is needed

Henkel potential solution: Engage Application Centers (US /Europe) at loctite3dp@Henkel.com with design, for cost and timing.



Face shield headband:

- 3D printed
- PA12
- Various designs individualized
- Fast response with no tooling

Fixtures, as for:

- Medical device assembly
- Adhesive application speed and accuracy
- Fast response, all in one design
- Individualized design possible

Note: Only for supportive tools or parts without biocompatibility requirements, unless written approval given by the customer

COVID-19 Treatment / Devices

General patient care – All Type of Medical Devices



- IV Catheters, Blood Collection Sets, Syringes, Lancets, Drug Delivery Devices, Anesthesia, Epidural & Insulin Syringes, ...
- Blood Oxygenators, blood filters, heat exchangers, blood bowls, manifolds, blood pressure transducers, tubing to fittings, connectors, adaptors, ports & Y-connectors, IV sets, blood collection sets, drug infusion sets, feeding tubes, ...
- Balloon to multi-lumen tubing, strain relief or transition of balloon to tube, thermistor potting, urological catheter balloon bonding, angioplasty catheters, drug eluting stents, marker band bonding, ...

➤ **Henkel solution offers: Wide range of Adhesives tested to ISO 10993 biocompatibility.**

A female surgeon in a blue scrubs and cap, holding a medical device in an operating room. The background is blurred, showing medical equipment and bright lights.

Thank you!

COVID-19 Treatment / Devices

Henkel Key Contacts

Region	Key KAM contact	Key TCS contact
Americas	Jason Spencer	Thomas Silva
EIMEA	Julia Kurtz	Bob Goss(UK), Susanne Camp(G), Jose Rodrigues(Fr, BNL), Belen DeISaz(E), Berk Kilicbeyli(Tr), Pankaj Choure(In)
APAC	Kate Yeo	Terry Zhang Jenny Cheng(CN), Isaac Lee(SEA), Yukio Isobe(JP), Jon Oh(KR)
World	Shweta Srikanth Philipp Loosen	Hermann Handwerker

Covid-19 active companies

Three type of customers

<p>Medical Device Manufacturer e.g. respirators (class 3 and 2)</p>	<p>Industrial company cooperating with Medical Device Manufact.</p>	<p>New manufacturer New Device (class 1 or none)</p>
<p>Extending existing production</p>	<p>Additional production capacities Replicating existing design</p>	<p>New Devices New Designs New productions</p>
<p>Higher demand on products already specified</p>	<p>Demand on products already specified; New demand on new solutions</p>	<p>New demand on new solutions</p>

Note: The Medical class (3, 2a, 2b, 1, none) reflects the risk potential of the device. As higher the class as more regulated, as less easy to enter by companies with no medical background