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AEROSOL & CONTAMINATION

A risk for the patient and the dental team?

Content

#dentalsunited

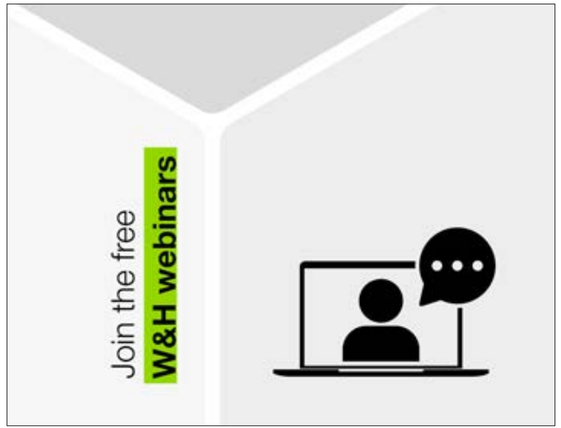
With the #dentalsunited initiative, W&H wants to help “Professionals” all over the world return to normal business operations quickly and safely. The first step was asking for your support by telling us what really matters to you right now and in the near future. And you told us, now we answer.

More information on **dentalsunited.com**

W&H Covid-19 measures

- With factories in Austria and Italy, the W&H Group has continued with uninterrupted production during the Covid-19 pandemic ensuring we complied with international social distancing measures and other safety guidelines to keep our Team and our Customers safe and where possible working.
- The W&H Group has provided uninterrupted customer service, service information, sales and after sales service. We have been open for business, again ensuring all the correct guidance including social distancing measures have been adhered to for all personnel.
- W&H has prepared for the new regulatory and information requirements of the European Medical Device Regulations (MDR) that came into force in 2021.
- Already available from W&H: A comprehensive video channel with a full range of informative videos.
  Join the W&H video channel **https://video.wh.com/en_global/**
- Coming soon from W&H: An e-learning platform for customers which will cover a whole raft of products and techniques. We will be working to provide updated courses on the entire range of existing and new products.
- New Products: New products will be designed to add value and improve safety in all areas, including: rotary instruments, sterilizers and surgical.
- W&H Webinars: As a solution provider, W&H offers additional support for the dentist in current general scientific topics affecting everyday work. Experts highlight specific topics such as aerosol and how treatment processes and their efficiency can be increased.

Webinars



We are building a program of webinars to help you build and expand your business. They allow us to engage with our audience on a new level. In terms of building and strengthening our brand, there is nothing better.

Free W&H Webinars:
"Aerosol in prophylaxis – a danger for the dental team?" by Prof Dr Georg Gaßmann
"Aerosol in surgery. Back to business! Back to surgery" by Dr Kristina Bertl

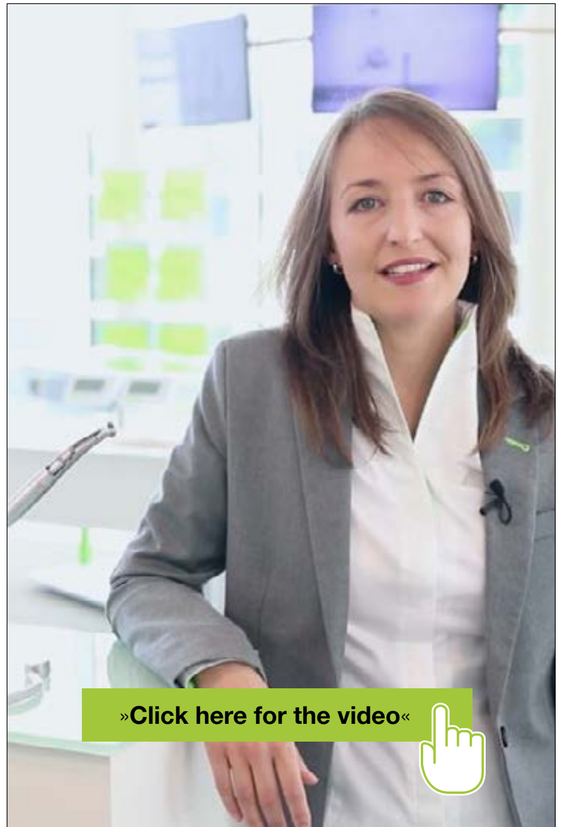
More information on wh.com

How can **W&H help you** ensure **your return** to dentistry?

Aerosol:
fact vs. fiction

Every activity in the dental practice is faced with challenges that have many different causes and for which appropriate countermeasures should be anchored in the daily routine. The formation of aerosols plays an essential role here. This makes it all the more important to recognize aerosols as known germ carriers and triggers of possible infections and to know which suitable protective measures can be taken. The individual risk of the respective system for aerosol formation should be recorded and appropriate protective measures taken. This is why we also devote ourselves intensively to this topic.

What is the correct way of dealing with aerosol and bacteria?
That´s the key question when it comes to safety in the dental practice. But what is fact and what is fiction? Product Manager Judith Berg has prepared some answers.



FAQ

What is aerosol?
Aerosol is a mixture of air, water and solid particles.
Aerosol consists of small particles called droplet nuclei (1–5 µm) or droplets (5-50 µm) (1). Aerosols can stay in the air for up to 30 minutes after treatment, it could be spread several meters during treatment (1). The most contamination you will find around a radius of 0.3 m to 1.5 m of the treatment area (2).

How is aerosol created?
Physically, most aerosols in dental practice are created by atomization. There are two sources of contaminated aerosol:
Rotating and oscillating handpieces / equipment (3,4)
By supplying energy through rotating handpieces or oscillating handpieces to liquids (saliva, cooling spray, cooling water) is atomized = aerosols.
However, with appropriate equipment reprocessing, coolant supply decontamination and water line decontamination – contamination of this aerosol can be avoided.

Patient (1,2)
Aerosol rebound occurs after the contact on the tooth or the soft tissue from the oral cavity.
The aerosol now contains germs, saliva and possibly blood (6) from the patient.

In this case the bacterial and viral load – which the patient carries inside his mouth – is dispersed and distributed everywhere the aerosol spreads.

FAQ

What can I do to reduce the bacterial load of the patient?
Recent studies from China using SARS CoV2 data have shown the effectiveness in dental practice of using pre-procedural mouth rinse: both 0.2% PVP-I solution as well as 1% H_2O_2 (= hydrogen peroxide) solutions strongly reduce or kill the number of germs – including the SARS CoV2. Numerous studies have proven the effectiveness of PVP-I (= povidone-iodine) in reducing germs (7). In this study it was shown that CHX with the concentration of 0.2% was less effective. Therefore, with pre-procedural mouth rinse using e.g. PVP-I, H_2O_2 being clinically proven as an effective way to reduce the bacterial load and viral contamination of aerosol (8) – it also reduces the negative impact of "aerosol being inevitable during dental treatment". Never to neglect the general necessary and recommended personal protective safety measures of course.

How can I protect my team and patients from aerosol?
You should not rely on one single but a multi-layer strategy, following existing guidance to protect dental personnel and patients and ensure professional handling of aerosol to reduce the risk to the lowest possible level! Please always respect your national recommendations.

Infection prevention control in dentistry:
- desinfection of surfaces, reprocessing of dental equipment (9,10)
- PPE (personal protective equipment): masks, goggles, gloves, scrubs, vaccination
- effectiveness of mouth rinsing
- rubber dam
- anti-suck-back capabilities of equipment
- high volume suction
- dental unit water lines decontamination

Bibilography

(1) Veena, H. R., et al. (2015). „Dissemination of aerosol and splatter during ultrasonic scaling: a pilot study." J Infect Public Health 8(3): 260-265.
(2) Bennett, A. M., et al. (2000). „Microbial aerosols in general dental practice." Br Dent J 189(12): 664-667.
(3)Graetz, C., et al. (2014). „Spatter contamination in dental practices--how can it be prevented?" Rev Med Chir Soc Med Nat Iasi 118(4): 1122-1134.
(4) Toroglu, M. S., et al. (2001). „Evaluation of aerosol contamination during debonding procedures." Angle Orthod 71(4): 299-306.
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(6) Shihama, K., et al. (2009). „Evidence of aerosolised floating blood mist during oral surgery." J Hosp Infect 71(4): 359-364
(7) Peng, X., et al. (2020). „Transmission routes of 2019-nCoV and controls in dental practice." Int J Oral Sci 12(1): 9.
(8) Eggers M, Koburger-Janssen T, Eickmann M, Zorn J. In Vitro Bactericidal and Virucidal Efficacy of Povidone-Iodine Gargle/Mouthwash Against Respiratory and Oral Tract Pathogens. Infect Dis Ther. 2018;7(2):249-259.
(9) Bracher, L., et al. (2019). „Surface microbial contamination in a dental department. A 10-year retrospective analysis." Swiss Dent J 129(1): 14-21.
(10) Zemouri, C., et al. (2017). „A scoping review on bio-aerosols in healthcare and the dental environment." PLoS One 12(5): e0178007.

Aerosol: Electric highspeed vs. turbine?

Tobias Schwarz is responsible for the product portfolio restorative dentistry at W&H. Due to the increased awareness about the role of aerosols in infection transmission we are receiving many questions. What is the right highspeed handpiece to be used to reduce the formation of aerosols? And many more...

FAQ

Do air turbine handpieces produce more aerosol than electric highspeed handpieces?
The amount of water spray, coming from both kind of handpieces, is basically the same. The essential difference is the bur speed, that would have different acceleration effects on the water drops once they hit the bur as well as different air velocity at the area around the bur. Turbine handpieces run at approximately 400,000 rpm. Electric highspeed handpieces are operated at 200,000 rpm, so half the speed as turbines. As a matter of fact, the intensity how particles are distributed is less. This has a beneficial effect on limiting the exposure of water spray generated aerosol into the dental operatory environment. Additional air, leaking at the turbine's head – caused by the drive air to run the turbine - increases the distribution radius of floating particles around the air turbine handpiece's head. This effect is significantly less with electric highspeed handpieces as well. Nevertheless, W&H turbine handpieces are known to have noticeably less air leakage at the turbine head then the average product on the market.

What's the purpose of the water spray in dental highspeed handpieces?
Highspeed preparation procedures require proper cooling at the contact area between the rotating instrument and the tooth. Especially the heat, generated during gross reduction of tooth structure, would cause significant thermal damage to vital teeth. That's why dental highspeed handpieces are equipped with an ideally multi-directional water spray system with 3, 4 or 5 ports directed to the bur's tip. Positive side effect is, that the cutting ability of rotating instruments is supported as the water spray cleans out debris at the cutting part of the bur.

How does the water spray affect the formation of potentially harmful aerosol?
The water spray itself, as it comes from the handpiece, is not a risk at all for infections if the water quality is ensured with the dental delivery system. Only when water droplets get in contact with the patient, it could have potentially absorbed germs which then subsequently rebounds from any surface within the oral cavity and spreads as infectious aerosol.

Why can't I just turn off the air used for the spray to reduce the formation of aerosol?
A water jet alone would not have enough cooling efficiency for highspeed preparations. That's why compressed air is added to create the spray. Due to the higher moistening capabilities of the small water droplets, much better cooling is achieved – reducing any risk of damage to the vitality of the patient's teeth!

High Speed Handpieces

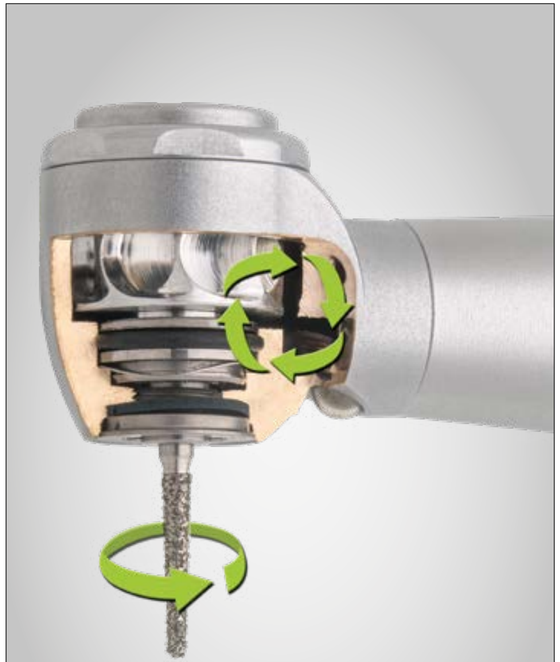
How does the **hygienic head** anti-retraction system **from W&H help?**

Hygienic head anti-retraction system

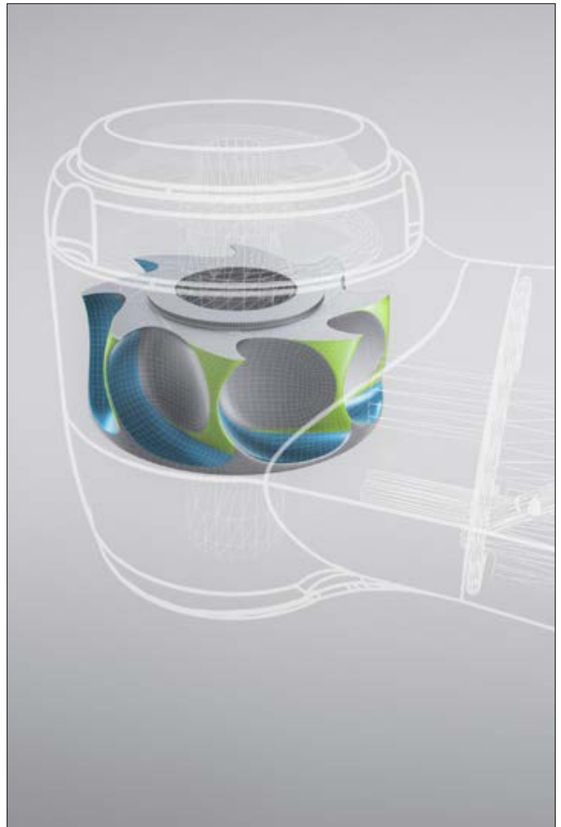
All W&H turbines have built-in hygienic head systems to prevent cross infection.

The system is patented in Europe and the USA.

W&H turbines are designed to prevent the suction effect caused while the rotor is stopping from a speed of 350,000 rpm, thus preventing contamination of the internal rotary ducts.



Explaining the run-out time of the rotor



Patented hygienic head system

The hygienic head is a standard feature across all W&H turbines from the most basic to the premium.

The hygienic head system is designed to minimize and offset any negative impact from run-out time when the rotor continues momentarily before stopping.

This is achieved by circulating air in the turbine head to minimize any aerosol particles being sucked back into the turbine as the rotor slows down to stop.

Typically once the drive air supply stops, the rotor needs some run-out time until it stops rotating completely, this causes air from the immediate area around the turbine head to be “sucked back” in. This air typically contains aerosol, including: air containing water particles mixed with saliva and potentially blood. The retraction of these particles into the handpiece constitutes a high risk of cross contamination.

Minimal escape **of air at the turbine head**

Anti-retraction systems

Below is an extract from the article “Transmission routes of 2019-nCoV and controls in dental practice*” which gives clear findings regarding the benefit of utilizing high-speed handpieces (turbines) with an anti-retraction system fitted:

The high-speed dental handpiece without anti-retraction valves may aspirate and expel the debris and fluids during the dental procedures. More importantly, the microbes, including bacteria and virus, may further contaminate the air and water tubes within the dental unit, and thus can potentially cause cross-infection. Our study has shown that the anti-retraction high-speed dental handpiece can significantly reduce the backflow of oral bacteria and HBV into the tubes of the handpiece and dental unit as compared with the handpiece without anti-retraction function. Therefore, the use of dental handpieces without anti-retraction function should be prohibited during the epidemic period of Covid-19. Anti-retraction dental handpieces with specially designed anti-retractive valves or other anti-reflux designs are strongly recommended as an extra preventive measure for cross-infection. Therefore, the use of dental handpieces without anti-retraction function should be prohibited during the epidemic period of Covid-19. Anti-retraction dental handpiece with specially designed anti-retractive valves or other anti-reflux designs are strongly recommended as an extra preventive measure for cross-infection.
(*Extract taken from: https://www.nature.com/articles/s41368-020-0075-9)

Note: The study looked exclusively at the use of turbines, therefore the term “handpiece” refers to turbines in this extract “Anti-retraction” refers to the functionality of a system, the W&H name for this functionality is “hygiene head anti-retraction system”

Please be aware that all W&H turbines in all ranges, include as standard the hygienic head anti-retraction system.

Anti-retraction valve

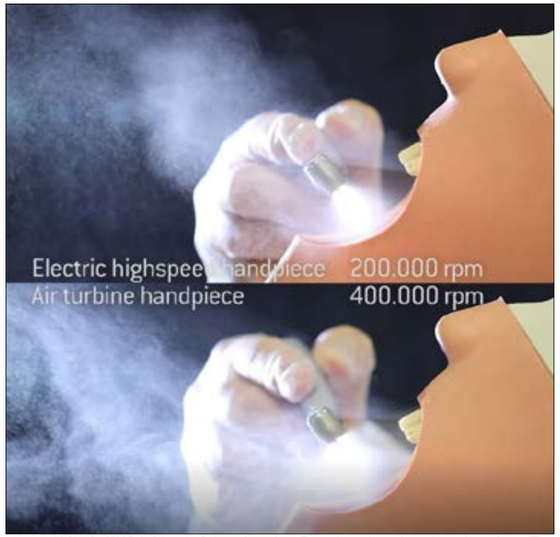
Water filter with anti-retraction valve

In addition to the hygienic head system, W&H turbines and quick couplings also have an anti-retraction valve which is located in the turbine itself for fixed connection turbines and for quick connection turbines, i.e. RQ range, in the relevant coupling.

The valve prevents the backflow of potentially contaminated water particles from the turbine or coupling into the hose, treatment center and central water supply system.

While the hygienic head system extensively prevents aerosol, saliva, blood etc from being sucked back into the turbine head, the anti-retraction valve offers additional protection. It prevents further backflow of potentially contaminated water via the turbine's waterlines towards the central water supply.

Contra-angle handpieces and aerosol



There are no additional hygiene systems incorporated in contra-angle and straight handpieces as they run at lower speeds, at a maximum of 200,000 revolutions. The electric or air motor is immediately stalling down the rotation of the handpiece. Therefore no specific hygiene head design is required.

Due to the lower speeds, aerosol exposure is less and for this reason, some practitioners choose to use speed-increasing handpieces instead of turbines.

Turbines vs speed increasing handpieces

Turbines produce more exhaust air than contra angle handpieces which 'swirls up' aerosol, increasing the amount in the atmosphere.

Contra-angle handpieces and aerosol

What are the benefits of using speed increasing contra-angle handpieces?

- They offer more torque and precision for increased control during treatment
- They usually require fewer repairs
- They produce reduced aerosol as they do not run on air

If using speed-increasing handpieces an electric motor will be required.

Important:
FG type turbine burs should be used.

How the turbine you choose can make so much difference

"When we first started using the TK-100 L handpieces I thought they were nice but not significantly different to our old handpieces. Then after a couple of weeks of only using the TK-100 L we tried using our previous turbines again, but the old handpieces suddenly felt uncomfortable. We had not realized how bad our fairly good turbine handpieces were until we returned to them. The TK-100 L was much lighter and had a better feel which made it easier to use. The internal LED lights and water spray were also much better aligned than the previous handpiece. **I had never realized how much excessive water spray the older handpieces were producing** which continually disrupted my field of view when working with the mirror. This was hugely reduced when we used the Synea Vision turbine."

Dr Chris McConnell, St Piran Dental, Cornwall

Prophy polishing handpieces

Speed without any cooling spray:
5 sec with approx. 800 RPM

Avoid aerosol creating procedures: Favor scaling and rotary polishing (no cooling spray nessesary at the right speed)!

Polishing entirely without restrictions: This allows you to polish without muscle strain, reach almost every corner of the mouth and always have the best view of the treatment site. Great emphasis was placed on features such as optimal adaptation, simple paste pickup and distribution as well as gentle cleaning into the sulcus.

The W&H Proxeo Polishing concept benefits from a unique triple seal head system which stops the ingression of paste and contaminated saliva etc which offers improved infection control.

The Decontamination and Lubrication Process

How to **avoid** lubrication **process-related aerosol?**

FAQ

What is a proper disinfectant?
Important, when choosing a ready to use disinfectant, it is primarily the microbiological efficacy in combination with the contact time. Please read the instructions for use of the manufacturer carefully. Some local institutions are offering free information on this topic. As an example for Germany you can consult the free accessible VAH list, for the US there is official information available on the FDA website.

How to clean and reprocess your instruments properly?
Sterilization, hygiene and maintenance are increasingly important in the dental practice!
W&H offers a complete and flexible workflow solution for your instruments. Hygiene guidelines and recommendations differ from country to country – we would like to give a best practice example.

W&H offers a wide range of accessories for optimizing the sterilization process. Minor extras lead to major results. Work in the practice is easier and your team saves time.

Decontamination cycle

1 Instruments
2 Cleaning and Lubrication
3 Bagging and Sealing
4 Sterilization
5 Periodic Testing
6 Traceability

***Note:** Not all products mentioned in this brochure are available in every country. Please contact your local W&H representative for availability and further details.

Maintenance units

What's the main benefit of automatic handpiece maintenance systems compared to the spray can?

All aerosols are removed from the process chambers through active suction and an integrated HEPA filter.

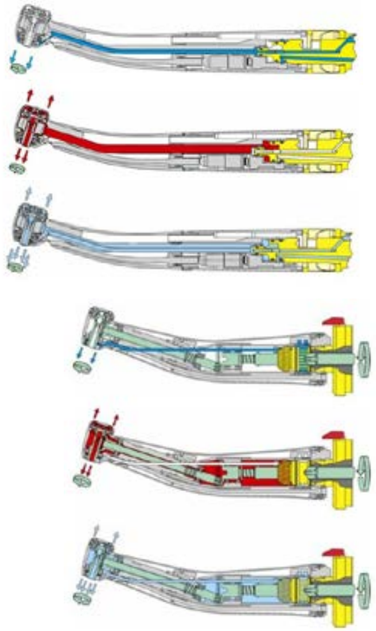
The user is protected and receives a safe working environment. Furthermore, a correct process result is guaranteed, due to the fixed amount of oil, which is inserted.

Benefits of Assistina Twin

Benefits:

- Improved handpiece maintenance from just 10 seconds
- Controlled maintenance process
- Benefits from high level filtration via a HEPA filter
- Consistent superior maintenance and lubrication guaranteed
- Improved cost and time efficiency
- Reduced aerosol due to filtration of exhaust

Benefits of an automated handpiece cleaning and lubrication process



Turbines, contra-angle and straight handpieces

- Cleaning of spray channels with W&H Cleaning Solution
- Lubrication of internal gear parts with W&H F1 Service Oil
- Flushing and drying with compressed air

A Close Up View

Assistina Twin

HEPA Filter

Handpiece connections ergonomically designed for ease of use

Refill cartridges can be easily and safely changed

The sliding cover can be easily removed for cleaning

Sterilization and Traceability

Why choose the Lexa sterilizer and why is traceability so important?

Lexa sterilizer:
High capacity & efficiency

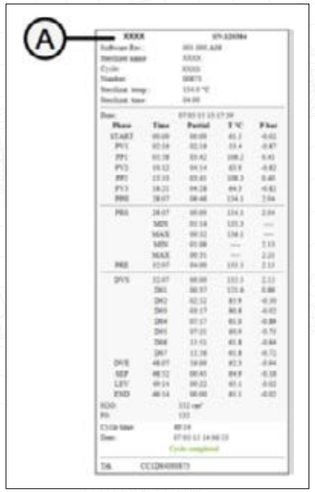
Lexa offers versatile cycle program options for several loads, guaranteed by the closed-door drying process with HEPA filters and the use of fresh water for each cycle.

ALL W&H sterilizers include a USB stick to record cycle traceability. The system automatically generates cycle folders, showing all cycles by year, month and day.

The importance **of traceability**

- The confidence of knowing that the correct protocol has been followed
- The knowledge that processes are risk averse
- All cycles parameters are recorded as verification that for both thermal disinfection and sterilization they have been achieved
- The knowledge that validated processes are being followed and monitored
- Ability to record cycle data for traceability purposes
- Protection against possible review

Traceability: cycle report structure



A	Sterilizer model
SN	Sterilizer serial number
Software rev.	Software revision number
Sterilizer Name	Surgery –practice –doctor name
Cycle	Name of the executed cycle
Number	Cycle counter
Sterilizat. temp.	Programmed sterilization temperature
Sterilizat. time	Programmed Plateau/Sterilization
Date (above)	Cycle start date and time
START	Cycle start
PV1, PP1, PV2, PP2, PV3	Pressure and vacuum pulses
PPH	Phase of pressure rise to sterilization conditions
PRS	Plateau/Sterilization phase start › MIN, MAX temperature › MIN, MAX pressure
PRE	Plateau/Sterilization phase end
DVS	Drying phase start
DVE	Drying phase end
SEP	Chamber venting phase
LEV	Pressure leveling phase
END	Cycle end conditions
H20	Cycle water consumption
F0	F0 value
Cycle time	Cycle duration
Date(below)	Cycle end date and time
„Cycle completed“	Cycle outcome
Trk.	Tracking code for traceability management

Advanced **traceability**

Includes:

- Label Printer
- 1 roll of labels
- 1 ribbon
- Instruction for use

Labelling is a quick easy way to ensure sterilization pouches are easily identifiable without compromising their efficacy by using a pen. The barcode scanner speeds up the process to save the information directly in the software management of the clinic.

Information shown on the barcode labels

The barcode labels include all the information relating to the sterilization process of instruments used to be included in the patient records.

- Sterilizer model, serial number and software version
- Sterilization type of cycle
- Date of sterilization
- Expiration date of packaged dental products
- Name who accepted the load (optional)
- Batch number

Maximum efficiency when reprocessing: How long should it take?

Handpieces can be manually disinfected or put in a thermal washer disinfector.

If cleaning manually, wipe down your instrument with a disinfectant wipe.

Automatic handpiece maintenance and lubrication from only 10 seconds in an Assistina Twin.

Lexa offers versatile program options for several loads in order to reduce overall cycle duration.

The Seal^2 conforms to UNI 868-5 regulations with a standard 12 mm seal ensuring optimal sealing. How can an automatic bag sealer be a benefit:

- A hermetic 12mm seal is produced in only two seconds
- Reduced waste and increased flexibility to use the size of bag needed
- Patented double roll holder to make a choice of roll size easily accessible
- Saves storage space as can be wall mounted
- Allows an easy opening while keeping the load

W&H AIMS
Advanced Infection prevention Management Solutions

Interrupting the chain of infection

W&H is taking selective measures to interrupt the chain of infection. And everyone needs to do their part:
Please contribute to your personal protection by using personal protective equipment such as mask, gloves and safety goggles!

Being aware of the current covid-19 situation, we draw attention again to the importance of the hygiene workflow. Germs can also be transmitted through contaminated dental instruments. For 130 years, W&H has lived by the core principle **“People have Priority”**. Rest assured your health, the well-being of patients and of course your business are an important motivating factor for us.

How else can dentist's protect themselves, their team and patients

Scenarios	Hand hygiene	Surgical mask	N95 mask	Face shield	Goggles	Gloves	Work clothes	Isolation gown	Protective clothing	Cap	Shoe Cover
Aerosol generating procedures	✔		✔	✔	✔	✔	✔	•	•	✔	✔
Oral examination / low risk procedures	✔	✔	•	•	✔	✔	✔	×	×	✔	•
Precheck triage / dental radiology / lab tests	✔	✔	×	•	•	✔	✔		×	✔	×
Waste transportation / apparatus cleaning	✔		✔	•	✔	✔	✔	✔	•	✔	✔
Suspected or confirmed COVID-19 patients	✔		✔	✔	✔	✔	✔	×	✔	✔	✔

✔ Recommended • Optional × Not recommended

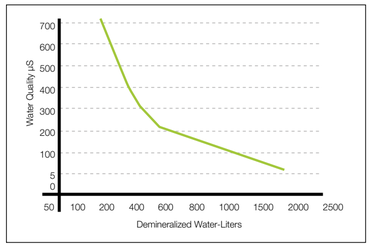
Based on the data from:
Meng and Li Chin J Stomatol, 2020

Why use demineralized water?

- The water quality for a steam sterilizer must follow the criteria mentioned in EN 13060.
- The primary purpose of utilizing demineralized water is to protect sterilizers from the formation of scale which renders them less effective and more prone to breakdown.
- Demineralized water ensures consistent high quality steam for proper sterilization.
- Not only is a water demineralization system the easiest and cheapest way to produce water, but also the most environmentally-friendly way thanks to reduction of plastic packaging and transportation.

Benefits of the water demineralization system

Water Consumption chart



Average Cost Per Cycle (by load type)

Incoming Water Conductivity Reading (microsiemens)

	50µS	100µS	200µS	400µS	**600µS Average**	800µS
0.3 Liters Average Load	0.02p	0.04p	0.09p	0.18p	**0.34p**	0.51p
0.5 Liters Full load	0.03p	0.06p	0.13p	0.27p	**0.51p**	0.77p
Total Liters Volume	2250L	1130L	565L	280L	**150L**	100L

Why choose a water demineralization unit such as the Multidem, when the average cost of a bottle of demineralization water is low?

- Ability to directly connect to your W&H sterilizer
- Environmental benefits as it runs off water pressure, so no power is required and there is no plastic waste

The charts explained

A Multidem cartridge's working life largely depends on:

- Water source quality
- Quantity of water being filtered or used

Water quality varies widely, so our example shows an average to poor quality supply of 600µS. The example demonstrates the low cost per cycle of between 34p–51p dependent on load and based on a total filtration volume per cartridge of 150 liters. In areas with better water quality, you will see, these figures continue to impress, with considerable savings per litre.

How much difference does your decontamination equipment make?

"Our practice invested in the Assistina Twin upon recommendation from a representative at W&H. The system has been excellent and I am really impressed by the speed of cycles which are very quick and efficient.

Everyone in the practice can use the Assistina Twin thanks to its clean and simple design. The unit is also incredibly safe, as it does not operate unless the sliding door is completely sealed.

Because each cycle of the Assistina Twin is so fast, handpieces that are loaded into the unit are dealt with immediately after a cycle has finished – ensuring that we are able to maintain a highly productive maintenance service of our instruments.

With the Assistina Twin, we can process more handpieces ready for decontamination and this has really improved our day-to-day workflow. I am very pleased with it and I think it's a very reliable, cost effective product.

The customer service from W&H has also been excellent providing our practice with consistent support and guidance."

Julie Marshall, Dental Excellence, Harewood

Possible ways to reduce the risk of Covid-19 spread in the dental practice

- Apply patient triage
- Use preprocedural rinsing with 1% hydrogen peroxide and 0.2% CHX.
- Use high volume suction with an effective technique.
- Avoid aerosol creating procedures.
- Favor scaling and rotary polishing.
- Use high standard precautions in case of questionable COVID-19 infection.
- Stick to the standard health precautions as we in our dental profession are used to and have proven to be effective.
- Use of Rubber Dam and similar products.

Notes

WE AT W&H

ARE HERE TO SUPPORT

YOU!

#dentalsunited

More information on **dentalsunited.com**

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