ENVIRONMENTAL PRODUCT DECLARATION

Key Facts and Further Explanations

MediSter® 60
MediSter® 160

HF-WASTE DECONTAMINATION DEVICES

METEKA'S CONTRIBUTION
TO A GREENER PLANET

METEKA

1 MEDISTER HF-WASTE DECONTAMINATION DEVICES
Designed for Sustainable Management of Infectious Waste

The MEDISTER HF-Waste Decontamination Devices set a high standard for environmentally sustainable decontamination of infectious healthcare waste. The Environmental Product Declaration (EPD) provides a detailed insight into the environmental impact of the MEDISTER HF-Waste Decontamination Devices throughout its complete life cycle.

Doing so, the environmental impact for the MEDISTER HF-Waste Decontamination Devices was evaluated by conducting a Life Cycle Assessment (LCA). In a LCA the extraction and processing of materials, the manufacture of the end-product (and its packaging), the distribution, the use, and the end of life of the product are analysed for their environmental impacts.

Communication of the Environmental Performance

The environmental performance of our products is communicated through Environmental Product Declarations (EPDs) following the international EPD system. They are based on Life Cycle Assessment methodology and function as an externally validated communication tool, providing complete transparency to the benefit of our customers and other stakeholders. The external validation is carried out by independent verifiers approved by the technical committee of the international EPD system and/or the EU Eco-Management and Audit Scheme (EMAS). The Environmental Product Declaration for the MEDISTER HF-Waste Decontamination Devices was developed considering the requirements of ISO 14025:2006.

The MEDISTER 60 and MEDISTER 160 configuration of the MEDISTER HF-Waste Decontamination Devices form the basis of the specific environmental information of the EPD.

Short Description of the MEDISTER HF-Waste Decontamination Devices

The MEDISTER 160 and MEDISTER 60 devices are manufactured by METEKA GmbH for the fully automatic high frequency (HF) decontamination of infectious waste from health-care facilities, laboratories, and research centres. The treatment process is accomplished in a puncture-proof and reusable waste container (MEDITAINER) specially designed for the use in the MEDISTER HF-Waste Decontamination Devices. (Potentially) infectious waste placed in the MEDITAINER container is thermally decontaminated by means of a special microwave technology. The result is inactivated, non-infectious waste material.

PERFORMANCE DATA	MEDISTER 60	MEDISTER 160
Max. Capacity	30 l	60 l
Max. Quantity of waste per cycle	12 kg	20 kg
Max. Power input	4,2 kW	6,5 kW
Average cycle time	45 min.	45 min.
DEVICE DATA	**MEDISTER 60**	**MEDISTER 160**
Dimensions [mm]	B: 1160 T: 732 H: 1370	B: 1160 T: 732 H: 1670
Weight of device (empty)	338 kg	398 kg
Weight of MEDITAINER container (empty)	1,24 kg	2,15 kg

Table 1: Performance and device data MEDISTER 60 and MEDISTER 160

Figure 1: MEDISTER 60 and MEDISTER 160
HF-Waste Decontamination Devices with collection trolleys

Material Content

The MEDISTER HF-Waste Decontamination Devices are developed with a strong emphasis on our commitment to eliminating hazardous substances and related toxic emissions, providing a safe and clean environment for our customers, as well as the public.

Table 2 gives an overview of the material composition of the MEDISTER devices. The portable MEDITAINER waste container and the packaging materials of the device for its distribution are included in this assessment. The manufacturing of such materials and components as well as the distance from the supplier to the production facility of METEKA GmbH in Judenburg are included as well.

MATERIAL (IN KG)	MEDISTER 60	MEDISTER 160
Metals	314.43	369.02
Plastics	25.06	26.17
Electronics	4.24	4.24
Fluids	0.79	0.79
Packaging	29.00	29.00
Other materials	0.78	0.78
Total	**369.27**	**430.00**

Table 2: Material composition of MEDISTER devices in kg

Excursus: Energy Efficiency

In the explanations below it is shown, that the direct use of the MEDISTER devices has the biggest impact on the global warming potential (see Figures 5 and 6), with the direct energy consumption being the key factor. However, when compared with alternative waste decontamination options, it becomes obvious that the MEDISTER treatment system is certainly one of the "greenest" possibilities to treat infectious waste, if not the "greenest" system currently available.

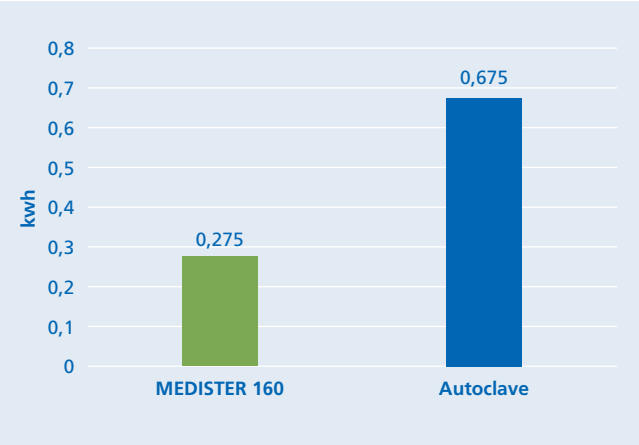

Figure 2: Comparison of direct energy consumption for 1 kg of treated waste in kWh

Figure 2 shows the direct energy consumption of a 160-litre vertical laboratory autoclave in comparison with the MEDISTER 160 HF-Waste Decontamination Device. Assuming an average loading for both devices (20 kg autoclave, 12 kg MEDISTER), the energy used for the treatment of 1 kg of waste with the autoclave is approximately 0.675 kwh, whereas the energy consumption of the MEDISTER 160 is with just 0.275 kwh almost 2.5 times lower. This difference in power consumption is due to the much more efficient heating up process of the waste in the MEDISTER device resulting in a cycle time which is less than half of the cycle time needed in the autoclave.

Excursus: Water Use

Very frequently the water consumption of infectious waste treatment devices is not considered much, although the differences are sometimes significant. Water is needed for the treatment process itself, it is used for the preparation of steam, and in many cases, also for cooling purposes.

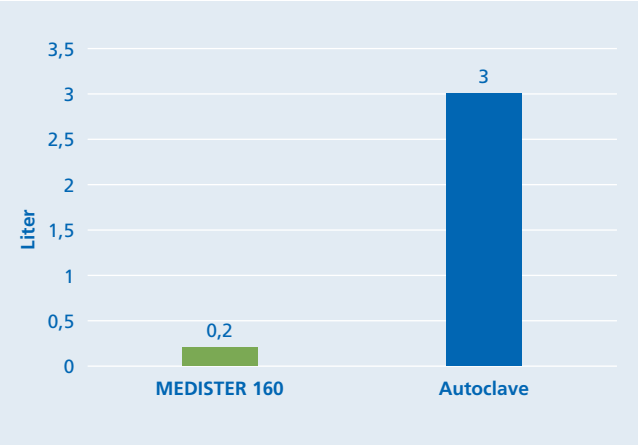

Figure 3: Comparison of water use for 1 kg of treated waste (in litres)

Figure 3 depicts the usage of water for the MEDISTER 160 in comparison with a 160-litre vertical laboratory autoclave: It can be shown, that the water consumption for the treatment of 1 kg of waste in the autoclave is 15 (!) times higher. Moreover, autoclaving requires deionized water, while with the MEDISTER system tap water can be used.

2 A LIFE CYCLE PERSPECTIVE
Environmental Profile of the MEDISTER 60 and the MEDISTER 160 devices

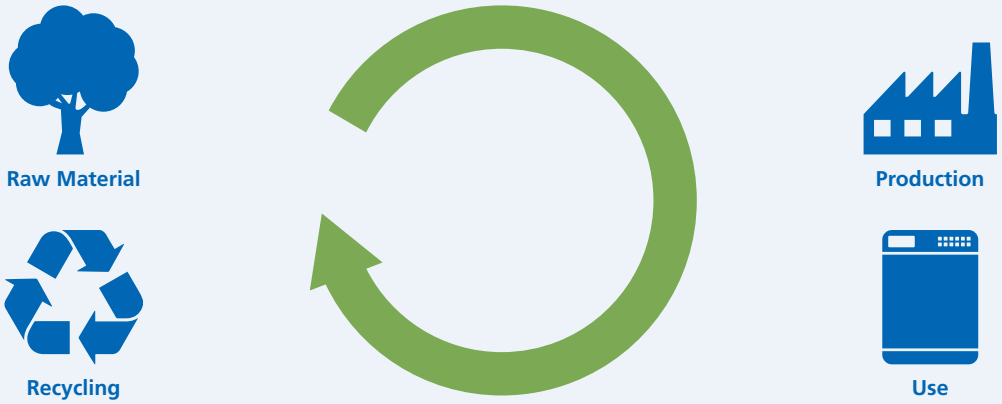

Figure 4: Product Life Cycle

At METEKA life cycle thinking is integrated to the design process, highlighting the significance of different design choices and the true overall environmental impact these choices have.

Life Cycle Assessment

Resource efficiency, waste generation and overall environmental impact are estimated throughout all life cycle phases of the MEDISTER HF-Waste Decontamination Devices following ISO 14040:2006 methodology.[1]

The Life Cycle Assessment has been performed as a cradle-to-grave approach, considering all stages in the life of the MEDISTER devices.

The results are based on a service life of 20 years for both, the MEDISTER 160 and the MEDISTER 60, with an average of 940 cycles for the MEDISTER 160 and 670 cycles for the MEDISTER 60 per year, which was calculated from statistical data provided by METEKA. This accounts for 18,800 and 13,400 cycles for the MEDISTER 160 and the MEDISTER 60, respectively. The average amount of effective cycles in a year greatly underestimates the treatment potential of the MEDISTER devices. The maximum amount of cycles possible in the service life is estimated with around 50.000 cycles.

The end of life phase of the life cycle is modelled according to technology available today. A generic scenario has been considered with recycling of selected metal and plastic fractions. The remaining materials are assumed to be disposed by means of incineration and landfill.

[1] Dr. A. Diaz, Dr. W. Wimmer, Life Cycle Assessment for the high frequency (HF) waste disinfection devices MEDISTER 160 and MEDISTER 60 of METEKA GmbH, Vienna, 2016

UPSTREAM MODULE

Materials
- Parts/components from suppliers
- Packaging materials for parts
- Transport of parts/components/packaging materials to METEKA GmbH

The Upstream Module considers the sourcing of parts and components including packaging materials and the necessary transportation of the same. The material composition is given in Table 2.

CORE MODULE

Manufacture
- Assembly and testing of devices at METEKA GmbH
- Packing for shipping
- Recycling/disposal of assembly waste

The Core Module looks at the manufacturing process for the assembly and testing of the MEDISTER models 160 and 60 at METEKA's production facility in Judenburg, Austria.

DOWNSTREAM MODULE

Distribution
- Transport to installation location
- Start-up of device

Use
- Installation and use (electricity, water, and consumables)
- Maintenance and repair

End of life
- Materials separation, recovery, recycling, and disposal (acc. to local conditions/regulations)

The Downstream Module includes the distribution, the use, and end of life disposal with waste recycling and treatment. The distribution comprises the transportation to the customer's installation site assuming a scenario with road and intercontinental air freight, according to information collected by METEKA.

Figure 5: Details of Upstream, Core, and Downstream Module

Power Supply

Electric power to MEDISTER 60 and MEDISTER 160 devices is sourced primarily from fossil energy. The geographical locations where the devices are installed (according to the portfolio of METEKA GmbH) have been combined to create a specific electricity profile (mix) for the use phase.

The electricity profile mix for the use phase results in emissions of 0,716 kg CO_2eq/kWh for the MEDISTER 60, and 0,694 kg CO_2eq/kWh for the MEDISTER 160.

Global Warming Potential/Carbon Footprint

Greenhouse gas emission throughout the MEDISTER life cycle are 2,56 kg (MEDISTER 160) respectively 1,81 kg (MEDISTER 60) of CO_2 equivalents per treatment cycle.

The LCA of the MEDISTER models 60 and 160 shows that most of the contribution to the global warming potential are primarily the result of the energy consumption in the use phase, followed by the raw material use, specifically those associated with the steel components, and finally the distribution of the devices to various world regions.

PRODUCT LIFE CYCLE MEDISTER 60
GLOBAL WARMING POTENTIAL

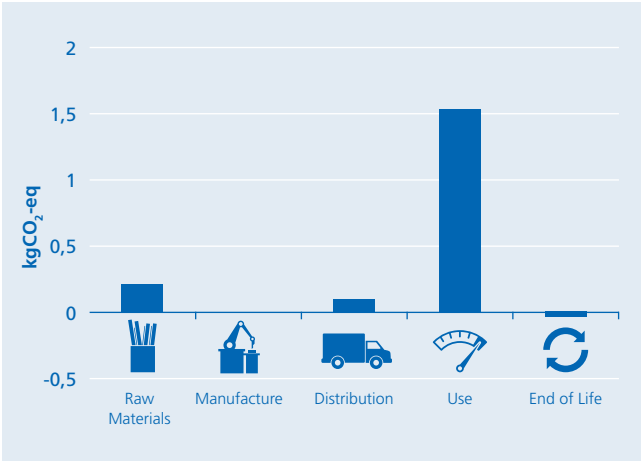

Figure 6: Global Warming Potential MEDISTER 60 for one cycle of decontamination with the MEDISTER 60

PRODUCT LIFE CYCLE MEDISTER 160
GLOBAL WARMING POTENTIAL

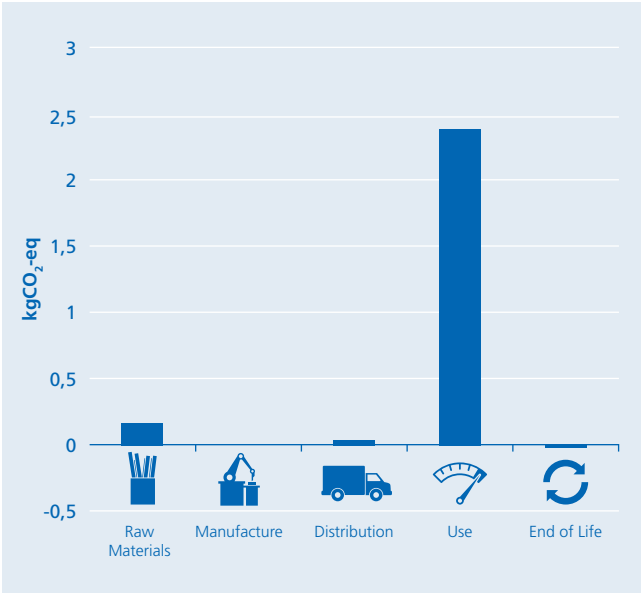

Figure 7: Global Warming Potential MEDISTER 160 for one cycle of decontamination with the MEDISTER 160

Material Resource Use

Renewable and non-renewable material resource use throughout the MEDISTER 60 and MEDISTER 160 life cycle is given in the following charts as a percentage of the total material resource mass of one decontamination cycle with the devices.

MEDISTER 60

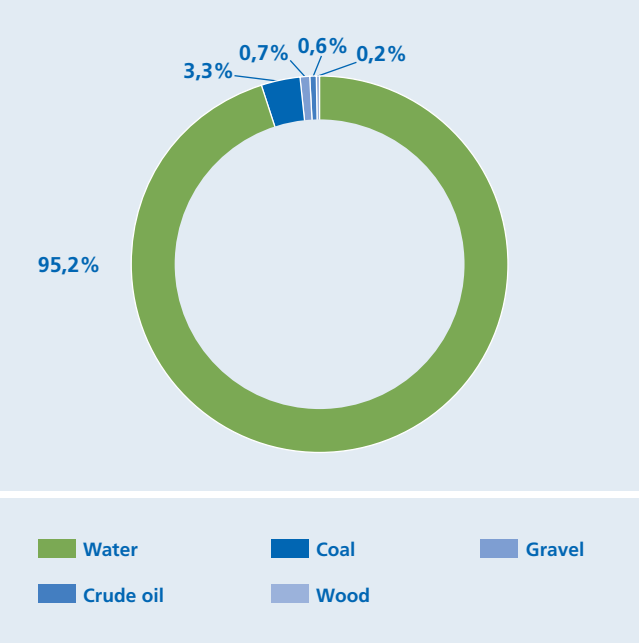

Figure 8: Distribution of material resource use for one cycle of decontamination with the MEDISTER 60 in percent by weight[2]

MEDISTER 160

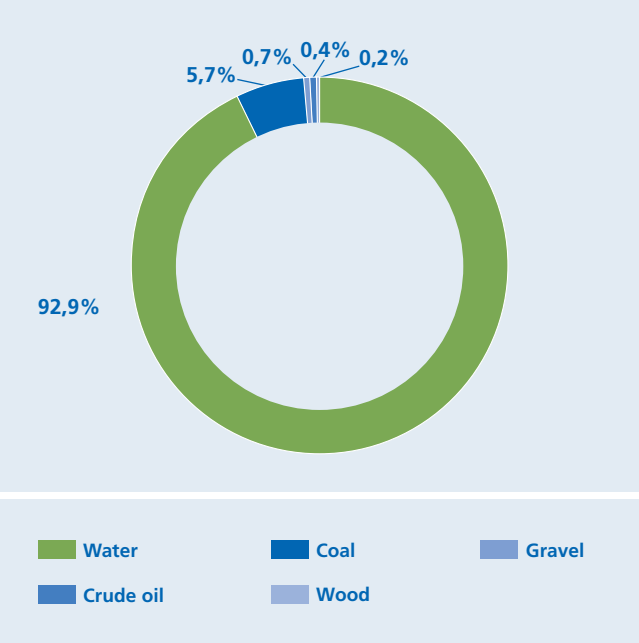

Figure 9: Distribution of material resource use for one cycle of decontamination with the MEDISTER 160 in percent by weight[2]

Energy Resource Use

Renewable and non-renewable energy resource use throughout the MEDISTER 60 and MEDISTER 160 life cycle is depicted in the following charts as a percentage of the total calorific value for the entire life cycle of the devices.

MEDISTER 60

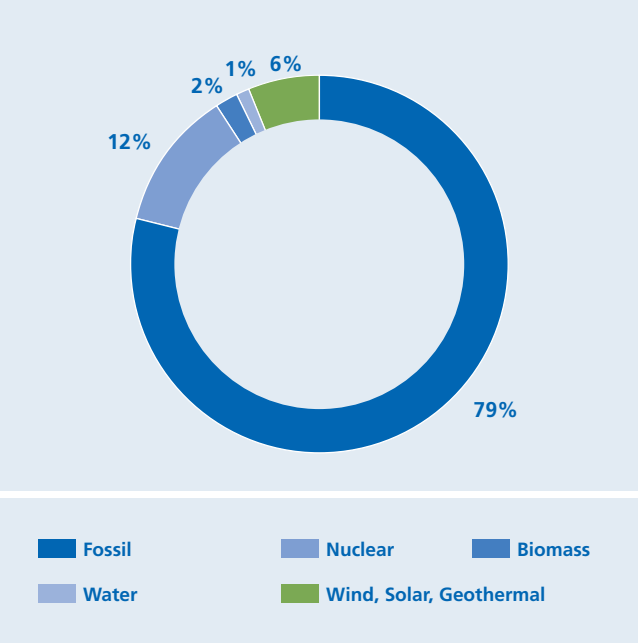

Figure 10: Distribution of total energy use for one cycle of decontamination with the MEDISTER 60

MEDISTER 160

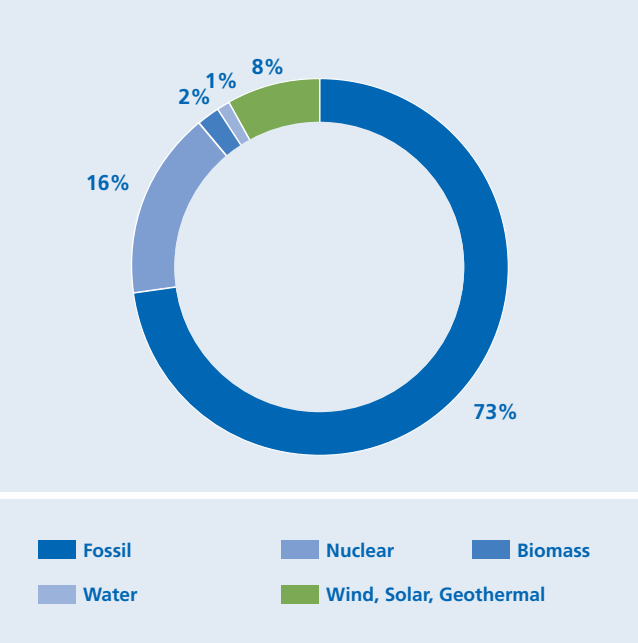

Figure 11: Distribution of total energy use for one cycle of decontamination with the MEDISTER 160

[2] To depict all material categories in one graph, the mass density for water and wood was calculated with 1000 kg/m³ and 470 kg/m³ respectively. The exact figures of wood and water in m³ are given in the tables 3 and 7 in section "Environmental Impacts in Detail."

Environmental Impacts in Detail – MEDISTER 60

The tables below show the use of material and energy, as well as the water use for one cycle of waste decontamination with the MEDISTER 60 for the Upstream, Core, and Downstream Module.

Renewable Resources

MATERIAL (m^3)	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Wood	6.89E-06	8.52E-08	5.56E-05	6.26E-05
Water	2.38E-03	4.77E-05	1.39E-02	1.63E-02
ENERGY (MJ)	**UPSTREAM**	**CORE**	**DOWNSTREAM**	**TOTAL**
Biomass	7.88E-02	8.71E-04	0.67	0.75
Wind, Solar, and Geothermal	1.94E-02	2.81E-04	1.73E-01	1.93E-01
Hydro Power	1.47E-01	7.58E-03	1.77	1.92

Table 3: Material and energy use from renewable resources for one cycle of decontamination with the MEDISTER 60

Non-Renewable Resources

MATERIAL (g)	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Coal	61.10	0.72	496.88	558.71
Gravel	28.95	9.73E-02	87.98	117.02
Crude oil	11.40	3.27E-02	96.92	108.35
ENERGY (MJ)	**UPSTREAM**	**CORE**	**DOWNSTREAM**	**TOTAL**
Fossil	2.31	2.06E-02	21.91	24.24
Nuclear	0.33	3.39E-03	3.21	3.54
Biomass	1.90E-04	1.47E-08	1.33E-03	1.52E-03

Table 4: Material and energy use from non-renewable resources for one cycle of decontamination with the MEDISTER 60

Waste

WASTE (kg)	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Non-hazardous waste	4.30E-02	7.46E-05	7.78E-02	1.18E-01
Hazardous waste	1.61E-05	4.79E-08	2.56E-05	4.17E-05
Radioactive waste	7.90E-06	4.62E-08	8.26E-05	9.06E-05

Table 5: Waste production for one cycle of decontamination with the MEDISTER 60

Environmental Impact Categories

	UPSTREAM	CORE	DOWNSTREAM			TOTAL
			Distribution	**Use**	**End of Life**	
Acidification potential [kg SO_2eq]	1.58E-03	3.23E-06	4.40E-04	8.58E-03	-1.31E-04	1.05E-02
Eutrophication potential [kg PO_4^{3-}eq]	5.83E-04	7.65E-07	6.38E-05	9.77E-04	-6.58E-06	1.62E-03
Global warming potential [kg CO_2eq]	2.12E-01	1.62E-03	1.04E-01	1.53	-3.18E-02	1.81
Photochemical oxidant creation potential [kg C_2H_4eq]	9.19E-05	1.78E-07	1.68E-05	4.50E-04	-2.04E-05	5.39E-04

Table 6: Potential environmental impacts for one cycle of decontamination with the MEDISTER 60

Environmental Impacts in Detail – MEDISTER 160

The tables below show the use of material and energy, as well as the water use for one cycle of waste decontamination with the MEDISTER 160 for the Upstream, Core, and Downstream Module.

Renewable Resources

MATERIAL (m^3)	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Wood	5.17E-06	6.07E-08	7.50E-05	8.03E-05
Water	1.85E-03	3.39E-03	1.74E-02	1.93E-02
ENERGY (MJ)	**UPSTREAM**	**CORE**	**DOWNSTREAM**	**TOTAL**
Biomass	5.90E-02	6.20E-04	8.96E-01	9.56E-01
Wind, Solar, and Geothermal	1.45E-02	2.00E-04	3.21E-01	3.35E-01
Hydro Power	1.11E-01	5.40E-03	3.37	3.48

Table 7: Material and energy use from renewable resources for one cycle of decontamination with the MEDISTER 160

Non-Renewable Resources

MATERIAL (g)	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Coal	47.18	0.52	1137.16	1184.86
Gravel	22.42	6.93E-02	130.96	153.45
Crude oil	8.76	2.33E-02	82.47	91.25
ENERGY (MJ)	**UPSTREAM**	**CORE**	**DOWNSTREAM**	**TOTAL**
Fossil	1.78	1.47E-02	30.46	32.25
Nuclear	0.26	2.42E-03	6.72	6.98
Biomass	1.41E-04	1.05E-08	2.68E-03	2.82E-03

Table 8: Material and energy use from non-renewable resources for one cycle of decontamination with the MEDISTER 160

Waste

WASTE (KG)	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Non-hazardous waste	3.18E-02	5.32E-05	9.74E-02	1.29E-01
Hazardous waste	1.20E-05	3.41E-08	3.34E-05	4.55E-05
Radioactive waste	6.03E-06	3.29E-08	1.29E-04	1.35E-04

Table 9: Waste production for one cycle of decontamination with the MEDISTER 160

Environmental Impact Categories

	UPSTREAM	CORE	DOWNSTREAM			TOTAL
			Distribution	**Use**	**End of Life**	
Acidification potential [kg SO_2eq]	1.16E-03	2.31E-06	1.38E-04	1.30E-02	-1.07E-04	1.42E-02
Eutrophication potential [kg PO_4^{3-}eq]	4.14E-04	5.46E-07	2.00E-05	1.58E-03	-6.16E-06	2.00E-03
Global warming potential [kg CO_2eq]	1.62E-01	1.16E-03	3.40E-02	2.39	-2.64E-02	2.56
Photochemical oxidant creation potential [kg C_2H_4eq]	6.89E-05	1.27E-07	5.62E-06	6.21E-04	-1.68E-05	6.79E-04

Table 10: Potential environmental impacts for one cycle of decontamination with the MEDISTER 160

3 DEFINITIONS

Life Cycle Assessment
Life cycle assessment (LCA) is a technique assessing the environmental impact associated with all stages of a product's life from-cradle-to-grave (i.e. from raw material extraction through material processing, manufacturing, distribution, use, repair and maintenance, and disposal or recycling).

Acidification potential
The aggregate measure of the acidification potential of some substances, calculated through the conversion factor of sulphur oxides and nitrogen and ammonia into acidification equivalents [kg SO_2eq].

Global warming potential
The Global warming potential expresses the impact of a material, energy, and/or process on climate change, in units of mass of CO_2 equivalent [kg CO_2eq], for the time horizon of 100 years.

Eutrophication potential
The aggregate measure of the inland water eutrophication potential of some substances, calculated through the conversion factor of phosphorous and nitrogen compounds (waste water discharges and air emissions on NOx and NH_3) into phosphorous equivalents [kg PO_4^{3-}eq].

Photochemical oxidant creation potential
It is a complex indicator which describes primary the influence of emissions to the generation of tropospheric ozone ("photochemical smog") [kg C_2H_4eq]. Photochemical smog arises due to solar radiation in a reaction of nitrogen oxide with volatile hydrocarbon under certain atmospheric circumstances. It can be understood as a local/regional appearing air pollution with negative impacts on the human health (respiratory symptoms, irritated eyes), on plants and other materials.

ETA Umweltmanagement

Independent Assurance Statement

ETA Umweltmanagement GmbH,
appointed by Meteka Austria GmbH
as an independent third party verifier,
confirms that the information given in this

Environmental Product Declaration

for MEDISTER ®160 and MEDISTER®60

is valid and sound and accurately reflects
the information of the underlying Life-Cycle Assessment
which has been performed by ECODESIGN company GmbH
in compliance with the requirements of
ISO 14040 Life-Cycle Assessment.

This EPD was developed considering the requirements of ISO 14025:2006. Applicable Product Category Rules (PCR) for the MEDISTER devices are not yet available.

Vienna, 9 September 2016

Dipl.-Ing. Manfred Mühlberger
Managing Director, EPD verifier

The Environmental Declaration is valid as long as there are no changes in the product specification but no longer than August 2020.
ETA Umweltmanagement GmbH is an accredited environmental verifier under the Austrian Environmental Management Act, Accreditation number A -V-001.

The Life Cycle Assessment and the Environmental Product Declaration was conducted by Dr. Adriana Diaz and Dr. Wolfgang Wimmer, "ECODESIGN company" engineering & management consulting GmbH, Vienna, Austria.

Independent verification of the declaration and data in accordance to ISO 14025:2006 was carried out by Manfred Mühlberger, Accredited Environmental Verifier, ETA Umweltmanagement GmbH, Vienna, Austria.

METEKA GmbH
Viktor-Kaplan-Straße 7 | 8750 Judenburg, Austria
Tel.: (+43) 3572 / 85 1 66 | Fax: (+43) 3572 / 85 166-6
E-Mail: info@meteka.com | Web: www.meteka.com

METEKA gives germs no chance

Certified according to EN ISO 9001:2015 (Quality Management System) and EN ISO 14001:2015 (Environmental Management System)