

# MIETZSCH

GmbH Lufttechnik Dresden

ANWENDERINFORMATION

## WASTE GAS CLEANING



# Waste Gas Cleaning Plants

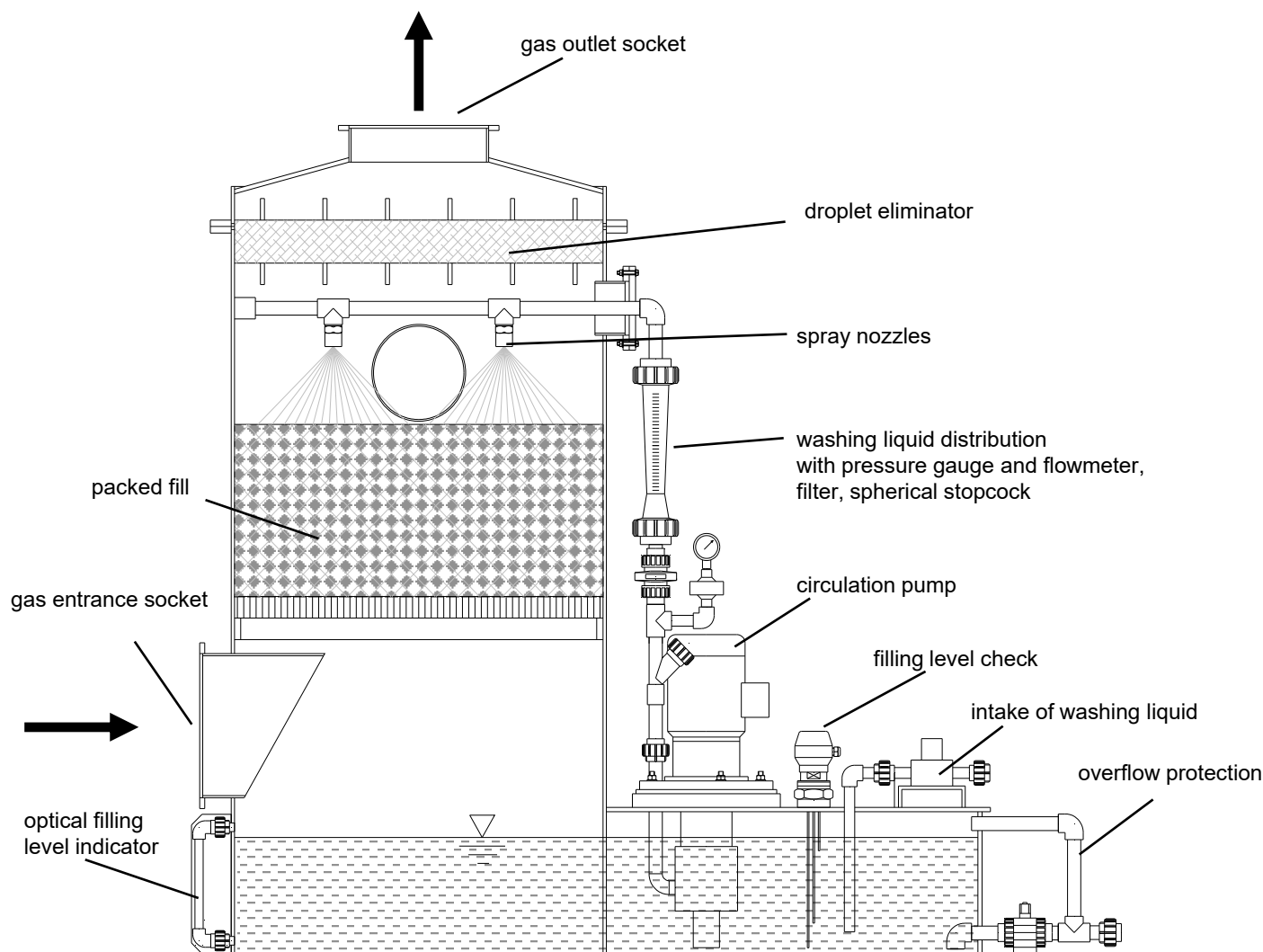
## Gas Scrubbers

Complete process solutions for the separation of noxious substances obtained as gases or aerosols (such as HCl, HF, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>S, Cl<sub>2</sub>, SO<sub>2</sub>, NH<sub>3</sub>, CN, amines and dust)

- ♦ Gas scrubbers in different sizes and different design
- ♦ with volumetric flow up to 42,000 m<sup>3</sup>/s
- ♦ Series production of corrosion-resistant materials
- ♦ PVC, PP, and PE
- ♦ The following methods are employed for solving the noxious air problem:
- ♦ Absorption plants reducing organic and inorganic air contaminations
- ♦ Biological waste gas cleaning for the reduction of odour emission (solvents, phenols, formaldehyde, amines, etc.)
- ♦ Oxidizing gas washing for the reduction of noise emission and oxidation of toxic gases
- ♦ Processes for the removal of solid, liquid, or gaseous contaminations from a flowing volume

Gas scrubbers have stood the test in application in the following branches:

- ♦ Chemical industry
- ♦ Textile industry
- ♦ Foundry industry
- ♦ Foodstuff industry
- ♦ Electrical engineering, electronic industry
- ♦ Surface-finishing industry
- ♦ Waste disposal plants



Scheme of a compact gas scrubber of vertical design

### Application

Legal prescriptions for keeping the air free of noxious substances make the treatment of exhaust gas or waste air an indispensable essential of many industrial and waste disposal plants. There are many problems involved, and so are ways and methods of solving them. The available assortment extends from simple filters for dust separation and biological and activated charcoal filters up to washing columns and their combination, if needed. The actual cleaning problem has to be checked in any case with the aim of choosing the technologically and economically most favourable solution from the wide range of facilities existing.

Mietzsch, a plastic-processing company, are concerned with cleaning problems, in particular those with aggressive substances and media participating in the processes so that the resistivity, chemical compatibility, and service life of the necessary plant components have to meet very high demands. Thermoplastic materials with their excellent resistivity to corrosion are often the only sensible means to solve such problems and, due to their price and easy processing, a real alternative to other materials.

### Survey of processes

The following survey of the most frequently applied waste air cleaning methods should not be regarded as complete.

#### Absorption scrubbers

Caused by the type of substances to be removed (such as HCl, HF, H<sub>2</sub>S, NH<sub>3</sub>, CN, NO<sub>x</sub>, SO<sub>x</sub>, H<sub>2</sub>S, and dust) and the quantity of waste air occurring, the processing industry most frequently applies absorption scrubbers with or without fills. The noxious substance passing through the scrubbing zones is bound to the detergent (physical absorption) and, in cases of need, converted chemically by additives such as NaOH or H<sub>2</sub>SO<sub>4</sub> (chemical absorption). The used washing liquid can be treated further in the following plants and then, often without any problem, released to central sewage plants. The design of the scrubber depends on the criteria mentioned above and largely on the desired degree of scrubbing and the inlet concentration of noxious substances. More details on this scrubber type will be found in the section *Explanation of plant technologies*.

#### Oxidation scrubbers

The extension of application of such compact scrubbers to elimination of odours and organic substances is a way to combine absorption and oxidation. The addition of oxidants, such as ozone, to the washing liquid initiates a very intense and almost complete reaction with the absorbed substance. Excess ozone will decompose into oxygen after the reaction and leave no undesired by-products.

#### Biological filters

An alternative to oxidation of odorous substances and organic matter is waste air treatment in biological filters. The specific properties of microorganisms responsible for the cleaning process allow application especially in plants running continuously with relatively constant waste air quantities and loading by noxious substances, such as in sewage and composting plants. The possible layout of biological filters extends from flat bed filters for large waste air quantities up to extensible modular container systems and separate filter units. This filter type represents a 'living organism'. Consequently, the desired function requires necessary boundary conditions, temperature and air humidity, for instance, to be observed which has corresponding repercussion on the overall plant concept (for example, integration of moisteners). A biological filter run correctly is relatively durable and free of maintenance.

#### Activated charcoal filters

If application of an oxidation scrubber or biological filter is impossible or not suitable, activated charcoal filters can be used for the treatment of waste air loaded with hydrocarbons or odorous substances (such as waste air from kitchens or foods industry plants). The fundamental principle of these filters is the attachment of molecules to the large inner surface of an activated charcoal layer through which the waste air is flowing (physical adsorption). When the capacity of the activated charcoal has been reached, the noxious substances will pass through the filter zone in continuously growing quantities so that the filter material has to be renewed. However, dimensioning corresponding to the application ensures an economical service life and operation free of maintenance.

#### Dust filters

Filters of most differing designs are used for the separation of dustlike noxious substances. The wide range of filter materials and the possible process-technological principles permit optimum adaptation to the corresponding applications by the selection of filter fineness, air throughput, dust quantity, and service life.

Dry-separating tissue or paper filters are often used. Excess of the possible dust capacity leads to a high increase of pressure loss and, consequently, to a reduced air capacity of the overall plant so that the filter has to be renewed. Used filters have to be disposed in consideration of the properties of the substance separated. Certain filter types allow partial or complete regeneration.

The great variety of possible filter types forbids further specification.

### Explanation of plant technologies

Due to the complexity of waste gas cleaning, the following details will be restricted to waste gas cleaning by means of absorption scrubbers. This method is widely used in the processing industry.

#### Design of absorption scrubbers

These scrubbers can be classified fundamentally according to the following features:

- horizontal or vertical design
- consisting of one or of several scrubbers
- for one or for several substances to be removed
- with one or with several washing zones
- with fills (packings or sieve bottoms) or free of fills (nozzle scrubber)
- with circulating detergent or with detergent passing through
- with detergent additives or without (for chemical absorption or oxidation washing)
- with or without waste water treatment
- with manual or with automatic process control or supervision

The combination of these variants, along with the given process parameters such as initial and final concentrations, temperature, and pressure, and the local conditions mainly decide on the design of the scrubber.

A great many applications can be made with plants of similar layout so that a range of types can be dimensioned. The scrubber series KVV or KWH has been dimensioned for maximum waste air quantities of 42 000 m<sup>3</sup> per year. Larger waste air quantities can be handled by special designs or parallel connection.

This series represents a combination of packing-type and nozzle scrubbers with one (type 1) or two (type 2) washing zones in horizontal or vertical plastic design (PVC, PP, or PE). The fundamental advantages of this variant are its universal resistivity to chemicals and the generation of a relatively large boundary surface between the gas and the washing liquid that is renewed continuously.

Compared with conventional packing-type scrubbers, this design requires a shorter absorption zone for the same degree of absorption. This leads to a more compact layout and lower pressure losses on the gas side. Gas quantity fluctuations can be tolerated within certain limits without fundamental reduction of efficiency. Minimized fills make the scrubber largely free of clogging.

The washing liquid is circulating in a system without the risk of dry running until it has to be renewed. The applied washing liquid is water. Chemicals can be added in defined portions for improving the efficiency according to the relevant application. These convert or bind the absorbed substance and thus maintain the absorption capacity of the washing liquid for a longer period.

A highly efficient droplet eliminator at the outlet of the scrubber inhibits the undesired exit of the finely sprayed washing liquid into the stream of gas.

The process in the standard version is run and supervised by hand, and so is replacement of the used detergent. Control includes activation and deactivation of the fan and pump and an overload protection for the motors.

According to the customers' wishes, the plants can also be equipped with a suitable control system for detergent level checking, acquisition of pH or conductivity values, detergent replacement, metered addition of chemicals, fan and pump supervision, neutralization of used washing liquid, and process logging.

### Process layout

Selection of the scrubber according to the stream of waste air volume is usually sufficient for the rough layout of the necessary plant size.

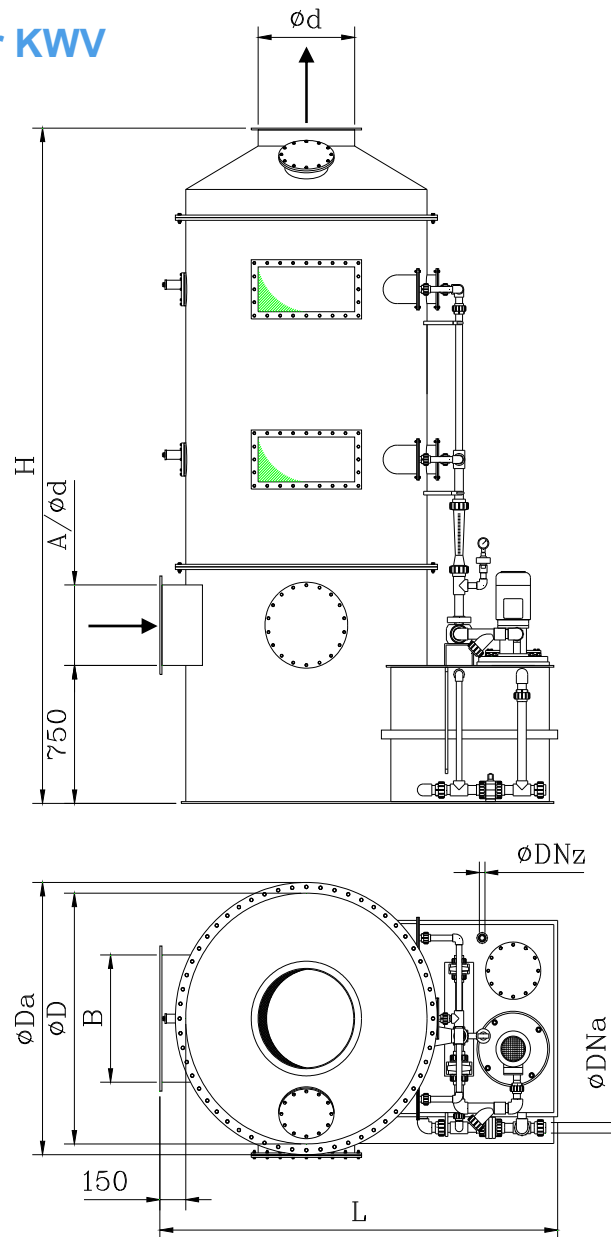
Ensuring of the functional reliability of the plant in any case requires a process-technical calculation of the existing gas cleaning method to warrant the desired washing capacity along with minimized investment and process cost.

### Process-technological implementation

The Mietzsch company, an enterprise of plastic processing, supply scrubbers and individual plant sections as well, and dimension, manufacture, and install complete air conditioning plants. Many years of experience make evident that technologically balanced and economically favourable solutions will be possible if one contractor is responsible for the complete performance including project design planning. You will get a survey of the capabilities and productivity of the Mietzsch company in other documents edited by us or by our field service.

### Compact gas scrubber KVV

Vertical design

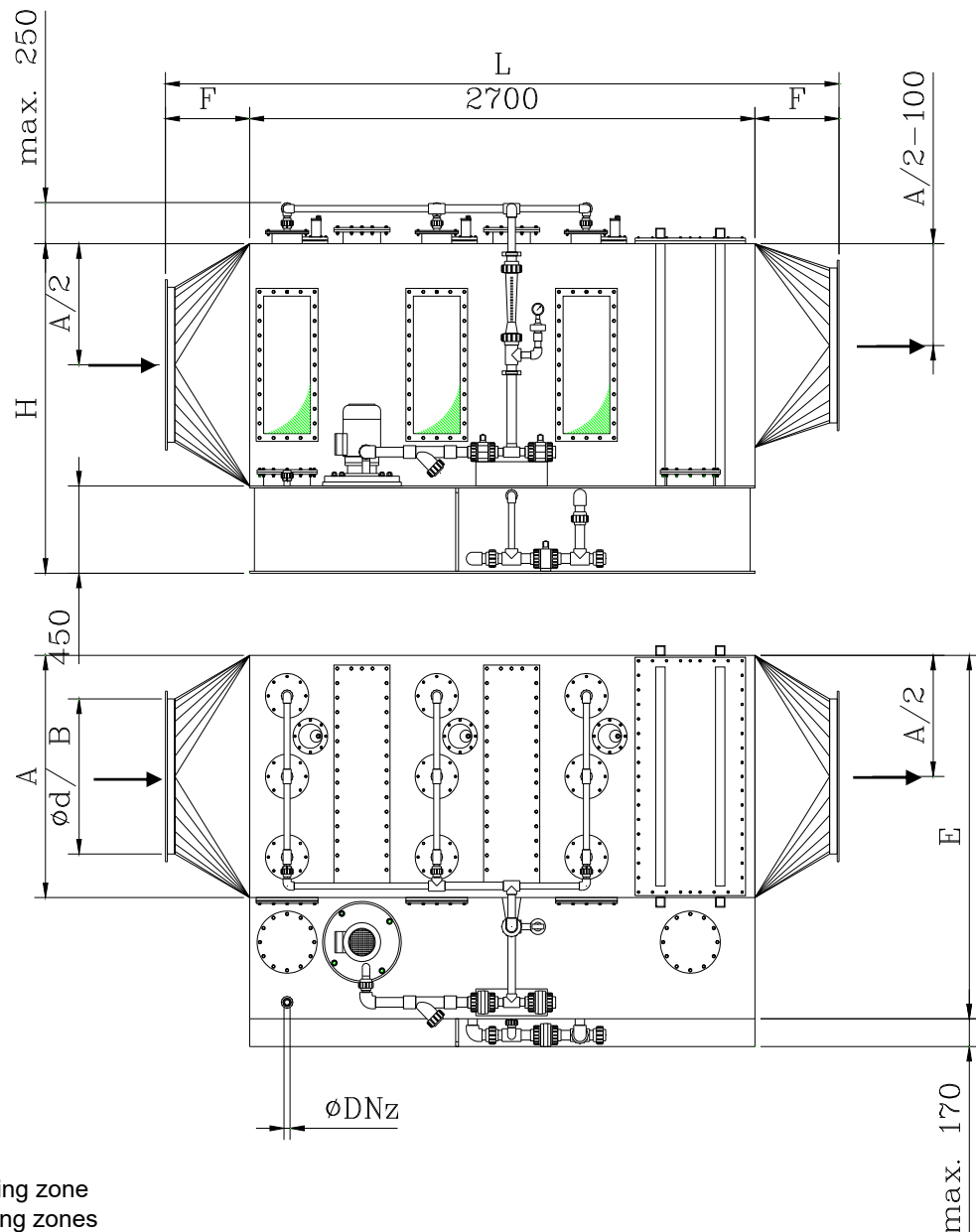


Type 1 - one washing zone  
Type 2 - two washing zones

$\phi D$	$\phi d$	A	B	$\phi D_a$	H	L	$\phi DN_z$	$\phi DN_a$	volumetric flow	receiver volume	pump power	fan typ	fan power
[mm]	[mm]	[mm]	[mm]	[mm]	type 1 [mm]	type 2 [mm]	[mm]	[mm]	[m³/h]	[m³]	[kW]	VRE... P1	[kW]
250	110	-	-	320	2150	2700	950	20	170- 340	0,28	0,37	100/734 R 4500	0,95
315	125	-	-	395	2220	2780	950	20	280- 560	0,28	0,37	100/734 R 4500	0,95
400	160	-	-	480	2340	2900	1050	20	450- 900	0,31	0,55	160/731 R 3850	1,40
500	200	-	-	580	2450	2950	1150	25	700- 1400	0,39	0,75	200/731 R 3200	2,00
630	250	-	-	710	2650	3200	1300	25	1100- 2200	0,50	1,10	250/731 R 2500	2,50
800	315	-	-	880	2750	3320	1450	25	1800- 3600	0,65	1,50	315/731 R 2000	4,70
1000	400	-	-	1100	2880	3480	1700	25	2800- 5600	0,65	1,50	400/731 R 1450	4,70
1250	500	400	630	1350	2950	3560	2080	32	4400- 8800	0,95	3,00	400/731 R 1550	6,40
1400	560	450	710	1520	3050	3660	2310	32	5500- 11000	1,15	3,00	500/731 R 1150	9,50
1600	630	500	800	1720	3150	3770	2600	32	7200- 14400	1,45	3,00	500/731 R1290	9,50
1800	710	560	900	1920	3270	3900	2920	32	9100- 18200	1,85	3,00	500/731 R 1390	14,00
2000	800	630	1000	2120	3390	4040	3220	40	11200- 22400	2,30	5,50	500/731 R 1470	16,00
2240	900	710	1100	2400	3540	4190	3460	40	14000-28000	2,80	5,50	630/731 R 1120	18,50
2400	1000	800	1240	2560	3680	4340	3640	40	16000-32000	3,20	5,50	630/731 R 1180	28,00
2600	1100	900	1240	2760	3830	4500	3840	40	19000-38000	3,60	7,50	630/731 R 1240	28,00

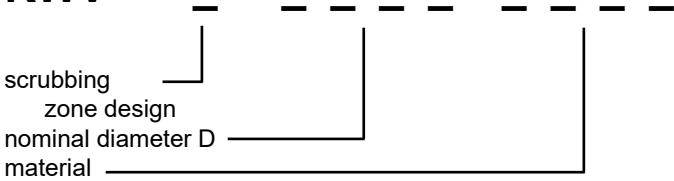
### Compact gas scrubber KWH

Horizontal design

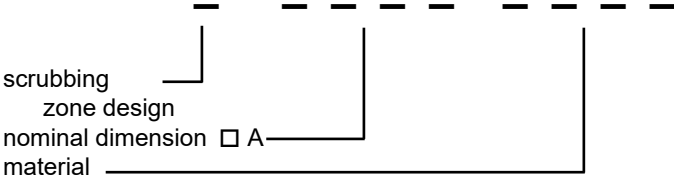


Type 1 - one washing zone  
Type 2 - two washing zones

□ A	∅ d	□ B	E	F	L	H	∅ DNz	∅ DNa	volumetric flow	receiver volume	pump power	fan typ	fan power
[mm]	[mm]	[mm]	[mm]	[mm]	type 1 [mm]	type 2 [mm]	[mm]	[mm]	[m³/h]	[m³]	[kW]	VRE... P1	[kW]
225	125	-	700	250	2400	3200	810	20	40	170- 510	0,75	100/734 R 4500	0,95
280	160	-	765	250	2400	3200	810	20	40	280- 840	0,80	160/731 R 3850	1,50
355	225	-	950	300	2500	3300	810	20	40	450- 1350	1,00	200/731 R 3200	2,00
450	280	-	1000	350	2600	3400	900	25	40	700- 2100	1,05	250/731 R 2500	2,50
560	355	-	1130	350	2600	3400	1010	25	40	1100- 3300	1,20	315/731 R 2000	4,70
710	450	400	1210	400	2700	3500	1160	25	40	1800- 5400	1,30	400/731 R 1450	4,70
900	550	500	1500	400	2700	3500	1350	25	40	2800- 8400	1,60	500/731 R 1150	9,50
1100	710	630	1700	400	2700	3500	1540	32	50	4400- 13200	1,80	500/731 R 1290	9,50
1250	800	710	1850	450	2800	3600	1700	32	50	5500- 16500	1,95	500/731 R 1390	14,00
1400	900	800	2000	450	2800	3600	1850	32	50	7200- 21600	2,10	630/731 R 1050	14,00
1600	1000	900	2200	500	2900	3700	2050	32	50	9100- 27300	2,30	630/731 R 1120	18,50
1800	1100	1000	2400	550	3000	3800	2250	40	63	11200- 33600	2,55	630/731 R 1180	28,00
2000	1250	1100	2700	600	3100	3900	2450	40	63	14000- 42000	2,90	800/731 R 870	28,00

no.	quantity	specification	individual price EUR	total price EUR
		<p><b>Vertical scrubber of plastic material</b></p> <p><b>Mietzsch</b> Lufttechnik - Series KWV</p> <p>Packing-type nozzle scrubber of plastic material (PVC, PP, PE) in vertical design</p> <p>Combined packing-type nozzle scrubbing zone in single / double layout</p> <p>Demister with separation efficiency of 99 % for droplets less then 8 µm</p> <p>Connection for intake and outlet air through frame / flange</p> <p>Integrated receiver with filling level indicator and outlet/overflow system and outlet valve</p> <p>Scrubbing liquid distribution system including pressure and volumetric flow supervision, hand-operated reducer valve, filters and nozzles, scrubbing liquid intake socket</p> <p>Scrubbing liquid circulation pump of plastic material, safe against dry running</p> <p>Inspection openings for demister and receiver, sightglasses for visual supervision</p> <p>Control cabinet for pump and fan control</p> <p><b>KWV</b></p>  <p>scrubbing zone design nominal diameter D material</p> <p>volumetric flow : _____ m<sup>3</sup>/h</p> <p>diameter D : _____ mm</p> <p>overall height : _____ mm</p> <p>n. of scrubbing zones : _____</p> <p>pump power : _____ kW</p> <p>scrubbing agent : _____ -</p> <p>pressure loss : _____ Pa</p> <p>permissible pressure : _____ Pa</p> <p>permissible temperature : _____ °C</p> <p>total weight : _____ kg</p> <p>Special conditions of use:</p> <p><b>Accessories and special equipment</b></p> <ul style="list-style-type: none"> <li>♦ Automatic evaporation compensation</li> <li>♦ Measurement of pH value / conductivity</li> <li>♦ Automatic scrubbing liquid change</li> <li>♦ Automatic detergent metering</li> <li>♦ Neutralization of scrubbing liquid</li> <li>♦ Process logging by recorder</li> <li>♦ Outlet air fan with connecting line to scrubber</li> </ul>		



no.	quantity	specification	individual price EUR	total price EUR
		<p><b>Horizontal scrubber of plastic material</b></p> <p><b>Mietzsch</b> Lufttechnik - Series KWH</p> <p>Packing-type nozzle scrubber of plastic material (PVC, PP, PE) in horizontal design</p> <p>Combined packing-type nozzle scrubbing zone in single / double layout</p> <p>Demister with separation efficiency of 99 % for droplets less then 8 µm</p> <p>Connection for intake and outlet air through frame / flange</p> <p>Integrated receiver with filling level indicator and outlet/overflow system and outlet valve</p> <p>Scrubbing liquid distribution system including pressure and volumetric flow supervision, hand-operated reducer valve, filters and nozzles, scrubbing liquid intake socket</p> <p>Scrubbing liquid circulation pump of plastic material, safe against dry running</p> <p>Inspection openings for demister and receiver, sightglasses for visual supervision</p> <p>Control cabinet for pump and fan control</p> <p><b>KWH</b></p>  <p>scrubbing zone design nominal dimension □ A material</p> <p>volumetric flow : _____ m<sup>3</sup>/h</p> <p>dimension □ A : _____ mm</p> <p>length L : _____ mm</p> <p>inlet diameter : _____ mm</p> <p>outlet diameter : _____ mm</p> <p>n. of scrubbing zones : _____</p> <p>pump power : _____ kW</p> <p>scrubbing agent : _____ -</p> <p>pressure loss : _____ Pa</p> <p>permissible pressure : _____ Pa</p> <p>permissible temperature : _____ °C</p> <p>total weight : _____ kg</p> <p>Special conditions of use:</p> <p><b>Accessories and special equipment</b></p> <ul style="list-style-type: none"> <li>♦ Automatic evaporation compensation</li> <li>♦ Measurement of pH value / conductivity</li> <li>♦ Automatic scrubbing liquid change</li> <li>♦ Automatic detergent metering</li> <li>♦ Neutralization of scrubbing liquid</li> <li>♦ Process logging by recorder</li> <li>♦ Outlet air fan with connecting line to scrubber</li> </ul>		

## Our program of products and services

### Roof fans

of all-plastic design, horizontally or vertically blowing out with many assembly accessories

### Radial fans

of thermoplastic material and FRP, direct and belt driven  
up to about 150 000 m³/h and 6 500 Pa

### Special fans

duct fans, built-in devices, mobile radial fans, Venturi injectors

### Explosion-proof fans

according to ATEX for zone 1 and zone 2

### AIR technology systems and components

pipes, ducts, fittings, flaps, gas-tight shutoff flaps, exhaust air hoods, deflector hoods, suction hoods and many more of plastic material, complete air technology systems for industry and craft, air cleaning plants, laboratory and process exhaust systems

### Central ventilation systems

in housing construction, special-purpose fans, exhaust elements, controlling and regulating devices

### Noise protection

rectangular and cylindrical sound attenuators, silencing casings in corrosion-proof design

### Exhaust gas cleaning

droplet eliminators and moisteners, gas scrubbers for separation of gaseous dangerous substances, dust filter

### Heat exchangers

for heat recovery from moist and aggressive exhaust air

### Tanks

of thermoplastic material for liquids endangering water, according to water resources regulations

### Controlling and regulating elements and systems

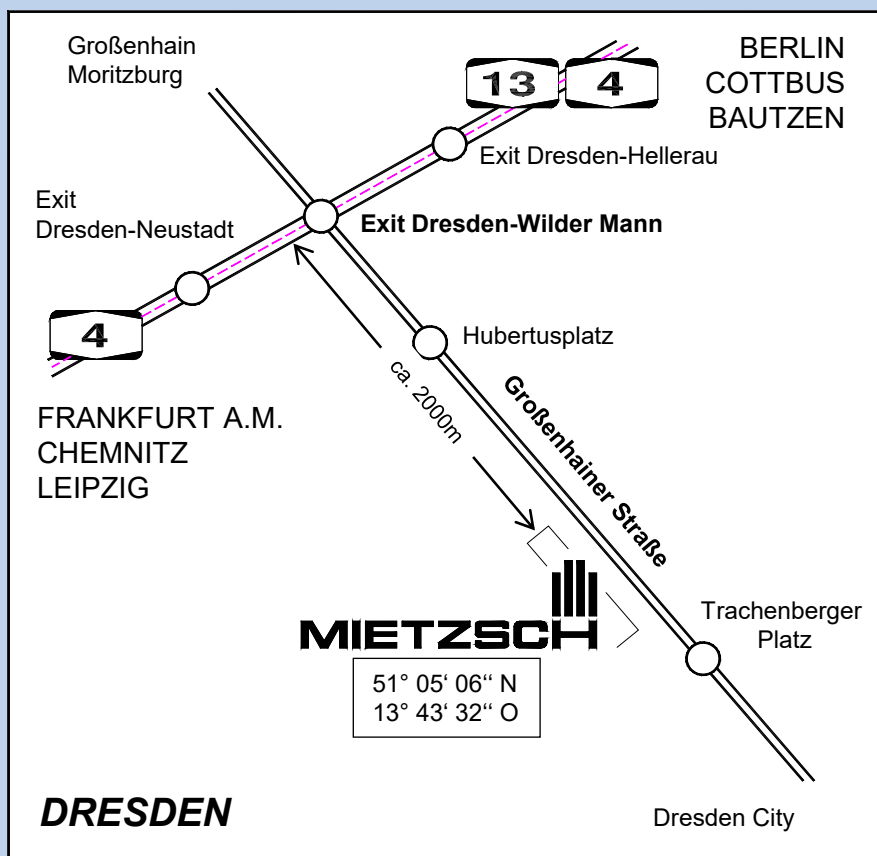
switches, motor protection devices, speed controllers, frequency inverter, fan controls, flow supervision

### Special designs

devices, linings, special components etc. of plastic material

### Engineering performances

planning, calculation, and design, ventilation measurement on standardized test stands, low and high temperature test in company-own climatic test chambers



**MIETZSCH**

GmbH Lufttechnik Dresden

Großenhainer Straße 137  
DE-01129 Dresden

Telefon: +49 351 8433 0  
FAX: +49 351 8433 160  
E-mail: mietzsch@mietzsch.de  
Internet: <http://www.mietzsch.de>