

## Oil Mist Separator STENO



# Oil Mist Separator STENO

## To the nature... from the nature...

HYDAC Filtertechnik has been your reliable partner for lubricating oil filtration and fluid service for more than 50 years. Now, with our oil mist separators, we also ensure the recovery of the valuable lubricant without affecting or damaging the fluid or its additives. With excellent separation efficiency, almost the entire lubricant can be recovered and reused. Our contribution to nature.

We were inspired by a small, black beetle from the desert that uses its wings to separate water droplets from the desert air. This unique natural role model also inspired the name of HYDAC's oil mist separator product series:

**STENO**cara dentata.



Fig. 1: Stenocara dentata

## The application

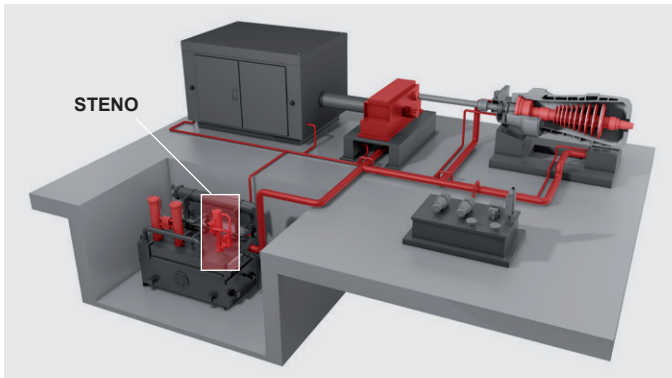


Fig. 2: Schematic representation of a lubricating oil circuit in a steam turbine

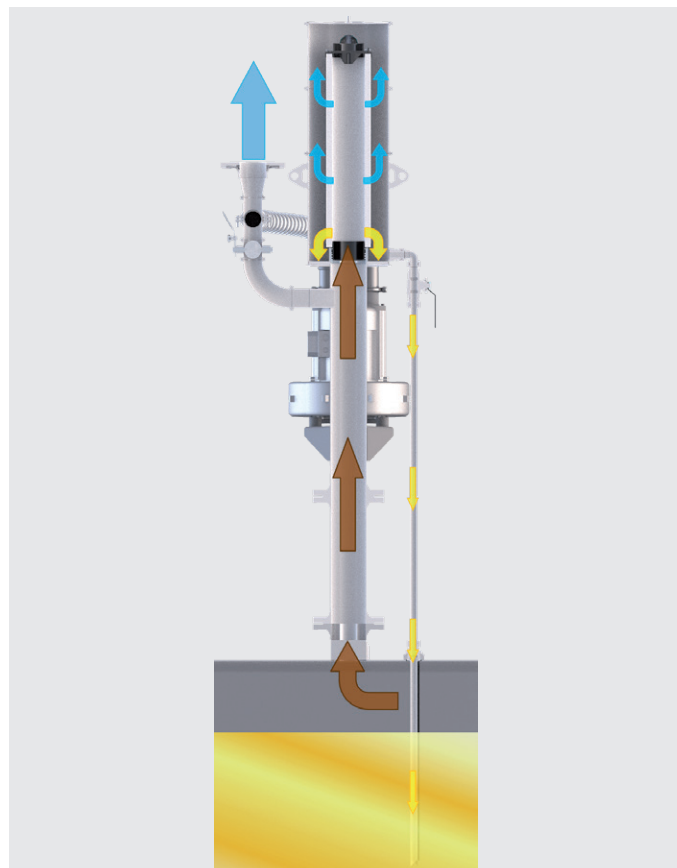


Fig. 3: Functionality of STENO

Oil mist separators are an important component of lubricating oil systems in turbines, such as gas, steam and hydro turbines. In the turbine bearings a fine oil mist is formed from the lubricant. Over 95% of the oil droplets are 0.15 to 1.0  $\mu\text{m}$  in size. The escape of this fine oil mist through the seals of the bearings must be prevented. An insufficient suction can have serious consequences.

### Consequences of oil mist emission

- Health risks by inhalation
- Formation of lubricating film on the floor and the machine surface → lack of work safety
- Lube oil loss in the system
- Emission requirements are not met
- Fire hazard

To prevent the escape of oil mist from the turbine bearings or the tank, a powerful low-noise side channel blower is used to extract air from the lubricating oil tank. This creates a defined negative pressure in the tank. The negative pressure can be adjusted securely and conveniently by means of a lockable throttle valve. The negative pressure is connected to the turbine bearings via the return lines, preventing oil mist from escaping there through the seals.

In addition, the extracted oil mist is separated by the highly efficient Optimicron® Drain filter elements with an outstanding separation efficiency of **more than 99.99 %** in the range of 0.1  $\mu\text{m}$ . The recovered and filtered lubricant finally flows back through a drainage line into the lubricating oil tank.

The residual oil content of **less than 5 mg/m<sup>3</sup>** is significantly below the legal requirements (e.g. TA Luft).

## ■ The heart of the filter – Optimicron® Drain Elements

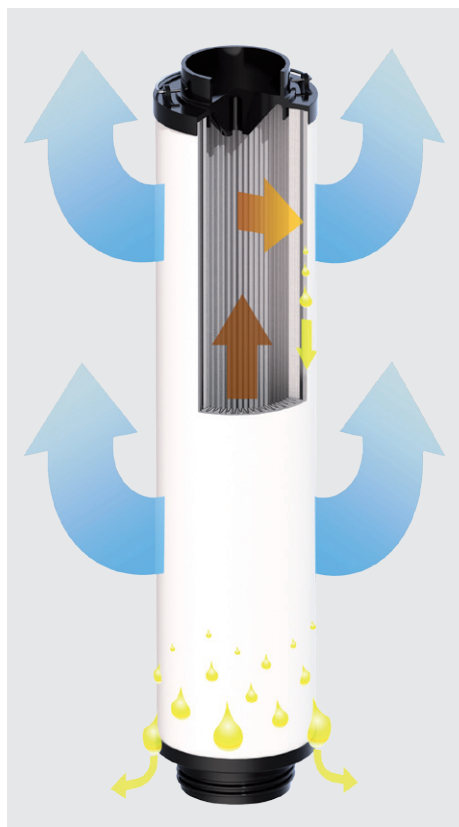


Fig. 4: Optimicron® Drain Element

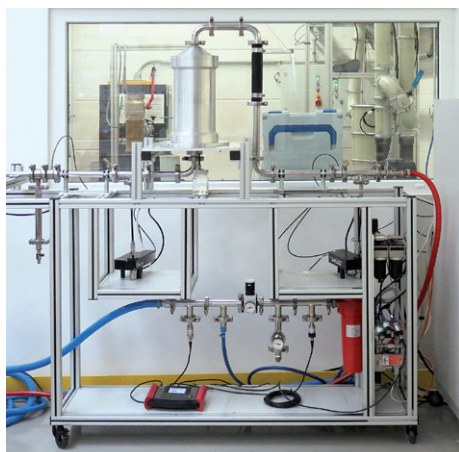


Fig. 5: Element test rig



Fig. 6: Testing chamber

Based on decades of experience in lubricating oil filtration, an innovative and efficient filter element technology has been developed. Compared to the common glass fiber cartridges, the Optimicron® Drain element consists of a star-pleated, multi-layer coalescence filter mesh and a cylindrical drainage layer. The highly efficient design and the special geometry of the element ensure that only a single element is required in the STENO (for sizes 50 – 200). The element is simply and safely screwed into the housing by a thread on the cap. There are no tie rods necessary to fix the element. As a result, a very fast element change is possible with low maintenance requirements.

### Functionality of Optimicron® Drain elements

The fine oil droplets are collected in the multi-layer coalescence mat and merge to larger drops. Within the following drainage layer, the large drops now flow downwards. A re-entrainment of the larger drops is prevented by the special drainage layer. The separated oil collects on the bottom of the filter bowl and is returned via a pipeline to the lubricating oil system. This completes the cycle.

Because dirt particles are also kept in the filter element, both the air and the separated lubricant are cleaned. By using the HYDAC Optimicron® Drain elements over 99.99% of the 0.1 µm oil droplets are separated. Thus, residual oil content of less than 5 mg/m³ is achieved even at high oil mist concentrations. As a result, legal requirements are significantly undercut over the entire service life. In addition, the sustainably clean exhaust air and the recovery of the clean lubricating oil ensure a reduced environmental impact.

### Advantages of Optimicron® Drain Elements

- Residual oil content of less than 5 mg/m³ is significantly below the legal requirements
- Excellent filter performance of >99.99% at 0.1 µm
- Significantly increased service life
- Only one element in the housing (STENO 50 – 200)
- Fast and safe element change under 10 minutes by simple thread connection without tie rod
- Innovative star-pleated construction
- Over 50 years experience in filter element production
- Worldwide and fast availability of spare elements

### Unique testing area

In order to validate the excellent filter performance of the elements and the entire oil mist separator, a unique test area was built in the HYDAC FluidCareCenter®. Individual filter elements can be measured in the element test bench in accordance to ISO 12500-1: 2007.

The examination of the complete STENO regarding functionality and performance is also possible in a test chamber.

Our experienced test engineers also go to the customer, validate the oil mist separators directly in the field and gladly answer your questions.



# The benefits at a glance

## SINGLE Version

Standardised product range

STENO 50	STENO 100	STENO 150	STENO 200	STENO 300	STENO 500	STENO 700

- Same connection sizes and dimensions over various sizes for an easy preliminary planning during project planning
- Easy replacement to a smaller or larger size

Fast element change

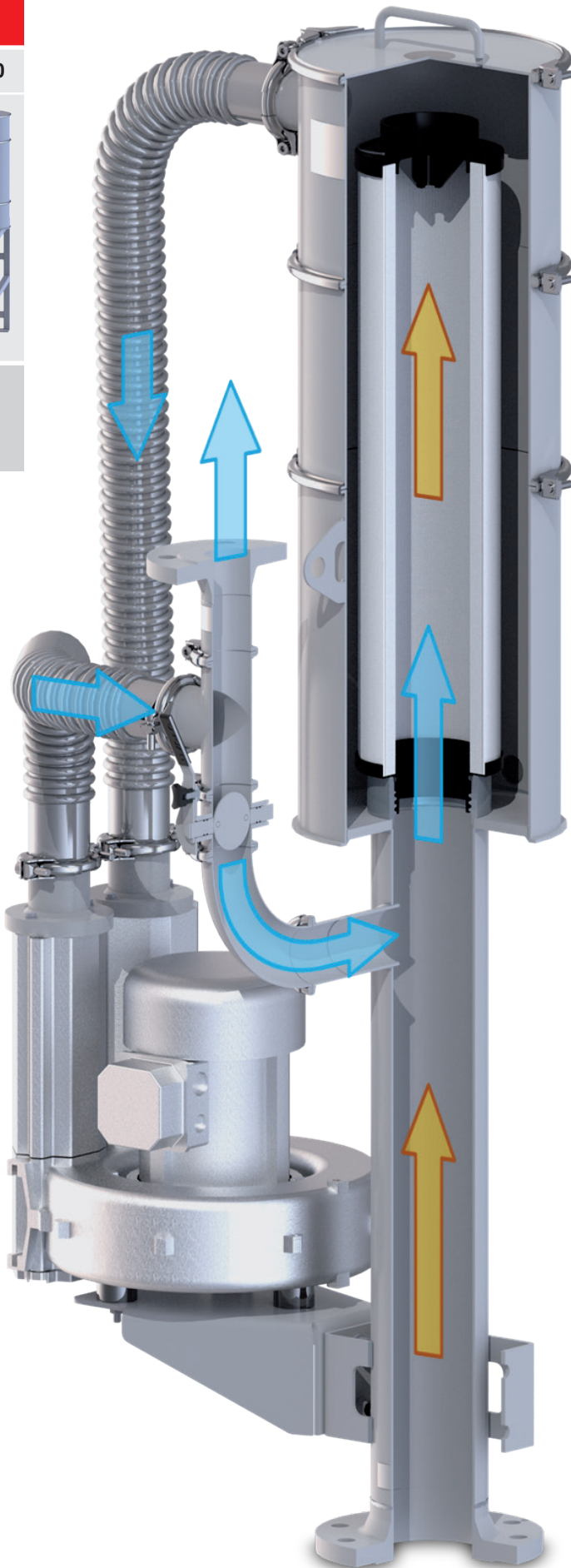
- Quick-release **clamping connection** of the lid
- Only **one element** for sizes 50 – 200
- Simple screw connection** of the element without tie rods
- Therefore a **faster, easier** and **safer** element change possible

Powerful side channel blowers

- Durable** and **robust** side channel blower with highly **efficient** performance

Compact design

- Significant savings** in **space** and **weight** due to compact design



Innovative bypass concept

- Independent of throttling position always in the **optimal operating point**
- If **oil condensate** forms in the exhaust duct, this can **not** flow back to the blower and damage it
- Fast commissioning** without several readjustments

Highly efficient element technology: Optimicron® Drain

- Residual oil content of **less than 5 mg/m³** is significantly below the legal requirements
- Excellent filter performance of **>99.99 %** at 0.1 µm
- Significantly increased service life

OPTIONAL

Internal drainage line

**Benefits:**

- Standardised version** for different tank sizes and levels possible
- Easy replacement** of the piping on site without removing the filter unit
- Reduced installation effort**, as the spacer and stub are included

Explosion-proof version / ATEX

Stainless steel version

Customised version







TRCU approval



# The benefits at a glance

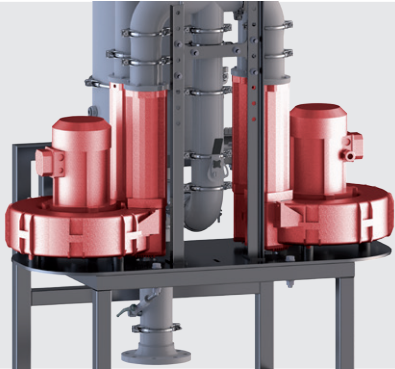
## DUPLEX Version

Standardised product range

STENO 100	STENO 150	STENO 200	STENO 300	STENO 500	STENO 700
					

- Same connection sizes and dimensions over various sizes for an easy preliminary planning during project planning
- Easy replacement to a smaller or larger size

Redundancy



- Increased functional safety through additional blower

Fast element change

- Quick-release clamping connection of the lid
- Simple screw connection of the element without tie rods
- Therefore a faster, easier and safer element change possible

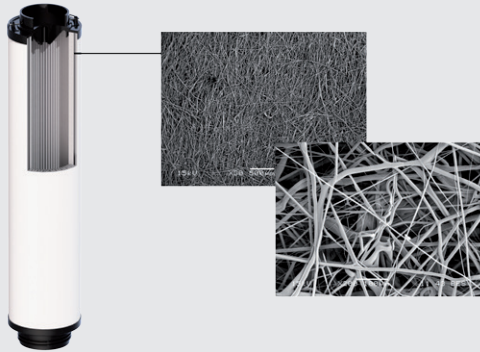
Powerful side channel blowers

- Durable and robust side channel blower with highly efficient performance

OPTIONAL
Internal drainage line
ATEX version
Stainless steel version
Customised version

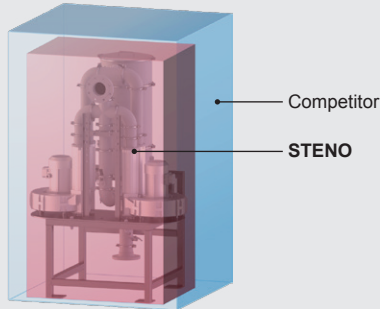


Highly efficient element technology: Optimicron® Drain



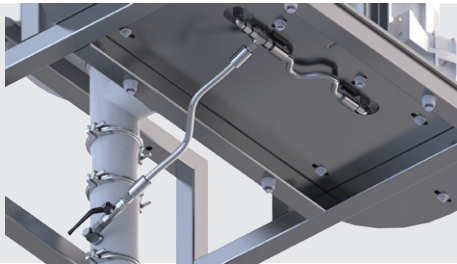
- Residual oil content of less than 5 mg/m³ is significantly below the legal requirements
- Excellent filter performance of >99.99 % at 0.1 µm
- Significantly increased service life

Compact design



- Significant savings in space and weight due to compact design

Continuous return



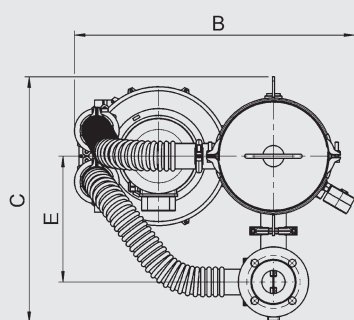
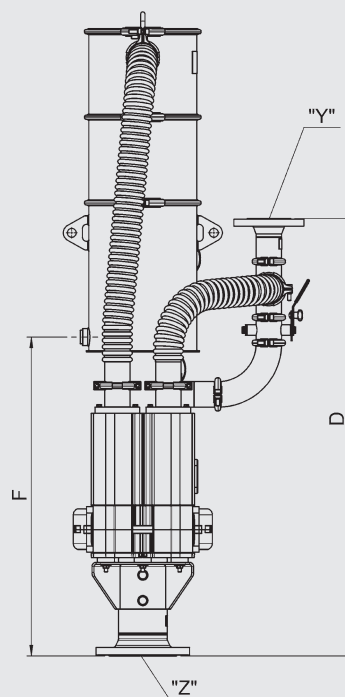
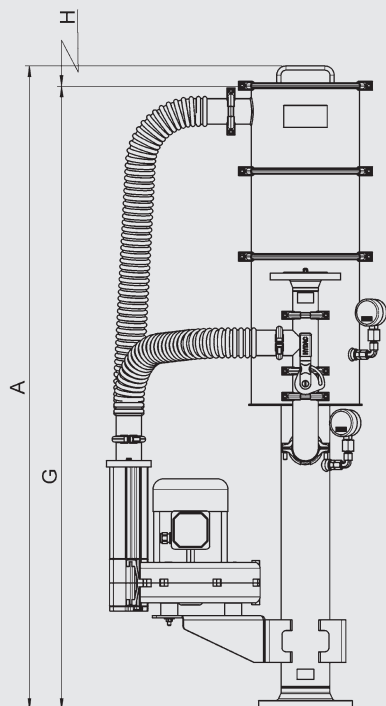
- Constant oil return – if condensate should accumulate on the non-operating side
- Saving of additional piping

Innovative bypass concept (→ page 5)

- Independent of throttling position always in the optimal operating point
- If oil condensate forms in the exhaust duct, this can not flow back to the blower and damage it.
- Fast commissioning without several readjustments

# Technical Data

## STENO 50 – 200 SINGLE

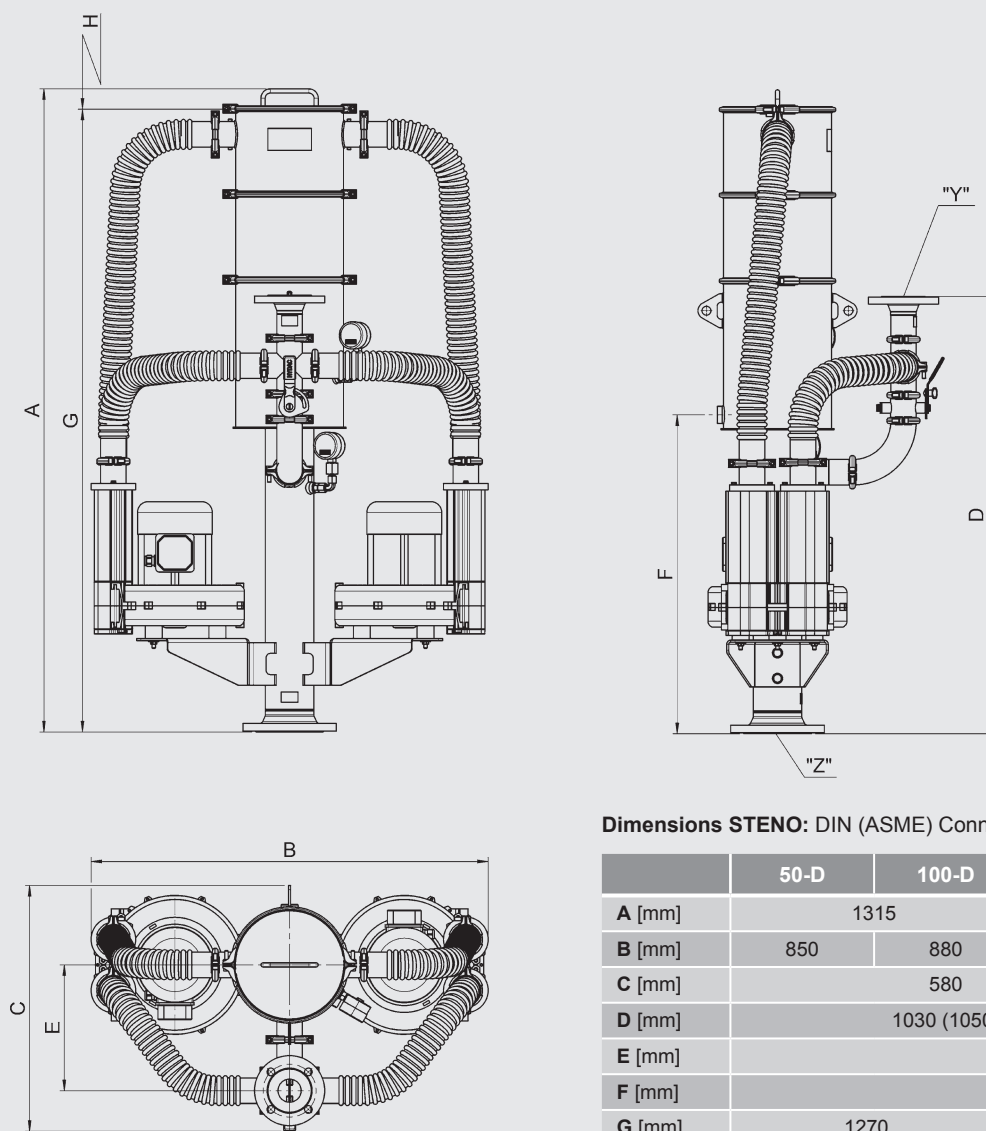


Dimensions STENO: DIN (ASME) Connections

	50-S	100-S	150-S	200-S
A [mm]	1315		1515	
B [mm]	615	630	640	670
C [mm]	580			585
D [mm]	1030 (1050)			1040 (1060)
E [mm]	300			
F [mm]	750			
G [mm]	1270		1470	
H [mm]	380		680	

	50-S		100-S		150-S		200-S	
Frequency [Hz]	50	60	50	60	50	60	50	60
Max. volume flow [m³/h] @ 60 mbar	50	70	110	145	180	240	265	240
Max. power consumption [kW]	0,55	0,65	0,75	0,90	1,10	1,70	2,20	1,70
Voltage [V] (± 10 %)	230/400	265/460	230/400	265/460	230/400	265/460	230/400	265/460
Efficiency class engine	IE3							
Elements	1 x 0300 OS 0.1 ON/DR				1 x 0600 OS 0.1 ON/DR			
Weight [kg]	60		65		80		90	
Flange connection “Y” DIN EN 1092-1 (ASME B16.5)	DN 50 PN 16 (2" – Class 150)						DN 80 PN 16 (3" – Class 150)	
Flange connection “Z” DIN EN 1092-1 (ASME B16.5)	DN 100 PN 16 (4" – Class 150)							
Drainage connection	G ¾"							
Pressure manometer	1x -40 to 0 mbar + 1x -160 to 0 mbar							
Paint DIN EN ISO 12944-5	C2-M with RAL 7001 (others on request)							
Insulation class	F							
Material hoses	Stainless steel							
Material piping	Carbon steel							

## STENO 50 – 200 DUPLEX



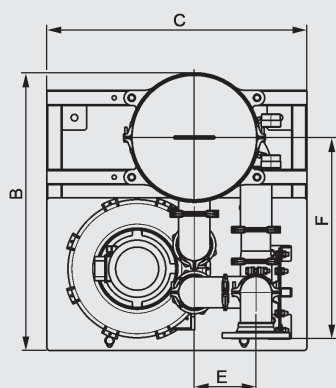
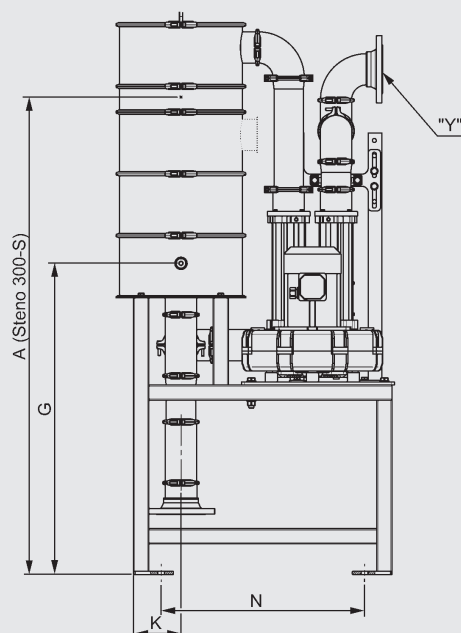
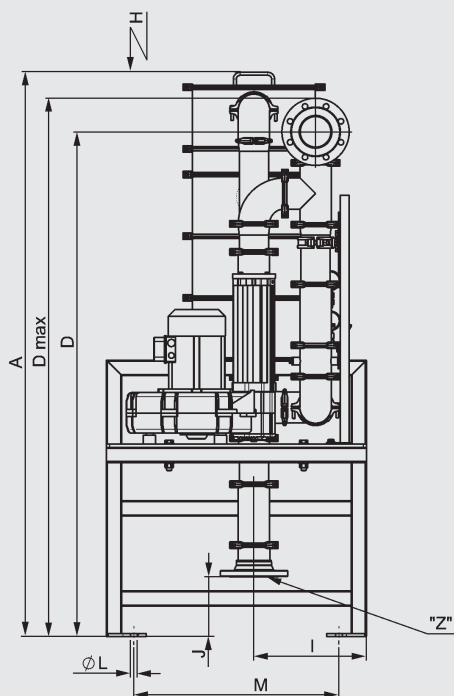
Dimensions STENO: DIN (ASME) Connections

	50-D	100-D	150-D	200-D
A [mm]	1315		1515	
B [mm]	850	880	900	950
C [mm]	580			585
D [mm]	1030 (1050)			1040 (1060)
E [mm]	300			
F [mm]	750			
G [mm]	1270		1470	
H [mm]	380		680	

	50-D		100-D		150-D		200-D	
Frequency [Hz]	50	60	50	60	50	60	50	60
Max. volume flow [m³/h] @ 60 mbar	50	70	110	145	180	240	265	240
Max. power consumption [kW]	0,55	0,65	0,75	0,90	1,10	1,70	2,20	1,70
Voltage [V] (± 10 %)	230/400	265/460	230/400	265/460	230/400	265/460	230/400	265/460
Efficiency class engine	IE3							
Elements	1 x 0300 OS 0.1 ON/DR				1 x 0600 OS 0.1 ON/DR			
Weight [kg]	80		90		115		130	
Flange connection “Y” DIN EN 1092-1 (ASME B16.5)	DN 50 PN 16 (2" – Class 150)						DN 80 PN 16 (3" – Class 150)	
Flange connection “Z” DIN EN 1092-1 (ASME B16.5)	DN 100 PN 16 (4" – Class 150)							
Drainage connection	G ¾"							
Pressure manometer	1x -40 to 0 mbar + 1x -160 to 0 mbar							
Paint DIN EN ISO 12944-5	C2-M with RAL 7001 (others on request)							
Insulation class	F							
Material hoses	Stainless steel							
Material piping	Carbon steel							

# Technical Data

## STENO 300 – 700 SINGLE



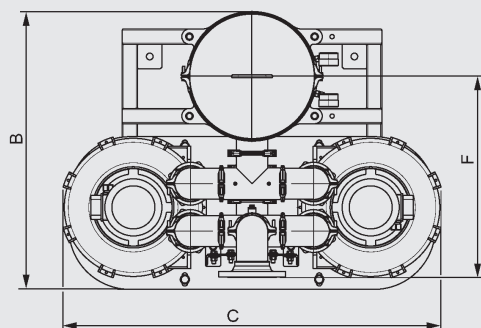
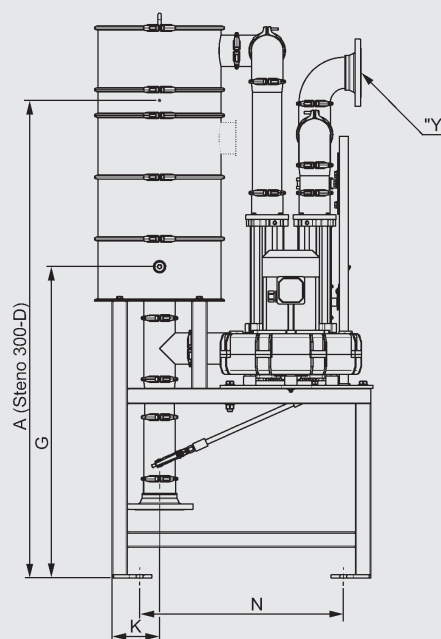
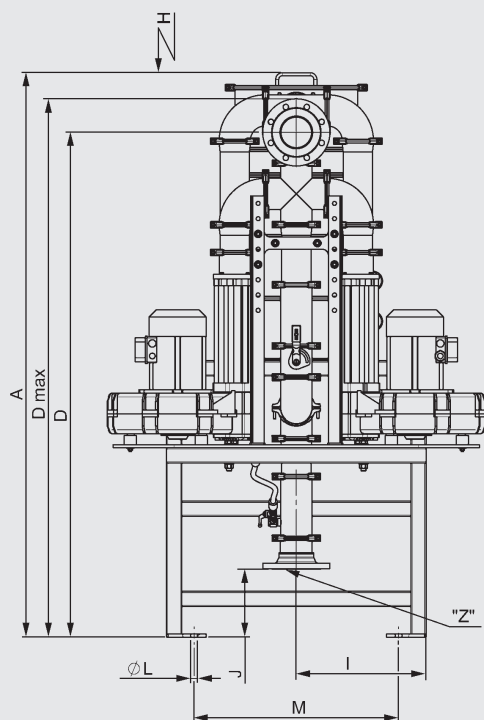
Dimensions STENO: DIN (ASME) Connections

	300-S	500-S	700-S
A [mm]	1562	1848	
B [mm]	910		915 (923)
C [mm]	850		
D [mm]	1653 (1637)	1653	1727
D <sub>max</sub> [mm]	1763 (1752)	1763 (1768)	1837 (1842)
E [mm]	202		
F [mm]	659 (641)	659 (671)	686 (711)
G [mm]	1018		
H [mm]	380	680	
I [mm]	368		
J [mm]	195 ... 310		
K [mm]	155		
Ø L [mm]	Ø 22		
M [mm]	670		
N [mm]	665		

	300-S		500-S		700-S	
Frequency [Hz]	50	60	50	60	50	60
Max. volume flow [m³/h] @ 60 mbar	360	355	480	460	710	750
Max. power consumption [kW]	3,0	2,6	4,0	3,5	5,5	6,5
Voltage [V] (± 10 %)	230/400	265/460	230/400	265/460	400/690	460/795
Efficiency class engine	IE3					
Elements	3 x 0300 OS 0.1 ON/DR		3 x 0600 OS 0.1 ON/DR			
Weight [kg]	270	250	285	280	310	
Flange connection “Y” DIN EN 1092-1 (ASME B16.5)	DN 100 PN 16 (4" – Class 150)					
Flange connection “Z” DIN EN 1092-1 (ASME B16.5)	DN 100 PN 16 (4" – Class 150)					
Drainage connection	G ¾"					
Pressure manometer	1x -40 to 0 mbar + 1x -160 to 0 mbar					
Paint DIN EN ISO 12944-5	C2-M with RAL 7001 (others on request)					
Insulation class	F					
Material piping / frame	Carbon steel					



## STENO 300 – 700 DUPLEX



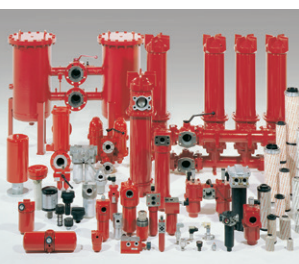
Dimensions STENO: DIN (ASME) Connections

	300-D	500-D	700-D
A [mm]	1562	1848	
B [mm]	910		915 (923)
C [mm]	1202 (1120)	1238 (1202)	1360 (1335)
D [mm]	1653 (1637)	1653	1727
D <sub>max</sub> [mm]	1763 (1752)	1763 (1768)	1837 (1842)
F [mm]	659 (641)	659 (671)	686 (711)
G [mm]	1018		
H [mm]	380	680	
I [mm]	425		
J [mm]	195 ... 310		
K [mm]	155		
Ø L [mm]	Ø 22		
M [mm]	670		
N [mm]	665		

	300-D		500-D		700-D	
Frequency [Hz]	50	60	50	60	50	60
Max. volume flow [m³/h] @ 60 mbar	360	355	480	460	710	750
Max. power consumption [kW]	3,0	2,6	4,0	3,5	5,5	6,5
Voltage [V] (± 10 %)	230/400	265/460	230/400	265/460	400/690	460/795
Efficiency class engine	IE3					
Elements	3 x 0300 OS 0.1 ON/DR		3 x 0600 OS 0.1 ON/DR			
Weight [kg]	350	310	365	360	415	
Flange connection “Y” DIN EN 1092-1 (ASME B16.5)	DN 100 PN 16 (4" – Class 150)					
Flange connection “Z” DIN EN 1092-1 (ASME B16.5)	DN 100 PN 16 (4" – Class 150)					
Drainage connection	G ¾"					
Pressure manometer	1x -40 to 0 mbar + 1x -160 to 0 mbar					
Paint DIN EN ISO 12944-5	C2-M with RAL 7001 (others on request)					
Insulation class	F					
Material piping / frame	Carbon steel					



Accumulator Technology 30.000



Filter Technology 70.000



Process Technology 77.000



Filter Systems 79.000



Compact Hydraulics 53.000



Accessories 61.000

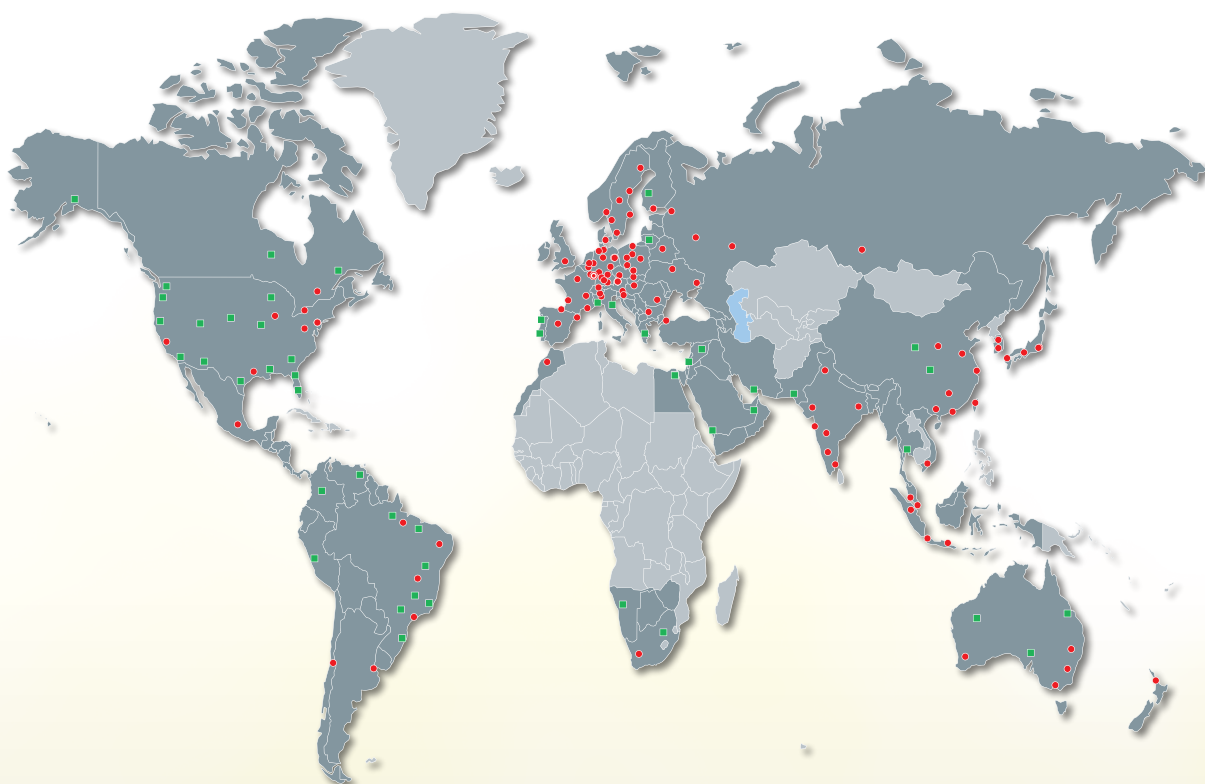


Electronics 180.000



Cooling Systems 57.000

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