

**MANN + HUMMEL
ProVent - Oil Separator for Open and
Closed Crankcase Ventilation Systems
Models 100, 150, 200, 400, 800**

Installation and Maintenance Manual



Contact information

This installation and maintenance manual is a component part of the scope of delivery. It must be kept in a safe place and remain with the equipment in the event of resale.

We reserve the right to make technical improvements to the products described in this installation and maintenance manual without notification.

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1 Foreword

This Installation and Maintenance Manual is intended to help become familiar with the oil separators of the ProVent series and their proper use.

The installation and maintenance manual contains important information on operating the components safely, properly and economically. Observation of the manual helps avoid potential risks, reduce repair costs and downtimes as well as improve machine reliability and increase its service life.

The instructions must be made accessible to any person charged with working on the device.

The respective existing national environmental protection regulations (especially on the disposal of removed parts), the general accident prevention regulations and the other generally recognised safety-related and industrial safety and health rules must be complied with.

We reserve the right to make technical changes to the oil separator and/or changes to the content of this installation and maintenance manual.

Information for the operator:

The operator is responsible for the provision of working equipment complying with basic health and safety requirements in accordance with the Ordinance on Industrial Safety and Health. This also includes deploying the work equipment such that it is only used within the scope of its intended use. The operator can define individual maintenance and service plans and intervals in addition to those stipulated in the installation and maintenance manual.

2 Safety

2.1 Warning notes and symbols



This symbol appears in all the sections of the manual in which your safety could be at risk. Failure to observe the information provided could put persons at risk.



This symbol appears in all the sections of the manual in which the information provided must be strictly observed to prevent damage to or destruction of system parts.



This symbol appears in all the sections of the manual in which the information provided must be carefully observed to ensure trouble-free, economic operation.

2.2 General information

Read the EU Material Safety Data Sheet on diesel fuel and observe the information contained in it regarding handling diesel fuel.

- Diesel fuel and fuel fumes are damaging to health.
- Do not inhale them, let them get in your eyes or come into direct contact with bare skin.
- Only complete assembly work when the engine has stopped.
- Relieve pressurised lines before starting any work.
- If fuel escapes, a collecting vessel must be placed under the vehicle to prevent environmental pollution.
- Only complete work for which you have been trained and received the necessary instruction.

2.3 Intended use

The various models of the ProVent series are exclusively intended for mechanical oil separation of blow-by-gas or for crankcase ventilation of diesel engines. Any other use above or beyond this is considered unintended use. The manufacturer / supplier is not considered liable for damage resulting from unintended use.

Intended use also includes observing the information in the installation and maintenance manual and meeting all the inspection and maintenance conditions.

The operator is obliged to check the ProVent once a week for externally recognisable damage and defects, and to immediately report any changes which have occurred (including in the operating behaviour), which impair the functional safety.

All labels and identifications on the ProVent must be kept in legible condition.

The crankcase ventilation system may only be serviced by trained and authorized personnel.

All ProVent systems are built according to state-of-the-art technology and the recognised safety-related rules. However, the functional safety of connected equipment can be at risk when:

- A ProVent system is used improperly,
- the operating conditions have changed,
- reconstructions have been made without prior consultation with the engine manufacturer,
- the necessary maintenance and repair work has been neglected.

Only use models of the ProVent series when in proper technical condition and in accordance with the technical design in a safety and danger-conscious manner while observing the installation and maintenance manual! Investigate faults (or have them investigated) immediately, particularly those which could impair safety!

3 Function Description

ProVent is a system for crankcase ventilation with integrated oil separation and pressure control which reduces the emissions of vehicles and deposits in the intake section to a minimum.

The ProVent series separates the blow-by gases containing oil which result during fuel combustion by means of an oil separating element, therefore reducing the residual oil content of the gas to a minimum level.

The ProVent systems mainly consist of an oil separating element, a pressure control system and, depending on the model, an overpressure or a bypass valve.

The mounting location and the design of the respective components vary depending on the size of the ProVent system.

ProVent oil separators can be used as open or closed systems.

Both with closed and with open systems, separated oil is routed back into the oil sump and is then available for the oil circuit again.

With an open crankcase ventilation system, the pressure control system is not active. After flowing through the oil separator, the blow-by gas is routed via the outlet fitting into the open. In the process, overpressure results in the crankcase during operation.

With a close crankcase ventilation system, the crankcase pressure is regulated by the pressure control system; after flowing through the oil separator, the blow-by gas is routed via the outlet fitting into the intake section of the engine.

Production of blow-by gases

During each working cycle of an engine, combustion gases (so-called blow-by-gases) flow between the piston rings and the cylinder sleeves into the crankcase.

On turbocharged engines, air can also flow into the crankcase via the oil return of the turbocharger.

This would result in an impermissibly high pressure in the crankcase after a short time.

This pressure build-up is prevented by a crankcase opening in a suitable location.

The blow-by gases mixed with oil mist from the crankcase exit from this ventilation hole.

ProVent oil separating systems can be used to prevent the blow-by gases from transporting oil mist out of the crankcase and from polluting the environment with blow-by gases containing oil.

ProVent systems are designed both for use as original equipment and for retrofitting.

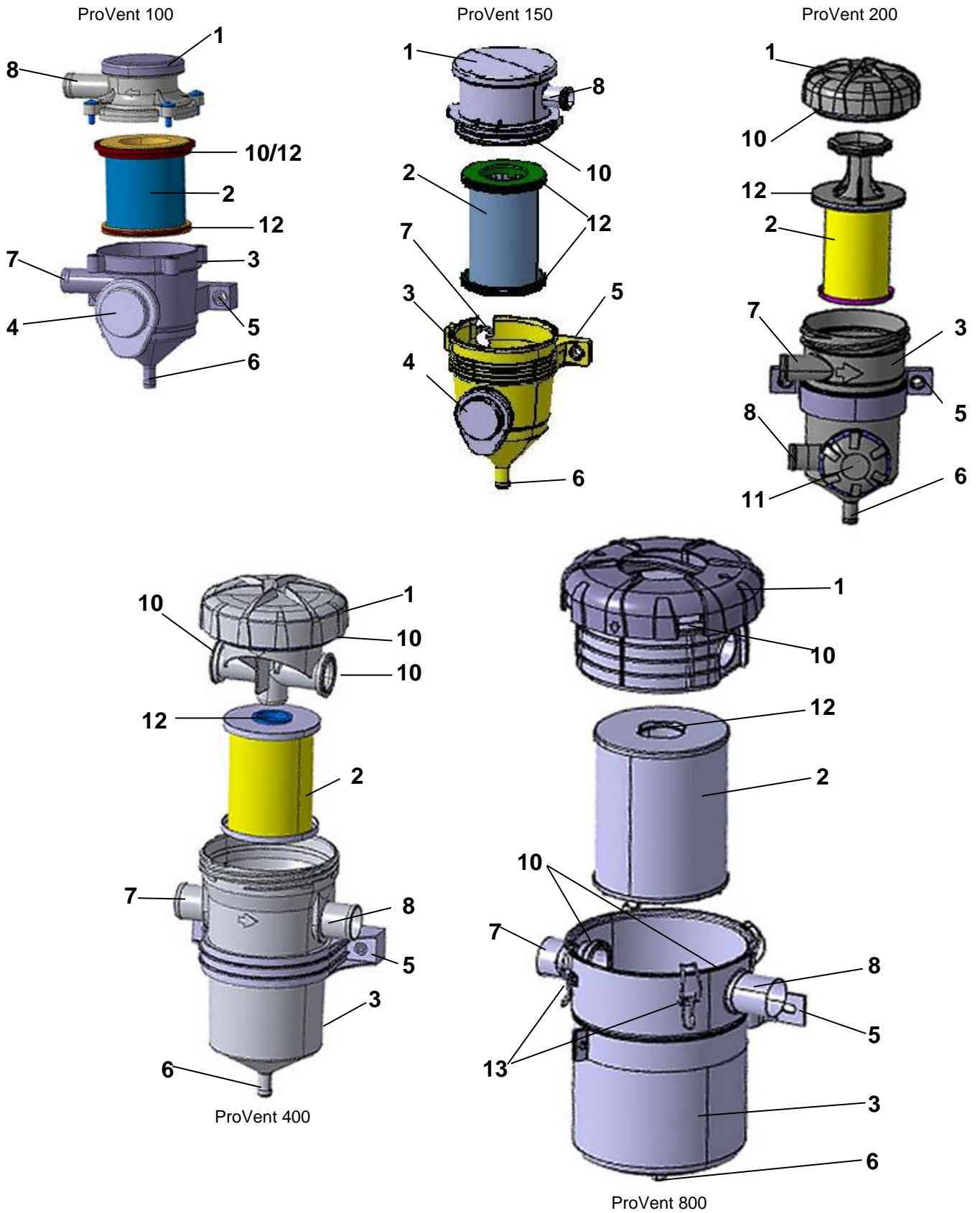


Fig. 1 Overview of ProVent® series

Pos.	Name	Pos.	Name
1	Lid with integrated pressure control valve	8	Outlet
2	Oil separating element	9	Seal of blow-by inlet
3	Housing	10	Seal of lid/housing
4	Pressure relief valve/bypass valve	11	Pressure control valve
5	Holder	12	Seals of element
6	Oil return	13	Quick-connect couplings
7	Inlet	14	Lid with integrated pressure relief valve

4 Assembly

4.1 General information

Check that the scope of delivery is complete and that there are no signs of damage.

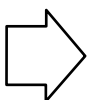
If parts delivered are damaged, please inform MANN+HUMMEL immediately.



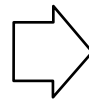
The assembly of the ProVent and the installation of the lines may only be carried out by qualified persons instructed for this purpose.



It is essential to observe the information on correct assembly when completing assembly and installation work.



Pay attention to the direction of flow. Carry out fixations conscientiously.



When working on the fuel supply, always place collecting vessels under the tank or lines to collect any escaping fuel. Dispose of collected fuel or oil in accordance with the respective applicable local waste disposal directives.



Health hazard due to escaping oil!
Wear safety goggles and gloves.
(Also refer to the material safety data sheet for diesel fuel)

4.2 Requirements for installation location

The ProVent system can be mounted on the engine or the frame of the machine/vehicle with the holder (5).

The arrow on the ProVent housing marks the direction of flow of the blow-by gas from the inlet to the outlet.

The highest possible point above the engine oil level (or, if present, above the non-return valve of the oil return line) must be selected as the installation location for the ProVent housing.

Minimum distance from surface of oil (or non-return valve) to oil return (6) of ProVent housing: at least 350 mm.

Connecting inlet fitting

The blow-by gases flow through a (hose) line from the crankcase via the inlet fitting (7) into the ProVent system.

Experience shows that optimum gas removal points from the crankcase are in the areas in which there are no moving parts and little oil spray, e.g. the upper areas of the crankcase or the cylinder-head cover.

This opening on the crankcase must be connected to the inlet fitting (7) of the ProVent system.

Connection of outlet fitting with closed crankcase ventilation system

The outlet fitting (8) is connected to the engine intake section with a (hose) line (after the air filter, but before the turbocharger, if present).

The intake vacuum present when a closed system is operating sucks the blow-by gas via the ProVent system and routes the cleaned blow-by gas back into the engine intake section.

When selecting the point of installation, the type of oil return must be taken into account (see 4.3 ff.)

Connection of outlet fitting with open crankcase ventilation system

The outlet fitting (8) remains open. The cleaned blow-by gas flows out of the outlet fitting (8) into the surrounding area.



Exiting blow-by gas may be hot. It must be ensured that the existing blow-by gases do not endanger persons or objects.

4.3 Connecting oil return fitting

Connecting drain line under engine oil level

The oil return fitting (6) is connected to the engine oil sump with a drain line.

The connection to the engine oil sump is made below the minimum permissible oil level.

For the ProVent system to function properly, the minimum distance of the oil level from the oil return fitting (6) of the ProVent housing must be at least 350 mm (see Fig. 2).

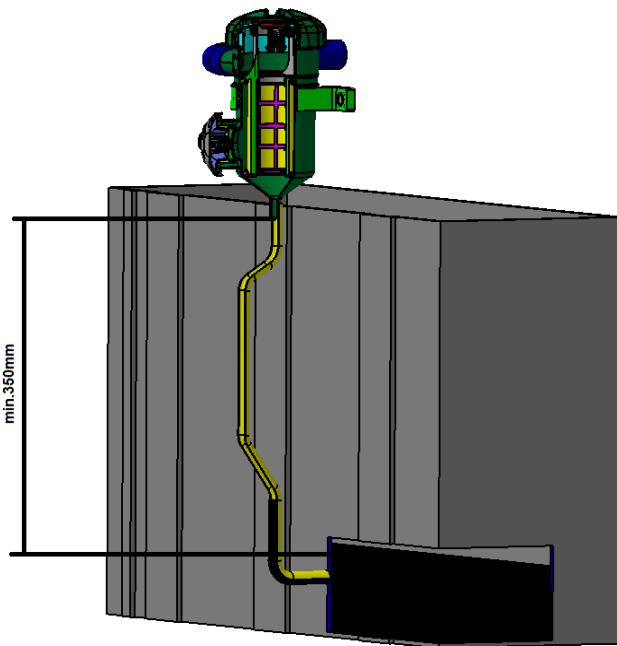


Fig. 2 Minimum distance from oil level to oil return fitting

Connecting above oil level

An optionally available non-return valve is required for this connection version.

The oil return fitting (6) is connected to the non-return valve with a drain line.

The non-return valve is then connected approx. 30 to 50 mm above the maximum oil level of the engine oil sump.

For the ProVent system to function properly, the minimum distance from the non-return valve to the oil return fitting (6) of the ProVent housing must be at least 350 mm (see Fig. 2).

Any angled positions which occur during mobile applications, which lead to a fluctuating oil level, must always be taken into account.

MANN+HUMMEL always recommends the use of a non-return valve for all ProVent installations.

4.4 Installing ProVent

ProVent 100

The holder (1) and the inlet fitting are integrated on the housing and are not adjustable.

The lid with the outlet fitting can be turned in 90° steps (2).

- Loosen the 4 screws (3) (3 mm Allen screw) and turn the lid to the desired position
- Retighten the 4 screws (3).
Tightening torque: 4 Nm.
- Mount the holder in the vertical position.
Recommended tightening torque for M8 screws: 10 Nm.
- Ensure sufficient strength of the screw and nut material.
- Connect the hoses to the inlet, outlet and oil return fittings (make sure a sufficient length of hose is pushed on) and secure with hose clamps (see Chap.4.2 and 4.3).
- Connect the oil return hose (and non-return valve if necessary) to the oil sump.
- To ensure proper functioning, the ProVent should be protected against dirt (mount splash guards if necessary).

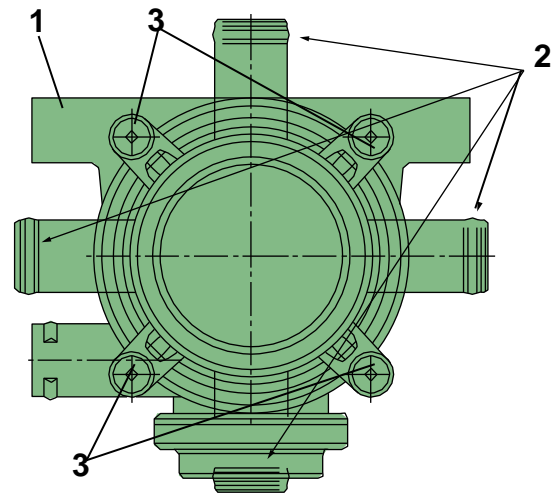


Fig. 3 Positions of outlet for ProVent 100

ProVent 150

The holder (1) and the inlet fitting are integrated on the housing and are not adjustable.

The lid with the outlet fitting can be offset in 3° steps.

➔ **ATTENTION:**
not in "Service/Open" position

- Turn the lid to the desired position.

➔ Do not turn the outlet to the 90° position (2)
Ensure locking of the retaining groove!

- Mount the holder in the vertical position.
Recommended tightening torque for M8 screws: 10 Nm.

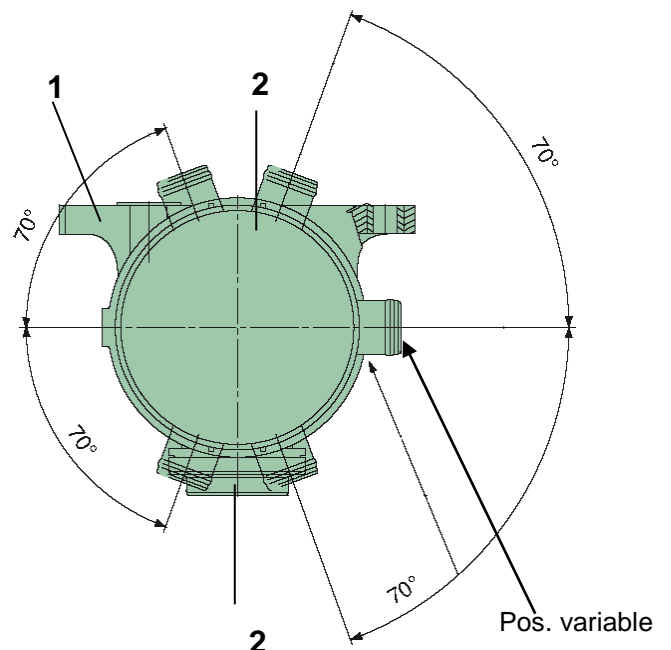


Fig. 4 Positions of outlet for ProVent 150

- Ensure sufficient strength of the screw and nut material.
- Connect the hoses to the inlet, outlet and oil return fittings (make sure a sufficient length of hose is pushed on) and secure with hose clamps (see Chap. 4.2 and 4.3).
- Connect the oil return hose (and non-return valve if necessary) to the oil sump.

- To ensure proper functioning, the ProVent should be protected against dirt (mount splash guards if necessary).

ProVent 200

The housing can (prior to installation) be turned in the holder in 30° steps around the longitudinal axis.

This enables the position "Inlet and outlet fitting to flange" to be flexibly adjusted to the installation situation.

- Remove the retaining clip (1) upward from the groove and turn the holder into the desired position.
- Press the holder together somewhat in the desired position and engage the retaining clip in the groove again
- Mount the holder in the vertical position. Recommended tightening torque for M8 screws: 10 Nm.
- Ensure sufficient strength of the screw and nut material.
- Connect the hoses to the inlet, outlet and oil return fittings (make sure a sufficient length of hose is pushed on) and secure with hose clamps (see Chap.4.2 and 4.3).
- Connect the oil return hose (and non-return valve if necessary) to the oil sump.
- To ensure proper functioning, the ProVent should be protected against dirt (mount splash guards if necessary).

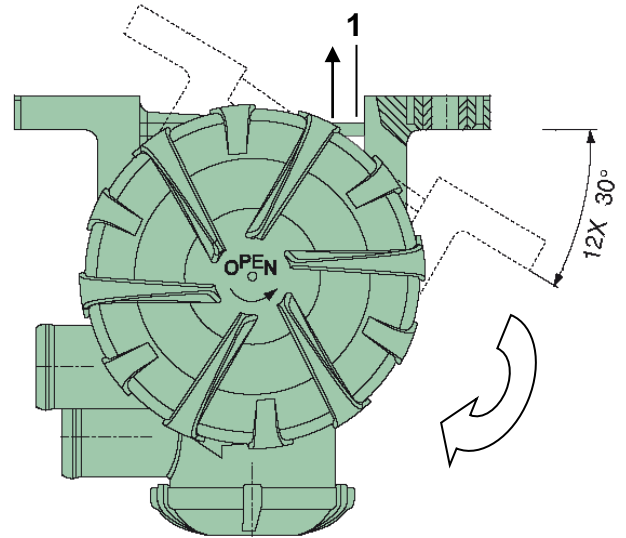


Fig. 5 Positions of outlet for ProVent 200

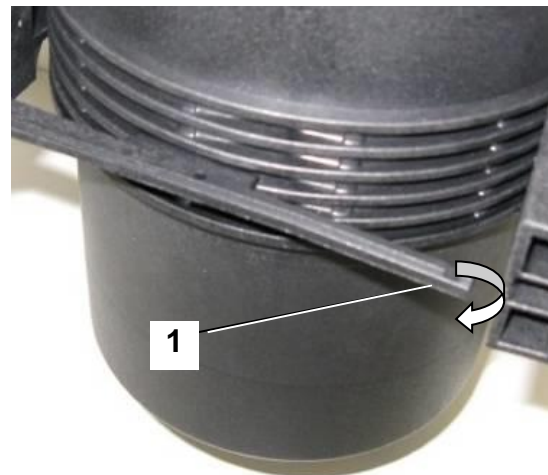


Fig. 6 Holder for ProVent 200

ProVent 400

The housing can (prior to installation) be turned in the holder in 30° steps around the longitudinal axis.

This enables the position "Inlet and outlet fitting to flange" to be flexibly adjusted to the installation situation.

- Remove the retaining clip (1) upward from the groove and turn the holder into the desired position.
- Press the holder together somewhat in the desired position and engage the retaining clip in the groove again
- Mount the holder in the vertical position. Recommended tightening torque for M8 screws: 10 Nm.
- Ensure sufficient strength of the screw and nut material.
- Connect the hoses to the inlet, outlet and oil return fittings (make sure a sufficient length of hose is pushed on) and secure with hose clamps (see Chap. 4.2 and 4.3).
- Connect the oil return hose (and non-return valve if necessary) to the oil sump.
- To ensure proper functioning, the ProVent should be protected against dirt (mount splash guards if necessary).

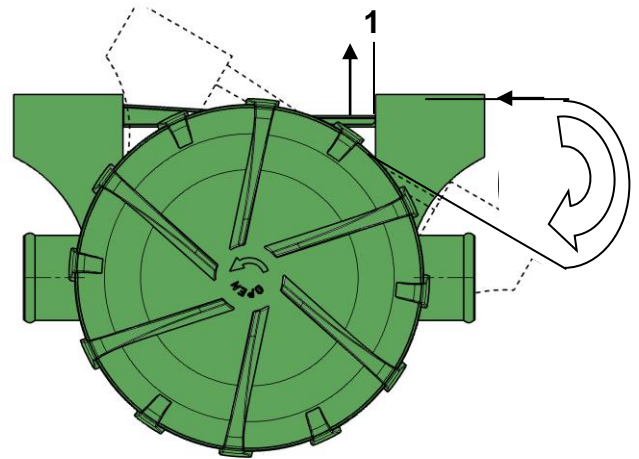


Fig. 7 Positions of outlet for ProVent 400

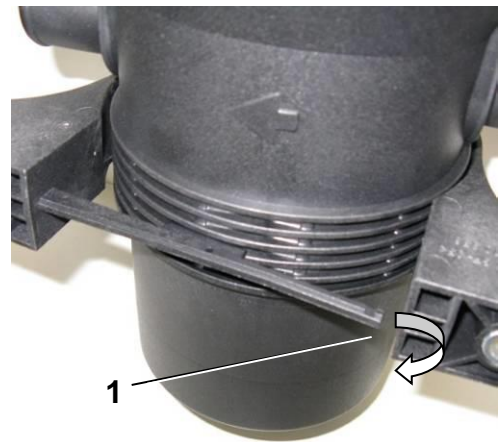


Fig. 8 Holder for ProVent 400

ProVent 800

The housing can be turned around the longitudinal axis before installing it in the holder.

This enables inlet and outlet fittings to be adjusted to the installation situation.

- Loosen the screw (1)
- Turn the holder (2) into the desired position and tighten the screw with the nut. Tightening torque: 9 Nm
- Mount the holder in the vertical position.
- Ensure sufficient strength of the screw and nut material.
- Connect the hoses to the inlet (3), outlet (4) and oil return fittings (5) (make sure a sufficient length of hose is pushed on) and secure with hose clamps.
- Connect the oil return hose (and non-return valve if necessary) to the oil sump.
- To ensure proper functioning, the ProVent should be protected against dirt (mount splash guards if necessary).



Fig. 9 Adjusting holder of ProVent 800

5 Maintenance

! Repair of the ProVent system by the driver or the workshop personnel is not possible.

5.1 Maintenance plan

Component	Activity	Comment
Oil separator element	Changing*	after 1,000 operating hours*, however at the latest after 1 year.
Check the ProVent system/non-return valve	(optional) for damage	when performing maintenance

* The maintenance interval can vary greatly depending on the actual oil available and the dirt/soot content in the blow-by gas.

5.2 Changing oil separator element



When working on the ProVent, place a collecting vessel underneath it beforehand and dispose of the collected oil properly



Before removing the old replacement element, unpack the new oil separator and check it for completeness and possible transport damage.

Only install undamaged replacement elements.

ProVent 100

- Detach the hose on the outlet fitting (1) if necessary.
- Loosen the 4 screws (3 mm Allen head)
The screws cannot be lost.
- Remove the lid (2).

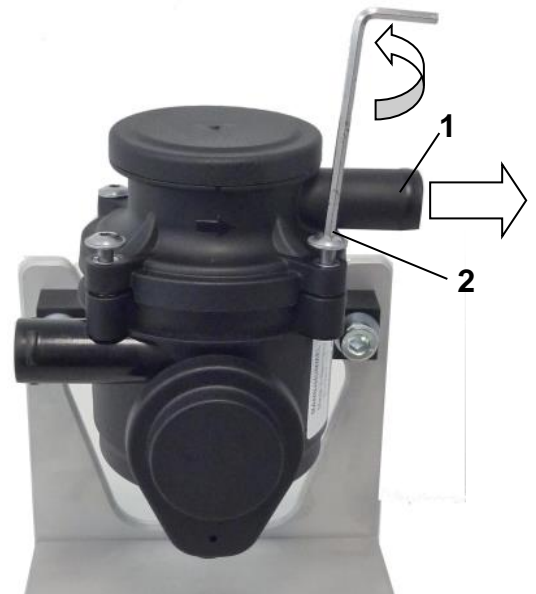


Fig. 10 Detaching lid of ProVent 100

- Manually remove the old oil separator element, if necessary with a suitable aid, and dispose of it properly.
- Mount the new replacement element in the ProVent. Ensure correct seating.
- Screw on the lid in the previous position again. Tightening torque: 4 Nm.
- Reconnect the drain hose if necessary.

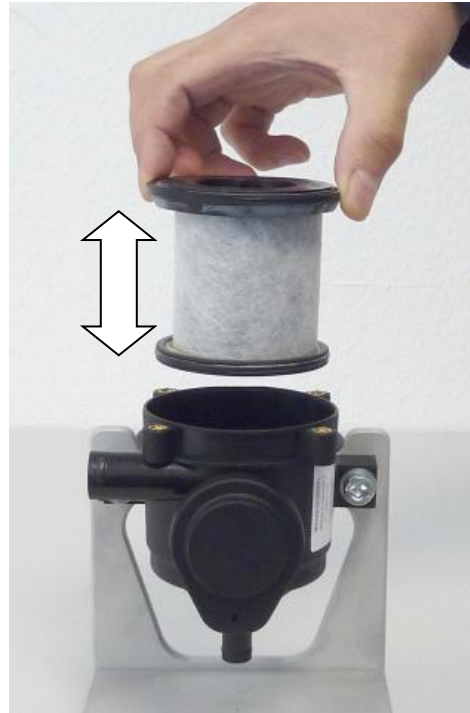


Fig. 11 Changing oil separator of ProVent 100

ProVent 150

- Detach the hose on the outlet fitting (1) if necessary.
- Turn the lid up to the fold recess ("Service" position, Fig. 12) and remove the lid upward with the element (see Fig. 12).

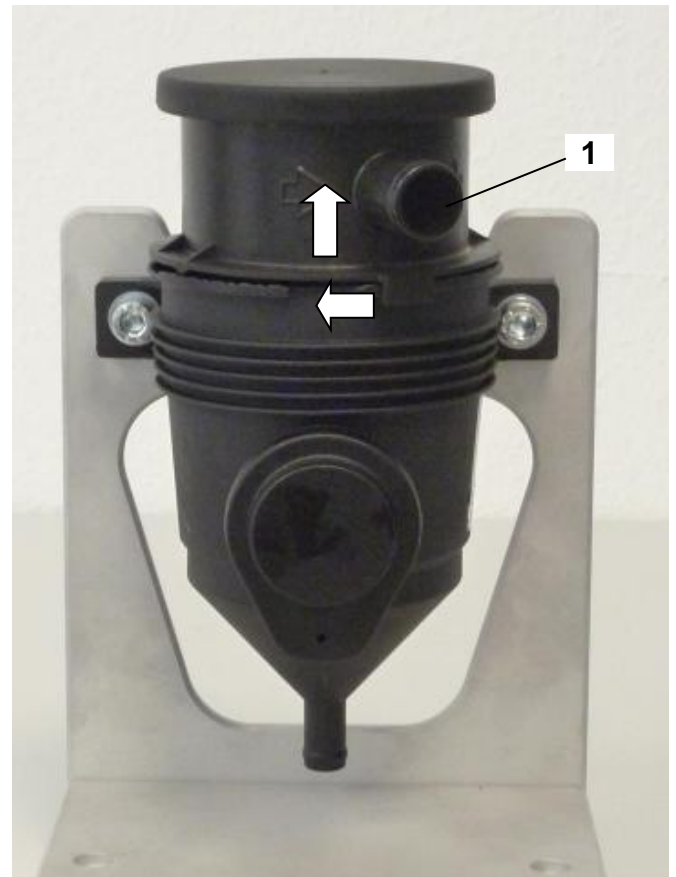


Fig. 12 Detaching lid of ProVent 150

- Pull the old oil separator element off the lid and dispose of properly.
- Mount the new replacement element in the ProVent. Ensure correct seating.
- Lay on the lid and turn it to the desired position.
- Reconnect the drain hose.



Fig. 13 Changing oil separator of ProVent 150

ProVent 200

- Screw off the lid in the direction of the arrow of the lid marking. If the lid is difficult to remove, use a suitable aid (see Fig. 14)



Fig. 14 Detaching lid of ProVent 200

- Remove the old oil separator element and dispose of it properly.
- Mount the new replacement element in the ProVent. Ensure correct seating.
- Lay on the lid and turn it opposite the direction of the arrow on the lid marking until it engages.



Fig. 15 Changing oil separator of ProVent 200

ProVent 400

- Screw off the lid in the direction of the arrow of the lid marking.



Fig. 16 Opening lid of ProVent 400 (1)

- If the lid is difficult to remove, use a suitable aid (see Fig. 17).



Fig. 17 Opening lid of ProVent 400 (2)

- Remove the lid with the oil separator element.



Fig. 18 Removing oil separator of ProVent 400

- Pull the oil separator element off the lid fitting (see Fig. 19)
Dispose of the old oil separator element properly.
- Mount the new replacement element on the lid fitting (see Fig. 19).

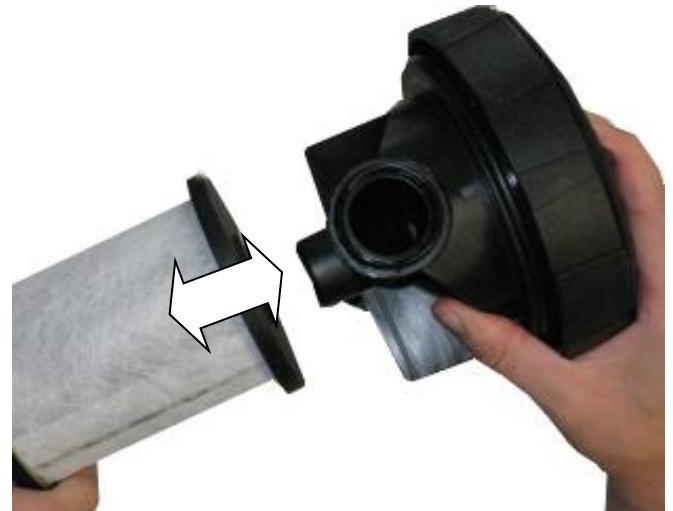


Fig. 19 Changing oil separator of ProVent 400

- Place the lid with the oil separator element on the housing. When doing so, watch the position of the inlet and outlet fitting (arrows on housing and lid (1) face in the same direction, see Fig. 20).
- Press the lid onto the housing and turn it opposite the direction of the arrow on the lid marking until it engages.



Fig. 20 Marking on ProVent 400

ProVent 800

- Open the 4 quick-connect couplings



Attention

Danger of clamping bar pinching and striking fingers.



Fig. 21 Opening quick-connect couplings of ProVent 800

- If necessary, position a suitable aid at the locking points at the edge of the lid and carefully lift the lid. This loosens the lid.



Fig. 22 Removing lid of ProVent 800

- Remove the lid with the oil separator element.



Fig. 23 Removing oil separator of ProVent 800

- Pull the oil separator element off the lid fitting (see Fig. 24)
Dispose of the old oil separator element properly.
- Mount the new replacement element on the lid fitting.

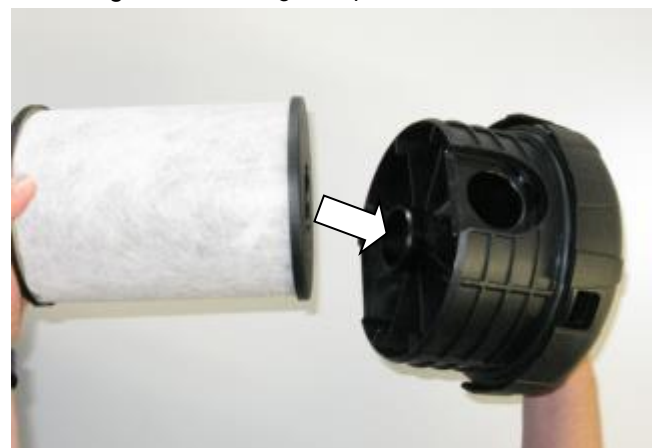


Fig. 24 Fitting oil separator of ProVent 800

- Place the lid with the oil separator on the housing. When doing so, watch the position of the inlet and outlet fitting (marking) (see Fig. 25).
- Close the quick-connect couplings.



Fig. 25 Marking on ProVent 800

5.3 Seal change

When changing the oil separator elements, the seals in the lid and the housing should also be checked for damage and correct seating regularly. Replace the seals if necessary. Seal sets are available as service kits.

- Service Kit for ProVent 100: LC 7001 (HE*)
- Service Kit for ProVent 150: LC 7201 X (HE)
- Service Kit for ProVent 200: LC 5001 X (HE)
LC 5002 X (UE**)
- Service Kit for ProVent 400: LC 10 001 X (HE)
- Service Kit for ProVent 800: LC 16 001X (HE)

*HE = High-Efficient Medium

**UE = Ultra-High-Efficient Medium

New separator elements are supplied with new seals.

Lightly coat the sealing rings (1) with oil before installation and lay them in the corresponding groove (2).



Fig. 26 Seal for lid of ProVent 150

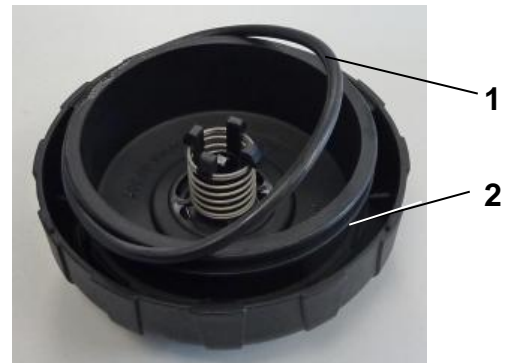


Fig. 27 Seal for lid of ProVent 200



Fig. 28 Seal for lid, inlet and outlet of ProVent 400

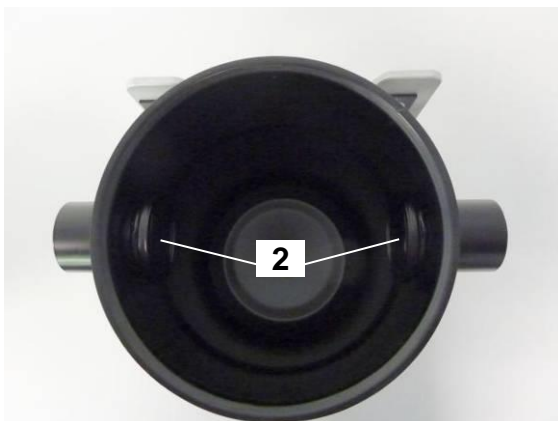


Fig. 29 Seals for inlet and outlet of ProVent 800

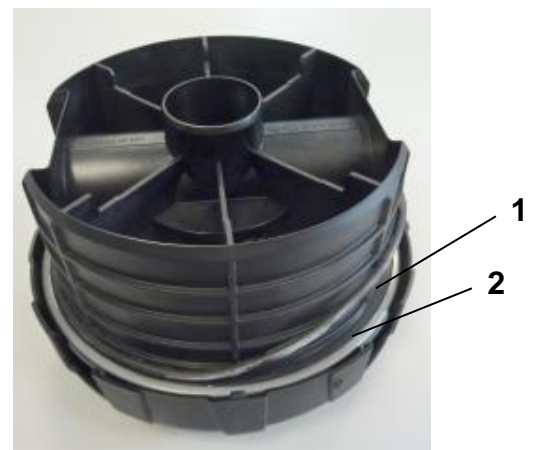


Fig. 30 Seal for lid of ProVent 800

5.4 Troubleshooting

Fault	Possible cause	Solution
Oil is sucked into the intake section	Mounting height too low No non-return valve in oil return line Separator element exhausted	Check mounting height Install non-return valve in oil return Conduct maintenance
Oil is not separated	Separator element is damaged	Conduct maintenance
Oil on outside of ProVent housing	Seal not in seal seat Seal defective Housing defective Hose not properly mounted Overpressure valve open	Check seal, hoses and housing. Correct if necessary Conduct maintenance
Increased crankcase pressure	Separator element exhausted Kinked or clogged hose	Conduct maintenance Check hose and correct if necessary
Oil drain-off not ensured	Oil return hose kinked	Check oil return hose and correct if necessary

5.5 Disposing of parts

Component	Material	Disposal
Oil separator element (contains oil)	PA-GF, elastomer, PU, metal, oil, soot	Dispose of according to local regulations
Oil separator element, free of oil/unused	PA-GF, elastomer, PU, metal	Dispose of according to local regulations
Housing parts, contain oil	PA-GF, metal elastomers, oil, soot	Dispose of according to local regulations
Oil non-return valve, contains oil	Aluminium, PA-GF, oil, soot	Dispose of according to local regulations

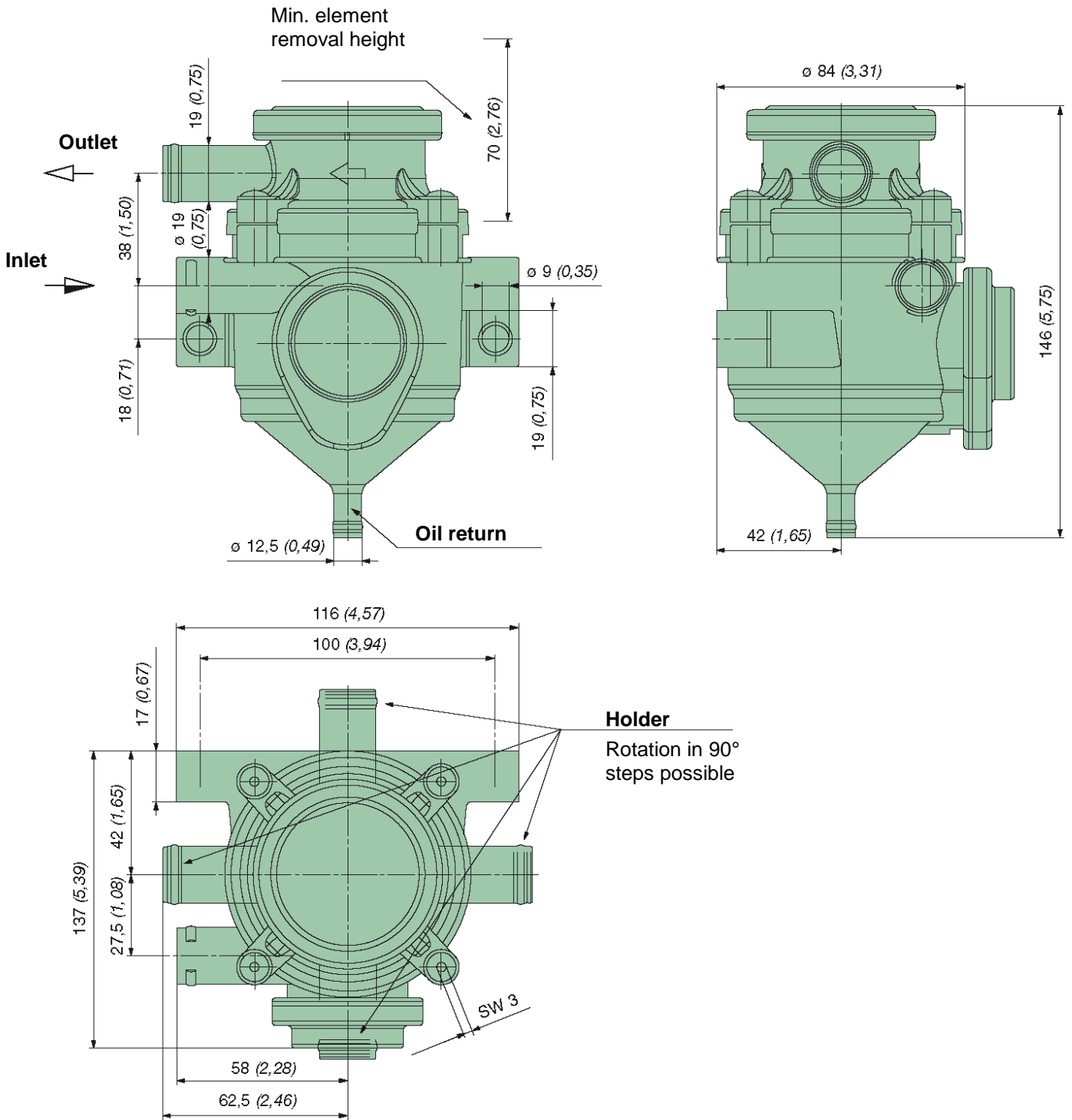
6 Technical Data

Also see the corresponding order drawing (on request).

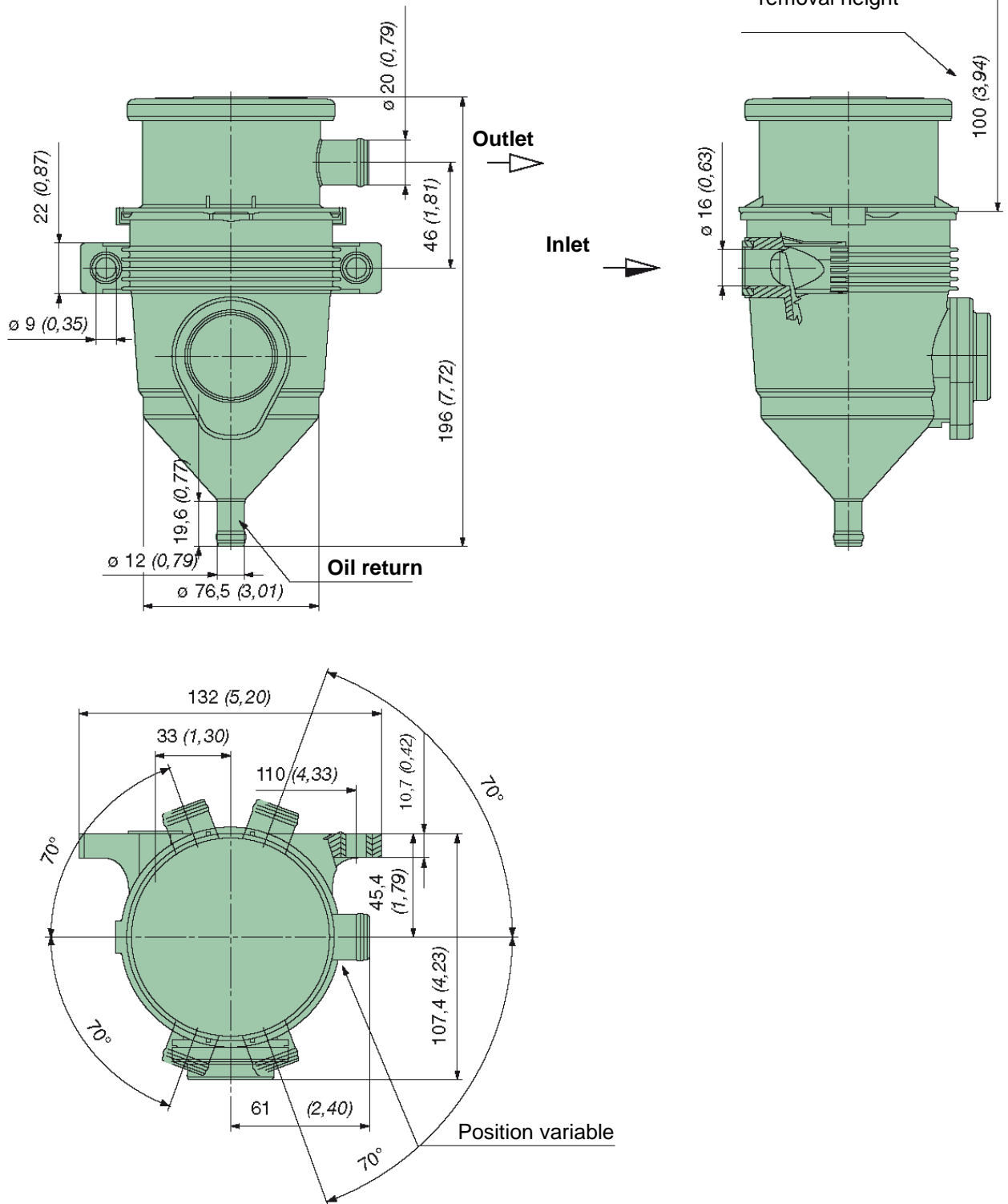
		ProVent 100	ProVent 150	ProVent 200	ProVent 400	ProVent 800
Reference value for the use of ProVent		up to 100 kW	up to 200 kW	up to 250 kW	up to 500 kW	up to 1,250 kW
Blow-by volume flow		max. 100 l/min	max. 150 l/min	max. 200 l/min	max. 400 l/min	max. 800 l/min
Installation position	vertical					
Permitted angled position of high axis	45° in all directions					
Positioning	Inlet	2 positions	1 position additional on request	12 positions	12 positions	stepless
	Outlet	4 positions	can be rotated in 3° steps			
Ambient temperature	-35°C to 120°C, briefly up to 140°C					
Mounting, screwing connection on engine block		2xM8				2xM10
Material	Housing	PA GF				Steel sheet
	Lid					PA GF
	Holder					Steel sheet
Resistant to		Diesel fuel, engine oil, lubricating oil, cold cleaner				
Weight		0.25 kg	0.33 kg	0.39 kg	1.20 kg	5.41 kg
Possible use of parallel connection of two ProVent of same size		X	X	X	X	X

6.1 Dimensions

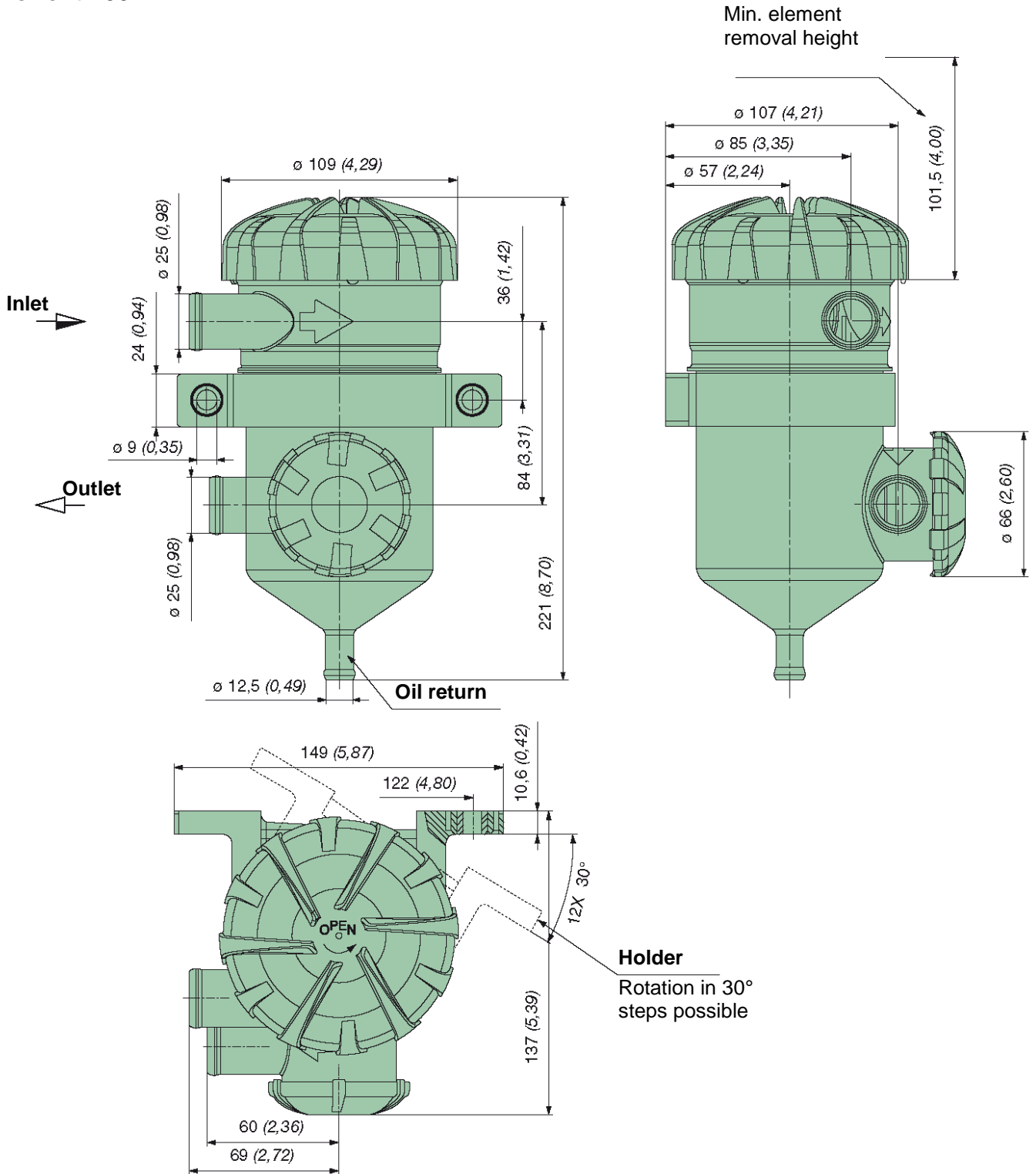
ProVent 100



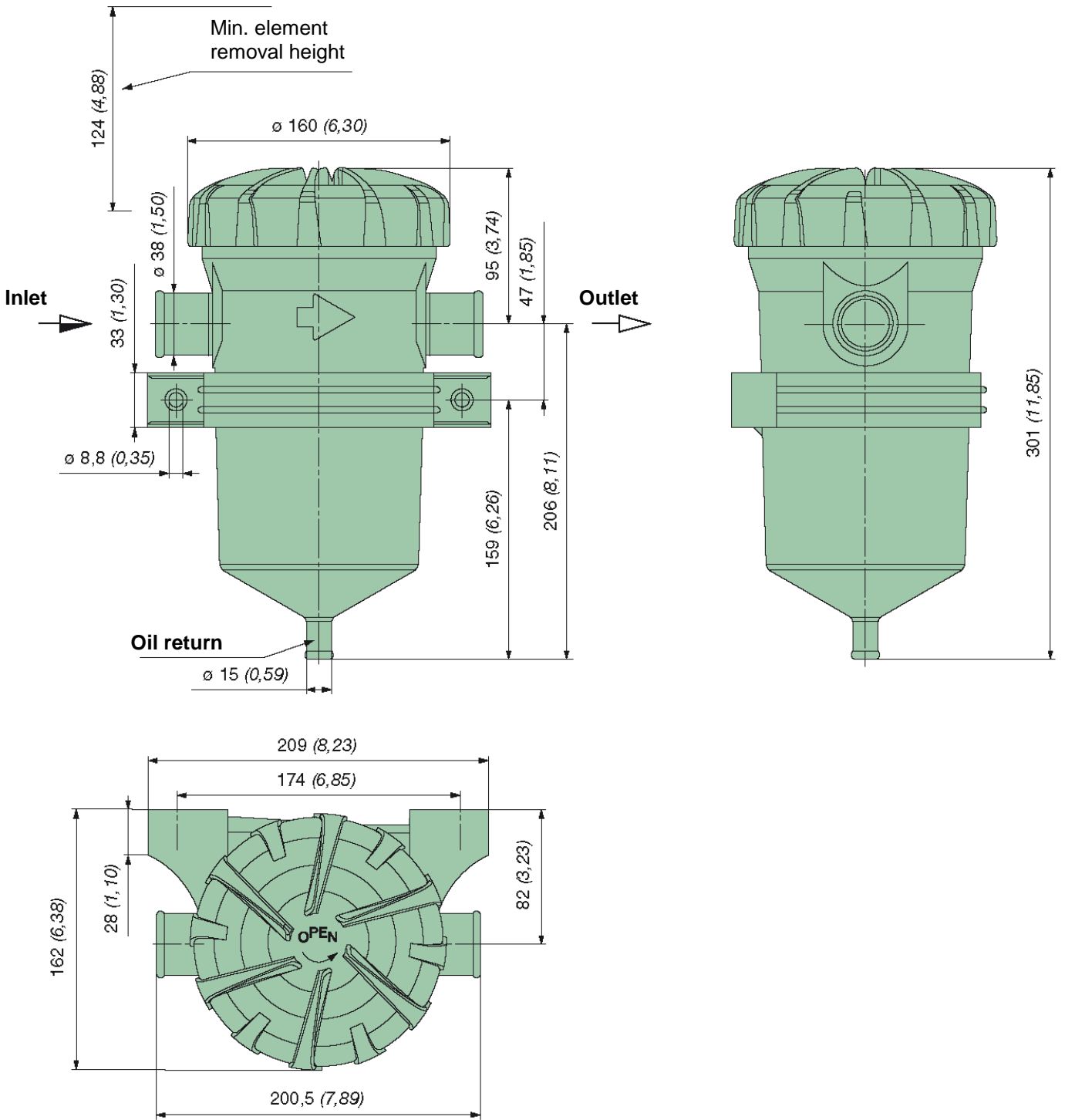
ProVent 150



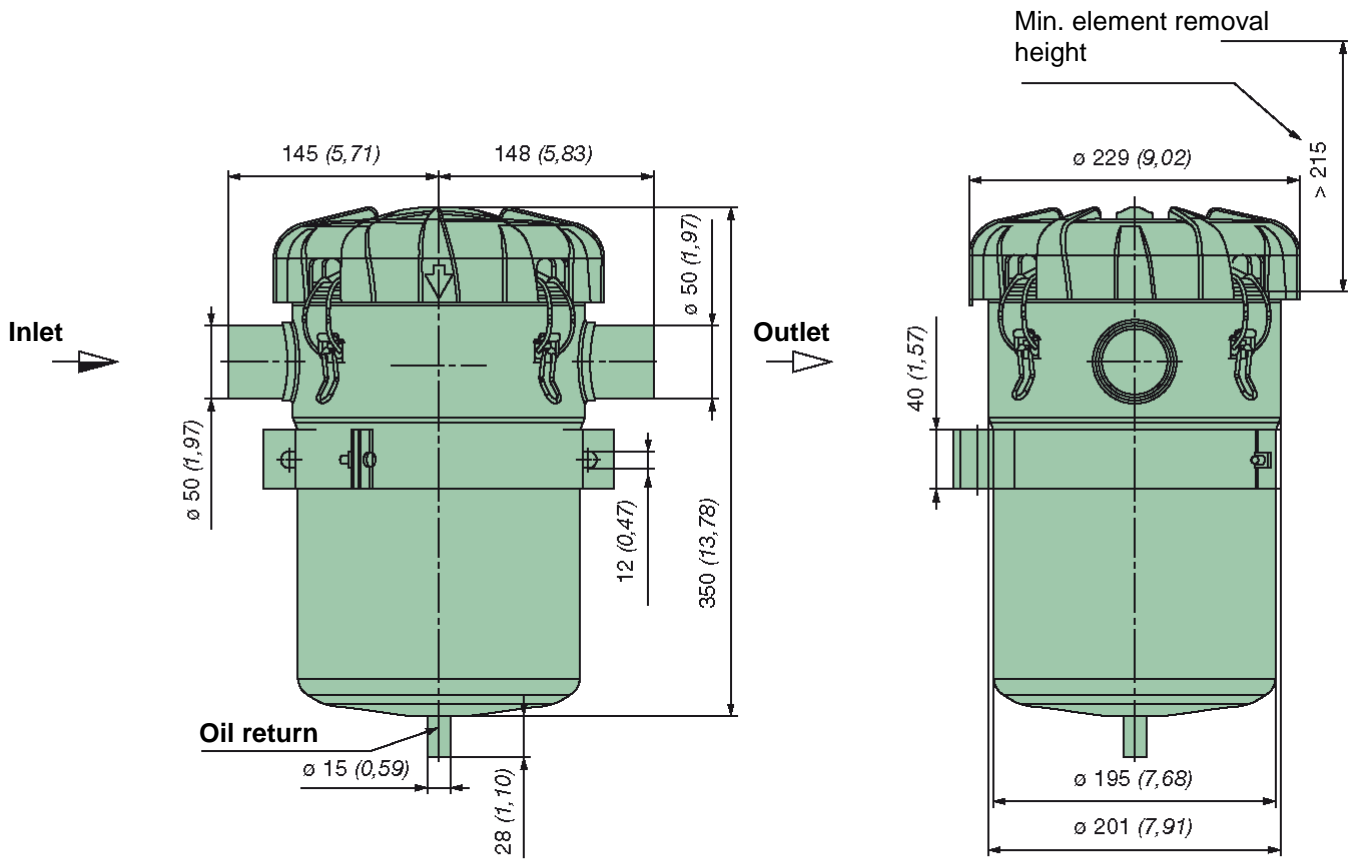
ProVent 200



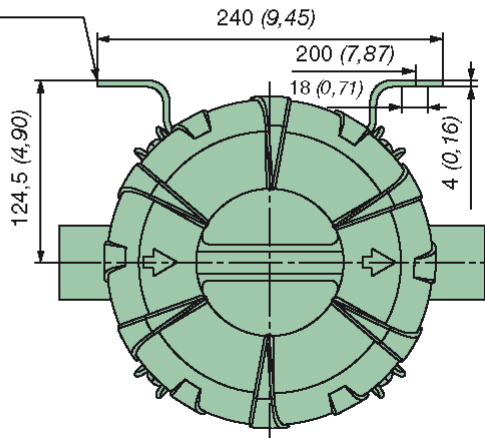
ProVent 400



ProVent 800



Position variable 360°



7 Related Documents

The following documents must also be observed and applied in addition to this Operating and Maintenance Manual:

- Technical data in accordance with respective order drawing.



MANN + Hummel Industrial Filters

The MANN+HUMMEL Group is an internationally active business with its company headquarters in Ludwigsburg (Germany) and employs a staff of over 9,500 people worldwide in more than 40 locations.

The company develops, produces and sells innovative technical components and systems for the automobile industry and many other market sectors.

High quality filtration products for vehicles (devices), engines and industrial applications play a key role in our business activities. The initial equipment business with the world's leading vehicle, machine and system manufacturers defines the basis for quality and performance capabilities of the products.

Filters for the international spare parts market are sold under the names of internationally renowned customer brand names as well as our own MANN-FILTER brand.

The Industrial Filters Business Division with headquarters in Speyer (Germany) specialises in the special requirements of the customers from the segments off-road vehicles/device and engine technology, compressed-air and vacuum technology, mechanical and systems engineering.

MANN+HUMMEL Industrial Filters provides a wide range of high performance products concerned with filtration and separation of air, gases and liquids for these and other business sectors.

MANN + HUMMEL

MANN+HUMMEL GMBH, Industrial Filtration

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