MAHLE

Industry

Air Filter Systems
Series 7000

Nominal volume flow 4.5 to 12 m³/min

1. Features

High performance air filter series for tractors, commercial vehicles, construction machines and compressors

- Flexible mounting possibilities due to the snap fasteners
- Flexible bracket concept
- Support rings for dirt and clean air connection optional
- Minimal strength required due to the radial sealing of the element
- Small dimensions for simple, easy maintenance
- Filter housing consist of reinforced polypropylene
- Pre separation due to the tangential arrangement of the air inlet nozzle
- Non-metallic eco-air filter element
- Safety element for difficult operation conditions
- Worldwide distribution

2. Rating criteria for air filters

Separation grade

The separation grade defines the particle retention ability of the air filter. The higher the separation grade, the better the engine is protected from wear.
The overall separation grade indicates the ratio of all particles filtered out by the filter to all particles sucked in by the filter.
MAHLE dry air filters reach the following overall separation grades using standardised test dusts SAE coarse and SAE fine:

SAE coarse	≥ 99.9 %
SAE fine	≥ 99.5 %

Filter size

The filter size is determined by the air requirement of the engine or compressor. This is usually stated by the manufacturer.

For suction engines, the air requirement can be calculated from the engine data as follows:

$V = V_H * n_{nenn} * \lambda / a * 1000$

V	Engine air requirement in m³/min
V_H	Capacity in l
n_{nenn}	Nominal speed in rpm
λ	Filling degree
	0.9 for 4-stroke engines
	0.7 for 2-stroke engines
a	2 for 4-stroke engines
	1 for 2-stroke engines

When selecting the filter size, in engines with 1 to 4 cylinders it is also important to take account of the changing flow speeds with pulsation factor:

	Pulsation factor	
No. of cylinders	**4-stroke engine**	**2-stroke engine**
1	2.0	1.5
2	1.4	1.2
3	1.3	1.1
4	1.1	1.0
5 and more	1.0	1.0

Resulting in:

Rated air flow = V ⋆ p

V	Engine air requirement in m³/min
p	Pulsation factor

The filter size should be selected so that the rated size is the same as or larger than the rated air flow.
For diesel engines, the air requirement can be approximately estimated as follows:

Suction engines:	approx. 0.08 m³/min per 1 kW
Supercharged engines:	approx. 0.09 m³/min per 1 kW

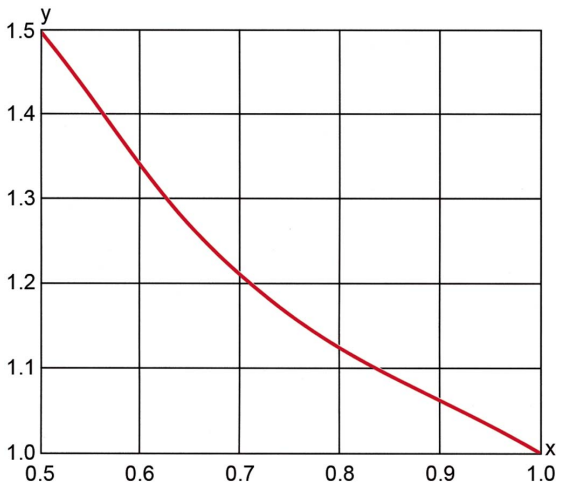
Service life

The service life of an air filter is defined by the dust absorption capacity of the air filter until a maximum flow resistanceΔp_{max}, is reached, as indicated by the engine or machine manufacturer. As a rule, this is between 50 and 60 mbar.
In order to achieve maximum dust capacity, knobs are pressed into the filter paper to keep the paper folds at the correct distance (filter pockets).

Laboratory dust capacity

The laboratory dust capacity at nominal air flow is ascertained on the test stand. A defined quantity of the test dust SAE-coarse is continuously added to the sucked in air. The increase in differential pressure is then evaluated depending on the dust quantity sucked in by the filter.
Any air quantities which differ from the nominal air flow are catered to using a correction factor. If the actual air requirement is lower than the nominal air flow through the defined filter, the dust capacity increases on account of the lower filter load. The filter load is the ratio between air requirement and filter nominal flow. However, from about half the nominal air flow, the pre-filtration function integrated in the filter is no longer fully effective. In this case, the next smaller filter size should be selected.

Correction curve



x = Filter load
y = Correction factor

Filter load = Air requirement / Nominal air flow

Dust levels in the air in practice

The filter service life in operating hours or mileage can be estimated on the basis of the laboratory dust capacity ascertained on the test stand, together with the dust concentrations in practical operating conditions.

The following table provides a guide line for dust concentrations in practical conditions:

Dust concentration [g/m³]	Location
... 0.001	Motorways, top class roads
0.001 - 0.003	Normal European road traffic, stationary machines in low-dust rooms
0.003 - 0.015	Neglected country roads, trucks on building sites, tractors in Central Europe, stationary machines at open air
0.010 - 0.050	Visible clouding of the air, field work on dry ground, individual travel on unpaved field tracks
0.050 - 0.200	Column travel on unpaved field tracks, stationary machines in very dusty conditions (quarries, threshing work)

The laboratory dust capacity can be converted into operating hours using the following formula:

Operating hours = Laboratory dust capacity / Dust concentration * Air requirement * 60

Laboratory dust capacity in g
Dust concentration in g/m³
Air requirement in m³/min

Calculation example

The following data are known:

Vehicle:	agricultural tractor
Engine:	4-stroke diesel engine
Capacity:	4.15 l
Cylinders:	4
Nominal speed:	4800 rpm
Max. tol. Δ p	60 mbar

Air requirement:

V = 4.15 * 4800 * 0.9 / 2 * 1000 = 8.96 m³/min

Rated air flow:

The rated air flow works with a pulsation factor of 1.1.

V = 8.96 * 1.1 = 9.86 m³/min

Filter size:

Always select the next largest filter size, i.e. a filter with nominal size 12. Safety elements are recommended for agricultural tractors.

Our suggestion: LPO 7120S/2

Laboratory dust capacity:

Indicated in the laboratory dust capacity diagram and correction curve.
Flow resistance for a new filter for 9.86 m³/min (see page 2) Δ p = 17 mbar.
This produces a flow resistance increase of 43 mbar up to the max. tolerable flow resistance of 60 mbar.
A filter nominal load of 12 m³/min results in a laboratory dust capacity of 5900 g (see page 2).

The filter load is calculated from:

Air requirement / Nominal air flow = 8.96 / 12 = 0.75

The correction curve indicates a correction factor of 1.16 for filter load 0.75.
A filter requirement of 8.96 m³/min results in a laboratory dust capacity of 5900 g * 1.16 = 6844 g

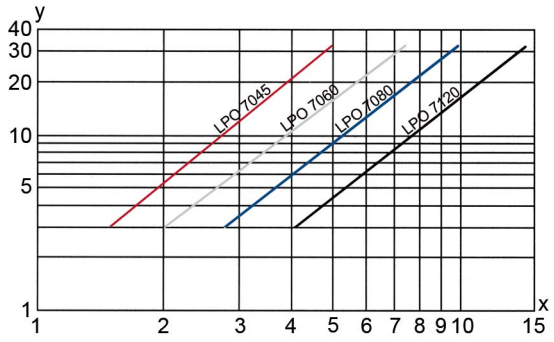
Service life:

Based on a dust concentration of 0.02 g/m³ and laboratory dust capacity of 6844 g, the service life amounts to:

Operating hours = 6844 / 0.02 * 8.96 * 60 = 637 h

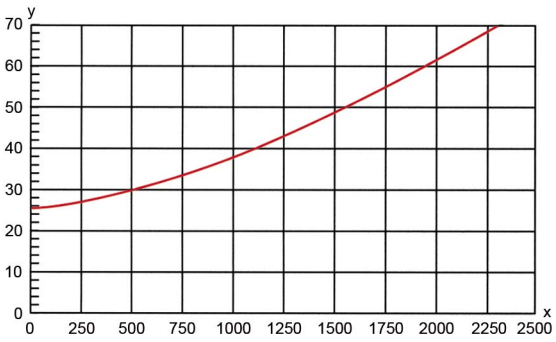
3.1 Performance features without safety element

Flow resistance acc. to ISO 5011

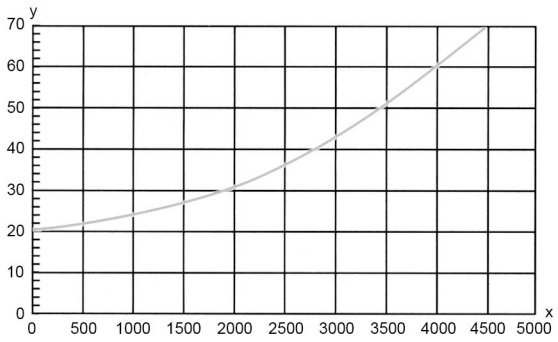


x = Volume flow in m³/min
y = Pressure loss in mbar

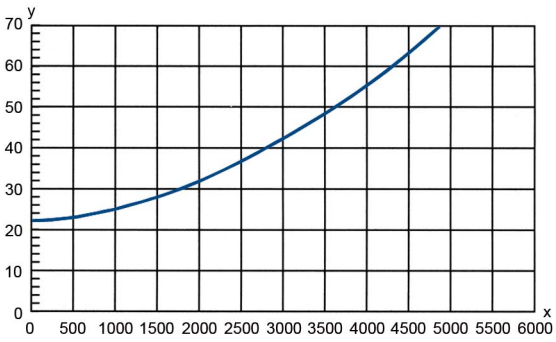
Dust absorption acc. to ISO-5011
Test dust: SAE coarse



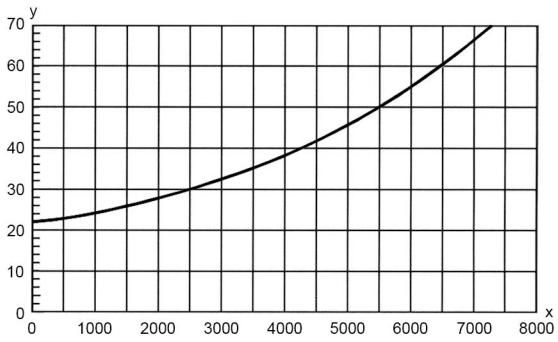
LPO 7045



LPO 7060



LPO 7080

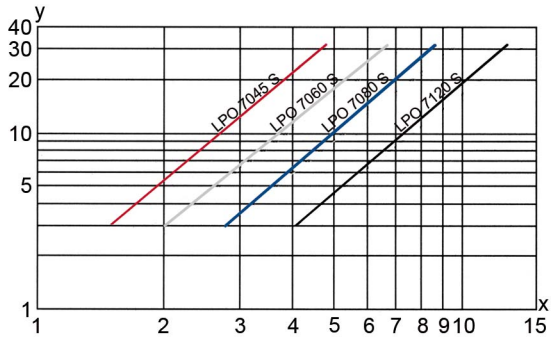


LPO 7120

x = Dust absorption in g
y = Pressure loss in mbar

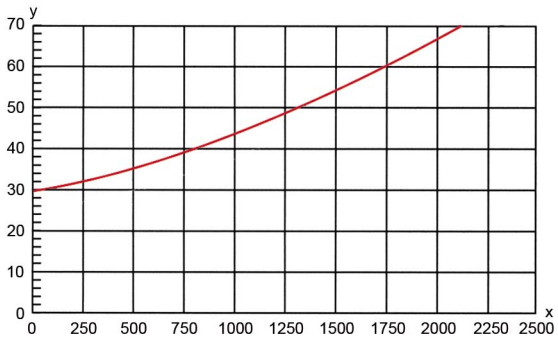
3.2 Performance features with safety element

Flow resistance acc. to ISO 5011

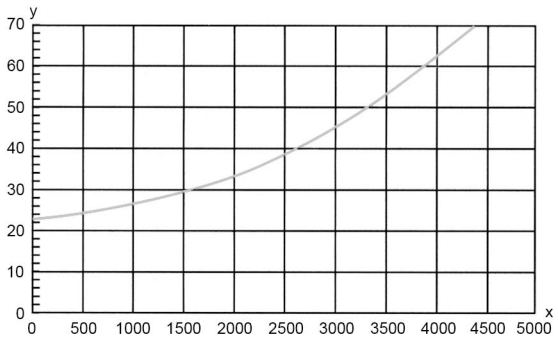


x = Volume flow in m³/min
y = Pressure loss in mbar

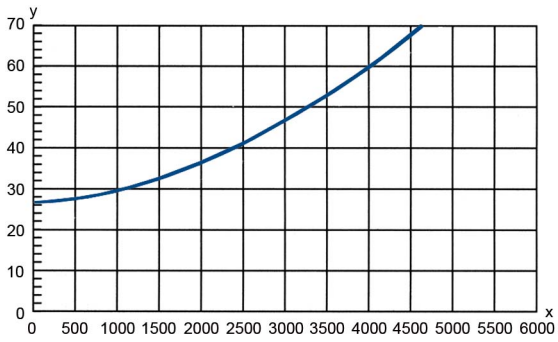
Dust absorption acc. to ISO-5011
Test dust: SAE-coarse



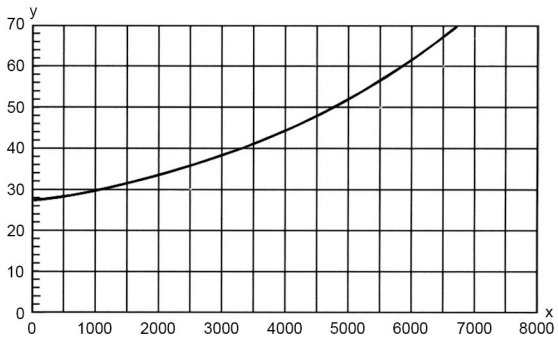
LPO 7045 S



LPO 7060 S



LPO 7080 S



LPO 7120 S

x = Dust absorption in g
y = Pressure loss in mbar

4. Order numbers

4.1 Complete filter

Nominal size [m³/min]	Order number	Type designation without safety element	Order number	Type designation with safety element	Figure
4,5	79754920	LPO 7045/1	79754938	LPO 7045 S/1	1
	79754995	LPO 7045/2	79755000	LPO 7045 S/2	2
	79755059	LPO 7045/3	79755067	LPO 7045 S/3	3
6	79755117	LPO 7060/1	79755125	LPO 7060 S/1	1
	79755174	LPO 7060/2	79755182	LPO 7060 S/2	2
	79755232	LPO 7060/3	79755240	LPO 7060 S/3	3
8	79755299	LPO 7080/1	79755307	LPO 7080 S/1	1
	79755356	LPO 7080/2	79755364	LPO 7080 S/2	2
	79755414	LPO 7080/3	79755422	LPO 7080 S/3	3
12	79755471	LPO 7120/1	79755489	LPO 7120 S/1	1
	79755539	LPO 7120/2	79755547	LPO 7120 S/2	2
	79755596	LPO 7120/3	79755604	LPO 7120 S/3	3

Figures see chapter 6

4.2 Filter elements

Nominal size [m³/min]	Order number	Filter element	Order number	Safety element
4,5	78796807	LX 7045	78796849	LXS 7045
6	78796815	LX 7060	78796856	LXS 7060
8	78796823	LX 7080	78796864	LXS 7080
12	78796831	LX 7120	78796872	LXS 7120

4.3 Brackets

Nominal size [m³/min]	Order number	Type designation
4,5	78796880	LH 7045
6	78796898	LH 7060
8	78792020	LH 7080
12	78796906	LH 7120

4.4 Rain caps

Nominal size [m³/min]	Order number	Type designation
4,5	79601162	LK 7045
6	79601170	LK 7060
8	79601188	LK 7080
12	79601196	LK 7120

4.5 Connection tubes		
Nominal size [m³/min]	**Order number**	**Type designation**
4,5	79601808	LVS 7045
6	79601816	LVS 7060
8	79601824	LVS 7080
12	79601832	LVS 7120

4.6 Elbows		
Nominal size [m³/min]	**Order number**	**Type designation**
4,5	79601840	LKR 7045
6	79601857	LKR 7060
8	79601865	LKR 7080
12	79601873	LKR 7120

4.7 Maintenance switch	
Order number	**Type designation**
79603101	LES 7250 ID

5. Technical specifications

Temperature range:	-40 °C to +80 °C (briefly to +100 °C) (with mounted maintenance switch -30 °C to +80 °C)
Filter housing material:	reinforced PP
Rain cap material:	PP
Bracket material:	fibreglass reinforced PA (console) steel (clamping strap)
Connection tube material:	TPO
Elbow material:	TPO
Maintenance switch setting:	
LES 7250 ID	50 mbar ± 3
Electrical data of maintenance switch LES 72.. ID:	
Contact load:	24 W
Type of protection:	IP65 in inserted and secured status
Contact:	normally open

Subject to technical alteration without prior notice!

6. Dimensions

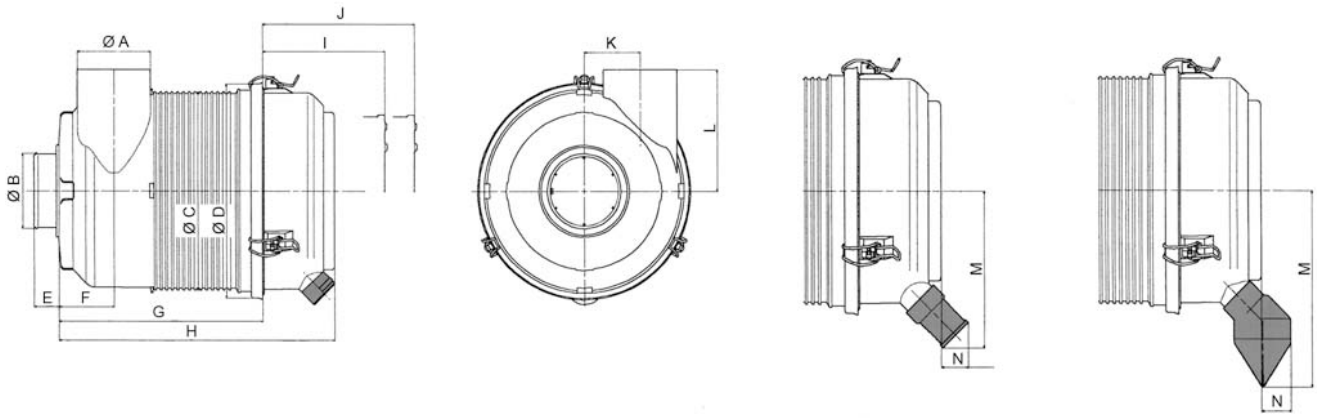


Fig. 1 with mushroom-headed dust ejection valve for pulsating suction air and little clearance

Fig. 2 with small dust ejection valve for pulsating suction air, ≤ 4 cylinders

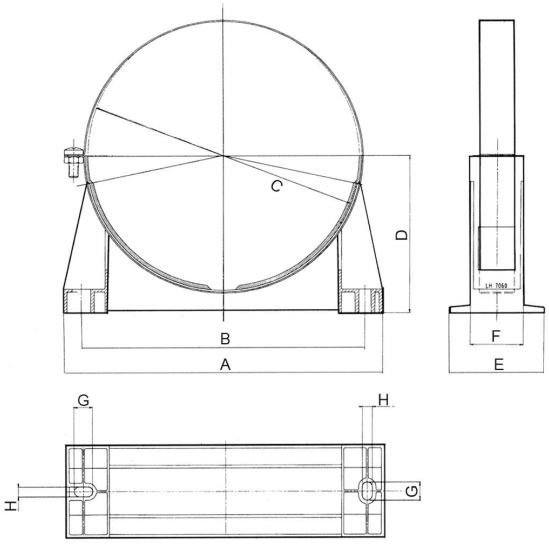
Fig. 3 with large dust ejection valve for slightly pulsating suction air, ≥ 4 cylinders

I = Minimum clearance required for element removal without safety element

J = Minimum clearance required for element removal with safety element

All dimensions in mm.

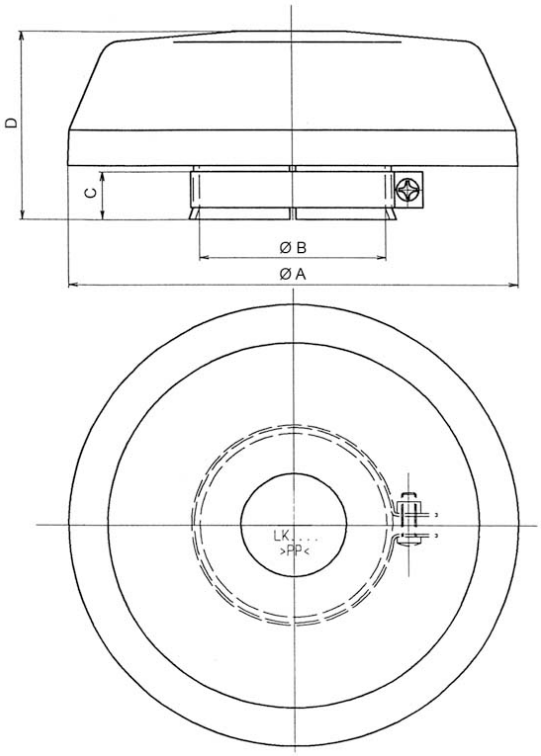
Type without safety element	Type with safety element	øA	øB	øC	øD	E	F	G	H	I	J	K	L	M	N	Fig.
LPO 7045/1	LPO 7045 S/1													-	-	1
LPO 7045/2	LPO 7045 S/2	62	60	180	205	25	52	225	300	295	355	55	120	148	30	2
LPO 7045/3	LPO 7045 S/3													197	33	3
LPO 7060/1	LPO 7060 S/1													-	-	1
LPO 7060/2	LPO 7060 S/2	70	70	205	230	30	57	255	345	340	416	63	130	161	30	2
LPO 7060/3	LPO 7060 S/3													209	33	3
LPO 7080/1	LPO 7080 S/1													-	-	1
LPO 7080/2	LPO 7080 S/2	82	80	236	255	30	65	265	355	350	425	65	145	173	30	2
LPO 7080/3	LPO 7080 S/3													220	33	3
LPO 7120/1	LPO 7120 S/1													-	-	1
LPO 7120/2	LPO 7120 S/2	102	100	270	295	35	77	285	385	380	465	78	165	187	33	2
LPO 7120/3	LPO 7120 S/3													234	36	3



Brackets

All dimensions in mm.

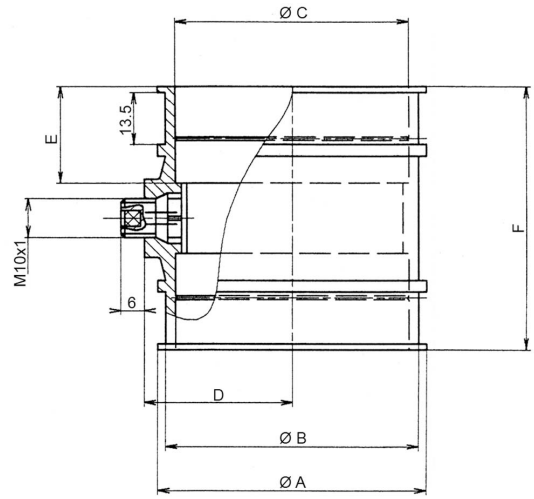
Type	A	B	C	D	E	F	G	H
LH 7045	220	190	180	110	70	45	15.5	8.5
LH 7060	250	220	205	125				
LH 7080	270	240	236	135	80			
LH 7120	310	280	270	155				



Rain caps

All dimensions in mm.

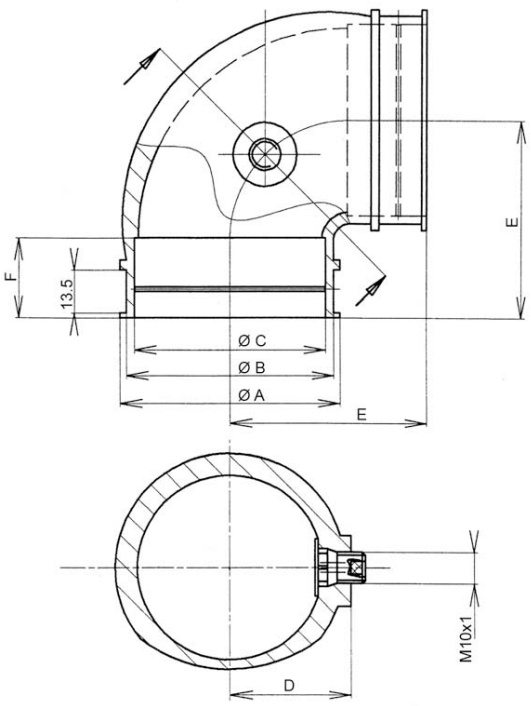
Type	øA	øB	C	D
LK 7045	150	62.2	22	63
LK 7060	200	68.2	30	85
LK 7080	200	82.2	30	85
LK 7120	270	102.2	40	115



Connection tubes

All dimensions in mm.

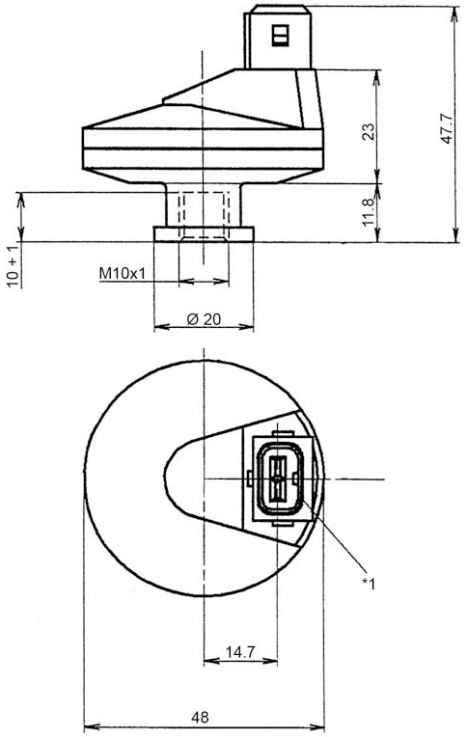
Type	øA	øB	øC	D	E	F
LVS 7045	69	65	60	38	25	68
LVS 7060	79	75	70	43	28	75
LVS 7060	89	85	80	48	30	78
LVS 7120	109	105	100	58	35	88



Elbows

All dimensions in mm.

Type	øA	øB	øC	D	E	F
LKR 7045	69	65	60	38	62	25
LKR 7060	79	75	70	43	72	29
LKR 7060	89	85	80	48	77	30
LKR 7120	109	105	100	58	92	35



Maintenance switch
*1 = Takes AMP connector 963040-3

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