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clean air at work

Test report

Testing of separation efficiency of MobileGo/MonoGo

According to EN-ISO-15012-1:2013

Test location: Plymovent Group BV
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1812 RK Alkmaar, NL

Test performed by:	G. De Vries
Test date :	12-09-2017
Report by:	J. Crezee

Table of content

1. General introduction

Plymovent is a global manufacturer of solutions for clean air at work. Plymovent offers solutions for three industrial segments: (1) welding fume, (2) oilmist and (3) exhaust extraction.

For welding fume, Plymovent offers a broad range of products and solutions to capture, transport and filter welding fumes. The products in this portfolio range from small mobile extraction units with disposable filter, up to centralized filter installations capable of handling air volumes up to 60.000 m^3/h.

In order to fulfill customer demands, and to be able to offer solutions for the extraction of high alloy welding fumes, Plymovent develops filter units with high efficiency filter, which are designed to comply with the W3 requirements as determined under a ISO 15012-1:2013.

This report describes the test procedure, results and forthcoming conclusion of the MobileGo being tested according this standard, and where conformity of the results is also claimed for the MonoGo, which is a product variant of the MobileGo.

2. Introduction to MobileGo and MonoGo

The MobileGo and MonoGo are fume extraction units, which are designed for occasional use, also refer to Figure 2-1. Both models are product variant, and both contain the same set of filters and interior construction.

The unit can handle welding fumes generated by common manual welding processes, such as MIG, TIG and electrode welding.

Figure 2-1 Image of the Plymovent MobileGo (left), and MonoGo (right) extraction units

2.1 Functional description of the filter units

As described before, MobileGo and MonoGo are build identical. The difference is in the application. The MobileGo features a set of wheels, so it can be used as a mobile extraction unit. The MonoGo does not have wheels, but can be mounted to a structure, such as a wall or stand.

The unit contains a 2 stage filter package, a built in fan and basic controls.

The unit functions by having a fan wheel create a negative pressure. Air is being extracted through a movable extraction arm, into a 2 stage filter package. The first filter the extracted fumes pass is a coarse prefilter. This filter is designed to separate course particles. This filter is a 1 m^2 polyester prefilter with a efficiency of ISO Coarse 70% according to ISO 16890.

The second filter the extracted fumes pass, is a glass fiber main filter, with a surface area of 15 m^2. The efficiency of this filter is E12 according to EN 1822-1:2009 .

Both the prefilter and the mainfilter are disposable filters – they are not intended to be cleaned and/or reused.

After the extracted air passes the filters and the fan, the air is being exhausted at the backside of the filter unit (MobileGo) or the topside (MonoGo).

To safeguard proper extraction capacity, the unit has a build in pressure switch, which monitor the pressure drop over the filter package. When the pressure drop reaches a preset level, an audio signal is being generated.

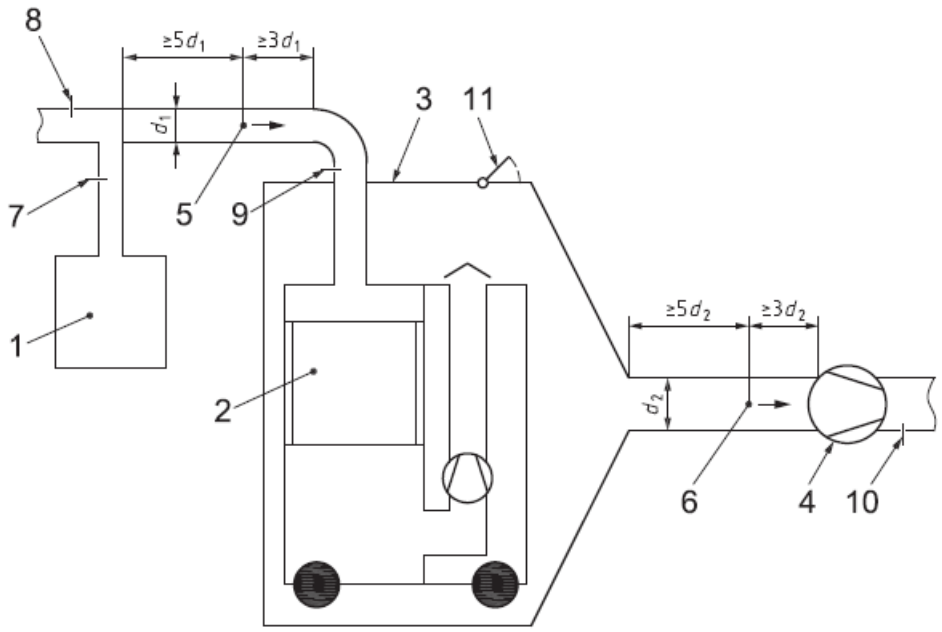
The minimum airflow of the MobileGo and MonoGo is prescribed by Plymovent at 500 m^3/h.

All relevant technical data is given in Appendix A: Product Data Sheet of the MobileGo Extraction unit., on page 19 and Appendix B: Product Data Sheet of the MonoGo Extraction unit, on page 22.

3. Measurement performance

3.1 General test setup and procedure

To assess the fume separation efficiency, the test setup as shown in Figure 3-1 is used.



Key

1 welding fume source (see Figure B.1)
2 welding fume separation equipment
3 test cabin with funnel shaped outlet
4 air mover
5 position for measuring the air flow rate in the upstream duct, $q_{V,1}$
6 positions for measuring the air flow rate in the downstream duct, $q_{V,2}$ and isokinetic sampling of welding fume in the downstream duct
7 damper (to control the air flow rate passing through the welding fume source in order to avoid shielding gas disturbance)
8 damper (to ensure that all welding fume is captured, even when filter units with a low air flow rate are under test)
9 damper (to regulate the total air flow rate passing through the separation equipment)
10 damper (to control the air flow rate in the downstream duct in order to achieve a slight overpressure in the cabin)
11 gap with a flap (to prevent damage on the cabin in case of high overpressure)
d_1 upstream duct diameter
d_2 downstream duct diameter

Figure 3-1 - Schematic layout of test setup (source: standard NEN-EN-ISO 15012-1:2013)

To determine the filtration efficiency of a filter unit, first the fume rate of a welding fume generator is determined, in accordance to EN-ISO 15011-1. The scale used to determine the weight of the filter before and after welding is a Kern EG 220-3NM. This scale complies with the demands as prescribed in to EN-ISO 15011-1. The calibration certificate of this scale is attached in the appendices. Second, welding fume is generated and separated for a period of 30 minutes. After that, the concentration of fume

passing through the filter unit is measured for a period of 30 minutes, by collecting the filtered air onto a sampling filter. Next, fume is extracted without sampling for another 60 minutes, after which the airflow is recorded again and a second welding fume rate is determined. Both welding fume generation rated are used to calculate the average. That average value, together with the concentration values from the samples is used in the calculation to determine the unit's filtration efficiency.

The procedure above is performed twice, and the two results are used to calculate the average, the 95% one-sided confidence interval and the lower confidence limit value, in accordance to ISO 2602-1980.

3.2 Test setup in practice

3.2.1 Setup to determine welding fume generation rate

Figure 3-2 shows the sample mechanism to collect the generated fumes onto a glass fibre filter (manufacturer specification: Whatman, glass microfiber filter, GF/A 240 mm, Cat No 1820-240), in order to determine the fume generation rate.

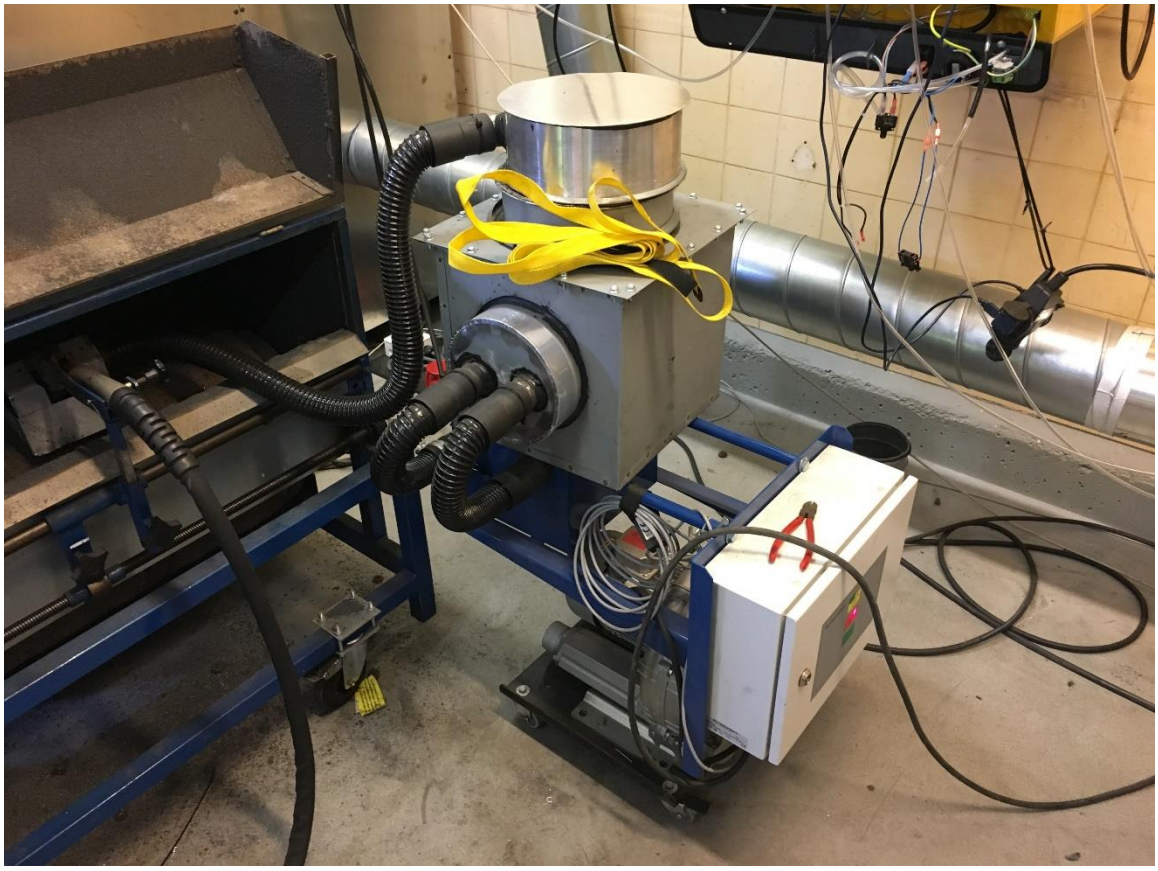


Figure 3-2 Setup to determine the fume source emission rate

Fumes are generated by using a MIG/MAG welding machine together with an automated rotation drum, where to combination can create a continuous weld to generate a constant amount of welding fumes for longer periods of time.

To collect the welding fume onto the sample filter, a construction was made to place the filter in a holder, where the holder is connected to a side channel blower (not shown) to create the required negative pressure in order to capture all fumes at the welding point. This construction is able to extract all generated welding fume from the welding chamber for a period of 60 seconds.

3.2.2 Setup to determine the filter unit separation efficiency

The filter unit is placed in a test enclosure, where the inlet of the filter unit is connected to the extraction hood on the welding machine, by means of spiral ducting (Ø 160 mm) (see Figure 3-3). This upstream duct is equipped with a flow measuring sensor (Micatrone MFS-C-160 MM), connected to a pressure monitor, to measure the upstream air low of the filter unit. The upstream duct can be connected to the inlet of the test filter machine. Also see Figure 3-4 on page 10.

Figure 3-3 Overall picture of the complete test setup

Also the downstream duct is equipped with an airflow measuring sensor (Micatrone MFS-C-200 MM). The diameter of this duct is 200 mm. This duct further houses a measurement point for the downstream air sampling, and is connected to a fan (Plymovent FUA 3000, 1.1 kW, 3Ph, 400V 50 Hz).

Figure 3-4 MobileGo placed in the test cabin with the upstream duct connected to the inlet

3.2.3 Sample taking of filtered air

Samples have been taken using preweighted, 37mm quartz fiber filters. These filters have been bought at RPS[1]. The samples have been taken using a rented, precalibrated pump, type: RPS Analyse, RX001. This pump has been set at RPS by an airflow of 20 liter/minute.

In order to achieve isokinetic sampling, specific sample inlet head have been made. These have been sized to achieve an inlet velocity in the sample inlet, based on 20 ltr/min, which equals the theoretical air velocity in the downstream air duct based on the measure airflow.

3.2.4 Airflow measurements and logging

During the tests, airflow measurements have been performed in both the upstream and downstream duct. The flow sensors (Micatrone MFS-C-XXX) have been connected to calibrated pressure monitors, of brand and type BLAUWE LIJN S4602 ST, serial numbers 036601686 and 036601600. The calibration certificated of these two monitors are added in the appendices. These pressure monitors fulfill the demands as prescribed in the NEN-EN-ISO 15012-1:2013. The resulting logs are stored for reference in a separate spreadsheet.

3.2.5 Other practical information

To assure sample taking and time recording during the welding sequences in the test, a datalogger has been connected to the welding machine setup. Both the drum as the welding machine itself have been

[1] RPS, Minervum 7002, 4817 ZL Breda

modified with sensors to check whether welding is active. In the welding machine itself, the wire throughput is checked, and the rotating drum is checked for continuous rotation. If either sensor detects a stall, the welding machine stops, and a datalogger records that. This means that each test is always performed with the exact same amount of welding time, and thus amount of fumes.

4. Measurement results

4.1 Test 1

All data that was collected and processed is filed in a separate spreadsheet. This file is named: MobileGo IFA efficiency test 1 12092017.

This file shows, that during sampling, the average airflow through the unit is 814 m^3/h. During the entire test the lowest measured airflow is 737 m^3/h and does not drop below the minimum airflow of 500 m^3/h.

The filter used for sampling in the downstream duct is known under reference FI1642-773.

4.1.1 Welding parameters

Test number	12-09-2017-001	
Welding type	MAG	
Welding wire material	EN 440G3 Si1	
Wire diameter	1,2	mm
Wire speed	7,28	m/min
Welding voltage	30	V
Peak current	222	A
Normal current	170	A
Peak period	nb	ms
Peak frequency	nb	Hz
Shielding gas	80/20 Ar/CO_2	
Flow rate shielding gas	14	l/Min
Distance tip to metal	20	mm
Drum diameter	390	mm
Welding speed	7	mm/sec
Flowrate	nb	M3/uur

Table 4-1 Welding parameters test 1

4.1.2 Determination of Fume Generation Rate

	New filter weight [mg]	Polluted filter weight* [mg]	Weight of pollution [mg]	Welding time [s]	Calculated pollution rate [mg/s]
	Before welding test				
1	2449	2924	475	60	7,92
2	2434	2865	431	60	7,18
3	2445	2892	447	60	7,45
	After welding test				
4	2449	2970	521	60	8,68
5	2455	2986	531	60	8,85
6	2431	3017	586	60	9,77

Average pollution rate before test **7,52** [mg/s]

Average pollution rate after test **9,10** [mg/s]

* filter weighted after 60s of continuous welding

4.1.3 Determination of parameter for efficiency calculation

The following calculation method is used (from ISO-15012-1:2013):

$$\eta = \left(1 - \frac{\gamma_{out}}{\gamma_{in}}\right) \times 100\,\% \quad (1)$$

where

$$\gamma_{out} = \frac{m_{s\,out}}{V_{s\,out}}\ \mathrm{mg/m^3} \quad (2)$$

$$\gamma_{in} = \frac{m_{in}}{V_{in}}\ \mathrm{mg/m^3} \quad (3)$$

in which

$m_{s\,out}$ is the mass of the welding fume particles on the sampling filter in the downstream air [mg];

m_{in} is total mass of emitted welding fume from the source calculated from the average emission rate multiplied by the measuring time [mg];

$V_{s\,out}$ is the total air volume that passes through the sampling filter in the downstream air [m³];

V_{in} is the total air volume that passes through the separation equipment during the test [m³].

$m_{s\,out}$ = 0,06 mg (see Appendix C: Result weight determination sample filter test 1)

$$m_{in} = \left(\frac{7{,}52\ [\mathrm{mg/s}] + 9{,}10[\mathrm{mg/s}]}{2}\right) \times 60\ \left[\frac{\mathrm{sec}}{\mathrm{min}}\right] \times 30[\mathrm{min}] = 14955\ \mathrm{mg}$$

$$V_{s\,out} = 30\ [min]\ \times \frac{20\ ltr/min}{1000} = 0{,}6\ m^3$$

V_{in} = average airflow during sampling[2] x sampling time = 814 m^3/h x 30 min = 407 m^3

4.1.4 Efficiency calculation

$$\gamma_{out} = \frac{m_{s\,out}}{V_{s\,out}} = \frac{0{,}06\ [mg]}{0{,}6\ [m^3]} = 0{,}10\ [\frac{mg}{m^3}]$$

$$\gamma_{in} = \frac{m_{in}}{V_{in}} = \frac{14955\ [mg]}{407\ [m^3]} = 36{,}74\ [\frac{mg}{m^3}]$$

$$\eta = \left(1 - \frac{\gamma_{out}}{\gamma_{in}}\right) \times 100\% = \left(1 - \frac{0{,}10}{36{,}74}\right) \times 100\% = 99{,}72\%$$

4.2 Test 2

All data that was collected and processed is filed in a separate spreadsheet. This file is named: MobileGo IFA efficiency test 2 13092017.

This file shows, that during sampling, the average airflow through the unit is 832 m^3/h. During the entire test the lowest measured airflow is 721 m^3/h and does not drop below the minimum airflow of 500 m^3/h.

The filter used for sampling in the downstream duct is known under reference FI1642-771.

4.2.1 Welding parameters

Test number	12-09-2017-002	
Welding type	MAG	
Welding wire material	EN 440G3 Si1	
Wire diameter	1,2	mm
Wire speed	7,28	m/min
Welding voltage	30	V
Peak current	222	A
Normal current	170	A
Peak period	Unknown	ms
Peak frequency	Unknown	Hz
Shielding gas	80/20 Ar/CO_2	
Flow rate shielding gas	14	l/Min
Distance tip to metal	20	mm
Drum diameter	390	mm
Welding speed	7	mm/sec
Flowrate	nb	M3/uur

Table 4-2 Welding parameters test 2

[2] Resulting from recorded air flow logs, also refer to chapter 3.2.4

4.2.2 Determination of Fume Generation Rate

	New filter weight [mg]	Polluted filter weight* [mg]	Weight of pollution [mg]	Welding time [s]	Calculated pollution rate [mg/s]
Before welding test					
1	2466	2946	480	60	8,00
2	2457	2934	477	60	7,95
3	2458	2937	479	60	7,98
After welding test					
4	2465	2940	475	60	7,92
5	2463	2970	507	60	8,45
6	2458	2970	512	60	8,53

Average pollution rate before test **7,98** [mg/s]

Average pollution rate after test **8,30** [mg/s]

* filter weighted after 60s of continuous welding

4.2.3 Determination of parameter for efficiency calculation

The following calculation method is used (from ISO-15012-1:2013):

$$\eta = \left(1 - \frac{\gamma_{out}}{\gamma_{in}}\right) \times 100\,\% \quad (1)$$

where

$$\gamma_{out} = \frac{m_{s\,out}}{V_{s\,out}}\ \mathrm{mg/m^3} \quad (2)$$

$$\gamma_{in} = \frac{m_{in}}{V_{in}}\ \mathrm{mg/m^3} \quad (3)$$

in which

$m_{s\,out}$ is the mass of the welding fume particles on the sampling filter in the downstream air [mg];

m_{in} is total mass of emitted welding fume from the source calculated from the average emission rate multiplied by the measuring time [mg];

$V_{s\,out}$ is the total air volume that passes through the sampling filter in the downstream air [m³];

V_{in} is the total air volume that passes through the separation equipment during the test [m³].

$m_{s\,out}$ = 0,08 mg (see Appendix D: Result weight determination sample filter test 2)

$$m_{in} = \left(\frac{7{,}98\ [\mathrm{mg/s}] + 8{,}30[\mathrm{mg/s}]}{2}\right) \times 60\ \left[\frac{\mathrm{sec}}{\mathrm{min}}\right] \times 30[\mathrm{min}] = 14650\ \mathrm{mg}$$

$$V_{s\,out} = 30\ [min]\ \times \frac{20\ ltr/min}{1000} = 0{,}6\ m^3$$

V_{in} = average airflow during sampling[3] x sampling time = 832 m^3/h x 30 min = 416 m^3

4.2.4 Efficiency calculation

$$\gamma_{out} = \frac{m_{s\,out}}{V_{s\,out}} = \frac{0{,}08\ [mg]}{0{,}6\ [m^3]} = 0{,}13\ [\frac{mg}{m^3}]$$

$$\gamma_{in} = \frac{m_{in}}{V_{in}} = \frac{14650\ [mg]}{416\ [m^3]} = 35{,}24\ [\frac{mg}{m^3}]$$

$$\eta = \left(1 - \frac{\gamma_{out}}{\gamma_{in}}\right) \times 100\% = \left(1 - \frac{0{,}13}{35{,}62}\right) \times 100\% = 99{,}62\%$$

[3] Resulting from recorded air flow logs, also refer to chapter 3.2.4

5. Calculation of final results and conclusion

5.1 Average efficiency

$$\eta_{average} = \frac{\eta_1 + \eta_2}{2} = \frac{99{,}72 + 99{,}62}{2} = 99{,}67\%$$

5.2 95% one-sided confidence interval

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i = \frac{1}{2}\,(99{,}72 + 99{,}62) = 99{,}67\%$$

$$\frac{t_{0,95}}{\sqrt{n}} = 4{,}465^{4}$$

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2} = \sqrt{\frac{1}{2-1}((99{,}72 - 99{,}67)^2 + (99{,}62 - 99{,}67)^2)} = 0{,}071$$

$$m < \bar{x} + \frac{t_{0,95}}{\sqrt{n}}s < 99{,}67 + (4{,}465 \times 0{,}071) < 99{,}98\%$$

$$m > \bar{x} - \frac{t_{0,95}}{\sqrt{n}}s > 99{,}67 - (4{,}465 \times 0{,}071) > 99{,}35\%$$

5.3 Lower confidence limit value

$$m > \bar{x} - \frac{t_{0,95}}{\sqrt{n}}s > 99{,}67 - (4{,}465 \times 0{,}071) > 99{,}35\%$$

5.4 Conclusion

The MobileGo filterunit has a lower confidence limit value for the dust capturing efficiency of 99,35%, and may therefore be marked as W3 according to ISO 15012-1 2013.

[4] From table on page 4, ISO 2602-1980 (E)

6. Literature

NEN-EN-ISO 15011-1:2009 (en) Health and safety in welding and allied processes - Laboratory method for sampling fume and gases - Part 1: Determination of fume emission rate during arc welding and collection of fume for analysis (ISO 15011-1:2009,IDT)

NEN-EN-ISO 15012-1:2013 (en) - Health and safety in welding and alliedprocesses - Equipment for capture and separation of welding fume - Part 1: Requirements for testing and marking of separation efficiency (ISO 15012-1:2013,IDT)

ISO 2602:1980 (en) Statistical interpretation of test results – Estimation of the mean – Confidence interval

Appendix A: Product Data Sheet of the MobileGo Extraction unit.

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MOBILEGO

MOBILE FILTER UNIT WITH HOSE TUBE ARM

The MobileGo is a mobile welding fume filter with built-in fan and a hose tube arm (EconomyArm). It contains a disposable filter package.

Thanks to the four transport wheels (two of which are swivel casters with brake), the MobileGo is suitable for use in relatively small facilities or near sources of pollution without a fixed location.

The MobileGo is an entry level extractor. It has been designed for the consumption of approx. 1 coil of solid wire or 7,5 kg (16.5 lbs) of electrodes per month and TIG welding.

APPLICATIONS

The MobileGo is intended to be used for the following applications:

- MIG-MAG/GMAW welding
- TIG welding
- FCAW welding
- stick/MMAW welding
- grinding
- polishing
- finishing

SPECIFICATIONS

Physical dimensions and properties	
Material (housing): • steel grade • steel grade no.	electro-zinc coated steel (according to DIN EN 10152) • DC01+ZE • 1.0330
Colour	yellow RAL 1004 grey RAL 7011
Weight (net), excl. arm	84 kg (185 lbs)
Mains cord: • type • length	 • 3G1.5 • 6 m (20 ft)
Extraction arm	
Type	EconomyArm (EA)
Material	hose tube
Diameter	Ø 160 mm (6.3 in.)
Hood opening	Ø 300 mm (11.8 in.)
Length: • EA-2 • EA-3	 • 2 m (6.6 ft) • 3 m (9.8 ft)
Weight: • EA-2 • EA-3	 • 11 kg (24.3 lbs) • 13 kg (28.7 lbs)
Filters	
Pre filter (cassette): • material • filter surface • filter classification • washable	 • polyester • 1 m² (10.8 ft²) • ISO Coarse 70% according to ISO 16890 • no
Main filter (cassette): • material • filter surface	 • glass fibre • 15 m² (161 ft²)
• efficiency class • washable	• E12 according to EN 1822-1:2009 • no
Welding fume class	
W3	according to ISO 15012-1:2013
Performance	
Fan type	radial
Extraction capacity (incl. extraction arm)	max. 850 m³/h (500 CFM)
Fan speed	2800 rpm
Noise level (according to ISO 3746)	67 dB(A)
Electrical data	
Power consumption	1,1 kW (1.5 HP)
Available connection voltages	• 115V/1ph/50Hz (115) • 230V/1ph/50Hz (215)
Motor design	IEC
Energy efficiency	*n.a. for single phase motors*
Plug: • 115V/1ph/50Hz • 230V/1ph/50Hz	Type: • *none* • F
Ambient and process conditions	
Process temperature: • min. • nom. • max.	 • 5°C (41°F) • 20°C (68°F) • 70°C (158°F)
Max. relative humidity	90%
Suitable for outdoor use	no
Storage conditions	• 5-45°C (41-113°F) • relative humidity max. 80%
Options and accessories	
MobileGo-AC/2m (215)	MobileGo with an activated carbon filter instead of a HEPA filter
MobileGo-AC/3m (215)	
Scope of supply	
Mobile filter unit – Extraction arm (pre-assembled; excl. hose tube) – Hose tube – Hose clamp (2) – Rotating flange – Arm swivel ring, incl. rubber collar – Extraction hood – Hood collar with safety mesh – Mounting material	

product data sheet

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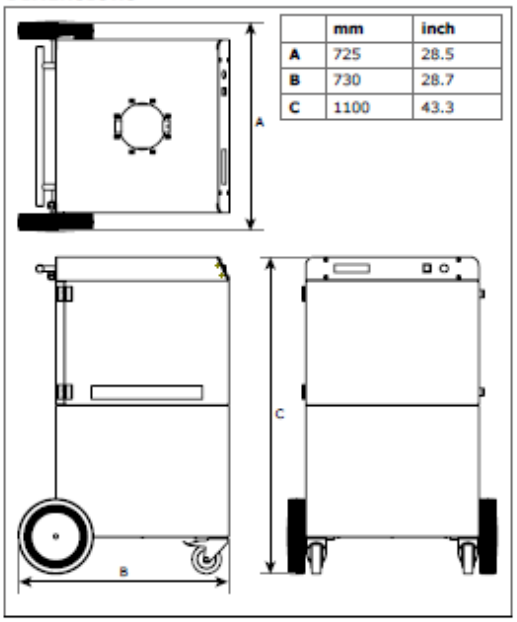
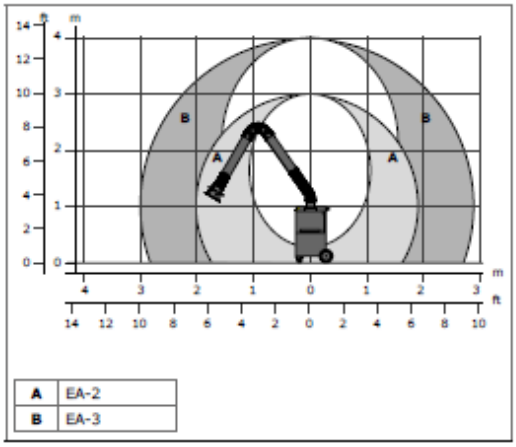
Type	MobileGo/2m		MobileGo/3m	
Connection voltage	115V/1ph/50Hz	230V/1ph/50Hz	115V/1ph/50Hz	230V/1ph/50Hz
Order information				
Article no.	0000111450	0000111449	0000111471	0000111470
• MobileGo-AC		0000112350		0000112353
Number/package	1	1	1	1
Logistics data				
Gross weight (incl. pallet)	101 kg (223 lbs)		103 kg (227 lbs)	
Packing dimensions (incl. pallet)	800 x 1200 x 1650 mm (31.5 x 47.2 x 65.0 in.)		800 x 1200 x 2250 mm (31.5 x 47.2 x 88.6 in.)	
Max. number/pallet	1		1	
Harmonized Tariff Code	84213925		84213925	

DIMENSIONS



	mm	inch
A	725	28.5
B	730	28.7
C	1100	43.3

WORKING RANGE



A	EA-2
B	EA-3

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FEATURES & BENEFITS

Compact design

Simple control | Service indicator (buzzer) monitors the airflow

APPROVALS/CERTIFICATES

CE	
RoHS	Directive 2011/65/EC (RoHS) valid as of 8 June 2011

Application restrictions

Do **not** use the product for the following applications or in the following circumstances: polishing applications in combination with grinding, welding or any other application that generate sparks (fibres from polishing or abrasive flap disks are highly flammable and pose a high risk of filter fires when exposed to sparks) | aluminium laser cutting | oil mist | heavy oil mist in welding fume | arc-air gouging | extraction of aggressive fumes and gases (e.g. from acids, from alkaline, from soldering paste containing lithium) | extraction of hot gases (more than 70°C/158°F continuously) | grinding aluminum and magnesium | flame spraying | extraction of cement, saw dust, wood dust etc. | sucking cigarettes, cigars, oiled tissues and other burning particles, objects and acids | explosive environments or explosive substances/gases

Product type	**MobileGo**
Article no.	*refer to Order information*
Product category	mobile filter units
Version	250518/F

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Appendix B: Product Data Sheet of the MonoGo Extraction unit

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MONOGO

STATIONARY FILTER UNIT WITH HOSE TUBE ARM

The MonoGo is a stationary welding fume filter with built-in fan and a hose tube arm (EconomyArm). It contains a disposable filter package.

The MonoGo is an entry level extractor. It has been designed for the consumption of approx. 1 coil of solid wire or 7,5 kg/16.5 lbs of electrodes per month and TIG welding.

APPLICATIONS

The MonoGo is intended to be used for the following applications:

- MIG-MAG/GMAW welding
- TIG welding
- FCAW welding
- stick/MMAW welding
- grinding
- polishing
- finishing

SPECIFICATIONS

Physical dimensions and properties	
Material (housing): • steel grade • steel grade no.	electro-zinc coated steel (according to DIN EN 10152) • DC01+ZE • 1.0330
Colour	yellow RAL 1004 grey RAL 7011
Weight (net), excl. arm	78 kg (172 lbs)
Mains cord	not included
Extraction arm	
Type	EconomyArm (EA)
Material	hose tube
Diameter	Ø 160 mm (6.3 in.)
Hood opening	Ø 300 mm (11.8 in.)
Length: • EA-2 • EA-3 • EA-4	 • 2 m (6.6 ft) • 3 m (9.8 ft) • 4 m (13.1 ft)
Weight: • EA-2 • EA-3 • EA-4	 • 11 kg (24.3 lbs) • 13 kg (28.7 lbs) • 15 kg (33.1 lbs)
Filters	
Pre filter cassette: • material • filter surface • efficiency • washable	 • polyester • 1 m² (10.8 ft²) • G4 according to EN 779 • no
HEPA filter cassette: • material • filter surface • efficiency	 • glass fibre • 15 m² (161 ft²) • HEPA E12 according to EN 1822:2009
• washable	• no
Welding fume class	
W3	according to ISO 15012-1:2013
Performance	
Fan type	radial
Extraction capacity (incl. extraction arm)	max. 850 m³/h (500 CFM)
Fan speed	2800 rpm
Noise level (according to ISO 3746)	67 dB(A)
Electrical data	
Power consumption	1,1 kW (1.5 HP)
Available connection voltages	• 115V/1ph/50Hz (115) • 115V/1ph/60Hz (116) • 230V/1ph/50Hz (215)
Motor design	IEC
Energy efficiency	*n.a. for single phase motors*
Ambient and process conditions	
Process temperature: • min. • nom. • max.	 • 5°C (41°F) • 20°C (68°F) • 70°C (158°F)
Max. relative humidity	90%
Suitable for outdoor use	no
Storage conditions	• 5-45°C (41-113°F) • relative humidity max. 80%
Scope of supply	
Stationary filter unit, incl. fan and wall bracket – Extraction arm (pre-assembled; excl. hose tube) – Hose tube – Hose clamp (2) – Rotating flange – Arm swivel ring, incl. rubber collar – Extraction hood – Hood collar with safety mesh – Mounting material – Switch box	

product data sheet

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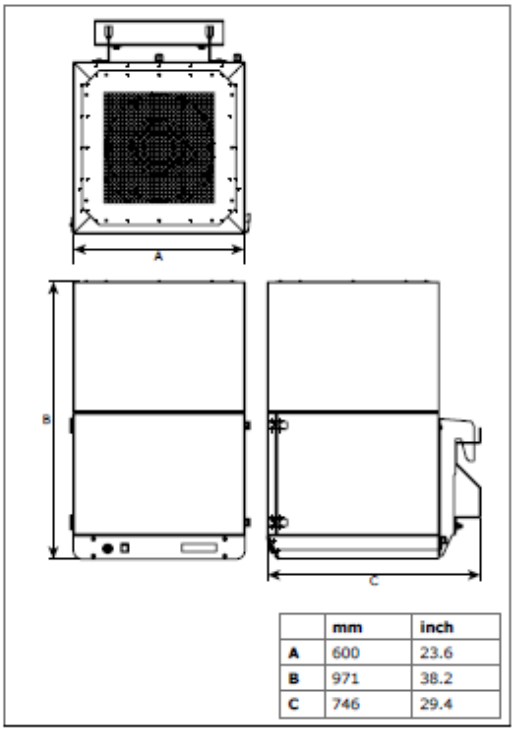
www.plymovent.com

PLYMOVENT®
clean air at work

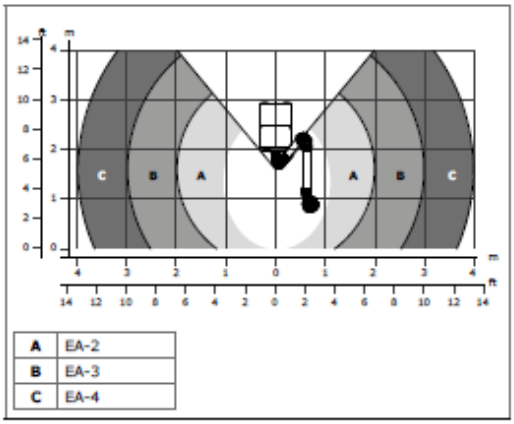
Type	MonoGo/2m	MonoGo/3m	MonoGo/4m
Order information			
Connection voltage	Article no.	Article no.	Article no.
115V/1ph/50Hz	0000111456	0000111477	0000111489
115V/1ph/60Hz	0000111457	0000111478	0000111490
230V/1ph/50Hz	0000111455	0000111476	0000111488
Number/package	1	1	1
Logistics data			
Gross weight (incl. pallet)	103 kg (227 lbs)	106,5 kg (235 lbs)	107,5 kg (237 lbs)
Packing dimensions (incl. pallet)	800 x 1200 x 1750 mm (31.5x47.2x68.9 in.)	800 x 1200 x 2250 mm (31.5x47.2x88.6 in.)	800 x 1200 x 2250 mm (31.5x47.2x88.6 in.)
Max. number/pallet	2	2	2
Harmonized Tariff Code	84213925	84213925	84213925

DIMENSIONS



	mm	inch
A	600	23.6
B	971	38.2
C	746	29.4

WORKING RANGE



A	EA-2
B	EA-3
C	EA-4

PLYMOVENT®
clean air at work

FEATURES & BENEFITS

Compact design

Remote control

Service indicator (buzzer)

APPROVALS/CERTIFICATES

CE	
RoHS	Directive 2011/65/EC (RoHS) valid as of 8 June 2011

Application restrictions

Do **not** use the product for the following applications or in the following circumstances: polishing applications in combination with grinding, welding or any other application that generate sparks (fibres from polishing or abrasive flap disks are highly flammable and pose a high risk of filter fires when exposed to sparks) | aluminium laser cutting | oil mist | heavy oil mist in welding fume | arc-air gouging | extraction of aggressive fumes and gases (e.g. from acids, from alkaline, from soldering paste containing lithium) | extraction of hot gases (more than 70°C/158°F continuously) | grinding aluminum and magnesium | flame spraying | extraction of cement, saw dust, wood dust etc. | sucking cigarettes, cigars, oiled tissues and other burning particles, objects and acids | explosive environments or explosive substances/gases

Product type	**MonoGo**
Article no.	*refer to Order information*
Product category	stationary filter units
Version	280917/G

Always check the latest version on **www.plymovent.com**

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Appendix C: Result weight determination sample filter test 1

RPS

Analyse certificaat

V280317_1

Datum rapportage 20-09-2017

Rapportnummer: 1709-1674_01

Datum order	13-09-2017
Monsternummer RPS	17-181376
Ordernummer opdrachtgever	Onbekend
Opdrachtgever	Plymovent Group BV Koraalstraat 9 1812 RK Alkmaar
Monsternamepunt	-
Adres monstername	W3 testopstelling
Datum monstername	-
Monsternummer opdrachtgever	-
Meettijd (min)	30
Volume (l)	600
Filternummer	FI1642-773
Soort monster	Kwartsvezel filter (37 mm)
Monstergegevens afkomstig van	Opdrachtgever
Opmerking	-

RPS analyse bv

Minervum 7002
4817 ZL Breda

Postbus 3440
4800 DK Breda

T 088 99 04 730

E analyse@rps.nl
W www.rps.nl

Code	Parameter	Absoluut		Relatief(1)	
	Stof gravimetrisch				
Q	Stof	0,06	mg	0,10	mg/m³

Toelichting:
'<' Het analyseresultaat is kleiner dan de rapportagegrens van de desbetreffende methode.
'>' Het meetresultaat valt boven het kalibratie- of werkgebied van de methode.
(s): semi kwantitatief
Code E: De analyse is uitgevoerd door een extern laboratorium.
Code Q: De analyse betreft een RvA Testen geaccrediteerde verrichting (registratienummer L192).
(1) Deze analyse resultaten zijn berekend op basis van het (evt. door de opdrachtgever) opgegeven volume of meettijd en vallen niet onder de scope van accreditatie L192.
n.t.b. Niet te beoordelen i.v.m. groei van overige micro-organismen
Dit certificaat mag uitsluitend in zijn geheel worden gereproduceerd waarbij alleen aan het originele analysecertificaat rechten kunnen worden ontleend.
De resultaten hebben uitsluitend betrekking op het aangeboden monster.
Meetonzekerheid op aanvraag.

Esther Ullings
Projectcoördinator

Appendix D: Result weight determination sample filter test 2

RPS

Analyse certificaat

V280317_1

Datum rapportage 15-09-2017

Rapportnummer: 1709-1935_01

Datum order	14-09-2017
Monsternummer RPS	17-182606
Ordernummer opdrachtgever	900448
Opdrachtgever	Plymovent Group BV Koraalstraat 9 1812 RK Alkmaar
Monsternamepunt	MobileGo test 2
Adres monstername	Koraalstraat Alkmaar
Datum monstername	-
Monsternummer opdrachtgever	2
Meettijd (min)	30
Volume (l)	-
Filternummer	FI1642-771
Soort monster	Kwartsvezel filter (37 mm)
Monstergegevens afkomstig van	Opdrachtgever
Opmerking	-

RPS analyse bv

Minervum 7002
4817 ZL Breda

Postbus 3440
4800 DK Breda

T 088 99 04 730

E analyse@rps.nl
W www.rps.nl

Code	Parameter	Absoluut	
	Stof gravimetrisch		
Q	Stof	0,08	mg

Toelichting:
'<' Het analyseresultaat is kleiner dan de rapportagegrens van de desbetreffende methode.
'>' Het meetresultaat valt boven het kalibratie- of werkgebied van de methode.
(s): semi kwantitatief
Code E: De analyse is uitgevoerd door een extern laboratorium.
Code Q: De analyse betreft een RvA Testen geaccrediteerde verrichting (registratienummer L192).
(1) Deze analyse resultaten zijn berekend op basis van het (evt. door de opdrachtgever) opgegeven volume of meettijd en vallen niet onder de scope van accreditatie L192.
n.t.b. Niet te beoordelen i.v.m. groei van overige micro-organismen
Dit certificaat mag uitsluitend in zijn geheel worden gereproduceerd waarbij alleen aan het originele analysecertificaat rechten kunnen worden ontleend.
De resultaten hebben uitsluitend betrekking op het aangeboden monster.
Meetonzekerheid op aanvraag.

Esther Ullings
Projectcoördinator

Appendix E: Calibration certificate of pressure monitor 1

CERTIFICAAT

Certificaatnummer 673984 Pagina 1 van 2

KALIBRATIECERTIFICAAT

Aanvrager

Naam	Plymovent Manufacturing BV
Ter attentie van	Dhr. van Rhee
Adres	Postbus 9350
Postcode en plaats	1800 GJ ALKMAAR

Instrument

Type instrument	Drukmeter
Fabrikaat	EURO-INDEX
Type	BLAUWE LIJN S4602-ST
Serienummer	036601686
Service-artikelnummer	188834
Service-overeenkomst	KWS

Kalibratiedatum 08-08-2017

Volgende kalibratie voor 08-08-2018

Kalibratiemethoden
Het instrument is gekalibreerd in overeenstemming met onderstaande methoden:
DR01-02 Het aanbieden van druk m.b.v. een drukkalibrator (PPC3/PPC4)

Kalibratoren
Bij de kalibratie is gebruik gemaakt van onderstaande kalibratiemiddelen:
EI-0120 Druk kalibrator met serienummer 1136
en certificaatnummer 4161221 (RvA)

Omgevingscondities
In het kalibratielaboratorium worden onderstaande omgevingscondities gehandhaafd:

Temperatuur	23 °C ± 3 °C
Relatieve luchtvochtigheid	50 %rh ± 20 %rh
Barometerdruk	1000 hPa ± 50 hPa

Resultaat
De meetresultaten zijn weergegeven op de volgbladen. Bij het bepalen van de kolom "BS" (Binnen Specificaties) is gebruik gemaakt van de bereiken en specificaties van het instrument, zoals weergegeven op dit kalibratiecertificaat.

Herleidbaarheid
De kalibratiemiddelen van EURO-INDEX b.v. zijn herleidbaar naar (inter-)nationale standaarden.

Capelle aan den IJssel, 08-08-2017

EURO-INDEX b.v.
Ing. A. de Bruin
Technische Dienst Manager

EURO-INDEX b.v.
Rivium 2e straat 12, 2909 LG
Postbus 700, 2900 AS
Capelle a/d IJssel, Nederland
Telefoon : +31(0)10 - 2 888 000
Fax : +31(0)10 - 2 888 010
E-mail : service@euro-index.nl

Appendix F: Calibration certificate of pressure monitor 2

CERTIFICAAT

Certificaatnummer 634054 Pagina 1 van 2

KALIBRATIECERTIFICAAT

Aanvrager	Naam	Plymovent Manufacturing BV
	Ter attentie van	Dhr. Crezee
	Adres	Postbus 9350
	Postcode en plaats	1800 GJ ALKMAAR
Instrument	Type instrument	Drukmeter
	Fabrikaat	EURO-INDEX
	Type	BLAUWE LIJN S4602-ST
	Serienummer	036601600
	Service-artikelnummer	180103
	Service-overeenkomst	KWS
Kalibratiedatum	30-11-2016	
Volgende kalibratie voor	30-11-2017	

Kalibratiemethoden
Het instrument is gekalibreerd in overeenstemming met onderstaande methoden:
DR01-02 Het aanbieden van druk m.b.v. een drukkalibrator (PPC3/PPC4)

Kalibratoren
Bij de kalibratie is gebruik gemaakt van onderstaande kalibratiemiddelen:
EI-0120 Druk kalibrator met serienummer 1136
en certificaatnummer 4161221 (RvA)

Omgevingscondities
In het kalibratielaboratorium worden onderstaande omgevingscondities gehandhaafd:

Temperatuur	23 °C ± 3 °C
Relatieve luchtvochtigheid	50 %rh ± 20 %rh
Barometerdruk	1000 hPa ± 50 hPa

Resultaat
De meetresultaten zijn weergegeven op de volgbladen. Bij het bepalen van de kolom "BS" (Binnen Specificaties) is gebruik gemaakt van de bereiken en specificaties van het instrument, zoals weergegeven op dit kalibratiecertificaat.

Herleidbaarheid
De kalibratiemiddelen van EURO-INDEX b.v. zijn herleidbaar naar (inter-)nationale standaarden.

Capelle aan den IJssel, 30-11-2016

EURO-INDEX b.v.
Ing. A. de Bruin
Technische Dienst Manager

EURO-INDEX b.v.
Rivium 2e straat 12, 2909 LG
Postbus 700, 2900 AS
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Telefoon : +31(0)10 - 2 888 000
Fax : +31(0)10 - 2 888 010
E-mail : service@euro-index.nl

Appendix G: Calibration certificate of precision scale

KERN CALIBRATION

KERN & Sohn GmbH

Älteste europäische Feinwaagen und Gewichtefabrik seit 1844
Oudste Europese fabriek voor precisie weegschalen en gewichten sinds 1844

akkreditiert durch die / *geaccrediteerd door de*

Deutsche Akkreditierungsstelle GmbH

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-K-19408-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in*

Deutschen Kalibrierdienst DKD

B63-205
D-K-19408-01-00
2016-12

Kalibrierschein
IJkcertificaat

Kalibrierzeichen
IJkmerkteken

Gegenstand *Voorwerp*	Präzisionswaage *Precision Balance*
Hersteller *Producent*	KERN & Sohn GmbH Ziegelei 1 72336 Balingen GERMANY
Typ *Type*	EG 220-3NM
Fabrikat/Serien-Nr. *Serienummer*	161311043
Auftraggeber *Opdrachtgever*	Stimag B.V. Meer en Duin 64a 2163HC Lisse NL
Auftragsnummer *Ordernr.*	26096373
Anzahl der Seiten des Kalibrierscheines *Aantal pagina's van het ijkcertificaat*	5
Datum der Kalibrierung *Datum van de ijking*	19.12.2016

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Dit kalibreerbewijs documenteert het terugvoeren tot op de nationale normale om de eenheden in overeenstemming met het internationale eenheidsstelsel (SI) weer te geven. De DAkkS is ondertekenaar van de multilaterale overeenkomst tussen de European co-operation for Accreditation (EA) en de International Laboratory Accreditation Cooperation (ILAC) betreffende een wederzijdse erkenning van de kalibreerbewijzen. De gebruiker draagt de verantwoordelijkheid voor het herhalen van het kalibreren binnen gepaste tijd.

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Datum *Datum*	Leiter des Kalibrierlaboratoriums *Hoofd van het kalibreerlaboratorium*	Bearbeiter *Verantwoordelijke medewerker*
19.12.2016	Otto Grunenberg	Frank Kleißberg

Archiv: 00478389

KERN & Sohn GmbH, Ziegelei 1, D-72336 Balingen, Germany
Phone +49-7433-99330, Fax +49-7433-9933-149

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