

Operating Instructions
Linear Conveyor „HFA ... / HFA ... SB“



HFA 0,4/200
HFA 0,6/250
HFA 0,6/300
HFA 1,5/400
HFA 2,5/500
HFA 0,4/200 SB
HFA 0,6/250 SB
HFA 0,6/300 SB
HFA 1,5/400 SB
HFA 2,5/500 SB

FB.-No.: _____
Customer: _____
Date: _____

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1. Safety Instructions

1.1 General

This section contains information necessary for the correct use of the products described. It is directed at technically qualified personnel.

Qualified personnel are persons who on account of their education, experience and training as well as their knowledge of appropriate norms, regulations, rules concerning accident prevention and conditions prevailing at the place of work who have been authorized by those responsible for the safety of the equipment to carry out the particular operation required and thereby are able to recognize and avoid possible dangers (definition from IEC 364 of skilled personnel).

Danger Warnings

The following notes relate not only to the operator's personal safety but also to the protection of the products described and the equipment involved.



ATTENTION!

Failure to observe can lead to personal injury or cause damage to the machine.



WARNING!

High voltage.

Ignoring this warning can result in death or severe bodily injury.



NOTE:

Here are given hints and important informations to handle the device.

Disconnect the power supply before installation or dismantling.

Observe the valid accident prevention and safety regulations for your specific application.

Before commissioning, check whether the nominal voltage of the device agrees with the local mains voltage.

EMERGENCY STOP mechanisms must remain active in all operating modes. Unlocking the EMERGENCY STOP mechanism must not result in uncontrolled reactivation.

Existing protective equipment must not be removed.

Carefully read through the operating instructions before commissioning and follow these.

1. Safety Instructions

1.2 Danger from the machine

Mechanical:

No danger is to be expected from a machine that is in its original condition.

Electrical:

No danger is to be expected from a machine that is used in accordance with operating instructions (chapter 1.4), that is in its original condition and the electrical equipment of which is technically in perfect order.

Contact with liquids may cause an electrical shock.

→ Ensure that the ground connections are in good order.

1.3 Noise emission

The level of noise generated by the HFA-L depends on the articles to be sorted and the construction of the conveyor rail. The noise level according to the EU directive „Machines“ can therefore only be ascertained on site under actual working conditions.

If the sound intensity level exceeds the authorized noise level, suitable noise protection measures must be taken.

1.4 Authorized applications

The linear conveyor may only be used in a dry environment, as it is not protected against being splashed with water.

It must not be used in explosive and wet areas!

The use of the HFA-L is to drive linear conveyor rails. The purpose of these is to transport and feed in the correct position mass-produced parts, as well as dosed feeding of dry bulk material.

Any other application of the HFA-L which varies from these uses are not authorized.



ATTENTION!

Improper use can lead to damage to the unit.

2. Transport and Storage

2.1 Transport

The linear conveyor units HFA can be moved manually on account of their light weight.



ATTENTION!

The HFA must not be lifted or transported by the oscillator.

2.2 Storage

If the linear conveyor is stored for a long period of time it must be protected from damp and aggressive agents.

Excessive variations in temperature should be avoided.

3. Installation and Starting up

3.1 Installation

The linear conveyor must be located on a sufficiently stable base. It must not pass on vibrations coming from the linear conveyor.

The HFA ... SB model machines are fitted during manufacture with rubber-metal buffers. These have an internal thread on the under side by which the linear conveyor can be securely screwed to its foundation.

The HFA... model machines are provided with clamping plates which have four boreholes for screwing the linear conveyor with its foundation.

Detail of the boreholes for the various models are given in the Technical Data (chapter 4).



NOTE:

In operation the linear conveyor and any elements connected to it must not come into contact with other machines.

3.2 Starting up

Mount the special linear conveyor rails to the HFA. When screwing on use a spacing plate which is available as an accessory. This operation does not apply where the HFA is a part of ready-built plant.



NOTE:

- ensure that the linear conveyor rail is securely screwed to the unit.
- check to ensure that the machine is standing freely.
- ensure that the linear conveyor power supply cable is in good condition.
- compare the details of the available voltage supply and its frequency with the HFA technical specification.

Connection to the electric mains is effected exclusively via a suitable control device. The connecting loads may be found in the Technical Data (Chapter 4).

A connection to the mains supply may only be made by a qualified electrician.

The behaviour of the conveyor must be checked after the power supply has been connected.

- complete HFA units are supplied by the manufacturer pre-adjusted to their optimal settings. These are marked on the scale of the control unit supplied.
- HFA supplied without linear conveyor rails are set during manufacture with a certain loading weight (linear conveyor rail, spacing plate and bulk material).). These loading weights are given in the Technical Data (chapter 4).

If the loading weight differs from the given values, the result will be a reduced conveying capacity. How the machine is to be re-set, is described in chapter 7.

3. Technical Data

4.1 Linear conveyor

model		HFA 0,4/200	HFA 0,6/250	HFA 0,6/300	HFA 1,5/400	HFA 2,5/500
dimensions (l x w x h)	[mm]	126 x 38 x 40	151 x 55 x 56	181 x 55 x 56	215 x 80 x 67	278 x 90 x 93
fixing measures borehole-Ø	[mm]	4,5 (4x)	5,5 (4x)	5,5 (4x)	6,0 (4x)	8,0 (4x)
boring measure	[mm]	106 x 24	131 x 35	161 x 35	195 x 50	258 x 60
number of springs (standard)						
front		2	1	1	1	2
rear		2	2	2	2	2
spring size (standard)	[mm]	0,6	1,0	1,0	1,0	2,0
weight of oscill. units (max.)	[kg]	0,4	0,6	0,6	1,5	2,5
rail length (max.)	[mm]	200	250	300	400	500
voltage *	[V]	230	230	230	230	230
mains frequency *	[Hz]	50	50	50	50	50
oscillation frequency	[1/min]	6000	6000	6000	6000	6000
current consumption	[A]	0,04	0,14	0,14	0,43	0,84
air gap (max.)	[mm]	1	2	2	2	2

model		HFA 0,4/200 SB	HFA 0,6/250 SB	HFA 0,6/300 SB	HFA 1,5/400 SB	HFA 2,5/500 SB
dimensions (l x w x h)	[mm]	132 x 38 x 37	147 x 55 x 56	187 x 55 x 56	238 x 78 x 67	333 x 94x 93
fixing measures borehole-Ø		M3 (4x)	M4 (4x)	M4 (4x)	M5 (4x)	M6 (4x)
boring measure	[mm]	120 x 24	130 x 35	170 x 35	200 x 50	300 x 60
number of springs (standard)						
front		2	1	1	1	2
rear		2	2	2	2	2
spring size (standard)	[mm]	0,6	1,0	1,0	1,0	2,0
weight of oscill. units (max.)	[kg]	0,4	0,6	0,6	1,5	2,5
rail length (max.)	[mm]	200	250	300	400	500
voltage *	[V]	230	230	230	230	230
mains frequency *	[Hz]	50	50	50	50	50
oscillation frequency	[1/min]	6000	6000	6000	6000	6000
current consumption	[A]	0,04	0,14	0,14	0,43	0,84
air gap (max.)	[mm]	1	2	2	2	2

* if required the units are also available with 115 V and 60 Hz

4.2 Accessories

model	mounting plate AP		spacing plate ZP		stand STV
	designation	dimensions l x w x h [mm]	designation	dimensions l x w x h [mm]	
HFA 0,4/200	-	-	ZP-200 / ZP-200-A	70 x 34 x 5 / 70 x 34 x 8	-
HFA 0,6/250	-	-	ZP-250 / ZP-250-A	85 x 50 x 5 / 85 x 50 x 8	-
HFA 0,6/300	-	-	ZP-300 / ZP-300-A	106 x 50 x 5 / 106 x 50 x 8	-
HFA 1,5/400	-	-	ZP-400 / ZP-400-A	136 x 70 x 6 / 136 x 70 x 8	-
HFA 2,5/500	-	-	ZP-500 / ZP-500-A	190 x 85 x 6 / 190 x 85 x 8	-
HFA 0,4/200 SB	AP-200	130 x 40 x 15	ZP-200 / ZP-200-A	70 x 34 x 5 / 70 x 34 x 8	-
HFA 0,6/250 SB	AP-250	145 x 60 x 20	ZP-250 / ZP-250-A	85 x 50 x 5 / 85 x 50 x 8	STV 100/50
HFA 0,6/300 SB	AP-300	185 x 60 x 20	ZP-300 / ZP-300-A	106 x 50 x 5 / 106 x 50 x 8	STV 100/50
HFA 1,5/400 SB	AP-400	220 x 80 x 20	ZP-400 / ZP-400-A	136 x 70 x 6 / 136 x 70 x 8	STV 100/50
HFA 2,5/500 SB	AP-500	325 x 100 x 20	ZP-500 / ZP-500-A	190 x 85 x 6 / 190 x 85 x 8	STV 100/50

5. Description of Machine

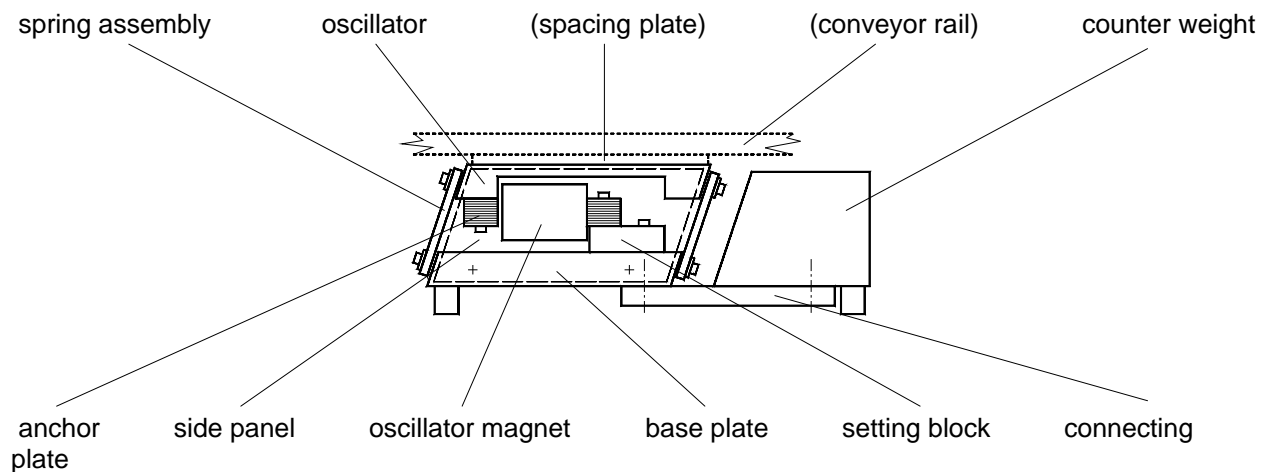
5.1 Lay out

The HFA... / HFA...SB linear conveyor consists of the following components:

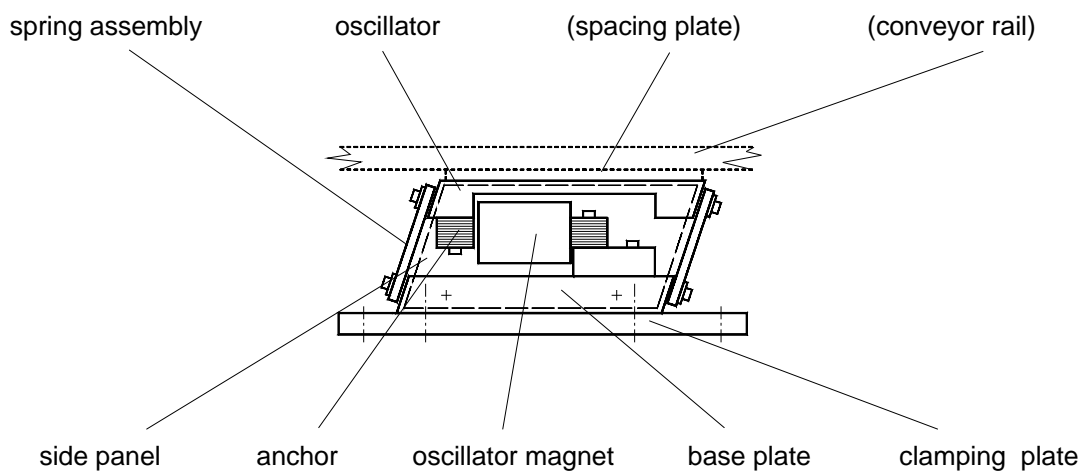
- base plate
- counter weight (only HFA...SB)
- oscillator
- oscillator magnet with anchor
- spring assembly
- side panels
- (- spacing plate)
- (- linear conveyor rail)

The HFA-L is available as model S (narrow) and model B (wide).

5.2 Side view of HFA ... SB



5.3 Side view of HFA ...



5. Description of Machine

5.3 Operating principle

The HFA... / HFA...SB linear conveyor employs a two mass oscillator system whereby the oscillator mass (oscillator, linear conveyor rail and bulk material) are connected via the spring assembly to the counter mass (base plates with directly attached elements and counter weights). This spring mass system has a certain natural frequency with which the system after initial activation - depending on the absorption being employed - reverberates for a certain period.

When alternating current passes through the oscillating magnet, it exercises on the active mass which is connected to the anchor, a sinusoidal force. As a result the system is compelled to respond by oscillating, the frequency from which diverges from the natural frequency. This frequency is described as the oscillating frequency.

Through vibrations, the linear conveyor rail which is connected to the oscillator, causes the bulk material being conveyed to make small jumping movements. The direction of the jump is dictated by the spring assembly setting and will be at right angles to the spring assembly plane.

The vibrations and therefore the jumping movements made by the material being sorted will be all the greater, the nearer the natural frequency approaches the oscillating frequency. The strongest vibrations occur at the resonance point where the natural and oscillating frequencies match. Resonance operation is not however worthwhile with linear conveyor units, as on the one hand every change in absorption (eg from uneven bulk material) causes changes to the vibrations, and on the other hand, it would be necessary to set a wide air gap between the oscillating magnet and anchor, in order to prevent them striking. In the latter case constant propulsion from the oscillating magnet would no longer be present, as magnetic attraction decreases in inverse proportion to the square of the air gap. In practice therefore a difference is made between two operating modes:

(a) Divergent operation:

Here the oscillating frequency exceeds the natural frequency.

The result of working in this mode - as with resonance operation - is that the vibrations and therefore the speed of conveyance become dependent on the character of the material being sorted. Additionally, electricity consumption can drastically increase, because the vibration movements and the force created run approximately in opposition of phase, and it can therefore occur that the widest air gap coincides with maximum electric current.

(b) Subcritical operation:

Here the operating frequency is less than the natural frequency.

In this operating mode the vibrations and therefore the speed of conveyance are to a great extent independent of the character of the material being sorted. Also, because the vibration movements and the force created almost run in phase, the narrowest air gap coincides with minimum electric current.

6. Maintenance

The linear conveyor units HFA ... / HFA ... SB are in main maintenance free. We do however recommend that a thorough cleaning is carried out if the unit comes into contact with liquids or becomes dirty.



WARNING!

The unit must be disconnected from the power supply before commencing maintenance work.

- First remove the linear conveyor power supply plug from the control unit.
- Remove the side panels.
- Remove accumulations of dirt in the air gap between oscillation magnet and anchor.
- Check the air gap and adjust if necessary (see chapter 7.3 and chapter 4).
- Replace the side panels. When doing this ensure that they do not rest against either the mounting plate, the spacing plate or the linear conveyor rail.
- Re-connect the power supply.

7. Adjustments



WARNING!

The unit must be disconnected from the power supply before commencing adjustments work.

7.1 Conveying behaviour, conveying speed

In order to achieve optimum running, it is necessary to match the linear conveyor to the special conveyor rail and the bulk material to be transported. This setting is made by adding or removing counter weights (conveyor behaviour) or by removing or inserting leaf springs and their accompanying spacer plates (conveyor speed).

In order that the bulk material is evenly carried on the conveyor rail, it is essential that the spring assembly angle of incidence is identical with the angle of the centre of gravity. The centre of gravity angle will be determined by the position of the oscillating mass and the counter mass centres of gravity. If the spring angle and centre of gravity angles match, the direction of the spring force will be lead to the centre of gravity of the oscillating mass, the vertical amplitude being the same for the incoming and outgoing side of the rail.

If the spring angle is greater than the centre of gravity angle, the direction of the spring force will be lead in front of the centre of gravity of the oscillating mass. The vertical amplitude on the incoming side is greater than at the outgoing side and the bulk material jumps in the rail incoming area, and in the outgoing area will be badly transported or not at all. On reducing the counter weight the centre of gravity angle approaches the spring angle and the conveying will become more even.

If the spring angle is less than the centre of gravity angle, the direction of force of the spring will be lead behind the centre of gravity of the oscillating mass. The vertical amplitude on the outgoing side is greater than at the incoming side and the bulk material jumps in the rail outgoing area, and in the incoming area will be badly transported or not at all. On increasing the counter weight the centre of gravity angle approaches the spring angle and the conveying will become more even.

If the loading weight is less than the pre-set values, a spring may be removed in order to increase conveying performance. If the oscillator magnet strikes the anchor when the HFA is switched on, the air gap between the magnet and the anchor must be increased. It should not however be greater than 0.3 mm as stated, as the more the air gap increases, the more the force drops and the more the magnet coil overheats.

If the loading weight is greater than the pre-set values, springs can be inserted and the air gap reduced. In this event, ensure that the magnet does not strike when the HFA is switched on.



NOTE:

- the linear conveyor side panels alter the HFA oscillating behaviour. For this reason it is essential to mount the side panels after every change of spring and then to check conveying behaviour and if necessary remove or insert further springs.
- when adjusting the unit ensure that the number of springs per spring assembly is as evenly distributed as possible (maximum difference of 2 springs).

The linear conveyor is optimally set when the carrying capacity remains steady on light pressure being applied to the oscillating mass and a constant conveying speed is reached.

7. Adjustments

7.2 Inserting and removing the leaf springs

The front leaf springs in the HFA can be changed after loosening the four cylinder screws and removing the two back plates.

On the HFA...SB the rear leaf springs are accessible after removing the connecting plate (between the base plate and the counter weight), and with the HFA... the clamping plate (below the base plate) must be removed.



NOTE:

- ensure that a spacer plate of impregnated paper is always inserted between the individual springs.
- the screws fixing the springs should be tightened with a torque of 0.6 kp/mm.

7.3 Adjusting the magnet gap

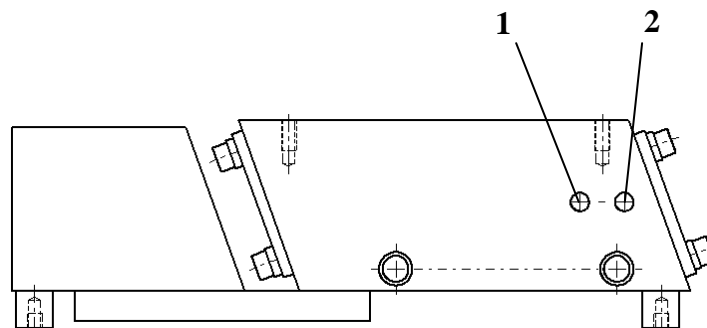
In order to adjust the magnet gap, proceed as follows:

1. Disconnect the mains plug.
2. Remove the side panels at the right side (viewed in the direction of conveyance).
3. Loosen the headless setscrew (pos. 1).
4. By turning the headless setscrew (pos.2) clockwise, the air gap between the magnet and the anchor becomes bigger.
By turning the headless setscrew (pos.2) counter clockwise, the air gap between the magnet and the anchor becomes smaller.
5. Check the recommended air gap with a feeler gauge (see chapter 4.1).
6. Replace the side panel.
7. Re-connect the power supply.



NOTE:

Pay attention, that the gap between oscillating magnet and anchor is adjusted parallel.



8. Rules for the Linear Conveyor Configuration

The conveyor rail should be laid out so that it is as light as possible. It should be ensured that the recommended loading weight (see chapter 4) is not exceeded. Included with loading weight is the conveyor rail, the spacing plate and any bulk material present on the conveyor rail.

The length of the conveyor rail should not exceed the given dimension (see chapter 4).

The projection of the conveyor rail above the linear conveyor mounting plate should be 1/3 (incoming side) to 2/3 (outgoing side).

In order to avoid uncontrolled vibrations at the ends of the rails, long conveyor rails should be adequately stiffened against twisting.

If the conveyor rail consists of several short pieces, these should be gathered on the oscillator and tightly screwed together. On the incoming side flat chamfering eases the changeover of bulk material from one part of the rail to another.

The play between the upper edge of the bulk material and the lower edge of the rail cover should be set taking into account the speed of conveyance. The greater the speed, the greater is the play. It is best to select the greatest play possible, by which the bulk material can be transported without it becoming tangled or wedged.

The conveyor rail cover must be securely screwed down. Loose or folding covers should not be used (reduction in oscillations, increase in noise level).

Tips for mounting the linear conveyor rail:

- * Screw the conveyor rail tightly to the linear conveyor.
- * Ensure that conveyor rail has a uniform and even base on the oscillator.
- * Try to arrange for the conveyor rail to be in the middle of the linear conveyor.
- * In order to reach a higher conveyor speed, the linear conveyor can be installed so that it has a slight inclination the direction of conveyance.

9. Malfunctioning



WARNING !

The mains plug may only be opened by a qualified electrician.

Before carrying out work on the linear conveyor the plug must be disconnected from the mains.

malfunction	possible cause	remedy
HFA does not start when switched on	mains plug not connected connecting cable between HFA and control unit not connected control unit fuse defective control unit mains cable defective connecting cable between HFA control unit defective oscillator magnet defective	plug in mains plug plug in connecting cable replace fuse replace mains cable replace connecting cable replace magnet
HFA vibrates weakly	control unit set too weakly electrical connected wattage incorrect	set controller to 80% check wattage
the HFA conveying performance reduces after a long operating period	air gap between magnet and anchor maladjusted conveying rail fixing screws loose spring assembly fixing screws loose broken leaf springs dirt accumulation between springs	reset air gap correctly tighten screws tighten screws replace leaf springs clean with air blast
strongly increasing noise level	foreign body lodged in air gap between magnet and anchor oscillator magnet strikes anchor leaf spring fixing screws loose	remove foreign body then check air gap correct air gap tighten screws

10. Accessories

10.1 Mechanical accessories

Because the linear conveyor rail fixing boreholes cannot be so placed that they exactly match the internal thread of the linear conveyor mounting plate, it is advisable to fit **ZP spacing plates**. These enable the conveyor rail mounting to be made in the centre and in an off-set position.

The HFA...SB linear conveyor can be fixed to a **stand (for example STV-100-50)** instead of being directly screwed down to a base plate. Matching **AP mounting plates** are available as an adapter between the HFA and the STV.

10.2 Electronic accessories

Connection to the electric mains is effected exclusively via a suitable **control device**. For this purpose we offer several equipment.

11. Spare Parts

For the models described in this operating instructions, the following components are available:

- * oscillator magnet
- * magnet anchor
- * leaf spring
- * spacer plate (between the individual leaf springs)
- * back plate (between leaf spring and fixing screws)
- * rubber-metal buffer (only HFA...SB)
- * cable plug STAS 20

In order to guarantee a quick and correct processing of your order, please always indicate the type of unit (see type plate) and the year of production of your linear conveyor, the necessary number of pieces and the exact designation of the spare part.



declaration of incorporation

The linear conveyor

<u>Description:</u>	HFA 0,4/200	HFA 0,4/200 SB
	HFA 0,6/250	HFA 0,6/250 SB
	HFA 0,6/300	HFA 0,6/300 SB
	HFA 1,5/400	HFA 1,5/400 SB
	HFA 2,5/500	HFA 2,5/500 SB

Year of construction: starting from 10 / 2014

Has been developed, designed and manufactured in accordance with the above mentioned EU guidelines by:

Manufacturer:	Person responsible for documentation:
fimotec - fischer GmbH & Co. KG Friedhofstraße 13 78588 Denkingen Tel.: 0 74 24 / 884-0	Edgar Nagel

Hereby we declare, that the incomplete machine comply with the requirements of the machine guidelines (2006/42/EG) attachment II 1 B.

The following harmonized norms have been adopted:

- DIN EN ISO 12100: 2011-03 (D) Safety of machinery- General principles for design - Risk assessment and risk reduction (ISO 12100: 2010)
- EN 60204-1: 2006 Safety of machinery- Electrical equipment of machines - Part 1: General requirements

The specified technical documents of the product according attachment VII part B were compiled. The manufacturer obligates himself, to offer those special technical documents to state departments on demand.

This machine may not be brought into operation until it has been ensured that the equipment into which it is to be incorporated accords with the conditions of the EU guidelines.

Denkingen	12.01.2015	Ralf Fischer, Geschäftsleitung
Place	Date	Identification of signatory

Signature