

Model: ERF 1, 2, 3, 5



Date of current version: March 2003
Replaces all previous versions
Technical specifications are subject to change.

Intended use

The ERF deferrisation filters are designed for removing iron and manganese. Even minimal quantities of iron and manganese in water can have a considerable detrimental effect on a water supply.

The German drinking water regulations (TrinkwV) and directive 98/83/EC on water quality for human consumption lay down the following limit values for drinking water in Germany:

Iron = 0.5 mg/l for systems with an output of up to 1000 m³ per year

Manganese = 0.2 mg/l for systems with an output of up to 1000 m³ per year

In keeping with TrinkwV § 15 (German regulations on the preparation of drinking water), residents must be notified of the installation of the deferrisation filter and be provided with an explanation as to how it works and what metered substance is used.

Caution: The unit must be installed as described in the installation and operating instructions guide in compliance with AVB Wasser V, §12 (general requirements for the supply of water in Germany) by a water supply company or by a party registered in the water supply company's index of fitters.

Function

The ERF deferrisation filters are filled with a biological filter material with a catalytic effect and with quartz gravel. The filter material's ability to remove iron is based on three properties:

The filter material oxidises iron and manganese. Oxidation causes these compounds to become insoluble in water, precipitate and allows them to be filtered out.

The catalytic property enables optimal use of the oxidising agent and shortens the reaction time.

The grain size of the filter material guarantees excellent filtration and thus the removal of the precipitated iron and manganese from the water.

In the operating position, untreated water flows from top to bottom through the filter material. Iron and manganese is oxidised and filtered away at the same time. The deferrisation filter must be backwashed when the pressure in the treated water pipeline downstream of the unit drops due to an increasing load on the filter.

The backwash process is time-controlled and is carried out automatically once the number of days programmed into the electronic system has expired (at least once a week). The water flows from bottom to top during backwashing. The filter material is loosened and the oxidised iron and manganese is flushed out.

The flushing water is discharged freely into the drain.

During backwashing, untreated water can be drawn through an integrated bypass. Once backwashing has finished, the deferrisation filter is available again at full capacity.

Process description

The deferrisation process is subdivided into several steps:

1. Oxygen concentration

The process required for oxygen concentration must be selected to suit the actual composition of the untreated water (see process selection).

The processes described below can be combined if the water is difficult to treat.

In **Process 1**, the oxygen in the water is sufficient to oxidise the iron or manganese ions.

In **Process 2**, an oxidising agent (potassium permanganate) must be added to the untreated water. For this, a metering station and a contact water meter with a pulse interval of one litre are required.

In **Process 3**, a small quantity of air is added to the untreated water upstream of the filter unit to oxidise the iron and manganese. The air is added using an oil-free compressed air unit or an external snifting valve (if a reciprocating pump is used).

When using our compact compressor, the max. water pressure must be limited to 5.0 bar.

The switching pressure of the compressed air unit must be at least 1.5 bar greater than the deactivation pressure of the blast-pressure tank.

The compressed air unit is connected to the power supply separately. An oxidation connection is integrated into the compressed air line. The electric valve of the oxidation connection must be connected in parallel to the source water pump. The electric valve is open when the pump is running and the filter is active.

The surplus air must be removed again before filtration. The ventilation valve must be connected to the adapter element below the control valve. The deferrisation unit must be installed upstream of the blast-pressure tank.

2. Oxidization process

The filter material acts as a catalyst for oxidation of the iron and manganese. The catalyst shortens the reaction time and minimises the residual content of iron and manganese.

3. Filtration

The grain size selected guarantees excellent filtration and thus the maximum removal of the precipitated iron or manganese from the water. If the process is planned and run correctly, pure water qualities with less than 0.1 mg/l of iron and 0.05 mg/l of manganese. However, in some cases, a run-in time of several days to several weeks is necessary.

4. Backwashing

The filter must be backwashed weekly to flush out the iron or manganese compounds. The flushing process is carried out automatically after the number of days programmed. During backwashing, a bypass is opened in the control valve in order to maintain the water supply. If this is not required, e.g. upstream of a reverse osmosis unit, a shut-off set must be integrated in the treated water pipeline.

Conditions for functioning (chemical)

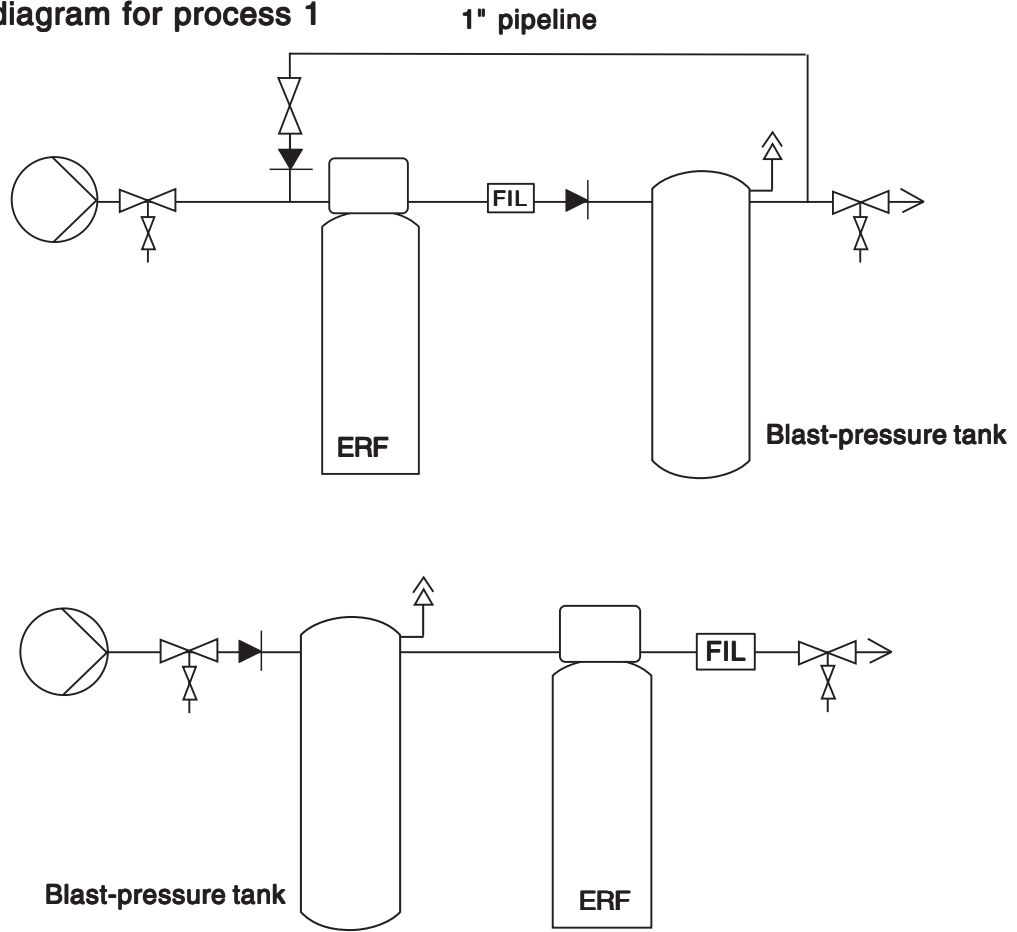
Untreated water composition	
pH value (must be measured on-site)	> 6.8; max. calcite saturation, difference 0.2 pH units
pH value for demanganisation acc. to process 1 and 3	> 7.6
KMnO ₄ Consumption (oxidisability)	< 20 mg/l (< 5 mg/l)
Hydrocarbons	Not detectable
Iron	< 5 mg/l
Manganese	< 1 mg/l
Ammonium	< 0.5 mg/l
Hydrogen sulfide	Not detectable
conductivity	< 250 mS/m
KS 4.3	<4 mmol/l
Oxygen concentration	must be measured on-site

Should the composition of the untreated water be different, please consult our technical service staff.

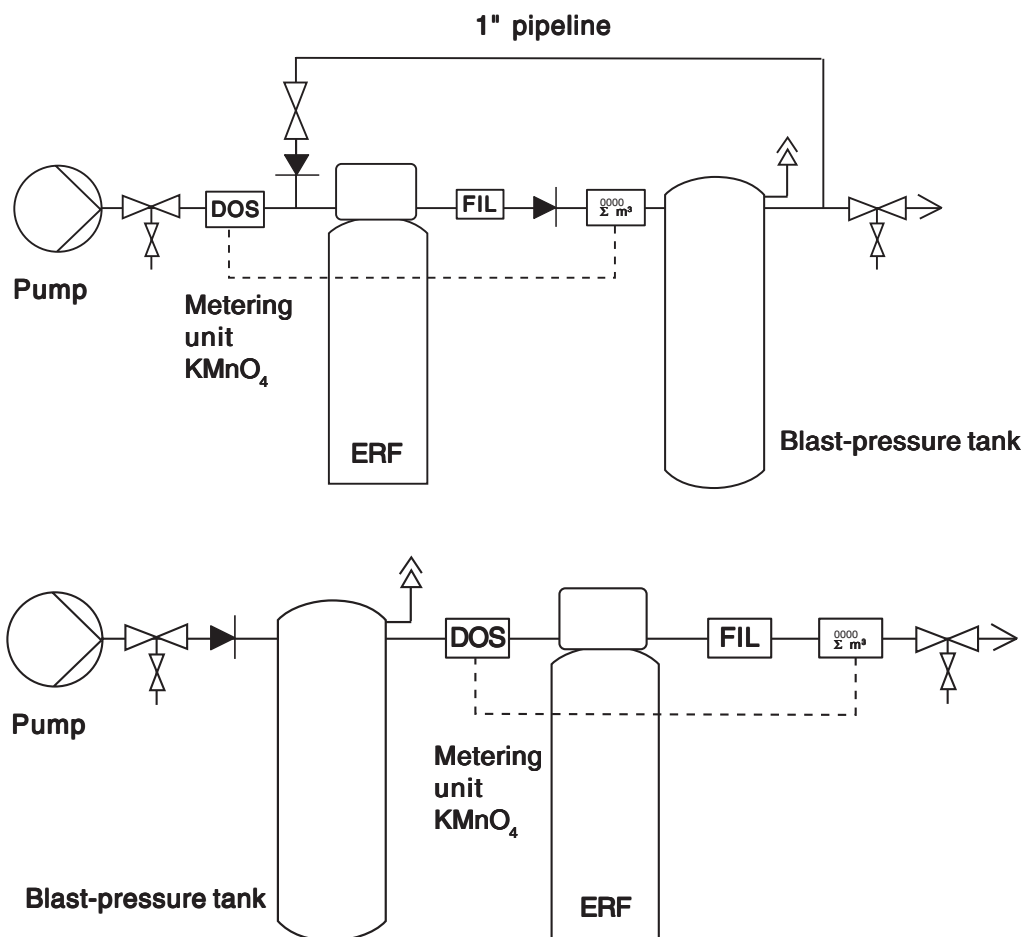
Process selection

Untreated water composition	Process	Equipment required
Iron < 5 mg/l Manganese < 0.1 mg/l Oxygen > 2 mg/l	1	ERF (see scope of supply)
Iron < 5 mg/l Manganese < 1 mg/l Oxygen > 7 mg/l	1	ERF (see scope of supply)
Iron < 1 mg/l Manganese < 0.1 mg/l Oxygen < 2 mg/l	2	ERF (see scope of supply) Metering unit with injection point 1/4" Contact water meter I = 1 Pulse cable
Iron < Manganese Manganese < 1 mg/l Oxygen > 1 mg/l	2	ERF (see scope of supply) Metering unit with injection point 1/4" Contact water meter I = 1 Pulse cable
Iron > 1 and < 5 mg/l Manganese > 0.1 and < 1 mg/l Oxygen < 7 mg/l	3	ERF (see scope of supply) Oil-free compressor Oxidation connection Ventilating valve

Installation diagram for process 1

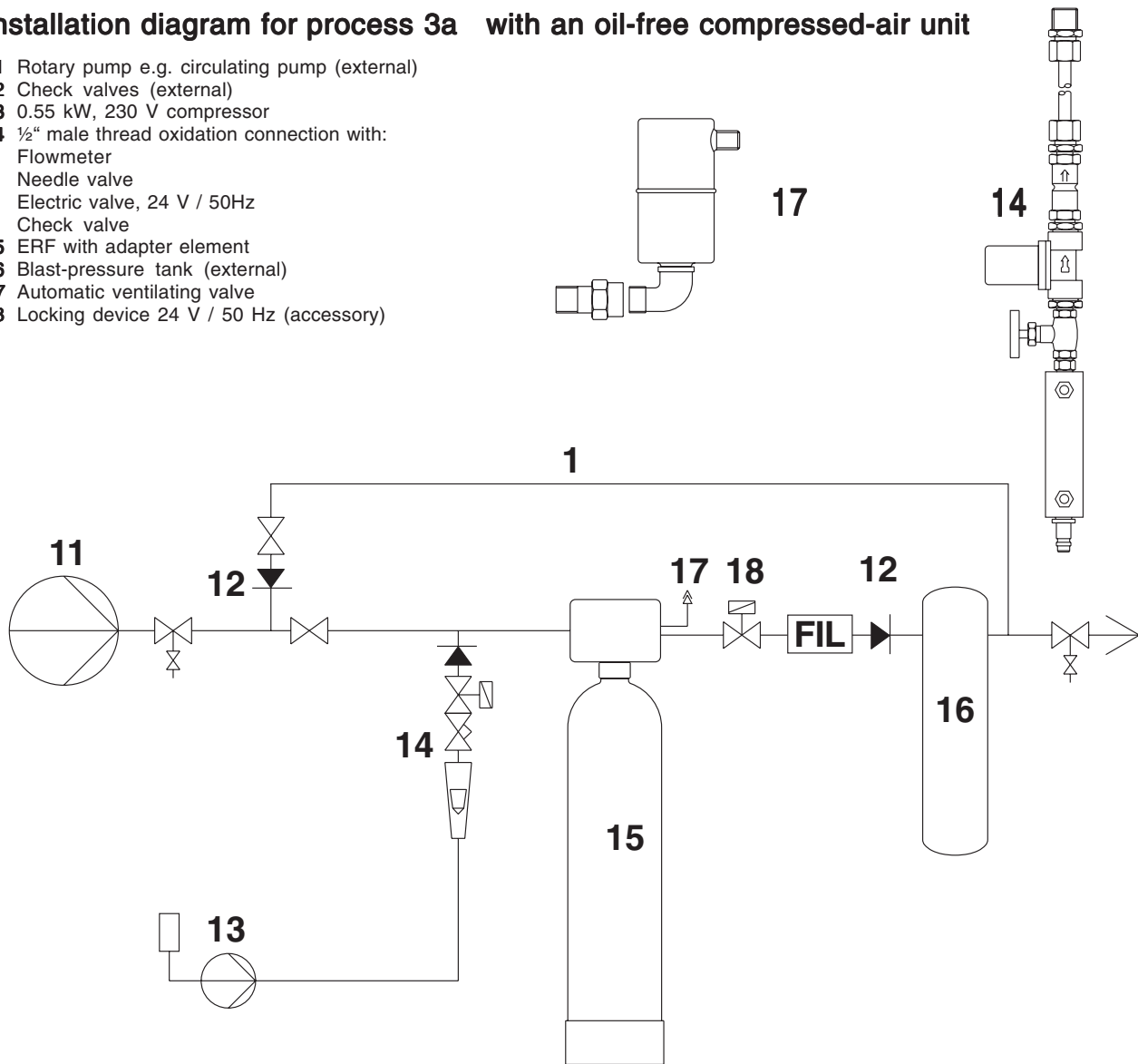


Installation diagram for process 2



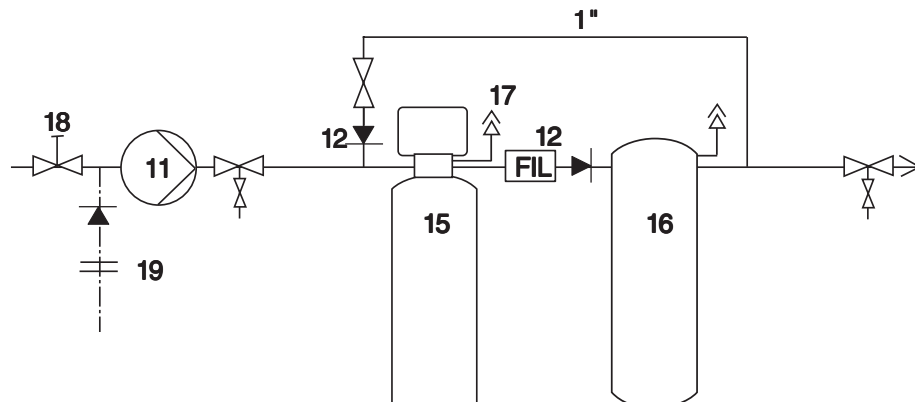
Installation diagram for process 3a with an oil-free compressed-air unit

- 11 Rotary pump e.g. circulating pump (external)
- 12 Check valves (external)
- 13 0.55 kW, 230 V compressor
- 14 ½" male thread oxidation connection with:
Flowmeter
Needle valve
Electric valve, 24 V / 50Hz
Check valve
- 15 ERF with adapter element
- 16 Blast-pressure tank (external)
- 17 Automatic ventilating valve
- 18 Locking device 24 V / 50 Hz (accessory)



Installation diagram for process 3 b) with reciprocating pump

- 11 Reciprocating pump (external)
- 12 Check valves (external)
- 15 ERF with adapter element
- 16 Blast-pressure tank (external)
- 17 Automatic ventilating valve
- 18 Throttle valve (external)
- 19 Sniffing valve (external)



Technical specifications

Deferrisation	Model	ERF 1	ERF 2	ERF 3	ERF 5
Nominal connection width	DN	32(1 1/4" malethread)	32(1 1/4" malethread)	32(1 1/4" malethread)	32(1 1/4" malethread)
Volume flow, max.	m ³ /h	1	2	3	5
Pressure drop at nominal flow	bar	0.2	0.3	0.5	1.0
Flushing water flow	m ³ /h	1.8 - 2.3	3.2 - 3.8	5.6 - 7.0	7.2 - 9.0
Flushing water quantity per backwash at 3 bar	litres	420	750	1200	2000
Operating pressure, min./max.*	bar	2 - 7			
Max. water temperature	°C	30			
Max. ambient temperature	°C	40			
Power	V/Hz	230 / 50 (Unit operation at 24 V ~)			
Electrical connection capacity	W	36			
Total height, max.	mm	1500	1930	1880	2135
Connection height (untreated water input), max.	mm	1335	1765	1715	1965
Diameter of filter container	mm	305	405	545	615
Supporting layer: filter gravel (grain size 2 -3.15 mm)	kg	10	37	50	70
Filter material, 28.3 litre sack	Sack	2	4	6	10
Weight, approx.	kg	165	350	545	860
PNR (=production number)		50134	50135	50136	50137

* When using our mini compressor, the max. water pressure must be limited to 5.5 bar (process 3).

List of supplied parts

- GRP filter container
- Centre tube with distributor nozzle and protective cap
- Control valve with mechanical controller
- Adapter
- Backwash blind
- Flow controller
- Filter gravel
- Deferrisation material
- Flushing water hose (25 x 34mm) with hose nozzle
- Filling funnel

Accessories for all units

- GIT Multiblock module Order no.: 51969
- Connection module 3/4" Order no.: 30012
- 1" connection module Order no.: 30014
- Connection module 1 1/4" Order no.: 30020
- 2 reinforced hoses Order no.: 11974
- Protective filter D 1" Order no.: 10092
- Protective filter 1 1/4" Order no.: 10093
- Quick iron test Order no.: 18959
- Quick manganese test Order no.: 18983

Additionally for process 1

- Locking device with transformer Order no.: 50953

Additionally for process 2

- Metering unit with injection point 1/4" Contact water meter I= 1L and pulse cable Order no.: 50958
- 5 kg potassium permanganate Order no.: 50969
- Locking device with transformer Order no.: 50953

Additionally for process 3

- Oil-free compressor Order no.: 50959
- 1/2" male thread oxidation connection Order no.: 50960
- Automatic ventilating valve Order no.: 50956
- Locking device without transformer (process 3a) Order no.: 50940
- Locking device with transformer (process 3b) Order no.: 50953

Installation conditions

Observe all applicable installation regulations, general guidelines, hygiene requirements, and technical specifications.

The composition of the untreated water must be determined by a physical/chemical water analysis, and must be within the permitted range (see the **Conditions for functioning** and **Process selection** tables).

If an independent water supply is used, the feed pump must be designed for the operating pressure required and the flushing water flow. If possible, the deferrisation filter should be installed upstream of the blast-pressure tank.

If the network pressure exceeds 7 bar, a pressure reducer must be installed upstream of the unit.

A DIN/DVGW-approved protective filter (finesness 0.1mm) must always be installed downstream (on the treated water side) of the unit. For the purpose of preventing corrosion, a DIN/DVGW-approved mineral dosing device must be installed downstream of the unit.

When installing the unit, select a location where the unit can easily be connected to the water supply network. The unit must be installed horizontally.

If two ERF units are operated alternately for a permanent supply of treated water, a shut-off device must be integrated into the treated water unit (see appendix).

There must be a minimum water pressure of 2 bar upstream of the deferrisation filter. No protection against a lack of water is provided. This must be installed on-site if required (e.g. pressure monitor for monitoring the minimum pressure and electrical disconnection of backwashing in the event of a water shortage).

The installation site must be free of frost and kept free of chemicals, paint, solvents and fumes. The ambient temperature should not exceed 40° C. There should be no adjacent heat sources, e.g. radiant heaters.

The rated mains power and the requisite operating pressure must be present at all times. A separate mains socket (230V/50Hz) must be near by (at a distance of 1.0m). There should be no voltage spikes above 1 kV.

There must be a drain connection for pressure-free drainage of the max. flushing water flow (see technical data). The drain connection must be lower than the outlet of the control valve, so that the flushing water hose **can be routed to the drain with a downward slope**.

If the flushing water is routed to a pump, ensure that the pump has the capacity required. If there is a power failure during backwashing, no flushing water may flow into the pump. In order to avoid this, a solenoid valve, closed when there is no current, can be integrated into the flushing water pipeline, for example.

Functional and warranty conditions

Filters require regular functional monitoring, maintenance and replacement of important parts after certain intervals. Depending on the operating conditions, the filter medium and possibly also the processing material become exhausted and must be replaced regularly. See the installation and operating instructions for the maintenance intervals. We recommend that you enter into a service agreement.