Energy-Efficient
Sludge Mixer Technology
MFS 2 - 8

FLOWSERVE
HALBERG™ Pumps

Technical data

Digester size:	< 1.000 m³ until < 20.000 m³
Digester design:	Egg-shaped design, all types with conical/cylindrical design
Dry solid content:	2 – 8 %
Specific power consumption:	1.8 – 4.5 W/m³
Drive power:	6.8 bis 58 kW
Capacity:	350 – 6.200 m³/h
Flow velocity draft tube:	2 – 4 m/s
Impeller:	Screw type impeller design, max. (incompressible) spherical diameter: 50 – 197 mm
Speed:	420 – 1,500 rpm, direct driven
Shaft seal:	Lip seal system
Direction of rotation:	Continuous operation with clock- and anticlockwise

Application

The sludge mixers are designed to circulate the sludge in different digester designs, causing an optimum mixing in both directions and a uniform heating of the sludge.
Due to the central draft tube and the continuous reversible operation the mixer gives the ability to circulate the sludge and fulfils three important process requirements:

1. **Downward flow**
   The screw type impeller forces surface sludge, including coarse floating residue, down the draft tube resulting in an ideal inter mixing and blending action that agitates settled sludge in the bottom of the digester. In the event foam forms on the top of the digester, sucked down the draft tube and remixed with the digester content.
2. **Upwards flow**
   The circulated sludge under pressure from the bottom of the digester up the draft tube to the rotating splash disc. The splash disc distributes the sludge over a large sludge surface area softening and dispersing the supernatant sludge layer.
3. **Biogas**
   The continuous reversible operation effect is an optimized Biogas production of the sludge. 1,000 m³ sludge produce according to the content 300 – 770 m³ Biogas/day.

Energy efficient and robust DESIGN

Vertical single-stage and two-stage HALBERG mixers with special screw-type impellers and a deflector disk mounted on the shaft.
The shaft is dynamic balanced acc. DIN 1940 Grade Q2.5 to increase the lifetime of the equipment.
The draft tube serves either as a suction pipe or as a discharge pipe.
Due to optimised volume- and flow design of the screw type impeller in combination of circumstances with the upper draft tube outlet high flow velocity is performed by lowest energy consumption.
The shaft is supported in a combined thrust and guide bearing located in the seating ring. The seating ring is fixed on the digester.
The sludge mixer is direct driven by a motor whose pedestal is mounted on the foundation.
The draft tube length will be aligned to suit the application.
Assembly and maintenance are easy to handle due to the flanged pipe section design.

Design details

According to code 94/9/EG, FSA 05 ATEX 1543; Ex II ½ G IIB T3

Flanges:

Dimensions of connection:	draft tube, inlet piece, discharge piece: DIN EN 1092-2, Type 11 PN10

Bearings:

Thrust and guide bearing in combined grease-lubricated rolling bearing design.
Bearing temperature monitoring with two immersion resistance thermometers PT 100 of intrinsically safe construction.

Shaft sealing:

Viton cap-type gaskets provide methane-resistant shaft sealing.

Types of installation:

Concrete digester:	Gas-tight grouting directly in the digester ceiling.
Steel digester:	Gas-tight grouting, with synthetic resin, in a gas cap **or** embedded in a concrete cone.
Retrofits/ reconstructions:	Gas-tight aligned with the existing digester

Automatic lubrication:

The bearings and the lip seal system are continuously supplied with a grease deposit (10 l) by a grease pump.
- Level monitoring by means of proximity switch with intrinsically safe construction

- Lubricants: HALBERG special Sludge Mixer grease

MFS

Paint:

Pre-treatment of surface: Rust removal blasting, SA 21/2 to DIN 55928 part 4.

Parts inside the digester:

Prime coat:	FRIAZINC W app. 60 µm
Top coat:	INERTOLPOXITAR F Two-component epoxy combination coat, low solvent content, colour black app. 410 µm
	Total layer thickness app. 510 µm

Parts outside the digester:

Prime coat:	Hot galvanised app. 80 µm
Intermediate coat:	FRIAZINC W app. 60 µm
Top coat:	ICOSIT-EG 5 UV-resistance, colour blue RAL 5009, layer thickness app. 90 µm
	Total layer thickness app. 150 µm

Test run:

Each sludge mixer will be tested in reference medium water at our test bay for a functional test run before delivery. The measurements include the vibration measurements, power consumption of drive motor and the temperature measurements at the bearings. Optional a flow capacity test can be performed.

Materials of construction *):

Part No.	COMPONENT	MATERIALS OF CONSTRUCTION	Part No.	COMPONENT	MATERIALS OF CONSTRUCTION
72.01	Intake section	GG-25, EN-GJL250	34.10	Motor pedestal	1.0038 – EN10025-2/ ZINCED
17.10	splash disc*	GG-25, EN-GJL250	52.40	Shaft protection sleeve*	1.0308-EN 10305-1 METCO 15E
21.00	Mixer shaft*	1.1191+N - EN 10083-2	71.10	Draft tube*	GGG-35/EN-GJL 350 or EN 10088 welded
23.00	Impeller*	1.0038 - EN 10025 -2/Hardox	72.03	Discharge section	GG-25, EN-GJL250
35.00	Thrust and guide bearing housing	GG-25, EN-GJL250	15.10	Seating ring	1.0038 – EN 10025-2/ZINCED

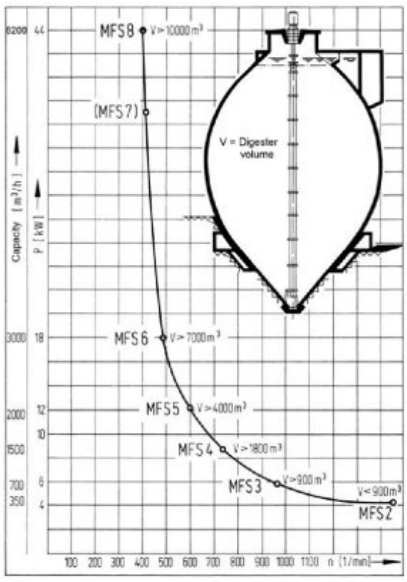
*) other material available on request, but it is not necessary because all processes are under absence of air in the digester

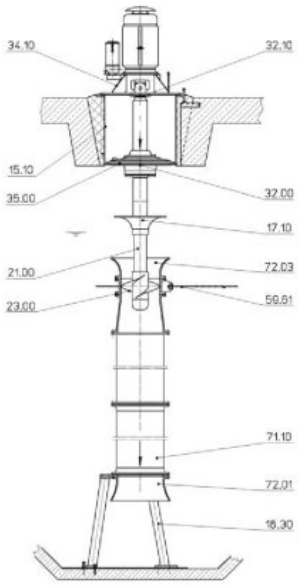
Drive / Coupling / Speed:

The drive system is equipped with commercial grade explosion-proof electric asynchronous motors. Gearbox is scope of supply at MSF 8 Mixer this is not necessary if the complete system running with a frequency drive control unit. The EUPEX-DS clutches are intrinsically safe construction. The max. speed amounts to 1500 rpm, depending on the construction type and model size.

Selection chart / Sectional drawing and List of parts:

HALBERG sludge mixer capacity and power consumption as s function of the digester volume and speed, for single- and two-stage mixer designs.





15.10	Seating ring
17.10	Splash disc
18.30	Support bracing
21.00	Mixer shaft
23.00	Impeller
32.00	Axial-thrust bearing
32.10	Support Bearing
34.10	Motor pedestal
35.00	Thrust and guide bearing housing
59.61	Pipe supporting
71.10	Draft tube
72.01	Intake section
72.03	Discharge section

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