

Cleaning System

Tank and Retention Chamber *

**50 Hz
Standard Programme**

Non standard designs are available upon request

* Sewers with storage capacity and overflow

Areas of Application

The **Amajet System** can, in principle, be used wherever there is a need for economical cleaning of tanks and storage chambers in sewage plant.

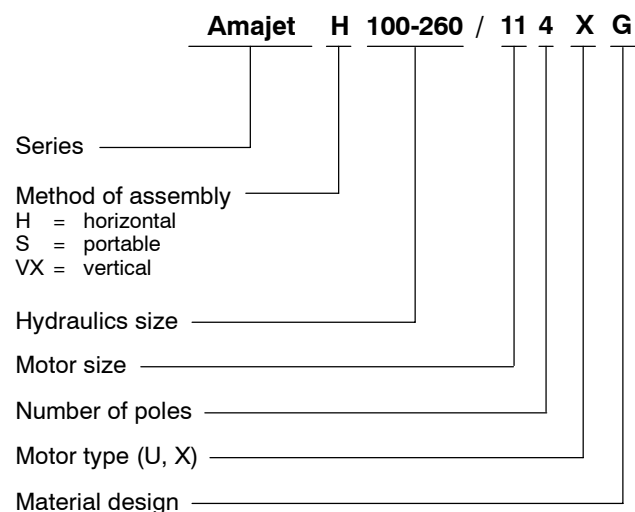
The **Amajet System** is particularly suited for automatic cleaning of tank walls and floors used for storm water retention, overflow and collection reservoirs as well as for the cleaning of storage chambers within sewage treatment systems. In addition, air input necessary for the cleaning process regenerates the sewage water and alleviates any unpleasant odour problems.

Design

Stationary or portable plant with horizontally or vertically mounted submersible forcing jet motor pump and non-clogging free-flow impeller.

Denomination

Example



Operating data

Size: **DN** 100
 Motor rating: **P₂** 5.5 to 16 kW
 Temperature of pumped medium: **t** to 40 °C
 Higher temperatures upon request.
 Protection type: **IP** 68 nach EN 60529/IEC 529

Drive

Three phase asynchronous motor;
 flameproof design is also available in accordance with EEx d IIB T3 (T4 upon request); 400 V (*Variants 500 V, 690 V*)

Materials

Standard design cast iron
 Unit: Material variants in wear resistant chilled cast iron;
 Material variants in corrosion and wear resistant duplex steel
 Material variants in corrosion and wear resistant duplex steel:
 Installations parts: ST TZN or 1.4571

Shaft Seal

Always supplied with 2 mechanical seals independent of direction of rotation with environmentally friendly oil supply.

Bearing

Lubricated radial ball bearings.

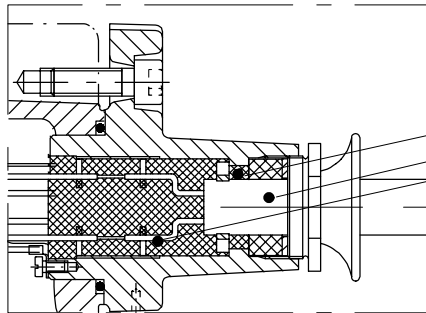
Design

Amajet H (horizontal design) a cleaning system for universal application. **Amajet S** a portable version and **Amajet VX** with guide wire and fixing arrangement.

Control Equipment

Control units, specifically designed to cope with the various areas of application, form part of the Amajet System. The system can also optionally be equipped with operating data input and data storage facility. For further details and description see the separate type series manual "Electronic control".

Product advantages - Amajet H 100-260/11 4 X G



Cable entry completely watertight over its entire length. Safety and reliability guaranteed by:

- 1. Long rubber stuffing box/gland
- 2. Cable sleeve additionally cast in resin
- 3. Individual cores are isolated, galvanised and cast in resin.

Benefit:
Guaranteed operating safety and reliability even with damaged cable sleeve or core insulation.

Mechanical seal independent of direction of rotation with silicon carbide rubbing surfaces.

Benefit:
A solution guaranteeing a long operating life and permitting brief periods of running in the reverse direction of rotation.

Fitting the cable entry at the top of the unit, provides additional protection

Benefit:
Risk of damage during transport and installation is eliminated.

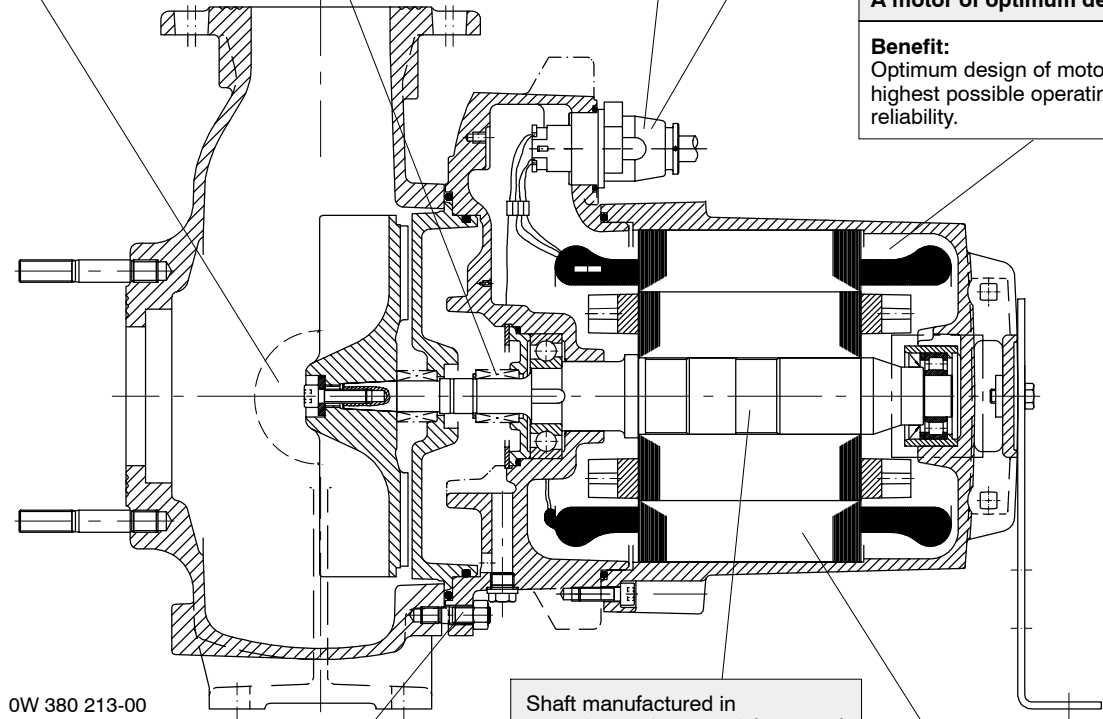
Cleaning Aperture DN 100

Benefit:
Access to pump casing for cleaning purposes whilst the unit remains installed.

Dry, watertight encapsulated power circuit cut-out motor. Insulation class F; also flameproof design complying with Euro-standard EEx d IIB T3 or T4.

A motor of optimum design

Benefit:
Optimum design of motor guarantees highest possible operating safety and reliability.



Shaft manufactured in corrosion-resistant stainless steel.

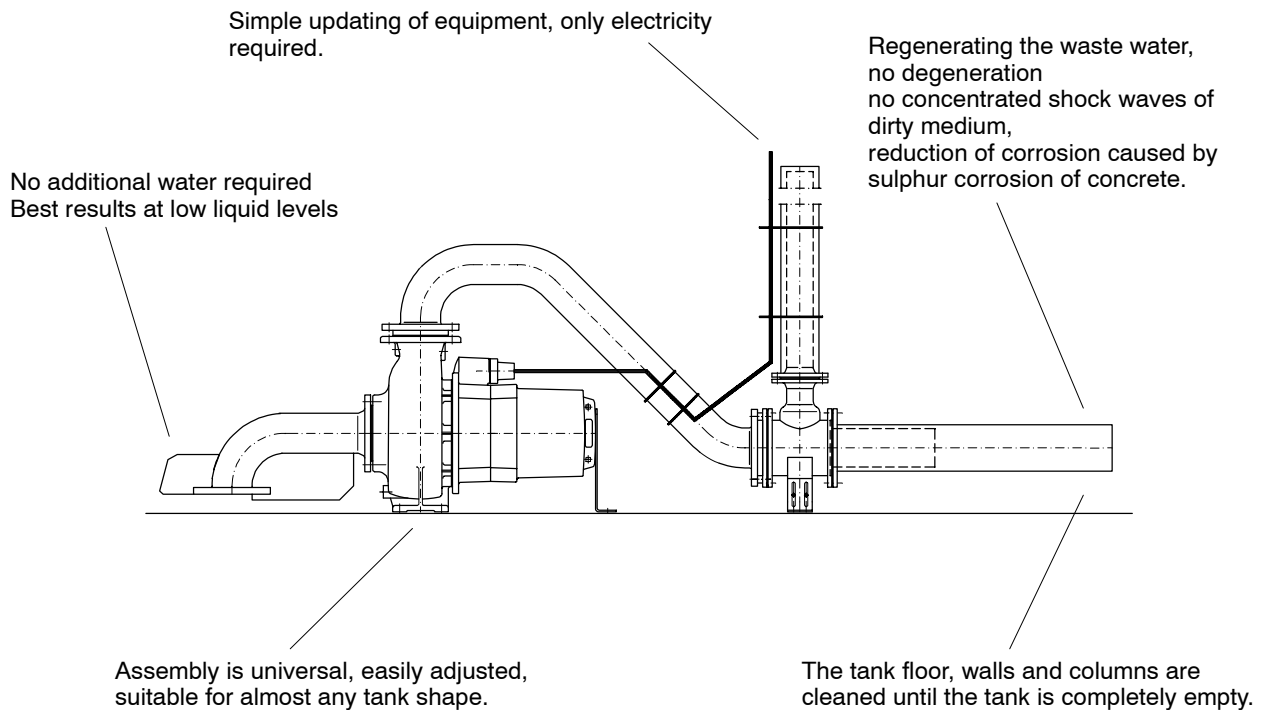
Benefit:
No corrosion problems, therefore a long operating life.

Bolts which come in contact with medium are manufactured in stainless steel

Benefit:
Just a small detail which makes the unit very service-friendly. Dismantling is easy even after years of operation

Dual winding temperature control.

Benefit:
Automatic operation is possible even in flameproof equipment.

Product advantages Amajet H

Example - Operating cost for one cleaning process:

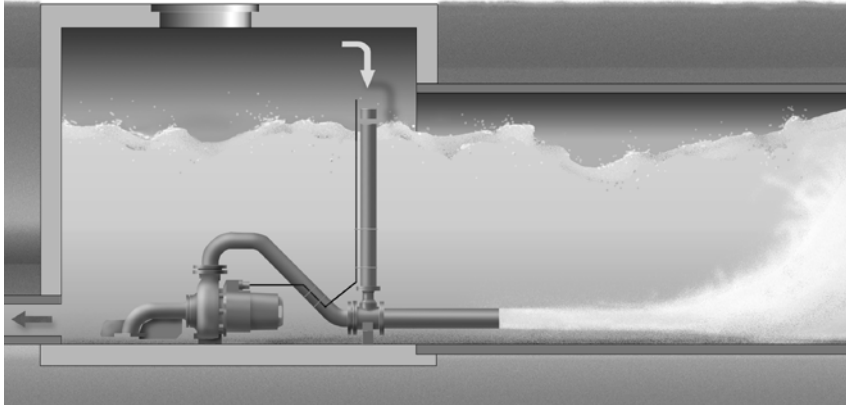
Model:	1 Amajet H 100-249/7 4 X G
Capacity of drainage pump:	$Q = 72 \text{ m}^3/\text{h}$
Tank size:	20 x 8 m
Water storage depth:	3.5 m
Power supply costs (estimated):	0.25 €/kWh
Total tank volume:	$V_B = 560 \text{ m}^3$
Water volume - continuous operation:	$V_D = 160 \text{ m}^3$
Water volume - interval operation:	$V_I = 400 \text{ m}^3$

Drainage time (without inflow):

1. During continuous operation:	$t_D = \frac{160 \text{ m}^3}{72 \text{ m}^3/\text{h}} = 2.2 \text{ h}$
2. During interval operation (at 30 % preset time):	$t_I = \frac{400 \text{ m}^3}{72 \text{ m}^3/\text{h}} \times 0.3 = 1.6 \text{ h}$
Duration of operation of Amajet:	$t_M = 2.2 \text{ h} + 1.6 \text{ h} = 3.8 \text{ h}$
Running costs (Power):	$K_{Str.} = 9.8 \text{ kW} \times 3.8 \text{ h} \times 0.25 \text{ €/kWh}$ $K_{Str.} = \underline{\underline{9.31 \text{ €}}}$

The Amajet System for the cleaning of Storm Water Tanks

Method of Operation



The Amajet circulates the storm water from the bottom of the tank and passes it to an ejector nozzle. The reduced nozzle increases the velocity both before and after the nozzle, producing a negative pressure in the mixing chamber. The negative pressure causes air to be drawn in, which is mixed with the storm water in the mixing chamber. The water-air mixture is ejected at high velocity through the jet pipe parallel to the tank floor.

The combined effect of the water jet and fine air bubbles ejected into the surrounding storm water creates strong horizontal and extensive vertical flows. This causes turbulence within the whole tank whereby sludge particles are always kept in suspension.

During drainage the sludge is carried out of the tank at an even rate and peak demand periods for biological storm water purification are avoided.

For tank water levels exceeding 1 metre the energy saving interval operation will result in energy savings of 10 to 50 % preset time.

This cleaning process is used for the cleaning of tank walls and columns. When the liquid level falls below 1 m the unit runs continuously to clean the tank floor.

Control

The KSB electronic control unit for the Amajet is designed to guarantee full automatic operation. It can be programmed to handle all plant requirements necessary for automatic operation. Parameters can be set as required to accommodate all levels and hysteresis required for automatic operation.

The Amajet only operates when the water level within the tank is falling, i.e. during the draining process.

The operating times for the individual Amajets are calculated separately to take into account the changing water levels.

The KSB Amajet consists of:

- A robust submersible **forcing jet pump** with non-clogging free-flow impeller
- An **Amajet ejector set designed** for high capacity
- A control unit with an option for data collection and data storage
- Level registration
- Motor control centre

For further details and description see the separate type series manual "Electronic control".

Pre-selection of Amajet units

Tank shapes and approximate parameters for the cleaning efficiency of a unit

For the preselection of the Amajet-aggregates and the selection for ideal tank shapes please contact KSB.

Because the parameters can only be calculated based on optimum marginal conditions and the fact that aspects which are specific to a project, such the constituents of the storm water, installation, surfaces, drainage etc. can affect these parameters considerably. We suggest that these factors are taken into account during the early planning stage.

The Amajet system for the cleaning of Retention Chambers*

Method of Operation

The Amajet is installed on the floor of the reservoir within the retention chamber. By means of a suction pipe and ejector nozzle the Amajet mixes waste water with air and the mixture is blasted lengthwise along the bottom of the retention chamber, thus enriching the water with oxygen and avoiding degradation.

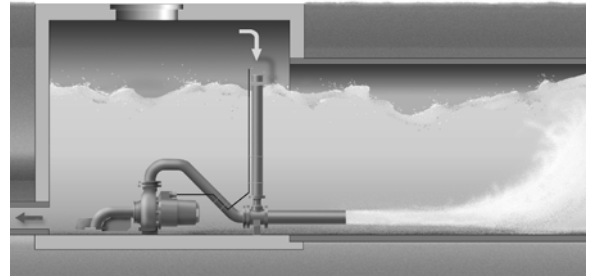
This high grade cleaning effect is achieved by a throttle valve, combined with a jet nozzle.

The opening and closing of the valve is controlled by impulses sent by the control unit.

When the valve is partly closed during continuous operation of the plant, the pressure increases 1.5 times. When the valve opens, this energy is suddenly released and produces shock waves, which spread over the entire length of the retention chamber.

In most situations the Amajet can be successfully fitted to existing retention chambers. The basic requirement, however, would be a chamber adequate to accommodate the installation of the Amajet.

The Amajet System is also suitable for the cleaning of retention chambers running parallel to one another with a single pump, providing certain requirements are fulfilled.



Control Units for Retention Chambers*

Fully automatic operation is guaranteed by the control unit which has been programmed to cope with the prevailing conditions within the retention chamber. To maintain a clean retention chamber the control unit can be adjusted to comply with the different operating conditions with regard to the dimensions of the retention chamber, water intake, emptying facilities and the level of contamination/dirt content of the waste water.

The KSB system consists of:

- A robust submersible forcing jet pump with non-clogging free-flow impeller
- An Amajet ejector set with valve
- Control unit with operating data connection and data storage facilities

For further details and description see the separate type series manual "Electronic control".

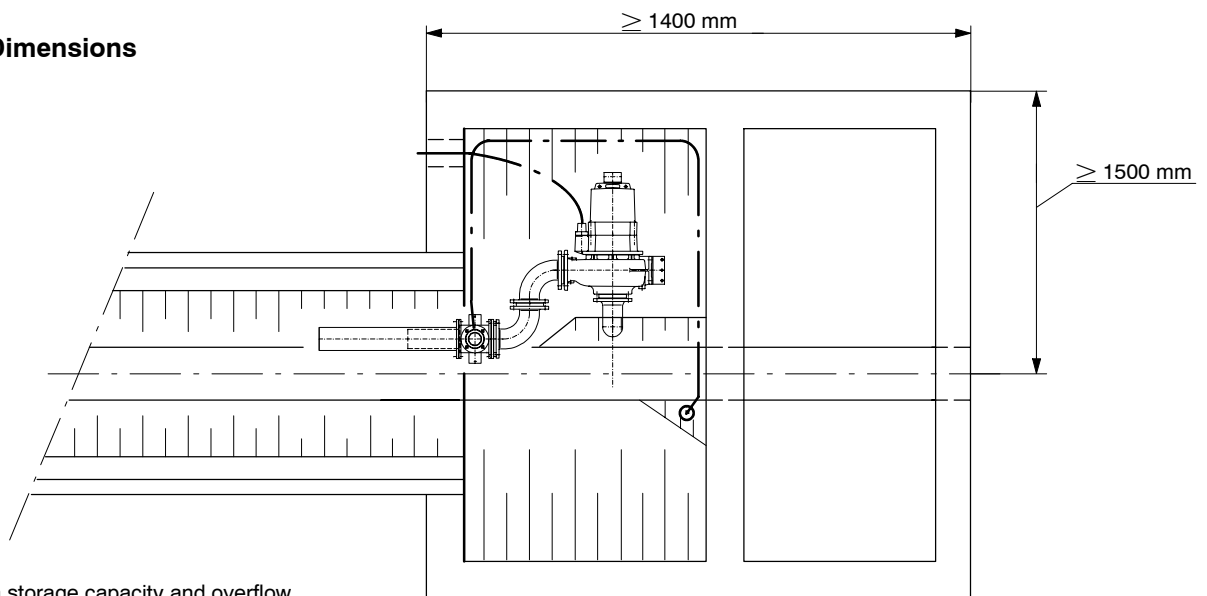
Pre-selection of the Amajet Units

Approximate values for the cleaning capacity of the Unit:

Bottom Gradient [%]	Maximum cleaning length per unit ^{**)} [m]
2-3	80

^{**)} These values are only achieved under ideal conditions, because tank floors, rough surfaces and unfavourable channel geometry have a negative effect on the level of cleaning achieved.

Chamber Dimensions



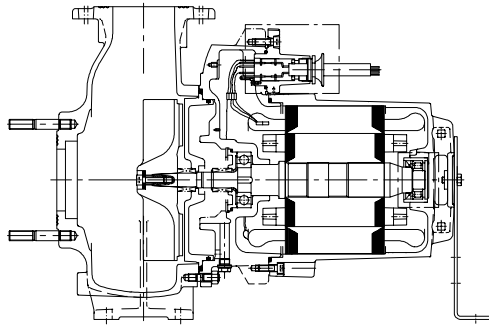
* Sewers with storage capacity and overflow

Material Design

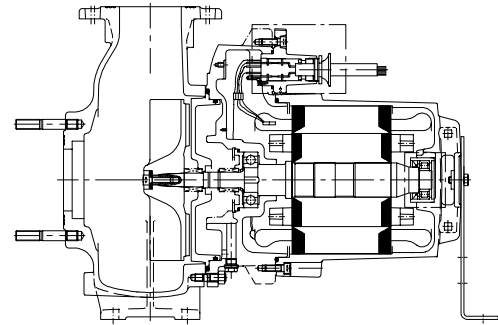
The main parts of the KSB Amajet system are manufactured in:

- **Cast Iron (GG-25),**
- **Chilled cast iron (0.9635),**
- **Duplex steel (1.4517) or or equivalent materials**

Cast Iron



OW 380 213-00



- G** = **Standard design**
Main parts in cast Iron
- G1** = G,
Impeller in duplex steel
- G2** = G,
Impeller in chilled cast iron

- GH** = like G,
Impeller and intermediate casing
in chilled cast iron

Part	Material design			
	G	G1	G2	GH
Pump Unit				
Pump casing	GG-25			
Impeller	GG-25	1.4517	0.9635	
Intermediate casing/Discharge cover	GG-25			0.9635
Mechanical seal (pump side)	SiC / SiC			
Mechanical seal (motor side)	Carbon / SiC			
Shaft	1.4021			
Bearing bracket	GG-25			
Motor casing	GG-25			
O-rings	Nitrile rubber			
Bolts	A4 (as 1.4571)			
Installation parts				
Clamp (Assembly VX)	GG-25			
Bracket (Assembly VX)	1.4571			
Clamp (Assembly VX)	1.4571			
Guide rope (Assembly VX)	1.4401			
Support foot (Assembly VX)	ST TZN (Var.: 1.4571)			
Inlet and outlet bend	ST TZN (Var.: 1.4571)			
Ejector set	ST TZN (Var.: 1.4571)			
- Mixing Chamber	GG-25			
Ventilation pipe	ST TZN (Var.: 1.4571)			
Connection pipe (Assembly H)	ST TZN (Var.: 1.4571)			
Other connection pipes	ST TZN (Var.: 1.4571)			

TECHNICAL DETAILS - STANDARD PROGRAMME / (Standard Variants)
Material Design: G, G1, G2, GH

Motor Size: 4-pole, 5 4 ... 16 4

Bearing assembly	Radial ball bearings - sealed for life
Motor	
Version U	Non-flameproof
Version X	Flameproof to EEx d IIB T3
Switching Method	Direct (Star delta possible for 400 V)
Voltage	400 V (Var.: 500 V, 690 V)
Cooling	By ambient medium
Cable	
Length	15 m (Var.: up to 50 m)
Entry	cast in resin, completely watertight over its entire length
Type	Rubber hose cable (see Motor data)
Special cable	(Var.: Tefzel = Modified fluorine-polymer EFTE)
Seals	
O-rings	Nitrite-rubber NR, (Var.: Viton - fluorite-rubber)
Shaft Seal	Bellows mechanical seal (Var.: Mechanical seal with covered spring)
Control/Monitoring	
Winding temperature	Cold conductor (PTC) and bimetal switch
Moisture	(Var.: moisture protection electrode within the motor chamber)
Paint	Environmentally friendly KSB 2-pack standard paint, Colour RAL 5002 (Var.: 2-pack Epoxy coating)
Max. ambient Temperature	40 °C
Max. storm water/medium temperature	40 °C
Acceptance	
Hydraulics	Only upon request
General	to ISO 9001 (Var.: with Works Certificate EN 10204 - 2.2)

Technical Data - Amajet-System
Standard Operation

Amajet	Ejector set		Nominal Power Rating P_2 [kW]	Hydraulic Power Rating $P_{Hydr.}$ [kW]	Capacity Q [l/s]	Output H [mWs]
	Jet	Diffuser				
	(inner diameter)					
	[mm]	[mm]				
100-200/ 5 4	60	104	5,5	4,0	23	5,5
100-237/ 5 4	60	104	5,5	5,5	32	7,0
100-249/ 7 4	60	104	7,5	7,5	40	7,5
100-260/ 11 4	65	104	11,8	11,3	48	10,0
100-262/ 16 4	65	104	16,0	13,0	52	11,5
100-265/ 16 4	65	104	16,0	14,0	54	13,0

Shock-wave Operation

Amajet	Ejector set		Nominal Power Rating P_2 [kW]	Hydraulic Power Rating $P_{Hydr.}$ [kW]	Capacity Q [l/s]	Output H [mWs]
	Jet	Diffuser				
	(inner diameter)					
	[mm]	[mm]				
100-249/ 11 4	60	104	11,8	7,5	40	7,5
100-260/ 16 4	65	104	16,0	11,3	48	10,5
100-262/ 16 4	65	104	16,0	13,0	52	11,5

Motor Data
Flameproof design EEx d IIB T3

Motor data für 400 V, 50 Hz, 3~	Motor Type	5 4 XG	7 4 XG	11 4 XG	16 4 XG
Power rating P_2	[kW]	5.5	7.5	11.8	16.0
Absorbed power P_1	[kW]	6.7	8.86	13.4	17.9
Nominal current I_N	[A]	12.1	15.8	23.5	33.0
Efficiency factor $\cos \varphi$		0.8	0.81	0.82	0.79
Starting method		direct/star delta	direct/star delta	direct/star delta	direct/star delta
Starting current I_A (direct) ¹⁾	[A]	56	80	132	200
Protection to DIN 40 050		IP 68	IP 68	IP 68	IP 68
Electric connection cable		H07RN-F12G1.5	H07RN-F12G1.5	H07RN-F12G1.5	NSS H0u-J (7 x 4 + 5 x 1.5)
Outer cable diameter	[mm]	17.0 to 19.0	17.0 to 19.0	17.0 to 19.0	26.9 to 28.8

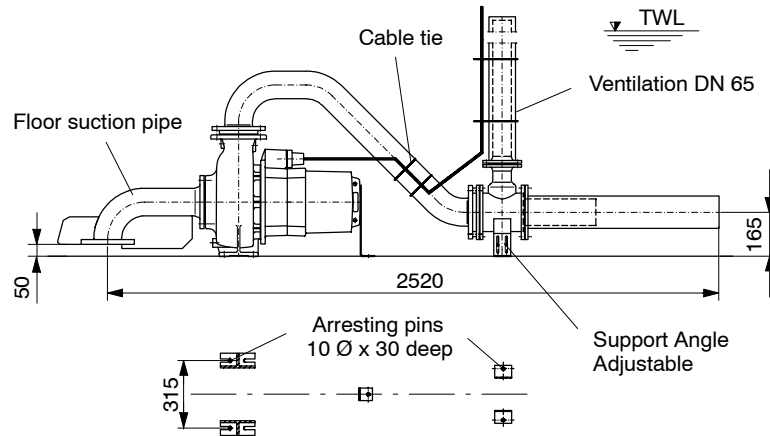
Non-Flameproof design

Motor data für 400 V, 50 Hz, 3~	Motor Type	5 4 UG	7 4 UG	11 4 UG	16 4 UG
Power rating P_2	[kW]	5.5	7.5	11.8	16.0
Absorbed power P_1	[kW]	6.7	8.86	13.4	17.9
Nominal current I_N	[A]	12.1	15.8	23.5	33.0
Efficiency factor $\cos \varphi$		0.8	0.81	0.82	0.79
Starting method		direct/star delta	direct/star delta	direct/star delta	direct/star delta
Starting current I_A (direct) ¹⁾	[A]	56	80	132	200
Protection to DIN 40 050		IP 68	IP 68	IP 68	IP 68
Electric connection cable		H07RN-F12G1.5	H07RN-F12G1.5	H07RN-F12G1.5	NSS H0u-J (7 x 4 + 5 x 1.5)
Outer cable diameter	[mm]	17.0 to 19.0	17.0 to 19.0	17.0 to 19.0	26.9 to 28.8

¹⁾ Data taken from Motor catalogue 2553.53/5-90

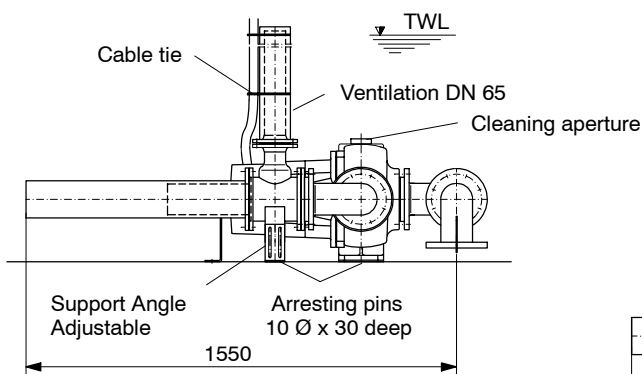
Main Dimensions

Amajet H - Horizontal design



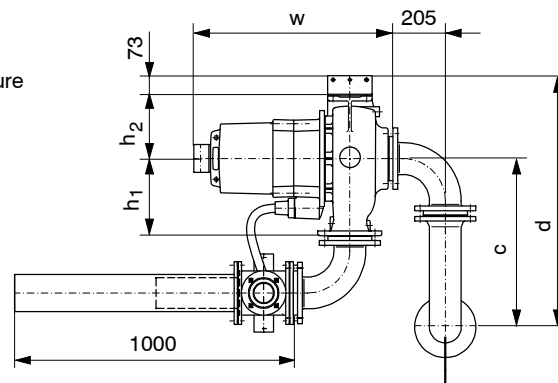
Amajet	Weight [kg]
H 100- ... / 5 4	140
H 100- ... / 7 4	150
H 100- ... / 11 4	165
H 100- ... / 16 4	180

Amajet S - Compact/portable design



Attention!

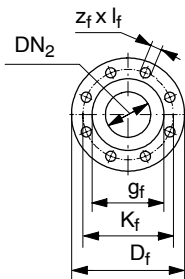
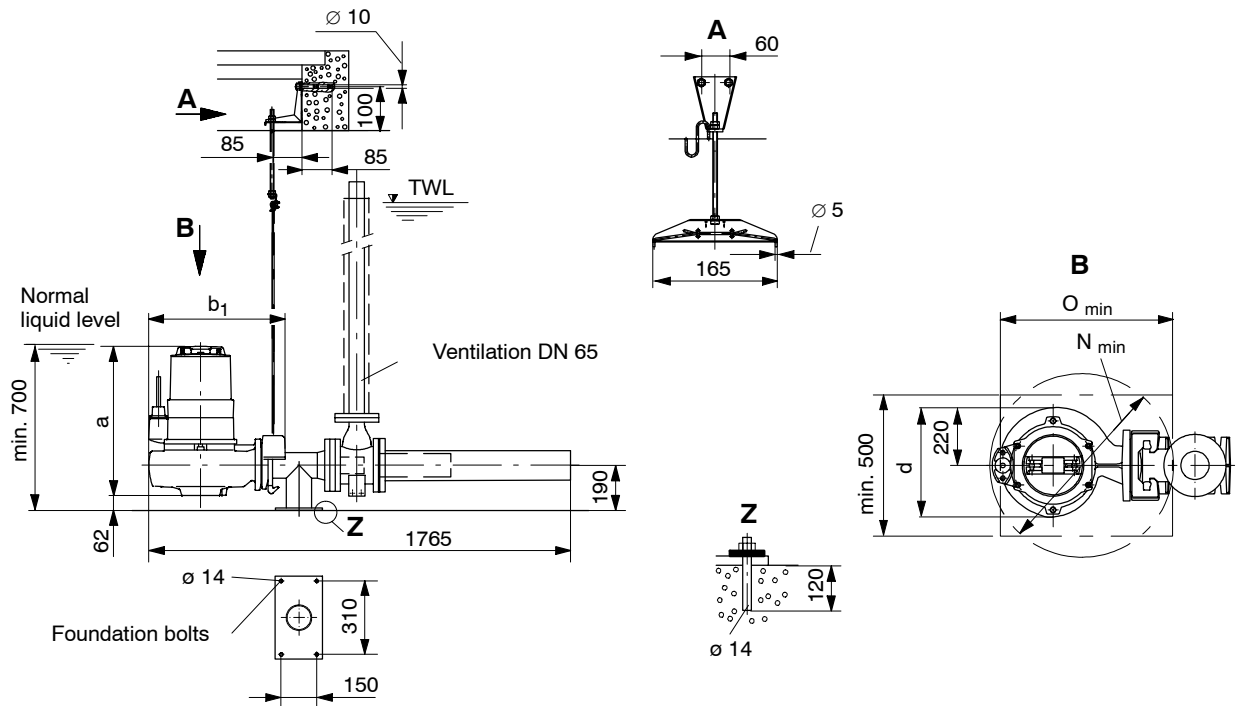
Installation must guarantee that the cleaning aperture is situated on top.



Amajet	Dimensions [mm]					Weight [kg]
	c	d	h_1	h_2	w	
S 100- ... / 5 4	485	903	225	280	610	140
S 100- ... / 7 4	485	903	225	280	610	150
S 100- ... / 11 4	485	903	225	280	640	165
S 100- ... / 16 4	485	903	225	280	640	180

Main dimensions

Amajet VX - Vertical Design



DIN 2501, PN 16

Flange		Dimensions [mm]			
DN ₂	g _f	K _f	D _f	z _f	∅ l _f
100	158	180	220	8	18

Amajet	Dimensions [mm]				Weight [kg]
	a	b ₁	d	N _{min} / O _{min}	
VX 100- ... / 5 4	600	580	388	610	130
VX 100- ... / 7 4	600	580	388	610	140
VX 100- ... / 11 4	630	580	388	610	155
VX 100- ... / 16 4	630	580	388	610	170

