

SEWAGE COMPRESSOR STATIONS



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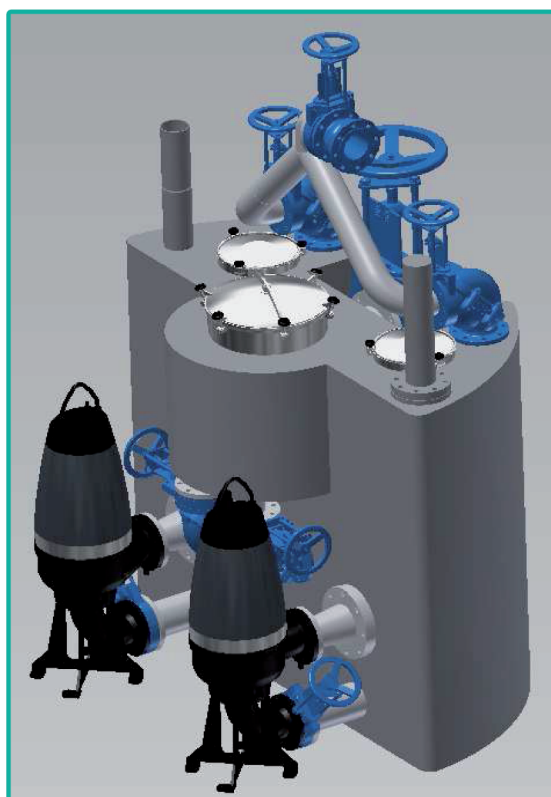
EKO-SYSTEM-POLSKA

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	2
2. SEWAGE COMPRESSOR STATION EQUIPMENT.....	3
3. PRINCIPLE OF OPERATION OF ESP SEWAGE COMPRESSOR STATION...	5
4. SERIES OF TYPES OF ESP SEWAGE COMPRESSOR STATION	6
5. CONTROL CABINET OF ESP SEWAGE COMPRESSOR STATION	8
6. ADVANTAGES OF ESP SEWAGE COMPRESSOR STATION.....	11
7. CERTIFICATES	13
8. NOTES.....	15

1. GENERAL INFORMATION

The traditional method of transport of sanitary, industrial and general floatable sewage us gravity sewer. However, it is not applicable everywhere. The limitations are lack of natural declines in land, high groundwater level, low population density or unfavorable soil conditions. In such cases, the gravity sewer is not economically justified, taking into account the development of alternative sewage systems. In such systems the sewage is transported in a manner forced by the pumps operation.



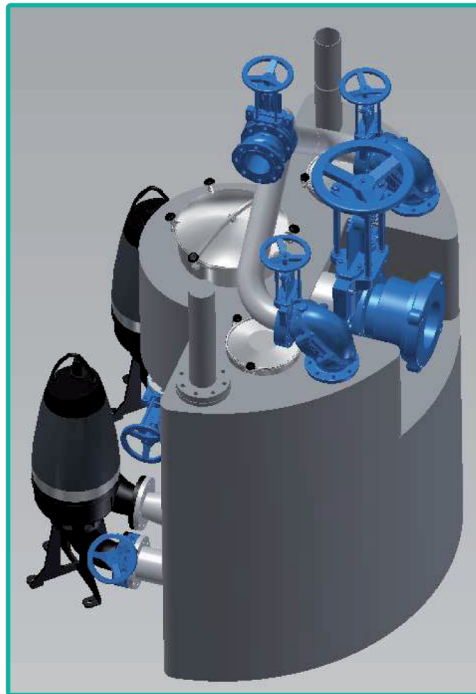
Commonly the sewage pumps are mounted directly in reservoirs, where together with discharge pipes, non-return fittings and automation of pumps operation they form the sewage compressor station. The pumps are at least partly submerged in the sewage accumulated in the reservoir, and the service staff is in direct contact with it, which makes difficult the operation of the compressor station.

Due to the limitation of the amount of water consumed by residents in households, problems associated with the increasing intensity of odor and problems associated with the increased concentration of solids in the sewage appear.

The solution to these problems is the use of the sewage compressor station in order to transport the sewage. An important element of the sewage compressor plants, distinguishing them from the pumping stations, is the use of separation of solids in sewage at the inlet to the pump that do not require the use of pumps submerged in the sewage.

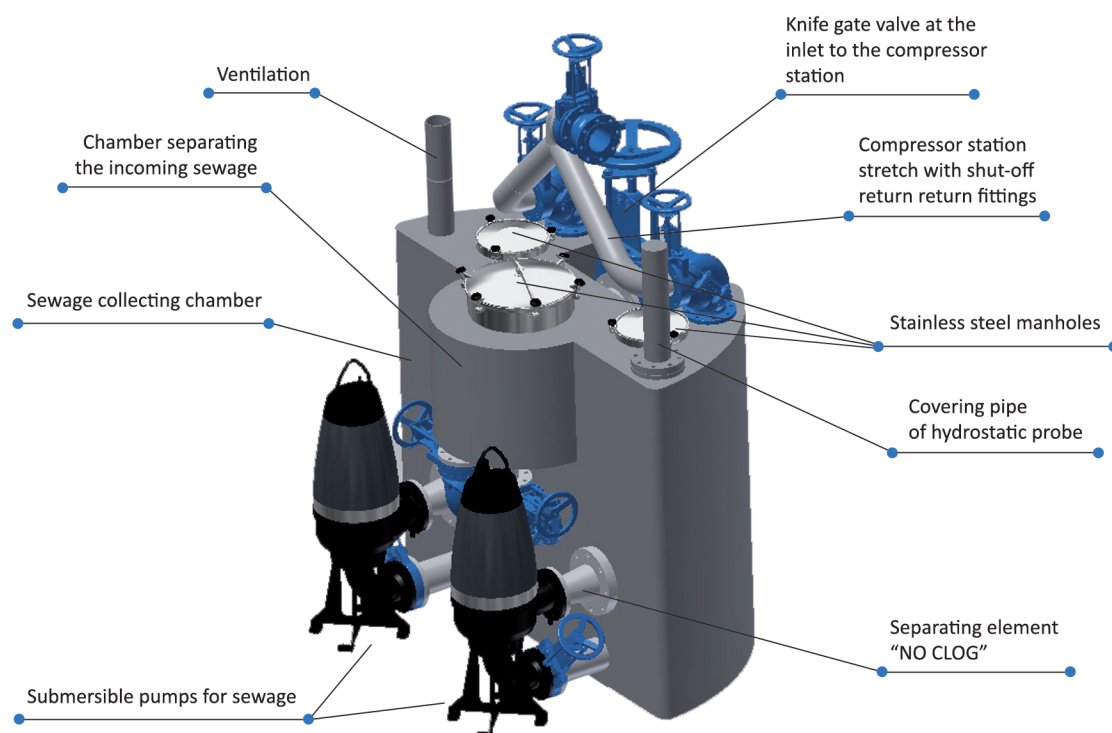
2. SEWAGE COMPRESSOR STATION EQUIPMENT

The sewage compressor station is a fully automated plant serving for pumping the sewage. Equipment of a complete F.SP sewage compressor station includes:



- external well of the sewage compressor station made of PEHD, as standard (*Optional: compressor station housing of concrete or polymer concrete*)
- chamber separating the incoming sewage made of stainless steel (min standard OH18N9) or PEHD
- innovative element separating fully demountable slot-flap "NO CLOG"
- chamber collecting solid pollution-free sewage, made of stainless steel (min standard OH18N9) or PEHD
- hydraulic system made of stainless steel min OH18N9 or PEHD with shut-off return fittings of a submersible pump running "dry" with a cooling blanket with IP68 degree of protection.
- control cabinet with a hydrostatic probe
- hydrostatic detachable probe alone or with a covering pipe
- knife gate valve at the inlet to the compressor station
- connector for connecting the gravity pipe
- ladder, handrails of stainless steel (min standard OH18N9)
- manhole made of stainless steel with a non-slip surface, insulated, equipped with actuators for easy opening of the manhole
- drainage pump made of stainless steel, controlled by conductometric probes with a shut-off return valve and screw connection for convenient disassembly

- the compressor station well and chambers ventilation) collecting sewage, made of stainless steel equipped with a check valve to protect against escape of odors from the inside of the chamber
- interior light of the external well of the compressor station is as standard executed as explosion proved
- *Additional equipment:* flow meter, mechanical exhaust, explosion-proof fan, ventilation with biofilter. lighting of the well and chambers) * collecting sewage, rinse connector pipe for compressor pipe system, system of automatic cleaning of sewage collecting chamber, coagulant dosing system, monitoring of compressor station operation, GSM/GPRS/, 5GHz or 2.4GHz Radio



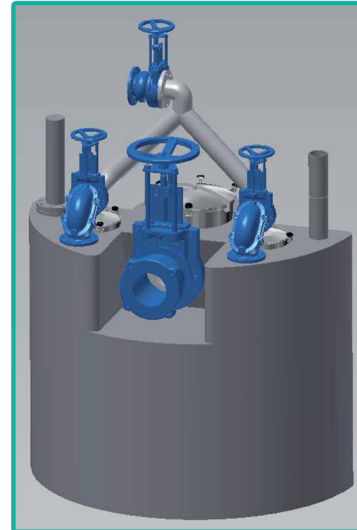
Construction of ESP sewage compressor station allows performing maintenance during the sewage compressor station operation and does not require a complete closure of the sewage inflow.

3. PRINCIPLE OF OPERATION OF ESP SEWAGE COMPRESSOR STATION

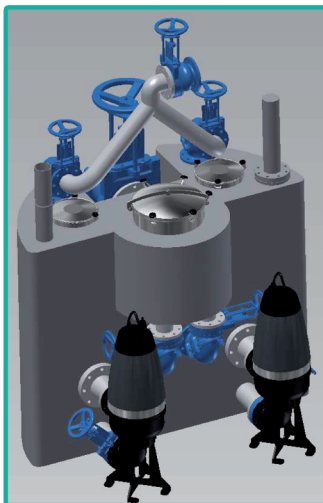
Operation of the sewage compressor station consists of two stages: filling and emptying.

➤ Stage of filling the sewage compressor station

During the stage of filling, the raw sewage enters the separating elements through the separation chamber. The solid pollution-free sewage by means of separating elements flows through one or both pumps not operating at that moment, filling the sewage collecting chamber. The level of sewage in that chamber is monitored by means of a hydrostatic probe.



➤ Stage of emptying the sewage compressor station

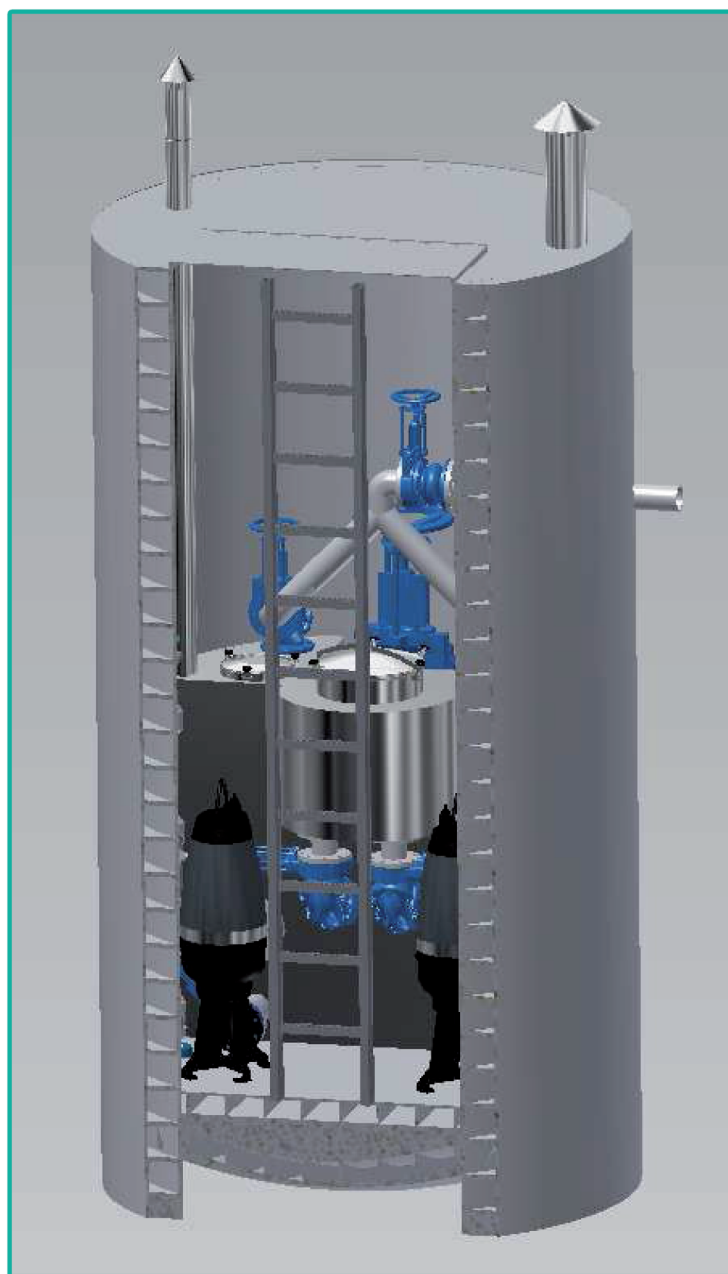


After reaching the maximum level, the stage of emptying the sewage collecting chamber occurs. At that moment, one of the pumps turns on, collecting sewage from the collecting chamber. This sewage is pumped at high velocity through the separating element and the solids are rinsed from it. The increase in pressure of the pipeline closes the return valve and shuts off the raw sewage inflow to the separating element at a given pump. The sewage can flow in that time, through a second separating element and a second pump. The achievement of a minimum level of sewage turns off the pump.

The pumps operation is carried out alternately. The inflow of sewage into the collecting chamber through the separating element and the pump can take place simultaneously with the operation of the second pump. This is possible thanks to two separate, independent discharge pipes in the compressor station.

4. SERIES OF TYPES OF ESP SEWAGE COMPRESSOR STATION

In the ESP sewage compressor stations, pumps with a channel or SuperVortex rotor are used having integrated motor cooling system without the use of liquid and with IP68 degree of protection. Tab. 1 shows the standard types of sewage compressor stations. It is possible to execute sewage compressor stations with other parameters tailored to individual requirements. Maximum capacity of ESP compressor station is 100l/s.



Parameter	Type of compressor station	Power of pump motor shaft in the nominal operating point	Nominal performance of the pump	Maximum size of solids	Maximum size of fixed parts	Sewage collecting chamber capacity	Recommended minimum diameter of the compressor station external well
Unit	[-] [-]	[kW]	[l/s]	[m]	[mm]	[m ³]	[mm]
1	TS-ESP/JOR.50.65.2222.5.60B/KW.KO/ZB.PE20	2.1	15.0	14.0	50	1.7	2000
2	TS-ESP/JOR.50.65.2302.5.60B/KW.KO/ZB.PE20	2.7	17.7	18.0	50	1.7	2000
3	TS-ESP/JOR.50.65.2302.5.70A/KW.KO/ZB.PE20	3.7	19.0	22.0	50	1.7	2000
4	TS-ESP/JOR.50.80.2222.5.60B/KW.KO/ZB.PE20	2.0	14.6	14.0	50	1.7	2000
5	TS-ESP/JOR.50.80.2302.5.70A/KW.KO/ZB.PE20	2.7	17.0	18.0	50	1.7	2000
6	TS-ESP/JOR.80.2152.B.60B/KW.KO/ZB.PE20	1.0	18.4	8.0	80	1.7	2000
7	TS-ESP/JOR.80.2222.8.60B/KW.KO/ZB.PE20	1.8	19.9	10.0	80	1.7	2000
8	TS-ESP/JOR.80.2302.8.60B/KW.KO/ZB.PE25	2.8	22.2	12.5	80	3.0	2500
9	TS-ESP/JOR.80.100.2152.8.60B/KW.KO/ZB.PE20	1.4	18.9	8.5	80	1.7	2000
10	TS-ESP/JOR.80.100.2222.8.B/KW.KO/ZB.PE20	1.8	20.9	10.5	80	1.7	2000
11	TS-ESP/VOR.80.2222.8.60A/KW.KO/ZB.PE20	2.0	11.4	11.5	80	1.7	2000
12	TS-ESP/VOR.80.2402.8.70A/KW.KO/ZB.PE20	3.8	16.0	16.0	80	1.7	2000
13	TS-ESP/VOR.80.2602.5.70A /KW.KO/ZB.PE20	5.6	11.4	25.0	80	1.7	2000
14	TS-ESP/VOR.80.752.5.70A/KW.KO/ZB.PE20	7.0	12.9	31.0	80	1.7	2000
15	TS-ESP/VOR.80.2922 .5.7DA/KW.KO/ZB.PE25	9.1	14.7	35.0	80	3.0	2000
16	TS-ESP/VOR.80.211025.70.A/KW.KO/ZB.PE25	11.0	16.2	41.0	80	3.0	2500
17	TS-ESP/VOR.80.21302.5.80 A/KW.KO/ZB.PE25	12.4	17.5	44.0	80	3.0	2500
18	TS-ESP/VOR.80.21 502 5.80 A/KW.KO/ZB.PE25	13.8	18.5	47.0	80	3.0	2500
19	TS-ESP/VOR.80.21702.5.80 A/KW.KO/ZB.PE25	15.7	19.6	51.0	80	3.0	2500
20	TS-ESP/VOR.80.21852.5.80A /KW.KO/ZB.PE25	17.8	20.9	55.0	80	3.0	2500
21	TS-ESP/VOR.80.22002 5.80 A/KW.KO/ZB.PE25	19.0	21.8	58.0	80	3.0	2500
22	TS-ESP/VOR.80.22202 5. A/KW.KO/ZB.PE25	21.0	22.7	61.0	80	3.0	2500
23	TS-ESP/VOR.100.2302 8.60 A/KW.KO/ZB.PE20	2.6	14.5	11.0	100	1.7	2000
24	TS-ESP/VOR.100.2402 8.70 A/KW.KO/ZB.PE20	3.5	17.0	14.0	100	1.7	2000
25	TS-ESP/VOR.100.2552 8.70 A/KW.KO/ZB.PE20	4.80	20.4	17.0	100	1.7	2000

5. CONTROL CABINET OF ESP SEWAGE COMPRESSOR STATION

Control cabinet of ESP sewage compressor station adapted to direct or indirect start-up (star/delta, soft-start or inverter) performs the function of automatic operation of the compressor station without constant maintenance. The airtight IP65 cabinet housing with 2nd class insulation, mounted close to the compressor stations well, together with cable connectors at the min height of 50 cm above the ground. The switching station is used for power supplying the pumps and the compressor station's own equipment and is adapted to the standard power supplying of 400 V, 50 Hz low voltage power lines with a typical cable connector / settlement measurement of energy consumption.

Control of sewage compressor stations is performed by the microprocessor controller. It provides alternating operation of the pumps. Such the system prevents overloading of the electrical network, as well as helps to reduce the power consumption.

To measure the level of sewage in the chamber, 4-20 mA analog signal of hydrostatic probe is used. The controller analyzes the transmitted signal and switches the pump, which did not operate in the previous cycle. This solution enables long-term trouble-free operation of the pumps.



Control cabinet equipment

IP65 plastic housing, 2nd insulation class, min 735x535x300mm
controller of operator panel mounted on the internal door
possibility of installing additional operator panel
controller equipped with binary and analog inputs-outputs
the controller equipped with RS232, RS422, RS485 communication ports
the console menu in Polish (clear and easy to use) with real time clock
contactors for the direct and indirect start-up for each pump or soft-start
CKF sequence and phase failure sensor
control system of pumps motor windings temperature
current measurement for each pump
surge arrester B + C (3 phase + N)
switch unit/network with unit socket
230V socket
double door with patented lock
interior doors with safety switch, illuminated buttons and switches 1-0-2 to select the operation mode
cabinet interior lighting
reed informing about burglary
external optical signaling device
hydrostatic probe in stainless steel housing
possibility to introduce to the system monitoring and visualization of the compressor station plant operation in OSM / GPRS / Radio SGHz or 2.4GHz system
switching on/off the pumps depends on the level of sewage in the chamber
protection against simultaneous activation of two pumps
protection by means of residual current circuit breaker
pumps short-circuit protection

pumps thermal protection

pumps overload protection

protection against loss or change of phases

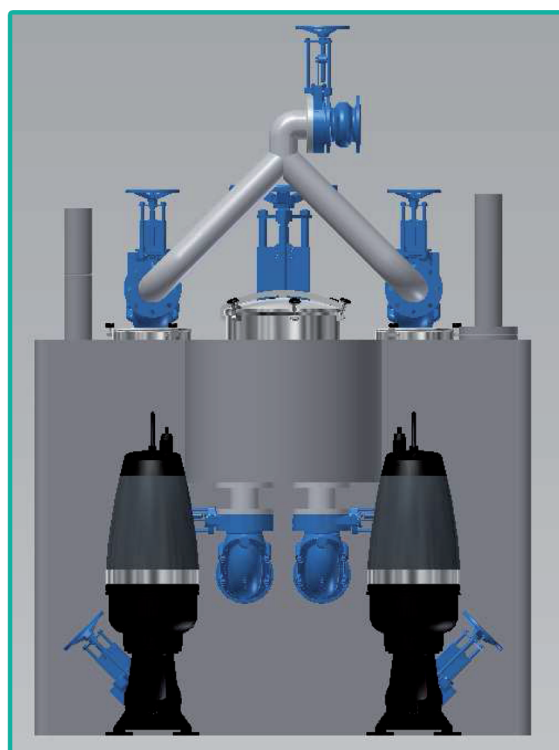
Class B + C overvoltage protection (3 phase + N)

over current protection of the control system

protection against dry-running, undercurrent and time protection

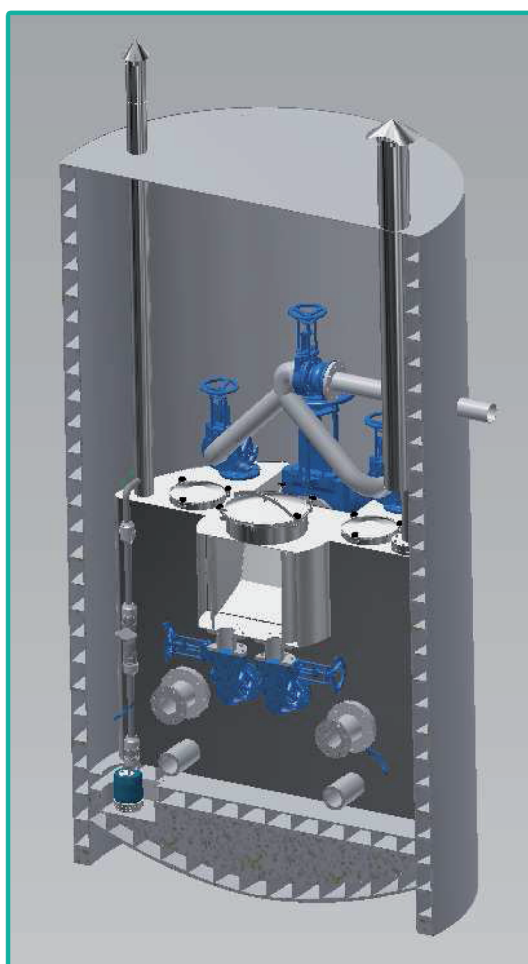


6. ADVANTAGES OF ESP SEWAGE COMPRESSOR STATION



- tight external well made of NAWO PEHD structural tube to be built to a depth of 10 m, equipped with a double structural bottom, guaranteeing 100% of tightness and no deformation under the pressure of soil and groundwater
- bottom of the external well equipped as standard with the drainage pump sump
- internal chamber of vertical, rounded, elliptical walls with all the sewage runoff surfaces directed with an adequate inclination to the pumps minimizes the possibility of sewage decay
- very high active retention compared to other available solutions taking into account the applied external diameter of the reservoir
- preventing blocking of the pumps through separation of solids on the separating element
- slot-flap "NO CLOG" separating element completely detachable
- eliminating the problem of odor, slurry and fouling due to the short sewage residence time in the collecting chamber and high turbulence
- use of high efficiency pumps with channel or SuperVortex rotors, with cooling blanket in a dry set, reducing electricity consumption
- sewage containing large amounts of solids can be transported over big distances / heights
- reliable, alternating pump operation ensures their long life due to appropriate controls and protections
- possibility to conduct maintenance/operating works during operation of the sewage compressor station, without having to completely shut off the flow of sewage

- possibility of dismantling the pump or separator from one discharge pipe by locating valves in the right place of the discharge pipe, with the possibility of simultaneous operation of the pump and the separating element on the second discharge pipe, a special hydraulic solution to prevent spillage of sewage in the external well during the pump dismantling
- design of the compressor ensures low maintenance costs
- the well which comprises the pump is always dry, clean and free of unpleasant odors and hazardous gases
- hygienic conditions during maintenance



Note: The manufacturer reserves the right to make changes resulting from technical progress, tendering specifications and user's requirements.

7. CERTIFICATES

SGS

Certificate HU10/5022
The management system of

ESP[®]

P.P.H. „EKO-SYSTEM-POLSKA”
Szarnecka-Placko Dorota
Tajęcina 112, 36-002 Jasionka, Poland
has been assessed and certified as meeting the requirements of

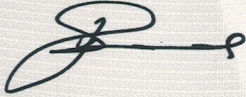
ISO 9001:2008

For the following activities

- production of complete sewage pumping station with steering and monitoring automatics
 - production of PEHD tanks and inspection chambers
 - production of PEHD pipes and pipe fittings


Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2008 requirements may be obtained by consulting the organisation


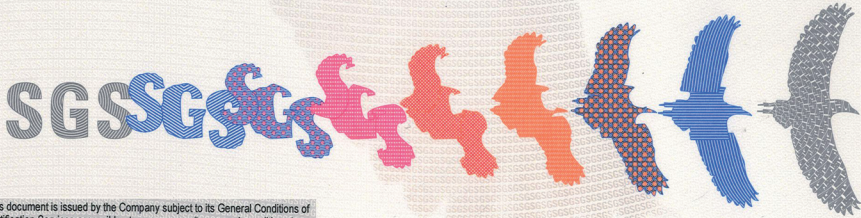
This certificate is valid from 7 May 2014 until 30 May 2016 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 30 April 2016
Issue 3. Certified since 31 May 2010
Authorised by



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Rossmore Business Park Ellesmere Port Cheshire CH65 3EN UK
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CERTYFIKAT

uprawnający do oznaczania wyrobu zastrzeżonym znakiem bezpieczeństwa

CERTIFICATE

authorizing to mark product with registered safety mark

nr B/12/057/11/M1

No. B/12/057/11/M1

Posiadacz certyfikatu: P.P.H. „EKO-SYSTEM-POLSKA”
(Nazwa i adres)
Certificate holder: Szarnecka-Placko Dorota
(Name and address) Tajęcina 112, 36-002 Jasionka, Poland

Producent: P.P.H. „EKO-SYSTEM-POLSKA”
(Nazwa i adres)
Manufacturer: Szarnecka-Placko Dorota
(Name and address) Tajęcina 112, 36-002 Jasionka, Poland

Nazwa wyrobu: Szafy sterownicze.
Name of the product: Control cabinets.

Typ (model): ESP-1P3S-370x275x140/..., ESP-1P3S-530x430x200/...,
Type (model): ESP-2P3S-370x275x140/..., ESP-2P3S-530x430x200/...,
ESP-2P3S-745x535x300/..., ESP-2P3Sp-745x535x300/...

Dane techniczne: U₁: 500 V; U₂: 230/400 V; IP54; kl.II class II
Technical data: I_n: 1x6,3 A lub or 2x6,3 A - obwody sterownicze
control circuits
1x100 A lub or 2x100 A - obwody główne
main circuits

System certyfikacji: 5 według Przewodnika ISO/IEC 67
Certification system: 5 according to ISO/IEC Guide 67

Data ważności: 2016-06-20
Valid until:

Wymieniony powyżej wyrób spełnia wymagania norm(-y):
Aforesaid product complies with the requirements of the standard(s):

Norma(-y) Standard(s)	Raport(-y) z badań nr Test report(s) No.	Wydany(-e) przez Issued by
EN-EN 60439-1:2003+A1:2006 (EN 60439-1:1999+A1:2004)	TA 6.89/1, TA 6.89/2, TA 6.89/3	BBJ
	BS-4/283/EMC/05	PREDOM

Niniejszy certyfikat dotyczy wyłącznie wyrobów mających identyczne właściwości (dane techniczne) jak przedstawiony do badań wzór, i spełniających wymagania ww. norm(-y).

This certificate covers only the products with characteristics (technical data) same as of the tested sample and those complying with the requirements of the aforesaid standard(s).

Prawa i obowiązki posiadacza niniejszego certyfikatu określa oddzielna umowa z BBJ.
Rights and duties of this certificate holder are defined in a separate agreement with BBJ.



Kierownik Jednostki Certyfikującej
Certification Body Manager

Teodor Pysznik
Teodor Pysznik

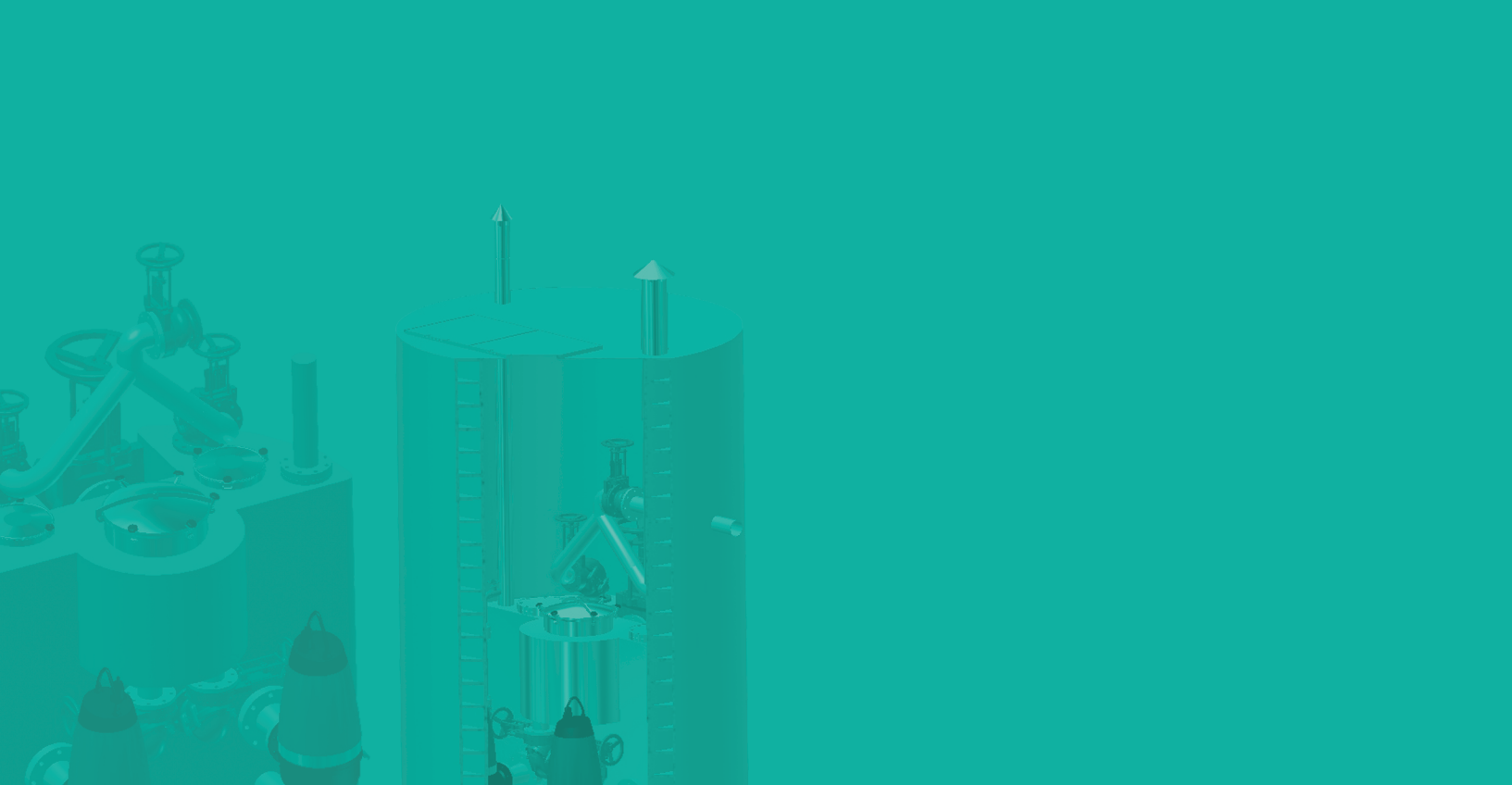
Warszawa, 2014-04-03

8. NOTES

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NOTES

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ISO 9001:2008

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