

SOLIDO SMART SBR-SYSTEM

**Biological SBR–Small Wastewater Treatment Plant
without primary treatment**



Doc.-No.: DOKK5204E

Version: 2022-12-14

PREMIER TECH WATER AND ENVIRONMENT

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1 GENERAL

SBR-small Wastewater Treatment Plant Solido SMART consists of highly resistant polyethylene plastic containers and work with the Sequencing Batch Reactor (SBR) Process. It is available in several versions for 2 – 50 inhabitants.

Approvals

A CE Declaration of Performance according to Construction Product Regulation and EN 12566-3 is available (see appendix).

A precondition for the operation of a small Wastewater Treatment Plant is obtaining the correct approvals from your local water authority and an acceptance / startup by a specialised company.

Warranty

25 years manufacturer's warranty for containers, 3 years manufacturer's warranty for electrical units such as compressor, valve and control unit with the correct operation and maintenance by a service partner authorised by Premier Tech.

Energy consumption

The SBR-system Solido SMART works with compressors with an electrical power from 39 to 210 Watt (depending on the size of the plant), one solenoid valve, one control unit, as well as a float switch (sensor). Because of the efficient utilisation of the compressed air the energy consumption according to the desired decomposition rate and actual utilization is about 49 kWh per inhabitant and year.

Holiday mode

The control offers the possibility to enter the length of a holiday / absence for up to 120 days. The running time for aeration and pumping will be reduced by half during this period. At the end of the entered time the control automatically returns again to the standard mode.

Maintenance and Sampling

A Solido SMART plant should be maintained twice a year. Within the maintenance the time of the sludge removal is fixed. This has to be carried out every 8-15 months, depending on the utilised capacity and the type series. The sampling is carried out by removing the content of the sample chamber. It is changed during the clearwater removal every 12 hours, ensuring that a current sample is available at any time.

Operator's duties

Among the general duty of care such as the avoidance of the discharge of inappropriate substances, like food leftovers, chemicals and contraries of all kinds, the operator has to make sure that the plant is operating correctly. Visual inspections have to be carried out monthly and have to be noted in the operations logbook. The operating times of the plant are automatically saved in the operations logbook of the control unit. A written logbook is recommended and required by many water authorities.

2 PRODUCT QUALITIES

Solido SMART combines the benefits of an ultra-compact solution with the trusted performances of SOLIDO systems. Integrating an SBR technology comparable to large municipal applications, the proven technology operates with direct aeration of the wastewater and without the need for primary treatment. This simple principle provides efficient wastewater treatment results without the emission of any odors.

The advantages compared to a conventional SOLIDO two chamber system:

- 10-20% less tank volume required
- 20-25 % less sludge production
- no primary treatment, no bad smells

All those trusted benefits of SOLIDO remain for sure:

compact:	minimum required space, low installation depth
quiet:	no noise inside the building because of integrated technology capsule
easy installation:	all hoses and small parts are pre-mounted in the container, only one pre-finished pipe between tank and house, no installation of complicated hose packages necessary
stable:	extremely robust and guaranteed single, one-piece container (no weak spots like with subsequently composite shells) container type M2 CE proved for installation in groundwater up to tank shoulder
fail-safe:	technology capsule now IPX6 airlift with a patented automatic backflush prevent sludge loss and improve the effluent quality, extends the lifespan of your infiltration
easy handling:	no sludge level measuring in primary tank necessary
energy efficient:	just 49 kWh per person and year due to efficient utilisation of compressed air and adapted aeration
clean:	Excellent performance according to EN12566-3
safe and reliable:	20.000 times reliable quality, "Made in Germany"

3 FUNCTIONAL CHARACTERISTICS

3.1 Definitions

The specific approach of Solido SMART is abandoning traditional septic tanks before the reactor. All of the inflowing wastewater is being intermittently aerated by tube diffusers in **one** chamber (resp. two connected chambers) resulting in simultaneous aerobic stabilization / aerobic biodegradation of primary and secondary sludge. The overall sludge production as well as bad smells are being significantly reduced whereas settleability of activated sludge is being improved compared to traditional activated sludge systems. Multiple usage of available tank volume is allowed for by sticking to the the principle of SBR (sequencing batch reactor) running the plant in a time-bound 12h cycle (24h-cycle as alternative) ending with sedimentation and clearwater discharge. The total volume of the tank is being used as **reactor**, sludge storage and buffer at different times within the 12h-cycle.

Solido SMART can be run with two or more chambers as long as they are being interconnected resulting in same water levels in all chambers.

3.2 Special features of Solido SMART process

In order to secure safe operation in one chamber the Solido SMART process provides for these distinct features.

- 12h-cycle enables the system to minimize the probability of hydraulic peaks during sedimentation and clearwater discharge. Starting times of the cycle are at 02:00 at night and 14:00 and can be changed according to the individual flow pattern.
- Submersed inlet for reduction of turbulence in combination with sufficient surface/volume do prevent sludge from being swirled up again by inflow once it has been settled during sedimentation. It is well accessible from the top if congestion should occur as an exception.
- Both emergency overflow as well as the inlet of the clearwater airlift are protected from floating solids by dip pipes.
- Patented backflushing technology prevents the clearwater airlift from being clogged at the inlet or polluted by sludge at the inside.
- Apart from biodegradation extraneous materials will be broken up mechanically / abrasively by turbulence and constant movement inside the reactor. Thus they will have no negative impact on the clarification process eventually being removed from the system by desludging.
- The control unit of Solido SMART will detect the length of power failure preventing major sludge wash-out by aerating the system in a state of being filled up to its rim directly after restart. SMART will restart with clearwater discharge if duration of mains power failure exceeds 45min.

As any other domestic small wastewater treatment plant Solido SMART requires regular maintenance and professional commissioning including personal instruction of

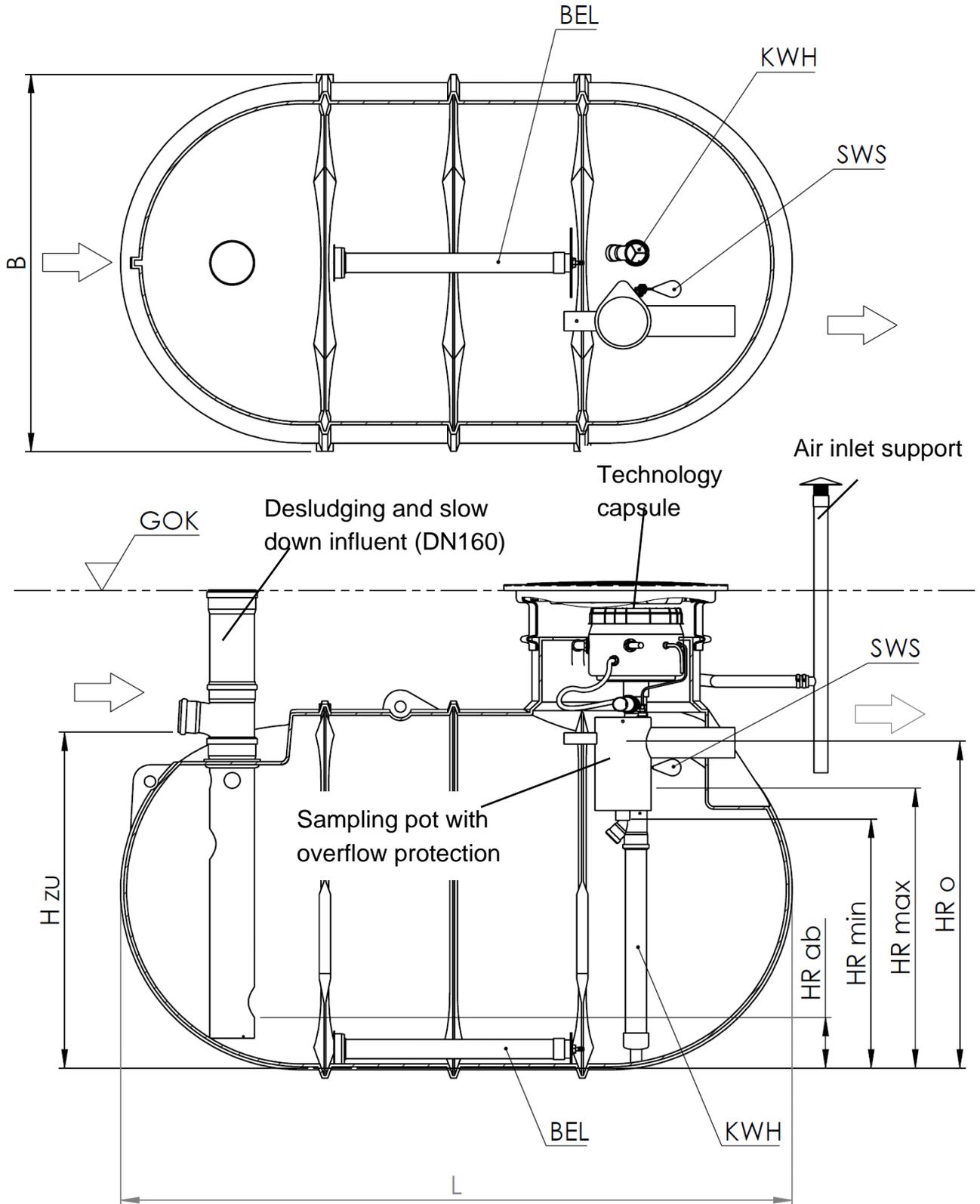
the home owner. The actual users have to be aware that Solido SMART is no good for disposal of solid garbage or leftover food. It is designed to treat domestic wastewater.

3.3 Distinctive characteristics of Solido SMART regarding maintenance and desludging

Even though maintenance of Solido SMART is not much different from maintenance of regular SBR plants there are some specific aspects to it.

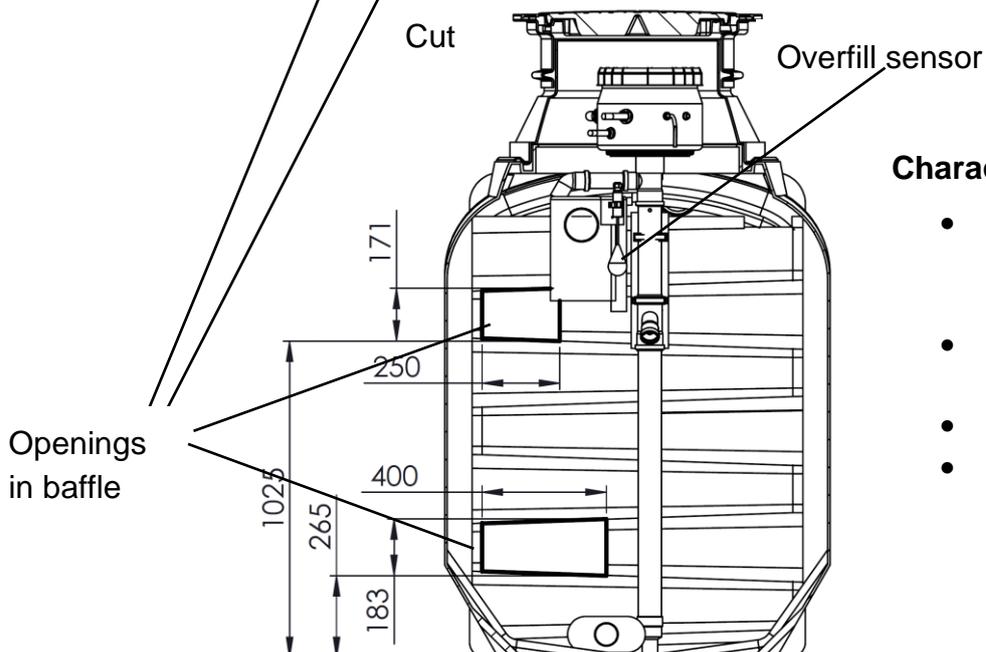
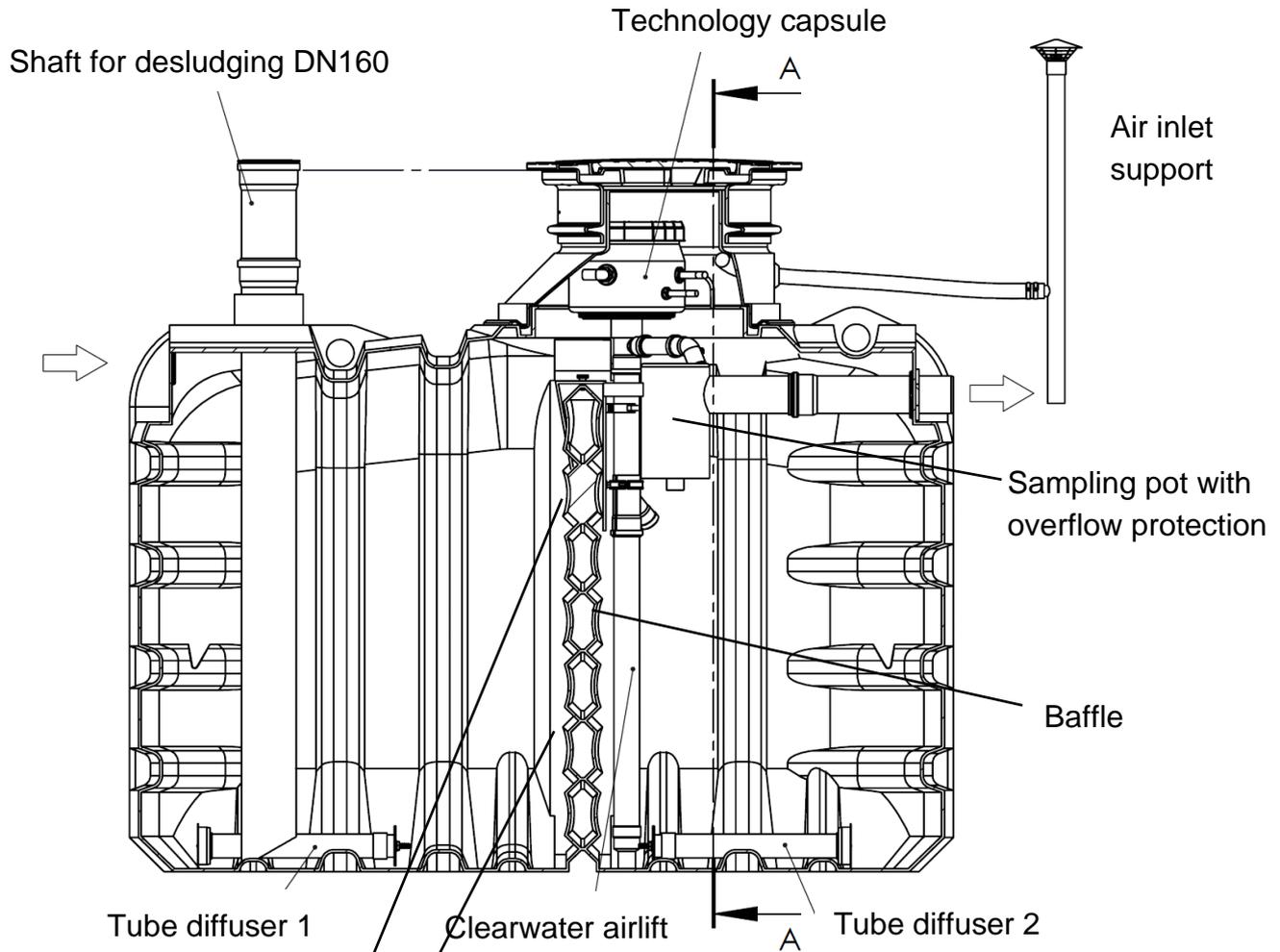
- make sure to check on clogging of inlet, outlet, diffusor and airlift.
- It is mandatory to conduct a sludge settling test (SV30) every six months, preferably during maintenance. The procedure is quite simple: Get a sample of 1 L of well mixed liquor out of the reactor tank and pour it into a wide cylinder. SV30 is measured in ml/l or % determining the height of sludge level compared to total level of liquid after 30min of sedimentation (no direct exposition to sunlight in order avoid convection).
- On the one hand sludge settling test (SV30) will indicate the quality of activated sludge (does the activated sludge settle well? Is it dark and rather compact? How clear or still turbid does the clearwater phase look like?). On the other hand it will also indicate the filling grade of sludge storage (due to the one chamber approach).
- Take into account that sedimentation inside the reactor will be better than in a cylinder for two reasons:
 - no interference of particles in wide tank as compared to narrow cylinder. In theory sample has to be diluted for SV30 > 250 ml/l (25%)
 - sedimentation time during the cycle is 90min instead of 30min
- Desludging within the next 4 weeks shall be mandated if correctly measured SV30 values reach 70% of HRmax (max. expected water level at full hydraulic capacity). In the field you will hardly ever measure correctly (no dilution) at water levels reaching 85-90% of HRmax only. As a rule of thumb undiluted SV30 values of 800-850 ml/l (80-85%) at normal water levels are equivalent to 70% of HRmax.
- For desludging use make sure to use desludging/inspection pipe (d=160mm with direct access from the ground  level) only.
- The design of the pipe will make sure that at least 10% of the volume will stay inside the tank. This is mandatory to keep up the performance of the plant right after desludging.
- Make sure that desludging does not take place during sedimentation (usually 12:15-14:00). Mix liquor by manual operation of aeration otherwise.
- With SMART EM2 (ML-2) the desludging is done in the same way. There is an opening in the baffle at a specific height, in order to desludge the first chamber almost completely and leaving a water level of about 25cm in the second chamber. Considering the whole volume there will remain enough sludge to continue the biological process.

3.4 Setup Solido SMART EBL in round tank BL:



KWH: clearwater airlift BEL: tube diffuser SWS: overfill sensor (float switch)

3.5 Setup Solido SMART EM2 in rectangular tank M2



Characteristics:

- chambers are connected by openings in baffle
- both chambers are aerated
- no slow down influent
- Desludging via pipe DN160 (remaining volume in second chamber)

3.6 Setup Solido SMART with clearwater pump instead airlift

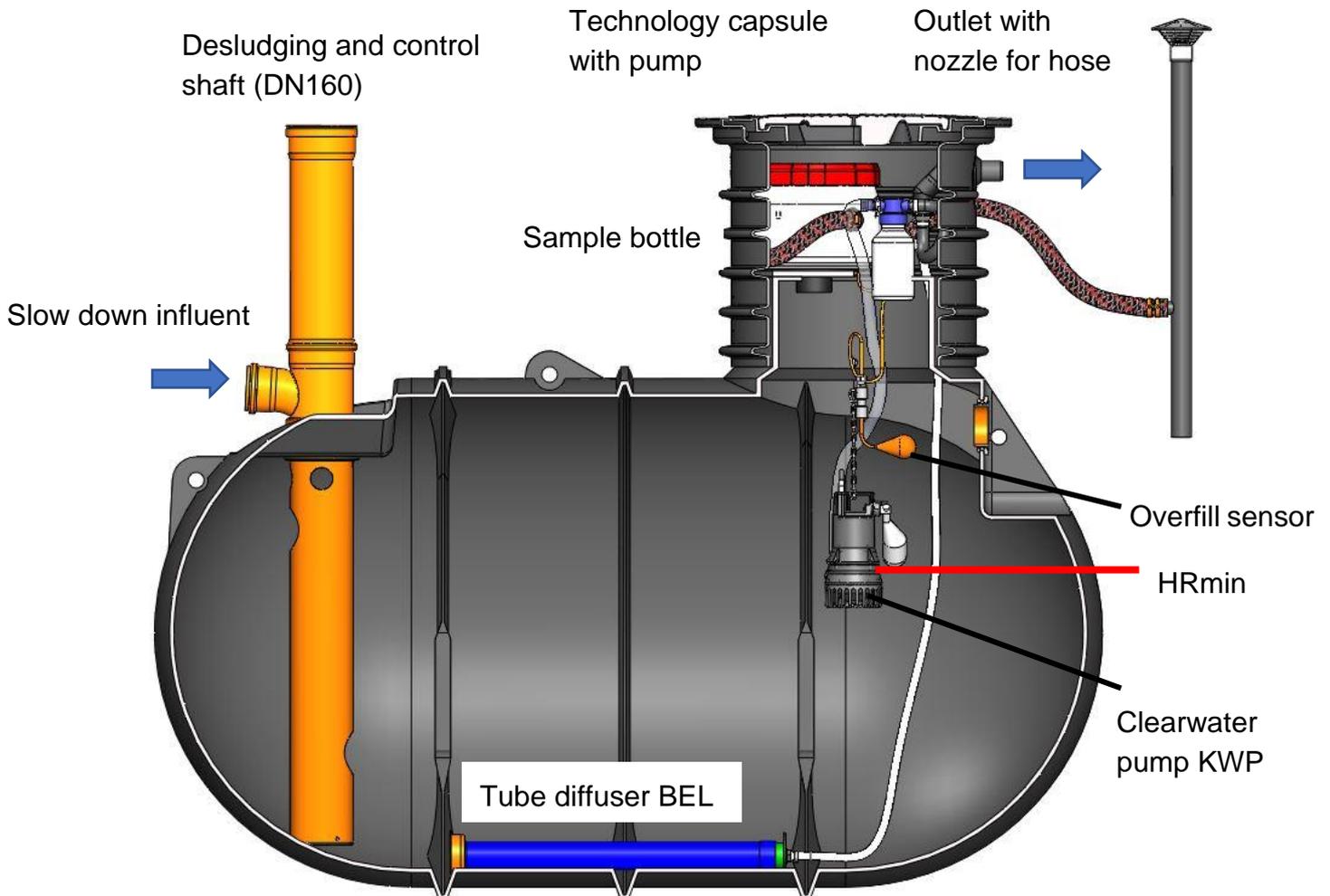


figure in tank BL26 (as example)

Characteristics:

- clearwater pump instead clearwater airlift
- no solenoid valve
- clearwater disposal independent from difference of level at outlet
- clearwater pump connected to technology capsule
- easy installation, pump is fixed to steel chains in the tank
- clearwater hose, sampling bottle, connection to hose included in delivery slope
- SBR volume alterable



Emergency outlet (in case of pump failure) has to be **implemented on site**. The operator has to be informed.

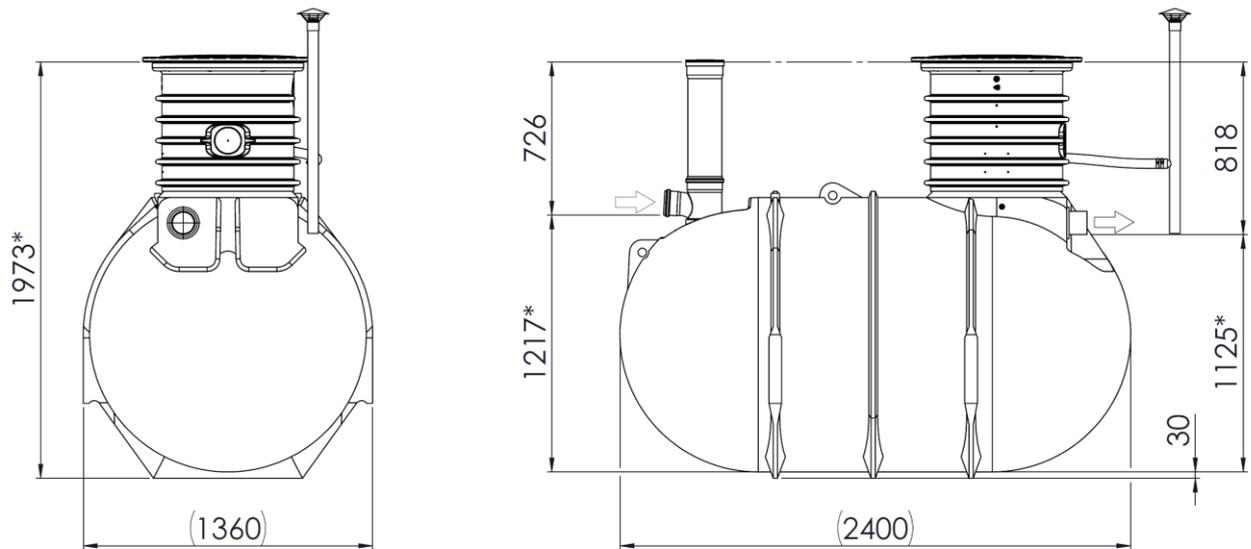
4 PRODUCTLINE AND DRAWINGS

4.1 Solido SMART EBL in round tank BL



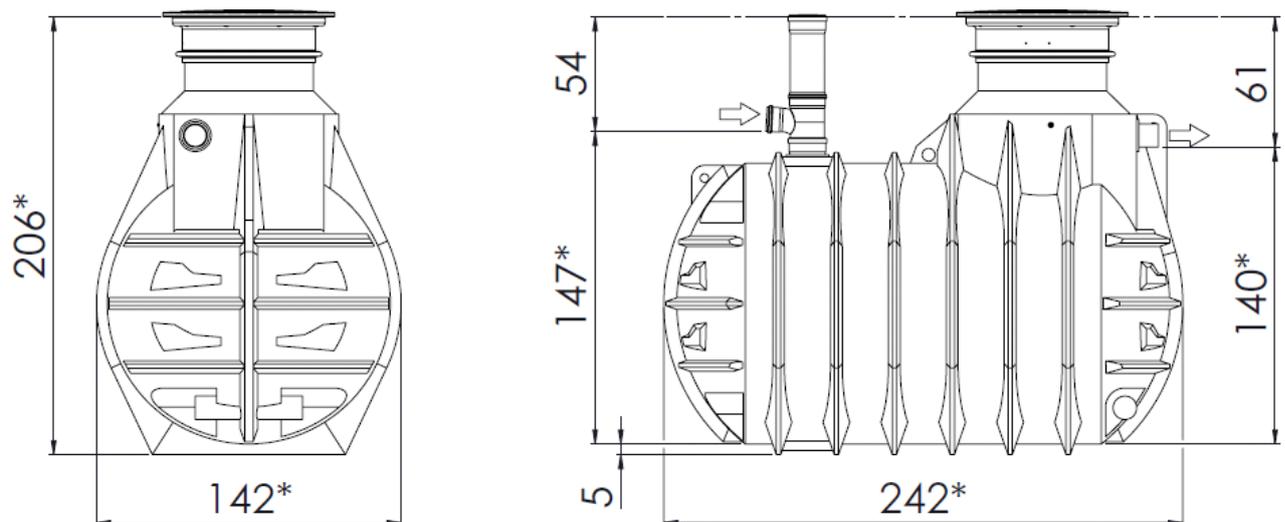
NOTE: For installation in groundwater up to middle of tank

Solido SMART EBL-26 (recom. 1-3 PE, max.5 PE)



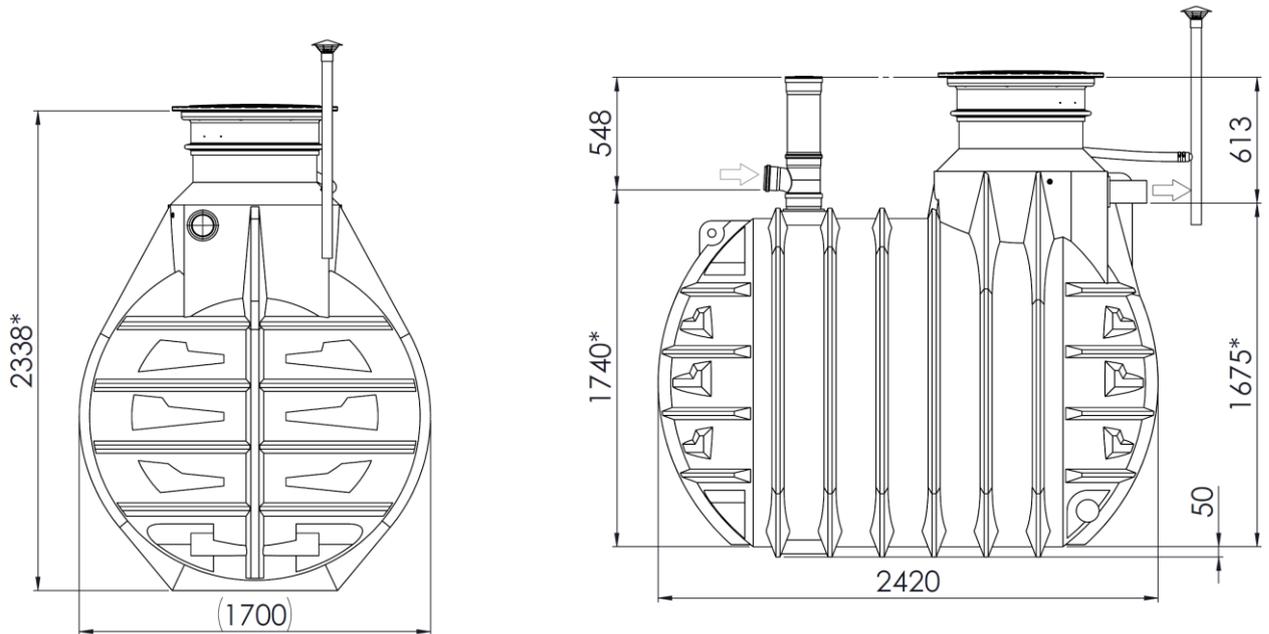
* production-related deviations in a range of -4/+1 cm

Solido SMART EBL-30 (recom. 2-5 PE, max. 6 PE)



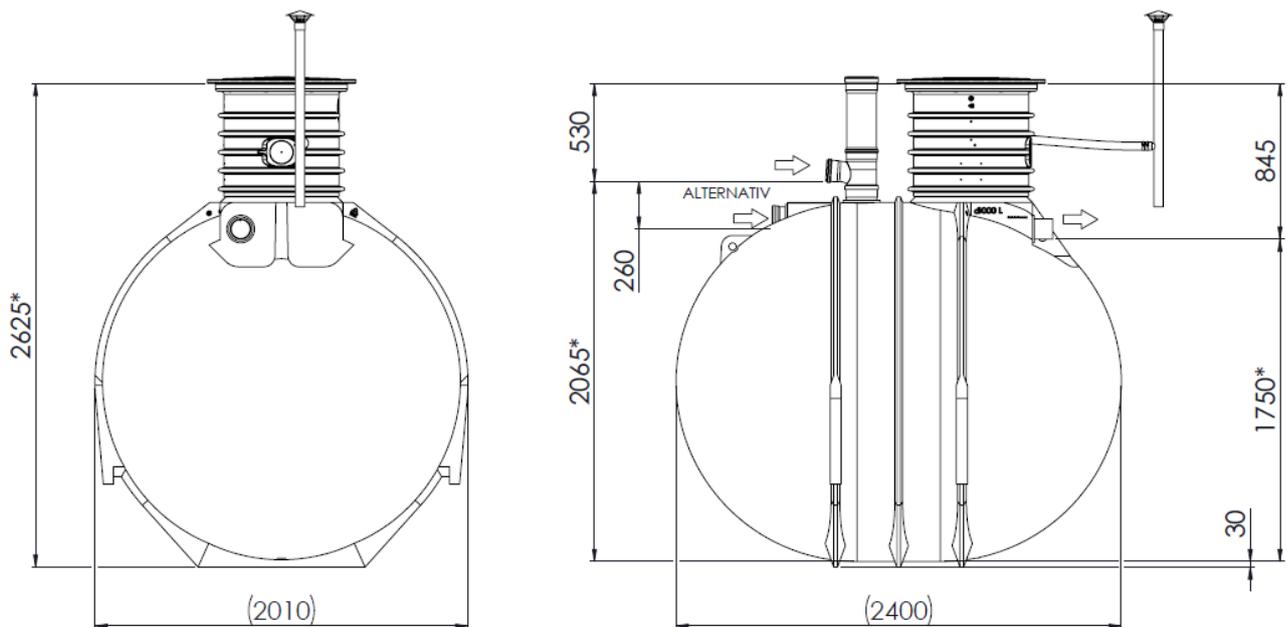
* production-related deviations in a range of -4/+1 cm

Solido SMART EBL-45 (recom.7 PE, max. 9 PE)



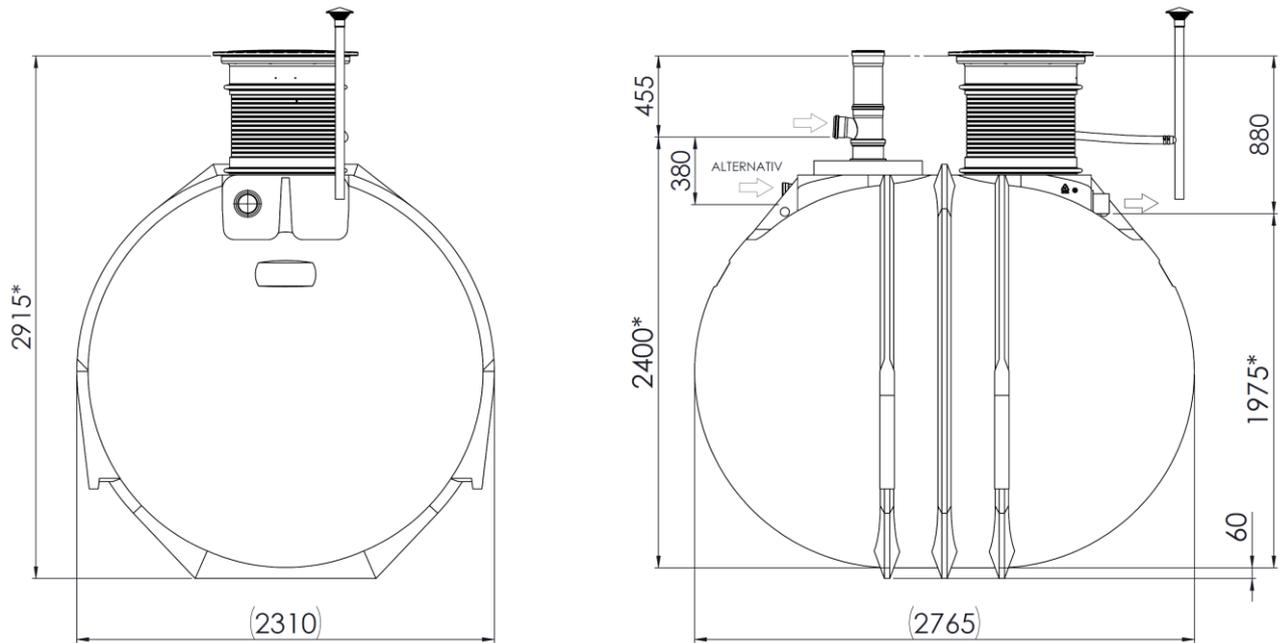
* production-related deviations in a range of -4/+1 cm

Solido SMART EBL-52 (recom. 10 PE, max. 12 PE)



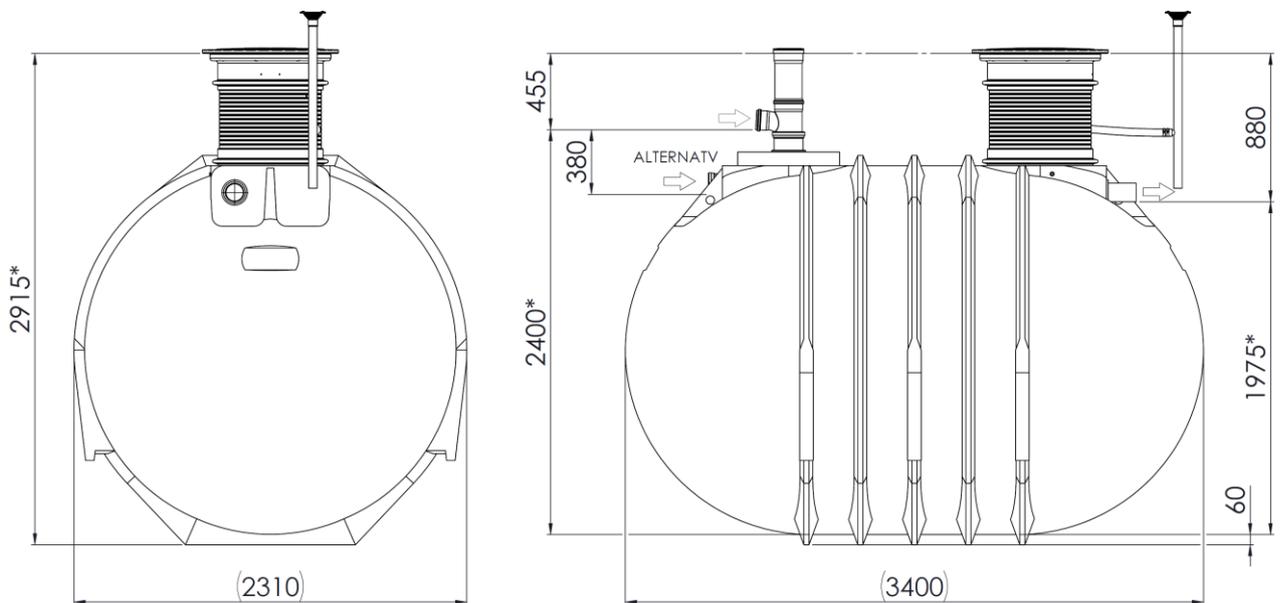
* production-related deviations in a range of -4/+1 cm

Solido SMART EBL-76 (recom.14 PE, max. 18 PE)



* production-related deviations in a range of -4/+1 cm

Solido SMART EBL-99 (recom. 20 PE, max. 25 PE)



* production-related deviations in a range of -4/+1 cm



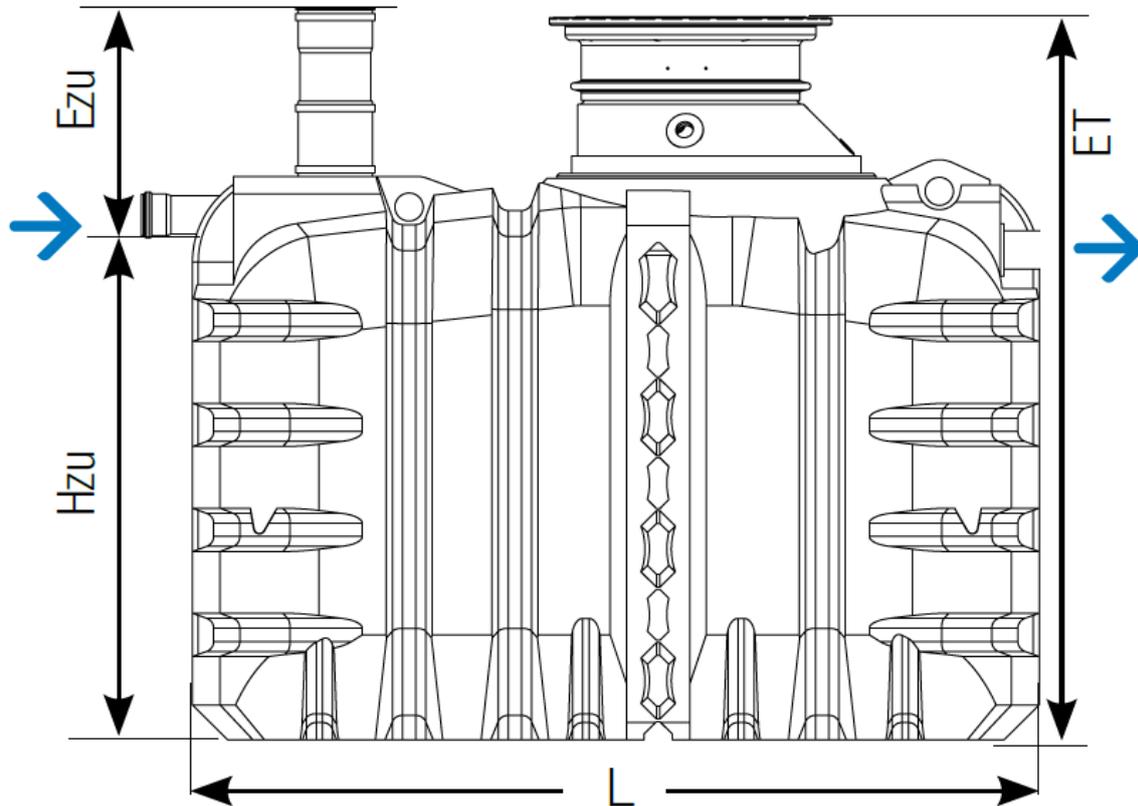
NOTE:

- Please contact us for information about multiple container plants!

4.2 Solido SMART EM2 in two-chamber rectangular tank M2

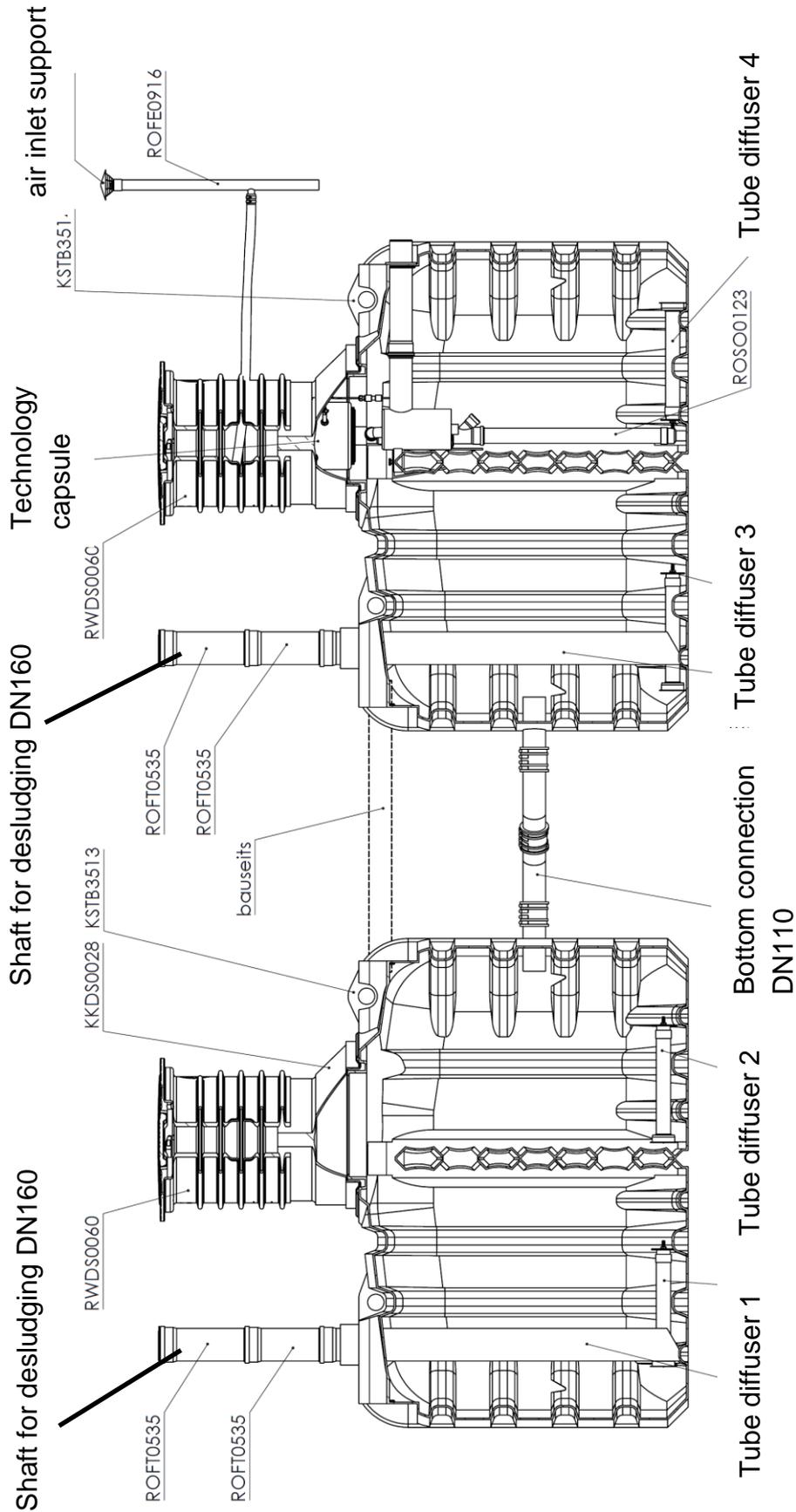


NOTE: For installation in groundwater up to shoulder of tank



Tank M2 (rectangular)			3500	4500	6000
PE			7	9	12
Weight	kg		185	250	330
Length (L)	cm		240	307	340
Width	cm		124	122	122
Height (ET)	cm	min.	206	206	240
		max	220	220	249
Inlet to ground level (Ezu)	cm	min.	61	61	67
		max	75	75	76
Inlet to bottom (Hzu)	cm		145	145	168
Inlet – Outlet (level difference)	cm		10	10	8
Diagonal length	cm		240	305	336

**4.3 Solido SMART in two-chamber rectangular tank M2 –
two container plant**



Solido SMART			EM2-35X2	EM2-45x2	EM2-60X2
Tank type			2 x 3500	2x 4500	2 x 6000
recommended PE			2-12	4-16	6-20
max. PE			16	20	24
Length	cm		585	714	783
Width	cm		124	122	122
Height	cm		256*	256	276
Inlet to ground level	cm		111	111	111
Inlet to bottom	cm		145	145	166



NOTE:

Please contact us for more information about multiple container plants!

5 CE DECLARATION OF PERFORMANCE



Declaration of Performance (according to Construction Product Regulation CPR No. 305/2011)

DOKK5452E 070222

- | | | |
|---|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Name of product | Solido SMART E / SMART C: Packaged domestic SBR-wastewater treatment plants made of PE rotomoulding |
| 2 | Product identification | EBL / CBL -26 / -30 / -45 / -52 / -76 / -99: one-tank plants BL-type
EBL-76X2 / -99X2 / -99X3 / -99X4²: multiple-tank plants BL-type
<small>(² system type > 50 PE and therefore only based on EN 12566-3)</small>
EM2 / CM2 -35 / -45 / -60: one-tank plants M2-type
EM2-35X2 / -45X2 / -60X2: multiple tank plants M2-type |
| 3 | Intended use | Underground treatment (no vehicle load, outside of buildings) of faecal water and organic effluent for up to 50 PE |
| 4 | Manufacturer | Premier Tech Water and Environment GmbH
Am Gammgraben 2, 19258 Boizenburg, Germany |
| 5 | Authorized person | Marco Rumberg (managing director), rumm@premiertech.com |
| 6 | System of assessment | 3 |
| 7 | Harmonized standard | EN 12566-3:2005+A1:2009+A2:2013 first year of CE-declaration: 2016 |
| 8 | Notified body | PIA GmbH (NB 1739) performed the initial inspection in the system of assessment 3 and created several test report, e.g. No PIA2015-239B22.e |

9	treatment efficiency	influent		effluent mg/l				effluent %		
		Ø	Ø	min	max	Ø	max	min		
	COD	796 mg/l	39 mg/l	< 15 mg/l	79 mg/l	95,1%	99,2%	91,9%		
	BOD ₅	333 mg/l	5 mg/l	< 3 mg/l	8 mg/l	98,5%	99,6%	97,3%		
	suspended solids	448 mg/l	13 mg/l	6 mg/l	23 mg/l	97,1%	98,7%	92,7%		
	NH ₄ -N	35 mg/l	0,7 mg/l	< 0,1 mg/l	5,6 mg/l	98,0%	99,9%	83,1%		
	N _{anorg}		8,2 mg/l	2,5 mg/l	20,1 mg/l					
	N _{tot}	59 mg/l	10 mg/l	3 mg/l	27 mg/l	83,1%	96,2%	50,0%		
	P _{tot}	7 mg/l	2,3 mg/l	0,4 mg/l	4,8 mg/l	68,5%	95,1%	35,1%		
	Solido SMART nominal load: 0,06 kg BOD ₅ /PE	PE max.	PE recommend.	sludge storage cap. [m³]	daily flow [m³/d]	peak flow [m³/12h]	peak flow [m³/h]	power consumption [kWh/d]	max H water table from base of plant¹ [WET m]	
	EBL-26* / CBL-26	5 EW	4 EW	1,30	0,60	0,60	0,40	0,56	0,70	
	EBL-30 / CBL-30	6 EW	5 EW	1,65	0,75	0,75	0,45	0,68	0,70	
	EBL-45 / CBL-45	9 EW	7 EW	2,30	1,05	0,95	0,50	0,92	0,85	
	EBL-52 / CBL-52(max.10)	12 EW	10 EW	3,10	1,50	1,25	0,60	1,48	1,00	
	EBL-76	18 EW	14 EW	4,10	2,10	1,85	0,75	2,04	1,00	
	EBL-99	25 EW	20 EW	5,65	3,00	2,60	0,95	2,88	1,00	
	EBL-76X2	40 EW	28 EW	8,20	4,20	3,70	1,50	4,00	1,00	
	EBL-99X2	50 EW	40 EW	11,30	6,00	5,20	1,90	5,68	1,00	
	EBL-99X3	75 EW	50 EW	12,30	7,50	7,80	2,85	7,08	1,00	
	EBL-99X4 ²	100 EW	80 EW	22,60	15,00	10,40	3,80	11,28	1,00	
	EM2-35 / CM2-35	8 EW	6 EW	2,05	0,90	0,85	0,45	0,80	1,40	
	EM2-45 / CM2-45	10 EW	8 EW	2,65	1,20	1,05	0,50	1,04	1,40	
	EM2-60 / CM2-60(max.10)	12 EW	10 EW	3,30	1,50	1,25	0,60	1,48	1,65	
	EM2-35X2	16 EW	12 EW	4,10	1,80	1,70	0,90	1,76	1,40	
	EM2-45X2	20 EW	16 EW	5,30	2,40	2,10	1,00	2,32	1,40	
	EM2-60X2	24 EW	20 EW	6,60	3,00	2,50	1,20	2,88	1,65	
10	Number of desludging	1 (after 23 weeks EBL-26* with 0,19 m ³ sludge storage / PE)								
11	Water tightness (test with water)	pass								
12	Structural behaviour (pit-test)	pass (WET conditions) ¹ testing with an earth cover of 1,00m								
13	Durability	pass								
14	Reaction on fire	E								
15	Release of hazardous materials	pass								

* EBL-26 was tested at 6 PE (0,90 m³/d) with a load of 0,30 kg BOD₅/d

The manufacturer according to nr.4 is solely responsible for this declaration.

This declaration confirms compliance with the named regulations, directives and standards. It does not guarantee for product properties. All provided safety advices and technical documentations for installation, commissioning, operation and maintenance must be regarded.

Treatment efficiency in the field depends on quality and flow pattern of raw wastewater.

Signed for and on behalf of the manufacturer by: Boizenburg, February 2022

6 CE DECLARATION OF CONFORMITY



EU declaration of conformity

No. DOKK5453E 260521

Premier Tech Water and Environment GmbH (authorised distributor)
Am Gammgraben 2
19258 Boizenburg

confirm hereby that the packaged domestic wastewater treatment plants for up to 50 PT in plastic container

Typ Solido SMART

comply with these EU-directives:

2006/42/EG	Machinery Directive*
2014/30/EU	Electromagnetic compatibility
2014/35/EU	Low voltage equipment
2011/65/EU	ROHS Directive
305/2011/EU	Construction products

*In the context of an evaluation process it was proved, that all relevant aspects regarding safety and health of Appendix I, Machinery Directive are met.

It was proved, that the following harmonised European standards are met:

EN ISO 12100-1-2:2003/A1:2009	Safety of machinery: Basic concepts, technical principles
EN ISO 13849-1-2:2008-09	Safety of machinery: Safety-related parts of control systems
EN ISO 14121-1:2007	Safety of machinery: Principles for risk assessment
EN 61000-3-2:2014	Electromagnetic compatibility: Limits for harmonic currents
EN 61000-6-1:2007	Electromagnetic compatibility: Interference immunity
EN 61000-6-3:2006	Electromagnetic compatibility: Emitted interference
EN 60204-1:2007	Safety of machinery - Electrical equipment of machines
EN 12566-3:2005+A1:2009+A2:2013	Small wastewater treatment plants for up to 50 PT

This declaration confirms compliance with the named directives and standards.

It does not guarantee for any properties of the product. All provided safety advices, technical documentation and guides for mounting, installation, commissioning, operation and maintenance must be regarded.

Boizenburg, May 2021

Date of first marking: February 15, 2016

Marco Rumberg, managing director Premier Tech Water and Environment GmbH and Documentation Agent

NOTES

Disclaimer

Subject to technical alterations without notice. All rights reserved. Premier Tech is not liable for printing errors. The contents of the technical documentation are part of the warranty conditions. All applicable standards and other guidelines, as well as accident prevention regulations, must be observed during planning and installation of the product.

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