Tasmanian Government

Certificate of Accreditation

On-Site Waste Water Management System

This Certificate of Accreditation is hereby issued by the Minister for Building and Construction pursuant to Section 59(2) of the *Building Act 2000* and the Plumbing Code of Australia as applicable.

System: Graf EPro 15 Three O+

Manufacturer or Supplier: Graf Australia PTY LTD

Of: 27 Deakin St, Brendale QLD 4500

This is to certify that the Graf Australia PTY LTD (Graf EPro 15 Three O+) as described in Schedule 1, has been accredited for use as an on-site waste water management system in single dwellings (within plumbing installations in Tasmania). This accreditation is subject to the conditions and permitted uses specified in Schedule 2, and the Plumbing Code of Australia as applicable.

Dale Webster

Director of Building Control

Delegate of the Minister for Building and Construction

Date of Issue: 7 November 2016 Certificate Number: DOC/16/69061

This Certificate of Accreditation is valid until 7 November 2021 subject to conditions unless withdrawn earlier by the Director

SCHEDULE 1 – SYSTEM DESCRIPTION

(Informative)

Summary of treatment process

The GRAF Modular Treatment System is a fully biological sewage treatment plant which works on the principle of the SBR method (sequencing batch reactor procedure).

The plant principally consists of 3 stages:

- Primary Sludge stage with an integrated pre-buffer
- Activated Sludge stage in sequencing batch operation
- (SBR chamber)
- Disinfection and Pump-out stage (optional)

These 3 stages are split into 6 treatment phases (= 1 cycle).

The Primary Sludge reservoir chamber with its integrated buffer has the following functions:

- Storage of primary and secondary sludge.
- Retention of sediment substances and floating substances.
- Storage of water influx.
- Adjustment of variations related to quantity or concentration in the influx of sewage water.

Operation of the plant is made by micro-processing control which activates the air compressor and air diffusion for the different lifters via magnetic valves. The process is a sequence of 6 phases which proceed in succession and are repeated usually 4 times a day.

Charging phase

The raw sewage water which is temporarily stored in the primary sludge reservoir chamber is fed into the SBR chamber by a compressed air lift system. This air lift is designed in such a way that only water without solid substances is pumped.

Aeration phase

In this phase the sewage water is aerated and mixed. Aeration is made by membrane pipe or plate diffusers which are mounted at the chamber bottom. The aeration equipment is supplied with compressed ambient air generated by an air compressor located in the switch cabinet. Aeration is intermittent. It typically features 4 minutes of aeration followed by 6 minutes of non-aeration over a period of 250 minutes.

Two effects are caused by aeration:

- The micro-organisms of the activated sludge are supplied with oxygen which is required for their metabolic activity and thus for the reduction of pollutants
- There is an intense contact between sewage water and bacteria.

Sedimentation phase

This phase is a rest phase in which no aeration takes place. The activated sludge settles with gravity. A clear water zone forms at the top and a sludge layer at the bottom. Any floating sludge is on top of the clear water zone.

Clearwater extraction phase

In this phase, the biologically cleaned waste water (clear water) is pumped out of the SBR chamber to the pump out chamber. The air lift system is designed not to pump out any floating sludge on top of the clear water layer. A minimum water level is maintained in the SBR chamber without any further components.

Excess sludge extraction phase

In this phase, excess activated sludge is pumped by the air lift system from the SBR chamber to the sludge reservoir chamber, where it is stored. After completion of phase 5 the clarification process begins again starting with phase 1.

Batch cycles

Usually 4 cycles per day occur as described above. The system is equipped with an automatic under load function, where by the system if no inflow is detected during a cycle can engage a pause in the upcoming batch or cycle. This can occur a maximum of 3 cycles in 24 hours. An individual adjustment of cycle times and cycle numbers is possible after consulting Graf Australia. This adjustment must only be made by an authorized maintenance company. It is possible to reset the plant manually to the vacation operation mode. The vacation operation is an extremely reduced mode of operation of the plant during longer periods without sewage water discharge.

SCHEDULE 2 – CONDITIONS OF ACCREDITATION

(Normative)

Definitions

Where included in this Certificate of Accreditation or Schedules:

AS/NZS 1547 means Australian Standard AS/NZS 1547:2012 On-site domestic-wastewater management;

AS/NZS 1546.3 means Australian Standard AS/NZS 1546.3:2008 On-site domestic wastewater treatment units Part 3: Aerated wastewater treatment systems.

AS/NZS 3000 means Australian Standard AS/NZS 3000:2007 Electrical installations.

AS/NZS 5667 means Australian Standard AS/NZS 5667.1:1998 Water quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and preservation and handling of samples.

BOD_5 means 5-day Biochemical Oxygen Demand.

Council means the Municipal Council having jurisdiction.

Commissioned means when the test results from a NATA Certified Laboratory show that the water quality requirements for the *system* have been met and all pre-commissioning tests have been carried out in accordance with AS/NZS 1547 on all associated equipment including the land application system or as required by the conditions of *permit*.

Designer means a person who is accredited under the *Building Act 2000* and who has a specialty in the area of designing on-site waste water management system installations.

Director means the Director of Building Control.

DO means dissolved oxygen

EC means electrical conductivity.

E. coli means Escherichia coli of the family Enterobacteriaceae which is a bacterium used in public health as an indicator of faecal pollution.

ELG means Emission Limit Guidelines for Sewage Treatment Plants that Discharge Pollutants in Fresh and Marine Waters: 2001

EP means Equivalent Population or Equivalent Persons.

FAC means free available chlorine.

g/m^3 means grams per cubic metre, which is equivalent to milligrams per litre (mg/L).

Informative defines the application of Schedule 1, which is for information and guidance only.

NATA means National Association of Testing Authorities.

Normative defines the application of Schedule 2, which is an integral part of the Certificate of Accreditation (CoA).

PCA means Volume Three of the National Construction Code series (Plumbing Code of Australia).

Permit means a Permit issued by the council Permit Authority pursuant to section 82 of the *Building Act 2000*.

Permit Authority means a person or body authorised for that purpose by the council of the municipal area in which the on-site waste water management system is installed.

pH means potential/power of Hydrogen (e.g. how acidic or alkaline the wastewater is).

Plumber means a person who holds an appropriate class of licence under the *Occupational Licensing Act 2005* as a Plumber Practitioner (Certifier).

Supplier means the party that is responsible for ensuring that products meet and, if applicable, continue to meet, the requirements on which the certification is based. The supplier for the Graf EPro15 is Graf Australia Pty Ltd.

System means Graf EPro15 Three O+ model only

TN means Total Nitrogen.

TP means Total Phosphorus.

TSS means Total Suspended Solids.

General

1. This CoA supersedes all previously issued certificates of accreditation; may be withdrawn by the *Director* at any time; and is not transferable.
2. The *system* must be supplied, constructed and installed in accordance with the design submitted by the *supplier* and accredited by the *Director*.
3. The *system* must not be installed or used in a plumbing installation other than in accordance with the conditions of *permit* issued by the *permit and this accreditation.*
4. Each system must be permanently and legibly marked on a non-corrosive metal plaque or equivalent, attached to the unit in a readily visible position after installation. The plaque must contain the following information:
   a. the manufacturer's name or registered mark;
   b. model number or designation;
   c. the month and year of manufacture;
   d. the capacity in litres/week;
   e. top load limitations; and
   f. weight of unit (metric).
5. The *supplier* must provide the owner or owner's agent with manuals containing the following:
   g. statement of warranty
   h. statement of service life
   i.emergency contact number
   j.procedures to be followed in the event of a system failure
   k. the treatment process
   l. on-going operation, monitoring and maintenance procedures
   m. installation instructions
   n. detailed servicing instructions
   o. user instructions
   p. service report form

q. engineering drawings (minimum A3 format)

r. detailed system specifications

s. CoA and associated Schedules

6. Any proposed modifications to the *system's* specified processes, equipment, materials, fittings or documentation (including manuals) must have prior authorisation in writing from the *Director*.

Note: Any changes may be subject to additional verification or testing.

7. The *supplier* is to keep a register of all installed systems in Tasmania.

8. At each anniversary of the accreditation date the *supplier* must submit to the *Director* a list of all *systems* installed in Tasmania.

9. The *systems* must not be installed where the influent temperature falls outside the range of 10° C and 40° C.

10. Each installation must be inspected and checked by the designer or the designer's agent. The designer, on completion, is to certify that the installation has been constructed, installed and commissioned in accordance with its design, the conditions of accreditation and conditions of *permit*.

11. Where discharging treated effluent to a land application system by shallow subsurface drip irrigation a lockable sampling tap or gate valve must be provided on the outlet pipe leading to the irrigation system.

12. Where the transfer of influent or effluent to or within the treatment facility via collection wells is provided for by pumping, each collection well must be equipped with a permanently installed high-level alarm.

13. The Graf EPro15 Three +O Home Sewage System requires little maintenance and requires maintenance servicing 6 monthly (2 x annually)

Performance

14. For land application systems designed to AS/NZS 1547, performance monitoring of effluent discharged from the *system* when tested must not exceed the following water quality limits:

t. For all discharges to land:

i. 90% of the samples must have BOD less than or equal to 20 g/m³ with no sample greater than 30 g/m³

ii. 90% of the samples must have TSS less than or equal to 30 g/m³ with no sample greater than 45 g/m³

iii. Phosphorus Reduction of 54% or less than 3mg/L

iv. Nitrogen Reduction of 50% or less than 24mg/L

Permitted uses

The effluent is suitable for land application by way of the following forms:

a. sub-surface by:

i. sub-surface drip irrigation in accordance with the relevant provisions of AS/NZS 1547;

ii. trenches, beds, mounds evapo-transpiration systems in accordance with the relevant provisions of AS/NZS 1547

Installation

15. The installation and operation of the system must comply with the conditions of *permit and this accreditation.*

16. The holder of a *permit* to install a *system* is to engage the installation designer to certify that the installation has been constructed, installed and commissioned in accordance with the conditions of *permit.*

17. Where effluent is pumped from the *system* to an approved land application system a lockable sampling tap or gate valve is to be fitted downstream of the effluent pump serving the irrigation system. Where alternate means for effluent sampling has been agreed to by the permit authority details must be provided in the *permit* documents.

18. To verify that the plant is commissioned, sampling must be carried out, by a council approved person, for BOD5, TSS, E. coli, FAC and Nitrate/Phosphate where applicable. The samples are to be tested and reported on by a NATA accredited laboratory at the first service after system start-up. If samples show the system has not achieved the required performance parameters sampling is to continue at the frequency determined by the permit authority.

Design Parameters – Hydraulic, Organic and Nutrient Loading

1	MODEL	Graf EPro15 Three O+	ADVANCED SBR Treatment
2	MANUFACTUER	Graf Australia Pty Ltd	Graf GmbH
3	DESIGN PARAMETERS Hydraulic Organic Nutrient	Maximum Hydraulic Load: Equivalent Persons (EP): BOD5: Total Suspended Solids: Total Nitrogen: Total Phosphorous:	1500l/day 10 20 g/m^3 30 g/m^3 24mg/L (50%) 3mg/L (54%)
4	Tank	GRAF CARAT 4800L	Total Volume 4.4L Width 1.99m Length 2.28m Water Depth 1.45m Partition Primary : SBR at 50% height 1.61m
	Primary Chamber 1st stage	Primary Treatment + Buffer + Sludge Storage	required Water Depth 1.29m required Volume 1.93m3 existing Total Volume 2.15m3
6	SBR Chamber 2nd stage	Aeration + clarification + clear water discharge + sludge return	required average volume 1.45m **Before Load Phase** required minimum volume 1.3m3 required minimum water depth .92m selected minimum water depth 1.00m selected average volume 1.60m3 **After Load Phase** existing volume 1.75m3 existing water depth 1.17m total water depth 1/45m
7	Air Compressor	Fine bubble diffusion in SBR + water transfer	Operation total time 9.7 hours

Operating and peak design capacity

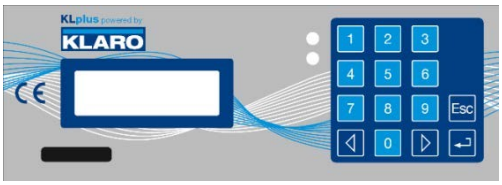
1	Primary Chamber	Operating Capacity Peak Capacity	1300L + 850L = 2150L
2	SBR Chamber	Operating Capacity Peak Capacity	1500L + 750L = 2250L
3	Pump Well	Operating Low level Peak Capacity ie. > h/level	300L 900L

Description of components including construction material

COMPONENTS		
TANK	**TANK Components incl LIDS** Graf Carat 4800L injection moulded underground tank **INTERNAL Airlift Unit** wastewater transfer system between phases **1** **INLET & OUTLET AIR HOSE** **In tank FITTINGS**	Constructed from Polypropylene ISO9001 manufacturing standard Graf Blow moulded polyethylene PVC 100mm DWV flexible reinforced poly hose 316 stainless steel
ELECTRICAL	**AIR COMPRESSOR EFFLUENT PUMP CONTROLLER** LCD screen -indicators for Power out Compressor Solenoid Fault/temp alarm	NITTO LA80B 86W-240V 80LPM Aluminium Submersible Zenox ZHS-040 Manufactured from Poly and Stainless Steel GRAF KL Plus – microchip real time SBR controller – Audio visual alarm
CONTROL CABINET	**GRAF External** Cabinet **Cooling Fan** Solenoid Valves	GRAF Injection Moulded PE Plastic & metal; thermostatically controlled 240V
ALARM SYSTEM	**Per GRAF Control Unit**	240V main unit – LED power/pump on /high level/system fault/aux Internal alarm plate. Floats – 12volt
REMOTE ALARM PLATE	**Standard HPM wall style plate**	Power + 3 alarm status, LEDs, Audible Buzzer Mute Button with 24 hour reset

Details of pumps, controls, electrical panels, alarm systems and aerators and controls

Controller



Display of operating states

The operating state of the plant is displayed by the light-emitting diode (green = operation / red = fault) and as text on the LC screen. In the automatic mode, the liquid crystal display indicates the current working phase and the remaining time of this work step. If a fault occurs, the message at which component the fault occurred (e.g. fault compressor) appears on the liquid crystal display.

Following phases are displayed:

Performed process	KL plus display
Valve 1 is driven; the feed lift conveys wastewater to be treated from the sludge storage into the bioreactor.	charging
Valve 2 is intermittently driven; the activated sludge is briefly mixed with the wastewater. This process is followed by long pauses (reaction times).	denitrification
Valve 2 is driven; the bioreactor is aerated at intervals.	aeration
No valve is driven, the activated sludge settles in the bioreactor.	sedimentation
Valve 3 is driven; the Clearwater is pumped into the outlet.	discharging
Valve 4 is driven; the reactor pumps the excess sludge into the Primary Chamber.	sludge return
Valve 2 is driven; the bioreactor is aerated at intervals (significantly less than during the “aeration" phase).	cycle pause
Valve 2 is driven; the bioreactor is aerated at intervals, no purification cycle is processed.	Vacation operation
Display of the remaining time.	rest: XXXX.XXm

Alarms – GRAF KL Plus Controller

Technical faults during the plant operation are displayed both visually and acoustically. The acoustic fault signal of the control can be switched off by pressing **ESCAPE**. The visual error display is only acknowledged after pressing the **ESCAPE** key once again. In the event of a power supply outage, an integrated battery-supplied power outage warning device sends alternately an acoustic warning signal and a visual message.

Specification

Remote Alarm	Standard HPM and wall plate style Power and 3 alarm status LEDs / Buzzer for audible alarm mute button with 24 hour reset

Disc Air Diffusers

Jetflex Disc Diffuser – HD 340

Construction Material EPDM membrane diffuser

Pump – effluent chamber – submersible

Zenox	Power (w)	Max Head (m)	Max Flow (l/m)	Outlet Size	Weight (kg)
ZHS - 040	400	20	180	1 ¼ "	13

The Graf EPro15 Three +O Home Sewage System requires little maintenance and requires maintenance servicing 6 monthly (2 x annually)

Required intervals for wastage of sludge

Only the faecal sludge that accumulates in the first chamber is removed. It consists of sedimenting residues resulting from the wastewater treatment. In small wastewater treatment plants, the faecal / sewage sludge consists of dead micro-organisms of the biological treatment stage and the settled solids resulting from the pre-cleaning. When the sludge storage reaches 70 % of the Primary Capacity a pump out is required.

Maintenance and monitoring

19. The *system* must be operated and maintained to ensure it performs continuously and without any intervention between inspections carried out by the council approved servicing contractor.
20. The owner of the system must enter into and maintain a maintenance contract an approved waste water treatment servicing contractor in accordance with the conditions of *permit and this accreditation.*
21. The system to be desludged at least once every 5 years or at the advice of the maintenance contractor
22. A record of the Graf service report must be kept by the council approved maintenance contractor and supplied to Graf, the local authority and the system owner; as per the recommended service interval
23. The approved maintenance contractor when servicing the system as per the recommended service intervals, should fully complete all information required on the Graf service report
24. System monitoring and reporting in addition to the *suppliers* maintenance schedule must include the following:
    a. weather conditions
    b. effluent temperature and malodour
    c. biomass colour and growth on aerotors

d. visual appearance of effluent in Humus tank
e. alarm system;
f. function of sludge return system from Humus tank;
g. sludge level and desludging;
h. Saran filter condition or replacement;
i. water meter reading (where applicable);
j. land application system (where applicable);
k. irrigation area, irrigation fittings and filters; and
l. on-site testing for FAC, pH and dissolved oxygen.

Reporting

25. Where any systems have been found not to operate satisfactorily during their service life, and as a result require modification to achieve the required performance requirements, in particular, water quality limits, the installed *systems* are to be modified by the Graf agent (supplier) or Graf Australia accordingly at no cost to the owner subject to written authorization by the owner and the *Director*.
26. Where anniversary testing of a system is required by the *Director,* the supplier, at their own expense, must arrange for the selected systems to be inspected and sampled a director their nominated NATA accredited laboratory. Sampling may include BOD_5; DO; E. coli; FAC; pH; TN; TP; and TSS. The results of these parameters must be reported to the *Director* by:
    a. address of premises
    b. date inspected and sampled
    c. sample type and identification number; and
    d. be accompanied with a copy of the *system's* service history.
27. In the event of failure to comply with the water quality limits specified in the *permit*, sampling for BOD_5, E. coli and FAC must be carried out at the frequency required by the *permit authority* until the plant is recommissioned.
28. The method of preserving and the handling of samples taken from the *system* must satisfy the relevant requirements of AS/NZS 5667.

Technical data sheet for GRAF EPro15 Three / Three + O Wastewater Treatment System

Graf Plastics Australia PTY Limited
23 Success Way
Henderson WA 6166
Tel. (+61) 1300 131 971
Email: info@grafplasticsaustralia.com.au

plant size **10 EP**

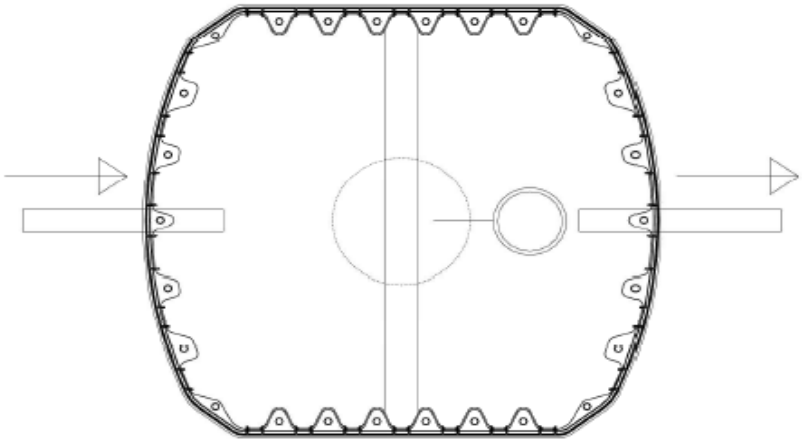
Maximum hydraulic load	Qd	1,50	KL/d
Maximum organic load	Bd	0,60	kg/d

Design according to EN 12566-3

effluent values:

	BOD5	COD	SS	NH4N	Ntot	P	colif. germs
<	20 mg/l		30 mg/l				

Total tank capacity:					4,3 m³
air compressor	type:	piston			LA 80
	installed motor power				0,08 kW
	power consumption at 0 bar				0,09 kW
	motor design			50 Hz 1~	230 V
calculated maximum daily operating time					14,5 h/d



symbolic representation

stage	number	container, material	diameter width [m]	length [m]	water depth maximum [m]	volume maximum [m³]
ss + b	1/2	Carat 4.800L, PP	1,99	2,28	1,45	2,1
sbr	1/2	Carat 4.800L, PP	1,99	2,28	1,45	2,1

www.grafplasticaustralia.com.au

calculation for GRAF Professional wastewater treatment plant according to EN 12566-3

basic data / project data

customer	Graf Plastics Australia PTY Limited	date	26.09.2016
project		editor	juk
type of waste water	domestic		
specialties			

base of calculation

	BOD5	COD	SS	NH4N	Ntot	P	colif. germs
outlet	< 20 mg/l		< 30 mg/l				

population equivalent				10	EP
wastewater	Q_d	at Q_{EP}	150 l/(EP*d)	1,50	KL/d
waste load	BOD5	B_d	60 g/(EP*d)	0,60	kg/d
waste load	COD		120 g/(EP*d)	1,2	kg/d
cleaning cycles per day				4	

1. Stage: sludge storage and buffer

type of container			Carat 4.800L	
number of containers / proportion of chambers			50%	
width			1,99	m
length			2,28	m
water depth			1,45	m
partition height			1,61	m
total area			2,27	m²
sludge storage (ss)	required volume	10EPx250l/(EP*a)x(6/12) =	1,25	m³
	required water depth		0,89	m
	selected water depth		1,06	m
	removal interval		6	months
	required water depth		0,89	m
	selected water depth		1,06	m
buffer (b)	percentage of daily load		40%	
	required volume		0,60	m³
	required water depth		0,40	m
	selected water depth		0,40	m
	selected volume	40% =	0,60	m³
overall (ss + b)	required water depth		1,24	m
	required volume	1,25m³ + 0,6m³ =	1,85	m³
	existing total volume	1,54m³ + 0,6m³ =	2,15	m³

2. Stage: biological treatment (SBR)

type of container			Carat 4.800L	
number of containers / proportion of chambers			50%	
width			1,99	m
length			2,28	m
water depth			1,45	m
total area			2,27	m²
reactor	required average volume		1,82	m^3
before loading phase	required minimum volume		1,63	m^3
	required minimum water depth		1,10	m
	selected minimum water depth		1,11	m
	selected average volume		1,83	m^3
after loading phase	existing volume		2,01	m^3
	existing water depth		1,35	m
	total water depth		1,45	m
existing total volume	V_{BB}		2,15	m^3
BOD5 volume load	B_R		0,33	kg/(KL*d)

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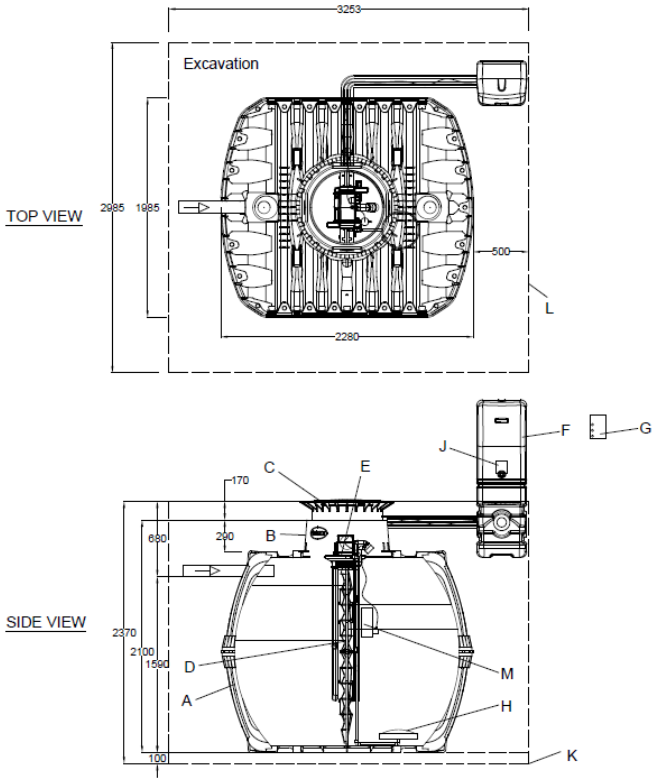

A Carat Tank 4800l
B Tank Dome Mini
C Tele Lid Mini
D Baffle
E Air Lift / Aeration
F Outdoor Cabinet Poly
G Internal Alarm Plate
H Air Diffusor
J Cabinet Ventilation Fan
K 100 mm Compacted Base Material
L Excavation
M Outlet with pump

Graf EPro15 Three +O 1500 L/d (10PE) - 1x Carat S 4800L

Artikel-Nr. 20.0004
product no.
article no.
articulo no.

drawn	UKO	weight	.	revision		
date	2016/09/19	tolerance	+/- 3%	scale	MASZ	units mm [inch] gal. = US gal.

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