NORHAM

PATENTED PRODUCT
EU N°2687633

FLO-PLUG®

VALVES

Protection for basin floors

- **Innovative :** patented product with no moving parts.
- **High-performance :** for rising groundwater levels, flow rate up to 4000 l/h.
- **Highly resistant** to pressure, corrosion, mechanical stress, and UV. etc.

NORHAM

afaq ISO 9001 Qualité AFNOR CERTIFICATION N° 1997 | 8004.7

130 RUE DES SAULES — 26260 SAINT DONAT SUR L'HERBASSE - FRANCE
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FLO-PLUG®

VALVES

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FLO-PLUG®
VALVES

INTRODUCTION

The **FLO-PLUG®** tank floor protection valves were developed and patented by NORHAM to provide a professional solution for **preventing mechanical damage** to structures caused by rising groundwater or gas.

FLO-PLUG® valves are compact, lightweight and quick and easy to install.

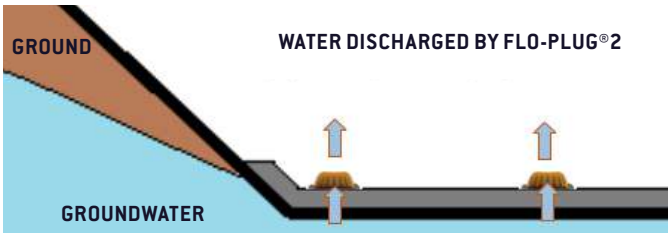
Once installed, they require **very little maintenance** (checking the product and cleaning the seal once or twice a year, depending on the load on the valve).

AREA OF USE

FLO-PLUG® tank floor protection valves protect tank structures against the risk of mechanical damage caused by rising groundwater or gas.

These valves release pressure into the interior of the tank, thus reducing the induced pressure underneath the tank. In the other direction, they prevent the water in the tank from infiltrating and polluting the groundwater(1).

They are designed for retention tanks, vats, etc. and are suitable for all types of ground: hard (concrete) or soft (geomembrane)(2).



Profile of a water table drained by FLO-PLUG® 2

*(1) See **Operational Diagram**, available on page 6.*

(2) In the case of a geomembrane, a density weight of 2.0 over 30 cm and the use of a spacer are recommended. Profile of groundwater table drained by FLO-PLUG® 2 valves.

TECHNICAL DATA

- **Pressure resistance :** 1,0 bar (10 mWG) ;
- **Pressure drop :** 60 mbars (60 cmWE) for a flow rate of 4000 l/h ;
  (Pressure drop = pressure of the groundwater or gas required to open the**FLO-PLUG®**).

SELF-CLEANING
any debris is flushed away by rising water and gas.

HOMOPOLYMER PP BODY WITH UV PROTECTION
The non-stick material minimises the formation of deposits.

MEMBRANE DESIGN
helps the groundwater to rise and optimises watertightness inside the tank,

MONOBLOCK EPDM MEMBRANE
enhances the durability of **FLO-PLUG®**.

BOTTOM VIEW

RIBBED RUBBER
Ensures perfect sealing between the base slab (or spacer) and the **FLO-PLUG®**.

PATENTED SYSTEM
for flow rates up to 4000 l/h.

PP HOMOPOLYMER FLANGES
ress the membrane against the body to hold the valve in place.

Dimensions in mm. Weight in kg. Operating pressure (W_p) in bar. Non-contractual visuals.

FLO-PLUG®
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MATERIALS QUALITY

Designed in UV-protected homopolymer PP + EPDM, materials chosen for their high resistance to pressure, corrosion, mechanical stress, UV exposure, wastewater, temperatures from -40 °C to +95 °C.

- **Body and flange :** homopolymer PP with UV protection ;
- **Membrane :** made of EPDM 40 Sh, WG according to NF-EN 681-1 standard(1).

(1) NF-EN 681-1: Specifications for elastomers used in pipe fittings and seals.

R&D STUDY

FLO-PLUG® valves are designed by **our R&D department**.

The department has access to CAD tools for **modelling the hydraulic and mechanical behaviour of the valves.**

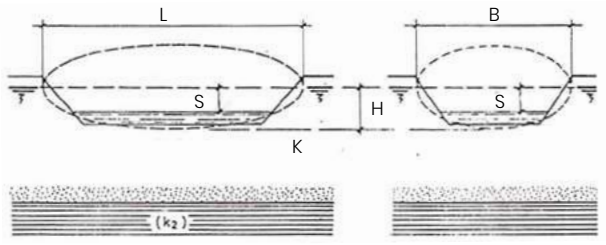
They are also tested on test benches to validate their behaviour under maximum pressure.

SIZING AID

REQUIRED DATA

To determine the number of valves in a structure, the following data must be known:

- The bottom surface area **S**
- the length at the top of the embankment **L**
- the width at the top of the embankment **B**
- the height of the tank **H**
- soil permeability(2) **k**.



Calculation theory extracted from the underground hydraulics checklist (CASSAN)

The number of **FLO-PLUG®** units to be installed is then determined by our Technical Department, which prepares a sizing note based on the following two criteria :

- Criterion 1 : the distribution of forces according to the configuration in which the valves are installed (basin, sump, etc.).
- Criterion 2 : the hydrogeology of the soil, by calculating the flow rate required to drain under the tank.

In order for us to prepare a sizing note that best suits the configuration, it is imperative to provide us with :

- detailed plans of the tank, basin, etc.
- soil permeability (if this information is not known, we will provide a recommendation based on Criterion 1. We will indicate the maximum permeability of the soil for this number of valves. If it turns out that the permeability is higher, a new, more suitable note will be required).

(2) Permeability is the property of the soil to transmit water: the more permeable the soil, the faster the water moves towards the bottom of the tank, and the greater the flow required to drain the water table and prevent rising. A soil survey and infiltration tests are required to define the system.

FLO-PLUG®

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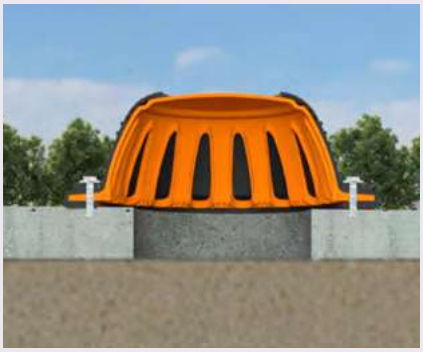
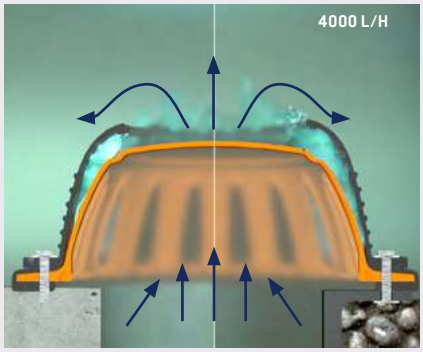
OPERATING DIAGRAM

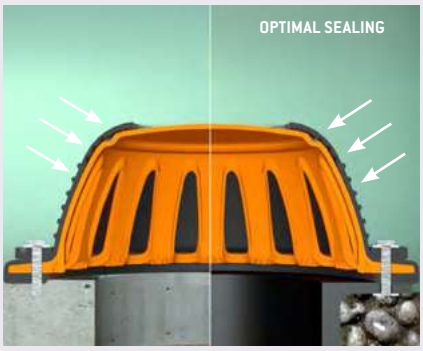
Protects buried structures against mechanical damage in the event of rising groundwater or gas.



Phase 0 : empty tank.



Phase 1 : rising groundwater.



Phase 2 : tank full, groundwater withdrawal.

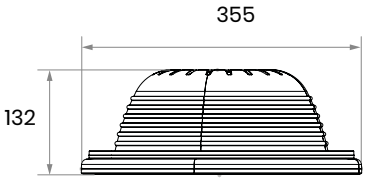
THE RANGE

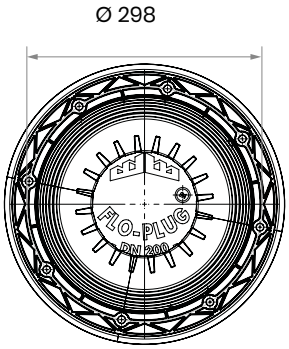
FLO-PLUG® FOR HARD OR SOFT GROUND

The **FLO-PLUG®** range of valves comprises a model for hard ground and a model for soft ground :

REF.	DESCRIPTION
FLO-PLUG200V2	Tank structure protection for **HARD GROUND**.
FLO-PLUG200BV2	Tank protection with ❶ HDPE adapter flange for a SOFT GROUND (geomembrane).

❶





For installation on a geomembrane, a spacer and backfill are required.

Consult our technical department for sizing.

ACCESSORIES

SPACERS FOR INSTALLATION ON GEOMEMBRANE

REF.	UTILISATION
FLO-PLUGR300	FLO-PLUGR300 300 mm spacer(1) for **FLO-PLUG200BV2** in HDPE for **SOFT GROUND** (geomembrane)(2),

(1) For other sizes , please contact us.
(2) In the case of a geomembrane, a density weight of 2.0 over 30 cm and the use of a spacer are recommended.

Dimensions in mm. Weight in kg. Operating pressure (W_p) in bar. Non-contractual visuals.

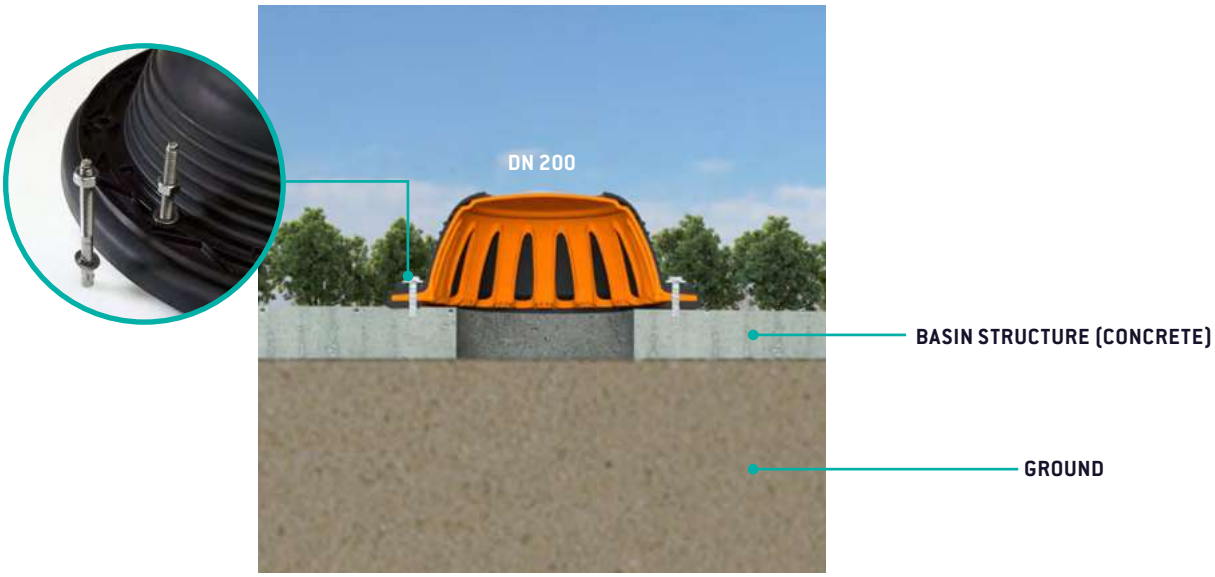
INSTALLATION

Regardless of the type of rise (groundwater or gas), it is important to take account of the head loss generated when the flow rate is at its maximum (60 mbar for a maximum flow of 5000 l/h) and to check that the force generated by the rise will not damage the tank structure (see *Sizing guide* p.5).

For more details on how it works, watch the video on our YouTube channel.

INSTALLATION ON HARD GROUND

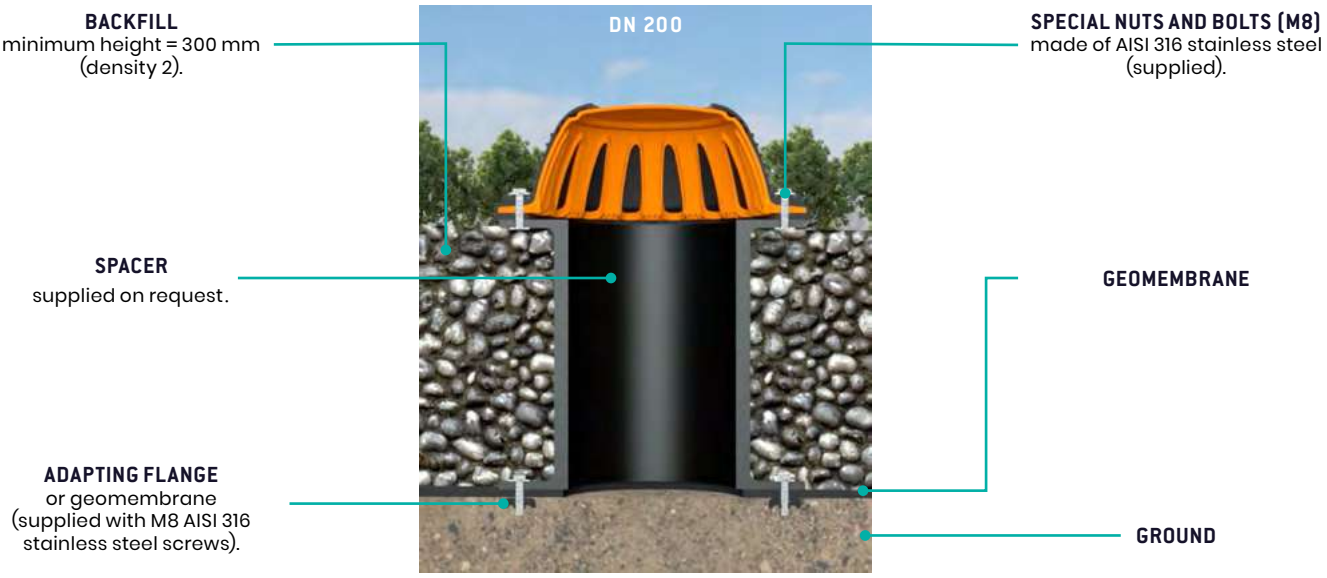
Installation requires AISI 316 stainless steel mechanical anchors (supplied).



INSTALLATION ON SOFT GROUND

For installation on soft ground, the bottom of the tank needs to be weighed down (600 kg/m²).

Provide for backfill and a spacer.



CASE STUDIES

1 FLO-PLUG® UNITS IN AN INDUSTRIAL ZONE

	CONDITIONS
SITE	Saint Donat sur l'Herbasse (FRANCE).
NEED	To protect the rainwater retention tank from mechanical damage, in anticipation of rising water tables.
SOLUTION	Installation of 4 **FLO-PLUG®** tank valves with spacers, to protect the tank structure from rising groundwater and gas. These valves were installed on soft ground (using a geomembrane). The structure was ballasted with gravel to take account of the pressure required to open the **FLO-PLUG®** units and prevent the force generated by the thrust from damaging the tank structure.

LEGENDS

1. Installation of drainage under geomembrane.
2. Installation of the geomembrane.
3. Installation of **FLO-PLUG®** tank bottom valves.
4. Tank filled with water. The valves allowed the groundwater to rise without damaging the structure.

PROJECT MANAGEMENT
CONTRACTING AUTHORITY : Cabinet Mangano, Valence.
PRIME CONTRACTOR : Eurovia.
FITTER : Alpes Geos Étanchéité (A.G.E).

Find all our case studies on our website:
www.norham.fr

FLO-PLUG®
VALVES

2 INSTALLATION OF PROTECTIVE VALVES FOR TANKS

	CONDITIONS
SITE	La Teste de Buch (FRANCE).
NEED	Construction of rainwater retention tanks. To ensure the durability of the tank structure, the tanks must be protected from rising water tables.
SOLUTION	Installation of 45 **FLO-PLUG®** tank bottom protection valves with a 50 cm spacer in 3 tanks, followed by pouring of concrete. The **FLO-PLUG®** valves installed in this way prevent any mechanical damage caused by rising groundwater.

LEGENDS

1

Concrete ballast for the tank.

2

View of the **FLO-PLUG®** valves installed in the retention tank. The number of valves required to protect the structure was determined by NORHAM's technical department.

3

View of one of the finished structures.

PROJECT MANAGEMENT

CONTRACTING AUTHORITY : DIRA (Direction Interdépartementale des routes Atlantique).

PRIME CONTRACTOR : Guintoli.

FITTER : Galopin.

Find all our case studies on our website: www.norham.fr

OTHER NORHAM SOLUTIONS

MULTITUBE	VAN'O'FLEX® KHAM MODEL
	
Non-return valves	Wall-mounted isolating valve
DOWLOAD DOCUMENTATION	DOWNLOAD DOCUMENTATION

Dimensions in mm. Weight in kg. Operating pressure (W_p) in bar. Non-contractual visuals.

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DC-V-FLO-PLUG-001-NUM-20230619

Dimensions en mm. Visuels non contractuels.