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Agrément Certificate

08/4596

Product Sheet 1 Issue 6

HYDRO INTERNATIONAL HYDRO-BRAKE FLOW CONTROLS

S-RANGE HYDRO-BRAKE OPTIMUM FLOW CONTROLS

This Agrément Certificate Product Sheet⁽¹⁾ relates to S-Range Hydro-Brake Optimum Flow Controls⁽²⁾, a range of units to control the discharge outlet flow in stormwater management systems.

(1) Hereinafter referred to as 'Certificate'.

(2) Hydro-Brake, and Kick-Flo are registered trademarks of Hydro International Ltd.

The assessment includes

Product factors:

- compliance with Building Regulations
- compliance with additional regulatory or non-regulatory information where applicable
- evaluation against technical specifications
- assessment criteria and technical investigations
- uses and design considerations

Process factors:

- compliance with Scheme requirements
- installation, delivery, handling and storage
- production and quality controls
- maintenance and repair

Ongoing contractual Scheme elements†:

- regular assessment of production
- formal 3-yearly review



KEY FACTORS ASSESSED

- Section 1. Mechanical resistance and stability
- Section 2. Safety in case of fire
- Section 3. Hygiene, health and the environment
- Section 4. Safety and accessibility in use
- Section 5. Protection against noise
- Section 6. Energy economy and heat retention
- Section 7. Sustainable use of natural resources
- Section 8. Durability

The BBA has awarded this Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Sixth issue: 12 October 2023

Originally certificated on 18 October 2008

Hardy Giesler
Chief Executive Officer

This BBA Agrément Certificate is issued under the BBA's Inspection Body accreditation to ISO/IEC 17020. Sections marked with † are not issued under accreditation.

The BBA is a UKAS accredited Inspection Body (No. 4345), Certification Body (No. 0113) and Testing Laboratory (No. 0357).

Readers MUST check that this is the latest issue of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

The Certificate should be read in full as it may be misleading to read clauses in isolation.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

British Board of Agrément

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SUMMARY OF ASSESSMENT AND COMPLIANCE

This section provides a summary of the assessment conclusions; readers should refer to the later sections of this Certificate for information about the assessments carried out.

Compliance with Regulations

Having assessed the key factors, the opinion of the BBA is that S-Range Hydro-Brake Optimum Flow Controls, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations:



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	H3(3)	Rainwater drainage
Comment:		The products can contribute to satisfying this Requirement. See section 1 of this Certificate.
Requirement:	7(1)	Materials and workmanship
Comment:		The products are acceptable. See sections 8 and 9 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of workmanship and materials
Comment:		The products can contribute to satisfying this Regulation. See sections 8 and 9 and the Annex of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.6	Surface water drainage
Comment:		The products can contribute to satisfying this Standard, with reference to clauses 3.6.1 ⁽¹⁾⁽²⁾ to 3.6.5 ⁽¹⁾⁽²⁾ . See section 1 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The products can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards applicable to conversions
Comment:		Comments made in relation to the products under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ .
		(1) Technical Handbook (Domestic).
		(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	23(1)(a)	Fitness of materials and workmanship
Comment:	(i)(iii)(b)	The products are acceptable. See sections 8 and 9 of this Certificate.
Regulation:	82	Rainwater drainage
Comment:		The products can be used in a construction to satisfy this Regulation. See section 1 of this Certificate.

Fulfilment of Requirements

The BBA has judged S-Range Hydro-Brake Optimum Flow Controls to be satisfactory for use as described in this Certificate. The products have been assessed as units to control the discharge outlet flow in stormwater management systems.

ASSESSMENT

Product description and intended use

The Certificate holder provided the following description for the products under assessment. S-Range Hydro-Brake Optimum Flow Controls are vortex flow controls manufactured from 3, 5 or 8 mm thick grade 1.4301 (A1 304)/ 1.4307 (A2 304L) and 1.4401 (A4 316)/ 1.4404 (A4 316L) stainless steel to BS EN 10088-4 : 2009. The units are self-activating without any moving parts and do not, therefore, require external power.

S-Range Hydro-Brake Optimum Flow Controls consist of:

- integral bypass door — on the front face of the unit, outlet pipe location spigot and mounting face gasket or push-fit sealing rings
- wire rope — to allow remote operation of the pivoting bypass door (3 mm diameter rope consisting of 7 x 7 strand elements of 0.018 mm diameter) and stainless-steel wire rope attachment brackets.

The products have the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (unit)	Typical range of values
Design flow rate ($\text{l}\cdot\text{s}^{-1}$)	0.7 to 250
Design head (m)	0.4 to 4
Maximum lateral dimension (mm)	
Lug mounted units	180 to 2000
Backplate mounted units	Dependent on discharge pipe size
Push-fit units	180 to 2000
Mass (kg) excluding packaging	
Lug mounted units	6 to 680
Backplate mounted units	Dependent on discharge pipe size
Push-fit units	6 to 680

The products are available with the following types of mounting arrangement:

- lug mounting — lugs are provided at points around the perimeter of the flow control mounting face. This is appropriate for the majority of applications where the outlet diameter of the installation structure is approximately 0.5 times the flow control body diameter or less
- push-fit spigot — a push-fit spigot with rubber sealing rings is provided. A single lug may also be provided on the outside perimeter of the mounting face to prevent rotation of the flow control in service. Precise specification of the outlet pipe is essential for push-fit mounting, in order to ensure a watertight seal
- backplate mounting — a rectangular mounting plate is provided to allow fixing to the outlet of the installation structure where lug mounting is not appropriate. If a flat surface is not available, the mounting plate may also be provided curved to the same radius as the chamber in which it is to be fitted.

Ancillary Items

The Certificate holder recommends the following ancillary items for use with the products, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- mounting anchor bolts (A2 304L or A4 316 stainless steel)
- storage facilities.

The products are intended for use in stormwater management systems to restrict the outlet flow from the system by increasing back pressure, achieved by inducing a vortex flow pattern in the water passing through the device. In this application, the units are often used in conjunction with geocellular storage systems, concrete tanks and oversized pipes and ponds.

Product assessment – key factors

The product was assessed for the following key factors, and the outcome of the assessments is shown below. Conclusions relating to the Building Regulations apply to the whole of the UK unless otherwise stated.

1 Mechanical resistance and stability

Data were assessed for the following characteristics.

1.1 Strength and stability

1.1.1 An assessment was made of the structural adequacy of the products under loads that they are expected to resist.

1.1.2 The products are manufactured from stainless steel of a sufficient strength and thickness to ensure that the products remain fit for purpose throughout their design life.

1.1.3 Under normal operation, the products will deflect by no more than the thickness of the material used for manufacture. This ensures that the volume of the unit available for water flow is not compromised during operation and therefore the hydraulic operation of the unit is not adversely affected by deformation of the unit.

1.2 Flow characteristics

1.2.1 An assessment of computational fluid dynamic (CFD) modelling was used to predict the hydraulic performance of the products.

1.2.2 An assessment of the Certificate holder's predicted characteristics was made against the results of hydraulic performance tests. Results of tests are given in Table 2.

Table 2 Characteristics of flow

Product assessed	Assessment method ⁽¹⁾	Requirement	Result
S-Range Hydro-Brake	Volume flow rate	±5% accuracy	Pass
Optimum Flow Controls	Dimensional accuracy	±2 mm accuracy	Pass

(1) In accordance with *Final Test Specification: Verification of Head Versus Flow Characteristic for Hydro International Hydro-Brake Flow Controls* document.

1.2.3 On the basis of data assessed, the products are deemed fit for the purpose of controlling the discharge outlet flow rates.

2 Safety in case of fire

Not applicable.

3 Hygiene, health and the environment

Not applicable.

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Not applicable.

7 Sustainable use of natural resources

The products are manufactured from stainless steel, which can be recycled.

8 Durability

8.1 The potential mechanisms for degradation and the known performance characteristics of the materials in the products were assessed.

8.2 Under normal service conditions, the products will have a life of at least 60 years, provided they are designed, installed and maintained in accordance with this Certificate and the Certificate holder's instructions.

PROCESS ASSESSMENT

Information provided by the Certificate holder was assessed for the following factors:

9 Design, installation, workmanship and maintenance

9.1 Design

9.1.1 The design process was assessed by the BBA, and the following requirements apply in order to satisfy the performance assessed in this Certificate:

9.1.1.1 The products are used to control flows across, or to limit the rate of discharge from, a site. Where used to limit the rate of discharge from a site, the allowable discharge rate to an appropriate outfall must be set by the Environmental Regulator, local Planning Authorities or the Sewer Undertaker.

9.1.1.2 The configuration of the inlet, volute and outlet is varied to achieve the required discharge control characteristics. The units must be fitted with a fixed inlet or an adjustable inlet gate to allow for post-installation adjustment of the discharge flow rate by up to 40%.

9.1.1.3 A minimum clear opening of 50 mm for protected and 100 mm for unprotected drainage system is needed. Except for some situations, where it is required to use a flow control with a smaller minimum opening. In which case, the installation of screens or debris removal systems upstream of the device is necessary.

9.1.2 Guidance on design of sustainable drainage systems is given in *Flood risk and coastal change guidance* and CIRIA C753 : 2015.

9.1.3 Additional information on flow characteristics of the units are given in Annex A of this Certificate.

9.2 Installation

9.2.1 Installation instructions provided by the Certificate holder were assessed and judged to be appropriate and adequate.

9.2.2 Installation must be carried out in accordance with this Certificate and the Certificate holder's instructions. A summary of instructions and guidance are provided in Annex A of this Certificate.

9.2.3 The units may be supplied for installation in purpose-built or existing structural housings on site. These must have adequate strength to resist the loads imposed by the units. The design of these structures is outside the scope of this Certificate.

9.2.4 The units may also be supplied ready-fitted to purpose-built reinforced concrete or plastic manhole chambers ready for installation into the ground. The performance of these chambers is outside the scope of this Certificate.

9.2.5 Other than where a curved backplate is supplied, this must incorporate a flat mounting surface on the inside face of the chamber wall at the outlet pipe.

9.2.6 The benching must be formed as indicated on the installation drawing.

9.2.7 Where an adjustable inlet gate is provided, the factory set position must not be adjusted without prior consultation with the Certificate holder.

9.3 Workmanship

Practicability of installation was assessed by the BBA on the basis of the Certificate holder's information and a site visit to witness installation in progress. To achieve the performance described in this Certificate, installation of the products must be carried out by a competent general builder, or a contractor, experienced with these types of products.

9.4 Maintenance and repair

9.4.1 Ongoing satisfactory performance of the products in use requires that they are suitably maintained. The guidance provided by the Certificate holder was assessed by the BBA and found to be appropriate and adequate.

The following requirements apply in order to satisfy the performance assessed in this Certificate:

9.4.2 Access must be allowed for clearing debris from the chamber housing the unit's flow control. In the event that the inlet to the unit becomes blocked, the pivoting bypass door may be operated by pulling the wire rope attached upwards to drain down the chamber and provide access for maintenance. The pivoting bypass door must be returned to the closed position following drain down of the chamber and clearance of the blockage.

9.4.2.1 Regular inspections must be carried out to ensure that debris that may obstruct the inlet to the flow control is not present in the chamber. The frequency of inspection will depend on the location of the units but must be at least once per year.

10 **Manufacture**

10.1 The production processes for the product have been assessed, and provide assurance that the quality controls are satisfactory according to the following factors:

10.1.1 The manufacturer has provided documented information on the materials, processes, testing and control factors.

10.1.2 The quality control operated over batches of incoming materials has been assessed and deemed appropriate and adequate.

10.1.3 The quality control procedures and product testing to be undertaken have been assessed and deemed appropriate and adequate.

10.1.4 The process for management of non-conformities has been assessed and deemed appropriate and adequate. An audit of each production location was undertaken, and it was confirmed that the production process was in accordance with the documented process, and that equipment has been properly tested and calibrated.

† 10.2 The BBA has undertaken to review the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

11 Delivery and site handling

11.1 The Certificate holder stated that the products are supplied wrapped in polythene and plywood packaging for small units and on a pallet for large units. Each unit is stamped with the Certificate holder's unique project reference number and carries a label bearing the Certificate holder's contact information and advice on orientation. The packaging also bears details of the package weight and client details.

11.2 Delivery and site handling must be performed in accordance with the Certificate holder's instructions and this Certificate, including:

11.2.1 The products should be transported in their original packaging if possible. During unloading they must be handled with care.

11.2.2 The products should be stored appropriately to avoid being dropped or receiving impacts, eg from construction plant.

Supporting information in this Annex is relevant to the product but has not formed part of the material assessed for the Certificate.

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

Management Systems Certification for production

The management system of the manufacturer has been assessed and registered as meeting the requirements of ISO/IEC 9001 : 2015 by Lloyd's Register Quality Assurance Limited (Certificate LRQ 10509695).

Additional information on design

A.1 The allowable discharge rate is often calculated in respect of the greenfield equivalent run-off rate for the undeveloped site. Where a site is being redeveloped, the allowable discharge rate may be determined based on the discharge rate prior to the redevelopment.

A.2 The design head acting on the upstream side of products is generally determined by the maximum design top water level within the storage volume.

Additional information on flow characteristics

A.3 Owing to the 'S'-shaped head-flow characteristic, the units are able to pass greater volume flow rates at lower heads, whilst still limiting the flow at the duty/design point to an acceptable level.

A.4 The products have a hydraulic characteristic, comprising three distinct stages corresponding to different phases of operation:

- pre-initiation phase — at low heads, the flow control provides similar performance to an orifice plate with equivalent size to its outlet⁽¹⁾. Flow rate accuracy of $\pm 5\%$ of the ultimate duty/design flow is typically achievable in this region
- vortex initiation phase — as the head increases, vortex motion will start to develop inside the unit, starting to restrict the flow⁽¹⁾. Flow rate accuracy of -5% of flow to +5% of phase peak is typically achievable in this region
- post-initiation/design phase — following vortex initiation, the flow control characteristic stabilises, providing hydraulic performance equivalent to a substantially smaller orifice plate than the unit's outlet. The units can be specified to give a duty/design point in any part of this region, though in most practical cases specification will be at flow rates above the initiation phase peak (corresponding to the Flush-Flo point). Flow rate accuracy of $\pm 5\%$ of flow is typically achievable in this region.

As the water level subsides and water in the system drains, the energy within the flow reduces and the vortex collapses. Air is drawn into the volute and the unit returns to operating in a similar manner to an orifice of the same cross sectional area. This drains the system quickly so that the upstream network is ready for the next event.

(1) Although a flow control would not usually be selected with the duty/design point in this region, this part of the characteristic will have implications to overall drainage system operation.

A.5 The products allow the inlet, volute and outlet to be individually configured to suit the application, enabling the system to be designed to provide the appropriate hydraulic performance or to suit constant discharge, multi-stage discharge or risk-based network designs. Individual configuration of the inlet, volute and outlet also allows the system designer to adjust the physical dimensions of the unit in order to:

- maximise the internal clearances
- comply with minimum outlet guidelines
- retrofit to existing infrastructure.

A.6 The products are specified and supplied to meet individual application requirements. Though the characteristics are incorporated into a number of commercially available hydraulic modelling packages, the Certificate holder should be contacted directly for advice on correct selection. The following information should be provided:

- operating head — depth from the unit's outlet invert to the design water level(s)
- flow — required discharge at the given head(s)
- manhole details or control chamber proposals, including outlet size
- information on any 'special' conditions, for example if the unit is expected to be subjected to downstream surcharging or possible siphoning effects.

A.7 In most cases the downstream drainage system will be designed to allow the unit a free discharge. However, this is not always possible and in certain cases it will be necessary to design the flow control to surcharge conditions. Surcharge of the flow control will affect the hydraulic performance, and advice should be sought from the Certificate holder. Installations where the outlet is surcharged are outside the scope of this Certificate.

A.8 Where a drainage system has been designed and hydraulically modelled based on the use of the products, it is essential to ensure that the same flow control, or a flow control that has been confirmed to provide an equivalent hydraulic performance across the whole design head range, is used in the final installation.

Additional information on installation

A.9 Care should be taken handling the units and when lowering into position for installation. Where appropriate, larger units should be lifted via the fitted lugs using mechanical lifting/lowering equipment.

A.10 The unit is offered up to the chamber outlet wall until the spigot projects into the outlet pipe with its invert seated to the outlet pipe invert and with the unit in the correct orientation.

Additional information on maintenance

A.11 Measures should be taken to remove silt sediment and debris from the surface water at an early stage to prevent problems further downstream.

A.12 The units may be jetted, in accordance with standard sewer jetting procedures, without affecting the hydraulic performance of the stormwater management systems.

Bibliography

BS EN 10088-4 : 2009 *Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for construction purposes*

CIRIA C753 : 2015 *The SuDS manual*

ISO/IEC 9001 : 2015 *Quality management systems — Requirements*

Flood risk and coastal change guidance — National Planning Policy Framework — August 2022

Conditions of Certificate

Conditions

1 This Certificate:

- relates only to the product that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

3 This Certificate will be displayed on the BBA website, and the Certificate Holder is entitled to use the Certificate and Certificate logo, provided that the product and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product
- actual installations of the product, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to UKCA marking and CE marking.

6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product which is contained or referred to in this Certificate is the minimum required to be met when the product is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.