DIRECT IN-LINE PUMP SYSTEM
AN INNOVATIVE PRINCIPLE

By lifting gravity effluent directly at the point of entry, without water loading or a collecting tank, the DIP System™ overcomes the drawbacks of retained volumes of effluent:

- Dangerous gases (H2S),
- Smells,
- Sand and grease accumulation,
- Equipment corrosion,
- Structural erosion,
- Clogged floaters,
- Access safety.

The DIP System™ makes it possible to design durable and economical pumping stations.

A COMPLETE CONCEPT

A main sewerage sectioning valve is fitted as standard for shutting off the waste water inlet.

The two conical VORTEX impellers are protected against clogging. Sealing equipment can be fully turned when dry, without causing damage, for a period of several weeks.

Two engine units are connected by a hydraulic body, the shapes, specially designed in CAD to be able to receive effluent directly.

The upstream level is measured by a static sensor, fitted in the water stream of the effluent inlet.

All parts in contact with fluids are made of boiler-plated stainless steel EN1.4306 or EN1.4404 (304L or 316L).

The internal valve two ways provides integrated flow without the need for complicated piping systems.
The only patented system to lift effluent directly at the point of entry

**OPERATION**

The DIP System™ is driven, as standard, by variable speed. Operation is no longer based on “all-or-nothing” pumping but on continuous and modulated pumping directly from the effluent inlet.

Thanks to its special design, the DIP System™ absorbs the air/fluid mix which flows in from the gravity lines and gives it the speed it requires to be discharged up to the outlet.

The proportion of gas transported can reach up to 10% of fluid flow without running the risk of air-binding.

Flow is also maintained by the system, which automatically adapts to constantly changing flow rate and load reduction, thanks to the special shape of the hydraulic body and the design of its impellers.

This operating mode enables solid or fibrous matter to move through the system without causing blockages. Electrical power adjusts in line with the incoming flow. Progressive start-ups and stops eliminate hydraulic surges.

If the inlet flow is less than the minimum load, operation is intermittent and, if the flow is zero, the DIP System™ shuts down completely.

**INTEGRATED FUNCTIONS**

- 4 operating levels
- 1 regulation level
- ‘ON’ LED indicator
- ‘FAULT’ LED indicator
- ‘LOW VOLTAGE’ LED indicator
- Ammeters
- Voltmeters
- Operating hours counter
- Energy meter
- Automatic permutation
- Automatic backup
- Automatic cascade
- Adjustable automatic reset
- Auto-clean for each start-up
- Automatic rotation direction reversal for clearing
- Auto-setting of operational limits

**INTEGRATED PROTECTION SYSTEMS**

- Overintensity
- Overvoltage
- Undervoltage
- Earthing fault
- Impeller blockage
- Phase loss
- Phase direction
- Sensor fault
- Internal fault
- Auto-diagnostic
- Fault log
- Emergency stop

**OPTIONS**

- Remote communication VIA MODBUS
- FACTORY remote maintenance VIA GPRS
- 2 x DIP control, in tandem or in parallel

The “A.L.C.V9” electronic control system: 4-pump unit version

Based on the associated principles of hydraulic regulation and variable speed, the operation of the DIP System™ uses an electronic control system which is just as complete as it is straightforward to use. It provides regulation for all configurations, including those of a complex combined sewerage system, by offering a high level of monitoring and control.
WALL FLANGE AND SECTIONING VALVE

SHARED HYDRAULIC BODY

LEVEL GAUGE

IMPELLERS

SEALING UNIT

MOTORS

A.L.C V9 CONTROL PANEL
NEW CURVED PROFILE

WALL FLANGE

The various stainless steel 304L wall flanges provide a sealed connection to the mains inlet, whatever the diameter or shape of the structure, round or square, as well as the discharge of the bottom drainage pump. Several inlets and an overflow can also be connected together, using a number of wall flanges and a collector.

MAINS SECTIONING VALVE AS STANDARD

Located at the DIP suction port, the valve enables the system to be cut off from the mains inlet. It is a guillotine type valve.

Its port gate valve is a stainless steel AISI 304L gate leaf with a sharpened edge, in order to cut any fibrous elements which might prevent it from shutting.

DESCRIPTION

SHARED HYDRAULIC BODY

Made entirely from AISI 304L (316L on request) “boiler-plated” stainless steel.

The bodies’ suction profiles are specially designed to take advantage of the flow speed from the gravity-driven inlet. The inlet body also serves as a stone trap with inspection port and draining valve.

The interior surface of the body is very smooth to improve efficiency, and doesn’t have any areas where matter in suspension might be held back.

The wide flow section continues through to the internal directional swing check valve.

The clapper box is an integral part of the body, thereby dispensing with the need for collection pipework between the two pumps.

The valve has three possible positions: right or left according to which pump is operating, and central if both are operating. It has a stainless steel frame and replaceable wear plates.

The joint discharge, DN80 to DN400 depending on the model, has a standard-compliant flange and a pressure measuring socket. A single retaining valve must be fitted directly to this flange to separate the volume contained within the discharge pipe (Rubber swing check valve).
**LEVEL GAUGE** (NEW SENSOR COATED IN VULKOLAN®)

**SIMPLE AND SAFE**

A pressure sensor located beneath the entry chamber constantly measures the height of fluid at the inlet.

Thanks to its stainless steel AISI 316 flush membrane, this sensor is highly wear resistant. It is resistant to deposit build-up because it benefits from, at this position, the inlet fluid speed, which is further enhanced by the suction effect of the pump operation.

This system dispenses with the need for classical detection methods, such as float or ultrasound measurement.

IP67 protection with 15m of cable as standard on all models.

**DATA TRANSMISSION**

In addition to the information transmitted to the regulation cabinet regarding the inlet fluid height, information from the sensor can also be sent by a transmitter for remote surveillance of the system, without the need for any accessories, thanks to the galvanic isolated output on the control panel.

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**IMPELLERS**

**WIDE FLOW SECTIONS**

The **DIP System™** is fitted with integrated AISI 304 L or 316L stainless steel VORTEX conical radial impellers within the flow section. The special properties of the alternate blade impellers allow most fibrous and solid bodies such as cloths, bandages, tights, plastic bottles, aluminium cans, etc. to pass through without causing a blockage. The central cone adjusts the vortex during air/water operation. It prevents clogging and helps the system to reprime quickly. The T4 version is fitted to the larger models.

**EASY TO DISMANTLE**

The impellers are fitted on removable plates to allow for easy dismantling. The dismantling/reassembly operation does not require special tools. Impellers can be replaced on-site in just 15 minutes.

**UNAFFECTED BY CAVITATION**

The structure has been deliberately designed to accept very turbulent steams of water without causing damage and without reducing efficiency.

**CONTRIBUTES TO THE ELIMINATION OF H2S WITH THE LIQUID/DIPHASIC GAS**

Unlike traditional systems with collecting tanks, the **DIP System™** injects a highly aerated air/water stream, which contributes naturally to the elimination of H2S effects. This phenomenon helps to avoid the need for additional treatment, via compressed air or chemical injection, for example.

**COMMINUTION TEETH WITH THE “SC” OPTION**

As an option, the **DIP System™** can be fitted with a comminution tooth per volute. This system is very practical in smaller models as it breaks down long fibrous materials (Please inquire).
VENTILATED IP56 and IP57 MOTORS
(NEW: IE2 50Hz/60Hz)

MOTORS FITTED TO THE DIP SYSTEM:

As standard:
Cast iron or aluminium motor body with fastener dimensions which comply with industrial standards and are, therefore, compatible with those of regular industrial motors. It is fitted with a ventilator and cooling ribs. Class F windings (155°C).

Sealing systems are, at level IP56 meeting, the same demands as for turning machinery installed in the holds of ships.

“Floodable” version:
On request, we can supply motors with IP57 “floodable” protection, fitted with 10m of armoured wiring and a sealed resinated connection.

The wiring entry point is similar to an IP68 submerged motor.

This version meets the requirements of pumping stations located in floodable areas, where motors must be resistant to submersion when stopped during flooding.

In all versions, bearings are greased for life for 10,000 hrs at 2,900 revs/min or 20,000 hrs at 1,500 revs/min.

They are designed to operate at up to 60 Hz with frequency converters from the DIP regulation system.
The **DIP System™** comes delivered either with its ALC (Advanced Level Control) panel to be assembled in a customer configuration, or in a complete cabinet. Each frequency converter is connected to its motor unit and communicates with the other. Speed variation and simplified control levels on the same panel allow regulation in all configurations, including those of complex combined sewerage systems. The ALC panel can be used to carry out all the functions of a traditional lifting station without the need for additional equipment:

- Automatic alternation,
- Emergency stop,
- Automatic backup,
- Manual control,
- Automatic cascade,
- Automatic rotation direction reversal for clearing,
- Auto-setting of operational limits.

It also provides a very high level of integrated protection systems:

- Overintensities, overvoltages and undervoltages
- Sensor faults
- Internal faults
- Earthing faults
- Auto-diagnostic faults
- Impeller blockage
- Fault log
- Phase loss
- Emergency stop
- Phase direction
- Remote communication VIA MODBUS
- FACTORY remote maintenance VIA GPRS
- 2 x DIP control in tandem or in parallel

**FLOW REGULATION, EVEN WHEN HIGHLY VARIABLE**

The **DIP System™** automatically adapts to the incoming flow, up to the limit of the total flow of 2 motor blocks, i.e. from 0 to 200% of the nominal flow. The performance of a DIP model is between 2 and 4 times higher than the flow rate achieved by traditional pumping in batch mode.

**STRAIGHTFORWARD HUMAN-MACHINE DIALOGUE**

On the front, an Auto/0/Manu switch and a continuous display of 3 key pieces of information. The control panels are removable for safe keeping. Simplified display for easy use:

- Values displayed for: speed, intensity, level gauge, motor power, motor torque, meters.
- Status readings for remote user surveillance.

**PROVIDES CONSTANT AND REGULAR FLOW**

Located upstream from the purification station, the **DIP System™** provides constant and regular flow. It therefore avoids fluids arriving in “batches”, detrimental to the biomass used for biological treatment. The system management also limits maximum outlet flows.

**ELIMINATION OF VALVE KNOCKS AND REDUCTION OF WATER HAMMERS**

The **DIP System™** uses a start ramp on start-up and a deceleration ramp before stopping each pumping unit to eliminate valve knocks. During diphasic pumping (liquid + gas), water hammers can also be reduced.

**ENERGY SAVINGS**

The problem of reducing the number of start-ups no longer exists and energy savings can be realized at low flow rates: the delivered power for the motors is adjusted in line with the required flow rates.

**READY TO COMMUNICATE**

The standard version includes functions designed with remote management in mind and, with the MODBUS option remote resetting, remote unblocking and interrogations via commercially available logic controllers.

The **ALCL panel available for DomoDIP10 and DIP11, 1.8kW single-phase and three-phase version.**
SIMPLIFIED CIVIL ENGINEERING

As part of a lifting station installation project, the DIP System™ enables civil engineering costs to be significantly reduced:

- Groundworks require, at least, one metre less in foundation depth and concrete, and take up less space than a traditional station.

- The elimination of marling deposits reduces the height of the structure to 50cm below the water stream intake.

- The structure’s shape can be either round or square and commercially available ducting and pipes prefabricated in concrete are more than adequate to contain the DIP equipment and the valve systems.

- Dry installation enables the single valve/gate block to be assembled in the same location as the DIP System™ without the need for a separate valve chamber. A single inspection port is required.

- For inlet levels which are not very deep, the equipment room can even be constructed out of breeze blocks as there is no “pit” to be flooded, and it is therefore watertight.

During station renovation: The DIP System™ adapts to any type of currently available pipework; so precise positioning of input/output pipes is no longer required. The discharge head can be positioned at any angle through 360°.

ABSENCE OF SUBMERGED TANK

The dry tank becomes an equipment room which can be fitted with lighting, a ladder and other accessories which enable maintenance personnel to carry out their work in safety.

The lifting station becomes a straightforward inspection chamber without human danger (no emission of dangerous gases, odours or accumulation of solid matter).

The equipment is rustproof, and is thus more resistant and more durable.

SIMPLIFIED MAINTENANCE

The absence of a collection tank eliminates costly cleaning operations of traditional units.

INCREASES THE CAPACITY OF EXISTING INSTALLATIONS

The DIP System™ enables flow or discharge capacities to be increased in a pumping station which has insufficient power, without changing the civil engineering.
MODEL SELECTION

The peak input flow rate and the corresponding total pressure directly determine the DIP model to be selected. See FAQs page 54.

In-line pumping does not require additional coefficients to be calculated (number of start-ups or drawdown volume): the directly adjusts itself in line with the inlet volume and can switch its motors on and off up to 150 times an hour.

The maximum inlet flow must correspond to one of the points on the upper curve of the operating range (next page). This graph shows the performance with a single motor unit in service, maintaining full backup with the second motor unit.

For all the lower operating points, the system automatically adjusts its flow and power at maximum efficiency for the total pressure head to be overcome.

PLEASE DO NOT HESITATE TO CONTACT US FOR ANY SPECIAL SELECTION DECISIONS; VARIABLE FLOW FROM 0 TO 400%; LINKED NETWORKS; ETC.

IN THE EVENT OF EXTENSIONS BEING PLANNED TO THE NETWORK, YOU CAN CHOOSE THE CORRESPONDING MODEL FOR THE MAXIMUM FUTURE OUTPUT, IN THE KNOWLEDGE THAT, FROM THE START, THE SYSTEM CAN OPERATE CONSTANTLY AT THE BOTTOM OF ITS RANGE WITHOUT EXCESSIVE CONSUMPTION. E.G.: A DIP 31/4 WITH RATED POWER OF 2 X 3.6kW USED AT 30% OF ITS OPERATING RANGE WILL ACTUALLY CONSUME 30% OF THE POWER OF ONE OF ITS MOTORS, I.E. 1.08kW.
DIP 31

**Description**

The diagram illustrates the selection range for the DIP SYSTEM™. The graph shows the relationship between H (m) and Q (m³/h) for different models. Each model is represented by a line:

- DIP 31/2V - 18 kW
- DIP 31/2V - 13.2 kW
- DIP 31/2V - 6.6 kW
- DIP 31/2V - 9 kW
- DIP 31/4V - 4.8 kW
- DIP 31/4V - 6.6 kW
- DIP 31/4V - 3.6 kW

The maximum flow rate for each model is indicated, assuming only 1 motor unit is in service.
DIP 61

**DESCRIPTION**

Q (m³/h) Max. (Only 1 motor unit in service)

- DIP 61R/2V-18kW
- DIP 61R/2V-13.2kW
- DIP 61/2V-9kW
- DIP 61/4VV-9kW
- DIP 61/4VV-6.6kW

$(W) H$
DIP101H/4VV - 54kW
DIP101H/4VV - 44.4kW
DIP101H/4VV - 36kW
DIP101H/4VV - 26.4kW
DIP101H/4VV - 22.2kW
DIP101/4VV - 6.6kW
DIP101/6VV - 4.8kW
DIP131/4VV - 26.4kW
DIP131/4VV - 22.2kW
DIP101R/4VV - 18kW
DIP101R/4VV - 13.2kW
DIP101/4VV - 18kW
DIP101/4VV - 13.2kW
DIP101/4VV - 6.6kW
DIP101/6VV - 4.8kW

H (m)

Q (m³/h) Max. (Only 1 motor unit in service)
CONSTRUCTION RULES
FOR THE DESIGN OF DIP STATION STRUCTURES ARE AS FOLLOWS:

Ideally bring the various inlets together in an inspection chamber before the station, at least 5m from the DIP. The slope between the chamber and the station must be equal to or greater than 1cm/m. New units can have a lesser slope, for existing or new installations. However, the inlets may be brought together using a set of wall flanges by the DIP enclosure.

Secure the side of the station’s base 0.5m beneath the water level of the lowest inlet (if there is more than one). This height is required for easy access of the sensor (See dimensions according to the model).

Apart from the minimum space around the motor units needed for maintenance, there are no constraints in terms of shape or volume for the enclosure containing the DIP System™. See dimensions of each model on the technical data sheets.

The form of the structure and the diameter of the inlet pipe must be specified when ordering the wall flange. The top of the wall flange is fitted with a return tap for drainage pump discharge. The construction may be of any type: the DIP System™ can be fitted into a round or square concrete structure, a simple inspection chamber made of ducting stacks or an enclosure made of breeze blocks for a network close to the surface.

The discharge direction can be chosen through 360° as the guiding system has no special requirements and the discharge pipe is shared by two motor units.

Discharge only requires a gate and a valve, except when it is a lifting only station. All the valve equipment and any measuring devices (flowmeter, sampling points, etc.) can be fitted in the station without separate valve chambers, as the enclosure area remains clean and healthy. For deep enclosures fitted with an intermediate floor, sufficient ventilation must be provided.

A simple trap door 700 x 700 is sufficient for equipment to be able to pass through it up to the size of the DIP61 models. Subsequent models require a double trap door directly above the system, of suitable dimensions for the size of the model selected.
DIFFERENT POSSIBLE SHAPES OF UNITS: ROUND, SQUARE, RECTANGULAR...

Other layouts available on request, don’t hesitate to contact us.
**ELECTRICAL CONNECTIONS**

**MOTOR CONNECTIONS**

Motor connections should preferably be made without a break between the frequency variators and the motors. Preferred cables are LIYCY armoured cables.

Connect to the motor terminal boards taking into account the voltages shown on the ratings plates.

IP56 protection of standard motors requires careful assembly of the compression glands fitted. IP57S versions are equipped with 10m of armoured cable per motor as standard.

For SIDINOX stations, cables are supplied.

**POWER CABLE SELECTION (STANDARD VERSION) for 460V**

(Maximum length of motor cables for power in excess of 1.8kW = 300 metres, and 100 metres for power below 1.8kW).

<table>
<thead>
<tr>
<th>POWER</th>
<th>INTENSITY</th>
<th>CABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8 to 3.6kW</td>
<td>3 to 7A</td>
<td>4G1.5mm²</td>
</tr>
<tr>
<td>4.8 to 6.6kW</td>
<td>8 to 12A</td>
<td>4G2.5mm²</td>
</tr>
<tr>
<td>9 to 13.2kW</td>
<td>15 to 19A</td>
<td>4G4mm²</td>
</tr>
<tr>
<td>13.2 to 18kW</td>
<td>21 to 28A</td>
<td>4G6mm²</td>
</tr>
<tr>
<td>22.2 to 26.4kW</td>
<td>34 to 42A</td>
<td>4G10mm²</td>
</tr>
<tr>
<td>36 to 44.4kW</td>
<td>55 to 67A</td>
<td>4G16mm²</td>
</tr>
<tr>
<td>54 to 66kW</td>
<td>90 to 110A</td>
<td>4G35mm²</td>
</tr>
</tbody>
</table>

**CONNECTION OF IP67 SENSOR**

If possible, the sensor should be connected without a break between the cabinet and the sensor.

The delivered cable is armoured to protect the signal.

It does not matter if the sensor is initially connected incorrectly as the display is protected. The motor cables used are armoured, ensure a wire routing distance of at least 50mm is maintained between them and the sensor cable.

If cables cross, place it on top of the power cables at an angle of 90°.

**CONTROL SYSTEM**

The cabinets and the control panels are delivered ready to be plugged in.

Electrical connections should be carried out by qualified personnel.

For SIDINOX stations, the cabinets include ventilation housed in the base, to be connected to the station via a buried duct (heavy duty TPC or equivalent – not supplied).

Only the two motors and the sensor require connection for operating the DIP. All internal connections are made and tested in the factory. Dry contacts for remote surveillance status reports are fitted as standard. Refer to installation and maintenance instructions.

The required general protection is of the 300 mA differential interrupter type, except for special requests.

For single panels to be fitted into a cabinet, correctly calibrated motor starter protection must also be fitted upstream of each variator (magnetic circuit breaker or fuse-holder (GG-GL) for example).
THE DIP RANGE

A single model covers an operating range corresponding to several models from other manufacturers. The standard DIP range therefore covers between 0 and 1000 m³/hr per motor unit, and between 1 and 65m of elevation with just twelve models.

**EACH MODEL HAS A SIMPLE NAME MADE UP AS FOLLOWS:**

DIP 101/HYD/4 _ - 22.2kW

- Average flow at top of the operating range per motor unit
- Number of motor poles at 50 Hz:
  - 2 poles = 2900 revs/min
  - 4 poles = 1450 revs/min
  - 6 poles = 990 revs/min

**Construction options:**

- C: Suction valves (depending on version)
- L: Horizontal discharge
- R: Increased motor power
- Y: Separate horizontal discharge
- P: Tripod for above-ground installation
- U: Same-side suction and discharge (depending on version)
- H: High pressure
- D: Removable body (suction flanges)

- Rated power at 50 Hz per motor

The ratings plate of each DIP carries additional information such as impeller characteristics, manufacture date and number, and the defined operating point for special applications.

**MODULAR CONSTRUCTION ENABLES US TO PRODUCE NON-STANDARD PRODUCTS TO MEET SPECIFIC DEMANDS OF UP TO 156kW PER MOTOR UNIT (DETAILS AVAILABLE ON REQUEST).**

**COUPLED UNITS**

For wide variations of input flow, unit variants exist enabling two DIPs to a connection in parallel. They can also be connected in series for higher elevations than standard, up to 100mce.

**PERFORMANCE RANGES**

The performance range of each model shows the automatic adaptation zone of the flow/height ratio.

The serie of DIP 11 - 21 - 31 - 61 - 101 – 131 - 151 etc. allows contraction of the column of water at the DIP inlet, which is less than 10% of the nominal flow. Accordingly, gentle slopes or flow variations beyond a range of 0 to 200% can be dealt with. Minimum load curves therefore no longer represent the lower flow limit on these new models.
### Construction Options

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIP 151D</td>
<td>D: Removable body (suction flanges) (compatible with the variants L, Y and U)</td>
<td><img src="image1.png" alt="Image" /></td>
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<tr>
<td>DIP 101C</td>
<td>C: Suction valves (Compatible with the variants L, Y and U)</td>
<td><img src="image2.png" alt="Image" /></td>
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<tr>
<td>DIP 61L</td>
<td>L: Horizontal discharge (Compatible with the variants D and C)</td>
<td><img src="image3.png" alt="Image" /></td>
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<tr>
<td>DIP 151Y</td>
<td>Y: Separate horizontal discharge (compatible with the variants D and C)</td>
<td><img src="image4.png" alt="Image" /></td>
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<tr>
<td>DIP 501U</td>
<td>U: Same-side suction and discharge (compatible with the variants D and C) (on inquiry according to the size)</td>
<td><img src="image5.png" alt="Image" /></td>
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<tr>
<td>DIP 21P</td>
<td>P: Tripod for above-ground installation (can only be fitted on DIP 11 to 101) (compatible with the variants D, C, L and U)</td>
<td><img src="image6.png" alt="Image" /></td>
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