FL 02.1 - LOSSES IN PIPES PANEL

The FL02.1 equipment has been designed for the study of both friction losses in pipes, and the losses of characteristic elements of facilities such as fittings, valves and measuring elements.

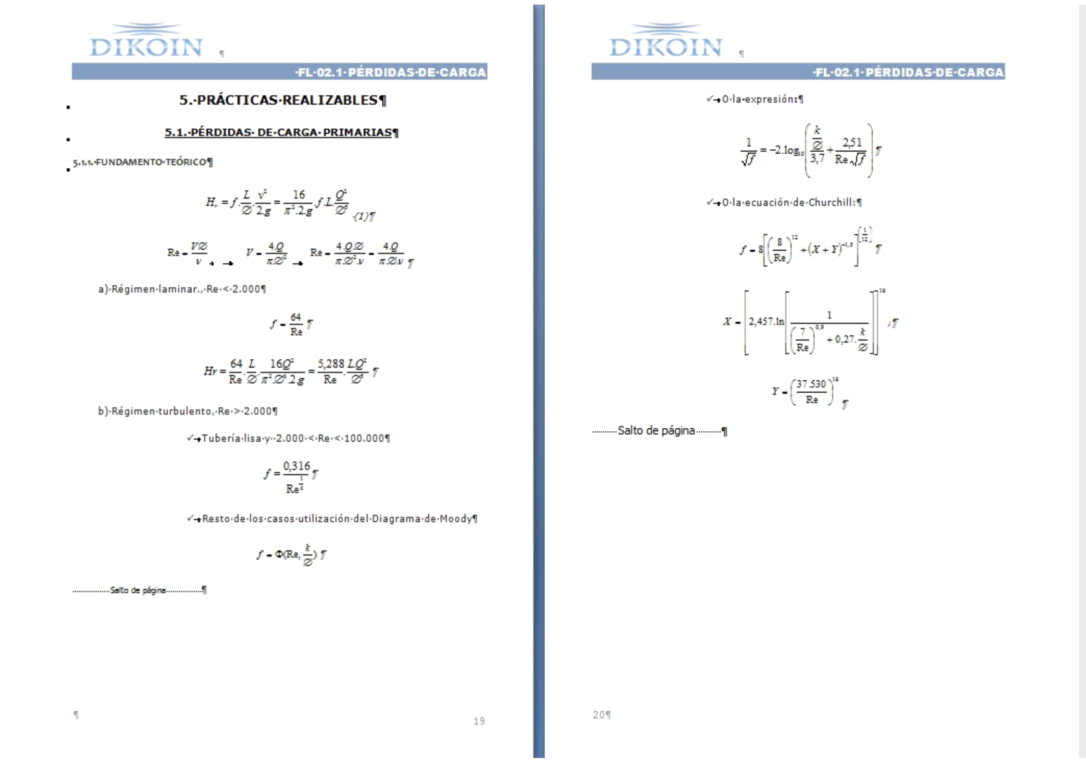
The equipment is designed to be as flexible as possible and can be built into the new fittings and straight pipe of different materials and roughness. The change operation is simple and clean, it is only necessary to use the quick links to unscrew the original section and replace it with the new one.

The channel on the bottom of the panel`s mission is to collect the residual water left in the pipes, so that the adjacent equipment do not get wet, and enabling this work to be make by the students themselves.

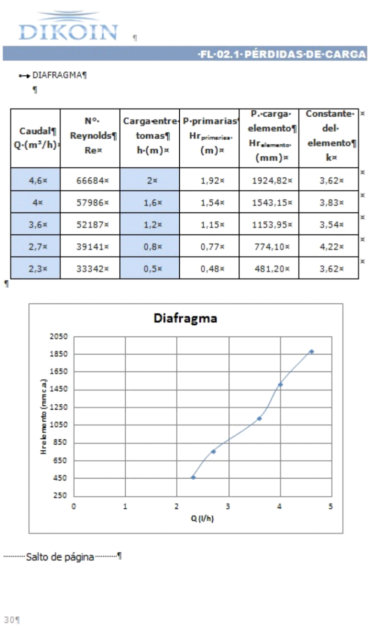
In this same line to avoid water leakage circuit, the installation has pressure taps called "ecological", which does not leak water when connecting or disconnecting the gauge jacks, since they are self-sealing connections.

The equipment can be connected to both the bank and the hydraulic power pack with flowmeter.

The manual shows clearly and with a lot of images, the hole process to operate the equipment.



The instruction manual explains and shows all the theoretical foundations, as well as all the mathematic expressions used during the experimentation.


DIKOIN

FL 02.1 PÉRDIDAS DE CARGA

DIAFRAGMA

Caudal Q (m³/h)	Nº Reynolds Re	Carga entre tomas h (m)	P primarias Hr primarias (m)	P. carga elemento Hr elemento (mm)	Constante del elemento k
4,6	66684	2	1,92	1924,82	3,62
4	57986	1,6	1,54	1543,15	3,83
3,6	52187	1,2	1,15	1153,95	3,54
2,7	39141	0,8	0,77	774,10	4,22
2,3	33342	0,5	0,48	481,20	3,62

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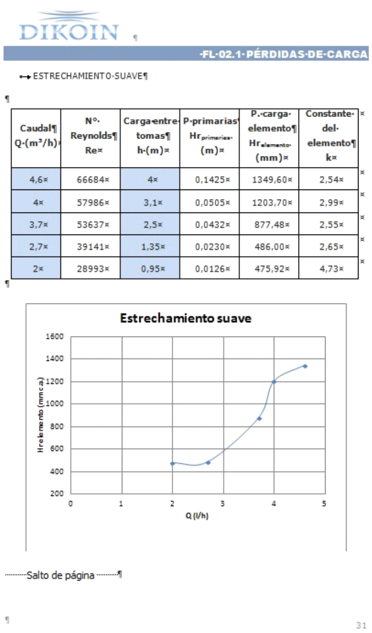
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FL 02.1 PÉRDIDAS DE CARGA

ESTRECHAMIENTO SUAVE

Caudal Q (m³/h)	Nº Reynolds Re	Carga entre tomas h (m)	P primarias Hr primarias (m)	P. carga elemento Hr elemento (mm)	Constante del elemento k
4,6	66684	4	0,1425	1349,60	2,54
4	57986	3,1	0,0505	1203,70	2,99
3,7	53637	2,5	0,0432	877,48	2,55
2,7	39141	1,35	0,0230	486,00	2,65
2	28993	0,95	0,0126	475,92	4,73

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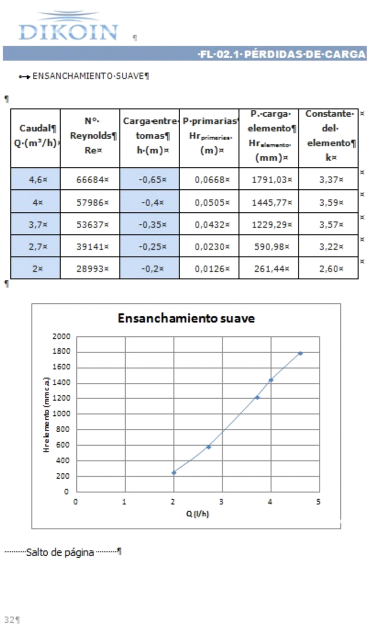
DIKOIN

FL 02.1 PÉRDIDAS DE CARGA

ENSANCHAMIENTO SUAVE

Caudal Q (m³/h)	Nº Reynolds Re	Carga entre tomas h (m)	P primarias Hr primarias (m)	P. carga elemento Hr elemento (mm)	Constante del elemento k
4,6	66684	-0,65	0,0668	1791,03	3,37
4	57986	-0,4	0,0505	1445,77	3,59
3,7	53637	-0,35	0,0432	1229,29	3,57
2,7	39141	-0,25	0,0230	590,98	3,22
2	28993	-0,2	0,0126	261,44	2,60

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With the instructions manual, it is delivered a completely solved one, with the data that has to be taken from the equipment during the experiments. This way, the teacher can compare easily if students are doing correctle the different experiments.

All equipment accessories have a detailed description on foot equipment, allowing easy identification of these and providing information at the time of calculation of pressure drop in each and everyone of the accessories.

Optional Accessory: FLZ.LP.DAQ - DATA ACQUISITION AND SOFTWARE FOR LOSSES IN PIPES

FL 02.1 - LOSSES IN PIPES PANEL

LEARNING OBJECTIVES

- Measurement and testing of primary load losses, analyzing the influence of fluid viscosity, diameter and roughness, that occur on straight sections of various types of pipes, considering the possibility of measuring losses in pipes:
  - Different interior diameters, 21.2 and 13.6 mm.
  - Different materials.

- Checking the relationship between pressure drop and flow velocity in the pipe.

- Obtaining pipe roughness:
  - galvanized steel
  - copper
  - etc ...

- Measurement and verification of secondary load losses that take place in elements of facilities such as:
  - Elbows 90 ° short radius.
  - Elbows 90 ° long radius.
  - 45 ° elbows.
  - Straight tee.
  - Tilted tee.
  - Brusque widening.
  - Brusque narrowing.
  - Gradual widening.
  - Gradual narrowing.
  - Gate valve.
  - Non-return valve.
  - Seat valve.
  - Ball valve.
  - Diaphragm valve.
  - Diaphragm.
  - Venturi.
  - Rotameter.
  - Filter.
  - etc ...

- Calculation of loss coefficients corresponding "K" to each of the elements mentioned above.

- Use, calculation and setting of various measuring elements, such as:
  - Rotameter.
  - Venturi.
  - diaphragms; inner diameter 15 mm. and 13 mm.
  - Flow metering valve.
  - etc ...

- Testing of the pressure of work throughout the facility.

- Use of different types of manometers:
  - Water column.
  - Electronic differential pressure manometer.
  - Bourdon type.

- Drawing and computing the characteristic of the pump installation.

TECHNICAL DATA

Inner diameters:
- Main pipe Øinner = 21.2 mm. ; outer = 25 mm.
- Narrowing / smooth widening.
  * Øinner = 13.8 mm. ; Øouter = 16 mm.
- Narrowing / sharp enlargement.
  * Øinner = 45.2 mm. ; Øouter = 50 mm.

Manometers:
- Water manometer, range wc 1 m
- Electronic differential pressure gauge (± 7000 mbar)
- Bourdon Manometer, read range 0/25 m wc
- Hand-Bourdon gauge, read range -76 cm Hg / wc 25 m

Lengths between manometric tappings:
- In the straight sections of pipe No. 7 and No. 14 is 1 meter.
- In the section No. 12 is 0.5 meters.
- There are always 40 mm between the manometric tappings and the beginning or the end of the accessory, except for the following cases:
  * Manometric tappings upstream and downstream of the diaphragm (3) to 135 mm.
  * Manometric tappings upstream widening (9) and down abrupt narrowing (11) to 125 mm.
  * Manometric tappings in the soft widening / narrowing (4-7) to 270 mm.

Venturi:
- Inner diameter of 12 mm throat.
- Inside pipe diameter 21.2 mm.
- Output cone 7º
- Input cone 21°

Diaphragm 15 mm:
- 15 mm inner diameter narrowing.
- 21.2 mm inner diameter pipe.

Diaphragm 13 mm:
- 13 mm inner diameter narrowing.
- 21.2 mm inner diameter pipe.

REQUERIMIENTOS

- DIKOIN Hydraulic Bench or Unit.