VERSION 4

VEGA

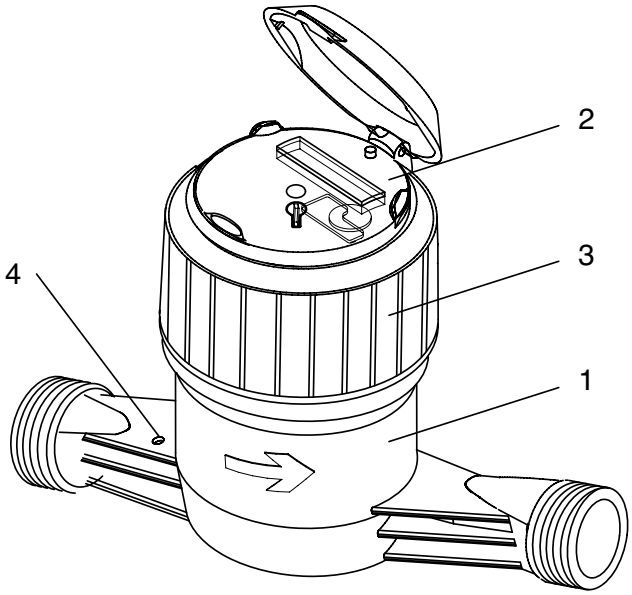
FTA 004

TECHNICAL MANUAL

sappel

The water meter is above all a precision measuring instrument. The greatest attention has been paid to its design and manufacture. In respect to its quality, it has been Class-C approved by the metrological authorities.This appliance has been approved for invoicing purposes and has to be handled with care.

1 - Summary description



The meter consists of a brass body (1) containing the hydraulic part, a register (2) and a blue ring (3) attaching the meter to the body. Free rotation of blue ring enables orientation of register, thus ensuring maximum legibility of data.

Hole (4) is used to seal the meter on the site.

2 - Configuration

All **Vega** meters may be subsequently fitted with an additional **Pulsar**, **Izar** or **Draco** device.

3 - Fitting precautions (To be carried out in compliance with ISO 4064 part 2).

3 -1 Cleaning of pipework

Before installation of **Vega** meter in pipeline, it must be ensured that pipework is free of impurities. In case of doubt, pipework should be flushed using a strong water jet, after putting a sleeve (by-pass) in place of meter.

3 - 2 Pipe alignment

To reduce mechanical strain on meter body to a minimum, the pipework has to be perfectly aligned. On intake side of meter a drilled nut should be used for connection to pipeline, thus enabling sealing of meter.

4 - Installation

4 - 1 Installation position

The **Vega** meter is a volumetric meter and therefore not influenced by horizontal or vertical

mounting position. Its metrological qualities remain the same, independent of mounting position.

During installation it should be checked that water flow direction corresponds to direction of arrow on meter's brass body.

4 - 2 Installation site

The **Vega** meter measures volume and not weight. It is important that the measured fluid does not have a gaseous phase. It should therefore be placed at a low point in the pipeline to avoid air pockets disturbing its operation. The applied technology does not require straight lengths before or after the meter.

4 - 3 Installation tools

The meter body is equipped with two connection pieces with standard threads. Sealing rings between meter body and connections are not supplied. To render installation easier for the plumber during tightening of connections, the 170 mm flat surfaces on the connection pieces allow placing of a 22 mm spanner. Use of this second spanner prevents rotation of meter during tightening, thus avoiding damage to sealing ring (max. torque: 30 m.N).

4 - 4 Responsability

The guarantee clause shall not apply if the installation is not made in compliance with good workmanship principles and if the operations described above are not followed.

5 - Precaution for storage, installation and use

- do not store the meters for more than three months ;

- do not stack pallets and do not subject the meters to loads greater than 80 kg ;

- make sure that there is water in the meter at all times, and leave the meters plugged ;

- the temperature of the water in the meter must be located between +1°C and +30°C and the outside temperature must not exceed 50°C (surface temperature 60°C) ;

- maximum admissible operating pressure is 12 bar ;

- the water must be clear and free of suspended solid particles (such as sand) larger than 0.1 mm (max. concentration 0.1 gram/litre). Clean the filter regularly in order to prevent clogging ;

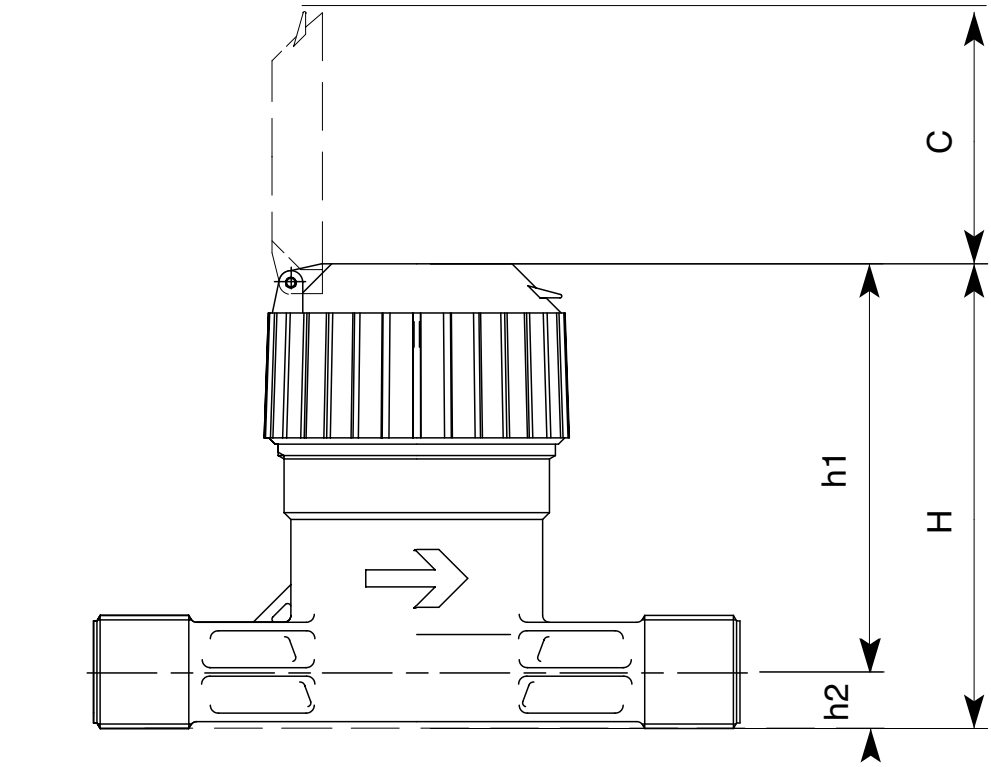
- flowrate in pipeline must not exceed maximum flowrate in meter ;

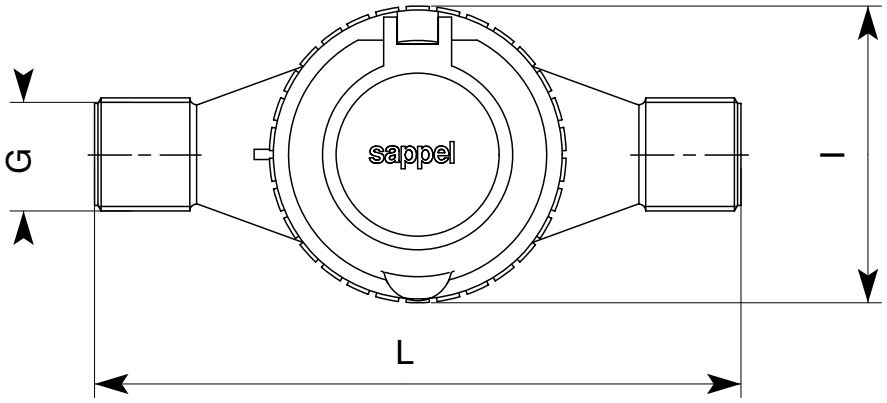
- manipulations and disturbances in system must not provoke sudden water hammer effect. While working on the pipes, bleed the air thoroughly in order to prevent air bubbles from forming when the water is turned on, as they could damage the meter ;

- clean with a slightly acid solution (water and vinegar or descaling agent etc...) or soapy water ;

- in the event of freezing, make sure that the meter is drained completely.

6 - Dimensions





Vega		**15**	**15**	**20**	**25**	**32**	**40**
G	G	3/4"	3/4"	1"	1"1/4	1"1/2	2"
L	in mm	110	170	190	260	260	300
l	in mm	90	90	90	112	146	165
H	in mm	125	135	140	162	187	193
h1	in mm	112	122	123	134	157	160
h2	in mm	13	13	17	28	30	33
C	in mm	75	75	75	75	75	75
weight	in kg	0.85	1.1	1.28	2.8	4.6	8.9
stainless steel filter							
mesh section	mm^2	0.597	0.597	0.597	0.795	0.795	0.795
number		971	971	1395	5542	5542	8193
useful area	mm^2	579	579	833	4406	4406	6513
retention volume	cm^3	8	8	21	77	77	250

1 - General

Vega water meters are used for precise measurement of drinking water consumed by subscribers of water board supply network.

The various models provide a solution for almost all cases of household distribution. Fitted with electrical pulse emitters, they enable connection with the radioreading system **Izar** or the flowrate analyser **Cursa**.

Vega meters stand out for their extreme sturdiness and reliability, guaranteeing precision metering even under difficult conditions and over a long period.

2 - General description

The **Vega** meter fig.1 is composed of a pressure-resistant brass cylindrical body (1) foreseen with two pipe connectors. It is fitted with a numbered-dial register (2), equipped with a patented Sappel anti - mist system (4). The whole being assembled with a blue plastic ring (3) bearing the EC stamp (7) of approval and date (8). Free rotation of blue ring enables orientation of register over 350°. Notches (5) around perimeter of register enable installation of a **Pulsar** pulse emitter or of the radioreading system **Izar**. First measurement meters are also equipped with a blue cover (6).

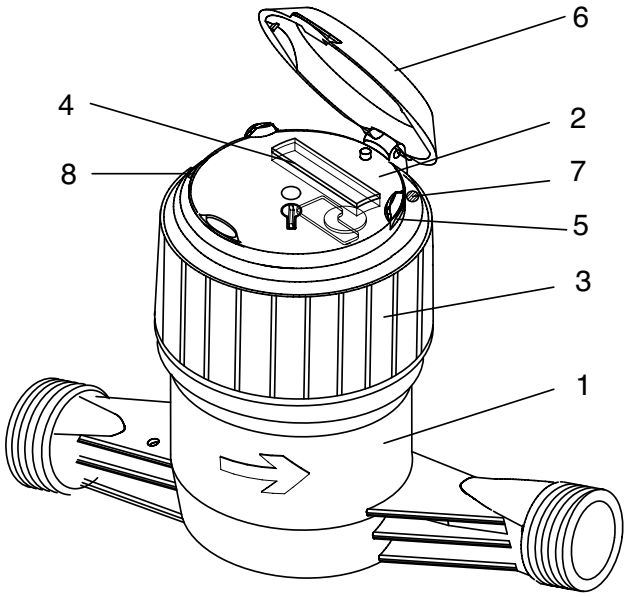
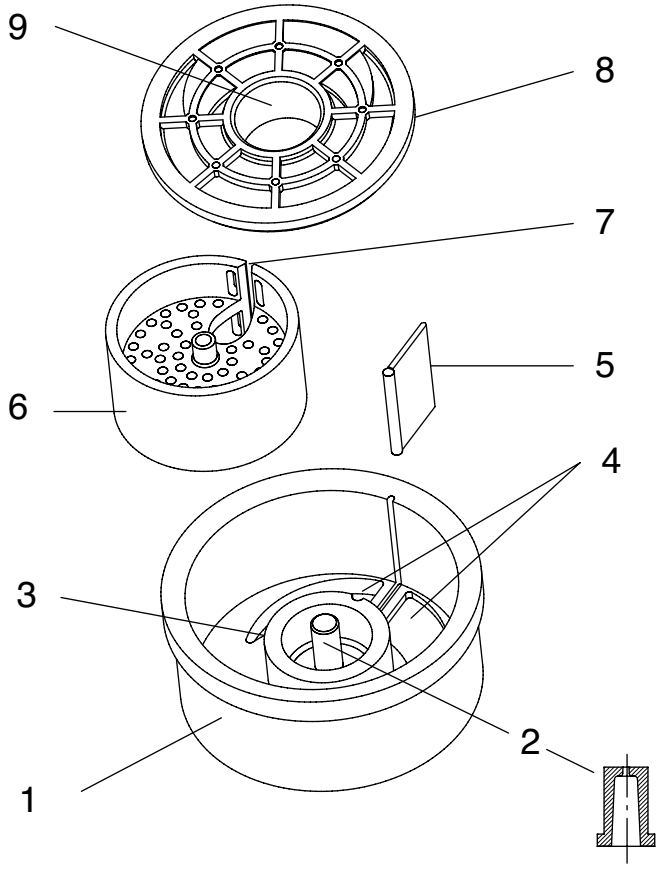


fig.1

3 - Measurement principle

Vega meters make use of the revolving wall volumetric technology. These meters are more commonly known as rotary piston or oscillating volumetric meters.

The principle consists of moving a known body of water from intake to outlet side of meter.



The measuring facility shown in fig.2 comprises a hollow cylindrical measuring chamber (1). Its lower section, foreseen with casted insert(2) and a well (3), is penetrated by two slits (4) enabling intake and outlet of water. A partition (5), placed radially, separates the two slits. The piston (6) is composed of a split ring on a generator (7), equipped with a penetrated centre plate. It revolves around the insert with the split ring, sliding along the partition. The cover (8) having the same well (9) as the chamber, seals the measurement chamber.

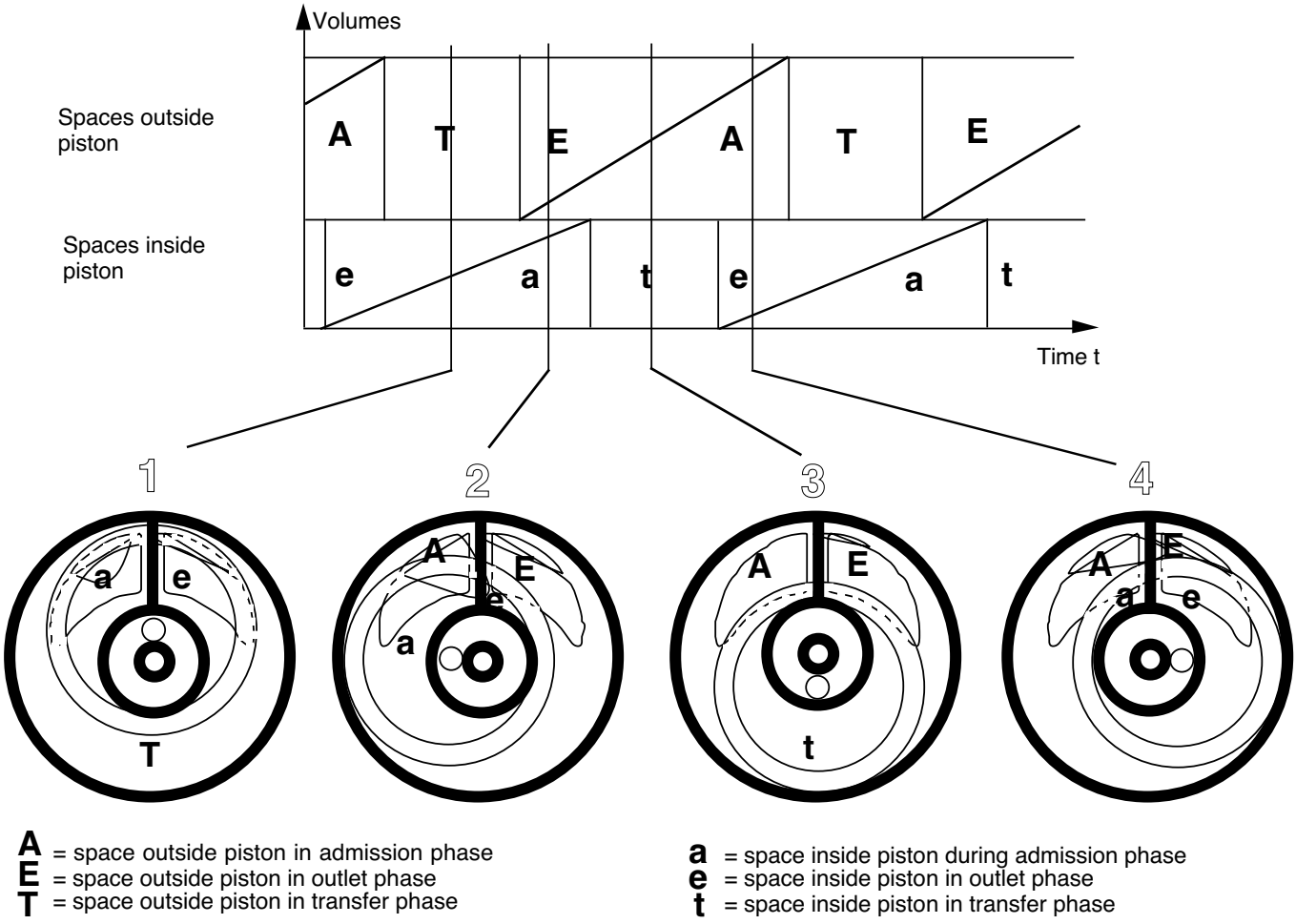
fig.2

3 - 1 Operation

Although the principle of a rotary piston meter is simple, its operation is more complex.

It is a double three-stroke system (see fig. 3):

- First stroke: admission
- Second stroke: displacement of a volume of water
- Third stroke: outlet



A = space outside piston in admission phase
E = space outside piston in outlet phase
T = space outside piston in transfer phase

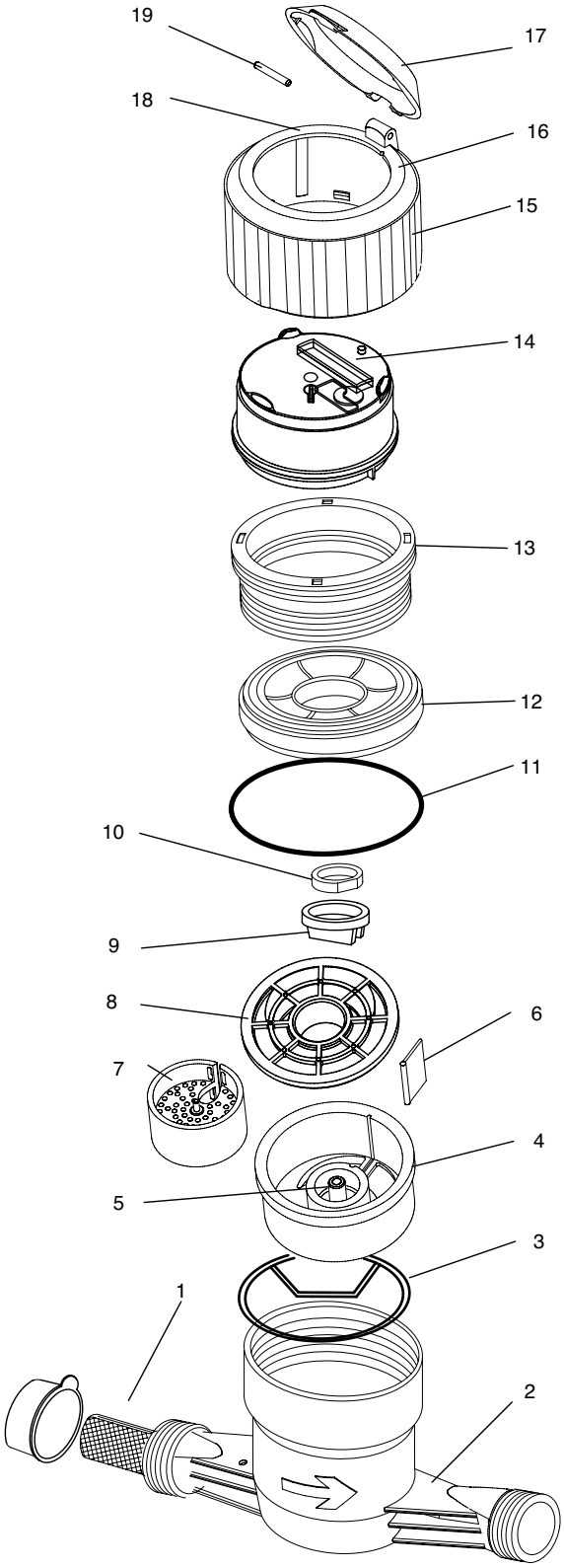
a = space inside piston during admission phase
e = space inside piston in outlet phase
t = space inside piston in transfer phase

fig.3

These three phases take place simultaneously with a phase shift of π between inside and outside of piston thus representing the double three-stroke. A partition separates the space between external surface of piston and internal surface of measurement chamber in two cavities. The same partition separates the space between internal surface of piston and guide cylinder in two further cavities.

In general, two cavities are in admission phase and two in outlet phase. For each piston revolution, two positions of the latter are characterised in that one of the cavities leaves its admission position before it is in its outlet position and thus constitutes a fixed volume moving from intake to outlet of meter. It is the water intake during admission which revolves the piston and gives it the energy necessary for translation of measured water volume followed by its escape to outlet of meter. This movement is brought about by the very special form of the admission and outlet slits.

4 - Assembly principle



The **Vega** meter is composed of a cylindrical body (2) foreseen with two pipe connections. The intake connection is fitted with a filter (1). The entire metering unit comprising measurement chamber (4) with insert (5), partition (6), piston (7) and unit cover (8) are enclosed in the body. A sealing ring (3) provides sealing between intake and outlet slits.

The lower drive element (9) equipped with a magnet (10) revolves at same speed as piston. It pivots on journal of plate (12). A threaded ring (13) fixes the whole in place. The seal (11) ensures watertightness.

The numbered dials of register (14) are turned by an upper magnetic drive element inside register. A verification disc enables detection of the least piston movement.

The adjustable locking ring (15) which bears the original verification mark (16), the official stamp of the Metrological Department, and the date, ensures the closure of meter.

On first measurement meters, the meter is fitted with a cover (17). It is hinge-fitted to the closing ring via a hinge pin (19).

fig. 4

5 - 5 - Technical characteristics

Calibration (DN in mm)	15	15	20	25	32	40
Length	110	170	190	260	260	300
Installation	All positions					

Measuring range (l/h)

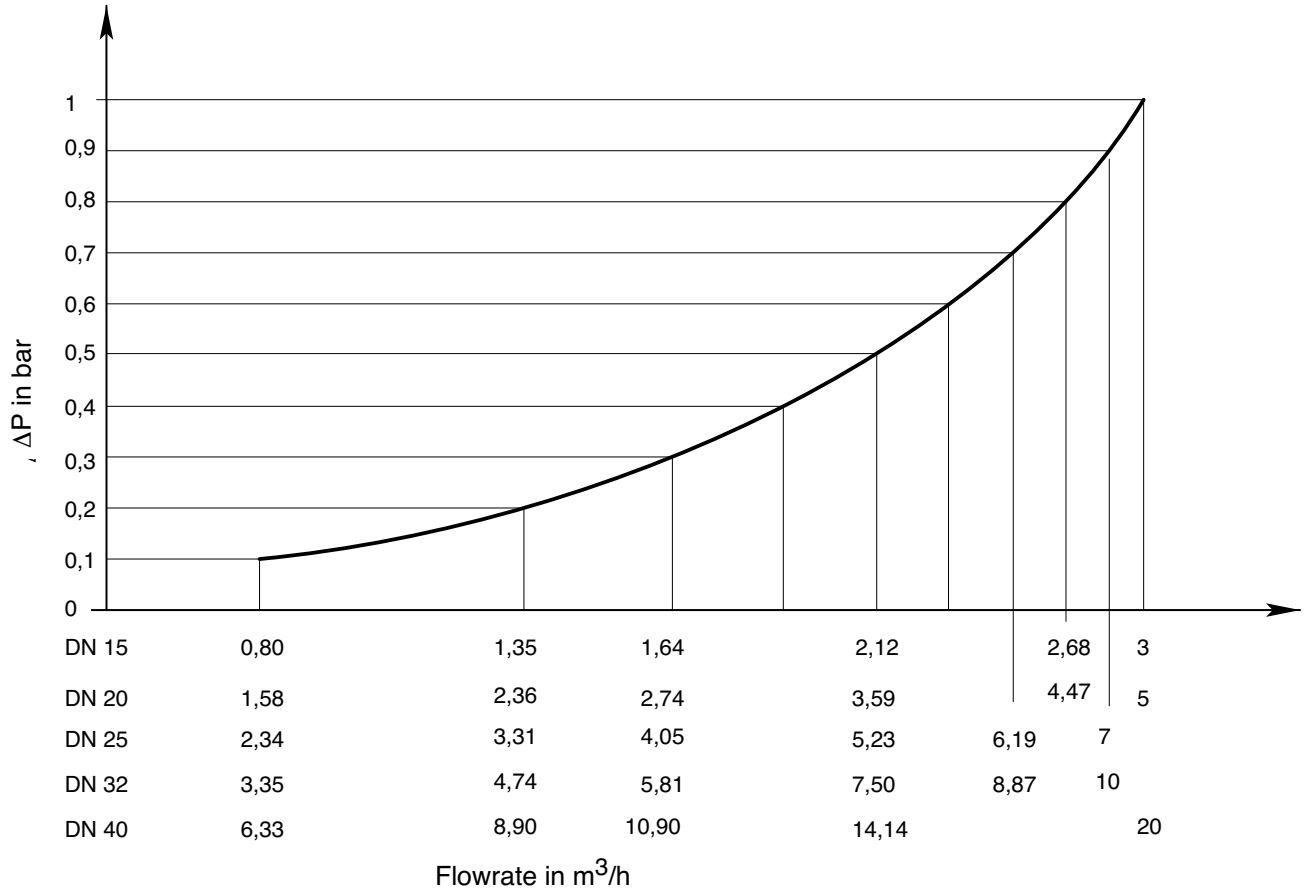
Min. constructor's flowrate	11.25	11.25		26.25	37.5	75
Min. approved flowrate Qmin.	15	15	25	35	50	100
Qt	22.5	22.5	37.5	52.5	75	150
Qn	1500	1500	2500	3500	5000	10000
Max. approved flowrate Qmax.	3000	3000	5000	7000	10000	20000
Permitted Qmax.	5000	5000	5000	7000	10000	20000

EC Approval

Class	C
Approval number	F86 01.384

Head loss	$\Delta P = \frac{Q^2\ (m^3/h)}{Kvs^2}$					
Kvs	3	3	5	7.4	10.6	20

Head loss curve



Dimension, weight and connections

Calibration	15	15	20	25	32	40
Length	110	170	190	260	260	300
Width in (mm)	93	93	93	112	146	165
Height in (mm)	125	135	140	160	185	196
Threaded connections	$^3/_4$"	$^3/_4$"	1"	1"$^1/_4$	1"$^1/_2$	2"
Weight in (kg)	0.85	1.1	1.3	2.8	4.6	8.9

• Length 170 may be extended to 191 mm, notably for the Mexican market

Temperatures and pressure	
Rated T. min. and max.	from 0 °C to 30 °C
T limits for water	from 0 °C to 50 °C*
T limits for storage	from -30°C to 50 °C**
Operation pressure	12 bar
Test pressure	24 bar
Rupture pressure	50 bar

* drain the meter completely before the temperature drops to freezing point

** the meter must always contain water

5 - 1 External forces

5 - 1 - 1 Weight load

When the cover is in closed position, the meter can withstand the weight of a man weighting 80 kg.

5 - 1 - 2 Falls

The meter is designed to withstand falls from 1 metre above a hard floor (as per Sappel standard NS E 019). In the event of a fall, if the meter shows signs of impact, it should be tested before installation.

5 - 2 Static pressure

The **Vega** meter is designed to operate at a maximum nominal pressure of 12 bar. The test pressure is increased to 24 bar (as per ISO 4064) and the average bursting pressure is 50 bar.

At greater pressure values, the plates of DN 15 and 20 mm meter crack and the leakage rate is about 200 l/hr. Meters DN 25, 32 and 40 remained sealed, but the body may be deformed and metrology properties are no longer guaranteed.

5 - 3 Water hammer

The meter can withstand water hammer effects as per Sappel standard NSE 006. The effect of excessive water hammer on the meter is identical to that of excess pressure.

5 - 4 Excess pressure due to the freezing

- when the meter is drained (the valve to the meter is shut and the draining valve from the meter is open), the measuring chamber is voided of water, and freezing has no effect on the future characteristics of the meter.

- when the meter is not drained, it shows the same characteristics (after testing to Sappel NSE 010) as when the pressure is exceeded.

5 - 5 Filtration

DN 15 and 20 mm meters come with plastic or stainless steel filters. When the water is not clear, the use of a plastic filter must be avoided.

- the filter is located in the intake pipe to facilitate maintenance. The filter must necessarily be cleaned regularly in order to avoid clogging.

- if clogged, the stainless steel filter can withstand the nominal supply pressure of the meter, but undesirable particles may be forced into the meter and could reduce its measuring performance.

The meter can withstand the passage of impurities with dimensions less than those of the filter mesh for a maximum duration of 2 hours, as per Sappel standard NSE 005. Howerver, during normal operation, the water going through the meter must not contain particles with dimensions greater than 0.1 mm for a concentration equal to 0.1 gram/litre.

5 - 6 Noise level

The sound level of the meter is measured in dBA, 15 cm away from the meter, as per standard NSE 004. The average value measured with **Vega** DN 15 is 60 dBA.

5 - 7 Accidental flowrate

The volumetric meter is not designed to withstand flowrates greater than the approved maximum flowrate. However, the DN 15 meter can operate for about 10 hours at 5 m^3/hr.

5 - 8 Readability

The meter is fitted with a Sappel-patented anti-fogging register, and is sealed against mist as per Sappel standard NSE 001. The register can withstand prolonged immersion for over six months at a depth of one metre of water. Use soapy water to clean the register capsule. Never use solvents.

5 - 9 Tamperproof design

In the event of any attempt to tamper with the meter by opening the sealed part, the sealing system (closing ring, lead seals, plastic sealing etc.) of the meter retains marks showing that such an attempt has been made (as per Sappel standard NSE 018).

If any attempt is made to tamper with the meter using a blowpipe, the painted and plastic parts retain burn marks.

5 - 10 Cleaning

The body of the meter is made of brass. However, it can be cleaned safely with a slightly acid solution (water with ninegar, descaling agent etc.) in order to remove traces of scale.

5 - 11 Food grade

Vega meters have been designed and developed in compliance with the food grade requirements of :

- WRC (Water Research Center) for microbiological tests ;

- Paris City Council for physical-chemical tests.

6 - Performance

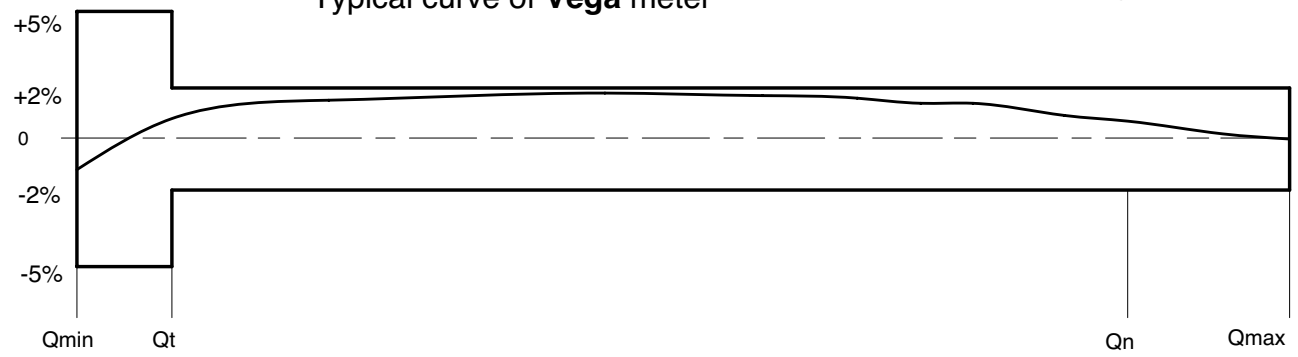
6 - 1 Precision

The **Vega** meter is class C approved according to European Metrological Directives. Thus ,it serror curve remains within the tolerance limits as indicated in fig.5.

It is recognised for its extreme stability which is characterised by the small typical deviations. (<0.15% between 150 and 3.000 l/h on one batch) and by the precision of its Qmin. (approximately - 1.8%).

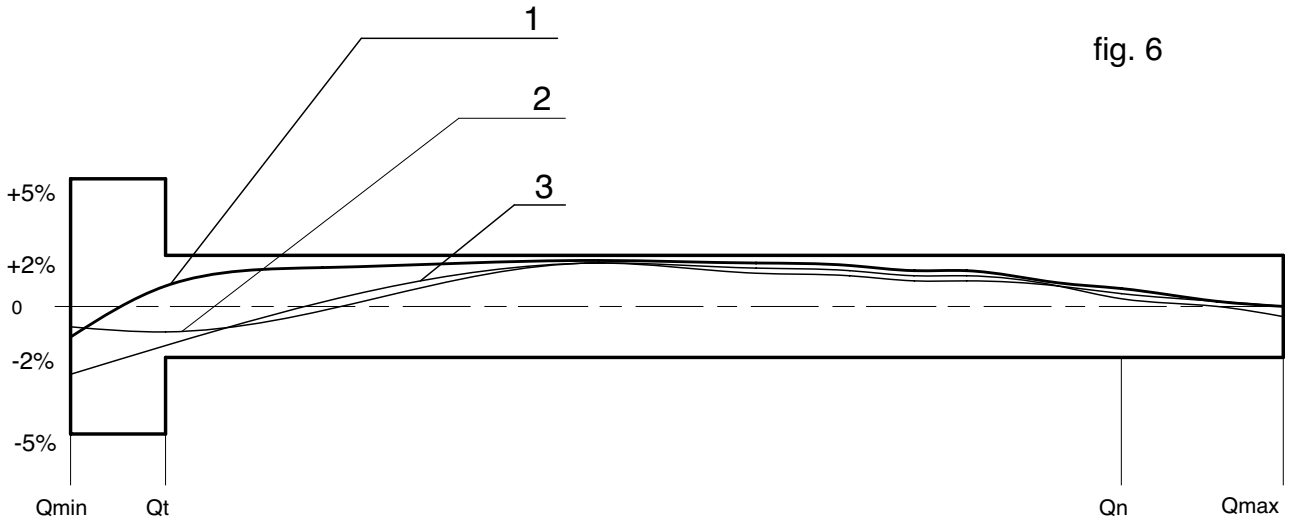
Typical curve of **Vega** meter

fig. 5



The **Vega** meter offers a high resistance to wear thanks to its low rotation speed (900 rpm at Qmax. for **Vega** DN 15 mm and 1.500 rpm for **Vega DN** 20 mm) and well as selected fabrication materials. The development of its error curve set against time is characteristic of this quality (fig. 6).

fig. 6



After 100 hours at Qmax., the curve deteriorates slightly at Qmin. (approx. 0.2%) but becomes linear at Qmax. (running-in phenomena). After 100.000 abrupt start/stop cycles at Qn, very destructive tests, deterioration at Qmin. is greater. The meter remains, however, within tolerance limits. From approx. 300 l/hr onwards the curve no longer changes.

The stability of these units is confirmed in wear tests. Typical deviations per batch remain less than 0.15% between 300 l/hr and Qmax. and less than 1.8% at Qmin.

6 - 2 Sand contamination

To ensure durable, silent and metrologically correct operation, a volumetric meter must be perfectly machined and its surfaces flawless. Its dimensions and surface conditions are considerably deteriorated when operating with water containing a high level of solid particles. In order to counteract this deterioration, all **Sappel** volumetric meters are series-fitted with a patented fluid collector which enables solid particles to escape from measurement chamber without causing damage to various surfaces.

Principle:

During operation with sandy water, the particles cross the measurement chamber without damage as they are suspended in water. However, in case of stoppage, the particles settle at base of measurement chamber and block piston when starting up again. The fluid collector enables particles to retreat before the piston, thus avoiding blockage. These particles are evacuated by water circulation when flowrate increases.

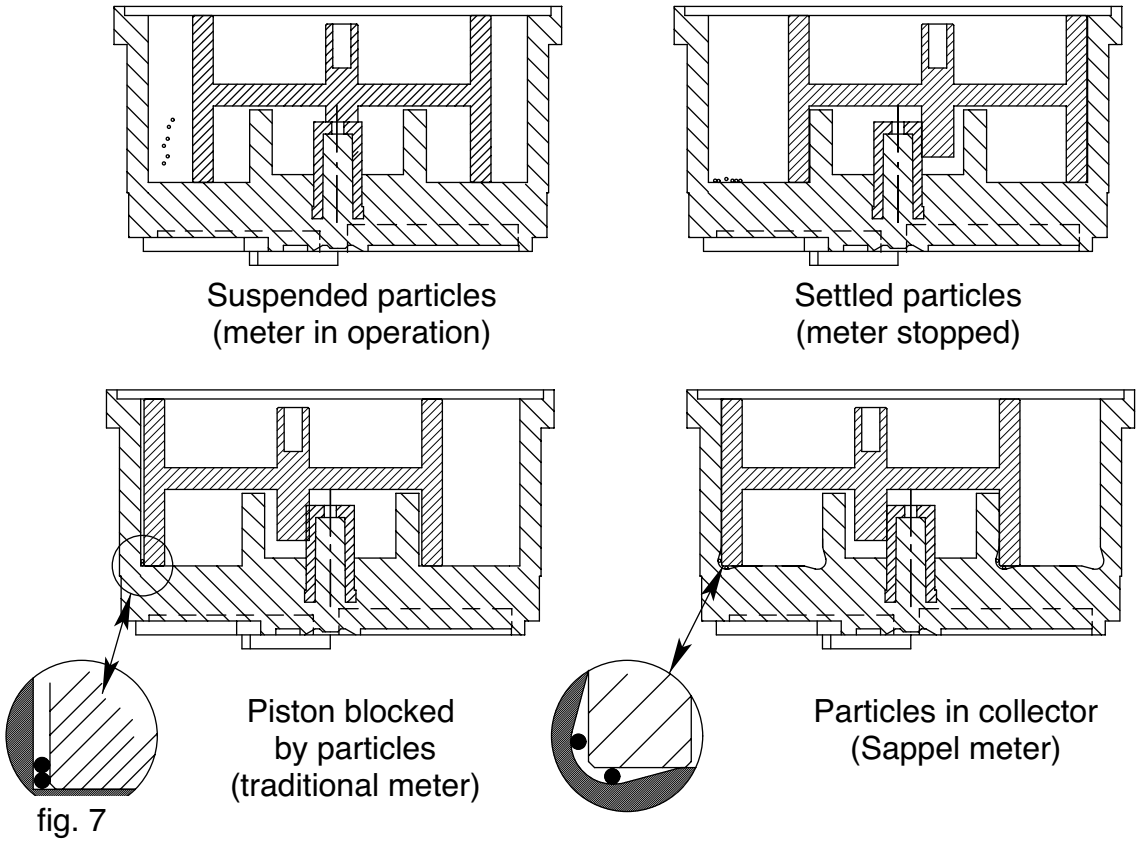


fig. 7

After operating with highly sand-contaminated water (more than 10 grams per litre) and after a powerful rinsing, the **Vega** meter conserves its original metrological properties whereas traditional meters permanently lost more than 3% of their precision and the start-up flowrates had tripled.

In practice:

- Water must be free of suspended particles (sand...) larger than 0.1 mm ;

- Water must be clear drinking water, max. concentration 0.1 gram/litre.

7 - Manufacturer's guarantee

Utmost care has gone into the manufacture of the meter, which comes with a 12-months guarantee, beginning from its release from our workshops. The guarantee is limited to the replacement of the defective part, with no other compensation, and will only apply if the principles of good workmanship and the precaution below have been complied with :

7 - 1 Storage and transport

- dot not store the meters for more than 3 months ;
- do not stack meter pallets ;
- do not place loads greater than 80 kg on the meter ;
- make sure that the meter is plugged at all times ;
- make sure there is water in the meter all the times ;
- do not store the meter in locations where its temperature could exceed 50°C ;

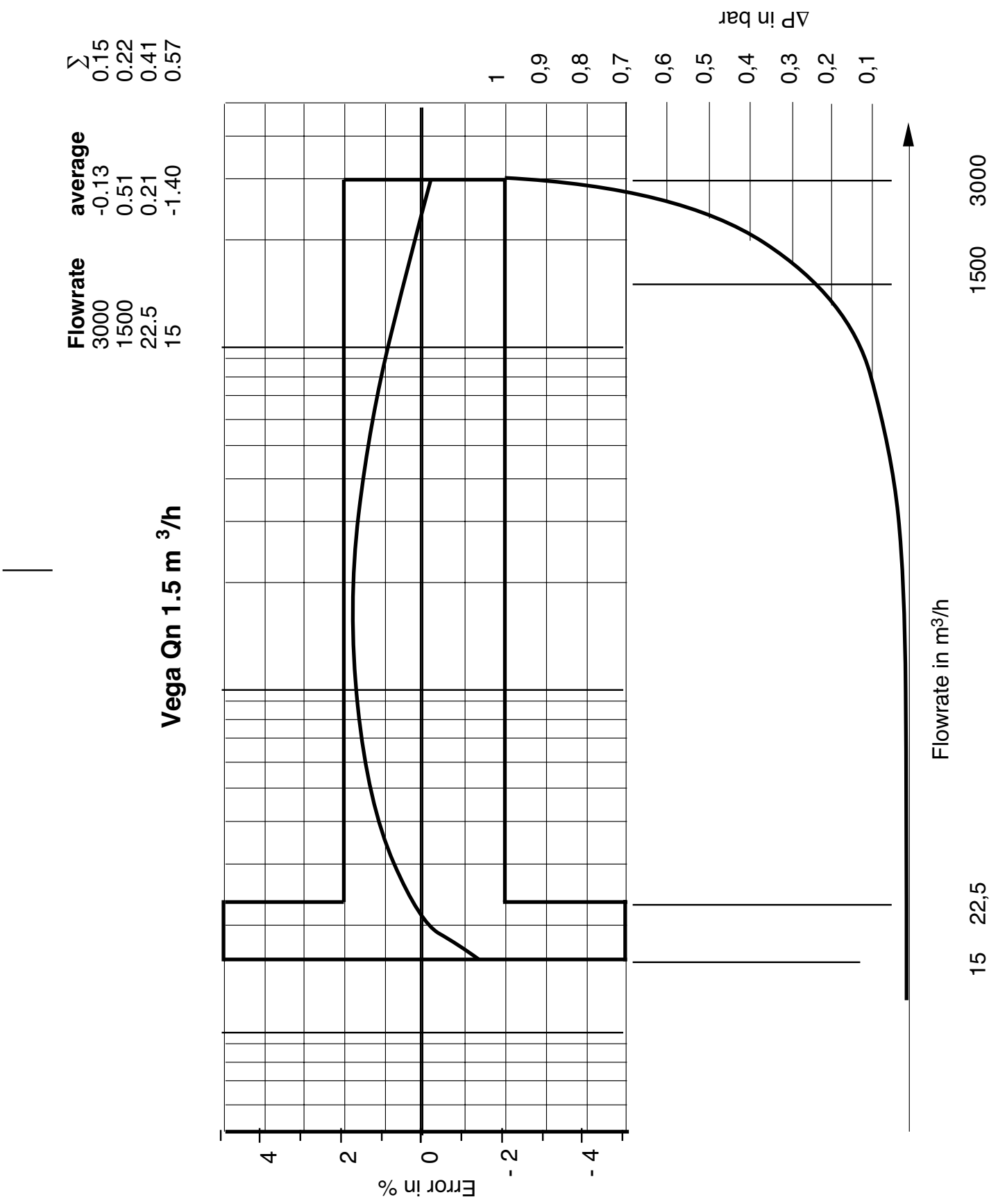
The guarantee shall not apply if the packaging is open or damaged upon receipt.

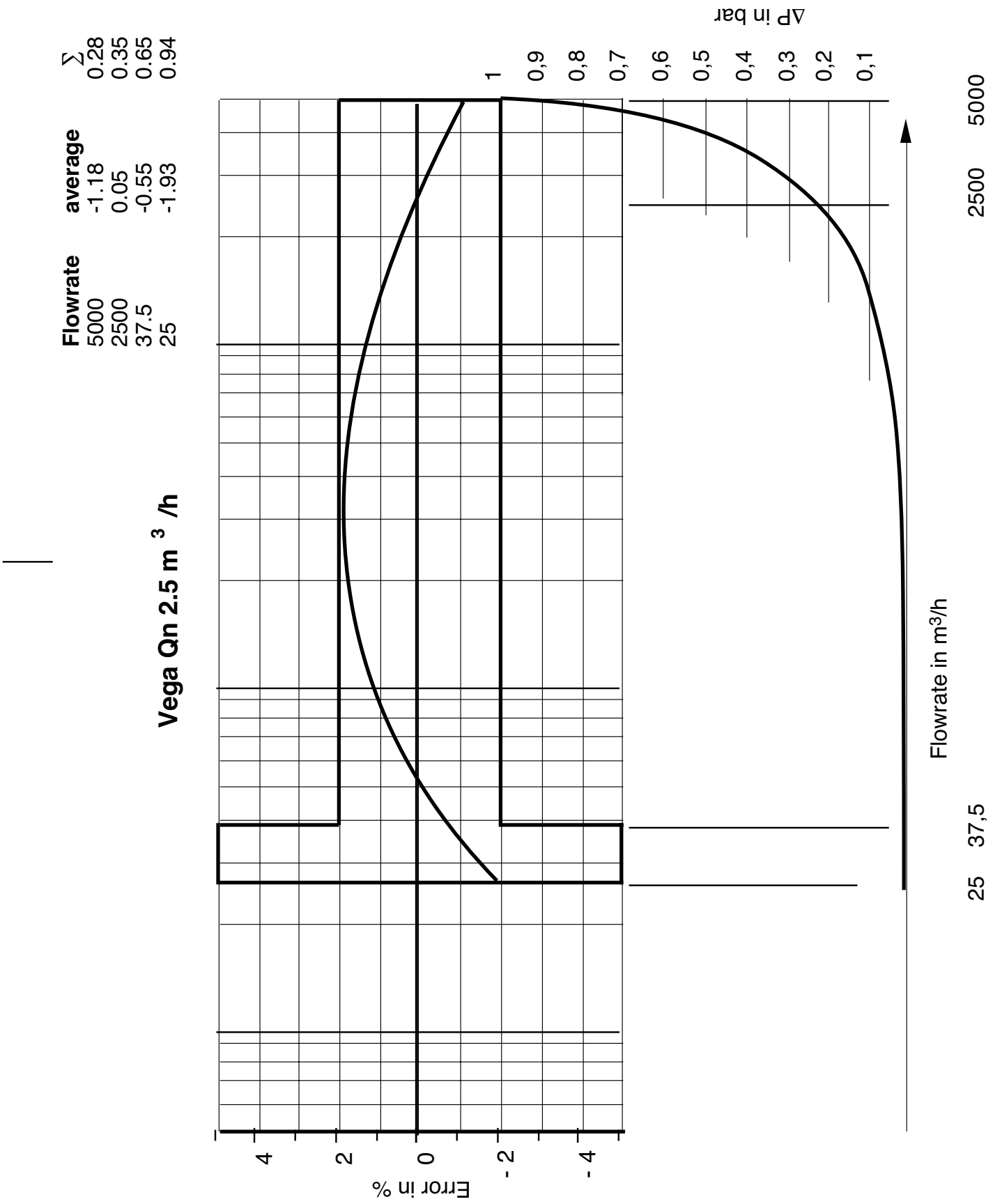
7 - 2 Installation

- follow the principles of good workmanship and the fitting and installation precautions given in FTA A 004;
- protect the meter from any return of hot water.

7 - 2 Use

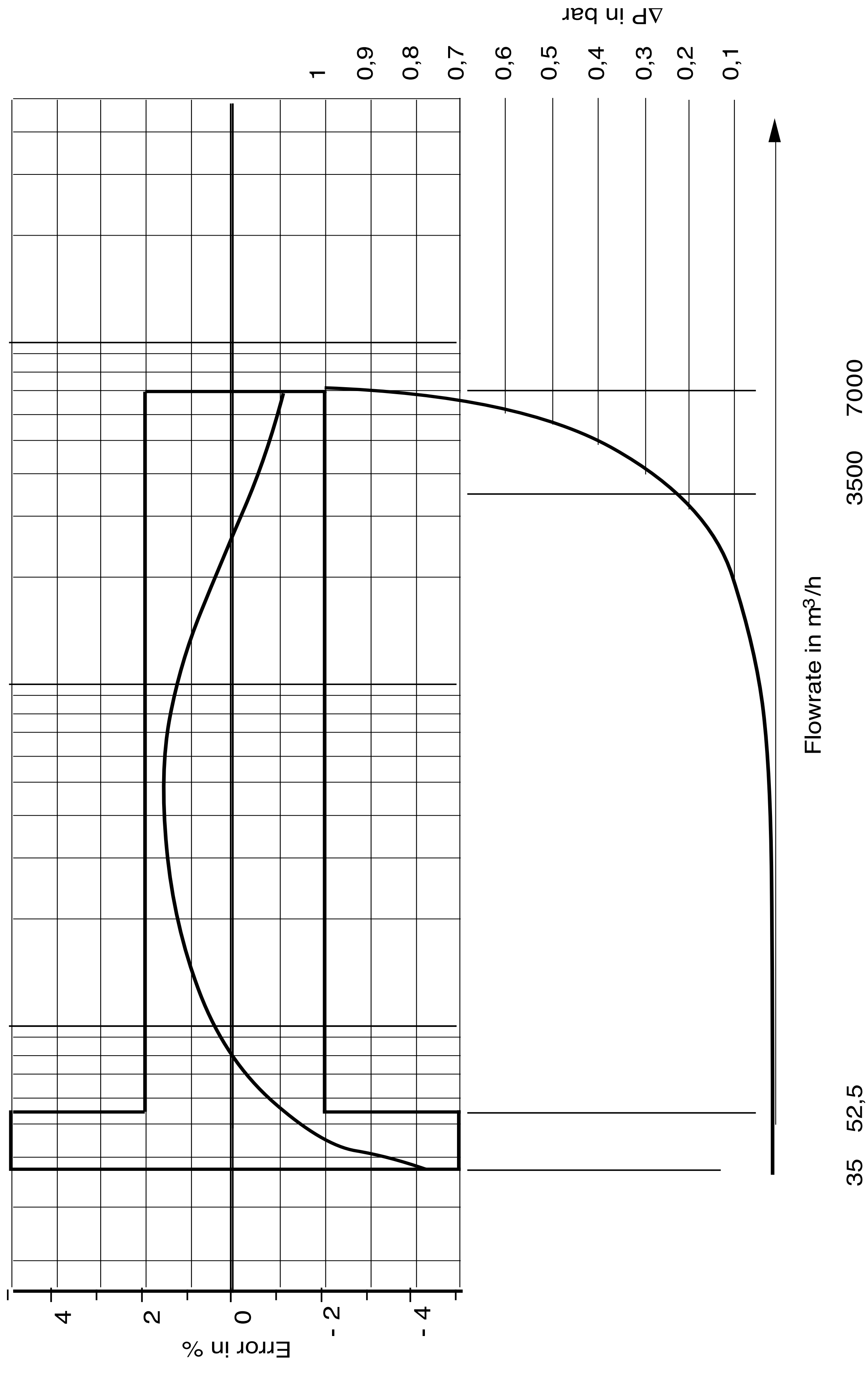
- follow the precautions for use given in FTA A 004 ;
- clean the filter regularly to prevent clogging and bursting ;
- do not let water freeze in the meter.

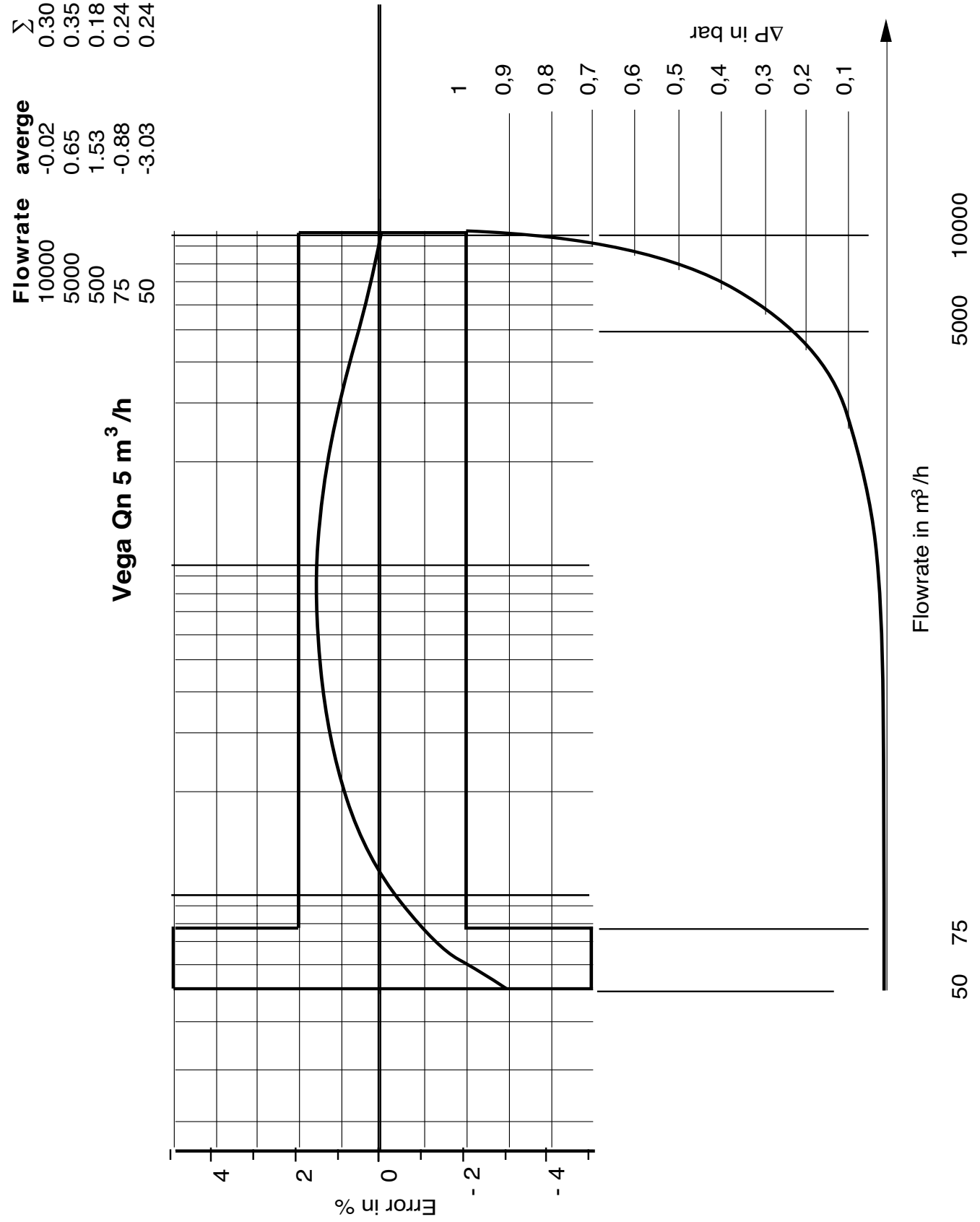

ΔP in bar
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
Σ
0.15
0.22
0.41
0.57
average
-0.13
0.51
0.21
-1.40
Flowrate
3000
1500
22.5
15
Vega Qn 1.5 m 3/h
Error in %
4
2
0
- 2
- 4
Flowrate in m3/h
3000
1500
22,5
15

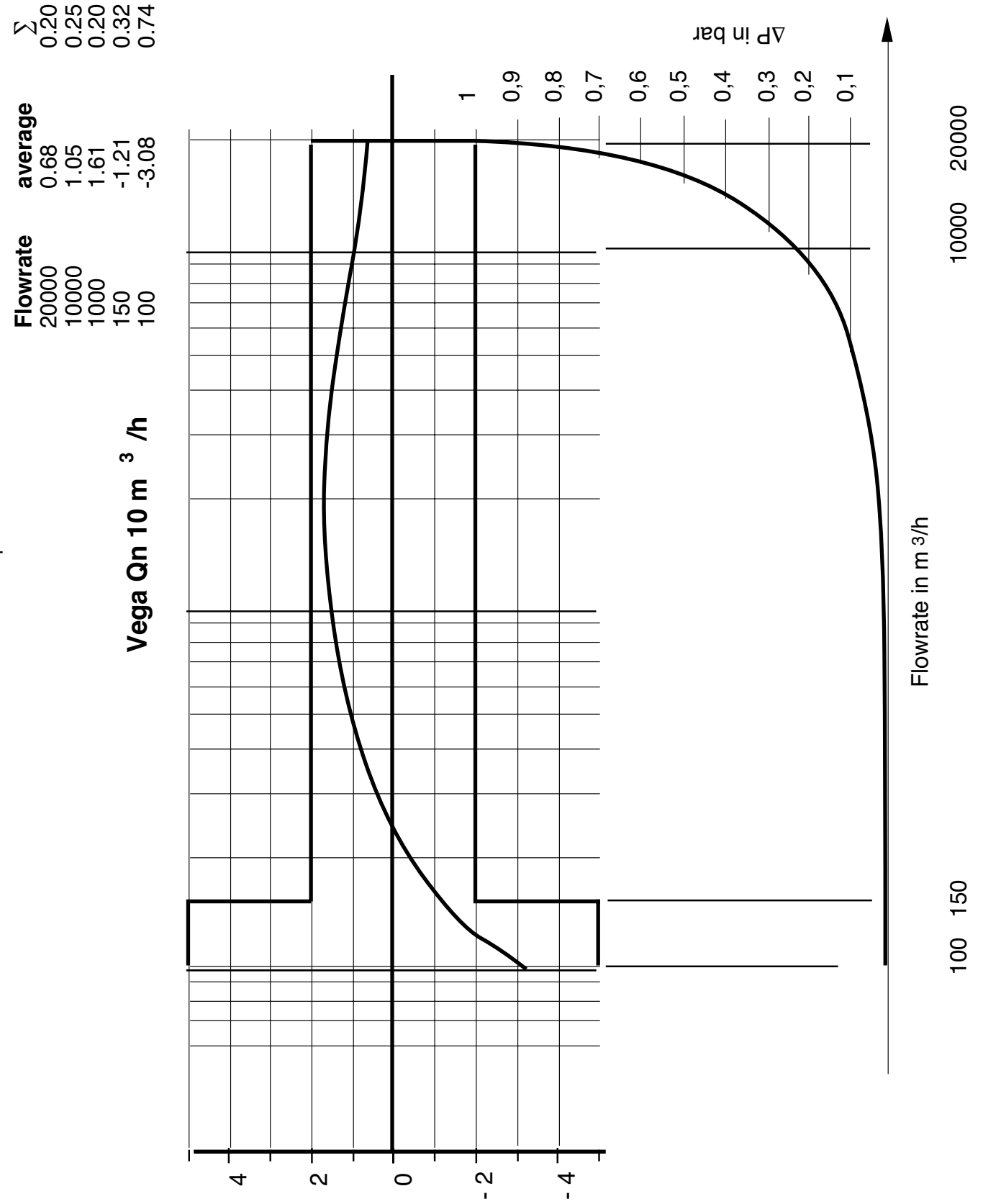

Vega Qn 2.5 m 3 /h
Flowrate
5000
2500
37.5
25
average
-1.18
0.05
-0.55
-1.93
Σ
0.28
0.35
0.65
0.94
Error in %
4
2
0
-2
-4
ΔP in bar
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
Flowrate in m3/h
25
37,5
2500
5000

Vega Qn 3.5 m^3/h

Flowrate	**average**	Σ
7000	-1.12	0.42
350	1.55	0.17
52,5	-1.48	0.28
35	-4.12	0.51




Vega Qn 5 m³/h
Flowrate averge Σ
10000 -0.02 0.30
5000 0.65 0.35
500 1.53 0.18
75 -0.88 0.24
50 -3.03 0.24
Error in %
4
2
0
- 2
- 4
ΔP in bar
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
Flowrate in m³/h
50
75
5000
10000


Vega Qn 10 m 3 /h
Flowrate
20000
10000
1000
150
100
average
0.68
1.05
1.61
-1.21
-3.08
Σ
0.20
0.25
0.20
0.32
0.74
4
2
0
- 2
- 4
ΔP in bar
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
Flowrate in m 3/h
10000
20000
100
150