

## ORIMAS Mass Flowmeter

### Typical Applications

The ORIMAS mass flow meters measure the mass flow of most liquids and gases within the process industries, including chemical, petro-chemical, pharmaceutical and the power industry.

The ORIMAS is based on the principle of measuring velocity, the static pressure and the temperature in the pipe line. The electronics computerise the mass flow by using the 3 measured values.

The ORIMAS flow meters are backed by international standards covering flow calculation, manufacturing tolerances, accuracy and installation requirements.

This type of bare bone technology is world wide accepted and supported by millions of successful installations.

### Features

*The ORIMAS mass flowmeter features are:  
Standardised product based on  
well proven technology.*

*Compact design.*

*Simple construction.*

*Free choice for horizontal or  
vertical pipe run.*

*Standardised construction  
means low inventory.*

*No moving parts.*

*Not sensitive to vibrations.*

*The electronics delivers output signal  
linear to mass flow.*

*Digital indicator for local mass flow  
reading.*

*High accuracy.*

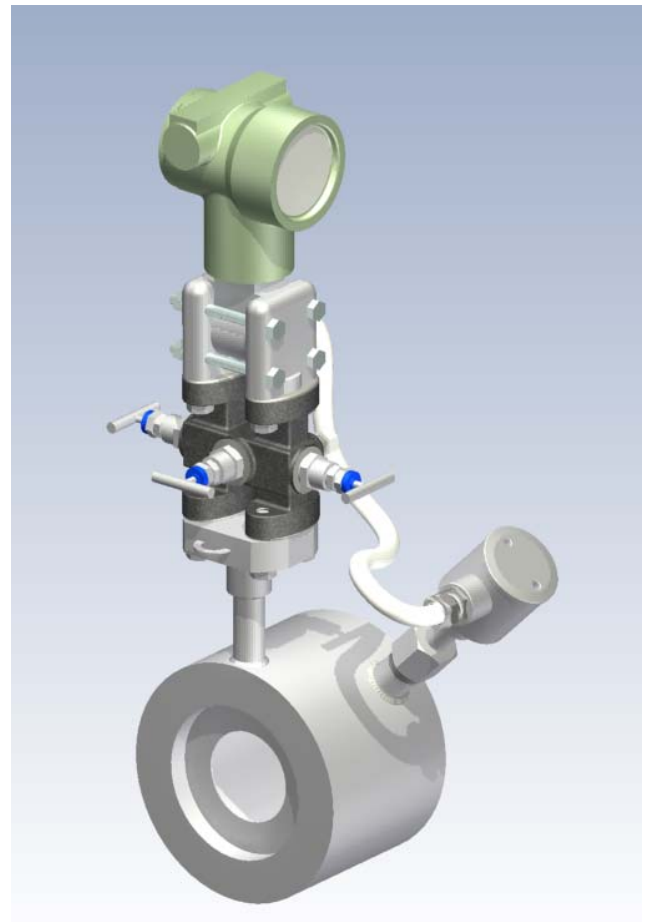
*Wide rangeability.*

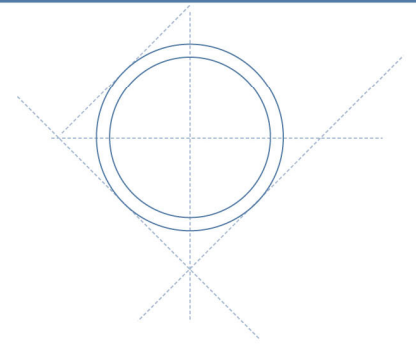
*Easy to install.*

*Easy to re-calibrate.*

*Fully in compliance to PED 97/23 EC*

*Model with integrated manifold valve.*





## Construction

### Model OR1

The ORIMAS flow meter model OR1 consists of a primary element based on the differential pressure principle, a 3 valve manifold, a multi variable transmitter and a temperature sensor. The multi variable transmitter measures the differential pressure, the static pressure and has an input connection to the temperature sensor.

The flow computer housed in the transmitter performs the dynamic flow calculation.

### Model OR2

The ORIMAS flow meter model OR2 consists of a primary element and operates as mentioned above but has an integrated 3 valve manifold.

The ORIMAS flow meter is mounted between flanges in sizes from DN 40 (1½") to DN 400 (16") in pressure ratings up to PN 40 (300 lbs).

Other sizes and pressure ratings on request.



Model OR1

## Accessories

Remote Mounting Kit type RMK is available if remote mounting of electronics is required in case of not easy accessible pipe line or elevated process temperature.

The customer has to provide the stainless steel instrument tube  $\varnothing$  12 x 1 mm between flow meter and electronics.



Remote electronic indicator with LCD is available for local flow indication and if required check/change of flow rate (differential pressure).

## Principle of measurement

The ORIMAS is a mass flow meter

A restriction in a pipe line changes the value of the different energies.

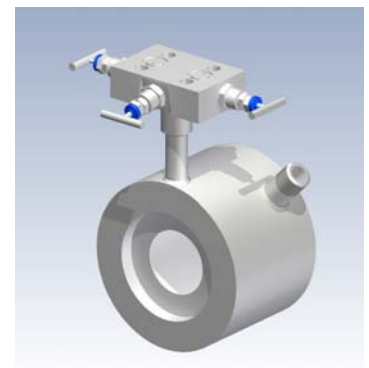
Based on the law of energy balance developed by Bernoulli the sum of energies remains constant.

Increases the velocity in the pipe line decreases the pressure in the restriction.

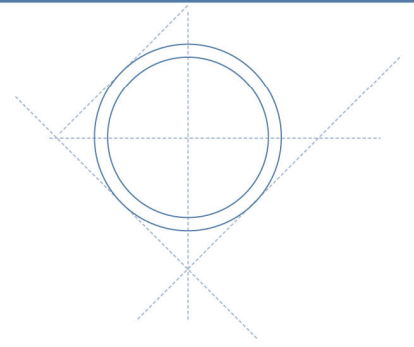
The pressure differential between the inlet pressure and the pressure in the restriction is measured expressing the flow velocity.

The static pressure and the temperature is measured.

When the physical values of the fluid is known and the inner pipe diameter is established the electronics calculate the mass flow. The mass flow is expressed in an analogue signal 4 - 20 mA or signal for digital communication.

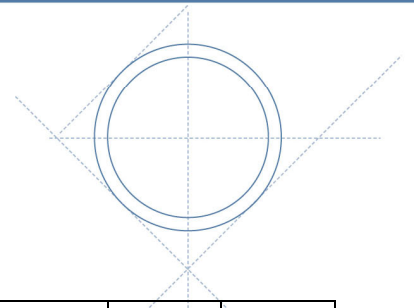


Model OR2



## Technical data

|                                  |   |
|----------------------------------|---|
| Sizes                            | : DN 40 - DN 400, 1½" - 16", larger sizes on request  |
| Pressure rating                  | : up to PN 40, 300 lbs, higher pressure ratings on request  |
| Temperature                      | : Process : -50 - +150°C,<br>higher temperature with Remote Mounting Kit                                      |
| Mounting style                   | : Between flanges according to DIN or ANSI standards  |
| Flange facing                    | : flat face (standard), raised face, DIN 2512 N, DIN 2513 R   |
| Overall length                   | : 120 mm  |
| Material                         | : Stainless steel AISI 316, others on request   |
| Design and calculation standards | : ISO 5167, ASME MFC-3M.  |
| Vent or drain hole               | : On request  |
| $\beta$ (d/D)                    | : 0,5 and 0,6; other $\beta$ on request.  |
| Accuracy                         | : +/- 1 %   |
| Rangeability                     | : 8 : 1   |
| Repeatability                    | : better than 0,1 %   |
| Pressure loss                    | : typical 150 mbar for liquid flow, and 50 mbar for gas flow<br>(values are given at full flow)               |
| Reynolds No                      | : Re > 5000   |
| Allowable differential pressure  | : max 2,5 bar   |
| Output signal                    | : analogue 4 - 20 mA or digital communication via protocol,<br>HART, PROFIBUS, Fieldbus Foundation or others. |
| Local indicator (option):        | LCD showing flowing units or %  |
| Power supply                     | : 14 - 36 Vdc, typical 24 Vdc.  |
| Max load (24 Vdc)                | : 700 Ohm   |
| Enclosure                        | : IP 67   |
| Ex protection                    | : intrinsically safe EEx ia IIC T6, Explosion proof EEx d IIC T6  |
| Temperature                      | : Ambient : -40 - +80°C   |



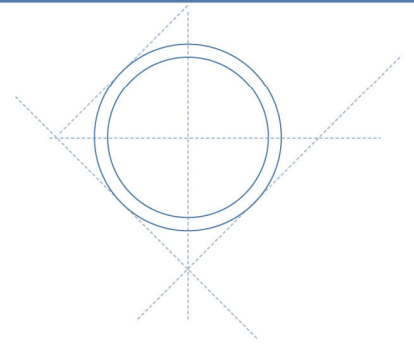
## Sizes

### DIN flanges

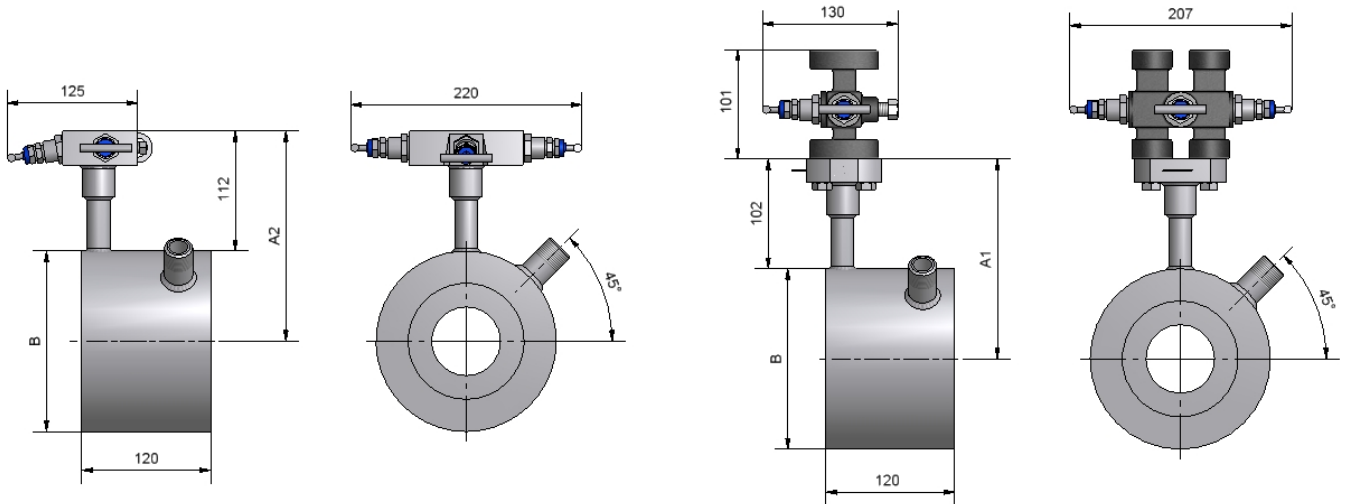
| Size   | Pipe OD | Pressure rating | Inner pipe diameter | $\beta = 0,5$<br>Bore | $\beta = 0,6$<br>Bore | B   | A1  | A2  |
|--------|---------|-----------------|---------------------|-----------------------|-----------------------|-----|-----|-----|
| DN 40  | 48,3    | PN 40           | 43,1                | 21,5                  | 26,0                  | 90  | 147 | 157 |
| DN 50  | 60,3    | PN 40           | 54,5                | 27,3                  | 32,0                  | 107 | 156 | 166 |
| DN 65  | 76,1    | PN 40           | 70,3                | 35,0                  | 42,0                  | 127 | 166 | 176 |
| DN 80  | 88,9    | PN 40           | 82,5                | 41,0                  | 49,5                  | 142 | 173 | 183 |
| DN 100 | 114,3   | PN 16           | 107,1               | 54,0                  | 64,0                  | 162 | 183 | 193 |
| DN 100 | 114,3   | PN 40           | 107,1               | 54,0                  | 64,0                  | 168 | 186 | 196 |
| DN 125 | 139,7   | PN 16           | 131,7               | 66,0                  | 79,0                  | 192 | 198 | 208 |
| DN 125 | 139,7   | PN 40           | 131,7               | 66,0                  | 79,0                  | 194 | 199 | 209 |
| DN 150 | 168,3   | PN 16           | 159,3               | 80,0                  | 96,0                  | 218 | 211 | 221 |
| DN 150 | 168,3   | PN 40           | 159,3               | 80,0                  | 96,0                  | 224 | 214 | 224 |
| DN 200 | 219,1   | PN 16           | 207,3               | 104,0                 | 124,4                 | 273 | 239 | 249 |
| DN 200 | 219,1   | PN 25           | 206,5               | 104,0                 | 124,4                 | 284 | 244 | 254 |
| DN 200 | 219,1   | PN 40           | 206,5               | 104,0                 | 124,4                 | 290 | 247 | 257 |
| DN 250 | 273     | PN 16           | 260,4               | 130,0                 | 156,0                 | 329 | 267 | 277 |
| DN 250 | 273     | PN 25           | 258,8               | 130,0                 | 156,0                 | 340 | 272 | 282 |
| DN 250 | 273     | PN 40           | 258,8               | 130,0                 | 156,0                 | 352 | 278 | 288 |
| DN 300 | 323,9   | PN 10           | 309,7               | 155,0                 | 185,0                 | 378 | 291 | 301 |
| DN 300 | 323,9   | PN 16           | 309,7               | 155,0                 | 185,0                 | 384 | 294 | 304 |
| DN 300 | 323,9   | PN 25           | 307,9               | 155,0                 | 185,0                 | 400 | 302 | 312 |
| DN 300 | 323,9   | PN 40           | 307,9               | 155,0                 | 185,0                 | 417 | 311 | 321 |
| DN 350 | 355,6   | PN 10           | 341,4               | 170,0                 | 204,0                 | 438 | 321 | 331 |
| DN 350 | 355,6   | PN 16           | 339,6               | 170,0                 | 204,0                 | 444 | 324 | 334 |
| DN 350 | 355,6   | PN 25           | 339,6               | 170,0                 | 204,0                 | 457 | 331 | 341 |
| DN 350 | 355,6   | PN 40           | 338,0               | 170,0                 | 204,0                 | 474 | 339 | 349 |
| DN 400 | 406,4   | PN 10           | 392,2               | 195,0                 | 234,0                 | 489 | 341 | 351 |
| DN 400 | 406,4   | PN 16           | 390,4               | 195,0                 | 234,0                 | 495 | 350 | 360 |
| DN 400 | 406,4   | PN 25           | 388,8               | 195,0                 | 234,0                 | 514 | 359 | 369 |
| DN 400 | 406,4   | PN 40           | 384,4               | 195,0                 | 234,0                 | 546 | 375 | 385 |

### ANSI flanges

| Size | Pipe OD | Pressure rating | Sch. 10S        | Sch. 40         | Sch. 80         | $\beta = 0,5$<br>Bore | $\beta = 0,6$<br>Bore | B     | A1  | A2  |
|------|---------|-----------------|-----------------|-----------------|-----------------|-----------------------|-----------------------|-------|-----|-----|
|      |         |                 | Inner pipe dia. | Inner pipe dia. | Inner pipe dia. |                       |                       |       |     |     |
| 1½"  | 48,3    | 150 lbs         | 48,3            | 40,9            | 37,3            | 20,0                  | 24,0                  | 85,7  | 145 | 155 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 2"   | 60,3    | 150 lbs         | 54,7            | 52,5            | 49,3            | 26,0                  | 31,5                  | 104,8 | 154 | 164 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 3"   | 88,9    | 150 lbs         | 82,8            | 77,9            | 73,7            | 39,0                  | 47,0                  | 136,5 | 170 | 180 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 4"   | 114,3   | 150 lbs         | 108,2           | 102,3           | 97,2            | 51,0                  | 61,0                  | 174,6 | 189 | 199 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 6"   | 168,3   | 150 lbs         | 161,5           | 154,1           | 146,3           | 77,0                  | 92,5                  | 222,3 | 213 | 223 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 8"   | 219,1   | 150 lbs         | 211,5           | 202,7           | 193,7           | 101,0                 | 121,6                 | 279,4 | 242 | 252 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 10"  | 273     | 150 lbs         | 264,6           | 254,5           | 242,8           | 127,0                 | 153,0                 | 339,7 | 272 | 282 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 12"  | 323,9   | 150 lbs         | 314,7           | 303,2           | 289,1           | 150,0                 | 180,0                 | 409,6 | 307 | 317 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 14"  | 355,6   | 150 lbs         | 346             | 333,3           | 317,5           | 165,0                 | 198,0                 | 450,9 | 327 | 337 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |
| 16"  | 406,4   | 150 lbs         | 396,8           | 381             | 363,6           | 190,0                 | 228,0                 | 514,4 | 359 | 369 |
|      |         | 300 lbs         |                 |                 |                 |                       |                       |       |     |     |



## Overall dimensions

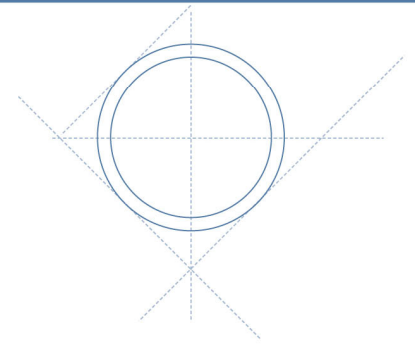


## Installation requirements

The ORIMAS flow meter can be mounted in a horizontal or vertical pipe.  
 For liquid flow in a horizontal pipe the electronics shall be mounted below the pipe.  
 For gas flow in a horizontal pipe the electronics shall be mounted above the pipe.

To insure high accuracy of measurement, long straight pipe runs upstream from the mass flow meter is necessary. The required straight pipe run depends on the disturbance upstream. To maintain the 1% accuracy the minimum straight pipe run upstream shall be 14 x inner pipe diameter and 6 x downstream.  
 If an additional inaccuracy of ½ % is acceptable the required straight pipe runs are reduced to half of the above values.

Saturated steam is covered by STEEMCO flow meters with multi variable transmitter and superheated steam is covered by STEEMCO-MAS flow meters



## ORIMAS coding

### 1. Type

|                                     |      |     |
|-------------------------------------|------|-----|
| In AISI 316 with transmitter flange | code | OR1 |
| integrated manifold                 | code | OR2 |

### 2. Size

|                      |      |      |
|----------------------|------|------|
| DN 40, DIN standard  | code | 040  |
| DN 50, DIN standard  | code | 050  |
| DN 65, DIN standard  | code | 065  |
| DN 80, DIN standard  | code | 080  |
| DN 100, DIN standard | code | 100  |
| DN 125, DIN standard | code | 125  |
| DN 150, DIN standard | code | 150  |
| DN 200, DIN standard | code | 200  |
| DN 250, DIN standard | code | 250  |
| DN 300, DIN standard | code | 300  |
| DN 350, DIN standard | code | 350  |
| DN 400, DIN standard | code | 400  |
| 1½", ANSI standard   | code | 01.5 |
| 2", ANSI standard    | code | 002  |
| 3", ANSI standard    | code | 003  |
| 4", ANSI standard    | code | 004  |
| 6", ANSI standard    | code | 006  |
| 8", ANSI standard    | code | 008  |
| 10", ANSI standard   | code | 010  |
| 12", ANSI standard   | code | 012  |
| 14", ANSI standard   | code | 014  |
| 16", ANSI standard   | code | 016  |

### 3. Pressure rating

|                        |      |    |
|------------------------|------|----|
| PN 10, DIN standard    | code | 10 |
| PN 16, DIN standard    | code | 16 |
| PN 25, DIN standard    | code | 25 |
| PN 40, DIN standard    | code | 40 |
| 150 lbs, ANSI standard | code | 15 |
| 300 lbs, ANSI standard | code | 30 |

### 4. Facing

|                           |      |    |
|---------------------------|------|----|
| DIN 2526 Form A           | code | 26 |
| DIN 2513 Form R13         | code | 13 |
| DIN 2512 Form N           | code | 12 |
| Raised face RF, ANSI std. | code | RF |
| Flat face FF, ANSI std.   | code | FF |

### 5. Pipe schedule ( only applicable for ANSI flanges)

|              |      |    |
|--------------|------|----|
| DIN flanges  | code | 00 |
| Schedule 10S | code | 10 |
| Schedule 40  | code | 40 |
| Schedule 80  | code | 80 |

### 6. β value

|                     |      |   |
|---------------------|------|---|
| β value 0,5         | code | 5 |
| β value 0,6         | code | 6 |
| β value free choice | code | 9 |

### 7. Drain/vent hole Ø3 mm

|                         |      |   |
|-------------------------|------|---|
| Without drain/vent hole | code | 0 |
| With drain/vent hole    | code | 1 |

### 8. manifold valve

|                          |      |   |
|--------------------------|------|---|
| OR1 - Without            | code | 0 |
| OR1 - 3 valve manifold   | code | 1 |
| OR2 - Integrated 3 valve | code | 2 |

### 9. Differential pressure transmitter

|          |      |                               |
|----------|------|-------------------------------|
| Without  | code | 0                             |
| Included | code | Original transmitter type no. |

### 10. Pt 100 temperature sensor

|                            |      |   |
|----------------------------|------|---|
| 1/1 DIN, Form B head, alu. | code | 0 |
| 1/2 DIN, Form B head, alu. | code | 1 |
| 1/3 DIN, Form B head, alu. | code | 2 |
| 1/1 DIN, Form B head, 316. | code | 3 |
| 1/2 DIN, Form B head, 316. | code | 4 |
| 1/3 DIN, Form B head, 316. | code | 5 |

## Examples

DN 100 ORIMAS in stainless steel PN 40 with DIN 2526 facing, β value 0,6, without drain/vent hole and 3 valve type G3H double flanged manifold valve, and without transmitter, but with Pt100 1/1 DIN element in Form B head has following code:

**OR1-100-40-26-00-6-0-1-0-0**

8" ORIMAS in stainless steel 150 lbs with RF facing with β value 0,5, with drain/vent hole, with integrated 3 valve manifold and Yokogawa differential pressure transmitter type EJX 110A has following code:

**OR2-008-15-RF-40-5-1-2-EJX110A-0**

Remote mounting kit type RMK is ordered separately.