DOMINO - System

For chemical liquids

Flow measurement
Dosing
Filling

Contents

1. Introduction

1.1

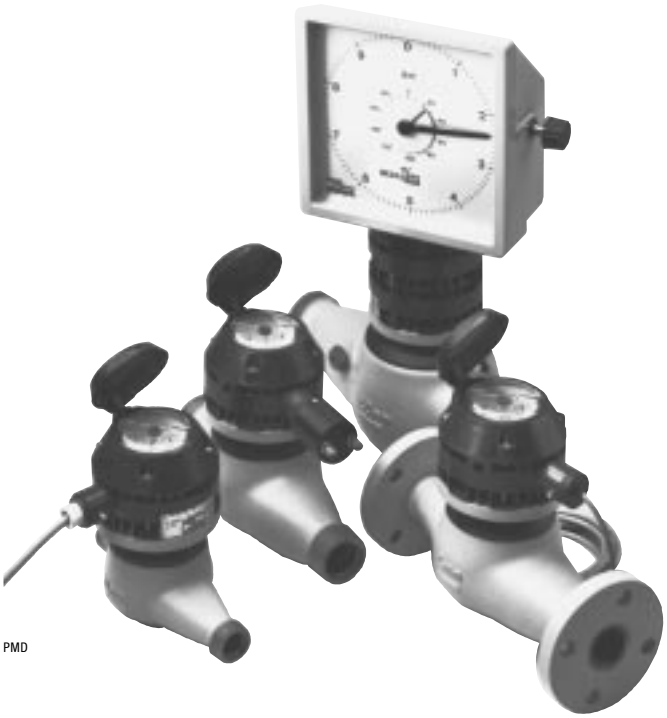
DOMINO®...the modular flow measurement concept

Benefits

- Economical point of measurement lay-out
- Customized systems for every application
- Easy retroconversion by exchanging modules
- Quality-certified to ISO 9001 / EN 29001

ARD

AMD



PMD

1.2

DOMINO®...for flow measurement, filling, dosing and process control

Measuring sensors

Three different ranges:
- ARD rotary piston flowmeters for chemical liquids
- AMD vane wheel flowmeters for chemical liquids
- PMD vane wheel flowmeters primarily for water dosing

Modules

Various modules according to application:
- Roller registers
- Reed-type pulsers or inductive

Auxiliary equipment

Filling control systems, flow computers, analogue signal generation

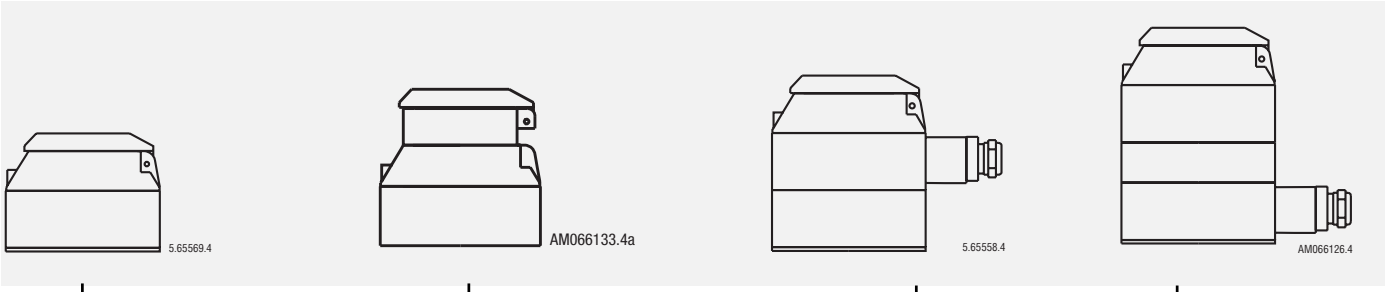
Modules (secondary device)

RW
Roller register
- local totalizing

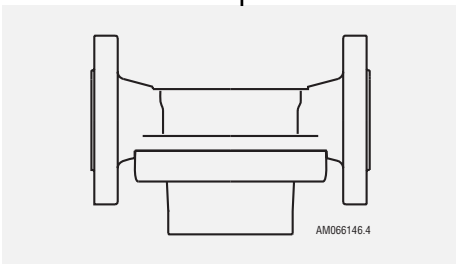
RV
Roller register with integral reed-type pulser
- local totalizing
- pulser for remote totalizing
- not for use in hazardous areas!

IN
Inductive pulser for industrial control systems
- to DIN 19234
- 2 different resolutions
- for explosion risk zone 1
- roller register

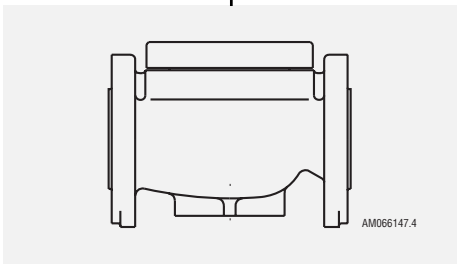
INA
Inductive pulser for industrial control systems
- to DIN 19234
- high resolution for analogue signal generation or input to electronic batching controls
- for explosion risk zone 1
- optional roller register



Flow sensors (primary device)



ARD rotary piston flowmeter for chemical liquids



AMD vane wheel flowmeter for chemical liquids

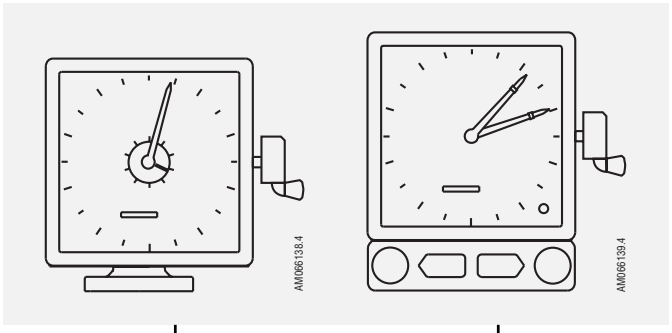
Additional units

Mechanical batching control

AS or ASP modules
- for explosion or non-explosion risk zones
- AS type for manual control systems
- ASP type for semi-automatic pneumatic control systems

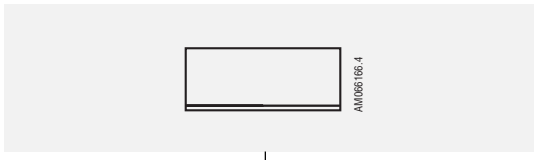
Electronic batching control

Combination of INA pulser with any external batching control.



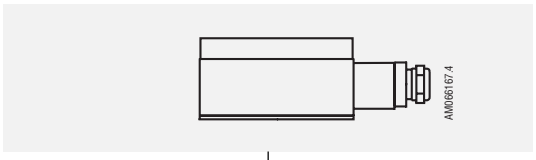
GTAS module

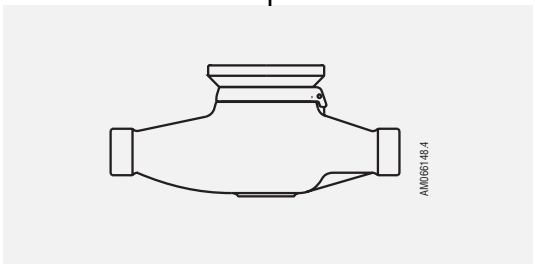
Intermediate drive for
AS or ASP batching control



INA module

Pulsers for
batching controls





PMD vane wheel flowmeter for cold and
hot water / dosing systems

1.3

DOMINO®...product group summary

ARD rotary piston flowmeters for 10...30.000 l/h

- Nominal bore DN 15, 20, 25, 40 and 50 mm
- Operating pressure PN 10, 16, 25 and 40 according to version
- Media temperatures up to 180°C
- Modular meter concept in various materials
- Measuring error limits ± 0,5% of effective value
- For high viscosity range up to about 10.000 mPa·s
- Swivelling roller register for optimal readability
- Special-purpose calibrations for differential pressure measurement (optional)
- All flowmeters available with various modules according to need

PMD vane wheel flowmeters for 100...20.000 l/h

- Nominal bore DN 20, 25 and 40 with threaded connections
- Operating pressure PN 16
- Media temperatures up to 90°C
- Primarily for water, also for non-aggressive low-viscosity fluids up to 4 mPa·s
- Measuring error limits ± 2% of effective value (± 5% at lower end of measuring range)
- All flowmeters available with various modules according to need

AMD vane wheel flowmeters for 140...12.000 l/h

- Nominal bore DN 25 and 40 with flanged connections
- Operating pressure PN 25
- Media temperatures up to 90°C, special versions up to 180°C
- For low viscosity range up to 4 mPa·s
- Measuring error limits ± 2% of effective value (± 5% at lower end of measuring range)
- All flowmeters available with various modules according to need

VZTH 8 rotary piston flowmeter for 5...150 l/h

In addition to the DOMINO® range, a flowmeter is also available for lower flows. For detailed technical data, please see our separate documentation.

Main data:
- Compact cubic design with tapped screw connections
- Measuring sensor of brass and graphite or hard rubber, viton seals, oil-resistant coloured plastic housing
- Operating pressure PN 25
- Media temperatures up to 90°C
- Measuring error limits ± 1% of effective value
- Roller register with glass cover for easy readability
- Optional versions with reed-type sensor

1.4

Applications

- ARD rotary piston flowmeters for pure chemical liquids of various types
- AMD vane wheel flowmeters for chemical liquids
- PMD vane wheel flowmeters for water (in particular for dosing)

Selection of commonly measured liquids

Acetic acid
Acetone
Animal fats
Ammonium hydroxide, ammonia solutiuon

Bromium hydroxide, bromic acid
Butyl acetate, acetic butyl ester

Chloroform, trichloromethane
Citric acid

Diethylene glycol
Distilled water

Ethyl acetate, acetic ether, acetic ester
Ethyl alcohol, alcohol, ethanol
Ethyl ethylene, ethylene, diethyl ethylene
Ethylene glycol

Formaldehyde solution
Formic acid

Glycerine

Hexine
Hydrochloric acid
Hydrofluoric acid
Hydrogen peroxide, hydrogen superoxide

Isopropyl ether, di-isopropyl ether
Isopropyl alcohol, propyl alcohol

Kerosine, petroleum

Liquid ammonia
Liquid bromium
Liquid butane

Magnesium sulphate
Methanol, methyl alcohol)
Methylene chloride, dichloromethylene
Methyl ethyl ketone
Molasses (without urea)

Nitric acid

Paraffin
Perchloroethylene, tetrachloroethylene
Phosphoric acid
Potassium hydroxide, caustic potash
Propionic acid
Prussic acid
Pure benzol

Sodium chloride solution, brine
Sodium hydroxide, caustic soda solution
Sodium hypochlorite solution, Javelle water
Sulfocarbonic acid
Sulphuric acid

Tar, pitch
Tetrachloromethane, carbon tetrachloride
Toluene
Trichloroethylene (dry)

Vegetable oils

For fuel oil measurement the product range CONTOIL® is recommended.

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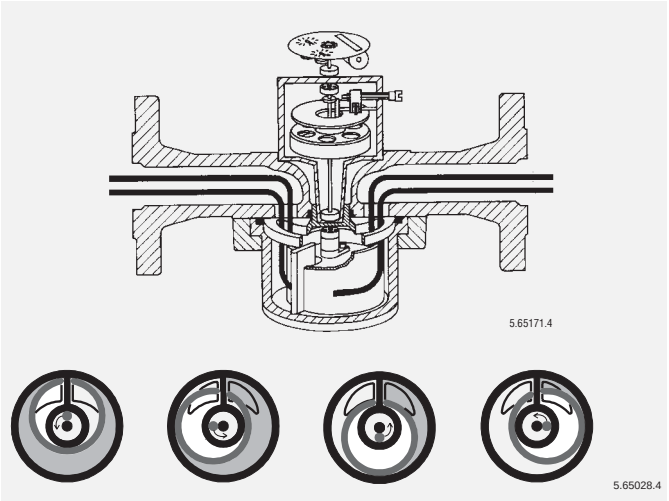
1.5

Operation principles

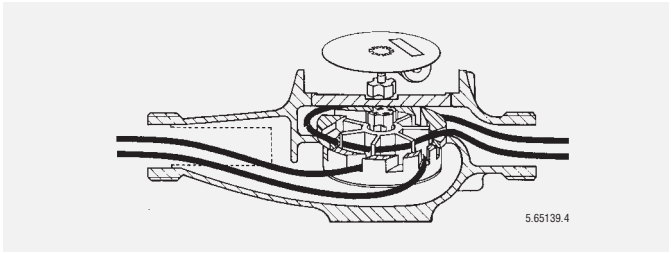
ARD range

- Works on the volumetric principle with rotary pistons
- Wide measuring range with high precision
- Suitable for high viscosities
- Insensitive to flow disturbances
- No power supply needed



AMD and PMD series

- Works on the velocity measuring principle with multi-jet vane wheel
- Extremely wide measuring range with good accuracy
- Largely insensitive to slight impurities in liquid media
- Insensitive to flow disturbances
- No power supply needed

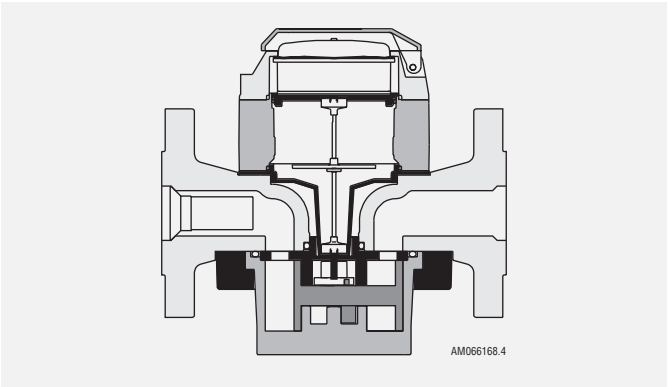


1.6

Design features

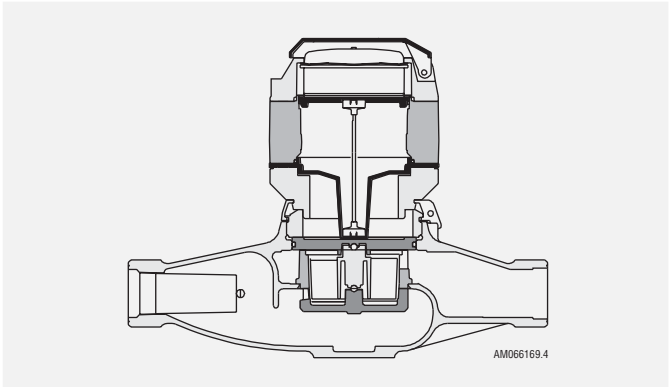
ARD range

- The only moving parts in contact with the liquid medium are the rotary piston, guide rollers and carrier. The hydraulic measuring module is completely isolated from the roller register, and signals are transmitted magnetically through the sealed cover of the measuring chamber.
- For optimal readability, the roller register can be swivelled through 360° on versions without RV integral pulser.



AMD and PMD series

- The only moving part in contact with the liquid medium is the vane wheel. In AMD models this is mounted between PTFE bearings, and in PMD models on ruby bearings. This ensures years of easy running and high precision, long life and excellent long-term stability of the measuring characteristic.
- The hydraulic measuring module is completely isolated from the roller register, and signals are transmitted magnetically through the sealed cover of the measuring chamber.
- For optimal readability, the roller register can be swivelled through 360° on versions without RV integral pulser.



1.7

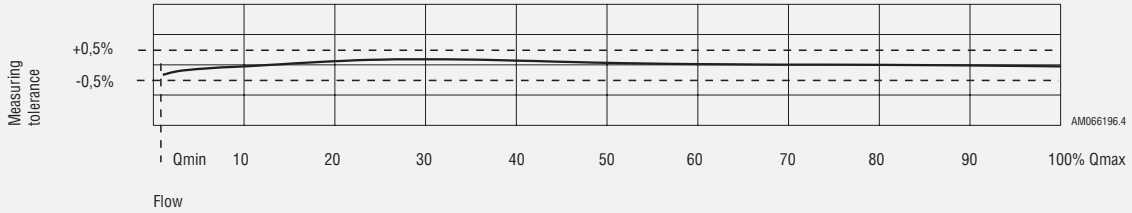
Measuring tolerances under reference conditions

ARD rotary piston flowmeters

Reference conditions:

	Group A	Group B
Medium:	Water	extra-light heating oil
Temperature:	20°C	18...25°C

Group A comprises the flowmeter with rotary pistons of vulcanized rubber, graphite or PTFE. Group B has aluminium or stainless steel rotary pistons.

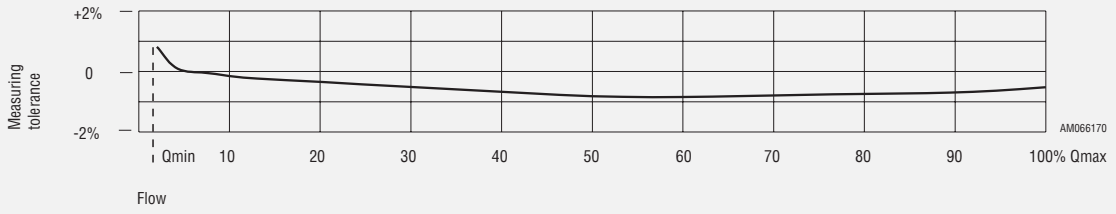


Measuring tolerance of 0% - impossible? Not necessarily!
DOMINO® ARD rotary piston flowmeters have an infinitely adjustable regulation mechanism for correcting the tolerance curve. So if necessary the measuring tolerance can be set to practically zero at constant flow either on site or by special works calibration.

AMD and PMD vane wheel flowmeters

Reference conditions:

Medium:	Water
Temperature:	20°C



2. ARD rotary piston flowmeters: Sensors

2.1

Technical data

- For chemical liquids with viscosities up to about 10 000 mPa·s
- For horizontal, vertical or oblique installation
- Measuring error limits ±0.5% of effective value, repeatability ±0.1%
  Max. temperature 40,50, 90, 130 or 190°C (according to version)
- Max. pressure 10, 16, 25 or 40 bar (according to version)
- Threaded connections (brass housing)
- Combinable with all DOMINO® modules
- Special versions with display in US gallons or with different flange hole spacings on request

Nominal diameter	DN		mm	15	20	25	40	50
			inches	1/2	3/4	1	1 1/2	2
Overall length			mm	165	165	[1] 190	300	350
Rated max. pressure with threaded connections	ARD 1000		bar	16				
Rated max. pressure with flanged connections	ARD 1000		bar	25				
	ARD 2000		bar	40				
	ARD 3000		bar	25				
	ARD 4000		bar	10				
Max. flow rate	Qmax	[2]	l/h	400	1 500	3 000	9 000	30 000
Flow in batching mode	Qch		l/h	320	1 200	2 400	7 200	24 000
Continuous flow rate	Qn	[2]	l/h	200	750	1 500	4 500	15 000
Min. flow rate	Qmin	[3]	l/h	10	30	75	225	750
Starting flow rate approx.		[3]	l/h	4	12	30	90	300
Smallest registered value		[4]	l	0.01	0.1	0.1	0.1	1
Metering capacity		[4]	m^3	1 000	10 000	10 000	10 000	100 000
Metering time at Qn without overflow		[4]	h	5 000	13 333	6 666	2 222	6 666
Safety filter mesh size			mm	0.4	0.4	0.4	0.8	0.8
Dirt trap filter mesh size			mm	0.1	0.1	0.25	0.25	0.25
Measuring chamber volume			cm^3	12	36	100	330	1 200
Housing finish				Enamelled yellow RAL 1007				
Weight		[5]						
ARD 1000	threaded		kg	2.200	2.500	4.200	17.320	40.000
ARD 1000	flanged		kg	3.800	4.500	7.100	20.270	42.000
ARD 2000	flanged		kg	4.370	5.480	7.600	19.100	42.000
ARD 3000	flanged		kg	4.650	5.800	8.350	20.470	53.000
ARD 4000	flanged		kg	--	--	8.850	20.240	--

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[1] Overall lengh with PTFE housings is 260 mm
[2] Flows with heating oil are higher. For precise data see "Technical Information VD 4-411", CONTOIL VZO oil flowmeter
[3] Qmin and starting flows are valid for material pairing: brass housing / aluminium pistons and EL heating oil as medium. Qmin for other material pairings is given in the table below:"Measuring range as a function of material pairing".
[4] For roller register.
[5] Meter weight depends on material combinations and modules. Data given are typical for meters with roller register

Measuring range as a function of material pairing

Qmin in % of Qmax with measuring error limits ±0.5%

Type	Measuring chamber	Rotary piston				
		Aluminium	Hard rubber	Graphite	Stainless steel	PTFE
ARD 1000	Brass	2.5 %	5 %	5 %	--	10 %
ARD 2000	Stainless steel	2.5 %	--	5 %	5 %	10 %
ARD 3000	Stainless steel	--	5 %	5 %	5 %	10 %
ARD 4000	PTFE	--	--	--	--	10 %

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2.2

ARD measuring sensors and materials

Type	Component	Material
ARD 1000	Housing	Brass (threaded connections) or spherolitic cast iron (threaded or flange connections)
	Measuring chamber	Brass / PPS (130°C) or brass / PTFE (180°C)
	Seals	FPM (fluoroelastomer)
	Rotary pistons	Aluminium, hard rubber, graphite or PTFE
ARD 2000	Housing	Spherolitic cast iron
	Measuring chamber	Stainless steel* / PPS (130°C) or stainless steel* / PTFE (180°C)
	Seals	FPM or PTFE (fluoroelastomer or polytetrafluoroethylene)
	Rotary pistons	Aluminium, graphite, stainless steel* or PTFE
ARD 3000	Housing	Stainless steel*
	Measuring chamber	Stainless steel* / PTFE
	Seals	FPM or PTFE (fluoroelastomer or polytetrafluoroethylene)
	Rotary pistons	Hard rubber, graphite, stainless steel* or PTFE
ARD 4000	Housing	PTFE, with metal sleeving
	Measuring chamber	PTFE / Tantal, with metal sleeving
	Seals	FFKM (Perfluoroelastomer)
	Rotary pistons	PTFE

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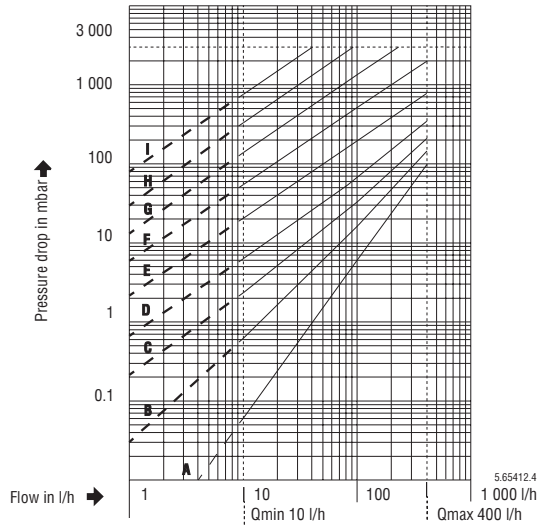
* Corrosion and acid-resistant steel (CrNiMo) to DIN 1.14408 / 1.4435

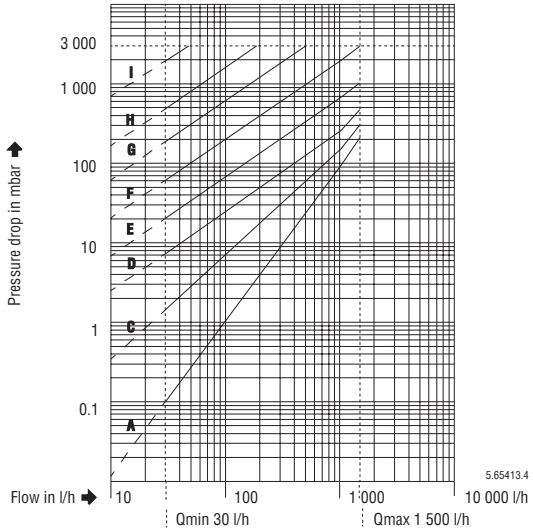
2.3

ARD pressure drop curves

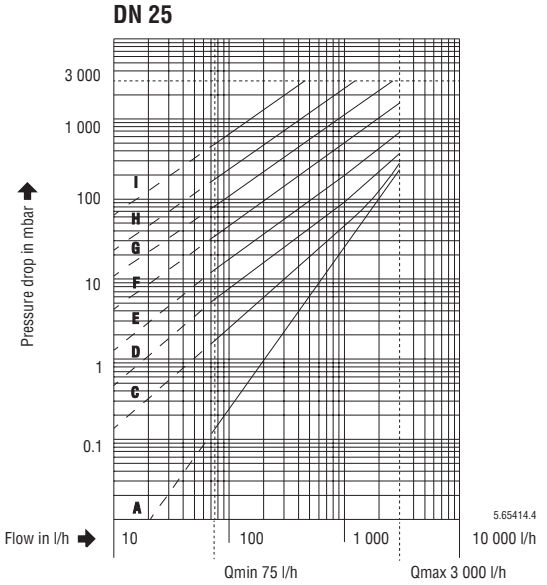
DN 15



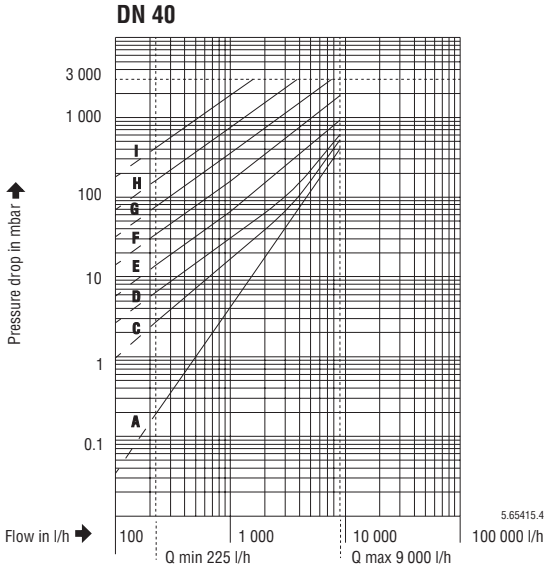
DN 20



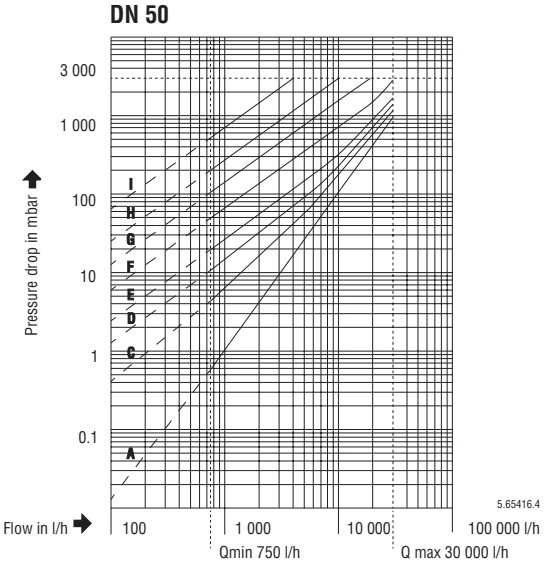
DN 25



DN 40



DN 50



Recommended pressure drop max. 1 bar
Admissible pressure drop max. 3 bar

Viscosities:

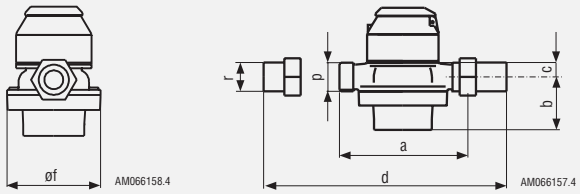
A = 4.5 mPa·s
B = 25 mPa·s
C = 50 mPa·s
D = 100 mPa·s
E = 200 mPa·s
F = 500 mPa·s
G = 1000 mPa·s
H = 2000 mPa·s
I = 5000 mPa·s

2.4

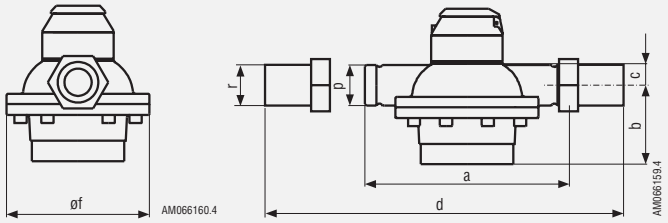
ARD flowmeter unit dimensions

ARD 1000 with threaded connections

DN 15, 20, 25

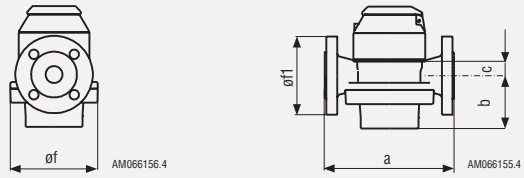


DN 40, 50

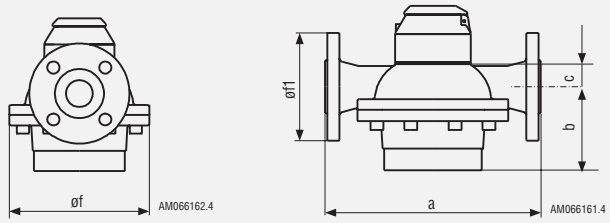


ARD 1000, 2000, 3000 with flanged connections (to DIN 2501)

DN 15, 20, 25



DN 40, 50



	DN	a	b	c	d	Øf	Øf1	p	r
ARD 15	15	165	42	17	260	105	95	G 3/4"	G 1/2"
ARD 20	20	165	54	17	260	105	105	G 1"	G 3/4"
ARD 25	25	190	78	21	305	130	115	G 1 1/4"	G 1"
ARD 40	40	300	116	32	440	210	150	G 2"	G 1 1/2"
ARD 50	50	350	166	38	510	280	165	G 2 3/8"	G 2"

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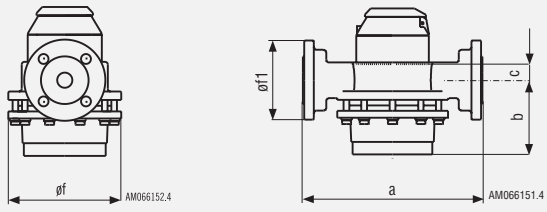
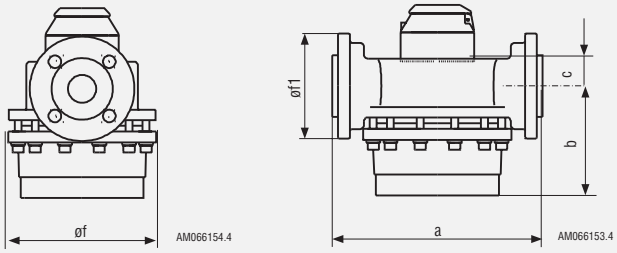
ARD 4000 with flanged connections (to DIN 2501 / SN 21843)

DN 25



DN 40



	DN	a	b	c	Øf	Øf1
ARD 25	25	260	107	23	160	115
ARD 40	40	300	157	35	212	150

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3. ARD rotary piston flowmeters: Modules

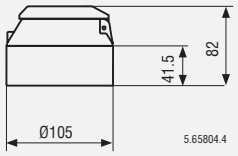
3.1

RW, RV roller registers

RW

without integrated pulser

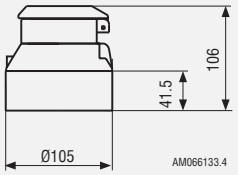
max. 180°C



RV

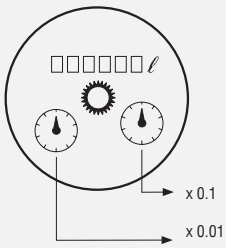
with integrated pulser (reed type)

max. 180°C

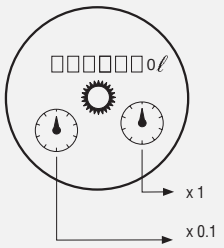


Dials

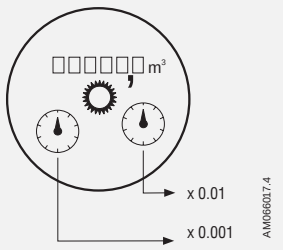
DN15



DN20, 25, 40



DN50



3.2

Pulsers

Technical data

When selecting modules, please note information in section 9.2 on pulser applications. For further technical data and wiring diagrammes, see sections "Pulsers".

Pulse values

Pulser type				Nominal diameter of measuring unit				
			mm	15	20	25	40	50
			inches	1/2	3/4	1	1 1/2	2
IN	Inductive proximity switch	[1] [2]	l / pulse	0.01	0.01	0.1	0.1	1
			l / pulse	0.1	0.1	1	1	10
INA	Inductive proximity switch	[1] [2] [3]	approx. l/pulse	0.0006	0.00185	0.005	0.017	0.06
RV	Reed switch		l / pulse	0.1	1	1	1	10
			l / pulse	1	10	10	10	100

5-111e_7

[1] High temperature versions are desigated with H
[2] With EC-Type-Examination Certificate II 2 G EEx ia IIC T6 for use in hazardous areas
[3] The exact pulse value is indicated on the meter. Since this value is not known until after calibration, the connected unit must have an adaptable input.
Versions with 2 pulsers on request

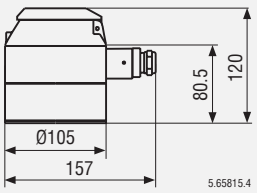
Pulse frequencies

IN	at Qmax	Hz	11.111	41.667	8.333	25.000	8.333
	at Qmin	Hz	0.278	0.833	0.208	0.625	0.208
INA	at Qmax	Hz	185.185	225.225	166.667	147.059	138.889
	at Qmin	Hz	4.630	4.505	4.167	3.676	3.472

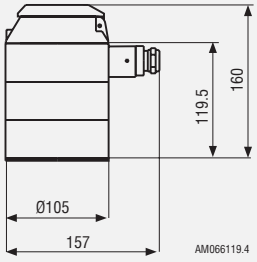
5-111e_8

IN / INH **Inductive pulser according to DIN 19234, with EC-Type-Examination Certificate ⟨Ex⟩ II 2 G EEx ia IIC T6 for use in hazardous areas, with roller register.**

IN max. 130°C



INH max. 180°C

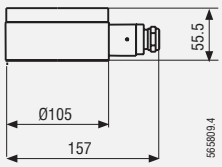


INA / INAH **Inductive pulsers according to DIN 19234, with high resolution, with EC-Type-Examination Certificate ⟨Ex⟩ II 2 G EEx ia IIC T6 for use in hazardous areas**

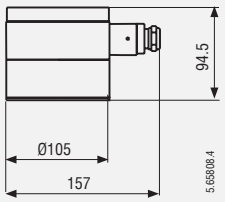
without RW (roller register)

INA

max. 90°C



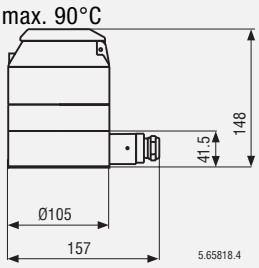
max. 180°C



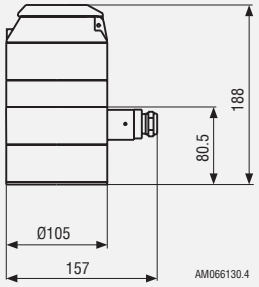
with RW (roller register)

INAH

max. 90°C



max. 180°C



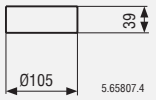
3.3

Installation data for AS / ASP mechanical batching controls

max. 180°C

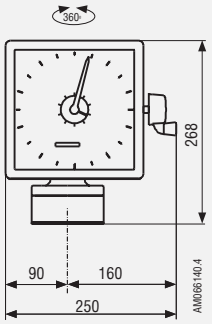
GTAS module

for AS / ASP

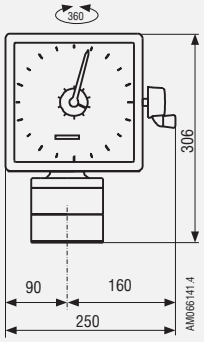


GTAS with dosing control (optional)

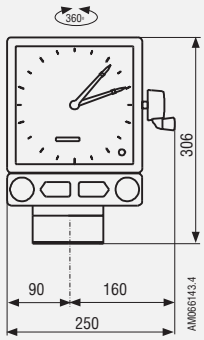
with AS 110, 120



all other AS



with ASP



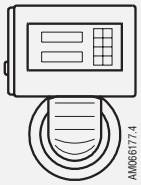
For technical data on AS / ASP batching control modules see separate documentation

3.4

Installation possibilities for external electronic batching controls

max. 90°C INA / RD.. recommended (others also possible)
max. 180°C INAH / RD.. recommended (others also possible)

Wall mounting



Panel mounting

4. AMD vane wheel flowmeters: Sensors

4.1

Technical data

- For chemical liquids with viscosities up to about 4 mPa·s
- For horizontal installation - dial upward
- Measuring error limits ±2% of effective value [1], repeatability ±0.3%
- Temperature 90°C, 180°C
- Rated pressure PN 25
- Housing with flanged connections to DIN 2501 / SN 218643
- Combinable with all DOMINO® modules
- Special versions with other flange holes on request

Nominal diameter	DN	mm	25	40
		inches	1	1 1/2
Overall length		mm	165	300
Rated pressure PN		bar	25	25
Max. temperature	Tmax	°C	90 resp. 180	
Max. flow rate	Qmax	l/h	5 000	12 000
Continuous flow rate	Qn	l/h	3 500	10 000
Transitional flow rate	Qt	l/h	280	800
Min. flow rate	Qmin	l/h	140	400
With AS 110 filling control:				
Transitional flow rate	Qt	l/h	350	1 000
Min. flow rate	Qmin	l/h	210	600
Smallest registered value		l	0.1	0.1
Metering capacity		m^3	100 000	100 000
Metering time at Qn without overflow		approx. h	28 500	10 000
Safety filter mesh size in meter base		mm	2.5	2.5
Housing finish			Enamelled yellow RAL 1007	
Weight		approx. kg	7.2	14.2

5-111e_9

[1] ± 5% at lower end of measuring range between Qmin and Qt

4.2

AMD measuring module materials

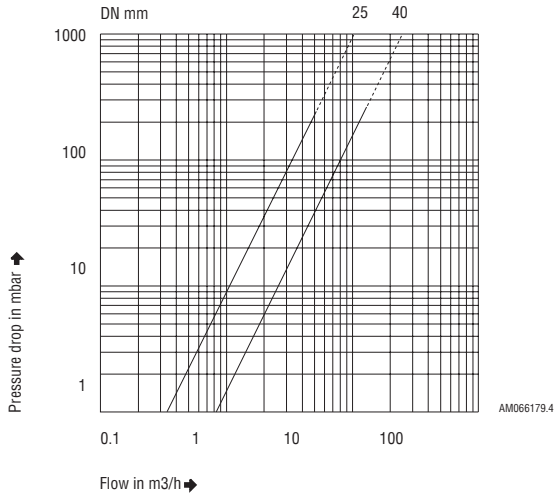
Component	Material
Housing	Stainless steel*
Measuring unit	Stainless steel*
Seals	PTFE
Vane wheel bearings	PTFE (90°C), graphite (180°C)

5-111e_10

*) Corrosion and acid-resistant steel (CrNiMo) to DIN 1.4408 / 1.44354

4.3

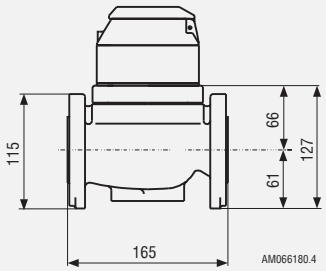
AMD pressure drop characteristics

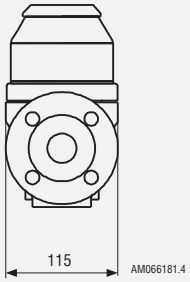


4.4

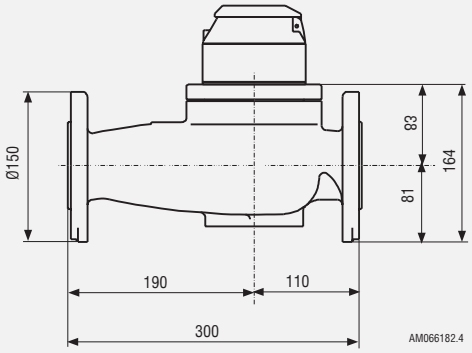
AMD measuring module dimensions

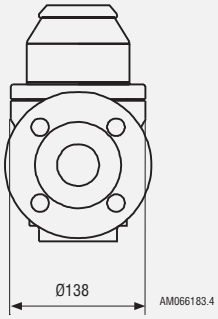
AMD 25





AMD 40





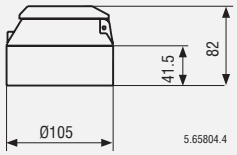
Flanges to DIN 2501 / SN 21843

5. AMD vane wheel flowmeters: Modules

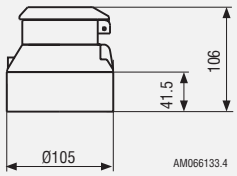
5.1

RW, RV roller register

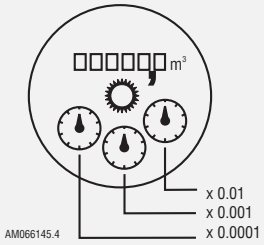
RW, max. 180° C
without integral pulser



RV, max. 180° C
with integral reed-type pulser



Dials DN 25, 40



5.2

Pulsers

Technical data

When selecting modules, please note information in section 9.2 on pulser applications. For further technical data and wiring diagrammes see sections "Pulsers".

Pulse values

Pulser type [2]		Nominal diameter of measuring unit		
		mm	25	40
		inches	1	1 1/2
RV	Reed switch	l / pulse	1	1
IN	Inductive proximity switch [1]	l / pulse	0.1	0.1
		l / pulse	1	1
INA	Inductive proximity switch [1]	approx. l/pulse	0.01032	0.03956

5-111e_11a

1) With EC-Type-Examination Certificate II 2 G EEx ia IIC T6 for use in hazardous areas
2) High temperature versions are designated with **H**

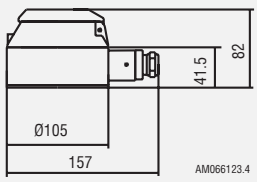
Pulse frequencies

IN 0.1	at Qmax	Hz	13.555	33.333
	at Qmin	Hz	0.389	1.111
INA	at Qmax	Hz	134.582	84.260
	at Qmin	Hz	3.768	2.809

5-111e_11b

IN pulser module

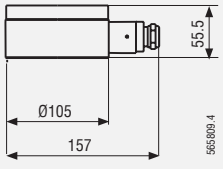
IN inductive pulser, according to DIN 19234, with EC-Type-Examination Certificate ⟨Ex⟩ II 2 G EEx ia IIC T6 for use in hazardous areas



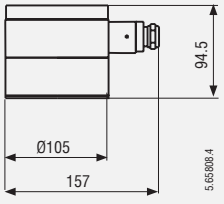
IN, max. 130°C

INA/INAH pulser modules

High resolution INA inductive pulser according to DIN 19234, with EC-Type-Examination Certificate ⟨Ex⟩ II 2 G EEx ia IIC T6 for use in hazardous areas



INA, max. 90°C



INAH, max. 180°C

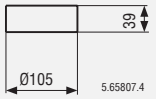
5.3

Installation data for AS/ASP mechanical batching controls

max. 180°C

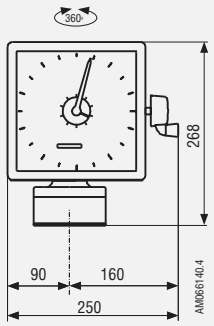
GTAS module

for AS / ASP

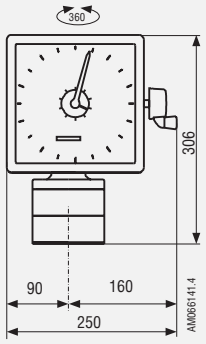


GTAS with batching control (optional)

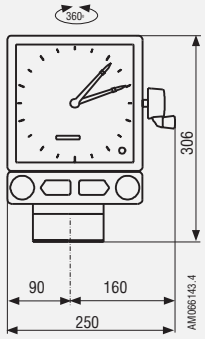
with AS 110, 120



all other AS



with ASP



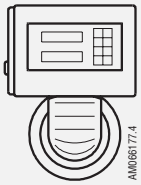
Ignition protection type "constructional safety c".
For technical data on AS/ASP batching control modules see separate documentation.

5.4

Installation possibilities for external electronic batching controls

max. 90°C INA/RD.. modules recommended (others also possible)
max. 180°C INAH/RD.. modules recommended (others also possible)

Wall mounting



Panel mounting

6. PMD vane wheel flowmeters

6.1

Technical data

- Primarily used for water flow measurement or dosing
- Brass housing with threaded connections or threaded flanges
- For horizontal installation - dial upward
- Measuring tolerances ± 2% of effective value [1], repeatability ± 0.3%
- Temperature max. 90°C
- Rated pressure 16 bar
- Available only with modules "pulser with roller register" or "installation for batching control".

		mm	20	25	40
Nominal diameter	DN	inches	3/4	1	1 1/2
Overall length		mm	190	260	300
Rated pressure	PN	bar	16		
Max. temperature		°C	90		
Max. flow rate	Qmax	l / h	5 000	7 000	20 000
Continuous flow rate	Qn	l / h	2 500	3 500	10 000
Transitional flow rate	Qt	l / h	200	280	800
Min. flow rate	Qmin	l / h	100	140	400
With AS 110 filling control:					
Transitional flow rate	Qt	l / h	350	450	1 000
Min. flow rate	Qmin	l / h	250	300	600
Smallest registered value		l	0.1	0.1	0.1
Meter capacity		m^3	100 000	100 000	100 000
Metering time at Qn without overflow		approx. h	40 000	28 500	10 000
Safety filter mesh size in meter base		mm	1.5	1.5	2.5
Housing thread		inches	1	1 1/4	2
Screw connection thread		inches	3/4	1	1 1/2
Housing finish			Enamelled yellow RAL 1007		
Weight without screw connections		kg	3.1	4.1	6.5

5-111e_12

1) ± 5% at lower end of measuring range between Qmin and Qt

6.2

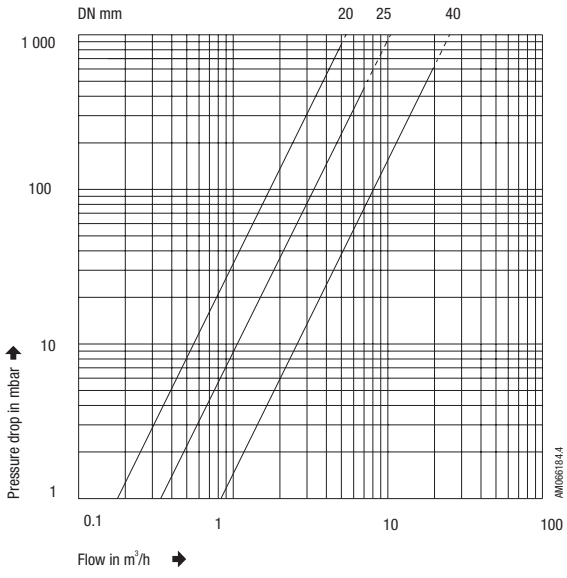
PMD materials

Component	Materials
Housing	Brass
Measuring unit	PPO plastic
Seal	EPDM (ethylene propylene)
Vane wheel	Plastic and synthetic ruby balls

5-111e_13

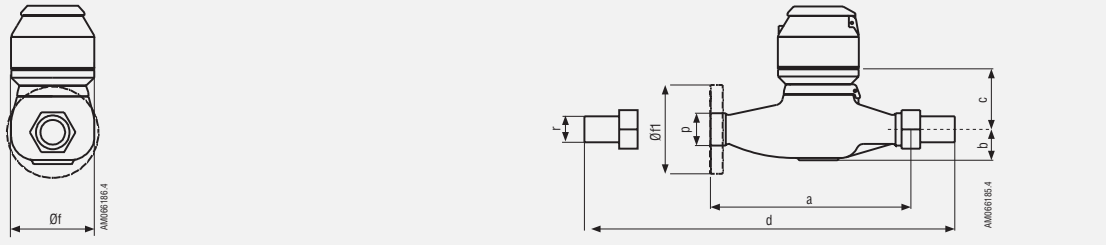
6.3

PMD pressure drop characteristics



6.4

PMD measuring module dimensions



	DN mm	a mm	b mm	c mm	d mm	Øf mm	Øf1 mm	p	r
PMD 20	20	190	37	74	285	92	105	G 1"	G 3/4"
PMD 25	25	260	40	83	375	105	115	G 1 1/4"	G 1"
PMD 40	40	300	60	91	440	139	150	G 2"	G 1 1/2"

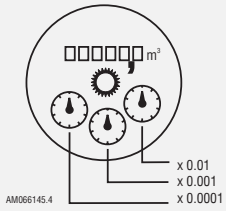
5-111e_14

Module installation heights are given in sections "AMD modules".

6.5

PMD roller register

Dials
DN 20, 25 and 40



6.6

Pulsers

Technical data

When selecting modules, please note information in section 9.2 on pulser applications. For further technical data and wiring diagrammes see sections "Pulsers".

Pulse values

Pulser type			Nominal diameter of measuring unit		
		mm	20	25	40
		inches	3/4	1	1 1/2
IN	Inductive proximity switch [1]	l / pulse	0.1	0.1	0.1
		l / pulse	1	1	1
INA	Inductive proximity switch [1]	approx. l / pulse	0.00864	0.01434	0.04990

5-111e_15a

1) With EC-Type-Examination Certificate II 2 G EEx ia IIC T6 for use in hazardous areas

Same specifications and dimensions as for AMD. See section 5.2.

Pulse frequencies

IN	at Qmax	Hz	13.888	19.444	55.555
	at Qmin	Hz	0.278	0.389	1.111
INA	at Qmax	Hz	160.751	135.596	111.334
	at Qmin	Hz	3.215	2.712	2.227

5-111e_15b

6.7

Installation data for AS/ASP mechanical batching controls

Same specifications and dimensions as for AMD. See section 5.3.

6.8

Installation data for electronic batching controls

Same specifications and dimensions as for AMD. See section 5.4.

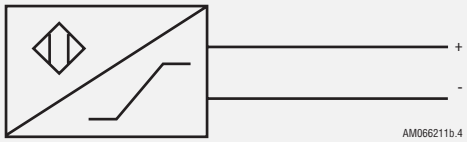
7. DOMINO® pulsers

7.1

Pulser types IN, INA
for industrial applications

IN, INA pulser module

Wiring diagramme



Technical data for industrial pulsers

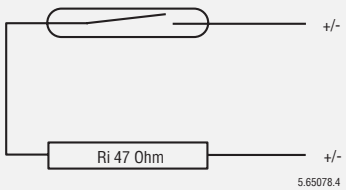
IN Inductive pulser with decadic pulse values
INA High-resolution inductive pulser

Switching element	Slotted disc initiator according to DIN 19234
Switching voltage	5...15 VDC
Residual ripple	max. 5%
Switching current	> 3 mA (at 8 VDC, 1KOhm)
Static current	< 1 mA (at 8 VDC, 1 KOhm)
Switch-on time	50 ± 10%
Ambient temperature	-10 ... +70°C
Protection class	IP 65 according to IEC 144 (protection against water jets and dust)
Use in explosion risk zones	With EC-Type-Examination Certificate II 2 G EEx ia IIC T6 for use in hazardous areas
Connection	Connect cabel (min. 2 x 0.35 mm^2) to pulser probe with plug provided. Cable outer diameter 4...6 mm. For use in explosion risk zones are preferably light blue cables to be used. See local regulations for Ex risk use!

7.2

RV pulser for remote totalizing
integrated in roller register

Wiring diagramme



Technical data for pulser integrated in roller register

RV Reed pulser with decadic pulse values

This simple version of a reed pulser is suitable for remote totalizing. For industrial control systems the IN or INA versions are recomended. Electronic pulse counters have low switching power consumption. They are therefore energized directly from the pulser. Electromechanical pulse counters with power consumption exceeding 2 W require an intermediate switching relay (e.g. WE 77).

Switching element	Reed contact tube filled with inert gas
Switching voltage	max. 48 V AC or DC
Switching current	max. 50 mA (internal resistance 47 Ohm/ 0.5 W)
Static current	open contact
Switching power	max. 2 W
Ambient temperature	-10 ... +70°C
Protection class	IP 65 according to IEC 144 (protection against water jets and dust)
Connection	Permanent mounted grey cable, 3m long, 2 x 0.14 mm^2 cross section

8. Auxiliary units

AS / ASP mechanical batching controls

- For explosion-protected or non-Ex.-protected zones
- AS type for manual controls
- ASP type for semi-automatic pneumatic controls

Electronic batching controls

Combination of INA pulser with any external batching control.

9. System planning

9.1

Conceptual design

Piping layout

All meters and modules should be easily accessible for reading.

Do not install meters facing downwards. Straight piping for flow stabilization is not required.

Meter installation

Meters with additional modules

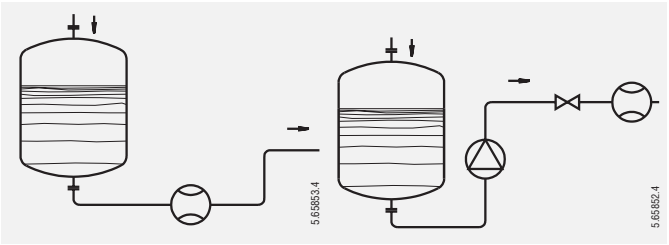
Install in the position shown in the module instructions.

Meters without additional modules

ARD rotary piston meters can be installed in horizontal, vertical or other positions.

AMD and PMD vane wheel meters must always be installed horizontally.

Piping layout



The piping layout must ensure that the flowmeter is always full of liquid, and that no air or gas can enter.

All consumers must be connected to the meter.

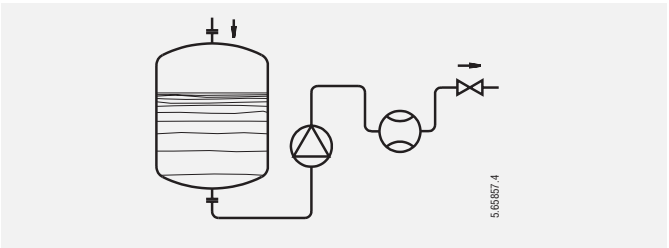
Layout of meters and auxiliaries

Meters and auxiliaries must be laid out to cover all plant operating conditions:

1. Operating pressure and temperature according to type plate
2. Ambient temperature -10 ... +60°C
3. Material resistance: dependent on measuring medium and ambient conditions
4. Flow capacity

Flowmeters must be dimensioned according to flow rate rather than pipe diameter. If necessary, change the calibre.

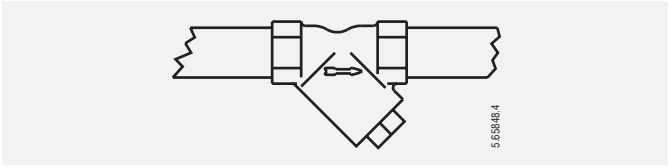
Shut-off valves



Shut-off valves must be installed downstream of the flowmeter in order to prevent return flow and emptying.

Return flow and emptying causes measurement errors and damages the flowmeter.

Dirt in the flowmeter or medium



To prevent dirt in the flowmeter or medium, a dirt trap or prefilter should be installed upstream of the flowmeter.

Max. prefilter mesh width:

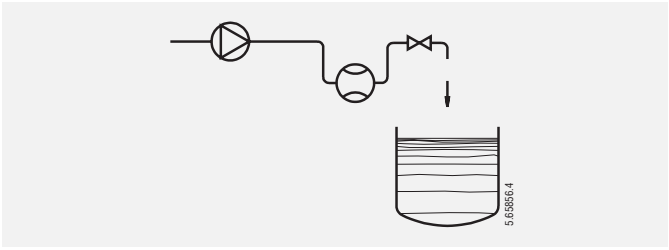
a) ARD rotary piston flowmeter

DN 15 mm	0.1 mm
DN 20 mm	0.1 mm
DN 25 mm	0.25 mm
DN 40 mm	0.25 mm
DN 50 mm	0.25 mm

b) AMD and PMD vane wheel flowmeters

Dirt traps are only necessary if the medium contains particles larger than 1-2 mm. Max. mesh width 0.8 mm.
The filter in the meter intake is purely for safety reasons. It is too small to function as a dirt trap.

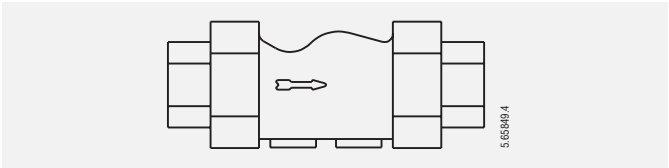
Filling/batching systems



For filling/batching systems the valve must be installed between the flowmeter and outlet.
Short pipes between the flowmeter to the outlet give the greatest accuracy.

To prevent water hammer, do not open or close valves too quickly. Water hammer will damage the flowmeter.

Remote evaluation / auxiliary units



In flowmeters with pulsers for remote display, return flow must be prevented.

If the system layout does not ensure this, a non-return valve must be installed.

Electrical cable layout

Electrical cables and installations are subject to legal regulations which must be taken into account during system planning. All cabling must be installed by professional electricians.

System layout must take account of:

1. Auxiliary equipment connections
2. Maximum cable lengths with/without amplifiers
3. Distributor boxes / cable ducts
4. Ambient interference factors

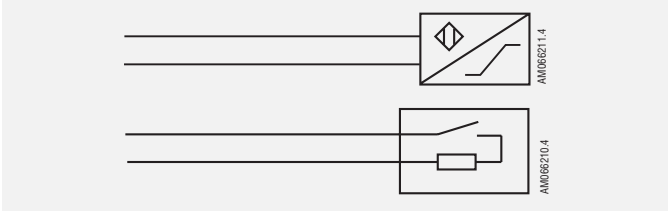
Electrical installations in explosion-risk zones are subject to special regulations. Flowmeters in such zones must be supplied with power from non-explosion-risk zones.

Consult a explosion risk expert.

9.2

Remote pulse transmission

Pulser power supply



For remote evaluation of flowmeter readings, passive pulsers are available.
The pulser must be powered from the connected unit. It generates one pulse per volumetric unit.

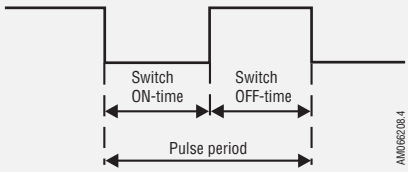
Selection of correct pulser

The correct pulser and best pulse value depends on the remote evaluation system. For remote totalization, large pulse values are generally selected (e.g. 10 litres / pulse). For instantaneous values, analogue signals and filling system control, small values should be selected. For battery-powered evaluation units, only reed-type pulsers can be used.

Correct pulse evaluation

If flow is interrupted, fluid oscillation may occur in some systems (hydraulic vibrations at very low forward and reverse flows). In such cases pulses may be generated which are interpreted by the evaluation unit as forward flow.
For instantaneous flow readings, these do not cause any interference because they can only occur when the flow is practically zero.
If the pulser controls a numerical function, however, hydraulic vibrations must be prevented by suitable means.

Pulse duration



Requirements of energizing units

The pulse duration depends on the flow. At zero flow permanent contact may occur.
The unit connected must therefore be designed for continuous loading. Otherwise protection e.g. by wiping relays must be provided.

Pulse values

These depend on the type and nominal bore of the flowmeter. Pulse values are indicated on the meter type plate.

The pulse duration and the switch-on and switch-off times are calculated with the following formulas:

$$\text{Pulse period in s} = \frac{\text{pulse value in l x 3600}}{\text{flow rate Q in l/h}}$$

$$\text{Switch-on time} = \frac{\text{pulse period in s x switch-on time in \%}}{100}$$

Switch-off time = pulse period minus witch-on time

It is recommended to calculate these values for the smallest and largest flows expected in the system.

10. Accreditations

10.1

ATEX
With the exception of the **- RV ... -** ancillary groups, all DOMINO components are certified according to ATEX Directive 94/9/EC.

Marking:  II2G cT6

The EC-Type-Examination Certificate is available on our homepage.

10.2

Pressure Equipment Directive PED
in accordance with guideline 97/23/EC, a CE or supplier conformity declaration are available on our Internet homepage for all DOMINO devices.

11. Ordering information

11.1

ARD sensors: Type designations and order numbers
(for standard versions; special versions on request)

ARD 1000 measuring module

Measuring chamber	Seal	Rotary piston	PN bar	Tmax °C	Type designation	Nominal bore 15	20	25	40	50
Brass housing with threaded connections										
Brass / PPS	FPM	Aluminium	16	130	ARD../1111-A2	83000	83033	83058		
		Hard rubber		50	ARD../1111-H2	83001	83034	83059		
		Graphite		130	ARD../1111-G2	83002	83035	83060		
		PTFE		40	ARD../1111-P2	83004	83036	83062		
Spherolitic cast iron housing with threaded connections										
Brass / PPS	FPM	Aluminium	16	130	ARD../1211-A2				83106	
		Hard rubber		50	ARD../1211-H2				83107	
		Graphite		130	ARD../1211-G2				83108	
		PTFE		40	ARD../1211-P2				83110	
Spherolitic cast iron housing with flanged connections										
Brass / PPS	FPM	Aluminium	25	130	ARD../1221-A2	83005	83037	83063	83111	83154
		Hard rubber		50	ARD../1221-H2	83006	83038	83064	83112	
		Graphite		130	ARD../1221-G2	86007	83039	83065	83113	83155
Brass / PPS [1]	FPM	Aluminium	25	130	ARD../1228-A2	83350	83351	83352	83353	83354
Brass / PTFE	FPM	Aluminium	25	180	ARD../1222-A2	83009	83040	83067	83115	83157
		Graphite		180	ARD../1222-G2	83010	83041	83068	83116	83158
		PTFE		40	ARD../1222-P2	83011	83042	83069	83117	83159
Brass / PTFE [1]	FPM	Aluminium	25	180	ARD../1223-A2	(83012)	83043	83070	83118	83160

5-111e_16

[1] Measuring chamber, particularly for heavy fuel oil (measuring tolerance ± 1%)

ARD 2000 measuring module

Measuring chamber	Seal	Rotary piston	PN bar	Tmax °C	Type designation	Nominal bore 15	20	25	40	50
Spherolitic cast iron housing with flanged connections										
Stainless steel / PPS	FPM	Aluminium	40	130	ARD.../2224-A2	83013		83071	83119	83161
		Graphite		130	ARD.../2224-G2	83014		83072	83120	83162
		Stainless steel		130	ARD.../2224-S2	83015		83073	83121	83163
		PTFE		40	ARD.../2224-P2	83017		83075	83123	83165
Stainless steel / PTFE	FPM	Aluminium	40	180	ARD.../2225-A2	83018	83044	83076	83124	86166
		Graphite		180	ARD.../2225-G2	83019	83045	86077	83125	86167
		Stainless steel		180	ARD.../2225-S2	83020	83046	83078	83126	83168
		PTFE		40	ARD.../2225-P2	83021	83047	83079	83127	83169
Stainless steel / PTFE	PTFE	Graphite	40	180	ARD.../2225-G6	83022	83048	83080	83128	83170
		Stainless steel		180	ARD.../2225-S6	83023	83049	83081	83129	83171
		PTFE		40	ARD.../2225-P6	83024	83050	83082	83130	83172

5-111e_17

ARD 3000 measuring module

Measuring chamber	Seal	Rotary piston	PN bar	Tmax °C	Type designation	Nominal bore 15	20	25	40	50
Housing with flanged connections		Stainless steel (corrosion and acid-proof)								
Stainless steel / PTFE	FPM	Hard rubber	25	50	ARD../3315-H2	83025	83051	83095	83143	
		Graphite		180	ARD../3315-G2	83026	83052	83096	83144	83173
		Stainless steel		180	ARD../3315-S2	83027	83053	83097	83145	83174
		PTFE		40	ARD../3315-P2	83028	83054	83098	83146	83175
Stainless steel / PTFE	PTFE	Graphite	25	180	ARD../3315-G6	83029	83055	83099	83147	83176
		Stainless steel		180	ARD../3315-S6	83030	83056	83100	83148	83177
		PTFE		40	ARD../3315-P6	83031	83057	83101	83149	83178

5-111e_19

ARD 4000 measuring module

Measuring chamber	Seal	Rotary piston	PN bar	Tmax °C	Type designation	Nominal bore 15	20	25	40	50
PTFE plastic housing with flanged connections										
PTFE / Tantal	FFKM	PTFE	10	50	ARD../4467-P5			83105	83153	

5-111e_20

Type designation key for device identification

Example of type designation key			ARD	25	/	1	22	3	/	A	2	/	J16
Type series		ARD	ARD										
Nominal bore		15 mm		15									
		20 mm		20									
		25 mm		25									
		40 mm		40									
		50 mm		50									
Configuration group		/1000				1							
		/2000				2							
		/3000				3							
		/4000				4							
Housing	Threaded	Brass					11						
		Spherolitic cast iron					21						
	Flanged	Spherolitic cast iron					22						
		Stainless steel					31						
		PTFE					46						
Measuring chamber		Brass / PPS						1					
		Brass / PTFE						2					
		Brass / PTFE (1%) [1]						3					
		Stainless steel / PPS						4					
		Stainless steel / PTFE						5					
		PTFE / Tantal						7					
		Brass / PTFE (1%) [1]						8					
Rotary piston		Aluminium								A			
		Hard rubber								H			
		Graphite								G			
		Stainless steel								S			
		PTFE								P			
Seal set		FPM Fluoroelastomer									2		
		FFKM Perfluoroelastomer									5		
		PTFE Polytetrafluoroethylene									6		
Flange drillings	DIN	PN 10 / 16 / 25 / 40											
	ANSI	150 PSI											A150
		300 PSI											A300
		600 PSI											A600
	JIS	K5											J5
		K10											J10
		K16											J16
		K30											J30

5-111e_2i

[1] Measuring chamber, particularly for heavy fuel oil measuring tolerance ± 1%

11.2

ARD modules: Type designations and order numbers (for standard versions; special versions on request)

Pulser module Pulse values in litres	Roller register RV Pulse values in litres	Tmax °C	Type designation	Nominal bore 15	20	25	40	50
RW module 180°C								
		180	RW / RD ..	83500	83526	83552	83578	83604
IN module 130°C								
0.01		130	IN 0.01 / RW / RD ..	83509	83535			
0.1			IN 0.1 / RW / RD ..	83512	83538	83561	83587	
1			IN 1 / RW / RD ..			83564	83590	83613
10			IN 10 / RW / RD 50					83616
IN module 180°C								
0.01		180	IN 0.01H / RW / RD ..	83513	83539			
0.1			IN 0.1H / RW / RD ..	83516	83542	83565	83591	
1			IN 1H / RW / RD ..			83568	83594	83617
10			IN 10H / RW / RD 50					83620
INA module 90°C								
High-resolution		90	INA / RW / RD ..	83517	83543	83569	83595	83621
High-resolution	Sealing plate	90	INA / RD ..	83520	83546	83572	83598	83624
INA module 180°C								
High-resolution		180	INAH / RW / RD ..	83521	83547	83573	83599	83625
High-resolution	Sealing plate	180	INAH / RD ..	83524	83550	83576	83602	83628
GTAS module for AS / ASP batching controls 180°C								
		180	GTAS / RD	83685	83686	83687	83688	83689

5-111e_22

5-111e_23

RV module 180°C - **Not available with EC-Type-Examination Certificate**								
	0.1	180	RV 0.1 / RD 15	83501				
	1		RV 1 / RD ..	83502	83527	83553	83579	
	10		RV 10 / RD ..		83528	83554	83580	83605
	100		RV 100 / RD 50					83606

5-111e_22a

Type designation key (for device identification)

Example of type designation key				**IN 1H**	/	**RV 10**	/	**RD 25**
Pulser	Pulse value in litres	Tmax °C						
None		180						
IN Inductive	0.01	130		IN 0.01				
	0.1			IN 0,1				
	1			IN 1				
	10			IN 10				
	0.01	180		IN 0.01H				
	0.1			IN 0.1H				
	1			IN 1H				
	10			IN 10H				
INA Inductive high-resolution		90		INA				
		180		INAH				
Module for AS / ASP filling control				GTAS				
Roller register						RW		
Roller register with integral pulser	0.1					RV 0.1		
	1					RV 1		
	10					RV 10		
	100					RV 100		
Sealing plate without roller register								
Nominal bore of flowmeter	DN 15							RD 15
	DN 20							RD 20
	DN 25							RD 25
	DN 40							RD 40
	DN 50							RD 50
Display units	Litres							
	US gallons							USG

5-111e_24

11.3

AMD measuring modules

Type designation key and order numbers (for standard versions)

Housing	Measuring unit / bearings	PN bar	Tmax °C	Type designation	Nominal bore 25	Nominal bore 40
AMD 3000						
Stainless steel	Stainless steel / PTFE	16	90	AMD../3331	84002	84006
	Stainless steel / graphite		180	AMD../3332	84003	84007

5-111e_25

Type designation key (for device identification)

Example of type designation key			**AMD**	**25**	**/**	**3**	**3**	**3**	**1**	**/**	**A150**
Type series	AMD		AMD								
Nominal bore	25 mm			25							
	40 mm			40							
Configuration group	/3000					3					
Housing	Stainless steel	PN 25					3				
Measuring unit	Stainless steel							3			
Bearings	PTFE	90°C							1		
	Graphite	180°C							2		
Flange drillings	DIN	PN 16 / 25									
	ANSI	150 PSI									A150
		300 PSI									A300
		600 PSI									A600
	JIS	K 10									J10
		K 16									J16
		K 30									J30

5-111e_26

11.4

AMD modules

Type designation key and order numbers (for standard versions)

Pulser module Pulse values in litres	Roller register RV Pulse values in litres	Tmax °C	Type designation	Nominal bore 25	 40
RW module					
		180	RW / MD ..	84010	84016
RV module					
		180	RV 1 / MD ..	84040	84041
IN module					
0.1		130	IN 0.1 / RW / MD ..	84012	84018
1			IN 1 / RW / MD ..	84013	84019
0.1		180	IN 0.1H / RW / MD ..	on request	
1			IN 1H / RW / MD ..	on request	
INA module					
High-resolution	Sealing plate	90	INA / MD ..	84015	84021
		180	INAH / MD ..	on request	
GTAS module for AS / ASP filling controls					
		180	GTAS / MD ..	84014	84020

5-111e_27

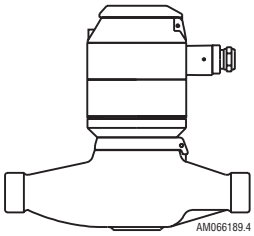
Type designation key (for device identification)

Example of type designation key			**IN 1**	**/**	**RW**	**/**	**MD 25**	
Pulser	Pulse value in litres	Tmax °C						
None								
IN Inductive	0.1	130	IN 0.1					
	1		IN 1					
INA Inductive high-resolution		90	INA					
		180	INAH					
Module for AS / ASP filling control			GTAS					
Roller register		180			RW			
Roller register with integrated pulser	1				RV 1			
Nominal bore of flowmeter	DN 25						MD 25	
	DN 40						MD 40	
Display units	Litres							

5-111e_28

11.5

Complete PMD flowmeters: Order numbers


AM066189.4

Type designation	Version		Order No.
PMD 20 - IN 0.1	with pulser IN 0.1 l	(Inductive)	84023
PMD 20 - IN 1	with pulser IN 1 l	(Inductive)	84024
PMD 20 - INA	with high-resolution pulser	(Inductive)	on request
PMD 20 + adapter	prepared for batching control system		84025
PMD 25 - IN 0.1	with pulser IN 0.1 l	(Inductive)	84027
PMD 25 - IN 1	with pulser IN 1 l	(Inductive)	84028
PMD 25 - INA	with high-resolution pulser	(Inductive)	on request
PMD 25 + adapter	prepared for batching control system		84029
PMD 40 - IN 0.1	with pulser IN 0.1 l	(Inductive)	84035
PMD 40 - IN 1	with pulser IN 1 l	(Inductive)	84036
PMD 40 - INA	with high-resolution pulser	(Inductive)	on request
PMD 40 + adapter	prepared for batching control system		84037

PMD: for versions without pulser or with reed-pulser type RH use type PMK (up to 40°C) or PMW (up to 90°C).

11.6

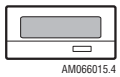
ATEX modifications

Modifications for ATEX devices	96044

5-111e_27a

11.7

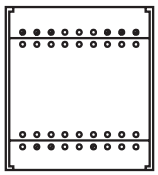
Data for ordering accessories


AM066015.4

Remote totalizer

Input pulse value = count step, without / with zeroing (adjustable)

SY 3233 Pulse counter — 93374

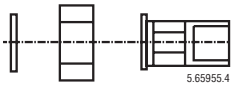

AM066078.4

Frequency current converter 0/4...20mA

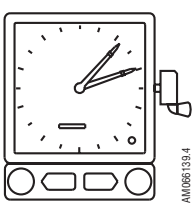
for instantaneous signal values in connection with high-resolution IN / INA pulsers

WEM-FSU	Freely programmable	93200
WEM / EX (for explosion risk applications)	Freely programmable	93240

5-111e_30


5.65955.4

Threaded connections Brass, without rim, with Klingerite seals	15	20	25	40	50	Order No.
VSR 1/2"	•					81160
VSR 3/4" - 1/2"		•				81163
VSR 3/4"		•				81166
VSR 1"			•			81169
VSR 1 1/2"				•		81181


AM066139.4

Batching controls

AS manual controls — on request

ASP pneumatic controls — on request

5-111e_31

DOMINO specification form

1. Customer and sales information

Name of customer .....

Address .....

Postal code, city, country .....

Tel. No. ..... Fax No. .....

Contact person ..... Date .....

Object ..... Measuring point .....

2. Operating conditions

Medium ..... Formula .....

For impure or unfamiliar media, please give the follwoing data:

☐ Pure, without solid or gas content ☐ Abrasive, fibrous, emulsion

If you already have experience with the medium, please indicate which of the following materials are chemically resistant to it:

- Metals ☐ Stainless steel ☐ Spherolitic cast iron ☐ Brass ☐ Aluminium anodized
- Plastics ☐ PTFE ☐ Hard-rubber ☐ Graphite
- Seals ☐ PTFE ☐ FPM ☐ .....

Rated pressure PN ..... Temperature range from ..... to ..... °C

Flow range from ..... to ..... l/h

Hazardous areas ☐ / non hazardous areas ☐

3. Evaluation of measurements

☐ Local totalizing with roller register

☐ Pulse transmission to:

☐ Analogue signal output to:

☐ 0...20 mA ☐ 4...20 mA

☐ Filling batch size from ..... to ..... l in ..... Minutes

4. Installation conditions

Meter position	☐ Horizontal	☐ Vertical	☐ Other	
Distance from evaluation unit	☐ Compact	☐ max. 5 m	☐ max. 50 m	☐ max. 500 m

5. Flowmeter specification

	Type	DN	Art. No.	Price
• Metering module	.....	.....	.....	.....
• Special flange	.....			.....
• Modules	.....	.....	.....	.....
• Auxiliary modules	.....	.....	.....	.....
Total	.....			.....

- Rated presure PN ..... Temperature max. ..... °C
- Measuring range ..... l/h ± ..... %
- Neasuring range ..... l/h ± ..... %
- wetted components .....

6. Remarks .....

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