aqua metro

Technical Information

HOT WATER

RUBY
Woltman Turbine Meters
WPDH, WSDH, SMQ Velocity Measuring Units

VD 2-301 e.10.2001

1. Introduction

1.1

Heating supply applications

- Measuring the consumption of hot water
- As a flow sensor for heat metering
- Flow sensors for control and building management technology

1.2

Your benefits

- Complete system for flow measurement up to 40 bar line pressure and 200°C medium temperature
- Versions available with nominal sizes up to DN 500
- Long service life and high measurement stability
- High overload capacity
- Symmetrical control for operation in both flow directions (optional)
- The register unit (roller counter unit) conforms to IP68
- The register unit can be rotated through 360° to provide the best reading position
- Up to 3 pulsers can be retrofitted without destroying the seals
- Local or remote totalization (AMSTACK, AMBILL®)

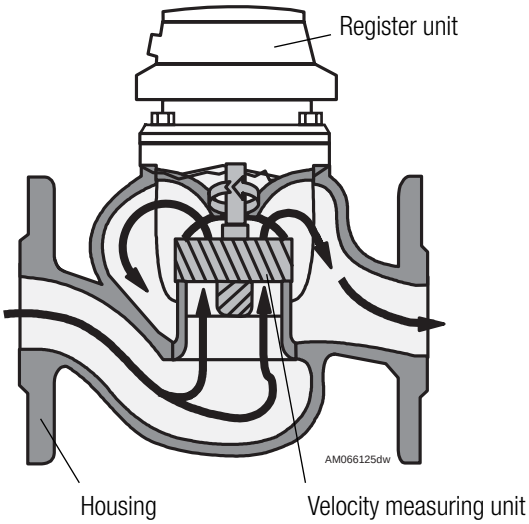
1.3

Operating principle and characteristics of RUBY hot water meters

- RUBY hot water meters operate according to the rate of flow or velocity measuring principle in which the movement of a moving element is transmitted to an indicating device (register unit) which totalizes the volume flow. The moving element in Woltman meters is a turbine which is fully exposed to flow, unlike, for example, the impellers of multi-jet meters.
- To obtain the uniform flow profile that is needed, the Woltman meter requires straight inlet sections.
- These sturdy Woltman meters are ideal for high flowrates, and they also feature wide measuring ranges.
- The hydrodynamic counter-pressure generated by the special geometry helps to ensure a floating, low-friction turbine bearing.
- The velocity measuring units can be removed and certified.
- A symmetrical regulating device (optional) ensures equal measurement accuracy for both forward and reverse flows.
- The hermetically encapsulated register unit can be retrofitted with various pulsers without destroying any seals.

1.4

RUBY WSDH parts and materials



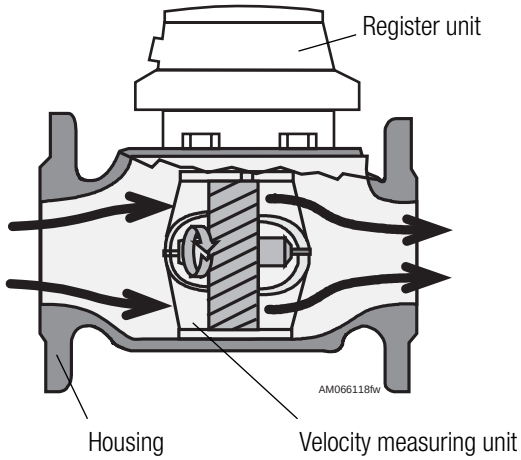
Part	Material
Housing assembly	
Housing	GG 25
Velocity measuring unit screws	stainless steel
Velocity measuring unit assembly	
Complete turbine	
Turbine / turbine shaft	PPS
Pin	hard metal
Washer, bushing	stainless steel
Bearing plate and locating ring	sapphire
Bearing sleeve, clip	brass
Magnet	hard ferrite
Complete regulating device	
Regulating vane	PPS
Push rod, threaded pin, bolts	stainless steel
O-ring	EPDM
Complete velocity measuring unit body	
Base pin, washer, hexagonal nut	stainless steel
Pin	hard metal
Upper section of unit	PPS
Lower section of unit	PPS
Bushing	stainless steel
Register unit assembly	
Circular gasket, lip seal	EPDM
Filler plug, centring ring, conversion ring	PPO
Sealing plate	brass
Sealing plug	PPS
Sliding ring	PC
Mechanism	glass/copper
Nameplate	PV film
Cover	POM

Explanation of abbreviations

GG	Grey cast iron
PPS	Polyphenylene sulphide
PPO	Polyphenylene oxide
POM	Polymethylene oxide
PC	Polycarbonate
EPDM	Ethylene/propylene diene rubber
PV	Polyvinyl

1.5

RUBY WPDH parts and meterials



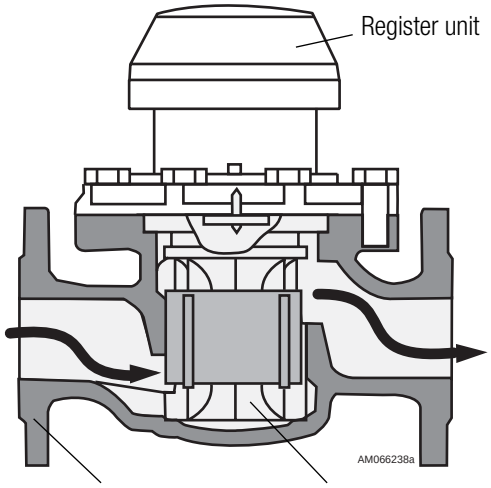
Part	Material
Housing assembly	
Housing	GG 25
Velocity measuring unit screws	stainless steel
Velocity measuring unit assembly	
Complete turbine	
Turbine	PPS
Cap jewel	sapphire
Bearing bushing for turbine	PPS
Complete regulating device	
Regulating ring	PPS
Push rod	stainless steel
Regulating bolt	brass
O-ring for regulating bolt	EPDM
Locking screw	brass
Complete velocity measuring unit body	
Head seal	EPDM
Cover flange	tinned brass
Basic body of unit	PPS
Moulded seal	EPDM
Protecting tube	PPS
Bearing ring	stainless steel
Bearing bushing for transmission shaft	PPS
Transmission shaft	PPS/stainless steel
Gear wheel for transmission shaft	PPS
Magnetic coupling	PPS/hard ferrite
Water flow stabiliser	PPS
Bearing bolt	stainless steel
Baffle plate	PPS
Register unit assembly	
Circular gasket, lip seal	EPDM
Filler plug, centring ring, conversion ring	PPO
Sealing plate	brass
Sealing plug	PPS
Sliding ring	PC
Mechanism	glass/copper
Nameplate	PV film
Cover	POM

Explanation of abbreviations

GG	Grey cast iron
PPS	Polyphenylene sulphide
PPO	Polyphenylene oxide
POM	Polymethylene oxide
PA	Polyamide
PC	Polycarbonate
EPDM	Ethylene/propylene diene rubber
PV	Plyvinyl

1.6

RUBY SMQ parts and materials



Part	Material
Housing assembly	
Housing	GS
Velocity measuring unit screws	stainless steel
Velocity measuring unit assembly	
Complete turbine	
Turbine	PEEK
Bearing bushing	sapphire
Bearing pin	hard metal
Magnet	ferrite
Complete velocity measuring unit body	
Velocity measuring unit	PEEK
Clips	stainless steel
Regulating unit	PEEK/stainless steel
Sealing plate	stainless steel
Flat seal	Novapress
Register unit assembly	
Transmission gear wheels	PPS
Bottom plate of mechanism	PPS
Bearings	sapphire/PPS
Upper housing of mechanism	PPS
Numbered roller indicators, gear wheels	PPS
Cover	PC

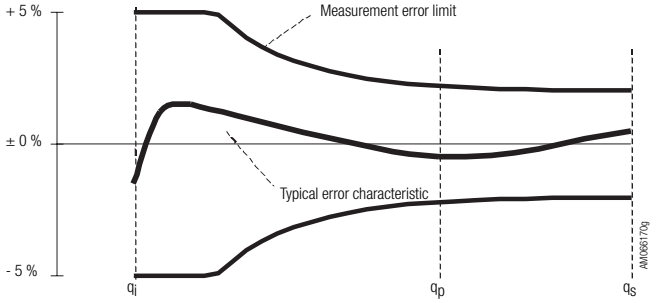
Explanation of abbreviations

GS	Cast steel
PPS	Polyphenylene sulphide
PC	Polycarbonate
PEEK	Polyetheretherketone
Novapress	Aramide rubber

1.7

Measurement error limits according to EN 1434 for flow sensors

- Measurement error limits for the flow sensor part of a heat meter



$$E_f = \pm \left(2 + 0.02 \ \frac{q_p}{q}\right) \ but\ not\ exceeding \pm 5\%\ (Class 2)$$

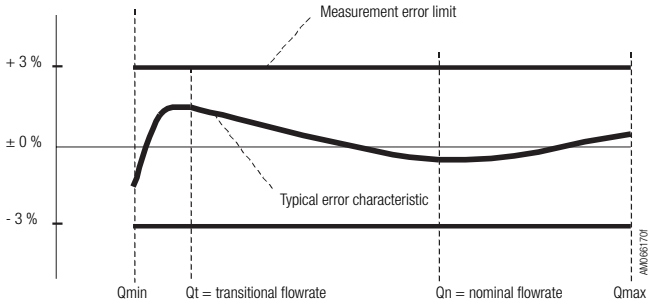
$$E_f = \pm \left(3 + 0.05 \ \frac{q_p}{q}\right) \ but\ not\ exceeding \pm 5\%\ (Class 3)$$

$q_i \ \widehat{=} \ Qmin$
$q_p \ \widehat{=} \ Qn$
$q_s \ \widehat{=} \ Qmax$

1.8

Measurement error limits according to OIML R72 and R75 Standards for flow sensors (Qn > 3 m³/h)

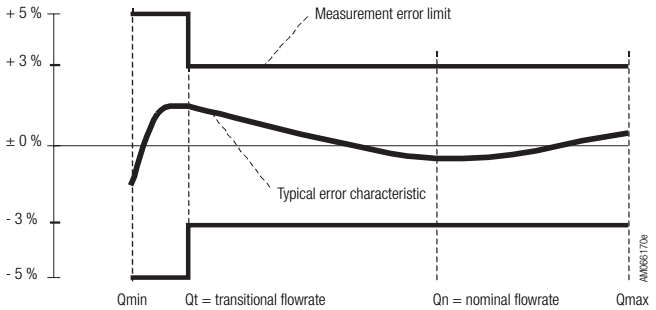
- Measurement error limits for the flow sensor part of a heat meter where Qn > 3 m³/h



1.9

Measurement error limits according to OIML R72 Standards and to Directive 79/830/EEC for hot water meters

- Measurement error limits for hot water meters according to OIML R72 as defined by the 79/830/EEC Directive.



- Metrological classes defined by Directive 79/830/EEC (hot water meter)

		Qn[1] ≥ 15 m³/h
Class A	Qmin	0.08 Qn
	Qt	0.20 Qn
	Qmax	2 Qn
Class B	Qmin	0.04 Qn
	Qt	0.15 Qn
	Qmax	2 Qn
Class C	Qmin	0.02 Qn
	Qt	0.10 Qn
	Qmax	2 Qn

1) All meters in the RUBY series have Qn ≥ 15 m³/h

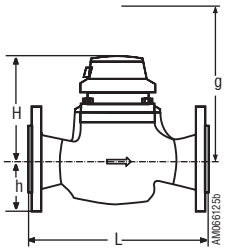
2. RUBY hot water meters

2.1

RUBY WSDH

- Woltman turbine meters with dry-type register units
- Better than Metrological Class B (Directive 79/830/EEC), or Class 2 (EN 1434)
- Measurement error limits, see Sections 1.7, 1.8 and 1.9
- For horizontal installation; a length of straight pipework of 3 x DN is recommended upstream of the meter
- Powder-coated grey cast iron housing with flange connections
- Velocity measuring unit made of plastic (for details, see Section 1.4)
- Nominal pressure: 16 bar
- Max. temperature: 130°C
- Pressure loss: see k_V value (page 9)
- Versions up to DN 150
- IP68

RUBY			**WSDH 50**	**WSDH 65**	**WSDH 80**	**WSDH 100**	**WSDH 150**
Article No.			92379	92380	92381	92382	180529
Nominal size	**DN**	**mm**	**50**	**65**	**80**	**100**	**150**
		inches	2	2 1/2	3	4	6
Overall length		mm	270	300	300	360	500
Maximum flowrate	Qmax [1]	m³/h	30	60	85	125	300
Nominal flowrate	**Qn**	**m³/h**	**15**	**25**	**40**	**60**	**150**
Minimum flowrate	Qmin	m³/h	0.25	0.30	0.30	0.50	0.80
Weight		kg	14	18	20	33	92
	Overall length	L	270	300	300	360	500
		h	80	100	100	110	180
		H	151	161	161	191	301
		g	281	301	301	341	581

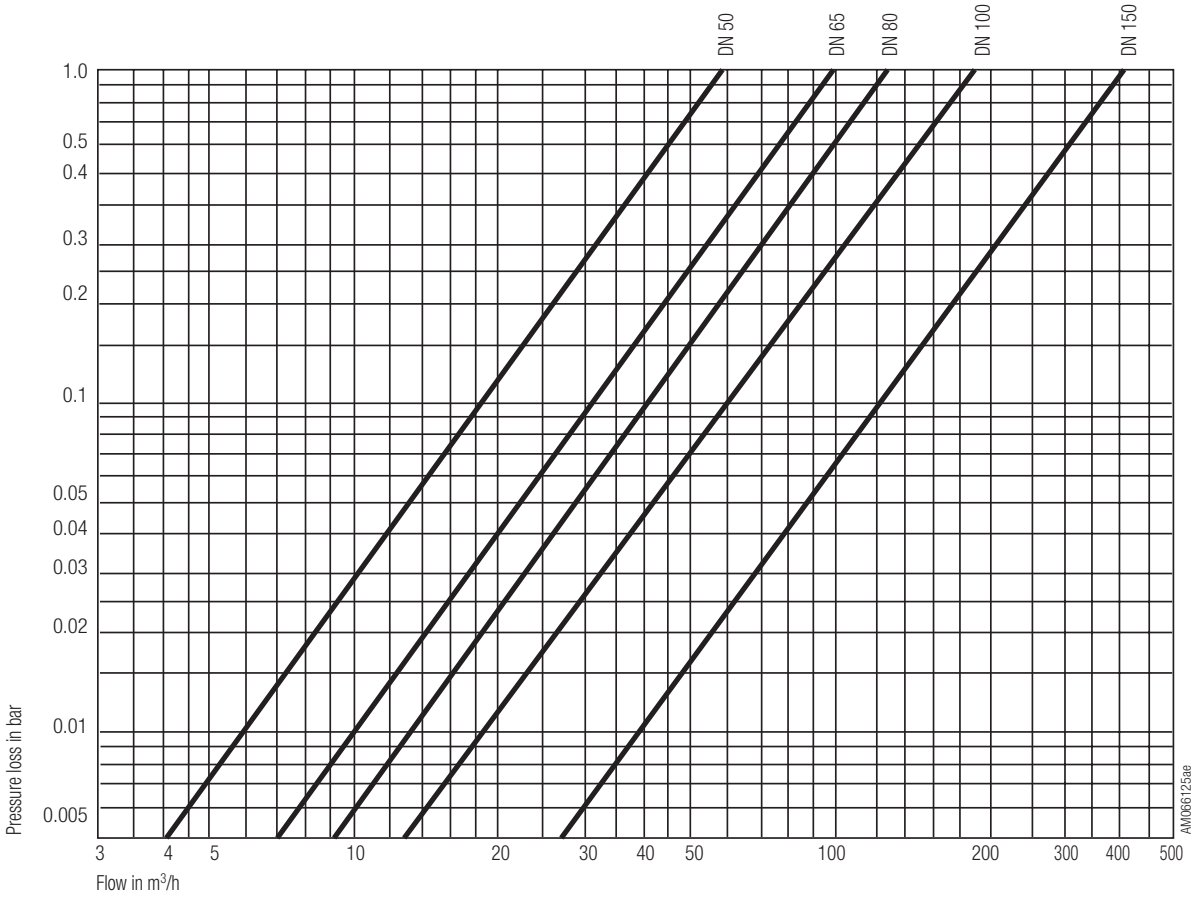


For explanation of g, see Section 6.5

Reed pulsers	**RD 02 / RD 022**					
Pulse value (low)	m³/pulse	0.1	0.1	0.1	0.1	1
Pulse frequency at Qmax	Hz	0.083	0.167	0.236	0.347	0.083
Pulse value (high)	m³/pulse	0.25	0.25	0.25	0.25	2.5
Pulse frequency at Qmax	Hz	0.033	0.067	0.094	0.139	0.033
Optoelectronic pulsers	**OD AM**					
Pulse value	m³/pulse	0.001	0.001	0.001	0.001	0.01
Pulse frequency at Qmax	Hz	8.333	16.67	23.61	34.72	8.33
Pulse frequency at Qmin	Hz	0.069	0.083	0.083	0.139	0.022
	OD 04					
Pulse value	m³/pulse	0.01	0.01	0.01	0.01	0.1
Pulse frequency at Qmax	Hz	0.833	1.667	2.361	3.472	0.833
Pulse frequency at Qmin	Hz	0.007	0.008	0.008	0.014	0.002

1) Max. 1 hour per day, and max. 200 hours per year

Pressure loss curves for WSDH



Calculation of the pressure loss [1] Δp					
$\Delta p = \left(\frac{Q}{K_v}\right)^{exp}$ [bar]; Q = flowrate in m³/h					
WSDH	**50**	**65**	**80**	**100**	**150**
K_V	60	98	138	195	400
exp	2	2	2	1.95	1.95

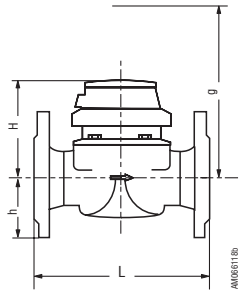
1) Medium: water

Pulsers	**Reed RD 02**	**Reed RD 022**	**Optoelectronic OD AM**	**Optoelectronic OD 04**
Article No.	93748	93749	93751	93753
Switch voltage	max. 48 VAC or DC	max. 125 VAC or DC	8.2 VDC	8.2 VDC
Switch current	max. 200 mA	max. 35 mA	< 1.2 mA	< 1.2 mA
Quiescent	— (open contact)	— (open contact)	> 2.1 mA	> 2.1 mA
Ambient temperature	≤ 70°C	≤ 70°C	≤ 70°C	≤ 70°C
Protection class	IP68	IP68	IP68	IP68
Forward/reverse flow recognition	no	no	yes [2]	yes [2]

2) See Section 3.6

RUBY WPDH

- Woltman turbine meters with dry-type register units
- Better than Metrological Class B (Directive 79/830/EEC), or Class 2 (EN 1434)
- Measurement error limits, see Sections 1.7, 1.8 and 1.9
- For horizontal or vertical installation; a length of straight pipework of 3 x DN is recommended upstream of the meter
- Powder-coated grey cast iron housing with flange connections
- Velocity measuring unit made of plastic (for details, see Section 1.5)
- Nominal pressure: 16 bar
- Max. temperature: 130°C
- Pressure loss: see k_V value (page 11)
- Versions up to DN 500
- IP68

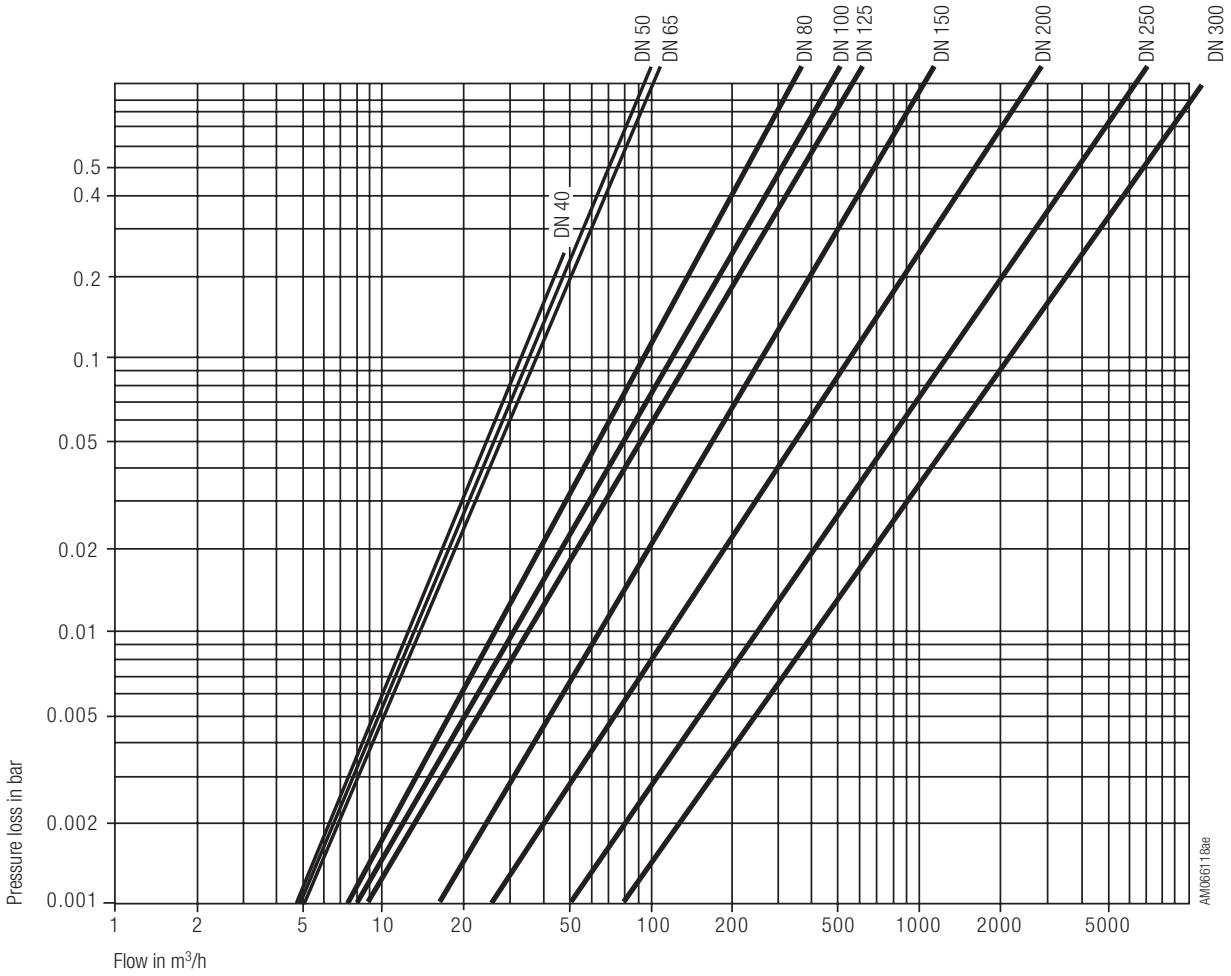
RUBY			**WPDH 50**	**WPDH 65**	**WPDH 80**	**WPDH 100**	**WPDH 125**	**WPDH 150**	**WPDH 200**	**WPDH 250**	**WPDH 300**
Article No.			92493	92494	92495	92496	92497	92498	180536	180536	180536
Nominal size	**DN**	**mm**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**	**300** [2]
		inches	2	2 1/2	3	4	5	6	8	10	12
Maximum flowrate	Qmax [1]	m^3/h	30	60	90	140	200	300	500	1000	1200
Nominal flowrate	**Qn**	**m^3/h**	**15**	**25**	**45**	**70**	**100**	**150**	**250**	**500**	**600**
Minimum flowrate	Qmin	m^3/h	0.6	1.0	1.4	2.0	3.5	4.5	8	25	30
Weight		kg	8	10	14	18	21	36	51	72	99
	Overall length	L	200	200	225	250	250	300	350	450	500
		h	73	85	95	105	118	135	162	194	226
		H	120	120	150	150	160	177	206	231	256
		g	200	200	270	270	280	356	441	466	491

For explanation of g, see Section 6.5

Reed pulsers	**RD 02/RD 022**									
Pulse value (low)	m^3/pulse	0.1	0.1	0.1	0.1	0.1	1	1	1	1
Pulse frequency at Qmax	Hz	0.083	0.167	0.250	0.389	0.556	0.083	0.139	0.278	0.333
Pulse value (high)	m^3/pulse	0.25	0.25	0.25	0.25	0.25	2.5	2.5	2.5	2.5
Pulse frequency at Qmax	Hz	0.033	0.067	0.100	0.156	0.222	0.033	0.056	0.111	0.133
Optoelectronic pulsers	**OD AM**									
Pulse value	m^3/pulse	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01
Pulse frequency at Qmax	Hz	8.333	16.67	25.00	38.89	55.56	8.333	13.89	27.78	33.33
Pulse frequency at Qmin	Hz	0.167	0.278	0.389	0.556	0.972	0.125	0.222	0.694	0.833
	OD 04									
Pulse value	m^3/pulse	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.1	0.1
Pulse frequency at Qmax	Hz	0.833	1.667	2.500	3.889	5.556	0.833	1.389	2.778	3.333
Pulse frequency at Qmin	Hz	0.017	0.028	0.039	0.056	0.097	0.013	0.022	0.069	0.083

1) Max. 1 hour per day, and max. 200 hours per year
2) Larger nominal sizes can be supplied on request

Pressure loss curves for WPDH



Calculation of the pressure loss [1] Δp

$$\Delta p = \left(\frac{Q}{K_v}\right)^{\exp}$$

[bar]; Q = flowrate in m³/h

WPDH	50	65	80	100	125	150	200	250	300
K_V	94	101	330	460	570	1050	2500	6200	11200
exp	2.3	2.3	1.8	1.7	1.65	1.65	1.5	1.43	1.38

1) Medium: water

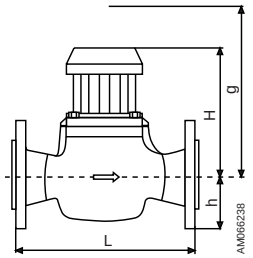
Pulsers	Reed RD 02	Reed RD 022	Optoelectronic OD AM	Optoelectronic OD 04
Article No.	93748	93749	93751	93753
Switch voltage	max. 48 VAC or DC	max. 125 VAC or DC	8.2 VDC	8.2 VDC
Switch current	max. 200 mA	max. 35 mA	< 1.2 mA	< 1.2 mA
Quiescent current	— (open contact)	— (open contact)	> 2.1 mA	> 2.1 mA
Ambient temperature	≤ 70°C	≤ 70°C	≤ 70°C	≤ 70°C
Protection class	IP68	IP68	IP68	IP68
Forward/reverse flow recognition	no	no	yes [2]	yes [2]

2) See Section 3.5

2.3

RUBY SMQ

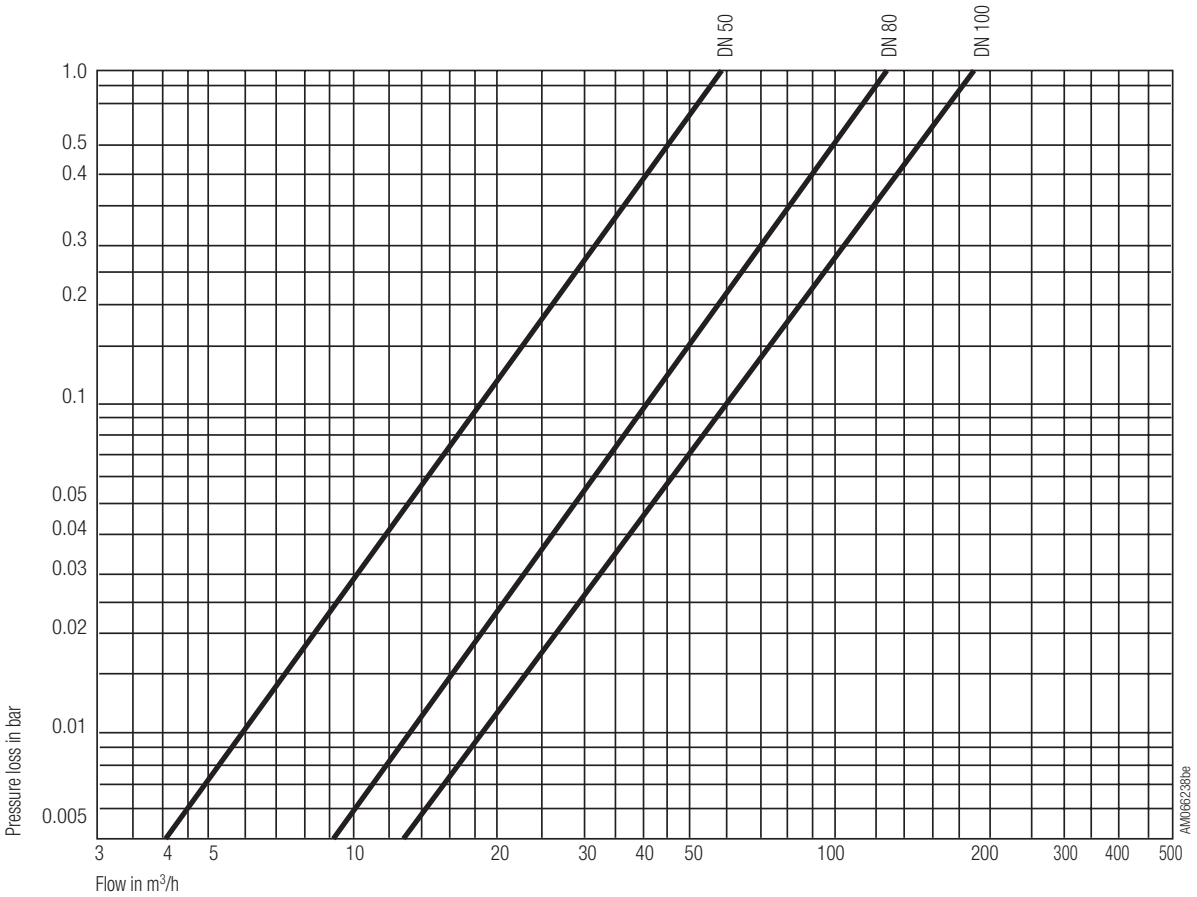
- Woltman turbine meters with dry-type register unit
- Better than Metrological Class A (Directive 79/830/EEC), or Class 2 (EN 1434)
- Measurement error limits, see Sections 1.7, 1.8 and 1.9
- For horizontal installation; a length of straight pipework of 3 x DN is recommended upstream of the meter
- Powder-coated cast iron housing with flange connections
- Velocity measuring unit made of plastic (for details, see Section 1.6)
- Nominal pressure: 40 bar
- Max. temperature: 200°C
- Pressure loss: see k_V value (page 13)
- Versions up to DN 100
- IP68

RUBY			**SMQ 50**	**SMQ 80**	**SMQ 100**
Article No.			92490	92491	92492
Nominal size	**DN**	**mm**	**50**	**80**	**100**
		inches	2	3	4
Maximum flowrate	Qmax [1]	m³/h	25	70	100
Nominal flowrate	**Qn**	**m³/h**	**15**	**40**	**60**
Minimum flowrate	Qmin	m³/h	0.6	1.6	2.4
Weight		kg	16	23	41
	Overall length	L	270	300	360
		h	80	100	110
		H	195	205	235
		g	325	345	385
	For explanation of g, see Section 6.5				

Reed pulsers	**K 02**			
Pulse value (low)	m³/pulse	0.1	0.1	0.1
Pulse frequency at Qmax	Hz	0.069	0.194	0.278
Pulse value (high)	m³/pulse	0.25	0.25	0.25
Pulse frequency at Qmax	Hz	0.028	0.078	0.111
Inductive pulsers	**K 05**			
Pulse value	m³/pulse	0.01	0.01	0.01
Pulse frequency at Qmax	Hz	0.694	1.944	2.778
Pulse frequency at Qmin	Hz	0.017	0.044	0.067
	K 06			
Pulse value	m³/pulse	0.001	0.001	0.001
Pulse frequency at Qmax	Hz	6.944	19.444	27.778
Pulse frequency at Qmin	Hz	0.167	0.444	0.667

1) Totalling max. 24 hours

Pressure loss curves for SMQ



Calculation of the pressure loss [1] Δp			
$\Delta p = \left(\frac{Q}{K_v}\right)^{\exp}$	[bar]; Q = Flowrate in m³/h		
SMQ	**50**	**80**	**100**
K_V	60	138	195
exp	2	2	1.95

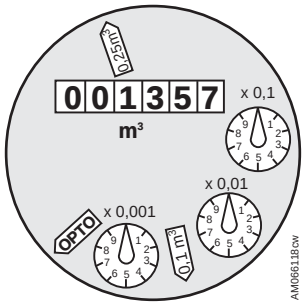
1) Medium: water

Pulsers	**Reed K 02**	**Inductive K 05**	**Inductive K 06**
Article No.	93715	93722	93754
Switch voltage	max. 48 VAC or DC	8 VDC	8 VDC
Switch current	max. 200 mA	≥ 3 mA	≥ 3 mA
Quiescent current	— (open contact)	≤ 1 mA	≤ 1 mA
Ambient temperature	≤ 60°C	≤ 60°C	≤ 60°C
Protection class	IP66	IP54	IP54
Forward/reverse flow recognition	no	no	no

2.4

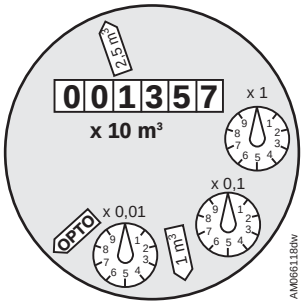
WSDH and WPDH register units (roller counters)

WSDH 50...100 and WPDH 50...125



AM066118cw

WSDH 150 and WPDH 150...300



AM066118dw

2.5

SMQ register unit

SMQ 50...100

3. Pulsers

3.1

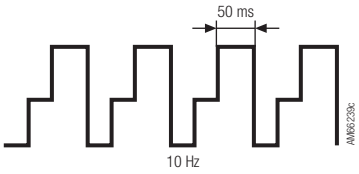
Notes on activation, selection and evaluation

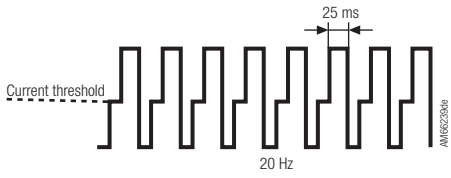
Power supply for pulsers
All pulsers require some form of activating device. The optoelectronic (OD) and inductive pulsers (K05 / K06) are powered by the heat calculating unit or by means of a suitable frequency converter, both of which are connected to a mains supply.
For remote totalization or display of the measured volume flow, passive (Reed) pulsers are also available (RD,K02). The pulser must be supplied with voltage from an auxiliary device. In the case of passive pulsers, battery-powered devices are another possibility.

Choice of a suitable pulser
The choice of a suitable pulser and of an adequate pulse value depends on the application. For instantaneous flow values, analogue signals and for use as a flow sensor for heat energy totalizers, pulsers with small pulse values should generally be selected (such as the OD AM optoelectronic pulser or the K06 inductive pulser with pulse values of 1 litre). For remote totalization, large pulse values are usually preferable (for example, Reed RD 02 pulser with a pulse value of 250 litres up to DN 125). For evaluation devices powered by battery, it is only possible to use Reed pulsers.

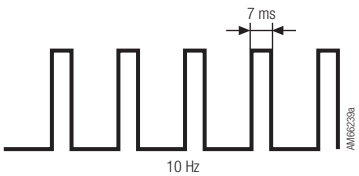
Requirements of the activating devices
With most pulsers, the duration of the pulse depends on the flowrate (except for OD AM pulsers). In these cases continuous contact may occur if there is zero flow. For this reason, the activating device must be able to tolerate a continuous load; if this is not the case, provision should be made for a protective device such as the WE 77 separating relay (article number 81526).

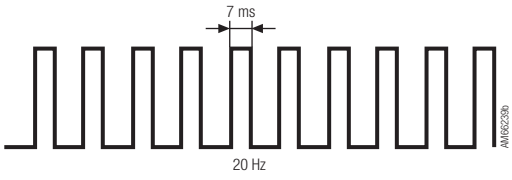
Example: with the OD 04 pulser, the pulse length depends on the flowrate since the active / passive ratio is always the same. During forward flow the rising flank of the pulse features an additional current threshold or step at 1.5 mA. During reverse flow, the current threshold is located on the falling flank of the pulse.





Correct pulse evaluation
When the flow is interrupted, oscillations of the liquid column may occur in the installation (hydraulic vibration with slightly alternating forward / reverse flows, known as jitter). This may give rise to pulses which will be exclusively registered as forward flow by the auxiliary device. Pulses of this sort are not disruptive as regards forming the instantaneous value, since the frequency is very low. However, when a metering function is being controlled with the pulser (as is the case with all heat metering points), the OD AM optoelectronic pulser should be selected as it can filter out the pulses generated by the forward / reverse fluctuations with the help of suitable electronic circuitry. The pulse width of the OD AM pulser is always constant. It is based on the maximum frequency of approximately 70 Hz, corresponding to about 7 ms for all pulse frequencies. Rising and falling pulse flanks are always identical, and no reverse flow pulses are emitted.





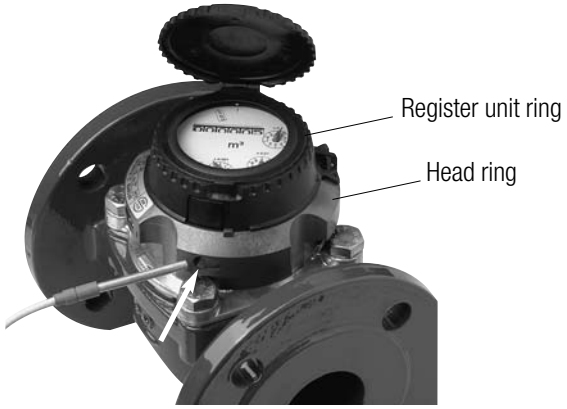
Note
When using the OD AM pulser in conjunction with the CALEC® calculating unit, it is important to remember that the bounce filter (normally used for passive Reed pulsers) must not be set when programming this unit. The NAMUR 200 Hz input on the calculating unit must be used.

3.2

Installing RUBY WPDH and WSDH pulsers

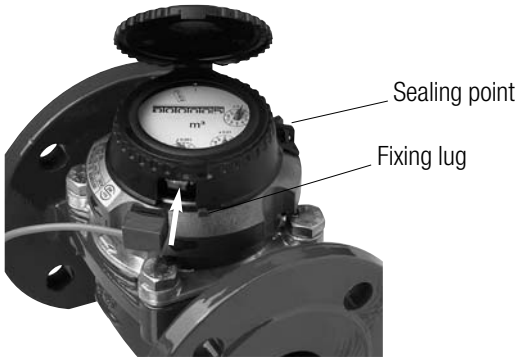
RD 02 / RD 022 Reed pulsers

These pulsers are designed in the form of plugs which can be inserted into every WPDH or WSDH meter at a later stage. When this is done, the main meter seal remains intact so that retrofitting is possible in the field. For retrofitting purposes, the security seal on the register unit is broken, and the head ring (red plastic part) is rotated to the right in relation to the register unit ring (brown plastic part). The RD Reed pulser can now be inserted into the side in either of the two plug-in positions in the head ring. The plug-in positions are identified on the dial of the register unit, making it possible to set two different pulse values. After the pulser has been plugged in (see direction of arrow), the head ring is rotated back again (to the left in relation to the register unit ring) and then secured with a seal.



OD AM / OD 04 optoelectronic pulsers

The OD pulsers can be inserted into every WPDH or WSDH meter at a later stage in the field without breaking the main meter seal (see the procedure for the RD Reed pulsers). To do this, after opening the security seal and rotating the rings in opposite directions to one another, the cover plate on the OPTO plug position in the register unit ring (brown plastic ring) must be broken out with a tool. The fixing lug for the head ring is now located to the right of the plug position. After the OD pulser has been inserted (see direction of arrow), it must be secured by turning the head ring back towards the left and then sealed.



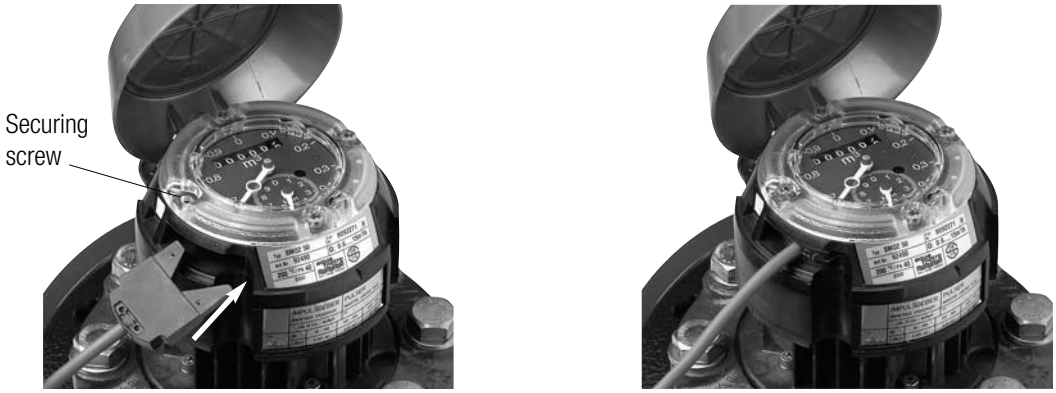
3.3

Installing RUBY SMQ pulsers

K02 Reed pulser

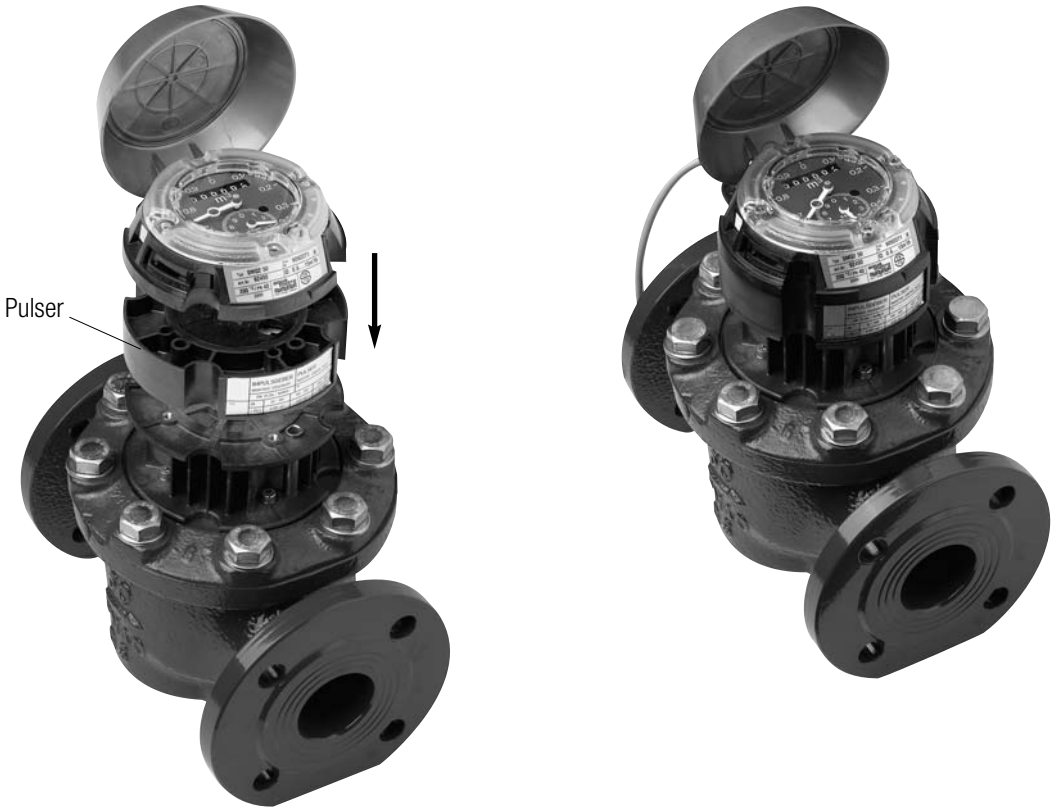
The pulser is designed in the form of a plug which can be inserted into any SMQ at a later stage.
When this is done, the main meter seal remains intact so that retrofitting is possible in the field. In order to retrofit a pulser, slacken one of the four securing screws on the register unit, push the plug in at the side (see direction of arrow), then use the same screw to secure it against removal and finally reseal it.

The plug and the Reed switch can be installed in two positions. Two different pulse values can be set with the K02 pulser by rotating it through 180° about the cable axis.



K05/K06 inductive pulsers

The K05/K06 pulsers are accommodated in a disk-like housing, being installed below the register unit of the SMQ meter (NB: the overall height is increased by the disk thickness ≈ 30 mm). The pulsers can be retrofitted without breaking the main meter seal.
To install them, the register unit must first be removed by slackening the four register unit screws and then carefully placing the K05/K06 pulser on top of the meter so that the cable of the control head (as viewed in the direction of flow) points to the left. The register unit is then replaced, secured with the longer screws (supplied with the product) and sealed.



3.4

Applications for RUBY WSDH and WPDH pulsers

Reed pulsers **RD 02 / RD 022 (passive)**

- Remote transmission, remote display
- Input signal for control and management systems
- Data logging (e.g. with the Aquametro AQUA-LOG Datalogger)
- As a pulser for the flow sensor of heat measuring points where the calculating unit is battery-powered
- Input signal for the AMBUS®-IS module with M-Bus output signal

Optoelectronic pulser **OD AM (small pulse value)**

- As a pulser for the flow sensor of heat measuring points where maximum accuracy is required
- Standard application for all heat measuring points with mains-powered calculating units and NAMUR-compatible pulse inputs
- To form instantaneous values
- For cooling measurements
- For automatic correction of pulses due to hydraulic oscillations (jitter)

Optoelectronic pulser **OD 04 (large pulse value)**

- As a pulser for the flow sensor of heat measuring points where high accuracy is required
- Suitable for auxiliary devices which, by means of an integrated forward/reverse flow detector, can generate the correct volume total when the direction of flow changes

3.5

Applications for RUBY SMQ pulsers

Reed pulsers **K 02 (passive)**

- Remote transmission, remote display
- Input signal for control and management systems
- Data logging (e.g. with the Aquametro AQUA-LOG Datalogger)
- As a pulser for the flow sensor of heat measuring points where the calculating unit is battery-powered
- Input signal for the AMBUS®-IS module with M-Bus output signal

Inductive pulsers **K 06 (small pulse value)**

- As a pulser for the flow sensor of heat measuring points where maximum accuracy is required
- Standard application for all heat measuring points with mains-powered calculating units and NAMUR-compatible pulse inputs
- To form instantaneous values
- For cooling measurements

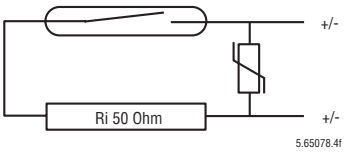
Inductive pulsers **K 05 (large pulse value)**

- As a pulser for the flow sensor of heat measuring points where high accuracy is required
- Application for all heat measuring points with mains-powered calculating units and NAMUR-compatible pulse inputs

3.6

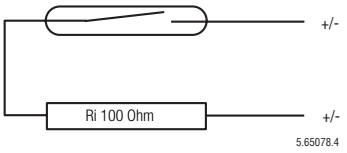
Technical data for RUBY WSDH and WPDH

RD 02 Reed pulser



Switch type	• Reed contact tube protected with an inert gas filling; plug-in design
Contact protection	• RD 02: with protective resistor (50 Ohm) and varistor • RD 022: with protective resistor (100 Ohm)
Switch voltage	• RD 02: max. 48 VAC or DC • RD 022: max. 125 VAC or DC
Switch current	• RD 02: max. 200 mA • RD 022: max. 35 mA
Quiescent current	• Contact open
Switch power	• RD 02: max. 4 W • RD 022: max. 2 W
Pulse duration	• independent of the flowrate; continuous contact is possible
Ambient temperature	• ≤ 70°C
Protection class	• IP 68 to IEC 144
Connection	• Fixed mounting grey cable, length: 3 m

RD 022 Reed pulser



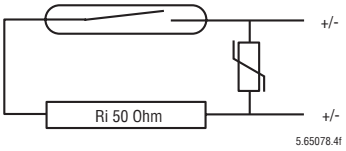
OD AM and OD 04 optoelectronic pulsers

Switch	• IR reflex light barrier to DIN 19234, plug-in design
Switch voltage	• 8.2 VDC
Switch current	• < 1.2 mA
Quiescent current	• > 2.1 mA
Forward/reverse flow recognition	• This is integrated in OD 04 by means of an additional current threshold at 1.5 mA • OD AM has an integrated forward/reverse flow recognition feature and it only emits forward flow pulses (jitter surppression)
Ambient temperature	• ≤ 70°C
Protection class	• IP 68 to IEC 144
Connection	• Fixed mounting grey cable, length: 3 m

3.7

Technical data for RUBY SMQ

K02 Reed pulser



Switch	• Reed switch with plug-in design
Contact protection	• with protective resistor and varistor
Switch voltage	• max. 48 VAC or DC
Switch current	• max. 200 mA
Quiescent current	• Contact open
Switch power	• max. 4 W
Pulse duration	• depends on flowrate; continuous contact is possible
Ambient temperature	• ≤ 60°C
Protection class	• IP 66 to IEC 144
Connection	• Grey cable, length: 2.5 m
Pulse values	• 100 litres / 250 litres (2 installation positions)

K05/K06 inductive pulser

Switch	• HF inductive control head to DIN 19234, as slot proximity switch for a plug-in socket (easy to change)
Switch voltage	• 8 VDC
Power consumption	• gap open ≥ 3 mA (internal resistance ≈ 1 kΩ) • gap closed ≤ 1 mA (internal resistance ≈ 7 kΩ) Changes in the internal resistance are used to control auxiliary transistor relays.
Pulse duration	• depends on flow, continuous contact is possible
Ambient temperature	• ≤ 60°C
Protection class	• IP 54 to IEC 144
Connection	• Grey cable, length: 2.5 m
Polarity	• Brown lead (+) / blue lead (-) to EN 50044

4. Heat measurement points

4.1

Temperature sensors

Type DS

Temperature sensor pairs for direct installation

Ideal for pipes up to 40 mm and for direct installation in ball valves or T-pieces.

Nominal pressure (PN)	10 bar
Temperature measurement range	5...130°C
Resistance values	PT100/PT500
Sensor connection	2 x 0.25 mm^2

Type PLH

Plastic headed sensor pairs for installation in sensor pockets

Used together with TH sensor pockets with installation lengths of 85 mm and 120 mm. The lightweight construction has good thermal properties (low radiation) and offers the possibility of direct 4-wire connection.

Nominal pressure (PN)	25 bar [1]
Temperature measurement range	5...130°C
Resistance values	PT100/PT500
Sensor connection	2 terminals

Type PLC

Temperature sensor pairs for installation in sensor pockets

Used together with TH sensor pockets with installation lengths of 85 mm,120 mm and 210 mm. The lightweight construction has good thermal properties (low radiation). The cables can be fed into a 4-wire connection by means of a sealable distribution box (VD-30).

Nominal pressure (PN)	25 bar [1]
Temperature measurement range	5...180°C
Resistance values	PT100/PT500
Sensor connection	2 x 0.5 mm^2

Type PLH-D [2]

Metal headed sensor pairs for installation in sensor pockets

Used together with TH sensor pockets with installed lengths of 85 mm, 120 mm, 155 mm and 210 mm. The lightweight construction has good thermal properties (low radiation) and offers the possibility of direct 4-wire connection.

Nominal pressure (PN)	25 bar [1]
Temperature measurement range	5...200°C
Resistance values	PT100/PT500
Sensor connection	2 terminals

Type TPK

DIN headed Pt100 sensor pairs

Excellent mechanical strength makes this pair suitable for high pressures (up to 40 bar) with installation lengths of 100 mm, 160 mm, 250 mm (up to 400 mm on request). The large heat dissipation of the head excludes them for applications with low temperature differences.

Nominal pressure (PN)	40 bar
Temperature measurement range	5...180°C
Resistance values	PT100
Sensor connection	4 terminals

1) with TH sensor pockets
2) with german certification

4.2

CALEC® MB heat calculator

Thanks to its high level of measurement accuracy and corresponding measurement stability, the successor to the well proved CALEC® MCL and CALEC® MCP generations of remote heat meters is used as the reference meter by several national approval authorities.
The CALEC® MB is designed as a modular system.

Your benefits:

- Ultra-modern electronics combined with reliable technology guarantee stability and precision
- Compact, modular structure and an independent certifiable unit allow output options to be installed at a later stage
- Easy-to-read, illuminated plain text display
- Parameter display with comfortable 3-key operation
- 8-digit totalizers for energy and volume
- Two billing date memories allow for seasonal related tariffs without the need for interim readings
- Extended data logger function for retroactive measuring point analysis of meter readings, peak consumption and peak flow per recording period
- Hand-held terminal reading via the built-in infrared interface
- Remote reading via the EN 1434-3 Standard M-Bus interface at any time without restrictions.
- Additional functions and parameters can also be programmed at a later stage via the interface, and access protection can be added when necessary
- Expansion options to create an intelligent measurement transmitter. The values are available as data, pulses or analogue current signals.
- Conforms to the EN 1434 heat meter standard.

4.3

CALEC® light heat calculator

The alternative for standard applications in the heating supply sector, such as distribution stations, transfer stations, block-type thermal power stations and refrigerating measurements/cooling applications with water ≥0°C.
CALEC® technology at a "light" price. The CALEC® name stands for heat calculators with high measurement accuracy, exceptional measurement stability and reliability. CALEC® light has everything that is needed for a standard heat measurement point.

Points to note:

- Compact, modular structure. The independent certifiable unit allows output options to be installed at a later stage.
- Easy-to-read, illuminated two-line display
- Simple 3-key operation
- 8-digit totalizers for energy and volume
- Two independent billing date memories
- 15-month memory for energy and volume consumption
- M-Bus interface for easy data exchange, at any time without restrictions:
  - fixed connection for continuous readings
  - infrared for temporary readings
- Output options (relay or analogue outputs) can be installed in the factory or retrofitted and parameterised on site
- Conforms to the EN 1434 heat meter standard.

4.4

AMTRON®-NW heat calculators

The heat calculator for modern buildings.
A new generation measuring instrument for innovative building and supply technology.
Conforms to the EN 1434 heat meter standard and the EMC Directive 89/336/EEC.
AMTRON®-NW has a standardised M-Bus interface. Hundreds of different meters can be read centrally via the M-Bus (examples include energy, water, gas and electricity).
According to choice, the AMTRON®-NW can be powered either individually with the 230 V mains supply, or centrally via AMBUS®.

- Can be combined with a large number of flow sensors
- Battery-free operation
- Push-button or M-Bus control for diagnosis and parameter call-up
- No reading restrictions
- Billing date function with freely programmable date
- Data protection thanks to EEPROM memory
- Integrated operation monitoring

4.5

Selection recommendations for RUBY heat measurement points

The accuracy of any heat measurement depends decisively on the correct choice of the four components that make up the measuring point. Therefore great care must be taken in their selection if the whole measuring point is to attain the best possible results. The devices forming the four components (1: flow sensor; 2: pulser; 3: heat calculator and 4: temperature sensors) can be dimensioned and selected correctly on the basis of the following criteria:

Procedure for selecting the flow sensor

Maximum nominal pressure in the pipe?

Pressure 16...40 bar → Installation? (SMQ)

Pressure 0...16 bar → Maximum temperature of the medium?

Maximum temperature of the medium?

Temp. 130...200°C → Installation? (SMQ)

Temp. 30...130°C → Installation? (WSDH / WPDH)

Installation? (SMQ)

In a vertical pipe [1] → SMQ series (for horizontal installation)

In a horizontal pipe → SMQ series (for horizontal installation)

Installation? (WSDH / WPDH)

In a vertical pipe → WPDH series (for vertical and horizontal installation)

In a horizontal pipe → Which feature is more important?

Which feature is more important?

Low pressure lost → WPDH series (for vertical and horizontal installation)

Low start-up of turbine → WSDH series (for horizontal installation)

Smaller inlet section/space requirement → WSDH series (for horizontal installation)

WSDH series (for horizontal installation)

Nominal flow?

Qn (m³/h)		Type
≤ 15	→	WSDH 50
15 ... 25	→	WSDH 65
25 ... 40	→	WSDH 80
40 ... 60	→	WSDH 100
60 ... 150	→	WSDH 150

WPDH series (for vertical and horizontal installation)

Nominal flow?

Qn (m³/h)		Type
≤ 15	→	WPDH 50
15 ... 25	→	WPDH 65
25 ... 45	→	WPDH 80
45 ... 70	→	WPDH 100
70 ... 100	→	WPDH 125
100 ... 150	→	WPDH 150
150 ... 250	→	WPDH 200
250 ... 500	→	WPDH 250
500 ... 600	→	WPDH 300
> 600	→	on request

SMQ series (for horizontal installation)

Nominal flow?

Qn (m³/h)		Type
≤ 15	→	SMQ 50
15 ... 40	→	SMQ 80
40 ... 60	→	SMQ 100

1) See note in Section 6.6 concerning installation in vertical pipes

Procedure for selecting the pulser

In order to select the correct pulser, the recommendations given in Section 3.4 should be taken into account, together with the following criteria:

Criterion	Selection
Resolution	1 litre, 10 litres, 100 litres, 250 litres, 1000 litres, 2500 litres
Power supply	Mains / battery
Forward / reverse flow recognition	Installation-specific

Procedure for selecting the calculating unit illustrated in Fig. 1

The maximum temperature difference (Δt in K) that occurs at the measuring point (the difference between the supply and return temperatures) is shown on the y-axis of the graph depicted in Fig. 1. The point of intersection between the temperature difference and the flowrate on the x-axis gives the working point for a particular nominal power (the example shown in Fig. 1 gives for $\Delta t = 60$ K and Q = 50 m³/h a working point in the power band between 3...4 MW). Starting from this working point, follow the course of the curve of constant power down to the right as far as the bottom edge of the graph. The cells adjoining the edges of the graph provide information about the tminimum choice of heat calculator that is suitable (in the example, this would be CALEC® light). The following selection recommendations are applicable, in accordance with the approvals:

Power band P = k * Q * ΔT	Recommended calculating unit
P = 0 ... 3 MW	AMTRON® NW
P = 0 ... 30 MW	CALEC® light
P = 0 ... 30.000 MW (30 GW)	CALEC® MB

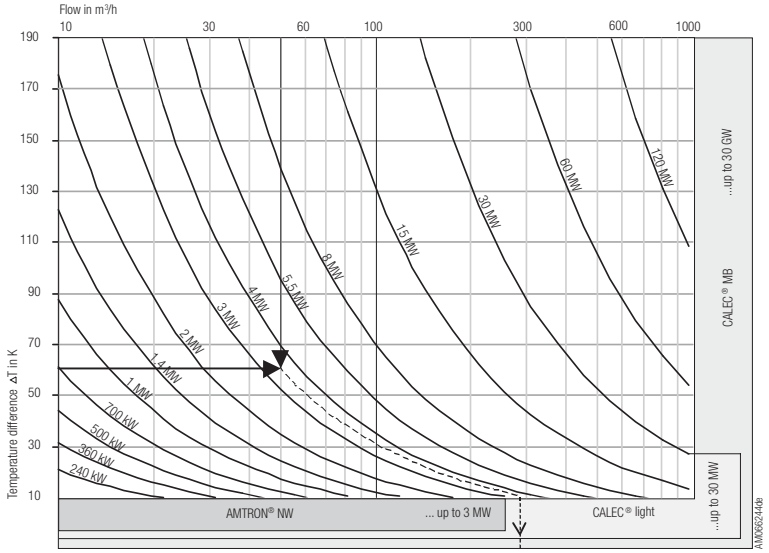
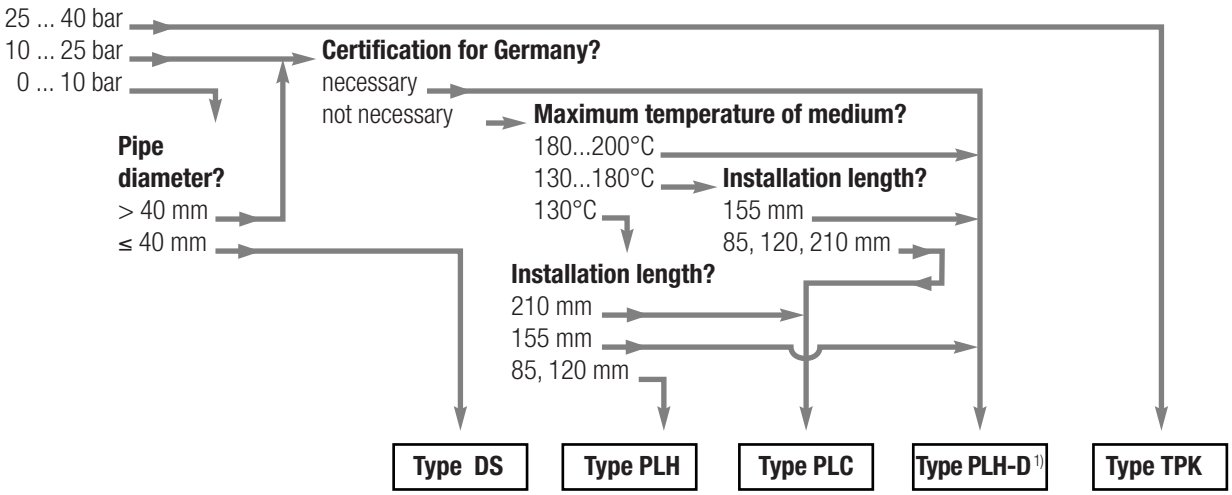


Fig. 1

Note
The recommended choice is not mandatory; if output signals which are only provided by the CALEC® MB are needed, this calculating unit can also be selected. Under no circumstances should a product from a lower power band be chosen.

Procedure to select the temperature sensor



Nominal pressure (PN)	10 bar	25 bar 2)	25 bar 2)	25 bar 2)	40 bar
Temperature measurement range	5 ... 130°C	5 ... 130°C	5 ... 180°C	5...200°C	5 ... 180°C
Overall length	3)	85, 120 mm	85, 120, 210 mm	85, 120, 155, 210 mm	100, 160, 250 mm 4)
Resistance	PT 100 / 500	PT 100 / 500	PT 100 / 500	PT 100 / 500	PT 100
Sensor connection	2 x 0.25 mm²	2 terminals	2 x 0.5 mm²	2 terminals	4 terminals
Type of connection for calculating unit	2-wire	2-/4-wire	2-wire	2-/4-wire	4-wire

1) PLH-D: with certification for Germany
2) with TH-sensor pocket
3) for pipe diameters up to 40mm
4) up to 400 mm on request

5. Auxiliary equipment

5.1

AMBUS® ZS

AMBUS® ZS M-Bus central monitoring units are the gateways to your meters. They convert the M-Bus signals into signals that correspond to RS232 or RS485 protocols, allowing the meters to be read with any PC.

- M-Bus protocol compatible with EN 1434-3
- Integrated power supply for connected meters
- Versions for 5, 60 or 250 meters are available
- Transmission over several km
- Network can be expanded by cascading several central monitoring units via the M-Bus repeater input
- RS232 and RS485 interfaces for connection to PCs or management systems
- Up to 16 central monitoring units can be networked via the RS485 interface

5.2

AMBUS® FA

The intelligent AMBUS® FA M-Bus central monitoring units allow quick and easy remote reading of your meters via the built-in keypad and display, as well as via PCs.

- Display of measuring point designation, current meter readings, instantaneous values, billing date values and alarm status
- Meters can be read individually or residence-by-residence
- Automatic meter search
- Automatic meter check every 24 hours
- Alarms issued via relay output
- Password protection to exclude unauthorised access
- Integrated power supply for connected meters
- Versions for 30, 60 or 150 meters are available
- Transmission over several kilometres
- Network can be expanded by cascading several central monitoring units via the M-Bus repeater input
- RS232 and RS485 interfaces for connection to PCs or management systems
- Up to 16 central monitoring units can be networked via the RS485 interface

Functions

- Automatic network monitoring
- Automatic supervision of meter alarms
- Automatic meter search by primary and secondary addresses
- Assignment of meters to residential units
- Individual meters or whole residential units can be read
- Values displayed: energy, volume, billing date energy, billing date volume, billing date, service hours, error messages, comment field, meter type

5.3

AMBUS® Modem

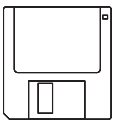
Thanks to AMBUS® Modem, you can carry out a tour of inspection in minutes, without leaving your office - so needless or ill-prepared servicing operations are now a thing of the past.

- Reliable, M-Bus compatible 11-bit transmission
- Connection to MBUSTOOL
- Stable steel plate housing suitable for field use, for wall or piggy-back mounting below a central M-Bus unit
- IP42 protection class
- Approvals: Switzerland (BAKOM) or Germany (BZT)
- Matching table-top modem on request

5.4

AMBUS® Data

The AMBUS® Data system software records and collates your consumption data. Your billing or visualisation system can access the consumption data directly via standardised Windows interfaces.



- Individual meter drivers allow optimal utilisation of each meter. Even meters that you install in the future can be integrated in the same way.
- You need not worry about any technical details: Aquametro will support you during planning, commissioning and maintenance of the system.
- It is therefore child's play to integrate meter data into your individual billing, visualisation or management/control system.

5.5

AMSTACK BIT

- Remote display of meter readings
- Input for Reed pulser
- Easy-to-read 8-digit LCD display with 8 mm high numerals
- Independent of mains supply thanks to an 8-year lithium battery; data are retained when the battery is changed.
- Ambient temperature: -20...+60°C
- Protection class: IP54

5.6

AMBILL® FAN

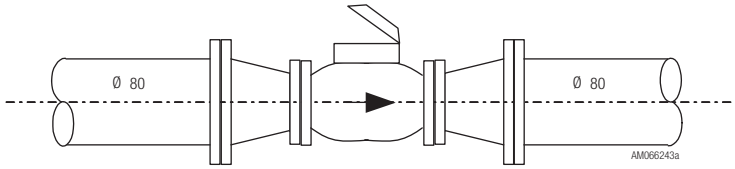
- Remote display of error status, meter reading, identification number and pulse value
- Adjustable parameters: pulse value, meter reading, unit of measurement, number of places after the decimal point
- Data reading or parameterisation via hand-held terminal or PC via ZVEI interface
- Easy-to-read 8-digit LCD display with 8 mm high numerals
- 230 VAC mains supply
- Data are secured by EEPROM if there is a power cut
- Ambient temperature: -20...+60°C
- Protection class: IP54

6. Installation notes

6.1

Nominal sizes: pipes, meters and pipe reducer

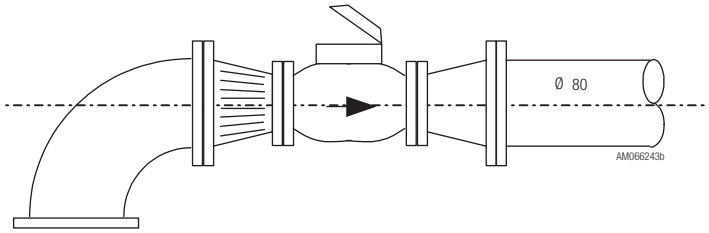
The choice of the nominal meter size should not automatically be based on the nominal size of the pipe. The decisive factor is the highest flowrate that occurs continuously in the pipe - this determines the nominal flowrate Qn of the meter. If the nominal flowrate in an 80 mm pipe is 25 m^3/h, it is preferable to install a WPDH 65 with pipe reducers upstream and downstream of the meter, rather than a WPDH 80.



6.2

Pipe bends and flow straighteners

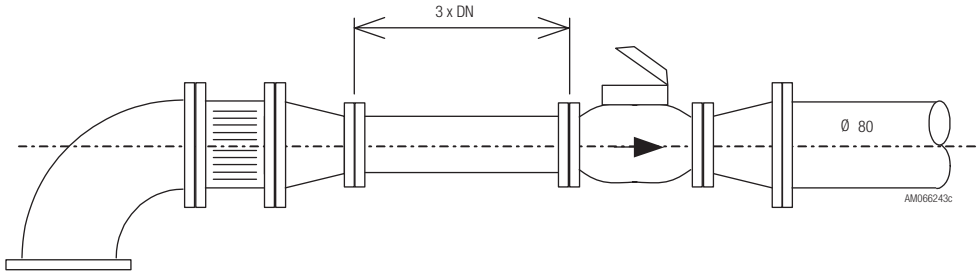
90° or (more rarely) 45° pipe bends are often encountered in installations. The flow (velocity) profile is greatly modified by the pipe bend to such an extent that the requirement for the meter turbine to receive uniform incoming flow is no longer met if the bend is located immediately downstream of the meter. As a result, measuring accuracy is impaired which can be prevented by suitable constructural precautions. For these purposes, flow straighteners which regularisze the profile can be used, these being installed directly downstream of the pipe bend. If there is enough space, additional "smoothing" sections should be added (see 6.3). Flow straighteners also exist in combination with pipe reducers (see drawing).



6.3

Inlet and outlet sections

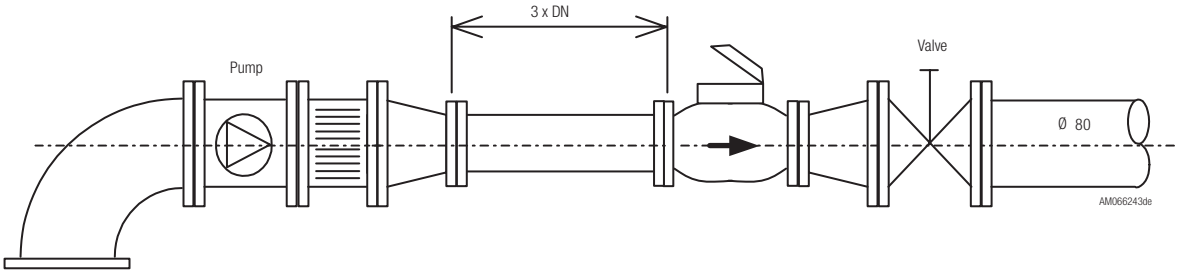
Woltman meters attain maximum accuracy if adequate inlet and outlet sections are included in the design of the measuring point. The inlet section should be at least 3 x DN. The requirements for the outlet section are less strict since the only essential requirement is to avoid abrupt changes of cross-section directly after the meter.



6.4

Pumps and shut-off devices

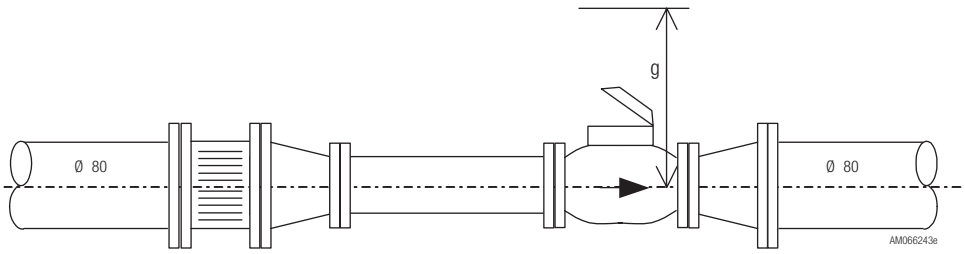
The meter should always be installed on the pressure side of the pump. If shut-off devices are fitted into the installation, they should always be downstream of the meter, especially if the pipe could run empty.



6.5

Exchangeable velocity measuring units

The RUBY Woltman meters have exchangeable velocity measuring units which can be tested and calibrated independently of the housing. For this purpose, the old units are removed upwards. When designing the installation, it is important to ensure that there is adequate space for removal above the meter (indicated as dimension 'g' in the Technical Data).



6.6

Installation position / vertical pipes

Note: with vertical pipes, you must always use a RUBY Woltman meter of type WPDH (but if a WSDH or an SMQ has to be fitted for reasons specific to the installation, we would remind you that the metrological approval requirements will not be satisfied with the meter installed in this position).

Meters must not be installed upside-down, i.e. with the register unit pointing downwards. The metrological approval requirements will not be satisfied with the meter installed in this position either.

6.7

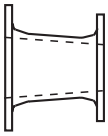
Electrical installations

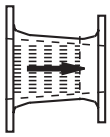
Electrical cables and installations are subject to legal regulations which must be followed when the installation is being planned. The installations must be carried out by a specialist in accordance with legal requirements.

6.8

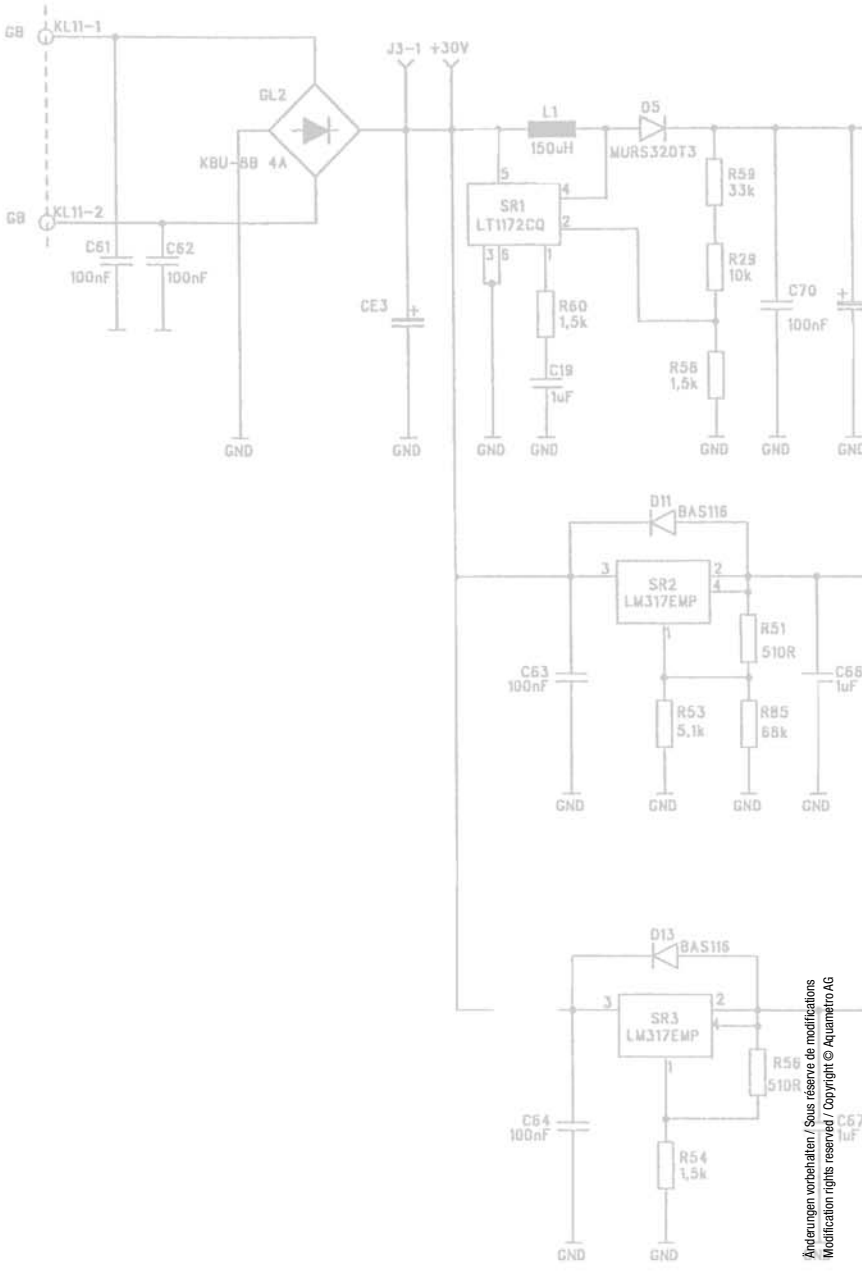
Ordering information for hydraulic accessories

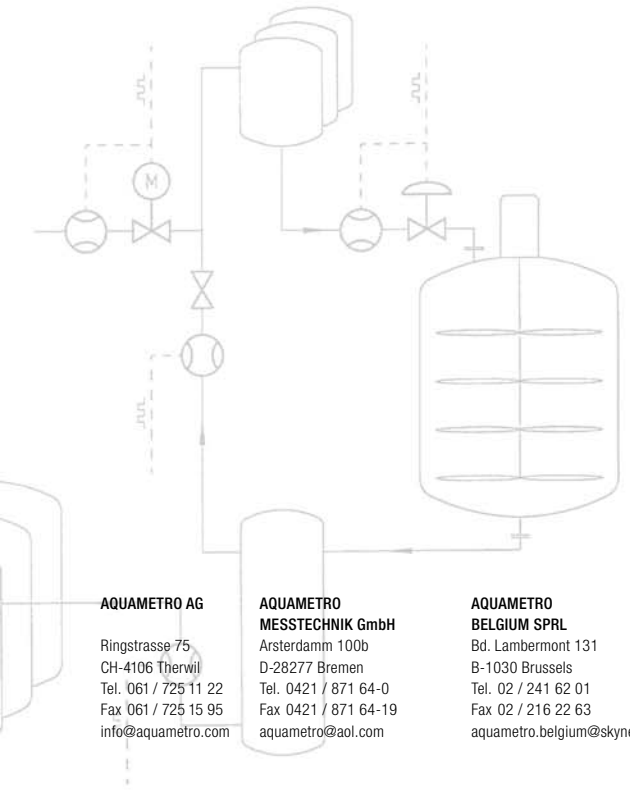
Flow straightener PN 16	Type designation	Version	Ordering number
	SR 50 PN 16 4-hole		91210
	SR 65 PN 16 4-hole		91211
	SR 80 PN 16 8-hole		91220
	SR 100 PN 16 8-hole		91213
	SR 125 PN 16 8-hole		91214
	SR 150 PN 16 8-hole		91215
	SR 200 PN 16 12-hole		91221
	SR 250 PN 16 12-hole		91222
	SR 300 PN 16 12-hole		91223

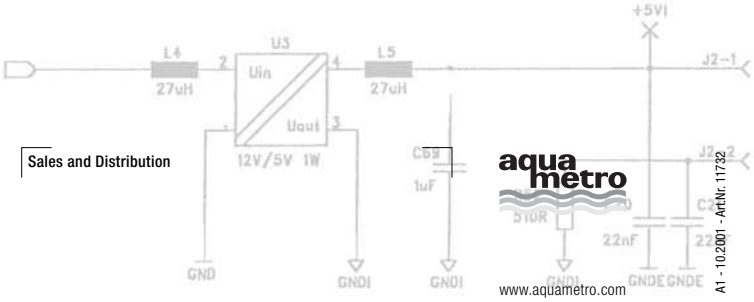
Pipe reducer PN 16	Type designation	Version	Ordering number
	KW 65/50x150	PN 10/16 4/4-hole	82102
	KW 80/50x200	PN 10/16 8/4-hole	82122
	KW 80/65x200	PN 10/16 8/4-hole	82123
	KW 100/65x200	PN 10/16 8/4-hole	82106
	KW 100/80x200	PN 10/16 8/8-hole	82109
	KW 125/80x200	PN 10/16 8/4-hole	82124
	KW 125/100x200	PN 10/16 8/8-hole	82112
	KW 150/100x200	PN 10/16 8/8-hole	82129
	KW 150/125x200	PN 10/16 8/8-hole	82130
	KW 200/150x300	PN 10/16 12/8-hole	82118
	KW 250/200x300	PN 10/16 12/12-hole	82121

Flow straightener with pipe reducer PN 16	Type designation	Version	Ordering number
	KW-SR 65/50x150	PN 10/16 4/4-hole	82150
	KW-SR 80/50x200	PN 10/16 8/4-hole	82167
	KW-SR 80/65x200	PN 10/16 8/4-hole	82168
	KW-SR 100/50x200	PN 10/16 8/4-hole	82152
	KW-SR 100/65x200	PN 10/16 8/4-hole	82154
	KW-SR 100/80x200	PN 10/16 8/8-hole	82156
	KW-SR 125/80x200	PN 10/16 8/8-hole	82169
	KW-SR 125/100x200	PN 10/16 8/8-hole	82159
	KW-SR 150/100x200	PN 10/16 8/8-hole	82173
	KW-SR 150/125x200	PN 10/16 8/8-hole	82174

Blanking cover	Type designation	Version	Ordering number
	BLD WPD.. 50-65		82056
	BLD WPD.. 80-125		82057
	BLD WPD.. 150		82058
	BLD WPD.. 200-300		180965
	BLD WSD.. 50-80		82053
	BLD WSD.. 100		82054
	BLD WSD.. 150		82055







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