



Instruction Manual

DR04

***Paddle wheel flowmeter, switch and monitor
also for high pressure***



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Safety Information

General Instructions

To ensure safe operation, the device should only be operated according to the specifications in the instruction manual. The requisite Health & Safety regulations for a given application must also be observed. This statement also applies to the use of accessories. Every person who is commissioned with the initiation or operation of this device must have read and understood the operating instructions and in particular the safety instructions!

The liability of the manufacturer expires in the event of damage due to improper use, non-observance of this operating manual, use of insufficiently qualified personnel and unauthorized modification of the device.

Proper Usage

The float-type flow meters DR04 are designed to monitor continuous flow rates of liquids or gases which do not attack the device materials. All other usage is regarded as being improper and outside the scope of the device.

In particular, applications in which shock loads occur (for example, pulsed operation) should be discussed and checked in advance with our technical staff.

The series DR04 flow meter devices should not be deployed as the sole agents to prevent dangerous conditions occurring in plant or machinery. Machinery and plant need to be designed in such a manner that faulty conditions and malfunctions do not arise that could pose a safety risk for operators.

Dangerous substances

For dangerous media such as e.g. Oxygen, Acetylene, flammable or toxic substances as well as refrigeration systems, compressors, etc. must comply with the relevant regulations beyond the general rules.

Qualified Personnel

The DR04 devices may only be installed by trained, qualified personnel who are able to mount the devices correctly. Qualified personnel are persons, who are familiar with assembling, installation, placing in service and operating these devices and who are suitably trained and qualified.

Inward Monitoring

Please check directly after delivery the device for any transport damages and deficiencies. Additional with reference to the accompanying delivery note the number of parts must be checked.

Claims for replacement or goods which relate to transport damage can only be considered valid if the delivery company is notified without delay.

Measuring Principle

The sensor consists of an impeller which is rotated by the flowing medium. The rotation is proportional to the flow rate per time. The rotational speed is measured by different sensor systems due to the different materials of the housing.

With some sensors, an LED indicator is integrated in the sensor, which signals that the rotor is rotating inside, especially when the sensor starts flashing.

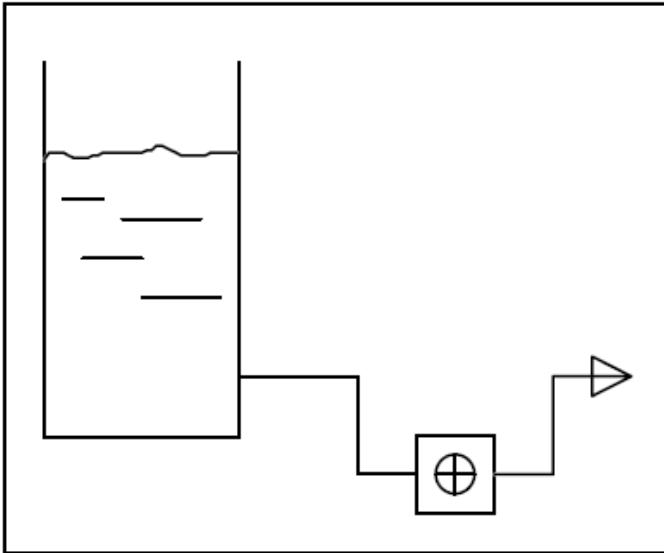
Combinability with electronic evaluation is possible with all converters that accept a frequency signal as an input signal. (see frequency range of the different ranges). For these sensors PKP offers local electronics of the type series DR04.M for display and signal processing directly on the sensor, or as control cabinet version.

General notes on installation

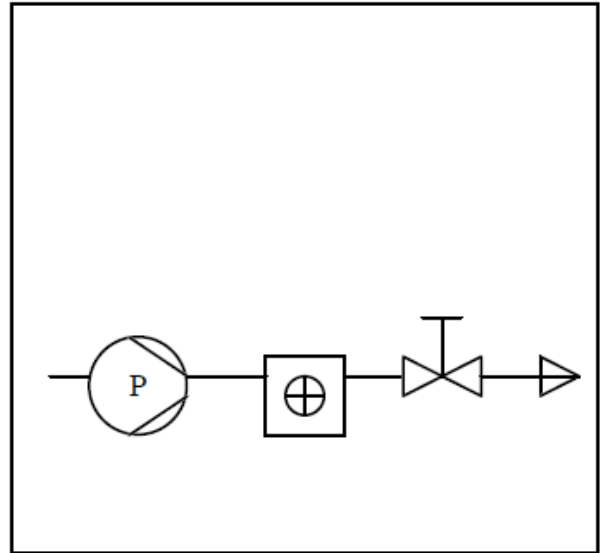
The sensors are inserted into the pipeline by means of rotatable adapter pieces. If the adapters are separated from the body, make sure that they are clean before reinserting the adapter and the receptacle (briefly pass your finger through the receptacle hole of the housing). The adapters should be inserted carefully (preferably turning) into the housing to avoid damaging the O-ring. An inlet section or an outlet section is not required for these flow sensors. However, it must be ensured that the flow sensors are always filled and remain filled with medium. Any mounting position is possible, but the best possible venting position should be selected (flow from left to right or from bottom to top).

Attention: Air bubbles have a strong influence on the measurement results!

Installation:

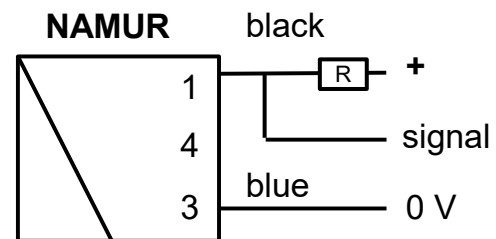
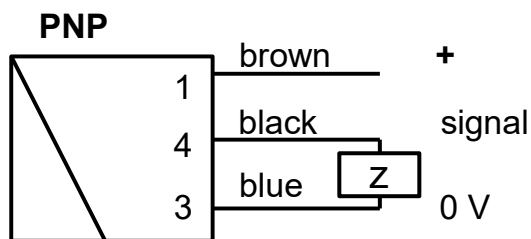


Rotor always covered with process liquid

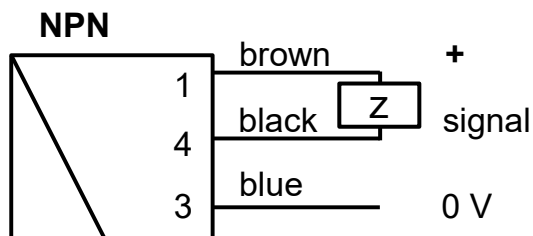


Rotor before valve

Pin assignment

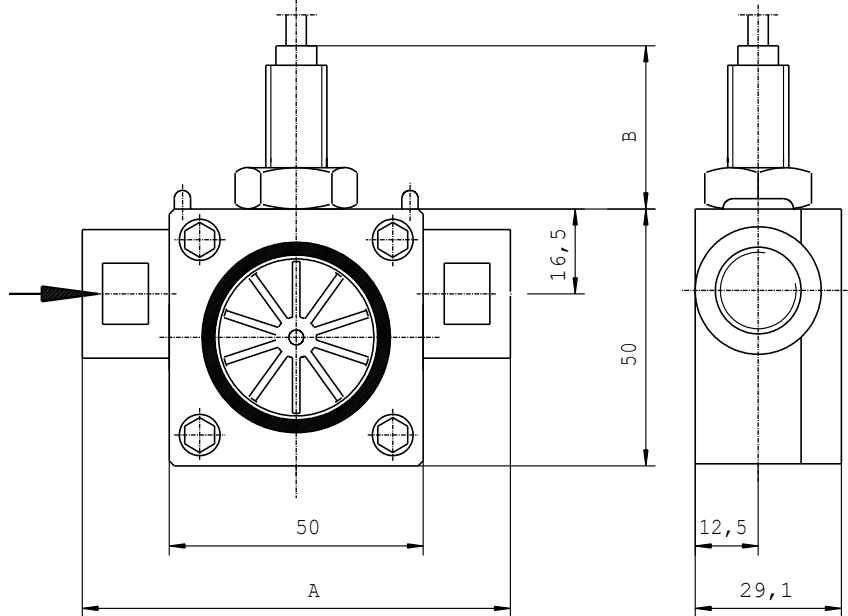


R = 1k for 5-15 VDC
R = 2k2 for 12-24 VDC



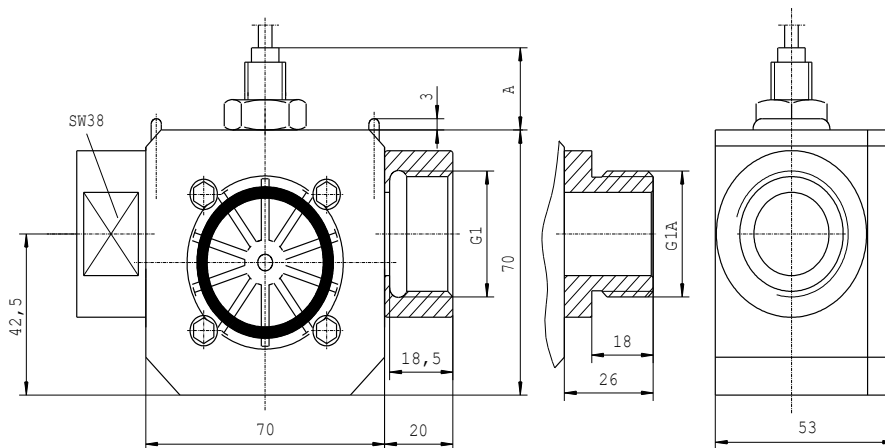
Dimensions

DR04.x.1... (50 x 50 mm), sensor with cable connector



DR04.x.1... Sensor Electr. connection Output A B Process connect.	Sensors							Adapters				
	inductive cable			plug	optical cable		plug	Hall cable	plug	nipple	inside	outside
	PNP	NPN	NAMUR	PNP	NPN							
										96,2	84,2	84,2
	19		30	41		64	60	33	60	10,4	G 3/8	G 3/8
										25	SW 22	SW 22

DR04.x.2... (70 x 70 mm), sensor with cable connector



DR04.x.2... Sensor Electrical connection Output A	Sensors								
	inductive cable			plug	optical cable		plug	Hall cable	plug
	NPN	PNP	NAMUR	NPN	PNP				
	33		24	36		58	54	28	54

Technical data

DR04.1... (with inductive sensor)

Power supply	5-30 V DC
Quiescent current input	10 mA
Output current max.	200 mA
Temperature max.	60 °C
Pressure max.	16 bar
Output circuit	NPN, PNP, NAMUR
Short-circuit proof	no
Reverse polarity protected	no
Connection sensor	cable outlet 2 m or plug outlet (accessory: plug with 2 m cable)
Protection class sensor	IP 67 (IP 65 with plug)
Material	
media contact:	POM or PVC housing, ceramic axis, Iglidur bearing PVDF rotor with st. steel clamps (V2A)
untouched by media	PVC cable, PVC PG cable bushing

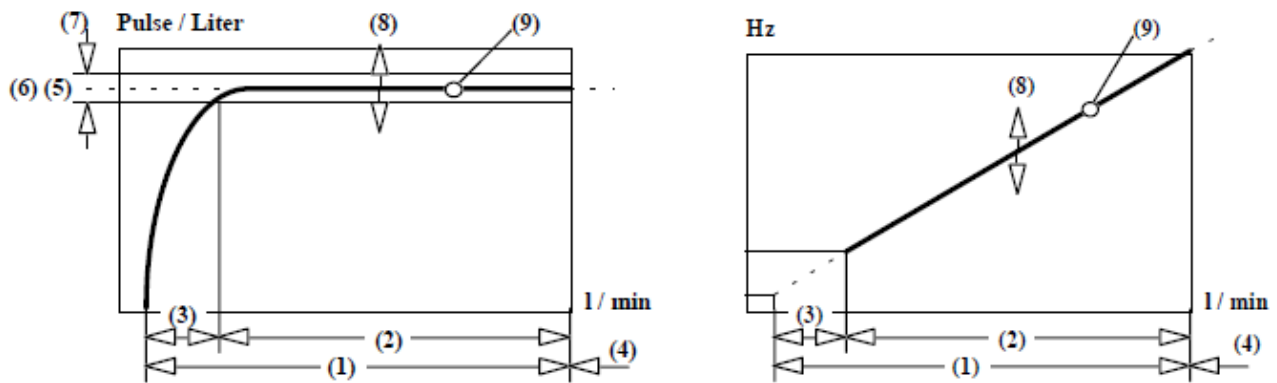
DR04.2... (with preloaded Hall Sensor)

Power supply	24 V DC \pm 10 %
Quiescent current input	30 mA
Output current max.	100 mA
Temperature max.	60 °C
Pressure max.	16 bar
Output circuit	NPN, PNP, NPN OC
Short-circuit proof	yes
Reverse polarity protected	yes
Connection sensor	cable outlet 2 m or plug outlet (accessory: plug with 2 m cable)
Protection class sensor	IP 67 (IP 65 with plug)
Material	
media contact	PVDF housing, ceramic axis, Iglidur bearing, PVDF rotor
untouched by media	PVC cable, PVC PG cable bushing

DR04.3/4... (with preloaded Hall Sensor)

Power supply	24 V DC \pm 10 %
Quiescent current input	30 mA
Output current max.	100 mA
Temperature max.	100 °C
Pressure max.	100 bar
Output circuit	NPN, PNP, NPN OC
Short-circuit proof	yes
Reverse polarity protected	yes
Connection sensor	cable outlet 2 m or plug outlet with plug and 2 m cable
Protection class sensor	IP 67 (IP 65 with plug)
Material	
media contact	brass- or 1.4305 st. steel housing, ceramic axis, Iglidur bearing, PVDF rotor with st. steel clamps 1.4310
untouched by media	PVC cable, PVC PG cable bushing

Measurement curves and tables



- (1) Complete measuring range
- (2) Specific measuring range
- (3) Start-up range
- (4) Extended operating range, increased wear, $D_p > 0,5$ bar
- (5) Pulses / litre (details on label)
- (6) Average pulses / litre
- (7) Tolerance $\pm 3\%$ of the measured value
- (8) Scatter $\pm 10\%$ of the pulses / litre value (5) in the batch
- (9) Reproducibility ($\pm 1\%$ of the full scale value) is the repeat accuracy of a frequency, relative to l/min
- (10) Max. frequency, related to the relevant measuring range up to approx. 0,5 bar pressure drop across the flow meter

TYPE	(1) l/min	(2) l/min	(3) l/min	(4)	(6) P/l	(7)	(8)	(9)	(10) Hz
DR04.1.1.x.1	0,1 -1,5	0,5 -1,5	0,1 -0,5	20%>max(1)	10.200	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	255
DR04.1.1.x.2	0,2 -10	2 -10	0,2 -2	20%>max(1)	3.345	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	580
DR04.1.1.x.3	0,4 -12	2 -12	0,4 -2	20%>max(1)	1.755	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	412

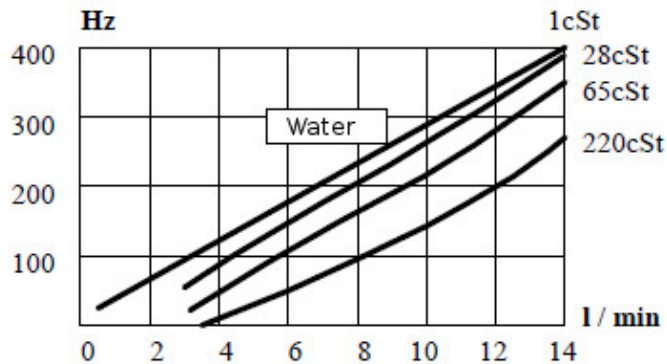
DR04.3(4).1.x.1	0,2-1,5	0,5 -1,5	0,1 -0,5	20%>max(1)	4.955	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	136
DR04.3(4).1.x.2	0,3-10	2 -10	0,2 -2	20%>max(1)	1.632	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	272
DR04.3(4).1.x.3	0,5-12	2 -12	0,4 -2	20%>max(1)	860	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	200

DR04.2.1.x.1	0,1-1,5	0,5 -1,5	0,1 -0,5	20%>max(1)	11.720	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	294
DR04.2.1.x.2	0,2-10	2 -10	0,2 -2	20%>max(1)	2.960	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	502
DR04.2.1.x.3	0,4-12	2 -12	0,4 -2	20%>max(1)	1.703	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	390

DR04.1.2.x.1	2 - 30	3 - 30	2 - 3	20%>max(1)	1216	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	620
DR04.1.2.x.2	3 - 60	5 - 60	3 - 5	20%>max(1)	607	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	617
DR04.1.2.x.3	4 - 100	6 - 100	4 - 6	20%>max(1)	252	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	420

DR04.3(4).2.x.1	2 - 30	3 - 30	2 - 3	20%>max(1)	544	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	281
DR04.3(4).2.x.2	3 - 60	5 - 60	3 - 5	20%>max(1)	295	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	298
DR04.3(4).2.x.3	4 - 100	6 - 100	4 - 6	20%>max(1)	126	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	212

DR04.2.2.x.1	2 - 30	3 - 30	2 - 3	20%>max(1)	1.090	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	590
DR04.2.2.x.2	3 - 60	5 - 60	3 - 5	20%>max(1)	588	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	597
DR04.2.2.x.3	4 - 100	6 - 100	4 - 6	20%>max(1)	265	$\pm 3\%$	$\pm 10\%$	$\pm 1\%EW$	444



Viscosity behaviour exemplary on DR04.x.1.3

Transmitter M5-M7

M5 frequency converter

The converter can be screwed into all PKP rotor and turbine flow meters which have an M12x1 screw-in thread for the sensor. With the aid of the integrated sensor, it receives a frequency signal proportional to the flow rate and converts this into the output frequency. A yellow LED indicates the switching state of the output, i.e. it flashes in the rhythm of the output frequency.

Programming

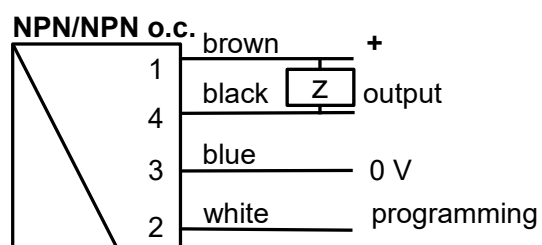
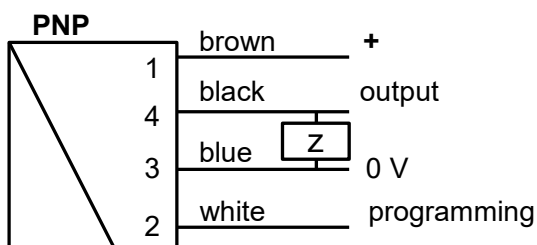
- Set maximum frequency (= maximum flow rate) in the system
- Apply a pulse of at least 0.5 s duration to pin 2 or white wire (with cable version) (e.g. by jumper to supply voltage or pulse from PLC)

Immediately after programming, the sensor shows its maximum frequency at the output. This must be specified when ordering.

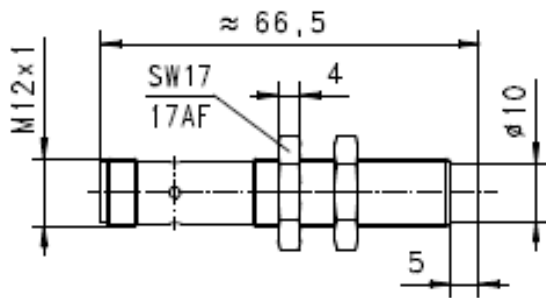
After programming has been completed, pin 2 (or white wire) must either remain unconnected or be connected to 0 V.

Pin assignment:

Please make sure that the supply voltage corresponds to the data before installing the electronics.



Dimensions



Technical data

Power supply	10...30 VDC
Current consumption	< 20 mA (without load)
Output	NPN or PNP
Output current	Max. 200 mA
Input frequency	4...10000 Hz
Output frequency	10...2000 Hz
Electrical connection	For round plug connector M12x1 – 4 pin, assignment according to DESINA
Housing material	brass nickel-plated, PA66
Protection class	IP 67
Operating temperature	0...70 °C
Weights	ca. 25 g

M6 limit value transmitter

The converter can be screwed into all PKP rotor and turbine flow meters which have an M12x1 screw-in thread for the sensor. With the aid of the integrated sensor, it receives a frequency signal proportional to the flow rate and evaluates it. If the value falls below the set limit value, an alarm signal is output and the yellow LED in the plug connection goes out.

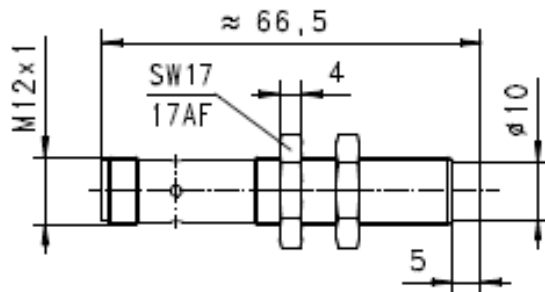
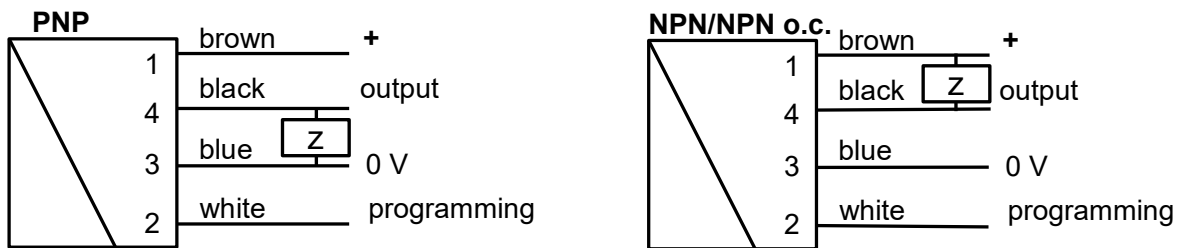
Programming

- Set setpoint frequency (= setpoint flow rate) in the system
- Apply a pulse of at least 0.5 s duration to pin 2 or white wire (with cable version) (e.g. by bridge to supply voltage or pulse from PLC).

Immediately after programming, the sensor switches to alarm status. The alarm is cancelled as soon as the flow rate has been increased to such an extent that the switching value plus 12 Hz (= hysteresis) is reached.

After programming has been completed, pin 2 (or white wire) must either remain unconnected or be connected to 0 V.

Pin assignment and Dimensions



Technical data

Power supply	10...30 VDC
Current consumption	< 20 mA (without load)
Output	NPN or PNP
Output current	Max. 200 mA
Frequency range	4...10000 Hz
Electrical connection	For round plug connector M12x1 – 4 pin, assignment according to DESINA
Housing material	brass nickel-plated, PA66
Protection class	IP 67
Operating temperature	0...70 °C
Weights	ca. 25 g

M7 frequency- / analogue converter

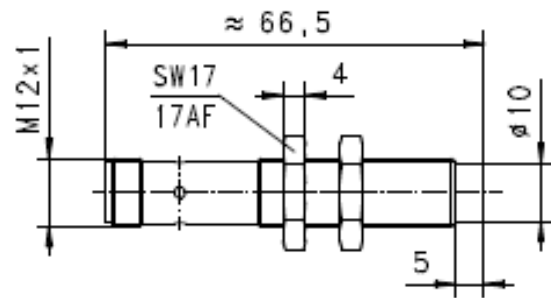
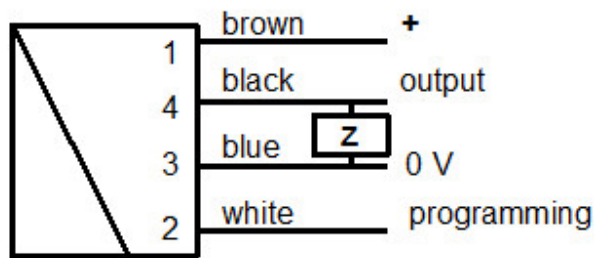
The converter can be screwed into all PKP rotor and turbine flow meters which have an M12x1 screw-in thread for the sensor. With the aid of the integrated sensor, it receives a flow-proportional frequency signal and converts it into an analogue 0 (4)...20 mA current signal.

Programming

- Set maximum frequency (=maximum flow rate) in the system)
- Apply a pulse of at least 0.5 s duration to pin 2 or white wire (with cable version) (e.g. by bridge to supply voltage or pulse from PLC).
-

After programming, pin 2 (or white wire) must be connected to 0 V.

Pin assignment and Dimensions



Technical data

Power supply	10...30 VDC
Current consumption	< 20 mA (without load)
Current output	0...20 mA or 4...20 mA
Frequency range	1...4095 Hz
Electrical connection	For round plug connector M12x1 – 4 pin
Housing material	brass nickel-plated, PA66
Protection class	IP 67
Operating temperature	0...70 °C
Weights	ca. 25 g

DR04

Paddle Wheel Flowmeter, switch and monitor also for high pressure

- for liquids
- robust and compact flow sensor
- large material variety
- position-independent
- measuring range ratios up to 40:1
- no inlet and outlet sections required
- measuring ranges: 0,5...1,5 l/min up to 6...100 l/min
- high process pressures up to 100 bar
- max. temperature 100 °C



Description:

The impeller flowmeters of the DR04 series consist of a sensor and an optional transmitter. The sensor has an impeller which is mounted in a housing made of PPS, PVDF, MS or stainless steel and is rotated by the flowing medium. Depending on the material version, this rotary motion is measured inductively or by a Hall sensor system and output as a flow-proportional frequency signal. A transmitter integrated in the housing with various output signals is optionally available for evaluating the signal.

Typical Applications:

The DR04 impeller flowmeters are a versatile measuring and monitoring system for all low-viscosity liquids, which do not attack the materials used, due to their design. The metal version allows high process pressures up to 100 bar, therefore the instruments can also be used under difficult process conditions.

Models:

DR04.1: PPS housing, inductive tap (10 st. st. clamps)
 DR04.2: PVDF housing, inductive tap (10 st. st. clamps)
 DR04.3: brass housing, hall sensor (5 magnets)
 DR04.4: st. steel housing, hall sensor (5 magnets)

Technical Data:

Max. pressure: DR04.1/2: 16 bar
 DR04.3/4: 100 bar

Max. temperature: DR04.1/2: 60 °C
 DR04.3/4: 100 °C

Accuracy: ± 3 % of measured value

Process connection:

	housing size 50 x 50 mm	housing size 70 x 70 mm
pipe size 3/8"	G 3/8 female G 3/8 male hose nozzle (Ø 11 mm)	
pipe size 1"		G 1 female G 1 male hose nozzle (Ø 30 mm)

Materials:

	DR04.1	DR04.2	DR04.3	DR04.4
Housing	PPS	PVDF	brass, nickel plated	st. steel 1.4305
Cover	PSU transparent	PVDF	brass (optional Makrolon)	1.4305 (optional Makrolon)
Connection	PVDF (optional brass, st. steel)	PVDF (optional brass, st. steel)	brass (optional flange)	1.4305 (optional flange)
Rotor	PVDF with 1.4310 st. steel clamps (titan on request)	PVDF with 1.4310 st. steel clamps (titan on request)	PVDF with 5 magnets	PVDF with 5 magnets
Axle	ceramic	ceramic	ceramic	ceramic
Bearing	Iglidur x (optional ceramic)	Iglidur x (optional ceramic)	Iglidur x (optional ceramic)	Iglidur x (optional ceramic)
Magnets	---	---	5xSm2Co5 (bonded with epoxy resin)	5xSm2Co5 (bonded with epoxy resin)
O-Ring	FKM (optional EPDM / NBR)	FKM (optional EPDM / NBR)	FKM (optional EPDM / NBR)	FKM (optional EPDM / NBR)

Measuring Range / Impulses:

Code	Measuring range [l/min] H ₂ O	Impulses/l DR04.1/2	Impulses/l DR04.3/4	Pipe size
1.	0,5...1,5	10200	4955	3/8"
2.	2...10	3345	1632	3/8"
3.	2...12	1755	860	3/8"
4.	3...30	1216	544	1"
5.	5...60	607	295	1"
6.	6...100	252	126	1"

Electrical Data:

Power supply: 10–30 VDC
 NAMUR: 7...12 VDC

Current input: DR04.1/2: 10 mA,
 NAMUR: max. 7 mA
 DR04.3/4: 30 mA

Output current max.: DR04.1/2: 200 mA,
 NAMUR: max. 7 mA
 DR04.3/4: 100 mA

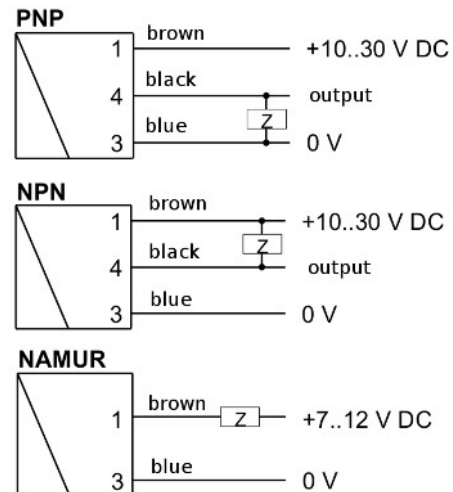
Output signal: square wave signal

Output: DR04.1/2: PNP, NPN, or NAMUR
 DR04.3/4 Push-Pull

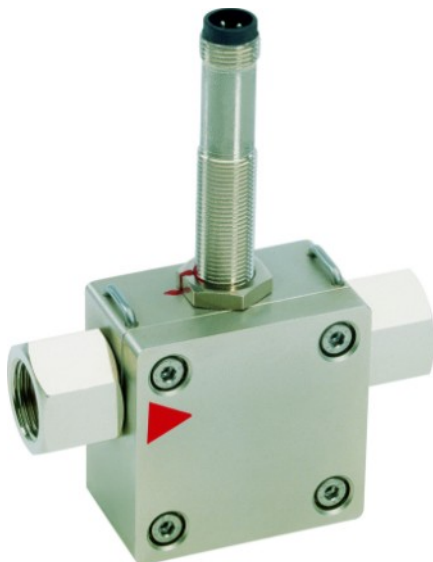
Connection: 2 m cable or M12x1, 4-pin

Protection class: IP67

Electrical Connection:



**Flow meter with transmitter
(integrated in connection housing):**



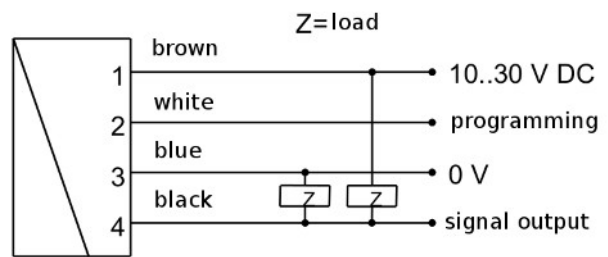
Measuring Range:

Code	Measuring range [l/min] water	Qmax [l/min] water	Pipe size
1M.	0,1...1,5	1,8	3/8"
2M.	0,2...10	12,0	3/8"
3M.	0,4...12	14,4	3/8"
4M.	2...30	36	1"
5M.	3...60	72	1"
6M.	4...100	120	1"

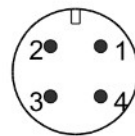
Technical Data:

- Power supply:** 10..30 V DC
with voltage output. 10 V: 15..30 VDC
- Power consumption:** < 1 W (with unloaded outputs)
- Source data:** all outputs are short-circuit proof and reverse polarity protected
- MI current output:** 4...20 mA
- MU voltage output:** 0..10 V current output max. 20 mA
- MF frequency output:** transistor output "Push-Pull"
I_{out} = 100 mA max. output frequency depending on measuring range, standard 500 Imp/l (corresponds to 666,7 Hz at 80 l/min) small quantity range: 5000 Imp/l (corresponds to 500 Hz at 6 l/min) (other frequencies on request)
- MZ counting pulse:** transistor output "Push-Pull"
I_{out} = 100 mA max.
pulse width 50 ms
pulse/quantity is to be indicated with the order
- MS switching output:** transistor output „Push-Pull“
I_{out} = 100 mA max.
- Electr. connection:** for round plug M12x1, 4-pole.
- Display:** yellow LED shows
MI / MU: operating voltage
MF / MZ: initial state
MS: ON = normal / OFF = alarm
(fast flashing = programming)
- Protection class:** IP67

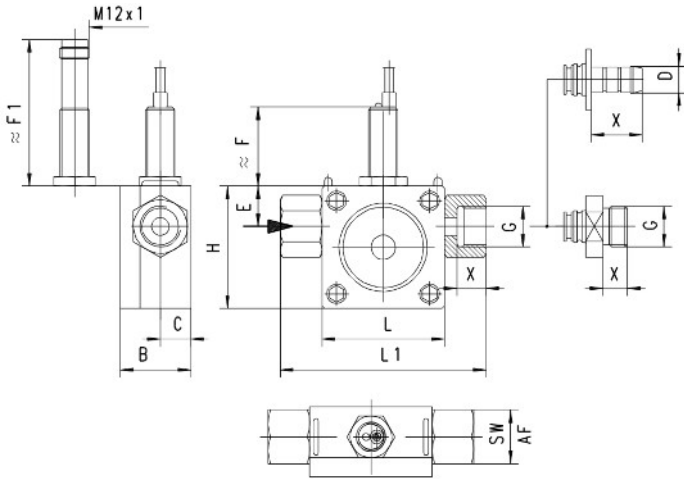
Connection Diagram:



connection example: PNP NPN



Dimensions:



Con- nection	H/L	L1	B	C	E	F*	F1	X	SW
G 3/8 f	50	84	29	12,5	16,5	33	60	12	22
G 3/8 m								14	
G 1 f	70	110	53	23	27,5	28	55	18	38
G 1 m		122							
Hose nozzle plastic housing:									
Ø 11	50	96	11	12,5	16,5	32	60	21	--
Ø 30	70	176	30	23	27,5	27	55	45	--
Hose nozzle metal housing:									
Ø 11	50	96	29	12,5	16,5	33	60	21	--
Ø 30	70	176	53	23	27,5	28	55	45	--

All dimensions in mm

*with integrated transmitter dimension for F:

3/4" or hose nozzle Ø 11 mm: **56 mm**

1" or hose nozzle Ø 30 mm: **51 mm**

Accessory:



Order code: **SM12. 4. 2. G. 0**

M12-plug with PVC cable

Number of pins:

4 = 4-pin

Cable length:

0 = without cable for self assembly
 2 = 2 m PVC cable (standard)
 5 = 5 m PVC cable
 10 = 10 m PVC cable

Version:

G = straight
 W = angled

Options:

0 = without
 9 = please specify in plain text

Order Code:

Order number: **DR04. 1. 2. 1. 4. 1. 1. 0**

Paddle wheel flowmeter, switch and monitor also for high pressure

Models:

- 1 = with PPS housing, inductive tap (10 stainless steel clamps)
- 2 = with PVDF housing, inductive tap (10 stainless steel clamps)
- 3 = with brass housing (nickel plated), hall sensor
- 4 = with st. steel housing, hall sensor

Housing- / pipe sizes

- 1 = 50 x 50 mm, for 3/8" pipe size
- 2 = 70 x 70 mm, for 1" pipe size

Process connection:

- 1 = female thread G (standard)
- 2 = male thread G
- 3 = hose nozzle
- 9 = special connection, please specify in plain text

Measuring range (valid for water):

DR04.x.1 (3/8" connection) only:

- 1 = 0,5...1,5 l/min
- 2 = 2...10 l/min
- 3 = 2...12 l/min

DR04.x.2 (1" connection) only:

- 4 = 3...30 l/min
- 5 = 5...60 l/min
- 6 = 6...100 l/min

for devices with integrated transmitter:

DR04.x.1 (3/8" connection) only:

- 1M = 0,1...1,5 l/min
- 2M = 0,2...10 l/min
- 3M = 0,4...12 l/min

DR04.x.2 (1" connection) only:

- 4M = 2...30 l/min
- 5M = 3...60 l/min
- 6M = 4...100 l/min

Electrical connection:

- 1 = 2 m cable (standard for devices without transmitter)
- 2 = plug connection M12 x 1, 4-pin, without mating connector (standard for devices with transmitter)

Output:

- 1 = PNP (standard)
- 2 = NPN

Output with transmitter

- MI = 4...20 mA
- MU = 0...10 V
- MF* = frequency output 2000 Hz (factory-set adjustable on request)
- MZ* = counting pulse (factory-set adjustable)
- MS = switching output (Push-Pull)

Options:

- 0 = without
- 9 = please specify in plain text

*For frequency output and counting pulse please specify desired data.