(logo here) **PTB**

Physikalisch-Technische Bundesanstalt
National Institute of Metrology

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EU-Baumusterprüfbescheinigung

EU type-examination certificate

Ausgestellt für *Issued to*	Diehl Metering GmbH Industriestrasse 13 91522 Ansbach
gemäß *in accordance with*	Anhang II Modul B der Richtlinie 2014/32/EU des europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung von Messgeräten auf dem Markt. *Annex II Module B of the Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments.*
Geräteart *Type of instrument*	Wasserzähler *Water meter*
Typbezeichnung *Type designation*	HYDRUS Type 173
Nr. der Bescheinigung *Certificate no.*	DE-19-MI001-PTB012, Amendment 4
Gültig bis *Valid until*	1 January 2030
Anzahl der Seiten *Number of pages*	15
Geschäftszeichen *Reference no.*	PTB-1.5-4113871
Notifizierte Stelle *Notified body*	0102

Zertifizierung *Certification*	Brunswick, 9 February 2023	Bewertung *Evaluation*
Im Auftrag *On behalf of PTB*	Siegel *Seal*	Im Auftrag *On behalf of PTB*
Dr Tobias Nickschick *(signature here)*	*(stamp of PTB here)*	*Silke Hansen* *(signature here)*

R3-072097

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Date 4.III.2023

Gareth Bartley
Für die Gerichte des Saarlandes und die saarländischen Notare allgemein vereidigter Übersetzer und Dolmetscher für Englisch
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Certificate history

Certificate issue	Date	Amendments
DE-19-MI001-PTB012	2 January 2020	Initial document
DE-19-MI001-PTB012, Amendment 1	25 August 2021	Extended to DIN 50 with installation lengths 270 mm and 300 mm Extended to DIN 15 and DIN 20 with installation length 115 mm and threaded connections G7/8B-G3/4B and G3/4B Enhancement of software versions 002.000.001 and 002.000.002 Simplified presentation of rated operating conditions Illustrations updated Re-edited
DE-19-MI001-PTB012, Amendment 2	16 December 2021	Extended to include housing DN25 with installation length 175 mm Extended to include plastic housing DN15 with installation length 110 mm
DE-19-MI001-PTB012, Amendment 3	9 March 2022	Extended to include software version 002.000.003
DE-19-MI001-PTB012, Amendment 4	9 February 2023	Extended to include housing DN20 with installation length 105 mm Extended to include plastic housing DN15 with installation lengths 115 mm / 165 mm / 170 mm and DN20 with installation length 190 mm

This amendment no. 4 supersedes amendment no. 3 of certificate no. DE-19-MI001-PTB012 of 9 March 2022, ref. no. PTB-1.5-4079880.

Results of review

The following essential requirements of Directive **2014/32/EU** of the European Parliament and of the Council dated 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available of measuring instruments on the market (Official Journal L 96 p. 149) in the currently applicable amendment:

– Annex I 'Essential requirements'
– Annex III (MI-001) 'Water meters'

in conjunction with Section 6 of the German law on measurement and calibration (MessEG) of 25 July 2013 (BGBl. I S. 2722) and Section 8 of the German ordinance on measurement and calibration (MessEV) of 11 December 2014 (BgBl. I S. 2010) in the currently applicable amendment.

The technical design of the measuring instrument described below complies with the essential requirements referred to above. This certificate authorises its owner to affix the number of this certificate to the instruments manufactured in accordance therewith.

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The instruments must comply with the following provisions:

1 Description of design

HYDRUS Type 173 ultrasonic water meter
Water meter for cold water T30 / warm water T50, T70 and T90

(illustration here)

HYDRUS Type 173

1.1 Construction

Electronic HYDRUS Type 173 water meters are electronic, static water meters which work according to the ultrasonic differential transit time method. The measurement path is marked by two sensors which are installed in the housing. The signals from the sensors are converted into volume in the electronic counting mechanism and expressed in m^3 with the appropriate algebraic sign on a 9-digit LCD display.

Apart from expression of the volume, additional extra-metrological measurement data can be measured, displayed and saved together with other data in the log file.

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Design in accordance with the following drawings and material list:

P173004, P173005, P173006, P173008, P1730010, P1730014,
P173025, P173026, P173043, P173044, P173045

Material list P173003, P173046

The HYDRUS Type 173 water meter exists in the nominal widths DIN 15 / 20 / 25 / 32 / 40 / 50 and in various different installation lengths with the following nominal sizes Q_3 in PN10 and PN16.

Q_3 in m^3/h	DN	Min housing length in mm	Max housing length in mm	Housing connections
1.6	15	110	170	G3/4B, 0.75" BSP
	20	130	190	G1B
2.5	15	110	170	G3/4B, 0.75" BSP, G7/8B
	20	130	190	G1B
		105	115	
4.0	20	105	220	G1B, G5/4B 1.28" BSW (installation length 154 mm only) 1.44" BSW BJ (installation length 154 mm only)
6.3	25	135	260	G5/4B, FL25 1.53" BSW (installation length 178 mm only) 1.72" BSW BJ (installation length 178 mm only)
	32	135	260	G3/2B, FL32
10	25	135	260	G5/4B, FL25
	32	135	260	G3/2B, FL32 FL32 oval (installation length 190 mm only)
	40	200	300	G2B, FL40
16	40	200	300	G2B, FL40 FL40 oval (installation length 232 mm only)
	50	270	300	G5/2B
25	50	270	300	G5/2B

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The counting mechanism is always manufactured with a mould which is cast with a filler.

The electronic counting mechanism for the HYDRUS Type 173 features the following interfaces: M-BUS, L-BUS, pulse output and radio, and also an optical IR interface. The software version is the same for all variants.

The following electronic variants are possible.

Variant	Radio	R4+ / L1C	L-BUS	Pulse	M-BUS	IR	Lead (number of cores)
1	434 Mhz	--	--	--	--	IR	0
2	434 Mhz	--	L-BUS	pulse	--	IR	3
3	868 Mhz	--	--	--	--	IR	0
4	868 Mhz	--	L-BUS	pulse	--	IR	3
5	434 Mhz	R4+ / L1C	--	--	--	IR	0
6	434 Mhz	R4+ / L1C	L-BUS	pulse	--	IR	3
7	868 Mhz	R4+ / L1C	--	--	--	IR	0
8	868 Mhz	R4+ / L1C	L-BUS	pulse	--	IR	3
9	--	--	--	--	M-BUS	IR	2
10	--	--	--	pulse 2x	M-BUS	IR	5
11	--	--	--	pulse 2x	--	IR	3
12	--	--	--	pulse 2x	--	IR	4

Variant	SW version 001.001.001	SW version 002.000.001	SW version 002.000.002	SW version 002.000.003
1	X	--	X	X
2	X	--	X	X
3	X	--	X	X
4	X	--	X	X
5	--	X	X	X
6	--	X	X	X
7	--	X	X	X
8	--	X	X	X
9	X	--	X	X
10	X	--	X	X
11	X	--	X	X
12	X	--	X	X

The counting mechanism is supplied with power for the scheduled working life of suitable batteries (2A cells). An external power supply via M-BUS is not possible.

1.2 Sensors

There are two ultrasonic sensors fitted in the housing of the HYDRUS Type 173. They form a measuring path with ultrasonic penetration.

1.3 Processing of measured data

The HYDRUS Type 173 has an electronic counting mechanism. It evaluates the difference in the transmit time of ultrasonic signals generated by the ultrasonic sensors and displays the result in m^3.

Software / firmware version	001.001.001	002.000.001	002.000.002	002.000.003
Checksum (CRC)	0h2591	0hd12b	0hd12b	0hd12b
Significant element	001	002	002	002
Functional element	001	000	000	000
Patch element	001	001	002	003

1.4 Display of measured values

The HYDRUS Type 173 has a 9-digit LCD display (see illustration below).

(illustration here)

Illustration of all the segments of the LCD display

In the basic state of the display, the volume is displayed with the appropriate algebraic sign and a maximum of 5 digits after the decimal point. When the display is in its quiescent state, it needs to be activated by actuation of the optical switch. The current direction of flow is shown on the LCD with a plus sign (forward flow) or a minus sign (backward flow). When there is backward flow the relevant volume is subtracted from the meter reading. The counting mechanism is always manufactured with a mould which is cast with a filler.

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The following table shows the possible numbers of digits before and after the decimal point on the display.

Q_3 in m^3/h	1.6	2.5	4.0	6.3	10	16	25
(Minimum) number of digits before decimal point	4	4	4	4	5	5	5
(Maximum) number of digits after decimal point	5	5	5	5	4	4	4
Smallest possible display on LCD in dm^3	0.01	0.01	0.01	0.01	0.1	0.1	0.1

The following configuration is selected as standard:

Digits before decimal point	6
Digits after decimal point	3

By actuating an optical switch, various different display modes such as software information can be set.

(illustration here)

(illustration here)

LCD with display of software version

LCD with display of checksum (CRC)

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1.5 Optional facilities and functions which are subject to the measuring instruments directive

– none –

1.6 Technical documentation

The technical documents that go with this certificate are on file in the relevant set of certification documents at the PTB. The list of contents of that set of documents has been sent to the holder of the certificate.

1.7 Integrated facilities and functions which are not subject to the measuring instruments directive

Other data can be displayed by actuating an optical switch, such as:

- current flow in m^3 or l/h
- reference volume and reference date
- high-resolution volume for testing purposes in m^3; additional digits possible after decimal point
- backward volume in m^3

Depending on the purpose for which it is being used, the HYDRUS Type 173 can be equipped with M-BUS, L-BUS, pulse output or radio (wireless M-BUS). The optical IRDA interface for read-out and retrieval systems is always fitted.

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2 Technical data

2.1 Rated operating conditions

Q_3 in m^3/h	DN	Temperature class	Installation position H[1]) $(Q_3/Q_1)_{max}$ R_{max}	Installation position V[1]) downpipe rising pipe sloping at 45 ° overturned (90 °) upside down $(Q_3/Q_1)_{max}$ R_{max}
1.6	15 and 20	T30	500	500
		T50		
		T70		250
		T90		
2.5	15 and 20	T30	800	800
		T50		
		T70		400
		T90		
2.5	20	T30	400[3])	400[3])
		T50		
		T70		250[3])
		T90		
4.0	20	T30	800 (630)[2])	800 (630)[2])
		T50		
		T70		400
		T90		
6.3	25 and 32	T30	500	500
		T50		
		T70		250[4])
		T90		
10	25 and 32	T30	800	800
		T50		
		T70		400
		T90		
10	40	T30	500	500
		T50		
		T70		250
		T90		
16	40	T30	800	800
		T50		
		T70		400
		T90		

Q_3 in m^3/h	DN	Temperature class	Installation position	Installation position
			H[1])	V[1]) downpipe rising pipe sloping at 45 ° overturned (90 °) upside down
			$(Q_3/Q_1)_{max}$ R_{max}	$(Q_3/Q_1)_{max}$ R_{max}
16	50	T30	250	250
		T50		
		T70		250
		T90		
25	50	T30	400	400
		T50		
		T70		400
		T90		

1) The meter may also be designed for lower flow ranges Q_3/Q_1 = R = R40, ... R_{max}.
2) $(Q_3/Q_1)_{max}$ = 630 for housing DN = 20 in the installation length 105 mm and 115 mm at Q_3 = 4.0 m^3/h
3) $(Q_3/Q_1)_{max}$ = 400 for housing DN = 20 in the installation length 115 mm at Q_3 = 2.5 m^3/h
4) $(Q_3/Q_1)_{max}$ = 400 for housing DN = 25 in the installation length 175 mm at Q_3 = 6.3 m^3/h at T50

Precision class	± 2% ($Q_2 \leq Q \leq Q_4$)
	± 3% ($Q_2 \leq Q \leq Q_4$) for water temperature > 30 °C
	± 5% ($Q_1 \leq Q \leq Q_2$) for water temperature 0.1 to 90 °C
Installation position	horizontal, vertical (overturned at 90 °, sloping at 45 °, rising pipe, downpipe and upside down)
Temperature range	0.1 °C to 90 °C (T30, T50, T70 and T90)
Flow profile sensitivities	U0 / D0

2.2 Ambient conditions

Climatic	55 °C / -25 °C
Mechanical	M1 / M2
Electromagnetic	E1 / E2

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2.3 Pressure range and pressure loss

Q_3 in m^3/h	DN	Installation length in mm		Pressure loss class	Pressure range	
		min	max	Δp in bar	Pmin in MPa	Pmax in MPa
1.6	15	110	170	0.25	0.03	1.6
2.5	15	110	170	0.63		
2.5	20	>105	190	0.4		
4.0	20	>105	220	0.4		
		105		0.4		
6.3	25	135	260	0.25		
6.3	32	135	260	0.25		
10	25	135	260	0.63		
10	32	135	260	0.63		
10	40	200	300	0.16		
16	40	200	300	0.25		
16	50	270	300	0.16		
25	50	270	300	0.4		

3 Interfaces and compatibility conditions

M-BUS, L-BUS, pulse output, radio and optical IRDA interface for retrieval and read-out systems.

4 Requirements relating to production, commissioning and use

4.1 Production requirements

It is recommended that the final metrological tests be carried out at the following three flows and water temperatures:

$$Q_1 \le Q \le 1.1\ Q_1$$
$$Q_2 \le Q \le 1.1\ Q_2$$
$$0.9\ Q_3 \le Q \le Q_3$$

T30 models at a water temperature of 0.1 to 30 °C
T50 models at a water temperature of 0.1 to 30 °C
T70 models at a water temperature of 0.1 to 30 °C
T90 models at a water temperature of 0.1 to 30 °C

The measurement deviation of the display must not exceed the maximum permissible value for any of the above flows.

4.1.1 Testing the HYDRUS Type 173

The meters can be tested conventionally via static start and stop by setting them to test mode via optical communication. The LCD shows the volume display in m^3 for the nominal sizes Q_3: 1.6 m^3/h to 6.3 m^3/h, always with 6 decimal places. The resolution of the counting mechanism at 6 decimal places is thus 0.001 litres (ℓ). For the nominal sizes Q_3: 10 m^3/h to 25 m^3/h, the LCD shows the volume display in m^3, always with 5 decimal places. The resolution of the counting mechanism here is thus 0.01 litres (ℓ) or greater.

4.2 Requirements relating to commissioning

It is not necessary to install straight inlet or outlet sections.

It is recommended that the pipe connections be secured with a safeguard for the user. The safeguard (adhesive label, lead seal or other), the purpose of which is to prevent the meter from being disassembled, should be constituted in such a way that it cannot be removed or loosened without obvious signs of damage.

A clear set of operating / installation instructions is to be provided with each meter (see 7.1).

4.3 Requirements relating to use

The attention of the user is to be drawn – for example in the installation instructions – to the fact that measuring instruments for applications which, in the EU member state concerned, are subject to statutory metrological controls may only be operated under the rated operating conditions cited in 2.1.

5 Controls of instruments which are already in operation

5.1 Documentation for testing

This type-examination certificate and the technical documents listed in 1.6.

5.2 Special testing equipment or software

Tests can be carried out volumetrically, gravimetrically or by comparison with other meters. The flows cited in 4.1 must be able to be set on the test equipment used. A special software is also required to activate the test mode.

5.3 Identification

The meter must conform to the technical documents referred to in 1.6. The labels must conform to the list in 7.2.

5.4 Calibration and adjustment methods

The meters are adjusted electronically. After adjustment and testing the meter is locked electronically.

6 Safeguards

6.1 Mechanical seal

The meter must be bolted together with its housing and secured by an adhesive label in such a way that it can only be opened deliberately by force leaving visible traces.

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6.2 Electronic seal

– logbook is present
– examples of recorded changes which require recalibration are:
– change in the number of decimal places in the volume read-out
– re-initialisation of volume status
– parameterisation.
– There are rewritable reference-date and monthly values and fault recorders.

7 Markings and labels

7.1 Information to be provided with the instrument

Operating / installation instructions

Clear operating / installation instructions must be provided with each meter. They must contain the following items, to which particular attention is to be paid.

a) Inspection of sealing surfaces and seals prior to installation. It may be necessary to take special measures to ensure that the seals do not fall out or suffer damage during transportation from the manufacturer's premises to the site of installation.
b) Inspection of the readability of meter characteristics after installation. Neither the visual readability of the counting mechanism display, the characteristics of the meter nor the markings relating to conformity and metrology must be impaired.
c) Care must be taken by appropriate measures to ensure that the instrument does not suffer any soiling or damage during transportation to the site of installation.

7.2 Markings and labels

The following information must be present on the meter as a minimum requirement.

– measurement unit m^3
– precision class if other than class 2
– numerical value of Q_3 and of the ratio Q_3/Q_1
– number of type-examination certificate
– name or brand name and address of manufacturer
– year of manufacture, last two digits of year of manufacture, or month and year of manufacture
– serial number (as close as possible to the display)
– direction of flow by an arrow (on both sides of the housing or on one side only provided that the arrow is clearly visible under all circumstances)
– maximum allowable pressure (MAP), if it exceeds 1 MPa (10 bar)
– the letter V or H if the meter can only be operated in a vertical or horizontal position
– temperature class if other than T30
– pressure loss class if other than Δp 63
– installation sensitivity if other than U0/30
– conformity and metrology are indicated in accordance with Directive 2014/32/EU
– software version and checksum (optional).

Additional labels are allowed provided that they cannot be confused with the above information.

8 Illustrations (by way of example)

(illustrations here)

HYDRUS 173

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Type label HYDRUS 173