HYDRUS 2.0 Domestic
(DN15 – DN40)
FW 1.1.1

Product specification

Static ultrasonic water meter for accurate reading and recording of consumption in all areas of drinking water supply.

Document version: 1.0

23.04.2020

Subject to technical changes

Contents

Application

HYDRUS 2.0 is a static ultrasonic water meter for accurate recording and reading of consumption in all areas of water supply.

It is not affected by sediment and suspended solids in the water and so ensures stable long-term measuring accuracy even under difficult conditions.

With its innovative combination of ultrasonic technology and integrated communication, HYDRUS makes water consumption transparent and is ideal as part of an automatic meter reading (AMR) system. Reading is possible in seconds using the radio protocol to the Open Metering standard or a wired M-Bus interface and most accurate meter counts create the perfect database for smart metering. HYDRUS 2.0 therefore provides the database for complex consumption profiles in real time if required.

Measuring principle

Ultrasonic measurement in HYDRUS 2.0 is based on the time difference measuring procedure. The ultrasonic transducer in the meter sends an ultrasonic signal in the flow direction and against the flow direction. This ultrasonic signal is reflected by the reflector, passes through the measuring tube to the reflector opposite and sends the signal to the second ultrasonic transducer. During a flow of water the time needed by the signal in the flow direction is shorter than the time needed against flow direction. This measured time difference correlates with the flow velocity and thus to the flow volume. This value together with the cross-section of the measuring tube can be used to calculate the flow volume. HYDRUS 2.0 makes every two seconds an ultrasonic measurement (standard measuring frequency).

The water temperature required to accurately determine the sound velocity and calculate flow effects is measured by a temperature sensor every sixteen seconds.
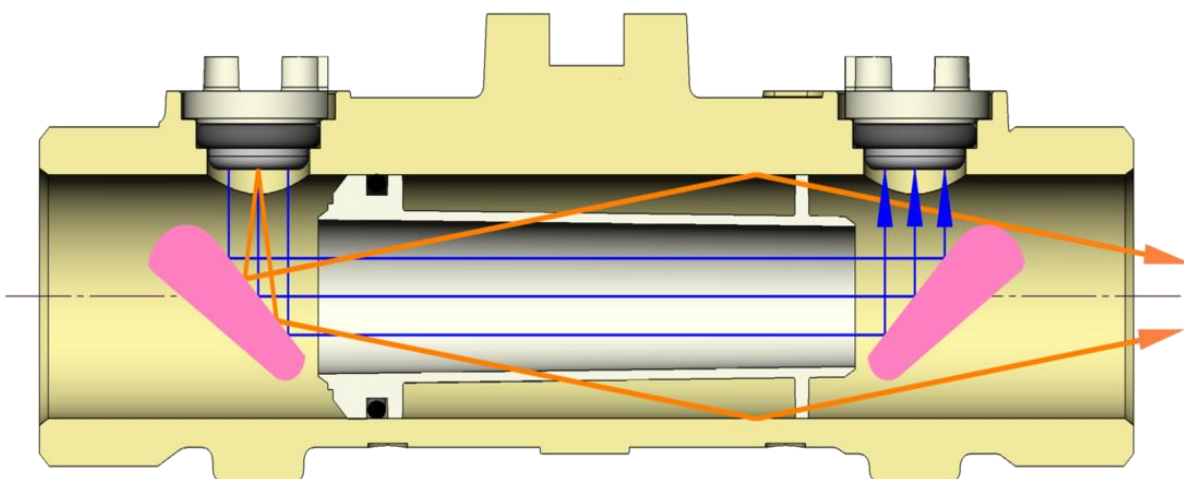
Overview technical data

HYDRUS Overview technical data	
Electromagnetic environmental class	E1 and E2
Metrological class	OIML R 49 class 2
Ambient class	OIML R 49 class C
Calming sections (not necessary)	U0 / D0
Protection class	IP 68
Nominal pressure	PN 16
MID approval for medium temperature	T30, T50
Medium temperature	0,1 … 50 °C
Ambient temperature	1 … 70 °C
Storage temperature	-10 … +70 °C (>35 °C max. 4 weeks)
Volume calculation	every 2 seconds
Measurement water temperature	every 16 seconds
Updating of the display values	every 3 seconds
LCD display	9-digit
Communication interfaces	Optical, Radio 434 / 868 MHz, L-Bus, M-Bus, Pulse
Battery lifetime T30*/T50*	up to 16 years (two batteries)
Radio mode	T1 (R3) / C1 Mode / R4 (unidirectional)
OMS versions	OMS 3, Security Profile A or OMS 4, Security Profile B (BSI security)
Sending interval OMS 3	aprox. every 14** / 64*** seconds
Sending interval OMS 4	aprox. every 15** / 5*** minutes
Data storage	Data logging capabilities to record up to 512 daily values (configurable to hourly, weekly, monthly) + 32 monthly (configurable to hourly, daily, weekly) values and an annual due date

*The battery life depends on the sending interval of the radio telegram, the telegram length and the ambient temperature at the installation location
** Fixed Network ready configuration
*** Fixed Network light configuration

Volume calculation and pendulum hysteresis

HYDRUS 2.0 is approved according to the MID for forward volume and can detect reverse volume. The calibrated total volume (value with lock symbol in the display) is composed of the difference between the forward volume and the reverse volume and is the value relevant for accounting / billing.

In order to prevent a misinterpretation of forward- and reverse consumption in the case of low fluctuating water columns, the electronic has a built-in pendulum hysteresis. The actual addition / subtraction of volume consumption is as shown in the example below for a HYDRUS with Q_3 2.5 m³/h. This applies for forward- and also reverse volume. The pendulum hysteresis serves for the exact calculation of the billing-relevant consumption, the alarm mechanisms and the flow calculation are excluded.

The pendulum hysteresis depends on the Q_3 value of the meter:
Q_3 **1,6** m³/h: 1,6 Liter
Q_3 **2.5** m³/h: 2.5 Liter
Q_3 **4** m³/h: 4 Liter
Q_3 **6.3** m³/h: 6.3 Liter
Q_3 **10** m³/h: 10 Liter
Q_3 **16** m³/h: 16 Liter

Example for Q_3 2.5 m³/h -> Pendulum hysteresis 2.5 Liter						
Process	Volume consumption	Hysteresis storage	Difference - Volume consumption depending on the hysteresis storage	Total volume	Forward volume	Reverse volume
1	0 Liter	0 Liter	0 Liter	0 Liter	0 Liter	0 Liter
2	+ 10 Liter	0 Liter	10 Liter	10 Liter	10 Liter	0 Liter
3	- 5 Liter	- 2,5 Liter	- 2,5 Liter	7,5 Liter	10 Liter	2,5 Liter
4	- 3 Liter	- 2,5 Liter	- 3 Liter	4,5 Liter	10 Liter	5,5 Liter
5	+ 2 Liter	- 0,5 Liter	0 Liter	4,5 Liter	10 Liter	5,5 Liter
6	+ 1 Liter	0,5 Liter	0,5 Liter	5 Liter	10,5 Liter	5,5 Liter
			5 Liter as total volume at the end of the example processes			

Conditions

HYDRUS modes		Errors	Alarms	Radio	Measuring interval
Storage mode		on	off	off	1/60 Hz (1 minute)
⬇ When water is detected	⬆ When water is detected less than 3 hours				
Field mode		on	off	on	0,5 Hz (2 seconds)
⬇ After detection of water for 3 hours without interruption					
Permanent Field mode		on	on	on	0,5 Hz (2 seconds)

Mechanical design

HYDRUS 2.0 consists of two main components – the hydraulic part and the encapsulated electronics. The hydraulic part consists of a brass housing, ultrasonic transducer, temperature sensor and a plastic measuring insert with holders for the two reflectors. The ultrasonic transducers are connected to the printed circuit board by a cable and fixed to the brass housing by plastic shells.

The complete electronics module consists of printed circuit board, batteries, LCD and the connected cables. It is fully potted to provide optimum protection against condensation or moisture penetrating from outside.

The electronics module is connected permanently to the hydraulic part of the meter and cannot be detached. HYDRUS 2.0 is encased in a UV-resistant plastic housing with suitable plastic and adhesive seals to protect against unauthorized opening.
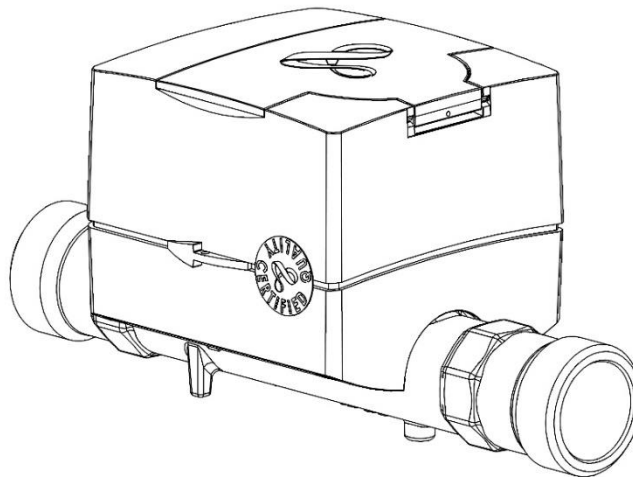
2. Approved meter data

DN 15 - 40	
Zulassung	MID DE-19-MI001-PTB012, OIML R49, EN 14154, TVO, KTW, ACS, WRAS
Dynamic range (Q3/Q1) - Q3 1.6 m³/h - T30	R 160 / 400
Dynamic range (Q3/Q1) - Q3 1.6 m³/h - T30	R 160 / 400
Dynamic range (Q3/Q1) - Q3 2.5 m³/h - T30	R 160 / 400 / 800
Dynamic range (Q3/Q1) - Q3 2.5 m³/h - T50	R 160 / 400 / 800
Dynamic range (Q3/Q1) - Q3 4 m³/h - T30	R 160 / 400 / 800*
Dynamic range (Q3/Q1) - Q3 4 m³/h - T50	R 160 / 400 / 800* (horizontal)
Dynamic range (Q3/Q1) - Q3 6.3 m³/h - T30	R 160 / 400
Dynamic range (Q3/Q1) - Q3 6.3 m³/h - T50	R 160 / 400 (horizontal)
Dynamic range (Q3/Q1) - Q3 10 m³/h - DN25 - T30	R 160 / 400 / 800
Dynamic range (Q3/Q1) - Q3 10 m³/h - DN25 - T50	R 160 / 400 / 800 (horizontal)
Dynamic range (Q3/Q1) - Q3 10 m³/h - DN32 - T30	R 160 / 400 / 800
Dynamic range (Q3/Q1) - Q3 10 m³/h - DN32 - T50	R 160 / 400 / 800 (horizontal)
Dynamic range (Q3/Q1) - Q3 10 m³/h - DN40 - T30	R 160 / 400
Dynamic range (Q3/Q1) - Q3 10 m³/h - DN40 - T50	R 160 / 400 (horizontal)
Dynamic range (Q3/Q1) - Q3 16 m³/h - T30	R 160 / 400 / 800
Dynamic range (Q3/Q1) - Q3 16 m³/h - T50	R 160 / 400 / 800 (horizontal)

* Maximum R630 for DN20 – 105mm – Q3 4 m³/h

PTB

Physikalisch-Technische Bundesanstalt
Nationales Metrologieinstitut

KBS

Konformitätsbewertungsstelle

EU-Baumusterprüfbescheinigung

EU Type-examination Certificate

Ausgestellt für: *Issued to:*	Diehl Metering GmbH Industriestr. 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 373
Nr. der Bescheinigung: *Certificate No.:*	DE-19-MI001-PTB012
Gültig bis: *Valid until:*	01.01.2030
Anzahl der Seiten: *Number of pages:*	23
Geschäftszeichen: *Reference No.:*	PTB-1.5-4097880
Notifizierte Stelle: *Notified Body:*	0102

Zertifizierung: *Certification:*	Braunschweig, 02.01.2020	Bewertung: *Evaluation:*
Im Auftrag *On behalf of PTB*	Siegel *Seal*	Im Auftrag *On behalf of PTB*
Dr. Michael Rinker		Silke Hansen

R3-072096

<DE><BG><ES><CS><DA><ET><EL><EN><FR><HR><IT><LV><LT><HU><MT><NL><PL><PT><RO><SK><SL><FI><SV>

<DE>**EU-KONFORMITÄTSERKLÄRUNG** <BG>**ЕС ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ** <ES>**DECLARACIÓN UE DE CONFORMIDAD** <CS>**EU PROHLÁŠENÍ O SHODĚ** <DA>**EU-OVERENSSTEMMELSESERKLÆRING** <ET>**ELi VASTAVUSDEKLARATSIOON** <EL>**ΔΗΛΩΣΗ ΣΥΜΜΟΡΦΩΣΗΣ ΕΕ** <EN>**EU DECLARATION OF CONFORMITY** <FR>**DÉCLARATION UE DE CONFORMITÉ** <HR>**IZJAVA EU-a O SUKLADNOSTI** <IT>**DICHIARAZIONE DI CONFORMITÀ UE** <LV>**ES ATBILSTĪBAS DEKLARĀCIJA** <LT>**ES ATITIKTIES DEKLARACIJA** <HU>**EU–MEGFELELŐSÉGI NYILATKOZAT** <MT>**DIKJARAZZJONI TAL-KONFORMITÀ TAL-UE** <NL>**EU-CONFORMITEITSVERKLARING** <PL>**DEKLARACJA ZGODNOŚCI UE** <PT>**DECLARAÇÃO UE DE CONFORMIDADE** <RO>**DECLARAȚIE UE DE CONFORMITATE** <SK>**EÚ VYHLÁSENIE O ZHODE** <SL>**IZJAVA EU O SKLADNOSTI** <FI>**EU-VAATIMUSTENMUKAISUUSVAKUUTUS** <SV>**EU-FÖRSÄKRAN OM ÖVERENSSTÄMMELSE**

1., 4. <DE> Gerätetyp / Produkt, Gegenstand der Erklärung - <BG> Тип на устройството / продукт, предмет на декларацията - <ES> Tipo de dispositivo / producto, objeto de dicha declaración - <CS> Typ zařízení / produkt, předmět prohlášení - <DA> Enhedstype / produkt, Erklæringens genstand - <ET> Seadme tüüp / toote, Deklareeritav toode - <EL> Τύπος συσκευής / προϊόν, Στόχος της δήλωσης - <EN> Device Type / Product, object of the declaration - <FR> Type d'appareil / produit, objet de la déclaration - <HR> Tip uređaja / proizvoda, Predmet izjave - <IT> Tipo di apparecchio / prodotto, oggetto della dichiarazione - <LV> Ierīces tipu / produkta, Deklarācijas priekšmets - <LT> Prietaisas tipas / gaminio, Deklaracijos objektas - <HU> Eszköz típusa/termék, a nyilatkozat tárgya - <MT> Tip ta 'apparat / prodott, ghan tad-dikjarazzjoni - <NL> Type apparaat / product, Voorwerp van de verklaring - <PL> Rodzaj urządzenia/produktu, przedmiot deklaracji - <PT> Tipo do aparelho/produto, objeto da declaração - <RO> Dispozitiv tip / produs, obiectul declarației - <SK> Typ prístroja/výrobku, predmet vyhlásenia - <SL> Vrsta aparata/proizvod, predmet izjave - <FI> Laiteen tyyppi / tuote, vakuutuksen kohde - <SV> Enhetstyp / produkt, föremål för försäkran:

Type 173

2. <DE> Name und Anschrift des Herstellers - <BG> Наименование и адрес на производителя - <ES> Nombre y dirección del fabricante - <CS> Jméno/název a adresa výrobce - <DA> Navn og adresse på fabrikanten - <ET> Tootja nimi ja aadress - <EL> Όνομα και διεύθυνση του κατασκευαστή - <EN> Name and address of the manufacturer - <FR> Nom et adresse du fabricant - <HR> Naziv i adresa proizvođača - <IT> Nome e indirizzo del fabbricante - <LV> Ražotāja nosaukums un adrese - <LT> Pavadinimas ir adresas gamintojo - <HU> A gyártó neve és címe - <MT> Isem u indirizz tal-manifattur - <NL> Naam en adres van de fabrikant - <PL> Nazwa i adres producenta - <PT> Nome e endereço do fabricante - <RO> Numele și adresa producătorului - <SK> Meno a adresa výrobcu - <SL> Ime in naslov proizvajalca - <FI> Nimi ja osoite valmistajan - <SV> Namn och adress på tillverkaren:

Diehl Metering GmbH, Industriestrasse 13, 91522 Ansbach, Germany

3. <DE> Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller - <BG> Настоящата декларация за съответствие е издадена на отговорността на производителя - <ES> La presente declaración de conformidad se expide bajo la exclusiva responsabilidad del fabricante - <CS> Toto prohlášení o shodě se vydává na výhradní odpovědnost výrobce - <DA> Denne overensstemmelseserklæring udstedes på fabrikantens ansvar - <ET> Käesolev vastavusdeklaratsioon on välja antud tootja ainuvastutusel - <EL> Η παρούσα δήλωση συμμόρφωσης εκδίδεται με αποκλειστική ευθύνη του κατασκευαστή - <EN> This declaration of conformity is issued under the sole responsibility of the manufacturer - <FR> La présente déclaration de conformité est établie sous la seule responsabilité du fabricant - <HR> Za izdavanje ove izjave EU-a o sukladnosti odgovoran je samo proizvođač - <IT> La presente dichiarazione di conformità è rilasciata sotto la responsabilità esclusiva del fabbricante - <LV> Šī atbilstības deklarācija ir izdota vienīgi uz ražotāja atbildību - <LT> Ši atitikties deklaracija išduota gamintojui prisiimant visą atsakomybę - <HU> Ezt a megfelelőségi nyilatkozatot a gyártó kizárólagos felelőssége mellett adják ki - <MT> Din id-dikjarazzjoni tal-konformità tinhareġ taht ir-responsabbiltà unika tal-manifattur - <NL> Deze conformiteitsverklaring wordt verstrekt onder volledige verantwoordelijkheid van de fabrikant - <PL> Niniejsza deklaracja zgodności wydana zostaje na wyłączną odpowiedzialność producenta - <PT> A presente declaração de conformidade é emitida sob a exclusiva responsabilidade do fabricante - <RO> Prezenta declarație de conformitate este emisă pe răspunderea exclusivă a producătorului - <SK> Toto vyhlásenie o zhode sa vydáva na výhradnú zodpovednosť výrobcu - <SL> Za izdajo te izjave o skladnosti je odgovoren izključno proizvajalec - <FI> Tämä vaatimustenmukaisuusvakuutus on annettu valmistajan yksinomaisella vastuulla - <SV> Denna försäkran om överensstämmelse utfärdas på tillverkarens eget ansvar.

5. <DE> Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union, soweit diese Anwendung finden - <BG> Предметът на декларацията, описан по-горе, отговаря на съответното законодателство на Съюза за хармонизация, доколкото те се прилагат - <ES> El objeto de la declaración descrita anteriormente es conforme con la legislación de armonización pertinente de la Unión, en la medida aplicable - <CS> Výše popsaný předmět prohlášení je ve shodě s příslušnými harmonizačními právními předpisy Unie, pokud se vztahují - <DA> Genstanden for erklæringen, som beskrevet ovenfor, er i overensstemmelse med den relevante EU-harmoniseringslovgivning, omfang de finder anvendelse - <ET> Eelkirjeldatud deklareeritav toode on kooskõlas asjaomaste liidu ühtlustatud õigusaktidega, niivõrd kui neid kohaldatakse - <EL> Ο στόχος της δήλωσης που περιγράφεται παραπάνω είναι σύμφωνος με τη σχετική ενωσιακή νομοθεσία εναρμόνισης, βαθμό που εφαρμόζονται - <EN> The object of the declaration described above is in conformity with the relevant Union harmonisation legislation, insofar as it is applied - <FR> L'objet de la déclaration décrit ci-dessus est conforme à la législation d'harmonisation de l'Union applicable - <HR> Predmet gore opisane izjave u skladu je s mjerodavnim zakonodavstvom Unije u usklađivanju, onoj mjeri u kojoj se primjenjuju - <IT> L'oggetto della dichiarazione di cui sopra è conforme alla pertinente normativa di armonizzazione dell'Unione, purché valgano - <LV> Iepriekš aprakstītais deklarācijas priekšmets atbilst attiecīgajam Savienības saskaņošanas tiesību aktam, ciktāl tas tie ir piemērojami - <LT> Pirmiau aprašytas deklaracijos objektas atitinka susijusius derinamuosius Sąjungos teisės aktus, tiek, kiek jos taikomos - <HU> A fent ismertetett nyilatkozat tárgya megfelel a vonatkozó uniós harmonizációs jogszabálynak, amennyiben azok alkalmazhatóak - <MT> L-ghan tad-dikjarazzjoni deskritta hawn fuq huwa konformi mal-leġiżlazzjoni ta' armonizzazzjoni rilevanti tal-Unjoni, safejn dawn applikati - <NL> Het hierboven beschreven voorwerp is in overeenstemming de desbetreffende harmonisatiewetgeving wordt van de Unie, voor zover van toepassing - <PL> Opisany powyżej przedmiot niniejszej deklaracji jest zgodny z odnośnymi wymaganiami unijnego prawodawstwa harmonizacyjnego, jeśli mające zastosowanie - <PT> O objeto da declaração acima descrito está em conformidade com a legislação de harmonização da União aplicável - <RO> Obiectul declarației descris mai sus este în conformitate cu legislația relevantă de armonizare a Uniunii, dacă aplicabil - <SK> Uvedený predmet vyhlásenia je v zhode s príslušnými harmonizačnými právnymi predpismi Únie, čo je použiteľný - <SL> Predmet navedene izjave je v skladu z ustrezno zakonodajo Unije o harmonizaciji, kot uporablja - <FI> Edellä kuvattu vakuutuksen kohde on asiaa koskevan EUn yhdenmukaistamislainsäädännön vaatimusten mukainen, soveltuvin osin - <SV> Föremålet för försäkran ovan överensstämmer med den relevanta harmoniserade unionslagstiftningen, i den mån tillämplig:

2014/30/EU (OJ L 96, 29.3.2014)   **2014/32/EU** (OJ L 96, 29.3.2014)   **2014/53/EU** (OJ L 153, 22.5.2014)

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6. <DE> Angabe der einschlägigen harmonisierten Normen oder normativen Dokumente, die zugrunde gelegt wurden, oder Angabe der anderen normativen Dokumente oder anderen technischen Spezifikationen, für die die Konformität erklärt wird - <BG> Позоваване на използваните хармонизирани стандарти или нормативни документи или позоваване на други технически спецификации, по отношение на които се декларира съответствие - <ES> Referencias a las normas armonizadas o documentos normativos pertinentes utilizados, o referencias a las otras especificaciones técnicas respecto a las cuales se declara la conformidad - <CS> Odkazy na příslušné harmonizované normy nebo normativní dokumenty, které byly použity, nebo na jiné technické specifikace, ve vztahu k nimž se shoda prohlašuje - <DA> Referencer til de relevante harmoniserede standarder eller anvendte normative dokumenter eller referencer til de andre tekniske specifikationer, som der erklæres overensstemmelse med - <ET> Viited kasutatud harmoneeritud standarditele või normdokumentidele või viited muudele tehnilistele spetsifikatsioonidele, millele vastavust deklareeritakse - <EL> Μνεία των σχετικών εναρμονισμένων προτύπων ή κοινοτικών εγγράφων που χρησιμοποιήθηκαν ή μνεία των λοιπών τεχνικών προδιαγραφών σε σχέση με τις οποίες δηλώνεται η συμμόρφωση - <EN> References to the relevant harmonised standards or normative documents used or references to the other technical specifications in relation to which conformity is declared - <FR> Références des normes harmonisées ou des documents normatifs pertinents appliqués ou références aux autres spécifications techniques par rapport auxquels la conformité est déclarée - <HR> Upućivanja na relevantne primijenjene usklađene norme ili normative dokumente ili upućivanja na druge tehničke specifikacije u vezi s kojima se izjavljuje sukladnost - <IT> Riferimento alle pertinenti norme armonizzate o ai documenti normativi utilizzati o riferimenti alle altre specifiche tecniche in relazione alle quali è dichiarata la conformità - <LV> Atsauces uz attiecīgajiem izmantojamiem saskaņotajiem standartiem vai normatīvajiem dokumentiem vai atsauces uz citām tehniskajām specifikācijām, attiecībā uz ko tiek deklarēta atbilstība - <LT> Nuorodos į atitinkamus darniuosius standartus ar naudotus norminius dokumentus arba nuorodos į kitas technines specifikacijas, pagal kurias deklaruota atitiktis - <HU> Az alkalmazott harmonizált szabványokra hivatkozás, illetve a normatív dokumentumokra vagy azokra az egyéb műszaki leírásokra való hivatkozás, amelyekkel kapcsolatban megfelelőségi nyilatkozatot tettek - <MT> Ir-referenzi għall-istandards armonizzati rilevanti jew dokumenti normattivi li ntużaw jew għall-ispeċifikazzjonijiet tekniċi l-oħra li fir-rigward tagħhom qed tiġi ddikjarata l-konformità - <NL> Vermelding van de toegepaste relevante geharmoniseerde normen of normatieve documenten of vermelding van de overige technische specificaties waarop de conformiteitsverklaring betrekking heeft - <PL> Odniesienia do odpowiednich norm zharmonizowanych lub odpowiednich dokumentów normatywnych, które zastosowano, lub do innych specyfikacji technicznych, w stosunku do których deklarowana jest zgodność - <PT> Referências às normas harmonizadas aplicáveis ou aos documentos normativos utilizados ou às outras especificações técnicas em relação às quais é declarada a conformidade - <RO> Trimiteri la standardele armonizate sau documentele normative relevante utilizate sau trimiteri la la alte specificații tehnice relevante în legătură cu care se declară conformitatea - <SK> Odkazy na príslušné použité harmonizované normy alebo normatívne dokumenty alebo iné technické špecifikácie, v súvislosti s ktorými sa zhoda vyhlasuje - <SL> Sklicevanja na zadevne harmonizirane standarde ali uporabljene normativne dokumente ali sklicevanja na druge tehnične specifikacije v zvezi s skladnostjo, ki je navedena v izjavi - <FI> Viittaukset niihin asiaankuuluviin yhdenmukaistettuihin standardeihin tai ohjeellisiin asiakirjoihin, joita on käytetty, tai viittaus muihin teknisiin eritelmiin, joiden perusteella vaatimustenmukaisuusvakuutus on annettu - <SV> Hänvisningar till de relevanta harmoniserade standarder eller normerande dokument som använts eller hänvisningar till de andra normerande dokument eller andra tekniska specifikationer enligt vilka överensstämmelsen försäkras:

EN 55032:2012/AC:2013	EN 14154-1: 2005/A2:2011	EN 14154-2: 2005/A2:2011
EN 14154-3: 2005/A2:2011	EN ISO 4064-1:2017	EN ISO 4064-2:2017
EN ISO 4064-3:2014	EN ISO 4064-5:2017	OIML R49-1:2006
OIML R49-2:2004	EN 62479:2010	EN 62311:2008
EN 301 489-1 v2.2.1	EN 301 489-3 v2.1.1	EN 300 220-2 v3.1.1
EN 62368-1:2014/AC:2015	WELMEC 7.2:2018	

<DE> Beteiligung notifizierter Stellen - <BG> Участие на нотифицираните органи - <ES> Participación de los organismos notificados - <CS> Participace oznámené subjekty - <DA> Deltagelse de bemyndigede organer - <ET> Osalemine teavitatud asutuste - <EL> Συμμετοχή των κοινοποιημένων οργανισμών - <EN> Participation of notified bodies - <FR> Participation des organismes notifiés - <HR> Sudjelovanje prijavljena tijela - <IT> Il coinvolgimento degli organismi notificati - <LV> Iesaistīšana pilnvaroto iestāžu <LT> Dalyvavimas notifikuotosios įstaigos - <HU> Részvétel a bejelentett szervezetek - <MT> Involviment ta' korpi notifikati - <NL> Deelneming aangemelde instanties - <PL> Uczestniczące jednostki notyfikowane - <PT> Envolvimento dos organismos notificados - <RO> Participante organismelor notificate - <SK> Účastnícke notifikované orgány - <SL> Udeležba priglašeni organi - <FI> Todistuksiin osallistuneet laitokset - <SV> Deltagande anmälda organ:

PTB Braunschweig und Berlin (NB 0102)   **Modul B (2014/32/EU) DE-19-MI001-PTB012**
                                                                            Modul D (2014/32/EU) No. DE-M-AQ-PTB004

<DE> Unterzeichnet für und im Namen von - <BG> Подписано за и от името на - <ES> Firmado por y en nombre de - <CS> Podepsáno za a jménem - <DA> Underskrevet for og på vegne af - <ET> Alla kirjutanud eest ja nimel - <EL> Υπογραφή για λογαριασμό και εξ ονόματος - <EN> Signed for and on behalf of - <FR> Signé par et au nom de - <HR> Potpisano za i u ime - <IT> Firmato a nome e per conto di - <LV> Parakstīts šādas personas vārdā - <LT> Už ką ir kieno vardu pasirašyta - <HU> A nyilatkozatot a ... nevében és megbízásából írták alá - <MT> Iffirmat għal u f'isem - <NL> Ondertekend voor en namens - <PL> Podpisano w imieniu - <PT> Assinado por e em nome de - <RO> Semnat pentru și în numele - <SK> Podpísané a a v mene - <SL> Podpisano za in v imenu - <FI> ... puolesta allekirjoittanut - <SV> Undertecknat för:

Diehl Metering GmbH
Ansbach, 16.01.2020

ppa. Andrea Sorg
CFO Customer Segment Energy

i.V. Matthias Wirsching
Head of Operations Germany

DMDE_CE180.docx - 2 -

DIEHL
Metering

smart in solutions

Konformitätserklärung　　　　　　**Declaration of Conformity**

Diehl Metering GmbH　　　　　　　　　　　　　　　DMDE-TW 130
Industriestrasse 13
91522 Ansbach
GERMANY
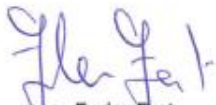
Wir erklären hiermit, dass die Produkte
We hereby declare that the products

Type 173

von uns gefertigt worden sind und den Vorgaben der einschlägigen europäischen[1] sowie nationalen[2] Vorschriften über die Trinkwasserqualität in ihrer jeweils gültigen Fassung entsprechen. Alle verwendeten Materialien entsprechen den Anforderungen des UBA[3] und des DVGW-Arbeitsblattes W 270[4] in jeweils gültiger Fassung.

have been produced by us and meet the requirements of the valid european[1] and national[2] regulations for drinking water quality. All used materials are in accordance with the valid requirements of UBA[3] and DVGW W270[4].

Ansbach, 01.08.2019
Diehl Metering GmbH

ppa. Ender Erat　　　　　　　　　　　　　ppa. Marc Sebald
Senior Vice President Energy　　　　　　Vice President Corporate Solution Design

derzeit: / at present:

[1] Richtlinie 98/83/EG des Rates vom 03.11.1998 über die Qualität von Wasser für den menschlichen Gebrauch, (ABl. L 330 vom 05.12.1998, S. 32)

[2] Trinkwasserverordnung in der Fassung der Bekanntmachung vom 10. März 2016 (BGBl. I S. 459), die zuletzt durch Artikel 1 der Verordnung vom 3. Januar 2018 (BGBl. I S. 99) geändert worden ist

[3] Bewertungsgrundlagen und Leitlinien des Umweltbundesamtes (https://www.umweltbundesamt.de/themen/wasser/trinkwasser/trinkwasser-verteilen/bewertungsgrundlagen-leitlinien)

[4] DVGW Technische Regel Arbeitsblatt W270 (November 2007) Vermehrung von Mikroorganismen auf Werkstoffen für den Trinkwasserbereich – Prüfung und Bewertung

Seite 1 von 1

This certifies that

DIEHL METERING GMBH

has had the undermentioned product examined, tested and found,
when correctly installed, to comply with the requirements of the
United Kingdom Water Supply (Water Fittings) Regulations and
Scottish Water Byelaws.

HYDRUS 2 RANGE OF WATER METERS

The certificate by itself is not evidence of a valid WRAS Approval. Confirmation of the current
status of an approval must be obtained from the WRAS Directory (www.wras.co.uk/directory)

The product so mentioned will be valid until the end of:

December 2023

1812048

Certificate No.

_____
Secretary

_____
Chairman, Product Assessment Group

Prüfbericht-Nr.: Test Report No.:	**60253907-001**	Auftrags-Nr.: Order No.:	3288574	Seite 1 von 10 Page 1 of 10
Kunden-Referenz-Nr.: Client Reference No.:	014/3300033476	Auftragsdatum: Order date:	Apr 04, 2019	
Auftraggeber: Client:	Diehl Metering GmbH, Industriestr. 13, 91522 Ansbach			
Prüfgegenstand: Test item:	Flow meter			
Bezeichnung / Typ-Nr.: Identification / Type No.:	Type 173, Type 174			
Auftrags-Inhalt: Order content:	Degree of protection test: IP6X, IPX5, IPX8			
Prüfgrundlage: Test specification:	EN 60529:2013 (partial test) Degrees of protection provided by enclosures (IP-code)			

Wareneingangsdatum: Date of receipt:	Apr 11, 2019	
Prüfmuster-Nr.: Test sample No.:	A000228274-002	
Prüfzeitraum: Testing period:	Apr 17, - Apr 25, 2019	
Ort der Prüfung: Place of testing:	Nuremberg	
Prüflaboratorium: Testing laboratory:	TÜV Rheinland LGA Products GmbH	
Prüfergebnis*: Test result*:	Siehe Sonstiges / See Other	

geprüft von / tested by:	kontrolliert von / reviewed by:
May 21, 2019 Maurice Wolf (SV)	May 21, 2019 Dipl.-Chem.(Univ.) Karin Hermann (SV)
Datum / Date	Name / Stellung Name / Position	Unterschrift Signature	Datum / Date	Name / Stellung Name / Position	Unterschrift Signature

Sonstiges / Other: see findings

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: Test item complete and undamaged

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor
	P(ass) = passed a.m. test specification(s)		F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested

Permanent flow rate	Q3	m³/h	1.6	1.6	1.6	2.5	2.5	2.5
Nominal Diameter	DN	mm	15	15	15	15	15	15
Overall length	L	mm	110	165	170	110	165	170
Dynamic (Q3/Q1)	R		400	400	400	800	800	800
Overload flow rate*	Q4	m³/h	2	2	2	3.125	3.125	3.125
Transitional flow rate*	Q2	l/h	6.4	6.4	6.4	5	5	5
Minimum flow rate*	Q1	l/h	4	4	4	3.13	3.13	3.13
Starting flow rate		l/h	1.4	1.4	1.4	1.4	1.4	1.4
Pressure loss at Q3	bar		0.19	0.19	0.19	0.46	0.46	0.46
Strainer / Non-return valve			Optional / Optional	Optional / Optional	Optional / Optional	Optional / Optional	Optional / Optional	Optional / Optional
Connection			G¾B	G¾B	G¾B	G¾	G¾	G¾B

Permanent flow rate	Q3	m³/h	2.5	2.5	4	4	4	4	4
Nominal Diameter	DN	mm	20	20	20	20	20	20	20
Overall length	L	mm	130	190	105	130	175	190	220
Dynamic (Q3/Q1)	R		800	800	400	800	800	800	800
Overload flow rate*	Q4	m³/h	3.125	3.125	5	5	5	5	5
Transitional flow rate*	Q2	l/h	5	5	16	8	8	8	8
Minimum flow rate*	Q1	l/h	3.13	3.13	10	5	5	5	5
Starting flow rate		l/h	1.4	1.4	3.0	2.5	2.5	2.5	2.5
Pressure loss at Q3	bar		0.4	0.4	0.55	0.4	0.4	0.4	0.4
Strainer / Non-return valve			Optional / Optional	Optional / Optional	Optional / Without	Optional / Optional	Optional / Without	Optional / Optional	Optional / Optional
Connection			G1B	G1B	G1B	G1B	G1¼	G1B	G1B

Permanent flow rate	Q3	m³/h	6.3	6.3	6.3	6.3	6.3	10	10
Nominal Diameter	DN	mm	25	25	25	25	32	25	25
Overall length	L	mm	135	150	175	260	260	135	150
Dynamic (Q3/Q1)	R		400	400	400	400	400	800	800
Overload flow rate*	Q4	m³/h	7.87	7.87	7.87	7.87	7.87	12.5	12.5
Transitional flow rate*	Q2	l/h	25.2	25.2	25.2	25.2	25.2	20	20
Minimum flow rate*	Q1	l/h	15.8	15.8	15.8	15.8	15.8	12.5	12.5
Starting flow rate		l/h	5	5	5	5	5	5	5
Pressure loss at Q3	bar		0.22	0.22	0.22	0.22	0.22	0.54	0.54
Strainer / Non-return valve			Integrated / Without	Integrated / Without	Integrated / Optional	Integrated / Optional	Integrated / Optional	Integrated / Without	Integrated / Without
Connection			G1¼	G1¼	G1¼	G1¼ / FL 25	G1½B / FL 32	G1¼	G1¼

Permanent flow rate	Q3	m³/h	10	10	10	10	10	16	16
Nominal Diameter	DN	mm	25	25	32	40	40	40	40
Overall length	L	mm	175	260	260	200	300	200	300
Dynamic (Q3/Q1)	R		800	800	800	400	400	800	800
Overload flow rate*	Q4	m³/h	12.5	12.5	12.5	12.5	12.5	20	20
Transitional flow rate*	Q2	l/h	20	20	20	40	40	32	32
Minimum flow rate*	Q1	l/h	12.5	12.5	12.5	25	25	20	20
Starting flow rate		l/h	5	5	5	8.7	8.7	8.7	8.7
Pressure loss at Q3	bar		0.54	0.54	0.22	0.22	0.22	0.5	0.5
Strainer / Non-return valve			Integrated / Optional	Integrated / Optional	Integrated / Optional	Integrated / Without	Integrated / Optional (G2B)	Integrated / Without	Integrated / Optional (G2B)
Connection			G1¼	G1¼ / FL 25	G1½B / FL 32	G2B	G2B / FL 40	G2B	G2B / FL 40

Check valve

The meter can be supplied with a non-return valve (accessory) on request (only for nominal diameters DN 15 – 40).
The non-return valve must be mounted in the meter outlet as shown in **Fig. I** for meters with a nominal diameter of DN 15 and in **Fig. II** for a nominal diameter of DN 20 and DN 40.
For meters with a nominal diameter of DN 25 and DN 32, a compensating ring must also be used to centre the non-return valve **(Fig. III)**.

Coupling fitting with collar (Fig. III)

In order to prevent damage to the non-return valve, there is a spacer for the non-return valve **(Fig. III)** and coupling fitting with collar combination.
During the installation, the water meter must be held in this position with a suitable tool to prevent damage to the plastic housing.

Fig. I   DN 15 – 110mm:

Coupling fitting
with and without collar

check-valve

Fig. II   DN 15 – 40:

Coupling fitting without collar

check-valve

sealing ring

Fig. III   DN 15 - DN 40:

Coupling fitting with collar

check-valve

sealing ring

spacer 4mm
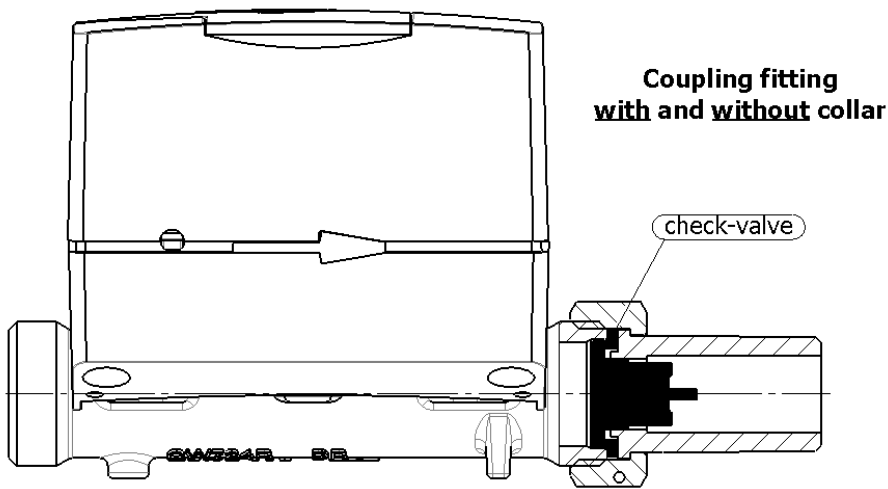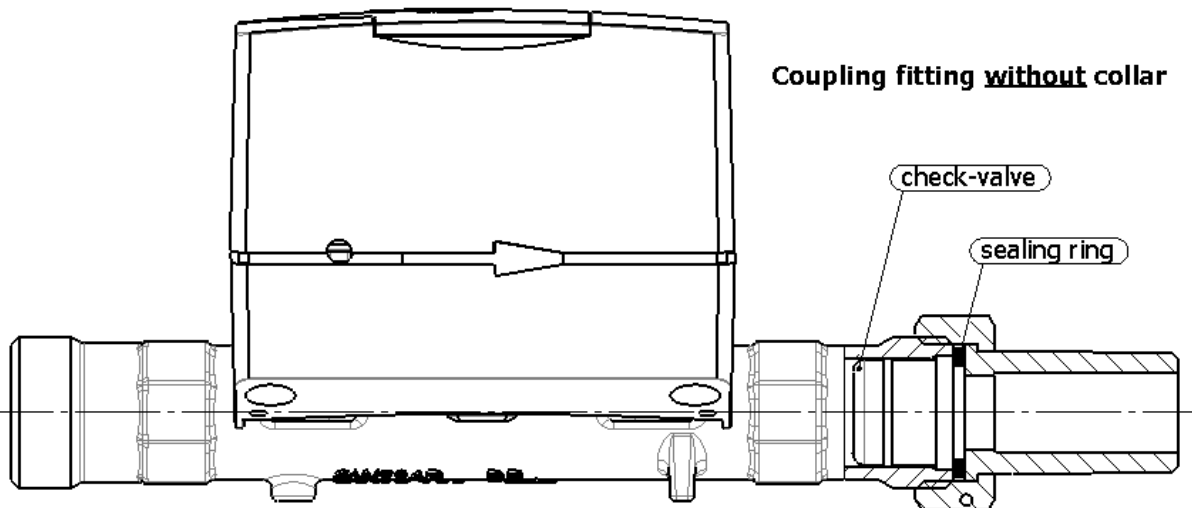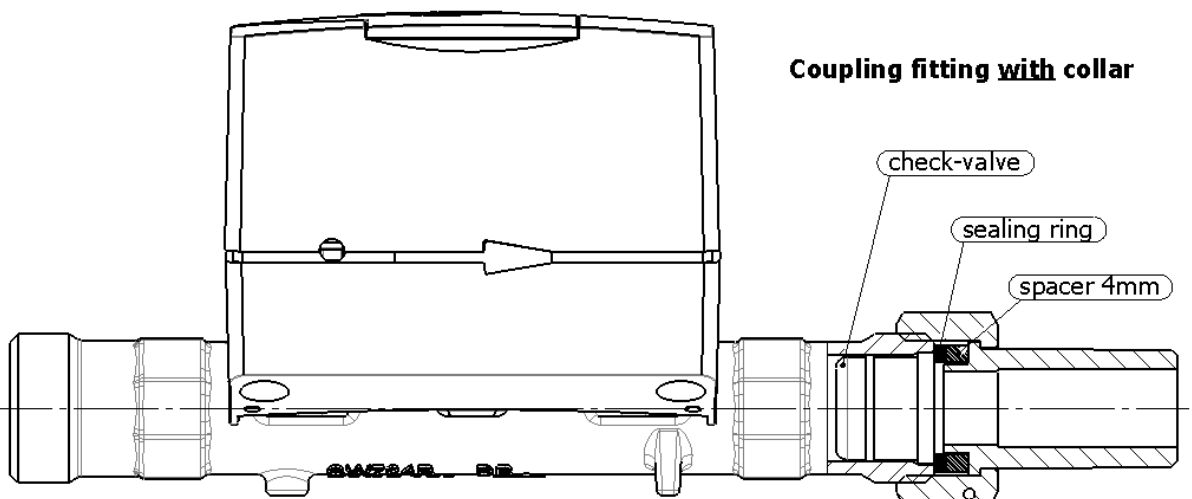
4. Materials

Components in contact with medium

Coupling housing	Lead-free brass, UBA conformity for screw thread according to ISO 228-1, Material: CW724R (CuZn21Si3P); UBA conformity for flange housing according to DIN 2501, Material: CC770S (CuZn36Pb)
Measuring insert	Composite, KTW conformity
O-Rings	EPDM
Locating studs	PES / PPS glass-fibre reinforced
Reflectors	Stainless steel, stainless
Ultrasonic transducers	Composite, KTW conformity

Other components

Cover + meter housing	UV resistant composite housing

5. Technical data

Electrical data

Power Supply	Two 3.6 VDC lithium-batteries
Battery lifetime T30*/T50*	up to 16 years
	*The battery life depends on the transmission interval of the radio telegram, the telegram length and the ambient temperature at the installation location
	Batteries cannot be replaced
LC display	9-digit
EMC data	MID class E1+E2

Mechanical data

Metrological class	OIML R 49 class 2
Ambient class	OIML R 49 class C
Ambient temperature	1 … 70 °C
Protection class	IP 68
Installation	Frost-free installation indoors or outdoors, in a shaft or installation box, resistant to UV rays
Medium temperature	0.1 … 50 °C
Storage temperature	-10 … +70 °C (>35 °C max. 4 weeks)
Nominal pressure	PN16

Accuracy

Accuracy class   2

Performance curve   Q3=4m3/h T30 R1000
Courbe de précision   Q3=4m3/h T30 R400

Average 3 Hydrus 2 DN20 - 190mm T30 R1000 -horizontal installed
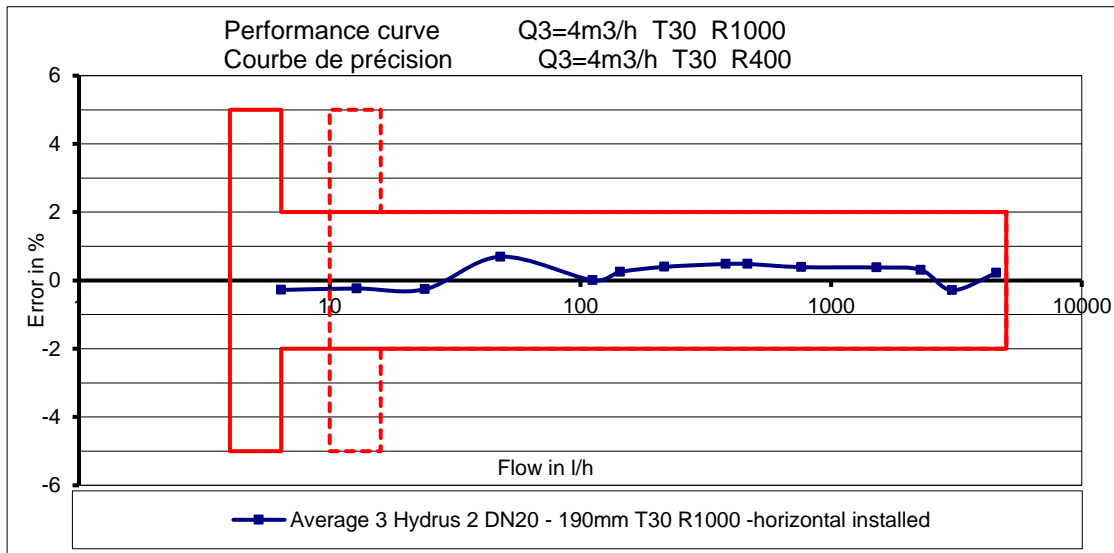
T30, T50:
± 5 % in the range Q1 ≤ Q < Q2
± 2 % in the range Q2 ≤ Q ≤ Q4
T90:
± 5 % in the range Q1 ≤ Q < Q2
± 3 % in the range Q2 ≤ Q ≤ Q4

6.1 14-digit manufacturer number

The 14-digit manufacturer number is based on the German standard DIN 43863-5.

Structure of the number:

The 14-digit manufacturer number consists of several components.

Division + Manufacturer + Manufacturer ID + 8-digit serial number of the meter

8 for cold water meter (Medium temperature 30°C)
9 for hot water meter (Medium temperature 50°C up to 90°C)

+

DME Manufacturer (manufacturer identification)

+

76 Manufacturer ID (associated device ID)

+

1234 5678 Serial number of the meter
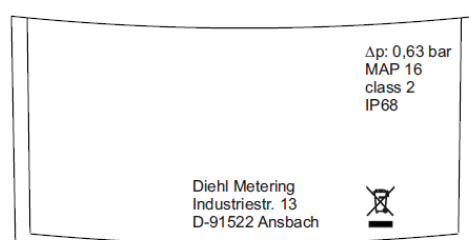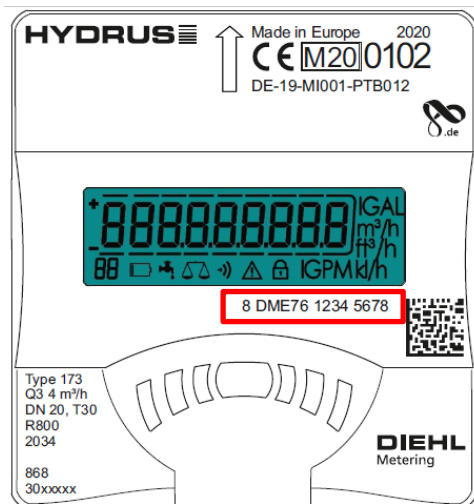
7. Communication / interfaces

Note: A detailed description of the communication interfaces (wired and wireless M-Bus) can be found in the Communication Description on our home page www.diehl.com/metering.

HYDRUS is equipped with different communication interfaces depending on the variant selected:

* Optical IrDA interface (standard - always)
* Radio 434 MHz
* Radio 868 MHz
* Radio 868 MHz / L-Bus / Pulse
* Radio 434 MHz / L-Bus / Pulse
* M-Bus
* Pulse / Pulse
* 4 wire Pulse / Pulse
* M-Bus / Pulse / Pulse

7.1 Optical

The optical IRDA interface serves two purposes. First it is used as optical button and second as communication interface.

Optical button:
This is used for switching to the next display and operating the LC display. If the button is not pressed for about 4 minutes, the meter switches to sleep mode, i.e. the display is off but the meter is still in operation and records all data.
The LC display can be taken into operation by pressing the button or by opening the cover.
The meter starts with a display test (all segments on, then all segments off), then the display loop always start with the total volume. This remains for at least 10 seconds on the display (also when the optical button is pressed). Afterwards the display loop can be switched with the help of the optical button.

Optical interface:
Communication with the meter is possible over the optical IrDA interface with the aid of an opto head together with a laptop or PC and the associated IZAR@MOBILE 2 software.
The radio telegram can be configured to the customer's requirements over the optical interface, but it is recommended that the desired configuration is agreed on ex works before placing the order; if no prior agreement is made, the default factory setting is used.
The optical interface can also be used together with an opto head for carrying out quick tests using suitable electronic test beds.

7.2 Security Role Concept

In order to enable customer to operate in accordance with the GDPR, Diehl Metering has implemented a Security Role concept in all Diehl Metering products.
The Diehl Metering Security Role Concept is based on different roles and each of the roles has a different purpose with different keys, and accordingly different rights to read and write data in Diehl Metering products.

Role overview:

Actors / Roles	Abbreviation	Description
Utility	UTL	The customer of Diehl Metering. Generally the owner of the metering devices and responsible for the legal and operational functionality of the meter site.
Technical Service	TES	Support instance only for "On-Demand" operations on the meter. Typical use cases are resetting the key material or reading of quality logs.
Laboratory	LAB	Instance for calibration or metrological test. Responsible for metrological correctness of the meter, e.g. for production tests or calibration
Rework (Repair)	REP	Repair department of the manufacturer to rework meters because of customer claims. Instance to "clean up" the meter for a "second delivery".

Additionally to the Security Role Concept also the Diehl Metering Software IZARMOBILE 2 has different licenses. The combination of roles and licenses enables the user to operate with the HYDRUS 2.0 as needed.

Impact of IZAR@MOBILE2 licenses and HYDRUS 2.0 roles:

Every HYDRUS 2.0 is set up with five keys:
- Master key: Key for the data transport security – radio key
- Utility Password: Key for the meter access security – key for the optical interface for the Utility role
- Technical Service Password: Key for the meter access security – key for the optical interface for the Technical Service role
- Laboratory Password: Key for the meter access security – key for the optical interface for the Laboratory role
- Rework (Repair) Password: Key for the meter access security – key for the optical interface for the Rework (Repair) role

Encryption key and passwords variants:

data transport security (radio): algorithm and use defined by **OMS** (standardized solution)

meter access security (optical/M-BUS): algorithm and use defined by **Diehl Metering** (proprietary solution)

	Master Key	UTL PW	TES PW	LAB PW	REP PW
Standard (Individual V1)	meter individual	meter individual	meter individual	meter individual	meter individual
Standard (Individual V2)	meter individual	DM global key	meter individual	meter individual	meter individual
customer individual ("utility-key")	customer individual	customer individual different from Master Key	meter individual	meter individual	meter individual
DM global key (Worldwide known key)	DM global key	DM global key	meter individual	meter individual	meter individual
Wired	N/A	DM global key	meter individual	meter individual	meter individual

Key ownership utility

Key management by Diehl Metering (control and release by utility)

7.2 Radio

HYDRUS can send radio protocols with OMS standards. OMS protocols can be sent with a frequency of 868 or 434 MHz.

The integrated radio function is switched off on delivery and the meter is set to "storage mode", in which HYDRUS performs an ultrasonic measurement every minute. The meter activates itself automatically (field mode) on detecting water in the measuring tube and starts measuring every two seconds. The integrated radio function is activated at the same time; the radio remains permanently active after continuous operation (> 3 hours) with water. The radio in HYDRUS can separately be activated or deactivated with the IZAR@MOBILE 2 software.

HYDRUS sends out radio frames unidirectionally in the T1, or C1, or R4 radio mode.

Radio power:
HYDRUS transmits at a power of <25 milliwatts.

A transmission takes 4 to 15 milliseconds. Between each two transmissions, a transmission pause must be observed for the used frequency band and the application, which is at least thousand times the length of a transmission (duty cycle = 0.1%).

For example, after a transmission with a length of 10 milliseconds, a transmission pause of 10 seconds must be observed. The meter thus transmits a maximum of 86.4 seconds during the day.

A comparison with other transmitter:

Devices	Frequency	Maximum transmission power
HYDRUS	868 MHz or 434 MHz	< 25 mW
Bluetooth	2400 MHz	100 mW
WLAN	2400 MHz	100 mW
DECT (Cordless phone)	1900 MHz	250 mW
GSM (E-Network)	1800 MHz	1000 mW
GSM (D-Network)	900 MHz	2000 mW
Television transmitter	470-790 MHz	5 000 000 000 mW

Radio protocol:
HYDRUS can provide the following OMS Versions:
- Generation 3 (Encryption Mode 5)
or
- Generation 4 (Security Profile B)

Encryption method OMS 3:
AES key (Advanced Encryption Standard): Used in OMS
- 16-byte hexadecimal (128-bit)
- Individual key for the variant (customer) possible - standard
- Individual key per meter is possible
- Standard key only used if explicitly requested by the customer

The Diehl Metering AES key for OMS is set ex works. An individual customer-specific key for OMS can be set in the customer's variant if required. We will also be pleased to create a key for you.

Please note that only the first **6 digits** can be individually arranged numerically. An individual key is not possible for the protocol type Real Data.

Also possible is an individual key per meter which is assigned automatically in our production with a secure algorithm for each meter. This **must** be specified when the order is placed.

Data Security OMS 4:

In OMS Version 4 The requirements of the Profile B correspond to the primary communication of the security mode 7 from EN13757-7. Session keys are used to individually encrypt each data telegram. HYDRUS therefore is compatible with the Smart Meter Gateway according to the German "Bundesamt für Sicherheit in der Informationstechnik" (BSI).

Technology OMS 4:

Securing transmission according to EN13757-7 Mode 7:
- Encryption is used to protect integrity and confidentiality.
- To protect the authenticity, a message authentication code (MAC) is generated from the data and another key.
- New keys are used for each transmission.

Encryption methods OMS 4:

AES-Key (Advanced Encryption Standard):
- - 16 Byte Hexadezimal (32-stellig h0-hF, 128 Bit)
- - **Individual key per meter is possible**
➔ The individual key per meter is generated in an electronic delivery note (EDN).
➔ When creating the EDN, the following information are required:
   1. Which EDN format should be used?
   - For third-party software or IZAR@NET before Version 2.4
   - For IZAR@NET from 2.4
   - For Elster ACM-modules
   2. The following information is required for sending the EDN:
   - A contact person (E-Mail address, postal address)
   -> Must be deposited in the order by order input of the Diehl Metering sales person

Scheme of a Open Metering Gen. 3 telegram:

Byte Nr:	Example	Designation	Description	
1	1E	L-Field	Without L-Field and CRCs	
2	44	C-Field	C-Feld = 0x44 for SND-NR	
3	A5	ManId0	Diehl Metering = DME	
4	11	ManId1		
5	81	A-Field IdentNo		
6	86	A-Field IdentNo		
7	98	A-Field IdentNo		
8	53	A-Field IdentNo	e.g. 53988681	
9	76	A-Field Version	e.g. 0x76 for HYDRUS 2	
10	07	A-Field DevType	e.g. 0x07 for water	
11	27	CRC0		
12	AC	CRC0		
13	7A	CI-Field	CI-Feld = 0x7A, because 4 Byte Header are following	
14	B1	Access No	Transmission counter	
15	30	State	M-Bus Status Byte	
16	10	Configuration field	Information about encryption (Mode 5) and block number (one)	
17	05	Configuration field		
18	2F	AES-Verify 0	Encryption verification bytes	AES Block 1
19	2F	AES-Verify 1		
20	0C	Data Record 1	DIF (4 byte BCD)	
21	13	Data Record 1	VIF (Volume in liter)	
22	00	Data Record 1	Total Volume = 200 liter	
23	02	Data Record 1		
24	00	Data Record 1		
25	00	Data Record 1		
26	7C	Data Record 2	DIF (4 byte BCD, StorageNo 1)	
27	13	Data Record 2	VIF (Volume in liter)	
28	00	Data Record 2	Due Date Volume = 0 liter	
29	B7	CRC1		
30	78	CRC1		
31	00	Data Record 2	Due Date Volume = 0 liter	AES Block 1
32	00	Data Record 2		
33	00	Data Record 2		
34	2F	AES fill bytes	Necessary to fill 16 byte AES block	
35	2F	AES fill bytes		
36	76	CRC2		
37	C7	CRC2		

The available DIF's and VIF's please see the communication description of the HYDRUS.

M-Bus Status Byte in the radio telegram:

The M-Bus Status Byte (Byte Nr. 15) is transmitted in every open metering radio telegram. The status byte indicates which errors/alarms are currently on the meter (hexadecimal coded).

Name of Status	Status Code	MBus Status	MBus Status	MBus Status	MBus Status	MBus Status	MBus Status	MBus Status	MBus Status	Mbus Status By
		manufacturer specific	manufacturer specific	manufacturer specific	temporary	permanent	low power	status field	status field	
Checksum										
Current Error	E01									
Continuous Error - Alarm	A01	0	0	0	0	1	x	1	1	0x0B
Historical Error	H01									
Backflow volume										
Current Error	E06									
Continuous Error - Alarm	A06	0	1	1	0	1	x	1	1	0x6B
Historical Error	H06	0	1	1	0	0	x	0	0	0x60
Hardware flow										
Current Error	E04									
Continuous Error - Alarm	A04	0	0	1	0	1	x	1	1	0x2B
Historical Error	H04	0	0	1	0	0	x	0	0	0x20
Undersized meter										
Current Error	E11	0	1	0	1	0	x	0	0	0x50
Continuous Error - Alarm	A11	0	1	0	1	0	x	1	1	0x53
Historical Error	H11	0	1	0	0	0	x	0	0	0x40
No usage										
Current Error	E12	1	0	0	0	1	x	0	0	0x88
Continuous Error - Alarm	A12									
Historical Error	H12									
Measurement interference										
Current Error	E22									
Continuous Error - Alarm	A22	0	0	1	1	0	x	1	1	0x33
Historical Error	H22									
Air in pipe										
Current Error	E07	0	1	1	1	0	x	0	0	0x70
Continuous Error - Alarm	A07									
Historical Error	H07									
Hardware temperature										
Current Error	E02									
Continuous Error - Alarm	A02	0	1	0	0	1	x	1	1	0x4B
Historical Error	H02									
High medium temperature										
Current Error	E13	1	1	0	1	0	x	0	0	0xD0
Continuous Error - Alarm	A13	1	1	0	1	0	x	1	1	0xD3
Historical Error	H13	1	1	0	0	0	x	0	0	0xC0
Freezing risk										
Current Error	E14	1	1	1	1	0	x	0	0	0xF0
Continuous Error - Alarm	A14	1	1	1	1	0	x	1	1	0xF3
Historical Error	H14	1	1	1	0	0	x	0	0	0xE0
Low battery										
Current Error	E09	x	x	x	x	x	1	x	x	0x04
Continuous Error - Alarm	A09									
Historical Error	H09									
Too much communication										
Current Error	E00	0	0	0	1	0	x	0	0	0x10
Continuous Error - Alarm	A00									
Historical Error	H00									
Leakage detection										
Current Error	E05									
Continuous Error - Alarm	A05	1	0	0	1	0	x	1	1	0x93
Historical Error	H05	1	0	0	0	0	x	0	0	0x80
Fallback mode - Only for HYDRUS 2.0 Bulk										
Current Error	E17									
Continuous Error - Alarm	A17	1	0	1	1	0	x	1	1	0xB3
Historical Error	H17	1	0	1	0	0	x	0	0	0xA0
Metrological log access										
Current Error	E18	1	0	1	0	1	x	0	0	0xA8
Continuous Error - Alarm	A18									
Historical Error	H18									
AnyApplicationError										
Current Error	E99	0	0	0	0	0	x	1	0	0x20
Continuous Error - Alarm	A99									
Historical Error	H99									
System reset										
Current Error	E98									
Continuous Error - Alarm										
Historical Error										

A detailed description of all errors and alarms is available in chapter 8.6 Errors and Alarms.

All errors and alarms can be determined and differentiated via the manual optical readout of the error log.

The value can be displayed via the "Specific device alarm" column during a tour in the IZAR@MOBILE 2/IZAR@NET2.

The specified hexadecimal value must then be converted to a binary value (as listed in above table).

7.3 Wired M-Bus

M-Bus telegram according to M-Bus EN 13757
- Baud rate 300 or 2400 bauds
- Two-wire M-Bus cable with polarity reversal protection, 1.5 m long
- For communication with M-Bus receiver or IZAR CENTER
- No external power supply possible, power supply via internal battery
- Maximum data transmission of 100 bytes per minute possible

The application reset subcode 0 (0x00) for the wired M-Bus interface is factory-set. The following standard telegram is programmed:

1) Total volume
2) Forward volume
3) Reverse volume
4) Current flow
5) Current medium temperature °C
6) Current ambient temperature °C
7) Date & Time
8) Due date 1
9) Due date 1 total volume
10) Due date 2
11) Due date 2 total volume

The telegram length of the standard telegram is about 95 bytes, so a maximum read-out interval of around 1 minute is possible. Shorter read-out intervals lead to an exceeding of the limit value of the logic capacitor.

HYDRUS has a separate logic capacitor for M-Bus communication. Error E5 is set if the limit of the capacitor is exceeded and deleted as soon as the capacitor drops below the limit again.

Method of operation of logic capacitor:
- Each byte received increments the logic capacitor by 1.
- Limit of logic capacitor: 65173 --> 65173 bytes can be received before the limit is reached.
- The logic capacitor is decremented by 100 every minute. -> Additional bytes can be received again.

An Application Reset 15 (0xF0) must be sent to the HYDRUS so that the meter answers with the customer telegram. The content of the wireless radio and wired M-Bus telegram will be identically created for the customer version.

7.4 L-Bus

- L-Bus for connection to an external radio module
- Cable length 1.5 m

7.5 Pulse outputs

Cable pin assignment (M-Bus/L-Bus/pulse):

The meter is supplied with Radio/L-Bus/Pulse, Pulse/Pulse, M-Bus/Pulse/Pulse variant with a 1.5 m long, 2- / 3- / 3- / 4- / 5-wire connection cable with wire end sleeves.

	Variant 1 Radio/L-Bus/Pulse	**Variant 2** Pulse/Pulse	**Variant 3** M-Bus/Pulse/Pulse	**Variant 4** M-Bus	**Variant 5** IZAR PULSE BE
M-Bus			X	X	
Pulse output 1		X	X		X
Pulse output 2	X	X	X		X
L-Bus	X				
Connection (Network name)					
GND	brown	brown	brown		brown
Pulse 1 or L-Bus	yellow	yellow	yellow		white
Pulse 2	green	green	green		yellow
M-Bus 1			white	white	
M-Bus 2			blue	blue	
Fraud					green
Number of wires	3	3	5	2	4

Electrical isolation:

A voltage potential between the ground terminal of the L-Bus/pulse output and the meter housing ground (brass) must be avoided to prevent possible damage due to electrical corrosion.
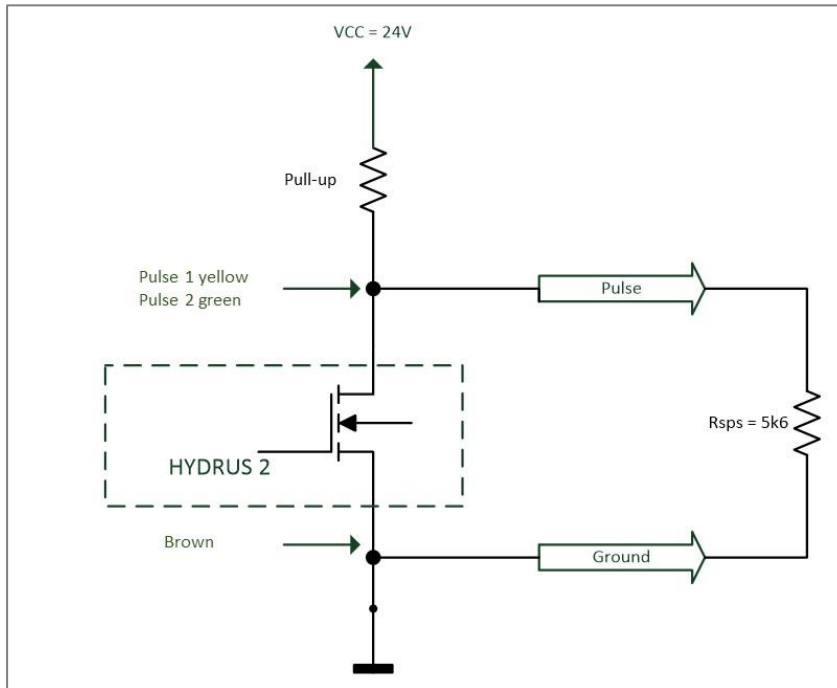
The pulse outputs are wired as open drain.

There is a 0-ohm resistor in the drain branch, i.e. there is no current limitation within the meter, this must be provided externally by a protective resistor (if not available on site).

The internal resistance value of the switching device should be 5 times the protective resistance.

The HYDRUS 2.0 type 173 has up to 2 interfaces for Pulse. Depending on the device configuration, the set pulse duration, pulse break and pulse frequency can be different.

A detailed description of the pulses can be found in the HYDRUS product specifications:
https://www.diehl.com/metering/en/diehl-metering/support-center/downloads

Pulse outputs and pulse rates, technical data:

Maximum input voltage	30 V
Maximum input current	27 mA
Maximum voltage drop at active output	2 V / 27 mA
Maximum current through inactive output	5 µA / 30 V
Maximum reverse current	27 mA
Pulse frequency	Depends on the device configuration, max. frequency 10 Hz
Pulse width	125 ms

Possible pulse variants:

Pulse 1: Total volume or forward volume
Pulse 2: Forward volume, error or direction
        (When total volume on pulse output 1, only direction possible on pulse output 2)

It is possible to subsequently modify the pulse settings in the meter using the IZAR@MOBILE 2 software in conjunction with the expert dongle and a Bluetooth optohead.

There are two types of pulses available in HYDRUS 2.0:
-    Time correct pulses – Pulses sent out in a time correct manner
-    Burst pulses – Pulses sent out in Pulse-packages

In the standard HYDRUS 2.0 configuration the maximum possible pulse frequency is set to 10 Hz. This means the green marked configurations of flow and pulse value are possible:

Q3	1,6 m³/h	2,5 m³/h	4 m³/h	6 m³/h	10 m³/h	16 m³/h	25 m³/h	40 m³/h	63 m³/h	100 m³/h	160 m³/h
Q4	2,00 m³/h	3,13 m³/h	5,00 m³/h	7,88 m³/h	12,50 m³/h	20,00 m³/h	31,25 m³/h	50,00 m³/h	78,75 m³/h	125,00 m³/h	200,00 m³/h
0,1 l/Imp	5,56	8,68	13,89	21,88	34,72	55,56	86,81	138,89	218,75	347,22	555,56
1 l/Imp	0,56	0,87	1,39	2,19	3,47	5,56	8,68	13,89	21,88	34,72	55,56
10 l/Imp	0,06	0,09	0,14	0,22	0,35	0,56	0,87	1,39	2,19	3,47	5,56
100 l/Imp	0,01	0,01	0,01	0,02	0,03	0,06	0,09	0,14	0,22	0,35	0,56
1000 l/Imp	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,01	0,02	0,03	0,06

Red marked configurations of flow and pulse values need a higher frequency than 10 Hz, they can be customized in the HYDRUS 2.0 customer variant on request.

The pulse width is 125 ms.

8. Programming / configuration

Note: A detailed description of the communication interfaces can be found in a separate Communication Description on our home page
http://www.diehl.com/de/diehl-metering.html

8.1 LC display

Meter information can be called up on the 9-digit LC display. The display information is arranged in a display loop in several display windows. The various display windows and display windows with automatic display changes are illustrated below. A list of the possible display information can also be found in the Communication Description.

The display windows can be changed by pressing the optical button. Each press of the button changes to the start display of the next display window.

To save the battery, the meter switches to sleep mode if the button is not pressed for approx. 4 minutes (see also section "Optical button").

After awakening, the display shows first a screen check (i.e. all symbols in the display are briefly switched on and off) and then the total volume. This remains for at least 10 seconds on the display (also when the optical button is pressed). Afterwards the display loop can be switched with the help of the optical button.

Display symbols:
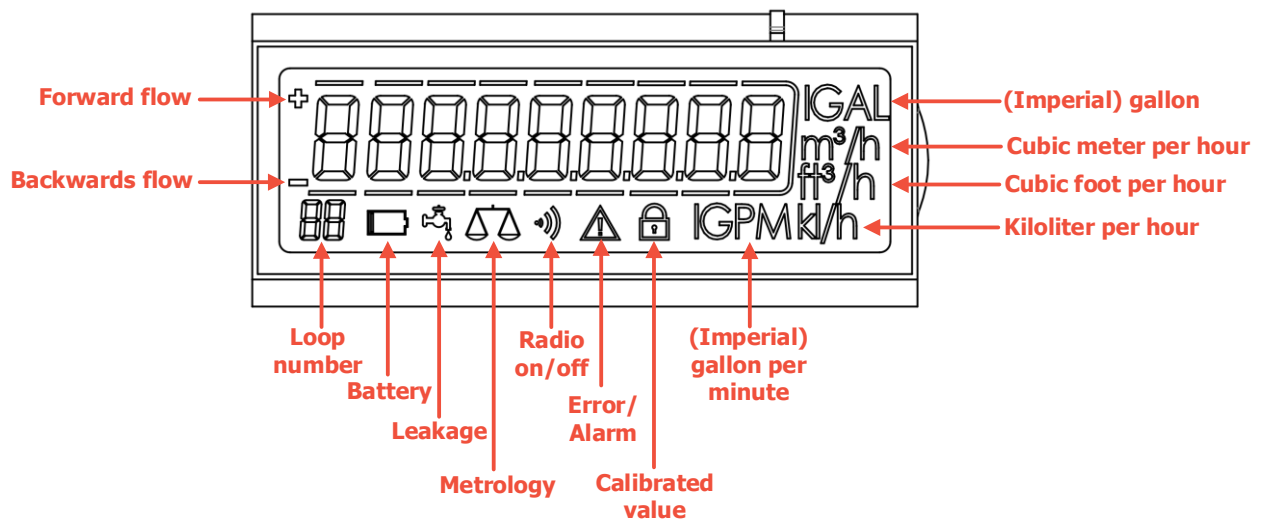
8.2 Display loop

The meter is factory pre-configured with one of the following loops:

Minimum loop
Display test
Total volume
Battery lifetime
Firmware version / Checksum

Medium loop
Display test
Total volume
Battery lifetime
Firmware version / Checksum
Current flow
Errors / Alarms

Maximum loop
Display test
Total volume
Battery lifetime
Firmware version / Checksum
Current flow
Errors / Alarms
High resolution total volume
Due date / Due date volume
Reverse volume

.

In the following, you can see the comprehensive factory settings for the loops
- Display test (88)
- Current total volume (01)
- Battery lifetime (02)
- Software version alternating with the checked sum of the software (03)
- Current flow rate (m³/h) (04)
- Error messages (05)
- Total volume high resolution (07)
- Total volume of the due date function alternating with the modification of the due date (08)
- Current reverse volume (09)

„loop" =
display off

„open lid"
(change from
dark to bright)

Display test

| Display test: all on | 2 s | Display test: all off |

88

2 s

Calibrated value

01

Minimum loop

Battery lifetime

02

Medium loop

Firmware

| Firmware version | 5s | Firmware checksum |

5s

03

Maximum loop

Current flow

04

Errors / Alarms

| Current error | 5s | Continuous error | 5s | Historical error |

5 s

05

High resolution volume

07

Due date

| Due date | 5s | Due date volume |

5s

08

Backflow

09

Explanation

Brightness shift
on optical
button

Automatical
shift

8.3 Radio / M-Bus telegram

The HYDRUS 2.0 has an integrated radio, which is an interface for unidirectional communication in order to read out the meter. Data generated by the meter will be sent every 14 seconds (Fixed Network ready) and every 64 seconds (Fixed Network light) in R3 mode for mobile reading. In long-range fixed network R4 mode the data will be sent every 15 minutes (Fixed Network ready) and every 5 minutes (Fixed Network light). The communication always transmits the currently measured data.

Mobile reading in Walk-by / Drive-by / Passive Drive-by:
The data sent by HYDRUS 2.0 can be collected using Diehl Metering's portable receiver IZAR RECEIVER BT with a handheld device as well as the software IZAR@MOBILE 2 for Walk-by/Drive-by, an IZAR RDC Vehicle for passive Drive-by or applying devices from qualified third parties. Data is then transferred directly to a centralized monitoring system.

Fixed network:
The stationary receivers IZAR RDC Standard/IZAR RDC Battery (fixed network R3) or IZAR RDC Premium (long-range fixed network R4) installed in buildings will collect the data and send it fully automatically at predefined intervals, via GPRS or LAN, to a centralized server. Reading through M-Bus application with an IZAR CENTER associated to an IZAR RECEIVER M-BUS and IZAR@NET 2 software, is possible as well.

Radio specifications	
Sending intervals	Every 14 … 256 seconds (variable, according to 0.1 duty cycle (min. 14 seconds); depending on protocol length and programming)
434 MHz frequency band	Transmission power (EN 300 220-2 V3.2.1): 10 mW e.r.p.
868 MHz frequency band	Transmission power (EN 300 220-2 V3.2.1): 25 mW e.r.p

Three different standard telegram packages are available for R3- and R4- telegrams for selection ex works. It is possible to subsequently modify the telegram contents and the sequence of values in the meter using the IZAR@MOBILE 2 software in conjunction with the expert licence and a Bluetooth optohead.

Telegram R3 for mobile reading
For mobile reading, the meter is factory pre-configured with one of the following telegram packages:

Mobile minimum	Mobile medium	Mobile maximum
Total volume	Total volume	Total volume
Due date	Due date	Due date / due date volume / due date reverse volume
Due date volume	Due date volume	Log entry 1 - Date & Time
Due date reverse volume	Due date reverse volume	Log entry 1 - Volume
Error bits	Error bits	Error bits
	Current flow	Current flow
	Battery lifetime	Battery lifetime
	Water temperature in °C	Water temperature in °C
		Ambient temperature in °C

Telegram R4 for fixed network

For fixed network, the meter is factory pre-configured with one of the following telegram packages:

Fixed Network minimum
Total volume
Reverse volume
Current flow
Water temperature in °C
Error bits

Fixed Network medium
Total volume
Ambient temperature in °C
Current flow
Water temperature in °C
Error bits
Log entry 1 – Max. volume flow
Log entry 1 – Min. volume flow
Log entry 1 – Date & Time

Fixed Network maximum
Total volume
Ambient temperature in °C
Current flow
Water temperature in °C
Error bits
Log entry 1 – Max. volume flow
Log entry 1 – Min. volume flow
Log entry 1 – Date & Time
Log entry 1 - volume
Reverse volume

When the telegram value "Error bits" is selected, all currently active error / alarm are transmitted and no prioritization in the transmission of the errors / alarms takes place as with the M-Bus Status Byte when several error/alarms are currently on the meter. Also all possible errors/alarms of the HYDRUS can be transmitted. The value can then be displayed via the "Info code" column during a tour in the IZAR@MOBILE 2 respectively in the IZAR@NET 2.

8.4 Errors and alarms

Error messages (optical notification on LC-display in case of error).
3 categories of error:
E - Current errors: The error event is active now
A - Continuous errors: The error event is active since a defined time (configurable); an Alarm is created in the system; Holding time as described in the table below
H - Historical errors: The error event is active since a defined time (configurable); Holding time as described in the table below

Checksum error	Event is triggered if any data in Flash or RAM is corrupted or was manipulated in any way	E01 / A01 / H01
Hardware temperature	Event is triggered if temperature sensor cable is broken	E02 / A02 / H02
Hardware flow	Event is triggered if flow measuring error occurs	E04 / A04 / H04
Leakage detection	Event is triggered if the continuous consumption over a period of one day (configurable) is higher than a configurable threshold	E05 / A05 / H05
Back flow volume	Event is triggered if the reverse volume is higher than the configurable threshold	E06 / A06 / H06
Air in pipe	Event is triggered if air is detected in the pipe	E07 / A07 / H07
Low battery	Event is triggered if calculated battery life is less than 400 days	E09 / A09 / H09
Undersized meter	Event is triggered if flow is higher than a configurable threshold	E11 / A11 / H11
No consumption	Event is triggered if volume is lower than a configurable threshold for a configurable period of time	E12 / A12 / H12
High medium temperature	Event is triggered if medium temperature is higher than the threshold, which is related to the temperature class	E13 / A13 / H13
Freezing risk	Event is triggered if medium temperature is lower than 3°C	E14 / A14 / H14
Fallback mode	Event is triggered if a significant deviation of the measurement in the two measuring paths occurs	E17 / A17 / H17
Metrological log access	Event is triggered if the metrological log has been accessed	E18 / A18 / H18
Measurement interference	Event is triggered if the measurement is disturbed by influences of cavitation, air water mixture or electromagnetic interference	E22 / A22 / H22
System reset	Event is triggered if the system processor has been reset	E98
Any application error	Event is triggered if the bidirectional communication (M-Bus or optical Interface) has been corrupted	E99 / A99 / A00
Too much communication	Event is triggered if the communication through the optical interface exceeds the threshold	E00 / A00 / H00

There is an entry in the error log for all current errors except E99 and E00.

Errors and alarms in the display

E - Current Error	E _ _._ _._ _._ _ **e.g. E _ _._ _.13.00**
A - Continuous error	A _ _._ _._ _._ _ **e.g. A _ _._ _._ _.06**
H – Historic Error	H _ _._ _._ _._ _ **e.g. H _ _.02.13.00**

Four errors of each type (current, continuous, historic) are displayed at the same time.
In case of more than four errors of each type (current, continuous, historic), the four errors with the highest priority are displayed. Error priorities are listed in chapter 8.4 Error flags.

Overview errors/alarms (Error flag, Display, entry in error log):

Name of Status	Priority	Status Code	Error Flag Mask	Code in Display	Symbol in Display	EventLog entry	Priority of Error in EventLog
Checksum	1						
Current Error		E01				x	High
Continuous Error - Alarm		A01	00 00 00 01	x			not logged
Historical Error		H01					not logged
Backflow volume	6						
Current Error		E06				x	Low
Continuous Error - Alarm		A06	00 00 00 20	x			not logged
Historical Error		H06	00 20 00 00	x			not logged
Hardware flow	2						
Current Error		E04				x	High
Continuous Error - Alarm		A04	00 00 00 02	x			not logged
Historical Error		H04	00 04 00 00	x			not logged
Undersized meter	5						
Current Error		E11	00 00 04 00	x		x	Low
Continuous Error - Alarm		A11	00 00 00 10	x			not logged
Historical Error		H11	00 10 00 00	x			not logged
No usage	9						
Current Error		E12	00 00 10 00	x		x	Low
Continuous Error - Alarm		A12					not logged
Historical Error		H12	01 00 00 00	x			not logged
Measurement interference	10						
Current Error		E22				x	Low
Continuous Error - Alarm		A22	00 00 00 80	x			not logged
Historical Error		H22	02 00 00 00	x			not logged
Air in pipe	8						
Current Error		E07	00 00 08 00	x		x	Low
Continuous Error - Alarm		A07					not logged
Historical Error		H07					not logged
Hardware temperature	3						
Current Error		E02				x	High
Continuous Error - Alarm		A02	00 00 00 04	x			not logged
Historical Error		H02					not logged
High medium temperature	12						
Current Error		E13	00 00 40 00	x		x	Low
Continuous Error - Alarm		A13	00 00 02 00	x			not logged
Historical Error		H13	08 00 00 00	x			not logged
Freezing risk	11						
Current Error		E14	00 00 20 00	x		x	Low
Continuous Error - Alarm		A14	00 00 01 00	x			not logged
Historical Error		H14	04 00 00 00	x			not logged
Low battery	15						
Current Error		E09	00 02 00 00		x	x	Low
Continuous Error - Alarm		A09					not logged
Historical Error		H09					not logged
Too much communication	13						
Current Error		E00	00 00 80 00	x			not logged
Continuous Error - Alarm		A00					not logged
Historical Error		H00					not logged
Leakage detection	4						
Current Error		E05				x	Low
Continuous Error - Alarm		A05	00 00 00 08	x	x		not logged
Historical Error		H05	00 08 00 00	x	x		not logged
Fallback mode - Only for HYDRUS 2.0 Bulk	7						
Current Error		E17	sd			x	Low
Continuous Error - Alarm		A17	00 00 00 40	x			not logged
Historical Error		H17	00 40 00 00	x			not logged
Metrological log access	14						
Current Error		E18	00 01 00 00	x (only for LAB Role)			not logged
Continuous Error - Alarm		A18					not logged
Historical Error		H18					not logged
AnyApplicationError	0						
Current Error		E99					not logged
Continuous Error - Alarm		A99					not logged
Historical Error		H99					not logged
System reset	16						
Current Error		E98				x	High
Continuous Error - Alarm							not logged
Historical Error							not logged

Detailed description of alarms:

Too much communication E00 / A00 / H00
E00 activation condition:
E00 is activated by too much optical readings in a short time. In case the communication capacity (optical or M-Bus communication) reaches 0 Bytes the communication is temporarily paused.

E00 deactivation condition:
When minimum communication threshold (500 Bytes – configurable) is reached (regeneration by 100 Bytes / minute), then the communication is released again.

A00 and H00 are activated together with E00.
Holding times are listed in the table below.

Checksum E01 / A01 / H01
E01 activation condition:
E01 is activated immediately when any checksum is corrupt.

E01 deactivation condition:
E01 never deactivates

A01 and H01 are activated together with E01.
Holding times are listed in the table below.

Hardware temperature E02 / A02 / H02
E02 activation condition:
E02 is activated if a hardware temperature error is detected for 1 minute, e.g. temperature cable is cut, or damaged.

E02 deactivation condition:
E02 is deactivated if no hardware temperature error is detected for 1 minute

A02 and H02 are activated together with E02.
Holding times are listed in the table below.

Hardware flow E04 / A04 / H04
E04 activation condition:
E04 is activated if a hardware error at the flow measuring or an ultrasonic sensor defect is detected

E04 deactivation condition:
E04 is deactivated after ultrasonic measurement for 1 minute without error

A04 and H04 are activated together with E04.
Holding times are listed in the table below.

Leakage detection E05 / A05 / H05
Activation condition:
E05 is activated if the 15 minute average consumption is always above the leakage threshold in 24 consecutive hours. E05 is only activated if the limit was always exceeded in the 24 hours (otherwise the meter starts the 24-hour calculation from the beginning).
Q3 1,0…9,9: $|\Delta Q sum\{15\ min\}| > 0,8$ l for 24 hours

Q3 10...99: $|\Delta Qsum\{15\ min\}| > 8\ l$ for 24 hours
Q3 100...999: $|\Delta Qsum\{15\ min\}| > 80\ l$ for 24 hours
Q3 1000...9999: $|\Delta Qsum\{15\ min\}| > 800\ l$ for 24 hours

Deactivation condition:
E05 is deactivated if the 15 minute average consumption is below the leakage threshold.
Q3 1,0...9,9: $|\Delta Qsum\{15\ min\}| <= 0,8\ l$
Q3 10...99: $|\Delta Qsum\{15\ min\}| <= 8\ l$
Q3 100...999: $|\Delta Qsum\{15\ min\}| <= 80\ l$
Q3 1000...9999: $|\Delta Qsum\{15\ min\}| <= 800\ l$

A05 and H05 are activated together with E05.
Holding times are listed in the table below.

Leakage E05
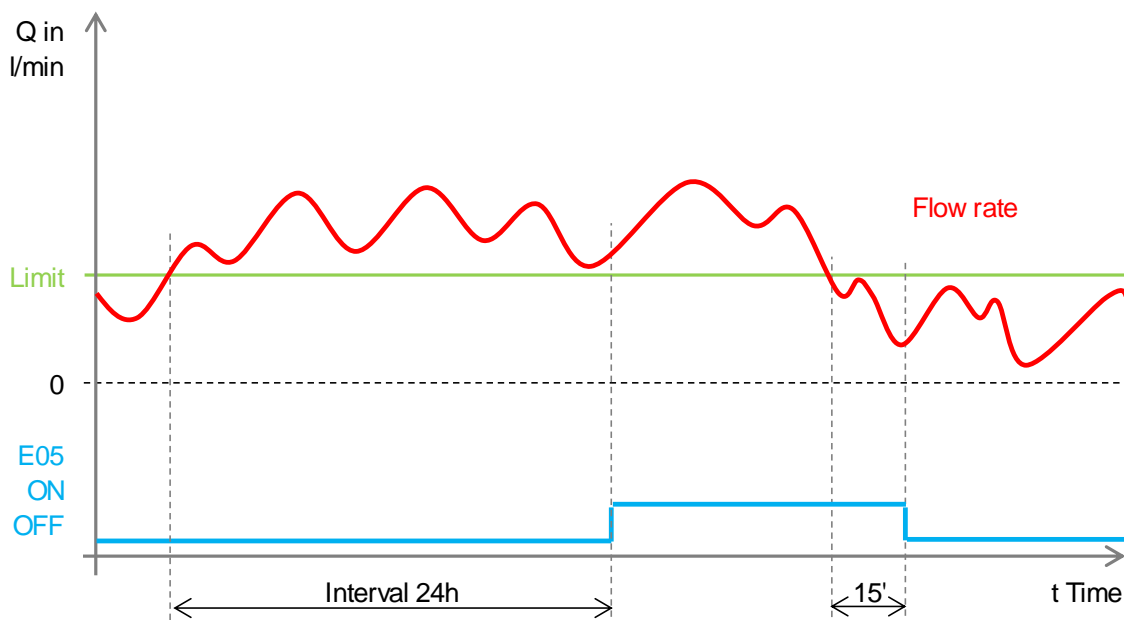
Example: In a 1-family house there has to be no flow (flow below the leakage threshold) for 15 min. once in a 24 hours timespan, otherwise a leakage may exist. The time window (15 min.) can be selected as desired or set ex works and the leakage threshold can also be defined. This means, for example, that the leakage threshold can be specified as the threshold in a factory in which water is generally drawn around the clock.

Backflow volume E06 / A06 / H06
E06 activation condition:
E06 is activated if the 15 min average flow is below the backflow (negative flow) threshold of Q3 / 100
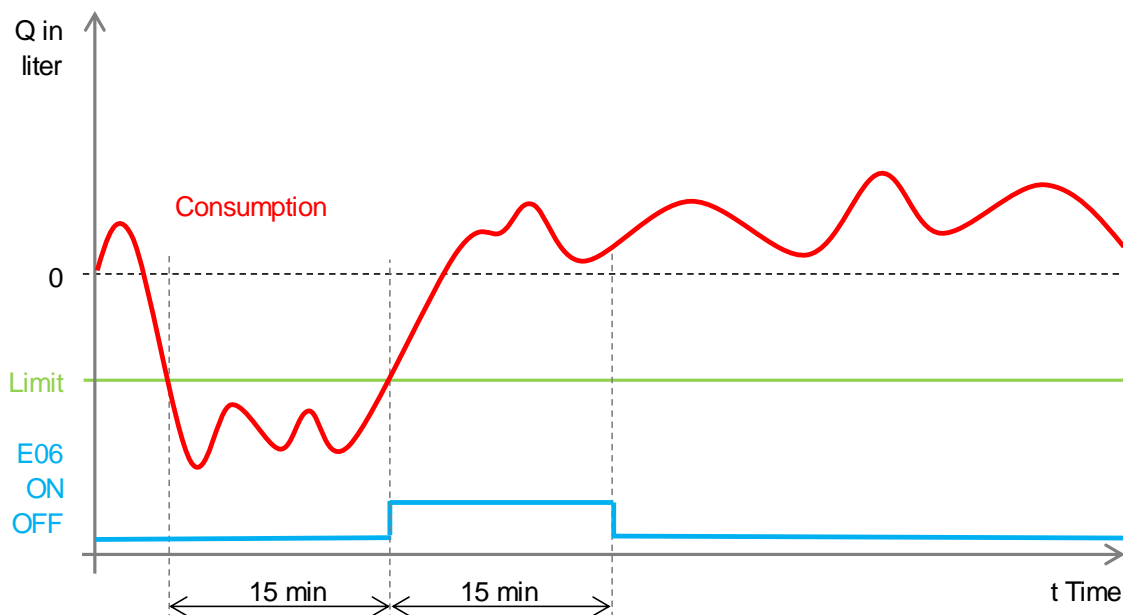$\Delta Qsum\{15\ min\} < -Q3/100$

E06 deactivation condition:
E06 is deactivated if the 15 min average flow is above the backflow (negative flow) threshold of Q3 / 100
$\Delta Qsum\{15\ min\} >= -Q3/100$

A06 and H06 are activated together with E06.
Holding times are listed in the table below.

Backflow E06

Air in pipe system (no flow rate measurement) E07 / A07 / H07
Activation condition:
E07 is activated if air in pipe is detected for 1 minute.

Deactivation condition:
E07 is deactivated if no air in pipe is detected for 1 minute

A07 and H07 are activated if E07 is active for 72 consecutive hours.
Holding times are listed in the table below.

Low battery E09 / A09 / H09
Activation condition:
E09 is activated 1 ½ years before the calculated end of life date.
current date >= end of life date - 1 1/2 years

Deactivation condition:
E09 is deactivated if current date < end of life date - 1 1/2 years

A09 and H09 are activated together with E09.
Holding times are listed in the table below.

Undersized meter E11 / A11 / H11
Activation condition:
E11 is activated if the flow (with standard measuring rate 0,5 Hz – every 2 seconds) is above the
undersized meter threshold of 1,3 * Q3 for one minute

$\Delta Q\{2\ s\} > 1,3 * Q3$ for 1 minute

Deactivation condition:
E11 is activated if the flow (with standard measuring rate 0,5 Hz – every 2 seconds) is below the undersized meter threshold of 1,3 * Q3 for one minute
$\Delta Q\{2\ s\} <= 1,3 * Q3$ for 1 minute

A11 and H11 are activated after 30 consecutive minutes of active E11.
Holding times are listed in the table below.

No usage E12 / A12 / H12
E12 activation condition:
E12 is activated if the 15 min average consumption is below the no usage threshold for 30 days
Q3 1,0…9,9: $|\Delta Qsum\{15\ min\}| < 8$ l for 30 days
Q3 10…99: $|\Delta Qsum\{15\ min\}| < 80$ l for 30 days
Q3 100…999: $|\Delta Qsum\{15\ min\}| < 800$ l for 30 days
Q3 1000…9999: $|\Delta Qsum\{15\ min\}| < 8000$ l for 30 days

E12 deactivation condition:
E12 is deactivated if the 15 min average consumption is above the no usage threshold
Q3 1,0…9,9: $|\Delta Qsum\{15\ min\}| >= 8$ l
Q3 10…99: $|\Delta Qsum\{15\ min\}| >= 80$ l
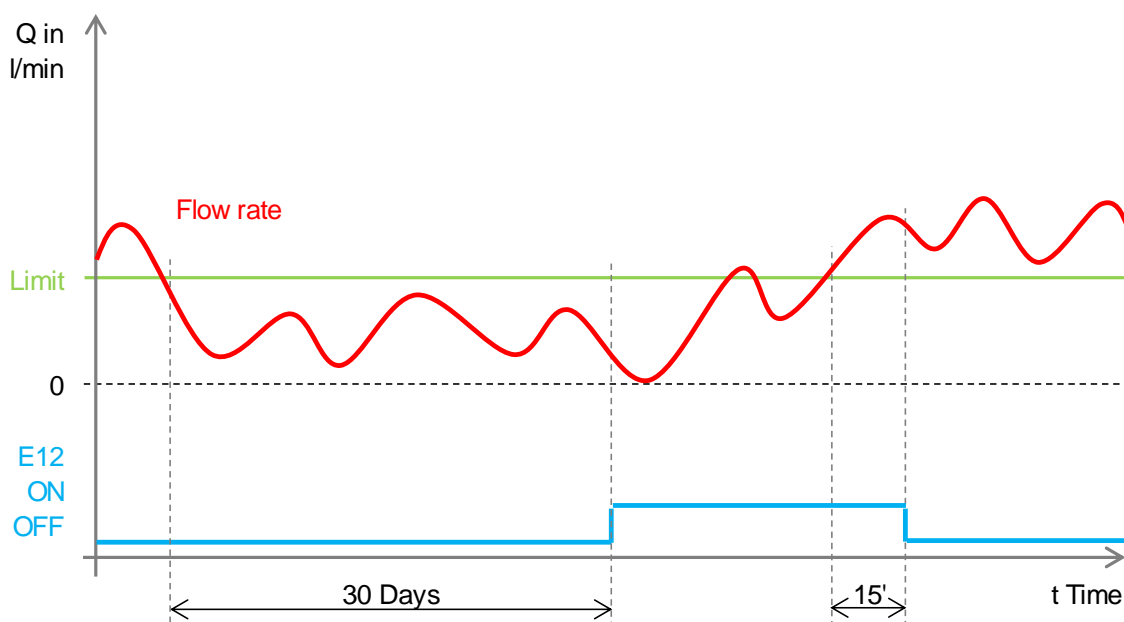Q3 100…999: $|\Delta Qsum\{15\ min\}| >= 800$ l
Q3 1000…9999: $|\Delta Qsum\{15\ min\}| >= 8000$ l

A12 and H12 are activated together with E12.
Holding times are listed in the table below.

No usage E12

High medium temperature E13 / A13 / H13

E13 activation condition:
E13 is activated if the measured medium temperature > 90 °C (KWZ) for 1 minute

E13 deactivation condition:
E13 is deactivated if the measured medium temperature <= 90 °C (KWZ) for 1 minute

A13 and H13 are activated if E13 is active for 60 consecutive minutes.
Holding times are listed in the table below.

Freezing risk E14 / A14 / H14

Activation condition:
E14 is activated if the medium temperature is < 3 °C for 1 minute.

Deactivation condition:
E14 is deactivated if the medium temperature is >= 3 °C for 1 minute

A14 and H14 are activated if E14 is active for 60 consecutive minutes.
Holding times are listed in the table below.

Fallback mode E17 / A17 / H17 – only applies for HYDRUS 2.0 Bulk (DN50 and bigger)

Metrological log access E18 / A18 / H18

Activation condition:
E18 is activated by an entry into the metrological log (only for LAB Role)

Deactivation condition:
E18 never deactivates

A18 and H18 are activated together with E18.
Holding times are listed in the table below.

Measurement interference E22 / A22 / H22

Activation condition:
E22 is activated by cavitation, air-water-mixture, as well as heavy electro-magnetic, or mechanic interferences (vibration), e.g. caused by pumps, other heavy duty equipment close to the meter

Deactivation condition:
E22 is deactivated as soon as heavy electro-magnetic, or mechanic interferences (vibration) have stopped.

A22 and H22 are activated if E22 is active for 7 consecutive days.
Holding times are listed in the table below.

System reset E98 / A98 / H98

Activation condition:
E98 is activated if a system reset is recognized

Deactivation condition:
E98 is deactivated after the system reset is done

A98 and H98 are not implemented.

Any application error E99 / A99 / H99
Activation condition:
E99 is activated if an error in the command execution (only used for bidirectional communication interfaces, i.e. optical communication) is detected

Deactivation condition:
E99 is deactivated after maximum 60 minutes or by receiving a new command or by an ApplicationReset.

A99 and H99 are activated together with E99.
Holding times are listed in the table below.

8.5 Holding times

Holding time:	
A - Continuous Errors	3 days
H - Historic Errors	15 months

The holding time for A - Continuous Errors is 3 days. Continuous Errors are useful for Fixed Network customers. Within 3 days, the continuous error information should be delivered to the customer via Fixed Network.

The holding time for H – Historic Errors is 15 months. Historic Errors are useful for Mobile Walk-By / Drive-By customers. Within 15 months, the historic error information should be delivered to the customer via a Walk-By / Drive-By tour, which usually happens at least once in a year.

Following subjects can be modified ex works by the customer (to be specified in the Customization Sheet):
- Deactivation of specific Current / Continuous / Historic Errors
- Modification of Holding times (same for all Continuous Errors and Historic Errors each)
- Modification of Error thresholds

For Leakage detection E05 / A05 / H05 it is possible to modify the leakage interval in the meter using the IZAR@MOBILE 2 software.

Information about
- which Errors are shown in the display with the respective Error code (and specific errors with a display symbol)
- which Errors are logged with their date and time in the Error Log

are listed in the table above (8.6 Overview errors/alarms (Display, entry in error log)).

8.6 Minimum / maximum flow rate

HYDRUS 2.0 calculates every 15 minute a minimum or maximum flow. The monitoring period is one month. If a new minimum or maximum value is reached in this period, the new value is stored.
It is possible to read out the values using the IZAR@MOBILE 2 software in conjunction with a Bluetooth optohead.

At the end of the month the minimum or flow maximum of this monitoring period is transferred in the periodical log and the values will be reset at the same time. It starts again a new monitoring period. Thus in the periodical log is always stored the minimum or maximum flow of the last monitoring period (last month).

Example calculation of the average flow rate values:

Time	Average flow rate	Minimum flow rate	Maximum flow rate
00:15	13 m³/h	13 m³/h	13 m³/h
00:30	15 m³/h	13 m³/h	15 m³/h
00:45	20 m³/h	8 m³/h	20 m³/h
..			
..			
23:30	10 m³/h	8 m³/h	20 m³/h
23:45	11 m³/h	8 m³/h	20 m³/h
00:00	12 m³/h	8 m³/h	20 m³/h

At 00:00 the monitoring period ends. The values for the minimum flow rate (= 8 m³/h) and maximum flow rate (= 20 m³/h) are now stored. At the end of the month the two values are then taken over into the periodical log and the values are reset for the new monitoring period begins.

8.7 History log 1 (Monthly log)

The History log 1 saves 32 hourly, daily, weekly or monthly entries. The data log is set ex works for saving **data monthly**. The data shown below are logged at 23:59 at the end of each month. The data log can be read out over the optical interface using IZAR@MOBILE 2 software in conjunction with the Bluetooth optohead.

Note:
The History log 1 is a ring memory and has only a limited space available. If the space is occupied, the oldest entry is overwritten with the newest entry in each case. Thus at least 32 entries are always available.

The History log 1 table shown in the IZAR@MOBILE 2 software can be exported as a .csv file and processed in MS Office Excel.

The following data are saved:

	Periodical log
1	Current date
2	Total volume
3	Forward volume
4	Reverse volume
5	Maximum flow
6	Minimum flow
7	Medium temperature
8	Ambient temperature
9	On time
10	Error time
11	Error Status

Description of the values:

1. Current date:

The date and time at the time of entry in the History log 1.

2. Total volume:

Total volume at the time of entry in the History log 1.

3. Forward volume:

Total detected forward volume at the time of entry in the History log 1.

4. Reverse volume:

Total detected reverse volume at the time of entry in the History log 1.

5. / 6. Minimum / Maximum flow:

The minimum/maximum flow rate will be logged once per month in the History log 1.
The minimum or maximum flow value of the last monitoring period (last month) is always stored, see description "8.7. Minimum / maximum flow rate".

7. Medium temperature:

Medium temperature at the time of entry in the History log 1.

8. Ambient temperature:

Ambient temperature at the time of entry in the History log 1.

9. On time:

On time specify since how many hours the meter is in the field mode. The hours are thus summed up monthly.

10. Error time:

The error time specify how many hours the meter ever detects Error E1 and/or E4. The error time are thus summed up monthly.

11. Error Status:

In the field "Error Status" the central error- and alarm register will be emitted at the time of entry in the History log 1, e.g. E7 (Air in the pipe).

8.8 History log 2 (Daily log)

The History log 2 saves 512 hourly, daily, weekly or monthly entries. The data log is set ex works for saving **data daily.**
At the end of every day HYDRUS 2.0 logs the following data for 512 days:

Current Date, Total volume, Ambient temperature °C, Error Status

The data memory is a so-called ring memory; this means after 512 entries, the oldest value is replaced by the newest value (first in - first out).

The memory can read via the optical interface using the Bluetooth Optohead and the IZAR@MOBILE 2 software in conjunction with the Bluetooth optohead.

Description of the values:

1. Current date:

The date and time at the time of entry in the History log 2.

2. Total volume:

Total volume at the time of entry in the History log 2.

3. Ambient temperature °C:

Ambient temperature °C at the time of entry in the History log 2.

4. Error Status

In the field "Error Status" the central error- and alarm register will be emitted at the time of entry in the daily log, e.g. E7 (Air in the pipe).

8.9 Event log

Errors are saved in the Event log with their date and time. The Event log can store up to 127 x 4-byte values and can also be read out over the optical interface using IZAR@MOBILE 2 software and a Bluetooth optohead.

Errors are shown in the log with a 0 or 1 flag. 0 = error not occurred and 1 = error occurred. If an error is no longer existing, HYDRUS sets also an entry with 0 for this error.

Only current errors

Note:
All errors are logged, even if several should be present at the same time.

The error log is is a so-called ring memory; this means after 128 entries, the old values are replaced by the new values, depending on Error priorities.

The error log table shown in the IZAR@MOBILE 2 software can be exported as a .csv file and processed in MS Office Excel.

9. Components / accessories

Seal for housing with thread connection:

DN 15 | connection G3/4B: material number 520408 (2 pieces)
DN 20 | connection G1B: material number 580341 (2 pieces)
DN 20 | connection G5/4B: material number 3011018 (2 pieces)
DN 25 | connection G5/4B: material number 3011018 (2 pieces)
DN 32 | connection G3/2B: material number 580142 (2 pieces)
DN 40 | connection G2B: material number 580343 (2 pieces)

Seal for housing with flange connection:

DN 25/32: Material number 580120 (2 pieces)
DN 40: Material number 580121 (2 pieces)

Check valve:

Article number	Nominal diameter	Overall length	Included
3002044	15 mm	110 mm	Non-return valve 3002044
3017441	15 mm	165 mm 170 mm	Non-return valve 809186 + O-Ring 580422
3065660	20 mm	130 mm	Non-return valve 3065599 + O-Ring 3065602
3017442	20 mm	165 mm 190 mm 220 mm	Non-return valve 809184 + O-Ring 3002823
3089793	20 mm	175 mm	Non-return valve 809185 + O-Ring 580315 + Compensating adapter 3011755
3089793	25 mm	150 mm 175 mm 260 mm	Non-return valve 809185 + O-Ring 580315 + Compensating adapter 3011755
3037565	32 mm	260 mm	Non-return valve 3049923 + O-Ring 3004189 + Compensating adapter 3050085
3108340	40 mm	200 mm 300 mm	Non-return valve 809188 + O-Ring 580348

For DN 20 | overall length 105 mm | G1B, non-return valve not possible
For DN 25 | overall length 135 mm | G5/4B, non-return valve not possible
For DN 25 | overall length 260 mm | flange coupling, non-return valve not possible
For DN 32 | overall length 260 mm | flange coupling, non-return valve not possible
For DN 40 | overall length 300 mm | flange coupling, non-return valve not possible

10. Spare parts

Lid HYDRUS 2.0 Domestic: Material number 3066017

11. Package dimensions / weights

Permanent flow rate	Q3	m³/h	1,6	1,6	1,6	2,5	2,5	2,5
Nominal Diameter	DN	mm	15	15	15	15	15	15
Overall length	L	mm	110	165	170	110	165	170
Weight thread meter without coupling		kg	0.7	0.8	0.8	0.7	0.8	0.8
Weight thread meter with coupling		kg	1.1	1.2	1.2	1.1	1.2	1.2
Weight flange meter		kg	-	-	-	-	-	-
Dimension carton	L x W x H	mm			221 x 140 x 107			
Weight of the carton incl. Inserts		g	105	105	105	105	105	105
Lot size		pcs.	15	15	15	15	15	15
Number of meters per pallet		pcs.	225	225	225	225	225	225

Permanent flow rate	Q3	m³/h	2,5	2,5	4	4	4	4	4
Nominal Diameter	DN	mm	20	20	20	20	20	20	20
Overall length	L	mm	130	190	105	130	175	190	220
Weight thread meter without coupling		kg	0.8	0.9	0.8	0.9	1.0	0.9	1.2
Weight thread meter with coupling		kg	1.2	1.3	1.2	1.3	1.6	1.3	1.4
Weight flange meter		kg	-	-	-	-	-	-	-
Dimension carton	L x W x H	mm				221 x 140 x 107			
Weight of the carton incl. Inserts		g	105	105	105	105	105	105	105
Lot size		St.	15	15	15	15	13	15	15
Number of meters per pallet		St.	225	225	225	225	225	225	225

Permanent flow rate	Q3	m³/h	6.3	6.3	6,3	6,3	6,3	10	10
Nominal Diameter	DN	mm	25	25	25	25	32	25	25
Overall length	L	mm	135	150	175	260	260	135	150
Weight thread meter without coupling		kg	1.0	1.0	1.1	1.4	1.5	1.0	1.0
Weight thread meter with coupling		kg	1.6	1.6	1.7	2.0	2.1	1.6	1.6
Weight flange meter		kg	-	-	-	3.4	4.6		
Dimension carton	L x B x H	mm		221 x 140 x 107		262 x 127 x163		221 x 140 x 107	
Weight of the carton incl. Inserts		g	105	105	105	50	50	105	105
Lot size		St.	15	15	13	9	9	15	15
Number of meters per pallet		St.	225	225	225	144	144	225	225

Permanent flow rate	Q3	m³/h	10	10	10	10	10	16	16
Nominal Diameter	DN	mm	25	25	32	40	40	40	40
Overall length	L	mm	175	260	260	200	300	200	300
Weight thread meter without coupling		kg	1.1	1.4	1.5	1.8	2.6	1.8	2.6
Weight thread meter with coupling		kg	1.7	2.0	2.1	3.0	3.8	3.0	3.8
Weight flange meter		kg	-	3.4	4.6	-	6.3	-	6.3
Dimension carton	L x B x H	mm	221 x 140 x 107	262 x 127 x163		235 x 170 x 160	300 x 180 x 280	235 x 170 x 160	
Weight of the carton incl. Inserts		g	105	50	50	370	800	370	800
Lot size		St.	14	9	9	5	5	5	5
Number of meters per pallet		St.	225	144	144	70	70	70	70

12. HYDRUS documentation

The following additional documents are valid in conjunction with the product specification and can be found on our home page at www.diehl.com/metering

- Data Sheet
- User Guide
- Installation guide
- Configuration Sheet
- Communication Description
- IZAR@MOBILE 2 Manual (Can be requested from Diehl Metering if required)
- Inspection and Test Instruction