

BEDIENUNGSANLEITUNG
OPERATING MANUAL

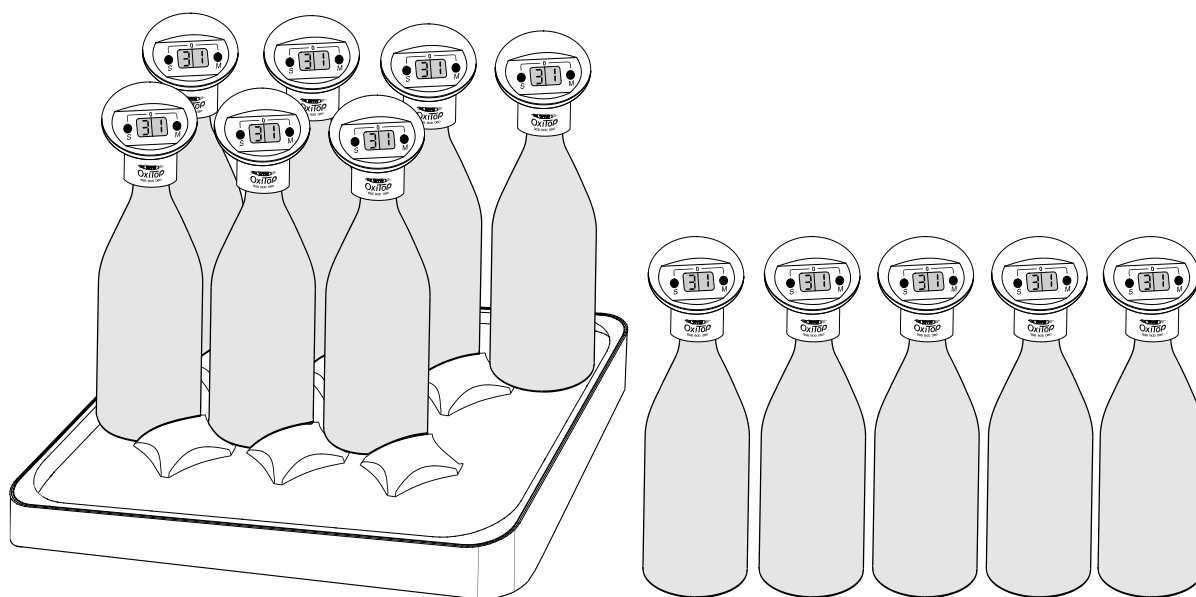
ba31107de05 07/2017

OxiTop® IS 6 / IS 12



Manometrische BSB-Messgeräte

OxiTop® IS 6 OxiTop® IS 12



BSB = Biochemischer Sauerstoffbedarf



Bitte lesen Sie diese Informationen vor der Inbetriebnahme des Gerätes!

Dieses Gerät ist gemäß IEC 1010, Sicherheitsbestimmungen für elektronische Messgeräte, gebaut und geprüft und hat das Werk in sicherheitstechnisch einwandfreiem Zustand verlassen.

Die einwandfreie Funktion und Betriebssicherheit des Gerätes kann nur dann gewährleistet werden, wenn bei der Benutzung die allgemein üblichen Sicherheitsvorkehrungen sowie die speziellen Sicherheitshinweise in dieser Bedienungsanleitung beachtet werden.

- Vor dem Verbinden des Steckernetzgerätes mit dem Stromversorgungsnetz ist sicherzustellen, daß die am Steckernetzgerät angegebene Betriebsspannung mit der Netzspannung übereinstimmt. (Angabe der Bereiche der Spannungsversorgung)
- Achtung Magnetismus. Auswirkungen des Magnetfeldes sind zu beachten (z.B. Datenträger, Herzschrittmacher).
- Die einwandfreie Funktion und Betriebssicherheit des Gerätes kann nur unter den klimatischen Verhältnissen, die im Kapitel "Technische Daten" in dieser Bedienungsanleitung spezifiziert sind, eingehalten werden.
- Wird das Gerät von einer kalten in eine warme Umgebung transportiert, so kann durch Kondensatbildung eine Störung der Gerätefunktion eintreten. In diesem Fall muß die Angleichung der Gerätetemperatur an die Raumtemperatur vor einer erneuten Inbetriebnahme abgewartet werden.
- Abgleich-, Wartungs- und Reparaturarbeiten dürfen nur von einer von uns autorisierten Fachkraft ausgeführt werden.
- Wenn anzunehmen ist, daß das Gerät nicht mehr gefahrlos betrieben werden kann, so ist es außer Betrieb zu setzen und vor einer weiteren Inbetriebnahme durch Kennzeichnung zu sichern.
- Die Sicherheit des Benutzers kann durch das Gerät beeinträchtigt sein, wenn es zum Beispiel
 - sichtbare Schäden aufweist,
 - nicht mehr wie vorgeschrieben arbeitet,
 - längere Zeit unter ungeeigneten Bedingungen gelagert wurde,
 - erschwerten Transportbedingungen ausgesetzt war.
- In Zweifelsfällen sollte das Gerät grundsätzlich an den Hersteller zur Reparatur bzw. Wartung eingeschickt werden.

Inhaltsverzeichnis

Bedienungsanleitung Manometrische BSB-Messgeräte

OxiTop® IS 6 / IS 12

Empfohlener Einsatzbereich	6
Lieferumfang	6

Bedienungsanleitung Bedienung des

Einzelmesssystems OxiTop® 7

Messprinzip	7
BSB ₅ -Bestimmung	8
Benötigte Geräte und Zubehör	8
Probenvolumen wählen	8
Probenvorbereitung	8
Messung	9
Störungen	11
Systemmeldungen	11
Reinigung	12
Batteriewechsel	12
Hinweise	13
Technische Daten OxiTop® -Einzelmesssystem	13

Bedienungsanleitung

Inductive Stirring System IS 6 / IS 12 14

Netzbetrieb	15
Bedienungshinweise	16
Hinweise	16
Empfohlenes Zubehör	17
Ersatzteile	17
Technische Daten	18
Prüfzertifikate EMV	19
Technische Kundenberatung	21

Empfohlener Einsatzbereich

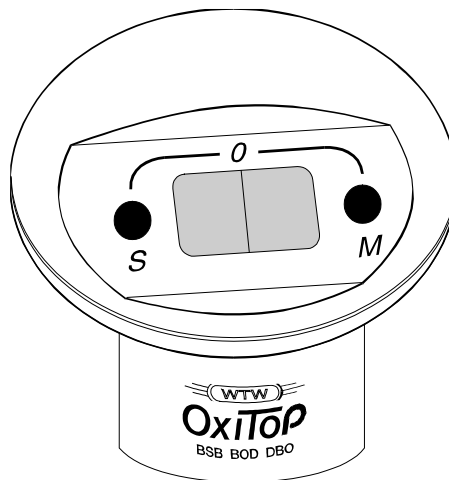
OxiTop®-Messsysteme mit Inductive Stirring System zur respirometrischen Bestimmung des Biochemischen Sauerstoffbedarfs (BSB) nach dem Eigenkontrollverfahren.

Lieferumfang

Modell	OxiTop® IS 6	OxiTop® IS 12
Bestell-Nr.	208 210	208 211
Inductive Stirring System Rührplattform Ausstattung	6 Messstellen 3 OxiTop® gelb 3 OxiTop® grün	12 Messstellen, 6 OxiTop® gelb 6 OxiTop® grün
<u>Zubehör:</u> Zubehörset 1 (Probeflasche braun, Rührstäbchen, Gummiköcher)	6 x	12 x
Zubehörset 2 (Rührstabentferner, Überlauf- messkolben 164 ml und 432 ml, Natriumhydroxid-Plätzchen, Diagrammblock)	1 x	1 x

Bedienung des Einzelmesssystems

OxiTop®



Messprinzip

Die BSB-Bestimmung mit dem OxiTop®-Messsystem basiert auf einer Druckmessung (Differenzmessung). Die Messwerterfassung erfolgt mittels Druckmessung über **piezoresistive elektronische Drucksensoren**.

Das OxiTop®-Messsystem ist durch folgende Funktionen speziell auf die Abläufe der respirometrischen BSB-Messung angepaßt, um den Messaufwand zu minimieren:

- **AUTO TEMP - Funktion:**

Kontrolle der **Temperaturanpassung** und **automatischer Start** der Messung (frühestens 1 Std., spätestens 3 Std. nach Starten des OxiTop®-Messsystems). Ein Vortemperieren auf genau 20°C ist nicht mehr erforderlich! Die Proben können bereits mit einer Temperatur von 15°C - 20°C eingesetzt werden. Die weitere Kontrolle übernimmt "AutoTemp".

- **Messwertspeicher:**

Automatische Messung mit täglicher Messwertspeicherung über 5 Tage: ermöglicht Messungen ohne Überwachung, z.B über das Wochenende.

- **Momentanwert**

Messwertanzeige (0 - 40 Digit) entspricht den Skalenteilen bisheriger WTW-BSB-Geräte.

Umrechnung von mbar zu Skalenteilen im Gerät gespeichert, d.h. die Auswertung der Messergebnisse bleibt unverändert.

- **Messbereichsreserve**

von 40 ... 50 Digit - für Messbereichsüberschreitungen ohne Nachbelüftung

BSB₅-Bestimmung

Kommunales Abwasser enthält normalerweise keine toxischen oder hemmenden Substanzen. Es sind genügend Nährsalze und geeignete Mikroorganismen vorhanden. Unter diesen Voraussetzungen ist die **BSB₅-Bestimmung in der unverdünnten Probe** mit dem OxiTop®-Messsystem möglich.

Benötigte Geräte und Zubehör

- OxiTop®-Messsystem
- Inductive Stirring System
- Thermostatschrank/-box (Temperatur 20°C ± 1K)
- Probeflaschen braun (Nennvolumen 510 ml)
- Rührstäbchen
- Rührstabentferner
- geeignete Überlaufmesskolben
- Gummiköcher
- Natriumhydroxid-Plätzchen

Probevolumen wählen

Abschätzung des für die Abwasserprobe zu erwartenden BSB₅-Werts:

Erwarteter BSB₅-Wert ≈ 80 % des CSB-Werts

Entsprechenden Messbereich in der folgenden Tabelle suchen und zugehörige Werte für Probevolumen und Faktor entnehmen.

Probevolumen (ml)	Messbereich (mg/l)	Faktor
432	0 - 40	1
365	0 - 80	2
250	0 - 200	5
164	0 - 400	10
97	0 - 800	20
43,5	0 - 2000	50
22,7	0 - 4000	100

Probenvorbereitung

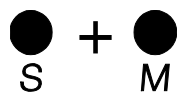
Siehe folgende WTW-Applikationsberichte:

- WTW-Applikationsbericht 895230:
"BSB-Messung in häuslichen Abwässern"
- WTW-Applikationsbericht 895231:
"BSB-Messung in organisch stark belasteten Abwässern"
- WTW-Applikationsbericht 895232:
"BSB-Messung bei Anwesenheit hemmender oder toxischer Stoffe"

Messung

Hinweise: Zum Abmessen des Messgutvolumens werden üblicherweise Überlaufmesskolben oder Messzylinder verwendet. Das Volumen entsprechend des zu erwartenden Messwertes auswählen, zu groß gewählte Messbereiche führen zu ungenauen Ergebnissen. Zum Abschätzen des Messwertes kann mit etwa 80% des CSB-Wertes gerechnet werden.

- **Probenvorbereitung und Befüllen der Messflaschen** vgl. folgende Vorschrift: DIN 38409 Teil 52: "Messung der Sauerstoffzehrung" sowie WTW-Applikationsberichte siehe Kapitel "Probenvorbereitung".
- Messflasche **mit der Wasserprobe vorspülen** - gut austropfen -.
- Erforderliche sauerstoffgesättigte (gut homogenisierte) **Probenmenge gemäß Hinweise genau abmessen**.
- **Magnetrührstäbchen** in die Messflasche geben.
- In den Flaschenhals einen **Gummiköcher** einsetzen.
- **2 Natriumhydroxid-Plättchen** mit einer Pinzette in Gummiköcher legen. (Achtung: Plättchen dürfen keinesfalls in die Probe gelangen!)
- OxiTop® auf **Messflasche** direkt aufschrauben (dicht verschließen).



Messung starten:

S und M gleichzeitig drücken (2 Sekunden) bis Anzeige auf 00 wechselt.



2 sec



Anzeige: Gespeicherte Werte sind gelöscht.

- Messflasche mit aufgesetztem OxiTop® **fünf Tage bei 20°C inkubieren** (z.B. Thermostatschrank/-box). Nach Erreichen der Messtemperatur (frühestens nach 1 Std., spätestens nach etwa 3 Std.; **AutoTemp-Funktion**), beginnt das OxiTop® automatisch mit der Messung des Sauerstoffverbrauchs.
- Während der 5 Tage die Wasserprobe **ständig rühren**. Das OxiTop® **speichert über 5 Tage automatisch alle 24 Std.** einen Messwert. Zur Abfrage des aktuellen Messwertes Taste M drücken.



Aktuellen Messwert anzeigen:

M drücken bis Messwertanzeige (1 Sekunde)

z.B.



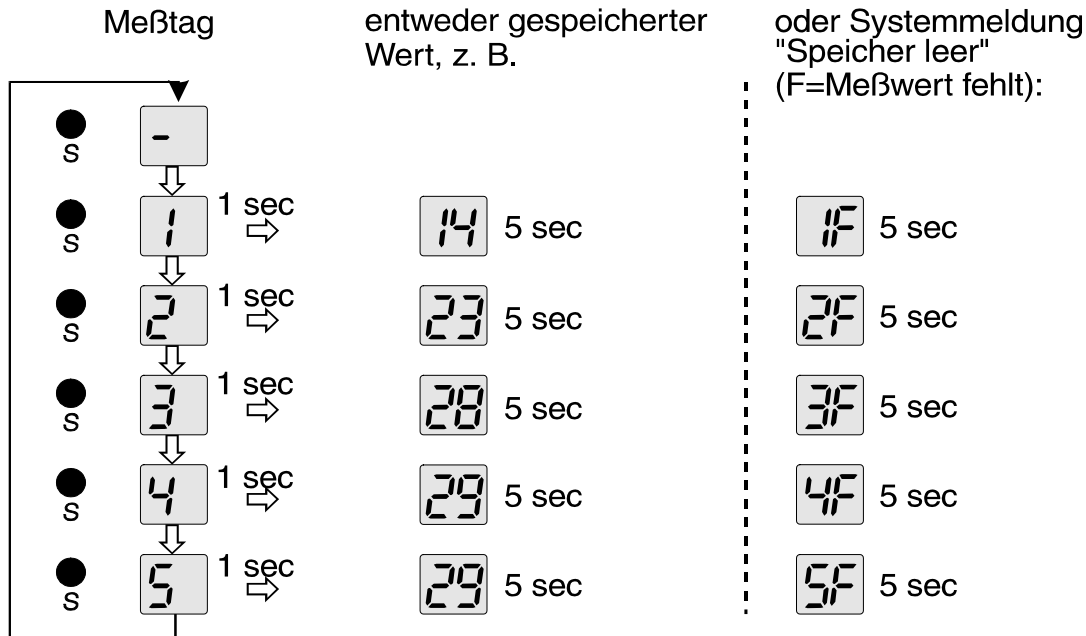
- Nach Ablauf der 5 Tage die **gespeicherten Messwerte auslesen**.



Gespeicherte Messwerte auslesen:

S drücken bis Messwertanzeige (1 Sekunde)

Weiterblättern zum nächsten Tag durch erneutes Drücken der Taste S während der Messwertanzeige (5 sec). Schnelles Weiterblättern durch Mehrfachbetätigung der Taste S.



- Angezeigten Messwert in Skalenteilen mit Hilfe folgender Tabelle in den BSB-Wert umrechnen (Skalenteile x Faktor = BSB5 in mg/l):

Probenvolumen (ml)	Messbereich (mg/l)	Faktor
432	0 - 40	1
365	0 - 80	2
250	0 - 200	5
164	0 - 400	10
97	0 - 800	20
43,5	0 - 2000	50
22,7	0 - 4000	100

Störungen

- **Messbereichsunterschreitungen**
Anzeige zeigt Null oder ein zu geringer Messwert.
Die Messanordnung ist undicht.
Gummiköcher, Schraubverschluß und Flasche prüfen.
Unzureichende Probenvorbehandlung, mangelnde Probenkonservierung.
Die Temperatur des Messgutes war nicht ausreichend angeglichen ($< 15^{\circ}\text{C}$).
- **Messbereichsüberschreitungen**
Es wurde ein zu kleiner Messbereich gewählt. Bei sehr hohen Werten ($> 2000 \text{ mg/l}$) empfiehlt sich die Probenvorverdünnung.
Fehlender, mangelnder Nitrifikationshemmstoff (ATH).

Nicht aufgeführt sind verfahrensbedingte Fehler.

Systemmeldungen



Speicher leer ( = Messwert 1.Tag fehlt)



Batterien wechseln (ca. alle 3 Jahre)



Messbereichsunterschreitung < 0 Digit



Messbereichsüberschreitung > 50 Digit

Reinigung

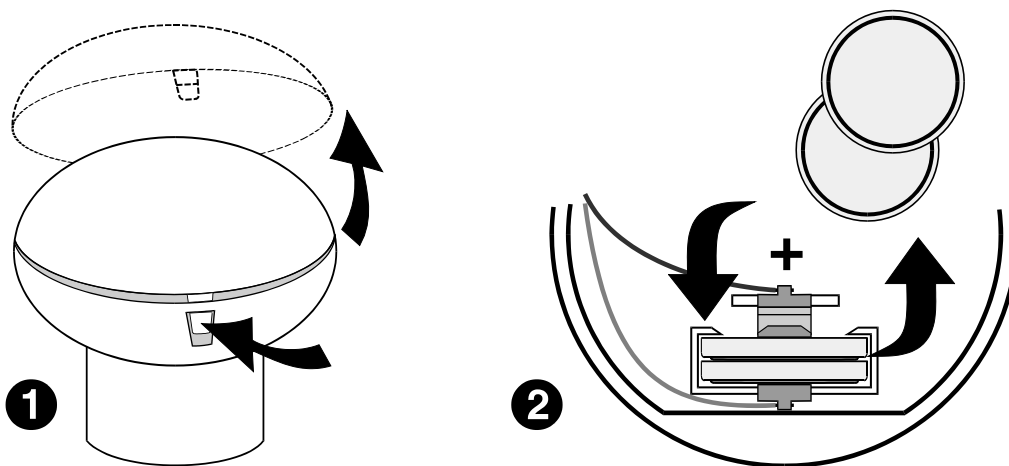
Reinigung der Messflaschen

- **Keine Desinfektionsmittel** verwenden! (Desinfektionsmittel töten die benötigten Mikroorganismen!)
- **Grobe Verunreinigungen** mechanisch entfernen, z.B. mit einer **Bürste**.
- Die Flaschen mit **klarem Wasser** oder mit **Wasser der nächsten Probe** spülen. (Nach Einsatz von Reinigungsmitteln gründlich spülen! Reinigungsmittelreste können die BSB₅-Bestimmung stören!)

Reinigung des OxiTop®-Einzelmesssystems

- **Keinen Alkohol oder Aceton** verwenden!
- Mit weichem Tuch und wässriger Seifenlösung reinigen

Batteriewechsel (ca. alle 3 Jahre)



- 1 - Schnapphalterung eindrücken.
- Oberschale öffnen.
- 2 - Batterien herausnehmen.
- Neue Batterien einsetzen, dabei auf Polung achten!
(z.B. WTW-Modell **Batt/OxiTop®**, Bestell-Nr. 209 012).
- Oberschale mit Lasche in Verriegelungsstift (Unterschale) einsetzen.
Achtung! Kabelverbindung nicht quetschen!
- Oberschale schließen (Haken einschnappen lassen).

Entsorgungshinweis:

Die Lithiumbatterien ordnungsgemäß an Batterie-Sammelstellen entsorgen.

Hinweise



Bitte verwenden Sie für Ihre OxiTop®-Messköpfe **auf keinen Fall Dichtungsfett oder sonstige Schmierstoffe**. Manche dieser Produkte enthalten Lösemittel, die schwere Schäden am Kunststoffgehäuse hervorrufen. Die Dichtigkeit der BSB-Flaschen ist auch ohne Fett völlig ausreichend. Grobe Verschmutzungen und Partikel auf den Dichtflächen von Gummiköcher und OxiTop® müssen aber in jedem Fall abgewischt werden. Für Schäden durch Anwendung von Dichtungsfett übernimmt WTW keine Gewährleistung.

Flaschenkennzeichnung:

Zur eindeutigen Kennzeichnung der Flaschen bietet WTW einen Markierungssatz an (6 Markierungsringe mit Nummern, die auf den Flaschenhals aufsetzbar sind):

Modell: **MARK-6** (6 Stück)
Bestell-Nr. 209 013.

Prüfung des Messsystems:

WTW bietet zur Prüfmittelüberwachung auf Anfrage spezielle Prüfmittel an.

Weiterführende Literatur:

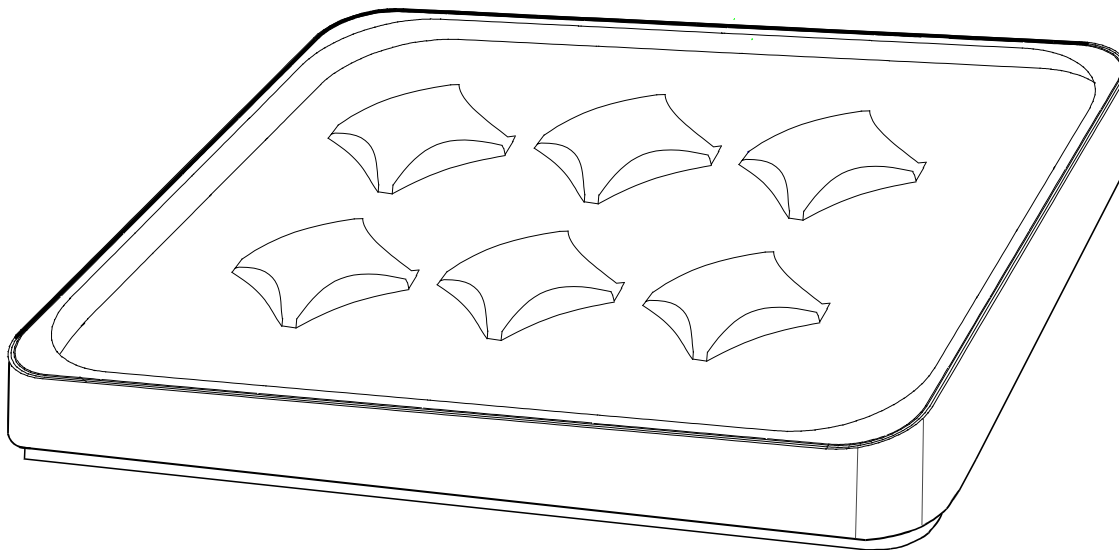
WTW BSB-Fibel
DIN 38409T51
DIN 38409T52

Technische Daten OxiTop®-Einzelmesssystem

Messprinzip	Respirometrisch (manometrisch)
Anzeige	2-stellige 7-Segment LED, 10 mm
Messgröße	Skalenteile
Messbereich	0 ... 40 Digit (+10 Digit für Messbereichsüberschreitung)
Zulässige Messtemperatur	20°C ± 1 K
Zulässige Probertemperatur (bei Befüllung)	15-20°C
Energieversorgung	Lithium-Batterien (260 mAh), 2 x Typ CR 2430 (3V)
Stromaufnahme	Max. 25 mA (bei Messung)
Gerätesicherheit	Schutzklasse 3 IEC 1010 Schutzart IP 54 IEC 529
EMV Störaussendung	EN 50081-1, FCC Class A
Störfestigkeit	EN 50082-2, NAMUR-Empfehlung
Klimaklasse	2, VDI/VDE 3540
Umgebungstemperatur	Lagerung: -25°C ... +65°C Betrieb: +20°C ± 1K
Prüfzeichen	CE
Abmessungen	H: 69 mm, Ø 70 mm
Gewicht	Ca. 85 g

Inductive Stirring System

IS 6
IS 12



Netzbetrieb

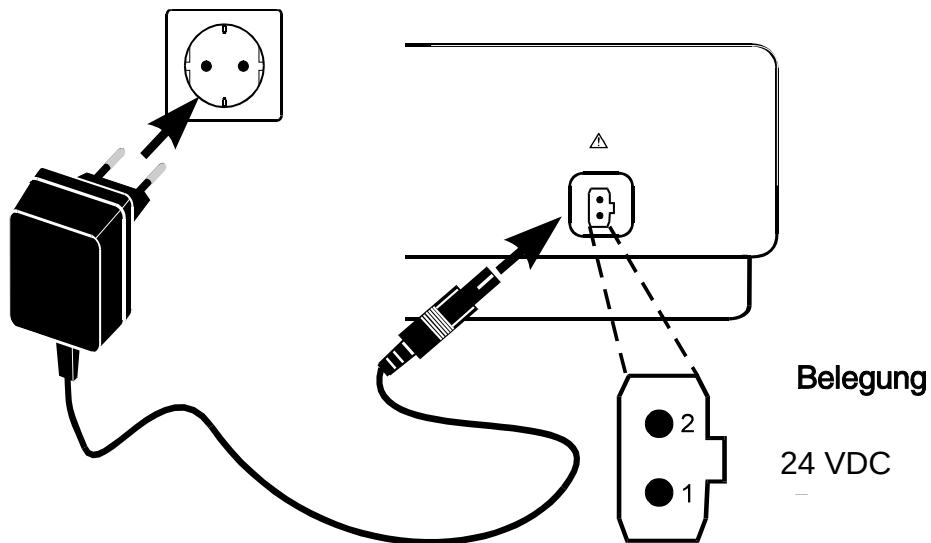
Verwenden Sie nur Original-Steckernetzgeräte (siehe Kapitel TECHNISCHE DATEN).



Die Netzspannung muß mit der am Netzsteckertrafo angegebenen Betriebsspannung übereinstimmen!



Steckernetzgerät am Stromnetz und am Gerät einstecken.



Bedienungshinweise

- Gerät in Thermostatschrank oder Thermostatenbox einsetzen.
- Netzsteckertrafo in Netzsteckdose stecken.
- Netzsteckertrafo am Gerät anschließen. Nach kurzer Wartezeit erfolgt automatisch der Aufbau des Inductiven Drehfeldes und damit der Anlauf der Rührstäbchen.
- Vorbereitete Probenflaschen auf IS 6 / IS 12 Inductive Stirring System stellen.

Hinweise

- Intervallgesteuertes Inductive Stirring System mit programmgesteuertem Rührverfahren.
Damit erfolgt ein optimaler Austausch zwischen dem Luftraum und der Probe. Über die automatische, zyklisch gesteuerte Rührstabzentrierung mit Drehfeldsynchronisation wird ein sicherer Rührbetrieb gewährleistet. Auch außer Tritt geratene Magnetrührsäbe werden wieder "eingefangen". Damit können Probenflaschen auch auf im Betrieb befindliche IS 6 / IS 12 Rührsysteme gestellt werden.
Die Geräte arbeiten ohne mechanisch bewegte Teile und sind verschleiß- und wartungsfrei.
- **Zur Gewährleistung einer optimalen und sicheren Rührfunktion nur Original WTW-Rührstäbe RST 600 verwenden.**
- Falls der Rührbetrieb einmal nicht anläuft, Netzsteckertrafo aus der Netzsteckdose ziehen und dann wieder einstecken. Dies bewirkt das Anlaufen der Rührstäbchen.
- Reinigung mit weichem Tuch und wäßriger Seifenlösung (**kein Alkohol oder Aceton!**).

Empfohlenes Zubehör

	Modell	Bestell-Nr.
Lagergestell für 6 OxiTop®-Messsysteme	St-OxiTop®	209 010
Satz Markierungsringe (6 St.) mit Satz Kennzeichnungsschilder (1-12) zur Flaschenkennzeichnung	Mark-6	209 013
Ersatzbatterien (1 Satz)	Batt/OxiTop®	209 012
Umrüstsatz für 2 Messstellen, komplett mit je 1 OxiTop®-Messsystem grün und gelb, 1 Flasche, 1 Köcher, 1 Magnetrührstab	OxiTop® SET-2	208 819
Überlaufmesskolben Inhalt		
22,7 ml	MK 22/60	209 030
43,5 ml	MK 43/600	209 040
97,0 ml	MK 97/600	209 050
164 ml	MK 164/600	209 060
250 ml	MK 250/600	209 070
365 ml	MK 365/600	209 080
432 ml	MK 432/600	209 090

Ersatzteile

	Modell	Bestell-Nr.
Ersatzmesssystem OxiTop®, Farbe gelb	OxiTop®/GB	208 810
Ersatzmesssystem OxiTop®, Farbe grün	OxiTop®/GN	208 800
Probeflasche braun	PF 600	209 100
Rührstäbchen	RST 600	209 120
Gummiköcher	GK 600	209 170
Rührstabentferner	REF 600	209 130
Natriumhydroxid-Plätzchen	NHP 600	209 140
Nitrifikationshemmer (ATH-Lösung 250 ml)	ATH 600	209 330
Diagrammblock	Dia/600	209 020

Technische Daten

Energieversorgung	Weitbereichs-Steckernetzgerät mit Euro-, US-, UK- und Austr.-Stecker: <u>Friwo FW7556 / 24</u> Friwo Part. No.1830829 Input: 100 ... 240 V ~ / 50 ... 60 Hz / 400 mA Output: 24 V DC / 750 mA
Leistungsaufnahme	24 VA max
Drehzahl der Rührstellen	programmgeführt 180 ... 450 min ⁻¹
Gerätesicherheit	• Schutzklasse 3, EN 61010-1 • Schutzart IP30
EMV	EN 61326-1/FCC Klasse A
Umgebungstemperatur	Lagerung: - 25°C ... + 65°C Betrieb : + 5°C ... + 40°C
Relative Feuchte	Jahresmittel: < 75 % 30 Tage/Jahr: < 95 % übrige Tage: < 85 %
Prüfzeichen	CE
Abmessungen (mm)	IS 6, IS 6 / 120 (B)265 x (T)181 x (H)67 IS 12, IS 12 / 120 (B)350 x (T)266 x (H)67
Gewicht (inklusive Netzsteckertrafo)	IS 6, IS 6 / 120 1,6 kg IS 12, IS 12 / 120 3,2 kg

Prüfzertifikat EMV: IS 6

SENTON

■ EMV-Prüfzentrum ■ EMI/EMC-Testcenter ■

GUTACHTEN

*über die elektromagnetische Verträglichkeit
zum Prüfbericht Nr. 52501-51217-1/-2*

Prüfling: IS 6
Beschreibung: Rührer
Auftraggeber: WTW GmbH
Prüfgrundlagen: EN 50081-1:1992
 FCC part 15 subpart B
 EN 50082-2:1995
 Namur Empfehlung 5/1993

Prüfergebnis:

Die Prüflinge entsprechen den Anforderungen der Störaussendung und der Störfestigkeit nach o. a. Prüfgrundlagen. Es wurden folgende Verträglichkeitswerte erreicht:

Störemissionen

EN 55011:1991 Grenzwertklasse B, Gruppe 1
 FCC part 15 subpart B Grenzwertklasse A

Störfestigkeit

Elektrostatische Entladungen	Kontaktentladung	4 kV
IEC 801-2:1991	Luftentladung	8 kV
Elektromagnetische Felder	80 - 1000 MHz	10 V/m
ENV 50140:1993	Rundfunkfrequenzbereich	3 V/m
ENV 50204:1995	900 ± 5 MHz (pulsmoduliert)	10 V/m
Schnelle transiente Störgrößen	Netzleitung (Wechselstrom)	2 kV
IEC 801-4:1988		
Stoßspannungen	Netzleitung symmetrische Einkopplung	1 kV
IEC 801-5	Netzleitung unsymmetrische Einkopplung	2 kV
Leitungsgeführte Störgrößen	150 kHz - 80 MHz	10 Veff
ENV 50141:1993	Rundfunkfrequenzbereich	3 Veff
Einschaltstrombegrenzung	Einschaltstrom (Peak)	≤ 15 x I _N
Namur Empfehlung 5/1993		
Netzspannungsunterbrechung	Unterbrechungszeit	≥ 20 ms
Namur Empfehlung 5/1993		
Netzversorgungstoleranzen	Netzspannung	U _N +20 %/-15 %
Namur Empfehlung 5/1993	Netzfrequenz	F _N ± 6 %
50 Hz-Magnetfelder		30 A/m
EN 61000-4-8		

Straubing, 17. Januar 1996


 Senton GmbH
 Johann Roidt

SENTON GmbH · EMV-Prüfzentrum · Äußere Frühlingsstraße 45 · 94315 Straubing · Tel. 094 21/420 81

Prüfzertifikat EMV: IS 12

SENTON

■ EMV-Prüfzentrum ■ EMI/EMC-Testcenter ■

GUTACHTEN

über die elektromagnetische Verträglichkeit
zum Prüfbericht Nr. 52501-51218-1/-2

Prüfling: IS 12
Beschreibung: Rührer
Auftraggeber: WTW GmbH
Prüfgrundlagen: EN 50081-1:1992
 FCC part 15 subpart B
 EN 50082-2:1995
 Namur Empfehlung 5/1993

Prüfergebnis:

Die Prüflinge entsprechen den Anforderungen der Störaussendung und der Störfestigkeit nach o. a. Prüfgrundlagen. Es wurden folgende Verträglichkeitswerte erreicht:

Störemissionen

EN 55011:1991 Grenzwertklasse B, Gruppe 1

FCC part 15 subpart B Grenzwertklasse A

Störfestigkeit (siehe Prüfbericht Nr. 52501-51217-1 für IS 6)

Elektrostatische Entladungen Kontaktentladung 4 kV

IEC 801-2:1991 Luftentladung 8 kV

Elektromagnetische Felder 80 - 1000 MHz 10 V/m

ENV 50140:1993 Rundfunkfrequenzbereich 3 V/m

ENV 50204:1995 900 ± 5 MHz (pulsmoduliert) 10 V/m

Schnelle transiente Störgrößen Netzleitung (Wechselstrom) 2 kV

IEC 801-4:1988

Stoßspannungen Netzleitung symmetrische Einkopplung 1 kV

IEC 801-5 Netzleitung unsymmetrische Einkopplung 2 kV

Leitungsgeführte Störgrößen 150 kHz - 80 MHz 10 Veff

ENV 50141:1993 Rundfunkfrequenzbereich 3 Veff

Einschaltstrombegrenzung Einschaltstrom (Peak) ≤ 15 x I_N

Namur Empfehlung 5/1993

Netzspannungsunterbrechung Unterbrechungszeit ≥ 20 ms

Namur Empfehlung 5/1993

Netzversorgungstoleranzen Netzspannung U_N +20 %/-15 %

Namur Empfehlung 5/1993 Netzfrequenz F_N ± 6 %

50 Hz-Magnetfelder 30 A/m

EN 61000-4-8


 Senton GmbH
 Johann Roidt

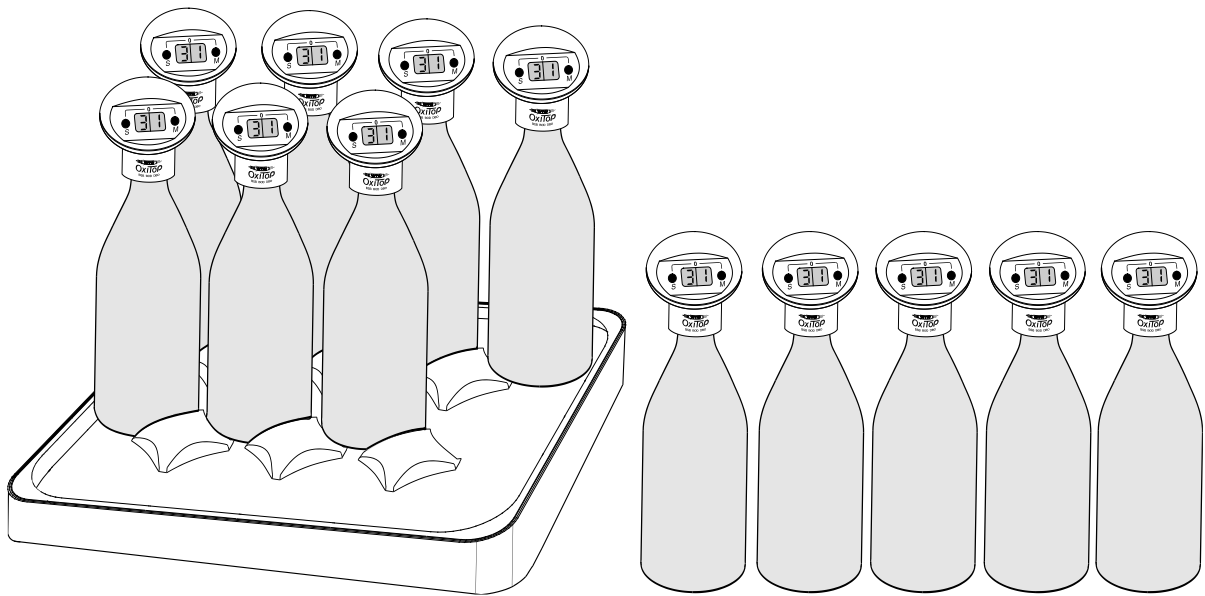
Straubing, 17. Januar 1996

SENTON GmbH · EMV-Prüfzentrum · Äußere Frühlingsstraße 45 · 94315 Straubing · Tel. 094 21 / 4 20 81



Manometric BOD Measuring Devices

OxiTop® IS 6 OxiTop® IS 12



BOD = Biochemical Oxygen Demand



Please read this information carefully before putting the device into service!

This device has been built and tested according to the IEC 1010 safety standards for electronic measuring instruments and has left our works in a condition complying with all the requirements of technical safety.

The perfect functioning and operational safety of the instrument can only be ensured if the user observes the normal safety precautions as well as the specific safety guidelines stated in the present operating instruction.

- Before connecting the plug-in power supply unit to the electricity supply network, it must be ensured that the operating voltage stated on the plug-in power supply unit corresponds to the mains voltage (statement of the supply voltage range).
- Attention. Magnetism! Effects of the magnetic field have to be taken into account (e.g. data carriers, cardiac, cardiac pacemakers...).
- The perfect functioning and operational safety of the instrument can only be maintained under the climatic conditions specified in the "Technical data" section of these operating instructions.
- When the instrument is moved from cold to warm surroundings, condensate may occur and interfere with the functioning of the instrument. In such a case, the user should wait until the temperature of the instrument has adapted to the ambient temperature before using the instrument again.
- Balancing, maintenance and repair work must only be carried out by a suitably qualified technician authorized by us.
- If there is reason to assume that the instrument can no longer be employed without a risk, it must be set aside and appropriately marked to prevent further use.
- The safety of the user may be endangered, e.g., if the instrument
 - shows visible damage,
 - no longer operates as specified,
 - has been stored over a longer period under unsuitable conditions,
 - has been subjected to difficult conditions during transport.
- If in doubt, the instrument should as a rule be sent back to the manufacturer for repair and maintenance.

Contents

Instruction manual Manometric BOC Measuring Devices

OxiTop® IS 6 / IS 12

Recommended range of application	26
Delivery equipment	26

Instruction manual Operation of the Single Measuring

System OxiTop® 27

Measuring principle.....	27
BOD ₅ determination	28
Required instruments and accessories	28
Selection of sample volume	28
Sample preparation	28
Measurement.....	29
Disturbances.....	31
System messages	31
Cleaning	32
Battery replacement	32
Information.....	33
Technical data OxiTop® single measuring system.....	33

Instruction manual

Inductive Stirring System IS 6 / IS 12 34

Mains power supply	35
Operation notes	36
Information.....	36
Recommended accessories	37
Spare parts	37
Technical data	38
Test certificate EMC	39

Recommended range of application

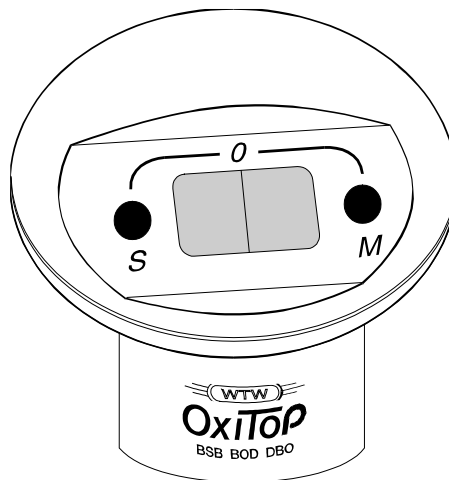
OxiTop® measuring systems with inductive stirring system, for respirometric determination of the biochemical oxygen demand (BOD) according to the self-checking method.

Delivery equipment

Model	OxiTop® IS 6	OxiTop® IS 12
Order Nr.	208 210	208 211
Inductive stirring system (Stirring device) Equipment <u>Accessories:</u> Accessory set 1 (brown sample bottle, stirring rods, rubber quivers)	6 OxiTop® instruments 3 OxiTop® yellow 3 OxiTop® green 6 x	12 OxiTop® instruments 6 OxiTop® yellow 3 OxiTop® green 12 x
Accessory set 2 (stirring rod remover, overflow measuring beaker 164 ml and 432 ml, sodium hydroxide tablets, note block)	1 x	1 x

Operation of the Single Measuring System

OxiTop®



Measuring principle

BOD measurement with the OxiTop® measuring system is based on pressure measurement (difference measurement). The measuring is made by pressure measurement via **piezoresistive electronic pressure sensors**.

With the following functions, the OxiTop® measuring system minimizes the measuring work and is especially suited to the courses of the respirometric BOD measurement:

- **AUTO TEMP function:**

Control of the **temperature adjustment** and **automatic start** of the measurement (1 hour after starting the OxiTop® measuring system at the earliest, after 3 hours at the latest). It is not necessary to temper the samples to exactly 20°C before starting OxiTop®. Samples between 15°C and 20°C can be started immediately as BOD measurement will not begin until a stable 20°C is reached. This is controlled by the "AutoTemp" feature.

- **Data logging**

Automatic measurement with daily storage of measured value for 5 days: facilitates measurement without supervising, e. g. over the weekend.

- **Current value**

Indication of measured value (0 - 40 digits) corresponds to the digits of the previous WTW BOD instruments. Conversion of mbar to digits is stored in the instrument, i. e. evaluation of the measured values remains unchanged.

- **Measuring range reserve**

from 40 to 50 digits - for overranging without reset by opening the bottle.

BOD₅ determination

Normally municipal wastewater does not contain toxic or impeding substances. There are enough nutrient salts and suitable microorganisms. Under these conditions the **BOD₅ determination** with the OxiTop® measuring system is possible **in the undiluted sample**

Required instruments and accessories

- OxiTop® measuring system
- Inductive stirring system
- Incubator thermostatic box (temperature 20°C ± 1K)
- Sample bottles brown (nominal volume 510 ml)
- Stirring rods
- Stirring rod remover
- suitable overflow measuring beakers
- Rubber quivers
- Sodium hydroxide tablets

Selection of sample volume

Estimate the BOD₅ value to be expected for the wastewater sample:

Expected BOD₅ value ≈ 80 % of the COD value

Look for corresponding measuring range in the following chart and gather correct values for sample volume and factor.

Sample volume (ml)	Measuring range (mg/l)	Factor
432	0 - 40	1
365	0 - 80	2
250	0 - 200	5
164	0 - 400	10
97	0 - 800	20
43.5	0 - 2000	50
22.7	0 - 4000	100

Sample preparation

See following WTW application reports:

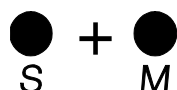
- WTW Application report 895230:
"BOD measurement in household wastewater"
- WTW Application report 895231:
"BOD measurement in organically heavily contaminated wastewater"
- WTW Application report 895232:
"BOD measurement with presence of impeding or toxic substances"

Measurement

Information:

To measure the sample volume, usually overflow measuring beakers or measuring cylinders are used.
Chose the volume according to the measured value expected.
Too large measuring ranges will lead to inaccurate results. To estimate the measured value you can reckon with approx. 80% of the CBS value.

- For **sample preparation and filling of the measuring bottles** see the following instruction: DIN 38409 part 52: "Measurement of the oxygen consumption" as well as WTW application reports, chapter "Sample preparation and measurement".
- **Rinse** measuring bottle with **sample**. Empty thoroughly.
- **Exactly measure** the required oxygen-saturated (thoroughly homogenized) **quantity of the sample** according to information.
- Put the **magnetic stirring rod** into the bottle.
- Insert a **rubber quiver** in the neck of the bottle.
- Put **2 sodium hydroxide tablets** into the rubber quiver with a tweezers. (Caution: The tablets must never come into the sample!)
- Screw OxiTop® directly on sample bottle (tightly close).

Start measurement:

Press S and M simultaneously. (2 seconds) until the display shows 00.



2 sec



Display: Stored values are deleted.

- Keep the measuring bottle with the OxiTop put on **for 5 days at 20°C** (e.g. in an incubator). After the meas. temperature has been reached (after 1 hour at the earliest, after 3 hours at the latest; **AutoTemp function**), the OxiTop automatically starts the measurement of the oxygen consumption .
- During the 5 days the sample is continuously stirred. The OxiTop **automatically stores one value every 24 hours** for 5 days. To have the current value shown press the M key.

Display current measured value:

Press M until measured value is displayed (1 second).



e.g.

- **Readout of the stored values** after the 5 days have passed.



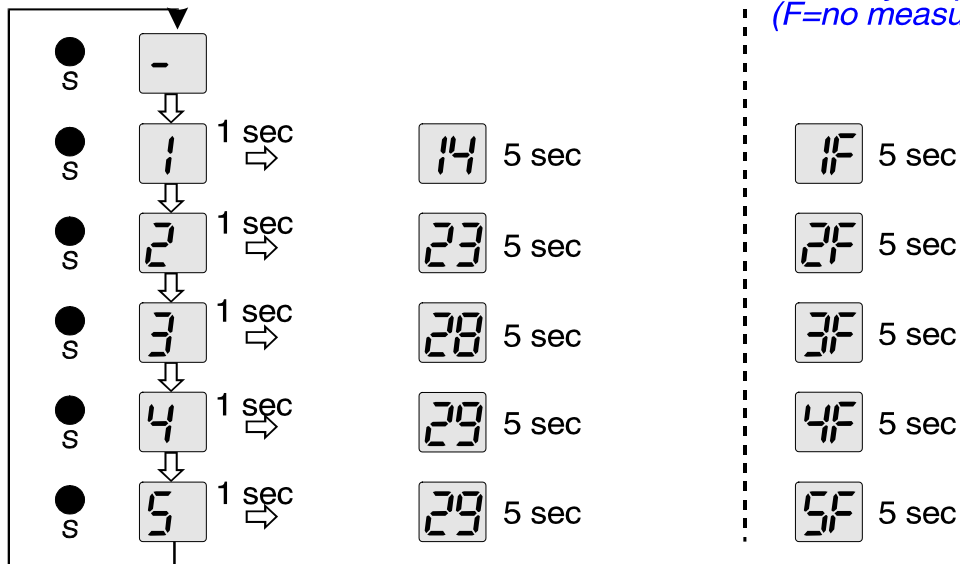
Recall stored values:

Press S until measured value is displayed (1 second).

Scroll to next day by repressing the S key while the measured value is displayed (5 sec). Fast scrolling by repeatedly pressing the S key.

Measuring day either stored value, e. g.

*or system message
"memory empty"
(F=no measured value):*



- Convert the displayed measured value (digits) into the BOD value with the following table (Digits x Factor = BOD5 in mg/l):

Sample volume (ml)	Measuring range (mg/l)	Factor
432	0 - 40	1
365	0 - 80	2
250	0 - 200	5
164	0 - 400	10
97	0 - 800	20
43.5	0 - 2000	50
22.7	0 - 4000	100

Disturbances

- **Measured value remains below measuring range**
The display shows zero or too low a value.
The measuring equipment is not water-tight.
Check rubber quiver, screw top and bottle.
Insufficient sample pretreatment or preservation.
The temperature of the sample had not sufficiently been adjusted ($< 15^{\circ}\text{C}$).
- **Measuring range exceeded.**
The measuring range chosen is too small. With very high values ($> 2000 \text{ mg/l}$) we recommend to predilute the sample.
Nitrification inhibitor (allylthiourea) is missing or lacking.

Errors due to procedure have not been mentioned.

System messages



Memory empty (IF = measured value of day 1 is missing)



Change batteries (approx. every 3 years)



Value remains below measuring range (< 0 digits)



Value exceeds measuring range (> 50 digits)

Cleaning

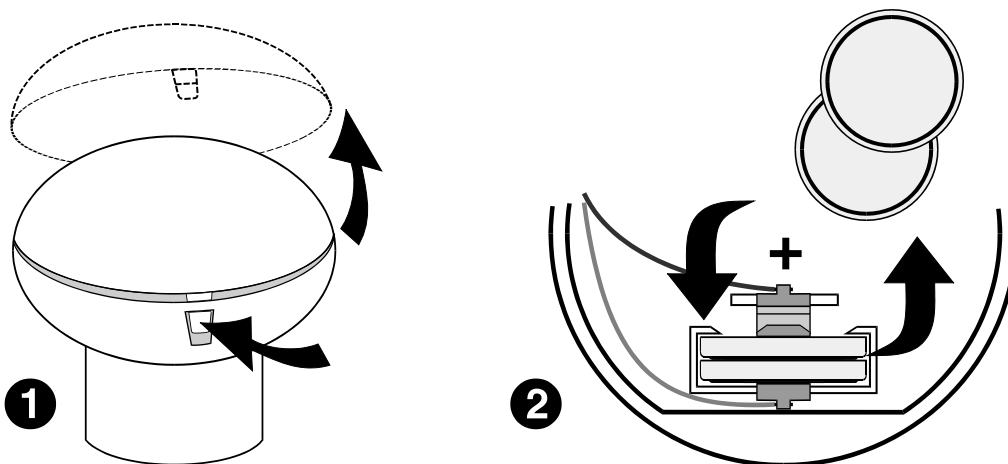
Cleaning of sample bottles

- **Do not use disinfectants!**
(Disinfectants will kill the required microorganisms!)
- Remove **gross contaminations** mechanically, e.g. with a **brush**.
- Rinse the bottles with **clear water** or with **water of the next sample**.
(After using detergents rinse thoroughly! Detergent residues may disturb the BOD₅ determination!)

Cleaning of the OxiTop® Single Measuring System

- **Do not use alcohol or acetone!**
- Clean with a soft cloth and aqueous soap solution

Battery replacement (approx. every 3 years)



- 1 - Push in spring catch.
- Open upper lid.
- 2 - Remove batteries.
- Put in new batteries, pay attention to polarity!
(e.g. WTW-Modell **Batt/Oxitop®**, Order No. 209 012).
- Place upper lid with tap on locking pin (lower lid). Attention! Do not squeeze cable connection.
- Close upper lid (make the hook click).

Disposal note:

Please dispose of the lithium batteries at a battery collection point.

Information



Never use sealing grease or other lubricants for your OxiTop® instruments. Some of these products contain solvents which cause severe damages on the plastic housings. The tightness of the BOD bottles is completely sufficient without grease. Rough contaminations and particles on the contact surfaces of the rubber quiver and the OxiTop® must always be wiped off. WTW grants no guarantee for damages caused by sealing grease.

Labelling:

To label the bottles clearly, WTW offers a marking set (6 marking rings with numbers, which can be put on the neck of the bottle):

Model **MARK-6** (6 pcs)
Order No. 209 013.

Check of the measuring system:

On request WTW offer special test instruments for test control.

Further literature:

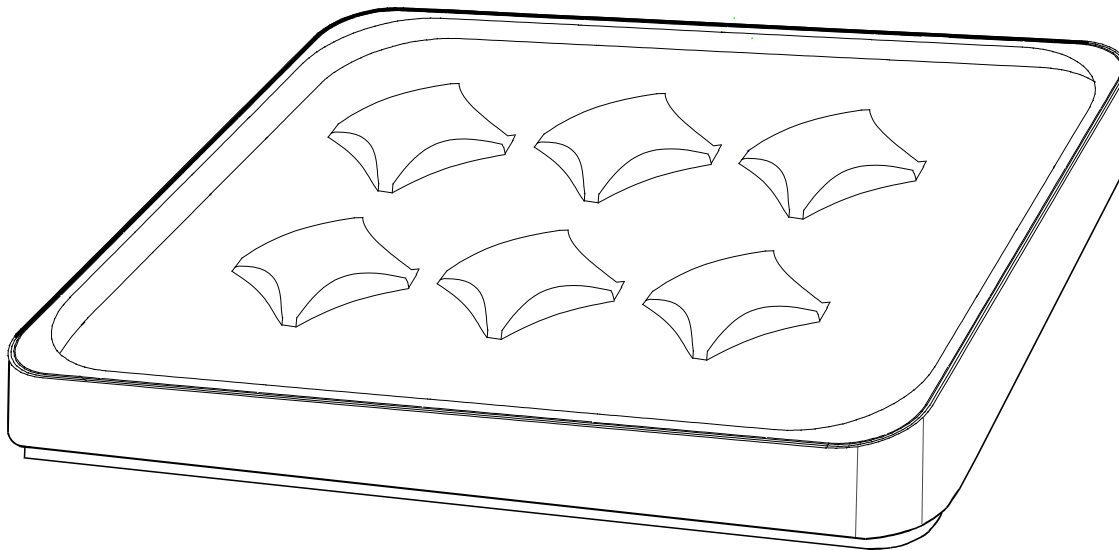
WTW BOD handbook
DIN 38409T51
DIN 38409T52

Technical data OxiTop® single measuring system

Measuring principle	Respirometric (manometric)
Display	2-digit 7-segment LED, 10 mm
Measured parameter	Digits
Measuring range	0 ... 40 digits (+10 digits for overranging)
Admissible measuring temperature	20°C ± 1 K
Admissible sample temperature (when being filled)	15-20°C
Power supply	Lithium batteries (260 mAh), 2 x type CR 2430 (3V)
Power consumption	Max. 25 mA (during measurement)
Protection class	3 IEC 1010
Protection system	IP 54 IEC 529
EMC Emissions	EN 50081-1, FCC Class A
Immunity	EN 50082-2, NAMUR recommendation
Climate class	2, VDI/VDE 3540
Ambient temperature	Storage: -25°C ... +65°C Operation: +20°C ± 1K
Test mark	CE
Dimensions	H: 69 mm, diameter 70 mm
Weight	Approx. 85 g

Inductive Stirring System

IS 6 IS 12



Mains power supply

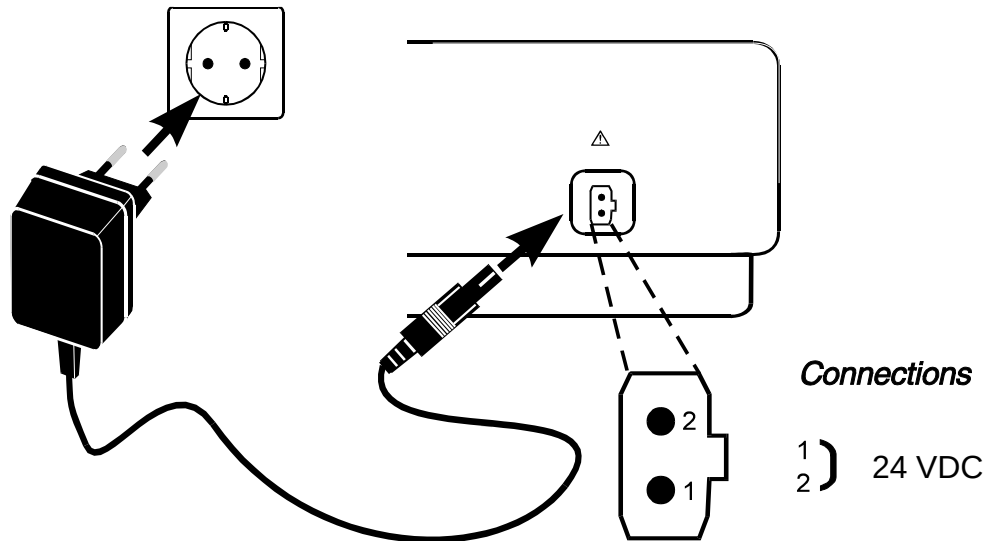
Use original plug-in power supplies only (see chapter TECHNICAL DATA).



Before the instrument is plugged in and switched on, check that the working voltage of the instrument and line voltage are corresponding!



Connect power-supply unit with electric circuit and the instrument.



Operation notes

- Place instrument into incubator or thermostatic box.
- Connect line adaptor to mains socket.
- Connect line adaptor to instrument. After a short waiting time the Inductive Rotary field is automatically built up and the stirring rods start running.
- Place prepared sample bottles onto IS 6 / IS 12 inductive stirring system.

Information

- Interval-controlled Inductive Stirring System with program-controlled stirring procedure.
This means an optimum exchange between air space and sample takes place. The automatic, cycle-controlled stirring rod centering with synchronization of the rotary fields guarantees a safe stirring operation. Magnetic stirring rods fallen out of step are resynchronized. The sample bottles can be placed on IS6 / IS12 stirring systems even when they are in operation. The instruments operate without mechanically moved parts and are resistant to wear and maintenance-free.
- If the stirring operation does not start, disconnect and then reconnect the line adaptor to the mains socket. This will cause the stirring rods to move.
- **To ensure an optimum and secure stirring function use only original WTW stirring rods RST 600.**
- Cleaning with soft cloth and aqueous soap solution **(no alcohol or acetone!)**.

Accessories

OxiTop®
IS 6 / IS 12

Recommended accessories

	Model	Order-No.
Storing rack for 6 OxiTop® measuring systems	St-OxiTop®	209 010
Marking ring set (6 pcs.) with label set (1-12) for bottles	Mark-6	209 013
Spare batteries (1 set)	Batt/OxiTop®	209 012
Upgrade kit for 2 meas. places, with 1 of each OxiTop® yellow or green, 1 bottle, 1 small rubber bung, 1 stirring rod	OxiTop® SET-2	208 819
Overflow measuring beaker	Content 22.7 ml	MK 22/60 209 030
	43.5 ml	MK 43/600 209 040
	97.0 ml	MK 97/600 209 050
	164 ml	MK 164/600 209 060
	250 ml	MK 250/600 209 070
	365 ml	MK 365/600 209 080
	432 ml	MK 432/600 209 090

Spare parts

	Model	Order-No.
Spare OxiTop® measuring system yellow	OxiTop®/GB	208 810
Spare OxiTop® measuring system green	OxiTop®/GN	208 800
Sample bottle brown	PF 600	209 100
Stirring rods	RST 600	209 120
Rubber quiver	GK 600	209 170
Stirring rod remover	REF 600	209 130
Sodium hydroxide tablets	NHP 600	209 140
Nitrification restraint (ATH solution 250 ml)	ATH 600	209 330
Note block	Dia/600	209 020

Technical data

Power supply	Plug-in power supply unit (Euro, US, UK, Australian plug): Friwo FW7556 / 24 Input: 100 ... 240 V ~ / 50 ... 60 Hz / 400 mA Output: 24V DC / 750 mA
Power consumption	24 VA max.
Speed of the stirring rods	programm-controlled 180 ... 450 min ⁻¹
Instrument protection class	• protection class 3, EN 61010-1 • protection class IP30
EMC	• Emissions EN50081-1/FCC class A • Immunity EN50082-1, EN50082-2, Namur
Ambient temperature	Storage: - 25°C ... + 65°C Operation: + 5°C ... + 40°C
Relative humidity	Yearly mean: < 75 % 30 days/year: < 95 % Remaining days: < 85 %
Test mark	CE
Dimensions (mm)	IS 6, IS 6 / 120 (B)265 x (T)181 x (H)67 IS 12, IS 12 / 120 (B)350 x (T)266 x (H)67
Weight (inclusive line adaptor)	IS 6, IS 6 / 120 1.6 kg IS 12, IS 12 / 120 3.2 kg

Test certificate EMC: IS 6

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■ EMV-Prüfzentrum ■ EMI/EMC-Testcenter ■

CERTIFICATE *to the Electromagnetic Compatibility* *to Test Report No. 52501-51217-1/-2*

Sample: IS 6
Description: Stirrer
Applicant: WTW GmbH
Regulations: EN 50081-1:1992
FCC part 15 subpart B
EN 50082-2:1995
Namur Recommendation 5/1993

Testresult:
The samples are in compliance with the RFI requirements and the immunity requirements according to above referenced regulations. The following severity levels have been achieved:

RFI Emissions

EN 55011:1991 Limit class B, group 1
FCC part 15 subpart B Limit class A

Immunity

Electrostatic Discharge	Contact discharge	4 kV
IEC 801-2:1991	Air discharge	8 kV
Electromagnetic Fields	80 MHz - 1000 MHz	10 V/m
ENV 50140:1993	Broadcasting frequency ranges	3 V/m
ENV 50204:1995	900 ± 5 MHz (pulse modulated)	10 V/m
Electrical Fast Transients	Power line (AC)	2 kV
IEC 801-4:1988		
Surge Immunity	Power line - symmetrical coupling	1 kV
IEC 801-5	Power line - unsymmetrical coupling	2 kV
Conducted RF immunity	150 kHz - 80 MHz	10 Veff
ENV 50141:1993	Broadcasting frequency ranges	3 Veff
Limitation of Starting Current	Starting current (peak)	≤ 15 x I _N
Namur Rec. 5/1993		
Mains Interruption	Interruption time	≥ 20 ms
Namur Rec. 5/1993		
Mains Supply Tolerance	Voltage	UN +20 %/-15 %
Namur Rec. 5/1993	Frequency	FN ± 6 %
50 Hz Magnetic fields		30 A/m
EN 61000-4-8		

Straubing, 17. January 1996


Senton GmbH
Johann Roidt

SENTON GmbH · EMV-Prüfzentrum · Äußere Frühlingsstraße 45 · 94315 Straubing · Tel. 09421/42081

Test certificate EMC: IS 12

SENTON

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CERTIFICATE

to the Electromagnetic Compatibility

to Test Report No. 52501-51218-1/-2

Sample: IS 12
Description: Stirrer
Applicant: WTW GmbH
Regulations: EN 50081-1:1992
 FCC part 15 subpart B
 EN 50082-2:1995
 Namur Recommendation 5/1993

Testresult:

The samples are in compliance with the RFI requirements and the immunity requirements according to above referenced regulations. The following severity levels have been achieved:

RFI Emissions

EN 55011:1991 Limit class B, group 1

FCC part 15 subpart B Limit class A

Immunity (see test report no. 52501-51217-1 for IS 6)

Electrostatic Discharge Contact discharge 4 kV

IEC 801-2:1991 Air discharge 8 kV

Electromagnetic Fields 80 MHz - 1000 MHz 10 V/m

ENV 50140:1993 Broadcasting frequency ranges 3 V/m

ENV 50204:1995 900 ± 5 MHz (pulse modulated) 10 V/m

Electrical Fast Transients Power line (AC) 2 kV

IEC 801-4:1988

Surge Immunity Power line - symmetrical coupling 1 kV

IEC 801-5 Power line - unsymmetrical coupling 2 kV

Conducted RF immunity 150 kHz - 80 MHz 10 Veff

ENV 50141:1993 Broadcasting frequency ranges 3 Veff

Limitation of Starting Current Starting current (peak) ≤ 15 x I_N

Namur Rec. 5/1993

Mains Interruption Interruption time ≥ 20 ms

Namur Rec. 5/1993

Mains Supply Tolerance Voltage UN +20 %/-15 %

Namur Rec. 5/1993 Frequency FN ± 6 %

50 Hz Magnetic fields 30 A/m

EN 61000-4-8



Senton GmbH
Johann Roidt

Straubing, 17. January 1996

SENTON GmbH · EMV-Prüfzentrum · Äußere Frühlingsstraße 45 · 94315 Straubing · Tel. 09421/42081

What can Xylem do for you?

We're a global team unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com.



Service and Returns:

Xylem Analytics Germany
Sales GmbH & Co. KG
WTW
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany

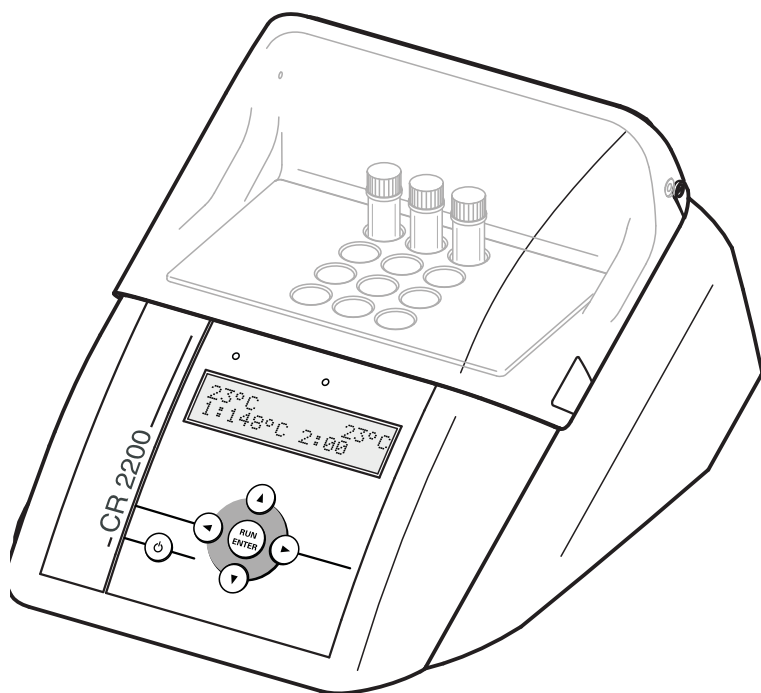
Tel.: +49 881 183-325
Fax: +49 881 183-414
E-Mail wtw.rma@xyleminc.com
Internet: www.WTW.com



Xylem Analytics Germany GmbH
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany

OPERATING MANUAL

ba41131e12 04/2015



CR 2200

THERMOREACTOR



a xylem brand

CR 2200 - Contents

1	Overview	5
1.1	Components of the thermoreactor	6
2	Safety	7
2.1	Safety information	7
2.1.1	Safety information in this operating manual	7
2.1.2	Safety signs on the product	7
2.1.3	Further documents providing safety information	7
2.2	Safe operation	8
2.2.1	Authorized use	8
2.2.2	Requirements for safe operation	8
2.2.3	Unauthorized use	8
2.3	Personal protective equipment	9
3	Commissioning	10
3.1	General handling instructions	10
3.2	Scope of delivery	10
3.3	Unpacking and positioning	10
3.4	Initial commissioning	11
4	Basic principles of operation	13
4.1	Operating and display elements	13
4.1.1	Keys	14
4.1.2	Display	15
4.1.3	Control lamps (LEDs)	15
4.2	Operating modes	15
5	Operation	17
5.1	Inserting and removing the reaction cells	17
5.2	Starting a temperature program	17
5.3	Stopping a temperature program	18
5.4	Settings	19
5.4.1	Setting the display contrast	19
5.4.2	Setting the timer for the reaction time	21
6	Maintenance, cleaning, disposal	22
6.1	Maintenance	22
6.2	Exchanging the fuses	22
6.3	Cleaning the enclosure	23
6.4	Cleaning the thermoblock of spilled cell contents	23
6.5	Disposal	24
7	What to do if...	25
8	Technical Data	26

9	Replacement parts and accessories / options	27
10	Index	29

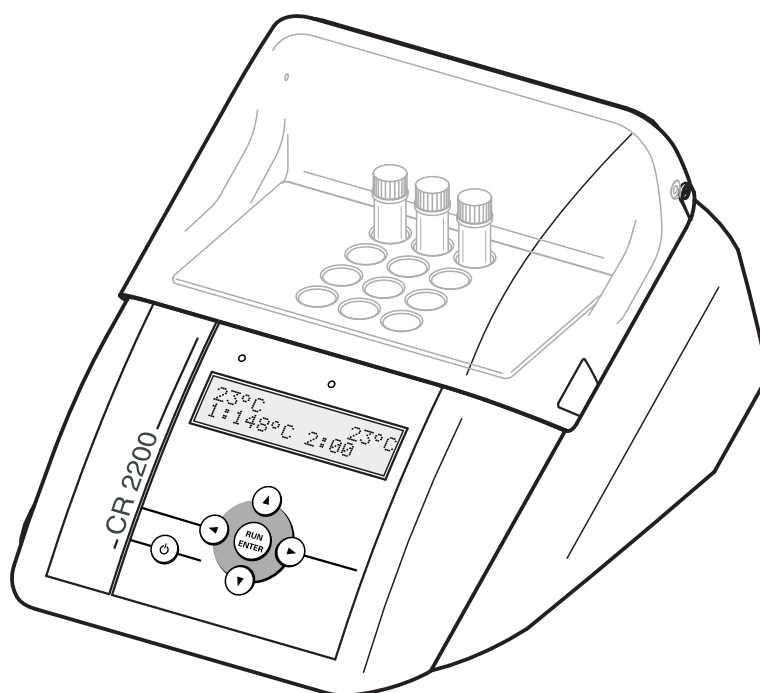
1 Overview

The CR 2200 thermoreactor is a dry temperature control device for use in the laboratory. It facilitates and safeguards the digestion with reaction cells.

8 temperature programs are permanently set.

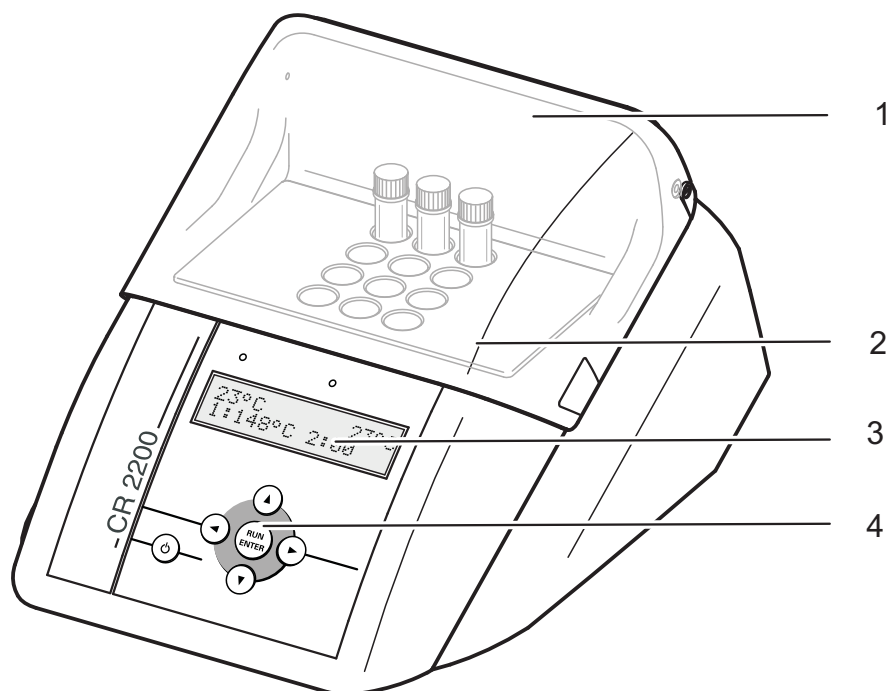
- 1: 148 °C for 120 minutes
- 2: 120 °C for 30 minutes
- 3: 120 °C for 60 minutes
- 4: 120 °C for 120 minutes
- 5: 100 °C for 60 minutes
- 6: 148 °C for 20 minutes
- 7: 150 °C for 120 minutes
- 8: 100 °C for 30 minutes

The thermoreactor accommodates 12 reaction cells with an outer diameter of 16 mm.



You will find information on accessories in the WTW catalog LABORATORY AND FIELD INFORMATION or on the Internet.

1.1 Components of the thermoreactor



1 Protective cover

2 Thermoblock with cell shafts

3 Sample display

4 Keypad

2 Safety

2.1 Safety information

2.1.1 Safety information in this operating manual

This operating manual provides important information on the safe operation of the instrument. Read this operating manual thoroughly and make yourself familiar with the instrument before putting it into operation or working with it. The operating manual must be kept in the vicinity of the instrument so you can always find the information you need.

Important safety instructions are highlighted in this operating manual. They are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "CAUTION") indicates the level of danger:



WARNING

indicates a possibly dangerous situation that can lead to serious (irreversible) injury or death if the safety instruction is not followed.



CAUTION

indicates a possibly dangerous situation that can lead to slight (reversible) injury if the safety instruction is not followed.

Note

indicates a situation where goods might be damaged if the actions mentioned are not taken.

2.1.2 Safety signs on the product

Note all labels, information signs and safety symbols on the product. A warning symbol (triangle) without text refers to safety information in this operating manual.

2.1.3 Further documents providing safety information

The following documents provide additional information, which you should observe for your safety when working with the thermoreactor:

- Analysis specifications for the cell tests
- Safety datasheets for the cell tests

2.2 Safe operation

2.2.1 Authorized use

The authorized use is exclusively the carrying out of reactions for photometric determinations, with the aid of commercial test sets, in round cells with a diameter of 16 ± 0.2 mm. Only the operation and running of the product according to the instructions given in this operating manual is authorized (see chapter 8 TECHNICAL DATA). Any other use is considered unauthorized.

2.2.2 Requirements for safe operation

Note the following points for safe operation:

- The product may only be operated according to the authorized use specified above.
- The product may only be supplied with power by the energy sources mentioned in this operating manual.
- The product may only be operated under the environmental conditions mentioned in this operating manual.
- The round cells to be used including the screw caps must be suitable and tested for the intended application (temperature resistance, chemical stability against the reaction mixture, pressure resistance, tightness).
- The reaction mixture in the round cells must not be inflammable.
- For operation, the cell shafts have to be clean and free of obstacles.
- Round cells may only be inserted and heated with the cap screwed on.
- The instrument may only be opened if this is explicitly described in this operating manual (example: inserting and removing the cells).
- The connection cable and fuses may only be replaced with original WTW replacement parts.

2.2.3 Unauthorized use

The product must not be put into operation if:

- it is visibly damaged (e.g. after being transported)
- it was stored under adverse conditions for a lengthy period of time (storing conditions, see chapter 8 TECHNICAL DATA).

2.3 Personal protective equipment

For your safety, wear the following personal protective equipment to be protected against any (residual) risk while carrying out certain activities:

- Protective goggles and protective clothing with long sleeves as a protection against any splashes of hot and corrosive liquids
- Chemical-resistant gloves as a protection against contact with possibly noxious substances
- Heat protection gloves to touch hot parts
- Safety shoes for protection against heavy falling objects

Activity	Protective goggles	Protective clothing with long sleeves	Chemical resistant gloves	Heat protection gloves	Safety shoes
Transport, positioning					✓
Inserting or removing cells or the external temperature sensor	✓	✓		✓ (if the instrument is hot)	
Cleaning after a cell has broken or its content has been spilled	✓	✓	✓		

3 Commissioning

3.1 General handling instructions

Always protect the instrument against conditions that might damage its mechanical and electronic components. Observe the following points especially:

- For operation and storage, the temperature and air humidity must be within the limits specified in chapter 8 TECHNICAL DATA.
- The following impacts on the instrument have to be avoided in any situation:
 - Extreme dust, moisture and wetness
 - Intensive light and heat
 - Corrosive or solvent-containing vapors.
- Any spilled or splattered liquid and broken glass in the thermoblock have to be removed immediately (see section 6.4).
- The protection cover should always be closed when the instrument is not operating.
- The thermoblock must be empty while the instrument is being transported.

3.2 Scope of delivery

- Thermoreactor CR 2200
- Power cable
- Operating manual

3.3 Unpacking and positioning



CAUTION

The instrument is quite heavy. Therefore, there is a risk of injury for the lower extremities if it falls down. Wear safety shoes during the unpacking and positioning of the instrument.



CAUTION

Fire hazard! The thermoreactor may only be operated on a surface of nonflammable material. The ventilation slots in the bottom and rear panel of the instrument must always be free. Air circulation in the area of the ventilation slots must not be impeded.

Note

Please make sure to keep the original packing including the inner packages so the instrument will be optimally protected against strong impacts if it has to be transported. The original packing is also required for the appropriate return transport if the instrument has to be repaired. Please note that the warranty does not cover any damage caused by inappropriate transport.

Note

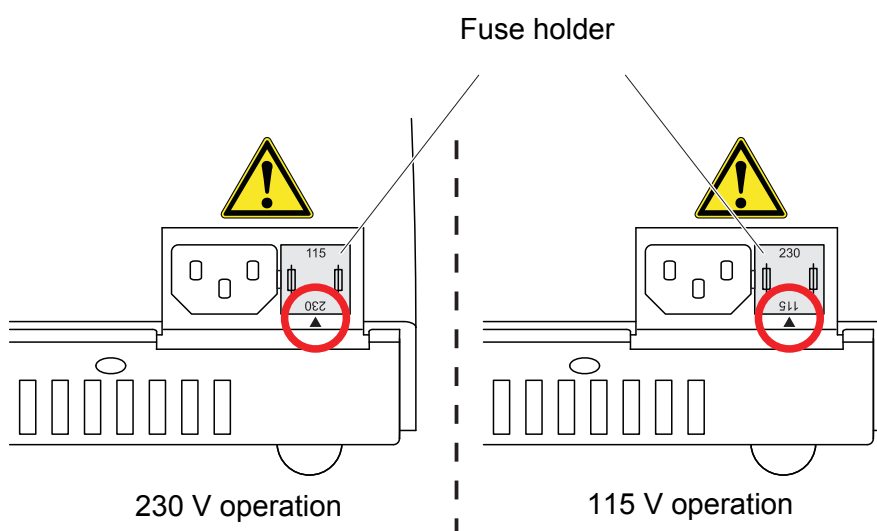
If the thermoreactor was transported from a cold environment to a warm environment, the formation of condensate can lead to the faulty functioning of the instrument. Wait until the thermoreactor has adapted to the changed environmental conditions before putting it back into operation.

Setting up the thermoreactor

1	Place the thermoreactor firmly on a flat, nonflammable surface.
2	Make sure that there is enough space between the thermoreactor and other instruments or devices that are heat sensitive.

3.4 Initial commissioning**Adjusting the line voltage**

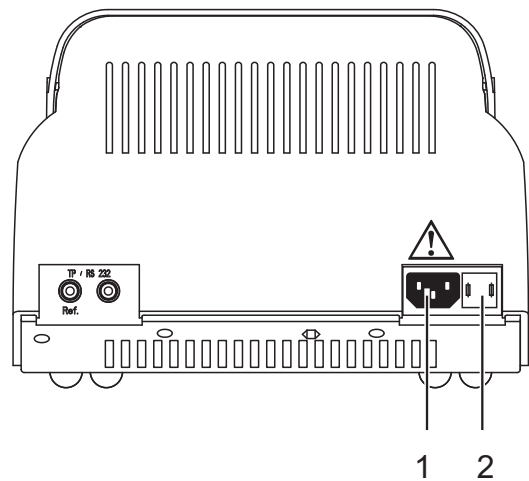
3	Check whether the arrow on the back of the housing points to the line voltage stated on the fuse holder that is provided by the power supply system (115 or 230 V).
---	---



4	If the wrong line voltage is set, perform steps 5 to 7.
5	Pull out the fuse holder.

- | | |
|---|--|
| 6 | Turn the fuse holder so that the arrow on the housing points to the line voltage (115 or 230 V) provided by the power supply system. |
| 7 | Push the fusion holder completely in. |

Connecting the power cable



- | | |
|---|----------------------------|
| 1 | Connection for power cable |
| 2 | Fusion holder |



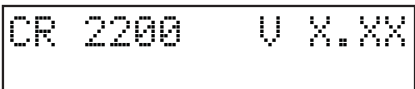
CAUTION

Each time before commissioning, check the outside of the power cable for intactness. A damaged cable must be removed and replaced by an original power cable. Original power cables are listed in chapter 9 REPLACEMENT PARTS AND ACCESSORIES / OPTIONS. Exclusively use original power cables suitable for the country-specific power supply system. Do not use any line adapters (fire hazard).



If the power cable is not suitable for the power supply system of your country, please contact your supplier for an exchange.

- | | |
|---|--|
| 8 | Connect the power cable to the socket 1 on the thermoreactor. |
| 9 | Connect the power cable to an easily available power socket. The thermoreactor is now in the Standby mode. The display shows the name of the instrument. |



The thermoreactor is ready for operation.

4 Basic principles of operation

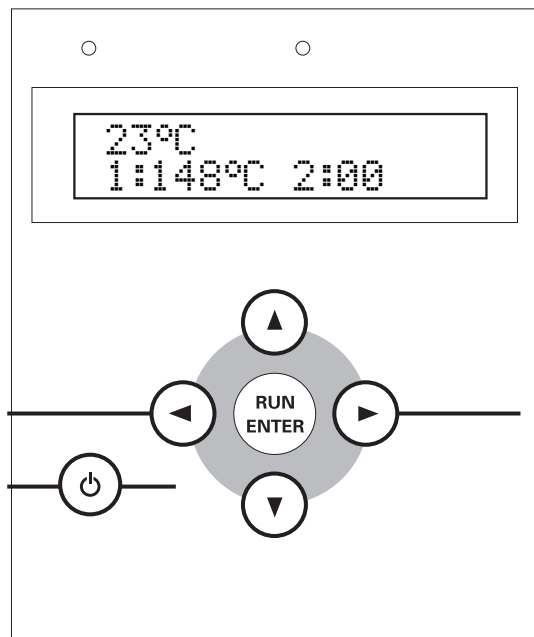
This chapter provides you with basic information on how to operate the thermoreactor.

4.1 Operating and display elements

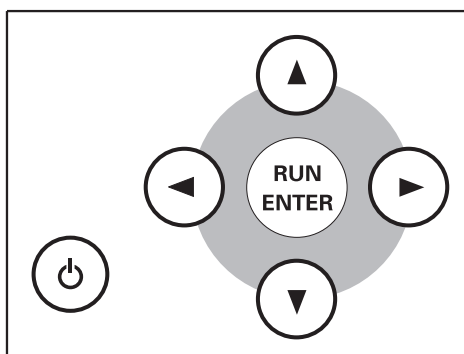
Using the six keys of the keypad (see section 4.1.1) you control the thermoreactor.

Temperature values, available temperature programs or settings can be viewed in the display (see section 4.1.2).

The control lamps above the operating panel are assigned to the thermoblock. Their color (red or green) and their state (flashing or illuminated) show the current operating state of the thermoreactor (see section 4.1.3).



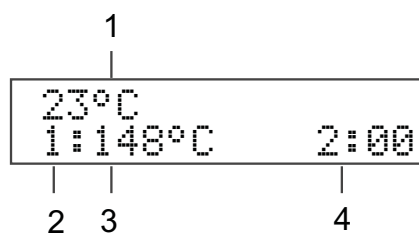
4.1.1 Keys



Key	Meaning
	On/off switch
	● Making or confirming a selection or ● Starting the timer for the reaction time (active temperature program).
	Keep depressed and simultaneously press : Changing to the <i>SETUP</i> menu from the Standby mode
	● Changing between the temperature setting and the reaction time setting (in the <i>SETUP</i> menu) or ● Canceling the active temperature program
	● Selecting the temperature program (program selection) or ● Changing settings and switching between settings (<i>SETUP</i>) ● Starting the scrolling through settings by keeping the key depressed

4.1.2 Display

Example: Program selection



1	Temperature in the thermoblock
2	Number of the temperature program
3	Specified temperature
4	Reaction time in hours and minutes

4.1.3 Control lamps (LEDs)

The control lamps above the operating panel are assigned to the thermoblock and indicate the current operating state.

LED	flashes	is illuminated
green		Program selection
red	active temperature program: heating period or cooling period	active temperature program: reaction temperature reached
red and green	active temperature program: program canceling selected	

If the control lamps are off the thermoreactor is in the Standby mode.

4.2 Operating modes

The thermoreactor has three operating modes:

- Standby

The display shows the model and version number of the thermoreactor.

With the key combination  and  you move to the *SETUP* menu. There you can:

- Setting the display contrast (*CONTRAST:0* to 9, see section 5.4.1)
- Activating a manual confirmation before the timer for the reaction time is started (*START TIMER:MAN.* or *AUTO*, see section 5.4.2)

- Program selection

After switching on with  the display shows the current temperature value for the thermoblock.

In the second display line there are the temperature programs to be selected. The control lamps above the display for the thermoblock light up green.

- Active temperature program

The display shows the current temperature value for the thermoblock. The control lamps above the display light up or flash red.

5 Operation

5.1 Inserting and removing the reaction cells



WARNING

Always wear protective goggles and protective clothing with long sleeves as a protection against any splashes of hot and corrosive liquids. When dealing with cell tests always follow the relevant safety data sheets and analysis specifications.



CAUTION

Very hot - burn hazard. Wear heat protection gloves to remove the cells when they are hot. Place hot cells in a cell rack.

1	Open the protective cover.
2	Insert or remove the reaction cells from the cell shafts without jamming.
3	Close the protection cover.



When cold reaction cells are inserted in the preheated thermoblock it can temporarily cool down by approx. 3 °C.

5.2 Starting a temperature program

1	Switch on the thermoreactor with  .
---	--

23°C
1:148°C 2:00

2	Select a temperature program with   . You can select from 8 predefined temperature programs.
---	---

23°C
4:120°C 2:00

3	Start the displayed temperature program with  . The control lamps of the thermoblock flash red. The nominal reaction time (in hours and minutes) appears on the display.
---	---



The reaction temperature is reached when the temperature in the thermoblock is in a range of ± 1 °C around the adjusted temperature for two minutes constantly. The control lamps of the thermoblock will then light up red.

Operation with automatic timer

If the start of the timer for the reaction time has been set to automatic in the *SETUP* menu (*START TIMER:AUTO* see section 5.4.2), the reaction time automatically starts after the reaction temperature has been achieved. The reaction temperature is kept constant during the reaction time.

After the reaction time has expired the control lamps flash red.

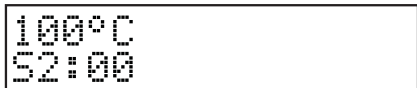
The temperature program is finished.

The thermoreactor is in the program selection mode.

As soon as the thermoblock has cooled down to under 50 °C, the control lamps switch themselves off.

Operation with manual timer

If the start of the timer for the reaction time has been set to manual in the *SETUP* menu (*START TIMER:MAN.* see section 5.4.2), an S is displayed in front of the nominal reaction time. With this setting the thermoreactor controls the temperature until the timer for the reaction time is started by pressing .



- 4 Start the timer for the reaction time with .
The S in front of the reaction time disappears.

The reaction temperature is kept constant during the reaction time. The control lamps of the thermoblock light up red.

After the reaction time has expired the control lamps flash red.

An audio signal sounds in addition.

- 5 Confirm the end of the reaction time for the thermoblock with .

The temperature program is finished.

The audio signal is finished.

The thermoreactor is in the program selection mode.

As soon as the thermoblock has cooled down to under 50 °C, the control lamps switch themselves off.

5.3 Stopping a temperature program

You can terminate a running program at any time.

- 1 Using  , terminate the running temperature program.
The control lamp for the thermoblock flashes red/green.
The safety query *STOP?* is displayed.

```
54°C
STOP?
```

- 2 Using  confirm the safety query *STOP?*
The temperature program is finished.
The control lamps of the thermoblock will then light up green.
or:
Using  , exit *STOP?*.
The query *STOP?* disappears from the display. The
temperature program is continued.



While *STOP?* is displayed the temperature program goes on running. As soon as a section of the temperature program is finished (e.g. after the end of the heating period or after the end of the reaction time), the *STOP?* display is overwritten.

5.4 Settings

5.4.1 Setting the display contrast

The display contrast can be set in 10 steps.

- 1 Switch to the Standby mode.
- 2 Keep the  key depressed while pressing  to switch to the *SETUP* menu.
SETUP and, in the second line, an editable parameter are displayed.
- 3 Using  , select *CONTRAST*.

```
SETUP
CONTRAST:5
```

- 4 Using  edit the contrast setting.
The editing is marked on the display by *.

```
SETUP      *
CONTRAST:5
```

5	Using ▲ ▼, set the contrast from 0 to 9.
6	Using  , confirm the changes. The marking on the display (*) disappears.
7	Using  leave the <i>SETUP</i> menu. The changes are stored. The thermoreactor is switched on (operation mode: program selection).

5.4.2 Setting the timer for the reaction time

After the start of a temperature program the thermoblock starts heating up. Depending on the setting, the timer for the reaction time starts automatically after the reaction temperature has been reached or only after confirmation by keypressing.

With the setting *START TIMER:AUTO* the timer for the reaction time starts immediately after the reaction temperature has been reached.

With the setting *START TIMER:MAN.* the timer for the reaction time only starts after confirmation by keypressing.

1	Switch to the Standby mode.
2	Keep the  key depressed while pressing  to switch to the <i>SETUP</i> menu. <i>SETUP</i> and, in the second line, an editable parameter or a temperature program are displayed.
3	Using   , select <i>START TIMER</i> .

```

SETUP
START TIMER:MAN.

```

4	Set the start of the timer for the reaction time with  . The editing is marked on the display by *.
5	Using   , select <i>MAN.</i> or <i>AUTO</i> .
6	Using  , confirm the changes. The marking on the display (*) disappears.
7	Using  leave the <i>SETUP</i> menu. The changes are stored. The thermoreactor is switched on (operation mode: program selection).

6 Maintenance, cleaning, disposal

6.1 Maintenance

The thermoreactor CR 2200 is maintenance free. Check the ventilation slots on the rear panel of the instrument at regular intervals. Remove any accumulations of dust in the slots, e.g. with a vacuum cleaner. Do not use compressed air!



CAUTION

Fire hazard! The ventilation slots in the bottom and rear panel of the instrument must always be free. Air circulation in the area of the ventilation slots must not be impeded.

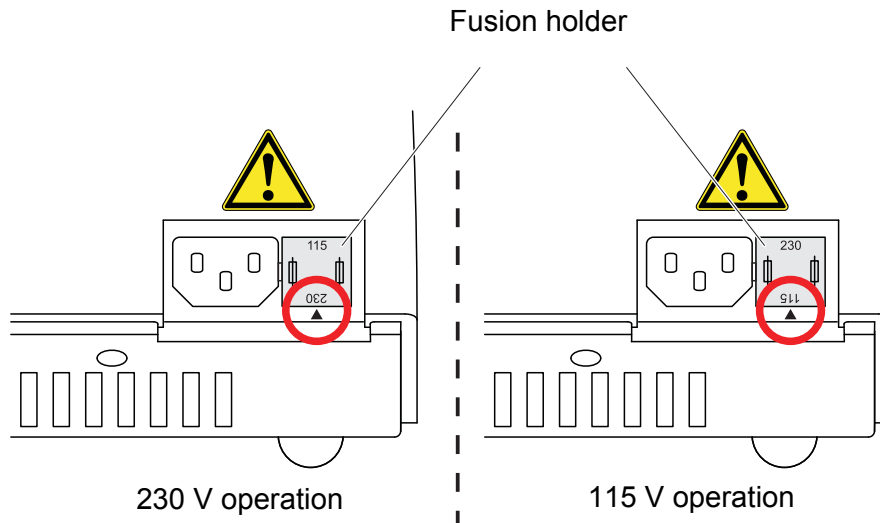
6.2 Exchanging the fuses



CAUTION

A defective fuse may only be replaced by an original fuse with UL approval. The original fuse is listed in chapter 9 REPLACEMENT PARTS AND ACCESSORIES / OPTIONS.

- | | |
|---|---|
| 1 | Disconnect the line power cable from the thermoreactor. |
|---|---|



- | | |
|---|--|
| 2 | Pull out the fuse holder. |
| 3 | Exchange defective fuses. |
| 4 | Turn the fuse holder so that the arrow on the housing points to the line voltage (115 or 230 V) provided by the power supply system. |
| 5 | Push the fusion holder completely in. |

6.3 Cleaning the enclosure

Wipe the thermoreactor with a damp cloth.

Note

The housing is made of synthetic material. Thus, avoid contact with acetone or detergents that contain solvents. Remove any splashes immediately.

6.4 Cleaning the thermoblock of spilled cell contents

If liquid penetrated a thermoblock (e.g. from a leaking or broken cell), clean the thermoblock as follows:



WARNING

Cells can contain poisonous or corrosive substances. If the content was released, heed the safety datasheet of the cell test and take the required protective measures (protective goggles, protective gloves etc.).



CAUTION

Danger of cuts due to broken glass. Remove any broken glass with a pair of tweezers completely. Do not pick any broken glass with your bare fingers.



CAUTION

Burn hazard on the hot thermoblock. Prior to cleaning, allow the thermoreactor to cool down.

1	Switch off the thermoreactor and disconnect the power plug.
2	Allow the thermoreactor to cool down.
3	Unscrew the cover plate on top of the thermoblock.
4	Remove any broken glass with a pair of tweezers <u>completely</u> .
5	Clean the cover plate, block surfaces and borings with a damp cloth.
6	Screw on the cover plate again.



CAUTION

Fire hazard. If any flammable detergents are used, completely remove all detergent residues prior to the next commissioning.



Discoloration that remains on the thermoblock and cover plate does not affect the functioning of the thermoreactor.

6.5 Disposal

Dispose of the thermoreactor as electronic waste at an appropriate collection point. It is illegal to dispose of the thermoreactor in household refuse.

7 What to do if...

There is nothing on the display	Cause	Remedy
	The power supply is interrupted	– Check power cable and connections – Exchange the fuses – Have repaired by service department
Bars are displayed instead of the temperature (-°C)	Cause	Remedy
	In the program selection mode: Internal temperature sensor defective	– Have repaired by service department
Cell contents spilled / thermoblock contaminated	Cause	Remedy
	e.g. leaking cell	– see section 6.4

8 Technical Data

Reactor type	Dry temperature control device with safety cover
Cell shafts	12 cell shafts for reaction cells, diameter: 16 ± 0.2 mm
Reaction time setting	20 min, 30 min, 60 min, 120 min (via fixed programs)
Temperature setting	100 °C, 120 °C, 148 °C, 150 °C via fixed programs
Controlling accuracy	± 1 °C ± 1 digit
Temperature stability	± 0.5 K
Overtemperature protection	190 °C ± 5 °C
Heating time (with empty thermoblock) from 25 °C to	100 °C approx. 5 min 120 °C approx. 7 min 148 °C approx. 10 min
Temperature of the enclosure at an environmental temperature of 25 °C	< 30 °C with a block temperature of 148 °C
Housing materials	Upper part: PC/ABS Blend Lower part: PA66 Protective cover: PC Cover plate: PBT GF30
Dimensions	D x W x H: 312 x 255 x 185 mm
Weight:	3 kg
Power supply	115/230 VAC 50/60 Hz, allowed voltage tolerance: ± 15 % Maximum power consumption: 280 W Fuses 2 x 3,15 AT
Protective class	I according to DIN VDE 0700 part 1
Overvoltage category	II
Protection	IP 20 according to EN 60529
Ambient temperature	Storage -25 °C to +65 °C Operation +5 °C to +40 °C

Climatic class	2 according to VDI/VDE 3540 Relative humidity: Yearly mean: < 75 % 30 days /year: 95 % Other days: 85 % Light dew: yes Site altitude: max. 5000 m above sea level
EMC	EN 61326-1 FCC 47 CFR Part 15
Test certificates	cETLus, CE
Safety standards	EN 61010-1 EN 61010-2-010 UL 61010-1 CAN/CSA C22.2#61010-1 CAN/CSA C22.2#61010-2-010

9 Replacement parts and accessories / options

Replacement parts

Designation	Accessory
REP3-3000 1004	Original fuse set (2 items; 3.15 A) with UL approval
REP3-3000 1006	Original power cable, type EU
REP3-3000 1007	Original power cable, type UK
REP3-3000 1008	Original power cable, type USA/Canada
REP3-3000 1009	Original power cable, type Australia

10 Index

C

Commissioning	10
Components of the thermoreactor	6
Control lamps (LEDs)	15

F

Fuses	22
-------------	----

K

Keys	14
------------	----

M

Maintenance	22
-------------------	----

O

Operating and display elements	13
Operating modes	15

P

Program selection	16
-------------------------	----

S

Safety	7
Sample display	15
Scope of delivery	10
Setting the display contrast	19
Standby	15
Starting a temperature program	17

T

Temperature program active	16
Trouble shooting	25

W

What to do if... ..	25
---------------------	----

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Service address:

Xylem Analytics Germany
Sales GmbH & Co. KG
WTW
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany

Tel.: +49 881 183-325
Fax: +49 881 183-414
E-Mail wtw.rma@xyleminc.com
Internet: www.WTW.com



Xylem Analytics Germany GmbH
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany

**TS 606/2-i ; TS 606-G/2-i
TS 606/4-i; TS 606-G/4-i
TS 1006-i**

THERMOSTATE CABINETS



a xylem brand

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TS 606...-i/1006-i - Contents

1	Overview	5
2	Safety instructions	7
2.1	Authorized use	7
2.2	General safety instructions	8
3	Commissioning	9
3.1	Unpacking and setting up the instrument	9
3.2	Initial commissioning	9
4	Operation	11
4.1	Operating elements	11
4.2	Switching on the thermostat cabinet	11
4.3	Connecting the stirring platforms	12
4.4	Setting the desired temperature	12
5	Maintenance, cleaning, disposal	15
5.1	General maintenance instructions	15
5.2	Disposal	15
6	What to do if...	17
6.1	Testing the thermostat cabinet	17
6.2	Measuring the actual value of the sample temperature	18
6.3	Error diagnosis	18
7	Technical data	21
7.1	General data	21
7.2	Electrical data	21
7.3	Temperature control unit TR-1	22
7.4	Dimensions and weights	22
8	Service information	23

1 Overview

Applications

The thermostat cabinets serve to continuously temper a variety of applications, e. g.:

- 20 °C BOD₅ determination
- 25 °C Enzymatic activity (TTC test)
- 37 °C Colony count

The instruments manage all tempering tasks in the range of 10 °C to 40 °C maintenance-free and reliably.

Features

- The fully insulated cabinet exactly controls the internal temperature via an integrated temperature sensor. The compressor cooling unit or the heating unit switches on separately.
- Depending on the operating condition, an LED display shows the internal measured temperature or the desired temperature that was set.
- The temperature can be set in the range of 10 °C to 40 °C in steps of 1 °C (via 2 keys, which are protected by a robust foil front).
- The recirculation ventilation is provided by a tangential blower. This guarantees a stable internal temperature in the whole thermostat cabinet.

2 Safety instructions

This operating manual contains basic instructions that have to be observed during the commissioning, operation and maintenance of the instrument. Thus, it is essential for the operator to read this operating manual before carrying out any work with the system. The operating manual must always be available within the vicinity of the measuring system.

General safety instructions

The following safety labels in the individual chapters of this operating manual indicate different levels of danger:



Warning

indicates instructions that must be followed precisely in order to prevent serious dangers to personnel.



Caution

indicates instructions that must be followed precisely in order to avoid slight injuries to personnel or damage to the instrument or the environment.

Other labels



Note

This symbol indicates instructions that describe special features.



Note

indicates cross-references to other documents, e.g. component operating manuals.

2.1 Authorized use

The authorized use of the TS 606...-i/1006-i thermostat cabinets consists exclusively of the use as a tempering instrument in water analysis. Please keep to the technical specifications according to chapter 7 TECHNICAL DATA. Only operation according to the instructions in this operating manual is authorized.

Any other use is considered to be **unauthorized**. Unauthorized use invalidates any claims with regard to the guarantee.

2.2 General safety instructions

Function and operational safety

The failure-free function and operational safety of the instrument is only guaranteed if the generally applicable safety measures and the special safety instructions in this operating manual are followed during its use.

The failure-free function and operational safety of the TS 606...-i/1006-i is only guaranteed within the operational limits under the environmental conditions that are specified in chapter 7 TECHNICAL DATA.

Safe operation

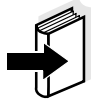
If safe operation is no longer possible, the instrument must be taken out of operation and secured against inadvertent operation. Safe operation is no longer possible if the instrument

- has been damaged in transport
- has been stored under adverse conditions for a lengthy period of time
- is visibly damaged
- no longer works as prescribed.

If you are in any doubt, please contact the supplier of your instrument.

3 Commissioning

3.1 Unpacking and setting up the instrument



Unpacking

Note

Please also follow the instructions on how to set up the instrument in the enclosed operating manual of the Liebherr company!

When unpacking the instrument pay attention to shipping damages. If you find damages inform the consigner immediately so that you can claim insurance cover.

Check the scope of delivery according to the delivery note.

Positioning at the location



Also observe the environmental conditions according to chapter 7 TECHNICAL DATA.

Caution

Do not expose the instruments with glass doors to direct sunlight, as the interior of the cabinets may be warmed up too much!

3.2 Initial commissioning

Caution

After transporting and setting up the thermostat cabinet, wait at least 60 minutes before switching on.



Course of the initial commissioning

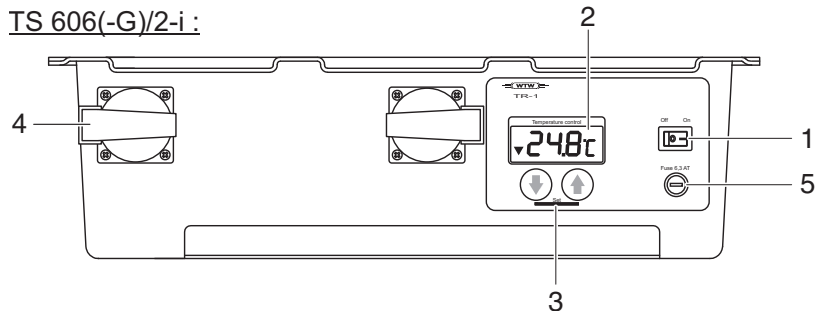
1	Connect mains plug to mains socket (230 V / 50 Hz, power see chapter 7 TECHNICAL DATA).
2	Switch on the thermostat cabinet and set the desired temperature (see chapter 4 OPERATION).

4 Operation

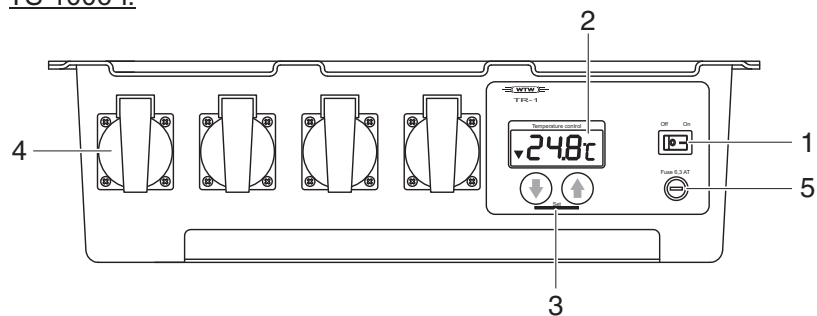
4.1 Operating elements

Control unit inside the
thermostat cabinet

TS 606(-G)/2-i :



TS 606(-G)/4-i
TS 1006-i:



- | | |
|---|---|
| 1 | <On/Off> switch: switch the instrument on and off |
| 2 | LED display: temperature and status display |
| 3 | <Up> and <Down> keys:
display desired temperature / set desired temperature |
| 4 | 4 Schuko sockets:
connection of BOD ₅ instruments or stirring platforms |
| 5 | Electrical fuse for control unit and compressor |



Note

The additional operation/light unit of the models TS 606/2i and TS 606-G/2i is inoperable.

4.2 Switching on the thermostat cabinet

To switch on, set the <On/Off> switch the control unit to **On**. In the switched on condition, the Schuko sockets are supplied with voltage.

To switch off, set the <On/Off> switch to **Off**.

4.3 Connecting the stirring platforms



Caution

Observe the maximum sum load for all 4 sockets (see chapter 7 TECHNICAL DATA). If the sum load is too high, the temperature control may be disturbed.

Connecting the stirring platforms

1	Open the door.
2	Equip the thermostat cabinet with stirring platforms. When doing so, observe the following points: ● Place the stirring platforms and other fillings in the center of the gratings to ensure an optimum air circulation! ● If the cabinet is only partly filled, use the upper levels.
3	Connect the stirring platforms to the sockets of the control unit. Note for the models TS 606/2i and TS 606-G/2i: With the included Y-cable you can connect up to four stirring platforms (for example 4 x IS 6).
4	Close the door.

4.4 Setting the desired temperature



Note

The adjusted desired temperature remains stored in the case of a power failure or when the instrument is switched off.

Setting the desired temperature

1	Open the door.
2	Press the <Up> and <Down> keys simultaneously for a short period of time. The LED display flashes and displays the current desired temperature.
3	With the aid of the <Up> or <Down> key set the desired temperature to the required value (increment of 1 °C): – <Up> Increase the desired temperature – <Down> Decrease the desired temperature.
4	Take over the adjusted value: After approx. 3 seconds without pressing the <Up> or <Down> key, the LED display shows the current internal temperature again and stops flashing. The control unit now regulates to the newly adjusted temperature.
5	Close the door.

**Operating example:
Changing the desired
temperature set in the
factory**

The desired temperature set in the factory is to be changed from 20 °C to 25 °C.

1	Press the <Up> and <Down> keys simultaneously for a short period of time. The LED display flashes and shows 20.0 °C.
2	Press the <Up> key until the LED display shows 25.0 °C.
3	Wait for approx. 3 seconds until the LED display shows the actual inside temperature again. The control unit now regulates the temperature to 25.0 °C.

Status display

The current operating mode is displayed with the aid of two arrow symbols on the left side of the temperature display:

▲ : Heating

▼ : Cooling

The required sample temperature is achieved after an adjustment time of one to three hours. The necessary duration of the adjustment time depends on the sample quantity.

While the sample temperature is being controlled, the air temperature in the thermostat cabinet (it is displayed as the actual value at the control unit) may fluctuate by up to several degrees centigrade.

The actual temperature of the sample liquid, however, fluctuates by a maximum of ± 0.5 °C.



Note

To check the actual sample temperature, see chapter 6 WHAT TO DO IF....

5 Maintenance, cleaning, disposal

5.1 General maintenance instructions

**Warning**

Before any work inside the cabinet disconnect the mains plug of the thermostat cabinet from the socket (do not only switch off the mains switch).

**Warning**

It is not allowed to perform any maintenance or cleaning work through the protective cover grid of the TR-1 control unit or to remove this grid. Any contamination can be removed through the cover grid using a vacuum cleaner.

Cleaning

Remove any dust inside the instrument every 6 to 8 months. When doing so, also remove the dust from the convection grids on the back of the instrument using a dry brush. Take care not to tear off cables or bend pipes.

For a more thorough cleaning of the cabinet inside (for example if the instrument is to be stored for a longer period of time), use lukewarm water with some washing-up liquid or household cleaner for synthetic material surfaces.

For more detailed instructions on cleaning, see the Liebherr company operating manual.

Defrosting

The instrument has an automatic defroster. Condensation water is collected in the condensation container and evaporates automatically. Take care that the condensation water can flow through the outlet in the back wall without obstructions. If necessary, clean the outlet with an elongated object, e. g. with a bottle brush.

For more detailed instructions on defrosting, see the Liebherr company operating manual.

Transport

Ship the instrument shock-protected (if possible in original packaging). Mark the packing accordingly (Keep dry / Attention, risk of fracture).

5.2 Disposal

**Note**

Instructions on how to dispose of the packing material and thermostat cabinet can be found in the operating manual of the Liebherr company.

6 What to do if...

6.1 Testing the thermostat cabinet

Test procedure

1	Prepare the test. Disconnect all consumers from the sockets of the control unit.
2	Switch on the instrument. The actual temperature must be displayed.
3	Test the ventilator: The ventilator must blow downwards. Hold your hand closely below the ventilator grating and check the air stream.
4	Test the cooling. Set the desired value to 10 °C. Make sure that the actual temperature is higher than the temperature setpoint. The compressor must switch on. Switching on may be delayed by 5 min due to the protection function against too frequent switching. The ▼ status display must appear. The temperature in the thermostat cabinet must decrease. For testing use additional thermometer without water-filled BOD bottle.
5	Test the heating and switching-off of the compressor. Set the desired value to 40 °C. Close the cabinet door. The compressor of the thermostat cabinet must switch off. The heating must switch on. The ▲ status display must appear. The temperature in the thermostat cabinet must increase. For testing use additional thermometer without water-filled BOD bottle.
6	Test the control of the thermostat cabinet. Set the desired value to 20 °C. Close the cabinet door. The actual value of the sample temperature must adjust itself in the range 19.0 °C to 21.0 °C. Test see: Measuring the actual value of the sample temperature.
7	Test the sockets. Connect a small consumer (for example WTW stirring platform) to each individual socket of the control unit. The small consumer must work at each socket.

If all test points are OK, the thermostat cabinet is OK. In the case of an error, contact the WTW service department.

6.2 Measuring the actual value of the sample temperature

Test procedure

1	Place a BOD sample bottle filled with approx. 400 ml water on a grating in the center of the thermostat cabinet.
2	Completely immerse the probe of a temperature meter (accuracy at least 0.5 °C, resolution at least 0.1 °C) in the sample bottle. The probe must not touch the bottle wall.
3	After three hours adjustment time read the temperature value.

6.3 Error diagnosis

**Control unit is switched on,
- no display indication
- no reaction**

Cause	Remedy
Mains power supply failed	Check mains power supply, connect an operable consumer (e.g. lamp) to the power socket
Fuse of the control unit defective	Check the fuse of the control unit. If it is defective, replace it by a new fuse (value, see chapter 7 TECHNICAL DATA). The fuse is available in specialist shops. <u>Warning:</u> Only use the specified type. Do not repair fuses!
Control unit defective	Contact the WTW service department.

Display of the control unit works. Desired temperature is not achieved. The actual temperature value is too low

Cause	Remedy
The waiting time was not sufficient for the loading of the thermostat cabinet.	Wait for a longer period of time and observe the development of the actual value.
The ambient temperature is too low.	Check the ambient temperature.
Control unit defective, compressor runs permanently.	Contact the WTW service department.

Display of the control unit works. Desired temperature is not achieved. The actual temperature value is too *high*

Cause	Remedy
The waiting time was not sufficient for the loading of the thermostat cabinet.	Wait for a longer period of time and observe the development of the actual value.
The heat output capacity of the consumers inside the instrument is too high.	Check the power consumption of the consumers inside the thermostat cabinet and reduce it if necessary. Also see chapter 7 TECHNICAL DATA, "Maximum sum load for all four sockets".
The ambient temperature is too high.	Check the ambient temperature.
The thermostat cabinets with transparent doors are exposed to direct sunlight.	Avoid direct sunlight on transparent doors.
Compressor runs, cooling unit defective.	Contact the Liebherr service department.
The compressor of the cooling unit does not work or the control unit does not switch on the compressor.	Contact the WTW service department.

7 Technical data

7.1 General data

Test certificates	CE	
Environmental conditions	Operation	10 °C ... + 32 °C (climatic class SN)
	Storage	- 25 °C ... + 65 °C
Guidelines and norms used	EMC	EC guideline 89/336/EEC EN 61326-1 EN 61000-3-2 EN 61000-3-3
	Instrument safety	EC guideline 73/23/EEC EN 61010-1

7.2 Electrical data

Mains power supply	Nominal voltage	230 VAC ± 10 %				
	Supply frequency	50 Hz according to DIN IEC 60038				
	Protective class	I				
	Internal instrument safety	6,3 A delay fuse, for TR 1 control unit and compressor. The fuse is on the operating front of the control unit.				
Protective class	I					
Maximum electrical power consumption [W]	TS 606/2-i	TS 606-G/2-i	TS 606/4-i	TS 606-G/4-i	TS 1006-i	
	160	320	380	380	380	

Consumers at the sockets of the control unit are not taken into account for these specifications.

7.3 Temperature control unit TR-1

Control range	10 °C ... 40 °C
Setting increment	1 °C (1 K)
Constancy of the sample temperature	± 0.5 °C (0.5 K)
Recirculation ventilation	120 m ³ /h by means of a tangential ventilator
Temperature and status display	● 3-digit LED display for temperature, resolution 0.1 °C (0.1 K) ● Status displays for heating and cooling phases
Connections	4 (respectively 2) Schuko sockets, maximum sum power consumption:

TS 606/2-i	TS 606-G/2-i	TS 606/4-i	TS 606-G/4-i	TS 1006-i
50 W	50 W	100 W	100 W	100 W

7.4 Dimensions and weights

	TS 606/2-i	TS 606-G/2-i	TS 606/4-i	TS 606-G/4-i	TS 1006-i
Volume [l]	180	180	360	360	500
Outer dimensions [mm]					
Height	850	850	1640	1640	1640
Width	600	600	600	600	750
Depth	600	600	610	610	730
Inner dimensions [mm]					
Height	702	702	1452	1452	1338
Width	513	513	470	470	600
Depth	441	441	440	440	560
Weight [kg]					
Gross (incl. packing)	37	46	58	74	75
Net	34	43	53	69	69

8 Service information

This chapter applies to service personnel of both the Liebherr and WTW companies.



Warning

Before working on the current circuits it is essential to disconnect the mains plug of the thermostat cabinet! The following tasks may only be carried out by a specialist electrician authorized by WTW. The customary regulations for building electrical appliances must absolutely be observed.

Check of the cooling unit

Example	Action
1. Control unit works.	● Set the desired temperature to 10 °C. Make sure that the actual temperature is higher than the temperature set-point. The compressor must switch on. Switching on may be delayed by 5 min due to the protection function against too frequent switching. The temperature in the thermostat cabinet must decrease.
2. Control unit does not work.	● Switch off the control unit! ● Disconnect the mains plug of the thermostat cabinet. ● Bridge the control contact of the control unit in the connection box of the compressor for a test (between the brown and black wire). ● Make sure that nobody is endangered by mains contact, then plug in the mains plug. ● If the cooling unit is operable, the compressor must run and the temperature in the thermostat cabinet must decrease.

Example	Action
2. Control unit does not work.	● Pull off the mains plug. ● If necessary, repair the cooling unit and restore the original state (to be carried out on site by Liebherr service personnel).

Replacing the control unit

1	Disconnect the mains plug of the thermostat cabinet.
2	Unscrew all fixing screws of the control unit.
3	Unplug the mains connection plug. It is located on the right-hand circuit board inside the control unit. Subsequently, take the control unit out of the cabinet.
4	Plug a new control unit onto the mains connection plug and screw it tight using the fixings screws.
5	Connect the mains plug of the thermostat cabinet. Then test the thermostat cabinet according to section 6.1.

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Service and Returns:

Xylem Analytics Germany
Sales GmbH & Co. KG
WTW
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany

Tel.: +49 881 183-325
Fax: +49 881 183-414
E-Mail wtw.rma@xyleminc.com
Internet: www.WTW.com



Xylem Analytics Germany GmbH
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany