

Solar Heat Meter For RHI

**Installation, Commissioning,
Operation & Service Instructions**

IMPORTANT NOTE

**THESE INSTRUCTIONS MUST BE READ
AND UNDERSTOOD BEFORE INSTALLING,
COMMISSIONING, OPERATING OR
SERVICING THIS EQUIPMENT**



Heating *at work.*

Customer After Sales Services

Telephone: **01202 662555** E-mail: **service@hamworthy-heating.com** Fax: **01202 662522**

Technical Enquiries

To supplement the detailed technical brochures, technical advice on the application and use of products in the Hamworthy Heating range is available from our technical team in Poole and our accredited agents.

Site Assembly

Hamworthy offer a service of site assembly for many of our products where plant room access is restricted. Using our trained staff we offer a higher quality of build and assurance of a boiler built and tested by the manufacturer.

Commissioning

Commissioning of equipment by our own engineers, accredited agents or specialist sub-contractors will ensure the equipment is operating safely and efficiently.

Service Contracts

Regular routine servicing of equipment by Hamworthy service engineers inspects the safety and integrity of the plant, reducing the risk of failure and improving performance and efficiency. Service contracts enable you to plan and budget more efficiently.

Breakdown service, repair, replacement

Hamworthy provide a rapid response breakdown, repair or replacement service through head office at Poole and accredited agents throughout the UK.

Spare Parts

We offer a comprehensive range of spare parts, providing replacement parts for both current and discontinued products. Delivery options are available to suit you. Please refer to our website for more details.

Solar Heat Meter Superstatic 449 For RHI

Installation, Commissioning, Operation & Service Instructions

NOTE: THE INSTRUCTIONS CONTAINED IN THIS MANUAL MUST BE READ AND UNDERSTOOD BEFORE INSTALLING & COMMISSIONING THIS HEAT METER.

*HEAT METER SUPERSTATIC 449 WITH INTEGRATOR SUPERCAL 531 COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.
HEAT METER SUPERSTATIC 449 & INTEGRATOR SUPERCAL 531 SOLD BY HAMWORTHY HEATING LTD IS A REGISTERED TRADEMARK OF SONTEX SA.*

**PUBLICATION NO. 500001294
ISSUE 'B'
JULY 2013**

CONTENTS

	SECTION
INSTALLATION GUIDELINES FOR HEAT METER SUPERSTATIC 449	1
OPERATIONS MANUAL FOR INTEGRATOR (SUPERCAL 531) SOLD WITH HEAT METER SUPER STATIC 449	2
SPARE PART NUMBERS FOR HEAT METER SUPERSTATIC 449 & INTEGRATOR SUPERCAL 531	3

SECTION 1

Installation Guidelines For Heat Meter Superstatic 449

Einbau- und Betriebsanleitung statischer Wärmezähler Superstatic 449 Installation guidelines Static Heat Meter Superstatic 449

Allgemeines

Der statische Durchflusssensor und das Rechenwerk dürfen nur innerhalb der auf dem Typenschild sowie in der technischen Spezifikation aufgeführten Bedingungen betrieben werden! Bei Missachtung dieser Vorgaben ist eine Haftung des Herstellers ausgeschlossen. Der Hersteller haftet nicht für unsachgemäßen Einbau und Betrieb. Plomben dürfen nicht bzw. nur durch autorisierte Personen entfernt werden, dabei sind länderspezifische und lokale Vorschriften sowie die Herstellerangaben zu beachten! Der Hersteller übernimmt keine Verantwortung für die Änderung der eich- und messrelevanten Daten, falls die werkseitige Verplombung aufgebrochen oder verletzt worden ist. Bei der Verwendung von mehreren Wärmezählern in einer Abrechnungseinheit sollten im Interesse einer möglichst gerechten Wärmeverbrauchs-Messung gleiche Gerätearten und Einbaulagen gewählt werden.

Vor der Montage

- Auslegungsdaten der Anlagen überprüfen.
- Die Impulswertigkeit und der Einbauort des Durchflusssensors müssen mit den auf dem Rechenwerk angegebenen Werten übereinstimmen, Typenschilder beachten!
- Die zulässige Umgebungstemperatur beim Rechenwerk beträgt 5...55°C.
- Die Installations- und Projektierungsvorschriften sind zu beachten.
- Die Ablesbarkeit des Rechenwerkes und sämtlicher Typenschilder ist zu beachten.

Hinweise zur richtigen Zählermontage: Bedingungen zur Einhaltung der Richtlinie 2004/22/EG (MID) und der korrekten Einbaulagen siehe Seite 12

- Das Rechenwerk ist standardmäßig für den Einbau im Rücklauf parametrierbar. Für den Einbau im Vorlauf ist eine spezielle Parametrierung erforderlich, welche bei der Bestellung angegeben werden muss.
- Das Kabel zwischen dem Durchflusssensor und dem Rechenwerk darf nicht verlängert oder verkürzt werden! Das Kabel ist plombiert.
- Alle Leitungen müssen mit einem Mindestabstand von 300 mm zu Starkstrom- und Hochfrequenzkabeln verlegt werden.
- Strahlungswärme und elektrische Störfelder in der Nähe des Rechenwerkes sind zu vermeiden.
- Das Rechenwerk ist generell abgesetzt von der Kälteleitung zu montieren.
- Es ist darauf zu achten, dass kein Kondensatwasser entlang der angeschlossenen Leitungen ins Rechenwerk laufen kann.
- Sofern die Gefahr von Erschütterungen im Rohrleitungssystem besteht, sollte das Rechenwerk getrennt an der Wand montiert werden.
- Der Durchflusssensor sollte zwischen zwei Absperrventilen montiert werden.
- Bei der Montage des Durchflusssensors muss der Messkopf seitlich liegen (siehe Seite 12).
- Beim Durchflusssensor ist die Durchflussrichtung zu beachten (Pfeil auf dem Durchflusssensor).
- Die Rohrleitung ist vor der Montage des Durchflusssensors zu spülen, um zu gewährleisten, dass sich keine Fremdkörper in der Leitung befinden.
- **Der Durchflusssensor soll VOR möglichen Regel-Ventilen montiert werden um mögliche Störeinflüsse auszuschließen.**
- Die Leitungen sind bei der Inbetriebnahme generell zu entlüften. Luft im System oder im Durchflusssensor kann das Messergebnis beeinträchtigen.
- Verwenden Sie nur geeignetes, neues Dichtungsmaterial.
- Die Dichtigkeit der verschiedenen Anschlüsse muss überprüft werden.
- Ein Blitzschutz kann nicht gewährleistet werden; dies ist über die Hausinstallation sicherzustellen.

Beim statischen Wärmezähler Superstatic handelt es sich um ein Kompaktgerät. Es besteht aus den folgenden drei Teilgeräten:

- Schwingstrahl Durchflusssensor
- Rechenwerk Supercal
- Temperaturfühler (2- oder 4-Leitertechnik) mit oder ohne Tauchhülsen

Die Impulswertigkeit des Rechenwerkes und des Durchflusssensors sowie der Widerstand der Temperaturfühler und Rechenwerk müssen aufeinander abgestimmt sein. Etiketten der Geräte vergleichen!

General

The static flow sensor and the integrator may only be operated within the conditions outlined on the identification plate, as well as within the technical specification! In case of ignoring these default conditions, the manufacturer's responsibility is void.

The manufacturer is not liable for inappropriate installation and operation. Seals may not be removed and/or only by authorized persons. The country-specific, local regulations, as well as the manufacturer instructions must be respected!

If the manufacturer's seal has been broken or damaged, the manufacturer cannot be made responsible for the change of the verified and measuring relevant data.

When using several heat meters in an installation unit, one should select, in the interest of a at most possible fair heat consumption measurement, the same types of device and installation positions.

Before installation

- Check the design layout data of the installation.
- The pulse value and the installation location of the flow sensor must match the values indicated on the integrator, consult the identification plate!
- The permissible ambient temperature range of the integrator is 5 - 55 °C.
- The installation and project prescriptions must be followed.
- The readability of the integrator and also the identification plates must be followed.

Remarks on the correct meter installation: Conditions to comply with the directive 2004/22/EU (MID) and correct mounting positions see page 12

- The integrator is by default parameterized for installation into the return flow. Special parameterization is necessary for installation in the supply flow and this must be specified with the order.
- The cable between the flow sensor and the integrator must not be extended or shorted. The cable is to be sealed.
- All wiring must be installed with a minimum distance of 300 mm from heavy voltage and high frequency cables.
- Radiated heat and interfering electrical fields close to the integrator must be avoided.
- In general, the integrator should be installed away from the cooling pipes.
- It has to be ensured that no condensed water can run along the wires into the calculator.
- If the danger of vibrations in the piping system exists, the integrator should be installed separately on the wall.
- The flow sensor should be installed between two shut-off valves.
- The flow sensor must be mounted with the measuring head to the side (see page 12).
- The flow direction of the flow sensor must be respected (arrow on the flow sensor).
- Flush the pipe system before installing the flow sensors to guarantee that no foreign particles remain in the pipe.
- **The flow sensor shall be mounted BEFORE any control valve to exclude any potential parasitic influences.**
- During commissioning the pipe system must be purged. Air in the system of the flow sensor may affect the measurement.
- Use only new and appropriate sealing material.
- Water tightness of the different connections should be verified.
- A lightning protection cannot be ensured; this protection has to be guaranteed by the house installation.

The static heat meter Superstatic is a compact unit and consists of the following three partial units:

- Fluid oscillator of flow sensor
- Integrator
- Temperature sensors (2- or 4-wire) with or without pockets

The pulse values of the integrator and of the flow unit, as well as the resistance value of the temperature sensors and the integrator are matched one to the other. Compare the labels of the Devices!

Kabelanschlüsse

Zum Anschluss der Ein- und Ausgänge ist das Oberteil des Rechenwerks zu entfernen. Die Anschlüsse sind wie folgt vorzunehmen:

Klemme	Anschlussart
1,2	Direktanschluss 2-Leitertechnik, Temperatur hoch
1,2 und 5,6	4-Leitertechnik, Temperatur hoch
3,4	Direktanschluss 2-Leitertechnik, Temperatur tief
3,4 und 7,8	4-Leitertechnik, Temperatur tief
10	(+) Impulseingang Durchflusssensor 449 (weisses Kabel)
11	(-) Impulseingang Durchflusssensor 449 (grünes Kabel)
9	Spannungsversorgung Durchflusssensor 449 (braunes Kabel)
50	(+) Impulseingang zusätzlicher Impulseingang 1
51	(-) Impulseingang zusätzlicher Impulseingang 1
52	(+) Impulseingang zusätzlicher Impulseingang 2
53	(-) Impulseingang zusätzlicher Impulseingang 2
16	(+) Open collector-Ausgang 1
17	(-) Open collector-Ausgang 1 + 2
18	(+) Open collector-Ausgang 2
24	M-Bus (Optionales oder ab Werk bestücktes Modul)
25	M-Bus (Optionales oder ab Werk bestücktes Modul)

Achtung: Die geschirmten Kabel müssen generell mit der Zugentlastung geerdet werden! (siehe Bild auf Seite 12)

Erdung

Es ist darauf zu achten, dass sämtliche Erdungsanschlusspunkte (Leitungsnetz, externe Speisung und Chassis vom Durchflusssensor) der Gesamtinstallation äquipotenzial sind.

Spannungsversorgungsmodule

Die Spannungsversorgungsmodule werden mittels einer Steckverbindung an die Hauptanschlussplatine angeschlossen.

Netzmodule

Das Netzmodul 230V – 45/60 Hz ist mit einer 1A-Sicherung installationsseitig abzusichern. Die Netzmodule 230V AC, 24 VAC oder 12 – 24 VDC sind mit einer Backupbatterie bestückt. Mit der Notstromversorgung über die Backupbatterie arbeitet das Rechenwerk in einem batterie-schonenden Modus. Die messtechnischen Eigenschaften sind gewährleistet. Die Kommunikationsoptionen werden nicht unterstützt.

Die Netzmodule sind ab Werk mit einem Jumper versehen. Dieser Jumper erlaubt das Aktivieren oder Deaktivieren der Backupbatterie. Im Auslieferungszustand ist der Jumper immer gesteckt, die Backupbatterie aktiviert. Auf Anfrage können die Netzmodule auch ohne Jumper geliefert werden.



Der elektrische Anschluss der Netzmodule

Der elektrische Anschluss ist gemäß gültigen Normen und unter Berücksichtigung lokaler Sicherheitsvorschriften von einer autorisierten Person auszuführen. Die elektrische Netzleitung ist so zu verlegen, dass keine heißen Teile (Rohre etc. über 80°C) berührt werden können (Gefahr bei beschädigter Isolation). Die elektrischen Anschlüsse dürfen nicht mit Wasser in Berührung kommen.

Backupbatterie für Datum und Uhrzeit

Das eich- und messrelevante Rechenwerkoberteil ist mit einer Knopfzellenbatterie bestückt. Sie dient als Notstromversorgung für das Datum und die Zeit sowie die LCD-Anzeige, wenn das Rechenwerkoberteil vom Rechenwerkunterteil entfernt wird. Auf der LCD-Anzeige wird in diesem Fall die kumulierte Betriebsdauer der Batterie in Minuten angezeigt. Die Backupfunktion der Knopfzellenbatterie ist bis zu 3 Monate ausgelegt, d.h. kumulierte Zeit wo das Rechenwerkoberteil vom Rechenwerkunterteil getrennt ist.

Achtung: Bei fehlendem Spannungsversorgungsmodul im Rechenwerkunterteil wird die Knopfzellenbatterie im Rechenwerkoberteil vorzeitig entleert.

Bei Lagerhaltung des Rechenwerks über längere Zeit soll darauf geachtet werden, dass die Backupbatterie im mess- und eichrelevanten Rechenwerkoberteil nicht aktiviert ist. Auf Anfrage kann im Werk ein Schutzfilm montiert werden, der die Batterie vor der frühzeitigen Entladung schützt. Es ist sicher zu stellen, dass der Schutzfilm vor der Inbetriebnahme entfernt wird.

Cable connection

To connect the inputs and outputs the integrator's upper part must be removed.. The connections are to be made as follows:

Terminal	connection type
1,2	2-wire direct connection, temperature high
1,2 and 5,6	4-wire, temperature high
3,4	2-wire direct connection, temperature low
3,4 and 7,8	4-wire, temperature low
10	(+) pulse inputs flow sensor 449 (white cable)
11	(-) pulse inputs flow sensor 449 (green cable)
9	supply voltage for the flow sensor 449 (brown cable)
50	(+) Pulse input, additional pulse input 1
51	(-) Pulse input, additional pulse input 1
52	(+) Pulse input, additional pulse input 2
53	(-) Pulse input, additional pulse input 2
16	(+) Open collector-output 1
17	(-) Open collector output 1 + 2
18	(+) Open collector output 2
24	M-Bus (module optional or equipped at factory)
25	M-Bus (module optional or equipped at factory)

Note: Generally, the shielded cables must be grounded with a strain relief! (see picture on page 12)

Grounding

It has to be guaranteed that all grounding connections (line and power mains and chassis of the flow sensor) of the total installation are equipotential.

Power supply modules

The power supply modules are connected by means of a plug-in connector to the main board.

Mains power supply modules

From the installation side, the main power 230V – 45/60 Hz is to be protected with a 1A fuse. The power supply module 230V AC, 24 VAC or 12 - 24 VDC are equipped at the factory with a backup battery. With the emergency power supply via the backup battery, the integrator is operated in a mode to preserve the battery. The instrumentation characteristics are ensured, however the communication options are not supported.

The mains power supply modules are provided ex factory with a jumper. This Jumper permits an activating or a deactivating of the backup battery. At the delivery of the integrator the jumper is always plugged, the battery activated. Per request the power supply module can also be supplied without the jumper.



The electrical connection of the mains power supply modules

The electrical connection has to be done in accordance with valid standards, under consideration of local safety regulations and by an authorized person. The electrical main is to be made in such way that no hot parts (pipes etc. over 80°C) can be touched (danger with damaged isolation). Water contact of the electrical connection must be avoided.

Backup battery for date and time

The calibration and measuring relevant integrator upper part is equipped with a button cell battery. This button cell battery serves as power supply for the date and time function as well as for the LCD display, if the integrator upper part is removed from the lower part. On the LCD display appears in this case the cumulated running time of the battery in minutes. The back up button cell battery suffices for up to 3 months cumulated time where the upper part is separated from the lower part.

Note: With missing voltage supply module from the lower part of integrator the button cell battery in the upper part of the integrator is emptied prematurely.

With the storage of the integrator make sure that the back-up battery is not activated. On request a protective film can be installed at the factory, in order to protect the battery from an early discharge. Make sure to remove the protective film before commissioning.

Sicherheitshinweise

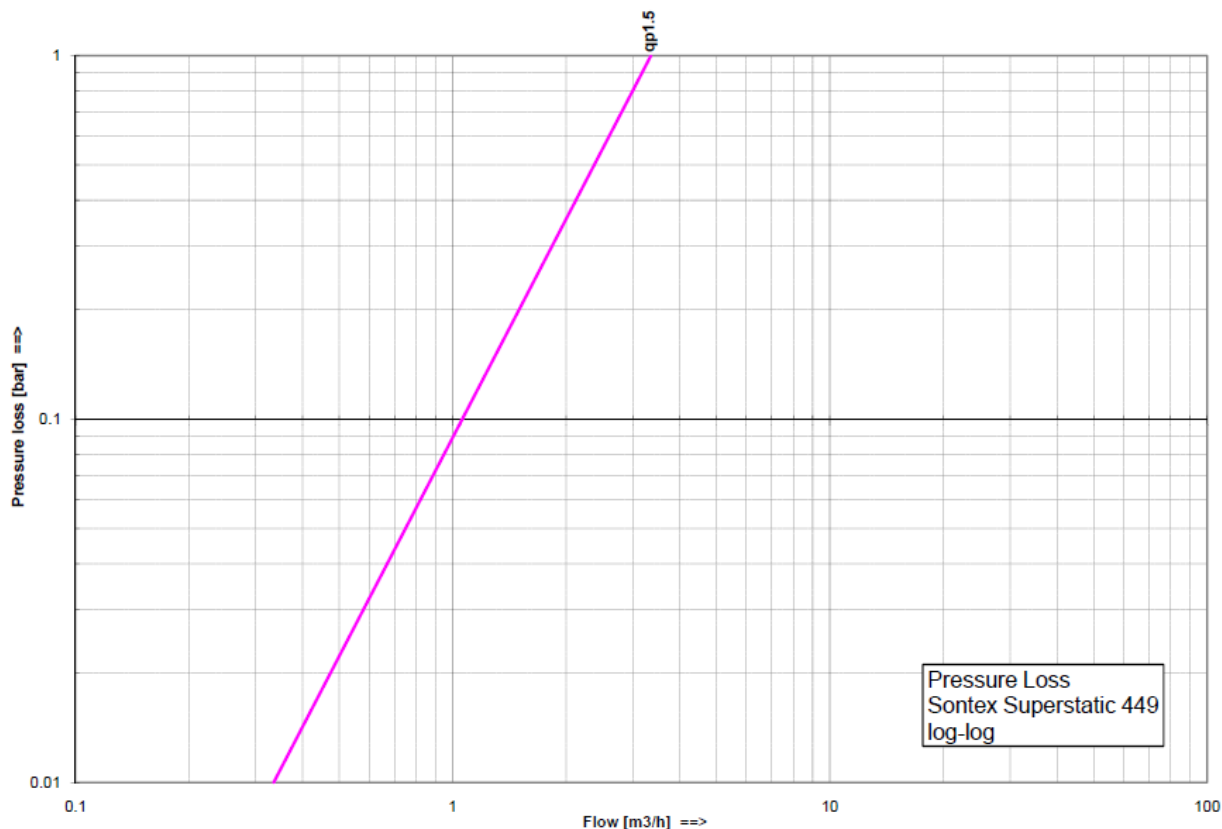
Das Rechenwerk ist gemäß EN 61010 Schutzmaßnahmen für elektronische Messgeräte gefertigt und geprüft und hat das Werk in sicherheitstechnisch einwandfreiem Zustand verlassen. Zur Erhaltung dieses Zustands und zum gefahrlosen Betreiben des Rechenwerks muss der Anwender die Hinweise und Warnvermerke beachten, die in der Installationsanleitung enthalten sind. Beim Öffnen von Abdeckungen oder Entfernen von Teilen, außer wenn dies von Hand möglich ist, können spannungsführende Teile freigelegt werden. Weiterhin können Anschlussstellen spannungsführend sein. Sämtliche Reparaturen- und Wartungsarbeiten dürfen nur von einer hierfür ausgebildeten und befugten Fachkraft ausgeführt werden. Weisen Gehäuse und / oder Anschlusskabel Beschädigungen auf, so ist das Rechenwerk außer Betrieb zu setzen und gegen versehentliche Wiederinbetriebnahme zu sichern. Vermeiden Sie generell eine Einbausituation mit einem überdurchschnittlichen Wärmestau. Ein überdurchschnittlicher Wärmestau beeinflusst massiv die Lebenszeit der elektronischen Bauteile. Wärmezähler sind Messgeräte und sorgsam zu behandeln. Zum Schutz vor Beschädigung und Verschmutzung sollte die Verpackung erst unmittelbar vor dem Einbau entfernt werden. Zur Reinigung ist ausschließlich ein mit Wasser befeuchtetes Tuch zu verwenden, keine Lösungsmittel. Die Anschluss- und Verbindungskabel dürfen nicht an der Rohrleitung befestigt und keinesfalls mit isoliert werden.

Funktionskontrolle

Nach dem Öffnen der Absperrorgane ist die Installation auf die Dichtigkeit zu prüfen. Durch wiederholtes Drücken der orangen Bedientaste können auf der LCD-Anzeige des Rechenwerkes diverse Betriebsparameter z.B. Durchfluss, Leistung, sowie Vor- und Rücklauftemperatur abgelesen werden. Der Kommunikationsindikator auf der LCD-Anzeige dient zur Überprüfung des Kommunikations-Input oder -Output. Mit der Software Prog449 können zudem die Kommunikationsausgänge simuliert werden. Der Durchfluss kann mit Hilfe des Durchflussindikators geprüft werden. Die Dynamik des Durchflusssensors kann mit Hilfe der aktuellen Durchflussanzeige in Verbindung mit einer Durchflussregelung überprüft werden.

Sämtliche Parameteranzeigen dienen zur Kontrolle des Zählers bzw. zur Einregulierung der Anlage. Es ist zu überprüfen, dass der einregulierte Durchfluss der Anlage den maximal erlaubten Durchfluss des Zählers nicht überschreitet. Zur umfassenden Funktionsprüfung wird ein Inbetriebnahmeprotokoll über die optische Schnittstelle mit der Auslese-Software empfohlen.

Druckverlustkurve



Safety instructions

The integrator is manufactured and tested according to EN 61010 safety control for measuring units and left the factory in perfect safety technical condition. To maintain this status and to guarantee safe operation of the integrator, the user must respect the instructions contained in this document. When opening covers or removing parts, parts under power can be accessed. Further connection terminals can be under power. All repair and maintenance work may be only implemented by a trained and an authorized specialist. If the housings and/or the connecting cable show any damage, the integrator unit should be disconnected and secured against accidentally reset up – put in operation. Generally, avoid an installation situation with an accumulation of heat above average. An above average heat buildup affects substantially the lifetime of the electronic components. Heat meters are measuring devices and must be handled with care. To protect the unit against damage and contamination, the packing should be only removed at the moment of installation. For cleaning just use water moistened cloth and no solvent. The connecting and connection cable may not be fastened on the pipe and under no circumstances be isolated together with the pipe.

Function test

After opening the shutoff devices the installation must to be examined for any leakage. By repeated pressing of the orange user button, various operating parameters e.g. flow, power, as well as supply and return temperature can be read from the LCD display of the integrator unit. The communication indicator on the LCD display serves for the test of the communication input or output. With the software Prog449 the communication outputs can be simulated. The flow can be tested with the help of the flow indicator. The dynamics of the flow measurement can be tested with the help of the current flow display in connection with a flow control.

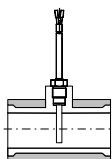
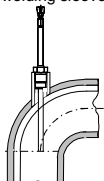
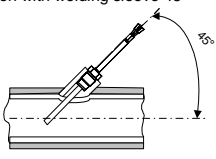
Several displayed parameters serve to control the meters and/or to adjust the installation. It has to be verified that the established flow of the system does not exceed the maximum permitted flow of the meter. For a comprehensive functional analysis, it is recommended to read the startup protocol by means of the optical interface and reading software

Temperaturfühlermontage

Die auf dem Typenschild der Temperaturfühler angegebenen Temperaturen sind zu beachten. Die Temperaturfühler sind immer gepaart abgestimmt. Sie werden nur gepaart geliefert und dürfen nicht getrennt, verlängert oder gekürzt werden, da dies die Messgenauigkeit beeinflusst. Bei Temperaturfühlerpaaren mit einer Kabellänge länger als 3 m, empfehlen wir ausschließlich den Einsatz von geschirmten Temperaturfühlerpaaren. In diesem Fall muss die Abschirmung korrekt angelegt werden. Temperaturfühler mit Tauchhülsen müssen bis zum Anschlag eingeführt werden – anschließend fixieren. Bei ungleichen Kabellängen oder länger 6 m empfehlen wir ausschliesslich die Vierleitertechnik. Die Temperaturfühler können wahlweise in Tauchhülsen oder direkt ins Heizungs- bzw. Kühlmedium montiert werden beide aber immer gleich. **Eine asymmetrische Montage, ein Fühler direkt und der andere mit Tauchhülse, ist NICHT zulässig.** Der messaktive Bereich der Temperaturfühlerspitze muss sich in der Mitte des Rohrleitungsquerschnitts befinden.

Temperature sensors mounting

The temperatures indicated on the identification plate of the temperature sensors are to be observed. The temperature sensors are always paired. Only matched pairs are supplied and may not be separated, extended or shortened, since this affects the measuring accuracy. With temperature sensor pairs with a cable length longer than 3 m, we exclusively recommend the use of shielded temperature sensor pairs. In this case, the shields must be installed correctly. Temperature sensors with protection pockets must be inserted up to the stall – and fixed afterwards. With unequal cable lengths or longer than 6 m we recommend exclusively the use of four-wire technology. The temperature sensors can be installed alternatively in protection pockets or directly in the heating and/or cooling agent however always both in the same way. **Asymmetrical mounting, one sensor direct the other with pockets, is NOT permitted** The measuring tip of the temperature sensor part must be positioned in the center of the cross section of the pipe

<p>DN15, 20, 25</p> <p>Einbau im T-Stück Installation in T-fitting</p>  <p>Temperaturfühler senkrecht zur Achse der Rohrleitung in der selben Ebene</p> <p>Temperature sensor perpendicularly to the axis of the piping in the same level</p>	<p>≤ DN 50</p> <p>Einbau in Schweissmuffe 90° Installation with welding sleeve 90°</p>  <p>Temperaturfühlerachse übereinstimmend mit der Rohrachse</p> <p>Temperature sensor axle coincide with the tubing axle</p>	<p>≤ DN 50</p> <p>Einbau in Schweissmuffe 45° Installation with welding sleeve 45°</p>  <p>Temperaturfühlermesselement eingetaucht in die Rohrachse</p> <p>Temperature sensor measuring element submerged onto the tubing axle</p>
---	---	---

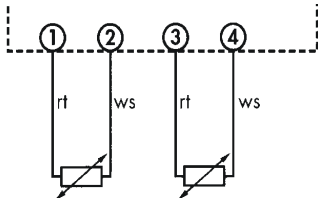
Zuordnungsliste Tauchhülsen / Allocation list sensor pockets

Temperaturfühler Temperature sensor	Versionen Versions	Tauchhülse Pocket	Artikelnummer Part number	Material	Temperaturbereich Temperature range
Ø 6x31mm	Pt100, Pt500	G3/8"	0460A202	Messing/Brass	0...100 °C
Ø 6x31mm	Pt100, Pt500	G1/2"	0460A206	Messing/Brass	0...100 °C

Anschlusschema Temperaturfühler / Temperature sensors connections

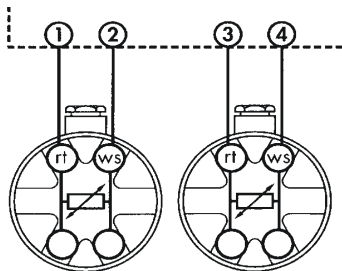
2-Leiter Kabelfühler / 2 wire cable sensor

1 / 2 Temperatur hoch / temperature high
3 / 4 Temperatur tief / temperature low



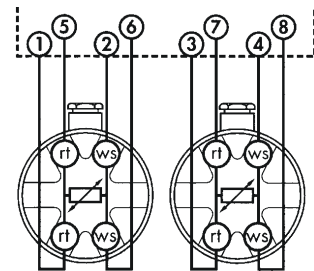
**4-Leiter Fühler mit 2-Leiter Rechenwerk
4 wire sensor with 2 wire integrator**

1 / 2 Temperatur hoch / temperature high
3 / 4 Temperatur tief / temperature low



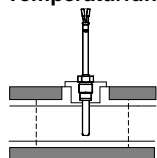
**4-Leiter Fühler mit 4-Leiter Rechenwerk
4 wire sensor with 4 wire integrator**

1 / 5 + 2 / 6 Temperatur hoch / temperature high
3 / 7 + 4 / 8 Temperatur tief / temperature low

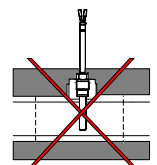


Kabelquerschnitte für Kopffühler ≥ 0,5 mm² (EN 1434-2) / Wire cross section for head sensors ≥ 0,5 mm² (EN 1434-2)

Temperaturfühlereinbau bei Kälteanlagen

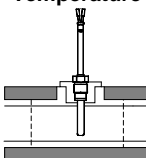


Die Isolation darf nur bis zur Temperaturfühlerverschraubung vorgenommen werden.

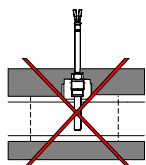


Die Verschraubung der Temperaturfühler darf auf keinen Fall mit isoliert werden. Dies gilt auch, wenn der Temperaturfühler direkt im Durchflusssensor montiert ist.

Temperature sensor installation with cooling applications




The isolation may be made only up to the temperature sensor screw connection.




The screw connection of the temperature sensors may in no case be isolated with. This applies even if the temperature sensor is installed directly in the flow sensor.

Fehlermeldungen

Das Rechenwerk Supercal zeigt auf der LCD-Anzeige mit der Bezeichnung Err und einem Zahlencode die anliegenden Fehlermeldungen an. Wenn mehrere Fehler gleichzeitig anliegen, werden die Nummern der Fehlermeldungen summiert.

Err1	Der Vorlauffühler hat einen Kurzschluss oder Unterbruch
Err2	Der Rücklauffühler hat einen Kurzschluss oder Unterbruch
	Temperaturfühler vertauscht bzw. Temperaturfühler im kälteren Strang ist höher als im wärmeren Strang
Err4	Durchfluss zu hoch
Err8	Speicherfehler EEPROM im mess- und eichrelevanten Teil (erst nach dem zweiten mal aktiv)
Err16	Speicherfehler EEPROM im Rechenwerkunterteil (erst nach dem zweiten mal aktiv)
Err32	Konfigurationsfehler EEPROM im mess- und eichrelevanten Teil
Err64	Konfigurationsfehler EEPROM im Rechenwerkunterteil
Err128	Interner Elektronikfehler, zurück zum Hersteller
Err256	Spannungsausfall (bei Netz- oder Busversorgung)
Err512	Defektes Kommunikationsmodul Steckplatz 1
Err1024	Defektes Kommunikationsmodul Steckplatz 2
Err2048	Fehler Impulseingang Zusatzzähler A1
Err4096	Fehler Impulseingang Zusatzzähler A2
Err8192	Interner Elektronikfehler, zurück zum Hersteller

Liegt ein Fehler mehr als eine Stunde an, so wird er im Fehlerspeicher mit Datum und Uhrzeit (Fehleranfang) und Dauer (in Minuten) abgespeichert. Wenn ein Fehler weniger als 60 Minuten anliegt, so wird er automatisch und ohne Speicherung gelöscht.

Die zwei Temperaturfühlerindikatoren  werden bei der kumulierten Energieanzeige auf dem Hauptmenü angezeigt, wenn:

- die Temperaturfühler vertauscht sind ⇒ dieser Anlagenzustand tritt bei den meisten Installationen während der Sommerzeit auf
- die Temperatur im kälteren Strang höher ist als im wärmeren Strang.

Sämtliche Fehlermeldungen werden 60 Sekunden nach der Fehler-Beseitigung automatisch auf der LCD-Anzeige gelöscht.

Optionale Kommunikationsmodule

Das Rechenwerk kann mit bis zu zwei verschiedenen optionalen Kommunikationsmodulen nachgerüstet werden. Die optionalen Kommunikationsmodule können nachbestückt werden, ohne dass die eichamtliche Prüfung verletzt wird. Die Optionsmodule sind rückwirkungsfrei auf den eichrelevanten Teil im Rechenwerkdeckel. Spätestens 10 Sekunden nach der Montage erkennt das Rechenwerk die eingesteckten Optionsmodule und ist für die Funktionen frei verfügbar. Beim Anschluss der Kommunikationsmodule ist die mitgelieferte Installationsanleitung zu beachten.

Parametrierungen

Durch setzen eines Jumpers auf der Hauptplatine auf dem Steckplatz JP1 wird der Parametrier- und Testbetrieb aktiviert. Über die 2 Bedientasten auf dem Rechenwerk können Datum und Zeit, Kundennummer und die M-Bus Primäradresse geändert werden. Der Stromverbrauch ist im Parametrier- und Testbetrieb grösser als im Normalbetrieb, also Jumper unbedingt wieder entfernen nach Abschluss der Parametrierungen.


Weitere Parameter können mit der Software Prog449 geändert werden abhängig von den Berechtigungen und ohne Setzen des Jumpers.

Kühlmittel (Glykol)


Für Kälteanwendungen mit Kühlmittel-Wassergemischen ist ausschliesslich der Kältezähler Superstatic 440 zu verwenden.

Error messages

The integrator indicates occurring errors by displaying on the LCD the Err-sign together with a numbered code. If several errors occur at the same time, the numbers of the error codes are added.

Err1	The supply sensor is short circuited or disconnected
Err2	The return sensor is short circuited or disconnected
	The temperature sensors are switched; the temperature sensor in the cooler line is higher than the temperature sensor in the warmer line
Err4	Flow rate too high
Err8	EEPROM error in the integrator base (only active after the second incident)
Err16	EEPROM error in the measurement and calibration part (only active after the second incident)
Err32	Configuration error into the measurement and calibration part
Err64	Configuration error into the integrator base
Err128	Internal electronic failure, return to manufacturer
Err256	Tension drop (by mains supply or bus supply)
Err512	Defective communication module connection place 1
Err1024	Defective communication module connection place 2
Err2048	Error pulse inputs additional meter A1
Err4096	Error pulse inputs additional meter A2
Err8192	Internal electronic failure, return to manufacturer

If an error lasts longer than an hour the error will be registered in the error register with its date and time (beginning) and duration (in minutes). When an error lasts less than 60 minutes the error will be automatically deleted without being memorized.

The two temperature indicators  are displayed on the cumulated energy by the main menu when:

- Temperature sensors are switched ⇒ this installation error mode happen with most installations during the summer time
- Temperature in the cooler line is higher than the one in the warmer line.

These error messages are automatically deleted from the LCD display 60 seconds after the error has been removed.

Communication options

The integrator can be fitted with up to two different optional communication modules. The optional communication modules can be equipped afterwards, without damaging the verification. The optional modules have no influence on the verified relevant part in the cover of the integrator unit. At the latest 10 seconds after the installation, the integrator unit recognizes the plugged in optional modules and the functions are freely available. When connecting the communication modules, the installation guidance - supplied with the unit - is to be considered.

Parameter mode

By plugging a jumper on the main board, position JP1, the parameter and test mode is activated. With the 2 buttons on the integrator date and time, customer number and the M-Bus primary address can be modified. The current consumption is higher with the parameter and test mode than in the normal mode, thus it's important to remove the jumper after the parameterisation.

Additional parameters can be modified with the software Prog449 depending on the user rights but without plugging the jumper.

Cooling liquids (Glycols)

For cooling applications with cooling liquids water mixtures exclusively use the Superstatic 440.

Anzeige

Das Rechenwerk verfügt über folgende Anzeigeebenen: siehe Etikette unterhalb der Anzeige

- **Favoritenmenü (sofern aktiviert)**
- **Hauptmenü (Abrechnungsrelevante Daten)**
- **Stichtage**
- **Monatswerte**
- **Mittelwerte**
- **Maximalwerte**
- **Konfiguration**
- **Service**

Die Anzeigeebenen können kundenspezifisch in der Anzahl sowie in der Reihenfolge der Anzeigesequenzen parametrisiert werden. Aus diesem Grund können Abweichungen im Bereich der Anzeigeebenen und der Reihenfolge der Anzeigesequenzen möglich sein.

LCD-Bedienkonzept



Mit der Pfeiltaste können Sie die verschiedenen Menüs oder die Positionen innerhalb der Menüs ansteuern. Im Prüfbetrieb können Sie auch die Zahlen von 0...9 mit der Pfeiltaste erhöhen.

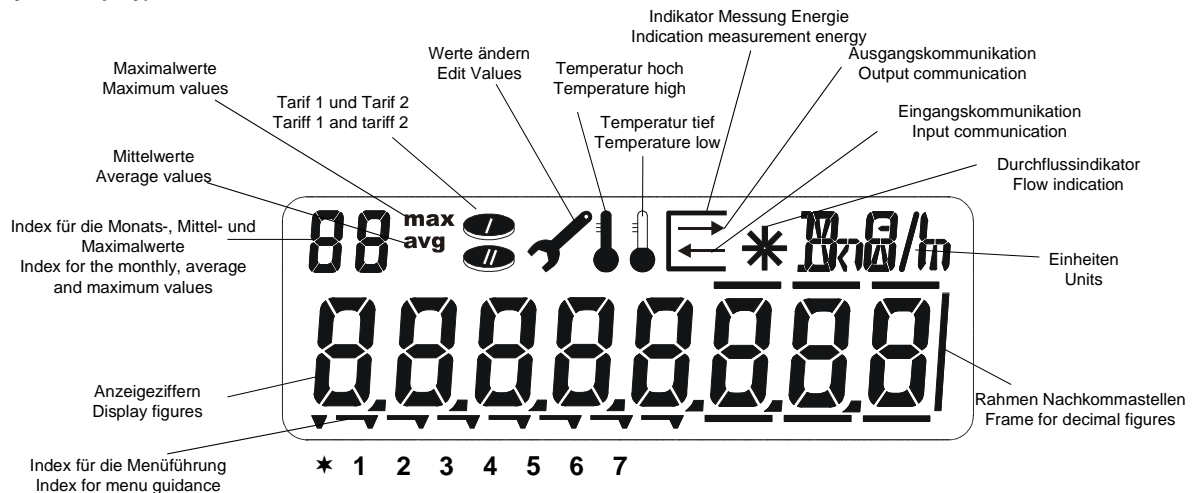


Durch Drücken der Entertaste können Sie das Menü oder die Position bestätigen.

Wenn Sie die Entertaste gedrückt halten (beliebige Position und/oder Menü), können Sie durch Drücken der Pfeiltaste auf die verschiedenen Ebenen zurückkehren oder durch gleichzeitiges Drücken der Entertaste und Pfeiltaste kehren Sie auf die vorherige Menüposition zurück.

Nach 3 Minuten schaltet die Anzeige des Rechenwerkes automatisch auf das Hauptmenü zurück.

LCD (Liquid Crystal Display)



Display

The integrator Supercal has the following display sequence: See label below the display

- **Favorite menu (if activated)**
- **Main menu (Billing relevant data)**
- **Set days**
- **Monthly values**
- **Average values**
- **Maximal values**
- **Configuration**
- **Service**

The display levels can be customized; in number and in order of the display sequences. For this reason deviations can be possible in the range of the display levels and the order of the display sequences.

LCD control concept



With the arrow key you can address the different menus or the positions within a menu. In the verification mode you can also increment with the arrow key the digits from 0...9.



By pressing the enter key you can confirm the menu or the position.


When you keep pressing the enter key, you can by pressing the arrow key (at any Pos. and/or menu) get back to the different levels or by simultaneously pressing the enter key and the arrow key you can get back to the previous menu position.

After 3 minutes the display of the integrator switches automatically back to the main menu.

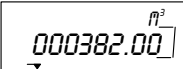
Statischer Wärmezähler Superstatic 449
Static Heat Meter Superstatic 449



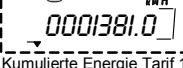
Hauptmenü Main menu



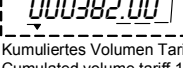
 *1 2 3 4 5 6 7
 Kumulierte Energie
 Cumulated energy



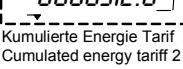
 Kumuliertes Volumen
 Cumulated volume



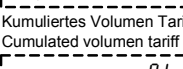
 Kumulierte Energie Tarif 1
 Cumulated energy tariff 1



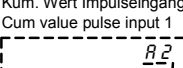
 Kumuliertes Volumen Tarif1
 Cumulated volume tariff 1



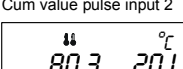
 Kumulierte Energie Tarif 2
 Cumulated energy tariff 2



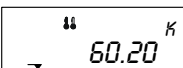
 Kumuliertes Volumen Tarif 2
 Cumulated volumen tariff 2



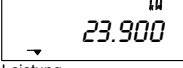
 Kum. Wert Impulseingang 1
 Cum value pulse input 1



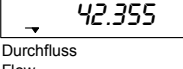
 Kum. Wert Impulseingang 2
 Cum value pulse input 2



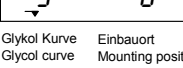
 Temperatur hoch / tief
 Temperature high / low



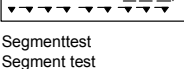
 Temperaturdifferenz
 Temperature difference




 Leistung
 Power



 Durchfluss
 Flow

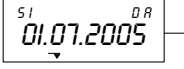


 Glykol Kurve Einbautort
 Glycol curve Mounting position




 Segmenttest
 Segment test

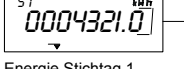
Stichtagsmenü Set day menu



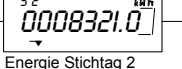
 * 1 2 3 4 5 6 7
 Datum Stichtag 1
 Date set day 1



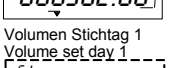
 Datum Stichtag 2
 Date set day 2



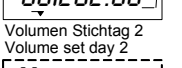
 Energie Stichtag 1
 Energy set day 1



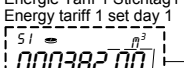
 Energie Stichtag 2
 Energy set day 2



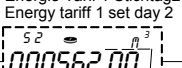
 Volumen Stichtag 1
 Volume set day 1



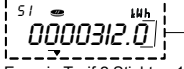
 Volumen Stichtag 2
 Volume set day 2



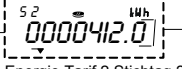
 Energie Tarif 1 Stichtag1
 Energy tariff 1 set day 1




 Energie Tarif 1 Stichtag2
 Energy tariff 1 set day 2




 Volumen Tarif1 Stichtag1
 Volume tariff 1 set day 1



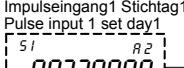
 Volumen Tarif1 Stichtag 2
 Volume tariff 1 set day 2



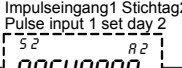
 Energie Tarif 2 Stichtag 1
 Energy tariff 2 set day 1




 Energie Tarif 2 Stichtag 2
 Energy tariff 2 set day 2




 Volumen Tarif2 Stichtag1
 Volume tariff 2 set day 1




 Volumen Tarif 2 Stichtag2
 Volume tariff 2 set day 2



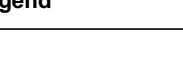
 Impulseingang 1 Stichtag1
 Pulse input 1 set day1



 Impulseingang 1 Stichtag2
 Pulse input 1 set day 2




 Impulseingang 2 Stichtag 1
 Pulse input 2 set day1




 Impulseingang 2 Stichtag 2
 Pulse input 2 set day 2

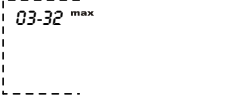
Legende Legend



 Standardanzeige
 Standard indication

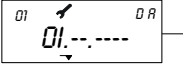


 Wird nur angezeigt wenn die Option verfügbar ist
 Only indicated if the option is available

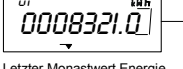


 Weitere Werte innerhalb des Menüs abrufbar:
 3 - 15 Monatswert
 3 - 32 Mittelwert
 3 - 32 Maximalwert

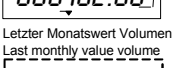
Monatswerte Monthly values



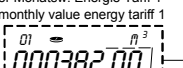
 * 1 2 3 4 5 6 7
 Speichertag Monatswerte
 Storage day monthly values




 Letzter Monatswert Energie
 Last monthly value energy



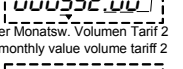
 Letzter Monatswert Volumen
 Last monthly value volume



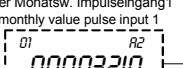
 Letzter Monatsw. Energie Tarif 1
 Last monthly value energy tariff 1




 Letzter Monatsw. Volumen Tarif 1
 Last monthly value volume tariff 1




 Letzter Monatsw. Energie Tarif 2
 Last monthly value energy tariff 2



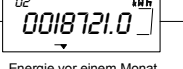
 Letzter Monatsw. Volumen Tarif 2
 Last monthly value volume tariff 2



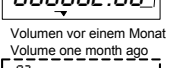
 Letzter Monatsw. Impulseingang 1
 Last monthly value pulse input 1



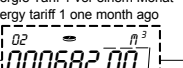
 Letzter Monatsw. Impulseingang 2
 Last monthly value pulse input 2



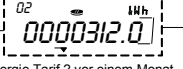
 Energie vor einem Monat
 Energy one month ago



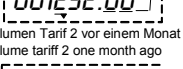
 Volumen vor einem Monat
 Volume one month ago



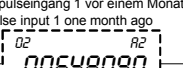
 Energie Tarif 1 vor einem Monat
 Energy tariff 1 one month ago




 Volumen Tarif 1 vor einem Monat
 Volume tariff 1 one month ago




 Energie Tarif 2 vor einem Monat
 Energy tariff 2 one month ago



 Volumen Tarif 2 vor einem Monat
 Volume tariff 2 one month ago

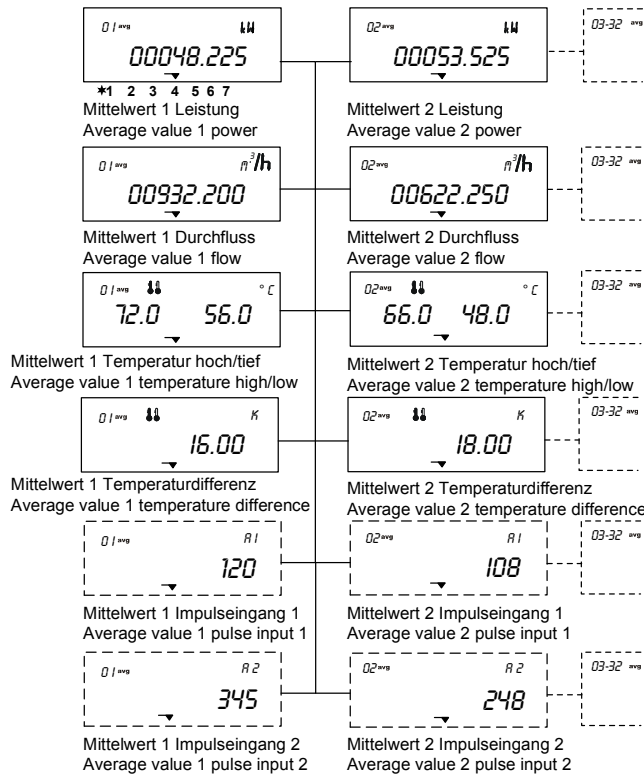


 Impulseingang 1 vor einem Monat
 Pulse input 1 one month ago

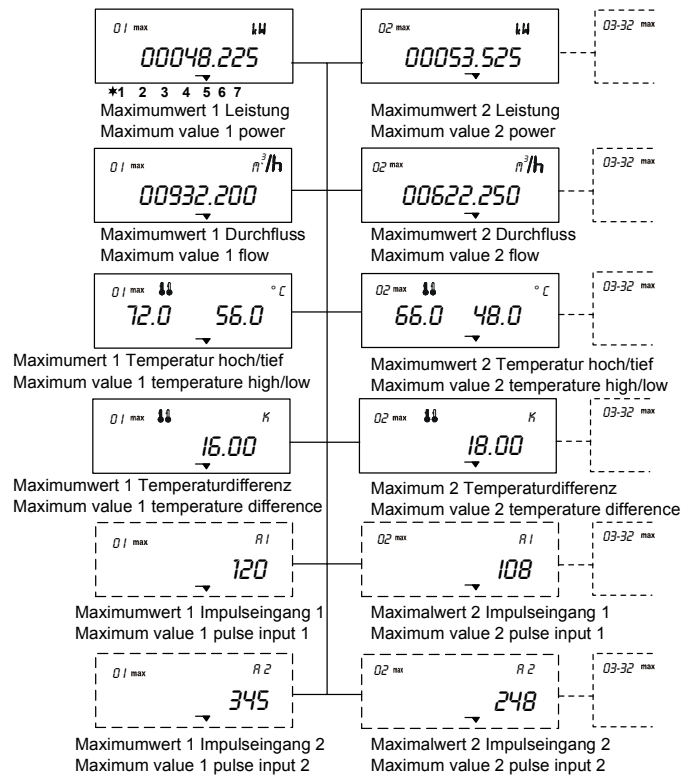


 Impulseingang 2 vor einem Monat
 Pulse input 2 one month ago

Mittelwerte Average values



Maximalwerte Maximum values



Sicherungsmaßnahmen

Plombierungen

Da die Plombierungen länderspezifisch unterschiedlich sein können, sind die lokalen Vorschriften zu beachten. Gegen allfällige Manipulation oder den unbefugten Ausbau müssen der Wärmezähler, die Verschraubungen sowie die Temperaturfühler und Tauchhülsen mit Benutzerplomben versehen werden. Die Plomben dürfen nur durch autorisierte Personen entfernt werden. Bei Nichtbeachtung entfällt die Gewährleistungspflicht. Es ist wichtig, dass die Plombierdrähte so kurz wie möglich ausgelegt werden und zur Plombe gut gespannt sind. Nur so ist die Plombierung gegen unbefugten Eingriff geschützt.

- Empfehlung für die Plombierung

Safety Measures

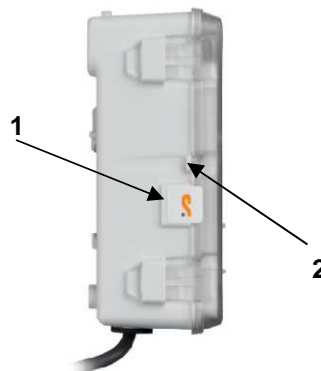
Security seals

Seals are country specific; the local regulations must be respected. Against possible manipulation or unauthorized dismantling, the heat meters, the screw connections, as well as the temperature sensors and pockets must be protected with user seals. The seals may be removed only by authorized persons. By neglecting this precaution the guarantee obligation is void. It is important that the seal wires are kept as short as possible and are well strained towards the seals. Only this way, the seal is protected against unauthorized interference.

- Recommendations for sealing



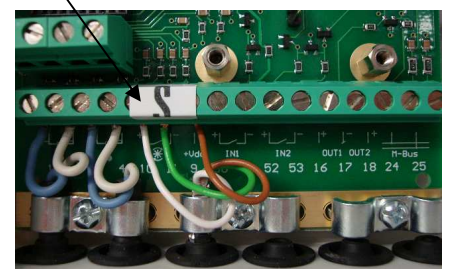
Ab Werk plombiert - Ex factory seals



1: Klebplombe / Sticker seal
2: Drahtplombe / Wire seal



Ab Werk plombiert - Ex factory seals



Konfiguration Configuration

DR
17.03.2006
*1 2 3 4 5 6 7
Aktuelles Datum
Actual date

Hr
15.02
Aktuelle Zeit
Actual time

PL
95.0
Impulswertigkeit
Pulse value

R1 0.01 **R2** 0.01
Einheit Impulseingang A1
Unit pulse input A1

R1 1.0000 **R2** 1.0000
Impulswertigkeit Eingang A1
Pulse value input A1

B1 1.0000 **B2** 1.0000
Impulswertigkeit Ausgang B1
Pulse value output B1

min
60
Integrationszeit Mittelwert
Integration time average value

h
24
Integrationszeit Maximalwert
Integration time maximum value

Rd
249
M-Busadresse
M-Bus address

Br
9600
M-Bus Baudrate address
M-Bus baud rate

Rd
60525623
Funkadresse
Radio address

Service Service

Cn
60525623
*1 2 3 4 5 6 7
Identifikationsnummer
Identification number

MFn
60525622
Nummer Rechenweroberteil
Number upper part integrator

CFn
60525622
Nummer Rechenwerkunterteil
Number lower part integrator

SW 4.1
Softwareversion
Software version

HW 4.2
Hardwareversion
Hardware version

OPn
00000000
Impulswertigkeit Eingang A 1
Pulse value input A 1

PL
500
Temperaturfühler Typ
Typ temperature sensor

rh
45698
Betriebsstunden
Runing hours

Df
249
Tage ohne Durchfluss
Days without flow

DE
249
Tage ohne Energie
Days without energie

Err 259
Fehlermeldung
Error code

Err 34256
Aktuelle Fehlerdauer in Minuten
Actual duration of error in minute

01 **EH**
Err 259
Fehlermeldung
Error code

01 **min**
238
Fehlerdauer in Duration of
Error duration in minute

01 **DR**
28.12.2006
Startdatum Fehler 1
Start date error 1

01 **Hr**
8.10
Startzeit Fehler 1
Start time error 1

02 **EH** **03-10**
Err 259
Fehlermeldung
Error code

02 **min** **03-10**
238
Fehlerdauer in Duration of
Error duration in minute

02 **DR** **03-10**
28.12.2006
Startdatum Fehler 1
Start date error 1

02 **Hr** **03-10**
8.10
Startzeit Fehler 2
Start time error 2

Prüfprogramm Test mode

5L
00000000
*1 2 3 4 5 6 7
Start Rechenwerkprüfung
Start integrator test

m³
2.0000000
Volumen für die Simulation
Volume for simulation

MWh
0.0000
Simulierte Energie
Simulated energy

K
10.10
Temperaturdifferenz
Temperature difference

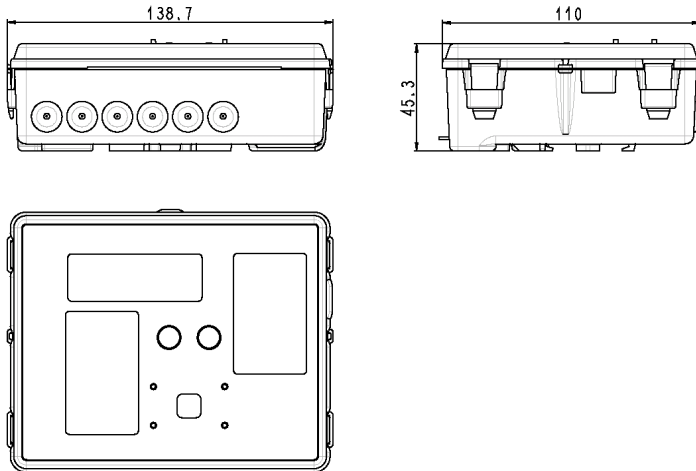
°C
60.12 50.02
Temperatur hoch / tief
Temperature high / low

m³
0.0000000
Simulierte Volumen
Simulated volume

m³/h
0.0000000
Aktueller Durchfluss
Actual flow

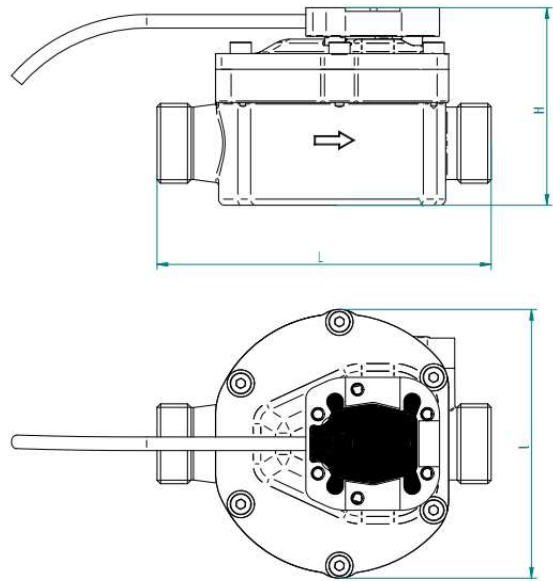
Massbilder statischer Wärmehähler Superstatic 449

Rechenwerk / Integrator



Dimensions heat meter Superstatic 449

Schwingstrahl Durchflusssensor / Fluid oscillator flow sensor



qp	G	PN	l (mm)	H (mm)	L(mm)
*0.6 m ³ /h	¾"	16	70	60	110
*1.5 m ³ /h	¾"	16	89	65	110
*1.5 m³/h	1"	16	89	65	130
*1.5 m ³ /h	1"	16	89	65	190
*2.5 m ³ /h	1"	16	89	65	130
*2.5 m ³ /h	1"	16	89	65	190

*In Vorbereitung / under way

Betriebstemperatur-Temperatur, dauernd / Operating Temperature, permanent	90°C
Empfohlene Einlaufstrecken / Inlet straight section (EN 1434)	3D für / for : L=110mm 3D für / for : L=130mm; 0D für / for : L=190mm
Verbindung zwischen Durchflusssensor und Rechenwerk Connection between flow sensor and integrator	0.8 m; fest / fix



Superstatic 449: Max. 140 x 110 x 112 [mm]

Technische Daten Durchflusssensor Superstatic 449

Technical Data Flow Sensor Superstatic 449

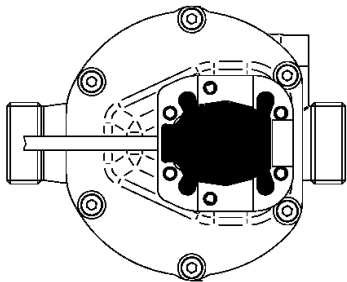
qp	Gewinde-Anschluss		Einbau-Länge	Mat.	PN	Maximal Durchfluss qs	Minimal Durchfluss qi	Ansprec-Grenze (50°C)	Fühler-Einbau-Platz	Gew.	Druck-abfall bei qp
qp	Threaded connection		Length	Mat.	PN	Maximal Durchfluss qs	Minimal Durchfluss qi	Low flow threshold value (50°C)	Threaded hole for sensor	wt.	Pressure loss at qp
m ³ /h	G"	DN	mm		PN	m ³ /h	l/h	l/h		kg	bar
*0.6	(EN ISO 228-1) 3/4"	(15)	110	Brass	16	1,2	6	-	Yes	-	-
1.5	3/4"	(15)	110	Brass	16	3	15	10	Yes	1.3	0.2
*1.5	1"	(20)	130	Brass	16	3	15	10	Yes	-	-
*1.5	1"	(20)	190	Brass	16	3	15	10	Yes	1.4	0.2
*2.5	1"	(20)	130	Brass	16	5	25	-	Yes	-	-
*2.5	1"	(20)	190	Brass	16	5	25	-	Yes	-	-

* In Vorbereitung / under way

Der Superstatic 449 kann ab 0.8 bar Rohrdruck eingesetzt werden.

The flow sensor Superstatic 449 can be operated from 0.8 bar pipe pressure.

Einbaulage horizontal - Horizontal mounting position



Horizontale Einbaulage

Der Messkopf MUSS seitlich +/- 45° bezogen auf die Rohrachse liegen, um Einflüsse durch allfällige Luft einschüsse (oben) oder Schmutz (unten) auszuschließen.

Horizontal Mounting position

The sensor head MUST be placed to the side +/- 45° in relation to the pipe axis to avoid influences of air inclusions (top) or dirt (bottom).

Vertikale Einbaulage

Montage in Steig- oder Fallrohren möglich.

Allgemeiner Einbauhinweis:

Nach dem Einbau und vor der Inbetriebnahme, System > 10 min. spülen um Luft einschüsse zu vermeiden.

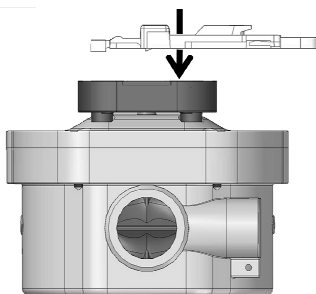
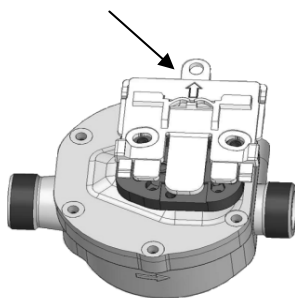
Bedingungen zur Einhaltung der Richtlinie 2004/22/EG (MID)

- Die Temperaturfühler sind symmetrisch in den Vor- und Rücklauf und vorzugsweise direkt einzubauen. Bei Verwendung von Tauchhülsen müssen diese ausschließlich für die verwendeten Temperaturfühler konformitätsuntersucht sein. Die Vor- und Rücklauffühler müssen auf den Tauchhülsenböden aufsitzen. Einbaustellen im Durchflusssensor können unter symmetrischem Einbau der Temperaturfühler genutzt werden. **Asymmetrischer Einbau der Temperaturfühler ist NICHT zulässig.**
- Für die austauschbaren konformitätsgekennzeichneten Temperaturfühler beträgt deren maximale Länge, gleichlang für den Vor- und Rücklauf, 15 m, für die Leitungsquerschnitte gilt EN 1434-2. Deren Anschluss erfolgt an die gekennzeichneten Anschlussbereiche unter Beachtung der elektrischen Kompatibilität Pt 100 bzw. Pt 500 des Rechenwerkes.
- Eine gerade Rohrstrecke von 3 DN ist vor dem Durchflusssensor einzuhalten.
- Die Auswahl der Batterie hat so zu erfolgen, dass diese mindestens über die Länge der geplanten Einsatzdauer und 1 Jahr Lagerfrist eine Versorgung mit Hilfsenergie gestattet.
- Angaben zur Messbeständigkeit erfolgen unter den Bedingungen einer Wasserzusammensetzung gemäß AGFW-Anforderungen FW 510. Im Falle abweichender Zusammensetzungen muss das Messgerät ausgebaut und regelmäßigen Instandsetzungen gemäß der Instandsetzungsrichtlinie der Firma Sontex unterzogen werden.

Rechenwerkmontage

Für die Rechenwerkmontage auf dem Durchflusssensor sind im Lieferumfang 2 Schrauben enthalten, mit denen sich die Halterung im Rücken des Rechenwerkes in 4 verschiedenen Positionen, jeweils um 90° gedreht, auf dem Durchflusssensor montieren lässt. Die Halterung muss auf dem Durchflusssensor so montiert sein, dass der **Pfeil** auf der Halterung sichtbar ist.

Pfeil / Arrow



2 Schrauben / 2 Screws



0449P300

Technische Unterstützung

Für technische Unterstützung wenden sie sich an die lokalen Sontex Vertretungen oder direkt an Sontex SA.

Hotline Sontex:

sontex@sontex.ch

+41 32 488 30 04

Technical support

For technical support contact your local Sontex agent or Sontex SA directly.

Hotline Sontex:

sontex@sontex.ch

+41 32 488 30 04

Technische Änderungen vorbehalten

Technical modifications subject to change without notice

CE Konformitätserklärung
Declaration of conformity

Die detaillierte Konformitätserklärung zum Herunterladen finden Sie auf unserer Homepage www.sontex.ch/
The detailed declaration of conformity can be found and downloaded on our homepage www.sontex.ch

SECTION 2

Operations Manual For Integrator (Supercal 531) Sold With Heat Meter Superstatic 449



■ Thermal Energy ■ Flow Metering ■

Manual

Integrator

Supercal 531



Issue:
Document:
Manufacturer:

Rev. 121109
Manual Integrator Supercal 531 12-11-2009
Sontex SA
2605 Sonceboz, Switzerland
Phone: +41 32 488 30 00
Fax: +41 32 488 30 01
Email: sontex@sontex.ch
Internet: www.sontex.ch

Revision

Issue	Date	Author	Description of Modification
030909	03.09.09	MS	Data copied, layout adapted
151009	15.10.09	EXT	English Translation
121109	12.11.09	MS	Completely reviewed

Table of Contents

1.	Introduction	6
1.1	Brief description	6
1.2	Advantages of the Supercal 531	6
2.	Concept of the Heat Meter	7
2.1	Measuring concept	7
2.2	Integrator	7
2.3	Flow sensors	7
2.4	Temperature sensor	8
2.4.1	2-Wire-cable sensor	8
2.4.2	4-wire-cable sensor	9
2.4.3	Installation guideline of temperature sensor acc. to EN1434	10
2.5	Installation guidelines	11
3.	The Integrator Supercal 531	12
3.1	The modular concept	12
3.1.1	Integrator upper part	12
3.1.2	Integrator base part	13
3.2	Wiring diagram	14
3.3	Flow measurement	14
3.4	Calculation of flow	15
3.4.1	Calculation of the flow rate with standard flow sensors	15
3.4.2	Calculation of the flow with fast flow sensors	15
3.5	Temperature measurement	15
3.5.1	General	15
3.5.2	Tolerated errors and limit values	16
3.6	Energy metering	16
3.6.1	Error limits	16
3.6.2	Cooling energy	16
3.6.3	Cooling energy – combined cold-/heat meter	17
3.6.4	Insulation instruction for cooling systems	17
3.7	Calibration- and measuring-relevant data	17
3.8	Possible parameterisations	18
4.	Data Storage	19
4.1	Data storage over EEPROM	19
4.2	Data storage with backup-batteries in the mains modules	20
5.	Operational Concept	22
5.1	The structure of the LCD-display	22
5.2	The display menu	23
5.3	The operator buttons	24
6.	The Communication Concept	25
6.1	Standard configuration	25
6.1.1	Optical interface	25

6.1.2	Pulse input for volume measurement	26
6.1.3	Two additional pulse inputs	26
6.1.4	Two open-collector pulse outputs	26
6.1.5	M-bus communication	26
6.1.6	Timing of M-Bus communication	27
6.2	Optional communication modules	28
6.2.1	Analogue module with two outputs	28
6.2.2	Relay module	29
6.2.3	Module RS-232 with two relay outputs	30
6.2.4	Module RS-232	30
6.2.5	Combined module	31
6.2.6	M-Bus module with two relay outputs	32
6.2.7	M-Bus module	32
7.	The Display Menus	33
7.1	Menu control	33
7.2	Main menu	33
7.3	Menu set day values	35
7.4	Menu monthly values	37
7.5	Menu average values	39
7.6	Menu maximum values	41
7.7	Menu configuration	43
7.8	Menu service	45
8.	Start-up and Applications	49
8.1	Start-up of the Supercal 531	49
8.1.1	Backup battery	49
8.1.2	Supercal 531	50
8.2	Applications	50
8.2.1	Flow calculation	50
8.2.2	The Supercal 531 in combination with standard (slow) flow sensors	51
8.2.3	The Supercal 531 in combination with the flow sensor Superstatic 440	53
8.2.4	The „cut off“- function of the Superstatic 440	54
9.	Special Functions	56
9.1	Status message of the transistor outputs	56
9.2	Threshold values	56
9.3	Solar power systems and cooling systems	56
9.4	Tariff functions and/or status message signal	56
9.5	Open System (In development)	57
9.6	Power Supply	57
9.7	Error Output	57
9.8	Energy-assessing hot water meter / 1 sensor system	57
10.	Seals and Operating Modes	58
10.1	Sealing concept	58
10.2	Test and parameterisation mode	58
10.3	Calibration Mode	59
10.4	Nowa / Unicon	59
11.	Technical Data	60
11.1	Integrator Supercal 531	60
11.2	Mains supplies	60

11.2.1	Mains module with backup-battery	61
11.2.2	Battery module	61
11.3	Communication features	62
11.3.1	Standard version	62
11.3.2	Options of standard setting.....	64
11.3.3	Optional communication modules.....	65
12.	Identification Plate Supercal 531	69
13.	Mounting and Dimensional Drawing	70
14.	Error Messages	71
15.	Project Planning.....	72
16.	Annexe.....	73
16.1	Nowa / Unicon.....	73
16.1.1	SONTEX NOWA.EXE V1.03	75
16.2	Tariff Functions	78

1. Introduction

1.1 Brief description

This Supercal 531 convinces by using state-of-the-art multi-functional technologies and by its modular concept.

It can easily be adapted to our customer's requirements such as e.g. simplified system integration, tariff functions, data logger functions, universal data transfer or connection to existing process systems. It is mainly used in applications where a calibrated energy meter is required such as in district heating networks and heating systems, cooling systems as well as in industry installations.

1.2 Advantages of the Supercal 531

- The modular concept enables simple and low cost replacement of the meter after expiry of the validity of the calibration
- Clear and user-friendly operational concept
- EEPROM for the communication set-up in the base part as well as customer ID
- Display of date and time guaranteed by back-up battery and readout over the EEPROM with the service device
- Communication options and functions can be installed later without infringing the calibration
- Up to four analogue outputs, M-Bus, RS-232, four relay-, two open-collector- outputs and two impulse inputs can be used
- Mains- or battery-supplied
- Self-recognition of the communication options and the power supply
- Monitoring and readout of the operating modes in different levels depending on authorization
- M-bus acc. to EN1434 (300..9'600 baud)
- Connection of temperature sensors Pt500 and Pt100 in two-wire or four-wire technology
- Maximum measurement precision due to high-sensitive temperature detection
- Precision even higher than required by EN1434
- High reliability due to extensive monitoring of the operating modes
- Various possibilities to combine with mechanical, magnetic-inductive, ultrasonic- or oscillating flow sensors up to Qn 10'000 m³/h
- Meets the requirements of MID, PTB, OIML and EN1434

2. Concept of the Heat Meter

2.1 Measuring concept

- The energy of a heat transfer medium is always calculated with its flow rate and the difference between „temperature high“ and „temperature low“.
- The heat capacity and the density of the heat transfer medium are also considered in this calculation.
- The flow rate is measured with an appropriate flow sensor.
- A temperature sensor pair detects the „temperature high“ and the „temperature low“ of the heat transfer medium. As soon as $\Delta T > 0.2$ K, the energy consumption is calculated.
- For solar- or cooling systems, the medium heat capacity of the customer's glycol mixture is taken instead of the medium heat capacity of water (1.15 kW/m³ K).
- Thus, the cooling energy is cumulated as soon as the temperature difference reaches $< - 0.2$ K and the „temperature high“ is $< 18^{\circ}$ C (the threshold value can be programmed freely).

2.2 Integrator

Modern integrators are required to fulfil a variety of customized and technical requirements, such as:

- Good readability of the displays of the integrator
- Logical and clear design of the menu
- Simple handling
- Low costs in case of meter replacement
- Flexibility with regard to the technical adaptation of different flow and temperature sensors
- Modularity with regard to the device options such as data inputs and outputs etc.
- High measuring precision and data safety
- Normally, every integrator should be clearly assigned to one heat measuring point and be easily accessible/readable.

It is essential to avoid electro-magnetic disturbances and overheating at the place of installation. All wiring has to be installed with a minimum distance of 300 mm from high-voltage and high-frequency cables.

2.3 Flow sensors

Below, please find the possible / standard flow sensors:

- Fluid Oscillator flow sensors
- Impeller and turbine-type water meters
- Magnetic-inductive flow sensors
- Ultrasonic flow sensors

The following operating conditions may influence the choice of the flow sensor:

- Type of measurement (heat-/cold-metering, viscosity of the medium, etc.)
- Mounting position
- Precision requirements of flow sensor
- Existing inlet-/outlet zones (accuracy of measurement)
- Price-/performance ratio in general

Normally, a low pulse factor (output pulse of the flow sensor per flowing volume) is chosen to achieve a resolution as high as possible.

Please pay attention to where the flow sensor is installed („cold side“ or „warm side“) since the conversion from flowing volume into flowing mass is carried out on the basis of the temperature assigned to the place of installation.

In general, the flow sensor is installed at a place where the temperature of the medium is nearer to the ambient temperature. In heating systems, this is the return line and in cooling systems, this is the supply line.

Thus a higher measuring precision and a longer service life of the flow sensor are achieved.

2.4 Temperature sensor

Please be careful when choosing and installing the temperature sensors.

Even the most intelligent integrator is not in a position to level out mistakes made here.

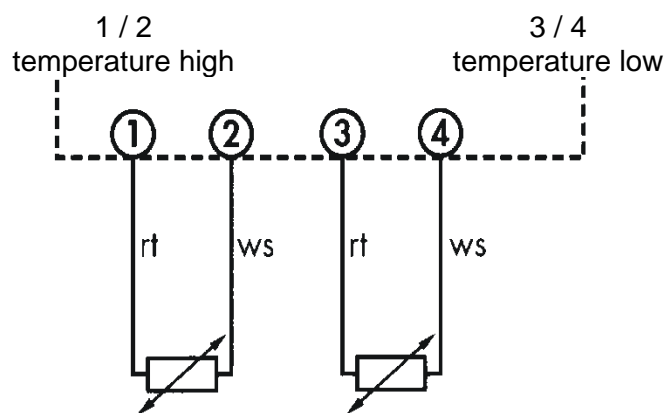
It is recommended to only use type-approved platinum temperature sensors in the versions Pt500 and Pt100. They are twin sensors and can be used in two-wire technology up to a cable length of 3 m. The connection cables may never be separated, extended or shortened.

If a length of more than 3 m is required, we recommend using shielded cables of the same length. The approval for the integrator Supercal 531 allows the use of two-wire temperature sensors up to a length of maximum 15 m and of four-wire sensors up to a max. cable length of 50 m.

In low temperature heating system, it is recommended to install the temperature sensor directly and without protection pocket because of the minimal temperature difference. Thus even the slightest temperature differences and errors due to heat dissipation can be detected immediately. In pipes up to DN 150 the temperature sensors are installed directly or with protection pocket so that the measuring-active part of the sensor tip is placed in the centre of the pipe cross section.

For more detailed information on temperature sensors, we refer you to the Sontex overview of temperature sensors.

2.4.1 2-Wire-cable sensor



Due to the fact that the exact temperature difference (and not the absolute temperature) is important for measuring the heat quantity, it is imperative that both sensor cables are of the same length (resistance). Ex works, the sensors are paired precisely by computer and may only be used in its original pairing.

EN1434-2 2004 stipulates the following maximum cable lengths for 2-wire temperature sensors:

Wire cross section Maximum cable length

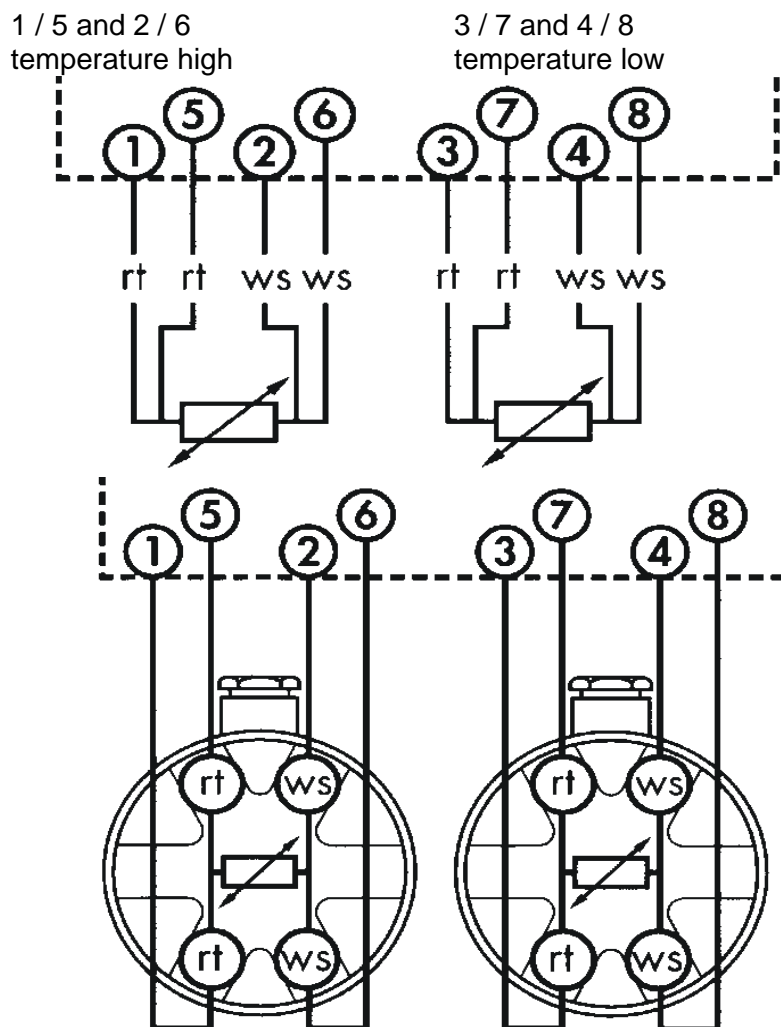
	Pt100	Pt500
0.22 mm ²	2.5 m	12.5 m
0.50 mm ²	5.0 m	25.0 m
0.75 mm ²	7.5 m	37.5 m
1.50 mm ²	15.0 m	75.0 m

2.4.2 4-wire-cable sensor

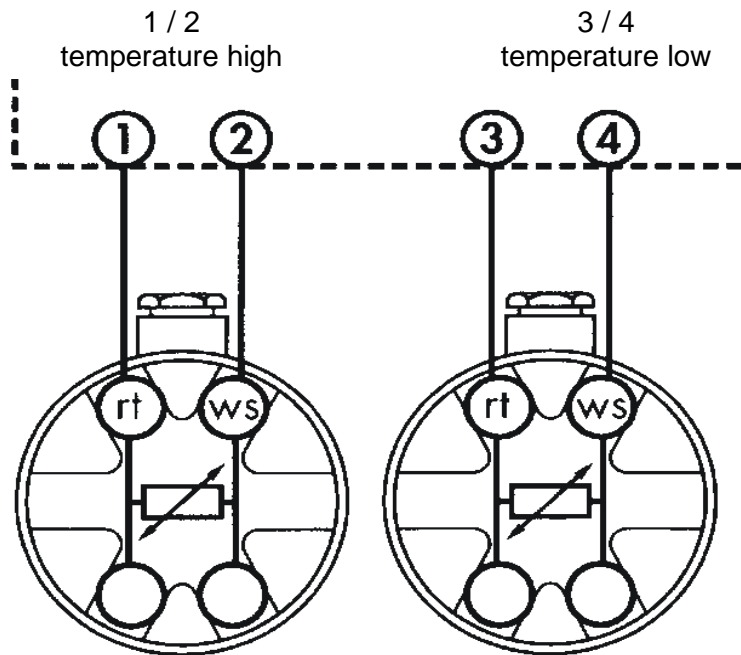
For installations with cable lengths of more than 3 m or with different cable lengths, we recommend using 4-wire-temperature sensors. The maximum cable length of the 4-wire temperature sensors is 50 m.

The connection cable must have four wires. The wire cross section should be at least 0.5 mm².

The insulation of the temperature sensor cable should be of PVC or silicone. Sontex recommends the use of silicone as insulator.



2.4.2.1 4-wire-cable sensor with 2-wire integrator



2.4.3 Installation guideline of temperature sensor acc. to EN1434

<p>DN 15 DN 20 DN 25</p> <p>Einbau im T-Stück</p> <p>Einbau im T-Stück</p> <p>Temperaturfühler senkrecht zur Achse der Rohrleitung und in der selben Ebene</p>	<p>≤ DN 50</p> <p>Einbau mit Schweissmuffe 90°</p> <p>Einbau im Rohrbogen</p> <p>Temperaturfühlerachse übereinstimmend mit der Rohrachse</p>	<p>≤ DN 50</p> <p>Einbau mit Schweissmuffe 45°</p> <p>45° schräg zur Durchflussrichtung</p>	<p>≤ DN 65 - DN 250</p> <p>Einbau mit Schweissmuffe 90°</p> <p>Einbau in der Rohrleitung</p> <p>Temperaturfühlerachse senkrecht zur Rohrachse oder darüber hinaus</p>
--	--	---	---

2.4.3.1 Adherence to the operating conditions acc. to MID for temperature sensors

The temperature sensors have to be installed symmetrically in the supply and return pipe and preferably directly. In case temperature sensors with protection pocket are installed, the sensor and the protection pocket have to be conformity-approved. The tips of the temperature sensors have to be inserted up to the halt. Installation points in the flow sensor can be used in case the temperature sensor is installed symmetrically.

The connection cables of firmly connected temperature sensors must not be shortened.

The connection cables of replaceable and conformity-approved temperature sensors installed in the supply and return pipe may be of a maximum length of 15 m; the cables must be of the same length.

The cable cross section must be in line with EN 1434-2.

Furthermore, attention has to be paid that the integrator is electrically compatible with the temperature sensors:

Pt100-temperature sensors must not be connected to an integrator which is designed for Pt500-temperature sensors (and vice versa).

To avoid unauthorized access, the installations points have to be sealed after installation.

2.4.3.2 Interfering factors

If there is a risk of electric or electro-magnetic interferences, temperature sensors in 2- and 4-wire technology with shielded cables or shielded cables on the connection heads have to be used. The shields always have to be connected to the electric mass provided in the integrator.

The risk of interfering influences rises with the length of the sensor cable.

2.4.3.3 Security advice

Risk of accident in case of improper dismounting of directly immersed temperature sensors!

Mounting and dismounting may only be carried out by authorized personnel.

2.5 Installation guidelines

The installation and start-up of a heat meter may only be carried out by authorized personnel and in accordance with the current standards, the local security and installation instructions.

The installation guidelines acc. to EN 1434-2 and EN 1434-6 have to be followed strictly. Please note that the heat meter will only provide the requested precision and reliability if the local regulations for electric installations and the guidelines given by the manufacturer are followed.

3. The Integrator Supercal 531

3.1 The modular concept

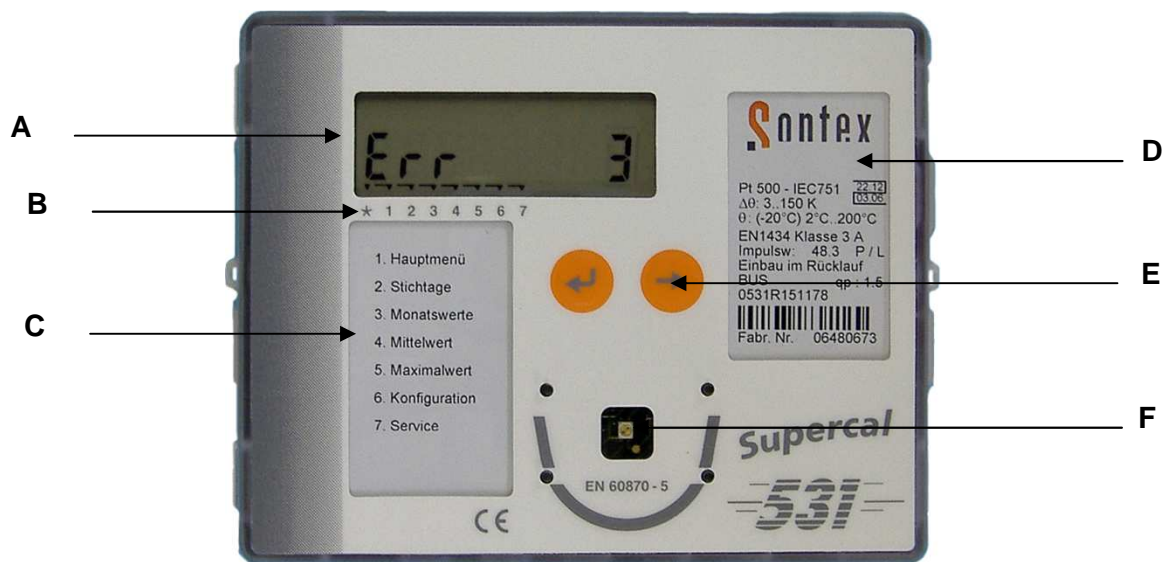
The integrator Supercal 531 consists of:

- Measuring- and calibration-relevant upper part
- Base part

Thanks to the modular concept of the integrator storing costs can be kept very low and replacement of the meter after expiry of the validity of the calibration is simple and reasonably-priced.

In this case only the integrator upper part is replaced. The base part with all the mechanical connections (mains, flow sensor, temperature sensor) does not need to be replaced.

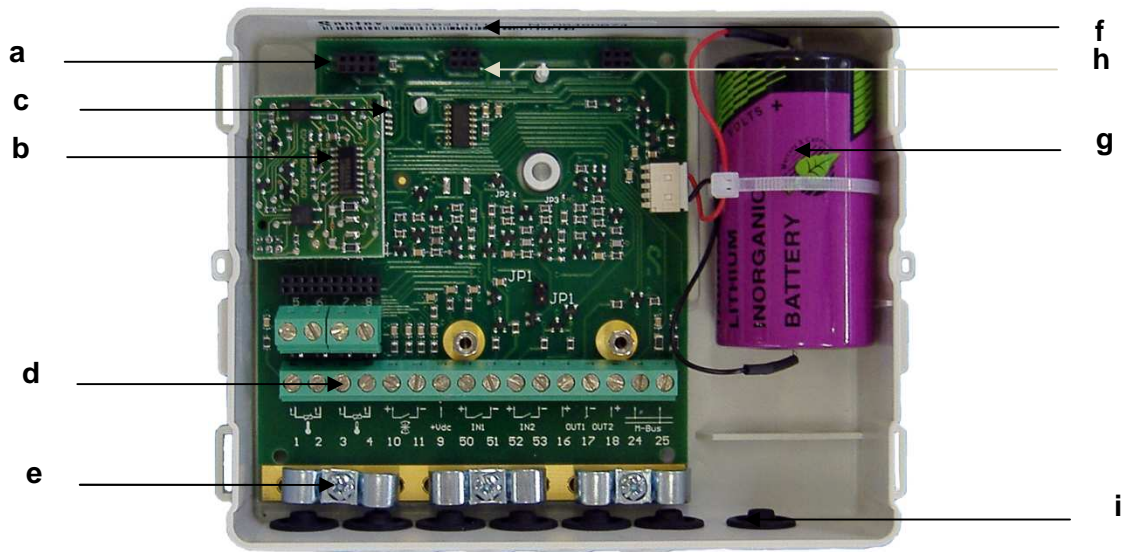
3.1.1 Integrator upper part



The following elements are incorporated in the integrator upper part:

- A LCD-display
- B Index for menu navigation
- C Identification plate list of menu items
- D Identification plate upper part of integrator with bar code
- E 2 operator buttons (control and enter key)
- F Optical interface
- G Calibration and user seal (not visible in picture)
- H EEPROM, first non-volatile memory for data storage (not visible in picture)

3.1.2 Integrator base part

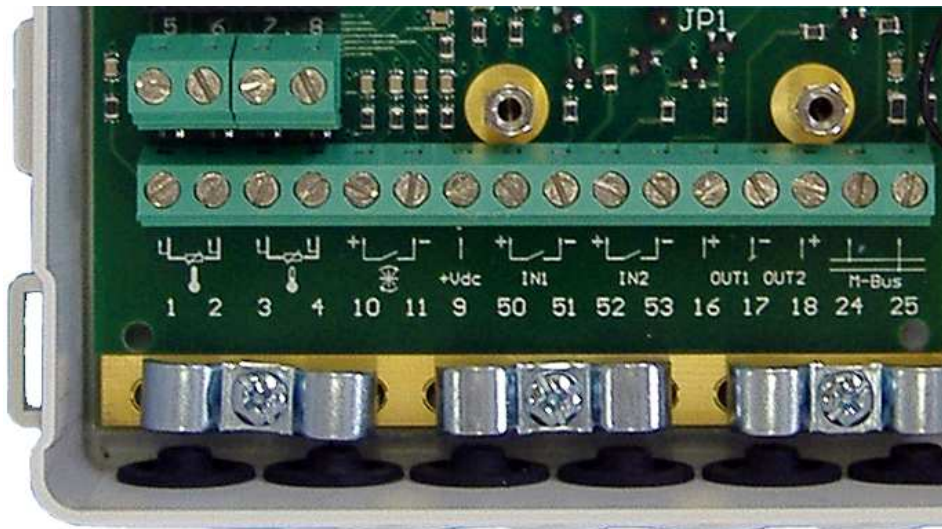


The following elements are incorporated in the base part of the integrator:

- a main board
- b connection point for M-Bus or radio module mounted at the factory (below b, not visible)
- c EEPROM, non-volatile memory for data storage
- d terminals
- e strain reliefs for connection cables and grounding
- f Bar code label
- g Optional mains- / battery supply
- h 2 slots for optional communication modules
- i rubber grommets/splash guard for connection cables
- j base plate (not visible here)
- k plug-in bracket for wall or top hat rail mounting (not visible here)

3.2 Wiring diagram

The integrator upper part has to be removed to connect the inputs and outputs. The wiring has to be done as follows:



Terminal	Description
1, 2	2-wire technology, temperature high
1, 2 and 5, 6	4-wire technology, temperature high
3, 4	2-wire technology, temperature low
3, 4 and 7, 8	4-wire technology, temperature low
10	(+) pulse input flow sensor
11	(-) pulse input flow sensor
9	power supply for flow sensor
50	(+) pulse input additional pulse input 1
51	(-) pulse input additional pulse input 1
52	(+) pulse input additional pulse input 2
53	(-) pulse input additional pulse input 2
16	(+) open-collector output 1
17	(-) open-collector outputs 1 + 2
18	(+) open-collector output 2
24	M-Bus (for M-bus module mounted at the factory) *
25	M-Bus (for M-Bus module mounted at the factory) *

*Terminals 24 and 25 are only active with mounted M-bus module (mounting at manufacturer).

3.3 Flow measurement

Type-approved flow sensors with a pulse or frequency output can be connected to the integrator Supercal 531.

The integrator has the following input pulse factors:

- Up to 99'999'999 pulses/litre
- Up to 99'999'999 litre/pulse

3.4 Calculation of flow

The calculation of flow bases upon the volume pulses detected and cumulated within a certain time interval.

For the first flow calculation, the integrator always requires two volume pulses to be able to calculate the actual flow. Depending on the configuration the internal flow calculations are carried out and the actual flow is indicated immediately on the LCD-display.

Configuration:

The frequency of the flow calculation depends on:

- The number of volume pulses detected within a defined time interval (minimum/maximum holding time).
- The required precision of the flow calculation
- The parameters relevant for the flow calculation are factory-set and can only be altered by authorized laboratories.

3.4.1 Calculation of the flow rate with standard flow sensors

The pulse factor of standard flow sensors, such as e.g. mechanical flow sensors, is stated in **litre/pulse** resp. the duration of the measuring period is stated in seconds/2.

Thus, the formula for the current flow rate in litre/hour is:

$$\text{Flow rate (l/h)} = \text{kw} \times 3600 \times \text{pulse/time}$$

$$\text{kw (litre/pulse)} = \text{pulse factor}$$

$$\text{Pulse} = \text{number of pulses per measuring interval}$$

$$\text{Time} = \text{duration of measuring interval [s]}$$

Examples see point 8.2.2, pages 52, 53

3.4.2 Calculation of the flow with fast flow sensors

The pulse factor of fast flow sensors is stated in **pulse/litre**.

The formula is as follows:

$$\text{Flow rate (l/h)} = 3600/\text{time} \times \text{pulse/kw}$$

$$\text{kw (pulse/litre)} = \text{pulse factor}$$

$$\text{Pulse} = \text{number of pulses per measuring interval}$$

$$\text{Time} = \text{duration of measuring interval [s]}$$

Examples see point 8.2.3, page 53.

3.5 Temperature measurement

3.5.1 General

In principle, the measuring range of the integrator is from - 20 °C to + 200 °C.

The measuring range approved acc. to MID is from 2 °C to 200 °C. There's no homologation below 2 °C according to the current applicable standards.

By default, the integrator Supercal 531 is designed for temperature sensors Pt500. On request, Sontex can parameterise the integrator ex works for operation with Pt100. The connection of the temperature sensors is possible in two-wire and four-wire technology. The temperature measurement is carried out acc. to the „dual slope procedure“. An integrated calibrating system guarantees

high measuring resolution and high measuring reliability. To improve the measuring reliability, a coherence test (check of the logical sequences of the values) has been implemented.

The mains-supplied integrator Supercal 531 measures the „temperature high“ and „temperature low“ every 3 seconds.

The battery-supplied (battery type C or D) integrator measures the temperatures every 30 seconds.

3.5.2 Tolerated errors and limit values

For firmly connected temperature sensors, the maximum tolerated error (in %) is calculated acc. to the following formula:

$$E_t = \pm (0.5 + 3 \Delta\theta_{\min} / \Delta\theta)$$

$\Delta\theta_{\min}$ = admissible minimum temperature difference = 3 K
(Acc. to MID EC type examination certificate)

The screws of the terminals of firmly connected sensors are secured with adhesive seals. A subsequent exchange of the temperature sensors is not possible without damaging the seals.

The integrator software checks if the measured temperatures are within the admissible measuring range.

If the limits of the measuring range are exceeded the integrator indicates a measuring error.

3.6 Energy metering

3.6.1 Error limits

A heat flux can be calculated on the basis of its mass, its specific heat capacity and the temperature difference.

The difference of the enthalpy between „temperature high“ and „temperature low“ during a set time t is integrated. The equation to calculate the heat energy acc. to EN 1434-1, point 8, is applied in this case.

The admissible error is calculated as follows:

$$E_c = \pm (0.5 + \Delta\theta_{\min} / \Delta\theta)$$

The minimum temperature difference $\Delta\theta_{\min}$ depends on the assembly of the components. If the integrator and the temperature sensors are checked as one unit, the min. temperature difference is 2 K acc. to the PTB-approval and 3 K acc. to the MID-approval.

To receive the EC-prototype test certificate, at least 3 K has to be reached.

3.6.2 Cooling energy

If an energy meter is installed in the return pipe to measure the cooling energy, the „temperature sensor low“ is installed in the supply and the „temperature sensor high“ in the return pipe.

By default, the integrator Supercal 531 is checked acc. to the metrological measuring points of EN1434 (2006) for cooling and heating energy before leaving the factory.

3.6.3 Cooling energy – combined cold-/heat meter

The combined cold-/heat meter (tariff function cooling/heat tariff) calculates the cooling energy as soon as the two following conditions are fulfilled at the same time:

- temperature difference (Δt) < - 0.2 K
- „temperature high“ < 18 °C

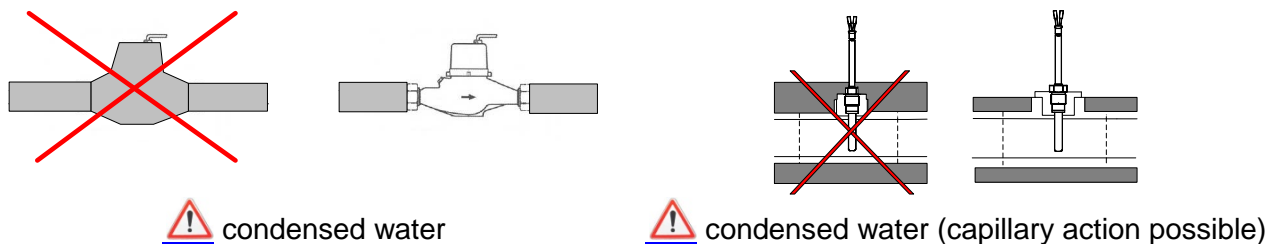
The threshold value of 18 °C for the switch-over of the combined cold-/heat meter is parameterised ex works. It is possible to alter this value with the software Prog531 over the optical interface.

If the integrator is used as combined heat and cold meter, the cooling energy, the cooling capacity and the temperature difference are displayed with a minus sign (-) and the relevant data are assigned to tariff 1.

An officially attested calibration of the cold meter can only be carried out, if the cooling energy measured is within the admissible temperature range with the medium water (without glycol).

3.6.4 Insulation instruction for cooling systems

In cooling systems, the mechanical flow sensors and temperature sensors may only be insulated to the connection.



3.7 Calibration- and measuring-relevant data

If integrators are used for the direct billing of energy from the energy supplier to the consumer (public monetary transfers), they are subject to the calibration obligation in most European countries.

The purpose of the obligatory calibration is to protect the consumer as well as the supplier of energy against fraud and malevolent manipulations.

Only type-approved measuring devices can be calibrated. Thus the use of inappropriate systems is avoided.

The period of validity of the calibration is governed by national law. In most European countries it is 5 years.

Especially the following parameters are submitted to the obligatory calibration:

- Pulse factor/frequency and place of installation of the flow sensor
- Accumulated energy and volume with respective units
- Displays and units of performance, flow and temperature

They are defined by the measuring points planned during the parameterisation at the factory or when the parameterisation is carried out by an authorized laboratory. Thereafter, they are sealed and thus protected against unauthorized manipulation.

If these calibration-relevant seals are damaged or removed, all warranty claims / service warranty claims as well as the calibration of the integrator are void.

3.8 Possible parameterisations

The Supercal 531 is parameterised with the software Prog531 over the optical interface or the ex factory M-Bus module. Each integrator is manufactured after order and parameterised in the factory in accordance with the customer's specifications.

Adaptations and modifications of the factory parameterisation can be carried out by authorized centres (e.g. external accredited laboratories) with the necessary equipment.

Parameterisations	Possibilities	Standard	Remarks
Units energy display	kWh, MWh, GJ, BTU	kWh or MWh	internal calculations are based on Joule
Units volume display	m ³ , US-gallons, litre	m ³	internal calculations are based on m ³
Units temperature display	°C, °F or K (Delta T)	°C and K	internal calculations are based on °C
Place of installation	return pipe, supply pipe	return pipe	
Pulse factor in l / pulse	0.0001 ... 99'999'999	to customer's request	
Pulse factor in pulse / l	0.0001 ... 99'999'999	to customer's request	
Flow	m ³ /l or US-Gallon/min	m ³ /l	m ³ /l
Power	KW or MW	KW	KW

4. Data Storage

4.1 Data storage over EEPROM

The Supercal 531 has two non-volatile EEPROMs for storing data. The data are updated every hour in the non-volatile EEPROM of the upper part of the Integrator (MET).

Thus, the data backup is kept even in case of power supply failure. All data are updated and stored automatically.

The first non-volatile memory is located on the PCB of the integrator in the calibration- and measuring-relevant upper part (MET):

Integrator upper part (MET):

- Integrator - configuration parameters
- Accumulated energy
- Accumulated volume
- Accumulated values of the additional meters A1 and A2
- Customer-specific tariff 1 (and tariff 2)
- 15 monthly values
- 32 maximum values
- 32 average values
- 2 set days
- Accumulated energy or volume on set day
- Operating hours
- Date and time
- Serial number MET*, integrator upper part
- Pulse factor of flow sensor
- Error history (last 10 errors)
- Alarm limits and threshold values
- Tariff functions

The second non-volatile memory is located on the circuit board of the integrator base part. Thus the configuration for the data communication as well as the customer ID is kept even if the calibration- and measurement-relevant upper part has to be replaced. Here, the following data are stored:

Integrator lower part (MIO):

- Serial number MIO* integrator base part
- ID number / customer ID
- Pulse factor of the additional meters A1 and A2
- Unit of the additional meters A1 and A2
- M-Bus (primary and secondary)
- Baud rate (M-bus)
- Radio address
- Pulse factor pulse output
- Parameterisation of the optional modules

* MET: Metrological

* MIO: Module Input Output

4.2 Data storage with backup-batteries in the mains modules

The mains modules:

- 230 VAC - 45/60 Hz
(115 VAC - 45/60 Hz on request)



- 24 VAC - 45/65 Hz



- 12..24 VDC



By default, each mains module is supplied with a backup-battery which guarantees the current supply in case of a power failure. If a power failure occurs, the Supercal 531 is operated automatically in a battery-saving mode to ensure the continuity of the metrological functions.

Without AC- or DC-mains supply, the service life of the backup-battery (depending on the application and the ambient conditions) in constant operation with an autarkic flow sensor is up to 260'000 minutes (approx. 6 months).

In backup-battery mode, the following functions of the Supercal 531 are still active:

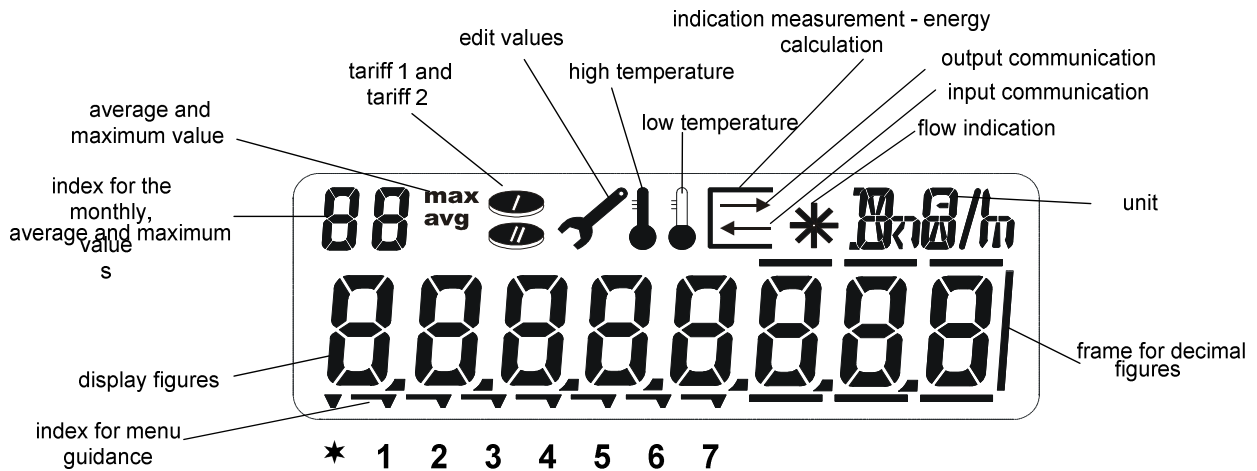
- Temperature and flow measurement, energy calculation
- Tariff- and alarm functions
- Inputs A1 and A2
- Outputs B1 and B2
- Optical interface

In battery-saving mode, all communication options are deactivated. The measuring cycle is reduced to 30 seconds.

5. Operational Concept

When designing the Supercal 531, main importance was placed on the user-friendliness. Thus, the integrator features an extremely large and clearly structured LCD-display. It has only two operator buttons to display the measuring data and for the menu navigation thus adding to the user-friendliness.

5.1 The structure of the LCD-display



Description of further indicators on the LCD-display

Communication indicator

This indicator shows if the Supercal 531 is calculating and/or communicating internally or externally.



Flow indicator

If the flow indicator is displayed, the Supercal 531 is measuring the volume pulse of the flow sensor.



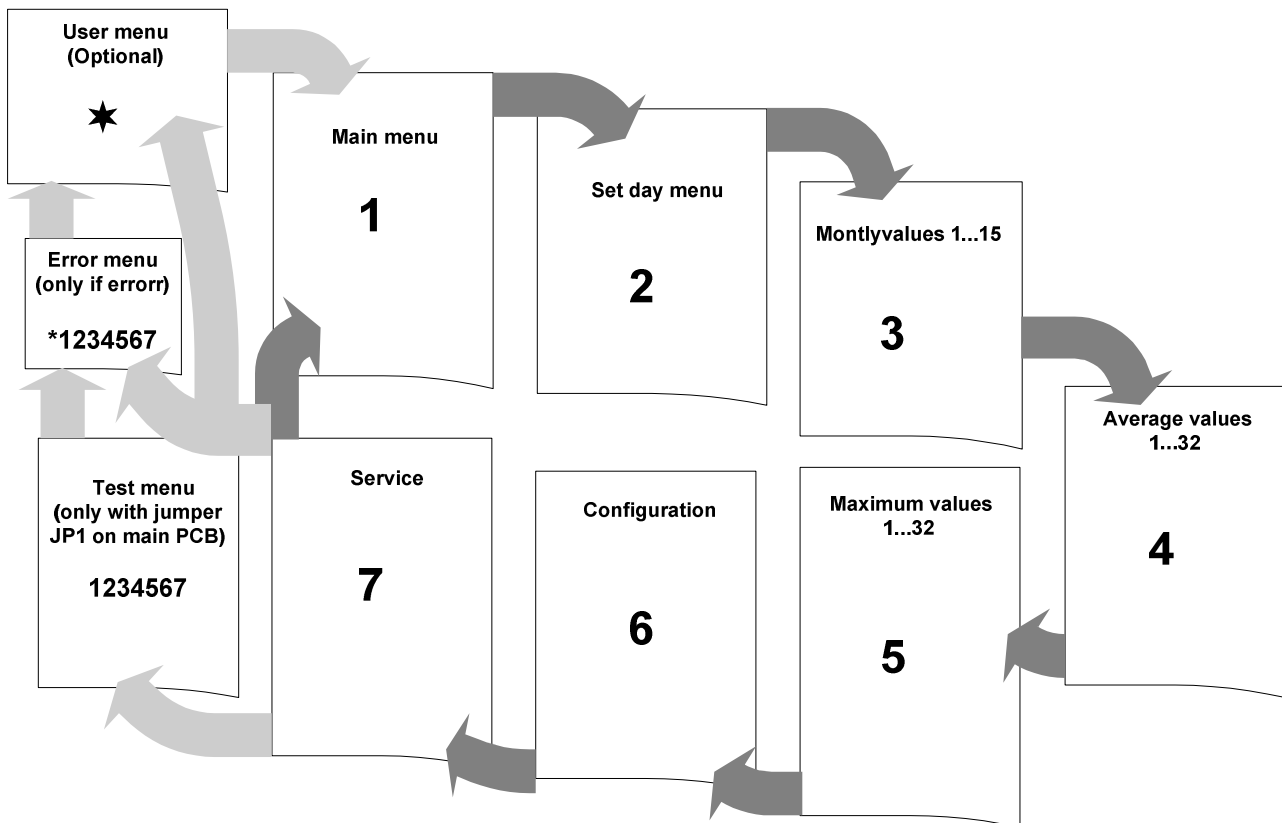
5.2 The display menu

The display sequences are divided into the following menus:

- 1 Main menu
- 2 Set day values
- 3 15 monthly values
- 4 32 average values
- 5 32 maximum values
- 6 Configurations
- 7 Service information
- * Favourites menu (optional)
- *1234567 Error menu
- 1234567 Verification menu

The display sequence can be set according to your requirements:

The menu „favourites“ can be placed on top of the main menu. Acc. to the approval regulations, the accumulated energy has to be displayed first in this menu. The display levels can be customized as to the number as well as in the order of the display sequences.



5.3 The operator buttons

The two operator buttons enable simple and customer-friendly handling of the Supercal 531.



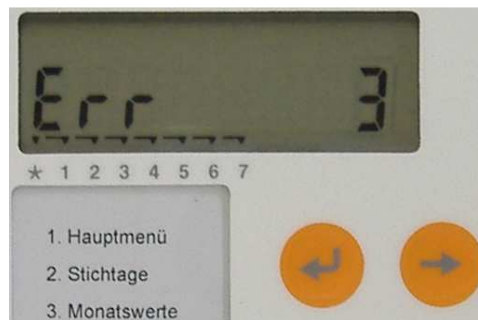
Pressing **control key**, you move on the actual menu level.



Pressing **enter key**, you go to the next sub-menu, one level down



Pressing **enter key** and **control key** simultaneously, you go one level up in the menu tree.



Regardless in which menu you are in the Supercal 531: after 3 minutes the integrator returns automatically to the first display of the main menu.

6. The Communication Concept

For instructions on the installation and the parameterisation of the modules, we refer to „Start-up and Applications“ (point 8), as from page 50

The terminal lay-out can be taken from the „wiring diagram Supercal 531“ (point 3.2.), page 15.

The specifications of the below mentioned communication configurations are stated in „Technical Data “ (point 11.), as from page 66.

6.1 Standard configuration

By default, the Supercal 531 features an optical interface, a pulse input (terminal 10 and 11), two additional pulse inputs (A1 and A2) and two open-collector outputs (B1 and B2).

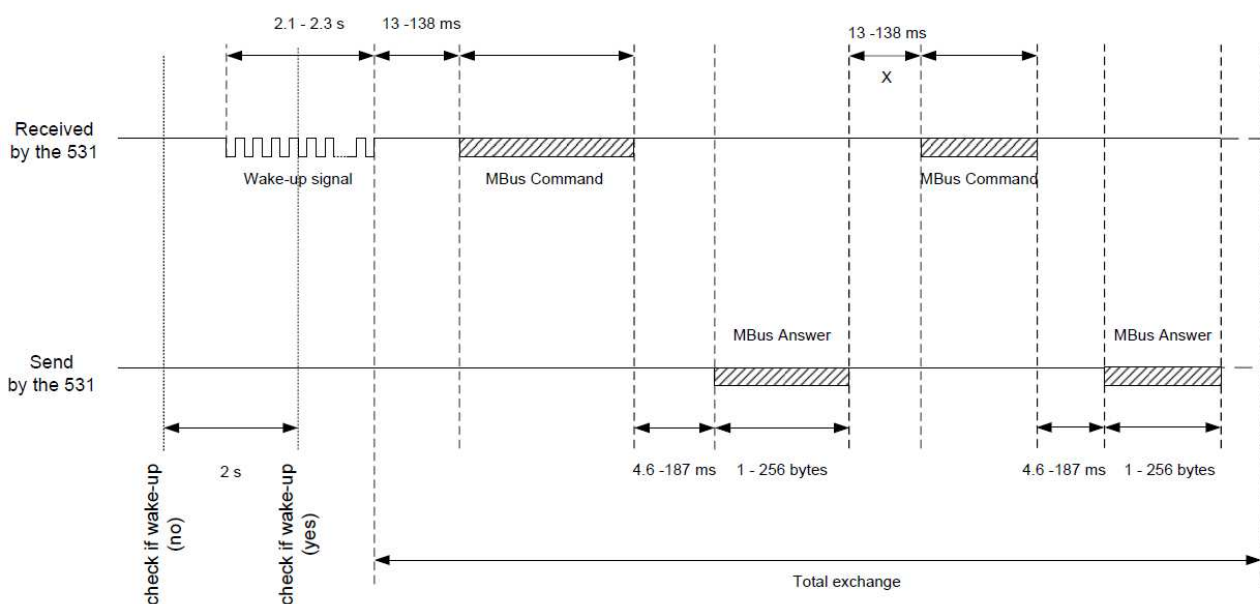
On request, a M-bus or radio module can also be integrated in the standard configuration at the factory.

6.1.1 Optical interface

The optical interface has been designed acc. to EN 61107 with the M-Bus protocol acc. to EN 1434. Its mechanical and electrical design corresponds to the ZVEI-Standard IEC 1107. This interface allows the following start-up and service jobs via the communication protocol acc. to EN 60870-5:

- Parameterisation of the optional communication modules
- Parameterisation and read out of the current and recorded values.
- Checking of the values
- Test acc. to NOWA / UNICON-standard (NOWA: standardized heat meter adapter)

6.1.1.1 Timing of the optical interface



Every 2 seconds the integrator Supercal 531 checks if an wake up is pending.

Alarm signal: 0101010101...
 Transmission time: 2.2 seconds +/- 0.1
 Total transmission time: If the time > 40 seconds or if X > 138 ms, a new wake up is sent.

6.1.2 Pulse input for volume measurement

The Supercal 531 allows the connection of slow and fast flow sensors. To this end, two specific filters have been integrated (normal- or fast mode) which can be selected over the software Prog531.

6.1.3 Two additional pulse inputs

The Supercal 531 features two additional pulse inputs (A1 and A2) to connect additional meters for cumulated pulse counting. These two additional pulse inputs are integrated automatically in the M-Bus, radio or optical telegram and transmitted.

Thus it is possible to connect water meters, electricity meters, gas meters or oil meters.

They are parameterised (normal and / or fast mode) ex factory over hardware bridges. Unless otherwise defined in the order, the two additional pulse inputs are set to normal mode.

In case a subsequent change from normal to fast mode is necessary, the solder bridge respectively the resistance (0 Ω) JP2 (A1) / JP3 (A2) on the main board has to be removed by authorized personnel.

6.1.4 Two open-collector pulse outputs

Two open-collector outputs (B1 and B2) can be used to optionally display energy, volume, tariff 1, tariff 2, alarm values and threshold values.

Maximum current per pulse output is 100 mA; maximum voltage is 30V.
 They are parameterised (both in normal or fast mode) with the service software.

Fast pulse outputs are used e.g. for controlling system processors. In this case, the maximum pulse frequency is 12 kHz.

These outputs are not isolated galvanically. When connecting to process systems, we always recommend using relay outputs.

6.1.5 M-bus communication

Besides the factory-assembled M-bus module up to two further communication modules can be mounted.

The factory-assembled M-bus module is controlled by the microprocessor located in the integrator upper part. The optional communication modules are equipped with an embedded microprocessor. Thus it is ensured that up to three M-Bus inquiries for different applications can be processed and answered at the same time.

The two additional pulse inputs are automatically integrated in the M-bus telegram and transmitted. To clearly identify the two pulse inputs, it is possible to parameterise an identification or part number for each input.

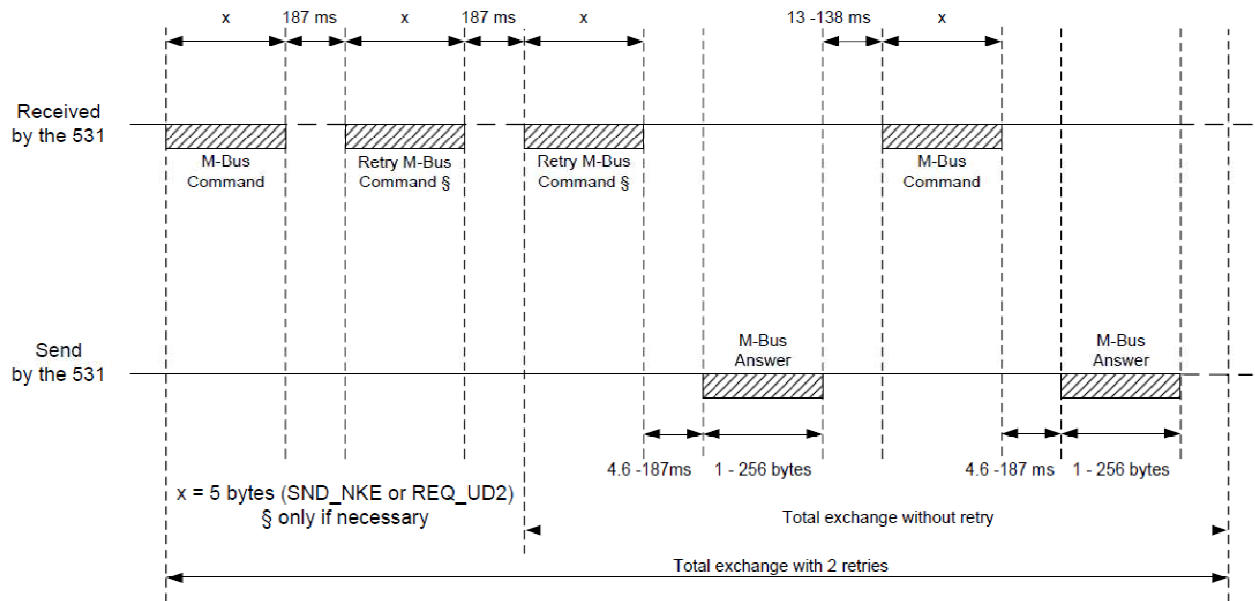
The integrator Supercal 531 works with a variable data structure. For each M-bus output an individual primary address as well as a baud rate can be parameterised.

The protocol of the optional communication modules with interface RS-232 also corresponds to the M-Bus protocol.

In case of an M-Bus "application reset" the default settings are set acc. to standard EN1434.

6.1.6 Timing of M-Bus communication

According to EN13757-3 and EN1434-3



6.2 Optional communication modules

The two free module connection points in the integrator base part can be used to retrofit the below mentioned optional communication modules without infringing the validity of the calibration. See „The modular concept“ (point 3.1.), page 13

After installation of the modules, they are identified automatically within 30 seconds by the Supercal 531.

All optional communication modules can be read out and parameterised over the optical interface. Due to the numerous retrofitting possibilities, the Supercal 531 allows a comprehensive transmission of the recorded data and the integration in many different process control systems and applications.

6.2.1 Analogue module with two outputs

6.2.1.1 Analogue modules with two outputs 4...20 mA

The optional analogue module with two outputs 4...20 mA enables the connection of the integrator Supercal 531 to read-out or control systems required for e.g. building management applications. The analogue module provides instantaneous values as analogue output signals. These outputs are passive and require an external power supply. The power supply is covered over the out puts (9...24VDC). If equipped with an analogue module, the Supercal 531 must always be mains voltage-supplied.

Analogue module with two outputs 4..20 mA



An analogue module can always provide two of the below mentioned instantaneous values as galvanically isolated analogue signal for each circuit:

- Flow
- Power
- Temperature high
- Temperature low
- Temperature difference
- Flow additional meter A1
- Flow value additional meter A2

Up to two optional analogue modules can be operated in the integrator Supercal 531 at the same time.

6.2.1.2 Analogue module with two outputs 0...20 mA, 4...20 mA or 0...10 VDC

Application identical to point 6.2.1.1

For each circuit, a separate flip switch allows the independent switchover of the analogue outputs to the range 0..10 VDC.

The two red LEDs are only on if the current does not correspond to the set value of the analogue signal, e.g. in case of open circuit. In voltage-supplied mode (0..10 VDC), the LEDs are deactivated. When using the Supercal 531 with an analogue module, it must always be mains voltage supplied.

Up to two optional analogue modules can be operated at the same time in the integrator Supercal 531. The power supply is covered over the two corresponding terminals.

Analogue module with two outputs 0..20 mA,
4..20 mA, 0..10 VDC, or 2...10 VDC



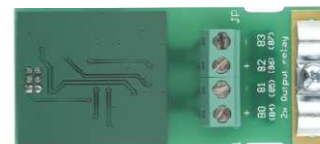
6.2.2 Relay module

The optional relay module with two outputs allows the transmission of status messages, alarms and/or errors.

The following information is available as pulse freely selectable for data readout:

- Energy
- Energy tariff 1
- Energy tariff 2
- Volume
- Volume tariff 1
- Volume tariff 2
- Volume additional meter A1
- Volume additional meter A2

Up to two optional relay modules can be operated in the integrator Supercal 531 at the same time. When equipped with a relay module, the Supercal 531 must always be mains voltage supplied.



6.2.3 Module RS-232 with two relay outputs

The optional module RS-232 with two relay outputs allows the connection of the integrator Supercal 531 to a control system, a system processor, a modem or a PC.

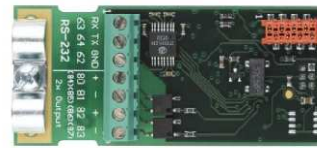
Thus, it is possible to readout the data of the heat meter and to transmit them via RS-232 interfaces.

The module RS-232 with two relay outputs combines the advantages of the communication with a control system (or any other controllers and remote readout systems) over RS-232 with the transmission of status messages, alarm and/or errors as relay output.

The communication is based on the M-Bus protocol acc. to EN 1434-3 and IEC 870-5.

The transmission rates are freely selectable between 300 and 38'400 baud. The readout can be done with a M-Bus read-out software. If equipped with a module RS-232 with two relay outputs, the Supercal 531 must always be mains voltage supplied.

Each relay output is galvanically isolated and features two switching contacts.



6.2.4 Module RS-232

Application identical to point 6.2.3

The module RS-232 features the advantages of the communication over RS-232 with a control system or any kind of controllers, control or remote readout systems.

The communication is based on the M-Bus protocol in accordance with EN 1434-3 and IEC 870-5.

The transmission rates are freely selectable between 300 and 9'600 baud. The readout can be done with a M-Bus readout-software. In case of continuous communication of more than once a day, we always recommend mains voltage supply.



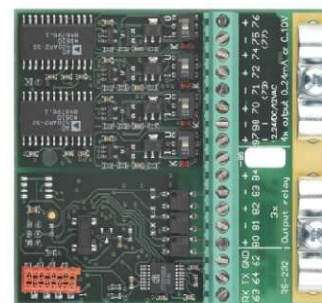
6.2.5 Combined module

RS-232 interface with three relay outputs and four freely programmable outputs 0...20 mA, 4...20 mA, 0...10 VDC or 2...10 VDC.

The optional combined module with RS-232, three relay outputs and four freely programmable outputs 0..20 mA, 4..20 mA, 0..10 VDC or 2...10 VDC combines at the same time:

- The communication over the serial interface RS-232 (with a control system or all kinds of controller or remote readout systems) with the transmission of status messages, alarm and/or errors as relay output
- the connection of the integrator Supercal 531 via the four freely selectable outputs to readout or control systems required e.g. for building management applications.

The instantaneous values of the analogue output signals are active and need an external current supply. The combined module of the Supercal 531 always requires mains voltage supply.



6.2.5.1 The RS-232 interface

Please see specification of module RS-232 with two relay outputs (point 6.2.3, page 28).

6.2.5.2 The relay outputs

Each output is galvanically isolated and contains 3 switching contacts.

6.2.5.3 The analogue outputs

They require an external current supply. Each current circuit can be set up individually as an active, galvanically isolated analogue current output or analogue voltage output.

6.2.6 M-Bus module with two relay outputs

The optional M-Bus module with two relay outputs allows the integration of the integrator Supercal 531 into a M-Bus-, control- or process system.

Thus it is possible to readout the data of the heat meter and to transmit them via M-Bus.

Therefore the M-Bus module combines the advantages of the communication via M-Bus with a data processing centre (or any kind of controller, control system and remote readout system) with the transmission of status messages, alarm and/or errors as relay output.

When equipped with an M-Bus module with two relay outputs, the Supercal 531 must always be mains voltage supplied.



6.2.7 M-Bus module

Application identical to point 6.2.6

The M-Bus module features the advantages of the communication over M-Bus with a data processing centre or with any kind of controller, control system and remote readout system.

In case of continuous communication of more than once a day, we always recommend mains voltage supply.

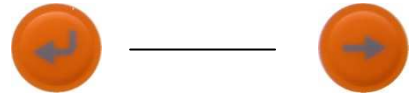
For combining with other devices, please see point 6.2.6



7. The Display Menus

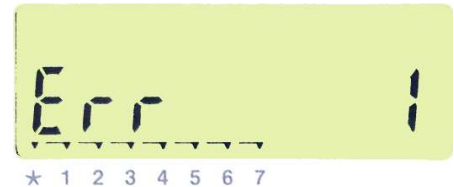
7.1 Menu control

Press the **enter key** and the **control key** simultaneously.



The last occurred error is displayed.

Press the control key:



The first display of the main menu, the **cumulated energy** is indicated.
The index for the menu navigation is above the „1“.

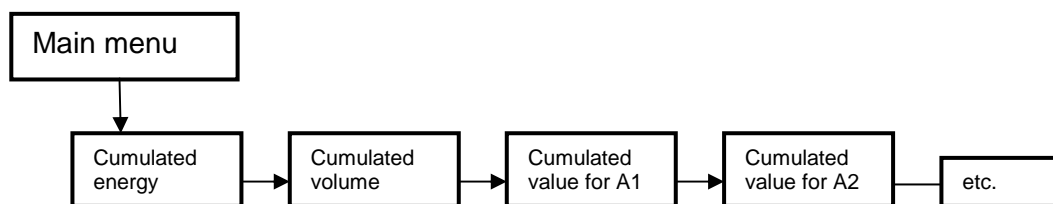


7.2 Main menu

Confirm **menu 1 = main menu** by pressing the enter key:



The index for the menu navigation flashes. Now, the display sequence of the main menu can be accessed and display after display can be read by repeatedly pressing the control key.



Cumulated Energy

Possible energy units: kWh, MWh, MJ, GJ, BTU
 Standard parameterisation ex works:kWh or MWh
 Maximal displayed energy: 99'999'999 (8 digits)
 The number of digits after the decimal point can be set at the factory or defined by an authorized laboratory.
 The displays of the cumulated energy for tariff 1 and tariff 2 are identical.



Cumulated Volume

Possible volume units: m^3 , US-gallon
 Default parameterisation ex works: m^3
 Maximal displayed volume: 99'999'999
 The number of digits after the decimal point can be set at the factory or by an authorized laboratory.
 The displays of the cumulated volumes for tariff 1 and tariff 2 are identical.



Cumulated values for the additional pulse inputs A 1 and A 2

Display in main menu: without units
 Units and pulse factors are defined in the menu configuration.
 In case of M-Bus- or radio readout, the units are transmitted automatically.



Temperature high and temperature low

Possible temperature units: $^{\circ}C$ or F
 Default parameterisation ex works: $^{\circ}C$
 Display range: - 20 up to 200 $^{\circ}C$
 „Temperature high“ and „temperature low“ are displayed side by side with one digit after the decimal point.
 Negative temperatures are displayed with a minus sign.



Temperature difference

Display: with two digits after the decimal point
 If „temperature low“ is above „temperature high“, the temperature difference is displayed with a minus sign.



Power

Possible units of energy: kW, MW, or BTU/h
 Default parameterisation ex works: kW
 The number of digits after the decimal point can be set at the factory or by an authorized laboratory.



Flow

Possible flow units: m^3/h , US-gallon/min
 Default parameterisation ex works: m^3/h
 The number of digits after the decimal point can be set at the factory or by an authorized laboratory.



Segment test

All segments of the LCD-display appear.



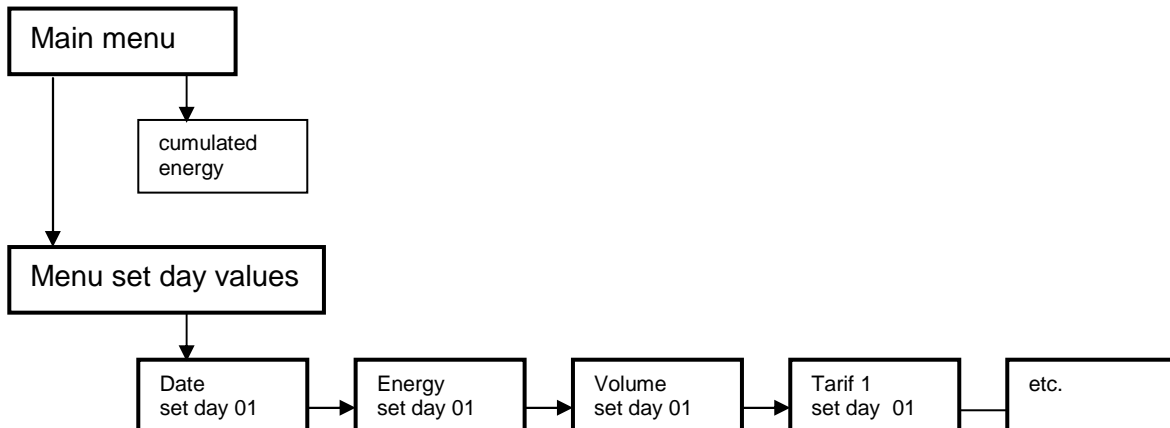
7.3 Menu set day values

Two set days are possible:
Values recorded on set day:

set day 1 = S1, set day 2 = S2.
energy, volume, tariff values and additional pulse inputs.

The first display of the display sequence indicates the date of the set day, if occurred.

Display and presentation of the cumulated set day values are identical with those of the main menu.



Path:

Please proceed as described in 7.1.

Then, press the control key:



The index for the menu navigation goes to „2“. Confirm the **menu 2 = menu set day values** by pressing the enter key:



The index for the menu navigation which now is above „2“ flashes and the date of the first set day 01 is displayed.



Now, the display sequence of set day 01 can be accessed and display after display can be read by repeatedly pressing the control key:



Energy on set day 01



Volume on set day 01



Energy tarif 1 on set day 01



Further data are displayed by repeatedly pressing the control key.

Selecting of set day 02:
Press enter key:



The index „S1“ for set day 01 flashes.
Press the control key:



The index goes to „S2“.



Confirm by pressing the enter key.

Now the display sequence for set day S2 can be accessed by pressing the control key.



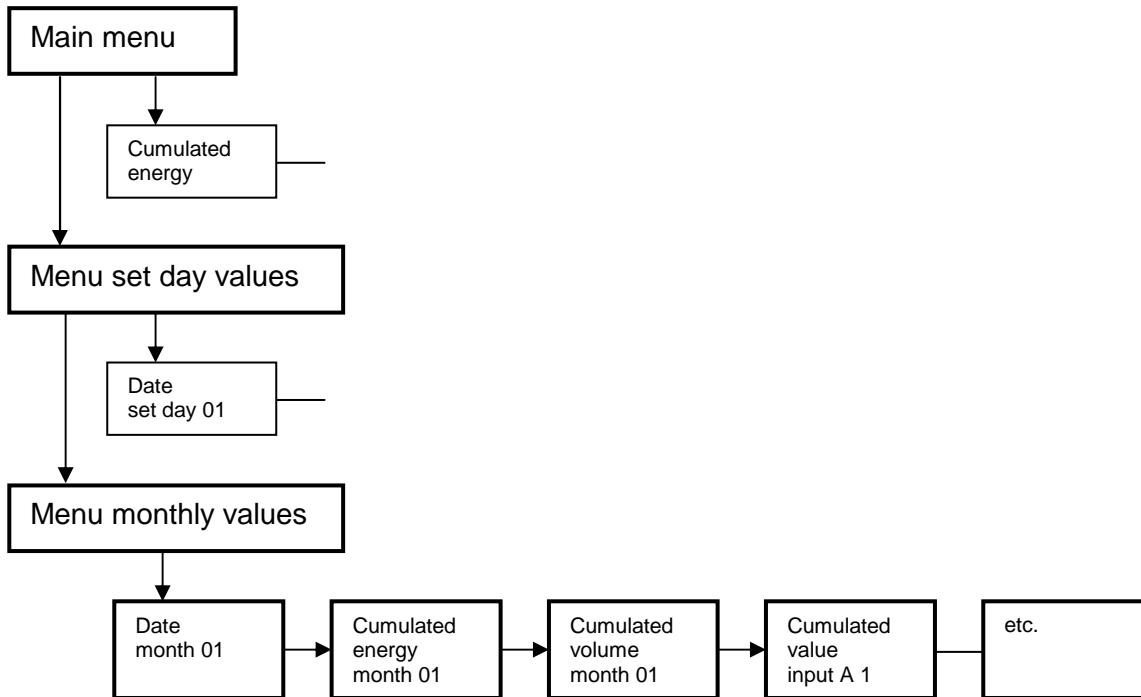
7.4 Menu monthly values

The Supercal 531 records 15 monthly values, in the order 01 to 15.

Every month, the cumulated values for energy, volume, additional pulse inputs and tariffs are recorded.

Index „01“ refers to the last monthly value, index „02“ refers to the month before last, the indices „03“ to „15“ refer to the previous months.

Display and presentation of the cumulated monthly values are identical with those of the main menu.



Path:
Please proceed as described in 7.1.

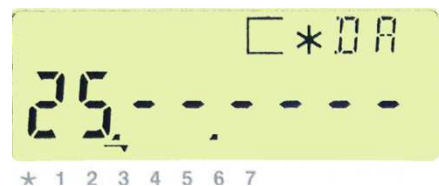
Then, press **control key twice**:



The index for the menu navigation goes to „3“. Confirm **menu 3 = menu monthly values** by pressing the **enter key**:



The index for the menu navigation which is above „3“ flashes and the date of the set day for the monthly values is displayed.



Press the **control key** again:



Then the first display of the display sequence for month 01 turns up, the **cumulated energy**.



By repeatedly pressing the control key, display after display for month 01 can be called: cumulated volume, cumulated values of the additional pulse inputs and tariffs.



Selecting of the monthly values 02 to 15:

Press **enter key**:

The index „01“ for the monthly value 01 flashes.



Now repeatedly press the **control key**. Thus the indices for all further monthly values (02 to 15, flashing) can be called.



Confirm the display sequence for the requested monthly value by pressing the **enter key**.



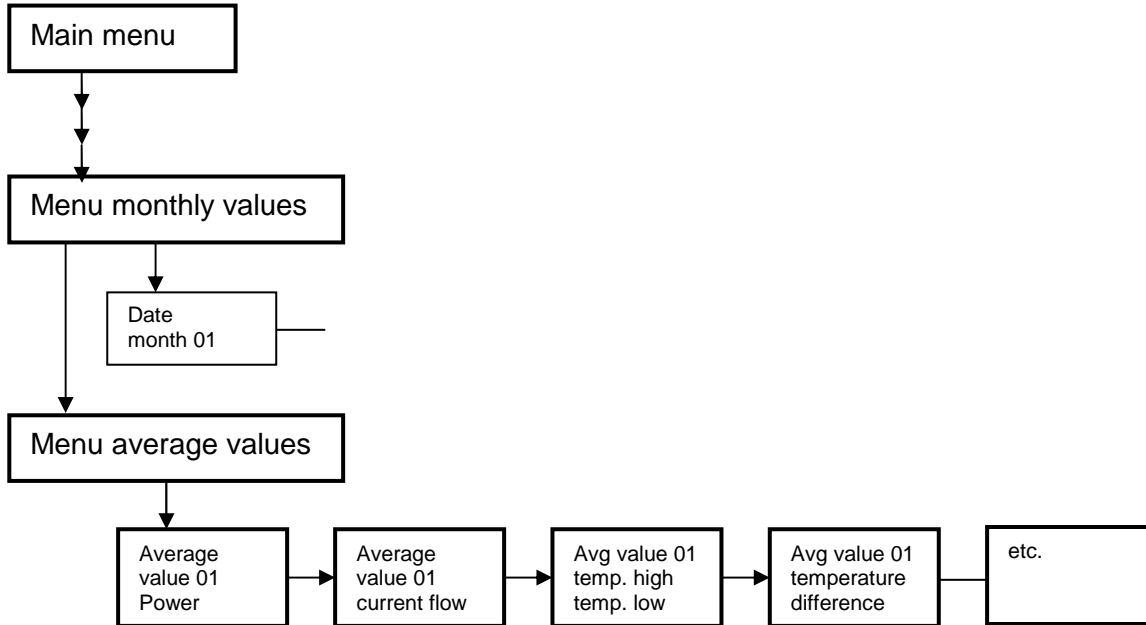
7.5 Menu average values

With the Supercal 531 a maximum of 32 average values can be readout and recorded. The average time can be set between 1 minute and 45 days.

The average values for the current power, flow, „temperature high“ and „temperature low“, temperature difference, flow A1 and flow A2 are recorded and displayed with the index „avg“.

The index „01 avg“ stands for the last recorded average value, index „02 avg“ stands for the average value before the last, the indices „03 avg“ to „32 avg“ stand for the previous average values.

Display and presentation of the average values are identical with those of the main menu.



Path:

Please proceed as described in 7.1.

Then press the **control key three times**:



The index for the menu navigation goes to „4“. Confirm the **menu 4 = menu average values** by pressing the **enter key**:



The index for the menu navigation which is above „4“ flashes and the current power of the last recorded average value with the index „01 avg“ is displayed.



By repeatedly pressing the **control key** all further recorded data of average value 01 can be called: flow, supply and return temperature, temperature difference, flow A1 and flow A2.



To address the average values 02 to 32:

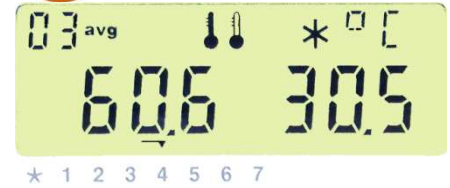
Please press the **enter key**



The index „01“ for average value „01 avg“ flashes. Now you can proceed in two different ways:

- Press the **control key** constantly.

Thus the indices of all further average values (02 to 32, flashing) can be called. The previously selected value with the current power, flow etc. is displayed as well.



- Alternatively, the display sequence for the requested average value can be selected by pressing the **enter key**.

The average values can then be called by repeatedly pressing the **control key**.



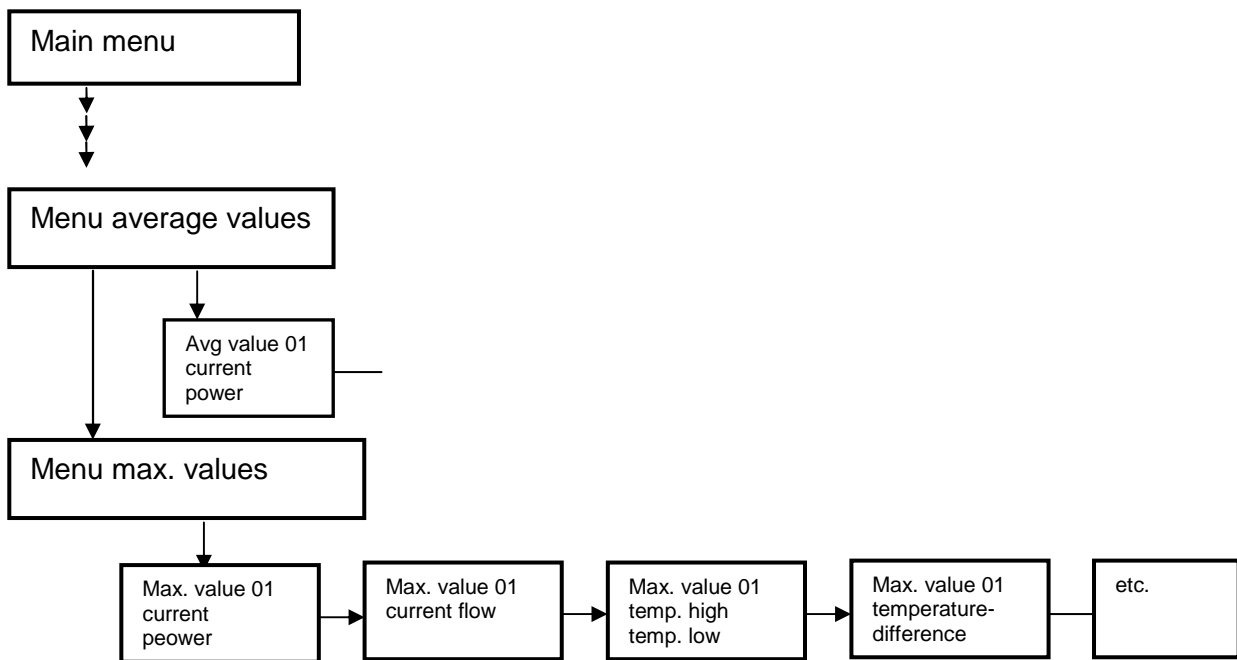
7.6 Menu maximum values

The time window for 32 maximum values can be selected freely between 1 hour and 1 year. The maximum values for performance, flow, „temperature high“ and „temperature low“, temperature difference and pulse inputs A1 and A2 are supplemented by the index „max“. Date and time of the recorded maximum values are also displayed.

Index „01 max“ refers to the last maximum value, index „02 max“ refers to the value before last month, the indices „03 max“ to „32 max“ refer to the previous maximum values.

The maximum values can be determined in two different ways:

The effective maximum values are measured and recorded during a defined average time. The maximum values of the average values measured and recorded within the programmed average time are used.



Path:
Please proceed as described in 7.1.

Press the **control key four times:**



The index for the menu navigation goes to „5“. Confirm the **menu 5 = menu maximum values** by pressing the **enter key:**



The index for the menu navigation which is above „5“ flashes and the current performance of the last recorded maximum value with the index „01 max“ is displayed.



By repeatedly pressing the **control key** all further recorded data of maximum value 01 can be called: flow, supply and return temperature, temperature difference, pulse input A1 and pulse input A2.



To select all further maximum values 02 to 32:

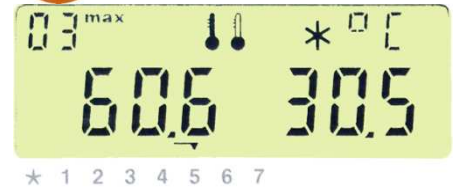
Press the **enter key**



The index „01“ for maximum value „01 max“ flashes. Now you can proceed in two different ways:

- Press the **control key** repeatedly.

Thus, the indices for all further maximum values (02 to 32, flashing) are called. The previously selected value with the current power, flow etc. is displayed as well.



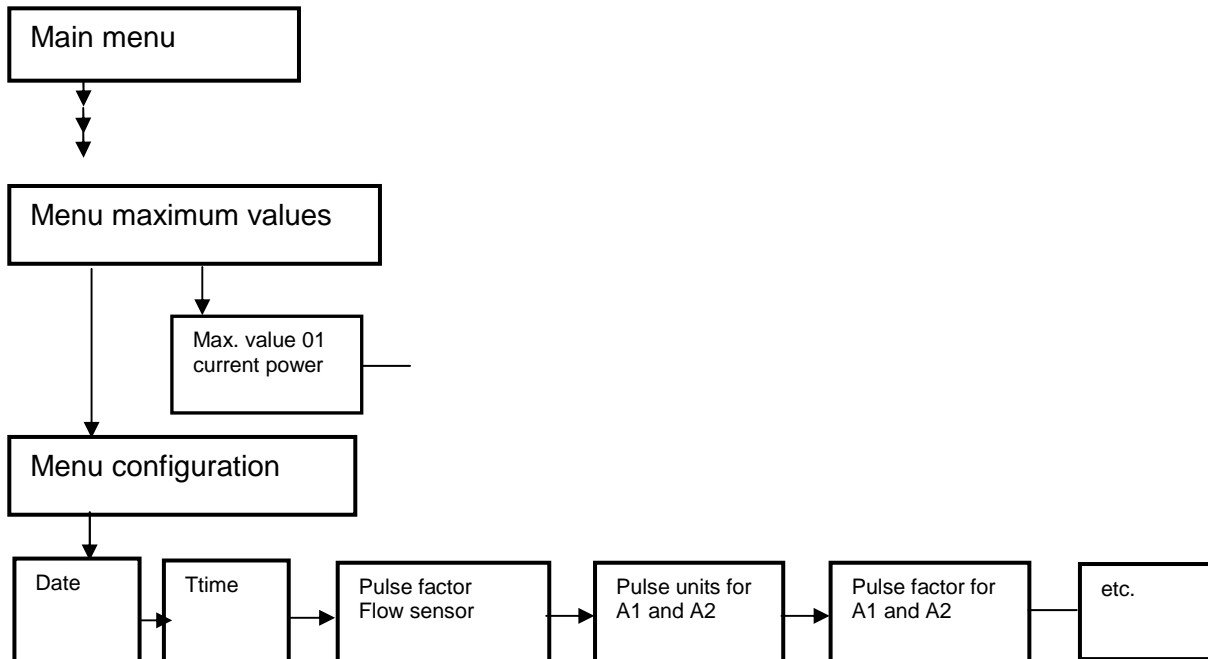
- Alternatively, the display sequence for the requested maximum value can be selected by pressing the **enter key**.

The maximum values can be called by repeatedly pressing the **control key**.



7.7 Menu configuration

Here, the configuration values of the Supercal 531 can be checked and altered if required.



Path:
Please proceed as described in 7.1.

Press the **control key five times**:



The index for the menu navigation goes to „6“. Confirm the **menu 6 = menu configuration** by pressing the **enter key**:



The index for the menu navigation which is above „6“ flashes and the current date (index DA) is displayed.



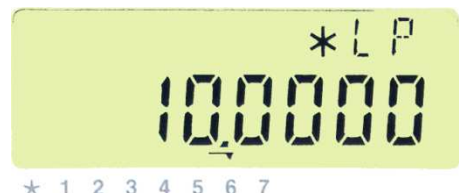
By repeatedly pressing the **control key** the display sequence of the menu **configuration** can be called:



Time (index Hr)
No differentiation is made between summer and winter period.



Pulse factor flow sensor (index „LP“ or PL) litre/pulse or pulse/litre



Pulse units of the additional pulse inputs A1 and A2 (indices A1 and A2)



Pulse factors of the additional pulse inputs A1 and A2 (indices A1 and A2)

Pulse units of the additional pulse outputs B1 and B2 (indices B1 and B2)



Pulse factors of the additional pulse outputs B1 and B2 (indices B1 and B2)

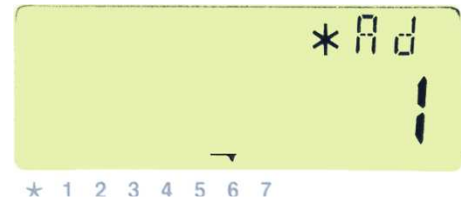
Integration period for calculating the average value



Integration period for calculating the maximum value



Primary address (index Ad) M-Bus

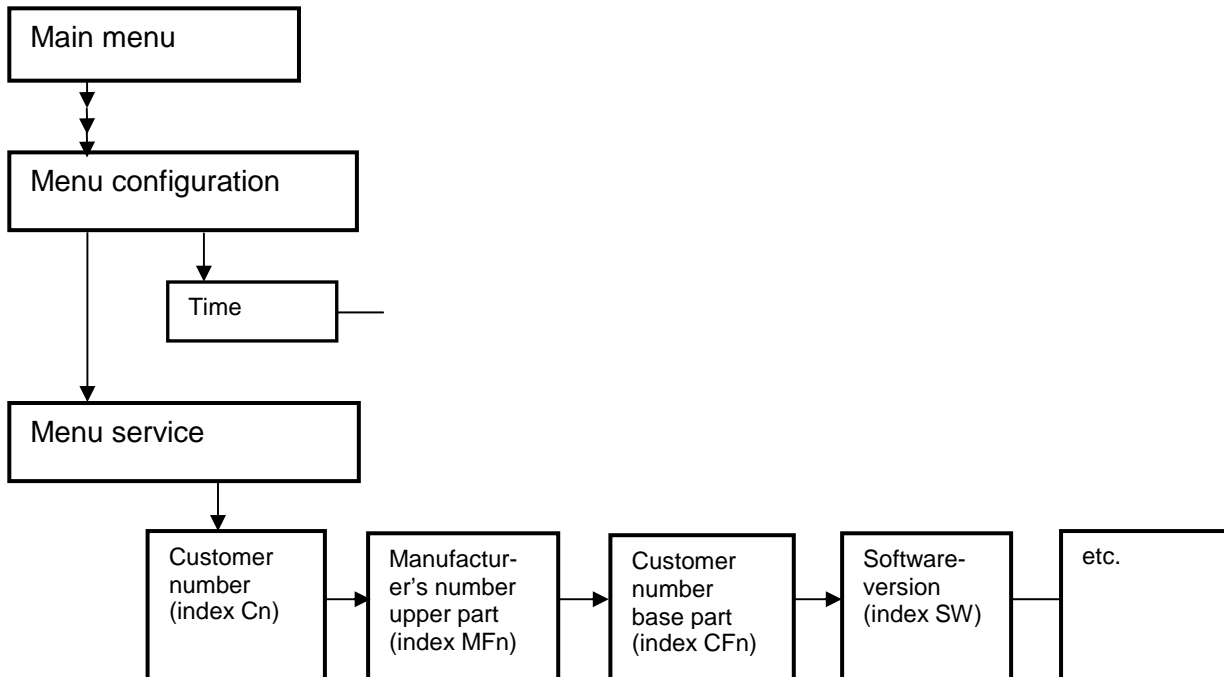


Baud rate (index Br) M-Bus



7.8 Menu service

Here, the configuration values of the Supercal 531 can be checked and altered if required.



Path:
Please proceed as described in 7.1.

Press the **control key six times**:



The index for the menu navigation goes to „7“. Confirm the **menu 7 = menu service** by pressing the **enter key**:



The index for the menu navigation which is above „7“ flashes and the **identification number / customer number** (index Cn), display with 8 digits, is displayed.



By repeatedly pressing the **control key** the display sequence of the menu **service** can be called:



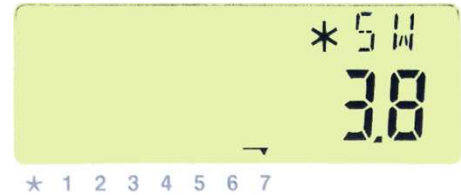
Manufacturer's numberMET (index MFn)



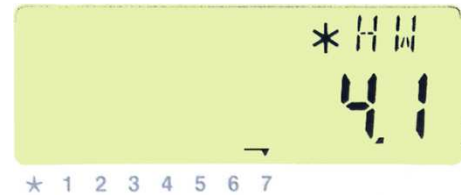
Manufacturer's number MIO (index CFn)



Software version (index SW)



Hardware version (index HW)



Options (index Opn)



Decoding of the options (positions numbered from left to right):

Pos 1	power supply	0 = battery 1 = mains
Pos 2	basic version	0 = standard 1 = M-Bus factory-mounted 2 = radio module
Pos 3 / 4	tariff 1 / 2	0 = off 1 = on
Pos 5 (7) & 6 (8)	communication modules	01 = analogue module only current 02 = analogue module current / voltage 03 = relay module 04 = Combined module 05 = module RS-232 relay 06 = module RS-232 07 = M-Bus module relay 08 = M-Bus module

Resistance value of the sensors Pt100 or Pt500 (index Pt) to be used.



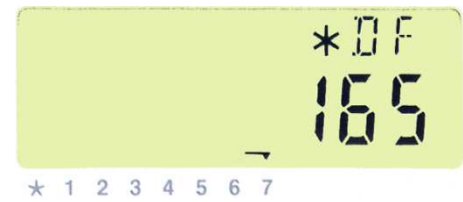
Place of installation of the flow sensor (index Ft);
0 = return pipe, 1 = supply pipe



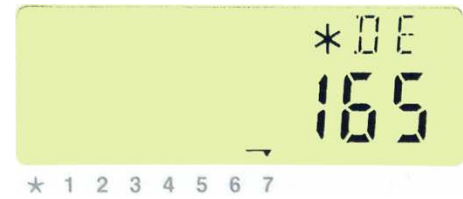
Operating hours of the Supercal 531 (index rh); indication of the operating time in hours



Number of days without flow (index DF)



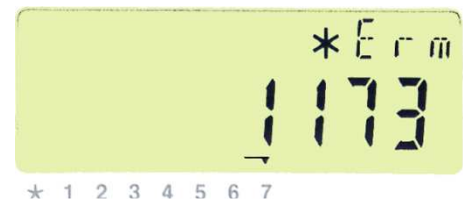
Number of days without energy measurement (index DE)



Display of current error (Err, error number)



Duration of current error in minutes (index Erm)



Error messages 1 – 10 (index EH)

Display of the 10 last recorded errors. The error code is displayed with „Err“ and the indices „01“ to „10“. Index „01“ stands for the last recorded error/error code, index „02“ for the error before last, the indices „03“ to „10“ for the previous recorded errors.

First, the error with index „01“ is displayed.

By pressing the **control key** again, the values are displayed in the sequence as follows:



Duration of error in minutes (min)



Date (DA)beginning of error



Time (Hr) beginning of error



By pressing the **control key** again, the display goes back to the **identification number / customer number** (index Cn) mentioned above.



To access the data of the recorded errors 02 to 10, repeat the procedure until reaching the error with index „01“.

Then press the **enter key**:



The index „01“ flashes.

Now select the error of which you want the error data to be displayed by pressing the **control key** (e.g. „02“ for the error before last).



Then press the **enter key**:



The error number of the error before last 02 is displayed.



By repeatedly pressing the **control key** the display sequence for error 02 is called:

Duration of error in minutes (min), date (DA) and time (Hr) when the error began.



Now press the **control key** again. Then the display returns to the **identification number / customer number** (index Cn) mentioned above.



8. Start-up and Applications

As already mentioned in 2.5, the installation of a heat metering point may only be carried out by authorized personnel and the directives of installation as well as the local rules have to be taken into account.

The same applies for the start-up of the metering point where an expert has to check its proper functioning. After execution of this function check, the Supercal 531 has to be provided with seals.

8.1 Start-up of the Supercal 531

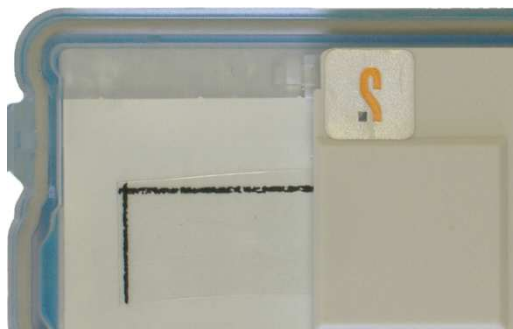
8.1.1 Backup battery

The backup battery in the measuring- and calibration-relevant integrator upper part serves as current supply for date and time in case it is disconnected from the base part of the integrator (e.g. recalibration, replacement or service).

On request, the backup battery in its original packaging can be protected against premature discharge by applying a protective film. Remove the protective film carefully if you want to activate the battery.

ATTENTION: The protective film cannot be reapplied after removal!

The service life of the battery in activated state and without external power supply is up to 130'000 minutes (approx. 3 months) depending on the operating and ambient conditions.



When replacing the battery, the calibration seal is damaged! Therefore, only personnel authorized and trained by Sontex may carry out the replacement. In case of improper handling, the warranty of Sontex is void!

If the integrator upper part is removed, the LCD display indicates the total operating time of the backup battery in minutes.

Thus, the service engineer is able to decide whether the battery has to be replaced or not. After replacement of the battery, we recommend to reset the battery hour meter to zero with the software „Prog 531“.

8.1.2 Supercal 531

8.1.2.1 Checking of date and time

The correct setting of date and time is important so that the recorded data of the Supercal 531 can be allocated chronologically.

They can be set with the service software Prog531 over the optical interface.

8.1.2.2 Flow check

If the pulse factor of the flow sensor has been adjusted correctly to the Supercal 531, an existing flow will immediately be displayed (see flow indicator, point 5.1, page 21).

8.1.2.3 Checking of temperatures

If the temperature sensors are installed correctly in the heating system and connected properly to the Supercal 531, the displayed temperatures will correspond to the expected system data:

Here, „temperature high“ should be above „temperature low“, and the temperature difference should be positive (see main menu, point 7.2, as from page 34).

8.2 Applications

8.2.1 Flow calculation

The parameters relevant for the calculation of the flow (precision of measurement, minimum and maximum holding time, see also 3.4, page 16) are set in our factory. On request, authorized laboratories may carry out alterations over the software Prog531.

The calculation of flow is based on three parameters:

- Precision of measurement of the flow sensor in % or the number of pulses necessary for a new calculation.
- Maximum holding time between two pulses in seconds
- Minimum holding time (battery operation / mains operation) in seconds

A new flow calculation is carried out if:

- a) The defined minimum holding time between the readouts is exceeded and the measured number of volume pulses is sufficient to reach the desired accuracy.
- b) The desired accuracy was achieved by a sufficient number of volume pulses within the minimum and maximum holding time.
- c) The defined maximum holding time expired but the number of volume pulses measured is not sufficient.

In this case however, the flow value will not reach the desired accuracy since the precision extremely depends on the number of pulses measured.

8.2.1.1 Response time and accuracy of the flow calculation

The time period during which the Supercal 531 carries out a new flow calculation is called response time.

At the same time, the value of the current flow is updated

- on the LCD-display
- in the M-Bus protocol (if existing)
- by pulse- or analogue output (if existing)

8.2.2 The Supercal 531 in combination with standard (slow) flow sensors

Example 1:

Flow sensor: Qn 10 m³/h, 10 litre/pulse
 Configuration 531: requested precision 1% (100 pulses)
 Minimum holding time 10 seconds
 Maximum holding time 200 seconds

	flow [m ³ /h]	frequency [pulse/sec]	period [sec/pulse]	response time [sec]	specification parameter	precision [%]
Qn	10	0.278	3.6	200	maximum period b)	1.8
Qn / 2	5.0	0.139	7.2	200	maximum period b)	3.6
Qn / 10	1.0	0.028	36.0	200	maximum period c)	18.0

Example 2:

Flow sensor: Qn 10 m³/h ,10 litre/pulse
 Configuration 531: requested precision 4% (25 pulses)
 Minimum holding time 10 seconds
 Maximum holding time 200 seconds

	flow [m ³ /h]	frequency [pulse/sec]	period [sec/pulse]	response time [sec]	specification parameter	precision [%]
Qn	10	0.278	3.6	90	achieved precision b)	4
Qn / 2	5.0	0.139	7.2	180	achieved precision b)	4
Qn / 10	1.0	0.028	36.0	200	maximum period c)	4

Example 3:

Water meter: Qn 25 m³/h, 100 litre/pulse
 Configuration 531: requested precision 4 % (25 pulses)
 Minimum holding time 10 seconds
 Maximum holding time 480 seconds

	flow [m ³ /h]	frequency [Imp/sec]	period [sec/pulse]	response time [sec]	specification parameter	precision [%]
Qn	25	0.0694	14.4	360	achieved precision b)	4
Qn / 2	12.5	0.0347	28.8	480	maximum period c)	6
Qn / 10	2.5	0.0069	144.0	480	maximum period c)	30

Example 4:

Water meter: Qn 25 m³/h, 100 litre/pulse
 Configuration 531: requested precision 10 % (10 pulses)
 Minimum holding time 10 seconds
 Maximum holding time 300 seconds

	flow [m ³ /h]	frequency [Imp/sec]	period [sec/pulse]	response time [sec]	specification parameter	precision [%]
Qn	25	0.0694	14.4	144	achieved precision b)	10
Qn / 2	12.5	0.0347	28.8	288	achieved precision b)	10
Qn / 10	2.5	0.0069	144.0	300	achieved precision c)	48

For explanations to b) and c), please see point 8.2.1, pages 51

Attention:

When setting the parameter of the maximum holding time, attention has to be paid that this value is higher than the duration between two volume pulses at mean flow of the connected flow sensor. Otherwise the displayed flow and the displayed power will be zero.

The maximum holding time always has to be adjusted specifically to the application. If, later, the heat meter is integrated into a controller application, it is important to check the setting of the maximum holding time.

8.2.3 The Supercal 531 in combination with the flow sensor Superstatic 440

Oscillating beam flow sensor Superstatic 440

The electronic output signal of the Superstatic 440 represents the oscillation frequency of the hydraulic fluid oscillator.

In the table below, please find the typical frequency at Q_n (q_p) as function for different nominal flows (DN):

DN [mm]	Q_n (q_p) [m ³ /h]	pulse factor [Imp/l]	f440 at Q_n [pulse/sec]
25	3.5	15.18	14.758
25	6.0	8.70	14.500
40	10	5.75	15.972
50	15	3.75	15.625
65	25	2.25	15.625
80	40	0.810	9.000
100	60	0.540	9.000
125	100	0.330	9.167
150	150	0.222	9.250
200	250	0.1360	9.444
250	400	0.0865	9.611

Example of the configuration of the integrator Supercal 531 combined with a flow sensor Superstatic 440 with Q_n 6 m³/h.

Configuration 531:	requested precision	2% (minimum: 50 pulses)
	Minimum holding time	5 seconds
	Maximum holding time	40 seconds

In the table below, please find the response time in dependence of the flow and the requested precision:

	flow [m ³ /h]	frequency [pulse/sec]	response time [sec]	specification parameter	precision [%]
Q_n	6.0	14.50	5	minimum period a)	< 2
$Q_n / 2$	3.0	7.25	7	achieved precision b)	2
$Q_n / 10$	0.6	1.45	35	achieved precision b)	2
Q_{min}	0.06	0.145	40	maximum period c)	20

For explanations to a), b) and c), please see point 8.2.1, pages 51

Possible parameterisation of the integrator Supercal 531 with mains module: the flow parameters are factory-set taking into account the specific properties of the flow sensor Superstatic 440.

	basic configuration	minimum values
precision	1 %	1 %
minimum period	5 sec. (10 sec. battery-operated)	5 sec. (10 sec. battery-operated)
maximum period	200 sec.	5 sec.

For specific applications, the minimal values of the holding time are reduced:

- Minimum holding time: 1 second
- Maximum holding time: 2 seconds

Attention:

When configuring the parameter of the maximum holding time, attention has to be paid that this value is higher than the duration between two volume pulses at mean flow of the connected flow sensor. Otherwise the displayed flow and the displayed performance will be zero.

The maximum holding time always has to be adjusted specifically to the application. If, later, the heat meter is integrated into a controller application, it is important to check the setting of the maximum holding time.

8.2.4 The „cut off“- function of the Superstatic 440

When combining the integrator Supercal 531 with the static flow sensor Superstatic 440, the possible flow measuring range is set and limited by a lower and upper threshold value („cut off“ and „flow saturation“) at the factory.

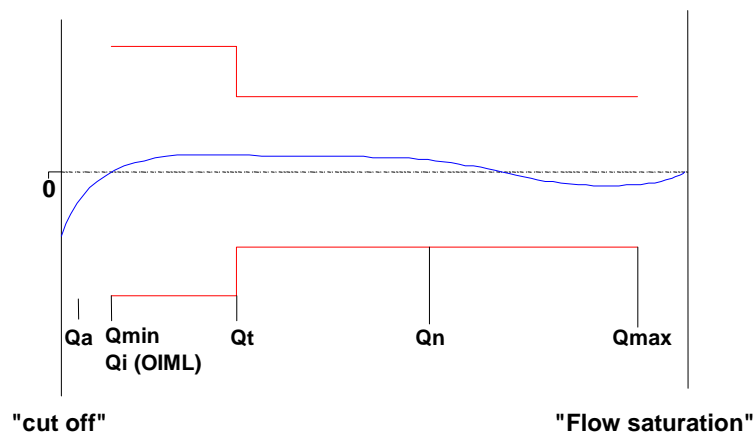
The „cut off“- function can only be integrated in the calibration- and measuring-relevant part of the Supercal 531 by damaging the calibration seal.

As soon as the flow drops below the set „cut off“, flow measurements are no longer carried out. Thus also the volume is no longer cumulated.

If the flow exceeds the flow saturation, the flow measurement stagnates at 2.4 x nominal flow and the volume is cumulated.

The „cut off“- function can also be used in case of hydraulic influences within the heating system, e.g. in case of system vibrations. Thus it is possible to limit a possible faulty measurement.

When combining the integrator Supercal 531 with the static flow sensor Superstatic 440 the threshold values „cut off“ and „flow saturation“ are programmed in the integrator Supercal 531 ex works.



Remark:

The threshold values of the „cut off“- function have to be regarded as autonomous from the other two additional threshold values.

Table with the factory-set threshold values acc. to PTB metrological class C

Length	Connection	Qn	Qt	Qmin	Qa (50°C)	Cut Off	Flow Saturation
110 mm	G 3/4"	1.0 m ³ /h	0.060 m ³ /h	0.010 m ³ /h	0.004 m ³ /h	0.003 m ³ /h	2.400 m ³ /h
110 mm	G 3/4"	1.5 m ³ /h	0.090 m ³ /h	0.015 m ³ /h	0.010 m ³ /h	0.005 m ³ /h	3.600 m ³ /h
190 mm	G1"	1.0 m ³ /h	0.060 m ³ /h	0.010 m ³ /h	0.004 m ³ /h	0.003 m ³ /h	2.400 m ³ /h
190 mm	G1"	1.5 m ³ /h	0.090 m ³ /h	0.015 m ³ /h	0.010 m ³ /h	0.005 m ³ /h	3.600 m ³ /h
190 mm	G1"	2.5 m ³ /h	0.150 m ³ /h	0.025 m ³ /h	0.010 m ³ /h	0.008 m ³ /h	6.000 m ³ /h
260 mm	G 1 1/4"	3.5 m ³ /h	0.210 m ³ /h	0.035 m ³ /h	0.015 m ³ /h	0.011 m ³ /h	8.400 m ³ /h
260 mm	DN25	3.5 m ³ /h	0.210 m ³ /h	0.035 m ³ /h	0.015 m ³ /h	0.011 m ³ /h	8.400 m ³ /h
260 mm	G 1 1/4"	6.0 m ³ /h	0.360 m ³ /h	0.060 m ³ /h	0.030 m ³ /h	0.018 m ³ /h	14.400 m ³ /h
260 mm	DN25	6.0 m ³ /h	0.360 m ³ /h	0.060 m ³ /h	0.030 m ³ /h	0.018 m ³ /h	14.400 m ³ /h
300 mm	G 2"	10 m ³ /h	0.600 m ³ /h	0.100 m ³ /h	0.050 m ³ /h	0.030 m ³ /h	24.000 m ³ /h
300 mm	DN40	10 m ³ /h	0.600 m ³ /h	0.100 m ³ /h	0.050 m ³ /h	0.030 m ³ /h	24.000 m ³ /h
270 mm	DN50	15 m ³ /h	0.900 m ³ /h	0.300 m ³ /h	0.075 m ³ /h	0.090 m ³ /h	36.000 m ³ /h
300 mm	DN65	25 m ³ /h	1.500 m ³ /h	0.500 m ³ /h	0.125 m ³ /h	0.150 m ³ /h	60.000 m ³ /h
300 mm	DN80	40 m ³ /h	4.000 m ³ /h	0.800 m ³ /h	0.400 m ³ /h	0.240 m ³ /h	96.000 m ³ /h
300 mm	DN100	60 m ³ /h	6.000 m ³ /h	1.200 m ³ /h	0.600 m ³ /h	0.360 m ³ /h	144.000 m ³ /h
250 mm	DN125	100 m ³ /h	10.000 m ³ /h	2.000 m ³ /h	1.000 m ³ /h	0.600 m ³ /h	240.000 m ³ /h
300 mm	DN150	150 m ³ /h	15.000 m ³ /h	3.000 m ³ /h	1.500 m ³ /h	0.900 m ³ /h	360.000 m ³ /h
350 mm	DN200	250 m ³ /h	25.000 m ³ /h	5.000 m ³ /h	2.500 m ³ /h	1.500 m ³ /h	600.000 m ³ /h
450 mm	DN250	400 m ³ /h	40.000 m ³ /h	8.000 m ³ /h	4.000 m ³ /h	2.400 m ³ /h	960.000 m ³ /h

Table with the factory-set threshold values acc. to OIML R75 1988

Length	Connection	Qn	Qt	Qmin	Qa (50°C)	Cut Off	Flow Saturation
110 mm	G 3/4"	1.0 m ³ /h	0.200 m ³ /h	0.010 m ³ /h	0.004 m ³ /h	0.003 m ³ /h	2.400 m ³ /h
110 mm	G 3/4"	1.5 m ³ /h	0.300 m ³ /h	0.015 m ³ /h	0.010 m ³ /h	0.005 m ³ /h	3.600 m ³ /h
190 mm	G1"	1.0 m ³ /h	0.200 m ³ /h	0.010 m ³ /h	0.004 m ³ /h	0.003 m ³ /h	2.400 m ³ /h
190 mm	G1"	1.5 m ³ /h	0.300 m ³ /h	0.015 m ³ /h	0.010 m ³ /h	0.005 m ³ /h	3.600 m ³ /h
190 mm	G1"	2.5 m ³ /h	0.500 m ³ /h	0.025 m ³ /h	0.010 m ³ /h	0.008 m ³ /h	6.000 m ³ /h
260 mm	G 1 1/4"	3.5 m ³ /h	0.700 m ³ /h	0.035 m ³ /h	0.015 m ³ /h	0.011 m ³ /h	8.400 m ³ /h
260 mm	DN25	3.5 m ³ /h	0.700 m ³ /h	0.035 m ³ /h	0.015 m ³ /h	0.011 m ³ /h	8.400 m ³ /h
260 mm	G 1 1/4"	6.0 m ³ /h	1.200 m ³ /h	0.060 m ³ /h	0.030 m ³ /h	0.018 m ³ /h	14.400 m ³ /h
260 mm	DN25	6.0 m ³ /h	1.200 m ³ /h	0.060 m ³ /h	0.030 m ³ /h	0.018 m ³ /h	14.400 m ³ /h
300 mm	G 2"	10 m ³ /h	2.000 m ³ /h	0.100 m ³ /h	0.050 m ³ /h	0.030 m ³ /h	24.000 m ³ /h
300 mm	DN40	10 m ³ /h	2.000 m ³ /h	0.100 m ³ /h	0.050 m ³ /h	0.030 m ³ /h	24.000 m ³ /h
270 mm	DN50	15 m ³ /h	3.000 m ³ /h	0.150 m ³ /h	0.075 m ³ /h	0.045 m ³ /h	36.000 m ³ /h
300 mm	DN65	25 m ³ /h	5.000 m ³ /h	0.250 m ³ /h	0.125 m ³ /h	0.075 m ³ /h	60.000 m ³ /h
300 mm	DN80	40 m ³ /h	8.000 m ³ /h	0.800 m ³ /h	0.400 m ³ /h	0.240 m ³ /h	96.000 m ³ /h
300 mm	DN100	60 m ³ /h	12.000 m ³ /h	1.200 m ³ /h	0.600 m ³ /h	0.360 m ³ /h	144.000 m ³ /h
250 mm	DN125	100 m ³ /h	20.000 m ³ /h	2.000 m ³ /h	1.000 m ³ /h	0.600 m ³ /h	240.000 m ³ /h
300 mm	DN150	150 m ³ /h	30.000 m ³ /h	3.000 m ³ /h	1.500 m ³ /h	0.900 m ³ /h	360.000 m ³ /h
350 mm	DN200	250 m ³ /h	50.000 m ³ /h	5.000 m ³ /h	2.500 m ³ /h	1.500 m ³ /h	600.000 m ³ /h
450 mm	DN250	400 m ³ /h	80.000 m ³ /h	8.000 m ³ /h	4.000 m ³ /h	2.400 m ³ /h	960.000 m ³ /h

9. Special Functions

The special functions of the Supercal 531 can either be activated at the factory or with the service software Prog531.

9.1 Status message of the transistor outputs

The Supercal 531 allows the transmission of the status messages to the transistor outputs. The displayed statuses can be defined over the threshold values.

Example: the alarm output can be used via the control system for the immediate and exact monitoring of an important operation mode of the system.

9.2 Threshold values

The threshold value is the value which is used as limit for processing a signal, e.g. for a tariff change or a control system. As soon as the value of the parameter drops below the minimum threshold value or exceeds the maximum threshold value, the signal- or alarm output is activated. Two threshold values can be parameterised over the optical interface or via the operator keys.

The following internal values/incidents can be used to define the thresholds:

- Current flow
- Current power
- „Temperature high“ or „temperature low“
- Temperature difference
- Time window (consisting of date and time)
- Occurrence of an error
- Flow additional meter A1
- Flow additional meter A2

9.3 Solar power systems and cooling systems

The Supercal 531 which originally has been calibrated for water also guarantees precise measurement of glycol mixtures. The medium to be measured and its average mixing proportion are parameterised acc. to the customer's requirements. In this case, the integrator also processes and calculates negative temperatures.

The dust- and splash-proof housing of protection class IP65 is also suitable for cooling systems. Please follow the insulation regulations for cooling systems.

An official calibration is not possible for solar systems and cooling systems with glycol mixtures.

9.4 Tariff functions and/or status message signal

Besides the cooling-/heating tariff, the Supercal 531 disposes of various customer-specific tariffs which can be defined over the respective threshold values.

They can be programmed over the optical interface or the M-Bus interface without damaging the calibration seal.

Examples of different types of tariffs:

- Tariff control by means of the current flow
- Tariff control by means of the current power
- Tariff control by means of the temperature low or temperature high
- Tariff control by means of the temperature difference
- Tariff control by means of the inner tariff time switch
- Combined cold- /heat meter

The tariff functions are explained in detail in the annexe 16.2 Tariff Functions.

9.5 Open System (In development)

In open heating systems one flow sensor is installed in the supply- and one in the return pipe. The Supercal 531 (Supercal 533) calculates the heat energy consumption with the temperature difference and the two flow volumes.

9.6 Power Supply

Batteries or power supply modules can be used. Retrofitting is possible at any time. The Supercal 531 automatically detects the type of power supply installed.

9.7 Error Output

The error output can be used as alarm contact to signalize the freely selectable error statuses of the heat meter.

The error outputs are programmed with the service software Prog531.

An error output will be active if at least one of the selected error messages of the heat meter is triggered.

9.8 Energy-assessing hot water meter / 1 sensor system

The integrator Supercal 531 (Supercal 531) can be set at the factory as energy-assessing hot water meter.

Up to 12 fixed monthly return temperatures can be set (via the tariff functions) as fixed values according to the customer's requirements and used as control elements. The temperature difference can be programmed in steps of 0.5 K.

10. Seals and Operating Modes

Generally, the Supercal 531 is set to normal mode. Apart from normal mode, the integrator software allows the following operating modes:

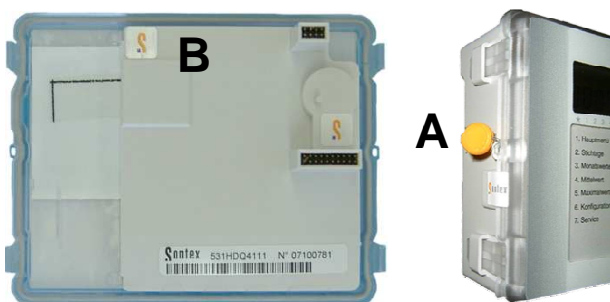
- Test mode (Damaging the seal A)
- Parameterisation mode (Damaging the seal A)
- Calibration mode (Damaging the verification seal B)

The integrator is parameterised ex factory according to the local regulations.

The factory-set parameters can only be changed by authorized personnel taking into account the official calibration regulations.

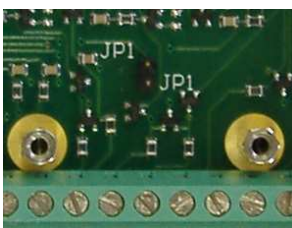
10.1 Sealing concept

The sealing concept is submitted to the local regulations. The sealing points of the Supercal 531 are designed-in as shown in the picture below.



10.2 Test and parameterisation mode

To access the test mode, the integrator upper part has to be removed. On the main board of the integrator base part you will find the jumper connection point JP1.



To activate the test and parameterisation mode, a jumper has to be plugged in. The test menu appears on the display of the Supercal 531 and the test results can be readout on the high-resolution display.

The jumper has to be removed after the test. Then the Supercal 531 goes back to normal mode automatically.

The following parameter can be modified over the operator keys:

- set date and time
- enter customer number
- enter primary address

As soon as the jumper is removed, the Supercal 531 goes back to normal mode automatically.

With the software Prog 531 via the optical interface and depending on the user rights a big amount of parameters can be set.

10.3 Calibration Mode

The Supercal 531 may only be switched over to calibration mode by authorized personnel. To access the calibration mode, the seal (C) on the back side of the integrator cover has to be removed.

As soon as the seal is damaged or removed, the validity of the official calibration test and the warranty from Sontex are void.

A jumper connection point is located below the calibration seal (C).



The jumper for the calibration mode has to be plugged in here. The calibration-relevant functions can only be activated and set over the optical interface with the service software Prog531.

As soon as the jumper is removed, the Supercal 531 goes back automatically to measuring mode.

10.4 Nowa / Unicon

See annexe 16.1

11. Technical Data

11.1 Integrator Supercal 531

CE-Conformity:

▪ EMC-directive	89/336/EEC
▪ Electro-magnetic immunity	acc. to EN 50082-1
▪ Electro-magnetic emission	acc. to EN 50081-1
▪ Low voltage directive	73/23/EEC for power supply units protection class *)
▪ Mains 230 VAC	II acc. to EN 61558
▪ Mains 24 VAC	III acc. to EN 61558
▪ Battery	III acc. to EN 61558

*) The protection class refers to the complete unit (integrator and connected power supply module)

Housing protection class: IP 65 acc. to EN 60529

Area class: A acc. to EN1434

Admissible ambient temperatures:

In operation	+ 5...55 °C
Transport and storage	- 20...70 °C (dry)

Admissible ambient humidity < 93% relative humidity

Display: 8 digits

Energy	99'999'999 (kWh, MWh, MJ, BTU or GJ)
Volume	99'999'999 (m ³ , US-gallons)
Data storage	non-volatile due to EEPROM

Temperature measurement:

Measuring element: Pt500 and Pt100 acc. to EN 60751

Temperature ranges:

Possible temperature range	$\Theta_{min} = -20\text{ °C}$, $\Theta_{max} = +200\text{ °C}$
Admissible temperature range	$\Theta 2\text{ °C}...200\text{ °C}$
Temperature difference	$\Delta \Theta_{min} = 1\text{ K}$, $\Delta \Theta_{max} = 150\text{ K}$
Admissible temperature difference	$\Delta \Theta 2...150\text{ K}$
Response limit	$\Delta \Theta 0.2\text{ K}$
Temperature resolution	0.005 K
Measurement precision	more precise than required by EN1434-1

11.2 Mains supplies

The Supercal 531 can be supplied by battery or mains modules. They can be retrofitted at any time.

The mains modules are provided with a jumper. The backup-battery can be activated or deactivated by this jumper. When commissioning the integrator 531, the jumper is plugged-in (activated).

11.2.1 Mains module with backup-battery

230 VAC – 45 / 60 Hz (on request 115 VAC)

Type	protection class II
Frequency	45 / 60 Hz
Voltage tolerance	+ 10 / - 15 %
Relative humidity	> 93 %
Fuse protection	T 200 mA

24 VAC – 45 / 60 Hz

Type	safety low voltage
Frequency	50 / 60 Hz
Voltage tolerance	+ 10 / - 15 %
Relative humidity	> 93 %
Galvanic isolation	Yes

12...24 VDC

Type	safety low voltage
Voltage tolerance	+ 10 / - 15 %
Relative humidity	> 93 %
Galvanic isolation	Yes

230 (115) VAC – 45 / 60 Hz with 12 VDC output

230 VAC	acc. to specification module 230 VAC	
12 VDC	Type	safety low voltages
	Voltage tolerance	+ 10 / - 0 %
	Relative humidity	> 93 %
	Galvanic isolation	Yes

Backup-battery

Type	½ AA (standard ANSI) with radial soldered connections
Nominal voltage	3.6 VDC
Nominal capacity	min. 1.0 Ah
Nominal current	min. 0.6 mA
Maximum ambient temperature	55 °C

11.2.2 Battery module

The standard battery used in combination with the autarkic flow sensors is the C-cell with a service life of 6 years. When combining with the static flow sensor Superstatic, the D-cell is always used.

For flow sensors with quick pulse sequence and/or unlimited M-bus readout, we recommend to use the D-cell as battery with a service life of 6 years.

Lithium C - cell

Nominal voltage	3.6 V
Service life	up to 6 + 1 years (in combination with autarkic flow sensors)
Maximum ambient temperature	55°C

Lithium D - cell

Nominal voltage	3.6 V
Service life	up to 11 + 1 years (in combination with autarkic flow sensors)
Maximum ambient temperature	55°C

11.3 Communication features

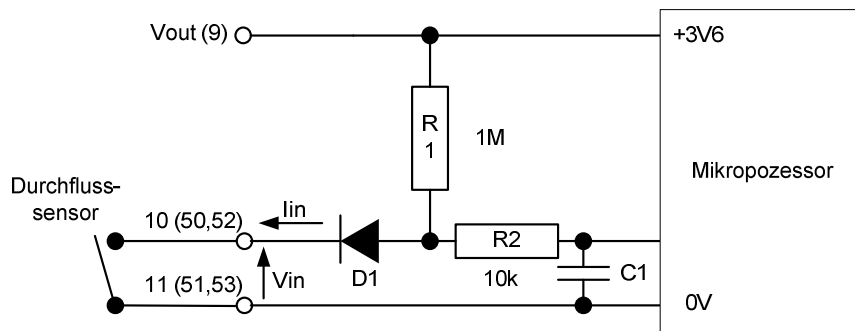
The features of the Supercal 531 (in the integrator lower part) mentioned in point 11.3.1 are standard features ex factory and the features mentioned in point 11.3.2 can be installed additionally in our factory.

11.3.1 Standard version

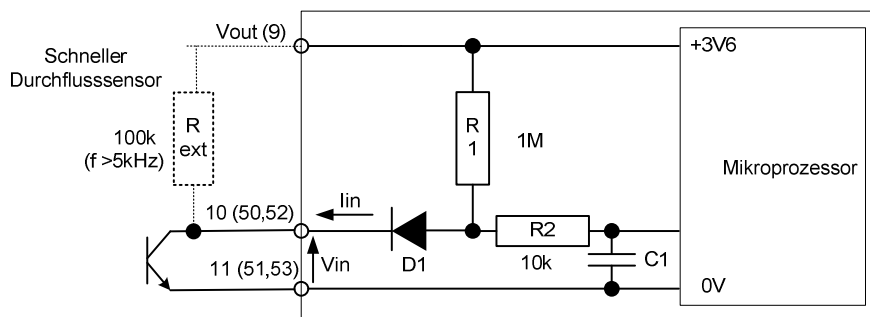
11.3.1.1 Pulse input for volume metering (see 6.1.2)

1 input	Terminal 10, flow sensor 440 white cable, Terminal 11, flow sensor 440 green cable
Input frequency:	Normal mode: max. 5 Hz Fast mode: Battery operation max. 3.5 kHz Mains operation max. 12 kHz
Input voltage	0...30 V
Slow volume pulses	0.0001 - 99'999'999 l/pulse or pulse/l
Fast volume pulses	0.0001 - 99'999'999 l/pulse or pulse/l

Circuit diagramme normal mode

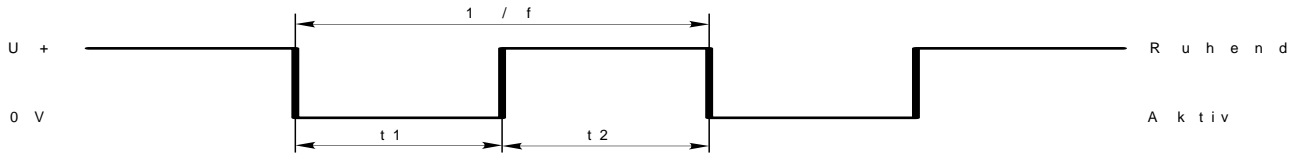


Circuit diagram fast mode



Terminal 9 is provided to supply a flow sensor with maximum $V_{max} = 3.7 V$ and $I_{max} = 20 \mu A$.

Circuit diagram pulse



Normal mode:	t1 = t2 min. 100 ms (pulse duty factor = 50%)
Fast mode (mains operation):	t1 = t2 min. 0.04 ms (pulse duty factor = 50%)
Vin max.	< 30 V quiescent, 0.5 V active
Vin min.	2.0 V quiescent, 0V active
Iin max.	26 µA quiescent, <100 µA active
Iin min	0 µA quiescent, 1.4 µA active

Two additional pulse inputs (see 6.1.3)

2 inputs (A1 on terminals 50 / 51, A2 on terminals 52 / 53)

Input frequency:	normal mode	max. 5 Hz
	fast mode:	battery operation: Max. 3.5 kHz mains operation max. 12 kHz
Input voltage	0...30 V	
Slow volume pulses	0.0001 - 99'999'999 l/pulse or pulse/l	
Fast volume pulses	0.0001 - 99'999'999 l/pulse or pulse/l	

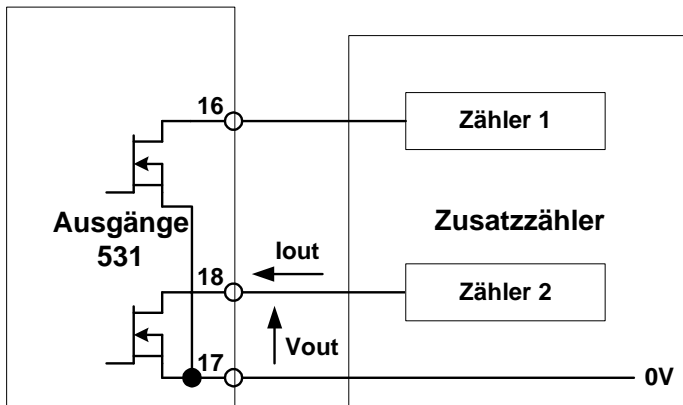
Circuit diagram see point 11.3.1

Two open-collector pulse outputs (see 6.1.4)

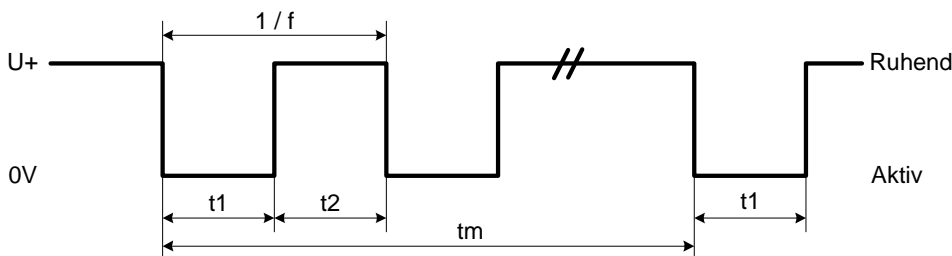
2 outputs (B1 on terminals 16 / 17, B2 on terminals 18 / 17)

Normal mode:	Voltage	max. 30 VDC
	Power	max. 100 mA
	Voltage drop	approx. 1.3 V at 20 mA
	Pulse duty factor	1:1
	Pulse duration	100 ms conductive
	Max. pulse frequency	5 Hz (+/- 20%)
Fast mode:	Voltage	max. 30 VDC
	Power	max. 100 mA
	Voltage drop	approx. 1.3 V at 20 mA
	Pulse type	linear or scaled pulses
	Max. pulse frequency	10 kHz (+/- 20%)

Circuit diagram:
Control of outputs



Control of pulse



Normal mode:	$t_1 = t_2$ 100 ms (pulse duty factor = 50%)
Fast mode:	$t_1 = t_2$ 0.04ms (pulse duty factor = 50%)
Vout max.	< 30 V quiescent, 0.3 V active
Vout min.	2.0 V quiescent, 0V active
Iout max.	< 5 μ A quiescent at 30 V, < 100 μ A active
Iout min.	0 μ A quiescent, 1.65 μ A active at 3,6 V

11.3.2 Options of standard setting

M-Bus module (factory-assembled)

Definition of interfaces	acc. to EN 1434-3
Interface	potential-free, protected against reverse polarity
Transmission rate	300...9'600 baud (... 4800 Baud on battery!)
	Modify with SW Prog531
Data structure	variable
Supply voltage:	
UMU,M(MARK)	36 V
UMU,S (SPACE)	24 V
UM,M (SPACE)	12 V
UM,S (MARK)	11,3 V
Supply current:	
IM	1,5 mA
IS	20 mA

Radio module (factory-assembled)

Method	FM, bidirectional
Frequency	433.82 MHz
Transmission power	≤ 10 mW
Operating range	on average 30m, depending on the local conditions and the structural engineering conditions

Radio telegram:

The radio telegram of the integrator Supercal 531 is structured in accordance with the M-Bus protocol to EN1434-3.

For radio readout, the following telegrams are available:

- Current values / fast mode
Cumulated values and current consumption values
- Monthly values energy
Cumulated values and current consumption values
15 monthly values energy

11.3.3 Optional communication modules

Analogue module with two outputs 4...20 mA (see 6.2.1)

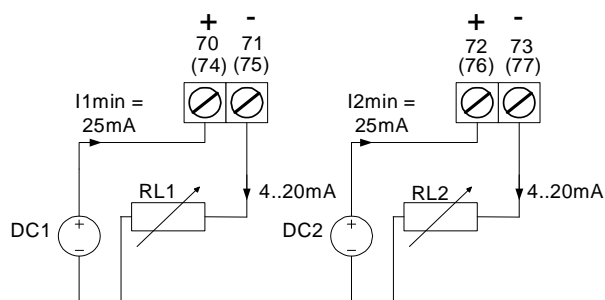
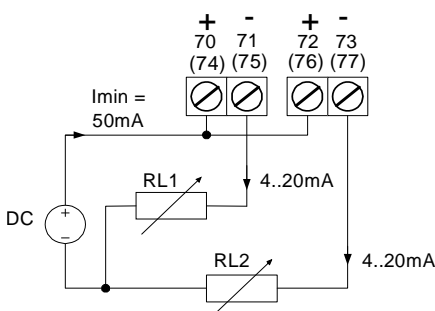
2 inputs:	(external voltage supply)
Voltage supply	9..24 VDC (external) for each input
Tolerances	9 VDC (- 5%), 24 VDC (+ 35%)

2 outputs	4..20 mA (in overflow 3,5..24 mA)
Analogue signal	RL (max.) = 580 Ω at 24 VDC
Burden	RL (max.) = 180 Ω at 12 VDC
	RL (max.) = 82 Ω at 9 VDC
Resolution	16 Bit (in overflow 15 Bit)
Maximum converter error	0.02 % of final value

Circuit diagram:

Combined operation

stand-alone operation



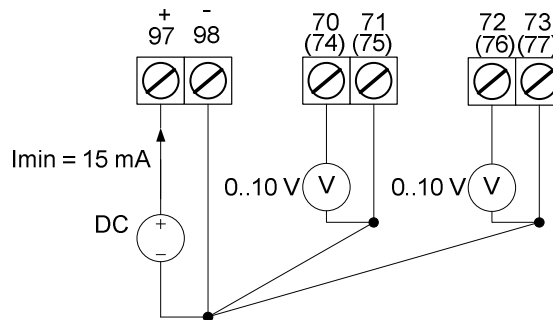
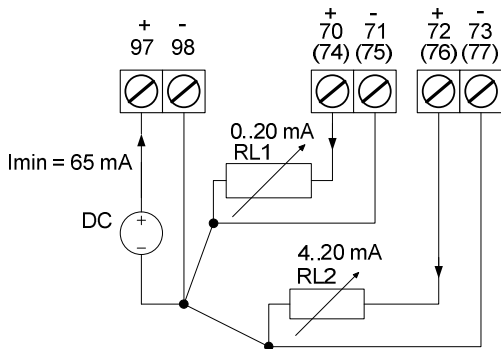
Analogue module with two outputs 0...20 mA, 4..20 mA or 0..10 VDC (see 6.2.1)

2 inputs:	2 (external voltage supply)
Voltage supply	12 VAC or 12...24 VDC (external)
Tolerances	12 VDC (0 %), 24 VDC (+ 35%)
2 outputs	
Analogue signal	0...20 mA, 4..20 mA (in overflow 3,5..24 mA)
Voltage signal	0...10 VDC, 2...10 VDC
Burden	RL (max.) = 650 Ω at 24 VDC RL (max.) = 350 Ω at 12 VDC
Resolution	16 Bit (15 Bit in overflow)
Maximum converter error	0.02 % of final value

Circuit diagram:

Factory setting (mains operation)

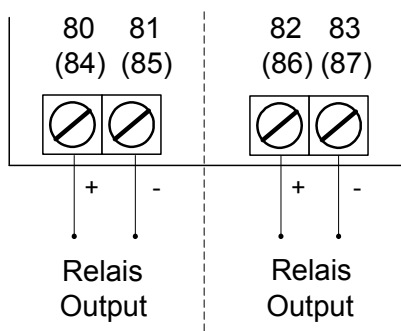
switch-over via flip switch (voltage operation)



Relay module (see 6.2.2)

Outputs	2 (freely selectable)
Max. switching voltage, peak	60 V AC/DC
Max. constant current	400 mA
Surge current (100 ms)	1'000 mA
Max. power dissipation	500 mW
Max. forward resistance	2,5 Ω
Typical output capacitance	150 pF
Max. frequency	100 Hz
Pulse duration	5..400 ms possible in steps of 1ms
Error status	closed (no error)
Alarm condition	open (no alarm)

Circuit diagram:

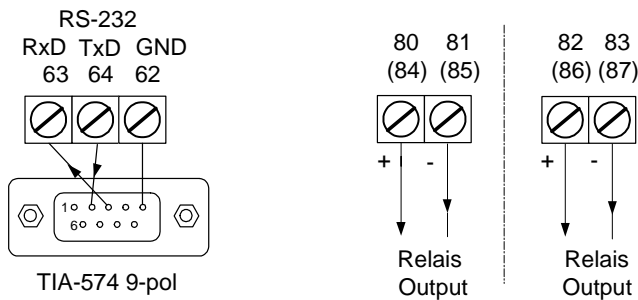


Module RS-232 with two relay outputs (see 6.2.3)

RS-232:
 Baud rate 300..38'400 baud
 Data transmission full duplex
 Protocol M-Bus acc. to EN 1434 (half-duplex)

Relays:
 Outputs 2
 Max. switching voltage, peak 60 V AC/DC
 Max. constant current 400 mA
 Surge current (100 ms) 1'000 mA
 Max. power dissipation 500 mW
 Max. forward resistance 2,5 Ω
 Typical output capacitance 150 pF
 Max. frequency 100 Hz
 Pulse duration 5..400 ms possible in steps of 1ms
 Error status closed (no error)
 Alarm condition open (no alarm)

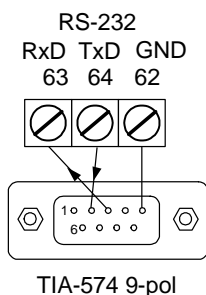
Connection diagram:



Module RS-232 (see 6.2.4)

Baud rate 300..9'600 baud
 Data transmission full-duplex
 Protocol M-Bus acc. to EN 1434 (half-duplex)

Connection diagram:



Combined module with RS-232, three relay outputs, four freely programmable outputs 0...20 mA, 4..20 mA or 0..10 VDC (see 6.2.5)

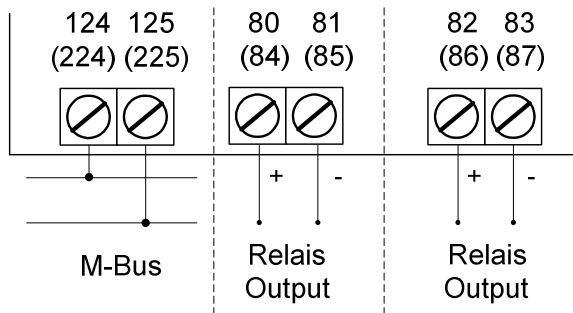
RS-232: acc. to specification RS-232 module with two relay outputs
 Relay: acc. to specification relay module
 Analogue: acc. to specification analogue module with two outputs
 0..20 mA, 4..20 mA or 0..10 VDC
 Analogue inputs 4 (external voltage supply)
 Analogue outputs 4

M-Bus module with two relay outputs (see 6.2.6)

M-Bus:
 Definition of interface acc. to EN 1434-3
 Interface potential-free, protected against reverse polarity
 Transmission rate 300...9'600 baud
 Data structure variable

Relay: see specification relay module

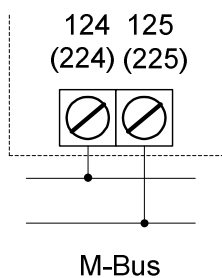
Connection diagram:



M-Bus module (see 6.2.7)

Definition of interface acc. to EN 1434-3
 Interface potential-free, protected against reverse polarity
 Transmission rate 300...9'600 baud
 Data structure variable

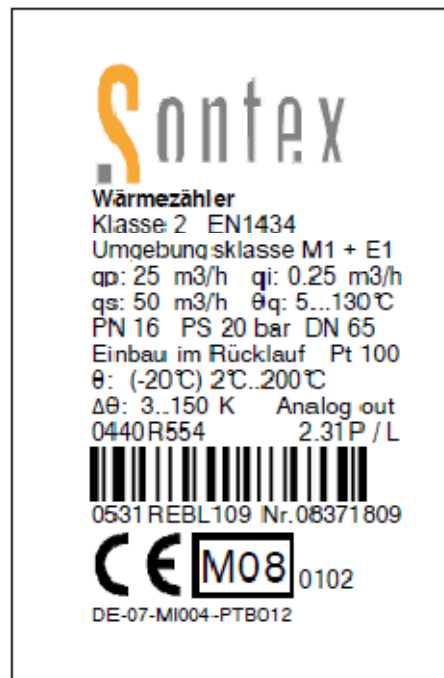
Connection diagram:



12. Identification Plate Supercal 531

In accordance with PTB / MID the following data are stated on the identification plate or on the integrator upper part:

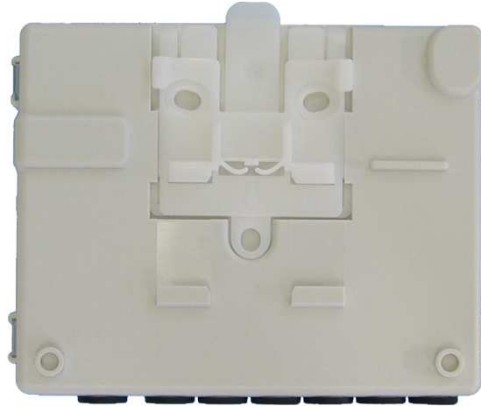
Manufacturer's logo	Sontex	standard
Ownership or metering point number		optional
Product description	Supercal 531	integrator upper part
CE-designation	CE	integrator upper part
Standard optical interface	EN 60870-5	integrator upper part
Part number	0531R001-BB00	standard
Serial number	02456789	standard
Barcode		standard
Class acc. To OIML or EN 1434	2 or 3	standard
Temperature range	2..200 °C	standard
Temperature difference	2..150 K	standard / PTB
Pulse factor		standard
Place of installation	return pipe	standard
Resistance	Pt500 or Pt100	standard
Homologation ID	country-specific	standard
If as heat meter Superstatic 440 (sample below)	Qp, qi,qs, DN, PN, p/n flow sensor	standard



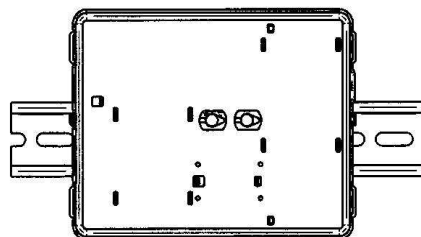
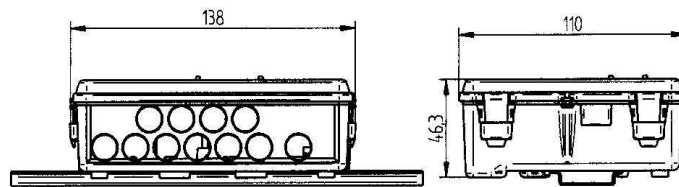
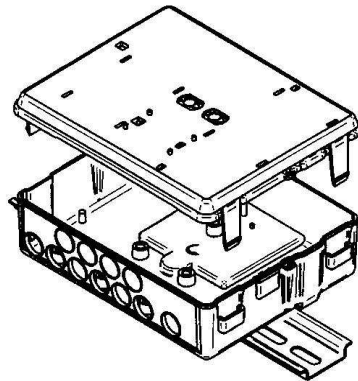
13. Mounting and Dimensional Drawing

The integrator Supercal 531 can be installed in different ways:

- Wall-mounting

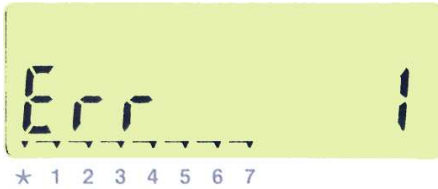


- Compact mounting on a flow sensor
- Top hat rail mounting



14. Error Messages

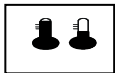
The Supercal 531 indicates an existing error on the LCD display with the designation „Err“ and a numerical code:



In case several errors occur at the same time, the numbers of error codes are listed and displayed.

Description of error messages

- Err0 no error detected (service level)
- Err1 the supply sensor is short-circuited or disconnected
- Err2 the return sensor is short-circuited or disconnected



The temperature sensors are interchanged or mounted incorrectly (Err3)

- Err4 flow too high
- Err8 storage error EEPROM in measuring- and calibration-relevant part (only active after the second time)
- Err16 storage error EEPROM in the integrator base part (only active after the second time)
- Err32 configuration error EEPROM MET in measuring- and calibration-relevant part
- Err64 configuration error EEPROM MIO in integrator base part
- Err128 short-circuit or internal error on supply and/or return sensor
- Err256 voltage breakdown (mains or bus supply)
- Err512 defective communication module, module location 1
- Err1024 defective communication module, module location 2
- Err2048 error pulse input additional meter A1
- Err4096 error pulse input additional meter A2
- Err8192 error of internal electronic: integrator to be returned to manufacturer

Example:

- Err3 both sensors are defective or are not connected

If the error is present for more than one hour, it is recorded in the error memory with date and time (error beginning) and duration (in minutes). If the error is present less than one hour, it is deleted automatically without being stored.

15. Project Planning

Security

The integrator Supercal 531 features state-of-the-art technology and is in compliance with EN1434. If the integrator is operated outside the specifications defined in this manual or is not operated in accordance with the regulations, all service and warranty claims toward Sontex are null and void.

Local regulations

- The following regulations have to be taken into consideration:
- Local regulations for electric installations
- Local regulations for the use of heat meters
- Mounting instruction for the installation of heat meters and temperature sensors acc. to EN1434-2 and EN1434-6

Voltage supply

- If the integrator is mains-supplied, an uninterruptible power supply must be guaranteed
- Local regulations for electric installations have to be followed
- Over- under- and surge voltages are not permitted

Lightning protection

- Preventive measures for lightning protection have to be taken for the mains supply or the bus systems.

Bus-systems

- All bus-systems must have a galvanic isolation on the flow sensor side. Otherwise, the integrator may be destroyed!

Cooling systems

- The insulation regulations have to be followed
- The integrator always has to be mounted away from the cooling pipe.

Installation

- The installation instruction is always supplied along with the integrator. These instructions have to be followed for the installation and the start-up.
- With temperature sensors of a cable length of more than 3 m, shielded temperature sensor cables have to be used. The shields must be installed correctly with the attached fixing clips.
- Please pay attention that all ground contacts of the whole installation (network, external supply, chase of flow sensor and integrator) have the same potential.
- Attention has to be paid to correct grounding!

Seals

- Each integrator has to be provided with the necessary seals to avoid unauthorized manipulation.
- Calibration-relevant seals must not be damaged or removed! Otherwise, the calibration of the integrator and all warranty and service claims are void.
- User seals may only be removed by authorized personnel for service purposes and renewed afterwards.

Service and repairs

- Service and repair work may only be carried out by experts who have expressly been authorized by Sontex.

16. Annexe

16.1 Nowa / Unicon

„NOWA“ stands for „NOrmierter Wärmehähler-Adapter“ (standardized heat meter adapter).

In accordance with the latest standard, it should rather say „UNICON“ (UNiversal Signal-CONverter).

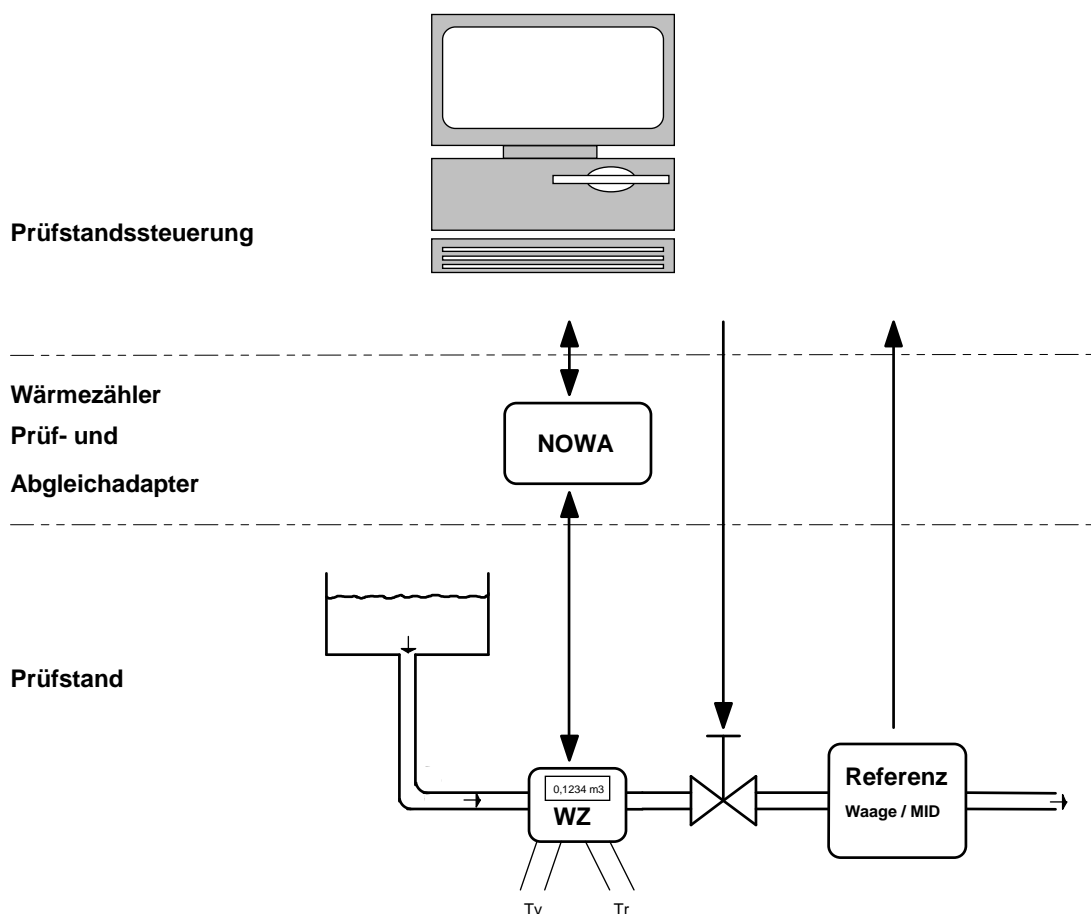
The NOWA-interface is a standardised interface, which over the interface of a modern integrator, provides the connection to the control of the official calibration test rig.

The relevant integrator data are recorded by the official calibration test rig and all necessary adjustments, calibrations and parameterisations are carried out during this calibration test.

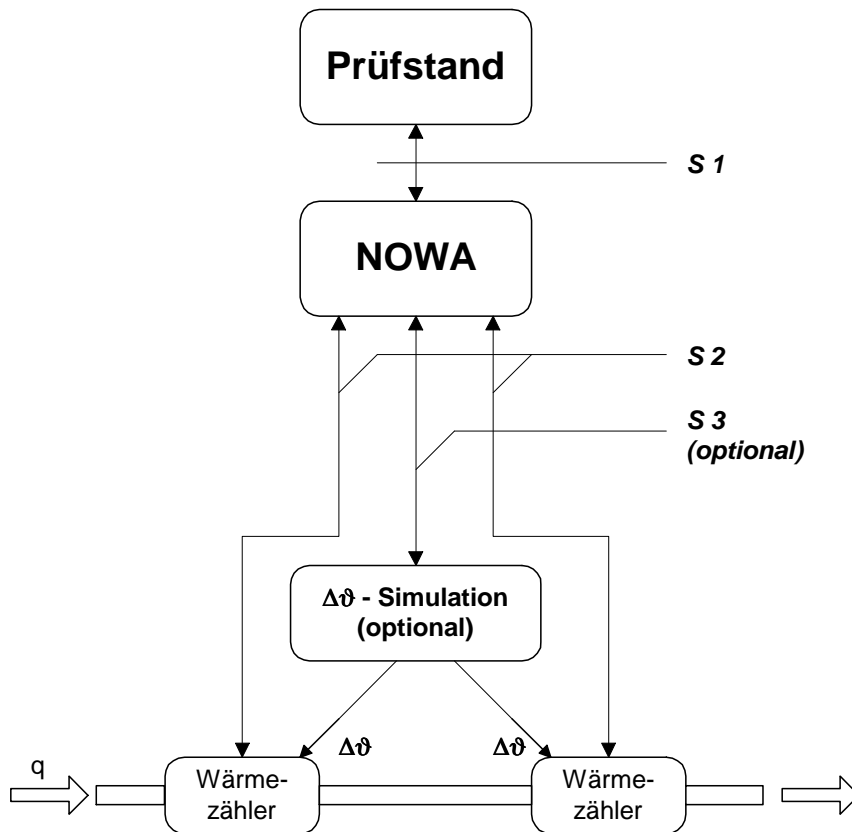
All modern integrators have so-called standardised interfaces which however are designed for the standardised readout of integrators and not for the adjustment, calibration and parameterisation of the integrator over an official calibration test rig.

Apart from this, so far it has not been possible to introduce a standardized telegramme structure of the integrator interfaces at all manufacturers of modern integrators. Therefore the development of the NOWA-adapter was necessary.

Schematic diagram of an official calibration test rig



The interfaces of the NOWA-adapter



Over the **interface S1** the test rig communicates the NOWA-function on the basis of defined specifications.

Over the **interface (s) S2** NOWA controls the integrators acc. to the function set via S1.

Over the **interface S3** NOWA controls an optional set-up to simulate the temperature sensors.

The NOWA-system can be used with manual and semi-automatic test rigs as well as with automated test rigs.

Due to the flexible concept of interface S2 up to 15 integrators can be submitted to the official calibration test at the same time. With the so-called multiplexing, it is possible to submit more than 15 process systems to the test and to guarantee further added functions (e.g. higher data transfer rates, parallel transmission etc.).

Further advantages of the NOWA-concept:

- High security with regard to errors in the handling of the test procedures
- Lower production and quality assurance costs for the integrator manufacturers
- Improved consumer protection

The NOWA.EXE file allows the adaptation to various applications and firmware configuration of modern integrators.

16.1.1 SONTEX NOWA.EXE V1.03

16.1.1.1 Key data

Manufacturer abbr.:	SON
Type of meter:	
Integrator Supercal:	SUPERCAL, SUPERCAL531 or SC
Volume measuring part:	SUPERSTATIC or SS440
Supported NOWA-test modes:	V, RKS, RTS, TK, TT
Adjustment options:	V
Parallel capability (With the respective Nowamux-hardware):	Yes

Special features:

To ensure a reliable communication, it is necessary to know if optical probes are used with or without echo.

Unless further specified, the programme assumes that optical probes with echo are used. In case optical probes without echo are used, the line ‚NoMirror‘ (without inverted commas!) has to be added to the text file „SON\Options.cfg“ (see point 3).

To calibrate the meter correctly, the meter has to be opened. Therefore two internal jumpers (calibration seal) are plugged in the integrator upper part and the test jumpers are plugged in the lower part.

16.1.1.2 Test and calibration procedure

General information on the test and the calibration:

For each meter, the important test points for the calibration are stated in a file in clear-text format. The files are in the sub-folder with the name of the meter: SON\SC531\...

This file name is made up as follows:

File name = „Qp in l/h“ with the file extensions

- ‚.PRF‘ for files with test points for the verification and
- ‚.ABG‘ for the files with test points for the adjustment.

Example: ‚SON\SC531\2500.ABG‘ resp. ‚SON\SC531\2500.PRF‘

The test points are filed line by line acc. to the NOWA-convention (indexes for the different parameters).

The diverse measuring methods are identified by the special programme-internal code number ‚10.03‘ (see annotated example: ‚1500.ABG‘).

Checking of a test cycle for its suitability as adjustment reference point:

The following parameters are (depending on the measuring method) compared with the set values of the calibration data file:

Test mode V:

Qmin-measurement:	min. measurement duration:	120s
	Current flow range:	0..5% Qp
Qp-measurement:	max. error:	10% of current meter setting
	Min. measurement duration:	90s
	Max. deviation current flow:	-50% / +10%

The effective CURRENT values which are sent by the test rig at least once during the test cycle are used for the comparison.

(Command ,I': parameter flow + tv/tr of the test items), resp. the locally defined test duration (parameter time).

For all test modes TK/TT/RKS/RTS the corresponding parameters are extracted from the command ,r' in case the test rig PC does not send any CURRENT parameters (,I').

Checking of several test points before carrying out the calibration:

Measuring method V (volume): minimum flow distance of the test points: 50% Q_{nenn}

Maximum volume error of the test item: 50%

The following influences have to be taken into consideration when evaluating the precision of the detected errors or adjustment processes:

- Time measurement:
on the basis of the PC-Timer: resolution 833ns, software rounding to 1ms, in general, stability higher than 100ppm (normal quartz)
- Jitter transmission time Nowacom:
This is only important for the time measurement from the beginning to the end of the test (and thus for the calculation of the current flow).
It is not possible to state an absolute deviation because the duration depends on the driver version and the response time of the programme of the test rig.

Maximal empirically detected anomalies are at < 25ms,
typical durations are at 0...4 ms with the combination NowaCom-driver CNOWA V1.01 / test rig programme CALRPS V4.28.

- Meter-specific influences:
Communication times / delays at start / stop, etc., have to be considered individually for each meter type.

Parameterisation:

For each meter, the parameterisation data are filed in clear-text format in the sub-folder ,SC531'. The file extension is ,.PRM'.

The parameterisation files are structured line by line.

The format is:

,option = value'.

Example:

Parameterisation file „SC531\PT100.PRM“.

First line: PT = PT100 (possible indication: PT100 or PT500)

Overview of the test sequence volume measurement ,V':

- NowaStart
- Instantaneous values received by test rig
- NowaStop
- Readout of current ultimate meter volume
- Calculation of test volume, interim storage and transmission to the test rig
- Errors received by test rig
- Check if run is permissible value point with current test mode. If “Yes” (JA): Save under the given index.
- Request „adjustment by test rig“: checking of the own measured values of the test points for suitability for the adjustment. In case of feedback signal „YES“: carry out adjustment

Overview of the test sequence integrator (simulated flow) ,RKS / RTS':

- Entry of the number of measurements of simulation pulses (1 temperature measurement per s)
- in the meter
- NowaStart
- NowaStop
- Readout of measuring data, interim storage and transmission to test rig
- Errors received by test rig

No calibration possible.

Overview of the test sequence temperature measurement ,TK / TT':

- NowaStart
- Instantaneous values received by test rig
- NowaStop
- Readout of measurement data, calculation of temperature, interim storage and transmission to test rig
- Errors received by test rig

No calibration possible.

16.1.1.3 Programme options and call parameters

Parameters compatible with test programmes from other manufacturers:

'/DEBUG' => extended debug displays on the screen

The programme options can be selected in three ways:

- as entry in the file c:\SON\SC531\OPTIONS.CFG
- as entry in the file c:\SON\OPTIONS.CFG
- as call parameter in the command line

In the same sequence and priority, the programme searches for applicable options. If an option is set several times (and possibly differently), the last stated value applies (e.g. of the command line).

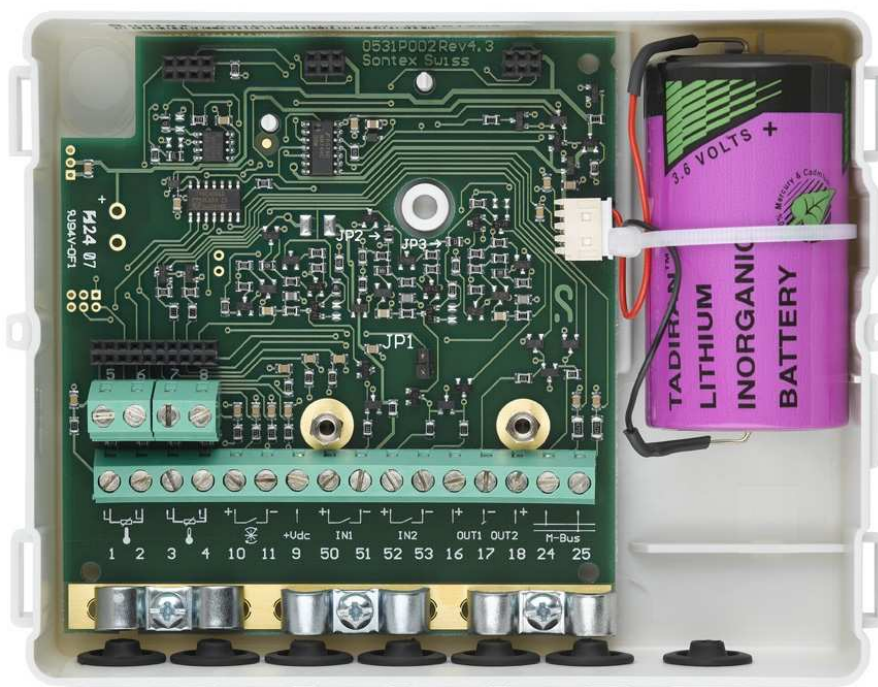
The following options are possible:

- NoMirror: Operation with optical head without echo
- NoMux: No Nowa-multiplexer hardware connected, operation directly over Com1 („standalone“)
- Debug: NowaCom-protocol window active
- Detection time = value [s]: During the set time the programme searches for meters (in case they have been connected only after start of the programme)
- Cmd = command file: Instead of the NowaCom-driver, the commands are read out from the stated file („standalone“)
- Prm = parameterisation file: In connection with a command file, the transfer of a file name is admitted for the parameterisation without being stated explicitly in the command file („standalone“)
- RegDump: After detection of the meter, all registers stated in the register file are read out and recorded in the file ,REGSPlatznummer.DMP' (e.g. REGS1.DMP) (may take some time)
- XP: Standalone-mode in WinXP (with the respective drivers)

In the file OPTIONS.CFG, the options can be registered line by line or within one line (with space character or put in commas). Format of the command line for options: NOWA [/SON:Option1,Option2,Option3,...etc.

16.2 Tariff Functions

Notes



Technical Support

For technical support, please contact your local Sontex representative or Sontex SA directly.

Hotline Sontex:

sontex@sontex.ch

+41 32 488 30 04

SECTION 3

Spare Part Numbers For Heat Meter Superstatic 449 & Integrator (Supercal 531)

SPARE PART NUMBERS

553001073 - Flow & Return Sensors For Heat Meter
Superstatic 449

Notes

A large empty rectangular box with a thin black border, intended for taking notes. It has small black squares in the top-right and bottom-left corners.

Hamworthy Heating Accredited Agents

Southern Ireland (Sales & Service)

HEVAC Limited
Naas Road, Dublin 12, Ireland
tel: **00 353 141 91919** fax: **00 353 145 84806**
email: **info@hevac.ie**

Scotland (Sales & Service)

McDowall Modular Services
2 Penson Road, Queenslie Industrial Estate, Glasgow, G33 4AG
tel: **0141 336 8795** fax: **0141 336 8954**
email:
MMS.McDowallModularServices@hamworthy-heating.com

Northern Ireland (Sales & Service)

HVAC Supplies Limited
Unit A6, Dargan Court, Dargan Crescent, Belfast BT3 9JP
tel: **028 9077 7737**
email: **hvacsupplies@btconnect.com**

North East England (Service)

Allison Heating Products
12 Sunnyside Lane, Cleadon Village, Sunderland SR6 7XB
tel: **0191 536 8833** fax: **0191 536 9933**
email: **allison.heating@gmail.com**

Hamworthy Heating Customer Service Centre

Sales

tel: **01202 662552**
email: **sales@hamworthy-heating.com**

Technical Enquiries

tel: **01202 662505**
email: **technical@hamworthy-heating.com**

Servicing

tel: **01202 662555**
email: **service@hamworthy-heating.com**

Spares

tel: **01202 662525**
email: **spares@hamworthy-heating.com**

British engineering excellence from Hamworthy Heating;
the commercial heating and hot water specialists.



Customer Service Centre

Hamworthy Heating Limited,
Wessex House,
New Fields Business Park,
Stinsford Road,
Poole,
Dorset,
BH17 0NF

Telephone: **01202 662500**
Fax: **01202 662522**
Email: **service@hamworthy-heating.com**
Website: **www.hamworthy-heating.com**