Metrohm
Ion analysis

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767 Calibrated Reference

for mV, pH, Ω, µS, °C

Instructions for Use

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Although all the information given in these instructions has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please inform the author at the address given above.

Table of contents

List of illustrations

1 Overview

1.1 Introduction

The measuring source **767.0010 Calibrated Reference for mV, pH, Ω, µS, °C** is a calibrated instrument for the quantities mentioned above.

It is connected instead of the electrodes and can be used for rapidly and easily checking of the functioning and the basic accuracy of most Metrohm instruments.

In addition the input resistance of high-impedance measuring amplifiers (pH Meters, Titrators) and, for separate amplifiers, the insulation of the reference point from the earth can be checked.

Fig. 1: 767 Calibrated Reference

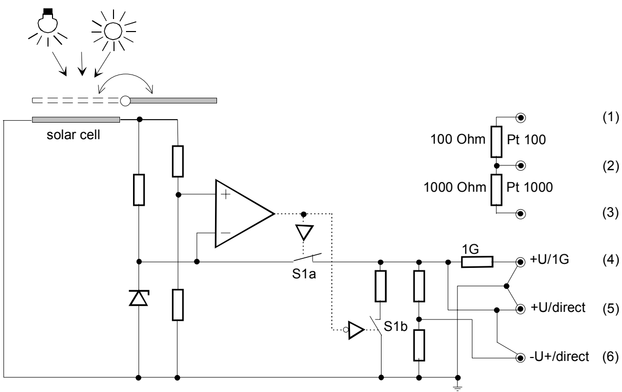


Fig. 2 Functional scheme: Position "Voltage source ON"

cover open ¦ cover closed

U		R	G	T	U		R	G	T
mV	pH	Ω	µS	°C	mV	pH	Ω	µS	°C
		100	10'000	0			100	10'000	0
		1000	1000	0			1000	1000	0
(1200)					0	7	1G		
1200					0	7	14'300	70	
-341	12.7				0	7	460'000	2	

Fig. 3: Label on cover

(exact values are given on the cover)

1.2 Functional description

As mentioned before the input resistance of high-impedance measuring amplifiers (pH Meters, Titrators) and, for separate amplifiers, the insulation of the reference point from the earth can be checked.

This is done using the potential of a reference diode (approx. 1200 mV) on the one hand at output socket (5) **+U/direct** and on the other hand a high-impedance resistor (1 GΩ) at socket (4) **+U/1 GΩ**. This potential is also switched to socket (6) –**U÷/direct** by a divider. This means that a lower potential (approx. 341 mV) with inverted polarity is also available; this can also be converted to a value within the pH scale (approx. pH 12.7).

The reference diode is fed by a **solar cell**. This means that neither a mains supply nor a battery is necessary and makes the instrument virtually maintenance-free. An internal potential monitor ensures that the output potential is switched off under inadequate lighting conditions before the tolerance requirements are no longer fulfilled.

The solar cell can be covered and thus switched off. The potential monitor then switches a second electronic switch so that the internal resistance of the switched-off source is 14.3 kΩ. This resistance can be used to check the current and voltage sources built into pH Meters and Titrators in a very simple manner. The voltage divider at socket (6) –**U÷/direct** gives a resistance of about 460 kΩ, which can also be used for testing purposes.

For checking the temperature measuring amplifier the 0°C resistances of the temperature sensors **Pt 100** and **Pt 1000** are built-in, see sockets (1), (2), (3). These are separated from the other circuits in the test instrument. This means that no unwanted earthing loops can occur when they are used.

This means that 4 resistance values which can be used for checking conductivity meters.

For the 767 Calibrated Reference we have done without fine adjustment and instead have entered the resulting exact values in the table on the cover. In this way we have gained a considerable degree of accuracy and stability. In addition we have converted the resistance values into conductance (µS) and temperature (°C), and the potential into the exact pH value wherever this makes sense. This means that it is possible to compare the display of the instrument to be tested directly with the corresponding value in this table. Two different tables are provided for the open and closed covers.

Practice has shown that problems are often caused by the electrode cable. They are subjected to mechanical stress (tension, pressure, torsion, etc.) and on the other hand they constantly and unavoidably come directly into contact with chemicals (spilt solutions, vapors, etc.). Nevertheless their insulation value must always remain exactly as good as that at the measuring amplifier input. Such an exposed element must therefore be included in a test at all costs. This is why this measuring source is equipped with sockets which correspond to the plug head of

Metrohm electrodes and means that a test can be carried out very easily:

Screw off cable at electrode plug-in head → plug into Calibrated Reference → measure

If this check produces a variation from the expected result then it is not immediately clear as to whether the error lies in the instrument to be checked or in the cable. Therefore specially labeled cables are available in the accessories which are included with the instrument; these can be temporarily used instead of the original cable (see list of cables *chap. 5.2*). These accessory cables are also useful for sensors which do not have a plug-in head.

Note

It must be mentioned here that under no circumstances can or should the 767 Calibrated Reference replace the periodic maintenance of the instrument, but should only be used for determining whether an error is present or not if functional difficulties occur. In addition, the basic accuracy and high impedance of the instrument can be checked at regular intervals.

During maintenance the instrument is subjected to a far more stringent check (e.g. linearity of display and A/D converter, etc.). In addition the switches, motors, mechanical components, etc. are also checked for corrosion and wear and tear.

2 General instrument handling

2.1 Storage

It is best to store the Calibrated Reference in its own case (with closed cover) together with its accessory cables. In this way it is protected against dirt, mechanical stress and moisture.

2.2 Maintenance

The instrument needs no real maintenance (it also contains no batteries). Finger prints or other dirt on the solar cell should be removed with a cloth which has been slightly moistened with window-cleaning liquid or alcohol. The colored tables on the cover **should not be exposed to cleaning agents**.

2.3 Calibration

The calibration certificate is printed on the cover and contains data required for retraceability purposes. The separately printed calibration certificate also contains the dates of the last and next calibrations. We recommend to carry out a service every 5 years.

It is best to send the instrument back to Metrohm for a new calibration. Please include all cables belonging to the set so that they can also be checked. It is expedient to transport the instrument in its own case, which should be packed in suitable transport packing material.

2.4 'High-Impedance', an important basic term

pH electrodes are potential sources with a very high internal resistance. If possible, no current should flow from the source in order not to falsify the measuring potential. This means that the whole measuring circuit consisting of electrode, cable, plug, socket, switching element up to the measuring amplifier itself must be extremely well insulated. Only high quality insulation material such as Teflon, polyethylene, glass, siliconized ceramics, etc. come into question. The intention is to achieve an insulation resistance of up to 10^{14} Ohm. This is quite an extreme requirement. This value can be regarded as being infinite in the following observations. From the *Figure 4, p. 5* it can be seen that the potential E in the amplifier is always effective, even when R_i changes very noticeably with the temperature (which is normal with electrodes).

Minute contamination caused by atmospheric deposits or spilt liquids can influence the insulation values.

What happens in such a case?

An on-load potential source is formed and there is therefore a potential drop at R_i (see *Fig. 5, p. 5*). The measuring potential effective at the amplifier will be falsified by this amount.

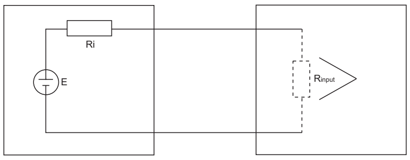


Fig. 4: Unloaded potential source

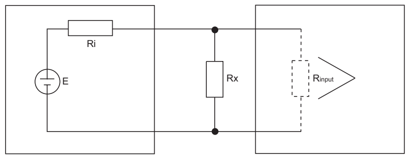


Fig. 5: On-load potential source

If the electrode is now calibrated, i.e. the electrode parameters are determined, then the instrument is in reality being adapted to the electrode. This means that the previously determined error will also be compensated. The measurement will again be correct.

Why make so much fuss when everything is back in order?

One must be aware of the fact that such contaminations form an extremely unstable resistance, whose value alters with the atmospheric humidity, temperature and many other chance occurrences. The resistance can therefore vary greatly. Together with R_i, which is strongly dependent on the temperature, this gives a very unstable potential divider. This is then no longer compensated, at best during the next electrode calibration (and therefore again by chance). Because this error is covered up again at every calibration it is often not noticed for a long time, although it produces false (and above all unstable) results.

From this it can be seen that a constant additional monitoring of the high impedance of pH Meters and Titrators must be a basic concern of quality assurance. However, this only makes sense when the most exposed element, the sensor cable, is included in the monitoring process.

2.5 Measurement of the insulation resistance

Explanation for the steps 9-12, *section 3.2.1 U/mV, pH*.

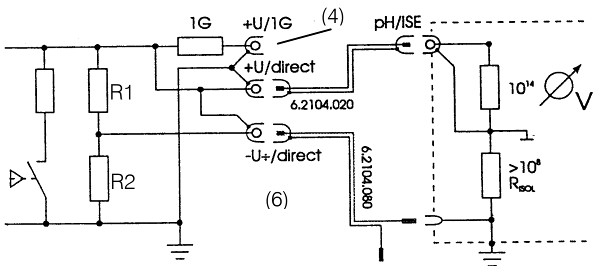


Fig. 6: Measurement of the insulation resistance versus earthing

R_{Isol} of the instrument to check via insulation of 6.2104.020 (6.2150.040) cable and socket (5) is in parallel with R_2 using this interconnection. With R_{Isol} ok, e.g. $> 10^8\ \Omega$, there is no change in the display of the instrument to check.

3 Procedure for checking instruments

3.1 Basics

The 767 Calibrated Reference is connected instead of the sensors, if possible by means of the original sensor cable. If this is not possible (e.g. for electrodes without a plug-in head) a list of suitable cables can be found in the appendix, see *chap. 5.2*.

Each instrument can be checked with the Calibrated Reference within the normal operating program and therefore also with the worked-out methods. This has the advantage that methods and selected function runs can be tested at the same time.

On the other hand the Instructions for Use of most instruments contain a so-called diagnosis instructions, selective instructions for checking the functioning of the instrument if malfunctioning is suspected. This type of check has the advantage that practically no (or only a very basic) knowledge of operating the instrument is required. In addition, checking the instrument by using the diagnosis instructions is usually significantly faster.

This operating instructions for Calibrated Reference 767 are instructions for checking the Metrohm instrument within the normal operating program. As the very large range of instruments means that for individual instruments many different names and operating structures may have been used, these instructions should therefore be interpreted logically.

It is not absolutely necessary to firmly screw down the electrode cap at sockets (4), (5), (6); plugging it in is quite adequate.

3.2 pH Meters and Titrators

Place the Calibrated Reference on the bench near the sensor. Ensure that light is not hindered from reaching the solar cell (no shadows from cables or accessories). If necessary switch on the room lighting.

On the instrument to be tested the slope must be set to 1, pH_{as} to 7 and the measuring temperature to 25 °C for measuring the pH.

Please note:

- On the basis of the pH calibration the pH is determined from the measured potential value. The pH checked here is therefore chiefly relevant as a functionality check.
- If the endpoint is evaluated from a curve in a titration, the absolute measured potential or pH value is not relevant.
- With KF titrators this check should be evaluated as a functionality test.

3.2.1 U/mV, pH

	carry out on instrument or sensor:	carry out on Calibrated Reference:	compare display with:	remarks
1.	screw off cable at sensor (for plug-in head electrodes, otherwise use corresponding accessory cable, see *chap. 5.2*	close cover		place sensor in storage tube
2.		connect sensor cable to socket (5)		
3.	measure mV		mV value (5)	
4.		open cover	mV value (5)	compare with permitted tolerance; note value
5.		connect sensor cable to socket (4)		permitted variation from value noted under step 4: ±0.1 mV (short-time larger deviations are normal)
6.		connect sensor cable to socket (6)	mV value (6)	observe polarity; (switch measuring range if required); compare with permitted tolerance
7.	measure pH	close cover	pH value (6)	set U_{as} to pH 7 if necessary
8.		open cover	pH value (6)	compare with permitted tolerance

End of check

Steps 9...12 are of secondary importance. In general it is sufficient to carry out this check once per year.

For instruments with earthed circuits (e.g. all Titrinos and early series of 692/713) or for instruments without an earth socket (604, 704, 744) these steps are not relevant. Further Information to steps 9...12 can be found in chapter 2.5.

	carry out on instrument or sensor:	carry out on Calibrated Reference:	compare display with:	remarks
9.	measure mV	connect sensor cable to socket (5)		note display as under step 4
10.		additionally connect cable 6.2150.020 (from accessories in case) to socket (6)		
11.	insert banana plug of cable in step 10 in earth socket of tested instrument. *Banana plug of shielding remains open.*	do not touch sockets (4), (5), (6) during the measurement	observe display while connecting the cable	permitted variation: ±0.1 mV display as under step 5 (short-time larger deviations are normal)
12.	remove cable from step 11	remove cable from socket (6)		

If the variation of the measured values is too large then first exchange the original sensor cable against the reference cable in the accessories. When the check is finished recalibrate the electrodes.

3.2.2 Polarization current and voltage source

	carry out on instrument or sensor:	carry out on Calibrated Reference:	compare display with:	remarks
1.	screw off cable at sensor	close cover		place sensor in storage tube
2.		connect sensor cable to socket (5)		
3.	set instrument to function Upol or Ipol	cover always remains closed	calculate R value (5) according to equation, see below	compare with permitted tolerance; take display resolution into account

If the variation of the measured values is too large then first exchange the original sensor cable against the reference cable in the accessories.

Equations for the calculation:
U pol: I = (U/R) = selected Upol potential / Ω value (5)
I pol: U = (IxR) = selected Ipol current x Ω value (5)

For different instruments the different control limits according to the individual technical data must be observed → observe overload display.

Example:
1 μA x 14 345 Ω = 14.345 mV

Consider resolution of display!

3.2.3 Temperature (Pt 100/Pt 1000)

	carry out on instrument or sensor:	carry out on Calibrated Reference:	compare display with:	remarks
1.	remove cable (with sensor) from instrument	close cover		
2.	connect temperature measuring input to Calibrated Reference with 2x banana cables (6.2150.000)	depending on sensor, connect: Pt 100 : sockets (1) (2) Pt 1000: sockets (2) (3)		
3.	set instrument to temperature function	Pt 100 : sockets (1) (2) → Pt 1000: sockets (2) (3) →	°C value (1)(2) °C value (2)(3)	compare with permitted tolerance

Note

During the pH measurement the two Pt 100 / Pt 1000 resistances at sockets (1)....(3) can also be used at the same time with the pH measurement (see above). Please note that the measuring temperature of the instrument to be tested is approx. 0°C, while the information in the table refers to 25°C. This must be converted accordingly.

For the Pt 1000 measuring input the following applies: value between sockets (1) and (3) (R-Pt100 and R-Pt1000 in series) corresponds approximately to 25°C (for the exact individual value see certificate for 767.0010).

3.2.4 Tolerances

Instruments with digital display:

Potential U	± 1 mV
pH value	± 0.02
Temperature	± 0.5 °C
Polarization	functionality test

Instruments with analog display:
The tolerance is within the reading accuracy.

Example:
Theoretical potential value: 1200.7 mV
Instrument resolution: 1 mV, i.e. nominal pot. value = 1201 mV.
The test is OK when the read off value lies between 1200...1202 mV.

If the measurements lie outside the tolerances they should be repeated with the reference cable from the accessories case.

If the measurements are still outside the tolerance range please contact your local Metrohm agency to arrange for the instrument to be serviced.

3.3 Conductivity meters

Read off and note the cell constant, the temperature coefficient, and the temperature on the instrument to be tested. Then set cell constant and temperature coefficient to 1 and the temperature to the reference temperature valid for the instrument. Set the measuring frequency to "automatic switchover".

Please note that a check carried out with this instrument and the diagnosis instructions (if available, see Instructions for Use of the Conductivity meter) may be quicker.

3.3.1 Conductance

	carry out on instrument or sensor:	carry out on Calibrated Reference:	compare display with	remarks
1.	screw off cable at sensor (for plug head electrodes, otherwise use corresponding accessory cable)	close cover		place sensor in storage tube
2.		connect cable to socket (5)		
3.	set instrument to 'conductivity' function	cover always remains closed	G value (5)	compare with permitted tolerance
4.		connect cable to socket (6)	G value (6)	compare with permitted tolerance
If further results are required:				
5.	remove measuring cable	remove measuring cable		
6.	connect conductivity measuring input to Calibrated Reference with 2x banana cables (6.2150.000)	connect cable to sockets (1) (2) connect cable to sockets (2) (3)	G value (1)(2) G value (2)(3)	compare with permitted tolerance

3.3.2 Temperature

Checking the temperature, see *chapter 3.2.3*.

> ***Note***
> *During the measurement the two Pt 100 / Pt 1000 resistances at sockets (1)....(3) can also be used at the same time as the conductance measurement (see further up). Please note that the measuring temperature of the instrument to be tested is approx. 0°C, while the information in the table refers to 20°C. This must be converted accordingly.*
> *When the test is finished the cell constant, temperature coefficient and the temperature must be set again to their current values.*

3.3.3 Tolerances

Instruments with digital display:
G value (5) ± 0.1 µS/cm
G value (6) ± 0.7 µS/cm
Temperature ± 0.5 °C

Instruments with analog display:
The tolerance lies within the reading accuracy.

If the measurements lie outside the tolerances they should be repeated with the reference cable from the accessories case.

If the measurements are still outside the tolerance range please contact your local Metrohm agency to arrange for the instrument to be serviced.

3.4 Rancimat 617 and 679

The Rancimat carries out conductivity measurements via the measuring channels. The function of the measuring channels and the presentation on the printer can be checked channel by channel by means of the Calibrated Reference. The conductance can be read off from the display. By variation of the conductance the sensitivity of the measurement can be shown on the printer in approximately the correct scale. The temperature of the heating block plays no role in the following measurements (if the instrument has reached the operating temperature the check can be started immediately). If this is not the case then the start condition should be achieved (for 679: > 50°C).

The following test can be used as a functionality test.

	carry out on instrument or sensor:	**carry out on Calibrated Reference:**	**compare display with:**	**remarks**
1.	unplug sensor from instrument	close cover		*(Sensor can remain in the measuring vessel)*
2.	plug in cable 6.2150.010 instead of the sensor	Plug in cable according to diagram (see *Fig. 7, p. 11*) so that 15.3 kΩ is obtained		

3.	note following parameters, then set (example 679) : temperature (see above) 50°C cond. range 20 µS/cm paper feed 20 cm/h			
4.	press start		see G value for Rancimat in certificate for 767.0010 (approx. 66 µS [1)])	allow all channels to write out 2 - 3 x (the zero line is shown in all channels)
5.		wait until the printer is printing out a channel which has not been checked. Replug cable (see *Fig. 8, p. 11*), so that 14.3 kΩ ≅ approx. 69 µS is obtained (see G value (5))	G value (5) (ca. 69 µS [1)])	allow all channels to write out 2 - 3 x. In the checked channel the line will be offset by the amount of the alteration in conductance → check by measuring with ruler
6.	if necessary repeat steps 1 - 5 for all channels			

1) Please consider the small number of decimal places in the display!

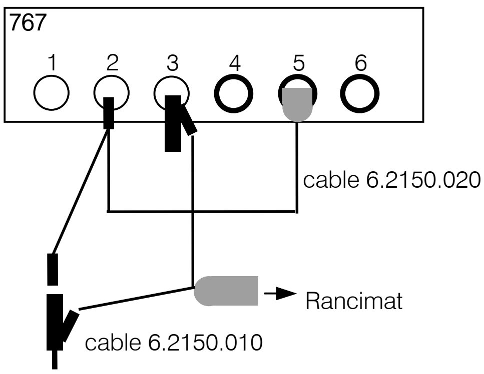


Fig. 7: Cable arrangement for 1st G value (15.3 kΩ →approx. 66 µS)

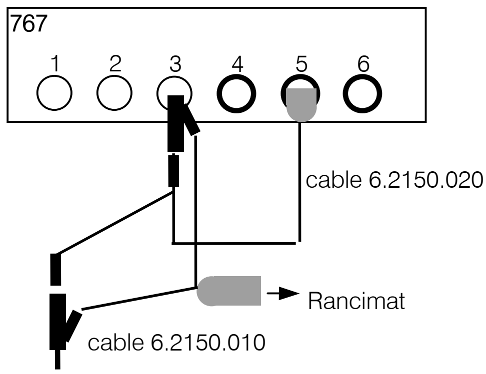


Fig. 8: Cable arrangement for 2nd G value (14.3 kΩ → approx. 69 µS)

4 Checking by means of the diagnosis instructions

For most Metrohm instruments the so-called diagnosis instructions can be found in the Instructions for Use. These are intended to provide the possibility of testing an instrument with real or suspected malfunctions in a simple way.

Until now when checking the measuring inputs the difficulty was always experienced that for the quantities ‘potential’ and ‘resistance’ there was often no suitable source available in the laboratories. In addition these could no longer be connected to the high impedance sockets of our instruments. This difficulty has now been remedied in an outstanding manner by our 767 Calibrated Reference.

In the diagnosis instructions of previous instruments the measuring source 767 Calibrated Reference for mV, pH, Ω, µS, °C is not mentioned. However, it is easy to see how the instrument is to be connected from the diagnosis instructions. The operation of the Calibrated Reference is almost self-evident and it is not difficult to derive the way in which it is to be used from section 1 of these Instructions for Use (please note that **polarization current** and **potential sources** can be very quickly checked in the diagnosis: connect sensor cable to socket (5), close cover, start test, read off !)

For measurement at the differential inputs (e.g. Ind I / Ind II) it should be noted that both inputs cannot be connected to the Calibrated Reference at the same time as this would short-circuit the output sockets. This problem can be avoided by actually connecting both inputs, but alternately shorting one of the two inputs with cable 3.496.5070. However, should this appear to be expedient under exceptional circumstances, two **different**, but **separately earthed** instruments can be connected to the same Calibrated Reference (to sockets (5) and (6)).

5 Appendix

5.1 Technical specifications

5.1.1 Measuring source

3 outputs with socket G:

<table>
<tr><td></td><td colspan="2">cover closed</td><td>cover open</td></tr>
<tr><td></td><td>voltage</td><td>resistance</td><td>voltage</td></tr>
<tr><td>socket (4)</td><td>0 mV</td><td>1 GΩ</td><td>approx. 1200 mV</td></tr>
<tr><td>socket (5)</td><td>0 mV</td><td>14.3 kΩ</td><td>approx. 1200 mV</td></tr>
<tr><td>socket (6)</td><td>0 mV
(pH = 7)</td><td>460 kΩ</td><td>approx. - 341 mV
(pH = 12.7)</td></tr>
</table>

Outputs with sockets B (temperature measurement):

<table>
<tr><td>socket (1)</td><td rowspan="2">100 Ω (Pt100)</td><td></td></tr>
<tr><td>socket (2)</td><td rowspan="2">1000 Ω
(Pt 1000)</td></tr>
<tr><td>socket (3)</td><td></td></tr>
</table>

The individual data are given in the two tables on the cover. Individual additional data can be found in the certificate.

5.1.2 Temperature coefficient

<table>
<tr><td></td><td colspan="2">cover closed</td><td colspan="2">cover open</td></tr>
<tr><td>socket (1)</td><td rowspan="2">25 ppm/°C</td><td></td><td rowspan="2">25 ppm/°C</td><td></td></tr>
<tr><td>socket (2)</td><td rowspan="2">25 ppm/°C</td><td rowspan="2">25 ppm/°C</td></tr>
<tr><td>socket (3)</td><td></td><td></td></tr>
<tr><td>socket (4)</td><td colspan="2">100 ppm/°C</td><td colspan="2">40 ppm/°C</td></tr>
<tr><td>socket (5)</td><td colspan="2">100 ppm/°C</td><td colspan="2">40 ppm/°C</td></tr>
<tr><td>socket (6)</td><td colspan="2">100 ppm/°C</td><td colspan="2">40 ppm/°C</td></tr>
</table>

5.1.3 Longterm stability (2 years)

<table>
<tr><td></td><td colspan="2">cover closed</td><td colspan="2">cover open</td></tr>
<tr><td>socket (1)</td><td rowspan="2">1.3 ‰</td><td></td><td rowspan="2">1.3 ‰</td><td></td></tr>
<tr><td>socket (2)</td><td rowspan="2">6 ‰</td><td rowspan="2">6 ‰</td></tr>
<tr><td>socket (3)</td><td></td><td></td></tr>
<tr><td>socket (4)</td><td colspan="2">5 ‰</td><td colspan="2">1.5 ‰</td></tr>
<tr><td>socket (5)</td><td colspan="2">5 ‰</td><td colspan="2">1.5 ‰</td></tr>
<tr><td>socket (6)</td><td colspan="2">5 ‰</td><td colspan="2">1.5 ‰</td></tr>
</table>

5.1.4 Ambient temperature

Nominal working range	5 ... 40 °C
Storage	– 20 ... 60 °C
Transport	– 40 ... 60 °C

5.1.5 Safety specifications

Construction and testing according to IEC publication 1010, protection class 3

5.1.6 Electricity supply

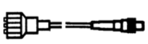
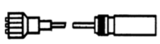
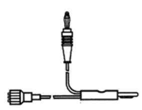
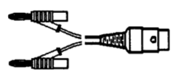
Solar cells (no batteries)

5.1.7 Dimensions

Width	125 mm
Height	45 mm
Depth	85 mm
Weight	approx. 350 g
Weight (with accessories)	approx. 1 kg

5.2 Cables for connecting 767 – instrument X

Please note that the cables in the 767.0010 accessories carry an ID and therefore have a new ordering number (see title lines).

ordering number of original cable with ID	6.2104.020 6.2150.040	6.2104.050 6.2150.030	6.2104.080 6.2150.020	2x 6.2106.020 2x 6.2150.000	6.2150.010
					
Conductometers					
527		X			
587			X		
644			X		
660, 712			X	X	
pH Meters					
500, 510		X		X	
512		X		(X)	
520, 532, 588, 603		X			
604	X				
605, 610		X		X	
620, 632		X			
654		X	X	X	
691, 692, 713	X		X	X	
704, 744	X			X	

ordering number of original cable with ID	6.2104.020 6.2150.040	6.2104.050 6.2150.030	6.2104.080 6.2150.020	2x 6.2106.020 2x 6.2150.000	6.2150.010
Titrators					
526		X			
536		X		X	
576		X			
636, 670		X			X
672, 682, 686	X			X	
702, 716, 718, 719, 720, 721, 726, 736, 751, 785	X			X	
KF instruments					
678	X			X	
684, 701, 737, 758, 784	X				
707, 768				X	
Rancimat					
617, 679					X

With newer instruments you can normally use the cables 6.2150.040 (pH/mV measurement) and 6.2150.000 (temperature measurement).

5.3 Standard equipment

Immediately upon receipt of the instrument please check that the delivery is complete.

Order no. 2.767.0010
The following accessories are included:

no.	*order no.*	*Description*
1	1.767.0010	Calibrated Reference for mV, pH, Ω, µS, °C
1	6.2103.130	Adapter red, 2 mm plug / 4 mm socket
1	6.2103.140	Adapter black, 2 mm plug / 4 mm socket
2	6.2150.000	Cable plug B / plug B
1	6.2150.010	Cable plug B 2x / plug DIN
1	6.2150.020	Cable plug B 2x / plug head G
1	6.2150.030	Cable plug head G / plug E
1	6.2150.040	Cable plug head G / plug F
1	6.2716.020	Case for 767 Calibrated Reference
1	8.767.1023	Instructions for Use for 767 Calibrated Reference
1	8.767.1203	Quick references for 767 Calibrated Reference
1		Certificate for 767 Calibrated Reference

5.4 Warranty and conformity

5.4.1 Warranty

The warranty on our products is limited to defects that are traceable to material, construction or manufacturing error which occur within 12 months from the day of delivery. In this case the defects will be rectified in our workshops free of charge. Transport costs are to be paid by the customer.

For day and night operation the warranty is limited to 6 months.

Glass breakage in the case of electrodes or other parts is not covered by the warranty. Checks which are not a result of material or manufacturing faults are also charged during the warranty period. For parts from outside manufacturers, insofar as these constitute an appreciable part of our instrument, the warranty stipulations of the manufacturer in question apply.

With the regard to the guarantee of accuracy the technical specifications in the instruction manual are authoritative.

Concerning defects in materials, construction or design as well as the absence of guaranteed features the purchaser has no rights or claims except those mentioned above.

If damage of the packaging is evident on receipt of a consignment or if the goods show signs of transport damage after unpacking, the carrier must be informed immediately and a written damage report demanded. Lack of an official damage report releases Metrohm from any liability to pay compensation.

If any instruments and parts have to be returned then the original packaging should be used if at all possible. This applies above all to instruments and electrodes. Before embedment in wood shavings or similar material the parts must be packed in a dustproof package (for instruments the use of a plastic bag is essential). If open assemblies are included that are sensitive to electromagnetic voltages (e. g. data interfaces, etc.) then these must be returned in the associated original protective packaging (e. g. conductive protective bag). (Exception: assemblies with a built-in voltage source belong in non-conductive protective packaging).

For damage which arises as a result of non-compliance with these instructions no warranty responsibility whatsoever will be accepted by Metrohm.

5.4.2 Declaration of Conformity

This is to certify the conformity to the standard specifications for electrical appliances and accessories, as well as to the standard specifications for security and to system validation issued by the manufacturing company.

Name of commodity

767 Calibrated Reference

Metrohm
Ion analysis
CH-9101 Herisau/Switzerland
E-Mail info@metrohm.com
www.metrohm.com

Description Instrument for verification of measured values: tension U/mV, pH, resistance, temperature, conductance.

This instrument has been built and has undergone final type testing according to the standards:

Electromagnetic compatibility: Emission
EN50081-1/92, EN55022/class B
EN55011/class B — Generic emission

Electromagnetic compatibility: Immunity
EN50082-1/92 — Immunity
IEC801-2/91 (level 2) — Static discharge
IEC801-3, ENV50140/93+ENV50204/93 (level 2) — Radiated rf electromag.field immunity

Safety specifications
IEC1010 class3, EN61010 class3, UL3101-1, EN60947:IP31

CE

The instrument meets the requirements of the CE mark as contained in the EU directives 89/336/EWG und 73/23/EWG and fulfils the following specifications:

EN 50081-1	Electromagnetic compatibility, basic specification Emitted Interference
EN 50082-1	Electromagnetic compatibility, basic specification Interference Immunity
EN 61010	Safety requirements for electrical laboratory measurement and control equipment

Metrohm Ltd. is holder of the SQS-certificate of the quality system ISO 9001 for quality assurance in design/development, production, installation and servicing.

The technical specifications are documented in the instruction manual.

Herisau, March 14, 1998

Dr. J. Frank
Development Manager

Ch. Buchmann
Production and
Responsible for Quality Assurance

5.4.3 Quality Management Principles

Metrohm
Ion analysis
CH-9101 Herisau/Switzerland
E-Mail info@metrohm.com
Internet www.metrohm.com

Metrohm Ltd., CH-9101 Herisau, Switzerland

Metrohm Ltd. holds the ISO 9001 Certificate, registration number 10872-02, issued by SQS (Swiss Association for Quality and Management Systems). Internal and external audits are carried out periodically to assure that the standards defined by Metrohm's QM Manual are maintained.

The steps involved in the design, manufacture and servicing of instruments are fully documented and the resulting reports are archived for ten years. The development of software for PCs and instruments is also duly documented and the documents and source codes are archived. Both remain the possession of Metrohm. A non-disclosure agreement may be asked to be provided by those requiring access to them.

The implementation of the ISO 9001 quality system is described in Metrohm's QM Manual, which comprises detailed instructions on the following fields of activity:

Instrument development
The organization of the instrument design, its planning and the intermediate controls are fully documented and traceable. Laboratory testing accompanies all phases of instrument development.

Software development
Software development occurs in terms of the software life cycle. Tests are performed to detect programming errors and to assess the program's functionality in a laboratory environment.

Components
All components used in the Metrohm instruments have to satisfy the quality standards that are defined and implemented for our products. Suppliers of components are audited by Metrohm as the need arises.

Manufacture
The measures put into practice in the production of our instruments guarantee a constant quality standard. Production planning and manufacturing procedures, maintenance of production means and testing of components, intermediate and finished products are prescribed.

Customer support and service
Customer support involves all phases of instrument acquisition and use by the customer, i.e. consulting to define the adequate equipment for the analytical problem at hand, delivery of the equipment, user manuals, training, after-sales service and processing of customer complaints. The Metrohm service organization is equipped to support customers in implementing standards such as GLP, GMP, ISO 900X, in performing Operational Qualification and Performance Verification of the system components or in carrying out the System Validation for the quantitative determination of a substance in a given matrix.

6 Index