INTEGRA QMR (QMR4)

USER'S MANUAL

Electronic downhole memory gauge used for recording pressure and temperature

NOTICE

This manual is intended for private information only, with the understanding that any other use of the subject matter, in whole or in part, by reference or otherwise, shall be only with the prior knowledge and approval of ***Geophysical Research Company, LLC,*** and with the further understanding that this manual is for informational purposes only and that suggestions and recommendations contained herein shall not be understood or construed as a guarantee or warranty of any method, product or device.

Any questions concerning the content of this manual, equipment operation, field maintenance, maintenance assistance and operation or maintenance training courses should be directed to:

6540 E. Apache
Tulsa, OK 74115 United States
Telephone: (918) 834-9600
E-mail: sales@sercel-grc.com

Visit our web page at www.**sercel-grc**.com

TABLE OF CONTENTS

1. SPECIFICATIONS FOR THE INTEGRA QMR

Transducer Type	**Quartz**
Pressure Ranges	**5,000 PSI (34 MPa)** **10,000 PSI (69 MPa)** **16,000 PSI (110 MPa)** **20,000 PSI (138 MPa) upon request**
Temperature Ranges	**302ºF (150ºC)** **350ºF (177ºC)**
Pressure Drift	**Less than 0.02% full scale PSI/year**
Pressure Accuracy	**0.02% full scale**
Pressure Resolution	**0.001 PSI**
Temperature Accuracy	**±0.2ºC**
Memory Capacity	**4,200,000 data sets (pressure, temperature)**
Sampling Rate	**1/100 second up to 18 hours**
Software	**Microsoft® Windows®**
Computer Interface	**USB**
Tool Diameter **Tool Length**	**1.25" (3.17 cm)** **22.8" (302°F QMR4)** **31.8'' (350°F QMR4)**
Housing Material	**718 Inconel**

THE INTEGRA QUARTZ MEMORY RECORDER™

A pressure/temperature gauge that uses state-of-the-art crystal-controlled oscillator technology to provide the most accurate absolute pressure data on the market. The enhanced software package and the flexibility and ease of use make the **Integra QMR** a complete package to gather and report pressure and temperature well data.

KEY BENEFITS

Improves reliability
Lowers operating and maintenance costs
Provides greater memory capacity
Extends downhole survey
Lowers parts and labor costs
World-wide service centers equipped with Integra QMR inventory (boards, batteries, and spare parts)

2. INTEGRA QMR: MAINTENANCE AND OPERATING PROCEDURE

2.1 Health and Safety

a. General Safety Instructions:

 Warning

Memory gauges are pressure tools. If procedures described in this manual are not followed carefully, pressure could be trapped inside the tool and the dismantling operation could become dangerous.

Memory gauges are designed for and can be run in a sour gas environment. Usual maintenance and safety practices for sour service equipment must be followed in order to protect personnel using the tool and to ensure the longest possible tool service life.

Memory gauges use lithium battery packs, which have special handling and disposal procedures.

If the following recommendations are not clear or in case of doubt, please contact GRC

Tel: (+) 1-918-834-9600
Email : sales@sercel-grc.com

Or contact Metrolog at:

Tel: + 33 5 61 34 80 74
Email: sales@metrolog.com

It is assumed that all relevant safety aspects, precautions and recommendations are known by the operators using GRC gauges.

b. Pressure:

 **Warning**

When removing a QMR housing, do not stand in the alignment of the tool. Make sure that nobody stands in the potentially dangerous area (that can be up to 30 m or 100 ft). Hold the body of the tool in a vice and unscrew its housing carefully with the proper safety equipment.

c. Lithium battery :

Lithium batteries used by GRC memory gauges are Lithium based batteries that are a potential hazard in case of wrong usage or wrong operation.
Lithium is a highly reactive element and caution must be taken when handling the Batteries;

We thus advise the users to observe particular precautions when using Lithium batteries, such as:

1. Do not use batteries above their temperature limit.

2. Do not open the batteries in order to prevent any risk of short circuit.

3. Do not introduce a metallic or conductive object in the battery connector in order to prevent any risk of short circuit.

4. Do not throw them in fire.

5. Do not open them.

6. Do not try to recharge them.

7. Do not put them under any pressure or stress that could deform them.

8. Do not knock on the batteries in order to depassivate them. If needed, use the depassiver supplied by GRC.

 **Warning**

In most of the countries, strict regulations apply for the disposal or the destruction of Lithium batteries. Please contact specialized companies or GRC.

In order to protect the users, these batteries are equipped with a double level of fuse. One fuse is built in the cell itself, a second fuse has been added at GRC's request by the battery manufacturer. However, it is important to understand and respect the above rules and to treat these batteries with special care with a full understanding of their specificity; the protection by fuses is of no use in case of deformation or crushing of a battery by a mechanical action.

If you have any question or doubt, please contact GRC.

 **Warning**

Before use, carefully check the maximum temperature of the selected battery and compare it with the expected downhole temperature.

2.2 Field Operations for the Integra QMR (1.25")

 **Warning**

DO NOT TRY TO REMOVE THE INSTRUMENT ELECTRONICS HOUSING FROM THE 1.25" INTEGRA QMR. THE ELECTRONICS HOUSING PROTECTS THE PCB ASSEMBLY FROM CONTAMINATION AND HANDLING DAMAGE.

DO NOT REMOVE THE BELLOWS FROM THE PRESSURE PORT.
THE BELLOWS HAS BEEN TORQUED AND EVACUATED AND IS FACTORY SEALED. IN THE CASE OF ACCIDENTAL REMOVAL, THE GAUGE MUST BE RETURNED TO GRC FOR REPLACEMENT OF THE BELLOWS AND RECALIBRATION.

Complete the following tasks prior to each run:

1) Remove and replace the Gauge Battery Housing O-Ring (Qty: 1 Viton P/N: 079-0212-00) on the 1.25" INTEGRA QMR (See Figure A – page 13).
   a) Remove all contaminates from the outside of the gauge body housing.
   b) Ensure that there is no moisture, oil, or any other contamination on the outside of the instrument housing including the connector area. Verify torque of instrument housing (90ft/lbs max).
   c) *CLEAN WITH ALCOHOL. DO NOT IMMERSE. ALLOW TO AIR DRY OR BLOW* DRY CAREFULLY WITH DRY AIR.

2) Remove and replace the TWO O-Rings (Qty: 2 Viton P/N:079-0018-00) from the INTEGRA QMR pressure port.
   a) Remove all contaminates from the INTEGRA QMR Gauge pressure port "O"-Ring grooves (See Figure A – page 13).
   b) Remove all contaminates from the Bellows End. Use a soft brush and a suitable solvent as necessary.

 **Warning**

DO NOT PRESS OR PULL OR FLEX THE BELLOWS. THIS CAN DAMAGE THE BELLOWS ASSEMBLY.
THE BELLOWS HAS BEEN TORQUED TO 25 FT/LBS AT CALIBRATION. **DO NOT REMOVE OR UNSEAL THE BELLOWS*. THIS CAN RESULT IN INVALID DATA AND CAN DAMAGE THE PRESSURE TRANSDUCER FROM WELL FLUID CONTAMINATION.***

3) Program the gauge as desired:
Start the GRCWin software, clik on "before the job", and create the desired program (see paragraph 2.4)

4) Connect the desired battery pack to INTEGRA QMR Gauge Assembly.

NOTE:
THE CONNECTORS ON BOTH THE BATTERY AND THE INTEGRA QMR GAUGE ASSEMBLY ARE KEYED. DO NOT ROTATE. THE BATTERY LED WILL FLASH 10 TIMES AND THEN EXECUTE THE PROGRAM PREVIOUSLY DOWNLOADED.

CAUTION: *THE INITIAL START-UP OF THE BATTERY FLASHING DRAWS A HIGH LEVEL OF CURRENT MA USING A SINGLE "C" OR "CC" CELL BATTERY PACK ON THE INTEGRA QMR. IF THE BATTERY IS PASSIVATED AND/OR THE BATTERY HAS BEEN PREVIOUSLY USED AT HIGH TEMPERATURES, THE TOOL MAY NOT START AT AMBIENT TEMPERATURES.*

5) Apply a small amount of Lubriplate on the 079-0212-00 VITON "O"-Ring (1 EA.) and 079-0018-00 VITON "O"-Rings (2 EA.) located on the INTEGRA QMR Gauge Assembly (See Figure A – page 13).

6) Install the Battery Housing over the Battery and mate to the threads of the INTEGRA QMR Gauge Assembly. Torque the Battery Housing to the 1.25" INTEGRA QMR Gauge Assembly to 90 ft/lbs to achieve a metal-to-metal seal (See Figure A – page 13).

NOTE:
THE SEALING SURFACES MUST BE FREE AND CLEAR OF ANY CONTAMINATION.

7) Install Oil Trap (P/N: 85B538) over the Bellows End of the 1.25" INTEGRA QMR Gauge Assembly and torque to 25 ft/lbs (See Figure A – page 45).
8) Install Bullet End (P/N: 75B4A 1.25" INTEGRA QMR) to the Oil Trap as required and torque to 25 ft/lbs.

To save time, steps 7 and 8 can be completed prior to installing the battery housing.

2.3 Firmware History

With the new version of Integra QMR (named QMR4), the software has changed. It is now named **GRC Win.**

MetroTool software remains compatible with the previous version of Integra QMR (QMRII and QMRIII) but is not compatible with QMR4.

2.4 Connecting, Programing and Reading the Integra QMR Memory Gauge

To program and start a downhole recorder:

1. **Connect** the tool to your PC with its dedicated interface cable and launch GRCWin
2. **Click** on 

, check that all information are correct
3. **Click** on  , modify the programming parameters if needed
4. **Click** on  then on 'Yes'
5. PC beeps and a message of success is displayed, **Click** on 

6. Disconnect the cable, connect a depassivated (*) battery instead and wait for confirmation signal (LED flashes)

   (*) to depassivate a battery, use the proper battery tester, plug the battery on and wait for the light to turn to GREEN. Once the green light is ON then the battery is depassivated and can be used. If the light keeps on RED light, do not use the battery (battery very passivated or about to be depleted) and use another one

7. Close the battery housing and run the recorder

To read a downhole recorder:

1. Connect the tool to your PC with its dedicated interface cable and launch **GRCWin**
2. Click on 

3. Once read, a message with number of jobs detected and samples is displayed, Click on 

4. Type a name for the newly created job then click on 'OK'

2.5 Other programming modes and features:

Please consult the Help section available in GRCWin or contact sales@sercel-grc.com

3. TROUBLESHOOTING :

This section describes common troubleshooting resolutions.

The symptoms are not presented by order of importance but chronologically as they may happen during the use of the gauge. Some may be obvious, some more complex.

It is assumed that the operator is following the standard procedure to access the gauge (for programming or reading) with the PC.

The gauge cannot be neither "stopped and tested" nor read

Symptom: After clicking the 'Stop & Test' icon or the 'Read Data' icon or ‘After the job’ , the message "Gauge Communication Failure, Gauge not Communicating" is displayed on the screen.

Reasons: There is no communication between the PC and the gauge for one or more of the following reasons:

#1: The communication port is erroneous.

Solution: Check the port to which the interface cable is connected it must be a USB port if the proper serial/USB adapter is used. Check that it is the port indicated in the Configuration | System menu.

#2: The interface cable is not properly connected to the computer or the gauge.

Solution: Check the connections by disconnecting the connectors and reconnecting them. In particular, on gauge side, check that the contacts are clean and in good condition

#3: The gauge communication system has failed.

Solution: DO NOT TRY TO REPROGRAM IT IF THERE IS DATA STORED INSIDE.

Communication stops during data reading

Symptom: After clicking the 'Read Data' icon, the PC starts reading the gauge, but after a while, a message is displayed on the screen saying that the gauge is not communicating.

#1: The communication cable is damaged.

Solution: Use another communication cable.

#2: The communication interface on the gauge may be damaged.

Solution: DO NOT TRY TO REPROGRAM IT IF THERE ARE DATA STORED INSIDE.

The gauge does not start after programming

Symptom: After programming the gauge, when plugging the battery, the LED on the battery is not flashing.

Reason: The gauge battery is nearly flat.

Solution: Replace it by a new battery.

Depassivation of a highly passivated battery

Symptom: The battery is not able to start a gauge.

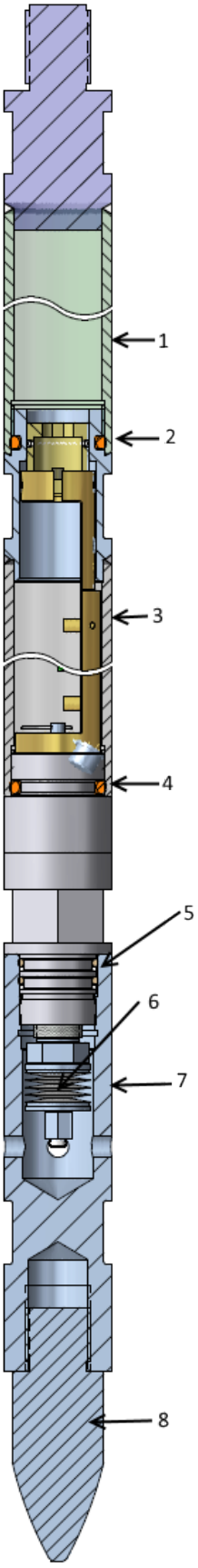
Note: It is extremely difficult to make a difference between a flat battery and a highly passivated battery. Both give the same low voltage when loaded. A battery that will not improve after the depassivation procedure must be considered as flat.

Reason: The battery has been stored for a long time or it has not been used quickly after the last operation or it has been disconnected from the gauge (or the gauge has been stopped) before the battery had cooled down.

Solution: Use the battery tester (depassiver) supplied by GRC. Connect the depassiver for a few minutes.

If a battery does not depassivate after a few minutes, there is no need in persisting. The battery must be disposed.

4. ACCESSORIES (QMR 1.25”):



1. Battery housing (2 types)
   a. Short one for 150°C 1-C Cell – PN# 75B2210
   b. Long one for 177°C 2-C Cell – PN# 75B2212

2. O-rings for the battery housing
   O-ring Viton 90, No. 212 – PN# 079-0212-00

3. Electronic housing : DO NOT OPEN

4. O-ring for electronic housing + Metal-metal seal
   O-ring Viton 90, No. 212 – PN# 079-0212-00

5. O-ring for the oil trap
   Backup ring, No.018 – PN# 079-0319-04
   O-ring Viton 90, #018 – PN# 079-0018-00

6. Bellow : DO NOT TOUCH or UNSCREW

7. Oil-trap or Bottom nose adaptor – PN# 85B538

8. Bull nose – PN# 75B4A

Other Accessories :

Type	Description	Part Number
Cable	USB Communication cable	D.60.A.ENDCIA
Batteries	QMR4 BATTERY, 150ºC LITHIUM (for short housing only)	10031167
Batteries	QMR4 BATTERY, 177ºC LITHIUM	10031166
Kit	QMR Running kit (for 10 runs) This kit contains :	ACC-073
	10ea PN# 079-0212-00 (O-ring for housing)	
	20ea PN# 079-0018-00 (O-ring for bottom nose adaptor)	
	5ea PN# 079-0319-04 (back-up ring for bottom nose adaptor)	
	1ea A.00.M.GREA (high temperatura grease)	
Grease	LUBRIPLATE 930, 1-3/4 oz TUBE	A.00.M.GREA
Case	Carrying case	85D2218
Case	Foam insert for the carrying case	85D3005

5. Mechanical information

Thread of the housing and Bottom nose adaptor	3/4-16 UNF-2
Length of the gauge with short housing	22.84'' (top of the top thread to bull nose)
Length of the gauge with long housing	31.15''
Diameter of the gauge (OD)	1.25''
Material of the gauge	Inconel 718

6. Replacement of O-rings (& backup rings for QMR4-T gauges)

The O-rings normally supplied by GRC are Viton O-rings 90.When replacing the O-rings, it is important to follow strict procedures in order to achieve the proper seals and longevity:

Apply the minimum possible stress. Pass the O-rings around the smaller diameter available. It is recommended to use an O-ring inserting tool whenever it is possible.

Because of the inevitable stress applied when installing new O-rings, once installed, wait 2 minutes before placing the housing that will cover them. This gives time for the O-rings to relax and to take back their original shape.

Warning !

Special O-rings for operations in gas wells

For long or multiple exposures to gas, it may be needed to replace the standard Viton90 O-rings by special O-rings made of other compounds or harder Viton like Viton 858/95, Aflas or Nitrile.

These O-rings have been designed to resist to explosive decompression and are used by major oil producing and service companies in gas fields for downhole and surface applications.

Their main characteristic being to have a very low permeability to gas, they greatly reduce the gas entry (by diffusion) into the gauge.

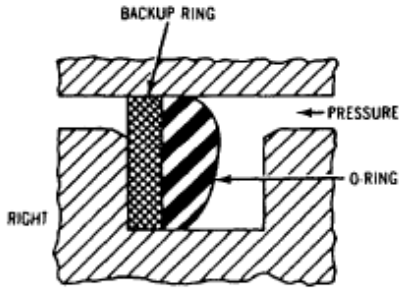
Same replacement precautions apply than for standard Viton O-rings.

In order to determine which compound is best adapted to each application, contact GRC and supply the fluid characteristics and chemical content.

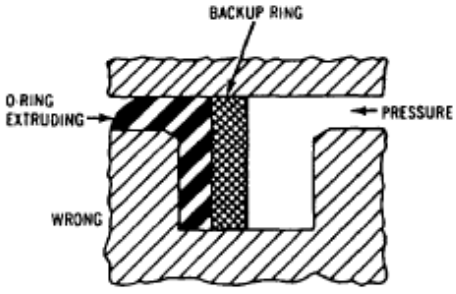
How to place a backup ring ?

When the use of a backup ring is required, be careful with the usage of backup rings, the two pictures bellows illustrate the dos and the don'ts and the specific case of the QMR4-T.

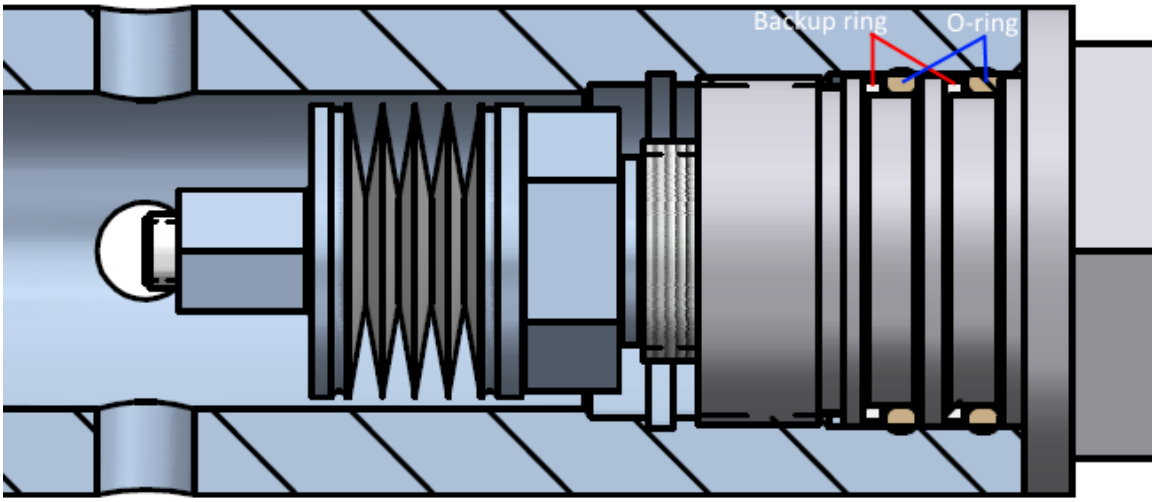
Some older generation of QMR4 or for upgraded QMR3, the use of a backup ring may not be possible due to the size of the groove.



VIEW A—PROPER LOCATION OF A SINGLE BACKUP RING



VIEW B—IMPROPER LOCATION OF A SINGLE BACKUP RING



How to change a battery and replace battery-housing O-rings

The battery housing O-rings must be changed every time the housing is removed:

1. Put the gauge on a flat surface.
2. Unscrew the electronics housing, using two flat wrenches.
3. Disconnect the battery by pulling it.
4. Place new housing O-rings by sliding them above the battery connector.
5. Grease the new O-rings and clean carefully the metal-to-metal seal. Especially avoid the presence of sand, mud, or any impurity that may affect or damage the sealing.
6. Wait couple minutes to allow the O-rings to take back their orininal shape.
7. Depassivate and then connect a new battery.
8. Clean the inner thread of the housing and the main thread of the body of the gauge to avoid seizing between the two.
9. Connect the battery and slide the electronics housing back in place with the same care than for removing it. Screw and tighten it.

Warning !

The electronics housing must not be over-tightened or removed. Only the battery housing.

7. ADDITIONAL CAUTIONS

Jobs in particular environment may compel GRC gauge users to take more care with the preparation of their gauges, especially in sour environment or in gas or for long term jobs. This paragraph lists the additional protection that can be used to enhance the life of your material

Shock absorbers & centralizer

During slickline runs, gauges may be damaged by shocks on the completion restrictions (nipple, restriction, mandrel, etc.).

Protecting your gauge with a shock absorber and a centralizer will help to extend the lifetime of your gauges.

Sensor protection against sour environment

1. In order to avoid any direct contact between the sensor and the effluent you can fill the nose of your gauge with high temperature grease.
2. Another and more reliable option is to use a specific bottom nose adaptor (BNA) with a buffer tube that prevents exchanges between the chamber of the sensor and the effluent.
3. You can also choose to run your gauges in a slickline gauge carrier for example.

Warning !

Never try to touch the bellow of the tool. If you want to clean it, do it extremely carfully.