Technical Manual

Instructions for installation, operation and maintenance

145

PROFLOW
Series “J” Vane meter

Publication nr. TIB-145-GB-0314
Supersedes TIB-145-GB-0114(2)
## CONTENTS

1  PREFACE ........................................................................................................... 4  
  1.1  General ............................................................................................................ 4  
  1.2  Symbols ............................................................................................................ 4  
  1.3  Copyright ......................................................................................................... 4  

2  PRODUCT DESCRIPTION ................................................................................... 5  
  2.1  Principle of operation ...................................................................................... 5  
  2.2  Liquid filter ..................................................................................................... 5  

3  TECHNICAL SPECIFICATION .......................................................................... 6  
  3.1  General flowmeter specifications ..................................................................... 6  
  3.1.1  Flowrate – pressure drop viscosity relation .................................................. 6  
  3.1.2  Specific Flowmeter specifications .................................................................. 6  
  3.2  E-counter ......................................................................................................... 7  
  3.2.1  Operation ...................................................................................................... 7  
  3.2.2  Physical ........................................................................................................ 7  
  3.2.3  Electrical ...................................................................................................... 7  
  3.2.4  Environmental .............................................................................................. 7  
  3.2.5  EMC ............................................................................................................. 7  
  3.2.6  Vibration ...................................................................................................... 7  
  3.2.7  Pulse output (optional) .................................................................................. 7  
  3.3  Optional pulse output ....................................................................................... 8  

4  SAFETY INSTRUCTIONS .................................................................................. 9  
  4.1  Safety precautions ........................................................................................... 9  

5  UNPACKING ....................................................................................................... 10  

6  INSTALLATION ................................................................................................ 11  
  6.1  Before installing the flowmeter ....................................................................... 11  
  6.2  System layout recommendations .................................................................... 11  
  6.2.1  Flowmeter supports ...................................................................................... 11  
  6.2.2  Liquid filter .................................................................................................. 11  
  6.2.3  Deaerator ..................................................................................................... 11  
  6.2.4  Pulsation damper ......................................................................................... 11  
  6.2.5  Vibrations ..................................................................................................... 11  
  6.2.6  Preventing the flowmeter from emptying ..................................................... 12  
  6.2.7  Bypass piping arrangement ......................................................................... 12  
  6.3  Installing the flowmeter .................................................................................. 13  
  6.4  Electrical connection (only with optional pulse output) .................................... 14  
  6.4.1  Pulse output specification ............................................................................. 14  
  6.4.2  Connecting the cable .................................................................................... 14  

7  OPERATING INSTRUCTIONS .......................................................................... 15  
  7.1  Startup procedures ........................................................................................ 15  
  7.1.1  Initial start up of a flowmeter system with bypass piping arrangement ........ 15  
  7.1.2  Initial start-up of a flowmeter system without bypass piping arrangement ... 16  
  7.2  Operation of the E-counter ............................................................................ 17  
  7.2.1  Layout of the E-counter ............................................................................... 17  
  7.2.2  Basic operation ............................................................................................ 17  
  7.2.3  Menu layout and setup ................................................................................. 18
1 PREFACE

1.1 GENERAL

This manual contains instructions for installation, operation and maintenance (IOM) of the VAF Instruments model series "J" ProFlow liquid flowmeters, with connection sizes DN15 (½") to DN 50 (2"). For IOM information of associated equipment supplied by VAF Instruments, refer to the separate manual supplied with those products.

This manual contains important information for the installer, the operator and for your maintenance department.

CAUTION:
TO ENSURE SAFE AND CORRECT INSTALLATION AND HANDLING, OPERATION AND MAINTAINING, READ THIS MANUAL COMPLETELY BEFORE INSTALLING THE EQUIPMENT AND STARTING OPERATIONS.

For any additional information contact:

VAF Instruments B.V.
Vierlinghstraat 24, 3316 EL Dordrecht
P.O. Box 40, NL-3300 AA Dordrecht
The Netherlands
Tel. +31 78 618 3100
Fax +31 78 617 7068
E-mail: sales@vaf.nl
Internet: www.vaf.nl

Or your local authorized VAF Instruments dealer.
Their addresses can be found on www.vaf.nl

1.2 SYMBOLS

The following symbols are used to call attention to specific types of information.

A WARNING TO USE CAUTION!
IN SOME INSTANCES, PERSONAL INJURY OR DAMAGE TO THE FLOWMETER OR E-COUNTER MAY RESULT IF THESE INSTRUCTIONS ARE NOT FOLLOWED PROPERLY.

AN EXPLANATION OR INFORMATION OF INTEREST.

1.3 COPYRIGHT

This technical manual is copyrighted with all rights reserved.
No part of this book may be copied or reproduced by any means without permission from VAF Instruments.
While every precaution has been taken in the preparation of this manual, no responsibility for errors or omissions is assumed. Neither is any liability assumed for damages resulting from the use of the information contained herein. Specifications can be changed without notice.
2 PRODUCT DESCRIPTION

VAF Instruments ProFlow positive displacement sliding vane type liquid flowmeters are used in continuous metering applications of oil-like liquids, especially for accurate measurement of fuel oil consumption.
The read out of the flowmeter is a 7-digit E-counter with a resettable total, a non-resettable accumulated total and flowrate.
The E-counter can be equipped with an optional pulse output.

2.1 PRINCIPLE OF OPERATION

The ProFlow series flowmeters operate on the sliding vane principle. The flowmeter consists of a specially shaped housing in which a rotor can rotate freely. Two pairs of vanes are placed into four slots in the rotor. Each pair is positioned by a rod and can move in and out of the rotor. The radial vane movement is guided by the special inner shape of the housing.
This patented construction provides a constant seal between the inlet and the outlet of the flowmeter. The incoming liquid forces the rotor to rotate. A magnet transmits the rotor rotations from the measuring chamber to a built-on E-counter (standard).
An electric pulse output can be installed on the E-counter as option for remote totalising or flow data processing.

NOTE:
The ProFlow series flowmeters are subject to P.E.D. (Pressure Equipment Directive) cat 3.3.

Figure 1, Sectional view of a VAF Instruments ProFlow sliding vane type liquid flowmeter

2.2 LIQUID FILTER

The liquid to be measured must be clean and free from air, gas or dirt or solid particles.
Since solid particles may cause excessive wear of the flowmeter and its components it is highly recommended to install a VAF Instruments liquid filter with a mesh width of 0.05 mm (280 mesh) at the inlet of the flowmeter.
If necessary also install a suitable deaerator. Refer to product bulletin 302 for more information.

NOTE:
VAF Instruments cannot be held responsible for any damage to flowmeters and accessories caused by dirt or foreign particles in the process liquid.
3 TECHNICAL SPECIFICATION

3.1 GENERAL FLOWMETER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Basic model number</th>
<th>J5015E</th>
<th>J5023E</th>
<th>J5025E</th>
<th>J5040E</th>
<th>J5050E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection size, DN [mm]</td>
<td>15 mm (½&quot;)</td>
<td>25 mm (1&quot;)</td>
<td>25 mm (1&quot;)</td>
<td>40 mm (1½&quot;)</td>
<td>50 mm (2&quot;)</td>
</tr>
<tr>
<td>Capacity [l/min]</td>
<td>see graphs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum, 8 hrs/day discontinuous</td>
<td>50</td>
<td>50</td>
<td>160</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>Maximum, continuous</td>
<td>37.5</td>
<td>37.5</td>
<td>120</td>
<td>187.5</td>
<td>375</td>
</tr>
<tr>
<td>Displaced volume per revolution [litre]</td>
<td>0.025</td>
<td>0.025</td>
<td>0.167</td>
<td>0.167</td>
<td>0.4</td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>range 1:10 ¹</td>
<td>0.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>range 1:20 ²</td>
<td>0.3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>better than ± 0.05 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required starting pressure [kPa (bar)]</td>
<td>3 (0.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>body, flanges, covers and rotor</td>
<td>ductile iron</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vanes</td>
<td>carbon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>O-rings</td>
<td>viton A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body pressure rating [kPa (bar)]</td>
<td>4000 (40)</td>
<td>2500 (25)</td>
<td>2000 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available flanges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIN PN (bar) raised face or with groove acc. DIN 2512N</td>
<td>6, 10, 16, 25, 40</td>
<td>6, 10, 16, 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANSI RF</td>
<td>150, 300</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JIS K</td>
<td>5, 10, 16, 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid temperature range standard</td>
<td>-10 °C to 125 °C</td>
<td>-10 °C to 180 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On application</td>
<td>-10 °C to 125 °C</td>
<td>-10 °C to 160 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Built-on counter</td>
<td>7 digit resettable totaliser</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>smallest readout unit</td>
<td>0.001 litre</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional pulse transmitter</td>
<td>1 scalable pulse output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse type</td>
<td>open collector NPN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight without counter [kg]</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>14</td>
<td>22</td>
</tr>
</tbody>
</table>

Notes: ¹ Standard factory calibration. ² Calibration on request.

3.1.1 Flowrate – pressure drop viscosity relation

To approximate the pressure drop in relation to flowrate and viscosity of the liquids, the graphs as shown in Figure 68, Figure 69 and Figure 70 must be used.

![Image](https://via.placeholder.com/150)

NOTE:
The data in these graphs only refer to standard flowmeters used on Newtonian liquids. When viscosities higher than shown in the graphs are applicable VAF Instruments should be consulted.

3.1.2 Specific Flowmeter specifications

The technical specification of a specific flowmeter can be found on the instrument text plate which is fitted to the back cover of the flowmeter.

![Image](https://via.placeholder.com/150)

Figure 2, Text plate
3.2 E-COUNTER

3.2.1 Operation
Display: 7 digit LCD display
Operator keypad: 2 keys

3.2.2 Physical
Size: 85 x 85 x 60 mm
Weight: 0.17 kg approx. (unpacked)
Cover material: Polycarbonate
Case material: Polysulfone

3.2.3 Electrical
Power supply: Lithium Thionyl Chloride battery, 3.6 V, Size AA, 85°C
Battery lifetime: Up to 5 years

3.2.4 Environmental
Operating ambient temperature range: 0 to 60 °C
Operating humidity range: 5 to 95 %RH (non-condensing)
Enclosure sealing: IP65

3.2.5 EMC
Emissions & immunity: Meets requirements of:
- EN 61000-4-2 (2009)
- EN 61000-4-4 (2012)
- EN 61000-4-6 (2009)

3.2.6 Vibration
Vibrations: Meets requirements of:
  Maritime navigation and radio communication equipment and system – General requirements –
  Method of vibration testing according to § 8.7.2

3.2.7 Pulse output (optional)
Number of outputs: 1
Type: Open collector NPN
Maximum load: \( U_{\text{max}} 25 \text{ V DC, } I_{\text{max}} 100 \text{ mA} \)
Range: 1 to 9.999 pulse per unit
Maximum frequency pulse output: 100 Hz
Pulse width: 5, 10, 20, 50, 100, 200, 500 or 1000 ms
Cable gland: 1x M12 x 1.5 mm, Ø3.5-7 mm
Maximum cable length: 100m / AWG-24 and 100KOhm pull up resistor
3.3 OPTIONAL PULSE OUTPUT

If the E-counter is equipped with a pulse output, the internal connections of the cable connected to the E-counter are, as shown in Figure 92. The number of generated output pulses per unit is marked on the text plate of the flowmeter.

NOTE:
Use of the pulse output may reduce battery lifetime.
4 SAFETY INSTRUCTIONS

4.1 SAFETY PRECAUTIONS

All precautions have been taken to ensure, in so far as reasonable practical, that the equipment has been designed and constructed to be safe and without risk to health or the environment when properly used.

Provided that the recommendations contained in this manual are carefully adhered to, no circumstances are foreseen where the equipment will present a health or safety hazard.

To ensure the safety of personnel, equipment and the environment:
- Always follow the safety, installation, repair and maintenance recommendations in this manual.
- Always observe warning labels on containers and packages.
- All personnel who installs, operates, repairs or maintains the equipment should read this manual completely and make themselves acquainted with the equipment before installing, operating, repairing or maintaining the equipment.
- Make sure that all safety requirements are met before installing, operating, repairing or maintaining the equipment.
- Always use personal protective means when necessary especially when working with hot, aggressive and toxic process liquids.
- Always use the right tools for the job.
- If the flowmeter is fitted with a lifting eye, use it when moving the flowmeter.
- Make sure that all equipment is isolated from the electrical supplies and process lines before installing, repairing or maintaining the equipment.
- Never assemble or disassemble electrical equipment with power switched ON.
- Always handle printed circuit boards with CMOS components according to the correct procedures for such components, to prevent any damage due to electrostatic discharges.
- Only use cleaning solvents in a well ventilated area.
  Avoid breathing fumes.
  Keep away from open fire.
  Do not use solvents on plastic components or parts.

⚠️ CAUTION:
THE BODY AND FLANGES OF THE FLOWMETER WILL BE THE SAME TEMPERATURE AS THE PROCESS LIQUID. TAKE PROPER MEASURES TO AVOID PERSONAL INJURY FROM TOUCHING A HOT OR COLD FLOWMETER.

⚠️ CAUTION:
SOME CALIBRATION FLUID Q8 INDUCO 4 (Q8 PUCCINI 4P) MAY BE LEFT BEHIND IN THE FLOWMETER.
Q8 INDUCO 4 (Q8 PUCCINI 4P) IS A REFINED MINERAL OIL,
EG NO. 265-158-7,
CAS NO. 64742-55-8.
5 UNPACKING

- The flowmeter is a precision instrument and should be treated with care.
- Let the equipment acclimatize inside the closed box for at least one hour at the location where the flowmeter will be installed.
- When the flowmeter is taken out of the box, please leave the special protection supplied with the equipment as long as possible in place to avoid any damage.
- The two yellow protection caps on the in and outlet of the flowmeter should be left in place as long as possible to avoid dirt and foreign particles from entering the flowmeter.
- Be careful not to put any force on the E-counter.
- Disposal of the packing material should be done according to local laws or regulations, or according to the rules that are applicable on the vessel.

Details of the flowmeter:

Flowmeter

Maximum weight (unpacked):

<table>
<thead>
<tr>
<th>Model No</th>
<th>Approx. net weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5015E</td>
<td>5</td>
</tr>
<tr>
<td>J5023E</td>
<td>7</td>
</tr>
<tr>
<td>J5025E</td>
<td>12</td>
</tr>
<tr>
<td>J5040E</td>
<td>14</td>
</tr>
<tr>
<td>J5050E</td>
<td>22</td>
</tr>
</tbody>
</table>

Maximum dimensions:

<table>
<thead>
<tr>
<th>Model No</th>
<th>W x H x D [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5015E</td>
<td>180 x 121 x 130</td>
</tr>
<tr>
<td>J5023E</td>
<td>220 x 137 x 130</td>
</tr>
<tr>
<td>J5025E</td>
<td>240 x 173 x 161</td>
</tr>
<tr>
<td>J5040E</td>
<td>240 x 173 x 161</td>
</tr>
<tr>
<td>J5050E</td>
<td>260 x 218 x 203</td>
</tr>
</tbody>
</table>

Weight and dimensions depending on flange rating
6 INSTALLATION

6.1 BEFORE INSTALLING THE FLOWMETER

1. Identify the flowmeter by comparing the type number on the text plate with the description on the packing list.
2. Record the data of the text plate and document this information properly together with the installation location and drawings of the process piping.
3. Ensure that the flowmeter is suitable for your process conditions.

CAUTION: NEVER EXCEED THE CAPACITY, TEMPERATURE AND PRESSURE LIMITS SPECIFIED ON THE TEXTPLATE OF THE FLOWMETER. CONSULT VAF INSTRUMENTS IF THE FLOWMETER MUST BE USED FOR A DIFFERENT PROCESS LIQUID THAN ORIGINALLY ORDERED.

6.2 SYSTEM LAYOUT RECOMMENDATIONS

6.2.1 Flowmeter supports

The flowmeter must never be used to support the piping or other system components. Suitable pipe brackets at each side of flowmeter, as shown on Figure 4 should be used. Either the flowmeter must be supported by the process piping, or both the pipeline and the flowmeter must be supported.

Figure 4, Pipe brackets for supporting the flowmeter

NOTE: The flowmeter should be accessible from all sides for easy inspection and servicing.

6.2.2 Liquid filter

The liquid to be measured must be clean and free from air, gas or dirt or solid particles. Since solid particles may cause excessive wear of the flowmeter and its components, it is highly recommended to install a VAF Instruments liquid filter with a mesh width of 0.05 mm (280 mesh) at the inlet of the flowmeter.

6.2.3 Deaerator

Accurate measurement of the process liquid is only possible if the measurement is not influenced by the presence of gas or air. When the process liquid contains gas or air, a deaerator should be installed upstream of the flowmeter.

6.2.4 Pulsation damper

To ensure trouble free operation of the instrument excessive pressure pulsations in the process liquid have to be avoided. When excessive pressure pulsations are present it is highly recommended to install a proper pulsation damper.
6.2.5 Vibrations
To ensure trouble free operation of the instrument, excessive vibrations have to be avoided. When excessive vibrations are present it is highly recommended to ensure decoupling from the source.

6.2.6 Preventing the flowmeter from emptying
To prevent the flowmeter from emptying or siphoning a back-pressure downstream of the flowmeter has to be maintained, so that it always remains full of liquid. This can be achieved by raising the pipeline downstream of the flowmeter, as shown in Figure 5 or by installing a back-pressure valve or by another suitable method.

![Figure 5, Raising the pipeline to prevent emptying](image)

6.2.7 Bypass piping arrangement
To insure that the flowmeter can be serviced without interrupting the flow in the system, it is highly recommended to install a bypass with manual block valves, as shown in Figure 6.

![Figure 6, Bypass piping arrangement](image)

**NOTE:**
A bypass may not be allowed when the flowmeter is used for custody transfer purposes.

**CAUTION:**
DO NOT INSULATE OR TRACE THE HOLDER AND ELECTRONIC COUNTER
6.3 INSTALLING THE FLOWMETER

SAFETY PRECAUTIONS:
MAKE SURE THAT ALL SAFETY REQUIREMENTS AS DESCRIBED IN SECTION 4.1 ARE MET BEFORE ANY WORK IS COMMENCED.

NOTE:
A VAF flowmeter is a precision instrument. Handle it with care.

To correctly install the flowmeter follow the procedure below.
1. Remove the two yellow protection caps from the in and outlet of the flowmeter just before installation.

CAUTION:
SOME CALIBRATION FLUID Q8 INDUCO 4 (Q8 PUCCINI 4P) MAY BE LEFT BEHIND IN THE FLOWMETER.
Q8 INDUCO 4 (Q8 PUCCINI 4P) IS A REFINED MINERAL OIL, EG NO. 265-158-7, CAS NO. 64742-55-8.

2. Inspect the flanges on both the flowmeter and the process piping.
Check for tool marks, dents, scratches or corrosion. Look for pitting and any other defects which would make sealing impossible. Any repairs must be made before bolting.
3. Inspect the gasket. Verify to be sure the gasket is of the proper material and style. Look for defects or damage.
4. Inspect and clean the bolts, nuts and washers. Verify to be sure they are of the specified material.
5. Lubricate the bolt threads and the nut contact surfaces.
The use of an anti-seize compound should be considered to facilitate subsequent disassembly.
6. Centre the gasket on the flange. This is extremely vital when raised faced flanges are used.

Install the flowmeter in the process piping in accordance with the relevant position from Figure 7.

Figure 7, Mounting position

NOTE:
- The back cover of the flowmeter must always be in vertical position.
- An arrow on the flowmeter body indicates the direction of the flow.
- The E-counter may be turned 90° to facilitate reading.
- Do not mount any object onto the flowmeter body.
8. Tighten the bolts approximately 30% to the final torque following the sequence shown in Figure 8 and Figure 9.
If the correct tightening sequence is not followed, the flanges can be misaligned, making it impossible to have uniform seating of the gasket.

[Images: Figure 8, Bolt tightening sequence for flanges using 4 bolts; Figure 9, Bolt tightening sequence for flanges using 8 bolts]

9. Repeat step 8, elevating the torque to 50 to 60 percent of the final torque.
10. Continue tightening in the recommended sequence until the final torque value is reached. Each bolt normally has to be tightened more than once.
11. All gaskets relax after seating. Retightening is recommended 24 hours after installation to compensate for the relaxation. On high-pressure or high-temperature applications, it is recommended that the flanges be re-torqued to the required stress after 24 hours at operating pressure and temperatures to compensate for any relaxation.

6.4 ELECTRICAL CONNECTION (ONLY WITH OPTIONAL PULSE OUTPUT)

The electrical connections of the pulse output are, as shown in Figure 92.
For electrical connections between the E-counter and associated electronic processing instrumentation, reference is made to the separate technical manuals supplied with these electronic instruments.

6.4.1 Pulse output specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs</td>
<td>1</td>
</tr>
<tr>
<td>Type</td>
<td>Open collector NPN</td>
</tr>
<tr>
<td>Maximum load</td>
<td>$U_{\text{max}}$ 25 V DC, $I_{\text{max}}$ 100 mA</td>
</tr>
<tr>
<td>Range</td>
<td>1 to 9.999 pulse per unit</td>
</tr>
<tr>
<td>Maximum frequency pulse output</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Pulse width</td>
<td>5, 10, 20, 50, 100, 200, 500 or 1000 ms</td>
</tr>
<tr>
<td>Maximum cable length</td>
<td>100m / AWG-24 and 100KOhm pull up resistor</td>
</tr>
</tbody>
</table>

6.4.2 Connecting the cable

The cable on the E-counter is screened to prevent false pulses being introduced by external electromagnetic interference.
On the inside of the E-counter this screening is properly finished.
On the inside of the connected instrument the screen must be connected to the IE (Instrument Earth) or PE (Protective Earth).
If no IE or PE terminal is available the screening must be connected to the ground terminal of the pulse input.
The maximum allowed cable length is 100m with minimum size AWG-24. With this length a 100KOhm pull up resistor at the connected device input is needed.
7 OPERATING INSTRUCTIONS

7.1 STARTUP PROCEDURES

Before the initial start up of a flowmeter system, or when taking the installation into use after a major repair or revision of the piping system, the following procedures are recommended.

1. Remove the filter element of liquid filter installed in on the inlet side of the flowmeter.
2. Remove the flowmeter from the piping system and replace it with a flushing pipe piece.
3. Flush the entire piping system to ensure that all dirt and other foreign matter, that could damage the flowmeter, has been removed.

CAUTION:
- DO NOT Flush DUCTILE IRON AND STEEL FLOWMETERS WITH WATER.
- NEVER EXCEED MAXIMUM FLOWRATE (CALMAX, ON THE TEXTPLATE OF THE FLOWMETER).
- WHEN RESTARTING THE FLOWMETER, MEASURES MUST BE TAKEN TO AVOID THE PRESENCE OF SOLIDIFIED OR CURED LIQUIDS INSIDE THE FLOWMETER. FAILURE TO DO SO MAY RESULT IN SERIOUSLY DAMAGING THE FLOWMETER.

7.1.1 Initial start up of a flowmeter system with bypass piping arrangement

1. Close valves A, B and C, as shown in Figure 10.
2. Remove the flushing pipe piece and reinstall the flowmeter and filter element.
3. Slowly open bypass valve C completely.
4. Start the pump and/or open the storage tank valve.
5. Open valve A slightly (5-10%).
6. Slowly open valve B. Depending on the internal resistance in the system, the flowmeter may start running. If it does, limit the flowrate to approximately 20% of its maximum capacity.
7. Slowly close bypass valve C until the flowmeter just starts running. Let the flowmeter run on this limited flow for a couple of minutes, to ensure that no air or gas will be left in the flowmeter.
8. Slowly open valve A, and if necessary also valve B, completely.
9. Slowly close valve C completely.

Figure 10, Flowmeter setup with bypass piping arrangement and flushing piece
7.1.2 Initial start-up of a flowmeter system without bypass piping arrangement

1. Close valves A and B, as shown in Figure 11.
2. Remove the flushing pipe piece and reinstall the flowmeter and filter element.
3. Start the pump and/or open the storage tank valve.
4. Open valve A slightly (5-10%).
5. Slowly open valve B until the flowmeter just starts running. Let the flowmeter run on this limited flow for a couple of minutes, to ensure that no air or gas will be left in the flowmeter.
7. Slowly open valve A completely.

Figure 11, Flowmeter setup without bypass piping arrangement and flushing piece.
7.2 OPERATION OF THE E-COUNTER

7.2.1 Layout of the E-counter

The E-counter mounted on the flowmeter displays all relevant information such as:
- Total Volume
- Accumulated Total Volume
- Flowrate

For operating the E-counter a select button and clear button are used.

NOTE:
To extend the lifetime of the battery, the display turns blank when no buttons are pushed for over 30 seconds.

7.2.2 Basic operation

When one of the buttons is pushed, the display of the E-counter turns on and displays Total Volume or Accumulated Total Volume (depending on the mode selected) and the current flowrate.

By pressing the select button it is possible to toggle between the amounts shown for Total Volume or Accumulated Total Volume. In the left top corner is shown which mode is selected.

When the E-counter is in Total Volume mode and the clear button is pressed, the message “Clear Total” appears on the display. To reset the Total Volume the clear button has to be pressed for confirmation.

If the select button is pressed the total is not reset. It is not possible to reset the Accumulated Total Volume.

If the flowmeter detects actual flowrate, the flowrate icon in the left lower corner rotates.
7.2.3 Menu layout and setup

The E-counter has a setup menu layout as shown below.

To enter the setup menu the \textit{select} button has to be pressed for approximately 7 seconds. Once the setup menu is entered, it is possible to navigate the different menus by pressing the \textit{clear} button. With pressing the \textit{select} button it is possible to navigate the sub menus.

When a submenu is entered, it is possible to change the settings by first entering the program mode. To enter the program mode, press the \textit{select} button and \textit{clear} button simultaneously for very short period of time.

When the E-counter is in program mode, the \textbf{PROG} icon will flash on the display.

By pressing the \textit{select} button it is possible to scroll through the preset values and select one of them. After selecting the appropriate setting, confirm this selection by pressing the \textit{select} and \textit{clear} button and \textit{clear} button simultaneously for very short period of time.

The following settings can be made:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Unit for totals and accumulated totals</td>
<td>Determines the measurement unit displayed for both total volume and accumulated total volume. The following units can be selected: l, m³, GAL</td>
</tr>
<tr>
<td>1.2</td>
<td>Number of decimals for totals</td>
<td>The decimal point determines the number of digits following the decimal point for total volume. The following can be selected: 0000000 - 111111.1 - 22222.22 - 3333.333</td>
</tr>
<tr>
<td>1.3</td>
<td>Number of decimals for accumulated totals</td>
<td>The decimal point determines the number of digits following the decimal point for accumulated total volume. The following can be selected: 0000000 - 111111.1 - 22222.22 - 3333.333</td>
</tr>
</tbody>
</table>
### Menu Description Remark

| 2.1 | Unit for flowrate | Determines the measurement unit displayed for flowrate. The following units can be selected: l/min, l/h, m³/h, GPM |
| 2.2 | Number of decimals for flowrate | The decimal point determines the number of digits following the decimal point for flowrate. The following can be selected: 000000.0 - 111111.1 - 22222.22 - 3333.333 |

Figure 15, Menu 2

To change the K-factor the **select** button can be pressed to change the value of a digit. To select the next digit the **clear** button must be pressed.

### Menu Description Remark

| 3.1 | K-factor | With the K-factor, the magnetic pulses of the flowmeter are converted to a quantity. The K-factor is based on the number of magnetic poles generated by the flowmeter per selected measurement unit (SETUP 1.1). The K-factor can be found on the text plate on the back cover of the flowmeter. The following range can be selected: 0.001 - 9,999.999 |

Figure 16, Menu 3

| 4.1 | Width | The period time determines the time that the pulse output will be switched; in other words the pulse length. The minimum time between the pulses is as long as the selected period time. The following can be selected: 5 - 10 - 20 - 50 - 100 - 200 - 500 - 1000 ms

Note:
If the frequency should go out of range e.g. when the flowrate increases, an internal buffer will be used to "store the missed pulses". As soon as the flowrate reduces again, the buffer will be "emptied". It can be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range. |

| 4.2 | Amount | According to the measurement unit settings for total volume, a X-number of pulses will be generated every unit. The following range can be selected: 1 - 9,999 pulse/unit |

Figure 17, Menu 4
The values in menu 5 are read-only and cannot be changed.

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Type</td>
<td>Displays the type of counter.</td>
</tr>
<tr>
<td>5.2</td>
<td>Software version</td>
<td>Displays the software version.</td>
</tr>
<tr>
<td>5.3</td>
<td>Serial number</td>
<td>Displays the serial number of the E-counter.</td>
</tr>
</tbody>
</table>

Figure 18, Menu 5

To exit program mode, press the select button and clear button simultaneously again for very short period of time. When no button is pushed for over 20 seconds, the E-counter will automatically exit the Program mode.

7.3 EXAMPLE, HOW TO SET THE NUMBER OF DECIMALS TO 1 FOR TOTALS

To change the number of decimals for Totals from 0 to 1, follow the steps below:

1. press the select button for 7 seconds to enter setup.(Total menu 1)
2. press the select button (Total submenu 1.1)
3. press the select button (Total submenu 1.2)
4. press the select button and clear button simultaneously for very short period of time, to enter program mode.
5. press the select button (1 decimal)
6. press the select button and clear button simultaneously for very short period of time, to exit program mode.
7. Press the select button for 7 seconds to exit setup.
8 MAINTENANCE

8.1 GENERAL MAINTENANCE

Under normal operating conditions the flowmeter requires no maintenance other than the periodic accuracy check as described in Section 8.2.

NOTE:
For flowmeters that are running continuously, it is recommend that the bearings are inspected every year as a preventive measure to keep the flowmeter in the best possible condition. In case of damage or wear the bearings should be replaced.

8.2 ACCURACY CHECK

The interval for calibration of the flowmeter depends on the nature of the process liquid and the operating conditions.

<table>
<thead>
<tr>
<th>Meter type</th>
<th>Calibration interval [litres]</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5015E</td>
<td>$11 \times 10^6$</td>
</tr>
<tr>
<td>J5023E</td>
<td>$11 \times 10^6$</td>
</tr>
<tr>
<td>J5025E</td>
<td>$35 \times 10^6$</td>
</tr>
<tr>
<td>J5040E</td>
<td>$55 \times 10^6$</td>
</tr>
<tr>
<td>J5050E</td>
<td>$110 \times 10^6$</td>
</tr>
</tbody>
</table>

Table 1, Calibration interval

Table 1 applies if:
- The process liquid is clean and non-abrasive.
- A liquid filter with correct mesh width has been installed at the flowmeter inlet as described in section 6.2.2.
9 REPAIR

9.1 REMOVING THE FLOWMETER FROM THE PIPING SYSTEM

SAFETY PRECAUTIONS:
MAKE SURE THAT ALL SAFETY REQUIREMENTS AS DESCRIBED IN SECTION 4.1 ARE MET BEFORE ANY WORK IS COMMENCED.

9.1.1 General procedure
1. Shut off the flow through the flowmeter.
2. Remove any electrical connections from the flowmeter. Record any connections, if necessary.
3. Empty the piping system.
4. Drain the flowmeter, in accordance with Section 9.1.2.
5. Remove the flowmeter from the piping system, as described in Section 9.1.3.

CAUTIONS:
EMPTYING A PIPING SYSTEM IS OFTEN DONE BY BLOWING THROUGH WITH STEAM OR AIR. THIS PRACTICE IS NOT RECOMMENDED WHEN A VANE TYPE FLOWMETER IS INSTALLED, BECAUSE IT WILL OVERSPEED THE FLOWMETER.

9.1.2 Draining the flowmeter
1. De-pressurise the pipe section with the flowmeter.
2. If the flowmeter is fitted with a drain plug, remove the plug to empty the flowmeter.
   When the flowmeter is not fitted with a drain plug, remove the flowmeter as described in Section 9.1.3.
9.1.3 Removing the flowmeter from the piping system

1. Ensure that flow through the flowmeter has been shut off and that all electric connections have been removed.
2. If the flowmeter is fitted with a lifting eye, use a lifting device to hold flowmeter in position.

CAUTIONS:
ALTHOUGH THE FLOW HAS BEEN SHUT OFF, THE FLOWMETER CAN STILL BE UNDER PRESSURE.
BE CAREFUL WHEN LOOSENING BOLTS ON INLET AND OUTLET FLANGES.

3. Loosen all bolts on both flanges of the flowmeter.
4. Remove half of all bolts and remove the gaskets, using an appropriate flange spreader.
5. Remove all remaining bolts.
6. Remove the flowmeter from the piping system.

CAUTIONS:
WHEN THE FLOWMETER HAS BEEN REMOVED FROM THE PIPING SYSTEM THERE WILL STILL BE SOME LIQUID LEFT IN THE MEASURING CHAMBER.

7. Hold the outlet of the flowmeter in a downward position and let the flowmeter leak out for approximately 10 minutes.
   High viscosity liquids will perhaps require more time. Rinsing the flowmeter with a suitable solvent may be of help.
8. Place the flowmeter on a dry and clean workbench.
9. If the flowmeter must be returned to VAF Instruments or a by VAF Instruments authorized local service agent, follow the instructions in Section 12.

9.2 DISASSEMBLING

The following procedures are recommended if the flowmeter must be disassembled for overhaul or repair.
Certain procedures require the use of special tools. If these tools are not available it is advisable to return the flowmeter to VAF Instruments or a by VAF Instruments authorized local service agent.

For disassembling and reassembling of the flowmeter and E-counter the following tools are required:
- Philips head screwdriver PH1
- Slot screwdriver 0.4 x 2.5 mm
- Allen key 3 mm
- Magnet nut wrench, VAF part number 0379-0016
- Allen key 1.5mm (extra short).
- (Socket) spanner 10 mm
- Fine emery cloth, fine sand paper or whetstone
- Feeler gauge 0.02 - 0.12 mm
- Bearing puller
- Bearing mounting tool
- Arbor press
- Torque wrench 1 - 20 Nm, 10 mm
9.2.1 Removing the flowmeter from the piping system
Follow the instructions in Section 9.1.1 through Section 9.1.3.

9.2.2 Removing the E-counter from the flowmeter
1. Unscrew the 3 screws of the E-counter cover, as shown in Figure 19.

⚠️ **CAUTION:**
THE COVER AND HOLDER OF THE E-COUNTER ARE CONNECTED WITH WIRING. TAKE CARE NOT TO DAMAGE THE WIRING.

2. If the E-counter is fitted with the optional pulse output, there is no need to disconnect the cable. Leave the cable connected to the E-counter, as shown in Figure 20.
3. Unscrew the 4 Allen screws from the E-counter holder, as shown in Figure 21, and take off the E-counter and gasket.

![Figure 19, Unscrewing the screws of the E-counter cover](image1)
![Figure 20, In case of pulse output, do not disconnect the cable](image2)
![Figure 21, Unscrewing the bolts of the holder](image3)
![Figure 22, Taking off the E-counter and gasket](image4)
9.2.3 Removing the magnet cap and magnet

1. Remove the magnet cap as shown in Figure 23, by loosening the nut using the magnet nut wrench (VAF part number 0379-0016).
2. Take of the magnet cap, as shown in Figure 24.

3. Loosen the Allen screw in the fixed magnet, as shown in Figure 25, using an appropriate Allen key

4. Finally remove the inner magnet and O-ring, as shown in Figure 26 and Figure 27.
9.2.4 Removing the front cover

1. Before disassembling the flowmeter, register the flow direction of the flowmeter. Look from the side where the E-counter was mounted on, for the arrow on the flowmeter indicating the flow direction, as shown in Figure 28 and Figure 29.

   **NOTE:**
   The standard flow direction is left to right.

   ![Figure 28, Flow direction left to right (standard direction)](image1)
   ![Figure 29, Flow direction right to left](image2)

2. Remove the front cover mounting bolts and lock washers, as shown in Figure 30.
3. Install 2 bolts, which were removed earlier, in the jacking positions of the front cover, as shown in Figure 31.
   Tighten these bolts evenly and alternately until the cover comes free.

   ![Figure 30, Removing the bolts of the front cover](image3)
   ![Figure 31, Jacking up the front cover](image4)

4. Ensure that the cover is lifted evenly to prevent the location pins from being damaged and take off the cover, as shown in Figure 32.
5. Remove the bolts and the O-ring, as shown in Figure 33.

   ![Figure 32, Lift off the cover by hand](image5)
   ![Figure 33, O-ring on the front cover](image6)
6. Visually inspect the side of the flowmeter housing for damage, caused by the bolts during the jacking of the cover, as shown in Figure 34. Remove any surface roughness with a fine emery cloth, fine sand paper or whetstone.

![Figure 34, Damage caused by jacking](image)

![Figure 35, Smoothening housing surface](image)

9.2.5 Removing the rotor/vanes assembly

1. Record how the vanes are installed in the rotor as indicated in Figure 36.

![Figure 36, Chamfered edge of the vanes in relation to the flow direction](image)

2. Take out the vanes, as shown in Figure 37. If the vanes appear to be broken, ensure that the vane rods will not scratch the inside of the flowmeter housing, when the rotor is pulled out.

3. Remove the rotor from the housing by gently pulling on the magnet shaft in the direction of the arrow, as shown in Figure 38.

![Figure 37, Taking the rotor out of the housing](image)

![Figure 38, Removing the rotor](image)

**CAUTIONS:**

BE CAREFUL NOT TO DROP OR DAMAGE THE FOUR VANES AND THE TWO VANE RODS WHEN REMOVING THE ROTOR FROM THE FLOWMETER HOUSING.

KEEP THE PAIR OF VANES OPPOSITE OF EACH OTHER AND THE VANE ROD AS A SET TOGETHER.
9.2.6 Removing the back cover

1. Remove the back cover mounting bolts and lock washers, as shown in Figure 39.
2. Install 2 bolts, which were removed earlier, in the jacking positions of the front cover, as shown in Figure 40.
   Tighten these bolts evenly and alternately until the cover comes free.

![Figure 39, Removing the bolts of the back cover](image1)
![Figure 40, Jacking up the back cover](image2)

3. Ensure that the cover is lifted evenly to prevent the location pins from being damaged.
4. Remove the bolts and the O-ring, as shown in Figure 41.

![Figure 41, O-ring on the back cover](image3)

5. Visually inspect the side of the flowmeter housing for damage, caused by the bolts during the jacking of the cover, as shown in Figure 42.
   Remove any surface roughness with a fine emery cloth, fine sand paper or whetstone.

![Figure 42, Damage caused by jacking](image4)
![Figure 43, Smoothening housing surface](image5)
9.3 INSPECTION

The following procedures are recommended for inspection of the flowmeter. Certain procedures require the use of accurate measuring tools. If these tools are not available it is advisable to return the flowmeter to VAF Instruments or a by VAF Instruments authorized local service agent.

NOTE:
Before any visual inspection all parts must be cleaned thoroughly using a suitable cleaning solution.

NOTE:
All parts that do not pass inspection must be replaced.

9.3.1 Inspecting the inside of the magnet cap and the magnet

1. Visually inspect the inner surface of the magnet cap and the outer surface of the magnet for grooves.
   If any grooves are found, the magnet shaft is probably bent or the bearings are worn out and must be replaced.
   Also replace the magnet and magnet cap if it is too heavily grooved.

9.3.2 Inspecting the inside surface of the covers

1. Visually inspect the inside surface of both the covers and the bearing cavities for grooves and other signs of wear.
   If any grooves or signs of wear are found, the bearings or vanes are probably damaged and must be replaced.
   Replace the cover if it is too heavily grooved or the bearing cavity is worn.

9.3.3 Inspecting the inside of the flowmeter housing

1. Visually inspect the inner surface of the flowmeter housing for grooves.
   Minimal grooving due to small impurities in the process liquid requires no further action, provided that the original shape of the metering chamber is not disturbed.
   Grooving caused by coarse particles in the process liquid, or by a vane rod when a vane is broken, will push the material up. Such obstructions may result in uneven running of the flowmeter and/or premature vane wear and effect the performance of the flowmeter.
   2. Remove any surface roughness with a fine emery cloth or fine sand paper.

NOTE:
If the inside of the flowmeter was severely scored, no guarantee can be given that after polishing, the flowmeter will still be able to operate within its specified limits of accuracy.

9.3.4 Inspecting the rotor and vanes

1. Visually inspect the vanes for chipped edges and grooves, replace the vanes if necessary.
2. Place the vane in the vane slot and measure the height of the vane in relation to the outside diameter of the rotor. If height of the vane(s) is less than the height of the rotor, the vane(s) need to be replaced.
3. Measure the clearance between the vane and the vane slot using a feeler gauge, as shown in Figure 44.
   For correct measurements the gauge must be bottomed out in the slot. If the tolerance shown in Table 2 is exceeded, the vane(s) must be replaced.
4. Visually inspect the vanes for damage at the side of the rod. Any damage to the vane can cause too much clearance between the vanes and flowmeter housing.

5. Check that the vane rods can slide freely in and out of the rotor. If the rods cannot move freely this may be caused by dirt, worn out bores, bent rods or scored vanes. Any defective parts must be replaced.

9.3.5 Inspecting the rotor shaft and the bearings

1. Visually inspect the bearing cavities in the covers and the rotor shaft for excessive wear or other damage.

2. To examine the condition of a bearing, hold the bearing by the inner ring horizontally in one hand and rotate the outer ring to confirm that it turns smoothly.

3. Examine the condition of following:
   a. the bearing raceways.
   b. external surfaces of the bearing.
   c. the amount of cage wear.
   d. the increase in internal clearance.

4. If a bearing has any of the following defects, the bearing must be replaced:
   a. cracks in the inner or outer rings, rolling elements, or cage.
   b. flaking of the raceway or rolling elements.
   c. significant smearing of the raceway surfaces, ribs, or rolling elements.
   d. significant wear of the cage.
   e. rust or scoring on the raceway surfaces or rolling elements.
   f. significant impact or brinell traces on the raceway surfaces or rolling elements.
   g. significant evidence of creep on the bore or the periphery of the outer ring.
   h. when discoloration by heat is evident.

5. Replace defective bearings in accordance with Section 9.4.2.
9.4 REASSEMBLING THE FLOWMETER

9.4.1 General
- If there is any doubt about the condition of a particular flowmeter part, it should be replaced while the flowmeter is still disassembled. This is more economical than having to disassemble the flowmeter again after a short period of time.
- Once the flowmeter has been disassembled it is recommended that the O-rings for the covers and the O-ring for the magnet cap are replaced.
- Metal and carbon parts must be degreased before reassembly. O-rings should only be wiped dry with a clean cloth.

9.4.2 Replacing a bearing
1. Remove the old bearing from the rotor shaft using a suitable bearing puller, as shown in Figure 45.

![Figure 45, Bearing puller](image)

NOTE: Because the distance between the side of the bearing and rotor is rather small (approximately 2 mm), this operation requires a puller with thin blades.

2. Before mounting the bearing, apply some oil to inside of the inner ring of the bearing and the rotor shaft surface for smooth insertion.
3. Place a mounting tool on the inner ring, as shown in Figure 46. The mounting tool must not be placed on the outer ring, since the bearing may be damaged.

![Figure 46, Mounting tool](image)

4. Slowly press the new bearing vertically onto the rotor shaft using an arbor press, as shown in Figure 47. Press until the side of the inner ring rests against the shoulder of the shaft.
9.4.3 Installing the back cover

1. Inspect and clean the bolts and washers.
2. Lubricate the bolt threads and the contact surfaces with an anti-seize compound. The use of an anti-seize compound should be considered to facilitate subsequent disassembly.
3. Clean the O-ring groove and install a new O-ring, as shown in Figure 48.
4. Position the back cover over the locating pins on the flowmeter housing.

5. Install the cover onto the flowmeter using the bolts and lock washers.
6. Tighten the bolts alternately and evenly to the torque value specified in Table 3.

<table>
<thead>
<tr>
<th>Meter model</th>
<th>Number of bolts</th>
<th>Torque values [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5015E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5023E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5025E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5040E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5050E</td>
<td>6x M8</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 3, Torque for bolts flowmeter cover
9.4.4 Installing the rotor and vanes

**CAUTIONS:**
WHEN USED VANES ARE REFITTED, MAKE SURE THAT THE PAIR OF VANES OPPOSITE OF EACH OTHER AND THE VANE ROD ARE KEPT TOGETHER AS A SET.

1. To install the rotor, place the two vane rods through the holes in the rotor, as shown in Figure 49.
2. Place the rotor with the vane rods into flowmeter body, with the magnet shaft facing up, as shown in Figure 50.

![Figure 49, Installing the vane rods](image1)
![Figure 50, Installing the rotor](image2)

**CAUTIONS:**
TAKE UTMOST CARE NOT TO DAMAGE THE BEARING IN THE BACK COVER.

3. Rotate the rotor so that two opposite slots in the rotor are in line with the inlet and outlet of the flowmeter.
4. Insert the four vanes one by one into the slots of the rotor, starting with the vane nearest to the inlet connection and continue with the opposite vane.
   Next, rotate the rotor ¼ turn and insert the other two vanes in the same order, as shown in Figure 51.
   The chamfered edge of each vane must be in the rotating direction of the rotor, as shown in

   ![Diagram](image3)

5. 
6. Figure 52.
   The top of the vanes must be flush with the upper surface of the rotor.
CAUTIONS:
TAKE UTMOST CARE NOT TO DAMAGE THE VANES.

7. Measure the radial vane clearance with a feeler gauge. The measurement should be taken, as shown in Figure 53. To measure correctly, the gauge must be bottomed out in the slot. If the tolerance is in excess of the value mentioned in Table 4, replace the vanes.

<table>
<thead>
<tr>
<th>Meter model</th>
<th>Tolerance [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5015E</td>
<td>0.025 - 0.060</td>
</tr>
<tr>
<td>J5023E</td>
<td>0.025 - 0.060</td>
</tr>
<tr>
<td>J5025E</td>
<td>0.040 - 0.090</td>
</tr>
<tr>
<td>J5040E</td>
<td>0.040 - 0.090</td>
</tr>
<tr>
<td>J5050E</td>
<td>0.050 - 0.100</td>
</tr>
</tbody>
</table>

Table 4, Vane - housing clearance

8. Rotate the rotor with a finger to ensure that it will run smoothly.
9.4.5 Installing the front cover

1. Inspect and clean the bolts and washers.
2. Lubricate the bolt threads and the contact surfaces with an anti seize compound. The use of an anti-seize compound should be considered to facilitate subsequent disassembly.
3. Clean the O-ring groove and install a new O-ring, as shown in Figure 54.

![Figure 54, O-ring](image1)

4. Tilt the flowmeter housing, so that the rotor shaft is in a horizontal position.
5. Position the front cover over the locating pins on the flowmeter housing, as shown in Figure 55.

![Figure 55, Positioning the front cover and installing it](image2)

**CAUTIONS:**

TAKE UTMOST CARE NOT TO DAMAGE THE LOCATING PINS. ENSURE THAT THE O-RING REMAINS IN PLACE AND IS NOT DAMAGED WHILE TAPPING DOWN THE COVER.

6. Install the cover onto the flowmeter using the bolts and lock washers, as shown in Figure 56.

![Figure 56, Installing the front cover](image3)

7. Tighten the bolts alternately and evenly to the torque value specified in Table 5, Torque for bolts flowmeter cover.

<table>
<thead>
<tr>
<th>Meter model</th>
<th>Number of bolts</th>
<th>Torque values [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5015E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5023E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5025E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5040E</td>
<td>6x M6</td>
<td>9</td>
</tr>
<tr>
<td>J5050E</td>
<td>6x M8</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 5, Torque for bolts flowmeter cover
9.4.6 Installing the inner magnet

1. Place the inner magnet on the magnet shaft, as shown in Figure 57.
2. The top of the magnet must be flush with the magnet shaft, as shown in Figure 58.

![Figure 57, Installing the magnet](image1)

![Figure 58, Installing the magnet flush on the magnet shaft](image2)

3. Tighten the Allen screw in the fixed magnet, as shown in Figure 59.
   Make sure to use an appropriate Allen key (Allen key 1.5mm, extra short).

![Figure 59, Tightening the magnet](image3)

4. With the rotor shaft in horizontal position, rotate the rotor shaft by hand using the magnet, to check that the rotor runs smoothly. The rotor must rotate freely. If the rotor does not run smoothly, disassemble the flowmeter and repeat the assembly procedures.
9.4.7 Installing the magnet cap

1. Clean the O-ring groove and install a new O-ring, as shown in Figure 60.
2. Place the magnet cap, as shown in Figure 61.

5. Place the nut and tighten the nut, as shown in Figure 62, using the appropriate tools.
9.4.8 Installing the E-counter

1. Put the gasket on the cover and install the holder using the 4 Allen screws M4x12, as shown in Figure 63 and Figure 64.
2. Mount the cover with the 3 screw.

CAUTION: THE COVER AND HOLDER OF THE E-COUNTER ARE CONNECTED THROUGH DELICATED WIRING. TAKE CARE THAT THE WIRING DOES NOT GET PINCHED BETWEEN THE COVER AND HOLDER.
9.5 CHANGING THE FLOW DIRECTION

Unless otherwise specified the VAF Instruments model series “J” ProFlow liquid flowmeters are delivered for a flow direction from left to right.

When the flow direction must be changed from left-to-right into bottom-to-top or top-to-bottom, this can easily be done by removing the mounting bolts of the E-counter and rotate it 90° clockwise or counter clockwise, as shown in Figure 66 and Figure 67.

NOTE:
- In all cases the flow direction of the flowmeter, pointed out by the marked arrow on the meter body, must be in the right direction.
- If a change in flow direction must be made from left to right or right to left, additional parts are required.
  Please consult VAF Instruments or your local VAF Instruments agent.
- If a change in flow direction must be made during the warranty period, contact the VAF Instruments or your local VAF Instruments agent, because unauthorized servicing will void the warranty.
- If a change in flow direction is made, the code number as stamped on the identification plate of the flowmeter is no longer valid. Therefore please keep record of the changes to avoid difficulties when ordering replacement parts.

Figure 66, Flow direction top to bottom
Figure 67, Flow direction bottom to top

10 TAKE OUT OF SERVICE

If the flowmeter has to be taken out of service follow the instructions in Section 9.1 to remove the flowmeter from the system.
- Flush the flowmeter with a clean non-corrosive fluid, like light diesel oil or kerosene.
- Empty the flowmeter as much as possible.
- Closed off the inlet and outlet of the flowmeter to prevent dirt or other particles entering the flowmeter as they may damage the flowmeter.

11 REMOVAL AND STORAGE OF EQUIPMENT

To remove the flowmeter from the system follow the instructions in Section 9.1.
- The flowmeter must be cleaned internally and externally and the inside of the flowmeter must been preserved adequately to protect against corrosion.
- The flowmeter must be emptied as much as possible.
- The inlet and outlet connections of the flowmeter must be plugged so that no dirt or other particles can enter the flowmeter.
- The flowmeter must be stored in a secure and save area.
- If the flowmeter is stored for a longer period of time, the inside of the flowmeter should be treated with a corrosion prevention liquid.
12 MALFUNCTION AND SEND FOR REPAIR

In case of a malfunction, follow the guidelines as described in Section 9. If the flowmeter cannot be repaired on site, it should be send back for repair. To take the flowmeter out of service, follow the instructions as described in Section 10.

The shipment must be accompanied by a fault report, as shown in Table 6, giving full information about the reason for return, all other relevant information and further instructions.

<table>
<thead>
<tr>
<th>Reason for return</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Repair</td>
</tr>
<tr>
<td>[ ] Warranty Claim</td>
</tr>
<tr>
<td>[ ] Calibration</td>
</tr>
<tr>
<td>[ ] Other:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of flow meter (see nameplate on instrument)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code / Type:</td>
</tr>
<tr>
<td>Serial Number:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Liquid (trade name or chemical composition):</td>
</tr>
<tr>
<td>Liquid properties:</td>
</tr>
<tr>
<td>[ ] harmless</td>
</tr>
<tr>
<td>[ ] toxic</td>
</tr>
<tr>
<td>[ ] explosion dangerous</td>
</tr>
<tr>
<td>[ ] inflammable</td>
</tr>
<tr>
<td>Operating pressure:</td>
</tr>
<tr>
<td>Specific gravity:</td>
</tr>
<tr>
<td>Flow rate [l/min] minimal:</td>
</tr>
<tr>
<td>nominal:</td>
</tr>
<tr>
<td>maximum:</td>
</tr>
<tr>
<td>Operating temperature:</td>
</tr>
<tr>
<td>Viscosity:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Complaint / Work to be performed</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Safety Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] The flow meter has been emptied</td>
</tr>
<tr>
<td>[ ] The flow meter has been internally cleaned and preserved using:</td>
</tr>
<tr>
<td>[ ] Inlet- and outlet ports have been plugged</td>
</tr>
<tr>
<td>Recommended cleaning fluid:</td>
</tr>
<tr>
<td>Recommended safety precautions before opening of flow meter:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure date:</td>
</tr>
<tr>
<td>Name &amp; Title:</td>
</tr>
<tr>
<td>Date &amp; Signature:</td>
</tr>
</tbody>
</table>

Table 6, Example of a fault report to accompany a return shipment to the VAF Instruments factory or a by VAF Instruments authorized local service agent.

The fault report should be filled out in the English language.
12.1 CONDITIONS FOR RETURN OF GOODS

Return shipments of goods to VAF Instruments or a by VAF Instruments authorized local service agent must meet the following conditions:

- The shipment must be accompanied by a fault report, as shown in Table 6, giving full information about the reason for return, all other relevant information and further instructions.
- The flowmeter must be cleaned internally and externally and the inside of the flowmeter must adequately been preserved to protect against corrosion.
- The flowmeter must be emptied as much as possible.
- The flowmeter must be free from risks of fire, explosion and toxic matters which may cause hazardous situations or personal injury.
- The inlet and outlet connections of the flowmeter must be plugged so that no dirt or other particles can enter the flowmeter and to prevent liquids leaking out of the instrument.
- The shipping container must be strong enough to protect the flowmeter during transport and should be packed with soft material to protect against shocks.
- Goods must be sent C.I.F. destination.

In the event a flowmeter has to be sent back for repair, send it directly to:

VAF INSTRUMENTS

VAF Instruments B.V.
Vierlinghstraat 24
3316 EL Dordrecht
P.O. Box 40
3300 AA Dordrecht
The Netherlands

Tel.: +31 (0)78 6183100
Fax: +31 (0)78 6177068

Website: www.vaf.nl
E-mail: service@vaf.nl
13 ENVIRONMENT
- The flowmeter has no negative influence on the environment during normal operation.
- The noise level produced by the flowmeter is less than 70 dB(A).

14 DISPOSAL
The flowmeter consists of metal, plastics and electronic parts. It should be disposed according to local laws or regulations.
If in doubt or not able to dispose of the equipment it can be returned to VAF Instruments.
VAF Instruments will dispose of the equipment in a correct way.
A green passport can be supplied on request.

Main materials:
- Body  Ductile iron
- covers  Ductile iron
- Rotor  Ductile iron
- Vanes  Carbon
- E-counter  Plastics
  Electronic parts
  Lithium Thionyl Chloride battery
15 TROUBLE SHOOTING AND FAULT FINDING

15.1 THE E-COUNTER DOES NOT DISPLAY ANYTHING.

Possible cause (perform the checks in sequential order) | Solution
--- | ---
1. The E-counter is in battery savings mode. | Press a button to activate the E-counter.
2. The battery of the E-counter is empty. At the end of the battery life time an Icon will be shown on the display. See Figure 68. | Replace the E-counter 3.6 V battery with a spare. During empty battery and replacing battery the Settings and Data will be kept.
3. The E-counter is malfunctioning. | Replace the E-counter.

![Figure 68, Battery Icon on display](image)

15.2 THE FLOWMETER DOES NOT INDICATE ANY FLOW ALTHOUGH LIQUID IS PASSING THROUGH THE FLOWMETER.

Possible cause (perform the checks in sequential order) | Solution
--- | ---
1. The valve in the bypass line is still open. | Close bypass valve.
2. The E-counter is malfunctioning. | Replace the E-counter.
3. Inner parts of the flowmeter may be stuck or broken. | Return the flowmeter to the VAF Instruments factory or a by VAF Instruments authorized local service agent.

15.3 THE FLOWMETER DOES NOT INDICATE ANY FLOW AND NO LIQUID IS PASSING THROUGH THE FLOWMETER.

Possible cause (perform the checks in sequential order) | Solution
--- | ---
1. Obstructions in the process line blocking the flow. | Check for obstructions, e.g. closed valves.
2. The dust cap in the inlet and/or outlet connection of the flowmeter was not removed when the flowmeter was installed in the process line. | Remove the dust cap(s) and check the flowmeter for damage.
3. Dirt is blocking the inner parts of the | Flush the flowmeter with a suitable solvent.
flowmeter.

If this does not solve the problem, return the flowmeter to the VAF Instruments factory or a by VAF Instruments authorized local service agent.

4. Inner parts of flowmeter may be stuck or broken.

Return the flowmeter to the VAF Instruments factory or a by VAF Instruments authorized local service agent.
16 CERTIFICATES
Certificates are delivered separately.

17 DRAWINGS

<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowrate - pressure drop - viscosity relation J5015E/J5023E</td>
<td>0801-1746</td>
</tr>
<tr>
<td>Flowrate - pressure drop - viscosity relation J5025E/J5040E</td>
<td>0801-1758</td>
</tr>
<tr>
<td>Flowrate - pressure drop - viscosity relation J5050E</td>
<td>0801-1759</td>
</tr>
<tr>
<td>Mounting position J5015E-23E-25E-040E-050E</td>
<td>0801-1800</td>
</tr>
<tr>
<td>Meter J5015E PN25</td>
<td>0801-1890</td>
</tr>
<tr>
<td>Partlist J5015E DN15 PN25</td>
<td>0801-2297</td>
</tr>
<tr>
<td>Meter J5023E PN25</td>
<td>0801-1390</td>
</tr>
<tr>
<td>Partlist J5023E DN25 PN25</td>
<td>0801-2298</td>
</tr>
<tr>
<td>Meter J5025E PN25</td>
<td>0801-1378</td>
</tr>
<tr>
<td>Partlist J5025E DN25 PN25</td>
<td>0801-2294</td>
</tr>
<tr>
<td>Meter J5040E PN25</td>
<td>0801-1383</td>
</tr>
<tr>
<td>Partlist J5040E DN40 PN25</td>
<td>0801-2295</td>
</tr>
<tr>
<td>Meter J5050E PN25</td>
<td>0801-1384</td>
</tr>
<tr>
<td>Partlist J5050E DN50 PN25</td>
<td>0801-2296</td>
</tr>
<tr>
<td>Dimensional drawing J5015E E-counter</td>
<td>0801-3301</td>
</tr>
<tr>
<td>Dimensional drawing J5015E E-counter with pulse output</td>
<td>0801-3302</td>
</tr>
<tr>
<td>Dimensional drawing J5023E E-counter</td>
<td>0801-3303</td>
</tr>
<tr>
<td>Dimensional drawing J5023E E-counter with pulse output</td>
<td>0801-3304</td>
</tr>
<tr>
<td>Dimensional drawing J5025E E-counter</td>
<td>0801-3305</td>
</tr>
<tr>
<td>Dimensional drawing J5025E E-counter with pulse output</td>
<td>0801-3306</td>
</tr>
<tr>
<td>Dimensional drawing J5040E E-counter</td>
<td>0801-3307</td>
</tr>
<tr>
<td>Dimensional drawing J5040E E-counter with pulse output</td>
<td>0801-3308</td>
</tr>
<tr>
<td>Dimensional drawing J5050E E-counter</td>
<td>0801-3309</td>
</tr>
<tr>
<td>Dimensional drawing J5050E E-counter with pulse output</td>
<td>0801-3310</td>
</tr>
<tr>
<td>Connection diagram E-counter</td>
<td>0830-2017</td>
</tr>
<tr>
<td>Connection diagram E-counter to LED counter</td>
<td>0830-2018</td>
</tr>
<tr>
<td>Connection diagram E-counter to LED counter and relay</td>
<td>0830-2019</td>
</tr>
<tr>
<td>Connection diagram E-counter to LED counter and 2x relay</td>
<td>0830-2020</td>
</tr>
<tr>
<td>Connection diagram E-counter to relay</td>
<td>0830-2021</td>
</tr>
<tr>
<td>Connection diagram E-counter to 2x relay</td>
<td>0830-2022</td>
</tr>
</tbody>
</table>
Figure 68, Drawing 0801-1746 Flowrate - pressure drop - viscosity relation J5015E/J5023E

Figure 69, Drawing 0801-1758 Flowrate - pressure drop - viscosity relation J5025E/J5040E
Figure 70, Drawing 0801-1759 Flowrate - pressure drop - viscosity relation J5050E

Figure 71, Drawing 0801-1800 Mounting position J5015E-23E-25E-040E-050E
Figure 72, Drawing 0801-1389 Meter J5015E PN25

Figure 73, Drawing 0801-2297 Partslist J5015E DN15 PN25
Figure 74, Drawing 0801-1390 Meter J5023E PN25

Figure 75, Drawing 0801-2298 Partslist J5023E DN25 PN25
Figure 76, Drawing 0801-1378 Meter J5025E PN25

Figure 77, Drawing 0801-2294 Partslist J5025E DN25 PN25
Figure 78, Drawing 0801-1383 Meter J5040E PN25

Figure 79, Drawing 0801-2295 Partslist J5040E DN40 PN25
Figure 80, Drawing 0801-1384 Meter J5050E PN25

Figure 81, Drawing 0801-2296 Partslist J5050E DN50 PN25
Figure 82, Drawing 0801-3301 Dimensional drawing J5015E E-counter

Figure 83, Drawing 0801-3302 Dimensional drawing J5015E E-counter wih pulse output
Figure 84, Drawing 0801-3303 Dimensional drawing J5023E E-counter

Figure 85, Drawing 0801-3304 Dimensional drawing J5023E E-counter with pulse output
Figure 86, Drawing 0801-3305 Dimensional drawing J5025E E-counter

Figure 87, Drawing 0801-3306 Dimensional drawing J5025E E-counter with pulse output
Figure 88, Drawing 0801-3307 Dimensional drawing J5040E E-counter

Figure 89, Drawing 0801-3308 Dimensional drawing J5040E E-counter with pulse output
Figure 90, Drawing 0801-3309 Dimensional drawing J5050E E-counter

Figure 91, Drawing 0801-3310 Dimensional drawing J5050E E-counter with pulse output
Figure 92, Drawing 0830-2017 Connection diagram E-counter

Figure 93, Drawing 0830-2018 Connection diagram E-counter to LED counter
Figure 94, Drawing 0830-2019 Connection diagram E-counter to LED counter and relay

Figure 95, Drawing 0830-2020 Connection diagram E-counter to LED counter and 2xrelay
Figure 96, Drawing 0830-2021 Connection diagram E-counter to relay

Figure 97, Drawing 0830-2022 Connection diagram E-counter to 2x relay
18 ABBREVIATIONS
PED  Pressure Equipment Directive

19 SPARE PARTS
Contact VAF Instruments or local agent for spare parts for flowmeter type ProFlow.
20 WARRANTY CONDITIONS

1. Without prejudice to the restrictions stated hereinafter, the contractor guarantees both the soundness of the product delivered by him and the quality of the material used and/or delivered for it, insofar as this concerns faults in the product delivered which do not become apparent during inspection or transfer test, which the principal shall demonstrate to have arisen within 12 months from delivery in accordance with sub article 1A exclusively or predominantly as a direct consequence of unsoundness of the construction used by the contractor or as a consequence of faulty finishing or the use of poor materials.

1A. The product shall be deemed to have been delivered when it is ready for inspection (if inspection at the premises of the contractor has been agreed) and otherwise when it is ready for shipment.

2. Articles 1 and 1A shall equally apply to faults which do not become apparent during inspection or transfer test which are caused exclusively or predominantly by unsound assembly/installation by the contractor. If assembly/installation is carried out by the contractor, the guarantee period intended in article 1 shall last 12 months from the day on which assembly/installation is completed by the contractor, with the understanding that in this case the guarantee period shall end not later than 18 months after delivery in accordance with the terms of sub article 1A.

3. Defects covered by the guarantee intended under articles 1, 1A and 2 shall be remedied by the contractor by repair or replacement of the faulty component either on or off the premises of the contractor, or by shipment of a replacement component, this remaining at the discretion of the contractor. Sub article 3A shall equally apply if repair or replacement takes place at the site where the product has been assembled/installed. All costs accruing above the single obligation described in the first sentence, such as are not restricted to shipment costs, travelling and accommodation costs or disassembly or assembly costs insofar as they are not covered by the agreement, shall be paid by the principal.

3A. If repair or replacement takes place at the site where the product has been assembled/installed, the principal shall ensure, at his own expense and risk, that:
   a. the employees of the contractor shall be able to commence their work as soon as they have arrived at the erection site and continue to do so during normal working hours, and moreover, if the contractor deems it necessary, outside the normal working hours, with the proviso that the contractor informs the principal of this in good time;
   b. suitable accommodation and/or all facilities required in accordance with government regulations, the agreement and common usage, shall be available for the employees of the contractor;
   c. the access roads to the erection site shall be suitable for the transport required;
   d. the allocated site shall be suitable for storage and assembly; the necessary lockable storage sites for materials, tools and other goods shall be available;
   e. the necessary and usual auxiliary workmen, auxiliary machines, auxiliary tools, materials and working materials (including process liquids, oils and greases, cleaning and other minor materials, gas, water, electricity, steam, compressed air, heating, lighting, etc.) and the measurement and testing equipment usual for in the business operations of the principal, shall be available at the correct place and at the disposal of the contractor at the correct time and without charge;
   f. all necessary safety and precautionary measures shall have been taken and adhered to, and all measures shall have been taken and adhered to necessary to observe the applicable government regulations in the context of assembly/installation;
   g. the products shipped shall be available at the correct site at the commencement of and during assembly.
4. Defects not covered by the guarantee are those which occur partially or wholly as a result of:
   a. non-observance of the operation and maintenance instructions or other than foreseeable normal usage;
   b. normal wear and tear;
   c. assembly/installation by third parties, including the principal;
   d. the application of any government regulation regarding the nature or quality of the material used;
   e. materials or goods used in consultation with the principal;
   f. materials or goods provided by the principal to the contractor for processing;
   g. materials, goods, working methods and constructions insofar as are applied at the express instruction of the principal, and materials or goods supplied by or on behalf of the principal;
   h. components obtained from third parties by the contractor insofar as that party has given no guarantee to the contractor.

5. If the principal fails to fulfil any obligation properly or on time ensuing from the agreement concluded between the principal and the contractor or any agreement connected to it, the contractor shall not be bound by any of these agreements to any guarantee regardless of how it is referred to. If, without previous written approval from the contractor, the principal commences disassembly, repair or other work on the product or allows it to be commenced, then every agreement with regard to guarantee shall be void.

6. Claims regarding defects must be submitted in writing as quickly as possible and not later than 14 days after the discovery of such. All claims against the contractor regarding faults shall be void if this term is exceeded. Claims pertaining to the guarantee must be submitted within one year of the valid complaint on penalty of invalidity.

7. If the contractor replaces components/products under the terms of his guarantee obligations, the replaced components/products shall become the property of the contractor.

8. Unless otherwise agreed, a guarantee on repair or overhaul work carried out by the contractor or other services shall only be given on the correctness of the manner in which the commissioned work is carried out, this for a period of 6 months. This guarantee only covers the single obligation of the contractor to carry out the work concerned once again in the event of unsound work. In this case, sub article 3A shall apply equally.

9. No guarantee shall be given regarding the inspection conducted, advice given and similar matters.

10. Alleged failure to comply with his guarantee commitments on the part of the contractor shall not absolve the principal from his obligations ensuing from any agreement concluded with the contractor.

11. No guarantee shall be given on products which form a part of, or on work and services on, goods older than 8 years.
Revision 0114
Chapter 3.2.3 Temperature added
Chapter 6.2.7 Warning added

Revision 0114(2)
Chapter 15.1 clarified

Revision 0314
Chapter 3.2.7 added max. cable length
Chapter 6.4.1 added max. cable length
Chapter 6.4.2 added max. cable length and explanation text.