MANUAL VALVE GEAR
M Series
Installation, Maintenance and Operating Instructions
READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the manual valve gear.
If you require additional assistance, please contact the manufacturer or manufacturer’s representative.
Addresses and phone numbers are printed on the back cover.

SAVE THESE INSTRUCTIONS!

Subject to change without notice.
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1 GENERAL

1.1 Preface
The gearbox of the M-series is a quarter turn gearbox intended to be used for the manual operation of valves (e.g. butterfly valves) in pipelines.

NB. This manual is valid only for the standard M-series gearboxes of Metso. For special versions, specifications and model can differ.

Metso is not responsible for any damage caused by incorrect use of the gearbox.

1.2 Technical data
Specifications
The maximum allowable input and output torque are listed in the Table 1.

Table 1 Connection data of the gearbox

<table>
<thead>
<tr>
<th>Gearbox type</th>
<th>Connection Valve</th>
<th>Max. Torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISO 5211/1</td>
<td>Input</td>
</tr>
<tr>
<td>M07</td>
<td>F05-F07-F10</td>
<td>29</td>
</tr>
<tr>
<td>M10</td>
<td>F05-F07-F10</td>
<td>43</td>
</tr>
<tr>
<td>M12</td>
<td>F10-F12</td>
<td>83</td>
</tr>
<tr>
<td>M14</td>
<td>F10-F12-F14-F16</td>
<td>152</td>
</tr>
<tr>
<td>M15</td>
<td>F10-F12-F14-F16</td>
<td>171</td>
</tr>
<tr>
<td>M16</td>
<td>F16-F25</td>
<td>136</td>
</tr>
<tr>
<td>M25</td>
<td>F16-F25</td>
<td>305</td>
</tr>
</tbody>
</table>

This gearbox is applicable to valve shafts with keyway only.
For more specified information, you can contact our sales department.

1.3 Handling and safety precautions
Be sure to read and understand this manual before installation and use of our gearboxes.

Storage
The gearboxes need to be stored in a safe way to avoid accidents. Also avoid storage in areas subjected to high temperature extremes and /or areas subjected to large amounts of humidity and dust.

Handling
Never drop the gearbox or otherwise subject it to strong impact.

Correct use
Prior to installation, be sure the gearbox will NOT be overloaded during normal use. For this, convince yourself the valve size and needed opening torque do not exceed the values given for the gearbox. For the maximum allowable torque on the gearbox, see Table 1.

Installation and operating
Not observing the rules as stated in this manual, can lead to damage and / or personal injuries. The qualified personnel must be fully aware of the instructions as described in this manual.

Only when the instructions are observed, correct operation of the gearboxes can be guaranteed.

Disposal
Never refuse a gearbox at a general disposal unit. The gearbox has to be offered to a disposal depot for recycling. The iron parts can be used for recycling. The seals are of nitrile and can be used for plastic recycling.

The grease may not be discharged to sewer- or surface water. It has to be disposed according to local regulations for incineration.

1.4 ATEX
Your gearbox can be supplied with a label with following markings:

This means that the gearbox meets the ATEX-directive 94/9/EG

This product is fabricated conform the procedure related to internal control of production with regards to the safety aspects.

This product meets the requirements for explosion prevention

II
In a potential explosive surrounding, other than in mines,

2
With a high level of safety, based on normal operation and anticipated risks

GD
Suitable for a possible explosive atmosphere caused by gases, vapours, mists of air/dust mixtures

C
Safety obtained by constructive solutions.

2 INSTALLATION

2.1 Mounting to the valve
Following description applies to standard type gearboxes.

1. The gearbox is standard delivered in the closed position.
2. It is recommended to mount a handwheel on the input shaft before assembling the gearbox to the valve, Figure 1.
3. Check if the boltcircle of the flanges (of gearbox and valve) coincide. Also check if the valve stem and the bore of the gearbox match.
4. Make sure the valve is in the closed position. If not, close the valve before continuing.
5. Check if the gearbox is in fully closed position by turning the handwheel clockwise.
6. In case of use of studbolts for fixing the gearbox to the valve, it is recommended to screw them into the bottom flange of the gearbox before mounting the gearbox on top of the valve.
7. Coat the valve stem and outer surface of the bushing (2) and actuator bore with a suitable grease to aid fitting. The plate (21) should be installed, when the bushing (2) is used, between the valve flange mounting face. This plate locks up the insert.
8. Mount the gearbox perpendicular to the valve (see Figure 2).
9. Fix the gearbox to the valve with nut and ring. In case of use of bolts, for the maximum screwdepth, see Table 2. For tightening, refer to standard VDI 2230.

Table 2  Max. screw depths

<table>
<thead>
<tr>
<th>Mounting</th>
<th>F05</th>
<th>F07</th>
<th>F10</th>
<th>F12</th>
<th>F14</th>
<th>F16</th>
<th>F25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. screw depth</td>
<td>8</td>
<td>11</td>
<td>13</td>
<td>16</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

10. The assembly is now ready for adjustment (see Chapter 2.2).

2.2 Adjustment of the setscrews
The gearbox is mounted on top of valve (see installation).
1. Close the valve totally, by turning the handwheel clockwise.
2. The valve position is indicated by the arrow on the position indicator.
3. Remove the plastic caps from the setscrews.
4. When the fully closed position can not be achieved, loosen the setscrew-close (see Figure 3) by turning them counterclockwise. Continue turning the handwheel until the valve is totally closed. Please note, that the butterfly valves need to be closed using a given torque, see the tables in a relevant valve manual.
5. Screw the set-screw back into the gearbox (by turning clockwise) until blocked. Secure the setscrew– close with the nut.
6. Open the valve by turning the handwheel counterclockwise.
7. When it can not be achieved to open the valve totally (90°), loosen the setscrew-open (see Figure 3) by turning it counterclockwise. Continue turning the handwheel until the valve is totally opened.
8. Screw the set-screw back into the gearbox (by turning clockwise) until blocked. Secure the setscrew– open with the nut.
9. Close the valve with the handwheel.
10. Put the plastic caps back on the setscrews.
11. Adjustment completed.

3 OPERATING INSTRUCTIONS

The series M gears are manually operated quarterturn gearboxes made of cast iron.

The maximum allowable input- and output torques are mentioned in Chapter 1.2.

1. The gearbox is manually operated by handwheel.
2. For opening the valve, the handwheel is turned counterclockwise. Closing is clockwise.
3. Stop turning when the required valve position is achieved. The number of turns needed from totally open to totally close the valve is in Table 3.
4. The valve position is indicated by the position indicator on top of the gearbox.
5. When the valve cannot be totally opened (or closed), first detect and solve the cause of malfunction.
6. In case of malfunction of the gearbox, this one has to be replaced (see chapter installation for dismounting). Return the gearbox to your supplier for repair.
7. When you do the repair in house, all replacement parts must be obtained from the manufacturer to assure proper operation of the gearbox.
8. The gearbox is self-braking. Therefore no fixation needs to be installed to retain the valve position.
9. When the fault is repaired, turn the handwheel until blocked.
10. The system is ready for use.

Table 3  No. of turns for totally open/closed

<table>
<thead>
<tr>
<th>Manual gear</th>
<th>Turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>M07</td>
<td>9,25</td>
</tr>
<tr>
<td>M10</td>
<td>9,25</td>
</tr>
<tr>
<td>M12</td>
<td>8,5</td>
</tr>
<tr>
<td>M14</td>
<td>9,5</td>
</tr>
<tr>
<td>M15</td>
<td>13,75</td>
</tr>
<tr>
<td>M16</td>
<td>27</td>
</tr>
<tr>
<td>M25</td>
<td>19,5</td>
</tr>
</tbody>
</table>

4 MAINTENANCE

Under normal conditions, the gearbox is maintenance free. The series M gearboxes can be used at ambient temperatures from –20 to +120 °C.

The standard gearbox reaches IP67 (dust- and waterspray proof). Cleaning can be done with a waterhose, not a high pressure waterjet.
.item | qty. | description
--- | --- | ---
1 | 2 | Set-screw
2 | 1 | Worm
3 | 1 | Gasket
4 | 1 | Needle-Bearing
5 | 1 | Bushing
6 | 1 | Oil-seal
7 | 1 | Shaft
8 |  | Grease
9 | 1 | Position indicator
10 | 1 | Coverplate
11 | 1 | Quadrant
12 | 1 | Body
13 | 1 | Handwheel
14 | 1 | Spring type straight pin
15 | 4 | Hexagon head screw
16 | 2 | Head cap screw
## DIMENSIONS

<table>
<thead>
<tr>
<th>Unit size</th>
<th>Bore size</th>
<th>Valve mounting flange ISO 5211</th>
<th>Dimensions, mm</th>
<th>S</th>
<th>N, no. of holes</th>
<th>U, dia</th>
<th>U, depth</th>
<th>Hand wheel dia ØZ/ type</th>
<th>Weight kg/lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>M07</td>
<td>insert 15</td>
<td>F05+F07+F10</td>
<td>G1, with std input shaft</td>
<td>185</td>
<td>241</td>
<td>102</td>
<td>124</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td>M07</td>
<td>straight 20 or 25</td>
<td>F05+F07+F10</td>
<td>G1, with std input shaft</td>
<td>185</td>
<td>241</td>
<td>102</td>
<td>124</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td>M10</td>
<td>straight 20 or 25</td>
<td>F05+F07+F10</td>
<td>G1, with std input shaft</td>
<td>187</td>
<td>243</td>
<td>102</td>
<td>124</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td>M12</td>
<td>insert 25 or 30</td>
<td>F10+F12</td>
<td>G1, with std input shaft</td>
<td>235</td>
<td>304</td>
<td>138</td>
<td>174</td>
<td>71</td>
<td>69</td>
</tr>
<tr>
<td>M12</td>
<td>straight 35</td>
<td>F10+F12</td>
<td>G1, with std input shaft</td>
<td>235</td>
<td>304</td>
<td>138</td>
<td>174</td>
<td>71</td>
<td>69</td>
</tr>
<tr>
<td>M14</td>
<td>insert 35 or 40</td>
<td>F12+F16</td>
<td>G1, with std input shaft</td>
<td>305</td>
<td>405</td>
<td>200</td>
<td>226</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>M14</td>
<td>straight 45</td>
<td>F12+F16</td>
<td>G1, with std input shaft</td>
<td>305</td>
<td>405</td>
<td>200</td>
<td>226</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>M15</td>
<td>insert 45 or 55</td>
<td>F16+F25</td>
<td>G1, with std input shaft</td>
<td>348</td>
<td>491</td>
<td>285</td>
<td>300</td>
<td>53</td>
<td>142</td>
</tr>
<tr>
<td>M16</td>
<td>straight 65 or 70</td>
<td>F16+F25</td>
<td>G1, with std input shaft</td>
<td>348</td>
<td>491</td>
<td>285</td>
<td>300</td>
<td>53</td>
<td>142</td>
</tr>
<tr>
<td>M25</td>
<td>straight 70,75 or 85</td>
<td>F16+F25</td>
<td>G1, with std input shaft</td>
<td>412</td>
<td>597</td>
<td>370</td>
<td>402</td>
<td>182</td>
<td>170</td>
</tr>
</tbody>
</table>
1. **PRODUCT GROUP**

   **M** Manual gear operator with attachment dimensions acc. to ISO 5211, VDI/VDE 3845 mounting surface.

2. **SIZE**

   E.g. 10/25 = actuator size / shaft bore diameter
   07/15, 07/20, 07/25, 07/D11* , 07/D14*
   10/20, 10/25
   12/25, 12/30, 12/35
   14/35, 14/40, 14/45
   15/35, 15/40, 15/45, 15/50, 15/55
   16/45, 16/50, 16/55, 16/65, 16/70
   25/70, 25/75, 25/85

3. **VALVE MOUNTING FLANGE, ISO 5211 TYPE**

   - **F05, F07, F10** For M07/15, M07/20, M07/25
   - **F10** For M10/20, M10/25
   - **F12** For M12/25, M12/30, M12/35
   - **F14** For M14/35, M14/40, M14/45
   - **F12, F16** For M14/35, M14/40, M14/45
   - **F14** For M15/35, M15/40, M15/45, M15/50, M15/55
   - **F16** For M15/35, M15/40, M15/45, M15/50, M15/55
   - **F16, F25** M16/45, M16/55, M16/65, M16/70
   - **F16, F25** For M25/75, M25/85

4. **OPERATION**

   - **SR6** Handwheel for M07
   - **SR8** Handwheel for M10
   - **SR12** Handwheel for M12
   - **R16** Handwheel for M14
   - **R20** Handwheel for M15
   - **R24** Handwheel for M16
   - **R24** Handwheel for M25

5. **SPECIAL CONSTRUCTION**

   - **-** Standard without sign. ISO 5211 mounting face. Temperature range -20 to +120 °C / -4 to +250 °F. Two mechanical stop screws.
   - **E** Extended shaft for handwheel. Extension length has to be specified. Over +0.3 m extensions have to be supported by customers own solution.
   - **V** Obsolete VDI/VDE 3845 mounting surface for accessories.
   - **P** Padlock flange
   - **C** Chain wheel
   - **CT** Low temperature version down to -55 °C / -65 °F
   - **HT** High temperature grease up to +160 °C / +320 °F
   - **OX** Oxygen grease, temperature range -20 to +80 °C
   - **Y** Special construction

*) D11 = square EN ISO 5211 Diagonal
D14 = square EN ISO 5211 Diagonal

**) Ensure the selection of the handwheel from technical bulletin 6MG21 (new)