

MTM

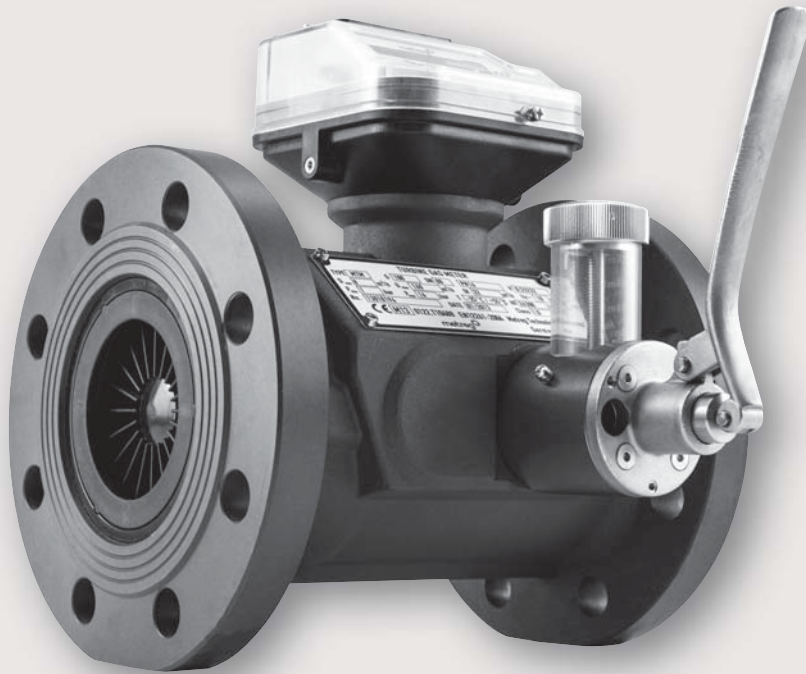
# Turbine Gas Meter



livinggas.

metreg   
Metreg Technologies GmbH

# MTM Turbine Gas Meter



## Applications

The MTM turbine gas meter is fit for use in the custody transfer measurement of gas volumes – especially natural gas in gas transmission stations, in power plants and city stations, in biogas injection stations as well as in various industrial plants wherever custody transfer equivalent accuracy of measurement is requested.

## Key features

- Meter size G 65 to G 4000
- Flow rates from 5 to 6500 m<sup>3</sup>/h
- Nominal sizes from DN 50 to DN 300 (2" to 12")
- Pressure class PN 10 to PN 100 and ANSI Class 150, 300 and 600
- Measuring range 1:20, optional 1:30 depending on operating conditions
- Meter housing made of anodized high strength Aluminum, Carbon Steel or a welded steel construction
- Permanent lubrication of ball bearings up to 16 bar and DN 50 - DN 150 as standard, optional manual lubrication by means of oil pump
- Manual lubrication by means of oil pump as standard for sizes DN 200 - DN 300 and for all MTM turbine meters with operating pressure > 16 bar
- Index head by default made of engineering UV stabilized polymer material, optional made of Aluminum
- Rotating counter (355 °)
- Compact installation by straight inlet pipe  $\geq 2DN$  and outlet pipe  $\geq 1 DN$  with low level perturbations. In case of high level perturbations an additional straight inlet pipe of 2DN is necessary
- Horizontal and vertical mounting positions possible
- Approvals according to MID (2004/22/EG), OIML, PED (PED 97/23/EG), ATEX

## Description and operation

The MTM turbine meter registers the operating volume using an eight-digit mechanical counter. Via pulses the operating volume is transferred to an electronic volume corrector and converted to normal or standard conditions. The MTM turbine is approved for custody transfer according to MID (2004/22/EC) / OIML.

The turbine meter MTM is a volume flow meter. The flow of the gas to be measured causes the turbine rotor to rotate.

The gas flow is narrowed on an annular cross section, is accelerated and directed onto the smooth-running Aluminum rotor. The number of rotations is proportional to the traversed gas volume, the frequency of rotations is proportional to the actual gas flow. The rotation of the rotor is connected to a speed-reducing gear train and transmitted by a magnetic coupling from the gas area to the adjustable roller counter in the atmospheric environment.

The actual volume flow can be transmitted to an electronic volume correctors or data loggers via low frequency (LF-) pulses generated by Reed contacts. An additional anti-tampering contact is placed in the LF pulser unit. This contact is triggered in the presence of strong magnetic fields in case these are used for tampering purposes.

The rotation of the rotor can also be scanned also with one or two high frequency (HF-) sensors. The HF-sensor signal allows the determination of the actual gas flow in high-resolution. It is used in flow computers on its own or in addition to the NF-signal. A damage of the rotor or missing or crooked blades can be detected by a changed frequency pattern.

## Technical specifications

|                               |  |
|-------------------------------|--|
| <b>Gas temperature:</b>       | +5 °C to +55 °C  |
| <b>Ambient temperature:</b>   | +5 °C to +55 °C  |
| <b>Storage temperature:</b>   | -25 °C to +55 °C   |
| <b>Operating pressure:</b>    | 100 bar max., according to housing specification   |
| <b>Protection class:</b>      | IP 65  |
| <b>Materials:</b>             |  |
| • Meter housing               | Aluminum alloy   |
| • Turbine rotor:              | Aluminum alloy   |
| • Meter index head:           | Engineered UV stabilized polymer, aluminum head as an option   |
| <b>PED-Approval:</b>          | Hpi / 222-103-Q-01   |
| <b>ATEX-Approval:</b>         | Ex -Zone 1 - $\text{Ex}$ II 2 G c II T4 - TÜV - 94/9/EC Annex 8  |
| <b>MID – Approval:</b>        | T10660 - NMI Certin  |
| <b>OIML – Recommendation:</b> | The gas meter of the type MTM meets the requirements of OIML R137-1 & 2: 2012 „gas meters“, confirmed by NMI |
| <b>Reproducibility:</b>       | < 0.1 %  |
| <b>Overload:</b>              | Short term up to 1.25 Qmax   |
| <b>Pressure change rate:</b>  | < 0.35 bar/s   |
| <b>Counter:</b>               | Eight-digit mechanical roller counter  |
| <b>Meter index head:</b>      | Standard synthetic material, aluminum as option  |
| <b>Pulse output:</b>          | 1 LF-pulser (Reed contact) and 1 anti-tampering contact<br>Option: additionally 1 HF-pulser or 2 HF-pulsers  |
| <b>Connections:</b>           |  |
| • Pressure:                   | 1 connection with ¼" NPT – thread  |
| • Temperature:                | 1 thermowell with G ¼" – thread (option)   |

# MTM Turbine Gas Meter

## Error limits and typical error curve

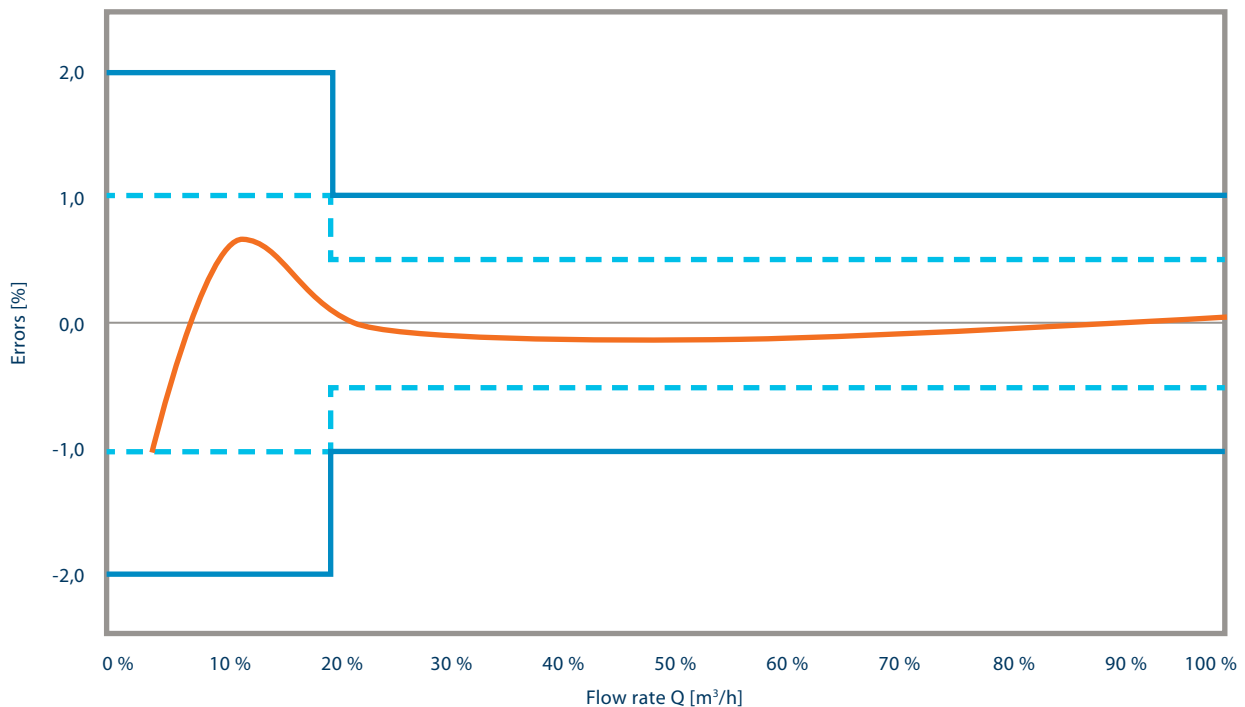
According to EN 12261 maximum permissible error limits:

$$Q_{\min} \leq Q < 0.2 \cdot Q_{\max} : \pm 2.0 \%$$

$$0.2 \cdot Q_{\max} \leq Q \leq Q_{\max} : \pm 10 \%$$

The turbine meters MTM are all initially calibrated within the standard measurement errors within the maximum permissible errors of EN 12261 and OIML. Reduced measurement errors with only half the maximum permissible error limits are optionally available.

Typical error curve



The turbine meters MTM show very stable and reproducible measurement results. The measurement cartridge has been designed to be assembled into the pressure containing housing positioned by soft O-rings. This makes the MTM meter very robust against any torsional and bending stresses resulting out of installation stresses.

The meters can withstand far more than double the specified torsional and bending stresses implied through the installation as defined in EN 12261.

The lifetime durability of the MTM turbine meter is very stable due to the large dimensioned high precision ball bearings "made in Germany" along with the high precision machining of the body and all moving parts on state of the art machines "made in Germany". After machining all aluminum parts, especially the turbine wheel, are hard anodized for less friction and higher resistance to mechanical wear and tear or chemical influences.

## Performance data

| DN  | G - Size | Q <sub>max</sub> [m <sup>3</sup> /h] | Measuring range 1:20<br>Pressure range<br>1-100 bar 8-100 bar |                                      | Measuring range 1:30<br>Pressure range<br>8-100 bar 16-100 bar |                                      | Measuring range 1:50 **<br>Pressure range<br>8-100 bar 30-100 bar |                                      | HF* [Imp/m <sup>3</sup> ] | NF/L [Imp/m <sup>3</sup> ] | Pressure loss<br>at Q <sub>max</sub> [mbar]<br>and ρ=1 bar abs. |  |
|-----|----------|--------------------------------------|---|--------------------------------------|--|--------------------------------------|---|--------------------------------------|---------------------------|----------------------------|---|--|
|     |          |                                      | Q <sub>min</sub> [m <sup>3</sup> /h]                          | Q <sub>min</sub> [m <sup>3</sup> /h] | Q <sub>min</sub> [m <sup>3</sup> /h]                           | Q <sub>min</sub> [m <sup>3</sup> /h] | Q <sub>min</sub> [m <sup>3</sup> /h]                              | Q <sub>min</sub> [m <sup>3</sup> /h] |                           |                            | Air<br>(ρ=1,2 kg/m <sup>3</sup> )                               | Natural gas<br>(ρ=0,83 kg/m <sup>3</sup> ) |
| 50  | 65       | 100                                  | 5   |                                      | 3,3  |                                      |   |                                      | 105000                    | 10                         | 13,7  | 8,81                                       |
| 80  | 100      | 160                                  |   | 8                                    |  | 5                                    |   | 3,2                                  | 26000                     | 1                          | 4,4   | 2,83                                       |
| 80  | 160      | 250                                  | 12,5  |                                      | 8  |                                      | 5   |                                      | 26000                     | 1                          | 8,7   | 5,60                                       |
| 80  | 250      | 400                                  | 20  |                                      | 13   |                                      | 8   |                                      | 26000                     | 1                          | 22,1  | 14,22                                      |
| 100 | 160      | 250                                  |   | 12,5                                 |  | 8,3                                  |   | 5                                    | 13500                     | 1                          | 5,0   | 3,22                                       |
| 100 | 250      | 400                                  | 20  |                                      | 13   |                                      | 8   |                                      | 13500                     | 1                          | 9,6   | 6,18                                       |
| 100 | 400      | 650                                  | 32,5  |                                      | 20   |                                      | 13  |                                      | 13500                     | 1                          | 25,0  | 16,09                                      |
| 150 | 400      | 650                                  |   | 32,5                                 |  | 22                                   |   | 13                                   | 5000                      | 1                          | 3,6   | 2,32                                       |
| 150 | 650      | 1000                                 | 50  |                                      | 33   |                                      | 20  |                                      | 5000                      | 1                          | 10,4  | 6,69                                       |
| 150 | 1000     | 1600                                 | 80  |                                      | 53   |                                      | 32  |                                      | 5000                      | 1                          | 21,4  | 13,77                                      |
| 200 | 650      | 1000                                 |   | 50                                   |  | 33                                   |   | 20                                   | 2200                      | 1                          | 1,1   | 0,71                                       |
| 200 | 1000     | 1600                                 | 80  |                                      | 53   |                                      | 32  |                                      | 2200                      | 1                          | 2,8   | 1,80                                       |
| 200 | 1600     | 2500                                 | 125   |                                      | 83   |                                      | 50  |                                      | 2200                      | 1                          | 6,5   | 4,18                                       |
| 250 | 1000     | 1600                                 |   | 80                                   |  | 53                                   |   | 32                                   | 1900                      | 0,1                        | 6,2   | 3,99                                       |
| 250 | 1600     | 2500                                 | 125   |                                      | 83   |                                      | 50  |                                      | 1900                      | 0,1                        | 12,5  | 8,04                                       |
| 250 | 2500     | 4000                                 | 200   |                                      | 133  |                                      | 80  |                                      | 1900                      | 0,1                        | 12,8  | 14,67                                      |
| 300 | 1600     | 2500                                 |   | 125                                  |  | 83                                   |   | 50                                   | 1200                      | 0,1                        | 4,6   | 2,96                                       |
| 300 | 2500     | 4000                                 | 200   |                                      | 133  |                                      | 80  |                                      | 1200                      | 0,1                        | 10,0  | 6,43                                       |
| 300 | 4000     | 6500                                 | 325   |                                      | 216  |                                      | 130   |                                      | 1200                      | 0,1                        | 22,1  | 14,22                                      |

\*\* in Vorbereitung

\* Der Impulswert kann variieren und wird für den Zähler bei der Eichung genau bestimmt

\* The absolute number of the pulses depends on the meter size and the single meter itself. The stated values are of typical size. Exact values determined by calibration of the meter are located on the nameplate.

The turbine meters MTM are manufactured with large measurement ranges due to the precision machining of the parts and a very reproducible assembly process. The standard calibrated measurement range for the MTM is 1:20 under atmospheric conditions. An extended measurement range of 1:30 is optionally available. Measurement ranges of 1:50 are under preparation.

The pressure loss of the MTM turbine meter is minimized through a fluid dynamically optimized inlet diffuser, very low manufacturing tolerances and the high precision, low friction ball bearings. The optimized flow conditions allow a minimal straight inlet pipe of 2 DN for low level perturbations and only 2 DN additional straight inlet piping under severe perturbations according to OIML standards. MTM turbine meters housings are manufactured on a standard basis with raised face (RF) flanges according to DIN/EN 1092-1 or ANSI B 16.5 for class 150/300/600 with a maximum operating pressure of 100 bar/ 10 MPa.

More technical details, especially for commissioning and operation, please refer to the operation manual of the MTM turbine meter.

# MTM Turbine Gas Meter

## Housing materials

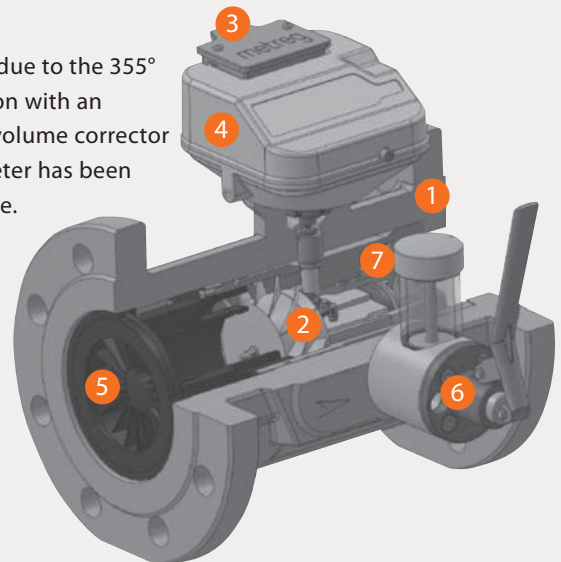
| DN [mm] | Pressure class         |              |              |              |              |              |              |              |
|---------|------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|         | PN 16                  | PN 25        | PN 40        | PN 63        | PN 100       | ANSI 150     | ANSI 300     | ANSI 600     |
| 50      | Aluminium/Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |
| 80      | Aluminium/Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |
| 100     | Aluminium/Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |
| 150     | Aluminium/Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |
| 200     | Aluminium/Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |
| 250     | Carbon Steel           | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |
| 300     | Carbon Steel           | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel | Carbon Steel |

## Meter design

The pressure containing housing (1) is very robust against torsional or bending forces due to the large cross sections. The Aluminum turbine wheel (2) is machined out of full material on a 5 axis machine, dynamically precision balanced, and hard anodized. The computer optimized profile of the turbine blades in combination with the fluid dynamic optimized inlet flow straightener (5) provide for a very stable measurement characteristic also under high pressure operating conditions. The high precision ball bearings "made in Germany" with minimal bearing play ensure a smooth running turbine wheel with a high load capacity. The measuring cartridge (7) is positioned in the pressure containing housing by O-rings. This design feature also creates a circular room with absolute static operating pressure for very precise pressure measurement without any dynamic flow influences. The oil lubrication of the ball bearings is ensured through the lubrication pump (6). The turning of the turbine wheel is transmitted via a low friction gear train and a pressure stable and leak tight magnetic coupling to the eight digit mechanical counter (4) with an environmental protection class of IP 65.

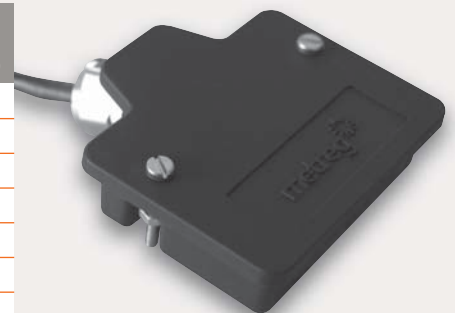
The turbine meter MTM can be installed horizontally and vertically up or down due to the 355° turnable index head. The exchangeable low frequency (LF) switch in combination with an anti-tampering contact provides for the electrical connection to an electronic volume corrector and a possible further AMR device. The complete design of the MTM turbine meter has been aimed to be very robust in combination with highest measurement performance.

- 1 pressure containing housing
- 2 turbine wheel
- 3 LF-Pulser and anti tampering unit
- 4 index head and 8 digit counter
- 5 flow straightener
- 6 lubrication oil pump
- 7 measuring cartridge



## Dimensions, weights and connections

| DN [mm] | Approx. weight [kg] |       |       |       |        |          |          |          |
|---------|---------------------|-------|-------|-------|--------|----------|----------|----------|
|         | PN 16               | PN 25 | PN 40 | PN 63 | PN 100 | ANSI 150 | ANSI 300 | ANSI 600 |
| 50      | 7                   | 15    | 15    | 17    | 31     | 13       | 15       | 22       |
| 80      | 10                  | 25    | 25    | 27    | 58     | 23       | 26       | 47       |
| 100     | 13                  | 36    | 36    | 38    | 51     | 35       | 39       | 56       |
| 150     | 77                  | 123   | 123   | 140   | 168    | 120      | 135      | 176      |
| 200     | 94                  | 139   | 151   | 173   | 203    | 136      | 161      | 210      |
| 250     | 140                 | 170   | 194   | 218   | 285    | 164      | 203      | 302      |
| 300     | 163                 | 193   | 230   | 262   | 368    | 195      | 249      | 356      |

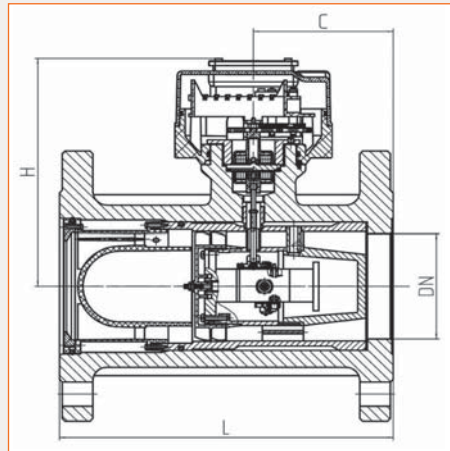


## Dimensions, weights and connections

| DN [mm] | Pressure class  | Housing dimensions |        |        |        |
|---------|---|--------------------|--------|--------|--------|
|         |   | DN [mm]            | H [mm] | C [mm] | L [mm] |
| 50      | PN 16   | 52                 | 163    | 75     | 150    |
|         | PN 25, PN 40, PN 63, Class 150, Class 300                   | 52                 | 168    | 75     | 150    |
|         | Class 600   | 52                 | 185    | 75     | 150    |
| 80      | PN 16   | 81                 | 170    | 101    | 240    |
|         | PN 25, PN 40, PN 63, Class 150, Class 300                   | 81                 | 189    | 101    | 240    |
|         | Class 600   | 81                 | 204    | 101    | 240    |
| 100     | PN 16   | 101                | 180    | 120    | 300    |
|         | PN 25, PN 40, PN 63, Class 150, Class 300, Class 600        | 101                | 199    | 120    | 300    |
| 150     | PN 16   | 151                | 200    | 180    | 450    |
|         | PN 25, PN 40, PN 63, Class 150, Class 300, Class 600        | 151                | 234    | 180    | 450    |
| 200     | PN 16, PN 25, PN 40, PN 63, Class 150, Class 300, Class 600 | 201                | 240    | 255    | 600    |
| 250     | PN 16, PN 25, PN 40, PN 63, Class 150, Class 300, Class 600 | 251                | 267    | 250    | 750    |
| 300     | PN 16, PN 25, PN 40, PN 63, Class 150, Class 300, Class 600 | 301                | 293    | 308    | 900    |

MTM turbine meters housings are manufactured on a standard basis with raised face (RF) flanges according to DIN/EN 1092-1 or ANSI B 16.5 for class 150/300/600 with a maximum operating pressure of 100 bar/ 10 MPa.

More technical details, especially for commissioning and operation, please refer to the operation manual of the MTM turbine meter.



## Connections

| DN [mm] | Flanges with threaded holes |          |          |          |             |           |             |             |
|---------|-----------------------------|----------|----------|----------|-------------|-----------|-------------|-------------|
|         | DIN EN 1092-1               |          |          |          | ANSI B 16.5 |           |             |             |
|         | PN 16                       | PN 25    | PN 40    | PN 63    | PN 100      | ANSI 150  | ANSI 300    | ANSI 600    |
| 50      | 4 x M12                     | 4 x M16  | 4 x M16  | 4 x M20  | 4 x M24     | 4 x 5/8"  | 8 x 5/8"    | 8 x 5/8"    |
| 80      | 4 x M16                     | 8 x M16  | 8 x M16  | 8 x M20  | 8 x M24     | 4 x 5/8"  | 8 x 3/4"    | 8 x 3/4"    |
| 100     | 8 x M16                     | 8 x M16  | 8 x M16  | 8 x M24  | 8 x M27     | 8 x 5/8"  | 8 x 3/4"    | 8 x 7/8"    |
| 150     | 8 x M16                     | 8 x M20  | 8 x M20  | 8 x M30  | 12 x M30    | 8 x 3/4"  | 12 x 3/4"   | 12 x 1"     |
| 200     | 8 x M20                     | 8 x M24  | 12 x M24 | 12 x M33 | 12 x M33    | 8 x 3/4"  | 12 x 7/8"   | 12 x 1 1/8" |
| 250     | 12 x M24                    | 12 x M27 | 12 x M30 | 12 x M33 | 12 x M36    | 12 x 7/8" | 16 x 1"     | 16 x 1 1/4" |
| 300     | 12 x M24                    | 16 x M27 | 16 x M30 | 16 x M33 | 16 x M39    | 12 x 7/8" | 16 x 1 1/8" | 20 x 1 1/4" |



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