Proportional pressure reducing valve, pilot operated

Type DRE(M) and DRE(M)E

Sizes 10 and 25
Component series 6X
Maximum operating pressure 315 bar
Maximum flow 300 l/min

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<td>12 to 14</td>
</tr>
</tbody>
</table>

Features

- Valve for reducing an operating pressure
- Operation by means of proportional solenoids
- Proportional solenoid with rotatable and detachable coil
- For subplate mounting:
  Porting pattern according to ISO 5781,
  Subplates according to data sheet RE 45062
  (separate order), see page 11
- Third path A to Y (Ø 7.5 mm)
- Minimum setting pressure 2 bar with command value zero
- Linearized command value-pressure characteristic curve
- Good transient response
- Optional check valve between A and B
- Maximum pressure limitation optional
- Type DRE(M)E with integrated electronics (OBE):
  • Little manufacturing tolerance of the command value-pressure characteristic curve

1) Size 32 see data sheet RE 29278

Information on available spare parts:
www.boschrexroth.com/spc
Ordering code

<table>
<thead>
<tr>
<th>DRE</th>
<th>-6X/</th>
<th>Y</th>
<th>G24</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>without maximum pressure limitation = no code</td>
<td>6X</td>
<td>Y</td>
<td>G24</td>
<td>*</td>
</tr>
<tr>
<td>with maximum pressure limitation ¹) = M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For external control electronics = no code
with integrated electronics (OBE) = E

Size 10 = 10
Size 25 = 20

Component series 60 to 69 = 6X
(60 to 69: Unchanged installation and connection dimensions)

Pressure rating
- 50 bar = 50
- 100 bar = 100
- 200 bar = 200
- 315 bar = 315

Pilot oil return always external separately and at zero pressure to the tank = Y

with check valve between A and B = no code
without check valve = M

Further details in the plain text

Seal material
- M = NBR seals
- V = FKM seals

Interface electronics
- A1 = Command value 0 to 10 V
- F1 = Command value 4 to 20 mA
- no code = with DRE

Electrical connection
for DRE(M):
- K4 = without mating connector,
  with connector according to DIN EN 175301-803
  Mating connector - separate order
  see page 8

for DRE(M)E:
- K31 = without mating connector,
  with connector according to DIN EN 175201-804
  Mating connector - separate order
  see page 8

no code = 1600 mA design
- 8 = 800 mA design ²)

Supply voltage of the control electronics
- G24 = Direct voltage 24 V

Accessories (not included in scope of delivery)

- External control for type DRE (only standard version G24 (1.6 A solenoid)):
  • Analog amplifier VT-MSPA1-11-1X/
    in modular design according to data sheet RE 30223
  • Digital amplifier VT-VSPD-2
    in Eurocard format according to data sheet RE 30523
  • Analog amplifier VT-VSPA1-11-1X/
    in Eurocard format according to data sheet RE 30100
  • Proportional plug-in amplifier VT-SSPA1-1-1X
    plug-in amplifier according to data sheet RE 30116
    connection M12 - 4-pole
- Mating connectors (details, see page 8)
  • For DRE(M): According to DIN EN 175301-803,
    Material no. R901017011
  • For DRE(M)E: According to DIN EN 175201-804,
    Material no. R900021267 or R900223890

¹) In case of an error (e.g. in case of contamination or overcurrent), the maximum pressure limitation prevents an inadmissibly high overpressure at the valve.

²) Replacement series 5X (Attention! External amplifiers only suitable for G24 = 1.6 A solenoid), see accessories.
Symbols

DRE -6X/...YM...

DREM -6X/...YM...

DRE -6X/...Y...

DREM -6X/...Y...
Function, section

Valves of type DRE(M) are pilot controlled pressure reducing valves. They are used for reducing an operating pressure.

These valves basically comprise of a pilot control valve (1) with proportional solenoid (2), main valve (3) with main spool insert (4), as well as an optional check valve (5).

**Type DRE...**

The pressure in channel A is set in a command value-dependent form via the proportional solenoid (2).

In rest position - no pressure in channel B -, the spring (17) holds the main spool (4) in its initial position. The connection from channel B to A is closed. A start-up jump is thus suppressed.

Via the bore (6), the pressure in channel A acts on the surface (7) of the main spool. The pilot oil is taken from channel B and flows via the bore (8) to the constant flow controller (9) keeping the pilot flow constant, independent of the pressure drop between channel A and B. From the constant flow controller (9), the pilot flow flows into the spring chamber (10), through the bores (11) and (12) via the valve seat (13) into the Y channel (14, 15, 16) and from there to the return.

The pressure required in channel A is preset at the related amplifier. The proportional solenoid moves the valve poppet (20) in the direction of the valve seat (13) and limits the pressure in the spring chamber (10) to the set value. If the pressure in channel A is lower than the specified command value, the higher pressure in the spring chamber (10) pushes the main spool to the right. The connection from B to A is opened.

If the set pressure in A is achieved, the forces at the main spool are balanced - the main spool is in control position.

Pressure in channel A • Spool face (7) = Pressure in the spring chamber (10) • Spool face – Spring force (17)

If in a standing hydraulic fluid column (e.g. cylinder piston to stop), the pressure in A is to be reduced, a lower command value is (e.g.) specified at the control electronics and thus, a lower pressure is pre-selected that is immediately applied to the spring chamber (10). The higher pressure in A at the face (7) of the main spool pushes the main spool against the plug screw (18) to stop. The connection A to B is blocked and A to Y is open. The force of spring (17) now acts against the hydraulic force at the face (7) of the main spool. In this main spool position, the hydraulic fluid can flow from channel A via the control edge (19) to Y into the return.

If the pressure in A has been reduced to the pressure in the spring chamber (10) plus Δp from spring (17), the main spool at the control edge A to Y closes the large control bores in the socket.

The remaining differential pressure of approx. 10 bar to the new command value pressure in A is only discharged via the fine control bore (21). This results in a good transient response without pressure undershoots.

For the free return flow from channel A to B, a check valve (5) can optionally be installed. A part of this flow from channel A simultaneously flows via the open control edge (19) of the main spool from A to Y into the return.

**Type DREM...**

For hydraulic protection against an inadmissibly high electric control current at the proportional solenoid, which imperatively results in increased pressures in port A, you can optionally install a spring-loaded pressure relief valve as maximum pressure limitation (22). The maximum pressure limitation is pre-set referred to the relevant pressure rating (table page 6).
Function, section

Type DRE(M) – with integrated electronics (OBE)

With regard to function and structure, these types correspond to type DRE. On the proportional solenoid, there is moreover a housing (23) with the control electronics.

Supply and command value voltage are applied at the connector (24).

In the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics see page 8.
# Technical Data
(For applications outside these parameters, please consult us!)

<table>
<thead>
<tr>
<th>general</th>
<th>Size</th>
<th>10</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>DRE and DREM</td>
<td>kg</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>DREE and DREME</td>
<td>kg</td>
<td>4.8</td>
</tr>
<tr>
<td>Installation position</td>
<td>Any</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>°C</td>
<td>-20 to +80</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>°C</td>
<td>-20 to +70</td>
<td>-20 to +50</td>
</tr>
</tbody>
</table>

## Hydraulic (measured with HLP 46, $\nu_{oil} = 40 ^\circ C \pm 5 ^\circ C$)

<table>
<thead>
<tr>
<th>Size</th>
<th>10</th>
<th>25</th>
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<tr>
<td>Max. operating pressure</td>
<td>Port A and B</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Port Y</td>
<td></td>
</tr>
<tr>
<td>Max. setting pressure in channel A</td>
<td>Pressure rating 50 bar</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 100 bar</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 200 bar</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 315 bar</td>
<td>bar</td>
</tr>
<tr>
<td>Min. setting pressure in channel A with command value zero</td>
<td>bar</td>
<td>2</td>
</tr>
<tr>
<td>Maximum pressure limitation (fixedly set)</td>
<td>Pressure rating 50 bar</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 100 bar</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 200 bar</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 315 bar</td>
<td>bar</td>
</tr>
<tr>
<td>Max. flow of the main valve</td>
<td>l/min</td>
<td>200</td>
</tr>
<tr>
<td>Pilot flow</td>
<td>l/min</td>
<td>0.8</td>
</tr>
</tbody>
</table>

### Hydraulic fluid
- On mineral oil basis and related hydrocarbons (HL, HLP, HLPD, HLPP) according to DIN 51524 1)
- Flame-resistant – water-free (HFDU(G), HFDU(E), HFDR) according to ISO12922 2), 4)
- Flame-resistant – containing water (HFC: Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620) according to ISO12922 3), 4)

### Hydraulic fluid temperature range
- °C | -20 to +80

### Viscosity range
- mm²/s | 15 to 380

### Max. admissible degree of contamination of the hydraulic fluid
- Class 20/18/15 5)

### Hysteresis
- % | ±3.5 of the max. setting pressure 6)

### Repeatability
- % | < ±2 of the max. setting pressure 6)

### Linearity
- % | ±2 of the max. setting pressure 6)

### Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve, pressure increasing
- DRE(M) | % | ±3.5 of the max. setting pressure 6)
- DRE(M)E | % | ±1.5 of the max. setting pressure 6)

### Step response $T_u + T_g$
- 10 → 90 % | ms | ~130, ~150
- 90 → 10 % | ms | ~160, ~150

Foot notes see next page
**Technical Data** (For applications outside these parameters, please consult us!)

1) Suitable with NBR and FKM seals  
2) Suitable **only** with FKM seals  
3) Suitable **only** with NBR seals  
4) When using flame-resistant hydraulic fluids HFC, the following limitations are to be observed:  
   - Max. operating pressure 210 bar  
   - Max. hydraulic fluid temperature 60 °C  
   - Expected service life 30...100 % as compared to HLP  

<table>
<thead>
<tr>
<th>electric</th>
<th>&quot;G24&quot;</th>
<th>&quot;G24-8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum solenoid current mA</td>
<td>≤ 100</td>
<td>≤ 100</td>
</tr>
<tr>
<td>Maximum solenoid current mA</td>
<td>1600 ± 10 %</td>
<td>800 ± 5 %</td>
</tr>
<tr>
<td>Solenoid coil resistance Cold value at 20 °C Ω</td>
<td>5.5</td>
<td>20.6</td>
</tr>
<tr>
<td>Max. hot value Ω</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Duty cycle %</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>electrical, integrated electronics (OBE)</th>
<th>&quot;G24&quot;</th>
<th>&quot;G24-8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Nominal voltage VDC</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Lower limit value VDC</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Upper limit value VDC</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Current consumption A</td>
<td>≤ 1.5</td>
<td></td>
</tr>
<tr>
<td>Required fuse protection A</td>
<td>2, time-lag</td>
<td></td>
</tr>
<tr>
<td>Inputs Voltage V</td>
<td>0 to 10</td>
<td></td>
</tr>
<tr>
<td>Current mA</td>
<td>4 to 20</td>
<td></td>
</tr>
<tr>
<td>Output Actual current value mV</td>
<td>1 mV Δ 1 mA</td>
<td></td>
</tr>
<tr>
<td>Protection class of the valve according to EN 60529</td>
<td>IP 65 with mating connector mounted and locked</td>
<td></td>
</tr>
</tbody>
</table>

**Caution!**

With an ambient temperature of 70 °C and a duty cycle of 100 % with max. current, the coil of the 800 mA solenoid reaches temperatures of up to 170 °C. In case of contact with the coil, this may lead to burns.
**Electrical connection** (dimensions in mm)

**DRE(M)**

Connection at connector

![Connector Diagram]

Connection at mating connector

![Mating Connector Diagram]

Mating connector (black) according to DIN EN 175301-803
Material no. R901017011
(separate order)

**DRE(M)E**

<table>
<thead>
<tr>
<th>Device connector allocation</th>
<th>Contact</th>
<th>Allocation interface &quot;A1&quot;</th>
<th>Allocation interface &quot;F1&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>A</td>
<td>24 VDC ((u(t) = 21 \text{ V to } 35 \text{ V})); (i_{\text{max}} \leq 1.5 \text{ A})</td>
<td>Reference contact F; 0 V</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0 V</td>
<td>Reference contact F; 0 V</td>
</tr>
<tr>
<td>Reference potential actual value</td>
<td>C</td>
<td>Reference contact F; 0 V</td>
<td>Reference contact F; 0 V</td>
</tr>
<tr>
<td>Differential amplifier input</td>
<td>D</td>
<td>0 to 10 V; (R_E = 100 \text{ k}\Omega)</td>
<td>4 to 20 mA; (R_E = 100 \text{ k}\Omega)</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Reference potential command value</td>
<td></td>
</tr>
<tr>
<td>Measuring output (actual value)</td>
<td>F</td>
<td>0 to 1.6 V actual value (1 mV (\Delta 1 \text{ mA}))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>Connected to solenoid and valve housing</td>
<td></td>
</tr>
</tbody>
</table>

Mating connectors according to DIN EN 175201-804, solder contacts for line cross-section 0.5 to 1.5 mm²

Plastic version, material no. R900021267, (separate order)

Metal version, material no. R900223890 (separate order)
Electrical connection

Connection cable for DRE(M)E
- Recommendation 6-wire, 0.75 or 1 mm² plus protective earthing conductor and screening
- Only connect the screening to PE on the supply side
- Max. admissible length 100 m

The minimum supply voltage at the mains adapter depends on the length of the supply line (see diagram).

Integrated electronics (OBE) with type DRE(M)E

Function
The electronics are supplied with voltage via ports A and B. The command value is applied to the differential amplifier ports D and E.

Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated and thus, a linear command value pressure characteristic curve is created.

The current controller controls the solenoid current independent of the solenoid coil resistance.

The power section of the electronics for controlling the proportional solenoid is a chopper amplifier with a cycle frequency of approx. 180 Hz to 400 Hz. The output signal is pulse-width modulated (PWM).

For checking the solenoid current, a voltage can be measured between pin F(+) and pin C(–) that is proportional to the solenoid current. 1 mV corresponds to 1 mA solenoid current.

Block diagram
**Characteristic curves** (measured with HLP46, $\theta_{\text{oil}} = 40 \, ^{\circ}\text{C} \pm 5 \, ^{\circ}\text{C})

**Pressure in port A depending on the command value** (flow = 0.8 l/min)

1) With valve DRE(M), the manufacturing tolerance at the external amplifier (type and data sheet see page 2) can be changed using the command value attenuator potentiometer “$G_w$”. With the digital amplifier, the setting is made using the “Limit” parameter.

In this connection, the control current according to the technical data must not be exceeded.

In order to be able to adjust several valves to the same characteristic curve, the pressure must - with a command value of 100 % - at no valve not exceed the maximum setting pressure of the relevant pressure rating.

**Pressure in channel A dependent on the flow $q_v$** (characteristic curve with constant $\Delta p$)

**Pressure differential via the check valve from A to B**

**Pressure differential from B to A**
Characteristic curves (measured with HLP46, $\theta_{\text{oil}} = 40 ^\circ \text{C} \pm 5 ^\circ \text{C}$ and amplifier VT-VSPA1-11-1X, 1600 mA coil...)

Pressure in channel A depending on the command value

Pressure rating 50 bar

Pressure rating 100 bar

Pressure rating 200 bar

Pressure rating 315 bar

Pressure rating 200 bar (with VT-SSPA1)

Comparison series 5X-6X / pressure rating 100 bar
(with amplifier VT-VSPA1-11-1X with 800 mA coil)

Comparison series 5X-6X / pressure rating 315 bar
(with amplifier VT-VSPA1-11-1X with 800 mA coil)
O-ring and plastic nut SW32 for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5 ± 1 Nm.

Required surface quality of the valve mounting face

<table>
<thead>
<tr>
<th>Size</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>ØD1</th>
<th>ØD2&lt;sup&gt;[11]&lt;/sup&gt;</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>H4</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>85</td>
<td>66.7</td>
<td>58.8</td>
<td>7.9</td>
<td>15</td>
<td>21.8</td>
<td>171</td>
<td>123</td>
<td>58</td>
<td>36</td>
</tr>
<tr>
<td>25</td>
<td>102</td>
<td>79.4</td>
<td>73</td>
<td>6.4</td>
<td>25</td>
<td>34.8</td>
<td>185</td>
<td>137</td>
<td>64</td>
<td>44</td>
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<table>
<thead>
<tr>
<th>Size</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>L7</th>
<th>L8</th>
<th>L9</th>
<th>L10</th>
<th>T1</th>
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<tbody>
<tr>
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<td>35.8</td>
<td>31.8</td>
<td>21.5</td>
<td>7.2</td>
<td>21.5</td>
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<td>44.5</td>
<td>59.5</td>
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<tr>
<td>25</td>
<td>60.3</td>
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<td>116</td>
<td>27.3</td>
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<td>2.9</td>
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<table>
<thead>
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<td>25</td>
<td>97</td>
<td>8.8</td>
<td>78</td>
<td>8.85</td>
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</tbody>
</table>
Unit dimensions type DRE(M)E (dimensions in mm)

<table>
<thead>
<tr>
<th>Size</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>ØD1</th>
<th>ØD2H11</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>H4</th>
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<tbody>
<tr>
<td>10</td>
<td>85</td>
<td>66.7</td>
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<td>15</td>
<td>21.8</td>
<td>192</td>
<td>123</td>
<td>58</td>
<td>36</td>
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<tr>
<td>25</td>
<td>102</td>
<td>79.4</td>
<td>73</td>
<td>6.4</td>
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<td>34.8</td>
<td>206</td>
<td>137</td>
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</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
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<th>L7</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>42.9</td>
<td>35.8</td>
<td>31.8</td>
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<td>25</td>
<td>60.3</td>
<td>49.2</td>
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<td>12.2</td>
<td>116</td>
<td>27.3</td>
<td>42</td>
<td>2.9</td>
</tr>
</tbody>
</table>

O-ring and plastic nut SW32 for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5 ± 1 Nm.

Coil and electronics freely rotatable!
Unit dimensions (continued)

1 Upon delivery, this port (G1/4) is closed. After removal of the blanking plug, an external and separate pilot oil return at zero pressure to the tank is, however, also possible here.

2 Space required for removing the mating connector

3 Name plate

4 Blind counterbore

5 Check valve, optional

6 Locating pin

7 Identical seal rings for ports A and B
   Identical seal rings for port Y and blind counterbore (item 4)

8 Pilot oil return always external and separately at zero pressure to the tank, or optionally at item 1

9 Mating connector according to DIN EN 175301-803

10 Integrated electronics (OBE), type DRE(M)E with connector "K31"

11 Mating connector according to DIN EN 175201-804

12 Processed installation surface, porting pattern according to
   ISO 5781-06-07-0-00 (size 10)
   ISO 5781-08-10-0-00 (size 25)

13 Cable fastening

14 Maximum pressure limitation with version DREM and DREME

Subplates according to data sheet RE 45062 and valve mounting screws must be ordered separately.

**Subplates:**

- **Size 10:**
  - G 460/01 (G 3/8)
  - G 461/01 (G 1/2)

- **Size 25:**
  - G 412/01 (G 3/4)
  - G 413/01 (G 1)

**Valve mounting screws:**

- 4 hexagon socket head cap screws
  ISO 4762-M10x45-10.9-flZn-240h-L
  (friction coefficient \( \mu_{\text{total}} = 0.09 \) to 0.14,
   Tightening torque \( M_A = 59 \text{ Nm} \pm 10 \% \)
  or

- 4 hexagon socket head cap screws ISO 4762-M10x45-10.9
  (friction coefficient \( \mu_{\text{total}} = 0.12 \) to 0.17)
  Tightening torque \( M_A = 75 \text{ Nm} \pm 10 \% \)
Notes