FAQ Title: Series Changes in Servo and Proportional Valves

Category: Proportional and Servo Valves
Sub-Category: Series changes / valve upgrades

Question:
What documentation is available to aid in the selection of new series proportional or servo valves, to replace previous series, or obsolete products?

Answer:
Please review the attachments, which include summary documents comparing serial feature differences and valve/electronic replacement information. To also aid in the selection of new series product, relevant data sheets for old and new series valves, and related components, (amplifier changes, for example) are included. These documents are for servo valves, proportional valves, including directional, pressure, and flow control versions.

Attachments:
Multiple comparison .pdf’s
Product substitution (Z)DBE(E) 6 series 1X to 2X

Discontinuation:

- From January 2012 the (Z)DBE(E)6...1X valves will be set to phase-out control (AL) status. These valves are only to be used as replacement. From April 2012 they will be set to order stop (AS) status.

Announcements:

- The start of the new series (Z)DBE(E)6...2X is January 2012.

Advantages of the new series:

- No solenoid venting required any more
- Maximum set pressure has been increased to 350 bar
- Improved damping
- Rotatable and/or detachable solenoid coil
- With OBE, the current/voltage interface can be selected (see data sheet)
- Solenoid current can be tapped at the connector (pin F-C)

Data sheet 29 158

Data sheet 29 258

Technical features

Size 6
Component series 1X
Maximum set pressure: 315 bar
Maximum flow: 30/l/min

Technical features

Size 6
Component series 2X
Maximum set pressure: 350 bar
Maximum flow: 30/l/min
Modification features

- As pilot valve, the DBET(E)-6X will be used for all variants.
- The valve main stages of both series are identical.
- Regarding the connection diagram as well as the hydraulic characteristic values, valves of series 2X and the current types are interchangeable.
- For safety reasons the units of series 6X are designed without manual override.
- Version (Z)DBEE6…2X with integrated electronics is 1:1 interchangeable (identical pin assignment).
- When variants with external electronics are to be replaced without changing the electronics, characteristic curves and valve response are different. So it is recommended to change the amplifier, too.

Comparison of series 1X and 2X

<table>
<thead>
<tr>
<th>series 1X</th>
<th>series 2X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve for limiting a system pressure</td>
<td>Valve for limiting a system pressure</td>
</tr>
<tr>
<td>Operation with proportional solenoid</td>
<td>Operation with rotatable proportional solenoid</td>
</tr>
<tr>
<td>For subplate mounting and sandwich plate mounting: Porting pattern according to DIN 24340 form D (without location hole) and ISO 4401 (with location hole), sub plates according to data sheet 45 052</td>
<td>For subplate mounting and sandwich plate mounting: Porting pattern according to ISO 4401, subplates according to data sheet 45052</td>
</tr>
<tr>
<td>Valve and electronic control from one source</td>
<td>Valve and electronic control from one source</td>
</tr>
</tbody>
</table>

For the control of types DBE and ZDBE:
- Analog amplifier type VT 11724 in modular design according to data sheet 29 865
- Analog amplifier type VT-VSPA1-1 in Eurocard format according to data sheet 30 111
- Digital amplifier type VT-VSPD-1 in Eurocard format according to data sheet 30 123

For the control of types DBE and ZDBE:
- Plug-in proportional amplifier type VT-SSPA1-1-1X plug-in amplifier according to data sheet 30 116 connection M12 – 4polig
- Analog amplifier type VT-MSPA1-11-1X in modular design according to data sheet 30 223
- Analog amplifier type VT-VSPA1-11-1X in Eurocard format according to data sheet 30 100
- Digital amplifier type VT-VSPD-2 in Eurocard format according to data sheet 30 523

Type DBEE and ZDBEE with integrated electronics (OBE):
- Little manufacturing tolerance of the command value/pressure characteristic curve
- Independently adjustable up and down ramp

Type DBEE and ZDBEE with integrated electronics (OBE):
- Little manufacturing tolerance of the command value/pressure characteristic curve
- Freely selectable voltage interface:
  A1: 0-10 V
  F1: 4-20 mA
3DRE(M)(E) 10, 16
Series change from 6X to 7X

Technical features

<table>
<thead>
<tr>
<th>3DRE(M)(E) series 6X (RE 29186)</th>
<th>3DRE(M)(E) series 7X (RE 29286)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component series 6X</td>
<td>Component series 7X</td>
</tr>
<tr>
<td>Sizes 10 and 16</td>
<td>Sizes 10 and 16</td>
</tr>
<tr>
<td>Maximum pressure setting</td>
<td>Maximum pressure setting</td>
</tr>
<tr>
<td>• 315 bar (size 10)</td>
<td>• 315 bar (size 10)</td>
</tr>
<tr>
<td>• 200 bar (size 16)</td>
<td>• 200 bar (size 16)</td>
</tr>
<tr>
<td>Maximum flow</td>
<td>Maximum flow</td>
</tr>
<tr>
<td>• 125 l/min (size 10)</td>
<td>• 125 l/min (size 10)</td>
</tr>
<tr>
<td>• 300 l/min (size 16)</td>
<td>• 300 l/min (size 16)</td>
</tr>
</tbody>
</table>

Features of the modification

- The cartridge valve of DBET(E)-6X will be used as pilot valve for all series 7X variants.
- The valve main stages of both series are identical.
- With regard to the porting pattern and the hydraulic data, valves of series 7X are interchangeable with the current types.
- Variant 3DRE(M)E with integrated electronics is fully interchangeable (identical connector pinout).
- In the case of variants with external electronics, valves of series 7X cannot be operated with the electronics of series 6X and vice versa.
- For safety reasons, valves of series 7X are designed without manual override.

Advantages of the new series

- Solenoid vent no longer required
- Improved damping
- Solenoid coil can be rotated or detached
- For OBE a current/voltage interface can be selected (see data sheet)
- Solenoid current can be picked up from the plug connector (Pin F-C)
Comparison of 3DRE(M)(E) series 6X with series 7X

<table>
<thead>
<tr>
<th>3DRE(M)(E) series 6X</th>
<th>3DRE(M)(E) series 7X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot operated valve for reducing a pressure (P to A) and for limiting (A to T) a system pressure</td>
<td>Pilot operated valve for reducing a pressure (P to A) and for limiting (A to T) a system pressure</td>
</tr>
<tr>
<td>Actuation by proportional solenoid</td>
<td>Actuation by rotatable proportional solenoid Proportional solenoid with detachable coil</td>
</tr>
<tr>
<td>For subplate mounting: Porting pattern to DIN 24340, form A and ISO 4401</td>
<td>For subplate mounting: Porting pattern to DIN 24340, form A and ISO 4401</td>
</tr>
<tr>
<td>Maximum pressure relief function optionally</td>
<td>Maximum pressure relief function optionally</td>
</tr>
<tr>
<td><strong>External control electronics for type 3DRE(M)</strong></td>
<td><strong>External control electronics for type 3DRE(M)</strong></td>
</tr>
<tr>
<td>• Analog amplifier, type VT 11131 of modular design according to RE 29865</td>
<td>• Analog amplifier VT-MSPA1-11-1X1V0/0 of modular design according to RE 30223</td>
</tr>
<tr>
<td>• Analog amplifier, type VT-VSPA1(K)-1 in Eurocard format according to RE 30111</td>
<td>• Analog amplifier VT-VSPA1-11-1X1V0/0 in Eurocard format according to RE 30100</td>
</tr>
<tr>
<td>• Digital amplifier, type VT-VSPD-1 in Eurocard format according to RE 30123</td>
<td>• Digital amplifier VT-VSPD-1-2XV0/-0-1 in Eurocard format according to RE 30623</td>
</tr>
<tr>
<td><strong>Linear command value/pressure characteristic curve</strong></td>
<td><strong>Linear command value/pressure characteristic curve</strong></td>
</tr>
<tr>
<td><strong>Integrated electronics (OBE) for type 3DRE(M)(E)</strong></td>
<td><strong>Integrated electronics (OBE) for type 3DRE(M)(E)</strong></td>
</tr>
<tr>
<td>• Small manufacturing tolerances of the command value/pressure characteristic curve</td>
<td>• Smaller manufacturing tolerances of the command value/pressure characteristic curve</td>
</tr>
<tr>
<td></td>
<td>• Current interface F1 or voltage interface A1 optional</td>
</tr>
</tbody>
</table>
Differences between 4WRA 6,10 Series 1X and 4WRA 6,10 Series 2X

RE29054

RE29055

- **4WRA series 1X used rectangular DC proportional solenoids**
  - 1.5A maximum current requirement for size 6 (5.4ohm coil)
  - 1.5A maximum current requirement for size 10 (10 ohm coil)
  - Control amplifiers:
    - Size 6 – VT3013 (RE29937) or VT3017 (RE29934)
    - Size 10 – VT3014 (RE39937) or VT3018 (RE29934)
    - Card Holder – VT-3002-2X/32D (RE29928)

- **4WRA series 2X uses DC proportional solenoids with pole tube and removable coils**
  - 2.5A maximum current requirement for size 6 and 10 (2ohm coil)
  - Control amplifiers – available with 1 or 5 ramp times (T1), (T5)
    - Sizes 6 and 10 – VT-VSPA2-1-2X (RE30110)
    - Card Holder – VT-3002-2X/48F (RE29928)
    - Modular amplifier VT-MSPA2-1-1X (RE30228)

- **4WRA series 2X is available with SO-589**
  - This option for replacing a 1X valve allows use of existing amplifier. Example: 4WRA 6 E15-2X/G24K4/V-589
  - For new applications we recommend using the current valve and amplifier

- **Solenoid connectors for 4WRA…2X…K4**
  - A side - R901017010 - gray
  - B side - R901017011 - black

- **Series 2X is available with on-board electronics – 4WRAE 6,10**
  - 24 volt supply voltage
  - Command signal options:
    - +/- 10 volt (A1)
    - 4-20ma (F1)
    - Mating Connector – R900021267 (plastic), R900223890 (metal)
• **Nominal flow rates are different from 1X to 2X**
  
  o **Series 1X**
    - Size 6
      - 05=(8 lpm)
      - 10=(13 lpm)
      - 20=(17 lpm)
  
  o **Series 2X**
    - Size 6
      - 07=(7 lpm)
      - 15=(15 lpm)
      - 30=(26 lpm)

  
  o **Series 1X**
    - Size 10
      - 10=(12 lpm)
      - 20=(22 lpm)
      - 40=(42 lpm)
  
  o **Series 2X**
    - Size 10
      - 30=(30 lpm)
      - 60=(60 lpm)

  
  • **4WRA series 2X has FKM “V” seals standard**

  • **Mounting bolt length changes 1X to 2X**

  o **Size 6:**
    - 1X = M5 x 40
    - 2X = M5 x 50

  o **Size 10:**
    - 1X = M6 x 50 or M6 x 40 (depends on age of valve)
    - 2X = M6 x 40
Since the release of the 4WRA series 2X valve there have been questions on how to replace a series 1X valve with the 2X. Is it a direct replacement and do we need a new amplifier are some of the more common questions asked. The following will explain the differences that must be taken into consideration when making a change from one series to the other. Although end users may be hesitant at first they must be made aware that the 4WRA series 1X is slated for obsolescence in the very near future.

Physical dimensions are very close between the two series. The one dimension to be concerned with would be the height when trying to use a 4WRAE (valve with on board electronics) in place of a 4WRA. Refer to data sheets RE29054 (series 1X) and RE29055 (series 2X) for these dimensions. The mounting bolt length has changed. The 4WRA(E)6 series 2X requires 10-24 X 2" (M5 X 50mm) socket head cap screws where the 4WRA6 series 1X required 10-24 X 1 ½" (M5 X 40). The 4WRA(E)10 series 2X requires ¼-20 X 1 ½" (M6 X 40mm) where the 4WRA10 series 1X required ¼-20 X 2” (M6 X 50mm).

Slight differences exist in the flow ratings between the two series.

<table>
<thead>
<tr>
<th>Series 1X</th>
<th>Series 2X</th>
</tr>
</thead>
<tbody>
<tr>
<td>NG6 05 (8 LPM)</td>
<td>NG6 07 (7 LPM)</td>
</tr>
<tr>
<td>10 (13 LPM)</td>
<td>15 (15 LPM)</td>
</tr>
<tr>
<td>20 (17 LPM)</td>
<td>30 (26 LPM)</td>
</tr>
<tr>
<td>NG10 10 (12 LPM)</td>
<td>NG10 30 (30 LPM)</td>
</tr>
<tr>
<td>20 (22 LPM)</td>
<td>60 (60 LPM)</td>
</tr>
<tr>
<td>40 (42 LPM)</td>
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</tbody>
</table>

When choosing a flow rate in the series 2X valve base your choice on the actual flow rate through the existing valve versus the pressure drop across it. For example let’s say the customer had a 4WRA10E10-1X/24NK4M that they needed to replace. Depending on the maximum percentage of the valve that they are using it would probably be best to use a 4WRA6E15-2X/G24N9K4/V with an adapter plate from D05 to D03. If a 4WRA10E30-2X…. was selected as a replacement control issues possibly could develop due to the fact that only a small percentage of the valve would be needed to match the characteristics of the original valve.
The **amplifier** is also an important consideration when replacing a series 1X valve with a series 2X valve. The current requirements for the solenoids/coils are different between the two series. The series 2X valve requires 2.5 amps while the series 1X required 1.5 amps. The suggested amplifier for the 4WRA series 2X valve is the VT-VSPA2-1-2X, data sheet RE30110. The amplifier for the series 1X valve was either a VT3013 or a VT3014 depending on the size of the valve, NG6 or NG10, data sheet RE29937. The most noticeable difference between these two amplifiers will be that the VT-VSPA2-1-2X has a 48 pin F connector whereas the VT3013/14 had a 32 pin D connector. This means that a new cardholder, VT3002-2X/48F R900020154 will be needed.

Another possibility for a substitute amplifier is the VT-MSPA2-1 (RE30228) which is a DIN rail mounted amplifier module. The VT-MSPA2-1 requires a 0 to +/-10 volt differential command such as an analog output from a PLC, etc.

A solution for customers who do not wish to change their amplifier at this time is **SO589**. With this SO the valve has coils which have the same current rating (1.5 amps) as the solenoids on the series 1X valve. The customer will be able to use their original amplifier.

If environmental conditions warrant its use then the 4WRAE (on board electronics version) can be considered as a replacement.

Contact: Product Management
Bosch Rexroth Corp.
2315 City Line Road
Bethlehem, PA 18017
(610)694-8300
Differences between 4WRE 6,10 series 1X and 4WRE(E) 6,10 series 2X

- **4WRE series 1X uses rectangular DC proportional solenoids**
  - 1.8A maximum current requirement for size 6; 2.2A for size 10
  - Control amplifiers:
    - Size 6 – VT-5005  RE30095
    - Size 10 – VT-5006  RE30095
    - Card Holder – VT-3002-2X/32D  RE29928

- **4WRE(E) series 2X uses DC proportional solenoids with pole tube and removable coils**
  - Maximum current requirement 2.5A for size 6 and 10
  - Control amplifiers - available with 1 or 5 ramp times (T1), (T5)
  - **Plug-in amplifiers for 3 position (2 solenoid) valves only**
    - Size 6 – VT-VRPA2-1-1X  RE30119
    - Size 10 – VT-VRPA2-2-1X  RE30119
    - Card Holder VT-3002-2X/48F  RE29928
  - Modular amplifiers
    - Size 6 – VT-MRPA2-1-1X (2 solenoids) RE30219
      VT-MRPA1-1-1X (1 solenoid) RE30219
    - Size 10 – VT-MRPA2-2-1X (2 solenoids) RE30219
      VT-MRPA1-2-1X (1 solenoid) RE30219
• Feedback (valves without on-board electronics)
  o Series 1X uses 3 wire LVDT
    ▪ Connector – R900013674
  o Series 2X uses 4 wire LVDT
    ▪ Connector – R900023126

• Nominal flow rates are different from 1X to 2X
  o Series 1X                      Series 2X
    Size 6                        Size 6
    08=(10 lpm)                   08=(8 lpm)
    16=(21 lpm)                   16=(16 lpm)
    32=(32 lpm)                   32=(32 lpm)

  Size 10                       Size 10
    16=(27 lpm)                   25=(25 lpm)
    32=(42 lpm)                   50=(50 lpm)
    64=(62 lpm)                   75=(75 lpm)

• Mounting Bolts:
  o Series 1X size 6 = M5 x 40, Size 10 = M6 x 40
  o Series 2X size 6 = M5 x 50, Size 10 = M6 x 40

Series 2X valves are available with on-board electronics – 4WREE 6,10
  o 24 volt supply voltage
  o Command signal options:
    o +/- 10 volt (A1)
    o 4-20mA   (F1)
  o Pin F – monitor actual feedback value, Pin C ref
  o Mating Connector – R900021267 (plastic), R900223890 (metal)
4WRKE
Differences Between Series 2X and 3X

4WRKE…2X (RE29074)
4WRKE…3X (RE29075)

Physical Appearance
- Series 2X – pilot valve with square solenoid design
- Series 3X – pilot valve with round removable coils with pole tubes

Spools
- Design
  - 2X = cone type
  - 3X = notch type
- Overlap
  - 2X = 10% overlap
  - 3X = 15% overlap
- Flow Characteristic
  - 2X = 10% fine metering notches to cone type flow characteristic
  - 3X = no fine metering, linear characteristic
    - “L” (linear) will be a suitable replacement for the 2X
- Nominal Flow Rates
  - No changes
- Designations
  - Changes to “W” spools
    - 2X 3X
    - W W6
    - W1 W8
  - E2 and W2 spools have no direct replacements, consult factory

Electrical Connector
- 2X = Z9 (R900013159) 6 pin
- 3X = Z31 (R900021267 plastic or R900223890 metal) 7 pin

Electronic Interface Designations
- A1
  - Command = 0 to +/-10V
  - Actual Value = 0 to +/-10V
- F1
  - Command = 4 to 20mA
  - Actual Value = 4 to 20mA
- A5
  - Command = 0 to +/-10V
  - Actual Value = 0 to +/-10V
  - Pin C = Enable (24V)
4WRKE Differences (continued)

Electrical Connections

- Pin A = 24V power (all series and interfaces)
- Pin B = 0V power (all series and interfaces)
- **Pin C**
  - 2X = Enable (24V)
  - 3X A1 = reference for Actual Value (Pin F)
  - 3X F1 = reference for Actual Value (Pin F)
  - 3X A5 = Enable (24V)
- Pin D = Input Command (all series and interfaces)
- Pin E = reference for input command (all series and interfaces)
- **Pin F** = Actual Value
  - 2X = 9V (+/-6V)
  - 3X A1 = 0 to +/-10V
  - 3X F1 = 4 to 20mA
  - 3X A5 = 0 to +/-10V
- **PE**
  - 2X = N/A
  - 3X = Protective Earth Ground
A common question is how to replace a 4WRTE valve, whether it is an older series being replaced by the current series or possibly replacing it with a different type of valve. This document will give you advice on the choices you will need to make.

**4WRTE Series 3X to Series 4X**

The most important point to note when doing such an update is that Pin C in the series 3X valve was for a 24 volt enable signal. There are two ways to accommodate this in the series 4X. One is to order the replacement valve in series 4X with the A5 electronics designation. The A5 in series 4X has the same electrical connections as earlier series such as the 3X. Another option would be to have the end user remove the 24 volt signal from pin C and then the standard A1 electronics could be used on the series 4X valve. Example:

4WRTE10E50L-3X/6BG24Z31/M  4WRTE10E50L-4X/6EG24K31/A5M
No changes required by the customer.

4WRTE10E50L-3X/6BG24Z31/M  4WRTE10E50L-4X/6EG24K31/A1M
Customer must remove the 24 volt enable signal from pin C.

There are other differences to be aware of when converting to series 4X. In the series 3X the designation “6B” meant the pilot valve had wet pin DC solenoids, now in the series 4X the designation “6E” means the pilot has proportional solenoids with removable coils.

The mating connector (Z31 designation) was included in older series valves, now in the series 4X (K31 designation) it is not. If needed, it must be ordered separately, part numbers R900021267 (plastic) or R900223890 (metal).

Some spool designations have changed. The “W” has become the “W6”, the “W1” has become the “W8” and the “W3” has become the “W9”.

For example:

4WRTE16W125L-3X/6BG24Z31/M  4WRTE16W6-125L-4X/6EG24K31/A5M

The only change to the size designations was made to the 4WRTE25…..3XH high flow valve. This has become the 4WRTE27 valve.

4WRTE25W500L-3XH/6BG24Z31/M  4WRTE27W6-500L-4X/6EG24K31/A5M
When converting from an older series to the current series always refer to the data sheets for electrical connections, spool configurations and flow rates. The data sheet for the 4WRTE series 3X valve is RE29082 and the 4WRTE series 4X is RE29083.

**What other type of valve could possibly be used to replace the 4WRTE?**

The 4WRLE can be used to replace the 4WRTE in various applications. It is always recommended that you consult with the particular application group for suggestions or experiences when doing such a conversion.

Certain items must be taken into consideration when making such a replacement. The electronics are on different ends from the 4WRTE to the 4WRLE. When making such a replacement please make sure there are no clearance issues on the machine. The 4WRLE has no options for pin C, so if pin C were used as an enable on the 4WRTE valve (A5 on series 4X or series 3X and earlier designs) the enable signal must be removed before using a 4WRLE valve. Pin C is always 0 volt reference for pin F on the 4WRLE valve.

Flow rates are somewhat different between these two types of valves but generally are close enough that a substitution is possible. The 4WRTE32 with a 600LPM spool is an example of one flow rate with no obvious substitution available.

Flow characteristics are also different which will cause the customer to do some retuning of control loops that are being used. An example of this would be on overlap spools such as the “E” and “W”. The 4WRTE valves have a general overlap of 15% which means a command of +/-1.5 volts is needed to start flow. The 4WRLE has a physical overlap of 20% on the “E” and “W” spools but the on board electronics uses overlap compensation so that a command of +/-0.5 volts is needed for the start of flow. If the controller has the option to select spool overlap you would enter 5% for the 4WRLE valve with the “E” or “W” spool.
The following diagrams show the flow characteristics of the spools.
4WRTE valve with the “E”, “W” and “V” spools. (V spool is considered 0 overlap)

4WRLE valve with the “E” or “W” spool.
4WRLE valve with the “V” spool.

The “L” version (Linear) spool is being developed for the 4WRLE and at the present time it is available only in certain sizes. Consult factory for availability.

Examples of possible substitutions depending on the application are:

4WRTE16E200L-3X/6BG24K31/A1M  4WRLE16EZ180SJ-3X/G24K0/A1M
Customer would be required to remove the 24 enable signal from pin C. The “Z” designation in the 4WRLE model code represents load sense ports “C1 and “C2”. It is not a requirement that these ports be utilized.

4WRTE25W6-350L-4X/6EG24K31/A1M  4WRLE25WZ350SJ-3X/G24K0/A1M

Note: Always contact the application group responsible for the market you are working in for advice when making such a substitution.

Data sheets for the 4WRLE are RE29088 for the “V” spool version and RE29089 for the “E” and “W” spool versions.
Overall Appearance
- Series 3X uses square solenoids
- Series 4X uses round detachable coils with pole tubes

Spools
- Design type
  - Series 3X – cone type
  - Series 4X – notch type
- Overlap (E & W)
  - Series 3X – 10% overlap
  - Series 4X – 15% overlap
- Flow Characteristic – no differences
  - L (linear) is the preferred version
- V spool (0% overlap)
  - Series 3X – spring center at loss of electrical power
  - Series 4X – spring offset (1 to 11% ) P>B A>T at loss of electrical power (please note for future designs)

Change in Designations
Series 3X  
W  
W1  
Series 4X  
W6  
W8

Nominal Flow Rates
- No Changes

Housings
- Series 3X
  - Same housing for all spool designations
- Series 4X
  - Different housings E, W versus V, Q spools
4WRTE Differences (continued)

Electrical Connections

<table>
<thead>
<tr>
<th>Series 3X</th>
<th>Series 4X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin A = +24V power</td>
<td>Pin A = +24V power</td>
</tr>
<tr>
<td>Pin B = 0V power</td>
<td>Pin B = 0V power</td>
</tr>
<tr>
<td>Pin C = Enable (24V)</td>
<td>Pin C = 0V reference for actual value (Pin F)</td>
</tr>
<tr>
<td>Pin D = Command Value</td>
<td>Pin D = Command value</td>
</tr>
<tr>
<td>Pin E = 0V reference for command</td>
<td>Pin E = 0V reference for command</td>
</tr>
<tr>
<td>Pin F = Actual value</td>
<td>Pin F = Actual value</td>
</tr>
<tr>
<td>PE = Protective Earth Ground</td>
<td>PE = Protective Earth Ground</td>
</tr>
</tbody>
</table>

- Series 4X A5 designation in model code Pin C becomes Enable (24V) similar to series 3X electrical connections.

New Model Code Designations

- Size
  - 4WRTE27 formerly 4WRTE25...3XH
- Electronic Interface
  - A1
    - Command = 0 to +/-10V
    - Actual Value = 0 to +/-10V
  - F1
    - Command = 4 to 20mA
    - Actual Value = 4 to 20mA
  - A5
    - Command = 0 to +/-10V
    - Actual Value = 0 to +/-10V
    - Pin C = Enable 24V
4WRZ
Differences between Series 5X, 6X and 7X

- Series 5X, 6X used rectangular DC proportional solenoids
  - 700mA maximum current required
- Series 7X uses DC proportional solenoids with pole tube and removable coils
  - 1500mA maximum current required

- Control Amplifiers:
  - Series 5X, 6X typically used VT-3000 (RE29935) or VT-3006 (RE29926)
  - Card Holder VT-3002-2X/32D (RE29928)
  - Series 7X uses VT-VSPA2-1-2X/T1 or T5 (RE30110)
  - Card Holder VT-3002-2X/48F (RE29928)
  - Or, modular amplifier VT11118-1X (RE30218)

- Replacement option series 7X available with on-board electronics – 4WRZE
  - No external amplifier needed
  - Input options:
    - A1 = +/- 10volt
    - F1 = 4-20mA

- Series 7X available with -674 replacement option
  - 4WRZ…7X…-674 allows use of existing amplifier for 5X, 6X
  - Not a direct replacement – valve opening is at 43% command vs 32% on the 5X, 6X
  - 750mA needed to achieve maximum shift vs 700 mA in the 5X, 6X
  - Command value adjustment may compensate for differences
• “W” spool designations change from 5X, 6X to 7X
  o 5X, 6X  7X
     W (1:1 SPOOL)    W6
     W1 (2:1 SPOOL)   W8
     W2 (1:2 SPOOL)   not available in 7X
     W3 (regen)       W9

• Nominal flow ratings of spools to be considered when replacing with 7X:
  o Command values may need to be adjusted

Nominal flow of series 5X / 6X:                  Replacement control spool in series 7X:
5X - NG 10 SO 118 = 25 l/min                  25 = 25 l/min
5X - NG 10: 25 = 40 l/min                    50 = 50 l/min
5X - NG 10: 50 = 75 l/min                    85 = 85 l/min
6X - NG 16: 100 = 130 l/min                  150 = 150 l/min
Pilot Operated 4 Way Servo Valves
Series Differences

<table>
<thead>
<tr>
<th>Old Series</th>
<th>New Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>4WSE3EE 16 (series 1X) RE29595</td>
<td>4WSE3E 16 (series 2X) RE29620</td>
</tr>
<tr>
<td>4WSE3EE 25 (series 2X) RE29595</td>
<td>4WSE3E 25 (series 3X) RE29621</td>
</tr>
<tr>
<td>4WSE3EE 32 (series 4X) RE29595</td>
<td>4WSE3E 32 (series 5X) RE29622</td>
</tr>
</tbody>
</table>

- The physical dimensions of the old series valves differ from the new series, especially the integrated electronics housing.
- The old series valves had a power supply of +/-15 vdc. The new series has the option of +/-15 vdc or +24 vdc.
- The hydraulic connection face (mounting surface) remains the same. However, the mounting bolt length changes (bolts included with valve).
- The maximum tank port pressure has been reduced to 250 bar (pilot oil return) in the new series due to the new main housing material. Operating pressure in P, A, B is increased to 350 bar (excluding size 32).
- The electrical connector remains the same. (R900223890 recommended). See RE data sheet for connections.
- 2:1 flow ratio spool version (V1) is available in the new series.
- FKM seals are standard in the new series.
- Failsafe (de-energized) spool position is also optional in the new series:

  N = 100% P to B
  P = 100% P to A
  Not defined = omit from model code
Product substitution DRE(M)(E) 10/25 Series 5X to 6X

Discontinuation:

1. As already announced in IH 006-10, the DRE (M)(E)...5X valves will be set to order stop (AS) status in November 2011.
2. The new DRE(E)...6X series without max. pressure limitation has been available since February 2010.
3. The new DREM(E)...6X with max. pressure limitation has been available since February 2011.

Advantages of the new series

- No solenoid ventilation required any more
- Improved damping
- Rotatable and/or detachable solenoid coil
- With OBE, the current / voltage interface can be selected (see data sheet)
- Solenoid current can be tapped at the connector (pin F-C)

Technical features

Size 10 and 25
Component series 5X
Maximum set pressure: 315 bar
Maximum flow:
- 200 l/min (size 10)
- 300 l/min (size 25)

Size 10 and 25
Component series 6X
Maximum set pressure: 315 bar
Maximum flow:
- 200 l/min (size 10)
- 300 l/min (size 25)
Modification features

- As pilot valve, the DBET(E)-6X is used for all variants.
- The valve main stages of both series are identical.
- Regarding the connection pattern as well as the hydraulic characteristic values, valves of series 6X and the current types are interchangeable.
- For safety reasons, the units of series 6X are designed without manual override.
- Version DRE(M)E with integrated electronics is interchangeable 1:1 (identical pin assignment).
- In case of versions with external electronics, valves of series 6X cannot be operated with the electronics of series 5X and vice-versa.
- There is the option of choosing a 800mA coil (G24-8) for valves with external electronics. This type can be used as an alternative functional replacement of series 5X without changing the amplifier.
- Attention: characteristic curves deviate from the old series 5X. See example and data sheet RD 29276.
Comparison of series 5X and 6X

<table>
<thead>
<tr>
<th></th>
<th>Serie 5X</th>
<th>Serie 6X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve for reducing an operating pressure</td>
<td>Valve for reducing an operating pressure</td>
<td></td>
</tr>
<tr>
<td>Proportional solenoid operation</td>
<td>Proportional solenoid operation</td>
<td></td>
</tr>
<tr>
<td>For subplate mounting: Porting pattern according to DIN 24340 from D, subplates according to data sheet 45062</td>
<td>For subplate mounting: Porting pattern according to ISO 5781, subplates according to data sheet 45062</td>
<td></td>
</tr>
<tr>
<td>Third way A to Y (Ø 6 mm)</td>
<td>Third way A to Y (Ø 6 mm)</td>
<td></td>
</tr>
<tr>
<td>Minimum set pressure 2 bar with command value zero</td>
<td>Minimum set pressure 2 bar with command value zero</td>
<td></td>
</tr>
<tr>
<td>Linearized command value/pressure characteristic curve</td>
<td>Linearized command value/pressure characteristic curve</td>
<td></td>
</tr>
<tr>
<td>Main spool in rest position closed from B to A</td>
<td>Main spool in rest position closed from B to A</td>
<td></td>
</tr>
<tr>
<td>Good oscillation behaviour</td>
<td>Good oscillation behaviour</td>
<td></td>
</tr>
<tr>
<td>Optional check valve between A and B</td>
<td>Optional check valve between A and B</td>
<td></td>
</tr>
<tr>
<td>Optional max. pressure limitation</td>
<td>Optional max. pressure limitation</td>
<td></td>
</tr>
<tr>
<td>For the control of types DRE and DREM:</td>
<td>For the control of types DREand DREM:</td>
<td></td>
</tr>
<tr>
<td>• Analog amplifier type VT_VSPA1(K)-1 in Eurocard format according to data sheet 30111</td>
<td>• Analog amplifier type VT-MSPA1-11-1X/ in modular design according to data sheet 30 223</td>
<td></td>
</tr>
<tr>
<td>• Digital amplifier type VT-VSPD-1 in Eurocard format according to data sheet 30123</td>
<td>• Digital amplifier type VT-VSPD-2 in Eurocard format according to data sheet 30 523</td>
<td></td>
</tr>
<tr>
<td>• Analog amplifier type VT 11724 in modular design according to data sheet 29866</td>
<td>• Analog amplifier type VT-VSPA1-11-1X/ in Eurocard format according to data sheet 30 100</td>
<td></td>
</tr>
<tr>
<td>• Plug-in proportional amplifier type VT-SSPA1-1-1X plug-in amplifier according to data sheet 30 116 connection M12 – 4polig</td>
<td>• Plug-in proportional amplifier type VT-SSPA1-1-1X plug-in amplifier according to data sheet 30 116 connection M12 – 4polig</td>
<td></td>
</tr>
<tr>
<td>Type DREE und DREME with integrated electronics (OBE):</td>
<td>Type DREE und DREME with integrated electronics (OBE):</td>
<td></td>
</tr>
<tr>
<td>• Little manufacturing tolerance of the command value/pressure characteristic curve</td>
<td>• Little manufacturing tolerance of the command value/pressure characteristic curve</td>
<td></td>
</tr>
<tr>
<td>• Independently adjustable ramp time for pressure build-up and pressure reduction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Old | New
--- | ---
Data sheet RD29160 | Data sheet RE29361 (future)

Data sheet RD29142

**Technical features**
Sizes 10, 25 und 32
Component series 3X and 5X
Maximum set pressure: 350 bar
Maximum flow:
- 200L/min – NG 10
- 400L/min – NG 25
- 600L/min – NG 32

**Technical features**
Sizes 10, 25 und 32
Component series 7X
Maximum set pressure: 350 bar
Maximum flow:
- 275L/min – NG 10
- 550L/min – NG 25
- 700L/min – NG 32

Special variant SO 699 series 3X available in NG 10 to 32 up to 500 bar
Subplate mounting and threaded connection
e.g. DBEM(E)…3X/500…SO699

**Changes**

- Valves of series 7X are 1:1 interchangeable with the current types in terms of port pattern, mounting screws and hydraulic data
- The electrical interfaces K4 and K31 (OBE) are identical
- In series 7X, manual overrides will no longer be available for safety reasons
- Series 7X will be available only with maximum pressure relief function
- SO 1 (800 mA Version) of the old series can be substituted by G24-8 in series 7X
- Compared with the old series, width and length are identical, the height is greater
- With sizes 10 and 25 of the new series, the external Y port is located at the same position as with the old series, with size 32, it is positioned 44.5 mm higher.
Dimensions

<table>
<thead>
<tr>
<th>NG</th>
<th>Height Old (3X/5X) with OBE</th>
<th>Height New (7X) with OBE</th>
<th>Height Old (3X/5X) without OBE</th>
<th>Height New (7X) without OBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>142.5mm</td>
<td>206.5mm</td>
<td>145mm</td>
<td>191.5mm</td>
</tr>
<tr>
<td>25</td>
<td>143.5mm</td>
<td>206.5mm</td>
<td>146mm</td>
<td>191.5mm</td>
</tr>
<tr>
<td>32</td>
<td>172.5mm</td>
<td>206.5mm</td>
<td>174mm</td>
<td>191.5mm</td>
</tr>
</tbody>
</table>

Changes, electrical

With regard to the variant with OBE, no changes must be taken into account

Activation with variant without integrated electronics (without OBE)

With standard coil G24 (1600mA):

<table>
<thead>
<tr>
<th>Control for type DBE...3X and 5X</th>
<th>Control for type DBEM...7X</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Analog amplifier VT-VSPA1-1 in Euro-card format to data sheet 30111</td>
<td>• Analog amplifier VT-VSPA1-2-1X/V0/... in Euro-card format to data sheet 30115</td>
</tr>
<tr>
<td>• Analog amplifier VT 11030 of modular design to data sheet 29741</td>
<td>• Analog amplifier VT-MSPA1-1-1X/V0/... of modular design to data sheet 30223</td>
</tr>
<tr>
<td>• Digital amplifier VT-VSPD-1 in Euro-card format to data sheet 30123</td>
<td>• Digital amplifier VT-VSPD-1-2X/V0/-0-1 to data sheet 30523</td>
</tr>
<tr>
<td>• Analog amplifier VT 11131 of modular design to data sheet 29865</td>
<td>• Analog amplifier VT-SSPA1-1-1X/V0/0-24 as plug-in amplifier to data sheet 30265</td>
</tr>
</tbody>
</table>

With solenoid coil G24-8 (800 mA):

With this variant, the old control electronics can be maintained.
Use as substitute for old series (SO 1, SO 2) with 800mA coil.
Exemplary comparison of characteristic curves of series 3X/5X and new series 7X (800mA coil)
DBET(E)
Differences between series 5X and 6X

- Coils:
  - Series 5X used rectangular DC proportional solenoids
    - Coil resistance 19.5 ohm / 800mA max current
  - Series 6X uses pole tube with removable coils
    - Coil resistance 5.5 ohm / 1600mA max current

- Control Electronics for DBET
  - Series 5X used VT-VSPA1-1-1X (RE30111) or VT-2000 (RE29904)
    - Cardholder VT-3002-2X/32D (RE29928)
    - Modular amplifier VT-11030 (RE29741)
  - Series 6X uses VT-VSPA1-2-1X (RE30115)
    - Cardholder VT-3002-2X/48F (RE29928)
    - Modular amplifier VT-MSPA1-1-1X (RE30223)

- Ramp function for DBETE:
  - 5X – ramp up and ramp down individual adjustments
  - 6X – no internal ramp functions; if required, an external ramp module will be needed

- Control Input for DBETE
  - Series 5X – Pots are used to set minimum and maximum currents
    - 0-10 volt only option
  - Series 6X – Only maximum current is adjustable
    - A1 = 0-10 volt
    - F1 = 4-20mA

- Pins F and C for DBETE:
  - Series 5X
    - C & F = no connection
  - Series 6X
    - C = reference
    - F = actual solenoid current (0 to 1.6V) mV=mA
• Other points
  o Manual override not available on series 6X
  o SO-1 in series 5X is standard in series 6X (threaded Y port G1/4 thread)
  o Viton seals are standard on series 6X
  o External Drain option Y available on both series
  o Mounting bolts
    ▪ 5X – M5 x 30
    ▪ 6X – M5 x 45

• Size differences DBETE:
Notice of Series Change for DRE10/20

Effective **October 2010** the DRE(E)...5X valves will be obsolete. The replacement DRE(E)...6X will be made available starting **February 2010**. During this time all new applications should be directed to the DRE(E)...6X valves while only orders for replacements should be taken for the DRE(E)...5X valves.

Effective **December 2010** the DREM(E)...5X valves will be obsolete. The replacement DREM(E)...6X will be made available starting in **July 2010**. During this time all new applications should be directed to the DREM(E)...6X while only orders for replacements should be taken for the DREM(E)...5X valves.

**Common features between the series:**
- Main stages of both series are identical.
- Hydraulic characteristics and connections are comparable between the two series.
- Version DREE with on board electronics is interchangeable between the two series (identical pin assignment).

**Differences:**
- Rotatable and removable coil design for series 6X.
- No manual override option.
- DRE(M)...6X valves require a new amplifier (Discussed in detail below).
- With OBE version a 4 to 20mA input command option is now available denoted by F1 in the model code.
- Solenoid current can be measured across pins F & C.

**Amplifiers Required for Series 6X:**
- VT-VSPA1-11-1X/V0/0 (R901152637) data sheet RE30100 with cardholder (R900020154) VT3002-1-2X/48F data sheet RE29928
- VT-MSPA1-11-1X/V0/0 (R901142360) data sheet RE30223
Notice of Series Change for DRE10/20 (continued)

Electrical Connection Changes:

### Electrical Connections

**VT-VSPA1-1-1X/**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>VT-VSPA1-11-1X/**</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>Ramp &quot;UP&quot; OFF</td>
<td></td>
</tr>
<tr>
<td>2c</td>
<td>Ramp &quot;DOWN&quot; OFF</td>
<td></td>
</tr>
<tr>
<td>4ac</td>
<td>Contact for Ramp Off option</td>
<td></td>
</tr>
<tr>
<td>6ac</td>
<td>Ground</td>
<td>z20</td>
</tr>
<tr>
<td>8ac</td>
<td>Ground</td>
<td>z20</td>
</tr>
<tr>
<td>10ac</td>
<td>+9V on board power supply</td>
<td>N/A</td>
</tr>
<tr>
<td>12ac</td>
<td>Input Command 1 (9V)</td>
<td>N/A</td>
</tr>
<tr>
<td>14ac</td>
<td>Measured Zero (M0)</td>
<td>N/A</td>
</tr>
<tr>
<td>16ac</td>
<td>-9V on board power supply</td>
<td>N/A</td>
</tr>
<tr>
<td>18ac</td>
<td>0V power supply</td>
<td>z32</td>
</tr>
<tr>
<td>20ac</td>
<td>Solenoid Connection</td>
<td>z2, z4</td>
</tr>
<tr>
<td>24ac</td>
<td>+24V Power Supply</td>
<td>z32, z30</td>
</tr>
<tr>
<td>26a</td>
<td>Actual Current Value</td>
<td>d32</td>
</tr>
<tr>
<td>26c</td>
<td>Ready for Operation</td>
<td>d22</td>
</tr>
<tr>
<td>28ac</td>
<td>Input Command 2 (+10V)</td>
<td>b14, b22</td>
</tr>
<tr>
<td>30ac</td>
<td>Input Command 2 (0V ref.)</td>
<td>b14, b22</td>
</tr>
<tr>
<td>30ac</td>
<td>Input Command 2 (4 to 20mA) +</td>
<td>b22</td>
</tr>
<tr>
<td>32ac</td>
<td>Command Value (0 to 6V)</td>
<td>d30</td>
</tr>
</tbody>
</table>

**VT11724-1X/**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>VT-MSPA1-11-1X/V0/0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V Power Supply</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0V Power Supply</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Input Command 0V Reference</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Solenoid Connection</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Solenoid Connection</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Input Command 0 to +10V</td>
<td>6</td>
</tr>
</tbody>
</table>
Product substitution DRE(M)(E) 32 series 4X to 6X

Discontinuation:

- From January 2012 the DRE(M)(E)32...4X valves will be set to phase-out control (AL) status. These valves are only to be used as replacement. From April 2012 they will be set to order stop (AS) status.

Announcements:

- The start of the new series DRE(M)(E)32...6X is January 2012.

Advantages of the new series:

- No solenoid venting required any more
- Improved damping
- Rotatable and/or detachable solenoid coil
- With OBE, the current/voltage interface can be selected (see data sheet)
- Solenoid current can be tapped at the connector (Pin F-C)

Technical features

**Size 32**
Component series 4X
Maximum set pressure: 315 bar
Maximum flow: 300l/min

**Size 32**
Component series 6X
Maximum set pressure: 315 bar
Maximum flow: 300l/min
Modification features

- As pilot valve, the DBET(E)-6X will be used for all variants.
- The valve main stages of both series are identical.
- Regarding the connection diagram as well as the hydraulic characteristic values, valves of series 6X and the current types are interchangeable.
- For safety reasons the units of series 6X are designed without manual override.
- Version DREE with integrated electronics is 1:1 interchangeable (identical pin assignment).
- In case of versions with external electronics, the valves of series 6X cannot be operated with the electronics of series 4X and vice-versa.
- Characteristic curve of the new series 6X is linearized, as a result modified nominal value / pressure behaviour.

Comparison of series 4X and 6X

<table>
<thead>
<tr>
<th></th>
<th>series 4X</th>
<th>series 6X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve for reducing an operating pressure</td>
<td>Valve for reducing an operating pressure</td>
<td></td>
</tr>
<tr>
<td>Operation with proportional solenoid</td>
<td>Operation with proportional solenoid</td>
<td></td>
</tr>
<tr>
<td>For subplate mounting: Porting pattern according to DIN 24340 form D, sub plates according to data sheet</td>
<td>For sub plate mounting: Porting patterns according to DIN 24340 form D, ISO 5781, ISO 5781</td>
<td></td>
</tr>
<tr>
<td>Valves and electronic control from one source</td>
<td>Valves and electronic control from one source</td>
<td></td>
</tr>
<tr>
<td>Optional check valve between A and B</td>
<td>Optional check valve between A and B</td>
<td></td>
</tr>
<tr>
<td>Optional max. pressure limitation</td>
<td>Optional max. pressure limitation</td>
<td></td>
</tr>
</tbody>
</table>

For the control of types DRE und DREM:
- Analog amplifier type VT 11030 in modular design according to data sheet 29 741
- Analog amplifier type VT-VSPA1(K)-1 in Eurocard format according to data sheet 30 111
- Digital amplifier type VT-VSPD-1 in Eurocard format according to data sheet 30 123

For the control of types DRE und DREM:
- Plug-in proportional amplifier type VT-SSPA1-1-1X plug-in amplifier according to data sheet 30 116 connection M12 – 4polig
- Analog amplifier type VT-MSPA1-11-1X in modular design according to data sheet 30 223
- Analog amplifier type VT-VSPA1-11-1X in Eurocard format according to data sheet 30 100
- Digital amplifier type VT-VSPD-2 in Eurocard format according to data sheet 30 523

Type DREE und DREME with integrated electronics (OBE):
- Little manufacturing tolerance of the command value / pressure characteristic curve
- Independently adjustable ramp time for pressure build-up and pressure reduction

Type DREE und DREME with integrated electronics (OBE):
- Little manufacturing tolerance of the command value / pressure characteristic curve

Option

- When replacing series 4X by 6X without changing valve electronics it is possible to choose a 800mA version of series 6X (G24-8). Using the 800mA version, characteristic curves of series 4X and 6X differ.

See example:
<table>
<thead>
<tr>
<th>Original Valve</th>
<th>Data Sheet</th>
<th>Replacement Valve</th>
<th>Data Sheet</th>
<th>Changes Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE16C1X/L</td>
<td>29203</td>
<td>FE16C-2X/140L...</td>
<td>29202</td>
<td>Amplifier must change to the VT-VRPA1-50-1X R900952202. The amplifier comes from the factory already setup for the FE16 series 2X valve. The only change required is to install jumper X3 for internal &quot;Enable&quot;.</td>
</tr>
<tr>
<td>FE16C1X/Q</td>
<td>29203</td>
<td>FE16C-2X/140Q...</td>
<td>29202</td>
<td>Amplifier must change to the VT-VRPA1-50-1X R900952202. The amplifier comes from the factory already setup for the FE16 series 2X valve. The only change required is to install jumper X3 for internal &quot;Enable&quot;.</td>
</tr>
<tr>
<td>FE25C1X/L</td>
<td>RE29203</td>
<td>FES(E)25CA-3X/315L</td>
<td>RE29209</td>
<td>Amplifier must change to the VT-VRPA1-50-1X R900952202. Jumper for X2, must be installed across pins 3&amp;4. Jumper X3 must be installed for internal &quot;Enable&quot;. The FESE with on board electronics is also an option if environmental conditions warrant its use.</td>
</tr>
<tr>
<td>FE25C1X/Q</td>
<td>RE29203</td>
<td>FES(E)25CA-3X/200Q</td>
<td>RE29209</td>
<td>Amplifier must change to the VT-VRPA1-50-1X R900952202. Jumper for X2 must be installed across pins 3&amp;4. Jumper X3 must be installed for internal &quot;Enable&quot;. The FESE with on board electronics is also an option if environmental conditions warrant its use.</td>
</tr>
<tr>
<td>FE25C-2X...</td>
<td>RE29204</td>
<td>FES(E)25CA-3X...</td>
<td>RE29209</td>
<td>Amplifier does not have to change. The FESE with on board electronics is also an option.</td>
</tr>
<tr>
<td>Model</td>
<td>Feedforward</td>
<td>Feedback</td>
<td>Jumper X3</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>----------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>FE32C-1X</td>
<td>RE29204</td>
<td>FES(E)32CA-3X</td>
<td>RE29209</td>
<td>Amplifier must change to the VT-VRPA1-51-1X R900952204. Amplifier is preset from the factory for the FES32. Jumper X3 must be installed for internal &quot;Enable&quot;. The FESE32 with on board electronics is also an option.</td>
</tr>
<tr>
<td>FE32C-1X/280Q</td>
<td>RE29204</td>
<td>FES(E)32CA-3X/280Q with SO5</td>
<td>RE29209</td>
<td>Amplifier must change to the VT-VRPA1-51-1X R900952204. Amplifier is preset from the factory for the FES32. Jumper X3 must be installed for internal &quot;Enable&quot;. The FESE32 with on board electronics is also an option.</td>
</tr>
<tr>
<td>FE40C-1X</td>
<td>RE29204</td>
<td>FES(E)40CA-3X</td>
<td>RE29209</td>
<td>Amplifier must change to the VT-VRPA1-51-1X R900952204. Jumper X3 must be installed for internal &quot;Enable&quot;. The FESE40 with on board electronics is also an option.</td>
</tr>
<tr>
<td>FE50C-1X</td>
<td>RE29204</td>
<td>FES(E)50CA-3X</td>
<td>RE29209</td>
<td>Amplifier must be changed to the VT-VRPA1-52-1X R900952205. Amplifier is preset from the factory for the FES50. Jumper X3 must be installed for internal &quot;Enable&quot;. If the original valve used 7/8 inch UNC bolts then order the FES with SO8 as the replacement. The FESE50 with on board electronics is also an option.</td>
</tr>
<tr>
<td>FE63C-1X</td>
<td>RE29204</td>
<td>FES(E)63CA-3X</td>
<td>RE29209</td>
<td>Amplifier must change to the VT-VRPA1-52-1X R900952205. Jumper X3 must be installed for internal &quot;Enable&quot;. The FESE63 with on board electronics is also an option.</td>
</tr>
<tr>
<td>FES(E)-2X</td>
<td>RE29208</td>
<td>FES(E)-3X</td>
<td>RE29209</td>
<td>Series 3X valves with SO1 will be the replacement for series 2X valves. SO1 is needed if the Z1 port was used on the series 2X valve. The &quot;CC&quot; version is being dropped from the standard product range but it will still be available in the series 3X to use as a replacement for series 2X. When valves from size 32 to 63 are replaced, their associated amplifier must be replaced also at that time. For the size 32 the VT5063 is replaced by the VT-VRPA1-51-1X R900952204. The VT-VRPA1-51-1X is preset from the factory for the FES32. For the size 40, the VT5064 is replaced by the VT-VRPA1-51-1X R900952204. Jumper X2 must be installed across pins 3&amp;4.</td>
</tr>
</tbody>
</table>

Contact: Bosch Rexroth Corp.  
2315 City Line Road  
Bethlehem, PA 18017  
(610)694-8300
For the size 50, the VT5065 is replaced by the VT-VRPA1-52-1X R900952205. The VT-VRPA1-52-1X is preset from the factory for the FES50.
For the size 63, the VT5066 is replaced by the VT-VRPA1-52-1X R900952205. Jumper X2 must be installed across pins 3&4.
NG10 Servo Valves
Differences Between Series 4X and Series 5X

4WS2EM10-4X (RE29586)  4WS2EM10-5X (RE29583)

Feedback Options:
- **Series 4X**
  - M = Mechanical feedback – standard for valves with separate amplifier
  - E = Electrical feedback – standard for valves with integrated electronics
  - B = Barometric feedback – spring centered
- **Series 5X**
  - M = Mechanical feedback
  - D = Mechanical & Electrical feedback – only available with integrated electronics

Flow Rate on the 5X series has been increased to 90L/min.

Coil Options for valves with non-integrated electronics:
- **Series 4X**
  - 1 = 5mA / 500 ohms per coil
  - 2 = 30mA / 40 ohms per coil
  - 3 = 7.5mA / 200 ohms per coil
  - 4 = 20mA / 80 ohms per coil
  - 5 = 50mA / 28 ohms per coil
- **Series 5X**
  - 11 = 30mA / 85 ohms per coil

Command Options for valves with integrated electronics:
- **Series 4X**
  - 8 = +/-10mA / 1K ohm
  - 9 = +/-10V / >50K ohm
- **Series 5X**
  - 9 = +/-10V
  - 13 = +/-10mA
Input Pressure Range:

- Series 4X
  - Electrical (E) or Barometric (B) versions: 40 / 70 / 140 / 210 bar
  - Mechanical (M) version: 315 bar
- Series 5X:
  - 210 / 315 bar

Mechanical Null:

- Series 4X had a mechanical null adjustment which was factory set
- Series 5X has no mechanical null adjustment
  - SO100: 10% offset P>B and A>T
  - SO102: 10% offset P>A and B>T

Electrical Connections:

- Series 4X:
  - K8 = External Control Electronics
  - K9 = Integrated Electronics with electrical feedback
  - K13 = Integrated electronics with Mechanical / Barometric feedback
- Series 5X:
  - K31 = Integrated or non-integrated electronics; K8 avail in some EM models

Spool Overlap: No changes

Physical Dimensions: Series 5X is larger than series 4X, consult the appropriate data sheet.

Seal Options:

- Series 4X was offered in NBR (B) or FKM (V) seals
- Series 5X is only offered in FKM (V) seals

Port Patterns:

- Series 4X with “ET” replaced by series 5X with “ET”
  - Series 5X requires a minimum mounting surface of 90 X 70mm
    - Plate R900320784 meets this requirement, bolt length changes by 5mm
    - Plate R978814677 meets the requirement, bolt length changes by 10mm
- Series 4X with external “X” port
  - Use plate R978048324 kit, mounting bolt length changes by 25mm

Mounting Bolts:

- Series 4X: M6 X 50mm
- Series 5X: M6 X 70mm
4WRD(E)

<table>
<thead>
<tr>
<th>Original Valve</th>
<th>Data Sheet</th>
<th>Replacement Valve</th>
<th>Data Sheet</th>
<th>Changes Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>4WRD-4X</td>
<td>29091</td>
<td>4WRD-5X</td>
<td>29093</td>
<td>The pilot valve has a different electrical connector, K17. Mating connector part number is R900005414. Coil A is wired across pins A &amp; C and coil B is wired across pins B and D. A positive signal to A&amp;B and negative to C&amp;D causes flow in the main stage from P to A. Pins E and F can be jumped to be used as a cable break signal. The connections for the position transducer are the same. The VT1610 amplifier should be updated when changing valve series. The &quot;L&quot; linear flow characteristic should be used to replace most older series spools.</td>
</tr>
<tr>
<td>4WRDE-4X</td>
<td>29091</td>
<td>4WRDE-5X</td>
<td>29093</td>
<td>The series 5X must have the +/-15Vdc supply voltage called out in the model code to directly replace the series 4X valve. Electrical connections would remain the same. The &quot;L&quot; linear flow characteristic can be used to replace most spools of the older series.</td>
</tr>
<tr>
<td>4WRD(E)-4X</td>
<td>29091</td>
<td>4WRL(E)-3X</td>
<td>29086</td>
<td>Before using a 4WRL(E) as a replacement make sure there is enough clearance for the position transducer on the valve. The 4WRL(E) has the position transducer on the opposite side from the standard 4WRD(E) valve. If the 4WRD(E) had SO259 then clearance for the position transducer will not be a factor. When replacing valves that had spools with positive overlaps such as E &amp; W the &quot;S&quot; flow characteristic is suitable. If replacing a V or Q spool the &quot;M&quot; characteristic is the most suitable. The Q4 will replace the Q2 used in the 4WRD. When using a 4WRL, the amplifier, cardholder and wiring must change. Also the power supply to the amplifier must change to +/-24Vdc supply as compared to the +/-15Vdc supply most VT1610 amplifiers use. The amplifier is 0811405063, data sheet 30045. The cardholder is 1834486001, DIN41 612-F32. When using the 4WRLE, the power supply voltage must change to 24Vdc. Most of the current 4WRDE valves use +/-15Vdc as the supply voltage. This would change the wiring to pins A, B and C. Pin A is 24 volts, pin B is 0 volts (common of power supply) and pin C is now the reference for pin F (feedback voltage). Pins D &amp; E are still the input for the command signal. The 4WRLE uses a 7 pin connector, mating connector part number is 1834482022 for solder connections.</td>
</tr>
<tr>
<td>4WRD(E)-5X</td>
<td>29093</td>
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<td>29087</td>
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<td>29088</td>
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<td>29089</td>
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</tbody>
</table>
4WRD(E)

4WRD(E)-4X  29091  4WRTE-4X  29083
4WRD(E)-5X  29093

The power supply voltage will need to change to 24Vdc from the +/-15Vdc. This will change the wiring on pins A, B and C. Pin A is 24Vdc, pin B is 0 volts (common of power supply) and pin C becomes the reference for pin F (feedback voltage). Pins D and E are still the input for the command signal.

The 4WRTE uses a 7 pin connector, K31. Mating connector part number is R900021267 for plastic or R900223890 for metal.

The "L" flow characteristic can be used to replace most spools. The "P" characteristic may be needed to be used with the Q2 spool.
ZDRE(E) 10
Series change from 1X to 2X

Products set to status AL in April 2008. Use only for spare parts purposes. Status AS from Dec. 2008 on

Start of new series in April 2008

ZDRE(E) series 1X Data sheet RE 29179

ZDRE(E) series 2X Data sheet RE 29279

Technical features

<table>
<thead>
<tr>
<th>ZDRE(E) series 1X (RE 29179)</th>
<th>ZDRE(E) series 2X (RE 29279)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component series 1X</td>
<td>Component series 2X</td>
</tr>
<tr>
<td>Size 10</td>
<td>Size 10</td>
</tr>
<tr>
<td>Maximum pressure setting 315 bar</td>
<td>Maximum pressure setting 315 bar</td>
</tr>
<tr>
<td>Maximum flow 80 l/min</td>
<td>Maximum flow 80 l/min</td>
</tr>
</tbody>
</table>

Features of the modification

- The cartridge valve of DBET(E)-6X will be used as pilot valve for all series 2X variants. The valve's main stage will remain unchanged.
- With regard to the porting pattern and the hydraulic data, valves of series 2X are interchangeable with the current types.
- Variant ZDREE with integrated electronics is fully interchangeable (identical plug connection)
- In the case of variants with external electronics, valves of series 2X cannot be operated with the electronics of series 1X and vice versa.
- For safety reasons, valves of series 2X are designed without manual override.

Advantages of the new series

- Solenoid vent no longer required
- Improved damping
- Solenoid coil can be rotated or detached
- For OBE a current/voltage interface can be selected (see data sheet)
- Solenoid current can be picked up from the plug connector (Pin F-C)
<table>
<thead>
<tr>
<th><strong>Comparison of ZDRE(E) series 1X with series 2X</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZDRE(E) series 1X</strong></td>
<td><strong>ZDRE(E) series 2X</strong></td>
</tr>
<tr>
<td>Actuation by proportional solenoid</td>
<td>Actuation by rotatable proportional solenoid</td>
</tr>
<tr>
<td><strong>Sandwich plate design</strong></td>
<td>Sandwich plate design</td>
</tr>
<tr>
<td>Porting pattern to DIN 24340 form A and ISO 4401</td>
<td>Porting pattern to DIN 24340 form A and ISO 4401</td>
</tr>
<tr>
<td><strong>External control electronics for type ZDRE 1X</strong></td>
<td><strong>External control electronics for type ZDRE 2X</strong></td>
</tr>
<tr>
<td>• Analog amplifier VT 11131 of modular design according to RE 29695</td>
<td>• Analog amplifier VT-MSPA1-11-IX/VO of modular design according to RE 30223</td>
</tr>
<tr>
<td>• Analog amplifier VT-VSPA1(K)-1 in Euro-card format according to RE 30111</td>
<td>• Analog amplifier VT-VSPA1-11-IX/VO/0 in Euro-card format according to RE 30100</td>
</tr>
<tr>
<td>• Digital amplifier VT-VSPD-1 in Euro-card format according to RE 30123</td>
<td>• Digital amplifier VT-VSPD-1-2X/V0/.0-1 in Euro-card format according to RE 30523</td>
</tr>
<tr>
<td><strong>Important:</strong> Control electronics cannot be used for series 1X</td>
<td></td>
</tr>
<tr>
<td><strong>Integrated electronics (OBE) for type ZDREE</strong></td>
<td></td>
</tr>
<tr>
<td>• Smaller manufacturing tolerances of the command value/pressure characteristic curve</td>
<td></td>
</tr>
<tr>
<td>• Current interface F1 or voltage interface A1 optional</td>
<td></td>
</tr>
</tbody>
</table>