NelesAce™
BASIS WEIGHT CONTROL UNIT
Installation, Maintenance and Operating Instructions
Table of Contents

1 GENERAL ..............................................................3
  1.1 General view .......................................................3
  1.2 Operating principle of the control unit ..............3
  1.3 Markings ............................................................3
  1.4 Technical specifications .....................................3
  1.5 Recycling and disposal .......................................5
  1.6 Safety precautions .............................................5

2 MOUNTING ..........................................................5
  2.1 Valve mounting .....................................................5
  2.2 Actuator mounting .............................................5
  2.3 Control unit mounting .......................................5

3 COMMISSIONING ...................................................6

4 MODIFYING THE PARAMETERS ..........................7
  4.1 Hardware requirements to use IPCOMM ..........7
  4.2 Getting started ....................................................7
  4.3 Basic functions ..................................................7
  4.4 Limitation of the motor current .......................8
  4.5 Option inputs and PLC commands ...............8

5 OPERATING ........................................................10
  5.1 General ..........................................................10
  5.2 Keyboard functions .........................................10
  5.3 LEDs in the control panel ................................10

6 MAINTENANCE ..................................................10
  6.1 General ..........................................................10
  6.2 Calibration of the display .................................10
  6.3 Replacement and calibration of the potentiometer and R/I modulator ...............11
  6.4 Removal and reinstallation of the actuator ..............11
  6.5 Trouble shooting ............................................11
  6.6 Recommended preventive maintenance. 11

7 ASSEMBLY DRAWINGS AND PART LISTS ..........15
  7.1 Actuator ..........................................................15
  7.2 Control unit ......................................................16

8 DIMENSIONS AND WEIGHTS ..............................17

9 TYPE CODE .........................................................18

READ THESE INSTRUCTIONS FIRST!
These instructions provide information about safe handling and operation of the control unit.
If you require additional assistance, please contact Metso’s Automation business or your authorized distributor or representative.

SAVE THESE INSTRUCTIONS!

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1 GENERAL

1.1 General view

Metso NelesAce® basis weight control system comprises a V-port segment valve, an actuator and a control unit.

The valve is a standard R-series V-port segment valve. A stepping motor is used in the actuator to reach the best possible degree of regulation. The actuator is equipped with both open and close position limit switches and with a position transmitter.

The process control system transmits a digital signal to the control unit which in turn automatically controls the actuator. Manual operation is also possible.

1.2 Operating principle of the control unit

The step motor controller is in command of the four-wire connected step motor in the valve actuator. The controller’s protection class is IP65. Input signals are transmitted to the controller through six digital input channels. Alternatives are pulse duration interface or time duration interface. There are also optional input channels (Option 1 and Option 2). When option inputs are in use, it is possible to change the step size and time duration frequencies remotely. The process control system (DCS) transmits a pulse mode. The pulse mode then drives the step motor to either the open or close directions depending on the channel which DCS is using (open or close). The movement stops if the pulses end or the actuator reaches the limit switch. In time duration mode the step motor starts to move from the pulse leading edge and stops from the pulse trailing edge or when the actuator reaches the limit switch. The opening angle of the actuator is 0 to 90°. The default factory value for the step setting is 1/2 step per pulse where 14100 pulses equals to 90 degree movement. The accuracy of regulation can be changed. In this case the step setting must be changed by programming it to 1/1 step (7050 pulses). The control unit is also equipped with inputs for two limit switch signals and feedback potentiometer signal. RS232/485 interface compatible IPCOMM software is delivered with the control unit. This software allows parameter changes to the control unit.

1.3 Markings

The valve controller is equipped with an identification plate sticker, see Fig. 2. Identification plate markings from top to bottom are:

- Type code of the actuator and control unit
- Nominal voltage
- Nominal current
- Supply voltage frequency
- Protection class
- Manufacturer number
- Serial number
- Gear ID
- Control unit ID
- Step motor ID
- Max. step motor current
- Ambient temperature

1.4 Technical specifications

1.4.1 Valve

See Installation, Maintenance and Operating instructions 3 R 74 for valve installation instructions.

Recommendation: Installation of the valve: 7 x DN downstream side and 10 x DN upstream side distance of the piping curve. Installing the valve into pipeline. See figure 3.

1.4.2 Actuator

Stepping motor:
- Motor type: ZSH87/3.200.5
- Number of steps: 200
- Step angle: 1.8° in full step mode
- Compatible with ministep-mode
- Protection class: IP68
- Insulation class: F
- EMC and CE approved (EN 60034-1)

Gear:
- Gear ratio: 1:141

Limit switches:
- Contacts: normally closed (NC)

Position transmitter:
- Output signal: 4–20 mA
- External load: 1 kΩ
Fig. 3  Installing the valve into pipeline

Fig. 4  Connection diagram
1.4.3 Control unit

- **Step motor controller type**: GSP 92-70
- **Nominal power**: 200 W max. motor power
- **Un**: 230 V AC (option 110 V AC)
- **In**: 2 A, fuse T 2.5 A (110 V: 4.2 A, fuse T 5 A)
- **Output power**: max. 9 A, when 70 V input to motor In 6.3 A
- **Steps**: 1/1 step 7050 pulses 0–90°
  - 1/2 step 14100 pulses 0–90°
  - 1/4 step 28200 pulses 0–90°
- **Factory settings**: 1/2 step, 14100 pulses / 0–90°
  - Local control mode 200 Hz
  - Time duration mode 150 Hz
- **Operational temp.**: 0°...50 °C
- **Protection class**: IP65
- **I/O alarm contact, opening contact**: 24 V DC, max. 50 mA
- **Manual operation, closing contact**: 24 V DC, max. 50 mA
- **Control signals**: pulse, time duration and option inputs: 24 V DC / 10 mA optocoupled

1.5 Recycling and disposal

Most control system parts can be recycled if sorted according to material. Most parts have material marking. A material list is supplied with the system. In addition, separate recycling and disposal instructions are available from the manufacturer. A control system can also be returned to the manufacturer for recycling and disposal against a fee.

1.6 Safety precautions

**CAUTION:**
Follow all marked cautions in Installation, maintenance and operating instructions when handling the valve.

**CAUTION:**
Do not exceed the permitted values!
Exceeding the permitted values marked on the control unit may cause damage to the control unit and to the equipment attached to it. Damage to the equipment and personal injury may result.

**CAUTION:**
Finger covers (170) must be on during operation!
Finger covers may only be removed from the bracket during maintenance and when power is switched off.

**CAUTION:**
The hand wheel (108) handle of actuator must be bent during operation. The handle can only be used when power is switched off.

2 MOUNTING

2.1 Valve mounting

**NOTE:** Install the valve with shaft in upright position. Consult factory for other positions.

See Installation, Maintenance and Operating Instructions 3 R 71 for valve installation instructions.

2.2 Actuator mounting

Actuator is mounted to valve at the factory.

The actuator is mounted to the valve with either two or four bolts. Actuator is connected to the valve shaft with a backlash-free joint.

2.3 Control unit mounting

2.3.1 General

- Dimensions for control unit are: length 400 mm, width 355 mm and height 150 mm.
- The cable between the control unit and the actuator may be up to 120 m.
- The control unit may not be installed above a radiant.
- Operating ambient temperature range of control unit is 0° to 50 °C.
- Heat sink (215) must have enough space to ensure cooling.
- Control unit must not be mounted on a vibrating base.
- Mount control unit on an even base using the attachment points of the control unit box.

2.3.2 Control unit connections

**ELECTRICAL SAFETY NOTE:**
The control unit does not have a main switch. The electrical installation must provide a main switch or a circuit breaker.

Control unit receives maximum of six cables, one or three from the control system, two from the actuator and one supply voltage cable. They are connected to the connector card of controller according to Fig. 3. The cable shields should be connected to the lead-ins to avoid any interference. Leading the cable from the DCS through a ferrite is recommended.

The internal connections of the control unit between the step motor controller, display card and connector card are made using cables with connectors. All cables must be connected to ensure the proper operation of the controller. Connector card, Fig. 4, connectors X1...X12, and step motor controller, Fig. 5, connectors X1...X6, are connected as follows:

<table>
<thead>
<tr>
<th>Connector card</th>
<th>Step motor controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>X7</td>
<td>X1</td>
</tr>
<tr>
<td>X9</td>
<td>X5</td>
</tr>
<tr>
<td>X10</td>
<td>X2</td>
</tr>
<tr>
<td>X11</td>
<td>X6</td>
</tr>
<tr>
<td>X12</td>
<td>display card</td>
</tr>
</tbody>
</table>
2.3.4 Cable connections for actuator

Two cables are connected to the actuator. The first is connected to the connector cover of actuator which has the connections of the limit switch and the feedback potentiometer, Fig. 6. The second cable is connected to the step motor, Fig. 7. The cables are connected as shown in Fig. 3.

3 COMMISSIONING

Check the following proceedings at commissioning:

- Check connections.
- Check grounding.
- Connect power supply.
- Check that LED 11 is lit (HW Enable), see Fig. 5.
- Move valve to open and close limits in manual mode. Check functioning of limit switches and position display.
- Connect control unit to automatic mode and check that the valve is also operable with the signal from control system.

NOTE:
When replacing the existing basis weight valve with NelesAce it is recommended to you verify and, if necessary, tune DCS parameters.

NOTE:
It is recommended that the valve position signal is used only for informative purposes and feedback for control is taken from other measures, e.g. flow.
4 MODIFYING THE PARAMETERS

IPCOMM program is a setup program for the controller. With the program the user can change every necessary parameter. Every controller is programmed with factory settings before sending to customer. The customer can modify the settings in accordance with the processes that they use. This chapter will concern only basics of the program. Use the online help (F1-button) file to get more information.

4.1 Hardware requirements to use IPCOMM

To use IPCOMM on your PC the following requirements should be fulfilled:

- Any modern PC with Windows® operation system.
- A free serial port (COM), or a suitable USB to serial port adapter (consult factory for suitability).

**NOTE:**
Most of the IPCOMM functions can also be started by using a keyboard input, but not all of them. Therefore, a mouse is necessary.

**NOTE:**
IPCOMM can only be used, if a controller is connected to your PC.

4.2 Getting started

When the customer has to modify parameters it is possible to do this with the PC and RS232 serial link cable (a laptop computer is recommended).

- Install the IPCOMM program to your PC.
- Connect the serial link cable to controller (connector X4) Fig. 5.
- Supply voltage for controller must be switched on.
- In login window (Fig.8) set the interface and baud-rate (COM1, 28800 Baud)
- Choose Axis 0.
- Push the Ø button from the toolbar.
- Now connection between the PC and the controller should be active.

4.3 Basic functions

Once a connection has been established between the computer and the controller, the user can carry out the configuration. The basic window (Fig. 9) includes several functions and information.

There are a few things that the user should check before any modifications are carried out.

- Check the general parameters. The OP-Mode must be PLC-Mode.
- The Type of Axis must be Linear.

**NOTE:**
Most of the IPCOMM functions can also be started by using a keyboard input, but not all of them. Therefore, a mouse is necessary.

**NOTE:**
IPCOMM can only be used, if a controller is connected to your PC.

![Fig. 9 Login window](image)

![Fig. 10 Basic window](image)

![Fig. 11 Status window](image)
4.4 Limitation of the motor current

Current settings are preset in the factory in accordance with the valve size. Settings can be modified in Current Selection window, Fig.11. In normal conditions there is no need to modify these settings, but in case the customer changes the actuator size and keep the same controller the settings can be modified.

Use IPCOMM software for motor current setting.

Remember to push Actual Parameters button after current value changes, otherwise changes will not be valid!

Factory settings and option input functions are indicated in Table 2. When option inputs are in use, it's possible to change the step size and time duration frequencies via DCS. The customer can make the control logarithmic instead of a linear control. The advantage of logarithmic control is that controlling grade changes is much faster and more accurate. Parameter changes can be done in following way:

- Check the possible errors before modifying the PLC commands.
- Push PLC>> button to open PLC-code window.
- Select parameter which you want to change.

To continue, follow instructions in Sections 4.5.1, 4.5.2 and 4.5.3.

Table 2 Factory settings and option inputs

<table>
<thead>
<tr>
<th>Pulse duration</th>
<th>Option input 1</th>
<th>Option input 2</th>
<th>Option input 1</th>
<th>Option input 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step size</td>
<td>1/2 step</td>
<td>1/1 step</td>
<td>2/1 step</td>
<td>1/4 step</td>
</tr>
<tr>
<td>max. step input frequency</td>
<td>400 Hz except 2/1-step 200 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time duration</th>
<th>Option input 1</th>
<th>Option input 2</th>
<th>Option input 1</th>
<th>Option input 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time duration speed</td>
<td>150 Hz</td>
<td>300 Hz</td>
<td>600 Hz</td>
<td>1200 Hz</td>
</tr>
<tr>
<td>min. time duration frequency is 50 Hz and max. 2 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following is a description of the application of NelesAce for the control system (DCS) vendor as the best available method to control basis weight through use of the features included in NelesAce.

The control method depends on the capabilities of the control system (DCS). In addition to the normal binary drive open, drive closed output card a pulse train output card is also needed to provide pulses to open and close the valve in discrete steps.

In normal automatic mode the DCS uses pulses to control NelesAce position. In this case DCS must have an appropriate pulse output card which can send pulses at the correct frequency (recommended time 25 ms per pulse). One pulse from the control system (DCS) moves the NelesAce by one pulse. Each pulse can equal 1/4 step, 1/2 step, 1 step, or 2 steps depending on which option or options are energized and how the NelesAce is programmed, see table 2.

Normal movement is 1/2 step per pulse. Connection 7 (see Fig. 3, Control 24 V DC) energized gives 1 step per pulse (= option 1). Correspondingly connection 8 energized gives 2 steps per pulse (= option 2). Both connections 7 and 8 energized gives 1/4 step per pulse (= option 1&2).

When using 1/4 step mode the valve takes 28200 pulses for full 0–100 % stroke, correspondingly 1/2 step takes 14100 pulses etc. Flow is controlled depending on the error between actual and desired flow rate. The decision for step size is made based on the magnitude of the error.
4.5.1 Changing pulse duration mode settings

**NOTE:**
In pulse duration command lines (move relative), don’t change the Offset and Run frequencies!

- To change the step size, scroll the command (Prog.) line selection slider to 0 (or up to 3, see Table 3).
- Set the new value; step size is indicated in 1/8 steps, so 4 is same as 1/2-step.
- Push Program it! button, that saves the new settings.
- Close PLC-code window.
- Now pulse duration mode change is finished.

![PLC-code window, pulse duration mode](image.png)

**Table 3** Pulse duration mode

<table>
<thead>
<tr>
<th>Prog. line (shown in PLC code window)</th>
<th>Step size and direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1/2 step open</td>
</tr>
<tr>
<td>1</td>
<td>1 step open</td>
</tr>
<tr>
<td>2</td>
<td>2 steps open</td>
</tr>
<tr>
<td>3</td>
<td>1/4 step open</td>
</tr>
<tr>
<td>16</td>
<td>1/2 step close</td>
</tr>
<tr>
<td>17</td>
<td>1 step close</td>
</tr>
<tr>
<td>18</td>
<td>2 steps close</td>
</tr>
<tr>
<td>19</td>
<td>1/4 step close</td>
</tr>
</tbody>
</table>

4.5.2 Changing time duration mode settings

- To change the open speed, scroll the command (Prog.) line selection slider to 32 (or up to 35, see Table 4).
- Change the Offsetfreq. and Run. Freq. values as required and press Program it! button, that saves the new settings.

**NOTE:**
In time duration command lines (Free run), notice that offset frequency (Offsetfreq.) must be smaller or equal than run frequency (Run. Freq.), otherwise the function of the time duration is not correct.

- On command (Prog.) line 48 (or up to 51, see Table 4) the close speed can be changed correspondingly.
- Close PLC-code window.
- Now time duration mode change is done.

![PLC-code window, time duration mode](image.png)

**Table 4** Time duration mode

<table>
<thead>
<tr>
<th>Prog. line (shown in PLC code window)</th>
<th>Speed and direction (factory settings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>150 Hz open</td>
</tr>
<tr>
<td>33</td>
<td>300 Hz open</td>
</tr>
<tr>
<td>34</td>
<td>600 Hz open</td>
</tr>
<tr>
<td>35</td>
<td>1200 Hz open</td>
</tr>
<tr>
<td>48</td>
<td>150 Hz close</td>
</tr>
<tr>
<td>49</td>
<td>300 Hz close</td>
</tr>
<tr>
<td>50</td>
<td>600 Hz close</td>
</tr>
<tr>
<td>51</td>
<td>1200 Hz close</td>
</tr>
</tbody>
</table>

See Table 2 for different option configurations.

4.5.3 Changing local control mode settings

- To change new speed for opening in the local control mode, scroll the command (Prog.) line selection slider to 40 (or up to 47, see Table 5).
- On command (Prog.) line 56 (or up to 63, see Table 5) the close speed can be changed correspondingly.
- Close PLC-code window.

**Table 5** Local control mode

<table>
<thead>
<tr>
<th>Prog. line (shown in PLC code window)</th>
<th>Action (factory settings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>41</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>42</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>43</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>44</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>45</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>46</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>47</td>
<td>200 Hz open</td>
</tr>
<tr>
<td>56</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>57</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>58</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>59</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>60</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>61</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>62</td>
<td>200 Hz close</td>
</tr>
<tr>
<td>63</td>
<td>200 Hz close</td>
</tr>
</tbody>
</table>
5 OPERATING

5.1 General

Step motor controller has two modes: automatic (AUTO) and local (MAN).

In automatic mode the control panel is disabled and step motor is controlled by the control system. In local control mode the step motor can be driven to both directions by using the control panel push buttons, Fig. 14. Automatic/local mode selection is done by AUTO/MAN push buttons. When selecting local control mode the MAN push button must be pressed for more than one (1) second. The lit LED indicates that local control mode (MAN) has been selected.

Control unit receives position information from the actuator’s potentiometer. This position information is shown as percentage in the panel’s LCD display. Control panel has LEDs to indicate limit switch status (open or close).

In the control panel display, 0 % indicates a closed valve and 100 % indicates an open valve.

5.2 Keyboard functions

Arrow push buttons < or >:

Arrow push buttons are only active in local control (MAN) mode. The valve closes with the arrow push button < and opens with the arrow push button >. The actuator moves as long as the button is pressed down or it reaches the limit switch.

AUTO/MAN selection:

AUTO and MAN modes are selected with corresponding keys.

5.3 LEDs in the control panel

AUTO/MAN (green):

LED indicates the operation mode of control unit. When LED is lit the control unit is in manual mode.

OPEN (red):

LED is lit when the actuator is in its opening position limit.

CLOSE (red):

LED is lit when the actuator is in its closing position limit.

6 MAINTENANCE

6.1 General

NelesAce is a digital and modular device. This facilitates maintenance. The smallest step motor movements are impossible to distinguish from the movements of valve or shafts without special measuring instruments. For this reason the functioning of control unit/actuator/valve-combination must be evaluated from the hand wheel (108) movements or lack of movements. The hand wheel is attached to motor shaft. The hand wheel’s handle must be pressed down during operation.

6.2 Calibration of the display

The output current of the actuator’s position transmitter is 4 mA when the valve is closed. When the valve is fully open the output current is 20 mA. Calibration to R/I modulator is carried out at the factory according to these output values. The display card has two potentiometers (R9 and R14) which are used to calibrate display readings to equal to the readings of current output.

Fig. 16 Calibration potentiometers in display card
The display is calibrated with the trimmer potentiometers of display card (216), Fig. 15. Potentiometers are marked as “SPAN” (R9) and “ZERO” (R14). When the valve is in the closing position and the current is 4 mA the display is adjusted with ZERO-potentiometer to 00.0 %. Current value is measured from the pins 2 and 3 in connector X5 in connector card. When the valve is in the open position the display reading is adjusted with SPAN-potentiometer to 100.0 %.

If the display shows - % continuously, the current loop is open. This can be the case if NelesAce is tested on the bench before connecting to DCS. In order to obtain the correct figures during the bench test connect a jumper between pins 3 and 4 on connector X5 to complete the circuit. Remove the jumper when connecting to DCS.

6.3 Replacement and calibration of potentiometer and R/I modulator

- Move valve to CLOSE position.
- Remove connector cover in actuator (143).
- Unfasten gear cover screws (126), 6 pieces.
- Disconnect modulator’s (50) connections.
- Unfasten potentiometer’s locking screws.
- Remove potentiometer and replace it with new one.
- Measure resistance from the potentiometer and adjust it to 50 Ω by turning the potentiometer’s shaft.
- Tighten potentiometer’s bracket (58).
- Tighten potentiometer’s locking screw (6).
- Attach gear cover.
- Measure current (4-20 mA) from connector X5 (2 and 3).
- When valve is in CLOSE position, current is 4 mA (potentiometer “4 mA” in R/I modulator).
- When valve is in OPEN position, current is 20 mA (potentiometer “20 mA” in R/I modulator).
- Attach connector cover in actuator.

6.4 Removal and reinstallation of the actuator

Actuator can be disengaged from the valve as follows:

- Move valve to CLOSE position.
- Switch off the power.
- Remove finger covers (170) e.g. by prying with a screwdriver from the gap between cover and bracket.
- Unfasten valve attachment bolts (173).
- Unfasten shaft’s locking screws (27).
- Remove actuator carefully without causing damage.

Reinstalling is made in reverse order. Note, that valve and actuator must be in CLOSE position before reinstallation.

- While installing the valve check the gap between segment and seat. The gap must be 0.20 mm in every part of segment. If the segment has moved, the gap may be smaller. In this case the segment must be centred before tightening the locking screws (27). Centring is made with a copper hammer or with another soft tool so as not to cause damage to the segment while hitting it. While the gap is of equal size in every part of segment, locking screws can be tightened.

- Install finger covers (170) by pressing them back in place. Check also the condition and stability of covers. If the covers do not stay properly, adjust them by bending the bracket. Never use the actuator without properly mounted finger covers!

6.5 Trouble shooting

In the following charts, Fig. 16 and Fig. 17, some failure situations have been presented. The charts refer to label (228) inside the controller and the LEDs of the controller, Fig. 5. IPCOMM communication program and instructions file can be also used in trouble shooting. The instructions file clarifies the functioning of application software. These charts are only applicable to correctly mounted and connected device. Installation and connection instructions are presented in Section 2.

6.6 Recommended preventive maintenance.

Recommended preventive maintenance for NelesAce, the part list and the service actions, see table 6.
<table>
<thead>
<tr>
<th>Part</th>
<th>Id-code</th>
<th>Part No</th>
<th>Part Description</th>
<th>Picture</th>
<th>Actions in one year interval</th>
<th>Actions in two years interval</th>
<th>Estimated service hours / h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>H025874</td>
<td>50, 61</td>
<td>Potentiometer + R/I modulator</td>
<td><img src="image1.jpg" alt="Picture" /></td>
<td>Calibration</td>
<td>Component change</td>
<td>2</td>
</tr>
<tr>
<td>1.1.</td>
<td>H092865</td>
<td>44, 45, 60</td>
<td>Belt roller set for NelesAce</td>
<td><img src="image2.jpg" alt="Picture" /></td>
<td>Checking the bearing condition</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>H015565</td>
<td>47</td>
<td>Potentiometer belt</td>
<td><img src="image3.jpg" alt="Picture" /></td>
<td>Checking: condition and tightness</td>
<td>Checking: condition and tightness</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>H016030</td>
<td>80</td>
<td>Limit switches (Micro switches)</td>
<td><img src="image4.jpg" alt="Picture" /></td>
<td>Checking: condition</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>H015545</td>
<td>107</td>
<td>Coupling element</td>
<td><img src="image5.jpg" alt="Picture" /></td>
<td>Component change</td>
<td>Component change</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>H015502</td>
<td>30</td>
<td>Spring pin</td>
<td><img src="image6.jpg" alt="Picture" /></td>
<td>Checking: condition</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>H015501</td>
<td></td>
<td>Coupling (gear) Aluminum piece</td>
<td><img src="image7.jpg" alt="Picture" /></td>
<td>Checking: condition</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>H015542</td>
<td>102</td>
<td>Coupling (motor) Aluminum piece</td>
<td><img src="image8.jpg" alt="Picture" /></td>
<td>Checking: condition</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>H027332</td>
<td>216</td>
<td>Display card</td>
<td><img src="image9.jpg" alt="Picture" /></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>H025875</td>
<td>100</td>
<td>Step motor</td>
<td><img src="image10.jpg" alt="Picture" /></td>
<td>Optional Spare part</td>
<td>Optional Spare part</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>2</td>
<td></td>
<td>Gear</td>
<td><img src="image11.jpg" alt="Picture" /></td>
<td>Checking: leakages</td>
<td>Checking: leakages, lubrication</td>
<td>1</td>
</tr>
<tr>
<td>10.1</td>
<td>H084903</td>
<td></td>
<td>Gear lubrication set</td>
<td><img src="image12.jpg" alt="Picture" /></td>
<td>Component change</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Clean valve surface of unwanted material (pulp, process medium etc.) covering it.</td>
<td></td>
<td>- Clean valve surface of unwanted material (pulp, process medium etc.) covering it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Check that the operation of the valve is smooth (no oscillation/clap between parts detected).</td>
<td></td>
<td>- Check that the operation of the valve is smooth (no oscillation/clap between parts detected).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Check that no leakage in valve body/shaft clamping is detected.</td>
<td></td>
<td>- Check that no leakage in valve body/shaft clamping is detected.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The valve doesn't move acc. to automatic control

Yes

Can valve be operated in MAN mode?

No

Is control signal available at connector X2?

Yes

Is LED 6 lit and does it turn off when valve is operated?

No

Failure before control unit.
Check the DCS connections.

Yes

Control unit is faulty.
Replace control unit.

No

Connector card is faulty.
Replace the connector card.

Fuse is faulty.
Replace the fuse.

Check power supply.
Is LED 11 lit?

Yes

No

Are LEDs 9 and 10 for limit switches lit?

Yes

Connector card is faulty.
Replace the connector card.

No

Limit switches are faulty.
Replace the limit switches.

Is LED 6 lit and does it turn off when MAN- close or MAN- open key is pushed?

Yes

No

Is motor supply voltage 70 VDC.

Yes

Control unit is faulty.
Replace control unit.

No

Check motor coils (2 pcs).
Resistance R=0,7 Ω

No

Step motor is faulty.
Replace step motor.

Yes

Control unit is faulty.
Replace control unit.

Fig. 17  Trouble shooting chart 1
Position display doesn’t match with actual valve position.

- Does current from position transmitter match with actual valve position?
  - Yes
    - Is position transmitter supply voltage 24 VDC?
      - Yes
        - Does potentiometer operate flawless?
          - No
            - R/I modulator is faulty. Replace R/I modulator.
          - Yes
            - Position display is in working order.
      - No
        - Actuator is faulty. Does potentiometer operate flawless?
          - No
            - Potentiometer is faulty. Replace potentiometer.
          - Yes
            - Display card is faulty. Replace display card.
    - No
      - Connect card is faulty. Replace connect card.

- No
  - Re-calibration of position display fix the problem?
    - Yes
      - Position display is in working order.
    - No
      - Display card is faulty. Replace display card.

*Fig. 18  Trouble shooting chart 2*
### 7 ASSEMBLY DRAWINGS AND PART LISTS

#### 7.1 Actuator

<table>
<thead>
<tr>
<th>Part</th>
<th>Qty</th>
<th>Description</th>
<th>Available spare parts</th>
<th>Recommended spare parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Mounting bracket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Flange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>2</td>
<td>Locking screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>Locking washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>1</td>
<td>Coupling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>1</td>
<td>Potentiometer belt roller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>1</td>
<td>Potentiometer belt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1</td>
<td>Potentiometer</td>
<td>X *)</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>1</td>
<td>R/I modulator</td>
<td>X *)</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>1</td>
<td>Pointer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>2</td>
<td>Limit switch</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>2</td>
<td>Release device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1</td>
<td>Step motor</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>102</td>
<td>1</td>
<td>Coupling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>1</td>
<td>Coupling element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>1</td>
<td>Hand wheel</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>1</td>
<td>Motor cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>1</td>
<td>Gear cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>1</td>
<td>Identification plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>1</td>
<td>Window</td>
<td></td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>6</td>
<td>Hexagon socket screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>1</td>
<td>Circuit board</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>1</td>
<td>Connector cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>146</td>
<td>1</td>
<td>Limit switch and position feedback cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>1</td>
<td>Limiter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>2</td>
<td>Finger cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>2/4</td>
<td>Hexagon screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>2/4</td>
<td>Spring washer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) Delivered as a set
## 7.2 Control unit

<table>
<thead>
<tr>
<th>Part</th>
<th>Qty</th>
<th>Description</th>
<th>Available spare parts</th>
<th>Recommended spare parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>210</td>
<td>1</td>
<td>HST housing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>211</td>
<td>1</td>
<td>HST housing cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>212</td>
<td>1</td>
<td>Bottom plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>213</td>
<td>1</td>
<td>Side plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>6</td>
<td>Lead in socket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>215</td>
<td>1</td>
<td>Heat sink</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>1</td>
<td>Display card</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>1</td>
<td>Connector card</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>218</td>
<td>1</td>
<td>Controller</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>228</td>
<td>1</td>
<td>Adhesive label</td>
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<td></td>
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</table>
## 8 DIMENSIONS AND WEIGHTS

### Actuator Dimensions, mm

<table>
<thead>
<tr>
<th>DN</th>
<th>Actuator</th>
<th>RA</th>
<th>RE</th>
</tr>
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<tbody>
<tr>
<td>75</td>
<td>NC4L-50</td>
<td>75</td>
<td>95</td>
</tr>
<tr>
<td>80</td>
<td>NC4L-65</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>100</td>
<td>NC4L-80</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>150</td>
<td>NC4L-100</td>
<td>115</td>
<td>120</td>
</tr>
<tr>
<td>200</td>
<td>NC4L-150</td>
<td>160</td>
<td>175</td>
</tr>
<tr>
<td>250</td>
<td>NC4L-200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>300</td>
<td>NC4L-250</td>
<td>240</td>
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<tr>
<td>350</td>
<td>NC4L-300</td>
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<tr>
<td>400</td>
<td>NC4L-350</td>
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<td>-</td>
</tr>
<tr>
<td>500</td>
<td>NC4L-400</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Actuator Dimensions, inch

<table>
<thead>
<tr>
<th>Size</th>
<th>Actuator</th>
<th>RA</th>
<th>RE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>NC4L-50</td>
<td>2.95</td>
<td>3.74</td>
</tr>
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<td>2 1/2</td>
<td>NC4L-65</td>
<td>2.95</td>
<td>3.94</td>
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<tr>
<td>3</td>
<td>NC4L-80</td>
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<td>4.33</td>
</tr>
<tr>
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<td>NC4L-100</td>
<td>4.53</td>
<td>4.72</td>
</tr>
<tr>
<td>6</td>
<td>NC4L-150</td>
<td>6.30</td>
<td>6.89</td>
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<tr>
<td>8</td>
<td>NC4L-200</td>
<td>7.87</td>
<td>7.87</td>
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<tr>
<td>10</td>
<td>NC4L-250</td>
<td>9.45</td>
<td>9.84</td>
</tr>
<tr>
<td>12</td>
<td>NC4L-300</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>NC4L-350</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>NC4L-400</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>NC4L-500</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### 9 TYPE CODE

#### SEGMENT VALVE RA AND RE FOR nelesACE

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>-</td>
<td>W</td>
<td>100</td>
<td>A</td>
<td>W</td>
<td>-</td>
<td>/</td>
</tr>
<tr>
<td>RE</td>
<td>M</td>
<td>W</td>
<td>100</td>
<td>A</td>
<td>W</td>
<td>A</td>
<td>/</td>
</tr>
</tbody>
</table>

1. **sign**: CV-CODE
   - Standard CV, without sign

2. **PRODUCT SERIES / DESIGN**
   - RA: Wafer, reduced bore, Neles face-to-face length, Body PN50 / ANSI Class 300*
   - RE: Flanged, reduced bore, ISA 5 75.04 and DIN/IEC 534 Part 3-2

3. **sign**: RA PRESSURE RATING
   - Body PN40 / ASME class 300
   - Body PN 10, flanged
   - Body PN 16, flanged
   - Body PN 25, flanged
   - Body PN 40, flanged
   - Body ANSI class 150, flanged
   - Body ANSI class 300, flanged

   **sign**: RE PRESSURE RATING
   - Body PN40 / ASME class 300
   - Body PN 10, flanged
   - Body PN 16, flanged

4. **sign**: CONSTRUCTION
   - W: Standard, drive shaft with keyway for nelesACE. Shaft/segment connection pinned and welded.

5. **sign**: SIZE
   - Max shut-off pressure
   - DIN/ISO PN10
   - DIN/ISO PN16
   - DIN/ISO PN25
   - DIN/ISO PN40

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>050*</td>
<td>50 bar</td>
<td>use PN40</td>
<td>use PN40</td>
<td>M</td>
</tr>
<tr>
<td>065*</td>
<td>50 bar</td>
<td>use PN16</td>
<td>K</td>
<td>use PN40</td>
</tr>
<tr>
<td>080*</td>
<td>50 bar</td>
<td>use PN40</td>
<td>K</td>
<td>use PN40</td>
</tr>
<tr>
<td>100*</td>
<td>40 bar</td>
<td>use PN16</td>
<td>K</td>
<td>use PN40</td>
</tr>
<tr>
<td>150*</td>
<td>40 bar</td>
<td>use PN16</td>
<td>K</td>
<td>use PN40</td>
</tr>
<tr>
<td>200</td>
<td>35 bar</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
<tr>
<td>250</td>
<td>35 bar</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
<tr>
<td>300</td>
<td>30 bar</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
<tr>
<td>350</td>
<td>30 bar</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
<tr>
<td>400</td>
<td>30 bar</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
<tr>
<td>500</td>
<td>30 bar</td>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
</tbody>
</table>

* According to DIN standard, flange dimensions in some sizes and pressure classes are same

6. **sign**: BODY SEGMENT SCREWS SHAFT, PINS / BEARINGS
   - A: CF8M Type AISI 329 + HCr A2-70 Type AISI 329 / PTFE
   - C: CG8M CG8M + HCr B8M XM-19 / PTFE

   **sign**: Gland packing: PTFE V-ring type
   - Blind flange: PTFE

7. **sign**: SEAT MATERIAL AND CONSTRUCTION
   - Seat welded away from segment.
   - Service: Basis weight service, unidirectional non tight.

8. **sign**: MODEL CODE
   - A: Version 0
   - Version A is used only with DN50, DN80-DN250 (Only for RE, NOT RA)

9. **sign**: FLANGE FACING
   - EN 1092-1 Type B1 (Ra 3.2 - 12.5), standard
   - Cover:
     - ASME B16.5 Ra 3.2 - 6.3 (Smooth finish, RMS 125 - 250).
     - DIN 2525 Form E (Ra 4)
**STEP MOTOR ACTUATOR nelesACE FOR BASIS WEIGHT CONTROL**

1. **PRODUCT SERIES / DESIGN**

<table>
<thead>
<tr>
<th>1. sign</th>
<th>NC4L</th>
<th>400</th>
<th>ND4KS2</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step motor actuator. Ambient temperature 0...+50 °C / +32...+122 °F, IP65 enclosure. Applicable only with RA_W -serie valves.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step motor actuator. Ambient temperature 0...+50 °C / +32...+122 °F, IP65 enclosure. Applicable only with RE_W -serie valves.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **ACCORDING TO THE SIZE OF THE SEGMENT VALVE**

- Available for sizes: 050, 065, 080, 100, 150, 200, 250, 300, 350, 400, 500.
- RA_W series available for sizes: DN050 ... DN250
- RE_W series available for sizes: DN050 ... DN500

---

**CONTROL UNIT FOR nelesACE FOR BASIS WEIGHT CONTROL**

1. **PRODUCT SERIES / DESIGN**

<table>
<thead>
<tr>
<th>1. sign</th>
<th>ND4KS2</th>
<th>1.</th>
<th>2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control unit for pulse or time duration signals, includes push buttons for manual operations and IPCOMM software for serial communication protocol of the RS232 or RS485 interface. ½ step mode as a default. Position indication LCD. IP65 enclosure</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **SUPPLY VOLTAGE**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 VAC</td>
<td>230 VAC</td>
</tr>
</tbody>
</table>

Exemple:

**RAW050AW-NC4L050-ND4KS22**
Sign: 050, 065, 080, 100, 150, 200, 250.(size).

**REJW200AW-NC4M200-ND4KS22**
Sign: J/K/L/M/C/R/S (flange drilling)
Sign: 050, 065, 080, 100, 150, 200, 250, 300, 350, 400, 500. (size)