

Metso NelesAce™ BASIS WEIGHT CONTROL VALVE

Basis weight control is one of the most critical applications for a valve in a paper machine. Metso NelesAce is the ultimate offering for this application. The unit consists of a reliable V-port segment valve, complete with a high-resolution step-motor-driven rotary actuator, limit switches, and potentiometer. The NelesAce control unit's unique feature to run valve with various step sizes, depending on error between actual and desired flow rate, makes it a superior element for basis weight control. Any error can be eliminated quickly and accurately without overshooting. This helps to reduce settling time during grade change for example.

The valve, a Metso R Series V-port segment valve, is available in sizes DN 50 - 250 / 2" - 10" in a flangeless design, and DN 50 - 500 / 2" - 20" in a flanged design. Complete valve specifications, dimensions, and construction material details are available in bulletins 3 R 21 and 3 R 24.

The electro-mechanical actuator uses a bipolar stepping motor to accomplish discrete and repeatable angular movement for each step. There is only one size actuator to suit the full range of valves offered. Valve position is clearly indicated by a feedback potentiometer that transmits an electrical signal to the display at the control unit. Mechanical limit switches are used to prevent over travel. A handwheel is provided for manual operation.

FEATURES

System compatibility

- The NelesAce is compatible with virtually all leading quality control systems.

Rugged, economical V-port segment valve

- High rangeability
- Equal percentage flow characteristics
- Solid-metal seat and maintenance-free bearing and packing provide long service life.
- Valve stem is pinned and welded to the segment and the valve seat is welded away from the segment to reduce hysteresis.
- Rugged one-piece body
- PTFE stem bearings and the trunnion mounting of the segment reduce operating torque.

Step-motor-driven actuator

- Step-motor-driven backlash-free rotary actuator provides the extreme accuracy needed in basis weight control.
- Performs precise, minimal changes in valve position with high repeatability and resolution.
- Assures consistent paper grade quality.



High resolution conformance

- Measurement devices today are capable of sensing a $\pm 0.1\%$ change in basis weight. The Metso Nelprof® control valve sizing program can easily calculate proper valve size and degree of opening to provide a basis weight control valve with precise accuracy.

Flexibility to operate on a variety of inputs

- Simple wiring determines whether the NelesAce responds to a pulse duration or a time duration.

Allows remote electronic control

- Electronic controls can be located up to 120 meters / 360 feet away, but in a normal operation the NelesAce control unit is installed near the valve. Standard cable length is 20 m.

Feedback potentiometer

- Standard 1 kOhm potentiometer gives $\pm 0.25\%$ linearity feedback (0.0025 % of span). Output signal of the control unit is 4-20 mA signal.

Limit switches

- End-of-travel limit switches are standard to prevent the valve from over-traveling.

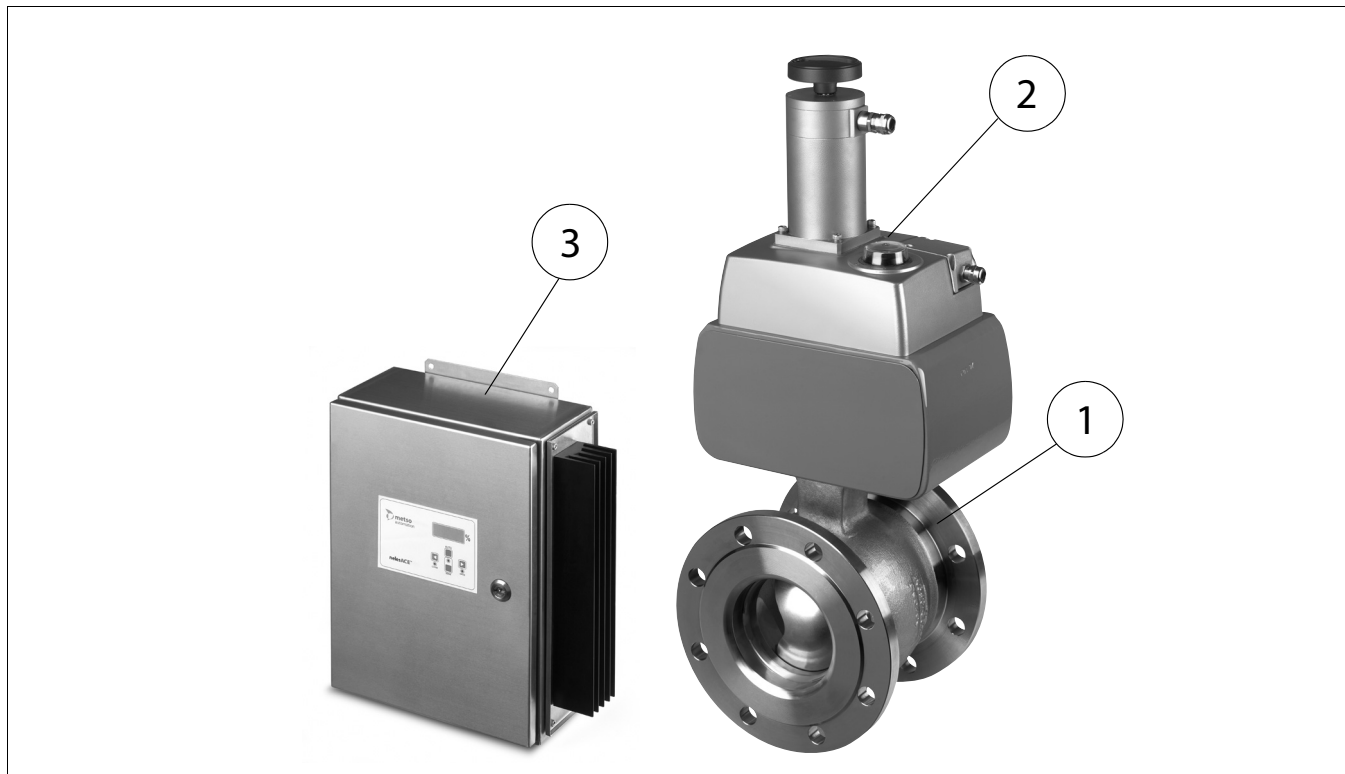
Position indication

- Located on the cover of the actuator, the potentiometer/limit switch housing also incorporates a valve position indicator.

Manual override

- A handwheel at the end of the motor allows for manual operation with minimum effort and a minimum number of turns in the event of loss of power.

OPERATING PRINCIPLE



1. The valve

The NelesAce basis weight control valve is based on our standard R Series V-port segment control valve familiar from many other paper mill applications.

The Metso RA / RE V-port segment valve has numerous applications in demanding processes where high rangeability and equal percentage flow characteristics are needed. The solid metal seat and maintenance free bearing and gland packing guarantee long service life. The rugged, one piece body withstands great mechanical force and, together with the PTFE stem bearings and the trunnion mounting of the segment, operating torque is reduced to a minimum.

High rangeability makes the RA / RE valve optimal for paper machines where production adjustments alter flow rates significantly.

For complete information, please see Metso bulletins 3 R 21 and 3 R 24.

2. The actuator

The extreme accuracy needed in basis weight control is achieved by a step-motor driven, backlash-free rotary actuator. It performs precise, minimal changes in valve opening with high repeatability and resolution. The rotary actuator is electromechanical.

One size of actuator covers all the requirements for the whole range of valve sizes. A bipolar stepping motor is used to accomplish a discrete and a repeatable angular movement with each step.

The shaft can also be manually operated with a handwheel attached to the end of the motor. The inbuilt mechanical limits are used to prevent overtravel. The valve position is clearly indicated on the cover of the actuator and a feedback potentiometer transmits a signal to the display at the control station or for customer use.

3. The control unit

When changing grades and setting new basis weights, the control unit and actuator quickly turns the valve to the new opening range with minimal delay.

Equipped with pulse train and time duration interface, NelesAce is compatible with any process computer output. The control unit operates in a response to a control command from a computer or an electronic controller. As a standard feature, there are also a push-buttons for manual operation (open and close) and a digital position display.

The DCS operation is activated in the "automatic" mode as a standard. Analog output (4–20 mA) can be used in the DCS to indicate valve position. In the manual mode the control unit replaces the signals of the computer and the valve can be operated manually from the push-buttons on the control unit. The push-buttons are lit during operation. In-built potential-free outputs inform the DCS of the state and mode of the control unit.

TECHNICAL SPECIFICATION

V-port segment valve, type RA / RE

Construction: Flangeless or flanged V-port segment valve.
 Nominal dimensions: DN 50 - 500 / 2" - 20".
 PN 25/40 (ANSI 150/300).
 Flow coefficients Cv: 180 - 8510 (100 % open).
 Standard materials: Body: ASTM A 351 gr. CF8M
 Segment: AISI 329 (SS 14 2324)
 Shaft&pins: AISI 329 (SS 14 2324)
 Seat: Cobalt based alloy

Standard temperature range: -40...+260 °C / -40...+500 °F.
 Operation range: 90 degree;
 With full steps: 7050 step / 90°
 With half steps: 14100 step / 90°

Number of steps/round: 200
 Step angle: 1,8° in full step mode
 Compatible with the ministep mode
 Protection class: IP68 and NEMA4 for step motor, IP65 and NEMA4 for gear housing
 EMC and CE approved (EN 60034-1)
 Holding torque: 5,4 Nm
 Insulation class: F
 Max. ambient temperature: +50 °C

Control Unit

Supply voltage: 230VAC, option 115VAC
 45...65 Hz
 Nominal power: 200W max., motor power
 Output power: Max. 9A, 70 VDC to motor in 6,3 A
 Protection class: IP65
 EMC and CE approved
 Max. ambient temperature: 50 °C
 Connections: Screw terminals
 Control Signals: 24 VDC
 Inputs are galvanically isolated. Additional input for selection of step modes and speeds.
 Pulse duration: Min input freq. 0 Hz
 Max input freq. 400 Hz (1/4, 1/2, 1/1-step)
 200 Hz (2/1-step)
 Time duration: Default speed 150 Hz
 Min. speed 50 Hz
 Max. speed 2 kHz
 Frequency response in manual mode: 5 Hz to 2 kHz (default 200 Hz)
 Electronics location: Max distance between motor and electronics is 120 m. / 360 ft.
 Manual push-button: man/auto push buttons
 open / close push buttons
 LCD display

Flow coefficients (Cv)

| Valve Size mm / inches | Cv 100 % open | Valve Size mm / inches | Cv 100 % open |
|------------------------|---------------|------------------------|---------------|
| 50 / 2 | 180 | 200 / 8 | 2030 |
| 65 / 2.5 | 280 | 250 / 10 | 3210 |
| 80 / 3 | 420 | 300 / 12 | 4490 |
| 100 / 4 | 620 | 350 / 14 | 6440 |
| 150 / 6 | 1260 | 400 / 16 | 8510 |
| | | 500 / 20 | 13015 |

Step motor rotary actuator

Valve sizes: DN 50 - 500 / 2" - 20"
 Output torque: 30 - 450 Nm, adjustable
 Gear ratio: 1:141
 Resolution per step size: 2 steps 3525
 1 step 7050
 1/2 step 14100 (default)
 1/4 step 28200
 Speed of operation: 7 to 3000 sec., adjustable (90 degree rotation)
 Manual handwheel turns: 35
 Limit switches: 2
 Feedback potentiometer: 1 kOhm

VALVE SIZING

Example
 Basis weight measurement devices today are able to sense changes of ±0.1 %. Paper machine data necessary to size a valve include: production rate, basis weight, wire size, machine speed, stock consistency, feed line, pressure drop and of course paper grade. The Metso Nelprof® program can provide accurate sizing to determine the best valve size for the application.
 In the following example, an DN200 / 8-inch R Series valve was selected. Case 1 gives the position of the valve under a given set of process conditions. Case 2 and 3 yield the resulting change in flow rate by altering the valve opening position: 1 step for Case 2 and 1/2 step for Case 3. It is interesting to note that the NelesAce has the capability to control to ±0.014 % about the set point using full steps (pulses) and ±0.007 % using 1/2 steps.

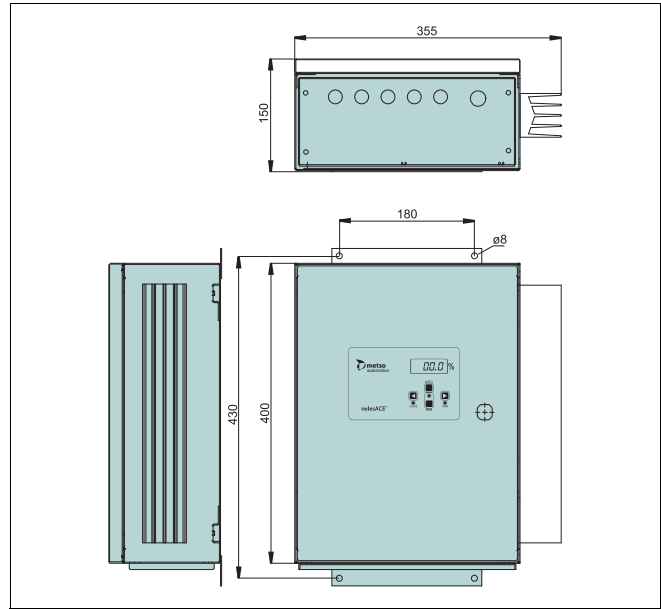
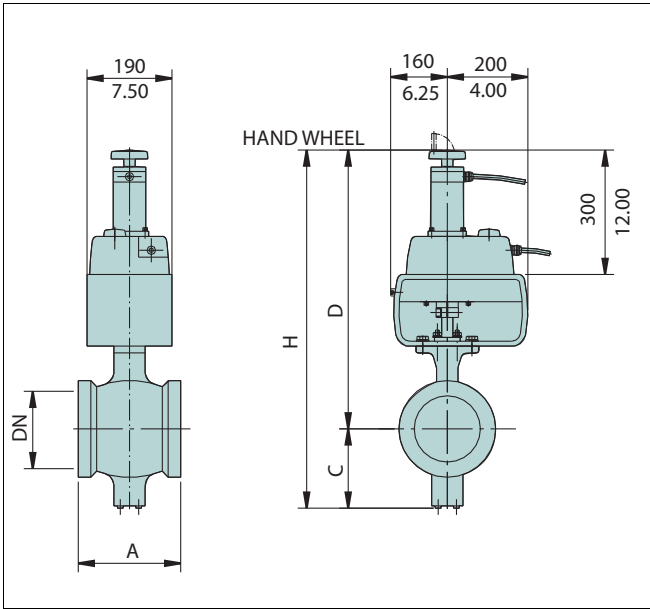
Process data

| Pipe | DN 250 / 10.00" | | |
|---------------------------------|--|-------------|-------------|
| | DN 250 / 10.00" schedule no. 10 | | |
| Fluid | Pulp Mechanical pulp 2 / 80 220 bar / 3208.20 psi | | |
| Case no. | 1. | 2. | 3. |
| Flow rate (gpm) | 800.00 | 800.88 | 800.44 |
| Upstream temp. (°C/°F) | 50/120.00 | 50/120.00 | 50/120.00 |
| pressure (bar/psi) | 1.80/25.500 | 1.80/25.500 | 1.80/25.500 |
| vap. press. (bar/psi) | 0.116/1.693 | 0.116/1.693 | 0.116/1.693 |
| Differential pressure (bar/psi) | 0.345/5.000 | 0.345/5.000 | 0.345/5.000 |

Calculated performance

| Case no. | 1. | 2. | 3. |
|--------------------------------|------------|------------|------------|
| Capacity (FpCv) | 374.97 | 375.39 | 375.18 |
| Percent of full travel | 56.76 | 56.79 | 56.77 |
| Opening in degrees | 56.51 | 56.54 | 56.53 |
| Sound pressure level (dBA) | 51.7 | 51.7 | 51.7 |
| Flow velocity—inlet (m/s/ft/s) | 1.53/5.106 | 1.56/5.112 | 1.55/5.109 |
| Terminal press. drop (bar/psi) | 1.23/17.85 | 1.23/17.85 | 1.23/17.85 |

DIMENSIONS



| DN | Dimensions, mm | | | | | | | | | | Weight, kg | |
|-----|----------------|-----|-----|-----|-----|----------|-----|-----|------|------|------------|-----|
| | Actuator | RA | | | | Actuator | RE | | | | RA | RE |
| | | A | C | D | H | | A | C | D | H | | |
| 50 | NC4L-50 | 75 | 95 | 530 | 625 | NC4M-50 | 124 | 91 | 610 | 705 | 35 | 40 |
| 65 | NC4L-65 | 75 | 100 | 540 | 640 | NC4M-65 | 145 | 97 | 615 | 715 | 38 | 42 |
| 80 | NC4L-80 | 100 | 110 | 555 | 665 | NC4M-80 | 165 | 108 | 645 | 755 | 40 | 45 |
| 100 | NC4L-100 | 115 | 120 | 565 | 685 | NC4M-100 | 194 | 120 | 655 | 775 | 42 | 50 |
| 150 | NC4L-150 | 160 | 175 | 610 | 785 | NC4M-150 | 229 | 174 | 700 | 875 | 59 | 72 |
| 200 | NC4L-200 | 200 | 200 | 645 | 845 | NC4M-200 | 243 | 201 | 755 | 960 | 83 | 131 |
| 250 | NC4L-250 | 240 | 250 | 720 | 970 | NC4M-250 | 297 | 251 | 830 | 1085 | 115 | 156 |
| 300 | NC4L-300 | - | - | - | - | NC4M-300 | 338 | 269 | 855 | 1125 | - | 220 |
| 350 | NC4L-350 | - | - | - | - | NC4M-350 | 400 | 311 | 950 | 1265 | - | 300 |
| 400 | NC4L-400 | - | - | - | - | NC4M-400 | 400 | 353 | 1015 | 1370 | - | 380 |
| 500 | NC4L-500 | - | - | - | - | NC4M-500 | 508 | 420 | 1110 | 1530 | - | 740 |

| Size | Dimensions, inch | | | | | | | | | | Weight, lb | |
|-------|------------------|------|------|-------|-------|----------|-------|-------|-------|-------|------------|------|
| | Actuator | RA | | | | Actuator | RE | | | | RA | RE |
| | | A | C | D | H | | A | C | D | H | | |
| 2 | NC4L-50 | 2.95 | 3.74 | 20.87 | 24.61 | NC4M-50 | 4.88 | 3.58 | 24.02 | 27.76 | 78 | 89 |
| 2 1/2 | NC4L-65 | 2.95 | 3.94 | 21.26 | 25.2 | NC4M-65 | 5.71 | 3.82 | 24.21 | 28.15 | 84 | 93 |
| 3 | NC4L-80 | 3.94 | 4.33 | 21.85 | 26.18 | NC4M-80 | 6.5 | 4.25 | 25.39 | 29.72 | 89 | 100 |
| 4 | NC4L-100 | 4.53 | 4.72 | 22.24 | 26.97 | NC4M-100 | 7.64 | 4.72 | 25.79 | 30.51 | 93 | 111 |
| 6 | NC4L-150 | 6.3 | 6.89 | 24.02 | 30.91 | NC4M-150 | 9.02 | 6.85 | 27.56 | 34.45 | 131 | 160 |
| 8 | NC4L-200 | 7.87 | 7.87 | 25.39 | 33.27 | NC4M-200 | 9.57 | 7.91 | 29.72 | 37.80 | 184 | 291 |
| 10 | NC4L-250 | 9.45 | 9.84 | 28.35 | 38.19 | NC4M-250 | 11.69 | 9.88 | 32.68 | 42.72 | 256 | 347 |
| 12 | NC4L-300 | - | - | - | - | NC4M-300 | 13.31 | 10.59 | 33.66 | 44.29 | - | 489 |
| 14 | NC4L-350 | - | - | - | - | NC4M-350 | 15.75 | 12.24 | 37.40 | 49.80 | - | 667 |
| 16 | NC4L-400 | - | - | - | - | NC4M-400 | 15.75 | 13.9 | 39.96 | 53.94 | - | 844 |
| 20 | NC4L-500 | - | - | - | - | NC4M-500 | 20 | 16.54 | 43.70 | 60.24 | - | 1644 |

HOW TO ORDER BASIS WEIGHT CONTROL UNIT NelesAce

V-PORT SEGMENT VALVE RA AND RE FOR NelesAce

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | | 9. |
|----|----|----|----|-----|----|----|----|---|----|
| | RA | | W | 400 | A | W | - | / | - |
| | RE | M | W | 400 | A | W | A | / | - |

| 1. sign | CV-CODE FOR VALVE SIZE DN 25 (01") |
|---------|------------------------------------|
| | STANDARD CV |
| - | Without sign |

| 2. sign | PRODUCT SERIES / DESIGN |
|--|---|
| RA | Wafer, reduced bore, Neles face-to-face length, Body PN50 / ANSI Class 300* |
| RE | Flanged, reduced bore, ISA S 75.04 and DIN/IEC 534 Part 3-2 |
| * Look table "5.sign", Column : "Max shut-off pressure". | |

| 3. sign | RA PRESSURE RATING | RE PRESSURE RATING |
|---------|---|------------------------------|
| J | --- | Body PN 10, flanged |
| K | --- | Body PN 16, flanged |
| L | RA Body PN50 / ASME class 300 (no sign) | Body PN 25, flanged |
| M | --- | Body PN 40, flanged |
| C | --- | Body ANSI class 150, flanged |
| R | --- | JIS 10K flanges |
| S | --- | JIS 16K flanges |
| Y | Special, to be specified | |

| 4. sign | CONSTRUCTION |
|---------|---|
| W | Standard, drive shaft with keyway for NelesAce. Shaft/segment connection pinned and welded. |
| Y | Special, to be specified |

| 5. sign | SIZE | | | | |
|---------|-----------------------|---------------|---------------|---------------|--------------|
| | Max shut-off pressure | DIN/ISO PN10 | DIN/ISO PN16 | DIN/ISO PN25 | DIN/ISO PN40 |
| 050* | 50 bar | equal to PN40 | equal to PN40 | equal to PN40 | M |
| 065* | 50 bar | equal to PN16 | K | equal to PN40 | M |
| 080* | 50 bar | equal to PN40 | equal to PN40 | equal to PN40 | M |
| 100* | 40 bar | equal to PN16 | K | equal to PN40 | M |
| 150* | 40 bar | equal to PN16 | K | equal to PN40 | M |
| 200 | 35 bar | J | K | L | M |
| 250 | 35 bar | J | K | L | M |
| 300 | 30 bar | J | K | L | M |
| 350 | 30 bar | J | K | L | M |
| 400 | 30 bar | J | K | L | M |
| 500 | 30 bar | J | K | L | M |

* According to DIN standard, flange dimensions in some sizes and pressure classes are same. That is reason why some sizes are available only some pressure classes.

| 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 |
| Seals for above: Gland packing: PTFE V-ring type Blind flange: PTFE | | | | |

| 7. sign | SEAT MATERIAL AND CONSTRUCTION |
|---------|--|
| W | Stainless steel + cobalt based hard facing Basis weight service |

| 8. sign | MODEL CODE |
|---------|--|
| - | Version 0. |
| A | Version A - availability for high temperature construction |

| 9. sign | FLANGE FACING |
|---------|---|
| | STANDARD |
| - | ASME B16.5 (Ra 3.2 – 6.3 / RMS 125-250) Cover EN1092-1 Type B1 |

STEP MOTOR ACTUATOR FOR NelesAce

| 1. | 2. | 3. |
|----|----|-----|
| NC | 4L | 400 |

| 1. sign | PRODUCT GROUP |
|---------|---|
| NC | Step motor actuator. Ambient temperature 0 °C...+50 °C/+32 °F...+122 °F, IP65 enclosure |

| 2. sign | SERIES CODE |
|---------|--------------------|
| 4L | Used with RA valve |
| 4M | Used with RE valve |

| 3. sign | ACCORDING TO THE SIZE OF THE SEGMENT VALVE |
|---------|--|
| | Available for sizes: 050, 065, 080, 100, 150, 200, 250, 300, 350, 400, 500. Applicable only with RA... W and RE... W valves. |

CONTROL UNIT FOR NelesAce

| 1. | 2. |
|--------|----|
| ND4KS2 | 2 |

| 1. sign | CONTROL UNIT |
|---------|---|
| ND4KS2 | 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. 1/2 step mode as a default. Position indication LCD. IP65 enclosure |

| 2. sign | SUPPLY VOLTAGE |
|---------|----------------|
| 1 | 110 VAC |
| 2 | 230 VAC |

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