

NelesAce™ basis weight control valve

Basis weight control is one of the most critical applications for a valve in a paper machine. 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 Neles™ 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 ± 0.1 % change in basis weight. The 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 ± 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.

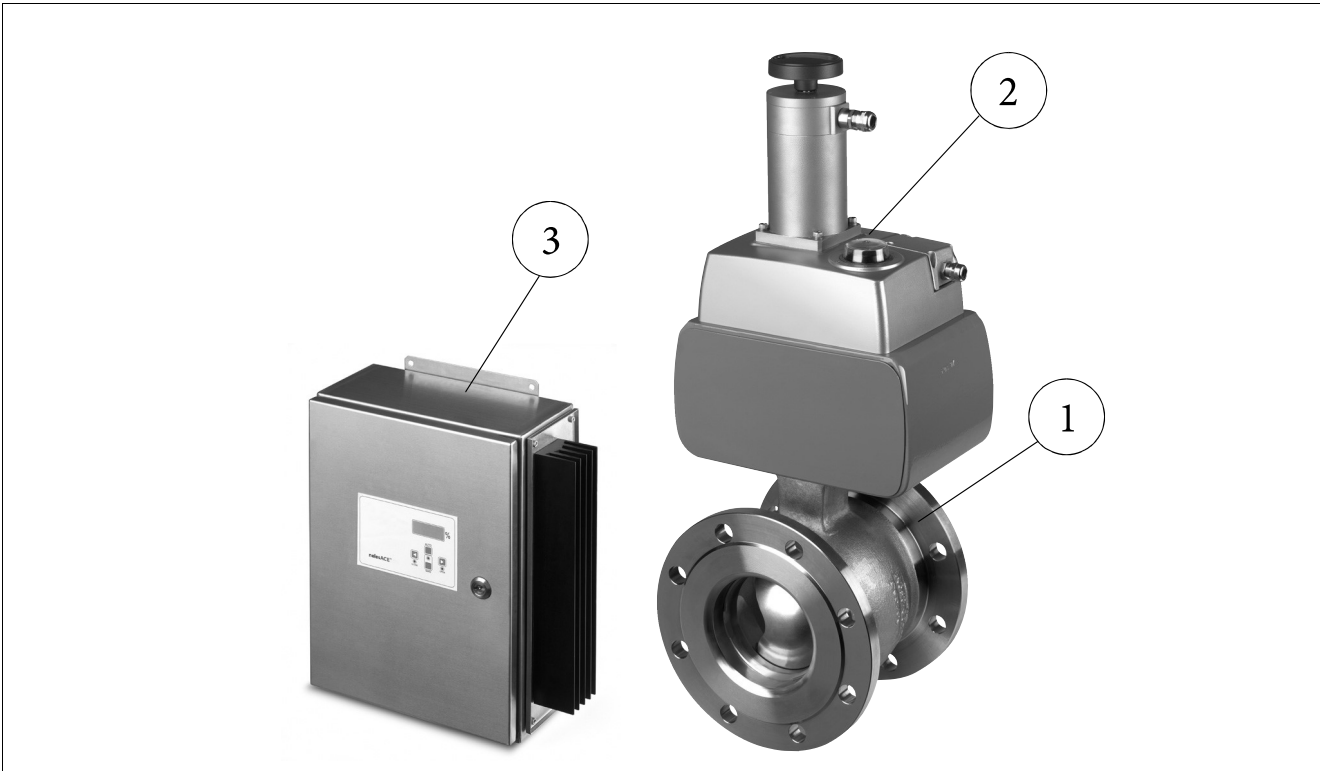
Position indication

- 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 Neles 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 Neles 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°

Flow coefficients (Cv)

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

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
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

Valve sizing

Example

Basis weight measurement devices today are able to sense changes of $\pm 0.1\%$. 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 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 $\pm 0.014\%$ about the set point using full steps (pulses) and $\pm 0.007\%$ using 1/2 steps.

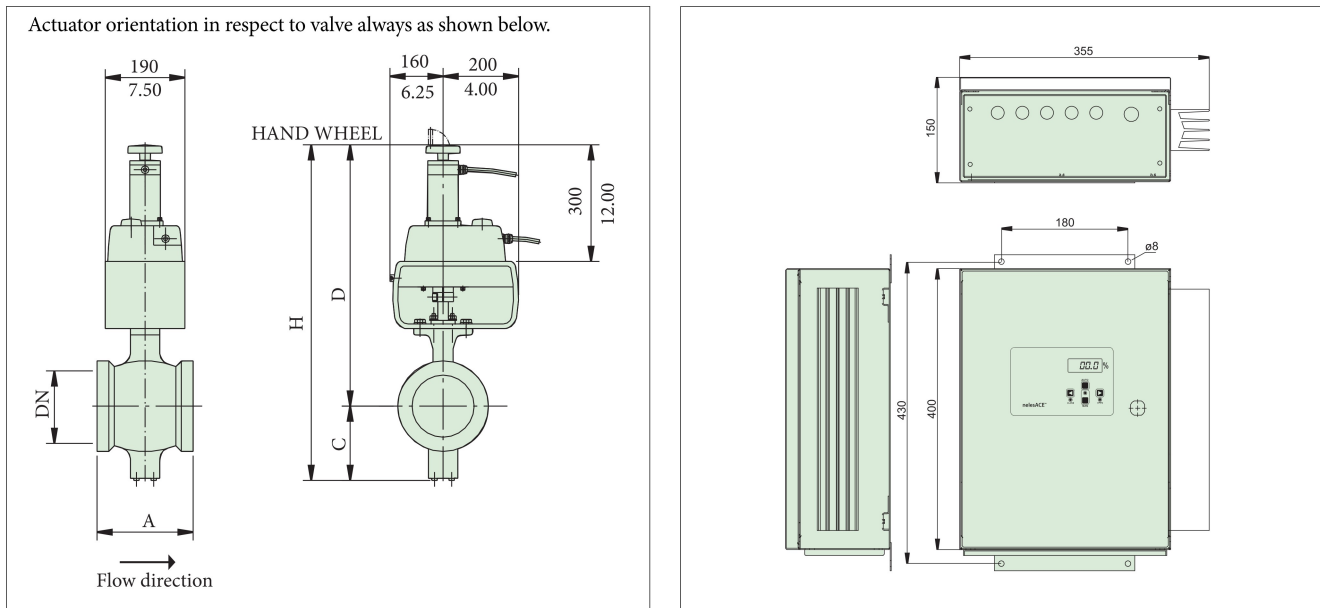
Process data

Pipe	DN 250 / 10.00"		
inlet diameter	DN 250 / 10.00" schedule no. 10		
outlet diameter			
Fluid nature	Pulp		
description	Mechanical pulp		
consistency	2 / 80		
critical pressure	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 is used only with NPS02, NPS03-10 / DN50, DN80-DN250, only in RE series

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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