

Data sheet

# Temperature controller AVTB (PN 16)

Description



AVTB is self-acting temperature controller used to control the water temperature in hot water tanks, heat exchangers, oil preheaters, etc. Controller closes on rising temperature.

The controller has a control valve, thermostatic actuator and handle for temperature setting. Thermostatic actuator consist of a bellows, capillary tube and sensor.

**Main data:**

- DN 15, 20, 25
- $k_{vs}$  1.9; 3.4; 5.5m<sup>3</sup>/h
- PN 16
- Setting range:  
0 ... 30°C/20 ... 60°C/30 ... 100°C
- Temperature:  
- Circulation water/glycolic water up to 30%:  
2 ... 130°C
- Connections:  
- Int. thread  
- Ext. thread (weld-on and ext. thread tailpieces)
- Flow or return mounting, depending on sensor type.

Ordering

- <sup>1)</sup> Complete controller including sensor stuffing box. The immersion pocket is an accessory.  
<sup>2)</sup> Including small sensor Ø 9.5 × 180. The sensor is to be mounted where the system temperature is warmer than the temperature in the valve housing. Insulation disk is factory mounted on the controller.  
<sup>3)</sup> Including small sensor Ø 9.5 × 150. Capillary tube length 2.3 m.  
<sup>4)</sup> Including sensor Ø 18 × 210; available on request

**Example:**  
 Temperature controller; DN 15;  
 $k_{vs}$  1.9; PN 16; setting range  
 30 ... 100°C;  $T_{max}$  130 °C; ext. thread

- 1x AVTB DN 15 Controller  
 Code No: **003N5141**

**Option:**

- 1x Imm. pocket, brass  
 Code No: **013U0290**
- 1x Weld-on tailpieces  
 Code No: **003H6908**

AVTB Controller

DN	Setting range (°C)	$k_{vs}$ (m <sup>3</sup> /h)	Max. sensor temp. (°C)	Internal thread		External thread	
				Connection ISO 7/1	Code No. <sup>1)</sup>	Connection ISO 228/1	Code No. <sup>1)</sup>
15	0 ... 30	1.9	55	R <sub>p</sub> 1/2	003N2232 <sup>4)</sup>	G 3/4 A	003N5101 <sup>4)</sup>
	20 ... 60		90				003N5114 <sup>2)</sup>
	30 ... 100		130				003N8141 <sup>3)</sup>
20	0 ... 30	3.4	55	R <sub>p</sub> 3/4	003N3232 <sup>4)</sup>	G 1 A	003N5102 <sup>4)</sup>
	20 ... 60		90				003N5115 <sup>2)</sup>
	30 ... 100		130				003N8142 <sup>3)</sup>
25	0 ... 30	5.5	55	R <sub>p</sub> 1	003N4232 <sup>4)</sup>	G 1 1/4 A	003N5103 <sup>4)</sup>
	20 ... 60		90				003N5116 <sup>2)</sup>
	30 ... 100		130				003N8143 <sup>3)</sup>

Capillary tube length: 2 m.

Service kits

Type designation	for	Code No.
Repair set Two diaphragms, two O-rings, one rubber cone, one tube of grease and eight valve cover screws	DN 15	003N4006
	DN 20	003N4007
	DN 25	003N4008
Thermostatic actuator 0 ... 30°C, sensor Ø 18 × 210, 2m		003N0075
Thermostatic actuator 20 ... 60°C, sensor Ø 9.5 × 180, 2m		003N0130
Thermostatic actuator 30 ... 100°C, sensor Ø 9.5 × 150, 2.3m		003N0131
Housing of sensor stuffing box, R 1/2 × M14 × 1 mm, rubber EPDM Ø 12.6 × 4 × 6 mm		013U8102 <sup>1)</sup>

<sup>1)</sup> For thermostatic actuators 20 ... 60°C and 30 ... 100°C; code includes housing and gasket of sensor stuffing box

Ordering (continuous)

Accessories

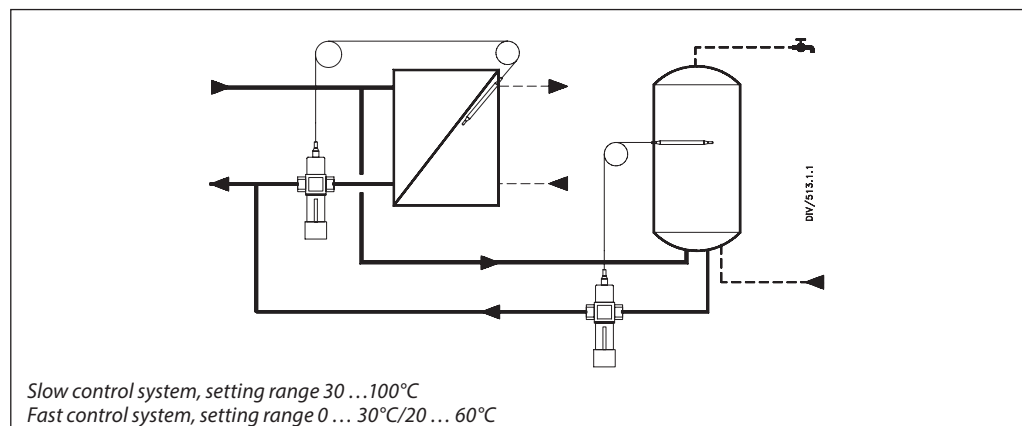
Picture	Type designations	DN	Connection	Code No.
	Weld-on taipieces	15	-	003H6908
		20		003H6909
		25		003H6910
	External thread taipieces	15	Con. ext. thread acc. to EN 10226-1	R 1/2" 003H6902
		20		R 3/4" 003H6903
		25		R 1" 003H6904
	Immersion pocket	R <sub>p</sub> 1/2 × M14 × 1 mm, brass 182 mm, without sens.stuff. box		013U0290
		R <sub>p</sub> 1/2 × M18 × 1.5 mm, st. steel 182 mm, with sens.stuff. box		003N0196
		R <sub>p</sub> 3/4 × M22 × 1 mm, brass 220 mm, with sens.stuff. box		003N0050
		R <sub>p</sub> 3/4 × M22 × 1 mm, st. steel 220 mm, with sens.stuff. box		003N0192
	Insulation disk <sup>1)</sup>			003N4022

<sup>1)</sup> For details see "Installation positions" section

Technical data

Nominal diameter	DN	15	20	25
k <sub>vs</sub> value	m <sup>3</sup> /h	1.9	3.4	5.5
Cavitation factor z		0.4		
Nominal pressure	PN	16		
Max. differential pressure	bar	10		
Medium		Circulation water/glycolic water up to 30%		
Medium pH		Min. 7, max. 10		
Medium temperature	°C	2 ... 130		
Connections	valve	Internal and external thread		
	tailpieces	Weld-on and external thread		
<b>Materials</b>				
Valve body	internal thread	MS 58, hot-pressed, DIN 17660, W.No. 2.0402, CuZn40Pb2		
	external thread	Dezincing-free brass, BS 2872/CZ132		
Valve seat		Cr Ni steel, DIN 17440, W.No. 1.4301		
Valve cone		NBR-rubber		
Spindle		Dezincing-free brass, BS 2872/CZ132		
Other metal parts		Dezincing-free brass, BS 2874/CZ132		
Diaphragms, O-rings		EPDM-rubber		
Temperature sensor		Copper		
Sensor charge	0 ... 30 °C	R 152 A, C2H4F2		
	20 ... 60 °C	Butane R600, C4H10		
	30 ... 100 °C	Carbon dioxide, CO2		

Application principle



Installation positions

Temperature controller

The controller can be installed in any position, with flow in the direction of the cast-in arrow.

AVTB 0 ... 30 and 30 ...100 can be installed either in flow or in return line.

AVTB 20 ... 60 must always be installed in the return line (sensor warmer than valve).

With AVTB 30 ... 100, if temperature variations of more than 20°C occur at the valve, insulation disk (003N4022) must be installed between thermostatic actuator and valve body.

If AVTB 20 ... 60 has been installed in the return line from a service water heat exchanger (where for certain periods the return temperature approaches the sensor temperature) the installation of insulation disk is recommended (003N4022). Insulation disk is factory mounted on the product.

Temperature Sensor

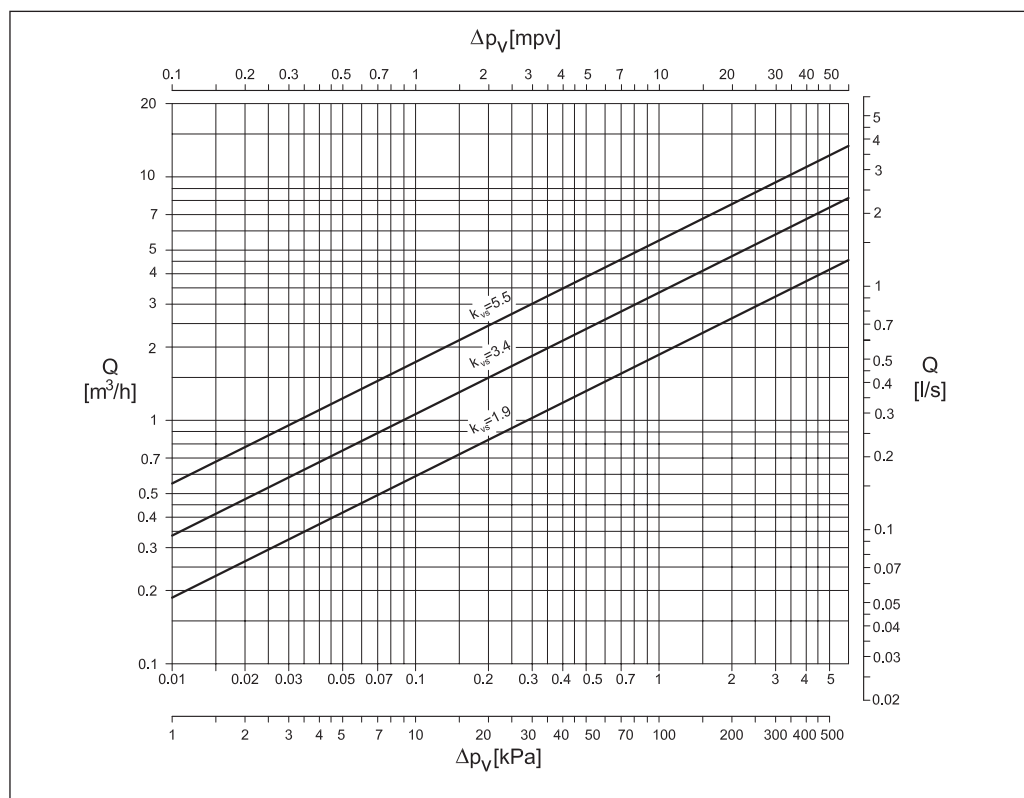
Sensor Ø 18 × 210 mm<sup>2</sup>  
(AVTB 0 ... 30 °C)

Sensor Ø 9.5 × 180 mm<sup>1</sup>  
(AVTB 20 ... 60 °C)

Sensor Ø 9.5 × 150 mm<sup>2</sup>  
(AVTB 30 ... 100 °C)

<sup>1</sup>) The sensor is to be mounted where the system temperature is warmer than the temperature in the valve body  
<sup>2</sup>) The sensor can be mounted where the system temperature is either warmer or colder than the temperature in the valve body

Sizing



Sizing (continuous)

**Example**

Hot water temperature control in hot water tanks.

Primary medium: Water  
 Given:  
 Load: 31 kW (26500 kcal/h)  
 Primary temperature drop  $\Delta t$ : 20 K  
 Differential pressure  $\Delta p$  across the valve: 1.7 bar  
 Max. hot water temperature: 55°C  
 Water volume Q:  $\frac{31 \times 0,86}{20} = 1,3 \text{ m}^3/\text{h}$

**Required:**

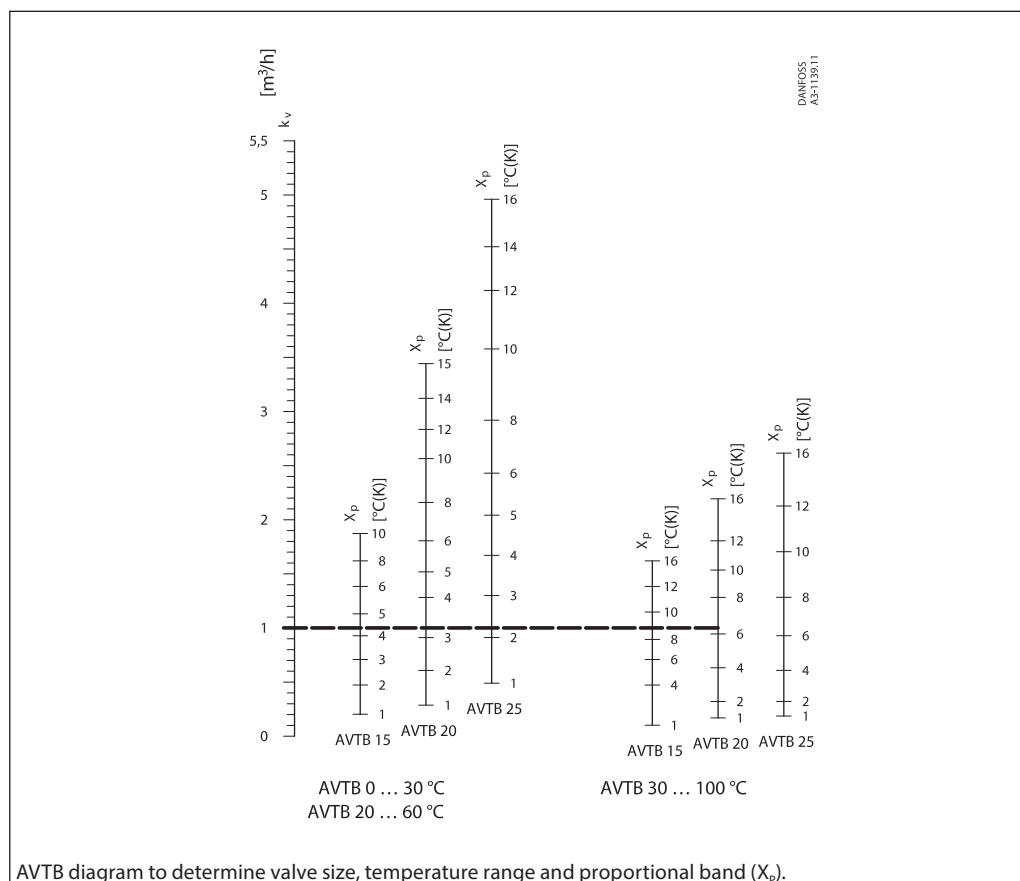
The correct valve size

$$k_v = \frac{Q}{\sqrt{\Delta p}} = \frac{1,3}{\sqrt{1,7}} = 1,0 \text{ m}^3/\text{h}$$

**Temperature range and P-band**

Calculated  $k_v$  value is  $1 \text{ m}^3/\text{h}$ . From this value on the  $k_v$  scale in the AVTB diagram, take a line horizontally to intersect the columns for recommended sizing range. Select the smallest possible valve, here an AVTB 15. A temperature range of  $30 \dots 100^\circ\text{C}$  can be assumed as suitable for this example. The P-band ( $X_p$ ) and final temperature range can also be read from the AVTB diagram. The required closing temperature can be read from the scale for the valve selected. However, there are two temperature ranges that meet the requirement for a closing temperature of  $55^\circ\text{C}$ .  $X_p$  is 9 K for the range  $30 \dots 100^\circ\text{C}$ , which means that the controller will yield the calculated capacity at a sensor temperature of  $55^\circ\text{C}$  minus 9 K =  $46^\circ\text{C}$ . For the range  $20 \dots 60^\circ\text{C}$   $X_p$  = 4 K. This means that the controller will yield the calculated capacity at  $55^\circ\text{C}$  minus 4 K =  $51^\circ\text{C}$ .

To ensure the most stable control an AVTB 15 with a range  $30 \dots 100^\circ\text{C}$  should be chosen. The water in the hot water tank will reach the closing temperature ( $55^\circ\text{C}$ ) only when there has been no hot water demand for some time.

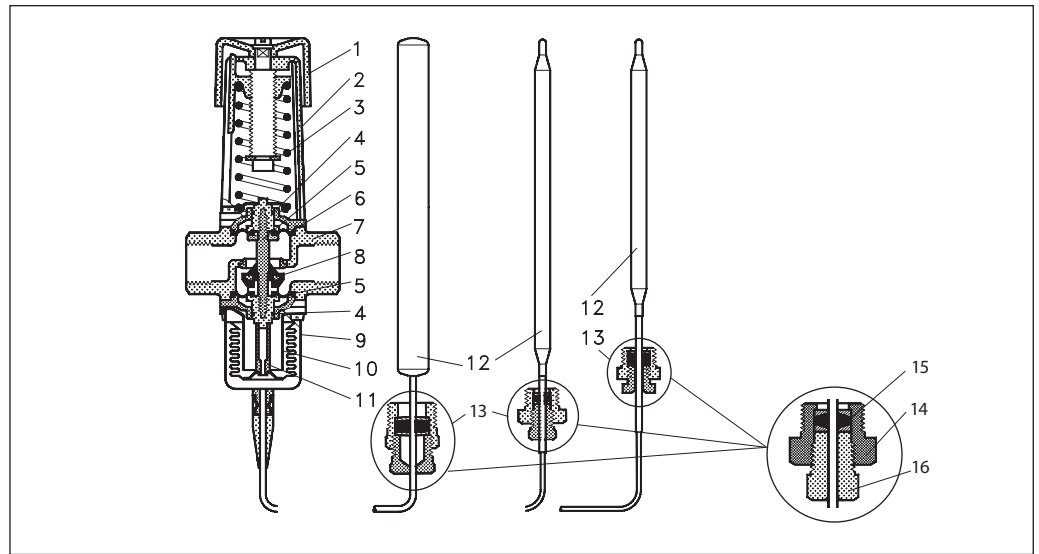


AVTB diagram to determine valve size, temperature range and proportional band ( $X_p$ ).

**Note:** The values stated are mean values

**Design**

- 1. Handle for temperature setting
- 2. Spring housing
- 3. Setting spring
- 4. O-ring
- 5. Diaphragm
- 6. Spindle
- 7. Valve body
- 8. Valve cone
- 9. Bellows
- 10. Bellows stop
- 11. Pressure stem
- 12. Temperature sensor
- 13. Sensor stuffing box
- 14. Housing of sensor stuffing box
- 15. Gasket of sensor stuffing box
- 16. Sealing bolt of sensor stuffing box



**Settings**

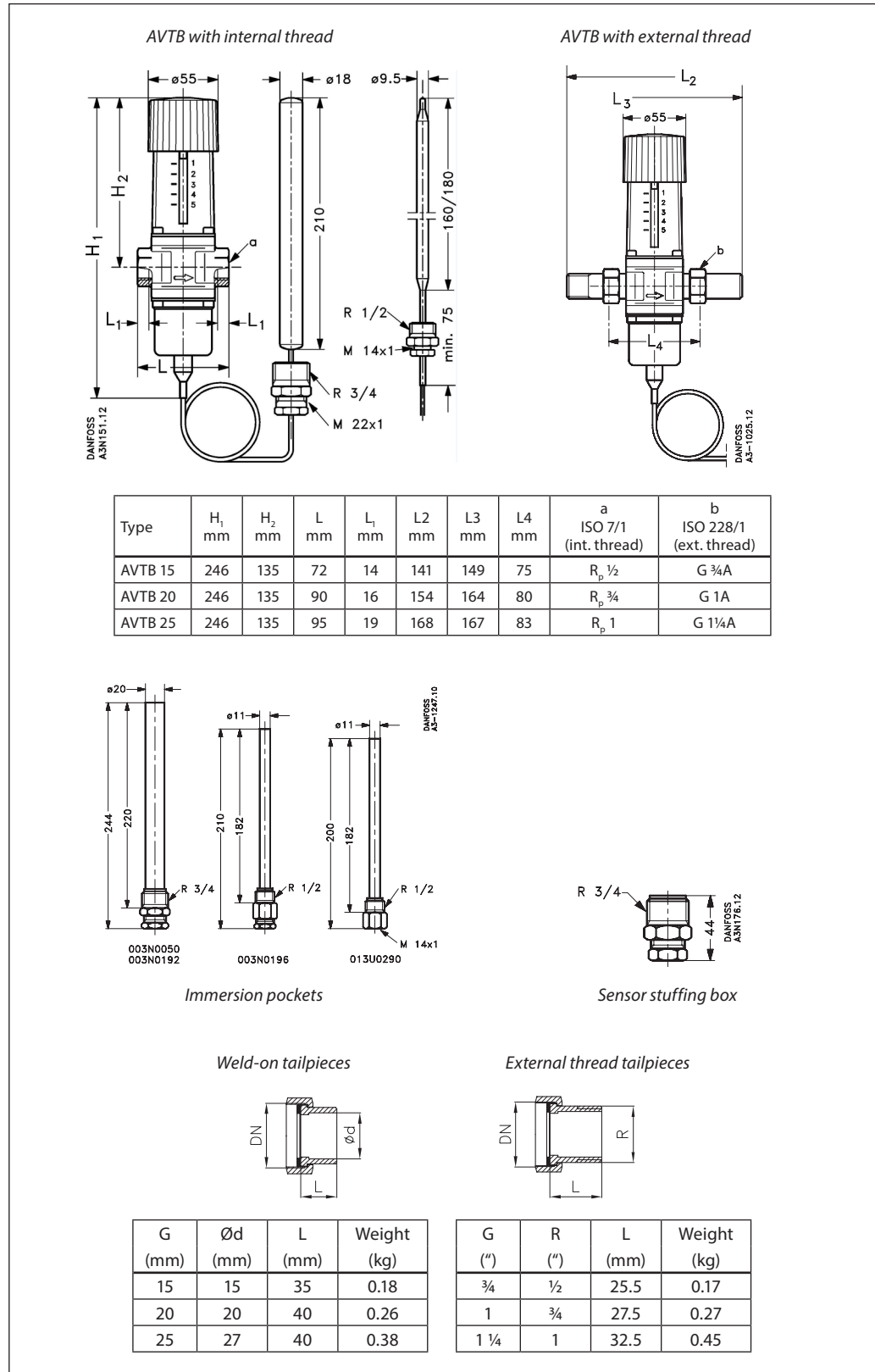
*Temperature setting*

Relation between scale numbers 1-5 and the closing temperature.

The values given are approximate.

Scale setting	1	2	3	4	5	
Closing temperature (0 ... 30 °C)		0	3	15	23	30 °C
(20 ... 60 °C)	20	35	50	60	70	
(30 ... 100 °C)	30	35	55	75	95	120

Dimensions



Danfoss A/S

Climate Solutions • danfoss.com • +45 7488 2222

Any information, including, but not limited to information on selection of product, its application or use, product design, weight, dimensions, capacity or any other technical data in product manuals, catalogues descriptions, advertisements, etc. and whether made available in writing, orally, electronically, online or via download, shall be considered informative, and is only binding if and to the extent, explicit reference is made in a quotation or order confirmation. Danfoss cannot accept any responsibility for possible errors in catalogues, brochures, videos and other material. Danfoss reserves the right to alter its products without notice. This also applies to products ordered but not delivered provided that such alterations can be made without changes to form, fit or function of the product.

All trademarks in this material are property of Danfoss A/S or Danfoss group companies. Danfoss and the Danfoss logo are trademarks of Danfoss A/S. All rights reserved.