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VECTOR 1
AUTOMATION, ELECTRONICS

LEVEL PROBES AND CONTROLLERS

Level controllers selection is based on following factors, depending on concrete implementation:

- liquid characteristics;
- vessel characteristics;
- measurement method (discrete or continuous).

The basic liquid characteristics are: viscosity, temperature, pressure, specific weight, electric conductivity.

Vessel characteristics: construction type, dimensions, material, heaters or mixers availability, location (on open air or under cover), vibrations.

At **discrete level measurement** it is monitoring if the vessel is empty, full or if liquids level is equal to a threshold value.

At **continuous measurement** it is monitoring current level value.

1. Probes for discrete level measurement:

a) electroconductive;
b) with floats;
c) vibrations type;
d) capacitive.

2. Probes for continuous level measurement:

a) ultrasonic and radar;
b) hydrostatic (measuring liquids pressure);

I. LEVEL PROBES AND CONTROLLERS FOR DISCRETE MEASUREMENT

1.1. LEVEL PROBES AND CONTROLLERS FOR ELECTROCONDUCTIVE LIQUIDS

Electroconductive liquids are liquids with electric resistance < 300 kOhm.
Electroconductive level devices consists from probes and controllers.

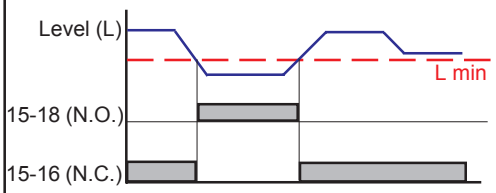
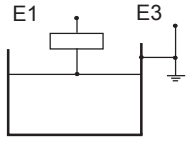
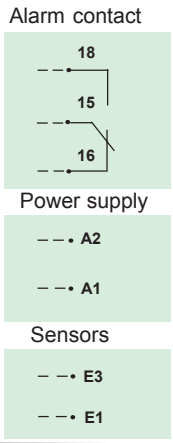
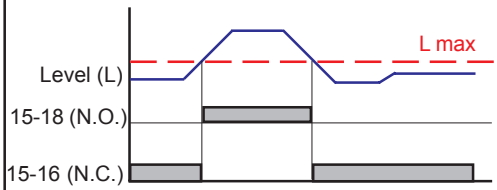
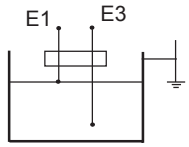
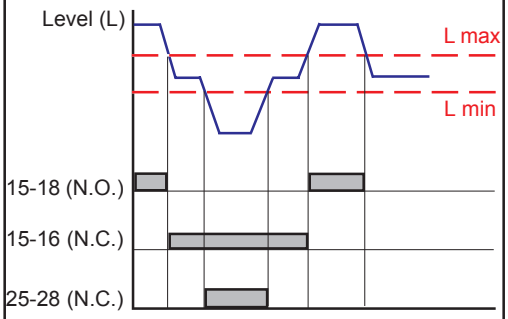
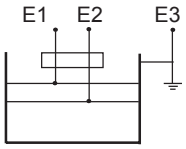
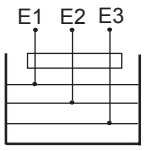
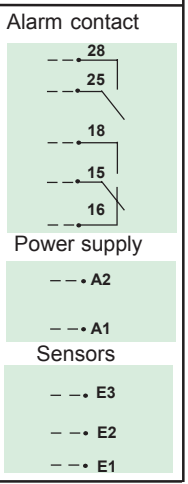
OPERATING METHOD:

Operating method is based on use of electrodes, that make contact when are covered with electroconductive liquid. The simplicity of measurement method determine the low price at high reliability for these type of level probes.

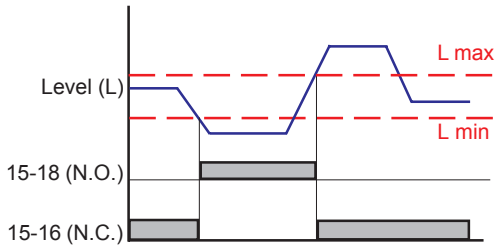
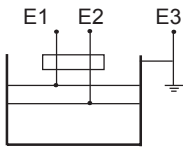
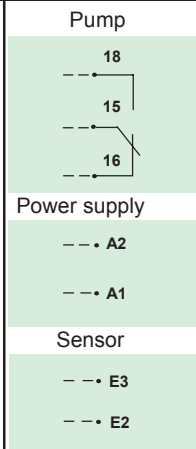
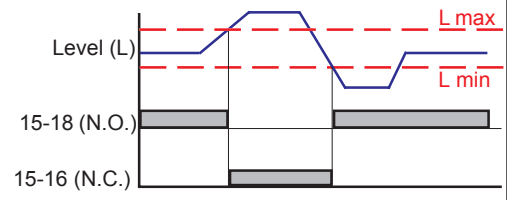
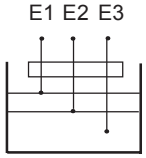
TECHNICAL DATA:

Function of controllers:

a) alarm signalization

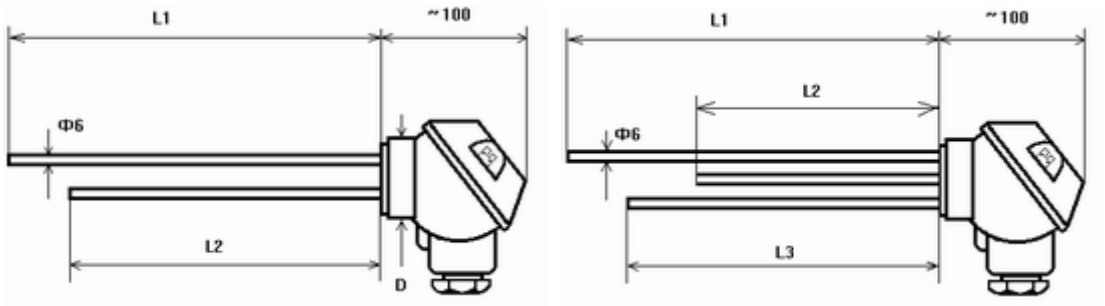
FUNCTIONAL DIAGRAM	FUNCTION	DESIGNATION	CONNECTION
	Switch on N.O. contact 15 - 18 at low level when: **L < L min**	 Vessel from electric conductive material	
	Switch on N.O. contact 15 - 18 at high level when: **L > L max**	 Vessel from electric non-conductive material	
	1. Switch on N.O. contact 15 - 18 when level is: **L > L max** 2. Switch on N.O. contact 25 - 28 when level is: **L < L min**	 Vessel from electric conductive material  Vessel from electric non-conductive material	

b) control of pumps for filling / emptying of vessels

FUNCTIONAL DIAGRAM	FUNCTION	DESIGNATION	CONNECTION
	Maintain level **L** between **L min and L max** by control of a pump in **vessel filling** mode.	 Vessel from electric conductive material	
	Maintain level **L** between **L min and L max** by control of a pump in **vessel emptying** mode.	 Vessel from electric non-conductive material	

Power supply:	24 V AC; 220 V AC
Power supply on probes:	15 V AC
Power consumption:	Max. 3 VA
Outputs:	1 switching or 1 switching + 1 N.O. contact
Sensibility control:	by potentiometer
Outputs electrical characteristics:	4 A, 250 V AC
Indication for output relay condition:	LED
Controller dimensions:	
- version with IP 20:	45 x 70 x 105 mm
- version with IP 55:	125 x 85 x 60 mm
Operating conditions for controller:	
- temperature:	(0 ... +50)°C
- relative humidity:	up to 80%
Controller mounting:	
- version with IP 20	M4 screw or DIN-rail
- version with IP 55	M4 screw on wall
Protection system of controller:	IP 20 or IP 55
Probe dimensions:	L = (0 ... 2000) mm

When the length of vessel is more then 2000 mm the level probes have to be mount not on top of the vessel. The better way of probes mounting is perpendicular outsite of vessel.



Protection system of probes:	IP 65
Electrodes material:	Φ6 stainless steel № 1.4571
Operating temperature for level probes:	(-25 ... +160) °C
Availability of probes for vessels with high pressure (up to 6 bar)**:**	“Sparking plug” probes type stainless steel Φ3, 150,300 or 500 mm

ORDER CODE FOR CONTROLLER

VCL	X	XX	X	X

1.Construction type:

Signalization	1
Control of filling / emptying	2

2. Function

Signaling when (L < L min)	11
Signaling when (L > L max)	12
Signaling when (L < L min) or (L > L max)	13
Signaling when (L > L min) and (L > L max)	14
Maintain of (L min < L < L max) by **filling** pump	21
Maintain of (L min < L < L max) by **emptying** pump	22

3. Number of controlled discrete values of level

1 controlled point	1
2 controlled points	2

4. Protection system

IP 20	1
IP 55	2

ORDER CODE FOR LEVEL PROBE

VSL	X	X	XXX / XXX / XXX

1. Connection thread:

- 3 / 4”	1
- M 27 x 3	2
- 1 / 2” when 1 electrode	3

2. Number of electrodes:

- 1 electrode	1
- 2 electrodes	2
- 3 electrodes	3

3. Electrodes length in cm:

electrod 1 / electrod 2 / electrod 3

Ordering examples:

a) controller: VCL 1- 13 - 2 - 1

The parameters for ordered above controller are:
- signalization function;
- signaling function when level L < L min or L > L max;
- 2 point of controlled discrete values of level (L max and L min);
- protection system IP 20.

b) level probe: VSL 1 - 2 - 142 / 160

The parameters for ordered above probe are:
- thread: 3 / 4”
- number of electrodes: 2;
- electrode 1 length 1: 142 cm / electrode 2 length: 160 cm

1.2. FLOAT LEVEL SWITCHES:

They are used for discrete level measurement of clean liquids, especially for liquids forming foam.

The operating principle of this level sensors is based on the switching of reed contacts by a magnetic float, moving alongside a protective tube.
They are connected to VCL devices for pumps control.

TECHNICAL DATA:

Tube length:	up to 2000 mm.
Maximal number of reed switches:	3
Switching current:	230 V AC / 0.5 A
Protection system:	IP 65
Tube material:	stainless steel
Float material:	polyamid (PA)
Connection:	thread M30x3,5; 1” or flange
Float diameter:	Φ24 or Φ44
Operating temperature:	up to 80 °C

ORDER CODE FOR FLOAT LEVEL SWITCH:

VSP	X	X	X	X	XXX / XXX / XXX

1. Tube length:

(0 ... 200)

2. Number of reed switches:

- 1 reed switch **1**
- 2 reed switches **2**
- 3 reed switches **3**

3. Connection thread:

- M30 x 3,5 **1**
- 1” **2**
- flange **3**

4. Float:

- Φ24 **1**
- Φ44 **2**

5. Length from probe head to reed contacts in cm:

r.c. 1 / r.c. 2 / r.c.3

Example: VSP 160 - 2 - 2 - 1 - 120 / 144

The ordered probe has following parameters:

- tube length: 160 cm
- number of reed switches: 2
- connection thread: 1”
- float: Φ24
- length from probe head to reed switch 1: 120 cm
- length from probe head to reed switch 2: 144 cm

II. LEVEL PROBES AND CONTROLLERS FOR CONTINUOUS LEVEL MEASUREMENT

The ultrasonic, radar and hydrostatic level sensors are imported and delivered from Vector 1 Ltd.

2.1. ULTRASONIC AND RADAR LEVEL SENSORS

The ultrasonic and radar level sensors are used for continuous level measurement of a liquid and bulk materials. For high accuracy of measurement an optimal place for sensor mounting is needed.

If the sensor is located at wrong place this can make worse the results of measurements, because of reflections from vessel equipment.

Ultrasonic and radar level controllers are applicable for various materials - clean, viscid and aggresive liquids, also for explosive environment.

TECHNICAL DATA:

Level ranges:	up to 5 m; up to 8 m;up to 15 m; up to 30 m; up to 60 m
Operating temperature:	(-20 ... 80) °C
Vessel pressure:	Max. 3 bar
Protection system:	IP 67
Power supply:	20 ... 72 V DC or 20 ... 250 V AC
Output signal:	4 ... 20 mA, 2-wire connection
Construction type:	standard or EEx ia IIc T6

2.2. HYDROSTATIC LEVEL SENSORS

They are used for level measurement of liquids with constant density. Level measurement is based on measurement of hydrostatic pressure of liquids.

At proper pipe output of vessel, the sensors are mounted outsite of vessel.

It is available a submersible construction type of sensor.

TECHNICAL DATA:

Sensor type:	for measuring of relative pressure
Pressure ranges:	from 0,1 up to 20 bar
Pressure transmitter type:	piezoresistive
Measuring membrane:	from stainless steel № 1.4571
Power supply:	(10 ... 30) V DC
Output signal:	(4 ... 20) mA, 2 - wire connection
Time constant:	1 msec
Accuracy:	0,5%; 1%
Operating temperature:	(-20 °C ... 80) °C
Construction type:	standard or EEx ia IIc T6

2.3. CONTROLLERS FOR CONTINUOUS LEVEL MEASUREMENT

They are digital controllers with input signal from radar, ultrasonic or hydrostatic level sensors.
These controllers are used for signalization or emptying / filling control of vessels for liquids or bulk materials.

The measured level value is digitally indicated.

TECHNICAL DATA:

Measuring input:	current signal (4 ... 20) mA from level sensors
Outputs:	1 or 2 relay contacts 250 V AC / 4 A
Outputs function:	a) alarm signalization b) control of pump for filling / emptying of vessels
Accuracy:	0,25% from span
Electrical connection:	screw terminals 2,5 mml
Hysteresis:	programmable from 0,2 to 5 cm
Data buckup:	EEPROM
Measurement circuit monitoring:	for probe break and short - circuit
Power supply:	220 V AC; 24 V AC
Consumption:	Max. 3 VA
Operating conditions:	
a) temperature:	(0 ... +45) °C
b) relative humidity:	up to 80% at 25 °C
Mounting:	on panel - horizontal or vertical
Protection system:	front panel - IP 54; rear - IP 20
Dimensions:	96 x 48 x 135 mm depth behind panel 130 mm
Panel cutout:	92 x 44 mm
ORDER CODE:	see VECON 10 datasheet