OPTICAL FLOW CONTROLLER

8039

Instruction Manual

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Table of Contents

ENGLISH

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⚠️ **Always respect the safety instructions marked by the symbol opposite as well as those included in the manual.**

1.1 Utilisation

The controller 8039 has only been designed to measure the flow of liquids that let through the infrareds.

There will be no manufacturer warranty for damages caused by unexpected handling or wrong usage of the device. The warranty on the device becomes invalid if any modification or change is made on the device.

⚠️ **The device should only be installed and repaired by specialist staff. The user is not allowed to work on the cables inside the housing. If any difficulties may occur with the product during installation, please contact your nearest Bürkert sales office for assistance.**

1.2 Precautions at installation and commissioning

- When the device is powered and the cover is open, protection against electric shocks is not ensured.
- Always ensure the materials in contact with the medium to measure are chemically compatible with this medium.
- To clean the device, only use chemically compatible products.
- When the controller is installed outside, protect it from the rain, ultraviolet radiations and electromagnetic perturbations.

⚠️ **When dismounting the controller from the pipe, take all the necessary precautions linked to the process.**
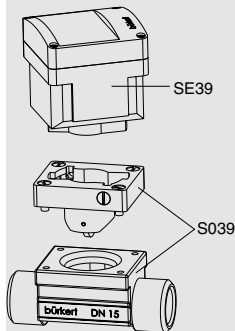
1.3 Conformity to standards

EMC: EN 50 081-1, 50 082-2
Security: EN 61 010-1
Vibration: EN 60068-2-6
Shock: EN 60068-2-27

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SE39

S039

bürkert DN 15

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2.1 Design

The flow controller 8039 is made up of an electronic module SE39 and a fitting S039 with integrated paddle-wheel. It may switch a solenoid valve, activate an alarm or establish a control loop. The switching point can be adjusted by means of the three keys located under the display.

The electrical connection is carried out via a DIN 43 650 connector and/or an M12 multipin connector.

2.2 Measuring principle

The controller 8039 detects the rotation of the paddle-wheel. The latter produces pulses whose frequency is proportional to the flow ($f = K.Q$, where f is the frequency in Hz, K the K factor specific to each fitting in pulses/l and Q the flow in l/s).

⚠ **The flow is only taken into account if the medium flows in the direction indicated by the arrow marked on the housing.**

2.3 Available versions

Order code table for the electronic module SE39

Supply voltage	Input	Output	Connection	Order codes
12-30 VDC	---	NPN	DIN 43650 connector	440 378
12-30 VDC	---	PNP	DIN 43650 connector	440 379
12-30 VDC	---	NPN and PNP	M12 connector	440 377
12-30 VDC	---	Relay	M12 and DIN 43650 connectors	440 382

2.4 Accessories

Order code table for the accessories

	Order codes
M12 female connector, 5 pins, to be wired	917 116
M12 connector, 5 pins, moulded on a shielded cable (2 m)	438 680

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General features

Pipe diameter	DN15 to DN50 (1/2'' to 2''); determine the appropriate diameter using the flow-velocity-DN diagrams (see Annex)
Medium temperature	100 °C
Medium pressure	depends on the S039 fitting (see the manual of the fitting)
Medium viscosity	max. 300 cSt
Rate of solid particles	max. 1%
Measuring range	0,3 m/s to 10 m/s *(1.0 to 32 fps)*, 0.3 m/s *(1.0 fps)* corrresponds to a flow of 3 l/min *(0.8 gpm)* in a DN15 *(1/2")* fitting.
Accuracy	±1 % of the full scale*, with calibration on site or using the teach-in function
	± (1 % of the full scale* + 3% of the measured value), with standard K factor
Linearity	± 0.5 % of the full scale*
Repeatability	0.4% of the measured value
Measuring element	paddle-wheel of the S039 fitting
Protection rating (housing)	IP 65, connectors being plugged-in and tightened

* full scale = 10 m/s

Electrical features

Installation class (overvoltage class)	2
Insulating strength	2300 VAC
Power supply	12-30 VDC
Max. current consumption	750 mA (with load) (versions with PNP output)
	80 mA (without load) (Relay version)
Protection against polarity reversal	yes
Transistor output	NPN and/or PNP, open collector, 700 mA max., NPN output: 0,2-30 VDC and PNP output: supply voltage (see example in the Annex)

Relay output   250 VAC, 3 A max. or 30 VDC, 3 A max. ; programmable
Protection against
short-circuits   yes for the transistor output
Type of cable recommended   shielded, wire section between 0.14 and 0.5 mm^2

Electrical connection

NPN version   DIN 43650 connector (supplied)**
PNP version   DIN 43650 connector (supplied)**
NPN/PNP version   M12 female connector, 5 pins (not supplied)
Relay version   DIN 43650 connector (supplied)** and M12 female connector, 5 pins (not supplied)

** EaseOn with 2511 connector on request

Materials

Housing   polycarbonate +20% of fiber glass
Front plate   polyester
Fitting S039   brass
Paddle-wheel and holder
of the S039   PVDF
Axis and bearings of the S039   ceramic
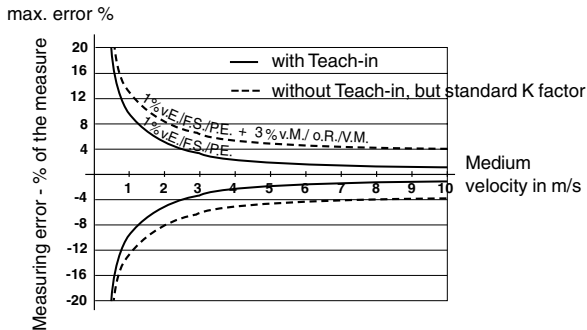O-rings   FPM in the standard versions (EPDM as an option)

Environment

Ambient temperature   0 to +60° C *(+32° F to +140° F)*
Relative humidity   < 80%

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Accuracy of the measures with and without teach-in

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max. error %

Measuring error - % of the measure

| 20 |
| 16 |
| 12 |
| 8 |
| 4 |

— with Teach-in

- - - without Teach-in, but standard K factor

1 % v.E./F.S./P.E.

1 % v.E./F.S./P.E. + 3 % v.M./ o.R./V.M.

Medium velocity in m/s

1 2 3 4 5 6 7 8 9 10

| -4 |
| -8 |
| -12 |
| -16 |
| -20 |

F.S = Full scale
o.R. = of Reading (measured value)

These values have been determined in the following reference conditions: medium = water, water and ambient temperatures = 20 °C, min. upwards and downwards distances respected, appropriate pipe dimensions.

Dimensions (mm)

DIN 43650

94

50

67,5

⌀ 54,2

30

M12

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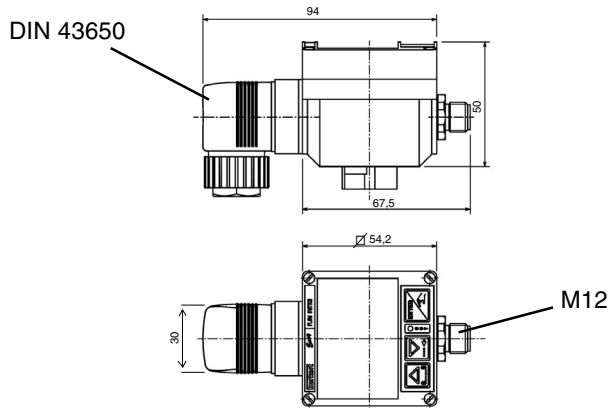
4.1 General recommendations

- Always check the chemical compatibility of the materials the controller is made of with the products it may be in contact with, for instance: alcohols, strong or concentrated acids, aldehydes, bases, esters, aliphatics, aromatics, ketones, aromatics or halogenated hydrocarbons, oxidizing agents and chlorinated products.
- Avoid installing the controller near industrial lighting which may disturb the optical sensor (mercury halide lamps for example).

For more information, please contact your Bürkert sales office.

4.2 Mounting on the pipe

The controller 8039 comprises an S039 fitting for installation on a pipe. Install the 8039 on the pipe so that the arrow on the housing indicates the direction of the flow.
During mounting, follow the instructions given with the fitting.
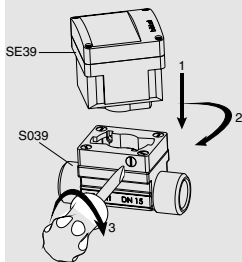
4.3 Electrical connection

Always ensure the power supply is switched off before working on the device. All the connectors must be plugged out. Use:
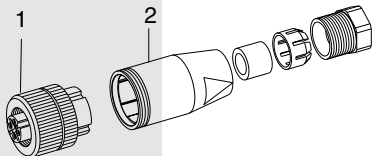
- a shielded cable with an operating temperature > +80° C *(+176° F)*.
- a high quality voltage supply (filtered and stable).
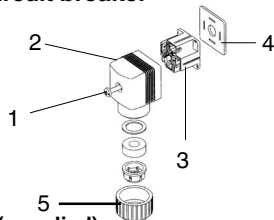
Install the following security devices:
- **for the power supply: a 1-A fuse**
- **for the relay: a max. 3-A-fuse and a circuit breaker (depending on the application).**

4.3.1 Connectors

DIN 43 650 connector (supplied)
- Remove part [3] from part [2].
- Wire according to pin assignment (see 4.3.2 or 4.3.3)
- Replace part [3].
- Tighten the cable gland [5].
- Place gasket [4] between the DIN 43 650 connector and the fixed connector of the 8039.
- Connect the DIN 43650 connector to the 8039.
- Tighten screw [1].

Multipin M12 connector (not supplied)
- Loosen threaded ring [1]
- Remove part [2] from the connector.
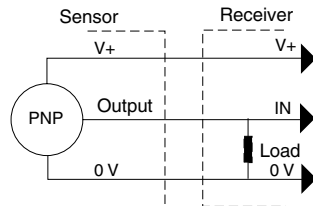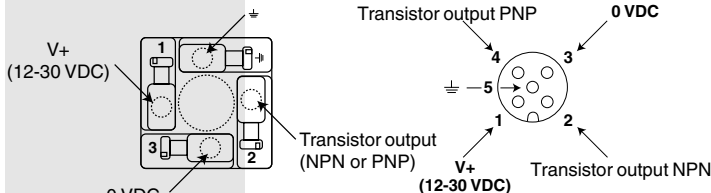- Wire according to pin assignment (see 4.3.2)

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4.3.2 Version with transistor output (NPN / PNP)
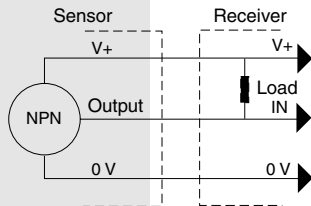
NPN output

PNP output

V+
(12-30 VDC)

0 VDC

**NPN or PNP wiring of
connector DIN 43650**

Transistor output PNP   **0 VDC**

Transistor output
(NPN or PNP)

**V+
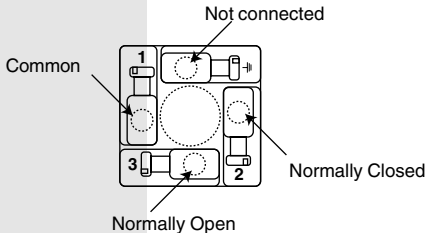(12-30 VDC)**   Transistor output NPN

**NPN / PNP wiring of the M12
connector on the controller**

M12 cable available as an option (reference 438 680); Correspondence between the connector pin numbers and the wire colours:	
Pin	Wire colour
1	brown
2	white
3	blue
4	black
5	grey

4.3.3 Version with relay output

Not connected

Common

Normally Closed

Normally Open

**Wiring of the DIN 43650
connector, relay output**

Not connected

0 VDC

4 **3**

$\perp$ — **5**

1 **2**

**V+
(12-30 VDC)**
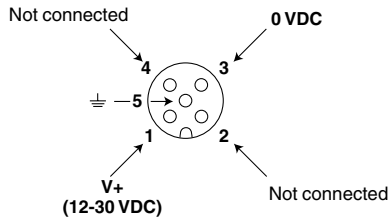
Not connected

**Wiring of the M12 connector
(12-30 VDC power supply)**

Operating safety

When the voltage at the relay terminals is higher than 24 V and the connectors are not correctly plugged-in and tightened, there is a risk to electrocute yourself.

Always check all the connectors to ensure the good operating of the device.

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5.1 General recommendations

⚠️ Keep in mind that the process may be influenced by all the parameter settings you make. Fill-in the table on page 22 with your settings of the controller 8039.

5.2 Functionalities

The device has three operating modes :

Normal Mode

Display of the measured flow and the switching thresholds programmed. From the Normal mode, you can access the Calibration and Simulation modes.

Calibration Mode

Access to the programming of all the parameters (unit, K-factor, calibration through the „Teach-in" feature, output, filter , bargraph). From the Calibration Mode, you can go back to the Normal Mode.
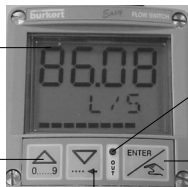
Simulation Mode

Entering a theoretical flow value to test the configuration programmed in the Calibration Mode. From the Simulation Mode, you can go back to the Normal Mode.

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5.3 Programming keys

To display the measured value and the configuration (8 characters: 4 numeric et 4 alphanumeric charact.)

To indicate the status of the switching output (red LED)

To modify the digit value (0…9) ; To go back to the previous function.

To validate a function; To validate the entered data.

To select the character; To go to the next function.

5.4 Default Configuration

At the first powering up, the configuration of the controller 8039 is as follows:

Flow unit: l/s
Output: hysteresis, inverted
OLO: 0
OHI: 0
DEL: 0 s
Filter: 2
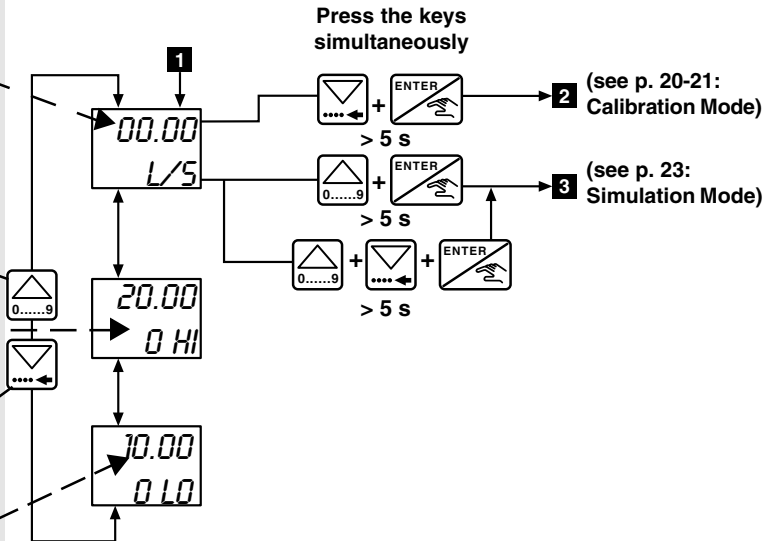BGLO: 0
BGHI: 0
Extension board: no (function not used)

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5.5 Normal Mode

Press the keys simultaneously

Display of the measured flow.

1

00.00

L/S

> 5 s

> 5 s

> 5 s

To go back to the previous function.

To display the high threshold value (O HI).

20.00

O HI

To go to the next function.

To display the low threshold value (O LO).

10.00

O LO

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5.6 Possible switching modes of the 8039
Hysteresis Mode

The change of state occurs when a threshold is detected (increasing flow: high threshold (OHI) to be detected, decreasing flow: low threshold (OLO) to be detected).
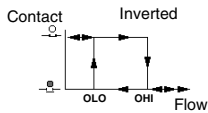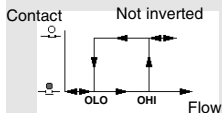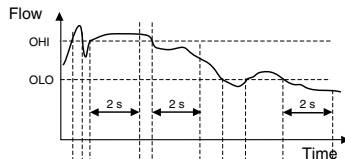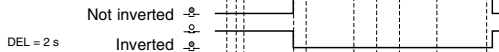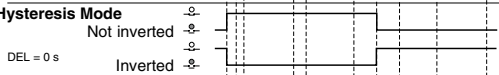

Window Mode

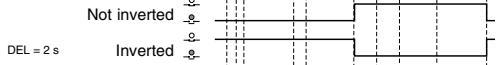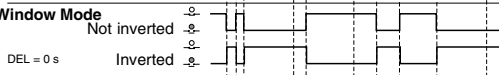The change of state occurs when any threshold is detected.
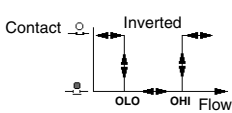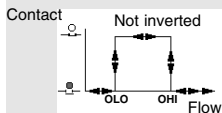
The delay (DEL) is set for the both switching thresholds. The switching only occurs when either threshold value (OHI - OLO) is exceeded for a duration higher than the DEL delay.

Switching examples of the 8039 depending on the flow and the switching mode chosen

8039 19

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5.7 Normal Mode

To choose the flow unit (l/s, l/min, l/h, m³/min, m³/h, Ga/s, Ga/min, Ga/h).

To go back to the previous function.

To go to the next function.

To enter the K-factor (refer to the fitting manual) or have it calculated through the Teach-in feature. K is the multiplication coefficient between the rotational frequency of the paddle-wheel and the fluid to be measured.

If you change the flow unit, change the switching threshold values, too.
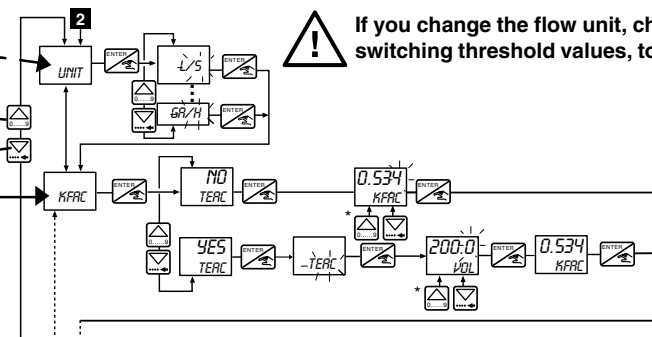
* To move the decimal point, press simultaneously keys

** To use the «Teach-In» feature, connect the 8039 controller to a valve which makes it possible to fill a tank with a capacity of x litres (200 litres for instance).
When the display shows «YES TEAC», press the «ENTER» key and open the valve: The «TEAC» message flashes.

When the tank is full (200 litres), press «ENTER» again. By means of the keys, enter the volume of fluid which circulated through the circuit (200 litres): the controller calculates the K factor and displays it.
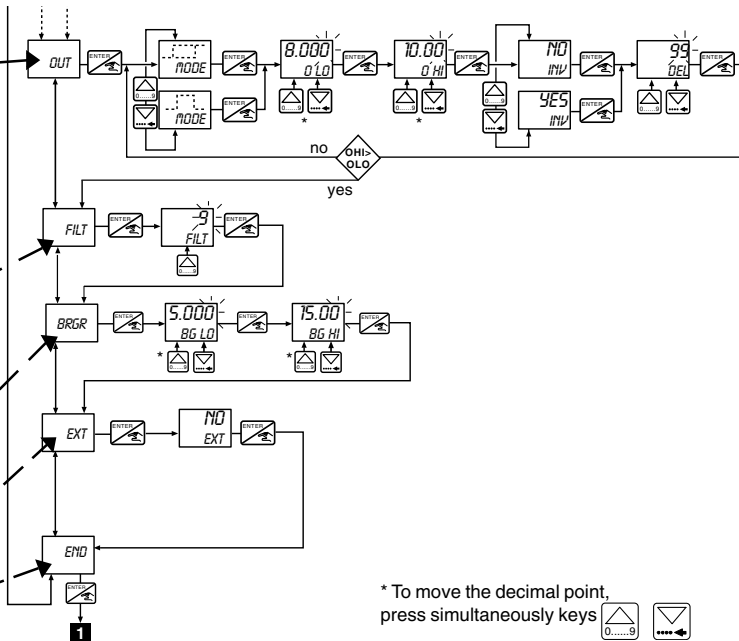
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To choose :
- the switching mode of the output (Hysteresis or Window, see p. 19)
- the low (O LO) and high (O HI) switching thresholds
- whether the switching mode is inverted or not (INV, see p. 19)
- the delay before switching (DEL, in seconds).

To choose the filtering level (FILT) of the flow displayed, only ; «0» means «all the flow variations are displayed», «9» smoothes the displayed flow changes at the most.

To define the min. (BG LO) and max. (BG HI) values of the bargraph at the bottom of the display.

Function EXT not used.

To return (END) to the display of the flow in the Normal mode.

* To move the decimal point, press simultaneously keys

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Configuration of the 8039: Fill-in the table with the parameters set in the Calibration mode.

Unit	K factor	Mode		Thresholds		Inverted		Delay	Filter	Bargraph		Date	Sign.
UNIT	K FAC	Hyst.*	Win.**	O LO	O HI	Yes	No	DEL (s)	FILT	BG LO	BG HI		

* Hysteresis mode:

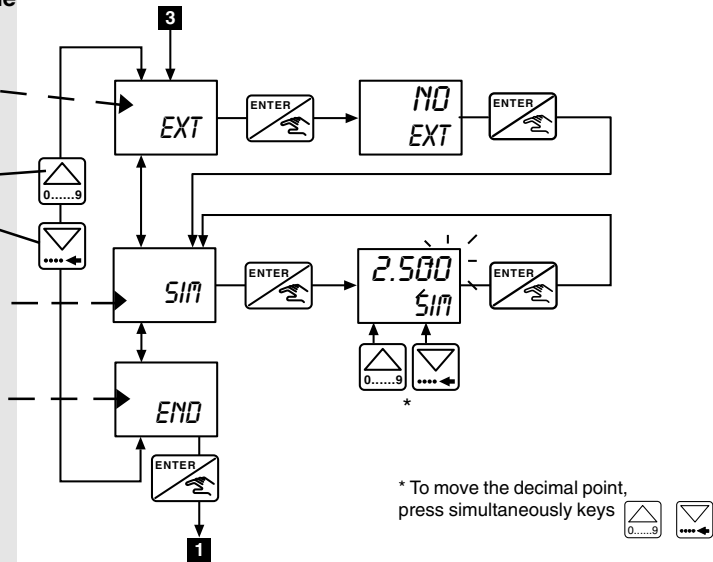**** Window mode:**

5.8 Simulation Mode

Function EXT not used.

To go back to the previous function.

To go to the next function.

To test the switching thresholds after entering a flow value (SIM) and PRESSING THE ENTER KEY.

To return (END) to the display of the flow in the Normal mode.

3

EXT

ENTER

NO
EXT

ENTER

0......9

••••◄

SIM

ENTER

2.500
SIM

ENTER

0......9

••••◄

*

END

ENTER

1

* To move the decimal point, press simultaneously keys

0......9

••••◄

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6.1 Cleaning

The controller 8039 can be cleaned with water or any solution compatible with the materials the device is made of.
For more information, please contact your Bürkert sales office.

6.2 Error messages

Type of message	Description	Solution
ERR 0	Calibration data are lost. Reading error: the process is stopped.	Press the ENTER key to go back to the Normal mode. The device has returned to its default configuration: the device must be calibrated again. If the message appears frequently, send the device back to your Bürkert sales office.
ERR 1	Calibration data cannot be saved. Write error: the process is stopped.	Press the ENTER key to go back to the Normal mode. The device displays the configured data; BUT this data has not been saved: the device must be calibrated again. If the message appears frequently, send the device back to your Bürkert sales office.

| Type of message	Description	Solution
ERR 2	The calibration parameters cannot be accessed. Menu reading error: the process goes on operating.	Press the UP and DOWN keys under the display to scroll through the menus. If the message appears frequently, send the device back to your Bürkert sales office.

6.3 Trouble shooting

If the display shows a flow equal to zero, do the following:
- ensure the controller has been installed so that the arrow on the housing shows the direction of the flow.
- ensure the K factor is different from 0 (menu CALIB, KFAC function).
- separate the SE39 from the S039 and pass your finger rapidly and several times in a row under the sensor to simulate the rotation of the paddle-wheel.
- ensure the paddle-wheel is clean.

If the display still shows a flow equal to zero, send the device back to your Bürkert sales office.

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7.1 Examples of Easy Link© with the 8039

NPN connection: controller 8039 (NPN/PNP version) and a Programmable Logic Controller.
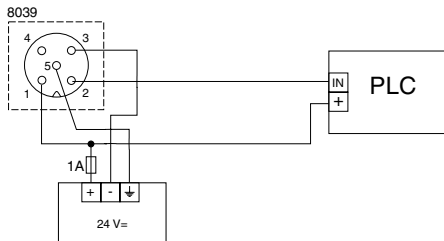
PNP connection: controller 8039 (NPN/PNP version) and a Top Control 8631.
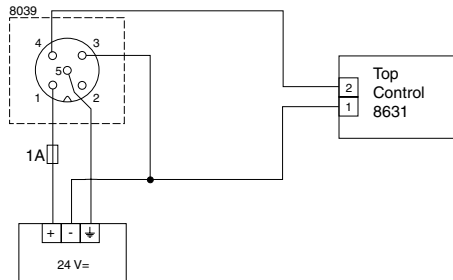
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NPN connection: controller 8039 (NPN/PNP version) and a solenoid valve 6014.
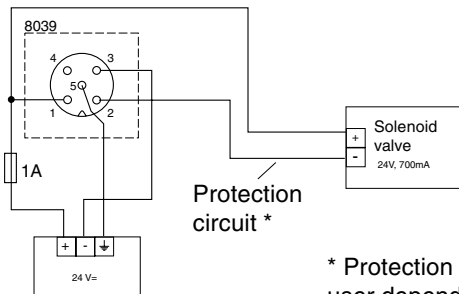
8039

4   3

5

1   2

1A

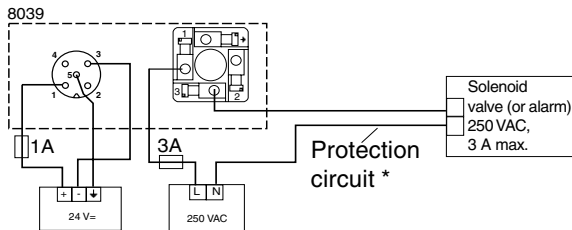Protection circuit *

Solenoid valve
24V, 700mA

24 V=

* Protection must be installed by the user depending on the load, for instance, a connector DIN 43650 with integrated varistor.

PNP connection: controller 8039 (NPN/PNP version) and a solenoid valve.

8039

4   3

5

1   2

1A

Protection circuit *

Solenoid valve
24V, 700mA

24 V=

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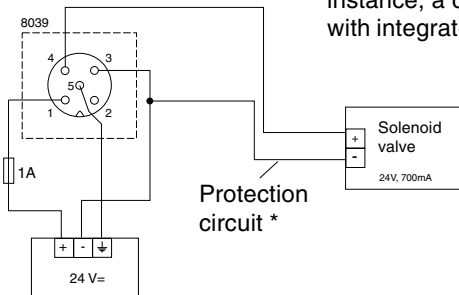
NO (Normally Open) connection: controller 8039 (relay version) and a solenoid valve.

NC (Normally Closed) connection: controller 8039 (relay version) and a solenoid valve.

* Protection must be installed by the user depending on the load, for instance, a connector DIN 43650 with integrated varistor.
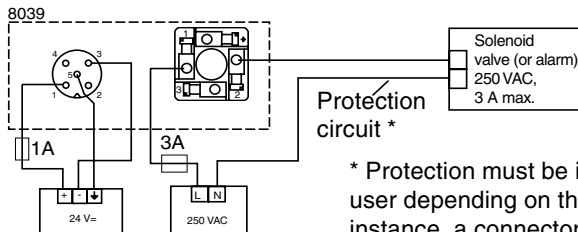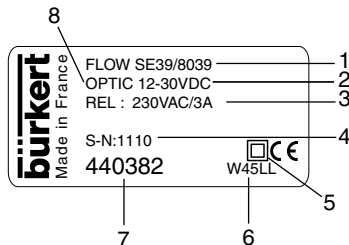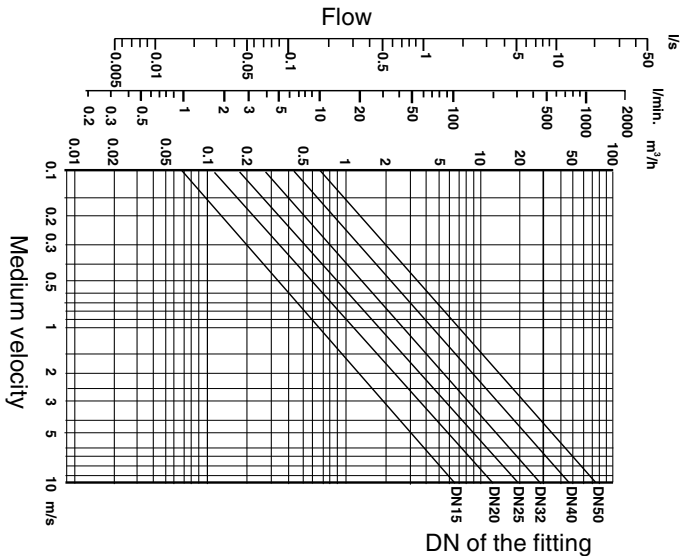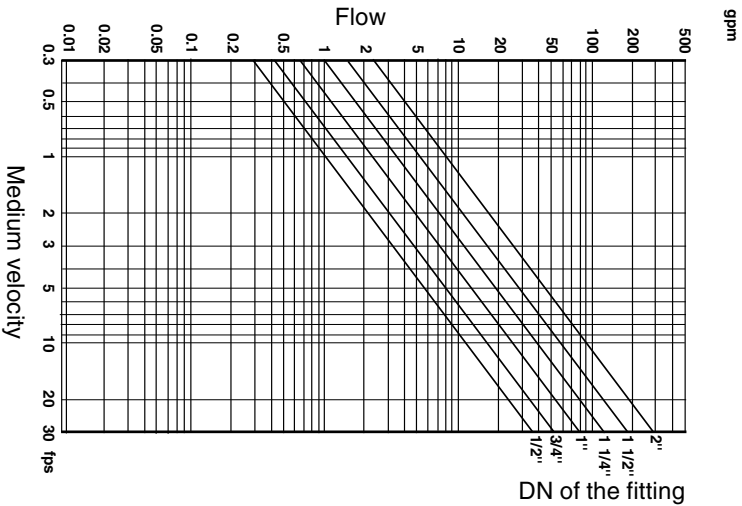
7.2 Description of the label of the controller 8039

1. Type of sensor
2. Power supply
3. Output characteristics
4. Serial number
5. Protection class : protective insulation
6. Manufacturer code
7. Order number
8. Optical detection sensor

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7.3 Flow-velocity-DN diagrams

Flow

Medium velocity

DN of the fitting

Flow

gpm

Medium velocity

DN of the fitting

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NOTES