Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
↳PUMPMAX	1 rpm	1	1	500	Maximum stroke rate of the low power relay (frequency relay)
mA OUT (Output value of the mA standard signal output)	meas val	off			off
		meas val			meas val
		corr val			corr val
		dosing			dosing = control value
		manual			manual
↳RANGE	4 - 20 mA	0 - 20 mA			Range of the mA standard signal output
		4 - 20 mA			
↳0/4 mA	2.00 pH	0.01 pH	0.00 pH	14.00 pH	pH value assigned 0/4 mA
↳20 mA	12.00 pH	0.01 pH	0.00 pH	14.00 pH	pH value assigned 20 mA
↳0/4 mA	0 mV	1 mV	-1000 mV	1000 mV	Redox value assigned 0/4 mA
↳20 mA	1000 mV	1 mV	-1000 mV	1000 mV	Redox value assigned 20 mA
↳0/4 mA	0.0 °C	0.1 °C	0.0 °C	120.0 °C	Temp. value assigned 0/4 mA
↳20 mA	100.0 °C	0.1 °C	0.0 °C	120.0 °C	Temp value assigned 20 mA

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
↳0/4 mA	32.0 °F	0.1 °F	32.0 °F	248.0 °F	Temp. value assigned 0/4 mA
↳20 mA	212.0 °F	0.1 °F	32.0 °F	248.0 °F	Temp value assigned 20 mA
↳20 mA [2]	- 100 %	1 %	10 %/ - 10 %	100 % / - 100 %	Control value assigned 20 mA (0/4 mA is fixed as 0%)
↳VALUE	4.00 mA	0.01 mA	0.00 mA	25.00 mA	Manual output current value
↳ERROR	off	23 mA			Output current value upon fault, 23 mA
		0/3.6 mA			Output current value upon fault, 0/3.6 mA
		off			off = no fault current is output

1 = The parameter maximum occurs at PERIOD/4 or 999, whichever is smaller

2 = dependent on metering direction, the limits are either -10% and -100% or +10% and +100%

8.7 DEVICE setting

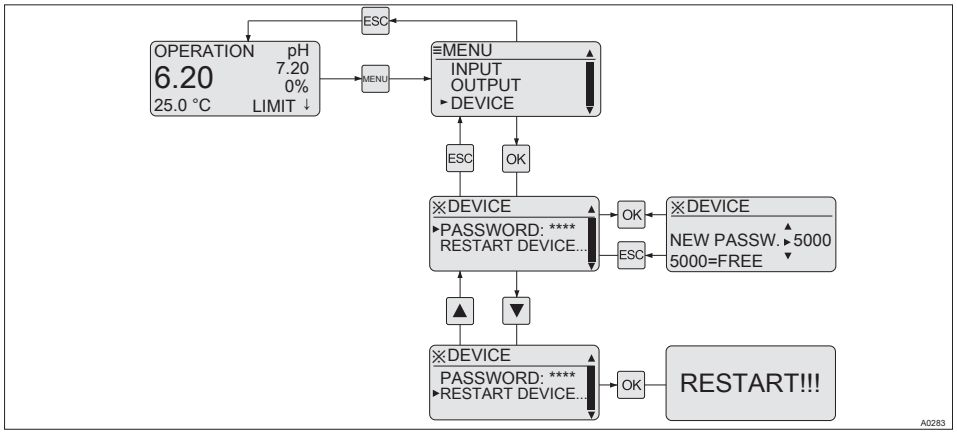

Fig. 32: Device setting

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
Password	5000	1	0000	9999	5000 = no password protection
Restart device					Controller is restarted

9 Control parameters and functions

- **User qualification:** trained user, see ↳ *Chapter 2.2 'Users' qualifications' on page 10*

9.1 DULCOMETER® Compact Controller function states

DULCOMETER® Compact Controller function states have the following priority:

- 1. *'STOP'*
- 2. *'PAUSE/HOLD'*
- 3. *'CAL'* (calibration)
- 4. *'OPERATION'* (normal mode)

"CAL" (calibration) peculiarities

- Control goes to basic load, mA measurement outputs are frozen
- New faults are detected, however they have no effect on the alarm relay or the mA output
- Detection of measurement variable relevant faults during *'CAL'* (calibration process) are suppressed (e.g. LIMIT↑)

"PAUSE" peculiarities

- Control is switched to 0% control variable. The I-proportion is saved
- New faults are detected, however they have no effect on the alarm relay or the mA output
- Special case alarm relay in *'PAUSE'*: If activated the output relay switches to *'PAUSE'* (error message CONTACTIN)

"HOLD" peculiarities

- Control and all other outputs are frozen
- New faults are detected, however they have no effect on the alarm relay or the mA output. However the effect of already existing faults (e.g. fault current) remains
- Special case alarm relay: Activation of the frozen alarm relay is permitted (= no alarm), if all faults have been acknowledged or have disappeared
- Special case alarm relay in *'HOLD'*: If activated the output relay switches to *'HOLD'* (error message CONTACTIN)

"STOP" peculiarities

- Control OFF
- New faults are detected, however they have no effect on the alarm relay or the mA output
- The alarm relay is switched off in *'STOP'*

Peculiarities of the "START" event, i.e. switching from "STOP" to "OPERATION" (normal mode)

- Fault detection starts afresh, all existing faults are deleted

Generally applicable information

- If the cause of a fault disappears, then the fault message in the LCD footer disappears.
- A previously existing *'PAUSE/HOLD'* state is not influenced by starting a *'CAL'* (calibration) process. If during *'CAL'* (calibration) the functional state *'PAUSE/HOLD'* is released, then all states will remain frozen until the end of the *'CAL'* (calibration) process.

- If *'CAL'* (calibration) is started while functional state *'OPERATION'* (normal mode) is active, then the functional state *'PAUSE/HOLD'* is ignored until *'CAL'* (calibration) completes. However STOP/START is possible at any time
- An alarm can be acknowledged or removed as follows: By clearing all faults by pressing the STOP START key and the OK key while the continuous display is visible

9.2 STOP/START key

The control function is started / stopped by pressing the STOP START key. The STOP START key can be pressed independently of the currently displayed menu. However, the [STOP]state is only shown in the continuous display.

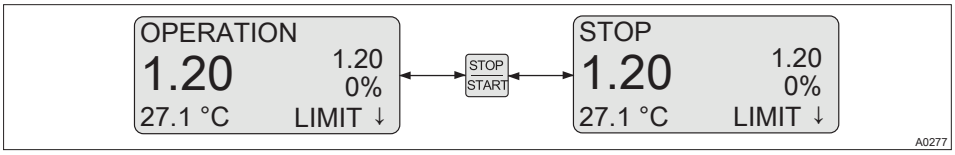

Fig. 33: STOP START-Key

When the controller is first switched on, the controller is in *[STOP]*status.

Upon certain defined fault conditions, the controller switches to the *[STOP]*status. The control is then off (= 0 % control variable).

To differentiate between the fault-related *[STOP]* and the operating status *[STOP]* by pressing the STOP START key, instead of *[STOP]*the identifier *[ERROR STOP]* is displayed.

Pressing the STOP START key causes operating status *[ERROR STOP]* to change to operating status *[STOP]* . Pressing STOP START once more causes the controller to be started again.

In *[STOP]*state, the controller must be started manually by pressing the STOP START key.

[STOP] of the controller causes the following:

- Control is stopped
- The P-relay functioning as a limit value relay and a PWM relay are switched to the de-energised state
- The P-relay acting as an alarm relay activates (no alarm)

Restarting of the controller causes the following:

- If a *[STOP]*state existed, then the controller must be manually started after being switched back on.
- Fault detection starts afresh, all existing faults are deleted

9.3 Priming (PRIME)

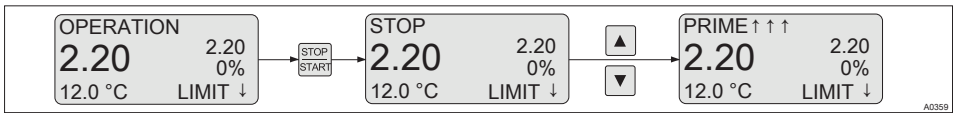

Fig. 34: Priming, e.g. to vent a pump

While the continuous display is visible and the states *'STOP'* or *'OPERATION'* are active, simultaneously pressing ▲ and ▼ causes the priming function *'PRIME'* to be started.

At the same time, dependent on the configuration of the controller, the output relay (P-REL) is actuated at 100 %, the frequency relay (f-REL) is actuated at 80 % of "PUMPMAX" and 16 mA is output at the mA output. However this is only the case if these outputs are set as actuator *'dosing'*.

The power relay (P-REL) starts after priming in an activated state.

You can use this function, for example, to transport the feed chemical up to the pump to vent the metering line.

9.4 Hysteresis limit

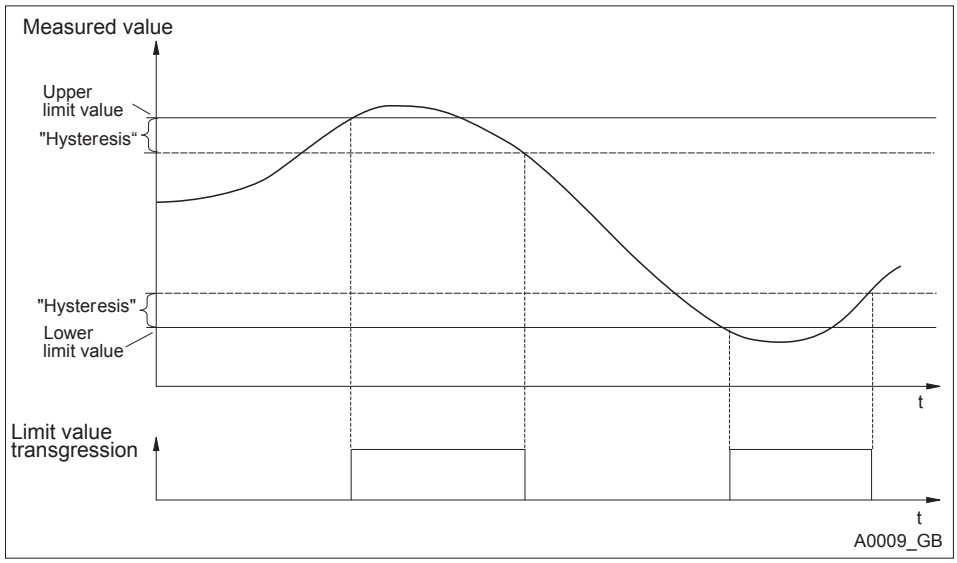

Fig. 35: Hysteresis

Upper limit value = LIMIT↑ Lower limit value = LIMIT↓

The range between LIMIT↑ and LIMIT↓ is the **valid measuring range.**

The DULCOMETER® Compact Controller has fixed *'hysteresis'*.

Measured variable	Hysteresis
pH	0.28 pH
Redox	20 mV

The *'Hysteresis'* acts to cause an increase in the limit value transgression, i.e. if the *'Limit↑'* of e.g. pH 7.5 was exceeded, then the criterion for a limit value transgression is only removed again when the value falls below pH 7.22. The hysteresis behaviour for a *'Limit↓'* functions in an analogue way (the hysteresis value is here added to the Limit↓), for example *'Limit ↓'* pH 4.00, hysteresis pH 0.28, then the limit value transgression criterion is only removed again when the pH exceeds 4.28.

9.5 Temperature correction variable for pH

The correction variable compensates for the effect of the temperature of the medium on the measured value. The correction variable is the temperature of the medium to be measured. The temperature of the medium affects the pH value to be measured.

Operating modes

- *[off]*: No temperature compensation takes place
  - For measurements which do not require temperature compensation
- *[auto]*: The DULCOMETER® Compact Controller evaluates the temperature signal of the connected temperature sensor
  - For measurements using a temperature sensor (Pt1000) (0 -120 °C)
- *[manual]*: The temperature of the medium to be measured has to be measured by the user. The measured value is then entered using the keys ▼ and ▲ in the parameter *'VALUE'* in the DULCOMETER® Compact Controller and saved using the key OK
  - For measurements where the medium to be measured has a constant temperature, which has to be taken into account in the control process

9.6 Checkout time for measured variable and correction variable

Error text	Description
LIMIT ERR	Checkout time of the measured variable
TLIMITERR	Checkout time of the correction variable

If upon the expiry of the checkout time, the valid measuring range is not reached, then the DULCOMETER® Compact Controller exhibits the following behaviour:

- **LIMIT ERR:** The control is switched off. An error current is emitted, provided the output is configured as a measured variable output
- **TLIMITERR:** The control is switched off. An error current is emitted, provided the output is configured as a correction variable output or a measured variable output

Initially the transgression of a limit is only a limit value transgression. This leads to a *'WARNING'*. Switching on the control time *'TIMELIM'* (> 0 minutes), creates an alarm from the limit value transgression. In the event of a *[TLIMITERR]* a, the control switches to *[STOP]*.

9.7 Checkout time control

Monitoring of the control path

The checkout time monitors the control path. The checkout time mechanism permits detection of possible defective sensors.

Dead time determination

Each control path has a dead time. The dead time is the time, which the control path requires to detect a change or addition of metered chemicals using its own instrumentation.

You must select the checkout time so that it is greater than the dead time. You can determine the dead time, by operating the metering pump in manual mode and, for example, dosing acid.

NOTICE!

Dead time determination

You should only determine the dead time if the current process cannot be negatively influenced by the manual metering.

You must determine the time, which the control path (i.e. the entirety of controllers, sensors, measurement water, flow gauges, etc.) requires to detect a first change in the measured value starting from the beginning of dosing. This time is the *'dead time'*. A safety margin, e.g. 25%, must be added to this dead time. You must allocate an appropriate safety margin for your own particular process.

The parameter *'LIMIT'* can be used to set a limit for the control variable. If the control variable exceeds this limit value, the CHECKTIME fault is triggered (checkout time of the control has elapsed). The control is switched to basic load and a fault current output.

9.8 Power relay "P-REL" as limit value relay

The power relay *'P-REL'* can be configured as a limit value relay. It always act only on the measurement variable, whereby the limits are set in *'LIMITS'* . The relay is activated upon infringement of either the top or lower limit values.

Constant checking is carried out to determine whether a limit has been infringed and if this is interrupted with the power relay configured *'P-REL= limit'* for at least *'DELAY ON'* seconds, then the relay is activated. If the limit value transgression disappears for at least *'DELAY OFF'* seconds, then the limit value relay is again deactivated.

The limit value relay is deactivated immediately upon: *'STOP'*, user calibration, *'PAUSE'* and *'HOLD'*.

9.9 Setting and functional description of "Relay Used as a Solenoid Valve"

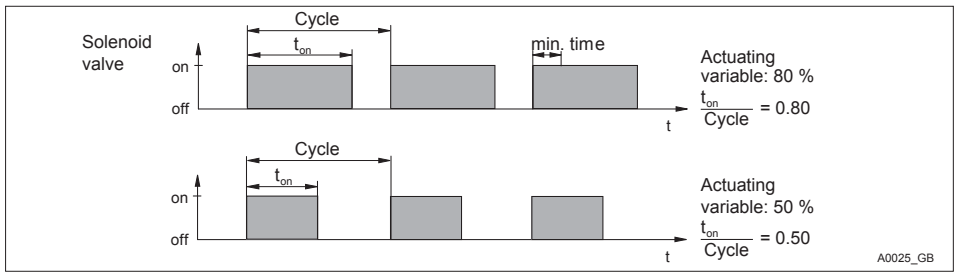

Fig. 36: Solenoid valve (= P-REL: dosing)

min. time *[MIN ON]* Cycle = *[PERIOD]* (in seconds)

Solenoid valve switching times

The switching times of the relay (solenoid valve) depend on the cycle time, the control variable and the 'min. time' (smallest permissible switch-on time for the connected device). The actuating variable determines the ratio t_{on}/cycle and thus also the switching times.

The 'min. time' affects the switching times in two situations:

1. Theoretical switching time < min. time

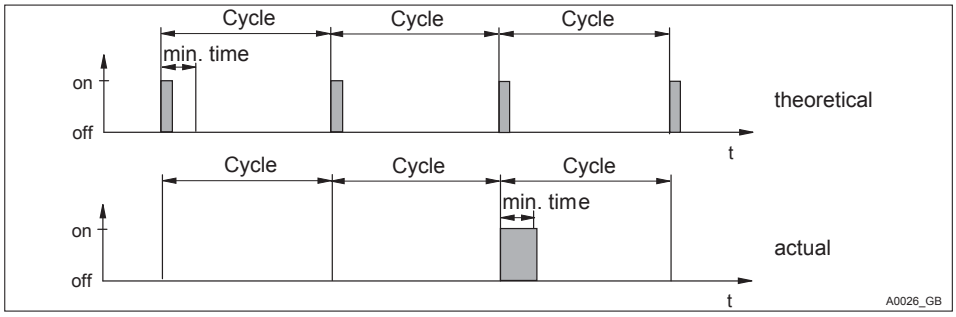

Fig. 37: Theoretical switching time < min. time

min. time *[MIN ON]*
Cycle = *[PERIOD]* (in seconds)

The DULCOMETER® Compact Controller does not switch on for a certain number of cycles until the sum of the theoretical switching times exceeds *'min. time'* . Then it switches for the duration of this total time.

2. Theoretical switching time > (cycle - min. time)

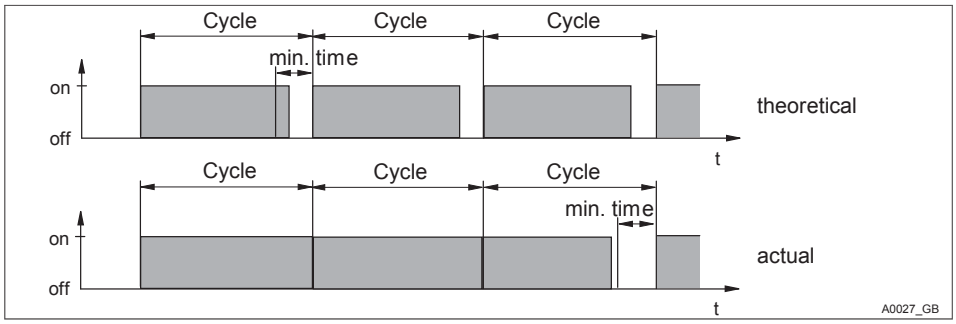

Fig. 38: Theoretical switching time > (cycle - min. time) and calculated switching time < cycle

min. time *[MIN ON]*
Cycle = *[PERIOD]* (in seconds)

The DULCOMETER® Compact Controller does not switch off for a certain number of cycles until the differences between the cycle and the theoretical switching time exceed *'min. time'* .

9.10 Alarm relay

The alarm relay triggers in *'OPERATION'* (normal mode) if an error occurs which has been defined as *'ERROR'* and not just as *'WARNING'*.

The error message *'ALARM'* in the continuous display is marked with a ✻ (star) and can be acknowledged with the OK key. The alarm and the ✻ will then disappear.

9.11 "Error logger" operating mode

The last three errors are displayed. Also displayed is how long ago (in minutes) they occurred. When a new fault occurs, the oldest fault is deleted.

Faults are only shown which occur in operating status *'OPERATION'*, i.e. not in operating status *'STOP'*, *'CAL'* (user calibration), *'HOLD'* or *'PAUSE'*.

Only *'ERRORs'* are shown, not *'WARNINGS'*, e.g. a *'LIMIT ERR'* is shown, but not *'LIMIT↑'*.

A fault, whose display has lasted for 999 minutes is automatically deleted from the *'Error Logger'*. The *'Error Logger'* is neither saved nor backed up in the event of power loss.

10 Maintenance

- **Users' qualification:** trained user, see *Chapter 2.2 'Users' qualifications' on page 10*

The DULCOMETER® Compact Controller is maintenance free.

10.1 Changing the fuse, DULCOMETER® Compact Controller

WARNING!

Danger from electrical voltage

Possible consequence: Fatal or very serious injuries.

- The DULCOMETER® Compact Controller does not have a mains switch
- When working inside the control unit, disconnect the control unit from the mains power via an external switch or by removing the external fuse

NOTICE!

Use only 5 x 20 mm micro-fuses

Possible consequence: Damage to the product or its surroundings

- 5x20 T 0.315 A
- Part number 732404

Fuse change

The mains fuse is located in a sealed fuse holder in the inside of the device.

1. Disconnect the controller from the mains power
2. Open the controller and fold the controller housing top section to the left
3. Remove the PCB cover
4. Remove the micro-fuse using a suitable tool
5. Fit the micro-fuse using a suitable tool
6. Refit the PCB cover
7. Replace controller housing top section and close the controller

10.2 Fault reporting and troubleshooting

- **Users' qualification for diagnostics:** trained user, see *Chapter 2.2 'Users' qualifications' on page 10*. Further measures depend on the type and scope of possible troubleshooting measures to be carried out.

Fault reporting and troubleshooting

Display	Description / cause	Status[1]	Mode[2]	Measured variable output[3]	Correction variable output[4]
pH/mV RANGE ↓	Input voltage too low	Error	Basic load	Fault current	-
pH/mV RANGE↑	Input voltage too high	Error	Basic load	Fault current	-
T RANGE ↓	Measured temperature beneath measuring range	Error	Basic load	Fault current	Fault current
T RANGE ↑	Measured temperature above measuring range	Error	Basic load	Fault current	Fault current
CAL ERROR	No valid user calibration exists	Error	-	-	-
NO PROBE	If activated: pH sensor monitoring outputs: no sensor	Error	Basic load	Fault current	-
PROBE ERR	If activated: pH sensor monitoring outputs: sensor break	Error	Basic load	Fault current	-
CHECK-TIME	Control checkout time elapsed	Error	Basic load	Fault current	-
mA RANGE ↑	mA output current has an upper limit	Error	-	-	-

Display	Description / cause	Status[1]	Mode[2]	Measured variable output[3]	Correction variable output[4]
mA RANGE ↓	mA output current has a lower limit	Error	-	-	-
LIMIT ↑	Measured variable exceeds upper set limit	Warning	-	-	-
LIMIT ↓	Measured variable falls below lower set limit	Warning	-	-	-
T LIMIT ↑	Correction variable exceeds upper set limit	Warning	-	-	-
T LIMIT ↓	Correction variable falls below lower set limit	Warning	-	-	-
LIMIT ERR	Set checkout time for monitoring the measurement variable limits has elapsed	Error	Stop	Fault current	-
TLIMITERR	Set checkout time for monitoring the correction variable limits has elapsed	Error	Stop	Fault current	Fault current
NO CAL	No valid user calibration exists	Warning	-	-	-
CONTACTIN	If activated: Power relay is activated in *'PAUSE/HOLD'*	Error	-	-	-

1 = *[Status]* Error status after occurrence of the fault (error means: alarm relay deactivates, *'*'* is displayed before the error message, can be acknowledged with OK)

2 = *[Mode]* Resulting controller mode (relates to control variable and thus, as necessary, mA output)

3 = *[Measured variable output]* Consequence for the current output, if this is set as *'a measured variable output'*

4 = *[Correction variable output]* Consequence for the current output, if this is set as *'a correction variable output'*

11 Technical data DULCOMETER® Compact Controller

11.1 Permissible ambient conditions

Degree of protection (IP)

The controller fulfils the IP 67 degree of protection requirements (wall/pipe mounting) or IP 54 (control panel mounting). This degree of protection is only achieved if all seals and threaded connectors are correctly fitted.

Permissible ambient operating conditions

Temperature	-10 °C ... 60 °C
Air humidity	< 95 % relative air humidity (non-condensing)

Permissible ambient storage conditions

Temperature	-20 °C ... 70 °C
Air humidity	< 95 % relative air humidity (non-condensing)

11.2 Sound Pressure Level

No noise generation measurable

11.3 Material data

Part	Material
Housing lower and upper section	PC-GF10
Bracket rear side housing bottom section	PPE-GF20
Operating film	Polyester PET membrane
Seal	Expanded PUR
Cover screws	Stainless steel A2
Profile seal (control panel mounting)	Silicone

11.4 Chemical Resistance

The device is resistant to normal atmospheres in plant rooms

11.5 Dimensions and weights

Complete device:	128 x 137 x 76 mm (W x H x D)
Packaging:	220 x 180 x 100 mm (W x H x D)
Weight of device without packaging:	approx. 0.5 kg
Gross weight of device with packaging:	approx. 0.8 kg

12 Electrical data

Mains connection	
Nominal voltage range	100 – 230 VAC ±10 %
Frequency	50 – 60 Hz
Current consumption	50 – 100 mA

The mains connection is isolated from other switching parts by reinforced insulation. The device has no mains switch; a fuse is fitted.

Power relay (P-relay)	
Loading of switching contacts	5 A; no inductive loads

Outputs galvanically isolated from other switching parts by reinforced insulation.

Digital input	
Open circuit voltage	15 V DC max.
Short circuit current	approx. 6 mA
Max.switching frequency	Static For switching processes such as *'PAUSE'*, *'HOLD'*, etc.

NOTICE!

Do not supply with voltage

For the connection of an external semi-conductor or mechanical switch.

mA Output	0 - 20 mA	4 - 20 mA	manual
Current range	0 – 20.5 mA	3.8 – 20.5 mA	0 - 25 mA
In the event of a fault	0 or 23 mA	3.6 or 23 mA	
Max. load	480 Ω at 20.5 mA		
Max. output voltage	19 V DC		
Overvoltage-resistant up to:	±30 V		
Output accuracy	0.2 mA		

Galvanically isolated from all other connections (500 V)

mV input	
Measuring range	-1 V ... + 1 V 0 pH ... 14 pH
Measurement accuracy	±0.25 % of the measuring range
Sensor monitoring of input (low resistance threshold) (can be switched off)	< 500 kΩ ... 1 MΩ (short circuit)
Sensor monitoring of input (high resistance threshold) (can be switched off)	no pH sensor connected
Display glass sensor resistance of ProMinent pH sensor	0 ... 5000 MΩ
Overvoltage-resistant up to:	±5 V

Pump control (f-relay)	
Max. switching voltage:	50 V (protective low voltage)
Max. switching current:	50 mA
Max. residual current (open):	10 µA
Max. resistance (closed):	60 Ω
Max. switching frequency (HW) at 50% filling factor	100 Hz

Digital output galvanically isolated from all other connections via OptoMos relay.

Temperature input	
Temperature measuring range:	0...120 °C
Measuring flow:	approx. 1.3 mA
Measuring accuracy:	±0.8 % of measuring range
Overvoltage-resistant up to:	±5 V
Short circuit-resistant	Yes

For connection of a Pt1000 temperature sensor using a 2-wire system. Not galvanically isolated from the mV input

13 Spare parts and accessories

Spare parts	Part number
Fine fuse 5x20 T 0.315 A	732404
Wall/tube retaining bracket	1002502
Guard terminal top part (knurled nut)	733389
Measured variable labels	1002503
DMT fixing strap	1002498
Cable connection set DMTa/DXMa (metric)	1022312
Controller housing lower part (processor/PCB), fully assembled	Identity code DCCA_E_E1 ...
Controller housing top part (display/operating part), fully assembled	Identity code DCCA_E_E2 ...

Accessories	Part number
Mounting kit for control panel installation	1037273
Check strap	1035918

14 Replacing spare part units

- **User qualification, mechanical installation:** trained qualified personnel, see ↳ *Chapter 2.2 'Users' qualifications' on page 10*
- **User qualification, electrical installation:** Electrical technician, see ↳ *Chapter 2.2 'Users' qualifications' on page 10*

⚠ CAUTION!

Check strap for strain relief

Possible consequence: Material damage.

The ribbon cable and its base cannot be mechanically stressed. Hence it is essential when mounting the controller in the control panel, that the check strap (part number 1035918) is fitted for strain relief and mechanical fixing. Without the check strap, the ribbon cable or its base could be damaged if they were to fall out of the top part of the controller housing.

14.1 Replacing the top part of the housing

! NOTICE!

Ribbon cable base

The base of the ribbon cable is firmly soldered onto the PCB. The base cannot be removed. Open the base lock (3) to loosen the ribbon cable, see Fig. 39

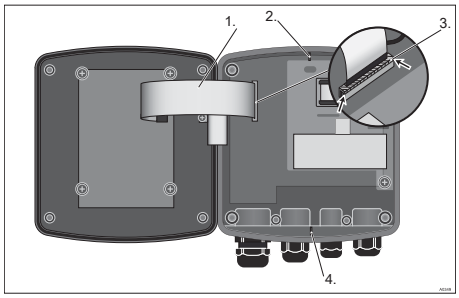

Fig. 39: Loosening the ribbon cable

1. Undo four screws and open the DULCOMETER® Compact Controller
2. Open the right and left lock (3) (arrows) on the base and pull the ribbon cable (1) out of the socket
3. The catches (2 and 4) are not needed with units for control panel installation.

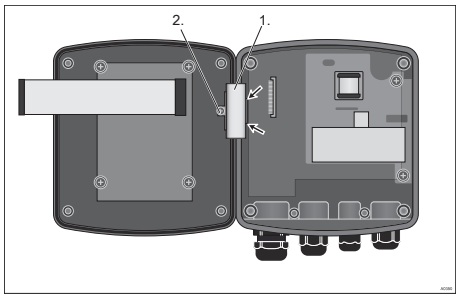

Fig. 40: Dismantling the hinge

4. Remove the screw (2), unclip the hinge (1) on the lower part of the controller housing (arrows) and remove the hinge

5. With control panel installation: Remove the two screws and remove the strain relief

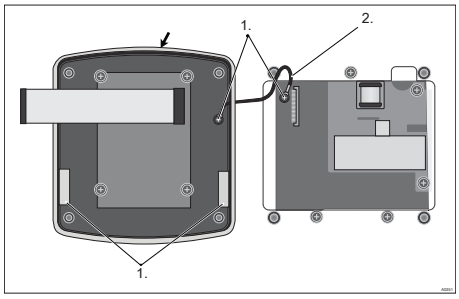

Fig. 41: With control panel installation: Fit the profile seal onto the top part of the controller housing

6. With control panel installation: Position the profile seal (arrow) evenly into the groove in the top part of the DULCOMETER® Compact Controller housing. Arrange the flaps (3) as shown in the figure

7. With control panel installation: Secure the strain relief (2) using two screws (1)

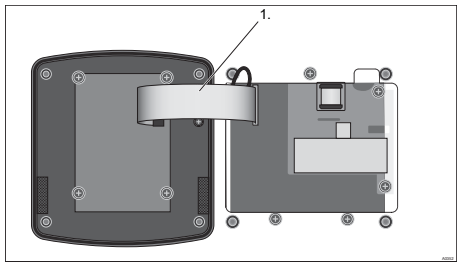

Fig. 42: Pushing and locking the ribbon cable in its base

8. Push and lock the ribbon cable (1) in its base

9. Fit the hinge

10. Screw the top part of the controller housing onto the lower part of the DULCOMETER® Compact Controller housing

11. With control panel installation: Re-check that the profile seals are fitted properly

    ⇨ Re-check that the seal is seated properly. Only if the mounting is correct, can IP 67 (wall/pipe mounting) or IP 54 (control panel mounting) degree of protection be achieved

14.2 Replacing the lower part of the housing (wall/tube retaining bracket)

Complete commissioning of the controller

Once the lower part of the housing has been replaced, it is necessary to fully commission the measuring and control point, as the new lower part of the housing does not have specific settings, only factory settings.

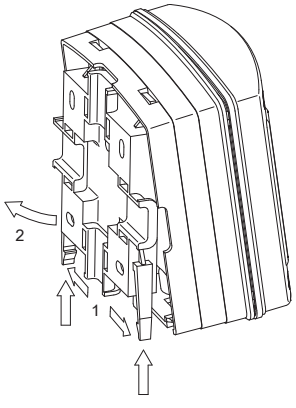

Fig. 43: Removing the wall/tube retaining bracket

1. Remove the wall/tube retaining bracket. Pull the two snap-hooks (1) outwards and push upwards

NOTICE!

Ribbon cable base

The base of the ribbon cable is firmly soldered onto the PCB. The base cannot be removed. Open the base lock (3) to loosen the ribbon cable, see Fig. 39

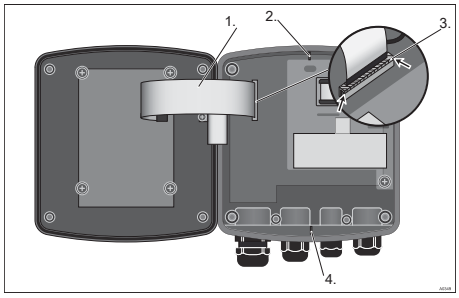

Fig. 44: Loosening the ribbon cable

2. Undo four screws and open the DULCOMETER® Compact Controller

3. Open the right and left lock (3) (arrows) on the base and pull the ribbon cable (1) out of the base. The catches (2 and 4) are used to aligned the two halves of the housing.

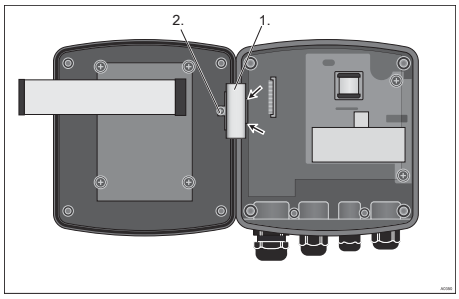

Fig. 45: Dismantling the hinge

4. Remove the screw (2), unclip the hinge (1) on the lower part of the controller housing (arrows) and remove the hinge

5. Label the cable connectors fitted to distinguish them and remove the cables from the lower part of the controller

Preparing the new lower part of the controller housing

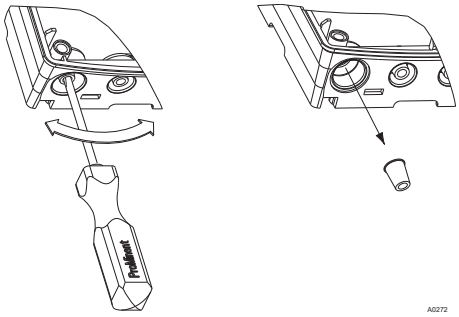

Fig. 46: Punching out the threaded holes

6.

Large threaded connection (M 20 x 1.5)

Small threaded connection (M 16 x 1.5)

Punch out as many threaded holes on the bottom of the lower part of the controller housing as required

Fit the cable and threaded connectors

7. Guide the cable into the respective reducing inserts

8. Insert the reducing inserts into the threaded connectors

9. Guide the cable into the controller

10. Connect the cable as indicated in the terminal diagram

11. Screw in the required threaded connectors and tighten

12. Tighten the threaded connector clamping nuts so that they are properly sealed

Refit the controller

13. Fit the hinge

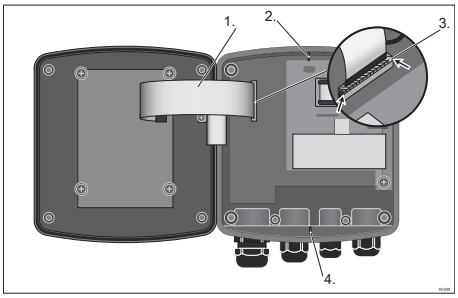

Fig. 47: Fix the ribbon cable

14. Push and lock the ribbon cable (1) in its base. The catches (2 and 4) are used to aligned the two halves of the housing.

15. Screw the top part of the controller housing onto the lower part of the DULCOMETER® Compact Controller housing

16. Re-check that the seal is seated properly. IP 67 degree of protection (wall/pipe-mounting) can only be provided if the installation is correct

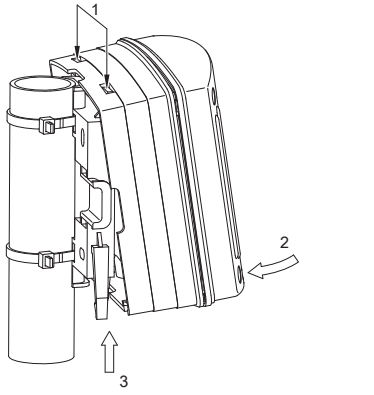

Fig. 48: Suspend and secure the DULCOMETER® Compact Controller

17. Suspend the DULCOMETER® Compact Controller at the top (1) in the wall/tube retaining bracket and push using light pressure at the bottom (2) against the wall/pipe retaining bracket. Then press upwards (3) until the DULCOMETER® Compact Controller audibly snaps into position

14.3 Replacing the lower part of the housing (control panel installation)

Complete commissioning of the controller

Once the lower part of the housing has been replaced, it is necessary to fully commission the measuring and control point, as the new lower part of the housing does not have specific settings, only factory settings.

NOTICE!

Ribbon cable base

The base of the ribbon cable is firmly soldered onto the PCB. The base cannot be removed. Open the base lock (3) to loosen the ribbon cable, see Fig. 39

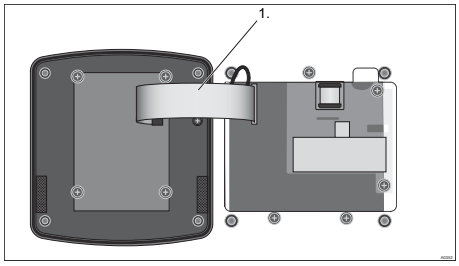

Fig. 49: Loosen the ribbon cable from the base

1. Undo four screws and open the DULCOMETER® Compact Controller

2. Open the right and left lock on the base and pull the ribbon cable (1) out of the base.

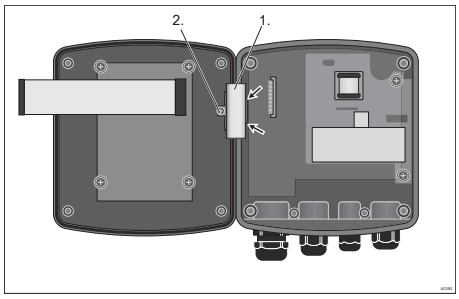

Fig. 50: Dismantling the hinge

3. Remove the screw (2), unclip the hinge (1) on the lower part of the controller housing (arrows) and remove the hinge

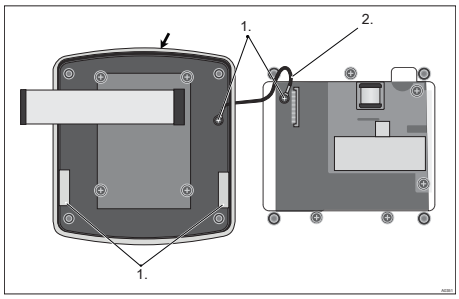

Fig. 51: Removing the strain relief

4. Remove the strain relief (2). Remove the screws (1) to do so.

5. Check the profile seal (arrow), then position the profile seal evenly into the groove in the top part of the DULCOMETER® Compact Controller housing. Arrange the flaps (3) as shown in the figure

6. Remove the top part of the controller housing (3 fixing bolts)

7. Label the cable connectors fitted to distinguish them and remove the cables from the lower part of the controller

Preparing the new lower part of the controller housing

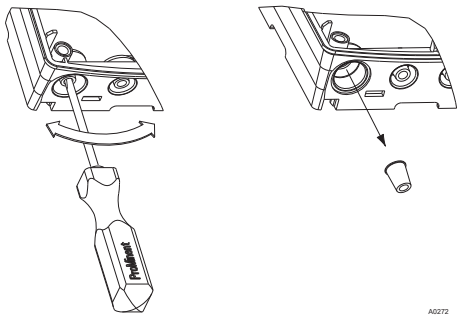

Fig. 52: Punching out the threaded holes

8.

Large threaded connection (M 20 x 1.5)

Small threaded connection (M 16 x 1.5)

Punch out as many threaded holes on the bottom of the lower part of the controller housing as required

Fit the cable and threaded connectors

9. Guide the cable into the respective reducing inserts

10. Insert the reducing inserts into the threaded connectors

11. Guide the cable into the controller

12. Connect the cable as indicated in the terminal diagram

13. Screw in the required threaded connectors and tighten

14. Tighten the threaded connector clamping nuts so that they are properly sealed

Refit the controller

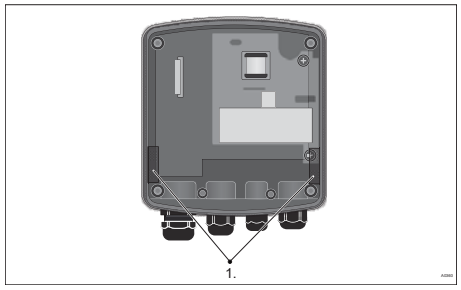

Fig. 53: Fitting the profile seal on the lower part of the controller housing

15. Use pliers to break off the catches. They are not needed for control panel installation

    Position the profile seal evenly around the top edge of the lower part of the DULCOMETER® Compact Controller housing. Arrange the flaps (1) as shown in the figure

    ⇨ Ensure that the profile seal evenly surrounds the top edge of the housing.

16. Insert the lower part of the DULCOMETER® Compact Controller housing with the profile seal from behind into the cut-out and use three screws to secure it in place

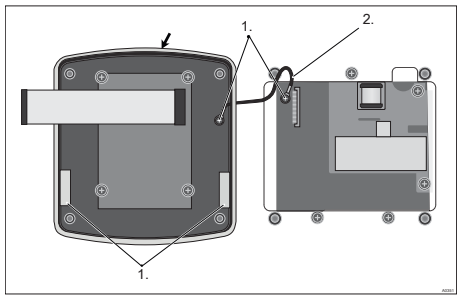

Fig. 54: Fit the profile seal onto the top part of the controller housing

17. Position the profile seal (arrow) evenly into the groove in the top part of the DULCOMETER® Compact Controller housing. Arrange the flaps (3) as shown in the figure

18. Secure the strain relief (2) using two screws (1)

19. Fit the hinge

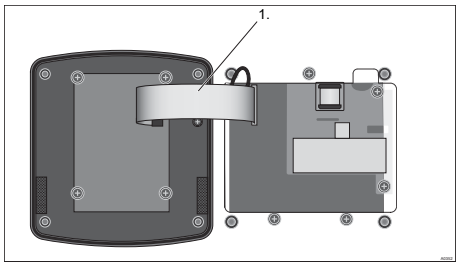

Fig. 55: Pushing and locking the ribbon cable in its base

20. Push and lock the ribbon cable (1) in its base

21. Screw the top part of the controller housing onto the lower part of the DULCOMETER® Compact Controller housing

22. Re-check that the profile seals are fitted properly

    ⇨ IP 54 degree of protection can only be provided if the control panel is mounted correctly

15 Standards complied with and Declaration of Conformity

The EC Declaration of Conformity for the controller is available to download on our homepage.

EN 60529 Specification for degrees of protection provided by housings (IP code)

EN 61000 Electromagnetic Compatibility (EMC)

EN 61010 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

EN 61326 Electrical equipment for measuring, control and laboratory use - EMC requirements (for class A and B devices)

16 Disposal of Used Parts

- **User qualification:** instructed user, see *Chapter 2.2 'Users' qualifications' on page 10*

NOTICE!

Regulations governing the disposal of used parts

– Note the current national regulations and legal standards which apply in your country

The manufacturer will take back decontaminated used units providing they are covered by adequate postage.

Decontaminate the unit before returning it for repair. To do so, remove all traces of hazardous substances. Refer to the Material Safety Data Sheet for your feed chemical.

A current Declaration of Decontamination is available to download on the ProMinent website.

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INDUMART Canada
www.indumart.com

Fillable Standard Pressure Gauges

PI-201/2 - Gauge, Pressure, 0-30psi, Indumart, P16T2-FG-30
PI-301 - Gauge, Pressure, 0-15psi, Indumart, P16T2-FG-15
PI-301/2 - Gauge, Pressure, 0-30psi, Indumart, P16T2-FG-30
PI-401/2 - Gauge, Pressure, 0-30psi, Indumart, P16T2-FG-30
PI-501/2 - Gauge, Pressure, 0-30psi, Indumart, P16T2-FG-30
PI-551/2 - Gauge, Pressure, 0-30psi, Indumart, P16T2-FG-30
PI-553/554 - Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60
PI-703/704 - Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60
PI-601/602 - Gauge, Pressure, 0-15psi, Indumart, P16K2-FG-15

SERIES: P16

Dial: 1½", 2", 2½", 4"
Accuracy: 1.6%, 2.5%

DESCRIPTION

Indumart *P16 Series* Fillable Standard Pressure Gauges are used at measuring points with high dynamic alternating loads and strong vibrations and pulses. The glycerin filling of the case provides lubrication of the moving parts which protects the measuring system against wear and at the same time ensures smooth pointer movement and thus good readability.

Indumart *P16 Series* pressure gauges have a high level of functional safety and long service lives. These gauges are suitable for applications in hydraulics, compressors and pumps.

Various types of wall or panel mounting configurations are available.

SPECIFICATIONS

Accuracy	1.6% (2½" & 4" dials); 2.5% (1½" & 2" dials)
Dial Sizes	1½" (40 mm), 2" (50 mm), 2½" (63 mm), 4" (100 mm)
Case	St. steel (standard)
Bezel	St. steel; crimped bezel
Connection	Centre back or bottom
Thread	⅛" NPT (1½" dial only), ¼" NPT (2", 2½", 4" dials) ½" NPT (option for 4" dial), BSP thread (option)
Window	Plexiglas
Bourdon Tube	Brass (std.), st. steel (option)
Max. Temperature	60°C
Range	0...10 to 0...8000 psi; 0...60 to 0...60000 kPa; 0...0.6 to 0...600 bar Vacuum and compound ranges are available; see the Range Table

ORDER CODES

Model P16 ☐ ☐ – ☐

CONNECTION
Back — K
Bottom — T

DIAL SIZE
40 mm (1½") — 0
50 mm (2") — 1
63 mm (2½") — 2
100 mm (4") — 4

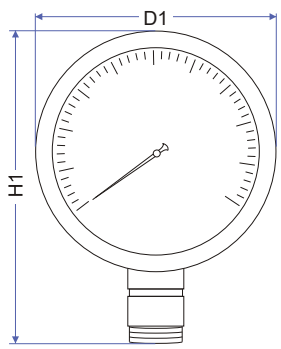
OPTIONS (more than one option may be selected)

Glycerine Filling	FG
Silicon Filling	FS
St. Steel Internal	IT
½" Process Connection (100 mm dial only)	TH
BSP Thread	TB
Back Flange for Wall Mounting (not for 40 mm dial)	MK
Front Flange for Panel Mounting (not for 40 mm dial)	MF
Clamp with 2 Screws (63 mm dial only)	MS

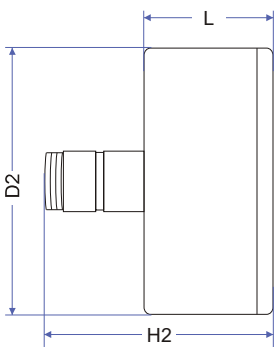
Example: P16T2-FG,IT

DIMENSIONS (mm) & WEIGHT

	Ø40 mm	Ø50 mm	Ø63 mm	Ø100 mm
D1	45	55	68	111
D2	41	51	63	100
H1	70	75	84	145
H2	47	52	57	74
L	29	30	30	35
Weight (g)	100	100	150	400



Bottom connection



Centre back connection

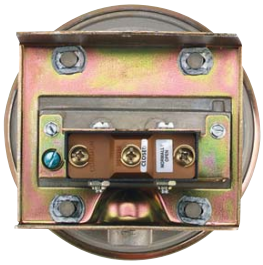
Specifications may change without prior notice.

Series 1800 Low Differential Pressure Switches for General Industrial Service

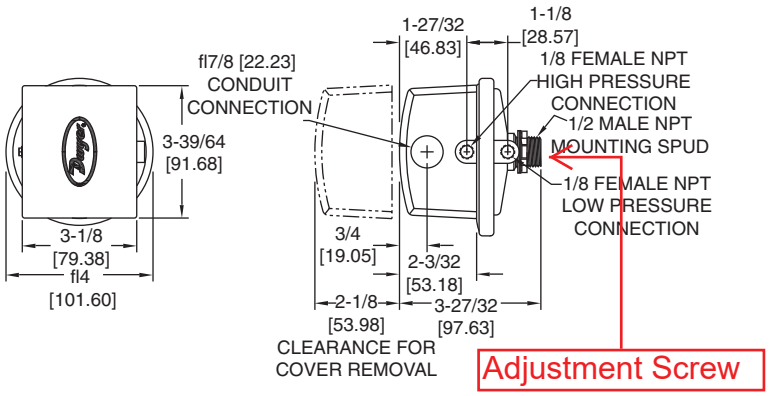
Specifications — Installation and Operating Instructions

PSL-301 - Switch, Pressure, 1823-2
PSL501 - Switch, Pressure, 1823-40
PSL-601/2 - Switch, Pressure, 1823-40
PSL-7911 - Switch, Pressure, 1823-2

Model 1823 pressure switch. UL and CSA Listed, FM and CENELEC approved.



Series 1823 pressure switch. Conduit enclosure removed to show electric switch.



Construction and dimensions. Series 1823 pressure switches.

One of our most popular pressure switches. Combines small size and low price with 2% repeatability for enough accuracy for all but the most demanding applications. Set point adjustment inside the mounting switch on one side of a wall or panel with adjustment easily accessible on the opposite side.

***Model 1823 shown; (1823 replaces 1820, 1821 and 1822 which are similar).**

Environmental (MIL) Switch

Unlisted Model 1820 can be furnished with special snap switch sealed against the environment for high humidity and/or for government applications. Similar to standard Model 1823 except dead band is slightly greater. Specify Model 1820 (Range No.) "MIL" in ordering.

SERIES 1823 SWITCHES — OPERATING RANGES & DEADBANDS

Model Number	Operating Range, Inches W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1823-00	0.07 to 0.22	0.05	0.05
1823-0	0.15 to 0.5	0.06	0.06
1823-1	0.3 to 1.0	0.08	0.08
1823-2	0.5 to 2.0	0.10	0.12
1823-5	1.5 to 5.0	0.14	0.28
1823-10	2.0 to10	0.18	0.45
1823-20	3 to 22	0.35	0.70
1823-40	5 to 44	0.56	1.10
1823-80	9 to 85	1.30	3.0

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.

Wetted Materials: Consult Factory.

Temperature Limits: -30 to 180°F (-34 to 82.2°C). 1823-00, -20 to 180°F (-28.9 to 82.2°C).

Pressure Limits: 10 psig (68.95 kPa) continuous, 25 psig (172.4 kPa) surge.

Switch Type: Single-pole double-throw (SPDT).

Repeatability: ±2%.

Electrical Rating: 15 A @ 120-480 VAC, 60 Hz. Resistive 1/8 HP @125 VAC, 1/4 HP @ 250 VAC, 60 Hz. De-rate to 10 A for operation at high cycle rates.

Electrical Connections: 3 screw type, common, normally open and normally closed.

Process Connections: 1/8″ female NPT.

Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.

Set Point Adjustment: Screw type inside mounting spud.

Weight: 1 lb, 5 oz (595 g).

Agency Approvals: CE, UL, CSA, FM.

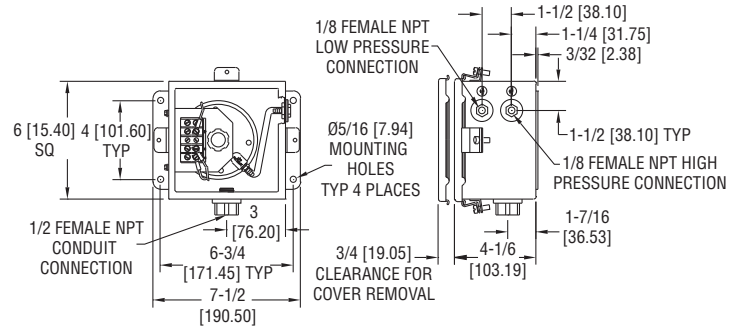
DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 www.dwyer-inst.com
Fax: 219/872-9057 e-mail: info@dwyer-inst.com

INSTALLATION

1. Select a location free form excessive vibration and where oil or water will not drip upon the switch. See special housings for unusual conditions.
2. **While not required, positioning the pressure connections down is recommended.** Mount the switch with the diaphragm in a vertical plane. Switch with the diaphragm in a vertical plane. Switch must be recalibrated for each change in operating position.
3. Connect switch to source of pressure differential. Metal tubing with 1/4" O.D. is recommended but any tubing system which will not restrict the air flow is satisfactory. Note that the low pressure connection may be made to the 1/2" spud at the back of the switch if desired. If so connected, drill 1/16" diameter holes in the Spring Retainer flange and the head of Adjustment Screw to provide opening to the switch interior and plug the other low pressure connection.
4. Electrical connections to the standard single pole, double throw snap switch are provided by means of screw terminals marked "common", "norm open", and "norm closed". The normally open contacts close and the normally closed contact open when pressure increases beyond the set point.
5. Switch loads should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with high load inductance or rapid cycle rates. whenever and application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonged switch life.

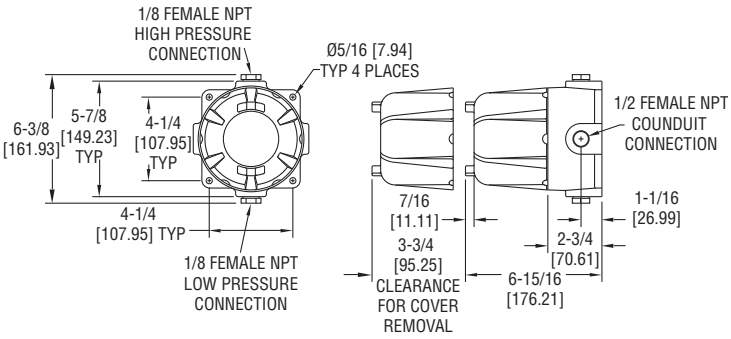
ADJUSTMENT

1. If the switch has been factory preset, check the set-point before placing in service to assure it has not shifted in transit.
2. If switching has not been preset or it is desired to change the point, observe the following procedure:
   a. To adjust the set point turn the slotted Adjustment Screw clockwise to increase the set point and counterclockwise to decrease the set point.
   b. The following is a recommended procedure for calibrating or checking calibration: Use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point slowly. Note the manometer and pressure switch will have different response characteristics due to different internal volumes, lengths of tubing, oil drainage, etc. Be certain switch is checked in position it will assume in use, i.e. vertical, horizontal, etc.



Weatherproof Enclosure

16 ga. steel enclosure for unusually wet or oily conditions. Withstands 200 hour salt spray test. Gasketed cover. Weight 5-1/2 lb (2.5 kg). Switch must be installed at factory. Specify "WP" in addition to switch catalog number.



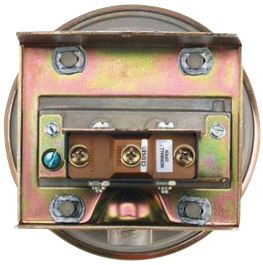
Explosion-Proof Housing

Cast iron base and aluminum dome cover. Approximate weight 7-1/2 lb (3.4 kg). Specify "EXPL" in addition to switch catalog number.

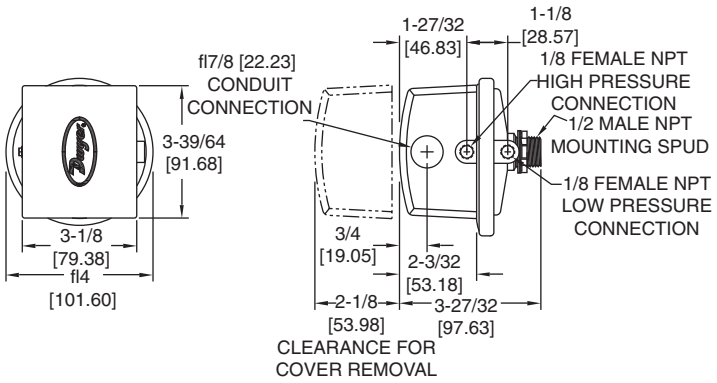
DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 www.dwyer-inst.com
Fax: 219/872-9057 e-mail: info@dwyer-inst.com

SERIE 1800 Interruptor Para Baja Presión Diferencial

Model 1823 pressure switch. UL and CSA Listed, FM approved.



Series 1823 pressure switch. Conduit enclosure removed to show electric switch.



Construction and dimensions. Series 1823 pressure switches.

Uno de nuestros mas populares interruptores de presión. Combina un pequeño tamaño y bajo precio, con una repetibilidad del 2%, exactitud suficiente para las aplicaciones con mas demanda. El ajuste del punto de operación en un extremo, permite instalar el interruptor de un lado en las pared o tablero, permitiendo acceso al tornillo de ajuste.

Interruptor para Ambiente Húmedo (MIL)

El modelo 1820 puede ser fabricado son un sello especial a prueba de intemperie, o para aplicaciones con alta humedad. Similar al modelo 1823, excepto que la banda de operación es mayor.

Especifique el modelo 1820 (Rango No.) “Mil” en su orden.

Model Number	Operating Range, Inches W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1823-00	0.07 to 0.22	0.05	0.05
1823-0	0.15 to 0.5	0.06	0.06
1823-1	0.3 to 1.0	0.08	0.08
1823-2	0.5 to 2.0	0.10	0.12
1823-5	1.5 to 5.0	0.14	0.28
1823-10	2.0 to10	0.18	0.45
1823-20	3 to 22	0.35	0.70
1823-40	5 to 44	0.56	1.10
1823-80	9 to 85	1.30	3.0

Especificaciones:
Interruptor de presión diferencial operado por diafragma de 4”, para activar un interruptor de presión tipo simple polo doble tiro. El diafragma esta controlado por un resorte calibrado que se puede ajustar para fijar la presión diferencial exacta a la cual el interruptor actuara. El movimiento del diagragma es transmitido al botón del interruptor por un medio mecánico. Interruptor Dwyer Instruments, Inc. Catalogo No. 1823-__ __ para el rango de operación requerido.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.

Wetted Materials: Consult Factory.

Temperature Limits: -30 to 180°F (-34 to 82.2°C). 1823-00, -20 to 180°F (-28.9 to 82.2°C).

Pressure Limits: 10 psig (68.95 kPa) continuous, 25 psig (172.4 kPa) surge.

Switch Type: Single-pole double-throw (SPDT).

Repeatability: ±2%.

Electrical Rating: 15 A @ 120-480 VAC, 60 Hz. Resistive 1/8 HP @125 VAC, 1/4 HP @ 250 VAC, 60 Hz. De-rate to 10 A for operation at high cycle rates.

Electrical Connections: 3 screw type, common, normally open and normally closed.

Process Connections: 1/8″ female NPT.

Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.

Set Point Adjustment: Screw type inside mounting spud.

Weight: 1 lb, 5 oz (595 g).

Agency Approvals: CE, UL, CSA, FM.

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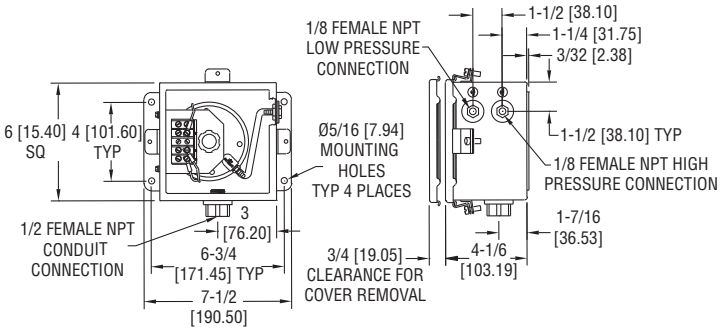
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**

INSTALACIÓN:

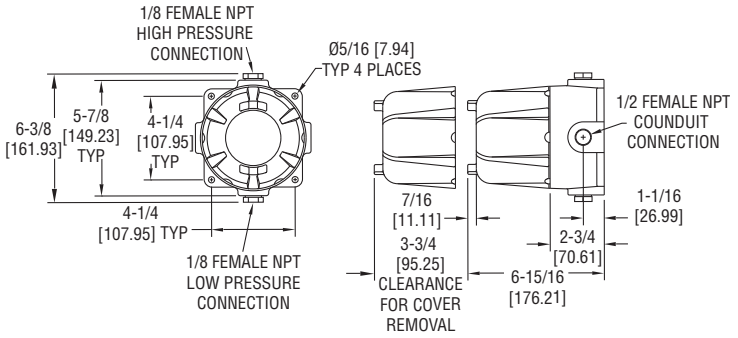
1. Seleccione una ubicación libre de vibración excesiva, en donde el agua o aceite no entre al interruptor. Revise encapsulados especiales para aplicaciones especiales.
2. Mientras no se requiera otra, las conexión de presión inferior es recomendada. Monte el interruptor con el diafragma en posición vertical, el interruptor debe recalibrarse para cada cambio de posición.
3. Conecte el interruptor a la fuente de presión diferencial. Tubo metálico con diámetro de 1/4" es recomendado, pero cualquier sistema de tubería que no restrinja el flujo de aire es bueno.
4. Conexiones eléctricas estándar de los interruptores SPDT, común, NA y NC. Los contactos cambian cuando se incrementa la presión del punto de operación.
5. La carga del interruptor no debe exceder los 15 Amp. Especificados. Las capacidades decrecen con altas cargas inductivas y ciclos rápidos de actuación, por lo que en estos casos los limites de corriente deben ser 10 Amp. 0 menores para incrementar la vida del interruptor.

AJUSTES:

1. Si el interruptor ha sido calibrado en fabrica, revise el punto de operación antes de ponerlo en servico.
2. De lo contrario, siga los siguientes pasos:
   A. Para ajustar el punto de operación, gire el tornillo de calibración en sentido de las manecillas del reloj para aumentar el valor y en contra de las manecillas del reloj para dis minuir el valor del punto de operación.
   B. Lo siguiente se recomienda para calibrar o revisar la calibración: Use una T con tres mangueras plásticas, tan pequeñas como sean posible. Conecte una manguera al interruptor de presión, otra al manómetro y por la tercera aplique la presión de esta forma podrá ajustar el interruptor a la presión requerida lo mas exacto posible.



Encapsulado a Prueba de Intemperie
Encapsulado de acero para condiciones húmedas y/o aceitosas, soporta pruebas de 200 horas de spray salino, pesa 5-1/2 libras. El interruptor debe ser instalado en la planta al momento de su fabricación. Especifique "WP" mas el modelo del interruptor en catalogo.



Encapsulado a Prueba de Explosión
Encapsulado a base de Hierro y Aluminio, pesa aproximadamente 7-1/2 libras. Especifique "EXPL" mas modelo del interruptor en catalogo.

Printed in U.S.A. 7/03

FR# 24-440256-00 Rev. 1

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PSL-7911 - Meter, Flow, Pitot Tube, 4"

newterra™
smart technology. sustainable solutions.℠

PITOT TUBE AIR FLOW METERS
PFLOW SERIES

Application:

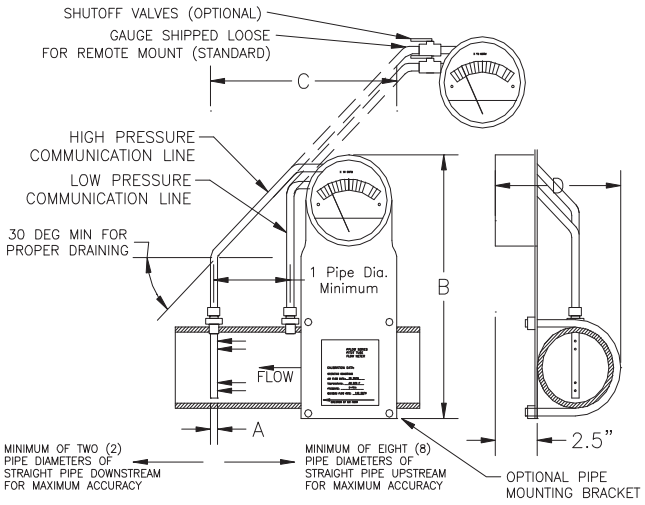
newterra Pitot Tube Air Flow Meters are designed to be a cost effective, accurate flow meters that are calibrated for your site-specific conditions. The unique self draining design allows the meter to function in process lines with high humidity and moisture content as well as dry air lines. The PFLOW meter takes two pressure readings in your process line, one at a high-pressure, zero velocity and one at a low-pressure, full velocity. The pressure differential is used to calibrate the meter for a desired flow and operating conditions. When ordering the flow meter, it is critical to supply: operating temperature, pressure or vacuum in psia, and the pipe ID. The PFLOW meter can be supplied with any scale range required in scfm (25deg C, 14.7psia) or acfm at your listed operating conditions.

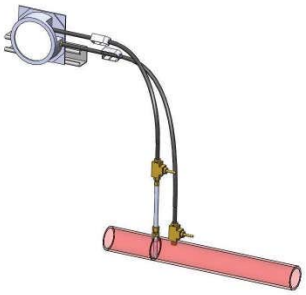
Construction:

The high, static pressure is measured using a 304 Stainless Steel probe inserted into the process line. The probe is designed with 4 measurement ports that provide an average reading for flow through your process pipe. Multiple ports on the static pressure line ensure that you can maintain an accurate reading while the tube is self-draining. The low pressure point is measured by tapping a 1/4" hole in the process line ahead of the high-pressure port. This tapping is completed on the top of the pipe to minimize moisture collection in the pressure communication lines. The differential pressure gauge is connected to the pressure ports using 3/8" Buna-N and the brass connections are capable of handling temperatures as high as 250 deg F. The Dwyer Magnehelic ® gauge provides a large, clear and accurate display of your airflow reading.

Standard Features:

- 304SS static pressure probe
- Brass compression fittings and Buna-N pressure communication tubing
- Direct read display can be calibrated for your specific operating conditions. Display can read ACFM or SCFM but SCFM is recommended as there is less error when the meter is operating above or below the calibrated pressure. Other units are available on request.
- Large 4" display for accurate reading
- Standard gauges are shipped loose for installation in an existing pipeline. The gauges can be wall mounted in site-specific locations. A pipe bracket can be purchased.





Dimensions Chart:

Part Number	A	B	C	D	Pipe
1" PFLOW	1/4"	12"	12"	4.75"	1"
1-1/2" PFLOW	3/8"	12"	12"	5.25"	1.5"
2" PFLOW	3/8"	12"	12"	5.75"	2"
3"PFLOW	1/2"	12"	12"	6.75"	3"
4"PFLOW	1/2"	14"	14"	7.75"	4"
6"PFLOW	1/2"	14"	14"	9.75"	6"
8"PFLOW	1/2"	14"	14"	12"	8"

Larger pitot tubes can be supplied as required.

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PITOT TUBE AIR FLOW METERS
PFLOW SERIES

Specifications:

Maximum Air Temperature:	250 °F (standard) 300 °F (high temp version)	Accuracy:	2.5 % of scale at calibration point
Max. Operating Pressure	15 psig (standard unit) 35 psig (medium pressure unit) 80 psig (high pressure unit)	Pressure Drop:	Less than 2" WC pressure drop in high flow applications
Repeatability:	1% of scale at calibration point		

The following table provides recommended flow rates for each meter at a given operating pressure range. These values are suitable for temperatures between 70-100 deg F. For meter applications outside this temperature range and outside of the operating pressure ranges listed below please contact our sales department for help in choosing a suitable meter.

Operating pressure	Recommended Operating Flow rates (SCFM)				
	0-5 psi	5-10 psi	0-10" Hg	10-20" Hg	20-26" Hg
PFLOW 1"	15-40	17-50	12-35	8-25	6-20
PFLOW 1-1/2"	35-90	40-115	25-75	20-60	15-50
PFLOW 2"	60-160	70-200	50-150	30-100	25-80
PFLOW 3"	135-360	150-450	100-300	75-250	50-180
PFLOW 4"	250-650	275-800	200-550	120-450	100-320
PFLOW 6"	550-1500	600-1800	450-1200	275-1000	200-750
PFLOW 8"	1000-2500	1100-3200	750-2250	500-1750	350-1250

Calibration and Correction Factors:

Each PFLOW pitot tube is calibrated for a specific operating temperature and pressure. If the pitot tube operates at a different pressure or temperature than the original design, the flow measurement can be adjusted with the following equation: (Units of $Flow_1$ and $Flow_2$ will be the same)

$Flow_1 = Flow_2 \times (P_2/P_1 \times ((T_1+460) / (T_2+460))^{1/2}$

Pressure units: psia, Temperature units: °F

Options Table:

Option	Description
Orientation:	The flow meter gauge can be oriented for flows from Left to Right, Right to Left, Up or Down as required for your specific application.
Site Specific Calibration and Gauge Range:	The following information is required to calibrate the flow meter for your specific application: Operating Pressure (psia): Operating Temperature (°F or °C): Operating Flow Rate (acfm or scfm or other scales as required): Maximum Flow rate (better accuracy is achieved when the operating flow rate is approximately ¾ of the scale range of the flow meter)
4-20ma Option	Flow meters can be ordered with 4-20ma outputs for control systems. Three versions are available: Nema 7 (Class 1 Div 1) FM or CSA approved Two Wire Connection: 24VDC+, Signal Output Power Consumption: 20mA 316SS Wetted parts Nema 4 (Weatherproof) or Nema 1 (General Purpose) Three Wire Connection: 24VDC+, 24VDC-, Signal Output Accuracy on all 4-20ma outputs: 2.5% of full scale for meter Aluminum with Silicon diaphragm
Shutoff Valves	The pressure gauges are not designed to operate with water collecting within the internal components. If you will be operating with hot wet air or condensing air streams, then it is recommended that we install shutoff valves in the pressure communication lines to isolate the gauge from the process lines when the operator is not taking a flow reading.
Pre Installed Section of Pipe	The flow meters can be preinstalled in a section of pipe with any configuration of material and fittings on the end. This will allow the PFLOW meter to be factory installed and tested in this section of pipe before leaving our facility.
Pipe Mounting Bracket	A pipe-mounting bracket can be supplied to allow the gauge to mount directly on the pipe as shown in the above picture.

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PITOT TUBE AIR FLOW METERS
PFLOW SERIES

Company Name: _____ Purchase Order Number: _____

Contact Name: _____ Contact Number (PH/FAX):_____/_____

(Note: Please include relevant credit information to set up an account if required.
Ship to Address: _____

Billing Address: _____

Credit Card Orders (Please check card type)

❑ VISA ❑ MASTERCARD

Credit Card Number: _____ Expiry Date (m/y): _____ / _____

Meter Size: (please check box)

❑ 1” ❑ 2” ❑ 4” ❑ 8”

❑ 1-1/2” ❑ 3” ❑ 6”

Process Pipe Material and Schedule: (please check box)

❑ Schedule 40 PVC ❑ Schedule 40 Steel

❑ Schedule 80 PVC ❑ Schedule 80 Steel

For other Materials and Schedule Specify Inner Diameter of Pipe: _____

Orientation: (please check box)

❑ Flow from Left to Right ❑ Flow Up

❑ Flow from Right to Left ❑ Flow Down

4-20mA Output (please check box)

❑ Nema 7, Class 1 Div 1, 316SS, with flow gauge ❑ Nema 7, Class 1 Div 1, 316SS, no direct read display

❑ Nema 4, Weatherproof, with flow gauge ❑ Nema 4, Weatherproof, no direct read display

❑ Nema 1, General Purpose, with flow gauge ❑ Nema 1, General Purpose, no direct read display

❑ None

Calibration Information (Required Information):

Operating Pressure: _____ **Operating Temperature:** _____

Elevation or Atmospheric Pressure: _____

Operating Flow Rate: _____ **Maximum Flow Rate*:** _____

Scfm units are preferred but any flow units can be provided. The operating flow rate should be approximately ¾ of full scale to allow for an accurate reading at that flow rate. Note Lowest accurate reading is at ¼ of full scale.
*Options for Maximum Flow Rates include:1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100 and any scale can be multiplied by 10, 100, 1000, 10000

Switch-Tek

Powered Level Switch

LZ12, LU10, LP15 and LO10 Series Manual

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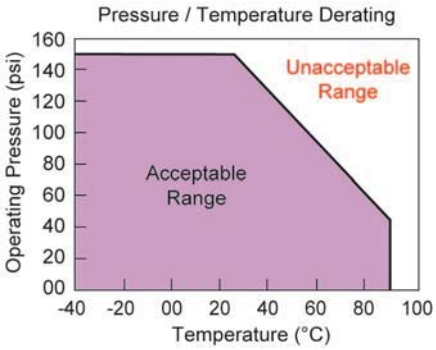
www.flowline.com

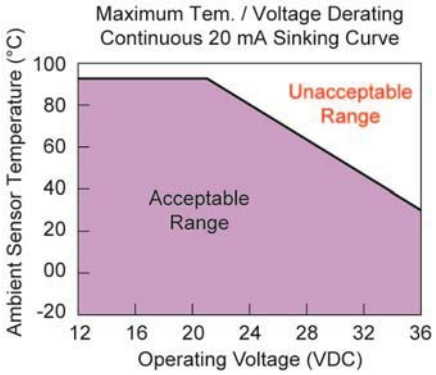
About Switch-Pak™ Powered Level Switches: This manual contains information on all four series of powered level switches; Vibration (LZ12 series), Ultrasonic (LU10 series), Optic Leak (LO10 series) and SuperGuard Capacitance (LP15 series). The switches all feature two outputs: 1) a 4 or 20 mA current switch and 2) a 60VA SPST dry contact relay. All four series are manufactured with thermoplastics, including the cable, making them submersible in design and ideal for corrosive applications. Package the switches with either Flowline controllers (LC10 or LC40 series) or interface directly to another controller or PLC.

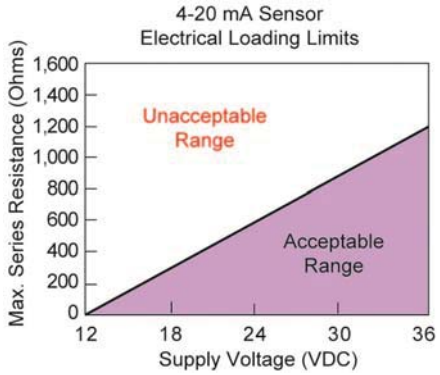
Table of Contents

Common Specifications:

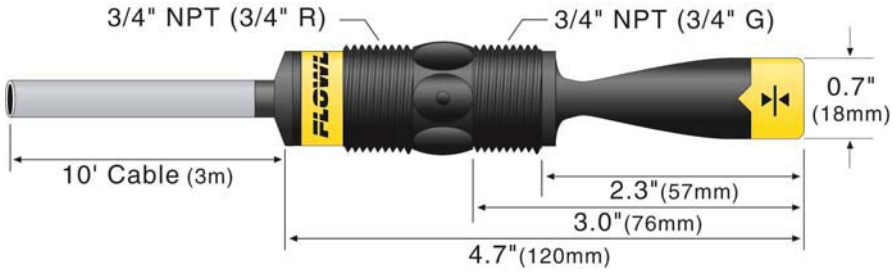
Orientation:	Universal	Pressure:	150 psi (10 bar) @ 25 °C., derated @ 1.667 psi (.113 bar) per °C. above 25° C.
Accuracy:	± 1 mm in water		
Repeatability:	± 0.5 mm in water		
Supply voltage:	12-36 VDC	Sensor rating:	NEMA 6 (IP68)
	12-30 VDC (LZ12 Only)	Cable type:	4-conductor, #22 AWG (shielded)
Consumption:	25 mA maximum	Cable length:	10' (3m) - Standard
Contact type:	(1) SPST relay		25' (7.6m) or 50' (15.2m) - Special
Contact rating:	60VA (125 VAC max / 1A max)	Process mount:	3/4" NPT (3/4" G / R)
Contact output:	Selectable NO/NC	Mount. gasket:	Viton® (G / R version only)
Process temp.:	F: -40° to 176°	Classification:	General purpose
	C: -40° to 80°	CE compliance:	EN 61326 EMC / EN 61010-1 safety







Vibration Switch (LZ12 Series): The Tuning Fork vibration switch operates at a nominal frequency of 400 Hz. As the switch becomes immersed in a liquid or slurry, a corresponding frequency shift occurs. When the measured frequency shift reaches the set point value, the switch changes state indicating the presence of a liquid or slurry medium. For optimum performance and proactive maintenance, the sensor automatically adjusts for coating, and if necessary, outputs a preventative maintenance alarm.



⚠ ***Do not squeeze the forks together. Doing so could damage or break the sensor and void the warranty.***

When powering up the LZ12, the start-up procedure requires the switch to cycle through a wet condition for 1/2 second in order to determine an initial resonance.

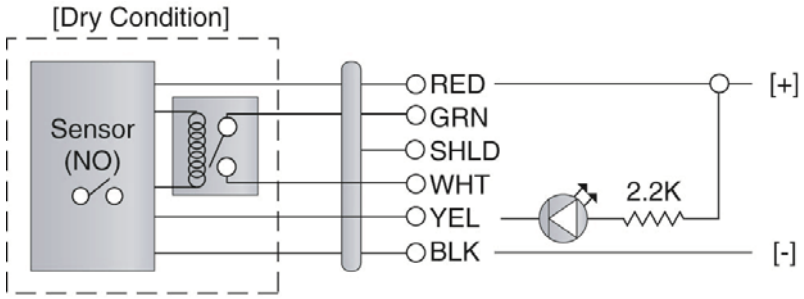
LZ12 Specifications:

Sensor material:	Ryton® (glass fill) Viton® cable grommet	Maint. alarm: Cable jacket mat'l:	NPN transistor, 10 mA max. PP
Process Temp.:	F: -40° to 176° C: -40° to 80°	Cable type:	5-conductor, #24 AWG (shielded)

Configurations:

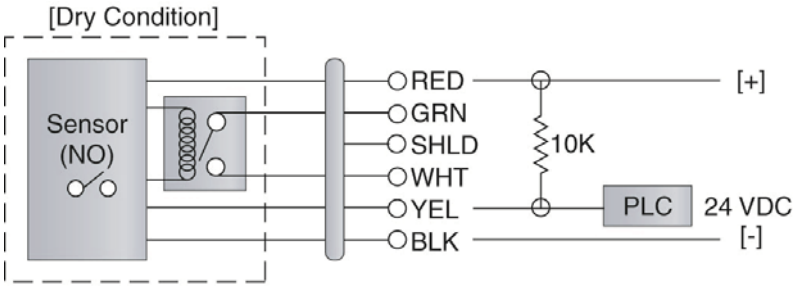
Part Number	Material (body)	Material (cable)	Thread (inside x outside)
LZ12-1405	Ryton	Polypropylene	¾" NPT x ¾" NPT
LZ12-1425	Ryton	Polypropylene	¾" R x ¾"G

Maintenance Alarm (LZ12 Vibration only): For optimum performance and proactive maintenance, the sensor automatically adjusts for coating, and if necessary, outputs a preventative maintenance alarm. The Yellow wire is a NPN transistor designed to switch when a build-up of material prevents the vibration switch from operating at its operational frequency. Use the Yellow wire to identify when the Vibration switch requires cleaning. To wire the maintenance output wire to an LED, follow the wiring diagram below. The Yellow wire is connected to the LED and a 2.2kΩ resistor in series and referenced back to the (+) of the power supply.



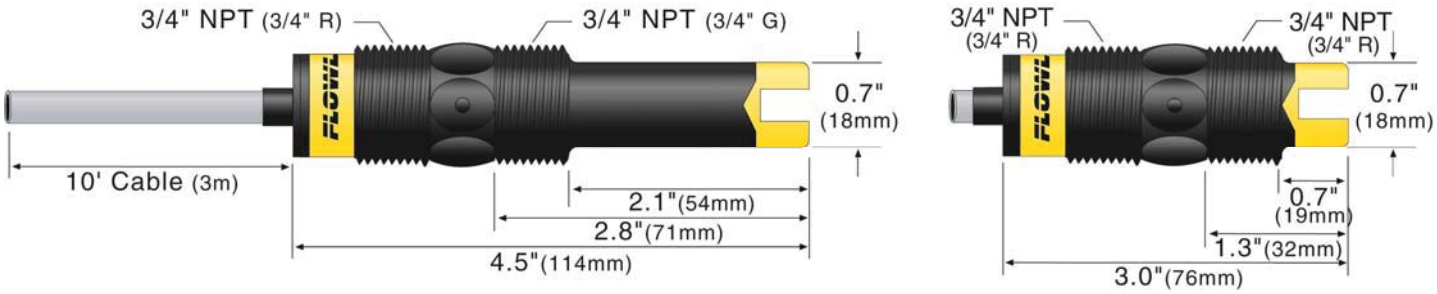
Sensor Power
[RED & BLK wires] / 36 VDC Max.
5 ±1mA Dry / 22 ±1mA Wet
Relay Rating
[GRN & WHT wires] / 60 VA
Maintenance Alarm
[YEL wire] / NPN Transistor / 10mA Max.

To wire the maintenance output wire to a PLC, follow the wiring diagram below. The Yellow wire is connected to the PLC input with a 10 kΩ resistor parallel to the PLC input and the (+) of the power supply.



Sensor Power
[RED & BLK wires] / 36 VDC Max.
5 ±1mA Dry / 22 ±1mA Wet
Relay Rating
[GRN & WHT wires] / 60 VA
Maintenance Alarm
[YEL wire] / NPN Transistor / 10mA Max.

Ultrasonic Switch (LU10 Series): The Ultrasonic level switch generates a 1.5 MHz ultrasonic wave from a miniature piezoelectric transducer located on one side of the gap within it's sensing tip. Another piezo transducer, located on the other side of the gap, acts as a microphone, picking up the sound wave. When liquid enters the gap, there is a change in the speed the wave crosses the gap. This change in the speed of sound identifies whether the sensor is in liquid or in air.



⚠ ***The sensor should be installed so that the liquid will drip out of the gap when the sensor becomes dry.***

LU10 Specifications:

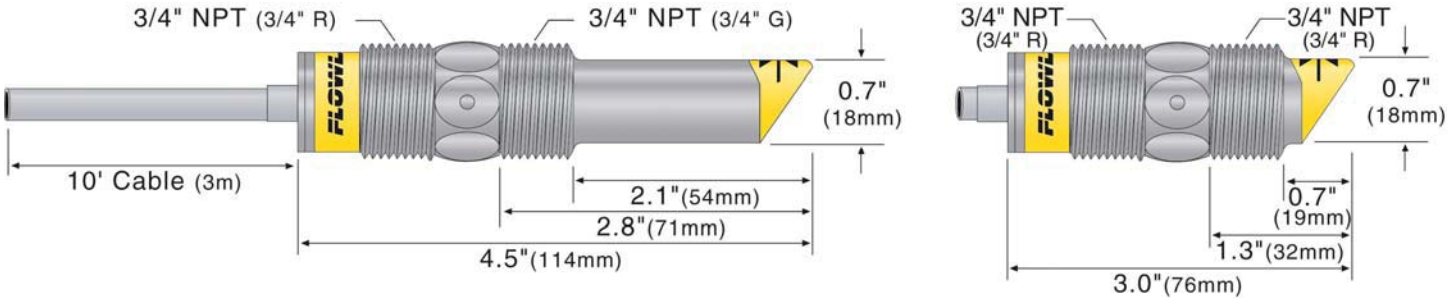
Sensor material:	1_ _5: PP 2_ _5: PFA	Cable jacket mat'l:	1_ _5: PP 2_ _5: PFA
Classification:	Intrinsically safe	Parameters:	CSA: Vmax = 32V, Imax = 300 mA, Pmax = 1.3 W; Ci = 0 µF, Li = 0 µH EEx: Ui = 32V; Ii = 300 mA; Pi = 1.3 W; Ci = 0 µF; Li = 0 µH
Approvals:	CSA: Class I, Groups A, B, C & D; Class II, Groups E, F and G; Class III EEx: Class 1, Division 1, Groups A, B, C, D; EEx ib IIC T6	Certificates:	CSA: LR 79326 EEx: LCIE 01.E6048 X

Configurations:

Part Number	Length	Material (body)	Material (cable)	Thread cable side x sensor side
LU10-1305	Short (3")	Polypropylene	Polypropylene	(¾" NPT) x (¾" NPT)
LU10-1325	Short (3")	Polypropylene	Polypropylene	(¾" R) x (¾"R)
LU10-1405	Long (4.5")	Polypropylene	Polypropylene	(¾" NPT) x (¾" NPT)
LU10-1425	Long (4.5")	Polypropylene	Polypropylene	(¾" R) x (¾"G)
LU10-2305	Short (3")	PFA	PFA	(¾" NPT) x (¾" NPT)
LU10-2325	Short (3")	PFA	PFA	(¾" R) x (¾"R)
LU10-2405	Long (4.5")	PFA	PFA	(¾" NPT) x (¾" NPT)
LU10-2425	Long (4.5")	PFA	PFA	(¾" R) x (¾"G)

Optic Leak Detection Switch (LO10 Series): The Optic Leak Detector use principles of optical refraction to detect the presence or absence of fluid. A pulsed infrared light beam is internally generated by a light emitting diode and aimed at the slanted optical tip of the sensor. If the tip is dry, the light beam bounces at a 90 degree angle to a receiving photo transistor, indicating a dry condition. If the tip is immersed in liquid, the light beam will refract out into the liquid instead of being reflected to the photo transistor, indicating a wet condition.

⚠ **The LO10 series is designed as a leak detection switch. The switch should be installed in applications where under normal conditions, it remains away from the liquid and will only come into contact during a leak.**



⚠ ***The Optic Leak Detector cannot detect the presence or absence of specular application liquids that reflect light (such as milk), or viscous liquids (such as paint) that form a coating on the sensor tip.***

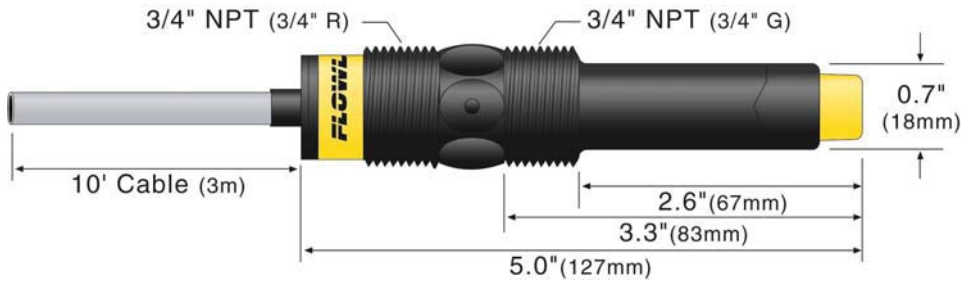
LO10 Specifications:

Sensor material: 1_ _5: PP 2_ _5: PFA	Cable jacket mat'l: 1_ _5: PP 2_ _5: PFA

Configurations:

Part Number	Length	Material (body)	Material (cable)	Thread cable side X sensor side
LO10-1305	Short (3")	Polypropylene	Polypropylene	(¾" NPT) x (¾" NPT)
LO10-1325	Short (3")	Polypropylene	Polypropylene	(¾" R) x (¾"R)
LO10-1405	Long (4.5")	Polypropylene	Polypropylene	(¾" NPT) x (¾" NPT)
LO10-1425	Long (4.5")	Polypropylene	Polypropylene	(¾" R) x (¾"G)
LO10-2305	Short (3")	PFA	PFA	(¾" NPT) x (¾" NPT)
LO10-2325	Short (3")	PFA	PFA	(¾" R) x (¾"R)
LO10-2405	Long (4.5")	PFA	PFA	(¾" NPT) x (¾" NPT)
LO10-2425	Long (4.5")	PFA	PFA	(¾" R) x (¾"G)

SuperGuard Capacitance Switch (LP15 Series): The SuperGuard level switch generates a pulse-wave radio frequency signal from the capacitance electrode located in the sensing tip of each sensor. When liquid comes into contact with the sensing tip, the capacitance as measured by the sensor changes based on the dielectric constant of the liquid. The guard circuit rejects the negative effects of coating buildup on the probe by eliminating the coating signal path between the active and reference electrodes.



⚠ ***The sensor's operation may vary based on the dielectric properties of various application liquids. The LP15 series sensor is factory-calibrated to be used with liquids with a dielectric value between 20 and 80. Liquids with a dielectric constant less than 20 will not be detected by an LP15 series sensor.***

Table of Common Dielectric Constants: NOTE: Liquids with a dielectric constant less than 20 will not be detected by an LP15 series level switch.

Acetone 21	Chlorotoluene 4.7	Ethylene chloride .. 10.5	Isobutyl methyl ketone 13	Nitrotoluene 25	Trichloroethylene 3.4
Acetoaldehyde 22.2	Chloroform ....4.5 to 5.0	Ethyl acetate 6.4	Jet fuel 1.7	Naphthalene ..2.3 to 2.5	Trichloroacetic acid 4.5
Acetyl methyl hexyl ketone 28	Chlorine, liquid 2.0	Ethyl salicylate 8.6	Lead carbonate 18	Oils, vegetable 2.5 to 3.5	Terephthalic acid ..... 1.5 to 1.7
Alcohol ..... 16 to 31	Carbon tetrachloride 2.2	Ethyl stearate 2.9	Lead nitrate 38	Oils, mineral ..2.3 to 2.4	Thinner 3.7
Ammonia ..... 15 to 25	Cyan 2.6	Ethyl silicote 4.1	Methyl salicylate 9.0	Oils, petroleum .....1.8 to 2.2	Urea 3.5
Acetic acid .... 4.1 to 6.2	Cyclohexane methanol 3.7	Formic acid 59	Methanol 33	Oleic acid 2.5	Vinyl chloride .. 2.8 to 6
Butyl chloride 9.6	D.I. Water 20	Ferric oleate 2.6	Methyl alcohol .33 to 38	Propane, liquid .....1.8 to 1.9	Vinyl alcohol 1.8 to 2.0
Barium chloride 9 to 11	Ethyl toluene 2.2	Freon 2.2	Margarine, liquid .....2.8 to 3.2	Potassium nitrate .....5.0 to 5.9	Water, 20°C 80
Benzene 2.3	Ethyl alcohol 23	Glycerine 47	Methyl acetate 7.3	Potassium chloride .. 5.0	Water, 100°C 48
Benzine 2.3	Ethylene glycol 37	Glycol 30	N-butyl formate 2.4	Stearic acid 2.3	
Barium nitrate 5.6	Ethylene oxide 14	Glycol nitrite 27	Nitrobenzene ...26 to 35	Toluene 2.4	
Bromine 3.1	Ethylene dichloride .....11 to 17	Gasoline ..... 2 to 2.2			
Chlorobenzene . 4.7 to 6		Hydrochloric acid ... 4.6			
		Isobutyric acid 2.7			

LP15 Specifications:

Dielectric range:	>20 constants	Sensor material:	PP
Conductive range:	>100 miromhos	Cable jacket mat'l:	PP

Configurations:

Part Number	Material (body)	Material (cable)	Thread cable side x sensor side
LP15-1405	Polypropylene	Polypropylene	(¾" NPT) x (¾" NPT)
LP15-1425	Polypropylene	Polypropylene	(¾" R) x (¾"G)

About Manual: PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on all models of Flowline Switch-Tek™ Powered Level Switches: LZ12, LU10, LP15 and LO10 series. Please refer to the part number located on the sensor label to verify the exact model which you have purchased.

User's Responsibility for Safety: FLOWLINE manufactures a wide range of liquid level switches and technologies. While each of the these switches are designed to operate in a wide variety of applications, it is the user's responsibility to select a switch model that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

Proper Installation and Handling: Because this is an electrically operated device, only properly trained staff should install and/or repair this product. Use a proper sealant with all installations. *Note: Always install the 3/4" Viton gasket with all versions of Switch-Tek™ with metric threads. The G threaded version will not seal unless the gasket is properly installed.* Never over tighten the sensor within the fitting, beyond a maximum of 80 inch-pounds torque. Always check for leaks prior to system start-up.

Material Compatibility: The LU10 and LO10 series sensors are available in two different wetted materials. Models L_10-1__5 are made of Polypropylene (PP). Models L_10-2__5 are made of Perfluoroalkoxy (PFA). The LZ12 series is made of made of Ryton® (40% glass filled) and the LP15 series is made of PP. Make sure that the model you have selected is compatible with the application liquid. To determine the chemical compatibility between the sensor and its application liquids, refer to an industry reference such as the Compass Corrosion Guide (available from Compass Publications, phone 858-589-9636).

Wiring and Electrical: The supply voltage used to power the sensor should never exceed a maximum of 36 volts DC *(30 VDC for LZ12 series)*. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

Flammable, Explosive and Hazardous Applications: Only the LU10-___5 series switch is rated for use in hazardous locations. Refer to the Certificate of Compliance for all applicable intrinsically safe ratings and entity parameters. Refer to the National Electric Code (NEC) for all applicable installation requirements in hazardous locations. **DO NOT USE THE LZ12, LP15 OR LO10 SERIES GENERAL PURPOSE SWITCH IN HAZARDOUS LOCATIONS.**

Warning

The rating for the relay is 60 VA (125 VAC max / 1A max).

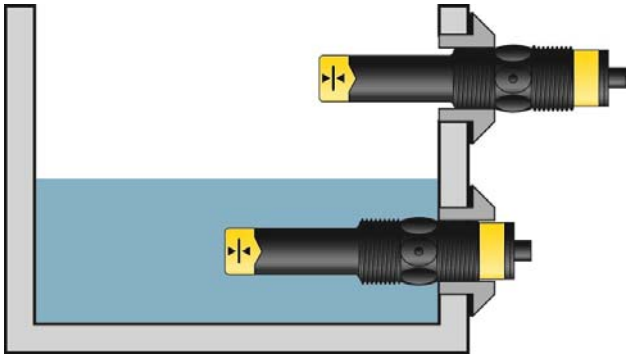
Flowline's Switch-Tek™ level switches are not recommended for use with electrically charged application liquids. For most reliable operation, the liquid being measured may need to be electrically grounded.

Always install the 3/4" Viton gasket with all versions of the powered sensors with metric threads. The G threaded version will not seal unless the gasket is installed properly.

Make a Fail-Safe System: Design a fail-safe system that accommodates the possibility of switch and/or power failure. FLOWLINE recommends the use of redundant backup systems and alarms in addition to the primary system. Adding a redundant high level float switch to the system is a cost effective means to prevent costly tank overflows.

All of the Switch-Tek™ Powered Level Sensors have a single internal relay. The normally open (NO) or normally closed (NC) operation is user selected based on the desired system control. Always design a fail-safe system that accommodates for the possibility of functional and/or power failure to the instrument. The "normal" relay state is where the relay coil is de-energized and the relay indicator is OFF. Therefore, if power is cut OFF to the switch it will de-energize the relay. Make sure that the de-energized state is the safe state in your system design. As such, if switch power is lost, a pump will turn OFF if it is connected to the normally open side of the relay.

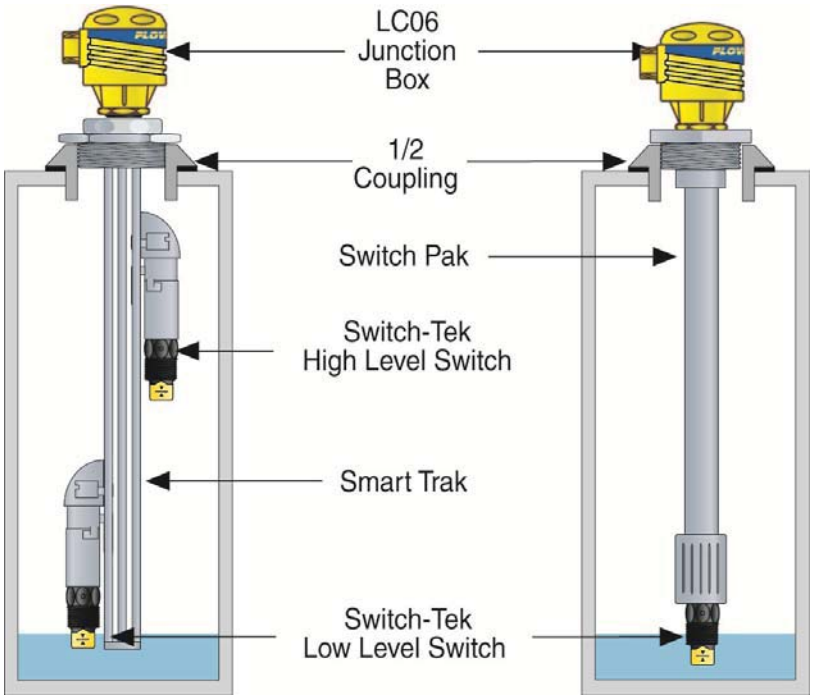
Through Wall Installation: Flowline's Switch-Tek™ level switches may be installed through the top, side or bottom of a tank wall. The sensor has male 3/4" NPT threads on either side of a 15/16" wrench flat. This enables the user to select the sensor's mounting orientation, installed outside of the tank in, or inside of the tank out.



⚠ ***Always install the 3/4" Viton gasket with the metric (long sensor length) versions of the L_ _ _-_ _2_. The G threaded version of the Switch-Tek™ will not seal unless the gasket is installed properly.***

Top Wall Installation: The powered level switches may be installed through the top wall of a tank. Flowline's Smart Trak LM10 series mounting system is an in-tank fitting which enables users to install up to four FLOWLINE sensors of any technology, to any depth, along the entire length of track. Smart Trak may be installed through the top wall of any tank using a standard 2" NPT tank adapter. If no tank top installation is available, Flowline's side mount bracket, LM50-1001, enables Smart Trak to be installed directly to the side wall of a tank. *Do not use PFA Teflon sensors with Smart-Trak.*

Flowline's Switch Pak LM45 series mounting system is an in-tank fitting which enables users to install one FLOWLINE sensor, of any technology, to a specific depth. The Flowline sensor may be installed onto the 3/4" NPT adapter at the end of the Switch Pak. Switch Pak may be installed through the top wall of any tank using a standard 2" NPT tank adapter. Flowline's side mount bracket, model LM50-1001, may also be used if top wall installation is not available.

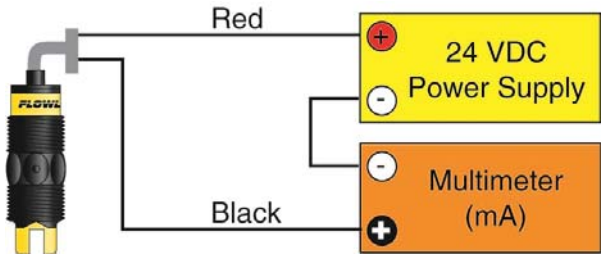


Supply Voltage: The supply voltage to the Switch-Tek™ level switch should never exceed a maximum of 36 VDC. Flowline controllers have a built-in 13.5 VDC power supply which provides power to all of Flowline's electrically powered sensors. Alternative controllers and power supplies, with a minimum output of 12 VDC up to a maximum output of 36 VDC (30 VDC with LZ12 series), may also be used with the Switch-Tek™ level switch.

Required Cable Length: Determine the length of cable required between the Switch-Tek™ level switch and its point of termination. Allow enough slack to ensure the easy installation, removal and/or maintenance of the sensor. The cable length may be extended up to a maximum of 1000 feet, using a well-insulated, 14 to 20 gauge shielded four conductor cable.

Wire Stripping: Using a 10 gauge wire stripper, carefully remove the outer layer of insulation from the last 1-1/4" of the sensor's cable. Unwrap and discard the exposed foil shield from around the signal wires, leaving the drain wire attached if desired. With a 20 gauge wire stripper, remove the last 1/4" of the colored insulation from the signal wires.

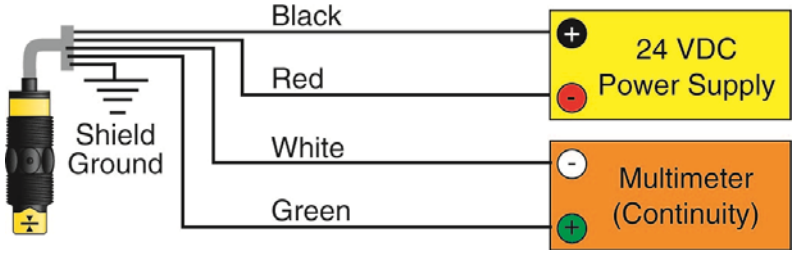
Signal Outputs (Current sensing): The standard method used by Flowline controllers; this technology uses only two wires (Red and Black). The sensor draws 5 mA when it is dry, and 22 mA when wet. NC/NO status must be set by the controller. The White and Green wires are not used.



Signal Output (Relay switching): Allows the sensor to switch a small load on or off directly, using an internal 1A relay (60 VAC/60 VDC). Only model LU10-___5 uses the relay and features 4 wires (red, black, white and green) and a shield wire. The NO/NC status is set by the polarity of the voltage feeding the red and black wires. The green wire is the common for the relay and the white wire is the NO or NC, depending on the polarity of red and black.

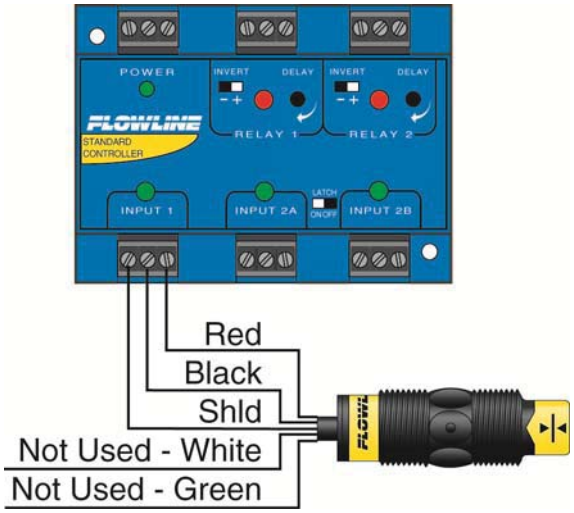
Normally Open Wiring:

Normally Closed Wiring:

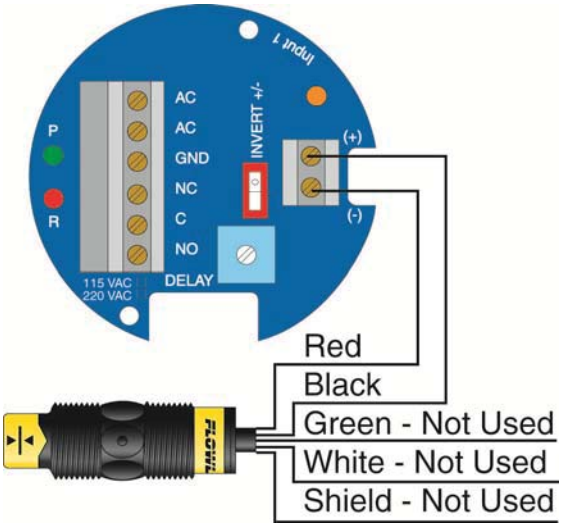


Wiring to a FLOWLINE Controller

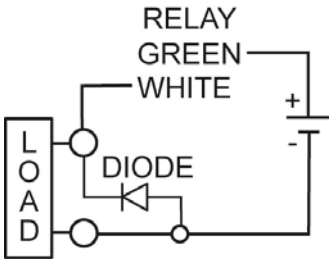
LC40 Series Controller (4 or 20 mA output)**:**
LC42-1001 Shown



LC10/LC11 Series Controller (4 or 20 mA output)**:**
LC11-1001 shown



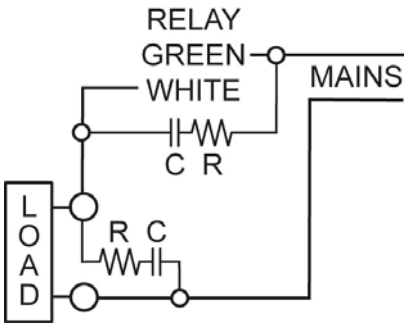
Switching Inductive Loads: The use of suppressors (snubbers) is strongly recommended when switching inductive loads to prevent disrupting the microprocessor's operation. The suppressors also prolong the life of the relay contacts. Suppression can be obtained with a catch diode for DC circuits and a resistor-capacitor (RC) for AC circuits.



Catch Diode

- Always use stepper relays between the sensor and external loads. For DC circuits use a catch diode such as 1N4148, shown on left.

Refer to the following circuits for RC network assembly and installation:



Choose R and C as follows:

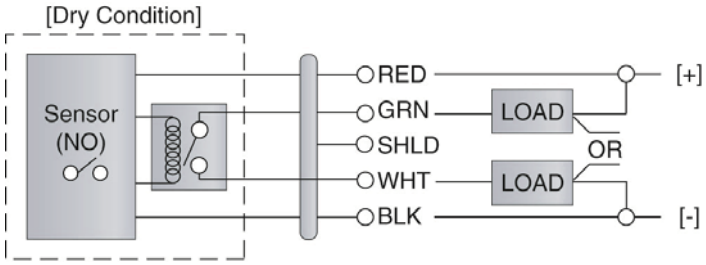
- R: 0.5 to 1 Ohms for each volt across the contacts
- C: 0.5 to 1 µF for each amp through closed contacts

Notes:

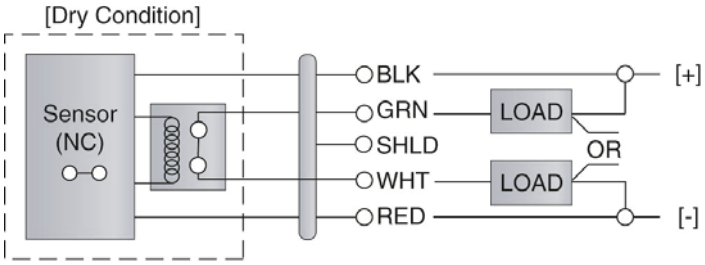
1. Use capacitors rated for 250 VAC.
2. RC networks may affect load release time of solenoid loads. Check to confirm proper operation.
3. Install the RC network at the meters relay screw terminals. An RC network may also be installed across the load. Experiment for best results.

Wiring the Relay Output: Switch-Tek™ requires 12 - 36 VDC (30 VDC max. for LZ12 series) power to operate the sensor and switch the relay. All illustrations below identify a Dry switch state as the normal position of the relay.

Switching a Normally Open DC Load:
The Red wire connects to Positive (+) of the power supply and the Black wire connects to Negative (-). The LOAD can be attached to either the Green or White wires. Complete the circuit by connecting the Green to (+) VDC power or White to (-) VDC power (see illustration below).

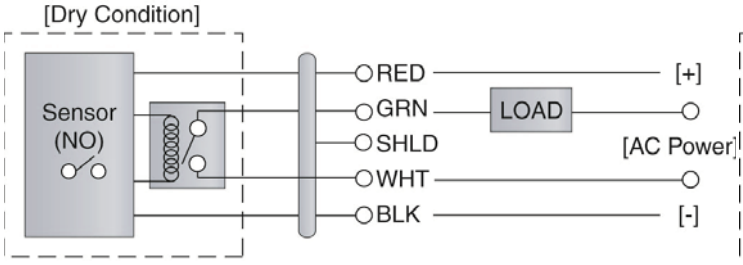


Switching a Normally Closed DC Load:
The Black wire connects to Positive (+) of the power supply and the Red wire connects to Negative (-). The LOAD can be attached to either the Green or White wires. Complete the circuit by connecting the Green to (+) VDC power or White to (-) VDC power (see illustration below).

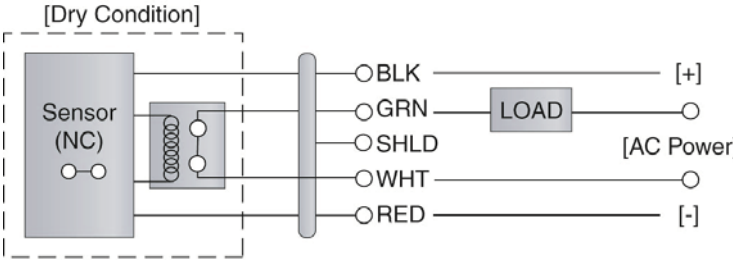


Sensor Power	*Relay Rating*
[RED & BLK wires] / 36 VDC Max. 5 ±1mA Dry / 22 ±1mA Wet	[GRN & WHT wires] / 60 VA

Switching a Normally Open AC Load:
The Red wire connects to Positive (+) of the DC power supply and the Black wire connects to Negative (-). The LOAD can be attached to the Green wire and the Hot of the VAC power. Connect the White to the Neutral of the VAC power (see illustration below).



Switching a Normally Closed AC Load:
The Black wire connects to Positive (+) of the DC power supply and the Red wire connects to Negative (-). The LOAD can be attached to the Green wire and the Hot of the VAC power. Connect the White to the Neutral of the VAC power (see illustration below).

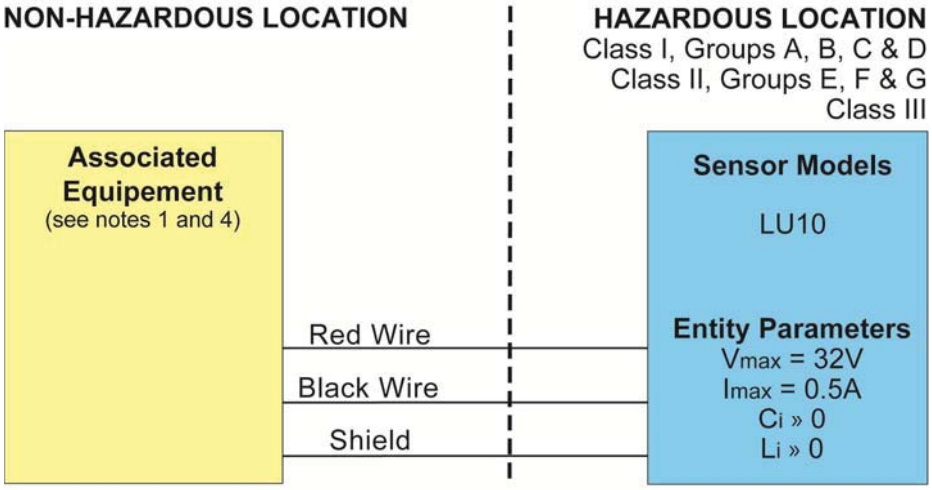


Sensor Power	*Relay Rating*
[RED & BLK wires] / 36 VDC Max. 5 ±1mA Dry / 22 ±1mA Wet	[GRN & WHT wires] / 60 VA

Models LU10-___5 Only: The LU10-___5 level switch has been approved for use in Class I, Groups A, B, C & D; UNDER CERTIFICATE NUMBER LR 79326-4. DO NOT USE THE LZ12, LP15 or LO10 SERIES IN INTRINSICALLY SAFE APPLICATIONS. The Entity parameter for the LU10-_ _ _5 are:

Vmax = 32 VDC / Imax = 0.5 A / Ci = 0 µF / Li = 0 mH

Intrinsically Safe Control Drawing:

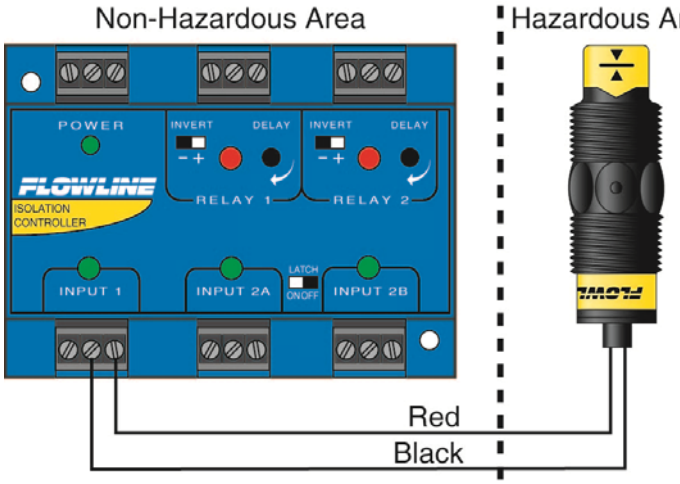


Notes:
1. CSA certified associated equipment with entity parameters.
2. $V_{max} \geq V_{oc}$, $I_{max} \geq I_{sc}$, $C_i + C_{cable} \leq C_a$., $L_i + L_{cable} \leq L_a$.
3. Installation should be in accordance with CEC Part I, or NFPA 70.
4. Associated equipment must be installed per manufacturers instructions

Sensor Drawing: LSD1
Rev. B 10-01-02

Wiring to a Flowline Controller: LC90 Series Controller (4 or 20 mA Signal Output)

LC90 Series
Entity Parameter
Voc = 17.47 VDC
Isc = 0.4597 A
Ca = 0.494 µF
La = 0.119 µH

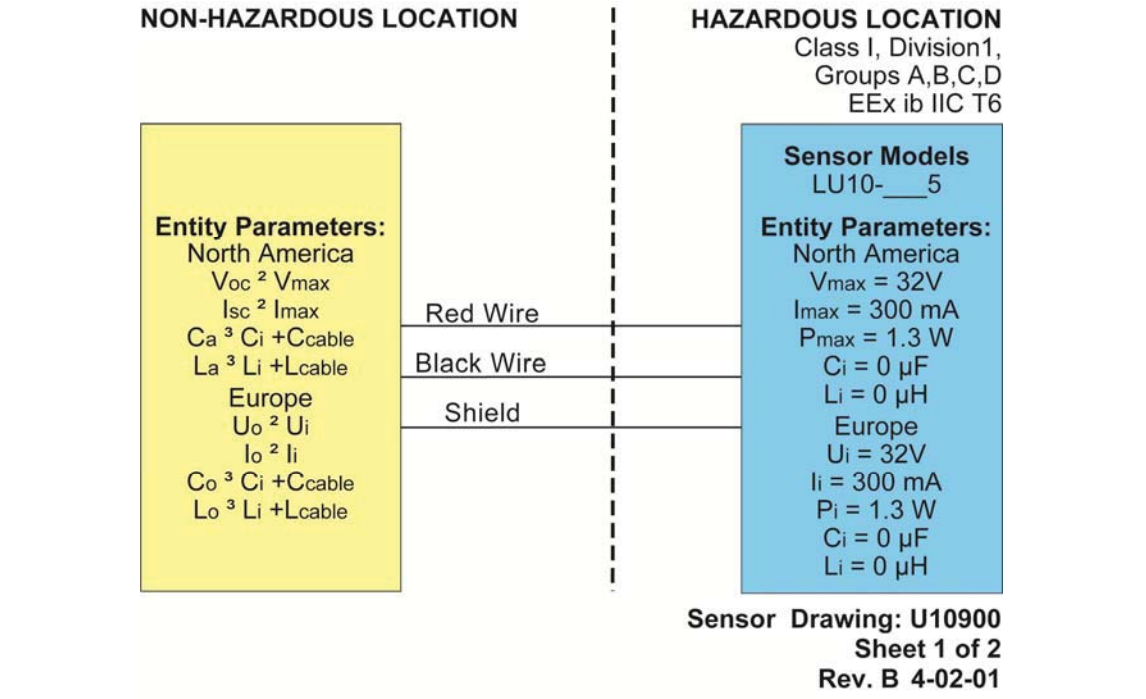


LU10 series
Entity Parameter
Vmax = 32 VDC
Imax = 0.5 A
Ci = 0 µF
Li = 0 µH

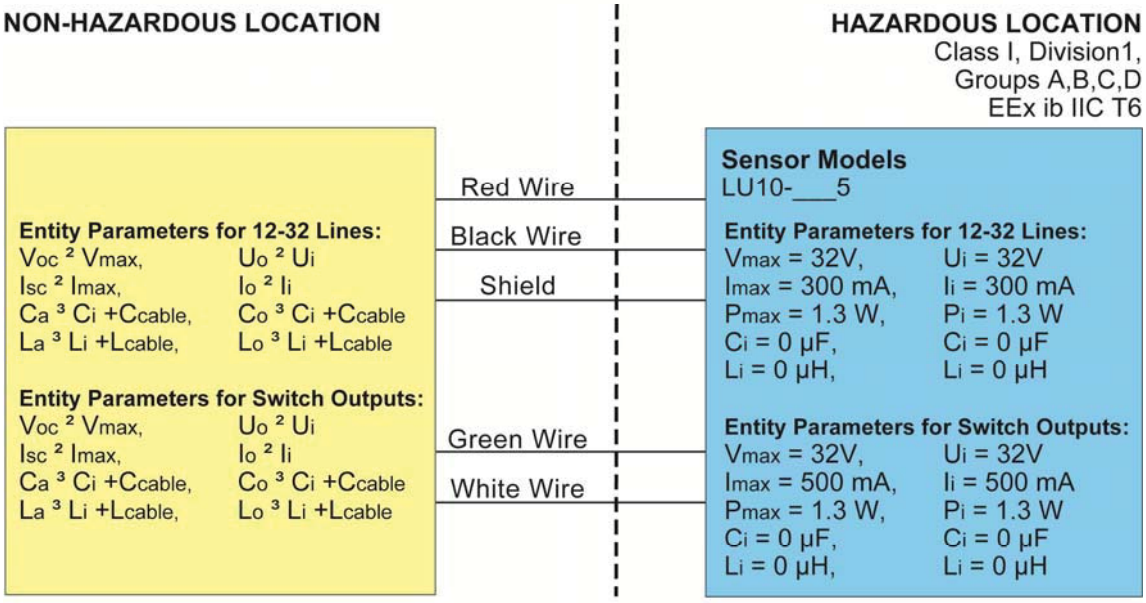
Models LU10-___5 Only: The LU10-___5 level switch has been approved for use in Class I, Division 1, Groups A, B, C & D; EEx ib IIC T6; UNDER CERTIFICATE NUMBER LCIE 01.E6048X. DO NOT USE THE LZ12, LP15 or LO10 SERIES IN INTRINSICALLY SAFE APPLICATIONS. The Entity parameter for the LU10-___5 are:

North America - Vmax = 32 VDC / Imax = 0.5 A / Pmax = 1.3 W / Ci = 0 µF / Li = 0 µH
Europe - Ui = 32 VDC / Ii = 0.5 A / Pi = 1.3 W / Ci = 0 µF / Li = 0 µH

Intrinsically Safe Control Drawing:



Sensor Drawing: U10900
Sheet 1 of 2
Rev. B 4-02-01

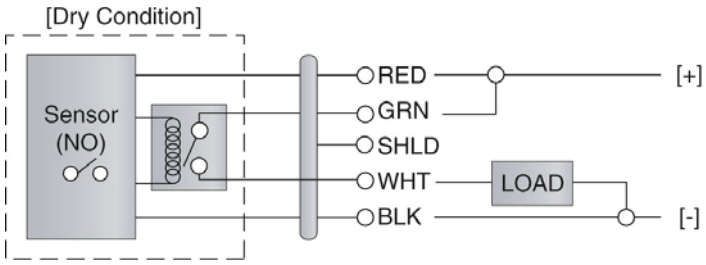


Notes: PARAMETERS DEPEND ON OUTPUT TYPE
1. Installation should be in accordance with CEC Part 1, or NFPA 70.
2. Associated Equipment shall be CSA certified with entity parameters connected in accordance with manufacturers instructions.

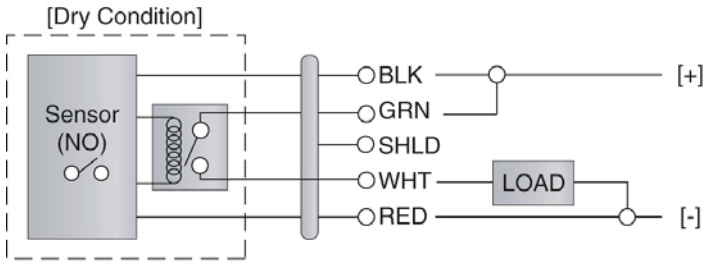
Sensor Drawing: U10900
Sheet 2 of 2
Rev. B 4-02-01

Wiring as a P-Channel or N-Channel output: The Switch-Tek™ can be substituted for either a P-Channel (PNP, sourcing) output or an N-Channel (NPN, sinking) output.

Normally Open DC Load as a P-Channel Output:
The Red wire connects to Positive (+) of the power supply and the Black wire connects to Negative (-). The Green wire is jumped to the Red wire while the White wire is connected to the LOAD. Jumper the LOAD to the Negative (-) to complete the circuit.

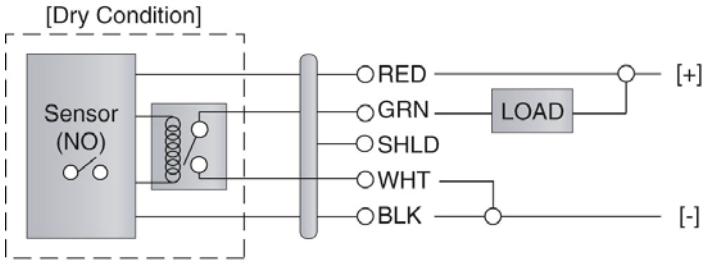


Normally Closed DC Load as a P-Channel Output:
The Black wire connects to Positive (+) of the power supply and the Red wire connects to Negative (-). The Green wire is jumped to the Black wire while the White wire is connected to the LOAD. Jumper the LOAD to the Negative (-) to complete the circuit.

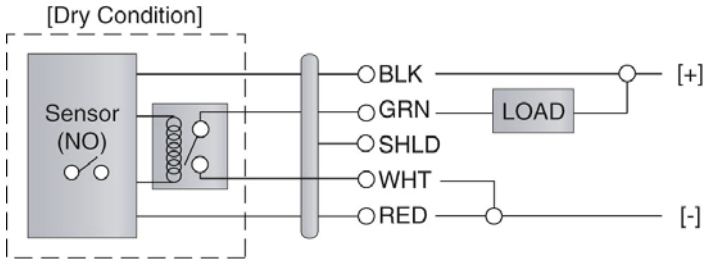


Sensor Power	*Relay Rating*
[RED & BLK wires] / 36 VDC Max. 5 ±1mA Dry / 22 ±1mA Wet	[GRN & WHT wires] / 60 VA

Normally Open DC Load as a N-Channel Output:
The Red wire connects to Positive (+) of the power supply and the Black wire connects to Negative (-). The White wire is jumped to the Black wire while the Green wire is connected to the LOAD. Jumper the LOAD to the Positive (+) to complete the circuit.



Normally Closed DC Load as a N-Channel Output:
The Black wire connects to Positive (+) of the power supply and the Red wire connects to Negative (-). The White wire is jumped to the Red wire while the White wire is connected to the LOAD. Jumper the LOAD to the Positive (+) to complete the circuit.



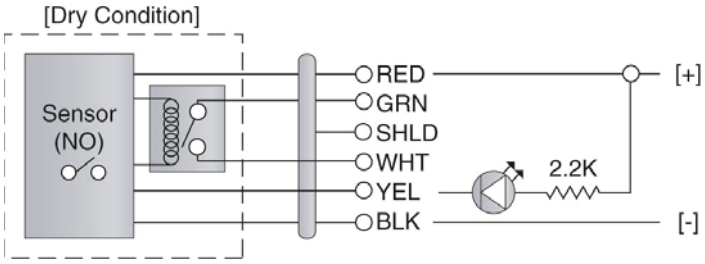
Sensor Power	*Relay Rating*
[RED & BLK wires] / 36 VDC Max. 5 ±1mA Dry / 22 ±1mA Wet	[GRN & WHT wires] / 60 VA

General: The Switch-Tek™ level switch requires no periodic maintenance except cleaning as required. It is the responsibility of the user to determine the appropriate maintenance schedule, based on the specific characteristics of the application liquids.

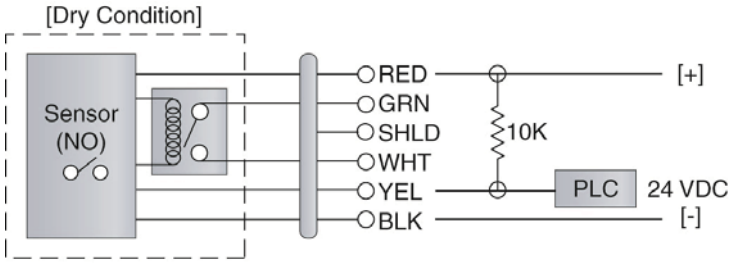
Cleaning procedure:

1. **Power:** Make sure that all power to the switch, controller and/or power supply is completely disconnected.
2. **Switch removal:** In all through-wall installations, make sure that the tank is drained well below the sensor prior to removal. Carefully, remove the sensor from the installation.
3. **Cleaning the switch:** Use a soft bristle brush and mild detergent, carefully wash the Switch-Tek™ level switch. Do not use harsh abrasives such as steel wool or sandpaper, which might damage the surface sensor. Do not use incompatible solvents which may damage the sensor's PP, PFA, PVDF or Ryton plastic body.
4. **Sensor installation:** Follow the appropriate steps of installation as outlined in the Installation section of this manual.

Maintenance Output to LED (LZ12 Only):
To wire the maintenance output wire to an LED, follow the wiring diagram below. The Yellow wire is connected to the LED and a 2.2kΩ resistor in series and referenced back to the (+) of the power supply.



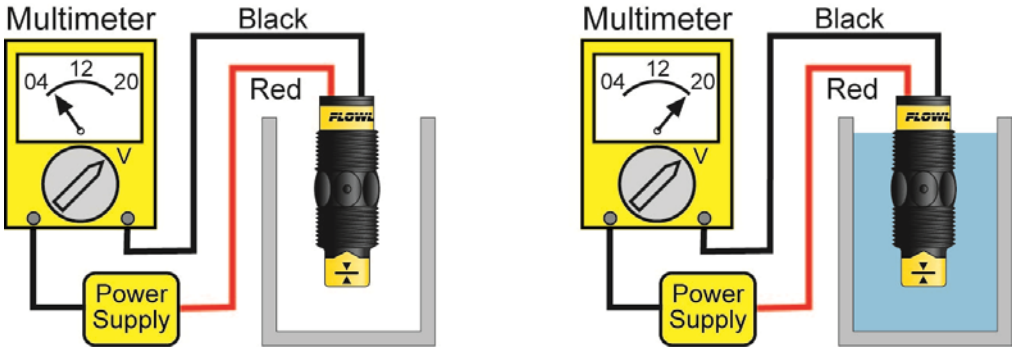
Maintenance Output to PLC (LZ12 Only):
To wire the maintenance output wire to a PLC, follow the wiring diagram below. The Yellow wire is connected to the PLC input with a 10 kΩ resistor parallel to the PLC input and the (+) of the power supply.



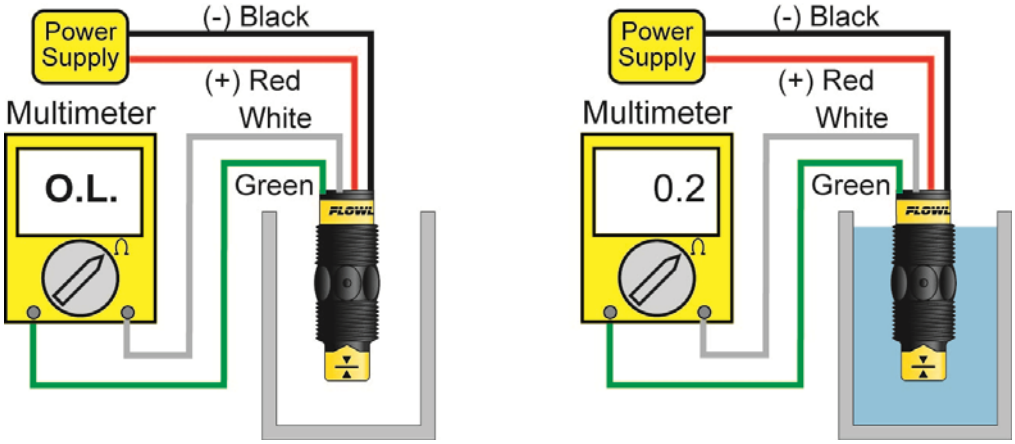
Sensor Power	*Relay Rating*	*Maintenance Alarm*
[RED & BLK wires] / 36 VDC Max. 5 ±1mA Dry / 22 ±1mA Wet	[GRN & WHT wires] / 60 VA	[YEL wire] / NPN Transistor / 10mA Max.

Testing the installation:

1. **Power:** Turn on power to the controller and/or power supply.
2. **Immersing the switch:** Immerse the sensing tip in its application liquid, by filling the tank up to the switches point of actuation. An alternate method of immersing the switch during preliminary testing is to hold a cup filled with application liquid up to the switch's tip.
3. **Test:** With the switch being fluctuated between wet and dry states, the switch indicator light in the controller should turn on and off. If the controller doesn't have an input indicator, use a voltmeter or ammeter to ensure that the switch produces the correct signal (see below).
4. **Point of actuation:** Observe the point at which the rising or falling fluid level causes the switch to change state, and adjust the installation of the switch if necessary.



Example: Testing the LU10 series with a Multimeter set to read current (mA). When wired NO [Red to (+)], the meter will read 5mA, ±1mA when dry and will read 20mA, ±1mA when wet.



Example: Testing the LU10 series with a multimeter set to read resistance (ohms). When wired NO [Red to (+)], the meter will read O.L when dry and will read some small amount of resistance (ex. 0.2 Ohms) when wet.

Warranty

Flowline warrants to the original purchaser of its products that such products will be free from defects in material and workmanship under normal use and service in accordance with instructions furnished by Flowline for a period of two years from the date of manufacture of such products. Flowline's obligation under this warranty is solely and exclusively limited to the repair or replacement, at Flowline's option, of the products or components, which Flowline's examination determines to its satisfaction to be defective in material or workmanship within the warranty period. Flowline must be notified pursuant to the instructions below of any claim under this warranty within thirty (30) days of any claimed lack of conformity of the product. Any product repaired under this warranty will be warranted only for the remainder of the original warranty period. Any product provided as a replacement under this warranty will be warranted for the full two years from the date of manufacture.

Returns

Products cannot be returned to Flowline without Flowline's prior authorization. To return a product that is thought to be defective, go to www.flowline.com, and submit a customer return (MRA) request form and follow the instructions therein. All warranty and non-warranty product returns to Flowline must be shipped prepaid and insured. Flowline will not be responsible for any products lost or damaged in shipment.

Limitations

This warranty does not apply to products which: 1) are beyond the warranty period or are products for which the original purchaser does not follow the warranty procedures outlined above; 2) have been subjected to electrical, mechanical or chemical damage due to improper, accidental or negligent use; 3) have been modified or altered; 4) anyone other than service personnel authorized by Flowline have attempted to repair; 5) have been involved in accidents or natural disasters; or 6) are damaged during return shipment to Flowline. Flowline reserves the right to unilaterally waive this warranty and dispose of any product returned to Flowline where: 1) there is evidence of a potentially hazardous material present with the product; or 2) the product has remained unclaimed at Flowline for more than 30 days after Flowline has dutifully requested disposition. This warranty contains the sole express warranty made by Flowline in connection with its products. ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED. The remedies of repair or replacement as stated above are the exclusive remedies for the breach of this warranty. IN NO EVENT SHALL FLOWLINE BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND INCLUDING PERSONAL OR REAL PROPERTY OR FOR INJURY TO ANY PERSON. THIS WARRANTY CONSTITUTES THE FINAL, COMPLETE AND EXCLUSIVE STATEMENT OF WARRANTY TERMS AND NO PERSON IS AUTHORIZED TO MAKE ANY OTHER WARRANTIES OR REPRESENTATIONS ON BEHALF OF FLOWLINE. This warranty will be interpreted pursuant to the laws of the State of California. If any portion of this warranty is held to be invalid or unenforceable for any reason, such finding will not invalidate any other provision of this warranty.

For complete product documentation, video training, and technical support, go to www.flowline.com.

For phone support, call 562-598-3015 from 8am to 5pm PST, Mon - Fri.

(Please make sure you have the Part and Serial number available.)

SCR-201/2 - Filter, Rotary screen, Newterra 17" wide SCR-50

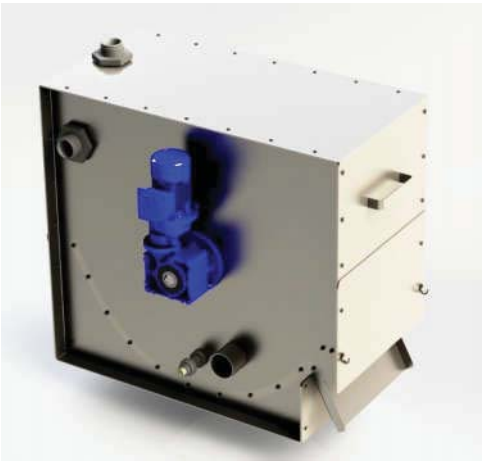
newterra
smart technology. sustainable solutions.

Waste Water Inlet Screens – SCR SERIES

newterra Inlet Screens are specifically designed to protect newterra MicroClear™ flat sheet membranes from fouling due to excessive debris from waste water plant influent. The SCR series is designed to complement the newterra small to medium size wastewater MBR plants. Typically the screens would be used at the inlet to the Equalization Basin or the Aeration Basin. The SCR units are rotating brush design with 0.5mm crossflow wedgewire screens, and are designed to minimize complexity while achieving superior performance.

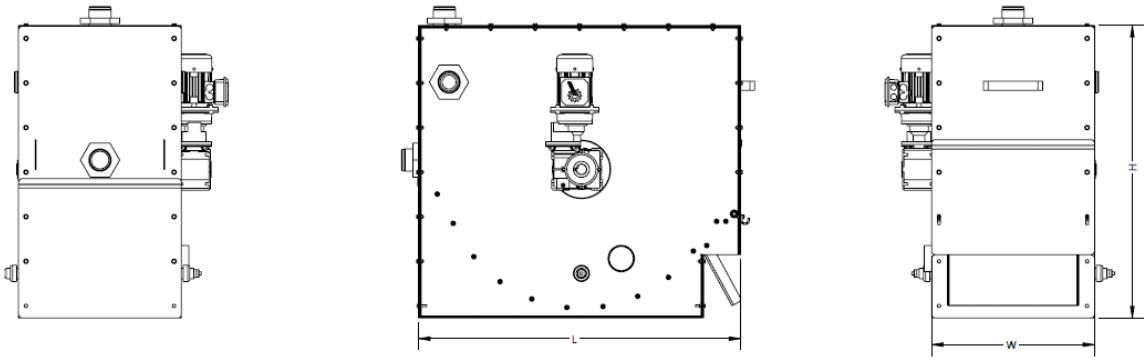
Standard Features:

- 304 SS construction
- 1/4 HP Gearbox/motor (waterproof aluminum)
- Easily replaceable heavy duty brushes
- Standard inlet on Top,Sides,Back
- Internal inlet baffling to provide full screen contact no matter which inlet is chosen
- Bag support
- High Level Switch Coupling
- Gravity Outlet
- Simple, reliable shear pin shaft/motor protection
- Can ship knocked down, easily assembled on site



Options:

- Stands
- Discharge Pump Tank
- Complete Packages c/w pumps and controls



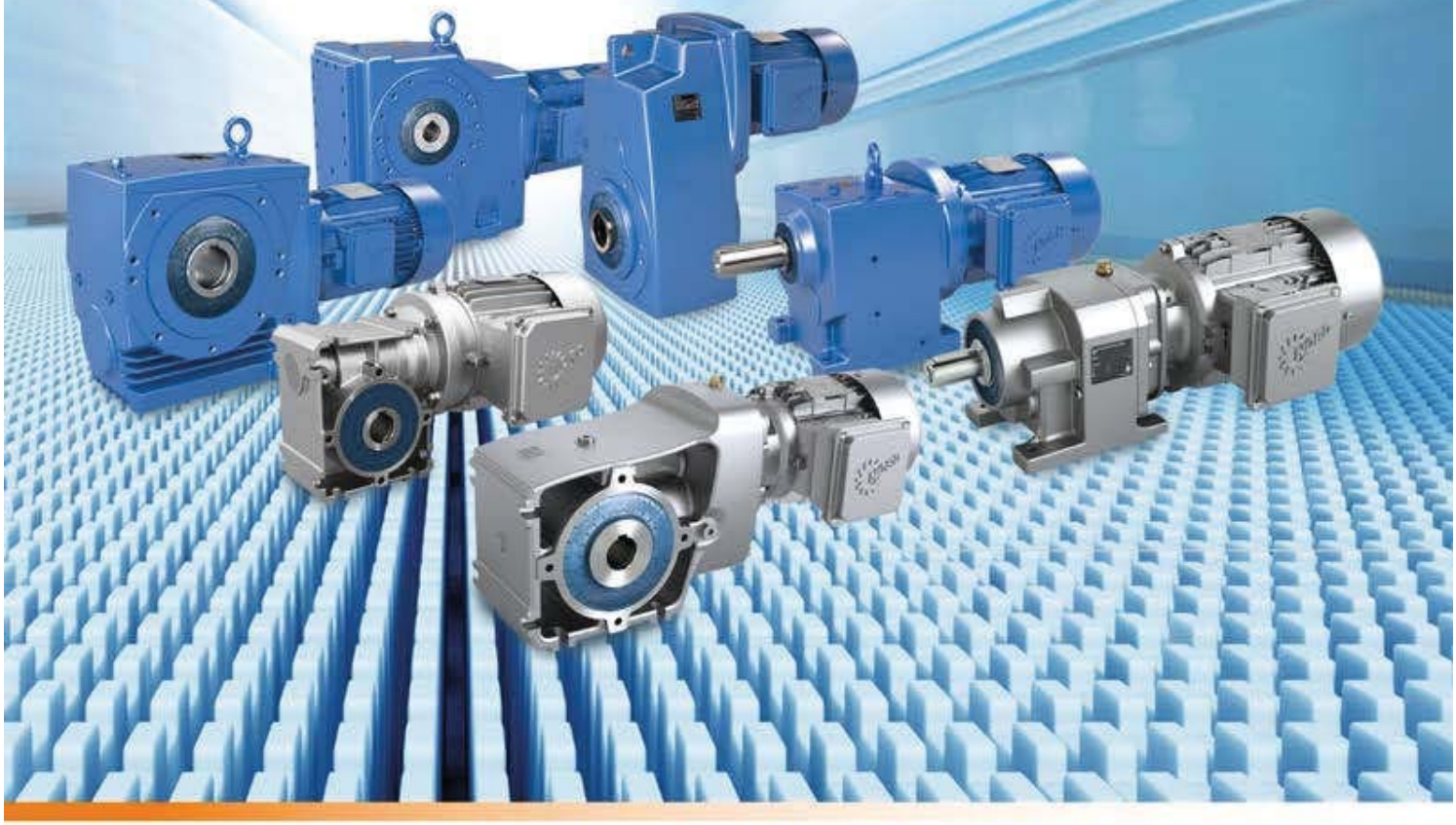
Dimension Chart:

Part Number	Width "W"	Standard Height "H"	Standard Overall Length "L"	Shipping Weight [lbs]	Inlet Size	Outlet Size	Nominal Flowrate gpm	Nominal Flowrate lps	Nominal Flowrate gpd	Nominal Flowrate m3/day
SCR-50	23"	39"	43"	150	2"	Open Bottom	50	3.2	72,000	273
SCR-100	41"	39"	43"	200	3"	Open Bottom	100	6.4	144,000	547

Nominal flowrates based on typical municipal characteristics

Intelligent Drivesystems, Worldwide Services

SCR-201/2 - Gear Motor, 230/460V 50/60 3P, 60/50hz 1/4hp
SK1SI63/H10-56C-63L/4 FRD DIV2 NSD+ 400:1
Nord Gear, 4.3 RPM, CSA CL1 DIV2"



EN

B 1000

Gear units

Operating and Assembly Instructions

NORD DRIVESYSTEMS

E-1278

General safety and operating instructions

1. General

Depending on its protection class, the device may have live, bare, moving or rotating parts or hot surfaces during operation,.

Unauthorised removal of covers, improper use, incorrect installation or operation causes a risk of serious personal injury or material damage.

All transport, installation, commissioning and maintenance work must be carried out by qualified specialist personnel (national accident prevention regulations must be observed).

Within the meaning of this basic safety information, qualified specialist personnel are persons who are familiar with the installation, assembly, commissioning and operation of the product and who have the training and experience to recognise and avoid any hazards and risks.

2. Correct use

NORD products may only be used according to the information in the catalogue and the associated technical documentation.

Compliance with the operating and installation instructions is a **prerequisite for fault-free operation** and for the fulfilment of any warranty claims. **These operating and installation instructions must be read** before working with the device!

These operating and installation instructions contain important information about **servicing**. They must therefore be kept **close to the device**.

All details regarding technical data and permissible conditions at the installation site must be complied with.

3. Transport, storage

Information regarding transport, storage and correct handling must be complied with.

4. Installation

The device must be protected against impermissible loads. In particular, during transport and handling, components must not be deformed or changed. Touching of electronic components and contacts must be avoided.

5. Electrical Connection

When working on live three-phase motors, the applicable national accident prevention regulations must be complied with (e.g. BGV A3, formerly VBG 4).

The electrical installation must be implemented according to the applicable regulations (e.g. cable cross-section, fuses, earth lead connections).

Information regarding EMC-compliant installation – such as shielding, earthing and installation of cables – can be found in the three-phase motor documentation. Compliance with the limiting values specified in the EMC regulations is the responsibility of the manufacturer of the system or machine.

6. Operation

Appropriate safety measures must be taken for applications where failure of the device may result in injury.

Where necessary, systems in which NORD devices are installed must be equipped with additional monitoring and protective equipment according to the applicable safety requirements, e.g. legislation concerning technical equipment, accident prevention regulations, etc.

All covers and guards must be kept closed during operation.

7. Maintenance and repairs

After the device has been disconnected from the power supply, live equipment components and power connections should not be touched immediately, because of possible charged capacitors.

Further information can be found in this documentation.

These safety instructions must be kept in a safe place!

Documentation

Name:	B 1000
Part No.:	6052802
Series:	Gear units and geared motors
Type series:	
Gear unit types:	**Helical gear unit** **NORDBLOC helical gear units** **Standard helical gear units** **Parallel shaft gear units** **Bevel gear units** **Helical worm gear units** **MINIBLOC worm gear units** **UNIVERSAL worm gear units**

Version list

Title, Date	Order number	Comments
B 1000, February 2013	6052802 / 0713	-
B 1000, September 2014	6052802 / 3814	General corrections
B 1000, April 2015	6052802 / 1915	New gear unit types SK 10382.1 + SK 11382.1
B 1000, March 2016	6052802 / 0916	General corrections New bevel gear units SK 920072.1 + SK 930072.1
B 1000, September 2016	6052802 / 3816	General corrections New SK 071.1 helical gear unit, SK 171.1, SK 371.1, SK 571.1, SK 771.1;

Table 1: Version list B 1000

Copyright notice

Publisher

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Getriebebau-Nord-Straße 1 • 22941 Bargteheide, Germany • http://www.nord.com/
Fon +49 (0) 45 32 / 289-0 • Fax +49 (0) 45 32 / 289-2253

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1 Notes

1.1 General information

Read the Operating Manual carefully prior to performing any work on or putting the gear unit into operation. Strict compliance with the instructions in this Operating Manual is essential. This Operating Manual and all associated special documentation must be kept in the immediate vicinity of the gear unit.

Getriebebau NORD accepts no liability for damage to persons, materials or assets as a result of the non-observance of this Operating Manual, operating errors or incorrect use. General wearing parts, e.g. radial seals are excluded from the warranty.

If additional components are attached to or installed on or in the gear unit (e.g. motor, cooling system, pressure sensor etc.) or components (e.g. cooling system) are supplied with the order, the operating instructions for these components must be observed.

If geared motors are used, compliance with the Motor Operating Manual is also necessary.

If you do not understand the contents of this Operating Manual or additional operating instructions, please consult Getriebebau NORD!

1.2 Safety and information symbols

1.2.1 Explanation of labels used

DANGER	Indicates an immediate danger, which may result in death or serious injury.
WARNING	Indicates a possibly dangerous situation, which may result in death or serious injury.
CAUTION	Indicates a possibly dangerous situation, which may result in slight or minor injuries.
NOTICE	Indicates a possibly harmful situation, which may cause damage to the product or the environment.
Note	Indicates hints for use and useful information.

1.3 Correct use

These gear units generate a rotational movement and are intended for use in commercial systems. The gear unit must only be used according to the information in the technical documentation from Getriebebau NORD.

Commissioning (start of proper operation) is prohibited until it has been established that the machine complies with the local laws and directives. The EMC Directive 2004/108/EC and the Machinery Directive 2006/42/EC in their currently valid scope of application must be complied with in particular.

DANGER! — **Explosion hazard**

Serious injury and material damage due to explosion are possible.

Use in explosion hazard areas is prohibited.

WARNING — **Injury to persons**

Appropriate safety measures must be taken for applications where failure of a gear unit or geared motor may result in injury.

Safeguard a wide area around the hazard zone.

WARNING — **Material damage and personal injury**

If the gear unit is not used as designed, this may cause damage to the gear unit or the premature failure of components. Personal injury as a result of this cannot be ruled out.

Strict compliance with the technical data on the type plate is essential. The documentation must be observed.

1.4 Safety information

Observe all safety information, including that provided in the individual sections of this Operating Manual. All national and other regulations on safety and accident prevention must also be observed.

DANGER! **Severe personal injury**

Serious physical and property damage may result from inappropriate installation, non-designated use, incorrect operation, non-compliance with safety information, unauthorised removal of housing components or safety covers and structural modifications to the gear unit.

- All work, e.g. transportation, storage, installation, electrical connection, commissioning, servicing, maintenance and repair must only be performed by qualified specialist personnel.
- Observe the Operating Manual
- Observe the safety information
- Observe the safety and accident prevention regulations.
- Tighten the drive elements or secure the parallel key before switching on.
- Do not make any structural modifications.
- Do not remove any safety devices.
- If necessary, wear hearing protection when working in the immediate vicinity of the gear unit.
- All rotating components must be provided with guards. In standard cases, covers are fitted by NORD . The covers must always be used if contact protection is not provided by other methods.

DANGER! **Injury to persons**

The surfaces of gear units or geared motors may become hot during or shortly after operation. Danger of burns!

- Installation and maintenance work must only be performed when gear unit is at a standstill and has cooled down. The drive must be isolated and secured to prevent accidental start-up.
- Wear protective gloves.
- Shield hot surfaces with contact guards.
- Do not store inflammable objects or substances in the immediate vicinity of the gear unit.

WARNING **Injury to persons**

Serious injury and material damage due to improper transport are possible.

- No additional loads may be attached.
- Transportation aids and lifting gear must have an adequate load-bearing capacity.
- Pipes and hoses must be protected from damage.

⚠ CAUTION **Injury to persons**

Danger of cuts from exterior edges of attachment adapters, flanges and covers.

Contact freezing with metallic components in case of low temperatures.

In addition to personal protective equipment, wear suitable protective gloves and suitable goggles during assembly, commissioning, inspection and maintenance, in order to prevent injuries.

It is recommended that repairs to NORD Products are carried out by the NORD Service department.

1.5 Other documents

Further information may be obtained from the following documents:

- Gear unit catalogues (G1000, G1012, G1014, G1035, G1050, G2000),
- Operating and maintenance instructions for the electric motor,
- if applicable, the Operating Manuals for attached or supplied options

1.6 Disposal

Observe the current local regulations. In particular, lubricants must be collected and disposed of correctly.

Gear unit components	Material
Gear wheels, shafts, rolling bearings, parallel keys, locking rings, …	Steel
Gear unit housing, housing components, …	Grey cast iron
Light alloy gear unit housing, light alloy gear unit housing components, …	Aluminium
Worm gears, bushes, ...	Bronze
Radial seals, sealing caps, rubber components,…	Elastomers with steel
Coupling components	Plastic with steel
Flat seals	Asbestos-free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (type plate code: CLP PG)	Polyglycol-based lubricants
Cooling spiral, embedding material of the cooling spiral, screw fittings	Copper, epoxy, yellow brass

Table 2: Disposal of materials

2 Description of gear unit

2.1 Type designations and gear unit types

Gear unit types / Type designations
Helical gear units
SK 11E, SK 21E, SK 31E,SK 41E, SK 51E (1-stage)
SK 02, SK 12, SK 22, SK 32, SK 42, SK 52, SK 62N (2-stage)
SK 03, SK 13, SK 23, SK 33N, SK 43, SK 53 (3-stage)
SK 62, SK 72, SK 82, SK 92, SK 102 (2-stage)
SK 63, SK 73, SK 83, SK 93, SK 103 (3-stage)
NORDBLOC helical gear units
SK 320, SK 172, SK 272, SK 372, SK 472, SK 572, SK 672, SK 772, SK 872, SK 972 (2-stage)
SK 273, SK 373, SK 473, SK 573, SK 673, SK 773, SK 873, SK 973 (3-stage)
SK 071.1, SK 371.1, SK 571.1, SK 771.1 (1-stage)
SK 072.1, SK 172.1, SK 372.1, SK 572.1, SK 672.1, SK 772.1, SK 872.1, SK 972.1 (2-stage)
SK 373.1, SK 573.1, SK 673.1, SK 773.1, SK 873.1, SK 973.1 (3-stage)
Standard helical gear units
SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage)
SK 10, SK 200, SK 250, SK 300, SK 330 (3-stage)
Parallel shaft gear unit
SK 0182NB, SK 0282NB, SK 1282, SK 2282, SK 3282, SK 4282, SK 5282, SK 6282, SK 7282, SK 8282, SK 9282, SK 10282, SK 11282 (2-stage)
SK 1382NB, SK 2382, SK 3382, SK 4382, SK 5382, SK 6382, SK 7382, SK 8382, SK 9382, SK 10382, SK 10382.1, SK 11382, SK 11382.1, SK 12382 (3-stage)
Bevel gear units
SK 92072, SK 92172, SK 92372, SK 92672, SK 92772; SK 920072.1, SK 92072.1, SK 92172.1, SK 92372.1, SK 92672.1, SK 92772.1, SK 93072.1, SK 93172.1, SK 930072.1, SK 93372.1, SK 93672.1, SK 93772.1 (2-stage)
SK 9012.1, SK 9016.1, SK 9022.1, SK 9032.1, SK 9042.1, SK 9052.1, SK 9062.1, SK 9072.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1 (3-stage)
SK 9013.1, SK 9017.1, SK 9023.1, SK 9033.1, SK 9043.1, SK 9053.1 (4-stage)
Helical worm gear units
SK 02040, SK 02050, SK 12063, SK 12080, SK 32100, SK 42125 (2-stage)
SK 13050, SK 13063, SK 13080, SK 33100, SK 43125 (3-stage)
MINIBLOC worm gear units
SK1 S32, SK1 S40, SK 1S50, SK 1S63, SK 1SU..., SK 1SM31, SK 1SM40, SK 1SM50, SK 1SM63 (1-stage)
SK 2S32NB, SK 2S40NB, SK 2S50NB, SK 2S63NB, SK 2SU…, SK 2SM40, SK 2SM50, SK 2SM63 (2-stage)

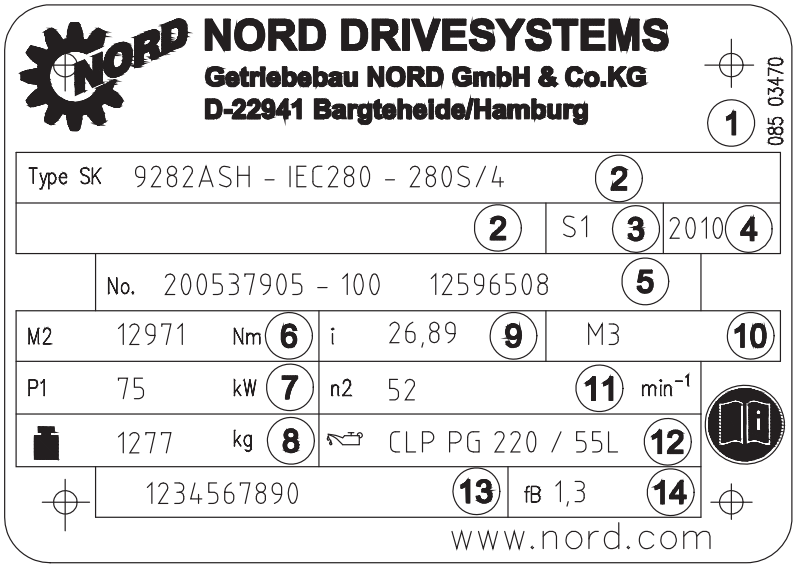
Gear unit types / Type designations					
UNIVERSAL worm gear units SK 1SI31, SK 1SI40, SK 1SI50, SK 1SI63, SK 1SI75, SK 1SIS31, …, SK 1SIS75, SK 1SID31, …, SK 1SID63, SK 1SMI31, …, SK 1SMI75, SK 1SMID31, …, SK 1SMID63, SK 1SIS-D31, …, SK 1SIS-D63 (1-stage), SK 2SMID40, SK 2SMID50, SK 2SMID63, SK 2SID40, …, SK 2SID63 (2-stage)					
Versions / Options					
-	Foot mounting with solid shaft	D	Torque support	IEC	Standard IEC motor mounting
A	Hollow shaft version	K	Torque bracket	NEMA	Standard NEMA motor attachment
V	Solid shaft version	S	Shrink disc	W	With free drive shaft
L	Solid shaft both sides	VS	Reinforced shrink disc	VI	Viton radial seals
Z	Output flange B14	EA	Hollow shaft with internal spline	OA	Oil expansion tank
F	Output flange B5	G	Rubber buffer	OT	Oil level tank
X	Foot mounting	VG	Reinforced rubber buffer	SO1	Synthetic oil ISO VG 220
XZ	Base and output flange B14	R	Back stop	CC	Casing cover with cooling spiral
XF	Base and output flange B5	B	Fastening element	DR	Pressure venting
AL	Reinforced axial output bearings	H	Covering cap as contact guard	H10	Modular contrate pre-stage
5	Reinforced output shaft (Standard helical gear units)	H66	Covering cap IP66	/31	Worm pre-stage
V	Reinforced drive shaft (Standard helical gear units)	VL	Reinforced bearings	/40	Worm pre-stage
		VL2	Agitator version		
		VL3	Drywell agitator version		

Table 3: Type designations and gear unit types

Double gear units consist of two single gear units. They are to be treated as per the instructions in this Manual, i.e. as two individual gear units.

Type designation for double gear units: e.g. SK 73 /22 (consisting of single gear units SK 73 and SK 22)

2.2 Type plate



	Explanation
1	Matrix or bar code
2	NORD gear unit type
3	Operating mode
4	Year of manufacture
5	Serial number
6	Rated torque of gear unit output shaft
7	Drive power
8	Weight according to ordered version
9	Overall gear unit ratio
10	Installation orientation
11	Rated speed of gear unit output shaft
12	Lubricant type, viscosity and quantity
13	Customer's part number
14	Operating factor

Fig. 1: Type plate (example) with explanation of the type plate fields

3 Assembly instructions, storage, preparation, installation

Please observe all general safety instructions (please see chapter 1.4 "Safety information"), the safety information in the individual sections and the proper use (please see chapter 1.3 "Correct use")bestimmungsgemäße Verwendung</dg_ref_source_inline>.

3.1 Transporting the gear unit

WARNING — **Hazard due to heavy loads**

Severe injuries and material damage due to falling or tipping heavy loads are possible.

- Standing under the gear unit during transport is **extremely dangerous**.
- To prevent injury, **the danger area must be generously cordoned off.**
- Only transport using the eyebolts attached to the gear unit.
- No additional loads may be attached.
- If geared motors have an additional eyebolt attached to the motor, this must also be used.
- The thread of the eyebolt must be fully screwed in.
- Avoid pulling the eyebolts at an angle.

NOTICE — **Gear unit damage**

Damage to the gear unit due to improper use is possible.

- Prevent damage to the gear unit. Impacts to the free ends of the shafts may cause internal damage to the gear unit.
- Use adequately dimensioned and **suitable means of transportation**. Lifting tackle must be designed for the weight of the gear unit. The weight of the gear unit can be obtained from the dispatch documents.

3.2 Storage

For short-term storage before commissioning, please observe the following:

Store in the installation position (please see chapter 6.1 "Configurations and maintenance") and secure the gear unit against falling,

- Lightly oil bare metal housing surfaces and shafts
- Store in a dry place.
- Temperature in the range from – 5 °C to + 50 °C without large fluctuations,
- Relative humidity less than 60 %,
- No direct exposure to sunlight or UV light,
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity,
- No vibration or oscillation

3.3 Long-term storage

CAUTION — **Injury to persons**

Incorrect, or excessively long storage may result in malfunctions of the gear unit.

Perform an inspection of the gear unit prior to commissioning if the permissible storage time has been exceeded.

Information — **Long-term storage**

For storage or standstill periods in excess of 9 months, Getriebebau NORD recommends the long-term storage option.

With the long-term storage option and the use of the measures listed below, storage for up to 2 years is possible. As the actual influences on the unit greatly depend on the local conditions, these times should only be regarded as guide values.

Conditions of the gear unit and storage area for long-term storage prior to commissioning:

- Store in the installation position (please see chapter 6.1 "Configurations and maintenance") and secure the gear unit against falling.
- Transportation damage to the external paint must be repaired. Check that a suitable rust inhibitor is applied to the flange bearing surfaces. If necessary apply a suitable rust inhibitor to the surfaces.
- Gear units with the long-term storage option are completely filled with lubricant or have VCI corrosion protection agent mixed with the gear oil (see adhesive label on the gear unit, or are not filled with oil, but rather with small quantities of VCI concentrate.
- The sealing band in the vent plug must not be removed during storage. The gear unit must remain sealed tight.
- Store in a dry place.
- In tropical regions, the gear unit must be protected against damage by insects
- Temperature in the range from – 5 °C to + 40 °C without large fluctuations,
- Relative humidity less than 60 %,
- No direct exposure to sunlight or UV light,
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity,
- No vibration or oscillation

Measures during storage or standstill periods

- If the relative humidity is <50 % the gear unit can be stored for up to 3 years.

Measures before commissioning

- If the storage or standstill period exceeds 2 years or the temperature during short-term storage has greatly deviated from the standard range, the lubricant in the gear unit must be replaced before commissioning.
- If the gear unit is completely filled, the oil level must be reduced before commissioning.
- For gear units without oil filling, the oil level for the version must be filled before commissioning. The VCI concentrate may remain in the gear unit. Lubricant quantities and types must be filled according to the details on the type plate.

3.4 Preparing for installation

⚠ CAUTION — **Injury to persons**

Transport damage may cause malfunctions of the gear unit, which may cause material damage or personal injury.

Please inspect the delivery for transport and packaging damage immediately on receipt. Report any damage to the carrier immediately. Gear units with transport damage must not be commissioned.

The drive unit must be inspected and may only be installed if no damage is apparent. In particular the radial seals and the sealing caps must be inspected for damage.

Pay attention to leaked lubricants, they may cause slips.

All bare metal surfaces and shafts of the gear unit are protected against corrosion with oil, grease or corrosion protection agents before shipping.

Thoroughly remove all oil, grease or corrosion protection agents and any dirt from the shafts and flange surfaces before assembly.

In applications where an incorrect rotational direction may result in damage or potential risk, the correct rotational direction of the output shaft is to be established by test running the drive when uncoupled and guaranteeing such for subsequent operation.

Gears with integrated return stops are marked with arrows on the drive/driven sides. The arrows point in the rotation direction of the gear unit. When connecting the motor and during motor control, it must be ensured that the gear unit can only operate in the direction of rotation. (For further explanations see catalogue G1000 and WN 0-000 40)

NOTICE — **Gear unit damage**

For gear units with an integrated back stop, switching the drive motor to the blocked direction of rotation, i.e. incorrect direction of rotation, may result in damage to the gear unit.

Take care that the direction of rotation is correct.

Ensure that no aggressive or corrosive substances are present in the area surrounding the installation site or are subsequently expected during operation, which attack metal, lubricants or elastomers. In case of doubt, please contact Getriebebau NORD and take the recommended action.

Oil expansion tanks (Option OA) must be fitted in accordance with works standard WN 0-530 04. For gear units with an M10x1 vent plug, works standard WN 0-52135 must be also be observed during installation.

Oil level tanks (Option OT) must be fitted in accordance with works standard WN 0-521 30.

If venting of the gear unit is provided, the vent or the pressure vent must be activated before commissioning. To activate, remove the transport securing device (sealing cord). Position of the vent plug (please see chapter 6.1 "Configurations and maintenance").

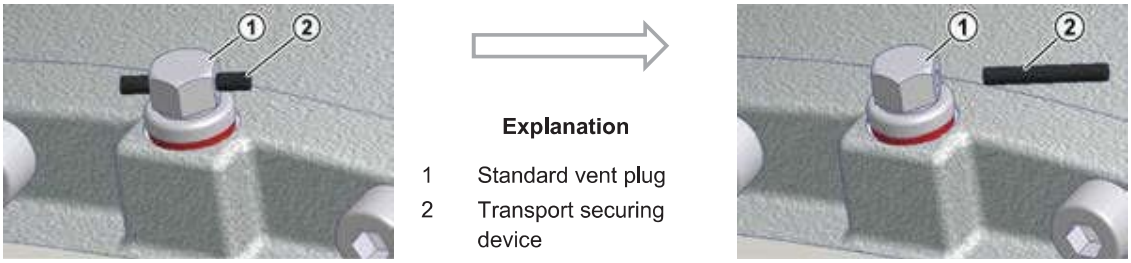


Figure 2: Activating the vent plug

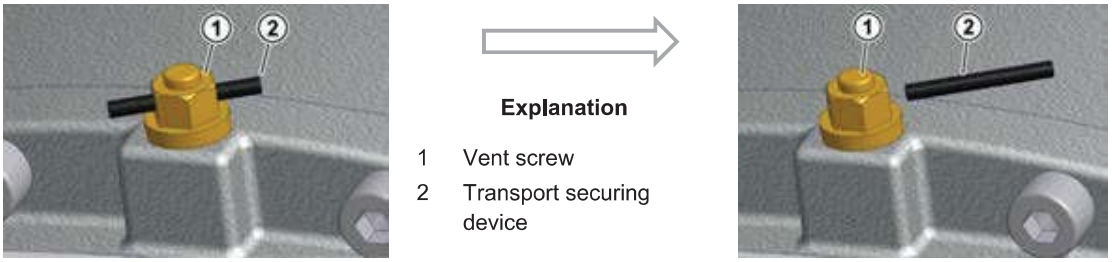


Figure 3: Activating the vent plug

Before commissioning, the vent plug must be replaced with the special pressure vent which is supplied as a loose part.

This is done by unscrewing the vent fitting and replacing it with the special pressure vent and seal (refer to Section 6.1 "Configurations and maintenance"). Double gear units consist of two single units and are equipped with 2 oil chambers and 2 pressure vents.

Figure 4: Removing the vent plug and fitting the special pressure vent

(please see chapter 6.5 "Torque values")

3.5 Installing the gear unit

⚠ WARNING — **Danger of burns**

The surfaces of gear units or geared motors may become hot during or shortly after operation.

Hot surfaces which can be touched directly must be protected with a contact guard.

⚠ WARNING — **Danger to persons**

If the foundation or the fastening of the gear unit is not adequately dimensioned, the gear unit may detach, fall down or rotate in an uncontrolled manner.

The foundation and the gear unit fastening must be appropriately designed for the weight and the torque. All bolts must be used to fasten the gear unit

NOTICE — **Damage to the gear unit due to overheating**

The gear unit may be damaged by overheating.

When installing, check that the cooling air from the motor fan can circulate around the geared motor and the gear unit without obstruction.

The eyebolts screwed into the gear units must be used during installation. No additional load may be attached to the gear unit.

If geared motors have an additional eyebolt attached to the motor, this must also be used. Avoid pulling the eyebolts at an angle. Observe the safety information (please see chapter 1.4 "Safety information").

The base and/or flange to which the gear unit is fitted should be vibration-free, torsionally strong and flat. The smoothness of the mating surface on the base or flange must be according to tolerance class K according to DIN ISO 2768-2. All contamination to the bolting surfaces of gear unit and base and/or flange must be thoroughly removed.

The gear housing must always be earthed. With geared motors, earthing via the motor connection must be ensured.

The gear unit must be precisely aligned with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion.

Welding of the gear unit is prohibited. The gear unit must not be used as the earth connection for welding work, as this may cause damage to the bearings and gear wheels.

The gear unit must be installed in the correct orientation(please see chapter 6.1 "Configurations and maintenance"). (UNIVERSAL SI and SM gear unit types do not depend on the configuration). Changes to the installation position after delivery require adjustment of the quantity of oil, and often other measures such as e.g. the installation of encapsulated roller bearings. **Damage may result if the stated installation position is not observed.**

All gear unit feet and/or all flange bolts on each side must be used. Bolts must have a minimum quality of 8.8. The bolts must be tightened to the correct torques (please see chapter 6.5 "Torque values"). Tension-free bolting must be ensured, particularly for gear units with a foot and flange.

The oil inspection screws, oil drain screws and the vent valves must be accessible.

3.6 Fitting hubs on the gear shafts

NOTICE — **Gear unit damage**

The gear unit may be damaged by axial forces.

Do not subject the gear unit to harmful axial forces when fitting the hubs. In particular, do not hit the hubs with a hammer.

Drive and driven elements, e.g. coupling and chain-wheel hubs must be mounted onto the drive and driven shaft of the gear unit using suitable pullers that will not apply damaging axial forces onto the gear unit.

Information — **Installation**

Use the end thread of the shafts for pulling. Fitting can be aided by coating the hub with lubricant or heating it up to approx. 100 °C beforehand.

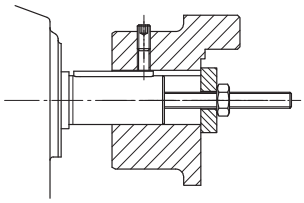


Figure 5: Example of a simple pulling device

DANGER — **Severe personal injury**

There is a danger of injury due to rapidly rotating drive and driven elements.

Drive and driven elements, such as belt drives, chain drives, shrink disks, fans and couplings must be fitted with contact protection.

Drive and driven elements may only subject the drive unit to the maximum radial forces F_R and axial forces F_A which are specified in the catalogue. Observe the correct tension, particularly on belts and chains.

Additional loads due to unbalanced hubs are not permitted.

The transverse force must be applied to the gear unit as closely as possible.

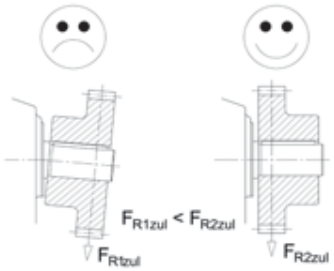


Figure 6: Correct assembly of drive elements

3.7 Fitting push-on gear units

NOTICE — **Gear unit damage**

The bearings, gear wheels, shafts and housing may be damaged by incorrect fitting.

- Observe the assembly instructions.
- The push-on gear unit must be fitted onto the shaft using a suitable puller, which will not exert damaging axial forces on the gear unit. In particular, do not hit the gear unit with a hammer.

Assembly and subsequent dismantling is aided by applying an anti-corrosive lubricant to the shaft before fitting (e.g. NORD Anti-Corrosion Part No. 089 00099). Excess grease or anti-corrosion agent may escape after assembly and may drip off. Clean these points on the output shaft after a running-in time of approx. 24 hours. This escape of grease is not due to a leak in the gear unit.

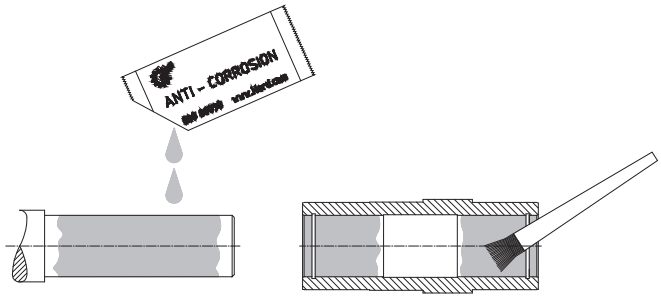


Figure 7: Applying lubricant to the shaft and the hub

Information — **Fastening element**

The gear unit can be fitted to shafts with and without a shoulder using the fastening element (Option B). Tighten the bolt of the fastening element to the correct torque (please see chapter 6.5 "Torque values"). For gear units with option H66, the factory-fitted closing cap must be removed before assembly.

For push-on gear units with option H66 and fastening element (Option B) the pressed-in closing cap must be pushed out before fitting the gear unit. The pressed-in closing cap may be destroyed during dismantling. As standard a second closing cap is supplied as a loose spare part. After fitting the gear unit, fit the new / new condition closing cap as described in Section 3.9 "Fitting the covers".

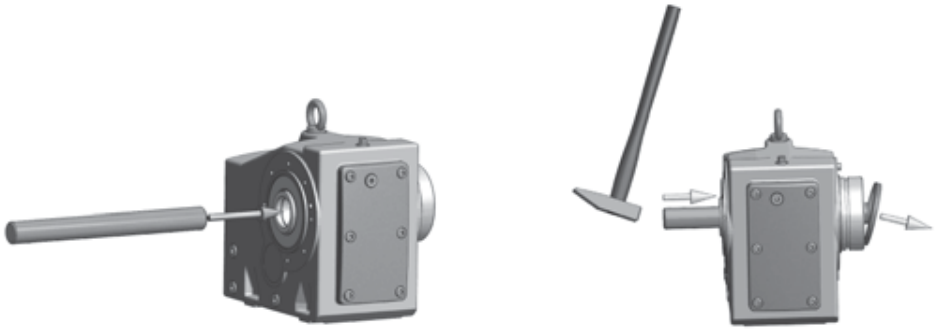


Figure 8: Removing the factory-fitted closing cap

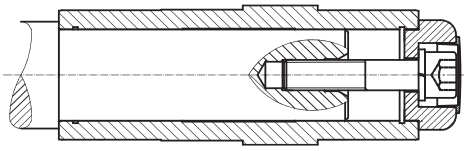


Figure 9: Gear unit mounted to shaft with a shoulder using the fastening element

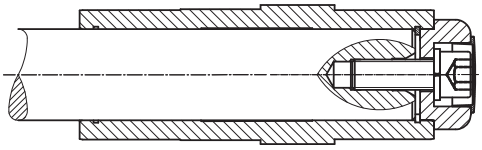


Figure 10: Gear unit mounted to shaft without a shoulder using the fastening element

A gear unit can be dismantled from a shaft with a shoulder using the following device, for example.

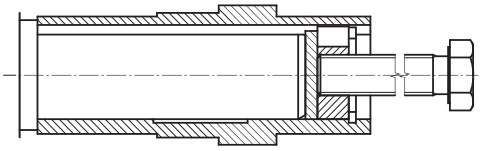


Figure 11: Dismantling using dismantling device

When assembling push-on gears with torque supports, the support must not be distorted. Tension-free mounting is aided by the rubber buffer (Option G or VG).