# 0411 / 0413 / 0415 / 0417 / 0419 / 0425

## Piston pressure switches, up to 42 V with supplementary functions

- Zinc-plated steel (CrVI-free)
- Overpressure safety up to 8,700 psi (600 bar)[1)]


### Plug-in types for piston pressure switches

| | | |
|---|---|---|
| Deutsch DT04-2P | 0411 – XXX XX – X – 001 | 0411 – XXX XX – X – 002 |
| AMP Superseal 1.5® | 0413 – XXX XX – X – 001 | 0413 – XXX XX – X – 002 |
| Packard MetriPack 280® | 0415 – XXX XX – X – 001 | 0415 – XXX XX – X – 002 |
| Deutsch DT04-3P | 0417 – XXX XX – X – 001 | 0417 – XXX XX – X – 002 |
| AMP Junior Timer® | 0419 – XXX XX – X – 001 | 0419 – XXX XX – X – 002 |
| M12x1 DIN EN 61076-2-101-A | 0425 – XXX XX – X – 001 | 0425 – XXX XX – X – 002 |

| Adjustment range in psi (bar) (tolerance at room temperature) | Male thread | **Order number** SPST-NO —› \|: | **Order number** SPST-NC —› :\| |
|---|---|---|---|

### 04XX Piston pressure switches

| | | | |
|---|---|---|---|
| 725 - 2,175 ± 72.5 psi (50 - 150 ± 5 bar) | M 10x1 taper | 04XX – X 19 01 – X – 001 | 04XX – X 20 01 – X – 002 |
| | 1/4" BSPP | 04XX – X 19 03 – X – 001 | 04XX – X 20 03 – X – 002 |
| | 1/8" NPT | 04XX – X 19 04 – X – 001 | 04XX – X 20 04 – X – 002 |
| | 1/4" NPT | 04XX – X 19 09 – X – 001 | 04XX – X 20 09 – X – 002 |
| | 7/16-20 UNF | 04XX – X 19 20 – X – 001 | 04XX – X 20 20 – X – 002 |
| | 9/16-18 UNF | 04XX – X 19 21 – X – 001 | 04XX – X 20 21 – X – 002 |

### Supplementary functions

| | | |
|---|---|---|
| **Resistor** | Diagnostics function | R XX XX |
| **Varistor** | Overvoltage protection | V XX XX |
| **NTC thermistor** | Filter monitoring | N XX XX |
| **PTC thermistor** | Overcurrent protection | P XX XX |
| **LED** | Display | L XX XX |
| **Multifuse, PPTC** | Overcurrent protection | M XX XX |

### Seal material – Application areas

| | | |
|---|---|---|
| NBR (BunaN) | Hydraulic/machine oil, heating oil, air, nitrogen, etc. | 1 |
| EPDM | Brake fluid, hydrogen, oxygen, acetylene, etc. | 2 |
| FKM (Viton®) | Hydraulic fluids (HFA, HFB, HFD), petrol/gasoline, etc. | 3 |
| HNBR | Hydraulic/machine oil, ester-based bio-oils | 9 |

Refer to page 41 for the temperature range and application thresholds of sealing materials.

| | |
|---|---|
| **Your order number:** | **04XX – XXX XX – X – 00X** |

RoHSII compliant

[1)] Static value. Dynamic value is 30-50 % lower. Values pertain to the hydraulic/pneumatic part of the pressure switch.

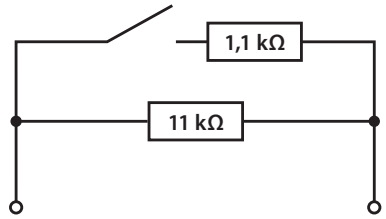
# M.6 Pressure switches ***PLUS***

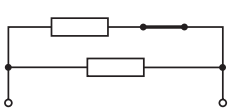
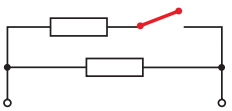
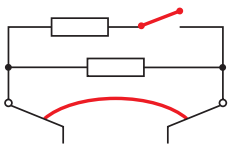
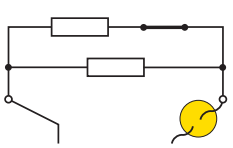
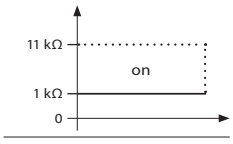
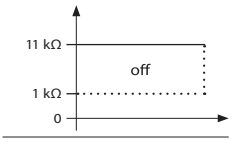
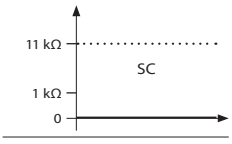
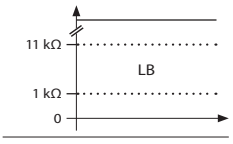
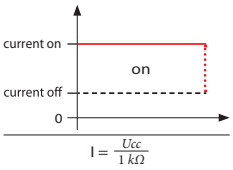
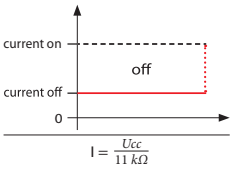
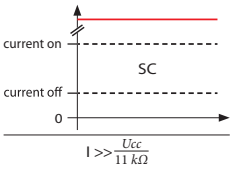
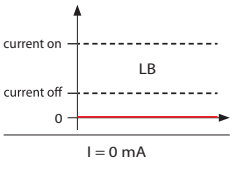
## PS ***PLUS*** hex 24

## Resistor circuit to NAMUR (pressure switches with part numbers 04XX-R)

The additional circuitry of the switching contact of the pressure switch enables not only the states to be shown enabled and disabled, it also enables interrogation for line breaks (standby current principle) and short-circuits in the electric circuit.

The resistor circuitry is designed such that the NAMUR specifications can be satisfied. An operating voltage of 8.2 V must be provided for NAMUR-compliant operation. A resistance of 11 kΩ is present in the circuit when the switch contact is open. The resistance is 1 kΩ when the switch contact is closed. Other resistance values can also be realised.




| Switching status | Closed | Open | Short-circuit SC | Line break LB |
|---|---|---|---|---|
| **Contact** |  |  |  |  |
| **Resistor** |  |  |  |  |
| **Current** |  |  |  |  |
| **Example** Supply Voltage is 24VDC | $I = \frac{24\ VDC}{1{,}000\Omega} = 24mA$ | $I = \frac{24\ VDC}{11{,}000\Omega} = 2.18mA$ | ISC (max. current) | I = 0mA |

| **Technical data** | |
|---|---|
| Rated working voltage Ucc: | 8.2 VDC … 30 VDC |
| Maximum rated operating current: | ≤ 30 mA |
| Switching capacity: | < 1 W |
| Switching frequency: | 200 / min. |
| Mechanical and electrical service life: | 1,000,000 cycles |
| Permitted pressure rise rate: | ≤ 14.5 psi/ ms (≤ 1 bar / ms) |
| Vibration resistance: | 10 g; 5 – 200 Hz sine wave; DIN EN 60068-2-6 |
| Shock resistance: | 294 m/s²; 14 ms half sine wave; DIN EN 60068-2-27 |
| Protection class: | Refer to the table on the following pages: According to manufacturer specifications for the respective plug-in system (but only when plugged in), otherwise IP00. |

## Circuit with varistor for overvoltage limitation (pressure switches with part numbers 04XX-V)

The switching off of inductive consumers such as valves, relays and motors by a mechanical pressure switch generates a high voltage peak. The cause for this is the energy stored in the magnetic field of inductance, which entails an induction voltage when the current is changed.

The induction voltage (or flyback voltage) is defined as follows:

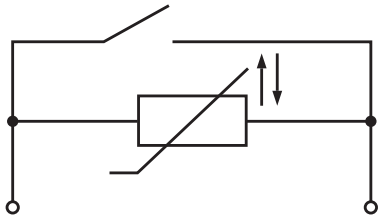
$$U_L = -L \frac{di}{dt}$$

where $L$ inductance
$di/dt$ change of current over time

This induction voltage can result in discharge effects and the occurrence of arcs at the opening contacts. This gives rise to localised, very hot places on the contact surfaces which are able to fuse the contact material. Increasing load damages the contact surface and the contact transition resistance rises. This can result in sporadic interruption, adhesion and welding of the contacts, and so lead to complete failure of the pressure switch.

The effect of induction voltage is countered by means of a varistor – a resistor which reduces its ohmic resistance with increasing connection voltage. The induction voltage is limited to the responding value of the varistor, and the energy is converted to heat in the varistor.

Varistors are suitable for DC and AC in equal measure. In DC circuits, the response voltage of the varistor must be greater than the highest value of the supply voltage. In AC circuits, it must be 1.5 times the peak-peak value of the supply voltage.

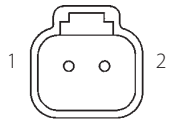
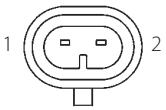
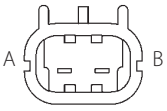


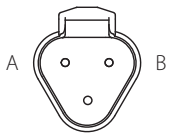
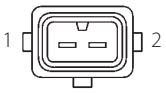
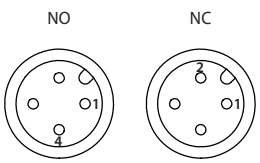
| **Technical data** | |
|---|---|
| Rated operating voltage Ucc: | 10 V … 24 … 30 VDC / 10 V … 21 VAC |
| Rated operating current, ohmic load DC12 / AC12: | 10 mA … 4 A |
| Rated operating current, inductive load DC13 / AC13: | 10 mA … 1 A |
| AC / DC switching capacity: | < 100 W / 100 VA |
| Switching frequency: | 200 / min. |
| Varistor response voltage: | 41 VDC ± 10 % @ 1 mA |
| Maximum varistor energy: | 0.4 J (10/1000 µs); 0.3 J (2 ms) |
| Maximum varistor peak current: | 120 A (8/20 µs, one-off loading), 60 A (8/20 µs, dual loading) |
| Mechanical service life: | 1,000,000 cycles |
| Permitted pressure rise rate: | ≤ 14.5 psi/ms (≤ 1 bar/ms) |
| Vibration resistance: | 10 g; 5 – 200 Hz sine wave; DIN EN 60068-2-6 |
| Shock resistance: | 294 m/s²; 14 ms half sine wave; DIN EN 60068-2-27 |
| Protection class: | Refer to the table on the following pages: According to manufacturer specifications for the respective plug-in system (but only when plugged in), otherwise IP00. |

# PS *PLUS*

Plug-in types for diaphragm and piston pressure switches

## Technical data of plug-in types

| | 0410 / 0411 | 0412 / 0413 | 0414 / 0415 |
|---|---|---|---|
| Model / type |  |  |  |
| Connector | **Deutsch DT04-2P** | **AMP Superseal 1.5®** | **Packard MetriPack 280®** |
| Protection class | IP67, IP6K9K | IP67 | IP67 |
| Overall height | H ≈ 61 mm | H ≈ 61 mm | H ≈ 62 mm |
| Contact assignment |  |  |  |

| | 0416 / 0417 | 0418 / 0419 | 0424 / 0425 |
|---|---|---|---|
| Model / type |  |  |  |
| Connector | **Deutsch DT04-3P** | **AMP Junior Timer®** | **M12x1 DIN EN 61076-2-101-A** |
| Protection class | IP67, IP6K9K | IP65, IPx4K | IP67 |
| Overall height | H ≈ 63 mm | H ≈ 54 mm | H ≈ 51 mm |
| Contact assignment |  |  |  |

RoHS II compliant

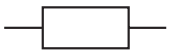
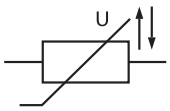
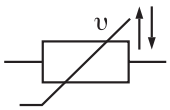
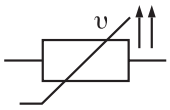
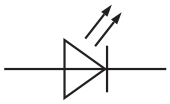
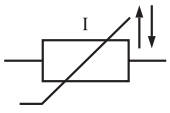
# Pressure switches ***PLUS***
## with integrated connector and supplementary functions

Hex 24, NC or NO, voltage up to 42 V

**Intelligent, supplementary electronic functions broaden the capabilities of mechanical pressure switches by adding numerous features:**

- Diagnostic function (fail-safe) with short-circuit and cable break detection
- Overvoltage protection for prolonging the contact service life
- Active reduction of EMC emissions
- Temperature-controlled switching function (e.g. cold start, i.e. switching function does not become active until a certain temperature is reached)
- In-rush current limitation (overload limitation of switching contacts from too high a switch loading, e.g. lamp load, motor start-up)
- Display of the switching status with LED
- Overload protection with self-resetting electrical fuse
- High protection class to IP67 and IP6K9K
- Large selection of electrical plug-in types for quick installation and reliable connection
- Switching point can be set on site with adjusting screw in the connector[1)]

## Overview of possible supplementary functions

| Circuit | Switch symbol | Function | Application | Code for order number |
|---|---|---|---|---|
| **Resistor**<br>Resistor circuit to NAMUR,<br>refer to page 68 |  | • Diagnostic function (fail-safe) with short-circuit and cable break detection | Safety systems such as brake systems, hydrostatic steering systems and fire extinguisher systems | 04XX - R |
| **Varistor**<br>Circuit with varistor for overvoltage limitation,<br>refer to page 69 |  | • Overvoltage protection for the prolonging of contact service life under conditions of inductive load and long connection length<br>• Active reduction of EMC emissions on switching of the pressure switch | The flyback voltage is effectively limited if the pressure switch interrupts the current in circuits with magnetic valves, relays or motors | 04XX - V |
| **NTC thermistor** |  | • Temperature-controlled switch behaviour (e.g. filter monitoring)<br>• In-rush current limitation, e.g. for motors ("soft start") and in PSUs<br>• On-delay (in series) and dropout delay (in parallel) for relays | For a cold start in a mobile hydraulic application, a pressure switch used for filter monitoring may activate due to the high viscosity of the oil at low temperatures, and signals a blocked filter. The NTC thermistor integrated in the pressure switch means the circuit remains interrupted until the pressure switch, and so also the thermistor, have warmed up; not until then does the circuit become low impedance. | 04XX - N |
| **PTC thermistor** |  | • Protection against overcurrent<br>• In-rush current limitation, such as for filament lamps and condenser load | E.g. brake light monitoring in mobile hydraulics: The in-rush current can be up to 8 times the nominal current of a filament lamp. This high current is only reduced at the moment of switch-on, thereby protecting the contact system of the pressure switch from overload. | 04XX - P |
| **LED** |  | • Displays the switching status of the integrated LED | Direct switching status display for applications in which the controller is physically remote; e.g. in an automation system or permanently installed extinguishing or gas systems. | 04XX - L |
| **Multifuse, PPTC** |  | • Protection against overcurrent<br>• Self-resetting: After removing the short-circuit (cooling the MF) the fuse resets | In applications which need to be protected against overcurrent e.g. elektronic applications | 04XX - M |

[1] Pressure switches can also be supplied preset at factory.
The switching point is embossed onto pressure switches preset at factory.