

# 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:**

- NAMUR 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. inactive switching function until a certain temperature is reached)
- In-rush current limitation (overload limitation of the switching contacts when switching load is too high, e.g. lamp load, motor start-up)
- Display of the switching status with LED
- Overload protection with self-resetting electrical fuse
- High protection class up to IP67 and IP6K9K
- Switching point can be set on site with adjusting screw in the connector<sup>1)</sup>

<sup>1)</sup> Pressure switches can also be supplied preset at factory.  
The switching point is embossed onto pressure switches preset at factory.

# Pressure switches *PLUS*

with integrated connector and supplementary functions

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## Overview of possible supplementary functions

Circuit	Symbole	Function	Application	Code for order number
<b>Resistor</b> Resistor circuit to NAMUR, refer to page 68		<ul style="list-style-type: none"> <li>Diagnostic function (fail-safe) with short-circuit and cable break detection</li> </ul>	Safety systems such as brake systems, hydrostatic steering systems and fire extinguisher systems	04XX - R
<b>Varistor</b> Circuit with varistor for overvoltage limitation, refer to page 69		<ul style="list-style-type: none"> <li>Overvoltage protection for the prolonging of contact service life under conditions of inductive load and long connection length</li> <li>Active reduction of EMC emissions on switching of the pressure switch</li> </ul>	The flyback voltage is effectively limited if the pressure switch interrupts the current in circuits with magnetic valves, relays or motors	04XX - V
<b>NTC thermistor</b>		<ul style="list-style-type: none"> <li>Temperature-controlled switch behaviour (e.g. filter monitoring)</li> <li>In-rush current limitation, e.g. for motors („soft start“) and in PSUs</li> <li>On-delay (in series) and dropout delay (in parallel) for relays</li> </ul>	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
<b>PTC thermistor</b>		<ul style="list-style-type: none"> <li>Protection against overcurrent</li> <li>In-rush current limitation, such as for filament lamps and condenser load</li> </ul>	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.	upon request <sup>1)</sup>
<b>LED</b>		<ul style="list-style-type: none"> <li>Displays the switching status by an integrated LED</li> </ul>	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.	upon request <sup>1)</sup>
<b>Multifuse, PPTC</b>		<ul style="list-style-type: none"> <li>Protection against overcurrent</li> <li>Self-resetting: After removing the short-circuit (cooling the MF) the fuse resets</li> </ul>	In applications which need to be protected against overcurrent e.g. electronic applications	upon request <sup>1)</sup>

<sup>1)</sup> Available from a minimum order quantity of 2,000 pieces.

# M.6

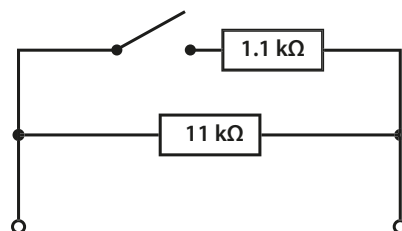
hex 24  
PS PLUS

# Pressure switches PLUS

Resistor circuit to NAMUR, with gold contacts  
(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 VDC 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
<b>Contact</b>				
<b>Resistor</b>				
<b>Current</b>				
<b>Example:</b> Supply voltage 12 VDC	$I = \frac{U_{cc}}{1\text{ k}\Omega} = \frac{12\text{ V}}{1\text{ k}\Omega} = 12\text{ mA}$	$I = \frac{U_{cc}}{11\text{ k}\Omega} = \frac{12\text{ V}}{11\text{ k}\Omega} = 1,1\text{ mA}$	$I \gg \frac{U_{cc}}{1\text{ k}\Omega} \quad I \gg \frac{12\text{ V}}{1\text{ k}\Omega} \quad I \gg 12\text{ mA}$	$I = 0\text{ mA}$

## Technical details

Rated working voltage $U_{cc}$ :	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:	≤ 1,000 bar / s
Vibration resistance:	10 g; 5 ... 200 Hz sine wave; DIN EN 60068-2-6
Shock resistance:	294 m/s <sup>2</sup> ; 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 (only when plugged in), otherwise IP00.

# Pressure switches *PLUS*

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

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The switching off 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:

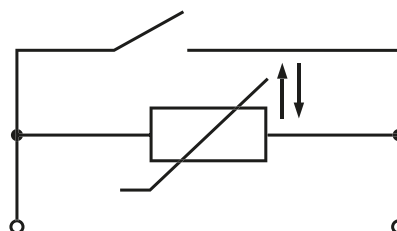
$$U_L = -L \frac{di}{dt}$$

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-to-peak value of the supply voltage.



Technical details	
Rated operating voltage $U_{cc}$ :	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 $\pm$ 10 % at 1 mA
Maximum varistor energy:	0.4 J (10/1000 $\mu$ s); 0.3 J (2 ms)
Maximum varistor peak current:	120 A (8/20 $\mu$ s, one-off loading), 60 A (8/20 $\mu$ s, dual loading)
Mechanical service life:	1,000,000 cycles
Permitted pressure rise rate:	$\leq$ 1,000 bar / s
Vibration resistance:	10 g; 5 – 200 Hz sine wave; DIN EN 60068-2-6
Shock resistance:	294 m/s <sup>2</sup> ; 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 (only when plugged in), otherwise IP00.

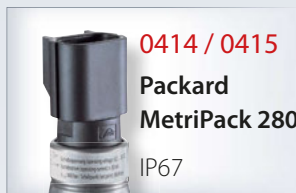
# 0410 / 0412 / 0414 / 0416 / 0418 / 0422 / 0424

Diaphragm pressure switches, up to 42 V  
with supplementary functions

- Zinc-plated steel (CrVI-free)
- Overpressure safety up to 300 bar<sup>1)</sup>
- Burst pressure safety up to 400 bar<sup>1)</sup>

## Plug-in types for diaphragm pressure switches

Deutsch DT04-2P	0410 - XXX XX - X - 001	0410 - XXX XX - X - 002
AMP Superseal 1.5°	0412 - XXX XX - X - 001	0412 - XXX XX - X - 002
Packard MetriPack 280	0414 - XXX XX - X - 001	0414 - XXX XX - X - 002
Deutsch DT04-3P	0416 - XXX XX - X - 001	0416 - XXX XX - X - 002
AMP Junior Timer®	0418 - XXX XX - X - 001	0418 - XXX XX - X - 002
M12x1 DIN EN 61076-2-101-A (PIN 1+3)	0422 - XXX XX - X - 001	0422 - XXX XX - X - 002
M12x1 DIN EN 60947-5-2 (PIN 1+2 / PIN 1+4)	0424 - XXX XX - X - 001	0424 - XXX XX - X - 002



Adjustment range (tolerance at room temperature)	Male thread	Article number NO →  :	Article number NC → :
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## 04XX Diaphragm pressure switches

0.1 - 1 (± 0.2) bar	G 1/4	04XX - X 03 03 - X - 001	04XX - X 04 03 - X - 002
	G 1/8	04XX - X 03 28 - X - 001	04XX - X 04 28 - X - 002
	M 10x1 cyl.	04XX - X 03 13 - X - 001	04XX - X 04 13 - X - 002
	M 10x1 con.	04XX - X 03 01 - X - 001	04XX - X 04 01 - X - 002
	M 12x1.5	04XX - X 03 02 - X - 001	04XX - X 04 02 - X - 002
	NPT 1/8	04XX - X 03 02 - X - 001	04XX - X 04 02 - X - 002

0.5 - 3 (± 0.3) bar	G 1/4	04XX - X 23 03 - X - 001	04XX - X 24 03 - X - 002
	G 1/8	04XX - X 23 28 - X - 001	04XX - X 24 28 - X - 002
	M 10x1 cyl.	04XX - X 23 13 - X - 001	04XX - X 24 13 - X - 002
	M 10x1 con.	04XX - X 23 01 - X - 001	04XX - X 24 01 - X - 002
	M 12x1.5	04XX - X 23 02 - X - 001	04XX - X 24 02 - X - 002
	NPT 1/8	04XX - X 23 04 - X - 001	04XX - X 24 04 - X - 002

1 - 10 (± 0.5) bar	G 1/4	04XX - X 07 03 - X - 001	04XX - X 08 03 - X - 002
	G 1/8	04XX - X 07 28 - X - 001	04XX - X 08 28 - X - 002
	M 10x1 cyl.	04XX - X 07 13 - X - 001	04XX - X 08 13 - X - 002
	M 10x1 con.	04XX - X 07 01 - X - 001	04XX - X 08 01 - X - 002
	M 12x1.5	04XX - X 07 02 - X - 001	04XX - X 08 02 - X - 002
	NPT 1/8	04XX - X 07 04 - X - 001	04XX - X 08 04 - X - 002

## Supplementary functions<sup>2)</sup>

Resistor	Diagnostics function	R XX XX
Varistor	Overvoltage protection	V XX XX
NTC thermistor	Filter monitoring	N XX XX

## Seal material – Application areas

NBR	Hydraulic/machine oil, air, nitrogen, etc.	1
EPDM	Brake fluid, water, hydrogen, oxygen, acetylene, etc.	2
FKM	Hydraulic fluids (HFA, HFB, HFD), petrol/gasoline, etc.	3
FFKM	Hot water, chemical acids, diluted alkalis, ketones, esters, alcohols	6
HNBR	Hydraulic/machine oil, ester-based bio-oils	9

Refer to page 24 for the temperature range and application thresholds of sealing materials.

Article number: **04XX - XXX XX - X - 00X**



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

<sup>2)</sup> Other versions available depending on minimum order quantity (see p. 67)

# 0410 / 0412 / 0414 / 0416 / 0418 / 0422 / 0424

Diaphragm pressure switches, up to 42 V  
with supplementary functions

- Zinc-plated steel (CrVI-free)
- Overpressure safety up to 300 bar<sup>1)</sup>
- Burst pressure safety up to 400 bar<sup>1)</sup>

## Plug-in types for diaphragm pressure switches

Deutsch DT04-2P	0410 - XXX XX - X - 001	0410 - XXX XX - X - 002
AMP Superseal 1.5®	0412 - XXX XX - X - 001	0412 - XXX XX - X - 002
Packard MetriPack 280	0414 - XXX XX - X - 001	0414 - XXX XX - X - 002
Deutsch DT04-3P	0416 - XXX XX - X - 001	0416 - XXX XX - X - 002
AMP Junior Timer®	0418 - XXX XX - X - 001	0418 - XXX XX - X - 002
M12x1 DIN EN 61076-2-101-A (PIN 1+3)	0422 - XXX XX - X - 001	0422 - XXX XX - X - 002
M12x1 DIN EN 60947-5-2 (PIN 1+2 / PIN 1+4)	0424 - XXX XX - X - 001	0424 - XXX XX - X - 002

Adjustment range (tolerance at room temperature)	Male thread	Article number NO → :	Article number NC → :
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## 04XX Diaphragm pressure switches

10 - 20 (± 1) bar	G 1/4	04XX - X 11 03 - X - 001	04XX - X 12 03 - X - 002
	G 1/8	04XX - X 11 28 - X - 001	04XX - X 12 28 - X - 002
	M 10x1 cyl.	04XX - X 11 13 - X - 001	04XX - X 12 13 - X - 002
	M 10x1 con.	04XX - X 11 01 - X - 001	04XX - X 12 01 - X - 002
	M 12x1.5	04XX - X 11 02 - X - 001	04XX - X 12 02 - X - 002
	NPT 1/8	04XX - X 11 04 - X - 001	04XX - X 12 04 - X - 002

20 - 50 (± 2) bar	G 1/4	04XX - X 15 03 - X - 001	04XX - X 16 03 - X - 002
	G 1/8	04XX - X 15 28 - X - 001	04XX - X 16 28 - X - 002
	M 10x1 cyl.	04XX - X 15 13 - X - 001	04XX - X 16 13 - X - 002
	M 10x1 con.	04XX - X 15 01 - X - 001	04XX - X 16 01 - X - 002
	M 12x1.5	04XX - X 15 02 - X - 001	04XX - X 16 02 - X - 002
	NPT 1/8	04XX - X 15 04 - X - 001	04XX - X 16 04 - X - 002

## Supplementary functions<sup>2)</sup>

Resistor	Diagnostics function	R XX XX
Varistor	Overvoltage protection	V XX XX
NTC thermistor	Filter monitoring	N XX XX

## Seal material – Application areas

NBR	Hydraulic/machine oil, air, nitrogen, etc.	1
EPDM	Brake fluid, water, hydrogen, oxygen, acetylene, etc.	2
FKM	Hydraulic fluids (HFA, HFB, HFD), petrol/gasoline, etc.	3
FFKM	Hot water, chemical acids, diluted alkalis, ketones, esters, alcohols	6
HNBR	Hydraulic/machine oil, ester-based bio-oils	9

Refer to page 24 for the temperature range and application thresholds of sealing materials.

Article number: **04XX - XXX XX - X - 00X**

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

<sup>2)</sup> Other versions available depending on minimum order quantity (see p. 67)



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# 0411 / 0413 / 0415 / 0417 / 0419 / 0423 / 0425

Piston pressure switches, up to 42 V with supplementary functions

- Zinc-plated steel (CrVI-free)
- Overpressure safety up to 600 bar<sup>1)</sup>
- Burst pressure safety up to 700 bar<sup>1)</sup>

### 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 (PIN 1+3)	0423 - XXX XX - X - 001	0423 - XXX XX - X - 002
M12x1 DIN EN 60947-5-2 (PIN 1+2 / PIN 1+4)	0425 - XXX XX - X - 001	0425 - XXX XX - X - 002

Adjustment range (tolerance at room temperature)	Male thread	Article number NO →  :	Article number NC → :
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### 04XX Piston pressure switches

50 - 150 (± 5.0) bar	G 1/4	04XX - X 19 03 - X - 001	04XX - X 20 03 - X - 002
	G 1/8	04XX - X 19 28 - X - 001	04XX - X 20 28 - X - 002
	M 10x1 cyl.	04XX - X 19 13 - X - 001	04XX - X 20 13 - X - 002
	M 10x1 con.	04XX - X 19 01 - X - 001	04XX - X 20 01 - X - 002
	M 12x1.5	04XX - X 19 02 - X - 001	04XX - X 20 02 - X - 002
	NPT 1/8	04XX - X 19 04 - X - 001	04XX - X 20 04 - X - 002

### Supplementary functions<sup>2)</sup>

Resistor	Diagnostics function	R XX XX
Varistor	Overvoltage protection	V XX XX
NTC thermistor	Filter monitoring	N XX XX

### Seal material – Application areas

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

Refer to page 24 for the temperature range and application thresholds of sealing materials.

Article number:	04XX - XXX XX - X - 00X
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<sup>1)</sup> Static value. Dynamic value is 30-50 % lower. Values pertain to the hydraulic/pneumatic part of the pressure switch.

<sup>2)</sup> Other versions available depending on minimum order quantity (see p. 67)

# Pressure switches *PLUS*

Plug-in types for diaphragm and piston pressure switches

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## Technical details of plug-in types

0410 / 0411	0412 / 0413	0414 / 0415
<b>Deutsch DT04-2P</b>	<b>AMP Superseal 1.5®</b>	<b>Packard MetriPack 280®</b>
IP67, IP6K9K	IP67	IP67
H ≈ 61 mm	H ≈ 61 mm	H ≈ 62 mm

◀ Model / type

◀ Connector

◀ Protection class

◀ Overall height

◀ Contact assignment

0416 / 0417	0418 / 0419	0422 / 0423	0424 / 0425
<b>Deutsch DT04-3P</b>	<b>AMP Junior Timer®</b>	<b>M12x1 DIN EN 61076-2-101-A</b>	<b>M12x1 DIN EN 60947-5-2</b>
IP67, IP6K9K	IP65, IPx4K	IP67	IP67
H ≈ 63 mm	H ≈ 54 mm	H ≈ 51 mm	H ≈ 51 mm
	 Not recommended for new applications	 NO / NC (black)	 NO (light grey) NC (dark grey)
		1: brown 3: blue	1: brown 2: black 4: white

◀ Model / type

◀ Connector

◀ Protection class

◀ Overall height

◀ Contact assignment

