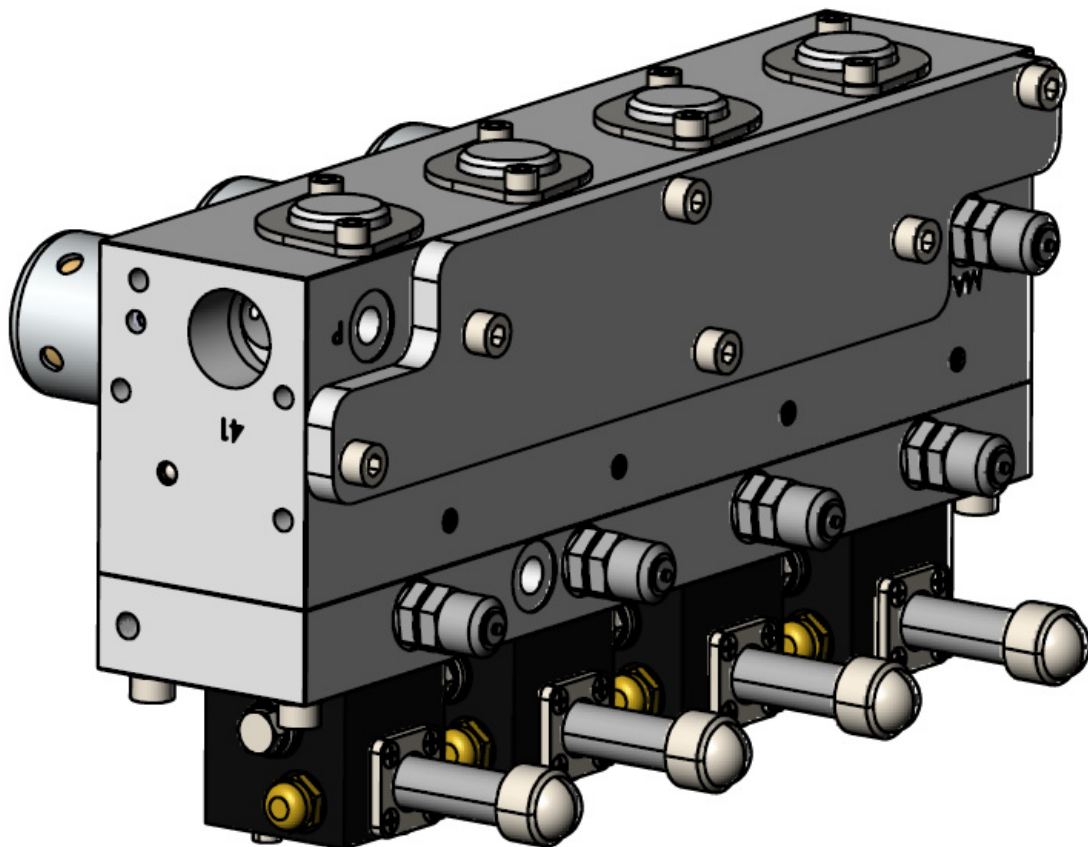


# Betriebsanleitung

## Manifold

Typ

UGP100066



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## 2 Index

- DC Auslastungsgrad (Duty Cycle)
- MC Messanschluss Steuerleitung (Measuring connection control line)
- MY1(oder 2,3) Messpunkt, Druck im Stellantrieb (Measuring point, pressure in actuator)
- MV1(oder 2,3) Magnetventil (Solenoid-Valve)
- FC1(oder 2,3) Durchflussregelventil (Flow control valve)
- EV1(oder 2,3) Pneumatisches Ventil (Pneumatic valve)
- Sicherheitsantrieb Zylinder
- Sicherheitsventil Vom Sicherheitsantrieb betätigtes Ventil

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### 3 Beschreibung UniteQ UGP100066

#### 3.1 Allgemein

Der UniteQ UGP100066 ist ein pneumatisches Sicherheitssteuerblock. Er ist entworfen, um einen federbelasteter einfachwirkender Sicherheitsantrieb zu bedienen. Der Sicherheitssteuerblock ist direkt am Sicherheitsantrieb montiert.

Der gesamte Aufbau soll als ein einheitliches sicherheitstechnisches Produkt betrachtet werden. Der Aufbau hat die gezielte Funktion, Sicherheitsventile zu betätigen.

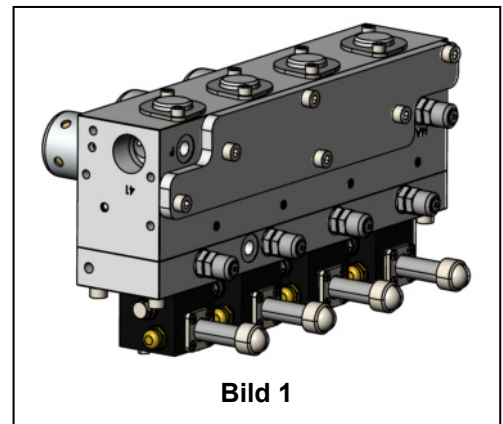
Wenn die Baugruppe an einem Sicherheitsventil montiert ist, kann sie in einer bestimmten Zeit die sichere Position (Schließen) erreichen und das bestimmte Medium schließen, das sich durch das Sicherheitsventil bewegt hat. Mit der Schnellöffnungsfunktion kann das Ventil innerhalb einer bestimmten Zeit vollständig geöffnet werden.

Der UGP100066 ist aus Aluminium gemacht, hat die UniteQ Spezifikationen und wird durch UniteQ im eigenen Hause produziert. Er ist ausgestattet mit UniteQ Pneumatikventile, Standardmagnetventile und Schalldämpfer.

#### 3.2 Identifikation

Der UniteQ UGP100066 ist an mehreren Merkmalen erkennbar:

- Er sieht im Prinzip aus wie in Bild 1 dargestellt,
- Sie Maße sind in Kapitel 8.3 beschrieben,
- Es ist direkt an einem federbelasteten einfachwirkenden Sicherheitsaktuator montiert.
- Im Verteiler sind drei Magnetventile integriert:
- Die Artikelnummer (UGP100066) und Projektnummer sind in den Block eingraviert.

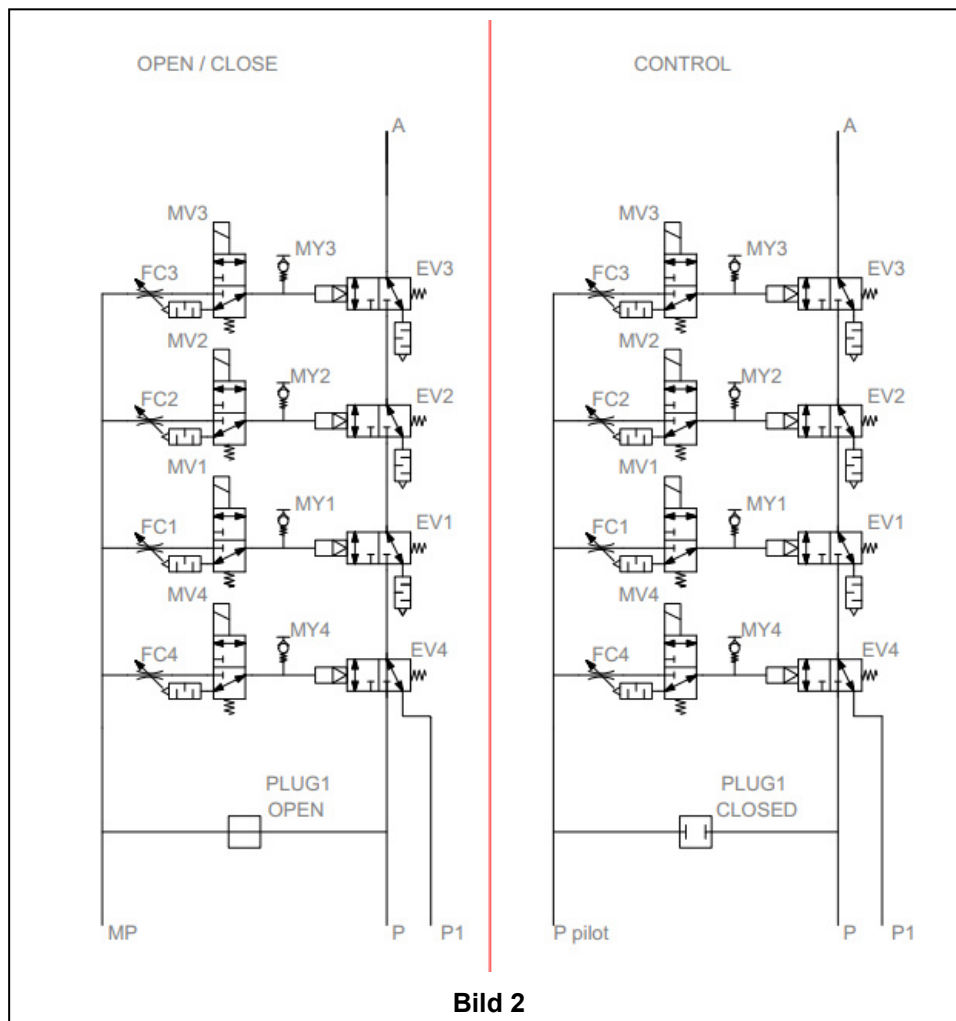


Wenn es Zweifel gibt, ob das Produkt echt ist, bitte wenden Sie sich an UniteQ.

#### 3.3 P&ID

Bild 2 zeigt den P&ID des UniteQ UGP100066.

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### 3.4 Funktionen

Der UniteQ UGP100066 hat mehrere grundlegende Steuerfunktionen:

- Druckfunktion (Port A unter Druck),
- Sicherheitsfunktion (Port A drucklos),
- Schnellöffnungsfunktion (Port A unter Druck),
- Magnetventil-Testfunktion
- Pneumatisches Ventil-Testfunktion

Im Folgenden Kapiteln werden diese vier Funktionen beschrieben und ihre Verwendung erläutert.

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### 3.4.1 Druckfunktion

Die Druckbeaufschlagungsfunktion setzt den Sicherheitsaktuator gegen seine Federkraft unter Druck. Abhängig vom Sicherheitsaktuator fährt der Aktuator ein oder aus, wodurch das Hauptventil innerhalb einer bestimmten Zeit geöffnet oder geschlossen wird.

Die Funktion arbeitet mit einer 3oo3-Schaltung. Die Steuerung erfolgt über Magnetventile MV1, MV2 und MV3.

Die Aktivierung der Druckfunktion erfolgt durch Einschalten der Spulen „MV1“, „MV2“ und „MV3“.


Die Druckluft tritt am Punkt P in den Verteiler ein. Je nach Variante des Verteilers ist ein Stopfen oder kein Stopfen vorhanden;

- Wenn die Pilotluft bei MP extern zugeführt wird, befindet sich ein Stopfen.
- Wenn keine externe Pilotluft vorhanden ist, ist keine Stopfen vorhanden.

Bei MP kann der Eingangs- / Pilotluftdruck gemessen werden. Die Druckluft strömt durch die Durchflussregelventile (FC1, FC2, FC3) zu den Magnetventilen (MV1, MV2, MV3). Diese Magnetventile sind mit einem Dampfprüfstock verbunden. Im Normalbetrieb werden die Magnetventile (vom Dampfprüfstock) aktiviert und die Luft strömt durch und aktiviert die Pneumatik Ventile (EV1, EV2, EV3). Jetzt kann der Luftdruck von P nach A zum Sicherheitsaktuator strömen.

Weitere Informationen finden Sie in Kapitel 3.4.6 Tabelle 1: Magnetventilsignale für den Betrieb.

#### 3.4.1.1 Fehlersuche

	<b>Achtung</b> Für alle Fehlersucharbeiten am Sicherheitsgerät müssen Sie qualifiziert sein. Lassen Sie sich im Zweifelsfall durch UniteQ beraten.
---	--

Wenn sich der Sicherheitsaktuator nicht gegen die Federkraft bewegt, kann Folgendes das Problem verursachen:

- Das Magnetventil „MV1“, „MV2“ und / oder „MV3“ ist / sind deaktiviert. Überprüfen Sie, ob das Magnetventil bei eingeschalteter Spule deaktiviert ist. Wenn ja, ersetzen Sie das Magnetventil durch ein neues.
- Das Pneumatikventil „EV1“, „EV2“ und / oder „EV3“ ist / sind deaktiviert. Überprüfen Sie, ob das pneumatische Ventil deaktiviert ist, während das

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zugehörige Magnetventil erregt ist. Wenn ja, ersetzen Sie das pneumatische Ventil durch ein neues.

- Der Systemdruck ist möglicherweise zu niedrig.  
Überprüfen Sie den Systemversorgungsdruck, der mindestens 1 bar betragen sollte.  
Wenn der Druck zu niedrig ist, überprüfen Sie den Druck der pneumatischen Versorgung.  
Überprüfen Sie, ob die Durchflussregelventile „FC1“, „FC2“ und / oder „FC3“ (teilweise) geschlossen sind.

Wenn sich der Antrieb immer noch nicht öffnet, wenden Sie sich an UniteQ.

### 3.4.2 Sicherheitsfunktion (Drucklos machen)

Die Sicherheitsfunktion macht den Sicherheitsaktuator drucklos. Abhängig vom Sicherheitsaktuator fährt der Aktuator durch Federkraft ein oder aus, wodurch das Hauptventil innerhalb einer bestimmten Zeit geöffnet oder geschlossen wird.


Die Funktion arbeitet mit einer 1oo3-Schaltung. Die Steuerung erfolgt über Magnetventile MV1, MV2 und MV3.

Die Aktivierung der Sicherheitsfunktion erfolgt durch Abschalten der Spule „MV1“, „MV2“ und / oder „MV3“.

Wenn die Sicherheitsfunktion aktiviert ist, wird ein (oder mehrere) Magnetventile deaktiviert und der Luftdruckfluss von P nach A unterbrochen. Gleichzeitig wird die vom Sicherheitsaktuator kommende Luft durch das entsprechende Pneumatik Ventil abgelassen.

Weitere Informationen finden Sie in Kapitel 3.4.6 Tabelle 1: Magnetventilsignale für den Betrieb.

#### 3.4.2.1 Fehlersuche

<b>Achtung</b> 	Für alle Fehlersucharbeiten am Sicherheitsgerät müssen Sie qualifiziert sein. Lassen Sie sich im Zweifelsfall durch UniteQ beraten.
---	---

Wenn sich der Sicherheitsaktuator nicht durch Federkraft bewegt, kann Folgendes das Problem verursachen:

- Die Magnetventile „MV1“, „MV2“ und „MV3“ sind aktiviert.  
Überprüfen Sie, ob die Magnetventile bei ausgeschalteter Spule aktiviert sind.  
Wenn ja, ersetzen Sie das Magnetventil durch ein neues.

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- Das Pneumatikventil „EV1“, „EV2“ und „EV3“ ist aktiviert. Überprüfen Sie, ob das Pneumatikventil aktiviert ist, während das zugehörige Magnetventil abgeschaltet wird. Wenn ja, ersetzen Sie das pneumatische Ventil durch ein neues.

Wenn sich der Antrieb immer noch nicht öffnet, wenden Sie sich an UniteQ.

### 3.4.3 Schnellöffnungsfunktion

Die Schnellöffnungsfunktion setzt den Sicherheitsaktuator gegen seine Federkraft unter Druck. Abhängig vom Sicherheitsaktuator fährt der Aktuator ein oder aus, wodurch das Hauptventil innerhalb einer bestimmten Zeit geöffnet oder geschlossen wird.


Die Funktion arbeitet mit einer 4oo4-Schaltung. Die Steuerung erfolgt über Magnetventile MV1, MV2, MV3 und MV4.

Die Aktivierung der Druckfunktion erfolgt durch Einschalten der Spulen „MV1“, „MV2“, „MV3“ und „MV4“.

Wenn die Schnellöffnungsfunktion aktiviert ist, wird Magnetventile MV4 aktiviert durch Einschalten der Spule aktiviert. Die Magnetventile MV1, MV2 und MV3 müssen durch einschalten der Spule aktiviert sind.

Weitere Informationen finden Sie in Kapitel 3.4.6 Tabelle 1: Magnetventilsignale für den Betrieb.

#### 3.4.3.1 Fehlersuche

<b>Achtung</b> 	Für alle Fehlersucharbeiten am Sicherheitsgerät müssen Sie qualifiziert sein. Lassen Sie sich im Zweifelsfall durch UniteQ beraten.
---	---

Wenn sich der Sicherheitsaktuator nicht gegen die Federkraft bewegt, kann Folgendes das Problem verursachen:

- Das Magnetventil „MV1“, „MV2“, „MV3“ und / oder „MV4“ ist / sind deaktiviert. Überprüfen Sie, ob das Magnetventil bei eingeschalteter Spule deaktiviert ist. Wenn ja, ersetzen Sie das Magnetventil durch ein neues.
- Das Pneumatikventil „EV1“, „EV2“, „EV3“ und / oder „EV4“ ist / sind deaktiviert. Überprüfen Sie, ob das pneumatische Ventil deaktiviert ist, während das zugehörige Magnetventil erregt ist. Wenn ja, ersetzen Sie das pneumatische Ventil durch ein neues.
- Der Systemdruck ist möglicherweise zu niedrig.

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Überprüfen Sie den Systemversorgungsdruck, der mindestens 1 bar betragen sollte. Wenn der Druck zu niedrig ist, überprüfen Sie den Druck der pneumatischen Versorgung.  
Überprüfen Sie, ob die Durchflussregelventile „FC1“, „FC2“, „FC3“ und / oder „FC4“ (teilweise) geschlossen sind.

Wenn sich der Antrieb immer noch nicht öffnet, wenden Sie sich an UniteQ.

### 3.4.4 Magnetventil-Testfunktion

Mit der Magnetventil-Testfunktion kann jedes Magnetventil einzeln getestet werden, während das System in Betrieb ist. Während der Testfunktion beträgt die Sicherheitsfunktion des Systems 1oo2. Die Testfunktion wird für Zeile 1 erläutert. Wiederholen Sie nach dem Testen von Zeile 1 den Test für die Zeilen 2 und 3, um den Magnetventilfunktionstest des UGP100066 abzuschließen.

- Nehmen Sie den Schalldämpfer aus dem Auspuff des Pneumatikventils EV1.
- Schrauben Sie ein Druckmessgerät ein, um eine Auslösung zu erkennen.
- Schließen Sie ein einstellbares Netzteil an MV1 an.
- Reduzieren Sie die Spannung allmählich, bis das Magnetventil auslöst und eine Auslösung am Auspuff von EV1 erkannt wird.
- Wiederholen Sie den Test dreimal, um ein genaues Ergebnis zu erhalten.
- Die Auslösespannung muss über 4 VDC liegen.
- Schließen Sie das Originalnetzteil an.
- Nehmen Sie die Druckmessung aus dem Auspuff von EV1 heraus.
- Schalldämpfer in EV1 einschrauben,
- Wiederholen Sie den Test für die anderen Positionen.

### 3.4.5 Pneumatikventil-Testfunktion

Mit der Pneumatikventiltestfunktion kann jedes Pneumatikventil einzeln getestet werden, während das System in Betrieb ist. Während der Testfunktion beträgt die Sicherheitsfunktion des Systems 1oo2. Die Testfunktion wird für Zeile 1 erläutert. Wiederholen Sie nach dem Testen von Zeile 1 den Test für die Zeilen 2 und 3, um den Funktionstest des pneumatischen Ventils des UGP100066 abzuschließen.

- Nehmen Sie den Schalldämpfer aus dem Ablass des Pneumatikventils EV1 heraus.
- Schrauben Sie eine Druckmessung ein, um eine Auslösung zu erkennen.
- Schließen Sie eine Druckmessung am Sicherheitsaktuator an, um den Druck im Sicherheitsaktuator zu messen.

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- Schließen Sie eine Druckmessung am MY1 an, um den Druck in der Pilotleitung an EV1 zu messen.
- Durchflussbegrenzer FC1 schließen
- Reduzieren Sie den Druck im Druck in der Pilotleitung auf EV1,
- Messen Sie, bei welchem Druck EV1 auslöst.
- Wiederholen Sie den Test dreimal, um ein genaues Ergebnis zu erhalten.
- Der Auslösedruck muss >25% des Drucks im Sicherheitsaktuator sein.
- Öffnen Sie FC1,
- Entfernen Sie die Messung von MY1,
- Entfernen Sie die Druckmessung am Auspuff von EV1,
- Schalldämpfer in EV1 einschrauben,
- Wiederholen Sie den Test für die anderen Positionen.


### 3.4.6 Tabelle

Signaltabelle				
Funktion	Signal zum Ventil			
Ventilcode	MV1	MV2	MV3	MV4
Druckfunktion	1	1	1	0
Sicherheitsfunktion	0	0	0	0
Schnellöffnungsfunktion	1	1	1	1

**Tabelle 1: Magnetventilsignale für den Betrieb**

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## 4 Wartung Anleitung

	<p><b>Achtung</b> Für alle Wartungsarbeiten am UniteQ UGP100066 Sicherheitsgerät müssen Sie qualifiziert sein. Lassen Sie sich im Zweifelsfall durch UniteQ beraten.</p>
---	--

Die Wartung ist in folgenden Fällen erforderlich:

- Externe Leckage;
- Interne Leckage;
- Ausfall oder Fehlerfunktion;
- Abweichung von einer anderen Anforderung.

Bitte beachten Sie, dass Leckagen an den Verschlussstopfen (Kapitel 11), nicht repariert werden können. Bitte lassen Sie sich von UniteQ beraten.

### 4.1 Negative Test Ergebnissen

Bei negative Test Ergebnissen ist der Einheit grundsätzlich nicht geeignet für weitere betrieb. In Absprache mit der Zugelassene Überwachungsstelle kann ein Reparatur Zeit vereinbart worden wobei der Anlage weiter verfahren werden kann.

Lassen Sie sich im Zweifelsfall durch UniteQ beraten.

### 4.2 Erforderliche Qualifikation

Jede Person, die Wartungsarbeiten oder Fehlerbehebungen am UniteQ UGP100066 durchführt, muss mindestens die folgenden Anforderungen erfüllen:


- Bachelor-Abschluss in Maschinenbau oder gut ausgebildeter Mechaniker,
- Ausreichende Erfahrung in der Pneumatik und
- Kenntnisse der Sicherheitstechnik und der Verfahren, insbesondere die Auswirkungen von Fehlern auf die Sicherheitsverfahren.

### 4.3 Vorbereitung

Stellen Sie vor Arbeitsbeginn sicher, dass Folgendes angewendet wird:

- Persönliche Schutzkleidung / -Werkzeuge,
- Kein Druck im pneumatischen System,
- Sicherheitsventil vollständig in sicherer Position,
- Stromversorgung ausgeschaltet,
- Sauberer Arbeitsplatz und
- Wartungsplan zur Hand.


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	<b>Achtung</b>	Schmutz im Pneumatik System verursacht Störungen und kann zum Verlust der Sicherheitsfunktion führen. Achten Sie darauf, dass kein Schmutz in die Pneumatik Anlage eindringen kann!
		Achten Sie darauf, Teile und Oberflächen nicht zu beschädigen!
		Seien Sie sich bewusst, dass das pneumatische System möglicherweise noch unter Druck stehen kann!

#### **4.4 Auswechseln eines Ventils**

Lösen Sie beim Wechseln eines Magnetventils die M5-Schrauben, um das Magnetventil zu entfernen. Das neue Magnetventil kann durch Anziehen der M5-Schrauben mit 7,0 Nm montiert werden.

Schrauben Sie beim Wechseln eines pneumatischen Ventils den M6 ab, um die Abdeckplatte zu entfernen. Nehmen Sie das pneumatische Ventil heraus und ersetzen Sie es durch ein anderes. Montieren Sie die Abdeckplatte wieder, indem Sie die M6-Schrauben mit 12 Nm festziehen.

	<b>Achtung</b>	Schmutz im Pneumatik System verursacht Störungen und kann zum Verlust der Sicherheitsfunktion führen. Achten Sie darauf, dass kein Schmutz in die Pneumatik Anlage eindringen kann!
		Achten Sie darauf, Teile und Oberflächen nicht zu beschädigen!
		Seien Sie sich bewusst, dass das pneumatische System möglicherweise noch unter Druck stehen kann!


#### **4.5 Auswechseln einer Dichtung**

Stellen Sie beim Wechseln eines O-Rings oder einer Dichtung sicher, dass dieser gegen den richtigen ausgetauscht wird. Kümmern Messungen und Materialspezifikationen!

Beim Einbau eines O-Rings / einer O-Dichtung Fett auf die Kontaktfläche des O-Rings / der O-Dichtung auftragen. Verwenden Sie nur das folgende Fett, um einen ordnungsgemäßen Betrieb zu gewährleisten:

Klübersynth AR 34-401. Datenblatt siehe Kapitel 11.

Beim Wechsel eines O-Rings von einem Ventil siehe Kapitel 4.4.

	<b>Achtung</b>	Schmutz im Pneumatik System verursacht Störungen und kann zum Verlust der Sicherheitsfunktion führen. Achten Sie darauf, dass kein Schmutz in die Pneumatik Anlage eindringen kann!
		Seien Sie sich bewusst, dass das pneumatische System möglicherweise noch unter Druck stehen kann!

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Wenn Sie eine Dichtung in einem Stopfen wechseln, schrauben Sie den Stopfen heraus, indem Sie ihn gegen den Uhrzeigersinn drehen. Beachten Sie, dass im pneumatischen System möglicherweise noch Druck vorhanden ist. Tauschen Sie das Siegel gegen ein neues aus. Befestigen Sie den Stopfen mit einem Drehmomentschlüssel.

#### **4.6 Stückliste**

Die Stückliste und eine Detailzeichnung finden sich im Kapitel 11.

#### **4.7 Dauer der Funktionsfähigkeit**

Die zu erwartende Funktionsdauer des UniteQ UGP100066 beträgt 20 Jahre, ausgehend von normalem Betrieb, wie in diesem Handbuch beschrieben, einer regelmäßigen Wartung und maximal 1000 Schaltungen pro Jahre. Die Garantie auf das Produkt beläuft sich auf 2 Jahre bei normalem Gebrauch wie in diesem Handbuch beschrieben.

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## 5 Umgebung / Umfeld

Der UniteQ UGP100066 kann nur in einer Umgebung bereitgestellt werden, die mindestens die folgenden Eigenschaften erfüllt:

- Die maximal zulässige Umgebungstemperatur für das UGP100066 liegt zwischen  $-20\text{ °C}$  und  $60\text{ °C}$ .
- Die maximal zulässige Temperatur der Oberfläche des UGP100066 beträgt  $80\text{ °C}$ .
- Stellen Sie sicher, dass der UGP100066 unter einem Dach steht und nicht nass werden kann. Dies verhindert, dass die Luftfilter verstopfen.
- Halten Sie den UGP100066 von Heizquellen fern.

### 5.1 Pneumatische Kraft

Die dem UniteQ UGP100066 zugeführte pneumatische Leistung muss die folgenden Anforderungen erfüllen:

- Der kontinuierlich verfügbare pneumatische Druck muss mindestens 3 bar und maximal 8 bar bei minimalem Durchfluss betragen. Der Nenndruck beträgt 6 bar,
- Luftqualität nach DIN / ISO 8573.1, Partikelgröße von max. 5  $\mu\text{m}$ , Teilchendichte von max. 5  $\text{mg} / \text{m}^3$  und Qualitätsklasse 3,
- Wassergehalt: max. Taupunkt  $+2\text{ °C}$  (Qualitätsklasse 4); Ein relativ anderer Taupunkt gilt für Standorte in großer Höhe oder niedrige Umgebungstemperaturen.
- Ölgehalt: max. 25 mg Öl pro 1  $\text{m}^3$  Luft (Qualitätsklasse 5) nach DIN / ISO 8573.1 mit Partikelgrößen, die von einer Wartungseinheit verarbeitet werden. Wenn der Antrieb bei Temperaturen unter null betrieben wird, muss trockene Steuerluft verwendet werden.

### 5.2 Elektrisch

#### 5.2.1 Magnetventil

Die Stromversorgung eines Magnetventils muss folgende Anforderungen erfüllen:

- Versorgungsspannung 21-27 VDC und
- Strom 0,8 Ampere.

### 5.3 Transport

Beim Versand eines neuen oder gebrauchten UniteQ UGP100066 muss man sicherstellen, dass keine Schäden während des Transports entstehen. Schäden können entstehen durch:

- Werfen eines Paket;

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- Hohe Belastung auf das Paket;
- Überseeversand;
- Schmutz gelangt durch Öffnungen ins Innere;
- usw.

Um Schäden zu vermeiden:

- Stellen Sie sicher, dass alle offenen Kanäle ausgestopft sind.
- Das UGP100066 sollte ordnungsgemäß befestigt sein.

### **5.3.1 Lagerung**

Lagerschaden ist folgendermaßen zu vermeiden:

- Vermeiden Sie Tageslicht;
- Aufbewahrung in einer versiegelten Verpackung
- Trocken Lagern;
- Lagerung bei erforderlichen Temperaturen (Siehe Kapitel 5)
- Usw.

### **5.4 Heben**

Der UniteQ UGP100066 wiegt weniger als 25 Kilogramm. Die Montage des UGP100066 ist ohne Kran möglich. Vergewissern Sie sich jedoch, dass Ihre Sicherheit nicht in Gefahr ist. Stellen Sie den Block immer in eine sichere Position, sodass, wenn es zum Fallen des UGP100066 Blocks kommt, Sie zum Beispiel nicht unter dem Block stehen.

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## 6 Zertifizierung


### 6.1 TRD Zertifizierung

Die pneumatische Verteilerleitung UniteQ 1003, zu der auch das UGP100066 gehört, wurde vom TÜV gemäß der PED-Richtlinie 2014/68 / EU validiert.

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## 7 Zustand des Produktes

### 7.1 Inbetriebnahme

	<b>Anmerkung</b> Vor Anschluss der Pneumatische Leitung des UniteQ UGP100066, müssen die Leitungen gemäß ISO 23309 eine ausreichende Zeit lang gespült werden, um sicher zu sein, dass die Pneumatische Leitungen Sauber sind.
---	--

Führen Sie die folgenden Schritte aus, um den UniteQ UGP100066 in Betrieb zu nehmen:

- Montieren Sie den UGP100066 an den Antrieb, siehe Kapitel 8.1.1,
- Schläuche installieren, siehe Kapitel 8.1.2,
- Installieren Sie die elektrischen Signale, siehe Kapitel 5.2,
- Zuluftdruck an das System gemäß den Angaben in Kapitel 5.1,

Nach diesen Schritten kann die Inbetriebnahme beginnen.

### 7.2 Normalbetrieb

Während des normalen Betriebs ist die Druckfunktion aktiv, siehe Kapitel 3.4.1, und der Antrieb wird gegen die Federkraft eingefahren / herausgezogen.

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## 8 Montage

### 8.1 Montage vom Manifold

#### 8.1.1 Montage Manifold am Sicherheitsantrieb

Der UniteQ UGP100066 sollte mit einer Montagehalterung am Sicherheitsaktuator montiert werden. Stellen Sie sicher, dass die Montagehalterung eine ausreichende Festigkeit aufweist. Die Montagehalterung kann an die vier M8-Löcher des Verteilers angeschlossen werden. Die Position der Löcher finden Sie in Kapitel 11. Der UniteQ UGP100066 kann mit maßgeschneiderten Montagewinkeln geliefert werden, die auf Ihren Sicherheitsaktuator passen.

#### 8.1.2 Montage der pneumatischen Rohrleitungen am Sicherheitsantrieb

Verwenden Sie für die pneumatische Verbindung vom Manifold zum Sicherheitsaktuator das Loch an der Seite des UGP100066. Beschreibung in der Nähe des Lochs am UGP100066 steht für:

A: Druckseite (G1 bis NEN167),

Die Position der Löcher finden Sie in Zeichnung UGP100066 in Kapitel 11.

### 8.2 Pneumatische Rohrleitungen montieren

Verwenden Sie für die pneumatische Verbindung vom Manifold zum Zylinder das Loch an der Seite des UGP100066 und den Anschluss an der Vorderseite des UGP100066. Beschreibung in der Nähe des Lochs / Anschlusses am MAN100071.01 steht für:

P: Druckleitung (G1 bis NEN167),

MP: Steuerleitung (G1 / 4 bis NEN167),

Die Position der Löcher finden Sie in der Zeichnung UGP100066 in Kapitel 11.

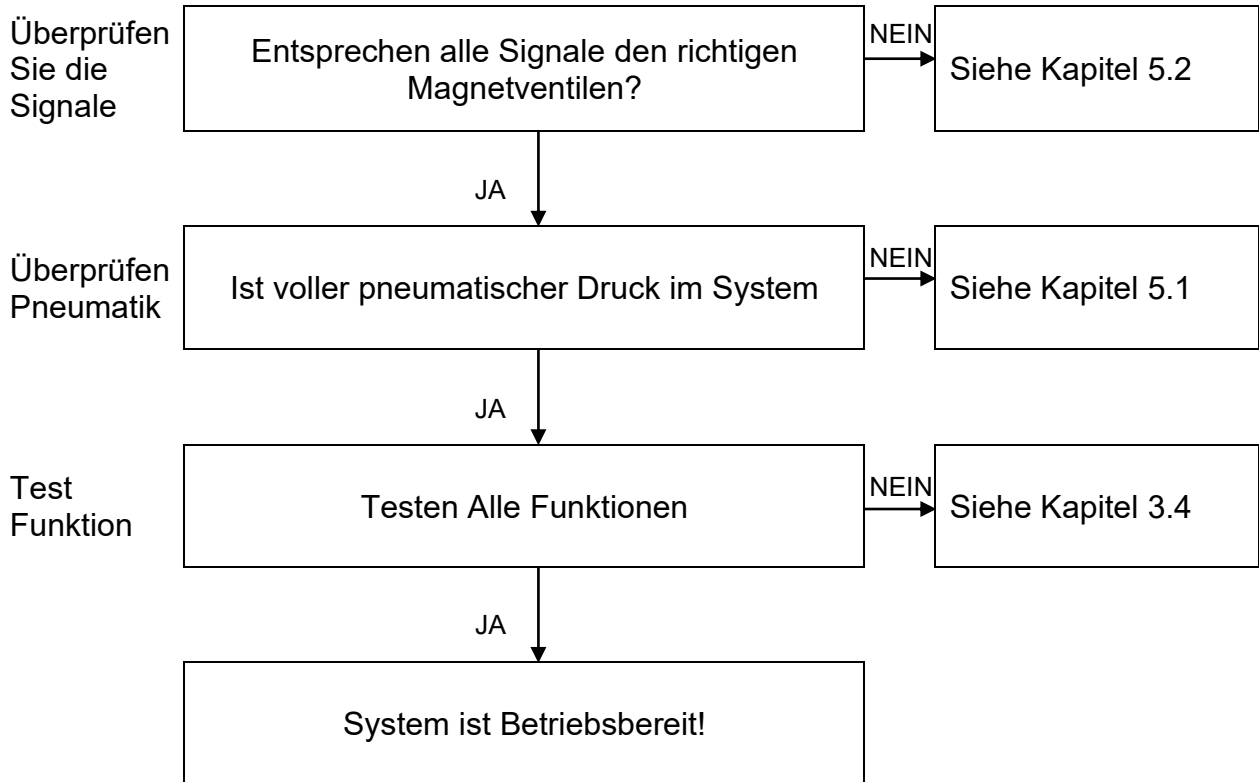
Optional kann der Stecker1 entfernt werden, anstatt die Steuerleitung MP anzuschließen. Der Druck, der auf die P-Leitung zugeführt wird, versorgt dann intern die Steuerleitung MP

### 8.3 Maße

Das Gesamtrockengewicht des UniteQ UGP100066 ist 10 Kilogramm. Für Abmessungen siehe Kapitel 11.

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## 9 Inbetriebnahme



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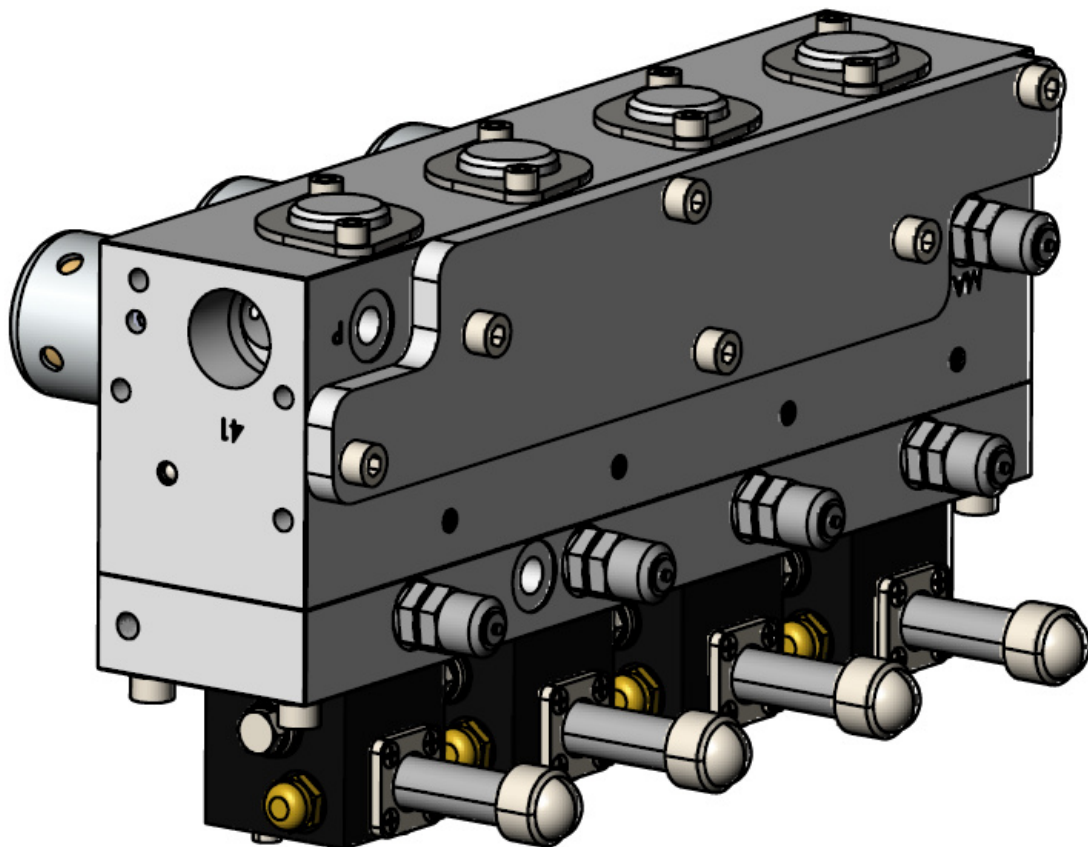


# Instruction Manual

## Manifold

### Type

### UGP100066



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Review			
Date	03-08-2023		
Revision	01		
Name	J.L. Timmermans		
signature			

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## 2 Glossary

- DC Duty Cycle
- MC Measuring connection control line
- MY1(or 2,3) Measuring point, pressure in actuator
- MV1(or 2,3) Solenoid-Valve
- FC1(or 2,3) Flow control valve
- EV1(or 2,3) Pneumatic valve
- Safety actuator cylinder
- Safety valve Actuated valve (e.g. Steam valve)

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### 3 Description UniteQ UGP100066

#### 3.1 General

The UniteQ UGP100066 is a pneumatic control block. It is designed to operate a spring loaded single acting safety actuator. Directly mounted on this safety actuator, the assembly is to be considered as one safety related product. The assembly has the specific use to actuate safety-valves.

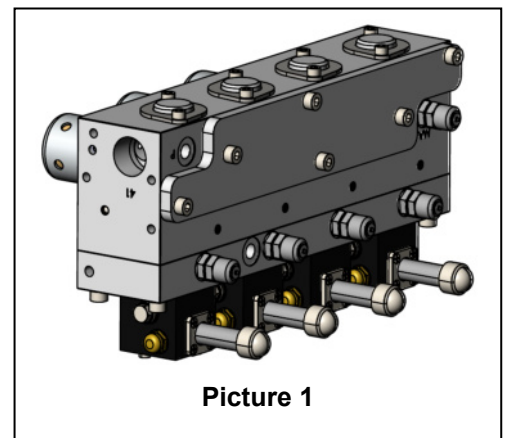
With the assembly mounted on a safety-valve, it has the capability to reach the safe position (close) in a certain amount of time, closing off the certain medium that was moving through the safety-valve. With the quick open function the valve can be fully opened within a certain amount of time.

The UGP100066 is designed as a aluminum manifold according to UniteQ specifications and produced by UniteQ. It is equipped with UniteQ pneumatic valves and standard solenoid valves and silencers.

#### 3.2 Identification

The UniteQ UGP100066 is recognizable by several features:

- It looks similar as shown in Picture 1,
- It has the measurements as described in chapter 8.3,
- It is directly mounted to a spring loaded single acting safety actuator,
- There are three solenoid-valves integrated in the manifold,
- The article number (UGP100066) and project number are on the manifold.



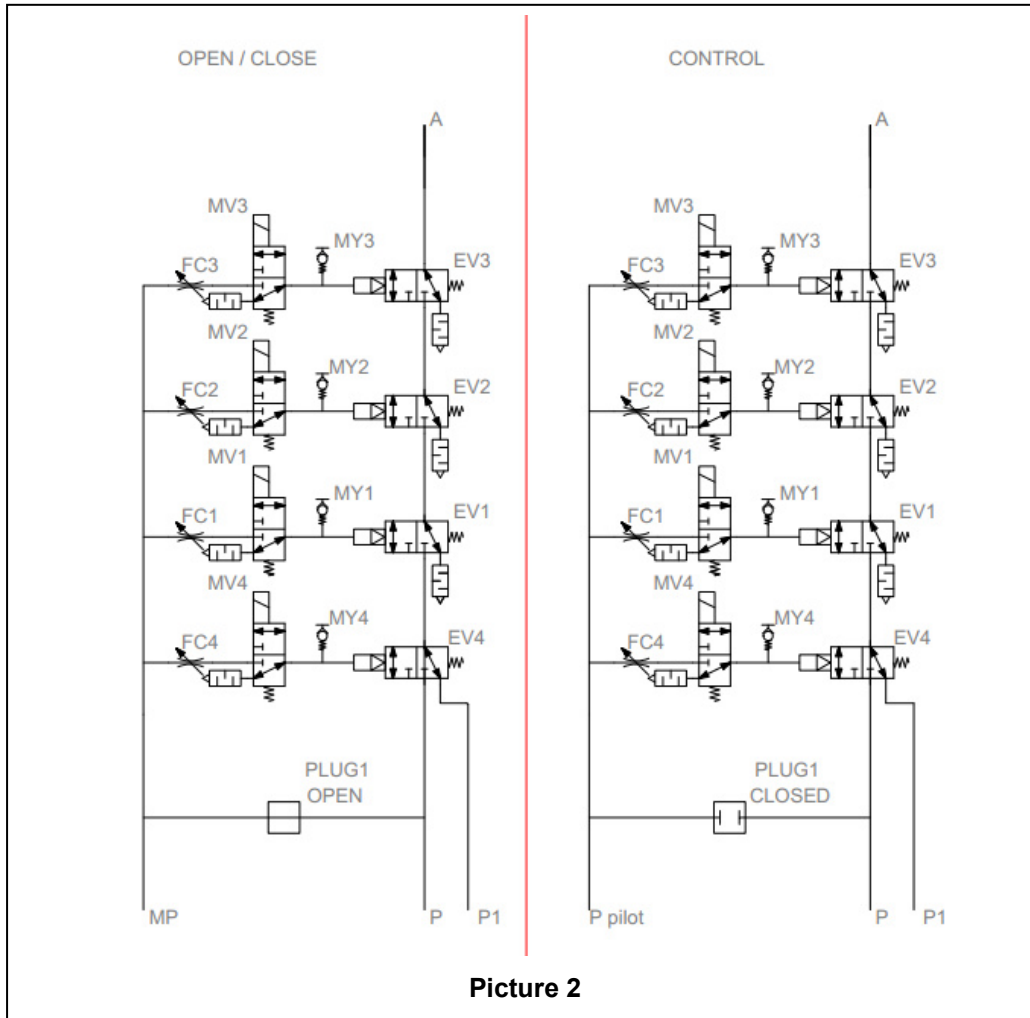
**Picture 1**

If there is doubt if the product is genuine, verify with UniteQ.

#### 3.3 P&ID

Picture 2 illustrates the P&ID of the UniteQ UGP100066.

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### 3.4 Functions

The UniteQ UGP100066 has several basic control functions, being:

- Pressurize function (Port A pressurized),
- Safety function (port A depressurized),
- Quick open function (Port A pressurized),
- Solenoid valve test function,
- Pneumatic valve test function.

Below these four functions are described and their use is explained.

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### 3.4.1 Pressurize function

The pressurize function will pressurize the safety actuator, against its spring force. Dependent on the safety actuator the actuator will retract or extract, which will open or close the main valve within a specific time.

The function works with a 3oo3 circuit. It is controlled with solenoid-valves MV1, MV2 and MV3.

Enabling pressurize function is done by energizing coil 'MV1', 'MV2' and 'MV3'.


The compressed air enters the manifold at point P. Depending on the variant of the manifold there is a plug or no plug present;

- If the pilot air is externally fed at MP there is a plug.
- If there is no external pilot air the plug is not present.

At MP the incoming/pilot air pressure can be measured by minimes coupling. The pressurized air goes through the flow control valves (FC1, FC2, FC3) to the solenoid valves (MV1, MV2, MV3). These solenoid valves are connected to a steam test device. In normal operation the solenoid valves are activated (by the steam test device) and the air flows through and activates the pneumatic valves (EV1, EV2, EV3). Now the air pressure can flow from P to A to the safety actuator.

See chapter 3.4.6 Table 1: solenoid-valve signals for operation for more details.

#### 3.4.1.1 Trouble shoot

<b>Warning</b> 	For all trouble shooting you must be qualified to work on equipment with functional safety. If in doubt, always seek UniteQ advice.
---	---

If the safety actuator will not move against spring force, the following might cause the problem:

- Solenoid-valve 'MV1', 'MV2' and/or 'MV3' is/are disabled.  
Check if the solenoid-valve is disabled with the coil being energized. If so replace the solenoid-valve with a new one.
- Pneumatic valve 'EV1', 'EV2' and/or 'EV3' is/are disabled.  
Check if the pneumatic valve is disabled while the accompanying solenoid valve is being energized. If so, replace the pneumatic valve with a new one.
- The system pressure might be to low.  
Check the system supply pressure, which should be at least 1 bar.

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If the pressure is too low, check the pressure of the pneumatic supply.  
Check if flow control valve(s) 'FC1', 'FC2' and/or 'FC3' is/are (partially) closed.

When actuator still does not open, contact UniteQ.

### 3.4.2 Safety function (depressurize)

The safety function will depressurize the safety actuator. Dependent on the safety actuator the actuator will retract or extend by spring force, which will open or close the main valve within a specific time.


The function works with a 1oo3 circuit. It is controlled with solenoid-valves MV1, MV2 and MV3.

Enabling safety function is done by deenergizing coil 'MV1', 'MV2' and/or 'MV3'.

In case the safety function is activated, one (or more) solenoid valve will be deactivated and the air pressure flow from P to A is cut off. At the same time the air coming from the safety actuator will be vented out through the corresponding pneumatic valve.

See chapter 3.4.6 Table 1: solenoid-valve signals for operation for more details.

#### 3.4.2.1 Trouble shoot

	<b>Warning</b> For all trouble shooting you must be qualified to work on equipment with functional safety. If in doubt, always seek UniteQ advice.
---	--

If the safety actuator will not move by spring force, the following might cause the problem:

- Solenoid-valve 'MV1', 'MV2' and 'MV3' are enabled.  
Check if the solenoid-valves are enabled with the coil being deenergized. If so replace the solenoid-valve with a new one.
- Pneumatic valve 'EV1', 'EV2' and 'EV3' are enabled.  
Check if the pneumatic valve is enabled while the accompanying solenoid valve is being deenergized. If so, replace the pneumatic valve with a new one.

When actuator still does not open, contact UniteQ.

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### 3.4.3 Quick open function

The quick open function will pressurize the safety actuator, against the spring force. Dependent on the safety actuator the actuator will retract or extract, which will open or close the main valve within a specific time.


The function works with a 4oo4 circuit. It is controlled with solenoid-valves MV1, MV2, MV3 and MV4.

Enabling pressurize function is done by energizing coil 'MV1', 'MV2', 'MV3' and 'MV4'.

In case the quick open function is activated, solenoid valve MV4 is enabled by energizing the valve. Solenoid valve MV1, MV2 and MV3 need to be enabled by energizing the valves.

See chapter 3.4.6 Table 1: solenoid-valve signals for operation for more details.

#### 3.4.3.1 Trouble shoot

	<p><b>Warning</b> For all trouble shooting you must be qualified to work on equipment with functional safety. If in doubt, always seek UniteQ advice.</p>
---	---

If the safety actuator will not move against spring force, the following might cause the problem:

- Solenoid-valve 'MV1', 'MV2', 'MV3' and/or 'MV4' is/are disabled.  
Check if the solenoid-valve is disabled with the coil being energized. If so replace the solenoid-valve with a new one.
- Pneumatic valve 'EV1', 'EV2', 'EV3' and/or 'EV4' is/are disabled.  
Check if the pneumatic valve is disabled while the accompanying solenoid valve is being energized. If so, replace the pneumatic valve with a new one.
- The system pressure might be too low.  
Check the system supply pressure, which should be at least 1 bar.  
If the pressure is to low, check the pressure of the pneumatic supply.  
Check if flow control valve(s) 'FC1', 'FC2', 'FC3' and/or 'FC4' is/are (partially) closed.

When actuator still does not open, contact UniteQ.

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### 3.4.4 Solenoid valve test function

The solenoid valve test function can be used to test each solenoid valve individually while the system is in operation. During the test function the safety function of the system will be 1oo2. The test function will be explained for line 1. After testing line 1, repeat the test for lines 2 and 3 to complete the solenoid valve function test of the UGP100066.

- Take the silencer out of the exhaust of the pneumatic valve EV1,
- Screw in a pressure measurement tool to detect a trip,
- Connect an adjustable power supply to MV1,
- Gradually reduce the voltage until the solenoid valve trips and a trip is detected at the exhaust of EV1,
- Repeat the test 3 times for an accurate result,
- Trip voltage must be above 4VDC,
- Connect the original power supply,
- Take out the pressure measurement out of the exhaust of EV1,
- Screw in the silencer into EV1,
- Repeat the test for the other positions.

### 3.4.5 Pneumatic valve test function

The pneumatic valve test function can be used to test each pneumatic valve individually while the system is in operation. During the test function the safety function of the system will be 1oo2. The test function will be explained for line 1. After testing line 1, repeat the test for lines 2 and 3 to complete the pneumatic valve function test of the UGP100066.

- Take out the silencer out of the exhaust of the pneumatic valve EV1,
- Screw in a pressure measurement to detect a trip,
- Connect a pressure measurement on the safety actuator to measure the pressure in the safety actuator,
- Connect a pressure measurement on the MY1 to measure the pressure in the pilot line to EV1,
- Close flow restrictor FC1
- Reduce the pressure in the pressure in the pilot line to EV1,
- Measure at what pressure EV1 trips,
- Repeat the test 3 times for an accurate result,
- Trip pressure must be >25% of the pressure in the safety actuator,
- Open FC1,
- Remove the measurement from MY1,

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- Remove the pressure measurement at the exhaust of EV1,
- Screw in the silencer into EV1,
- Repeat the test for the other positions.


### 3.4.6 Tables

Signal table				
Function	Signal to valve			
Valve code	MV1	MV2	MV3	MV4
Pressurize function	1	1	1	0
Safety function	0	0	0	0
Quick open function	1	1	1	1

**Table 1: solenoid-valve signals for operation**

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## 4 Maintenance manual

	<p><b>Warning</b> For all maintenance on the UniteQ UGP100066 you must be qualified to work on functional safety equipment. If in doubt, always seek UniteQ advice.</p>
---	---

Maintenance is required in the following cases:

- External leakage,
- Internal leakage,
- Dysfunction or malfunction, and
- Deviation from any other requirement.

Please note that leakage due to one of the sealing plugs (see chapter 11), is not repairable. Please consult UniteQ.

### 4.1 Required Qualification

Every person doing maintenance or trouble shooting on the UniteQ UGP100066 must at least fulfill the following requirements:

- Bachelor degree in mechanical engineering or highly trained mechanic,
- Sufficient experience in pneumatics, and
- Knowledge of safety systems and the process, in particular the effect of defects of the safety function on the process.

### 4.2 Negative test results

If the test results are negative, the unit is generally not suitable for further operation. In consultation with the Approved Monitoring Body, a repair time can be agreed upon, whereby the system can continue to be operated.


If in doubt, let UniteQ advise you.

### 4.3 Preparation

Before commencing work make sure the following is applied:

- Personal protective clothing/items,
- No pressure in the pneumatic system,
- Safety valve fully in safe position,
- Electrical power supply off,
- Clean workspace, and
- Maintenance plan at hand.


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	<b>Warning</b>	Dirt in the pneumatic system causes malfunction and may lead to the loss of the safety function. Make sure no dirt enters the pneumatic system.
		Make sure not to damage parts and surfaces.
		Be aware that the pneumatic system may still be under pressure!

#### **4.4 Changing a valve**

When changing a solenoid valve, unscrew the M5 bolts to remove the solenoid valve. The new solenoid valve can be mounted by tightening the M5 bolts with 7.0 Nm.

When changing a pneumatic valve, unscrew the M6 to remove the cover plate. Take out the pneumatic valve and replace it for an other one. Mount back the cover plat by tightening the M6 bolts with 12 Nm.

	<b>Warning</b>	Dirt in the pneumatic system causes malfunction and may lead to the loss of the safety function. Make sure no dirt enters the pneumatic system.
		Make sure not to damage parts and surfaces
		Be aware that the pneumatic system may still be under pressure


#### **4.5 Changing a seal**

When changing an o-ring or seal make sure that it is changed for the right one. Mind measurements and material specifications!

When installing an o-ring/seal place grease on the contact surface of the o-ring/seal. To ensure proper working order, only use the following grease:

Klübersynth AR 34-401. For data sheet see chapter 11.

When changing an o-ring on a valve, see chapter 4.4.

	<b>Warning</b>	Dirt in the pneumatic system causes malfunction and may lead to the loss of the safety function. Make sure no dirt enters the pneumatic system.
		Be aware that the pneumatic system may still be under pressure

When changing a seal in a plug, screw out the plug by turning it counter clockwise. Be aware a pressure can still exist in the pneumatic system. Change the seal for a new one. Mount the plug by using a torque wrench.

#### **4.6 Part list**

For part list and exploded view see chapter 11.

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#### **4.7 Life expectancy**

The life expectancy of the UGP100066 is 20 years, based on normal operation as described in this manual, regular maintenance and max. 1000 switches per year. The warranty on the product expires after 2 years, in normal use as described in this manual.

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## 5 Surroundings / environment

The UniteQ UGP100066 can only be mounted in an environment that at least fulfills the following properties:

- the maximum admissible environmental temperature for the UGP100066 is between -20°C and 60°C,
- maximum admissible temperature of the surface of the UGP100066 is 80°C,
- make sure the UGP100066 is placed under a roof and can not get wet. This to prevent the air filters might get clogged.
- keep the UGP100066 away from heating sources.

### 5.1 Pneumatic power

The pneumatic power supplied to the UniteQ UGP100066 has to meet the following requirements:

- the continuous available pneumatic pressure shall be minimal 3 bar and maximal 8 bar with a minimal flow. Nominal pressure is 6 bar,
- air quality in accordance with DIN/ISO 8573.1, particle size of max. 5µm, particle density of max. 5 mg/m<sup>3</sup> and quality class 3,
- water content: max. dew point +2°C (quality class 4); an relatively different dewpoint applies to high altitude locations or low ambient temperatures,
- oil content: max. 25 mg oil per 1 m<sup>3</sup> of air (quality class 5) in accordance with DIN/ISO 8573.1 with particle sizes processed by a maintenance unit. If the actuator is operated at temperatures below zero, dry control air must be used.

### 5.2 Electrical

#### 5.2.1 Solenoid valves

Power to a solenoid must meet following requirements:

- Supply voltage 21-27 VDC, and
- Current 0.8 amps.

### 5.3 Transport

When shipping a new or used UniteQ UGP100066 one must make sure no damage occurs during transport. Damage may result from:

- throwing a package,
- high loads on top,

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- overseas shipping,
- dirt going in to open cavity's,
- etc.

To prevent damage:

- make sure all open ports get plugged,
- the UGP100066 should be properly fixed.

### **5.3.1 Stock**

Stocking damage is to be taken into consideration. Think of:

- Keeping it free of daylight,
- Keeping it in a sealed bag,
- Keeping it dry,
- Keeping it at required temperatures (see chapter 5),
- Etc.

### **5.4 Hoisting**

The UniteQ UGP100066 weights less than 25 kilograms. Mounting of the UGP100066 is possible without a crane. However, make sure to be safe in case the UGP100066 falls down, e.g. do not stand underneath.

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## 6 Certifications


### 6.1 TRD certification

The UniteQ 1oo3 pneumatic manifold line, which includes the UGP100066, has been validated by the TÜV in accordance with the PED directive 2014/68/EU.

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## 7 State of product

### 7.1 Taking into operation

	<b>Note</b> Before mounting the pneumatic tubing to de UniteQ UGP100066, the tubing must be cleaned for a sufficient amount of time to be sure that the tubing is clean, in accordance to ISO23309.
---	--

Follow the steps below to take the UniteQ UGP100066 in operation:

- Mount the UGP100066 to the actuator, see chapter 8.1.1,
- install tubing, see chapter 8.1.2,
- install the electrical signals, see chapter 5.2,
- supply air pressure to the system, according to specifications in chapter 5.1,

After these steps commissioning may begin.

### 7.2 Normal operation

During normal operation the 'pressurize' function is active, see chapter 3.4.1 and actuator is retracted/extracted against spring force.

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## 8 Mounting

### 8.1 Mounting manifold

#### 8.1.1 Mounting manifold on safety actuator

The UniteQ UGP100066 should be mounted to the safety actuator with a mounting bracket. Make sure that the mounting bracket is of a sufficient strength. The mounting bracket can be connected to the four M8 holes of the manifold. For the position of the holes see chapter 11. The UniteQ UGP100066 can be delivered with custom made mounting brackets that will fit on your safety actuator.

#### 8.1.2 Mounting pneumatic piping to safety actuator

For pneumatic connection from manifold to safety actuator, use the hole on the side of the UGP100066. Description near the hole on the UGP100066 stands for:

A : pressurised side (G1 to NEN167),

For the location of the holes see drawing UGP100066 in chapter 11.

### 8.2 Mounting pneumatic piping

For pneumatic connection from manifold to cylinder, use the hole on the side of the UGP100066 and the connection on the front of the UGP100066. Description near the hole/connection on the MAN100071.01 stands for:

P : Pressure line (G1 to NEN167),

MP : Control line (G1/4 to NEN167),

For the location of the holes see drawing UGP100066 in chapter 11.

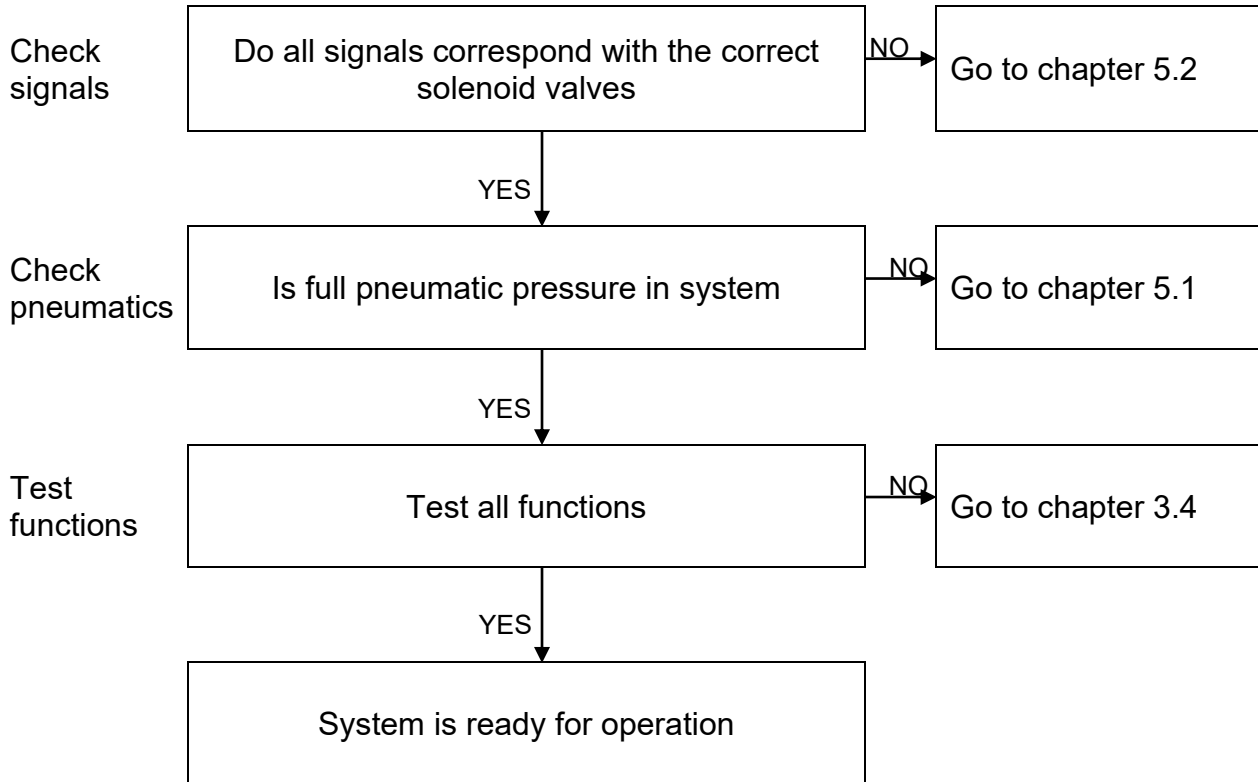
Optional, instead of connecting the control line MP, the plug1 can be removed. The pressure that is supplied on the P line will then internally supply the control line MP.

### 8.3 Measurements

Total dry weigh of the UniteQ UGP100066 is 10 kilograms. For measurements see chapter 11.

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## 9 Commissioning



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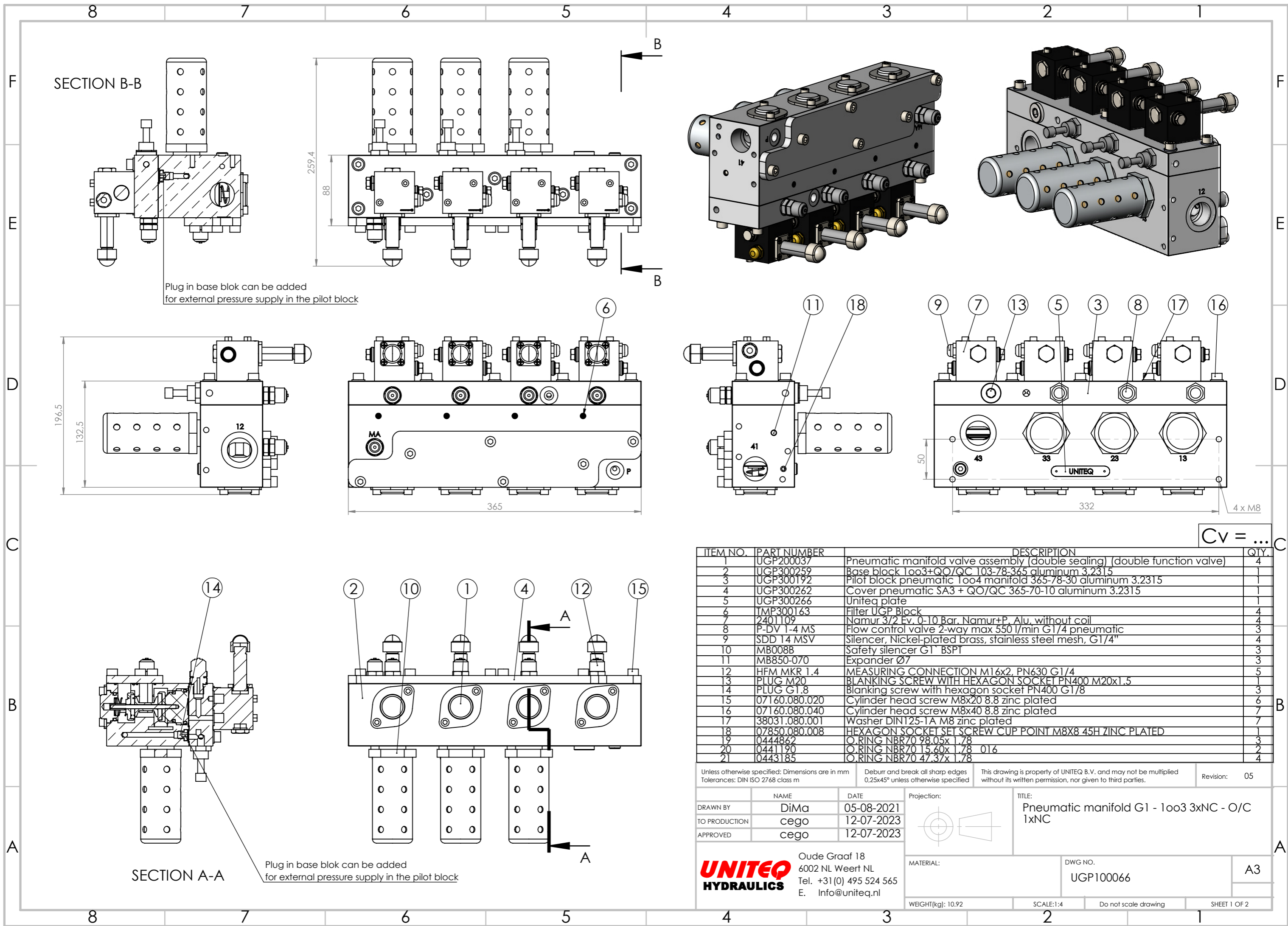


## 11 Attachments

Documents are in English

- Assembly drawing & part list UGP100066
- Documentation on all valves,
- Documentation on connectors.

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Cv = ...

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	UGP200037	Pneumatic manifold valve assembly (double sealing) (double function valve)	4
2	UGP300259	Base block 1oo3+QO/QC 103-78-365 aluminum 3.2315	1
3	UGP300192	Pilot block pneumatic 1oo4 manifold 365-78-30 aluminum 3.2315	1
4	UGP300262	Cover pneumatic SA3 + QO/QC 365-70-10 aluminum 3.2315	1
5	UGP300266	Uniteq plate	1
6	TMP300163	Filter UGP Block	4
7	2401109	Namur 3/2 Ev. 0-10 Bar, Namur+P, Alu, without coil	4
8	P-DV 1-4 MS	Flow control valve 2-way max 550 l/min G1/4 pneumatic	3
9	SDD 14 MSV	Silencer, Nickel-plated brass, stainless steel mesh, G1/4"	4
10	MB008B	Safety silencer G1" BSPT	3
11	MB850-070	Expander Ø7	3
12	HFM MKR 1.4	MEASURING CONNECTION M16x2, PN630 G1/4	5
13	PLUG M20	BLANKING SCREW WITH HEXAGON SOCKET PN400 M20x1.5	1
14	PLUG G1/8	Blanking screw with hexagon socket PN400 G1/8	3
15	07160.080.020	Cylinder head screw M8x20 8.8 zinc plated	6
16	07160.080.040	Cylinder head screw M8x40 8.8 zinc plated	7
17	38031.080.001	Washer DIN125-1A M8 zinc plated	7
18	07850.080.008	HEXAGON SOCKET SET SCREW CUP POINT M8X8 45H ZINC PLATED	1
19	0444862	O.RING NBR70 98.05x 1.78	3
20	0441190	O.RING NBR70 15.60x 1.78 016	2
21	0443185	O.RING NBR70 47.37x 1.78	4

Unless otherwise specified: Dimensions are in mm  
Tolerances: DIN ISO 2768 class m

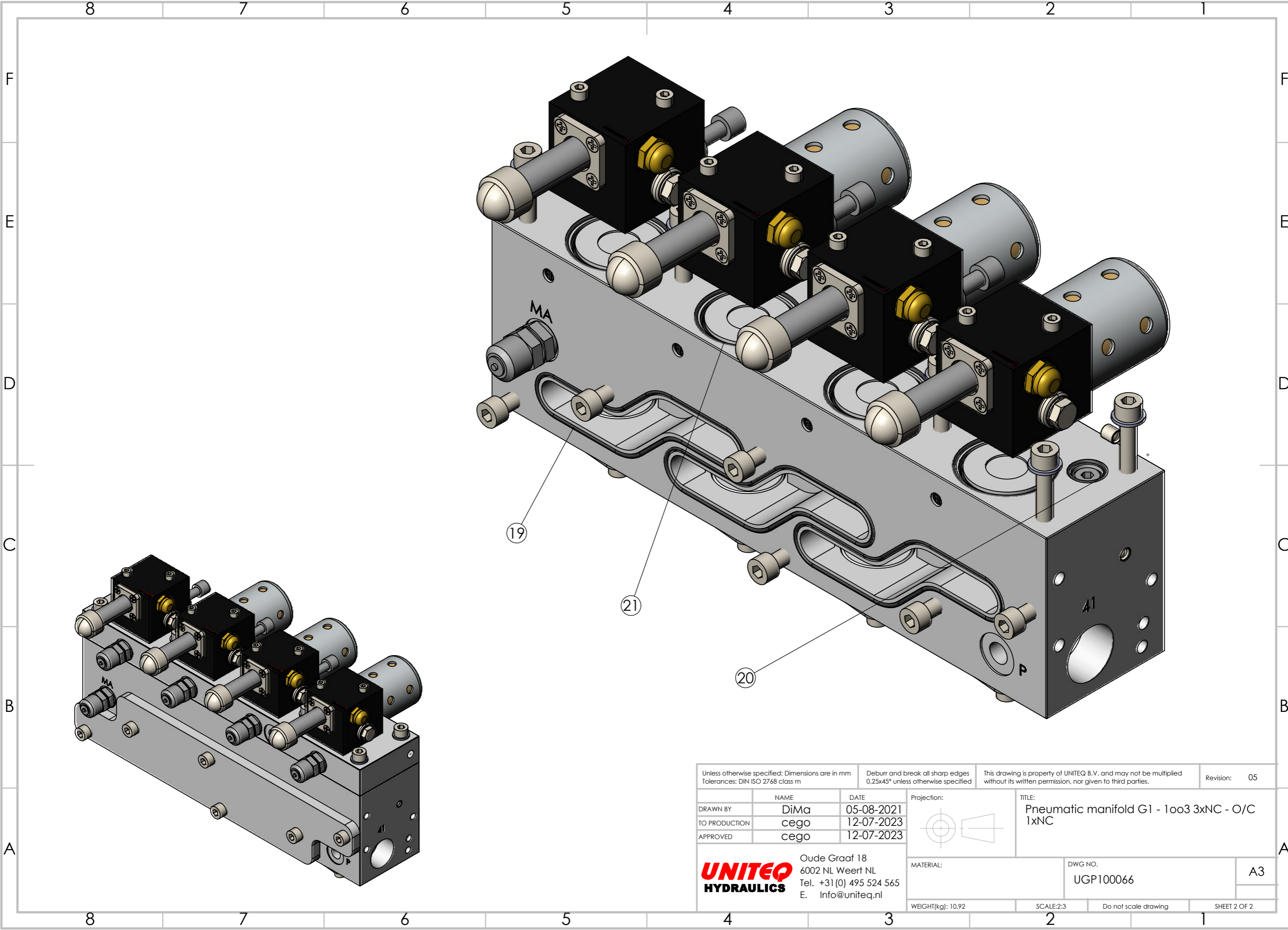
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0,25x45° unless otherwise specified

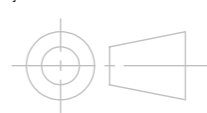

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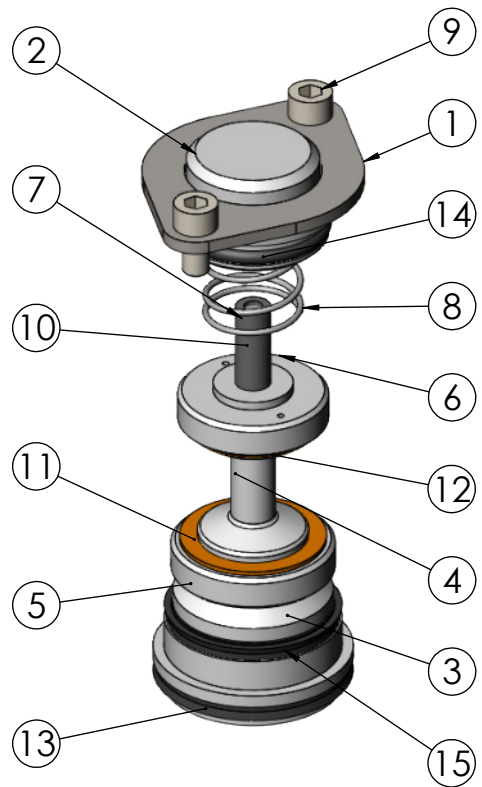
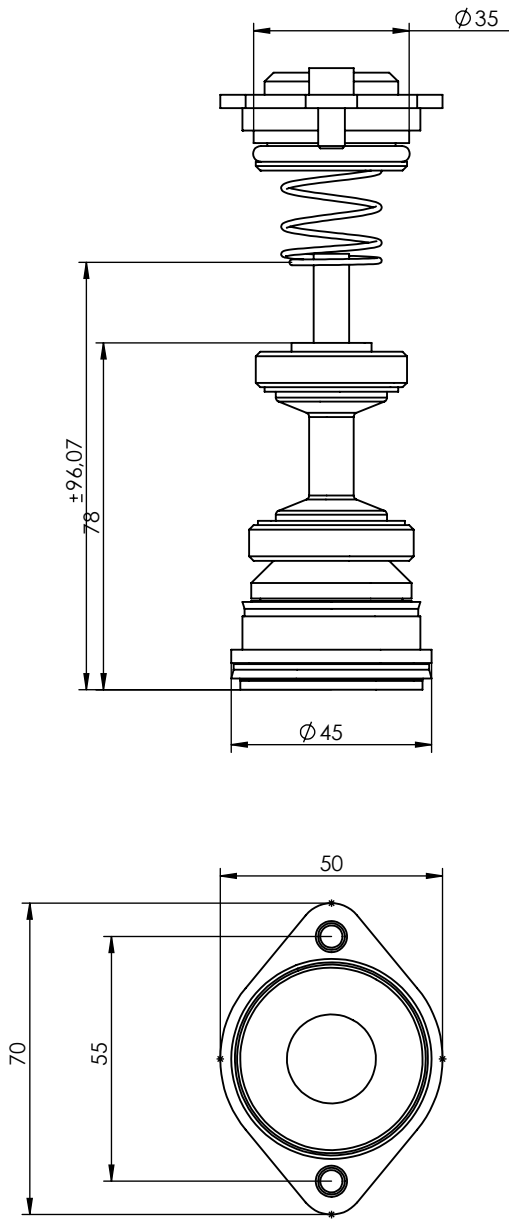
Revision: 05

DRAWN BY	DiMa	DATE	05-08-2021	Projection: 	TITLE: Pneumatic manifold G1 - 1oo3 3xNC - O/C 1xNC
TO PRODUCTION	cego	DATE	12-07-2023		
APPROVED	cego	DATE	12-07-2023		

 Oude Graaf 18 6002 NL Weert NL Tel. +31(0) 495 524 656 E. Info@uniteq.nl	MATERIAL:	DWG NO.	A3
	UGP100066		
WEIGHT(kg): 10.92	SCALE:1:4	Do not scale drawing	SHEET 1 OF 2



Unless otherwise specified: Dimensions are in mm Tolerances: DIN ISO 2768 class m			Deburr and break all sharp edges 0,25x45° unless otherwise specified		This drawing is property of UNITEQ B.V. and may not be multiplied without its written permission, nor given to third parties.		Revision: 05	
NAME		DATE		Projection:		TITLE:		
DRAWN BY		DiMa		05-08-2021		Pneumatic manifold G1 - 1oo3 3xNC - O/C 1xNC		
TO PRODUCTION		cego		12-07-2023				
APPROVED		cego		12-07-2023				
				Oude Graaf 18 6002 NL Weert NL Tel. +31 (0) 495 524 565 E. Info@uniteq.nl			MATERIAL:	
				DWG NO. UGP100066			A3	
WEIGHT(kg): 10.92			SCALE:2:3		Do not scale drawing		SHEET 2 OF 2	



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	UGP300156	Cover plate 70-50-3 Ø31 stainless steel 1.4301	1
2	UGP300194	Valve cap Ø40 L=22 hole Ø 8.3 aluminum 3.2315	1
3	UGP300236	Valve piston Ø45 L=29 POM	1
4	UGP300162	Valve distance sleeve Ø25 L=29 POM	1
5	UGP300161	Seat sealing Ø33 37-8-5 POM	1
6	UGP300160	Seat sealing Ø30 34-10-5 POM	1
7	UGP300195	Piston guide pen Ø5 L=81,5 (for double working valve) stainless steel 1.4301	1
8	DRKV07568	Coil spring Do 21,3 Thread 1,3 L0 25,8 mm	1
9	07160.060.012	Cylinder head screw M6x12 8.8 zinc plated	2
10	11401.050.020	Round connection nut M5X20 Zinc plated	1
11	0546589	Seal ring PU 70 33x4.7x5	1
12	0546588	Seal ring PU 70 30x4.7x5	1
13	1356550	Piston seal pneumatic P/DEM 75.00x63.00x 8.2/8.5 PU Z8	1
14	0442130	O.RING NBR70 28.17x 3.53 216	1
15	0358222	Piston seal pneumatic P/DEM 40x32x3.25/3.5 PU Z8	1

Unless otherwise specified: Dimensions are in mm  
Tolerances: DIN ISO 2768 class m

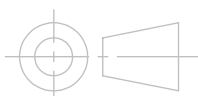
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0.25x45° unless otherwise specified

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Revision: 01

NAME	DATE
DRAWN BY: DiMa	19-04-2021
TO PRODUCTION: cego	06-12-2021
APPROVED: dima	21-04-2021

Projection:



TITLE:

Pneumatic manifold valve assembly (double sealing) (double function valve)

**UNITEQ**  
**HYDRAULICS**

Oude Graaf 18  
6002 NL Weert NL  
Tel. +31(0) 495 524 565  
E. Info@uniteq.nl

MATERIAL:

DWG NO.

UGP200037

A4

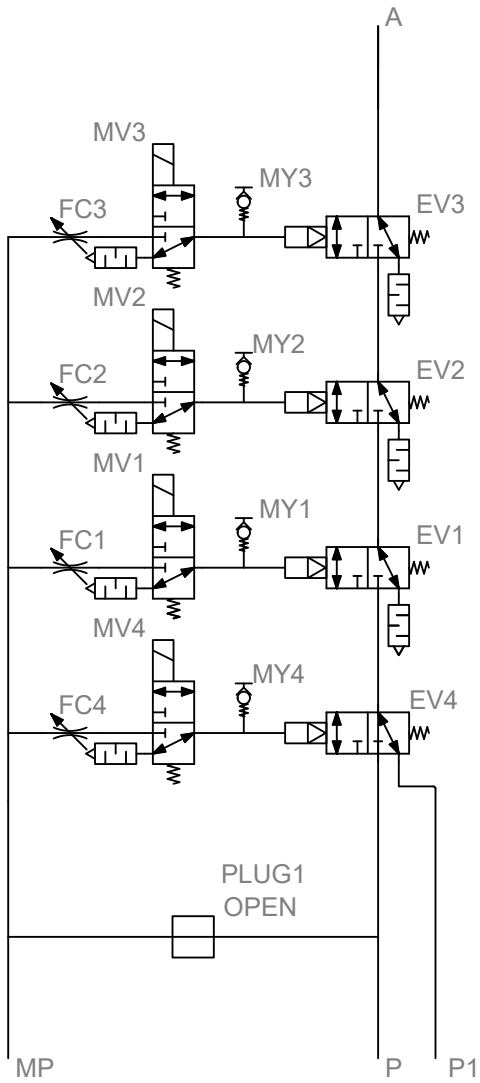
WEIGHT(kg): 0.18

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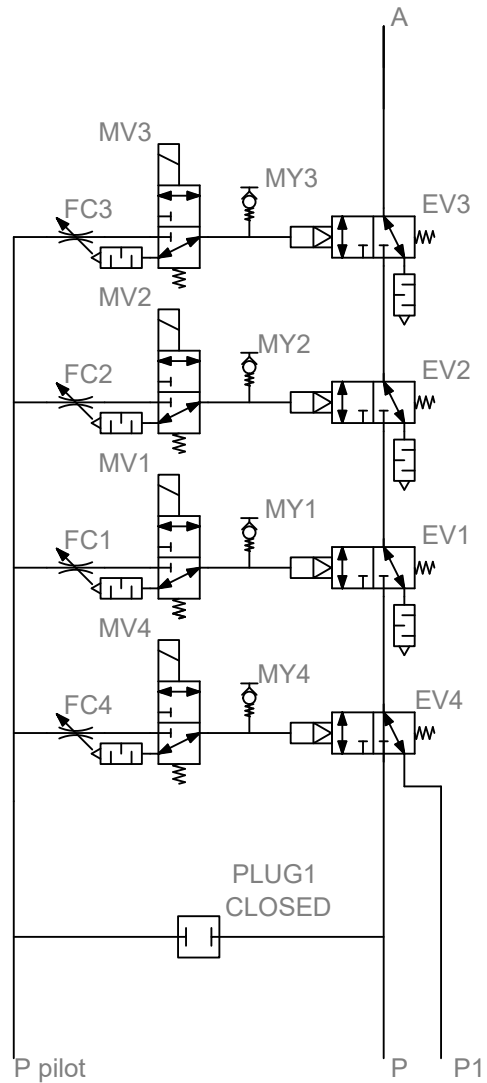
Do not scale drawing

SHEET 1 OF 1

OPEN / CLOSE



CONTROL



Drawn:	Checked:	Approved:	Date: 06.07.2020	Title UGP100050		
		Peelterbaan 8 6002 NK Weert (NL) T: +31(0)495-524565 F: +31(0)495-524506 E: info@uniteq.nl www.uniteqhydraulics.com		Projection: 	Client:	Scale: 1:1.5
		Project no: n/a	Drawing no: UGP100050	Status:	Revision: 01	Sheet: A4

- > Port size: 1/4" (ISO G or NPT), NAMUR Interface
- > Main application: Single and double acting actuators
- > TÜV-approval based on type examination DGRL 97/23/EC and IEC 61508, multichannel up to SIL 3 (12 years)
- > Add-on manual override or inductive limit switches on request
- > Suited for outdoor use under critical environment conditions.
- > Variable valve solenoid combination



### Technical features

#### Medium:

Compressed air, filtered, non-lubricated and dry. Other gas and liquid fluids on request. (Viscosity for gaseous or liquid fluids up to 40 mm<sup>2</sup>/s)

#### Operation:

Direct solenoid operated poppet valve

#### Operating pressure:

0 ... 10 bar (0 ... 145 psi)

#### Orifice:

5 mm

#### Flow:

Gaseous fluids: 340 l/min  
Liquid fluids: Cv 0,34

#### Port size:

G1/4, 1/4 NPT  
NAMUR Interface with integrated recirculation from the exhaust air to the actuator spring chamber

#### Flow direction:

Optional

#### Mounting position:

Any, but preferably with solenoid vertical

#### Ambient/Media temperature:

NBR: -25 ... +80°C (-13 ... +176°F)  
FPM: -10...+120°C (+14 ... +248°F)  
Water +95°C (+203°F)  
VMQ: -40... +60°C (-40 ... +140°F)  
Depending on solenoid system  
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).  
For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

#### Materials:

Body: Aluminium anodized (suitable for high humidity, sulphuric, sodium chloride or ammonia environments), brass 2.0401 (Ms 58) or stainless steel 1.4404 (316 L)  
Seal: FPM, NBR, VMQ  
Inner parts: stainless steel, brass

#### Flow conversion:

Cv US Gallon/min (water) =  
l/min (air) x 0,001  
Kv m<sup>3</sup>/h (water) =  
l/min (air) x 0,000906

### Technical data

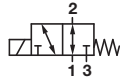
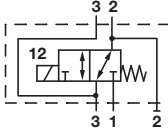
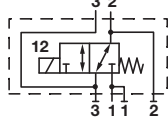
#### Housing: Brass

Symbol	Port size	Orifice (mm)	Operating pressure (bar) (psi)	Material Seal seal	Manual override	Test certificate IEC 61508 97/23/EC	Weight (kg)	Drawing No.	Solenoid group	Model *1)
	G1/4	5	0 ... 10 0 .. 145	NBR	Not possible	X —	0,65	1	A + B	2401103
	G1/4	5	0 ... 10 0 .. 145	NBR	Push only	X —	0,70	1	A + B	2401107
	G1/4	5	0 ... 10 0 .. 145	NBR	Turn and lock	— —	0,70	1	A + B	2401119
	G1/4	5	0 ... 10 0 .. 145	NBR	Not possible	X X	0,65	1	A + B	2401149
	G1/4	5	0 ... 10 0 .. 145	FPM	Not possible	X —	0,65	1	A + B	2401126
	G1/4	5	0 ... 10 0 .. 145	VQM	Not possible	X —	0,65	1	A + B	2401153
	G1/4	5	0 ... 10 0 .. 145	VQM	Semi automatic	X —	0,70	1	A + B	2401154
	1/4 NPT	5	0 ... 10 0 .. 145	NBR	Not possible	X X	0,65	1	A + B	2401138
	1/4 NPT	5	0 ... 10 0 .. 145	NBR	Push only	X —	0,70	1	A + B	2401148
	1/4 NPT	5	0 ... 10 0 .. 145	NBR	Turn and lock	— —	0,70	1	A + B	2401136
	1/4 NPT	5	0 ... 10 0 .. 145	NBR	Semi automatic	X —	0,70	1	A + B	2401140
	1/4 NPT	5	0 ... 10 0 .. 145	FPM	Not possible	X —	0,65	1	A + B	2401131
	1/4 NPT	5	0 ... 10 0 .. 145	VQM	Not possible	X —	0,65	1	A + B	2401106
	1/4 NPT	5	0 ... 10 0 .. 145	VQM	Push only	X —	0,70	1	A + B	1025226

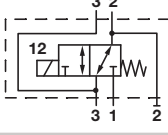
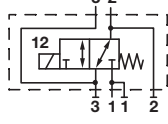
\*1) When ordering please indicate solenoid, voltage and current type (frequency).

• Particular for valves with TÜV approval and attachment in plants based on safety standard IEC 61511, taking into account to the operating and maintenance instructions document 7503444.

### Housing: Stainless steel

Symbol	Port size	Orifice (mm)	Operating pressure (bar)	Material Seat seal	Manual override	Test certificate		Weight (kg)	Drawing No.	Solenoid group	Model *1)
						IEC 61508	97/23/EC				
	G1/4	5	0 ... 10	NBR	Not possible	X	X	0,65	2	A + B	2401186
	1/4 NPT	5	0 ... 10	NBR	Not possible	X	X	0,65	2	A + B	2401112
	1/4 NPT	5	0 ... 10	FPM	Semi automatic	—	—	0,70	2	A + B	2401146
	1/4 NPT	5	0 ... 10	FPM	Not possible	—	—	0,65	2	A + B	1025227
	G1/4	5	0 ... 10	FPM	Not possible	—	—	0,70	2	A	2401127 *2)
	G1/4	5	0 ... 10	FPM	Push only	—	—	0,70	2	A	2401170 *2)
	G1/4	5	0 ... 10	FPM	Turn and lock	—	—	0,70	2	A	2401139 *2)
	G1/4	5	0 ... 10	VMQ	Not possible	—	X	0,65	2	A	2401155 *2)
	1/4 NPT	5	0 ... 10	FPM	Not possible	—	—	0,65	2	A	2401147 *2)
	1/4 NPT	5	0 ... 10	VMQ	Not possible	—	X	0,65	2	A	2401168 *2)
	NAMUR G1/4	5	0 ... 10	NBR	Without	X	—	1,00	2	A + B	2401196
	NAMUR G1/4	5	0 ... 10	VQM	Without	—	—	1,00	2	A	2401142
	NAMUR G1/4	5	0 ... 10	NBR	Without	X	X	1,00	3	A + B	1025212 *3)
	NAMUR 1/4 NPT	5	0 ... 10	NBR	Without	X	X	1,00	3	A + B	1025328 *3)

### Housing: Aluminium anodized

Symbol	Port size	Orifice (mm)	Operating pressure (bar)	Material Seat seal	Manual over-ride	Test certificate		Weight (kg)	Drawing No.	Solenoid group	Model *1)
						IEC 61508	97/23/EC				
	NAMUR G1/4	5	0 ... 10	NBR	Without	X	X	0,55	3	A + B	2401191
	NAMUR G1/4	5	0 ... 10	NBR	Without	X	X	0,55	3	A + B	2401116 *4)
	NAMUR G1/4	5	0 ... 10	NBR	Without	—	—	0,70	5	A + B	1025333 *5)
	NAMUR 1/4 NPT	5	0 ... 10	NBR	Without	X	X	0,55	3	A + B	1025254
	NAMUR G1/4	5	0 ... 10	VQM	Without	X	—	0,55	3	A + B	2401133
	NAMUR G1/4	5	0 ... 10	NBR	Without	X	X	0,55	4	A + B	2401109 *3)

\*1) When ordering please indicate solenoid, voltage and current type (frequency).

\*2) Complete stainless steel version

\*3) Port P in flange according to VDI/VDE 3845 for attachment of positioners or to interlinking plate (see data sheet N/en 5.8.300)

\*4) Free of non-ferrous metals

\*5) Proximity switch

• Particular for valves with TÜV approval and attachment in plants based on safety standard IEC 61511, taking into account to the operating and maintenance instructions document 7503444.

**Solenoids group A, standard voltages**

	Power consumption		Rated current		Protection class IP/NEMA	Ex-Protection (ATEX-Category)	Temperature Ambient/ Media (°C)	Electrical connection	Weight (kg)	Drawing No.	Circuit diagram No.	Model
	24 V d.c. (W)	230 V a.c. (VA)	24 V d.c. (mA)	230 V a.c. (mA)								
	16,9	—	703	—	IP65 (with connector)	—	-25 ... +60 Media: +80 max	Connector DIN EN 175301-803, Form A *1)	0,26	3	1	0800
	—	17,3	—	75	IP65 (with connector)	—	-25 ... +60 Media: +80 max	Connector DIN EN 175301-803, Form A *1)	0,35	4	6	3803
	8,9	—	369	—	IP65	—	-30...+90 Media: +110	Terminals, cable gland Pg 13,5	0,5	9	2	4120
	—	10	—	43	IP65	—	-30...+90 Media: +110	Terminals, cable gland Pg 13,5	0,5	9	6	4121
	8,9	—	369	—	IP67	—	-30...+90 Media: +110	3 m cable, encapsulated in EP resin	0,7	9	2	4122
	—	10	—	43	IP67	—	-30...+90 Media: +110	3 m cable, encapsulated in EP resin	0,7	9	6	4123
	8,9	—	369	—	IP66 (with cable gland)	II 2 G Ex e mb IIC T4/ T5 Gb II 2 D Ex tb IIC T130°C Db IP66	T4: -40 ... +65 T5: -40 ... +55 -40 ... +65	M20 x 1,5 *1)	0,5	6	4	4270
	—	10,0	—	43	IP66 (with cable gland)	II 2 G Ex e mb IIC T4/ T5 Gb II 2 D Ex tb IIC T130°C Db IP66	T4: -40 ... +65 T5: -40 ... +55 -40 ... +65	M20 x 1,5 *1)	0,5	6	7	4271
	8,9	—	369	—	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	1/2 NPT *1)	0,8	7	20	4670
	—	10,0	—	43	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	1/2 NPT *1)	0,8	7	21	4671
	8,9	—	369	—	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	M20 x 1,5 *1)	0,8	7	20	4672
	—	10,0	—	43	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	M20 x 1,5 *1)	0,8	7	21	4673
	8,9	—	369	—	IP66 (with cable gland)	II 2 G Ex mb d IIC T4/T6 II 2 G Ex mb e II T4/T6	T4: -40 ... +50 T6: -40 ... +40	M20 x 1,5 *1)	1,2	10	4	4872
	—	10	—	43	IP66 (with cable gland)	II 2 G Ex mb d IIC T4/T6 II 2 G Ex mb e II T4/T6	T4: -40 ... +50 T6: -40 ... +40	M20 x 1,5 *1)	1,2	10	7	4873
	13,6	—	567	—	NEMA 4, 4X, 6, 6P, 7, 9	XP/DIP, Div. 1 & 2 Cl. I, Gr. A-D Cl. II/III, Gr. E-G T3 (160°C)	-20 ... +60	Flying leads 450 mm	0,5	8	1	3826
	—	15,7	—	68	NEMA 4, 4X, 6, 6P, 7, 9	XP/DIP, Div. 1 & 2 Cl. I, Gr. A-D Cl. II/III, Gr. E-G T3 (160°C)	-20 ... +60	Flying leads 450 mm	0,5	8	5	3827

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

\*1) Connector/cable gland is not scope of delivery, see table »Accessories«

Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland. Example: if an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.

**Approvals**

Model	Approvals ATEX	IECEX	FM	Datasheet
382x	—	—	CSA-LR 57643-6	N/en 7.1.575
42xx	KEMA 98 ATEX 4452 X	IECEX KEM 09.0068X	—	N/en 7.1.580

**Approvals**

Model	Approvals ATEX	IECEX	Datasheet
46xx	PTB 02 ATEX 2085 X	IECEX PTB 11.0094X	N/en 7.1.585
48xx	PTB 06 ATEX 2054 X	IECEX PTB 07.0039X	N/en 7.1.590

Solenoids group B, standard voltages

	Power consumption		Rated current		Protection class IP/NEMA	Ex-Protection (ATEX-Category)	Temperature Ambient/ Media (°C)	Electrical connection	Weight (kg)	Drawing No.	Circuit diagram No.	Model
	24 V d.c. (W)	230 V a.c. (VA)	24 V d.c. (m A)	230 V a.c. (m A)								
	6,8	—	284	—	IP65 (with connector)	—	-25 ... +60	Connector DIN EN 175301-803, form A *1)	0,33	2	1	0827
	—	10,6	—	46	IP65 (with connector)	—	-25 ... +60	Connector DIN EN 175301-803, form A *1)	0,34	3	6	3805
	3,9	—	162	—	IP65	—	-30...+100 Media: +110	Terminals, cable gland Pg 13,5	0,5	9	2	4140
	—	5,3	—	23	IP65	—	-30...+100 Media: +110	Terminals, cable gland Pg 13,5	0,5	9	6	4141
	3,9	—	162	—	IP67	—	-30...+100 Media: +110	3 m cable, encapsulated in EP resin	0,7	9	2	4142
	—	5,3	—	23	IP67	—	-30...+100 Media: +110	3 m cable, encapsulated in EP resin	0,7	9	6	4143
	3,9	—	162	—	IP66 (with cable gland)	II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIIC T130°C Db IP66	T4: -40 ...+80 T6: -40 ... +55 -40 ...+80	M20 x 1,5 *1)	0,6	6	4	4260
	—	5,3	—	23	IP66 (with cable gland)	II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIIC T130°C Db IP66	T4: -40 ...+80 T6: -40 ... +55 -40 ...+80	M20 x 1,5 *1)	0,6	6	7	4261
	3,9	—	162	—	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIIC T130°C Db	T4: -40 ...+80 T6: -40 ... +55 -40 ...+80	1/2 NPT *1)	0,8	7	20	4660
	—	5,3	—	23	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIIC T130°C Db	T4: -40 ...+80 T6: -40 ... +55 -40 ...+80	1/2 NPT *1)	0,8	7	21	4661
	3,9	—	162	—	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIIC T130°C Db	T4: -40 ...+80 T6: -40 ... +55 -40 ...+80	M20 x 1,5 *1)	0,8	7	20	4662
	—	5,3	—	23	IP66 (with cable gland)	II 2 G Ex d mb IIC T4/ T6 Gb II 2 G Ex e mb IIC T4/ T6 Gb II 2 D Ex tb IIIC T130°C Db	T4: -40 ...+80 T6: -40 ... +55 -40 ...+80	M20 x 1,5 *1)	0,8	7	21	4663
	8,9	—	369	—	NEMA 4, 4X, 6, 6P, 7, 9	XP/DIP, Div. 1 & 2 Cl. I, Gr. A-D Cl. II/III, Gr. E-G T3 (160°C)	-20 ... +60	Flying leads 450 mm	0,5	8	1	3824
	—	9,5	—	41	NEMA 4, 4X, 6, 6P, 7, 9	XP/DIP, Div. 1 & 2 Cl. I, Gr. A-D Cl. II/III, Gr. E-G T3 (160°C)	-20 ... +60	Flying leads 450 mm	0,5	8	5	3825

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

\*1) Connector/cable gland is not scope of delivery, see table »Accessories«

Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland.

Example: if an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.

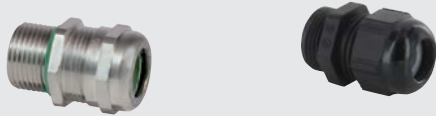
Approvals

Model	Approvals ATEX	IECEX	FM	Datasheet
372x, 382x	—	—	CSA-LR 57643-6	N/en 7.1.575
42xx	KEMA 98 ATEX 4452 X	IECEX KEM 09.0068X	—	N/en 7.1.580
46xx	PTB 02 ATEX 2085 X	IECEX PTB 11.0094X	—	N/en 7.1.585

## Accessories

### Electrical connection

Cable gland  
Protection class  
Ex e, Ex d



Page 9

Thread	Cable Ø (mm)	Materials	Protection class (ATEX)	Model
M20 x 1,5	5 ... 8	Nickel plated brass	II 2 GD Ex e	0588819
M20 x 1,5	10 ... 14	Nickel plated brass	II 2 GD Ex d	0588851
1/2 NPT	7,5 ... 11,9	Nickel plated brass	II 2 GD Ex d	0588925
M20 x 1,5	9 ... 13	Stainless steel 1.4571 (316 Ti)	II 2 GD Ex e	0589385
M20 x 1,5	7 ... 12	Stainless steel 1.4404 (316 L)	II 2 GD Ex d	0589395
M20 x 1,5	10 ... 14	Stainless steel 1.4404 (316 L)	II 2 GD Ex d	0589387
M20 x 1,5	5 ... 9	Plastic (PA)	—	0110854
M20 x 1,5	6 ... 12	Plastic (PA)	—	0110855

## Accessories

Connector for proximity switch  
4-pin, 90°



Page 12

0523058  
(2 m cable, 4-core)

0523053  
(5 m cable, 4-core)

4-pin, 90°



Page 12

0523056  
(without cable)

4-pin, straight



Page 12

0523057  
(2 m cable, 4-core)

0523052  
(5 m cable, 4-core)

4-pin, straight



Page 12

0523055 (wi hout cable)

Connector  
DIN EN 175301-803



0570275 (form A)

Silencer \*1)



Page 10

C/S2 (1/8 NPT)  
M/S2 (G1/8)

Exhaust guard \*2)



Page 10

0613422 (G1/4, 1/4 NPT)

Filter



Page 10

0681173 (G1/4, 1/4 NPT)

Add-on manual override \*3)  
Without detent



Page 7

0600205

with detent



Page 7

0601765

\*1) For indoors use

\*2) For outdoors use, opening pressure ~ 0,2 bar

\*3) Add on for NAMUR valves always possible, Inline on request  
Using the manual override with detent cancels the SIL-Approval!

### Manual Override

The manual override is meant to be used for system testing. Upon de-energisation of the coil the valve returns to rest position by mechanical spring force (for testing only prior to commissioning).

### Semi automatic/Manual reset

Function: The valve does not switch after energisation of the coil. It will only operate if the reset button is being pushed. The valve will then, by means of the coil voltage, be held in its switching position even if the reset button is being released. It will return to rest position when the coil is being de-energised. Allowable voltage tolerance: +/- 10%.

**NAMUR accessories**

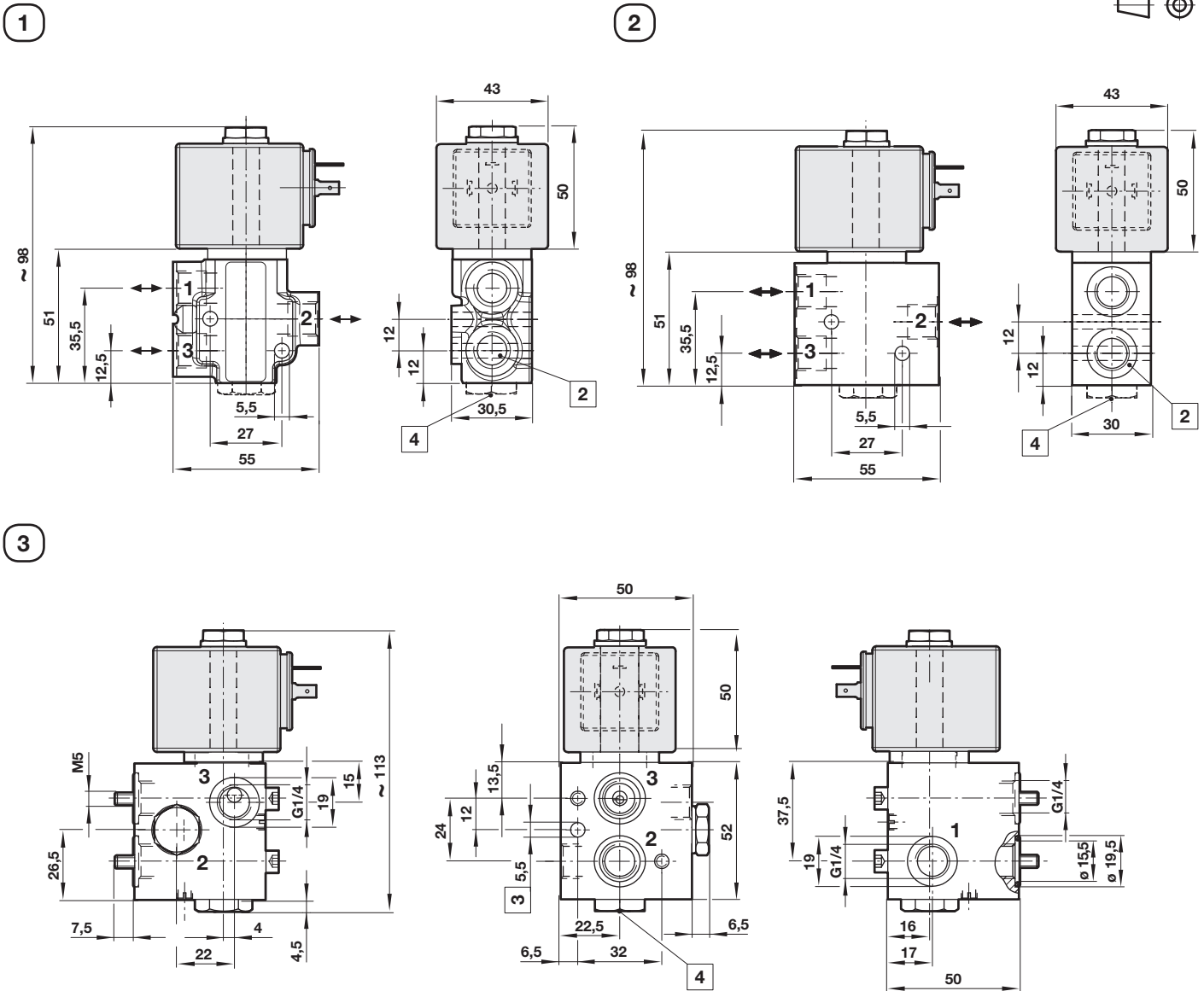
Throttle control plate *1)	Flange plate	Yoke	Distance plate for pressure switches	Mounting plate	Quick exhaust module *2)
Page 11	Page 10 & 11	Page 11	Page 11	Page 11	
4040239	0612790 (NAMUR single connection plate) 0612791 (NAMUR-rip use in combination with 0612790)	0540593	0540109	0613453 (90°) 0612631 (180°) 0613556 (270°)	4050218

\*1) The throttle control plate 4040239 has a minimum flow rate for safety reason.

\*2) Technical details see catalogue page en 5.4.820.

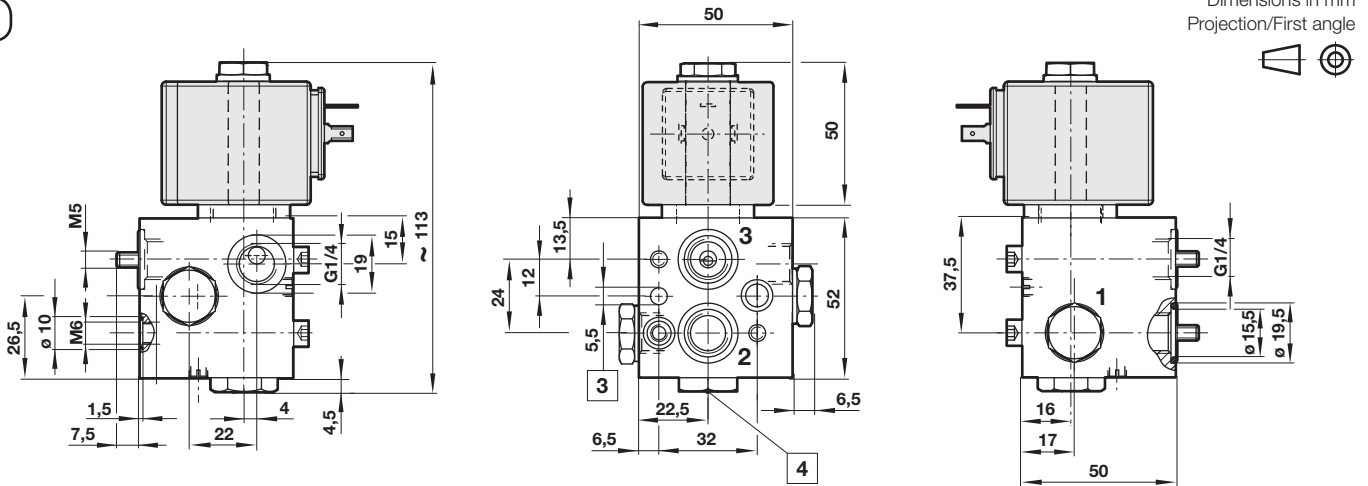
**Drawings  
Valves**

Dimensions in mm  
Projection/First angle



- ② Port size G1/4 or 1/4 NPT
- ③ 3 mm deep
- ④ Retrofit option for manual override

4

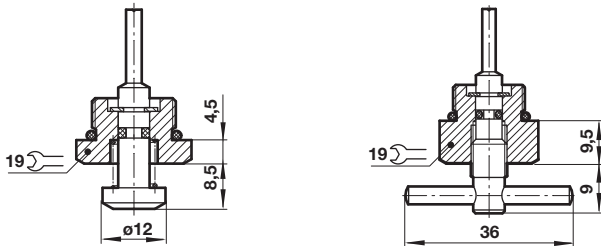


- 2 Port size G1/4 or 1/4 NPT
- 3 3 mm deep
- 4 Retrofit option for manual override

### Add-on manual override

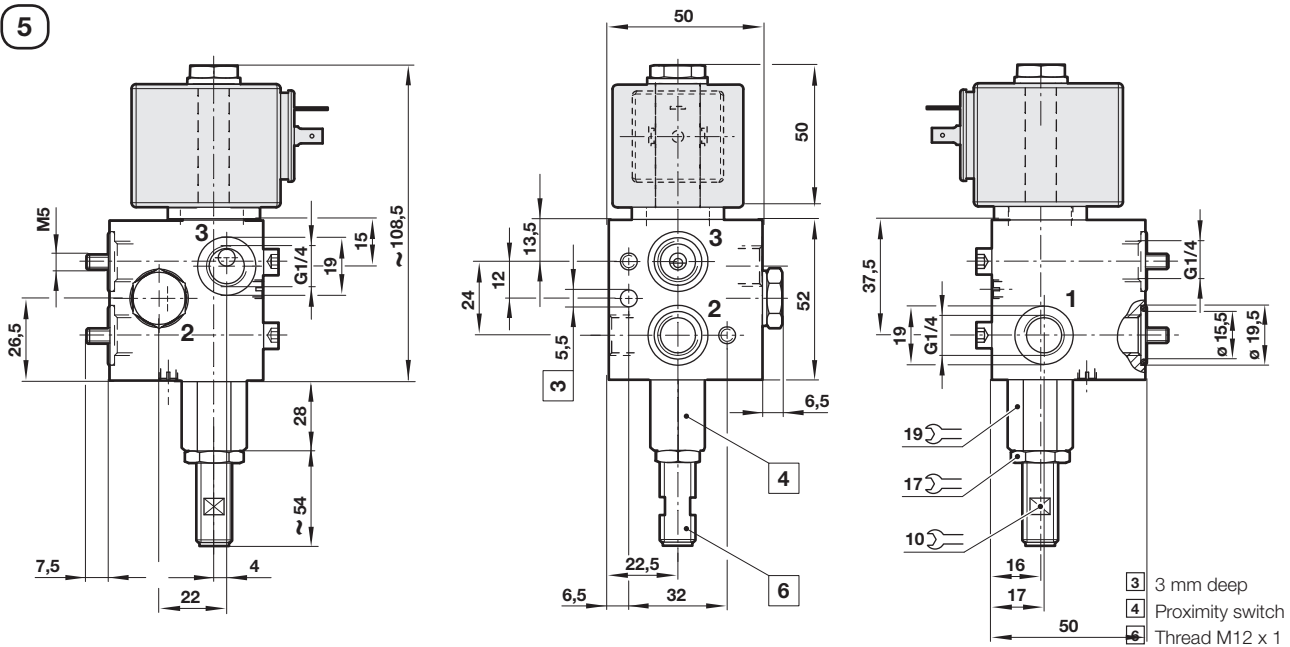
Without detent  
Model: 0600205

With detent  
Model: 0601765



Please note: add-on manual override for NAMUR valves provided only for commissioning and tests

5



- 3 3 mm deep
- 4 Proximity switch
- 6 Thread M12 x 1

### Proximity switch Technical features

**Supply voltage (U<sub>b</sub>):**

7,7 ... 9 V d.c.

**Ripple:**

15%

**Frequency of operating cycles:**

1000 Hz

**Protection class:**

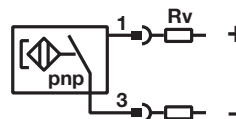
IP68

**Pressure-resistant:**

500 bar (7251 psi)

**Ambient temperature:**

-25 ... +70°C (-13 ... +158°F)

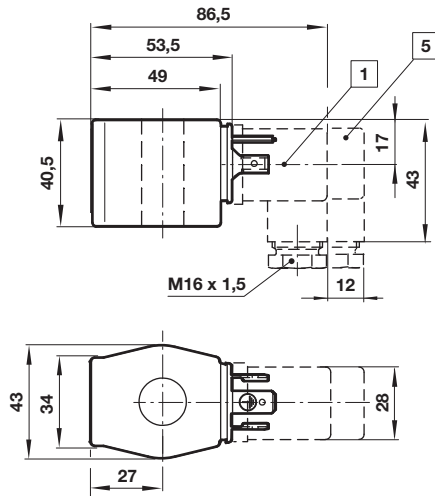


Solenoids

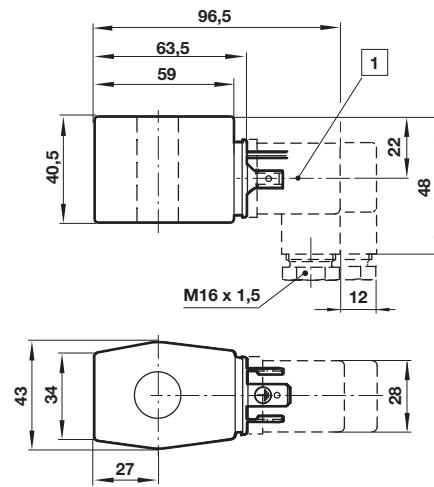
Dimensions in mm  
Projection/First angle



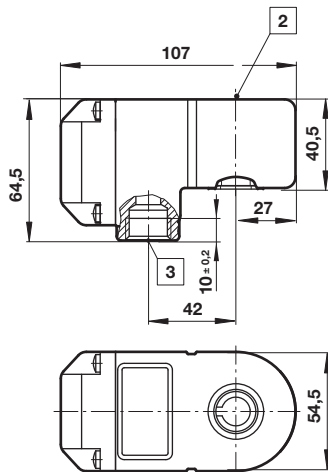
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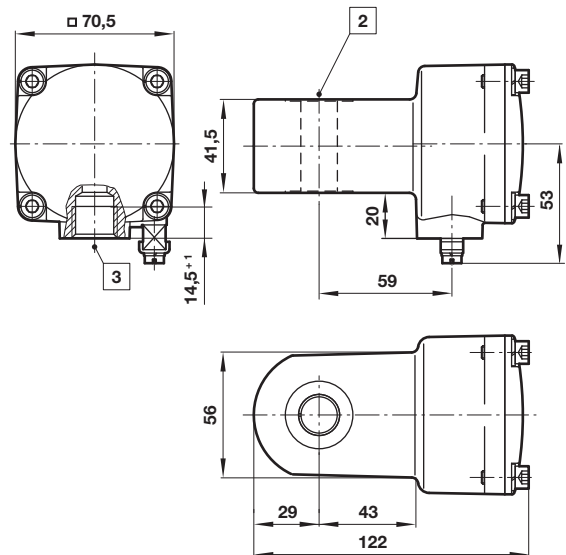
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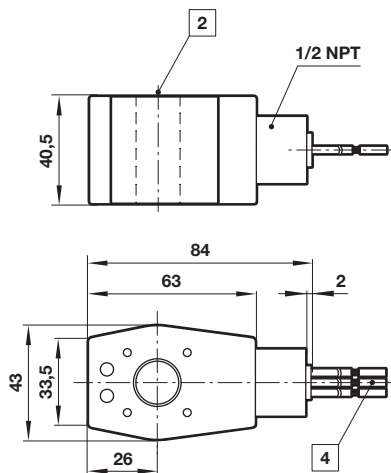
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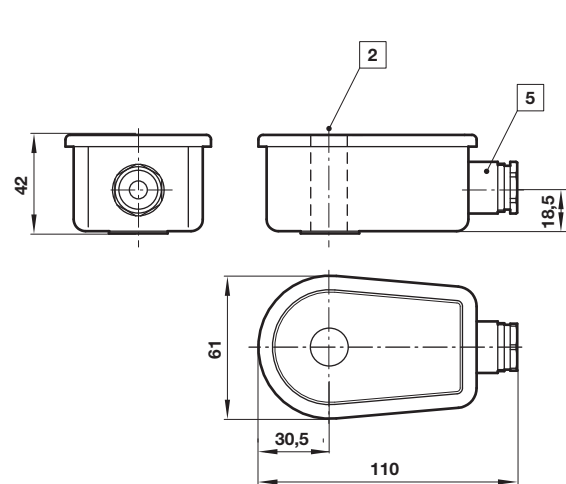
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8

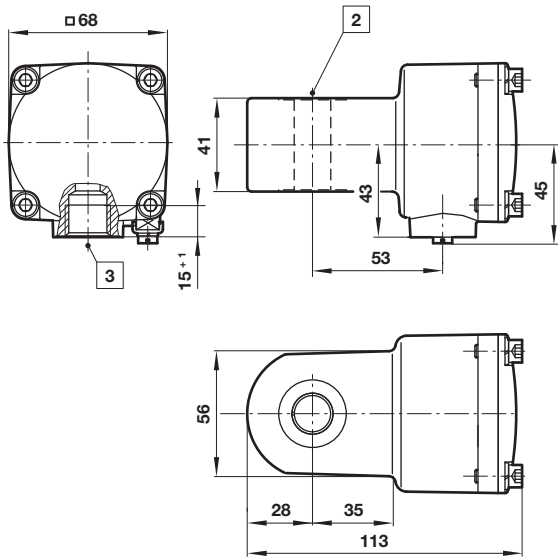


9



- 1 Connector can be indexed by 4x90°
- 2 Ø 16 or 13 (with spacer tube)
- 3 M20 x 1,5 or 1/2 NPT
- 4 Flying leads AWG 18 (450 mm long)
- 5 With cable gland, Pg 13,5

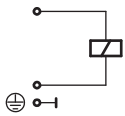
10



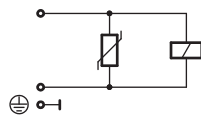
2 Ø 16  
3 M20 x 1,5

Circuit diagrams

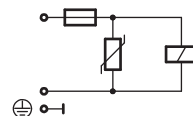
1



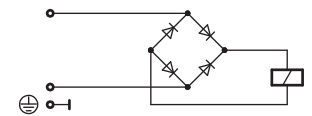
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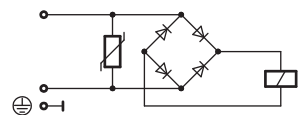
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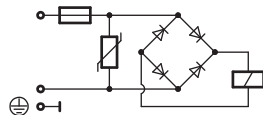
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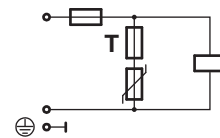
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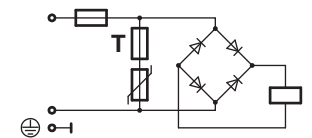
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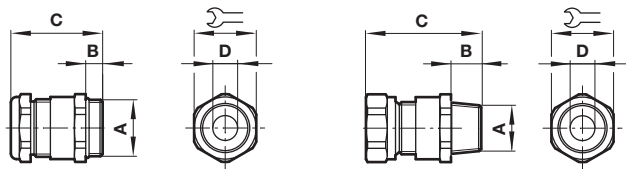
20



21



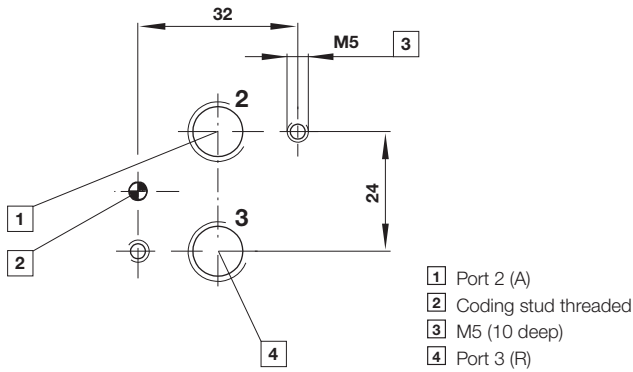
Cable gland



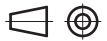
0588925 only

A	B	C	ø D		Model
M20 x 1,5	9	36	5 ... 8	22	0588819
M20 x 1,5	6,5	27,5	9 ... 13	22	0589385
M20 x 1,5	14	39	10 ... 14	24	0588851
1/2 NPT	15	58	7,5 ... 11,9	24	0588925
M20 x 1,5	14	39	7 ... 12	24	0589395
M20 x 1,5	10	34	10 ... 14	24	0589387
M20 x 1,5	9	36	5 ... 9	24	0110854
M20 x 1,5	9	36	6 ... 12	24	0110855

NAMUR hole pattern (driving side)



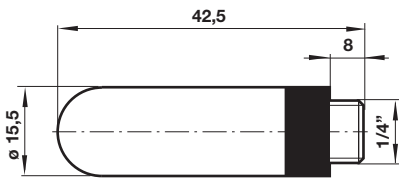
Dimensions in mm  
Projection/First angle



Accessories

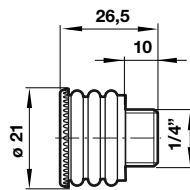
Silencer

Model: M/S2, C/S2



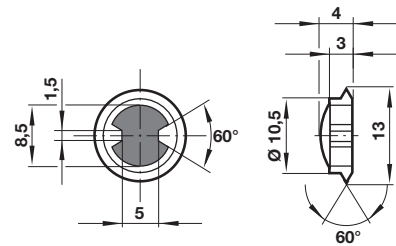
Exhaust guard

Model: 0613422



Filter

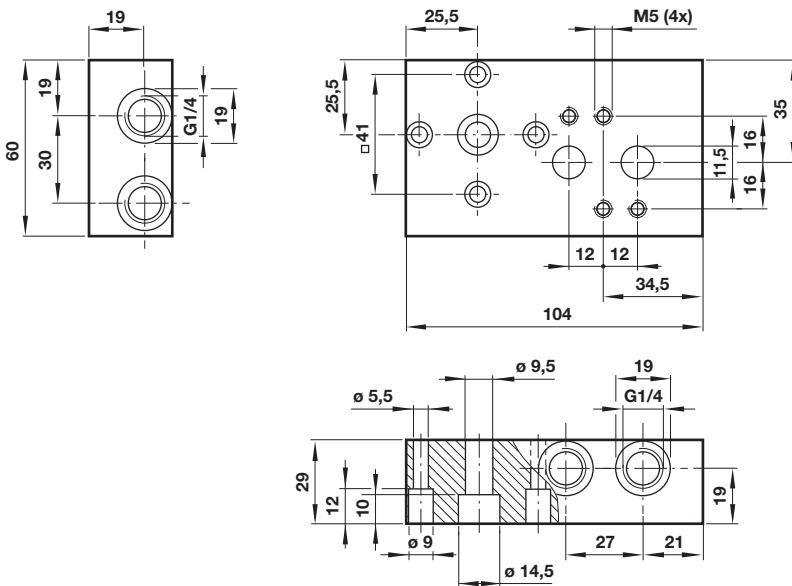
Model: 0681173



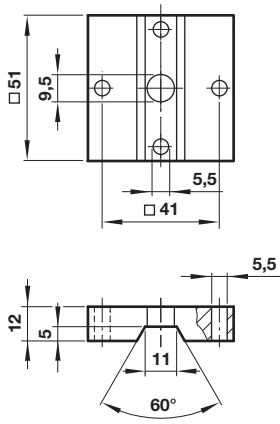
Thread pitch diameter max. 11,85 mm

Single connection plate

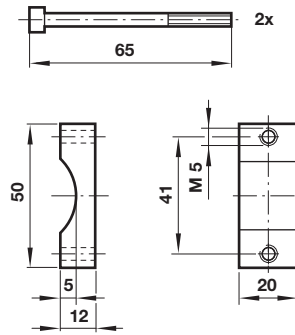
Model: 0612790



**NAMUR slot**  
Model: 0612791

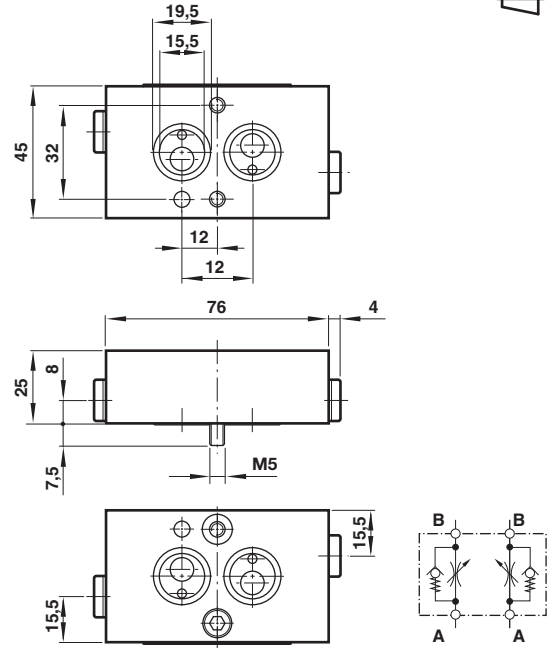


**Yoke**  
Model: 0540593

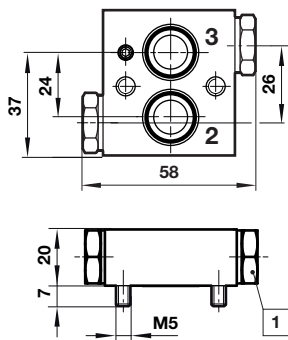


**Throttle control plate**  
Model: 4040239

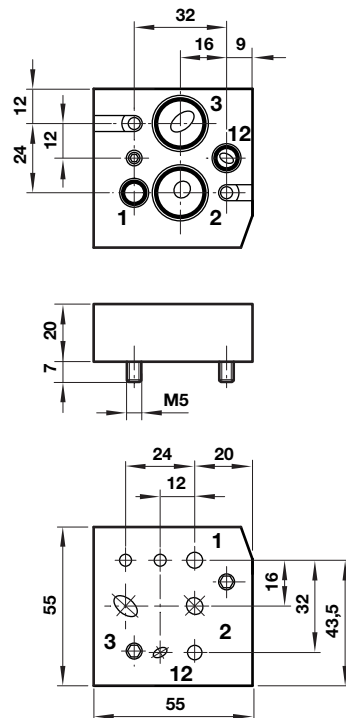
Dimensions in mm  
Projection/First angle



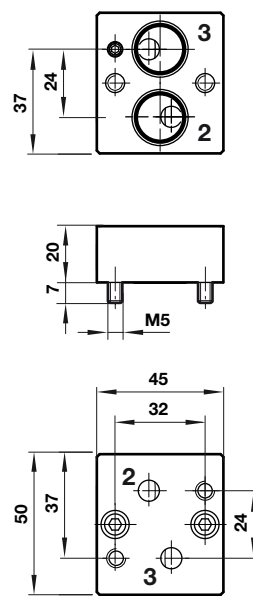
**Distance plate for pressure switches**  
Model: 0540109



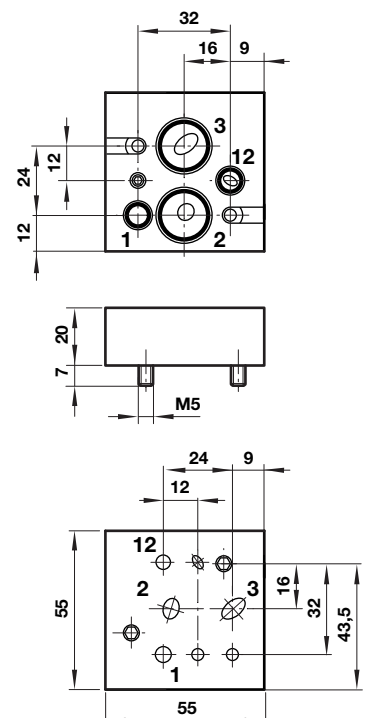
**Mounting plate**  
Model: 0613453 (90°)



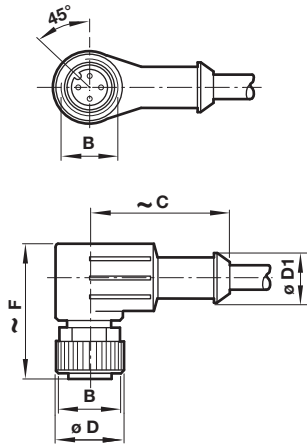
Model: 0612631 (180°)



Model: 0613556 (270°)



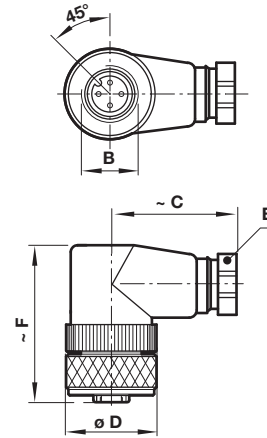
**Connector**  
**90°, 4 pin, with PUR cable**



B	C	øD	øD1	F	Wire x dim.	Cable length (m)	Weight (g)	Model
M12 x 1,5	32,5	15	11	27	4 x 0,34 mm <sup>2</sup>	2	90	0523058
M12 x 1,5	32,5	15	11	27	4 x 0,34 mm <sup>2</sup>	5	180	0523053

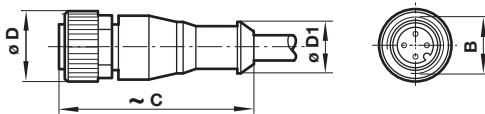
**90°, 4 pin, without cable**

Dimensions in mm  
Projection/First angle



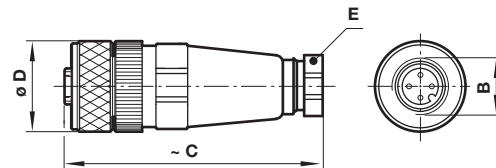
B	C	øD	E	F	Weight (g)	Model
M12 x 1,5	40,5	20	Pg 7	35	30	0523056

**Straight, 4 pin, with PUR cable**



B	C	øD	øD1	Wire x dim.	Cable length (m)	Weight (g)	Model
M12 x 1,5	40	15	11	4 x 0,34 mm <sup>2</sup>	2	80	0523057
M12 x 1,5	40	15	11	4 x 0,34 mm <sup>2</sup>	5	200	0523052

**Straight, 4 pin, without cable**



B	C	øD	E	Weight (g)	Model
M12 x 1,5	40,5	20	Pg 7	26	0523055

**Warning**

These products are intended for use in industrial compressed air and fluid systems only. Do not use these products where pressures and temperatures can exceed those listed under »**Technical features/data**«. Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult NORGREN.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes. The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the

event of such failure. System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided. System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.

Functional safety (SIL): Suitable for certain applications can only be evaluated through examination of each safety-related overall system with regard to the requirements of IEC 61508/61511.

- > Port size: R1/8 ... R2, Rc1/8 ... Rc1, Rp1 1/4 ... Rp2
- > Reduce the noise levels of pneumatic equipment
- > High flow capacity with low back pressure
- > Brass mesh screen and aluminium construction
- > Provide improved flow, longer life and cleanable element



### Technical features

#### Medium:

Compressed air, filtered, lubricated and non-lubricated, inert gases

#### Operation:

Heavy duty silencer

#### Operating pressure:

20 bar (290 psi) maximum

#### Port size:

1/8", 1/4", 3/8", 1/2", 3/4", 1, 1 1/4", 1 1/2"

#### Mounting:

Directly in exhaust port

#### Ambient/Media temperature:

-40 ... +80°C (-40 ... +176°F)  
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).

#### Materials:

Body: aluminium and shell, Filter element: brass mesh

### Technical data

#### Male thread, standard models

Symbol	Port size	Flow factor Cv	C *1)	Kv *2)	Weight (kg)	Model
	R1/8	2	8,2	1,75	0,03	MB001B
	R1/4	2,2	9	1,92	0,03	MB002B
	R3/8	2,94	12	2,56	0,03	MBP03B
	R3/8	4,78	19,5	4,16	0,10	MB003B
	R1/2	5,49	22,4	4,78	0,09	MB004B
	R3/4	5,49	22,4	4,78	0,09	MBP06B
	R3/4	12,5	51	10,78	0,45	MB006B
	R1	15,68	64	13,65	0,40	MB008B
	R1 1/4	16,67	68	14,5	0,40	MBP10B

\*1) Measured in dm<sup>3</sup>/(s.bar)

\*2) Measured in m<sup>3</sup>/h

#### Female thread, standard models

Symbol	Port size	Flow factor Cv	C *1)	Kv *2)	Weight (kg)	Model ISO Rc
	Rc1/8	2	8,2	1,75	0,03	MA001B
	Rc1/4	2,57	10,5	1,29	0,03	MA002B
	Rc3/8	5,83	23,8	5,07	0,10	MA003B
	Rc1/2	5,71	23,3	4,97	0,09	MA004B
	Rc3/4	16,18	66	14,07	0,45	MA006B
	Rc1	16,67	68	14,5	0,40	MA008B

Symbol	Port size	Flow factor Cv	C *1)	Kv *2)	Weight (kg)	Model
	Rp1 1/4	26,7	110	23,45	0,62	MA010C
	Rp1 1/2	40,93	167	35,6	0,60	MA012C
	Rp2	53,9	220	46,9	0,76	MA016C

### Option selector

#### Male thread

Port size	Substitute
1/8"	001
1/4"	002
3/8"	P03*
3/8"	003
1/2"	004
3/4"	P06*
3/4"	006
1"	008
1 1/4"	P10*
Thread form	Substitute
PTF (SAE short, ANSI B1.2.0.3)	A
ISO R, taper	B

\* Compact size

#### MB★★★★

#### Female thread

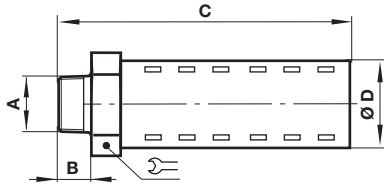
Port size	Substitute
1/8"	001
1/4"	002
3/8"	003
1/2"	004
3/4"	006
1"	008
1 1/4"	010
1 1/2"	012
Thread form	Substitute
PTF (SAE short, ANSI B1.2.0.3)	A
ISO Rc, taper	B
ISO Rp, parallel	C

#### MA★★★★

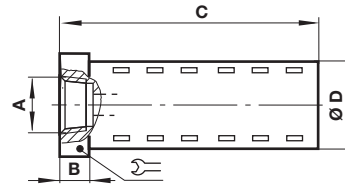
## Dimensions


Dimensions in mm  
Projection/First angle


### Male thread



### Female thread



A	B	C	D		Model
R1/8	9	51	21	21	MB001
R1/4	13	55	21	21	MB002
R3/8	13	55	21	21	MBP03
R3/8	13	88	32	32	MB003
R1/2	17	92	32	32	MB004
R3/4	17	92	32	32	MBP06
R3/4	20	134	51	51	MB006
R1	23	138	51	51	MB008
R1 1/4	26	140	51	51	MBP10

A	B	C	Ø D		Model
Rc1/8	6	42	21	21	MA001
Rc1/4	9	45	21	21	MA002
Rc3/8	9	78	32	32	MA003
Rc1/2	12	83	32	32	MA004
Rc3/4	12	118	51	51	MA006
Rc1	15	118	51	51	MA008
Rp1 1/4	15	144	64	64	MA010
Rp1 1/2	15	144	64	64	MA012
Rp2	16	168	76	76	MA016

## Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under

»**Technical features/data**«.

Before using these products with fluids other than those specified, for non-industrial applications, life-support systems or other applications not within published specifications, consult IMI NORGREN.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes.

The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.

System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.

System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.

# Dokumentation

## ***Drosselventile und Drosselrückschlagventile***

***- Typ DR ... , DRV ... , DRVE ... , DV ... -***



## 1. Inhalt

1. Inhaltsverzeichnis	1
2. Typen DV ... , DV ... E, DRV ...	1
3. Typen DRVE ... , DR ... , DRV SK ...	5
4. Typ DR ... ES und DV 14 ES	7

## 2. Typen DV ... , DV ... E, DV 14 ES, DRV ...

### 2.1. Allgemeines

Drossel- und Drosselrückschlagventile DV/DRV sind zur Beeinflussung der Durchflussmenge durch eine einstellbare Querschnittsverengung. Der Volumenstrom ist von Druckdifferenz und Viskosität bei DV / DRV ... HD abhängig. Drosselventile DV ermöglichen durch eine speziell ausgebildete Drosselform eine feinfühligere Verstellung des Volumenstromes. Die Drosselfunktion erfolgt in beide Richtungen. Drosselrückschlagventile DRV ermöglichen die gleiche feinfühligere Verstellung des Volumenstromes. Die Drosselfunktion erfolgt jedoch nur in eine Richtung. In entgegengesetzter Richtung gestattet das eingebaute Rückschlagventil ungedrosselten Rücklauf.

Weitere Vorteile dieser Ventile sind:

- Durch kompakte Bauweise platzsparender Einbau in Rohrleitungen
- Verstellbarkeit
- Beliebige Einbaulage

### 2.2. Funktion

#### Typ DV ...

Drosselventile bestehen im wesentlichen aus einem Ventilkörper, einer speziellen Drosselspindel und dem Drehknopf. Ausgehend von völlig geschlossener Stellung der Drosselspindel, der Durchfluss ist abgesperrt, nimmt mit zunehmender Anzahl der Umdrehungen am Drehknopf der Volumenstrom zu.

#### Typ DV ... E

Zur Regulierung der Durchflussmenge, z.B. für die Kolbengeschwindigkeit von Zylindern. Das Medium (Luft) lässt sich in beide Strömungsrichtungen einstellen.

#### Typ DV ... HD

Der Drehknopf mit Farbskala und Skalerring gestattet die Wiederholbarkeit der eingestellten Werte.

Anhand der Fläche des Farbdreiecks ist die Größe des Durchfluss-Querschnitts erkennbar.

Vergrößerung des Farbdreiecks = Vergrößerung des Durchfluss-Querschnittes. Die Verstellbarkeit erfolgt durch eine Klemmschraube. Die Drosselung ist in beiden Durchflussrichtungen wirksam.

#### Typ DRV ...

Drosselrückschlagventile bestehen im wesentlichen aus einem Ventilkörper mit integriertem Ventilsitz, einem gehärteten und geschliffenen Schließkegel, einer Druckfeder, der Drosselspindel und dem Drehknopf. Der Schließkegel wird durch die Druckfeder auf den Ventilsitz gepresst und sperrt somit Anschluss A von Anschluss B ab. Ausgehend von völlig geschlossener Stellung der Drosselspindel, der Durchfluss ist abgesperrt, nimmt mit zunehmender Anzahl der Umdrehungen am Drehknopf der Volumenstrom in Durchflussrichtung A → B entsprechend zu. Der Schließkegel öffnet, wenn der Druck am Anschluss B höher ist als der Druck am Anschluss A einschließlich dem durch die Federkraft erzeugten Öffnungsdruck.

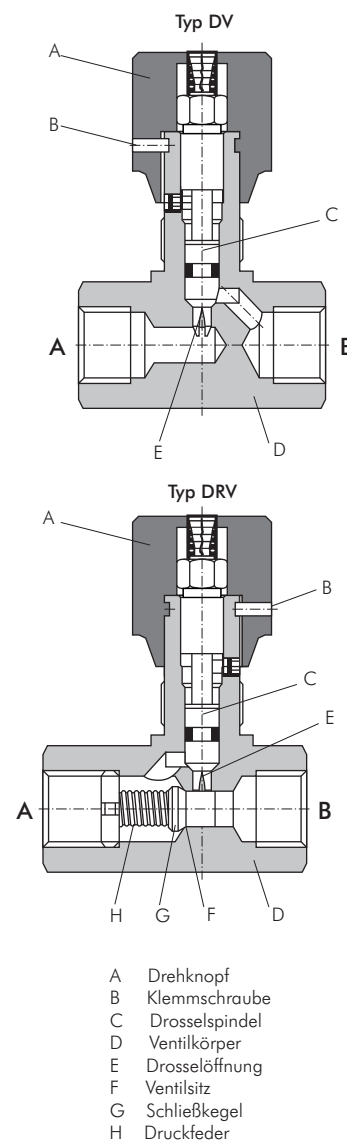
### 2.3. Anwendung

Drossel- und Drosselrückschlagventile DV/DRV werden eingesetzt:

- zur Geschwindigkeitseinstellung von lastbeaufschlagten Verbrauchern
- zur systemangepassten Dämpfung in Hydraulikkreisläufen
- zur druckabhängigen Drosselung von Volumenströmen allgemein
- zur Druckentlastung von Speicheranlagen
- als Notablass für die Lastabsenkung ohne Totmannschaltung Anwendungsgebiete sind z.B.:
  - Aggregate
  - Hubarbeitsbühnen
  - Mobilhydraulik

### 2.4. Hinweise:

Bei Drosselrückschlagventilen erhöht sich der Öffnungsdruck des Schließkegels um den am Anschluss A anliegenden Druck (bei geschlossener Drosselspindel)!



- A Drehknopf
- B Klemmschraube
- C Drosselspindel
- D Ventilkörper
- E Drosselöffnung
- F Ventilsitz
- G Schließkegel
- H Druckfeder

## 2.5. Technische Daten

### Drosselventile

Temperaturbereich: 0°C bis +60°C  
 Betriebsdruck: 0 bis 10 bar

Typ	Typ für Lebensmittelindustrie	Anschluss Gewinde	Gewinde für Schalttafeleinbau	Durchfluss	Typ Befestigungsmutter
<b>Standard-Drosselventile</b>					
DV 18	---	G 1/8"	M 12 x 0,75	5 - 80 l/min.	GM 12075 MSV**
DV 14	---	G 1/4"	M 12 x 0,75	8 - 435 l/min.	GM 12075 MSV**
DV 38	---	G 3/8"	M 18 x 1	10 - 820 l/min.	GM 181 MSV**
DV 12	---	G 1/2"	M 18 x 1	15 - 1450 l/min.	GM 181 MSV**
<b>Drosselventile mit Feinregulierung</b>					
DV 25 E	---	M 5	M 10 x 1	0 - 80 l/min.	GM 101 MSV
DV 18 E	DV 18 MS*	G 1/8"	M 12 x 1	0 - 125 l/min.	GM 121 MSV
DV 14 E	DV 14 MS*	G 1/4"	M 20 x 1,5	0 - 550 l/min.	GM 2015 MSV
DV 38 E	---	G 3/8"	M 24 x 1,5	0 - 1050 l/min.	GM 2415 MSV
DV 12 E	---	G 1/2"	M 24 x 1,5	0 - 2000 l/min.	GM 2415 MSV

\* Ventileinsatz und Spindel aus Messing, \*\* Befestigungsmutter im Lieferumfang enthalten



### Drossel- und Drosselrückschlagventile

PN 350

**Verwendung:** Drossel- und Drosselrückschlagventile beeinflussen den Volumenstrom durch eine einstellbare Querschnittsverengung und werden zur Geschwindigkeitseinstellung bei Zylindern oder Motoren verwendet.

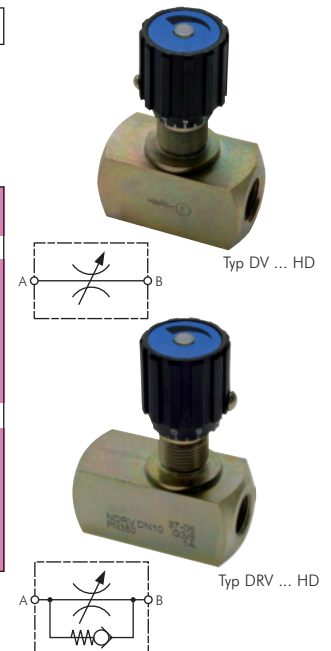
**Werkstoffe:** Ventilkörper: Stahl verzinkt, Drehknopf: Polyamid, Dichtungen: NBR

**Temperaturbereich:** -20°C bis max. +80°C

**Betriebsdruck:** max. 350 bar

**Medien:** Hydrauliköle auf Mineralölbasis

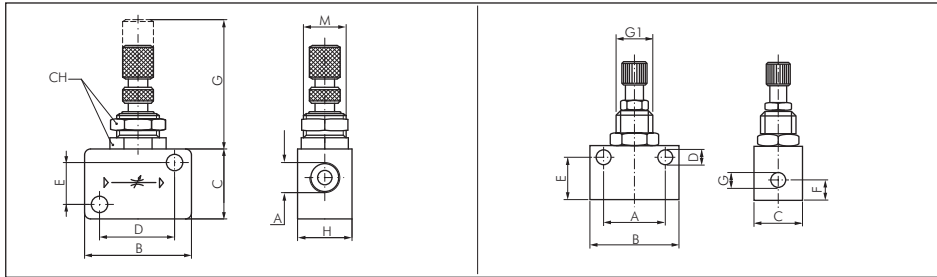
Typ	Anschluss-gewinde	praxisbezogene Durchflussmenge	max. Durchflussmenge	freier Rückfluss B - A bei 5 bar Druckabfall	Typ Einbauset für Schalttafeleinbau
<b>Drosselventile</b>					
DV 18 HD	G 1/8"	10 l/min	14 l/min	---	DV EINBAUSET 18
DV 14 HD	G 1/4"	15 l/min	60 l/min	---	DV EINBAUSET 1438
DV 38 HD	G 3/8"	20 l/min	75 l/min	---	DV EINBAUSET 1438
DV 12 HD	G 1/2"	40 l/min	150 l/min	---	DV EINBAUSET 1234
DV 34 HD	G 3/4"	60 l/min	180 l/min	---	DV EINBAUSET 1234
DV 10 HD	G 1"	150 l/min	400 l/min	---	DV EINBAUSET 10
<b>Drosselrückschlagventile</b>					
DRV 18 HD	G 1/8"	10 l/min	20 l/min	25 l/min	DV EINBAUSET 18
DRV 14 HD	G 1/4"	15 l/min	50 l/min	45 l/min	DV EINBAUSET 1438
DRV 38 HD	G 3/8"	20 l/min	60 l/min	65 l/min	DV EINBAUSET 1438
DRV 12 HD	G 1/2"	25 l/min	90 l/min	100 l/min	DV EINBAUSET 1234
DRV 34 HD	G 3/4"	60 l/min	180 l/min	140 l/min	DV EINBAUSET 1234
DRV 10 HD	G 1"	150 l/min	300 l/min	270 l/min	DV EINBAUSET 10



## 2.6. Abmessungen

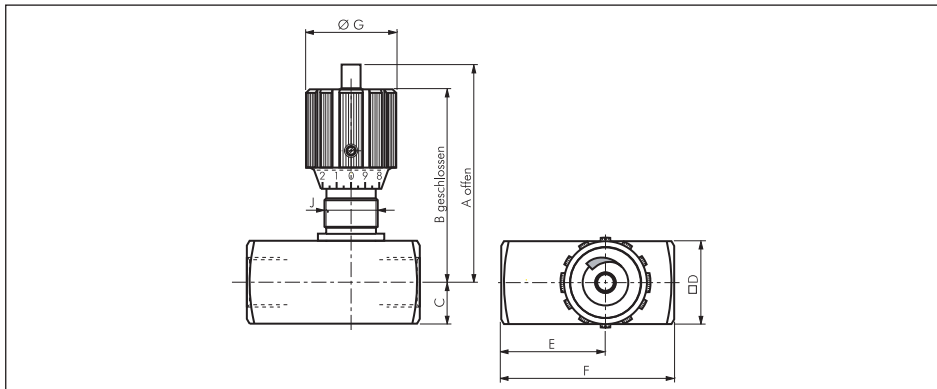
### 2.6.1. Typ DV ...

### Typ DV ... E/MS



Typ	G	G1	A	B	C	D	E	F	H	M	CH
DV 18	35	---	1/8"	32	22	23	13	4,5	15	M 12	17
DV 14	35	---	1/4"	40	32	30	22	4,5	15	M 12	22
DV 38	43	---	3/8"	56	42	43	27	6,5	24	M 18	27
DV 12	43	---	1/2"	56	42	43	27	6,5	24	M 18	27
DV 25 E	M5	M10x1	18	26	14	4,5	12,5	5,5	---	---	---
DV 18 E	G 1/8"	M12x1	24	32	16	4,5	18,0	9,5	---	---	---
DV 14 E	G 1/4"	M20x1,5	35	55	25	6,5	25,0	12,0	---	---	---
DV 38 E	G 3/8"	M24x1,5	43	58	30	6,5	33,0	15,0	---	---	---
DV 12 E	G 1/2"	M25x1,5	50	68	30	6,5	33,0	15,0	---	---	---
DV 18 MS	G 1/8"	M12x1	24	32,5	16	4,4	17,5	9,0	---	---	---
DV 14 MS	G 1/4"	M20x1,5	35	55	25	6,5	25	12,0	---	---	---

### 2.6.2. Typ DV/DRV ... HD

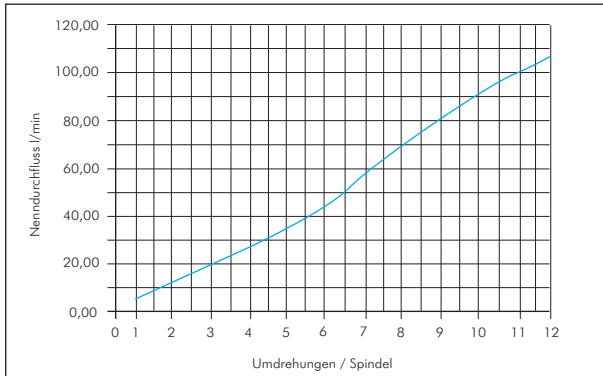


Typ	A	B	C	D	E	F	G	J
<b>Drosselventile</b>								
DV 18 HD	56	51	8,0	16	19	38	24	PG 7
DV 14 HD	71	65	12,5	25	24	48	29	PG 11
DV 38 HD	75	68	15,0	30	29	58	29	PG 11
DV 12 HD	92	82	17,5	35	34	68	38	PG 16
DV 34 HD	106	96	22,5	45	39	78	38	PG 16
DV 10 HD	134	121	25,0	50	54	108	49	PG 29
<b>Drosselrückschlagventile</b>								
DRV 18 HD	56	51	8,0	16	26,0	45	24	PG 7
DRV 14 HD	71	65	12,5	25	33,5	55	29	PG 11
DRV 38 HD	75	68	15,0	30	41,0	65	29	PG 11
DRV 12 HD	92	82	17,5	35	44,0	73	38	PG 16
DRV 34 HD	106	96	22,5	45	57,0	88	38	PG 16
DRV 10 HD	134	121	25,0	50	77,0	127	49	PG 29

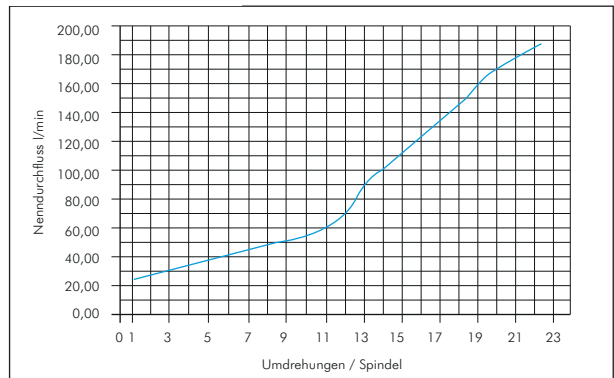
## 2.7. Durchflussdiagramme und Ventilkennlinie

### 2.7.1. Durchflussdiagramme Typ DV ... E / DRVE ... E

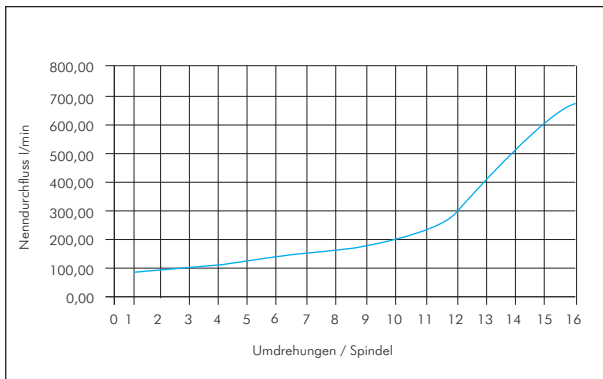
Durchflussdiagramm M 5



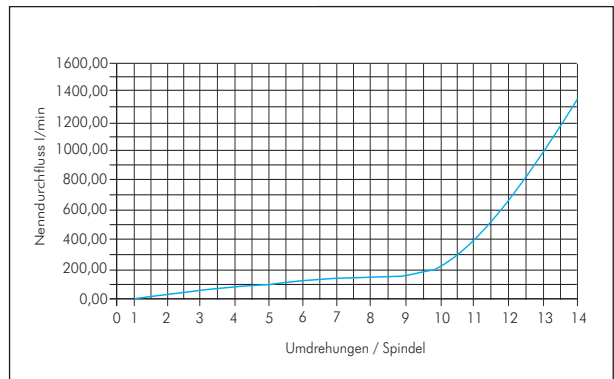
Durchflussdiagramm 1/8"



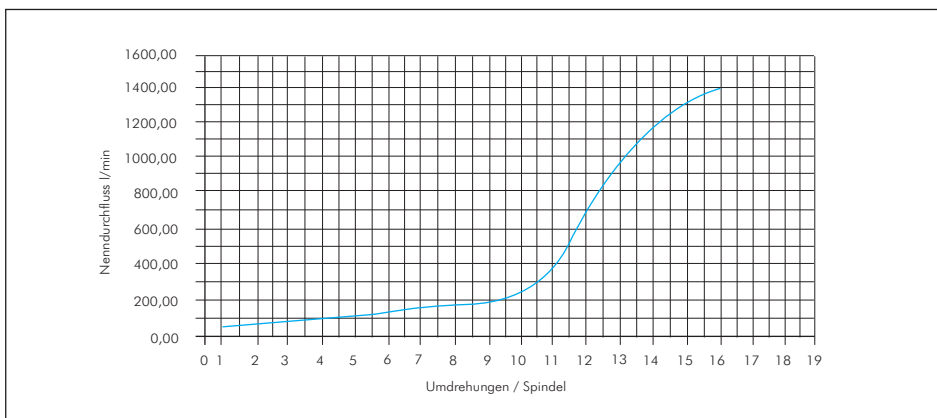
Durchflussdiagramm 1/4"



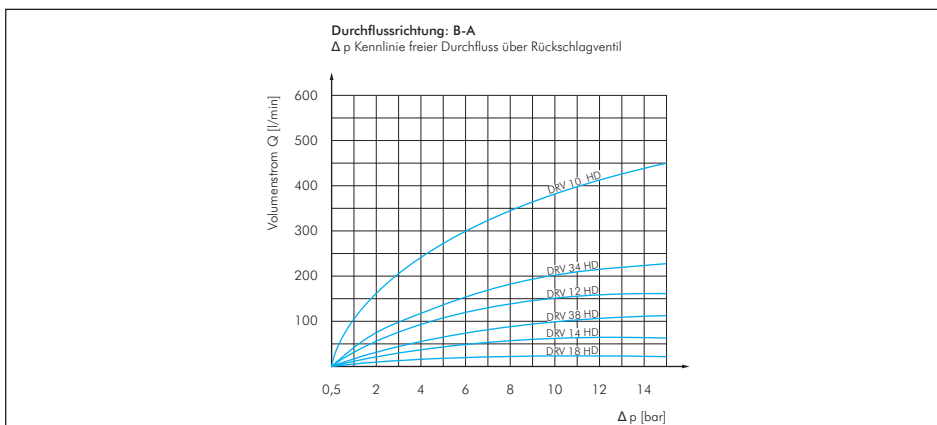
Durchflussdiagramm 3/8"



Durchflussdiagramm 1/2"



### 2.7.2. Ventilkennlinien Typ DV ... HD



## 3. Typen DRVE ..., DR ..., DRV SK ...

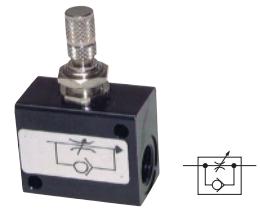
### 3.1. Technische Daten

#### Drosselrückschlagventile

**Standard**

Lieferumfang: Ventil inkl. Befestigungsmutter  
 Temperaturbereich: 0°C bis max. +60°C  
 Betriebsdruck: 0 - 10 bar

Typ	Anschluss- gewinde	Gewinde für Schalttafeleinbau	Durchfluss geregelt	Durchfluss ungeregelt	Baulänge
DRVE 18	G 1/8"	M 12 x 0,75	5 - 80 l/min.	325 l/min.	32
DRVE 14	G 1/4"	M 12 x 0,75	8 - 435 l/min.	850 l/min.	39
DRVE 38	G 3/8"	M 18 x 1	10 - 820 l/min.	1300 l/min.	56
DRVE 12	G 1/2"	M 18 x 1	15 - 1450 l/min.	2000 l/min.	56

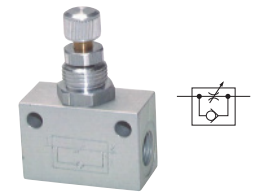


#### Drosselrückschlagventile

**Feinregulierung**

Temperaturbereich: 0°C bis max. +60°C  
 Betriebsdruck: 1 - 10 bar

Typ	Anschluss- gewinde	Gewinde für Schalttafeleinbau	Durchfluss geregelt	Durchfluss ungeregelt	Typ Befestigungsmutter
DRVE 25 E	M 5	M 10 x 1	0 - 80 l/min.	80 l/min.	GM 101 MSV
DRVE 18 E	G 1/8"	M 12 x 1	0 - 125 l/min.	125 l/min.	GM 121 MSV
DRVE 14 E	G 1/4"	M 20 x 1,5	0 - 550 l/min.	550 l/min.	GM 2015 MSV
DRVE 38 E	G 3/8"	M 24 x 1,5	0 - 1050 l/min.	1050 l/min.	GM 2415 MSV
DRVE 12 E	G 1/2"	M 24 x 1,5	0 - 2000 l/min.	2000 l/min.	GM 2415 MSV

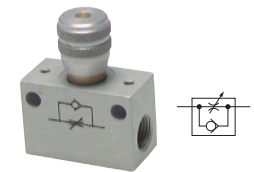


#### Drosselrückschlagventile

**Präzision**

Temperaturbereich: -10°C bis max. +70°C  
 Betriebsdruck: 0,5 - 10 bar

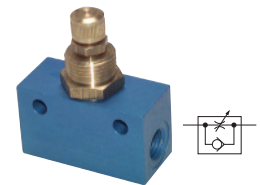
Typ	Anschluss- gewinde	Gewinde oben	Durchfluss geregelt	Durchfluss ungeregelt
DR 25 <span style="color:red">NEU</span>	M 5	M 3	5 - 40 l/min.	120 l/min.
DR 18	G 1/8"	M 3	5 - 90 l/min.	480 l/min.
DR 14	G 1/4"	M 4	50 - 600 l/min.	1300 l/min.



#### Drosselrückschlagventile mit Messingspindel und -ventileinsatz

Temperaturbereich: -20°C bis max. +80°C, Betriebsdruck: 0,5 - 10 bar  
 Verwendung: Diese Drosselrückschlagventile mit Messingspindel sind besonders geeignet für lebensmittelverarbeitende Betriebe, bei denen aggressive Reinigungsmittel verwendet werden. Als zusätzlichen Schutz für die Einstellspindel empfehlen wir die Schutzkappen Typ DRV SK ...

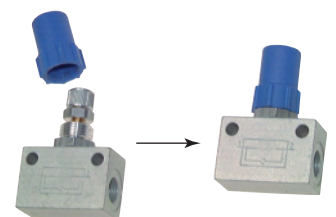
Typ	Anschluss- Gewinde	Gewinde für Schalttafeleinbau	Durchfluss geregelt	Durchfluss ungeregelt	Typ Befestigungsmutter
DRVE 18 MS	G 1/8"	M 12 x 1	0 - 125 l/min.	125 l/min.	GM 121 MSV
DRVE 14 MS	G 1/4"	M 20 x 1,5	0 - 550 l/min.	550 l/min.	GM 2015 MSV



#### Schutzkappen für Drosselrückschlagventile

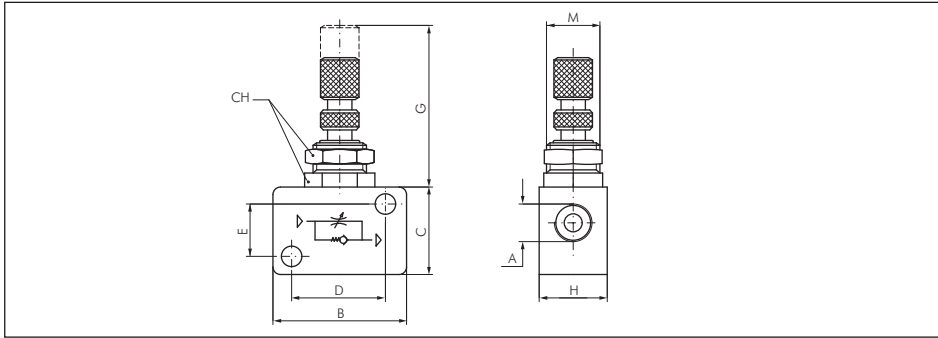
Verwendung: Die Schutzkappen dienen zur Abdeckung von Ventilspindeln und -einsätzen zum Schutz gegen Reinigungsmittel und unbeabsichtigtes Verstellen.

Typ	Gewinde	Verwendung für
DRV SK 25	M 10 x 1	DV 25 E, DRVE 25 E
DRV SK 18	M 12 x 1	DV 18 E, DRVE 18 E, DRVE 18 MS
DRV SK 14	M 20 x 1,5	DV 14 E, DRVE 14 E, DRVE 14 MS



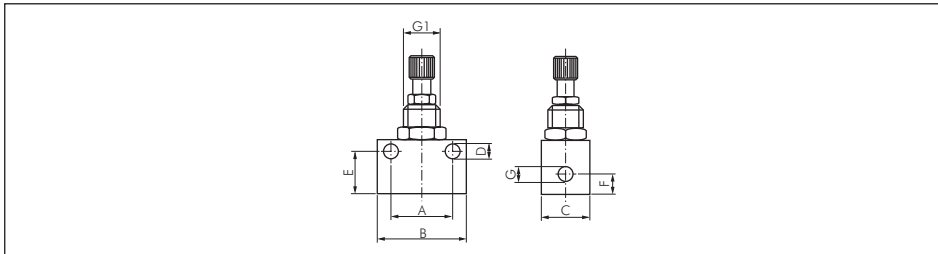
## 3.2. Abmessungen

### 3.2.1. Typ DRVE ...



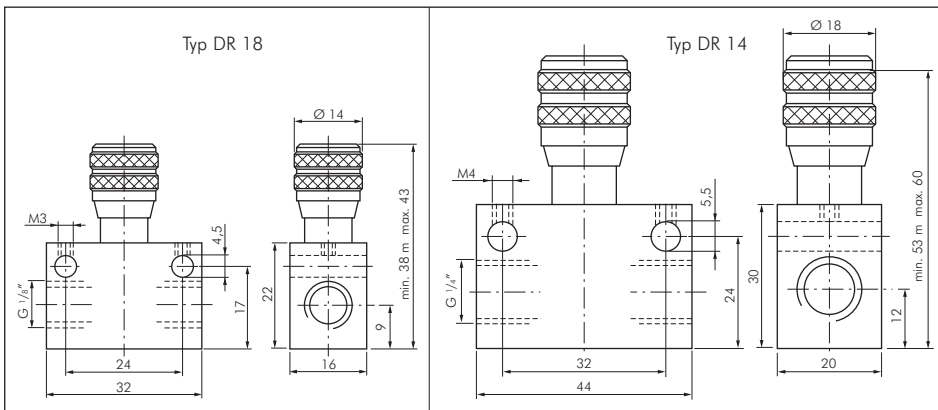
Typ	A	B	C	H	D	E	F	G	M	H
DRVE 18	G 1/8"	32	22	17	23	13	4,5	35	M12	15
DRVE 14	G 1/4"	40	32	22	30	22	4,5	35	M12	15
DRVE 38	G 3/8"	56	42	27	43	27	6,5	43	M18	24
DRVE 12	G 1/2"	56	42	27	43	27	6,5	43	M18	24

### 3.2.2. Typ DRVE ... E

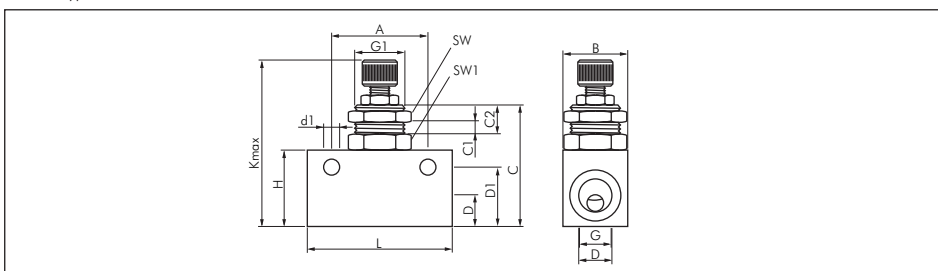


Typ	G	G1	A	B	C	D	E	F
DRVE 25 E	M5	M10x1	18	26	14	4,5	12,5	5,5
DRVE 18 E	G 1/8"	M12x1	24	32	16	4,5	18,0	9,5
DRVE 14 E	G 1/4"	M20x1,5	35	55	25	6,5	25,0	12,0
DRVE 38 E	G 3/8"	M24x1,5	43	58	30	6,5	33,0	15,0
DRVE 12 E	G 1/2"	M25x1,5	50	68	30	6,5	33,0	15,0

### 3.2.3. Typ DR ...



### 3.2.4. Typ DRVE ... MS



Typ	G	H	B	L	d	D	C	C1	C2	D1	A	d1	SW	SW1	G1	Kmax
DRVE 18 MS	G 1/8"	22	16	32,5	13,5	9	31,5	2,5	6	17,5	24	4,4	10	17	M12x1	9,5
DRVE 14 MS	G 1/4"	32	25	55	19	12	48,0	4,5	10	25	35	6,5	13	22	M20x1,5	12,0

Alle Angaben verstehen sich als unverbindliche Richtwerte! Für nicht schriftlich bestätigte Datenauswahl übernehmen wir keine Haftung. Druckangaben beziehen sich, soweit nicht anders angegeben, auf Flüssigkeiten der Gruppe II bei +20°C.

## 4. Typ DR ... ES und DV 14 ES

### 4.1. Technische Daten



#### Drosselrückschlagventile / Drosselventile aus Edelstahl

Werkstoffe: Körper und Einstellnadel: 1.4436, Dichtungen: FKM

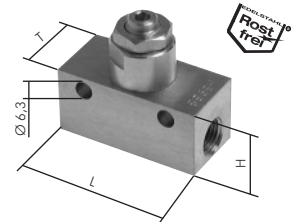
Temperaturbereich: -20°C bis max. +180°C

Betriebsdruck: 0 - 12 bar

Medien: geölte und ungeölte Druckluft und Gase, aggressive Gase und Flüssigkeiten, Öle und Wasser (50 µm)

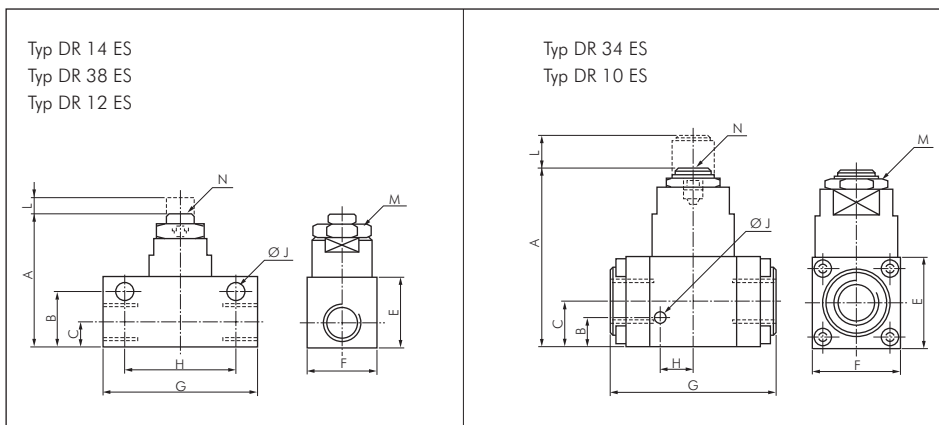
Typ	Gewinde	L	H	T	Durchfluss
<b>Drosselrückschlagventile</b> 					
DR 14 ES	G 1/4"	54	25	25	1000 l/min
DR 38 ES	G 3/8"	76	35	35	1680 l/min
DR 12 ES	G 1/2"	76	35	35	2520 l/min
DR 34 ES*	G 3/4"	95	50	50	5428 l/min
DR 10 ES*	G 1"	95	64	64	9820 l/min
<b>Drosselventile</b> 					
DV 14 ES	G 1/4"	54	25	25	640 l/min

\* nur eine Befestigungsbohrung



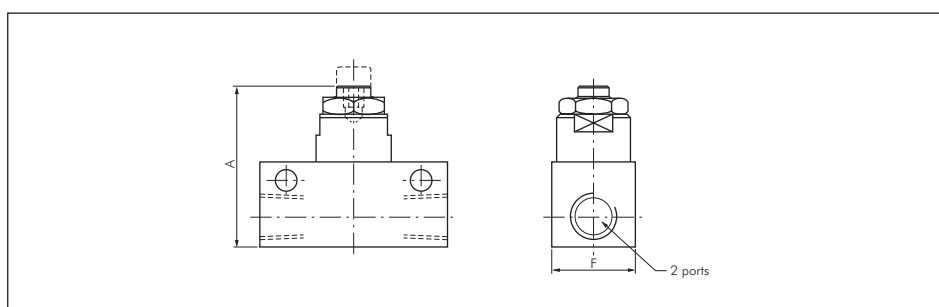
### 4.2. Abmessungen

#### 4.2.1. Typ DR ... ES



Typ	Gewinde	A	B	C	E/F	G	H	J	L	M	N	Gewicht
DR 14 ES	1/4"	48	20	9	25	56	40	6,35	6	18	5	0,26
DR 38 ES	3/8"	70	29	14	35	76	45	6,35	12	23	6	0,75
DR 12 ES	1/2"	70	29	13	35	76	45	6,35	12	23	6	0,75
DR 34 ES	3/4"	100	16	25	50	95	19	6,35	19	30	10	1,75
DR 10 ES	1"	125	19	31	64	95	24	6,35	19	36	12	2,75

#### 4.2.2. Typ DV 14 ES



Typ	Ports	A	F	Weight
DV 14 ES	1/4"	48	25,4	0,26

# Klübersynth AR 34-401, AR 34-402

Special synthetic lubricating greases for pneumatic drives and sealing elements



## Benefits for your application

- Reduces friction and wear in pneumatic components
- Low breakaway torque, even after longer periods of standstill ("Monday morning effect")
- Suitable for all types of pneumatic components, preferably those made of NBR but also of PU materials
- Wide piston speed range from approx. 0.01 to 1m/s and much more in individual cases
- Light colour, adhesive

## Description

Klübersynth AR 34-401 and -402 are synthetic wide-range greases based on a special calcium soap thickener. They are free from raw materials containing heavy metals and solid lubricants. The special additives contained in these greases provide utmost performance along with operational reliability and long service life. The pneumatic components consisting of the sealing elements and the opposing friction bodies, such as piston rods or cylinder barrels, can therefore be used in a relatively wide service temperature range. This is the result of a close cooperation between Klüber Lubrication, manufacturers of pneumatic elements and joints and university research centers.

Klübersynth AR 34-401 is NSF H1 registered and therefore complies with FDA 21 CFR § 178.3570. The lubricant was developed for incidental contact with products and packaging materials in the food-processing, cosmetics, pharmaceutical or animal feed industries. The use of Klübersynth AR 34-401 can contribute to increase reliability of your production processes. We nevertheless recommend conducting an additional risk analysis, e.g. HACCP.

## Application

Besides many other applications, Klübersynth AR 34-401 and -402 are mainly used for pneumatic control and sealing elements, such as ISO single-acting and double-acting pneumatic cylinders with and without piston rod, pneumatic rotary actuators, short-stroke and compact cylinders, for valves and corresponding sealing elements. Wide piston speed ranges from approx. 0.01 m/s to > 1 m/s can be achieved. Other advantages of Klübersynth AR 34 401 and -402 are low breakaway torque even after longer periods of standstill and

reduced tendency to stick-slip at very low piston speeds. This special grease is preferably used in combination with various types of piston, rod and damping seals made of NBR or PU elastomer materials. Klübersynth AR 34-402 is an approved lubricant for gas burning installations and actuators acc. to DIN EN 377 class D, for a temperature range from 0 to +140°C. A corresponding DIN-DVGW test certificate is available.

## Application notes

Klübersynth AR 34-401 and -402 are applied by brush, sponge, spatula, grease gun or other conventional metering systems. For the lubrication of cylinder faces the use of round brushes or automatic greasing pistons has proven effective. It is important that after assembly the piston is moved several times over the full stroke length in order to ensure adequate wetting of the sealing elements on both sides if, for example, only one-sided lubrication was possible. A similar procedure applies to valves. Excessive lubrication of the piston seal after several piston strokes – depending on the size and circumference – may provide a more uniform grease layer. The lubricant should be applied on to a cleaned, grease-free surface.

## Material safety data sheets

Material safety data sheets can be requested via our website [www.klueber.com](http://www.klueber.com). You may also obtain them through your contact person at Klüber Lubrication.

Pack sizes	Klübersynth AR 34-401	Klübersynth AR 34-402
Can 1 kg	+	+
Bucket 25 kg	+	+

# Klübersynth AR 34-401, AR 34-402

Special synthetic lubricating greases for pneumatic drives and sealing elements

Product data	Klübersynth AR 34-401	Klübersynth AR 34-402
Article number	017153	017033
Lower service temperature	-40 °C / -40 °F	-30 °C / -22 °F
Upper service temperature	120 °C / 248 °F	140 °C / 284 °F
Colour space	beige	beige
Density at 20 °C	approx. 0.90 g/cm <sup>3</sup>	approx. 0.90 g/cm <sup>3</sup>
Worked penetration, DIN ISO 2137, 25 °C, lower limit value	310 x 0.1 mm	265 x 0.1 mm
Worked penetration, DIN ISO 2137, 25 °C, upper limit value	340 x 0.1 mm	295 x 0.1 mm
Kinematic viscosity of the base oil, DIN 51562 pt. 01/ASTM D-445/ASTM D 7042, 40 °C	approx. 400 mm <sup>2</sup> /s	approx. 400 mm <sup>2</sup> /s
Kinematic viscosity of the base oil, DIN 51562 pt. 01/ASTM D-445/ASTM D 7042, 100 °C	approx. 40 mm <sup>2</sup> /s	approx. 40 mm <sup>2</sup> /s
NLGI grade, DIN 51818	1	2
Shear viscosity at 25 °C, shear rate 300 s <sup>-1</sup> , equipment: rotational viscometer, lower limit value	2 000 mPas	8 000 mPas
Shear viscosity at 25 °C, shear rate 300 s <sup>-1</sup> , equipment: rotational viscometer, upper limit value	8 000 mPas	20 000 mPas
Copper corrosion, DIN 51811, (lubricating grease), 24h/100°C	<= 2 - 100 corrosion degree	<= 2 - 100 corrosion degree
Oil separation, DIN 51817 N, after 7 d/40 °C	<= 3.5 % by weight	<= 3 % by weight
Drop point, DIN ISO 2176, IP 396	>= 200 °C	>= 220 °C
Minimum shelf life from the date of manufacture - in a dry, frost-free place and in the unopened original container, approx.	24 months	24 months





# Klübersynth AR 34-401, AR 34-402

Special synthetic lubricating greases for pneumatic drives and sealing elements



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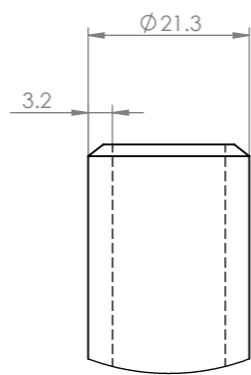
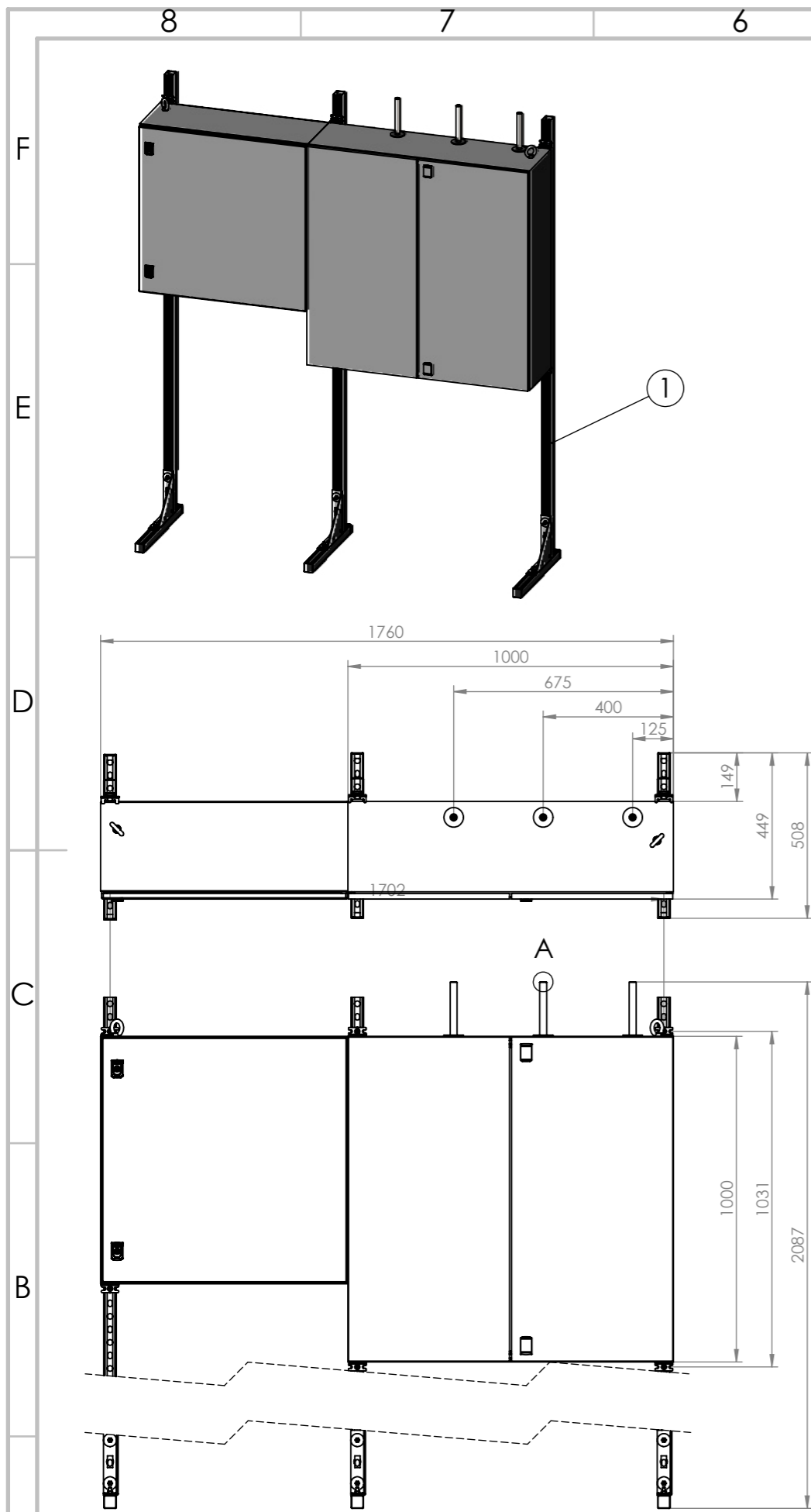
## Klüber Lubrication – your global specialist

Innovative tribological solutions are our passion. Through personal contact and consultation, we help our customers to be successful worldwide, in all industries and markets. With our ambitious technical concepts and experienced, competent staff we have been fulfilling increasingly demanding requirements by manufacturing efficient high-performance lubricants for more than 80 years.

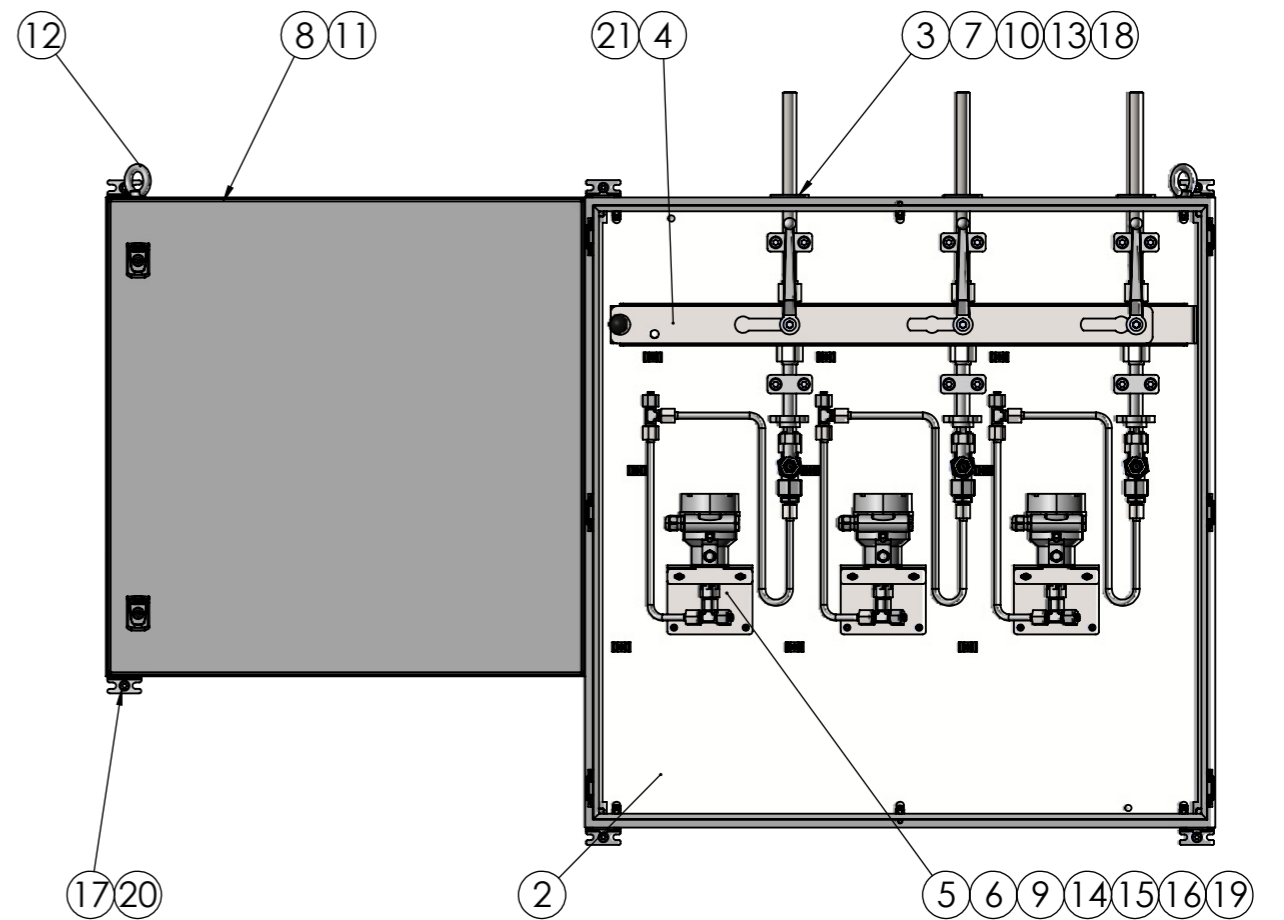
**Klüber Lubrication München SE & Co. KG /  
Geisenhausenerstraße 7 / 81379 München / Germany /  
phone +49 89 7876-0 / fax +49 89 7876-333.**

The data in this document is based on our general experience and knowledge at the time of publication and is intended to give information of possible applications to a reader with technical experience. It constitutes neither an assurance of product properties nor does it release the user from the obligation of performing preliminary field tests with the product selected for a specific application. All data are guide values which depend on the lubricant's composition, the intended use and the application method. The technical values of lubricants change depending on the mechanical, dynamical, chemical and thermal loads, time and pressure. These changes may affect the function of a component. We recommend contacting us to discuss your specific application. If possible we will be pleased to provide a sample for testing on request. Klüber products are continually improved. Therefore, Klüber Lubrication reserves the right to change all the technical data in this document at any time without notice.

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DETAIL A  
SCALE 1 : 1



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	STD100029	Support frame STD Height max. 2000mm	3
2	STD200149	Measuring cabinet STD base top connection 1000x1000x300	1
3	STD300006	Std protection rubber 21x60x4	3
4	STD300003	Lockingplate STD: 860x59x10: AISI 304	1
5	STD300126	Bracket Endress&Hauser Cerabar 135-110-90-2	3
6	STD300127	Locking plate Endress&Hauser Cerabar 135-30-21-2	3
7	STD300155	Steam Tube 21,3x3,2 L=310 1.0460 (P250GH)	3
8	ECU100361	Artes 240213 STD-S-1x230VAC-0-3/0-020-1-500-1-3-SS0000	1
9	PMP51-1CN4-0	Cerabar M PMP51 pressure sensor HART and SIL PPMP51-PMP51-AA22IA1SGBGCJA1	3
10	SRS 4021.3AL	PIPE CLAMP, HEAVY SERIES CLAMP SIZE 2 PIPE Ø21.3 ALUMINIUM	3
11	SZ 2508.100	Wall connection set rittal	2
12	2509010	AX CABINET HOIST EYE	1
13	BOOK 20S	FLARE CONNECTION WITH 2 O-RINGS PN400 M30x2	3
14	MAV-R 10S	PRESSURE GAUGE CONNECTION FITTING PN630 G1/2 / M18x1.5	3
15	01300.050.001	Hexagon nut M5 zinc plated	6
16	07160.050.010	Cylinder head screw M5x10 8.8 zinc plated	18
17	07160.080.016	Cylinder head screw M8x16 8.8 zinc plated	6
18	07160.100.055	Cylinder head screw M10x55 8.8 zinc plated	6
19	38031.050.001	Washer DIN125-1A M5 zinc plated	24
20	38031.080.001	Washer DIN125-1A M8 zinc plated	6
21	56914.080.032	Hand knob M8 Ø32	1

Unless otherwise specified: Dimensions are in mm  
Tolerances: DIN ISO 2768 class m  
Deburr and break all sharp edges  
0,25x45° unless otherwise specified  
This drawing is property of UNITEQ B.V. and may not be multiplied  
without its written permission, nor given to third parties.  
Revision: 01

	NAME	DATE
DRAWN BY	brvr	24-07-2024
TO PRODUCTION	brvr	24-07-2024
APPROVED	brvr	20-08-2024



TITLE:  
Steam Test Device (STD); Pressure;  
Temperature; E&H PMP51; 3NC; TRD421, SIL2.

Trip pressure	11.00	Bar(a)
Reset pressure	< 11.00	Bar(a)
Trip temperature	250	°C
Reset temperature	< 250	°C

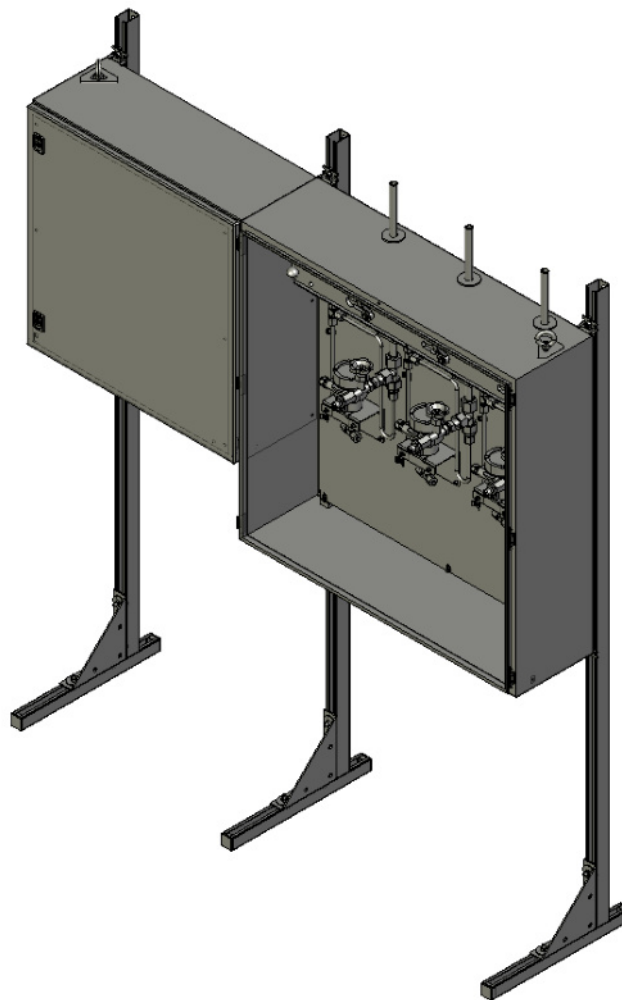
**UNITEQ**  
HYDRAULICS  
Oude Graaf 18  
6002 NL Weert NL  
Tel. +31(0) 495 524 565  
E. Info@uniteq.nl

MATERIAL:	DWG NO. STD100126	A3
WEIGHT(kg): 53.61	SCALE:1:18	Do not scale drawing
		SHEET 1 OF 1

# Instruction Manual

## Steam Test Device (pressure & temperature)

**Type STD100126**



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Review			
Date	31-10-2024		
Revision			
Name			
Signature			

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## 2 Glossary

- DCS Distributed Control System;
- Actuator Hydraulic / Pneumatic cylinder to actuate the main valve
- Main valve Actuated valve (e.g. Steam valve);
- STD Steam Test Device;
- TÜV Certification and inspection body;
- VDC Volts direct current;
- SIL Safety integrity level.

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## **3 Description STD**

### **3.1 General description**

The UniteQ steam test device protects a system by means of three individual pressure switches which are connected to the pipeline system by pipe runs. All three individual pressure switches are connected to three individual electromagnetic valves. The electromagnetic valves (3/2-way) operate the actuator which is connected to the main valve. In case the pressure in the pipeline system exceeds the pre-set switching pressure the STD will trigger the movement of the main valve to safe position.

Each pressure measuring line can be taken out of operation by a mechanical lock. Only one pressure measuring line can be taken out of operation at the same time. As a consequence there will be always two lines that remain in operation. This enables testing each pressure switch separately. See Figure 1 and for a drawing of the STD with the component designations.

### **3.2 Identification**

The STD is recognizable by build and size, for a drawing of the STD see chapter 12.

Furthermore a type plate is mounted on the STD which contains the following information:

- project number,
- article number,
- serial number,

If there is doubt if the product is genuine, verify with UniteQ.

### **3.3 P&ID**

For the P&ID of the STD, see chapter 12.

### **3.4 Connections**

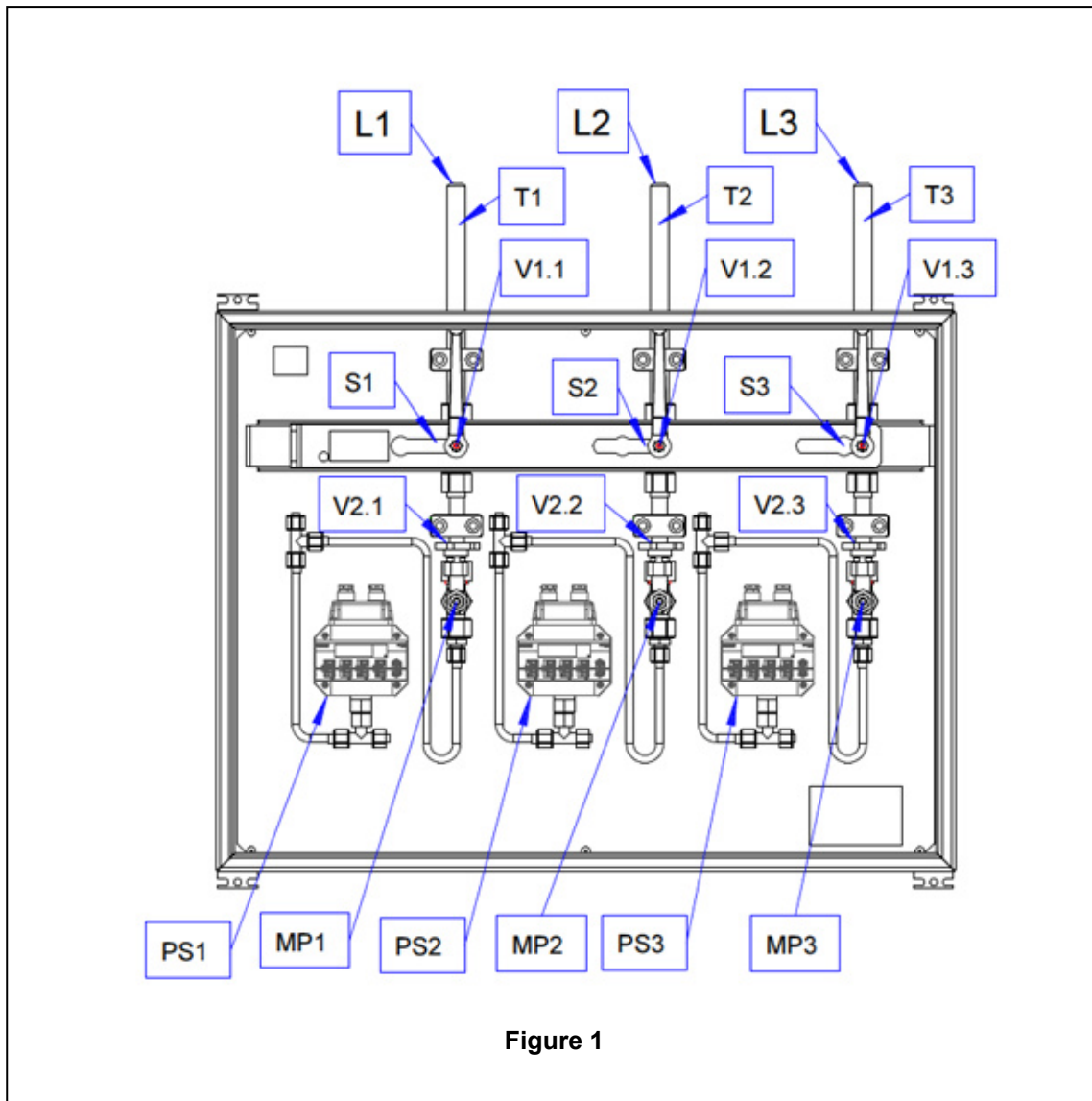
The required connections for operation of the STD can be found in the following chapters.

The steam tube connections are described in chapter 9.2 Steam connection.

The mechanical connections are described in chapter 9.1 Required construction.

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The electrical connections are described in chapter 6.2.1 Electrical connections.



### **3.5 Functional description**

The STD has three independent pipe runs L1, L2 & L3. These pipe runs are connected to the pressurized pipes through three pipe sockets T1, T2 & T3. A pipe run consists out of a shut-off ball valve (V1.1, V1.2 & V1.3) with a limit switch (S1, S2 & S3), a shut-off needle valve (V2.1, V2.2 & V2.3) with a minimes coupling (MP1, MP2 & MP3), a pressure switch (PS1, PS2 & PS3), and a contactor (K1.x, K2.x & K3.x). The contactor is connected to the electromagnetic valves Y1, Y2 & Y3 of a manifold, which is connected to a actuator. This actuator brings the main valve in the



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safe position. If one of the three pressure switches is triggered the safety function is activated, therefore the system setup is 1 out of 3 (1oo3).

During normal operation all three high-pressure shut-off ball valves V1.1, V1.2 & V1.3 are open. To ensure that all shut-off ball valves stay open the interlocking slide is secured with a padlock which can only be locked if the interlocking slide is in the most left position and the shut-off valves are open.

If the system pressure increases above the preset limit value, the safety function is activated. The contactors K1.x, K2.x and K3.x are disconnected which interrupts the power to the electromagnetic valves Y1, Y2 and Y3. Switching the electromagnetic valves Y1, Y2 & Y3 will trigger the actuator to move the main valve in the safe position.

### 3.6 Test functions

 <b>Warning</b>	All tests on the STD need to be performed by personnel, qualified for working with functional safety equipment. If in doubt, always contact HORA for advice.
 <b>Note</b>	At least once a year an inspector of HORA or UniteQ needs to be present when the function test is carried out. The inspector is qualified for working with functional safety equipment

The STD enables safety testing during operation of the system. It is possible to perform a function test of the individual independent pipe runs, as well as a check of the set switching points for the pressure switches. During testing the system setup remains 1oo2.

The function test is carried out on one pipe run at a time, the other two pipe runs will be fully functional.

#### 3.6.1 Measuring, recording, and setting the triggering time

During the test procedure, the pressure variations in the actuator is measured and recorded. A pressure sensor will be connected to the actuator.

The switching time is set in the STD electrical cabinet via interval time relays. It must be set in such a way that the valve can be seen to move. Make sure that the switching time is set by an expert of the inspection test.

#### 3.6.2 Function test

Perform the function test at one independent pipe run (L1, L2 or L3) at a time. Build up the test circuit of (Figure 2. Test circuit of L3) as described in the steps below:

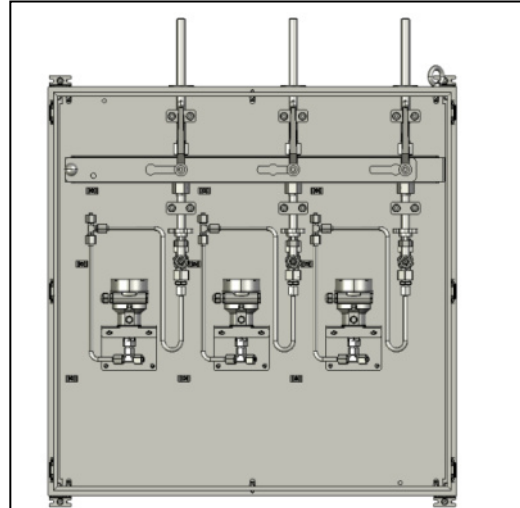
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- Position the interlocking slide in the right position.
- Close high-pressure shut-off ball valve V1.
- The now activated limit switch S, enables the test circuit.
- To simulate the system pressure a test pump is used.
- Connect the test pump to needle valve V2. The test pump can be connected to the needle valve through the minimess coupling MP.
- Open needle valve V2.

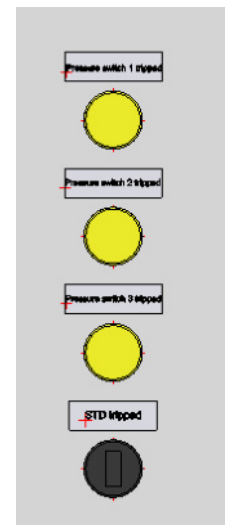
### ***3.6.2.1 Increasing pressure***

To increase the testing pressure follow the steps listed below:

- Switch the key switch S4 “STD test” to position 1, see Figure 3. STD test switch.
- With the test pump the pressure can be increased. Raise the pressure to approximately 90% of the preset triggering pressure.
- Now slowly increase the pressure at the pressure switch PS until it reaches the preset switching point. When the preset triggering pressure is reached or exceeded, the yellow lamp H, on the cabinet designated as “PS1 (2 or 3) activated”, will light up.
- The tested electromagnetic valve will receive a short pulse. The electromagnetic valve will shortly switch and move the actuator for a shot amount of time towards safe position of the main valve and back.
- The circuit is now tested.



**Figure 2. Test circuit of L3**



**Figure 3 STD test switch**

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### ***3.6.2.2 Lowering the pressure to below the reset value***

To release the pressure follow the steps listed below:

- Release the pressure in test pump.  
The pressure switch PS will be reset when the reset value is reached. The yellow lamp H, on the cabinet designated as “PS1 (2 or 3) activated”, will turn off.
- Before ending the test, the pressure must be lowered below the reset value, using the test pump.

### ***3.6.2.3 Test options***

It is also possible to adjust the test to a different function. By switching selector switch S6 the pressure test will not switch the electromagnetic valve and the actuator will not move.

The electromagnetic valve test and the actuator test can be done without increasing the pressure to the pressure switch. This can be done by pressing manual test enable S5.

### ***3.6.2.4 End function test***

The steam test device is brought back to normal operation as follows:

- Close needle valve V2.
- Disconnect the test pump from the minimess connection at the needle valve V2, make sure to screw the protective cover on the minimess connection.
- Open the high-pressure shut-off ball valve V1.
- The mechanical blocking of the interlocking slide is lifted.
- The interlocking slide can now be set on the next control pipe run.
- The function test can now be performed on the other two independent pipe runs following the same steps, starting from paragraph 3.6.2.
- When the complete function test is performed the interlocking slide is pushed to starting position.
- The interlocking rail must be secured with a padlock.

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### 3.6.3 Test forces of electromagnetic valves

#### *3.6.3.1 Testing the electromagnetic valves*

The test function for sufficient positioning force of the electromagnetic valve is done during the function test.

During the function test of the STD the power supply to the electromagnetic valves Y1, Y2 or Y3, will run through the resistor R1. The resistor is fixed.

When the STD is triggered, the voltage at the electromagnetic valves Y1, Y2 and Y3 is reduced by the resistor R1 to a residual voltage of approximately 1/6 of the nominal voltage. The spring in the electromagnetic valves Y1, Y2 and Y3 must move electromagnetic valve against the reduced magnetic force.

The electromagnetic valve (Y1, Y2 or Y3) will shortly switch and move the actuator for a short amount of time towards safe position of the main valve and back.

#### *3.6.3.2 Additional test in the event of negative results*

An additional test needs to be performed when the actuator does not react when the triggering pressure is reached during the function test. The test should be performed as follows:


- Approach the triggering pressure approximately 3 times. The actuator should react if triggering occurs. If this does not happen it is assumable that the positioning force reserves of the electromagnetic valve are reduced.
- The resistor needs to be taken out of the circuit. This can be done by de-energizing the magnet coil completely. The magnet coil fluid is de-energized by switching switch S4 "STD Test" to position 0.
- The STD should now work perfectly when the triggering pressure is reached. Check this by approaching the triggering pressure at least 3 times.
- The electromagnetic valve Y with the reduced positioning force reserves needs to be replaced, as soon as possible but at least within one week in, concert with a UniteQ inspector.

**Danger**

If the resistor are taken out of the circuit, but the triggering still does not take place there is a dangerous situation. The cause of the fault must be found as soon as possible and eliminated with a UniteQ inspector.

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## 4 Maintenance manual STD

	<b>Warning</b> All maintenance on the STD needs to be performed by personnel, qualified for working with functional safety equipment. If in doubt, always contact HORA or UniteQ for advice.
	Dirt in the hydraulic system causes malfunction and may lead to the loss of the safety function. Make sure no dirt enters the hydraulic system.
	Make sure not to damage parts and surfaces.
	Be aware that the system may still be under pressure.

Maintenance is required in the following cases:

- Leakage.
- Dysfunction or malfunction.
- Deviation from switching pressure.

### 4.1 Required Qualification

Every person doing maintenance or performing test on the STD must at least fulfil the following requirements:

- Bachelor degree in mechanical engineering or highly trained mechanic.
- Sufficient experience with the steam test devices.
- Knowledge of safety systems and the process, in particular the effect of defects to the safety to the process.

### 4.2 Preparation

Before commence work make sure the following is applied:

- Maintenance activities are in concert with the control room.
- Personal protective clothing/items.
- Prescribed calibrated equipment at hand.
- Clean workspace.
- Maintenance plan at hand.
- Main valve is in safe position.
- When applicable, the medium is blocked by an additional valve.
- Electrical power supply off.
- Hydraulic / Pneumatic power supply off.

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### **4.3 Changing a seal**

When changing an O-ring or seal make sure that it is changed with the right one. Mind measurements and material specifications! You can find them in the part list.

### **4.4 Changing a pressure switch**

When changing a pressure switch follow the steps listed below

- Close shut-off valve V1.
- Open V2 en relieve pressure through Minimes MP.
- Carefully disconnect the pressure switch PS. When blocking fluid is used, make sure to collect the blocking fluid leaking out of the pipeline system en the pressure switch.
- Place a new calibrated and sealed pressure switch.
- If blocking fluid is used refill the blocking fluid, see chapter 9.3.
- Perform the function test, see chapter 3.6.2.

### **4.5 Part list**

For part list and exploded view see chapter 12.



### **4.6 Life expectancy**

The life expectancy of the STD is 20 years, based on normal operation as described in this manual and regular maintenance. In normal use, as described in this manual, the warranty on the product expires 1 year after the delivery date.

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## 5 Danger STD

### 5.1 General

<b>Warning</b> 	It is not allowed to perform tests or maintenance activities when you are not qualified for working with functional safety equipment, see chapter 4.1.
<b>Danger</b> 	Removing the interlocking slide of the high-pressure shut-off ball valve during operation can cause dangerous situations.

### 5.2 Personal safety hazards

Take into account the following safety hazards when working at the STD.

- When opening the cabinet of the STD hot steam can come out of the cabinet. Be careful when opening the cabinet to prevent burning or cutting injuries.
- The pipelines within the cabinet of the STD can be hot. Personal protection equipment is obligatory to prevent burning injuries.
- Electrocution: several components inside the electrical cabinet are under voltage (24VDC). Disconnect the power supply before opening the electrical cabinet.

### 5.3 Danger signs



Figure 4. Wear safety goggles



Figure 5. Read the manual

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Figure 6. Electrical hazard



Figure 7. Hot surface



Figure 8. Check blocking fluid testing



Figure 9. Lock the interlocking slide after

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## 6 Surroundings / environment STD

When mounting the STD keep in mind that there should be enough space to perform the function test. Please see the dimensions in chapter 12 before searching for a suitable location. The STD can be bolted on a frame for standing assembly, which can be supplied by UniteQ, or directly onto the wall. The distance between the STD and the main valves cannot be over 20 m. From the location of the STD the main valves should be visible. The closer the STD is located to the main valves the better, this to improve the convenience of the function test. When choosing the location and length of the pressure pipes between the STD and the main valves take into consideration that the water temperature at the pressure switches and the high-pressure shut-off ball valves cannot be above 80°C.


The following ambient conditions must be complied with. The maximum admissible environmental temperature for the STD is between -20°C and 60°C. The STD should be protected from vibrations, which could influence the switching points. If necessary one could attach a damper (e.g. rubber buffer). Furthermore the location of the STD should be protected against wet (water/steam) and dirt. The STD must always be protected from weather influences. It shall be stored, mounted and applied inside a controlled environment.

### 6.1 Blocking fluid

To protect the pressure switches from steam and water influences a blocking fluid is used. The tubing is constructed with a syphon, equipped with filling and drain connection.

For transport reasons the system is delivered without blocking fluid. The syphon must be filled during installation and taking in operation.

The blocking fluid is a perfluoropolyether oil delivered by HORA or UniteQ, type is Ontropeen 40 made by Fuchs. For product information see chapter 12.

<b>Note</b>	Do not use other blocking fluid than the perfluoropolyether oil.
	

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## 6.2 Electrical

The general electrical specifications are:

Maximum expected simultaneous current:	10A
Maximum primary fuse:	1x10A
Supply:	230VAC
Control voltage:	24VDC

### 6.2.1 Electrical connections

The electrical connection in the STD are wired to it intern components. The electrical connections to other components are described in the electrical P&ID see chapter 12.

Electrical connections are:

DCS or other main control system:

- Power supply 230 VDC / 16A
- Remote trip:  
Refer to wiring diagram X10 terminal 1 to 4.
- Steam test device tripped:  
Potential free switch over contact.
- Steam test device failure:  
Potential free switch over contact.
- Steam test device test active:  
Potential free switch over contact.
- PS1 signal tripped,  
Potential free switch over contact.
- PS2 signal tripped,  
Potential free switch over contact.
- PS3 signal tripped,  
Potential free switch over contact.

Actuator 1:

- Power to valve 1:  
Normal open 24VDC 2A.
- Power to valve 2:  
Normal open 24VDC 2A.
- Power to valve 3:  
Normal open 24VDC 2A.

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### 6.3 Transport

When shipping a new or used STD one must make sure no damage occurs during transport. Damage may result from:

- Throwing a package.
- High loads on top.
- Overseas shipping.
- Dirt going in to open tubing.
- etc.

To prevent damage:

- Make sure all open ports get plugged.
- Fix the STD cabinet properly.
- Protruding tubes must be protected.

#### 6.3.1 Stock

Stocking damage is to be taken into consideration. Think of:

- Keeping it at required temperatures (see chapter 6).
- Avoid stocking in moist places.
- Etc.

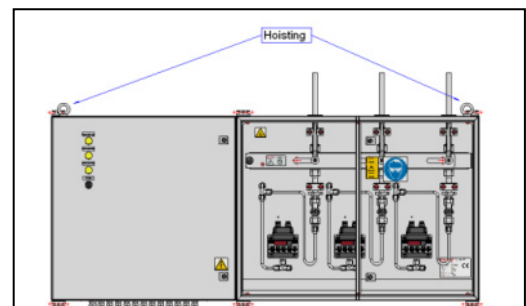
#### 6.3.2 Hoisting

The STD can be hoisted as follows:

- With a sling on the lifting points, see Figure 10. STD Hoisting.

Before hoisting take in to consideration:

- Mass.
- Forces on hoisting eye.
- Centre of gravity.
- Damageable parts of STD are protected.



**Figure 10. STD Hoisting**

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## 7 Safety Manual STD

### 7.1 General

The STD for controlling main valves conforms to the following regulations:

- Alignment 97/23/EG European parliament.
- NEN-EN-ISO 4126-5:2004: Safety devices for protection against excessive pressure Part 5: Controlled safety pressure relief systems (CSPRS).
- NEN-EN 12952-10:2002: Water-tube Boilers And Auxiliary Installations - Part 10: Requirements For Safeguards Against Excessive Pressure.
- NEN-EN-IEC 61508:2010: Functional safety of electrical/electronic/programmable electronic safety-related systems.
- TRD 421:1998: Safeguards Against Excessive Pressure - Main valves - For Steam Boilers Of Groups 1, 3 and 4.
- CE-norm.


#### 7.1.1 Safety Data

The safety data are calculated by UniteQ. Therefore, no safety level higher then SIL 3 can be issued. Please see attachment for the safety data of the STD100111.

### 7.2 Test Functions

The following test functions are implemented in the STD:


- Function test (chapter 3.6.2).
- Test for sufficient positioning force reserves (chapter 3.6.3).

<b>Note</b> 	The expected skill level of the person executing and reviewing the tests. The person should have knowledge of the safety systems and be experienced with operating the equipment. If in doubt, always contact UniteQ for advice.
--	--

### 7.3 Proof Test

A proof test has to be carried out every year. During the proof test the operator must prove that the safety related components of the product still meet the specifications and can be regarded "as new". When carrying out the proof test, results must be documented and analysed.

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	<p><b>Note</b></p> <p>The expected skill level of mechanic executing the proof test. The mechanic should have general knowledge of the safety systems and extended knowledge of the STD. The mechanic is to be considered an expert in steam test devices. If in doubt, always contact UniteQ for advice.</p>
	<p>A UniteQ inspector with sufficient knowledge and experience with steam test devices needs to be present when the function test is carried out.</p>

The following points must be checked during the proof test:


Pos.	Test	Reference
10	Switching points of pressure switches	See chapter 3.6.2
20	Positioning force reserves	See chapter 3.6.3

All maintenance on the STD needs to be performed by personnel, qualified for working with functional safety equipment. If in doubt, always contact UniteQ for advice.

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## 8 State of product STD

### 8.1 Taking into operation


	<p><b>Note</b></p> <p>Before mounting the STD to the steam tube, the steam tubing must be flushed for a sufficient amount of time, this to be sure that the steam tubing is clean.</p>
---	--

First the tubing is installed to the STD, see chapter 9.2. Secondly, the electrical signals are all installed, see chapter 6.2. Third blocking fluid is added to the reservoir, see chapter 9.3. After these three steps the commissioning may begin.

### 8.2 Maintenance/repair

For maintenance and repair, take all described in chapter 4 into consideration.

### 8.3 Duty to report

	<p><b>Note</b></p> <p>When tests are performed, the user of the product is obligated to report the test results to HORA. Please use the form for test results provided in chapter 12.</p>
	<p>When faults occur during operation or maintenance is carried out, the user of the product is obligated to report this to HORA. Please use the form for failure/maintenance reports provided in chapter 12.</p>

### 8.4 Sealed

The pressure switches PS are sealed to ensure that the pre-set triggering value is not changed. When the seal is broken HORA and UniteQ are not responsible for damages caused by wrong triggering values.

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## 9 Mounting STD

### 9.1 Required construction

The STD can be supplied with a frame for standing assembly. It can be bolted onto this frame or directly on the wall.

Use the mounting brackets on the backside of the STD for dimensional drawing see chapter 12 Appendix.

### 9.2 Steam connection

The Measuring cabinet of the STD is connected to the pressurized pipes through three pipe sockets T1, T2 & T3.

For dimensional drawing see chapter 12 Appendix.

### 9.3 Pressure switches

The STD is delivered with three Endress+Hauser Cerabar PMP51 Pressure sensors PS1, PS2 & PS3.

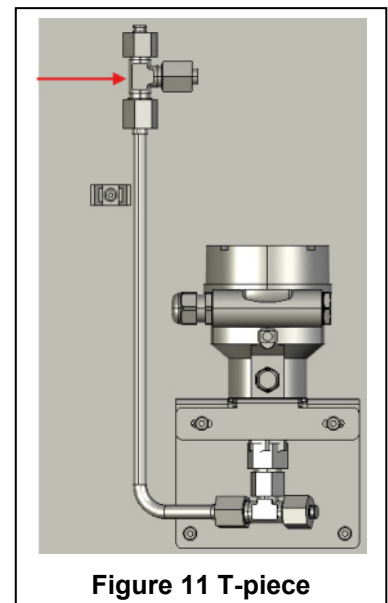
The electronic pressure switches need to be protected against water and steam influences. Therefore, prior to the initial start-up, make sure to add a blocking fluid with the right specifications, see chapter 12 into the tubes in front of the pressure switches PS. One can do this via the T connection piece, indicated by the red arrow in Figure 11 T-piece. Make sure that the blocking fluid filling is not drained. During every test the blocking fluid level should be checked.

### 9.4 Pressure test of the pipeline system

When testing the pressure of the pipeline system, make sure that all three shut-off ball valves V1.1, V1.2 & V1.3 are closed. This is to protect the pressure switches PS1, PS2 & PS3.

Because of the mechanical lock, closing all three shut-off valves at the same time is not possible in the default situation. To close all three shut-off ball valves perform the following steps:

- Open all three high-pressure shut-off ball valves V1.1, V1.2 & V1.3 completely.



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- Take off the manual lever from the high-pressure shut-off ball valves.
- Remove the interlocking slide of the high-pressure shut-off ball valves.

Make sure to place back the interlocking slide in the right way after performing the pressure test of the pipeline system. It is very important that the manual lever is installed in the correct position and is tightened at 5 Nm.

It is the responsibility of the operator to ensure that all measures are reversed or cancelled immediately after the pipeline pressure test.

### **9.5 Pickling and flushing the pipeline system**

When picking and flushing the pipeline system, make sure to follow the steps below to make sure that the STD will not be damaged:

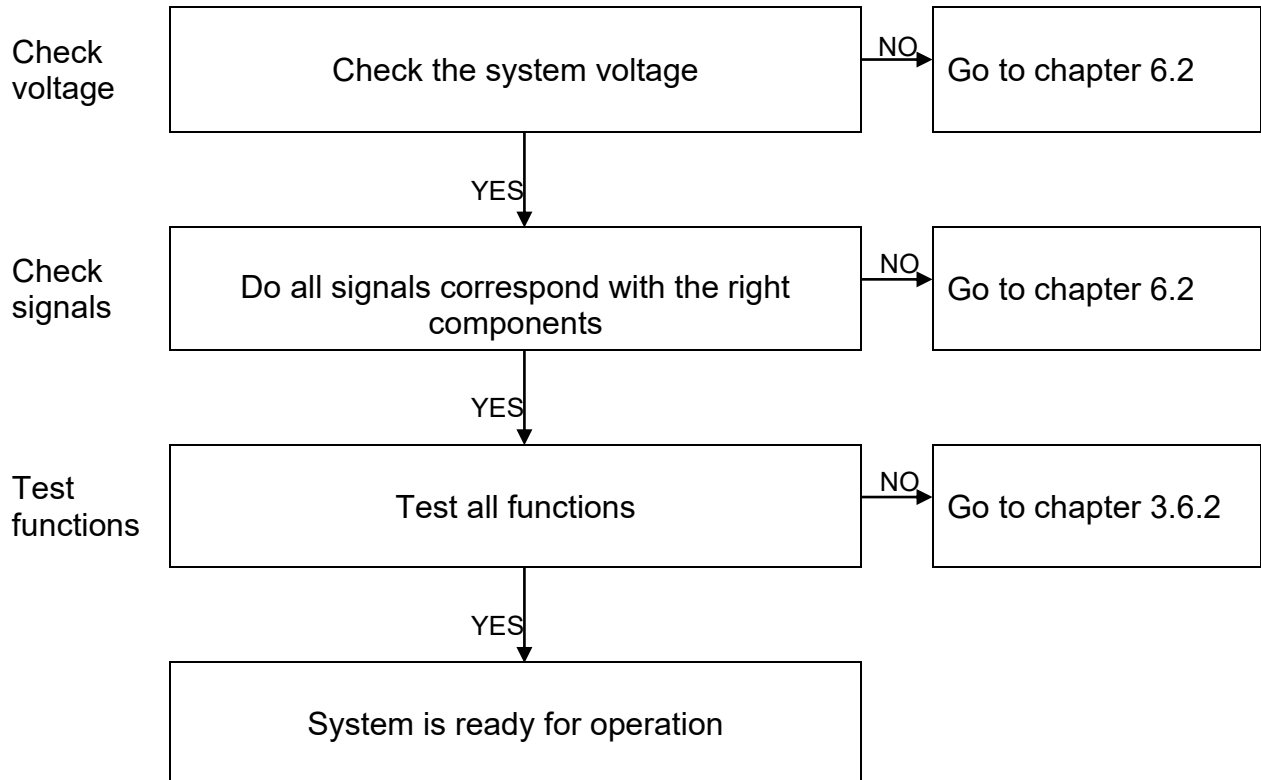
- Close all three high-pressure shut-off ball valves V1.1, V1.2 & V1.3 as described in chapter 9.4.
- After the pickling and flushing is finished, the pipes connecting the high-pressure shut-off ball valves V1.1, V1.2 & V1.3 to the pressure switches P1, P2 & P3 must be disassembled.
- Make sure that the pipeline system is depressurized.
- Collect the flushing liquids remaining in the pipeline system under the high-pressure shut-off valves. Carefully open one shut-off valve at a time to prevent any acid residues and impurities from splashing and damaging the pressure switches.
- Reconnect the connection pipes.
- Pressure test the connection pipes with a test pump through the test connections MP1, MP2 & MP3 until the triggering pressure of the pressure switches is reached and check for leaks.
- Refit all interlocking devices of the high-pressure shut-off ball valves.
- Refit the manual lever in the right position and make sure that it is tightened at 5 Nm

### **9.6 Measurements**

Total dry weight of the STD is approximately 150 kilograms. For measurements see chapter 12.

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## 10 Commissioning STD



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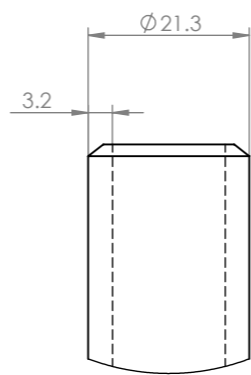
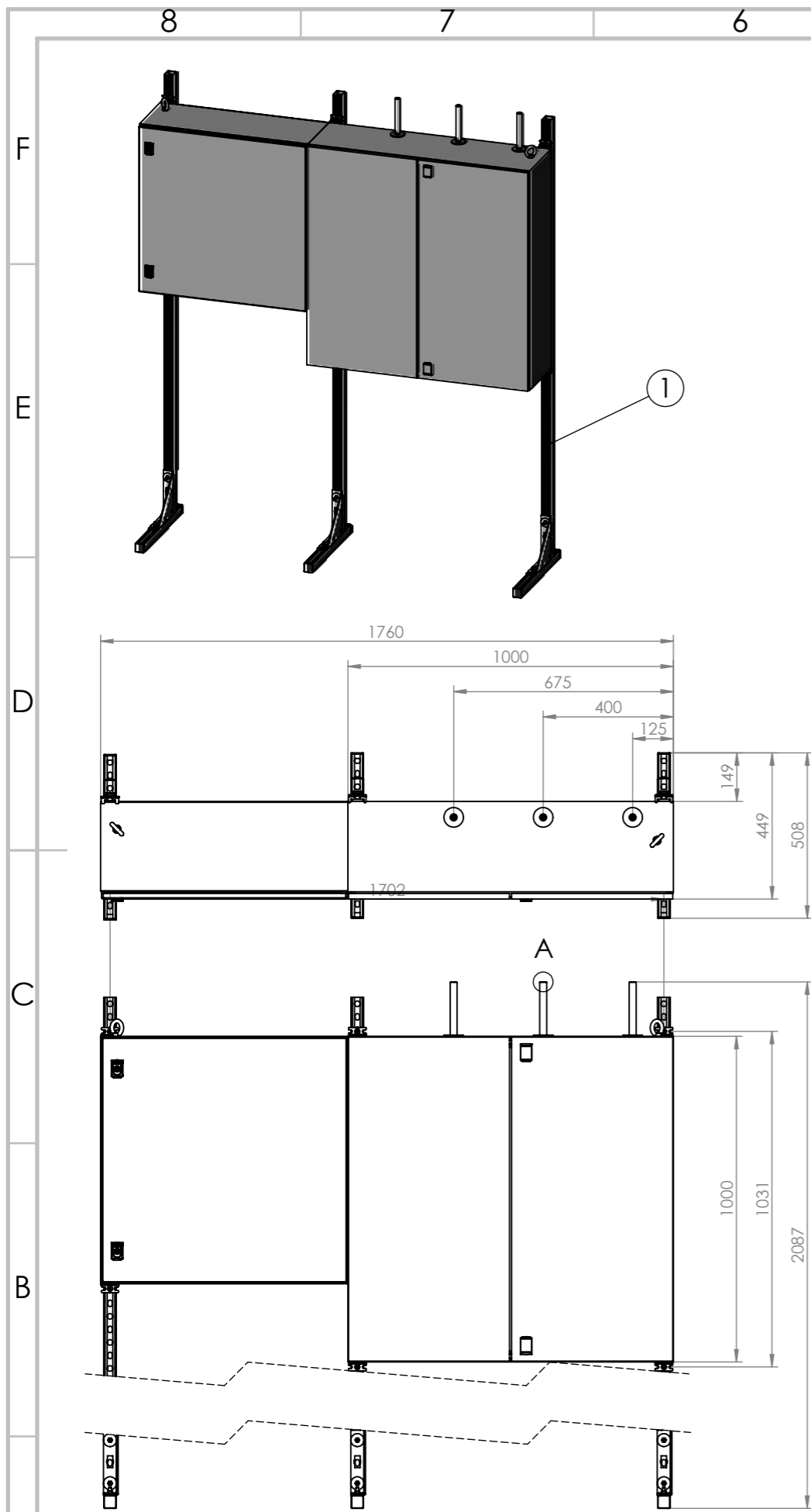


## 12 Appendix

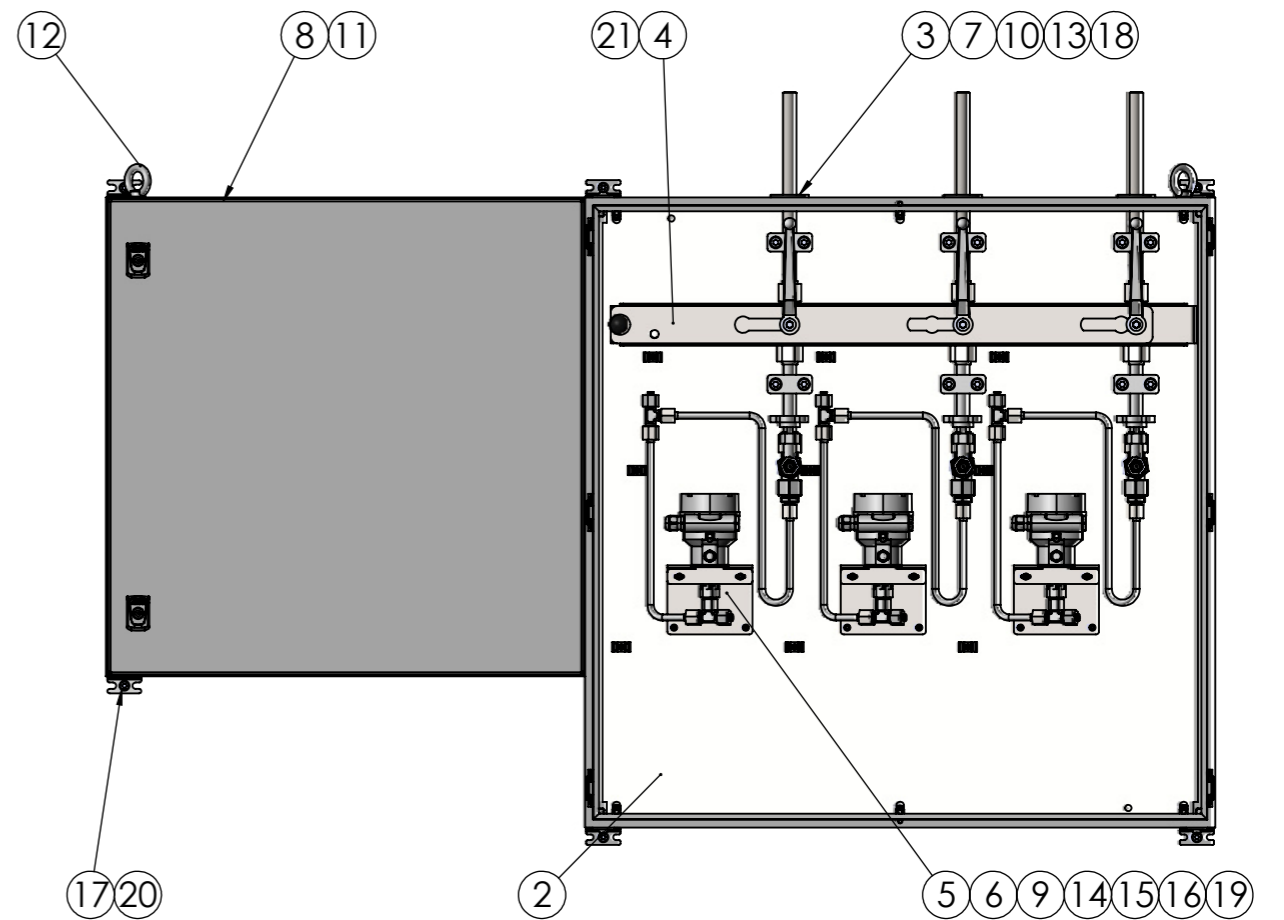
The appendix contains the following documents, all documents are in English:

- Technical Clarification
- Assembly drawing / Dimensions drawing.
- Electrical P&ID / Part list.
- Documentation on components.

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DETAIL A  
SCALE 1 : 1



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	STD100029	Support frame STD Height max. 2000mm	3
2	STD200149	Measuring cabinet STD base top connection 1000x1000x300	1
3	STD300006	Std protection rubber 21x60x4	3
4	STD300003	Lockingplate STD: 860x59x10: AISI 304	1
5	STD300126	Bracket Endress&Hauser Cerabar 135-110-90-2	3
6	STD300127	Locking plate Endress&Hauser Cerabar 135-30-21-2	3
7	STD300155	Steam Tube 21,3x3,2 L=310 1.0460 (P250GH)	3
8	ECU100361	Artes 240213 STD-S-1x230VAC-0-3/0-020-1-500-1-3-SS0000	1
9	PMP51-1CN4-0	Cerabar M PMP51 pressure sensor HART and SIL PPMP51-PMP51-AA22IA1SGBGCJA1	3
10	SRS 4021.3AL	PIPE CLAMP, HEAVY SERIES CLAMP SIZE 2 PIPE Ø21.3 ALUMINIUM	3
11	SZ 2508.100	Wall connection set rittal	2
12	2509010	AX CABINET HOIST EYE	1
13	BOOK 20S	FLARE CONNECTION WITH 2 O-RINGS PN400 M30x2	3
14	MAV-R 10S	PRESSURE GAUGE CONNECTION FITTING PN630 G1/2 / M18x1.5	3
15	01300.050.001	Hexagon nut M5 zinc plated	6
16	07160.050.010	Cylinder head screw M5x10 8.8 zinc plated	18
17	07160.080.016	Cylinder head screw M8x16 8.8 zinc plated	6
18	07160.100.055	Cylinder head screw M10x55 8.8 zinc plated	6
19	38031.050.001	Washer DIN125-1A M5 zinc plated	24
20	38031.080.001	Washer DIN125-1A M8 zinc plated	6
21	56914.080.032	Hand knob M8 Ø32	1

Unless otherwise specified: Dimensions are in mm  
Tolerances: DIN ISO 2768 class m  
Deburr and break all sharp edges  
0,25x45° unless otherwise specified  
This drawing is property of UNITEQ B.V. and may not be multiplied  
without its written permission, nor given to third parties.  
Revision: 01

	NAME	DATE
DRAWN BY	brvr	24-07-2024
TO PRODUCTION	brvr	24-07-2024
APPROVED	brvr	20-08-2024



TITLE:  
Steam Test Device (STD); Pressure;  
Temperature; E&H PMP51; 3NC; TRD421, SIL2.

Trip pressure	11.00	Bar(a)
Reset pressure	< 11.00	Bar(a)
Trip temperature	250	°C
Reset temperature	< 250	°C

**UNITEQ**  
HYDRAULICS  
Oude Graaf 18  
6002 NL Weert NL  
Tel. +31(0) 495 524 565  
E. Info@uniteq.nl

MATERIAL:	DWG NO. STD100126	A3
WEIGHT(kg): 53.61	SCALE:1:18	Do not scale drawing
		SHEET 1 OF 1

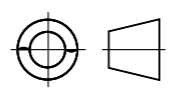


Oude graaf 18  
6002NL WEERT  
info@uniteq.nl  
+31 (0)495 - 52 45 65

Kunde	ARTES Valve & Service GmbH
Projektbeschreibung	KVA Vera II / HDU-DT2 Dampfprüfstock
Kundenreferenz	4500208001
Endkunde	
Referenz	
Herstellerreferenz	240213
Hersteller Artikel-Nr	ECU100361 STD-S-1x230VAC-0-3/0-020-1-500-1-3-SS0000
KKS /AKZ nr.	
Nach Standard	NEN-EN-IEC 60204-1
Hersteller (Gehäuse)	RIT. AX 1014000 (760 x 760 x 300 AISI304)
Schutzklasse	IP66
Gesamtgewicht	50 Kg
Erstellt am	2-7-2024
Bearbeitet am	4-11-2024

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Sofern nicht anders angegeben (mm)



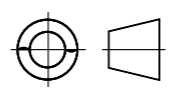
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APD					

# Inhaltsverzeichnis

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1	Titel Blatt		29-10-2024
2	Inhaltsverzeichnis		4-11-2024
2.a	Inhaltsverzeichnis		4-11-2024
3	Allgemeine Regeln		29-10-2024
4	Verdrahtung		29-10-2024
5	Haupt Einspeisung		22-10-2024
6	ET200MP		4-11-2024
7	Druckmessleitung 1		4-11-2024
8	Temperaturmessleitung 1		4-11-2024
9	Druckmessleitung 2		4-11-2024
10	Temperaturmessleitung 2		4-11-2024
11	Druckmessleitung 3		4-11-2024
12	Temperaturmessleitung 3		4-11-2024
13	Dampfprüfstock Auslösung		22-10-2024
14	Sicherheitsventile 1003		22-10-2024
15	ET200MP Eingänge		8-7-2024
16	ET200MP Eingänge		8-7-2024
17	ET200MP Ausgänge		8-7-2024
18	ET200MP Ausgänge		8-7-2024
19	ET200MP Analoge Eingänge		4-11-2024
20	ET200MP Analoge Eingänge		4-11-2024
21	Verbindungen Kunde		22-10-2024
22	Schrank / montageplatte ansicht		4-11-2024
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24	Klemmenplan		22-10-2024
25	Klemmenplan		22-10-2024
26	Klemmenplan		22-10-2024
27	Klemmenplan		22-10-2024
28	Klemmenplan		22-10-2024

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REVISION					



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CHD					
APD					



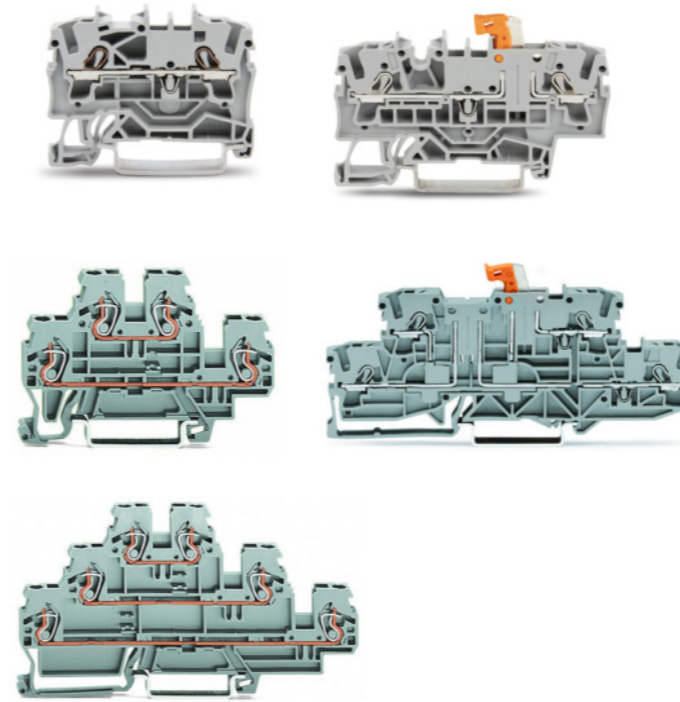
### Komponentencodierung

Codierung schwarz auf weiß.  
Kodierung auf Bauteil und Montageplatte



### Klemmen

Standard WAGO Topjob-S Klemmen  
Push in Cage Clamp



### Standard-Kabelverschraubungen aus Polyamid

Schutzklasse IP68 (5bar 30min) / IP69  
Glühdrahtprüfung 750 °C  
Temperaturbereich -40 °C - 100 °C  
Material Verschraubung Polyamid, Dichtung EPDM



- Klemmleiste X0 (Orange Klemmen) > 300VAC
- Klemmleiste X1 Hauptgruppen
- Klemmleiste X3 (Orange Klemmen) DC
- Klemmleiste X4 (Intern von/zum Feld) 24VDC
- Klemmleiste X5 (Messklemme) 4-20mA

- : AC-Wechselstromversorgung
- : (Motoren, Heizung usw.).
- : Gleichstromversorgung
- : Signale von/zum Feld
- : Analoge Signale ein / aus

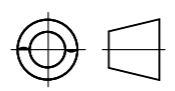
#### Kundensignale

- Klemmleiste X11 Potentialfrei
- Klemmleiste X12 Potentialfrei

- : Signale an den Kunden (Meldungen).
- : Signale vom Kunden (Freigabe usw.).

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4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Skala  
1 : 1

Sofern nicht anders angegeben (mm)



Allgemeine Regeln				
240213				= STD
DRN	JaDa	29-10-2024	+	REV NO
CHD				
APD				
Blatt 3				

# DRAHT FARBEN

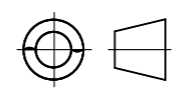
	Spannung		Schwarz	Hellblau	Grün / Gelb	Dunkel Blau	Orange	Weiß	Rot	Braun	Grau	.....
Haupt Speisung	400 - 500 / 50/60Hz	L1,L2,L3	×									
		N		×								
	230 / 50/60Hz	230V-L	×									
		230V-N		×								
Steuerspannung	< 60V	60VDC				×						
		0VDC				×						
Steuerspannung	> 72V	72VAC	×									
		N		×								
Steuerspannung	> 72V	72VDC	×									
		0VDC	×									
Analoge Signalen	0/4...20mA / 0-10V	+									×	
		-									×	
Externe Spannung	Alle Steuerspannungen						×					
PE		PE			×							
.....		.....										

Aderendhulzen	Weiß	Grau	Rot	Schwarz	Blau	Grau	Gelb	Rot	Blau	Gelb	Rot
Draht Ø Imax	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>	4,0 mm <sup>2</sup>	6,0 mm <sup>2</sup>	10,0 mm <sup>2</sup>	16,0 mm <sup>2</sup>	25,0 mm <sup>2</sup>	35,0 mm <sup>2</sup>
0 - ≤5A	×	×	×								
>5 - ≤10				×							
>10 - ≤16A					×						
>16 - ≤25A						×					
>25 - ≤32A							×				
>32 - ≤40A								×			
>40 - ≤63A									×		
>63 - ≤80A										×	
>80 - ≤125A											×

Haupteispeisung mindestens 1,5mm<sup>2</sup>

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△					
△					
△					
△					
△	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



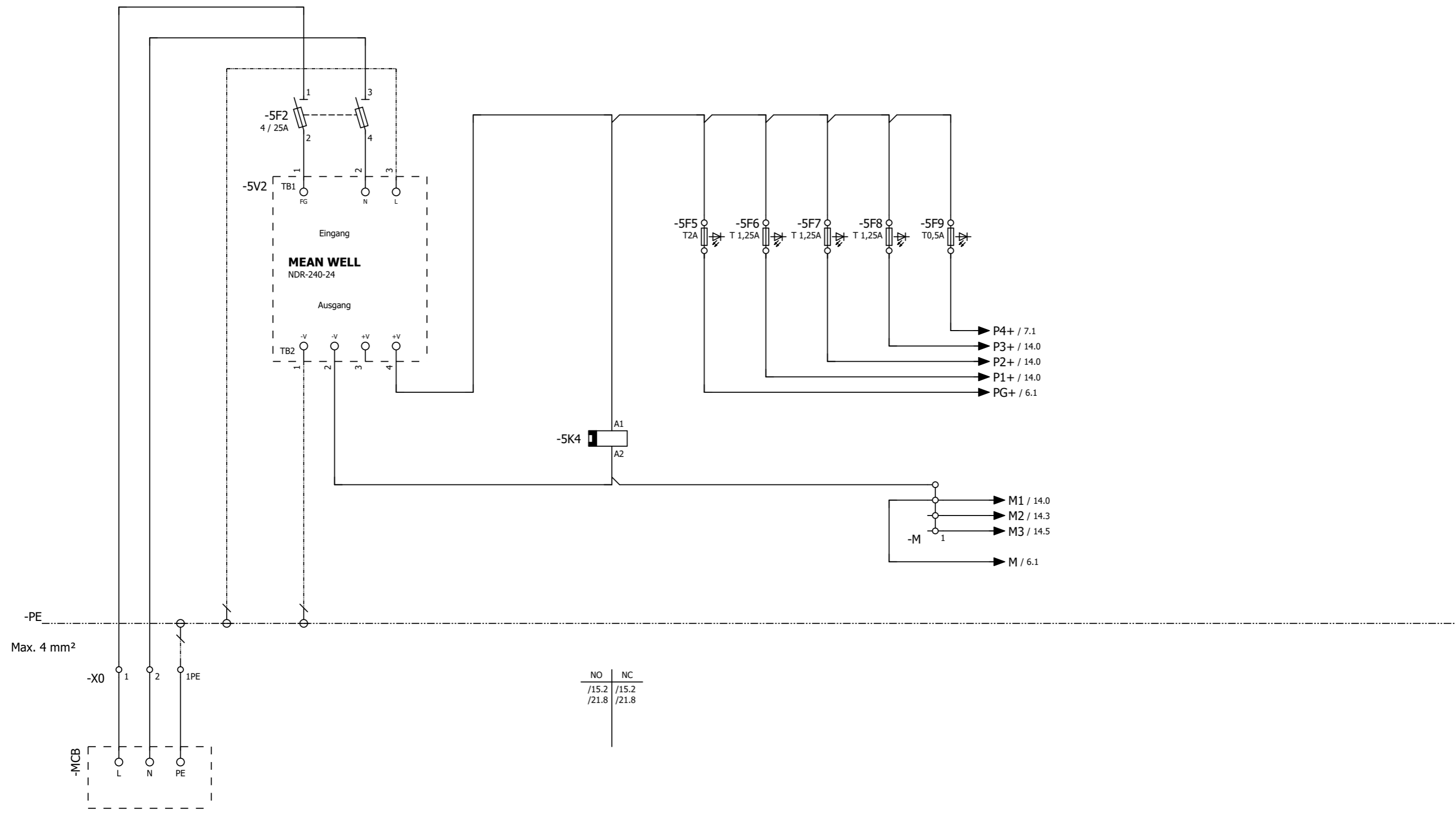
Skala  
1 : 1

Sofern nicht anders angegeben (mm)



Verdrahtung 240213				= STD
DRN	JaDa	29-10-2024	+	REV NO
CHD				
APD				
Blatt 4				

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Max. 4 mm<sup>2</sup>

-PE

-X0 1 2 1PE

-MCB

EINSPEISUNG KUNDE 230VAC / 4A

24VDC POWER SUPPLY

FEHLER EINSPEISUNG

SPEISUNG STRANG 1

SPEISUNG STRANG 2

SPEISUNG STRANG 3

SPEISUNG ALGEMEIN

SPEISUNG STRANG 2

SPEISUNG SIL RELAIS

NO /15.2 /21.8

NC /15.2 /21.8

M1 / 14.0

M2 / 14.3

M3 / 14.5

M / 6.1

P4+ / 7.1

P3+ / 14.0

P2+ / 14.0

P1+ / 14.0

PG+ / 6.1

-5K4

A1

A2

-5F5 T2A

-5F6 T 1,25A

-5F7 T 1,25A

-5F8 T 1,25A

-5F9 T0,5A

-5V2

TB1

TB2

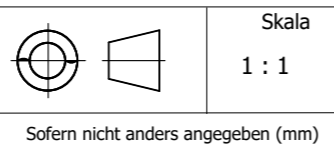
Eingang

Ausgang

MEAN WELL NDR-240-24

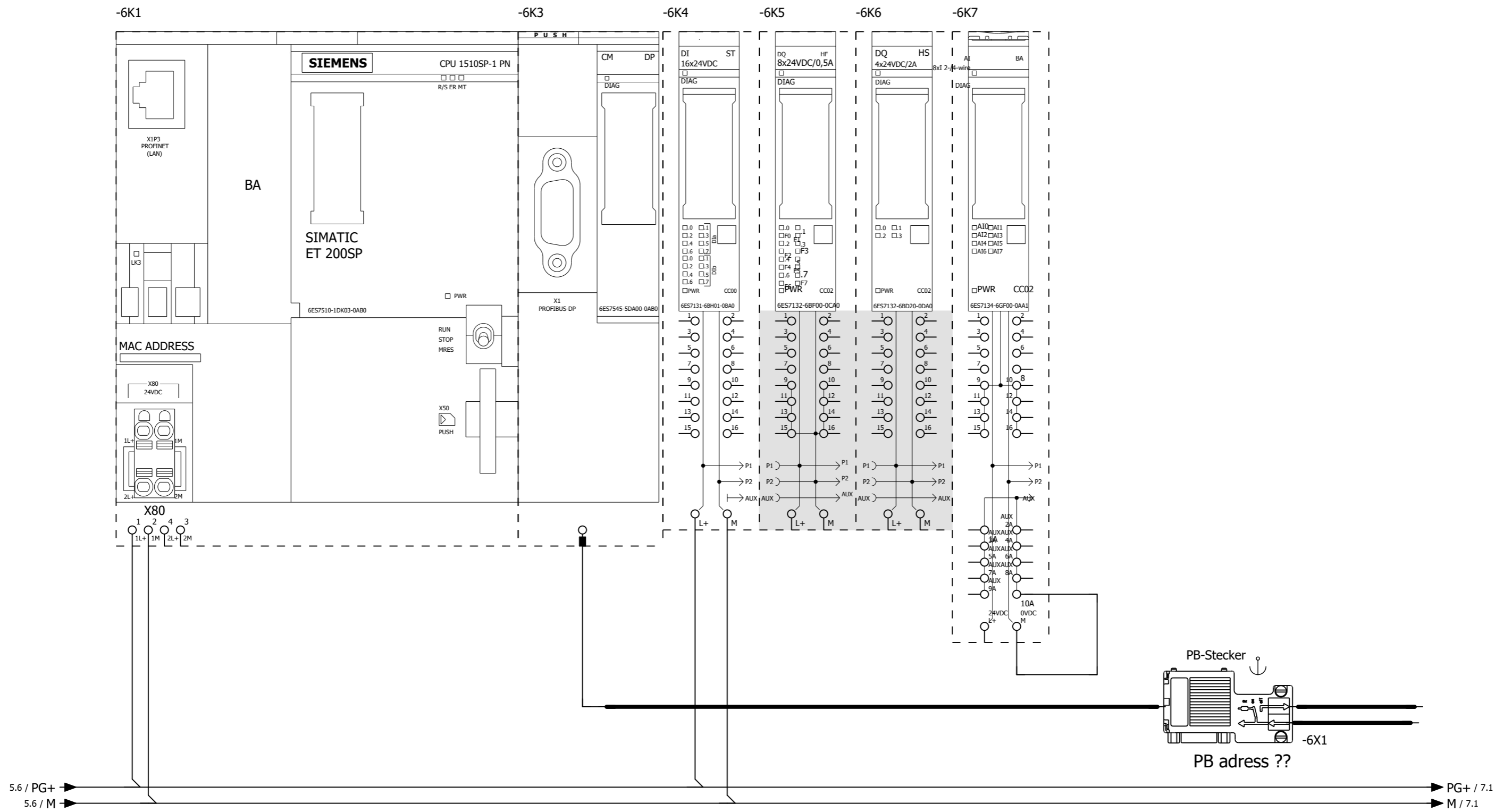
-5F2 4 / 25A

REVISION	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
4					
3					
2					
1					

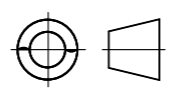


Haupt Einspeisung 240213				REV NO
DRN	JaDa	22-10-2024	= STD	
CHD			+	
APD			Blatt 5	

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4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



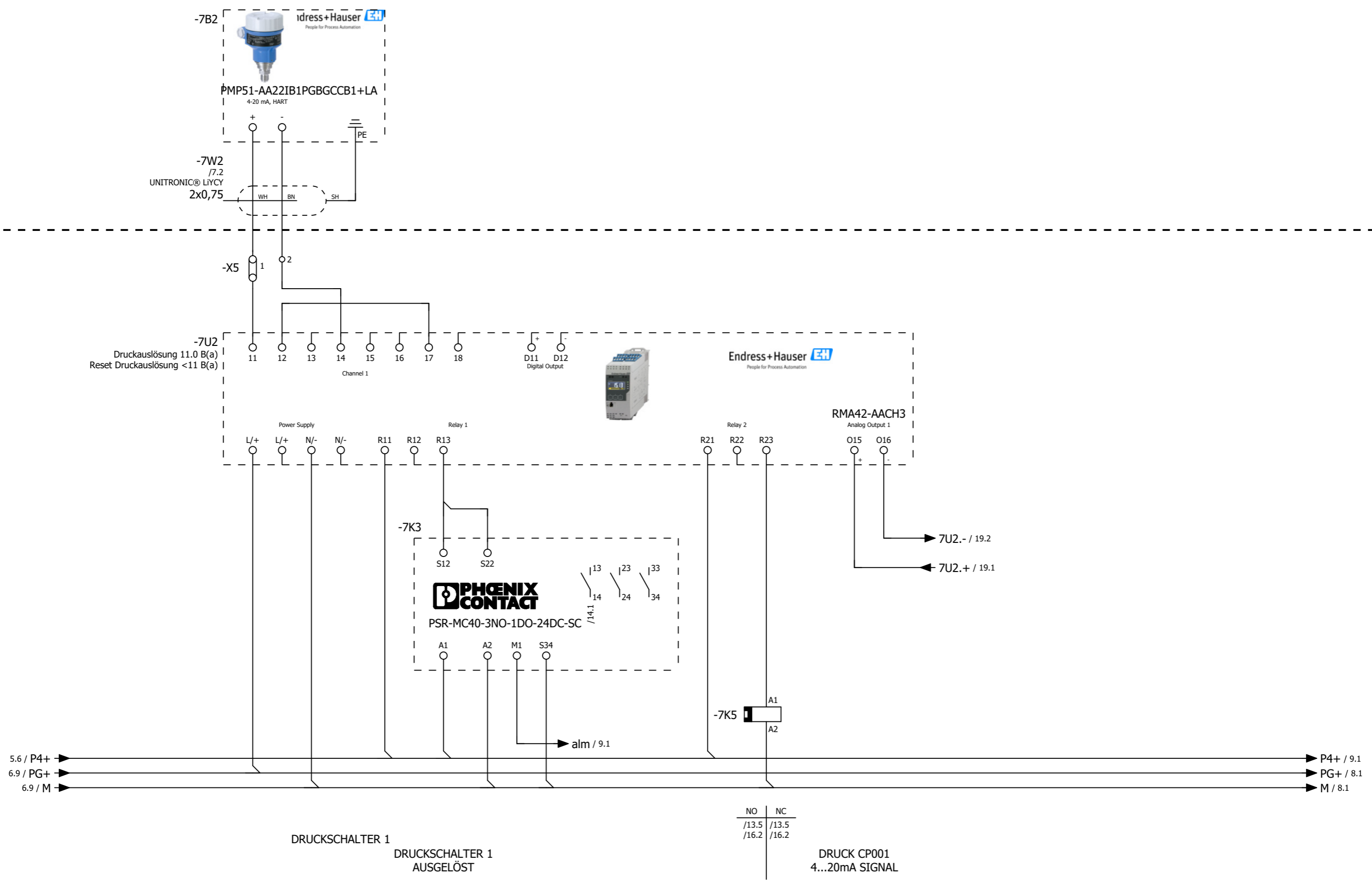
Skala  
1 : 1

Sofern nicht anders angegeben (mm)



ET200MP 240213		= STD	
DRN	JaDa	4-11-2024	+
CHD			
APD			
Blatt 6			REV NO

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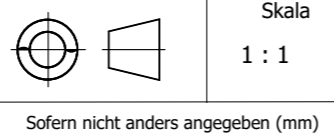
DRUCKSCHALTER 1

DRUCKSCHALTER 1  
AUSGELÖST

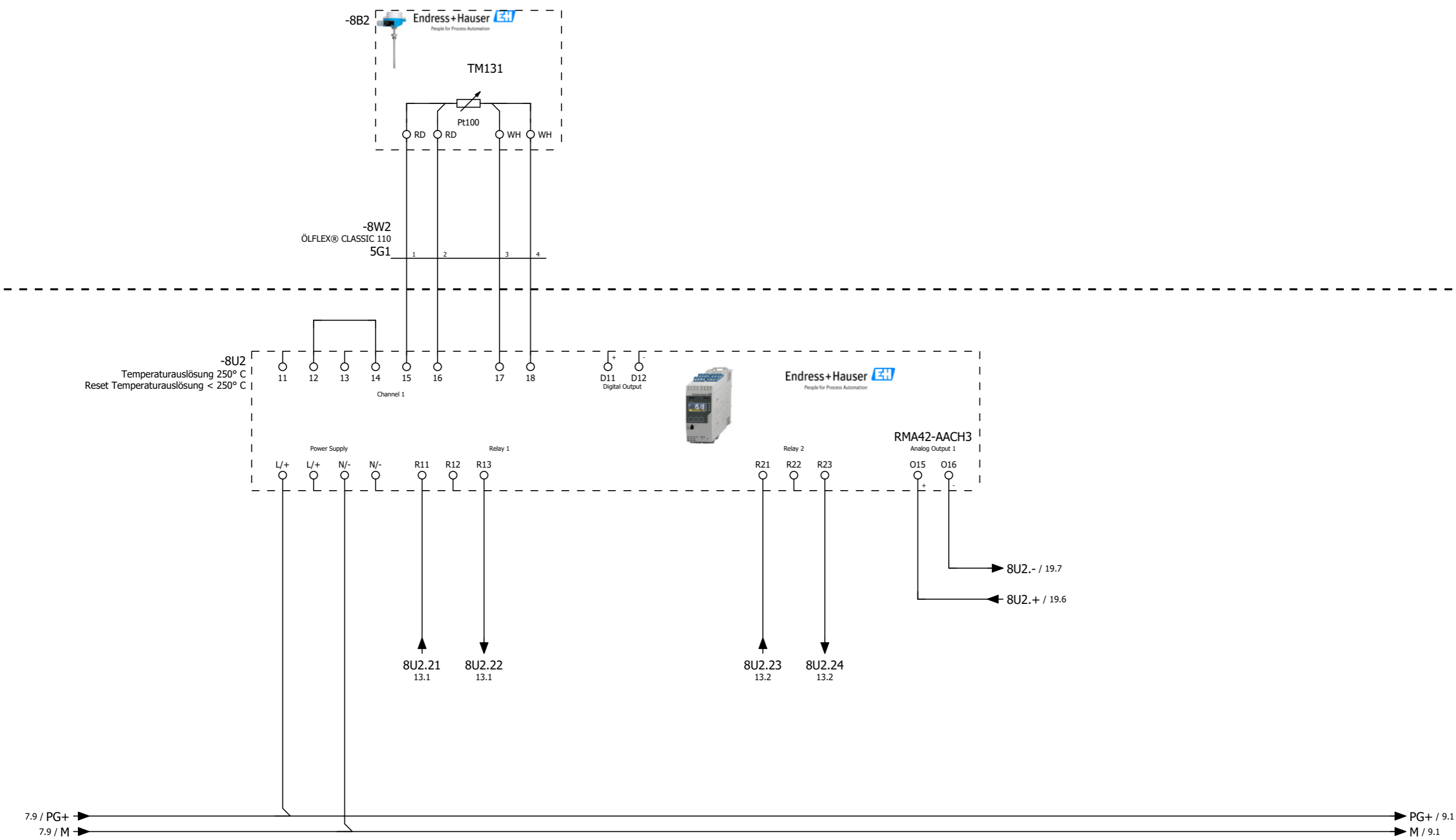
NO	NC
/13.5	/13.5
/16.2	/16.2

DRUCK CP001  
4...20mA SIGNAL

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



Druckmessleitung 1				= STD	REV NO
240213					
DRN	JaDa	4-11-2024	+	Blatt 7	
CHD					
APD					



TEMPERATURLINIE 1  
AUSGELÖST

CT001 2oo3  
RELAIS KONTAKT

CT001 2oo3  
RELAIS KONTAKT

TEMPERATUR CT001  
4...20mA

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4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					

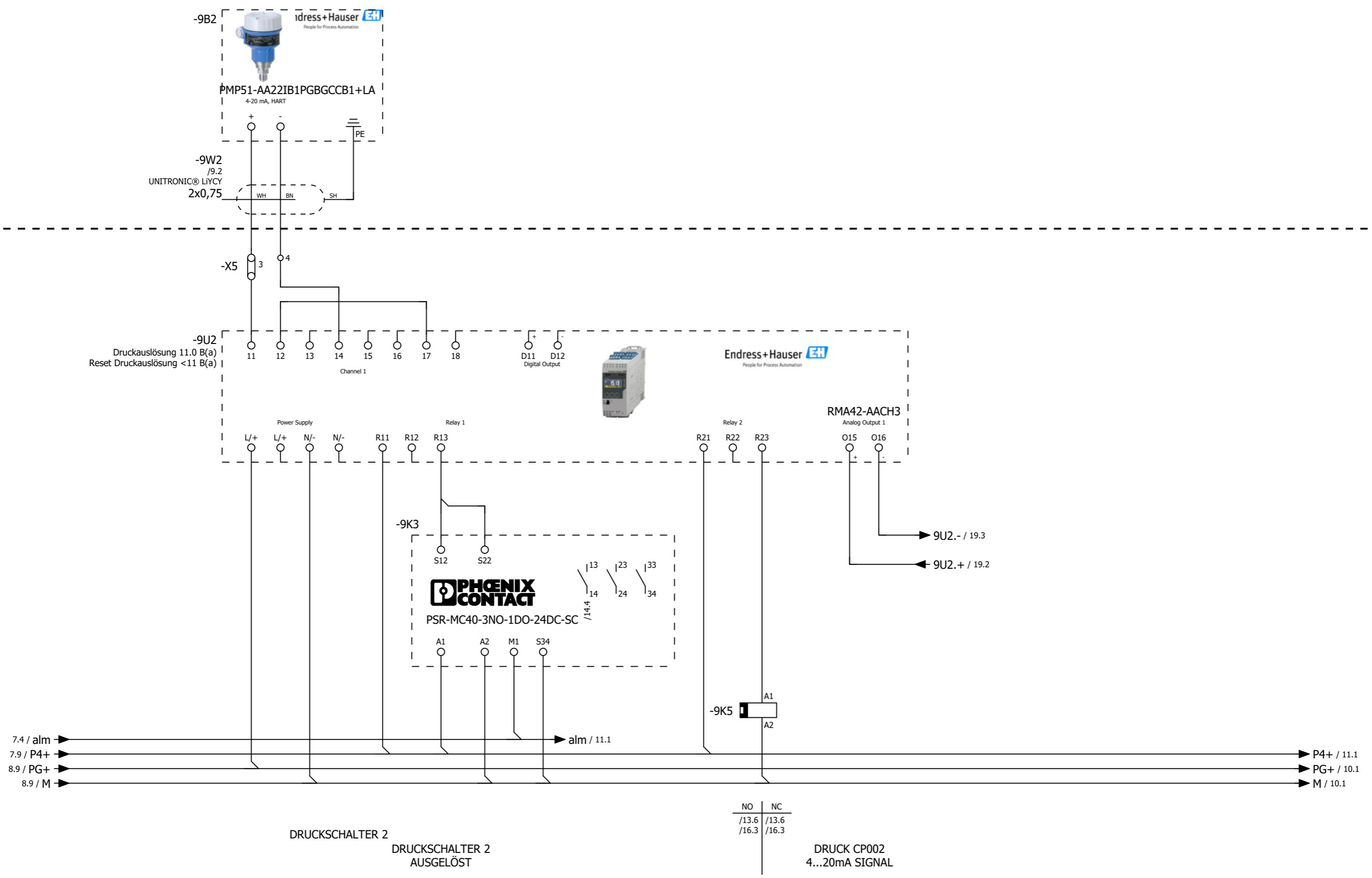
Skala  
1 : 1

Sofern nicht anders angegeben (mm)



Temperaturmessleitung 1 240213				= STD	REV NO
DRN	JaDa	4-11-2024	+	Blatt 8	
CHD					
APD					

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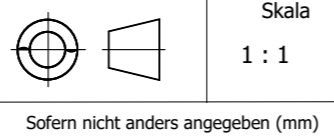
DRUCKSCHALTER 2

DRUCKSCHALTER 2  
AUSGELÖST

NO	NC
/13.6	/13.6
/16.3	/16.3

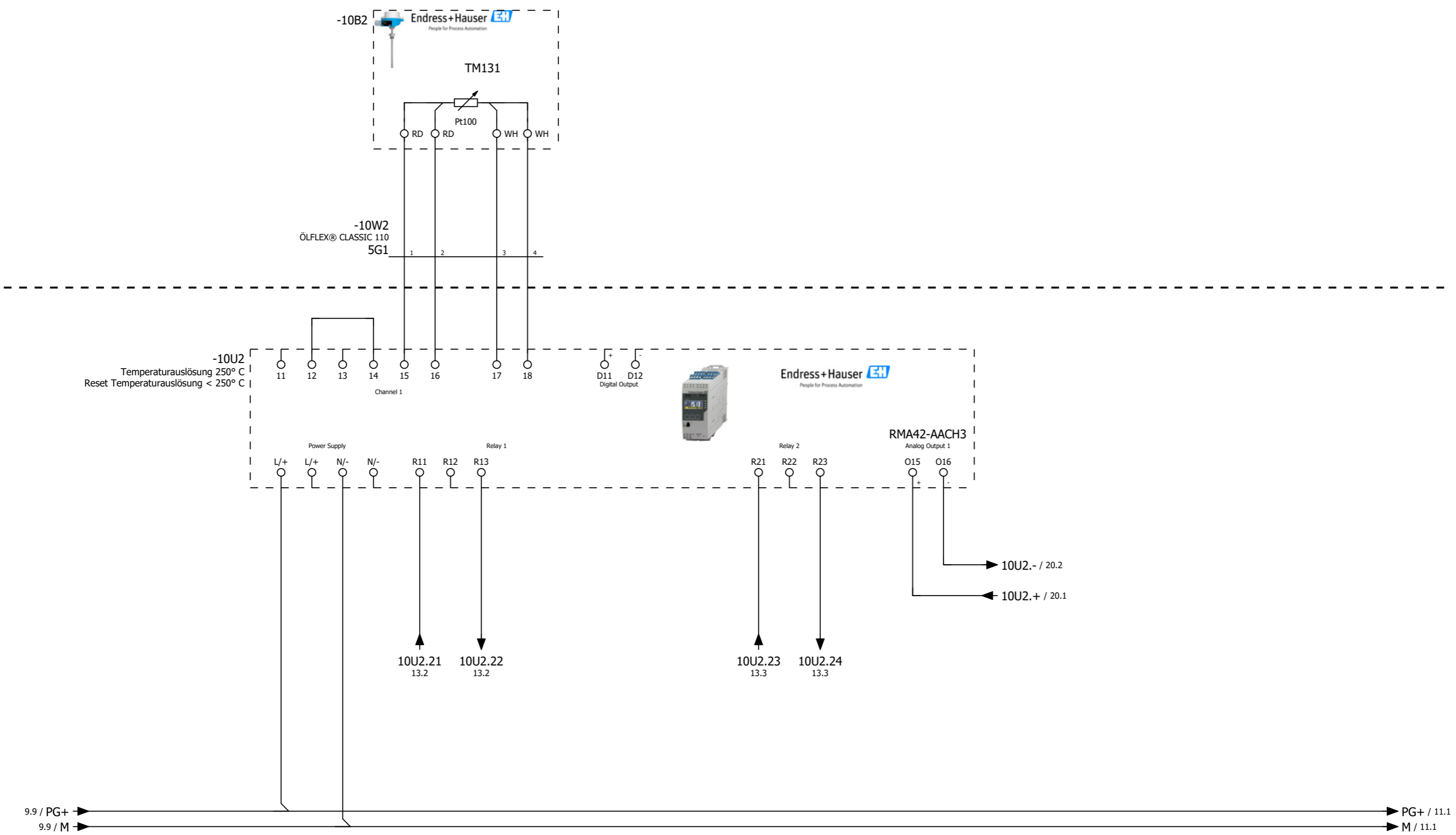
DRUCK CP002  
4...20mA SIGNAL

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



Druckmessleitung 2				= STD	REV NO
240213					
DRN	JaDa	4-11-2024	+	Blatt 9	
CHD					
APD					

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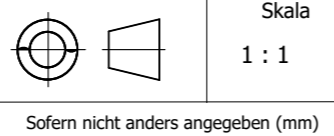
TEMPERATURLINIE 2  
AUSGELÖST

CT002 2oo3  
RELAIS KONTAKT

CT002 2oo3  
RELAIS KONTAKT

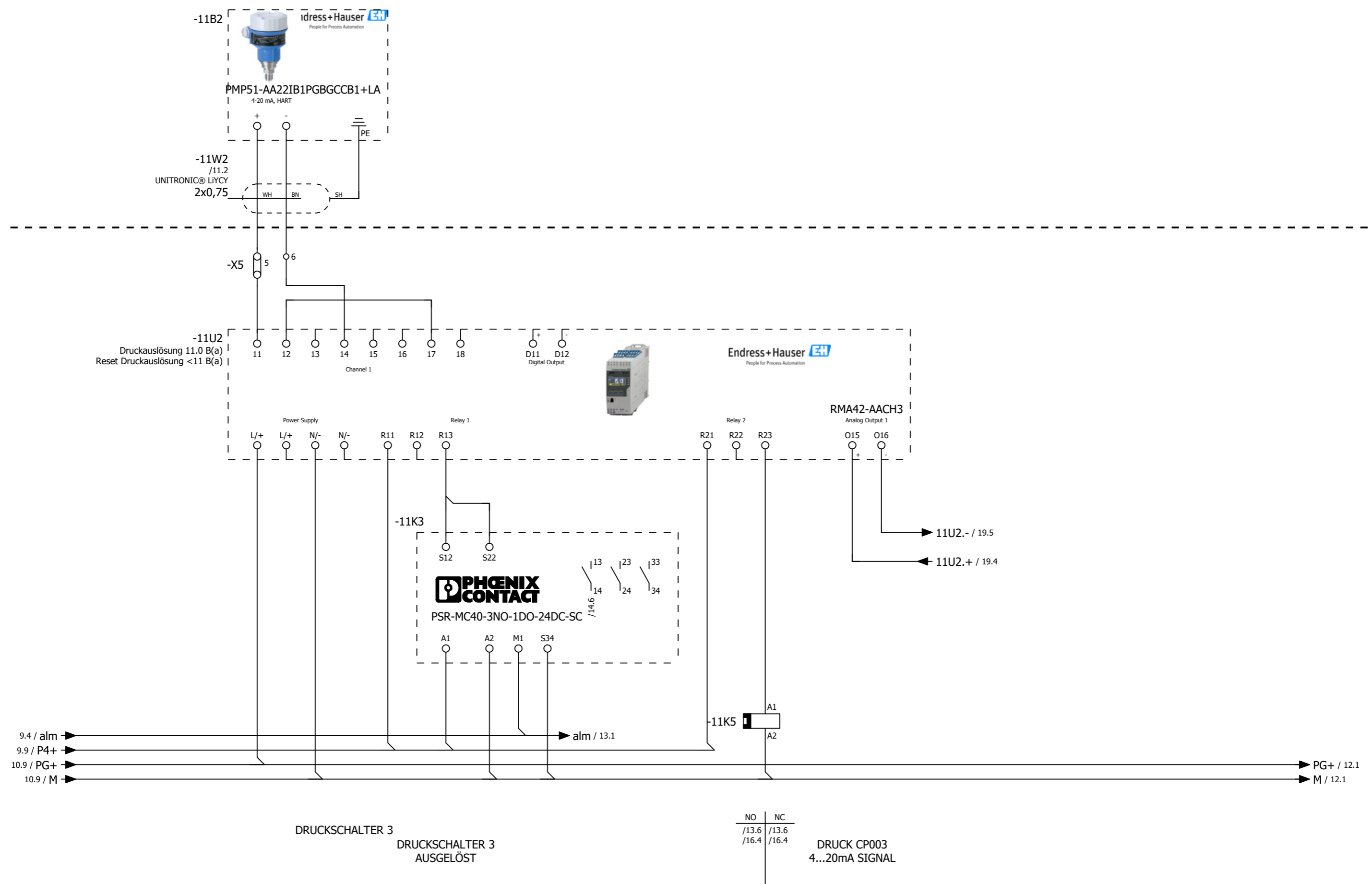
TEMPERATUR CT002  
4...20mA

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Temperaturmessleitung 2 240213				= STD	REV NO
DRN	JaDa	4-11-2024	+	Blatt 10	
CHD					
APD					

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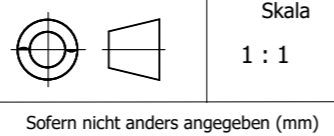
DRUCKSCHALTER 3

DRUCKSCHALTER 3  
AUSGELÖST

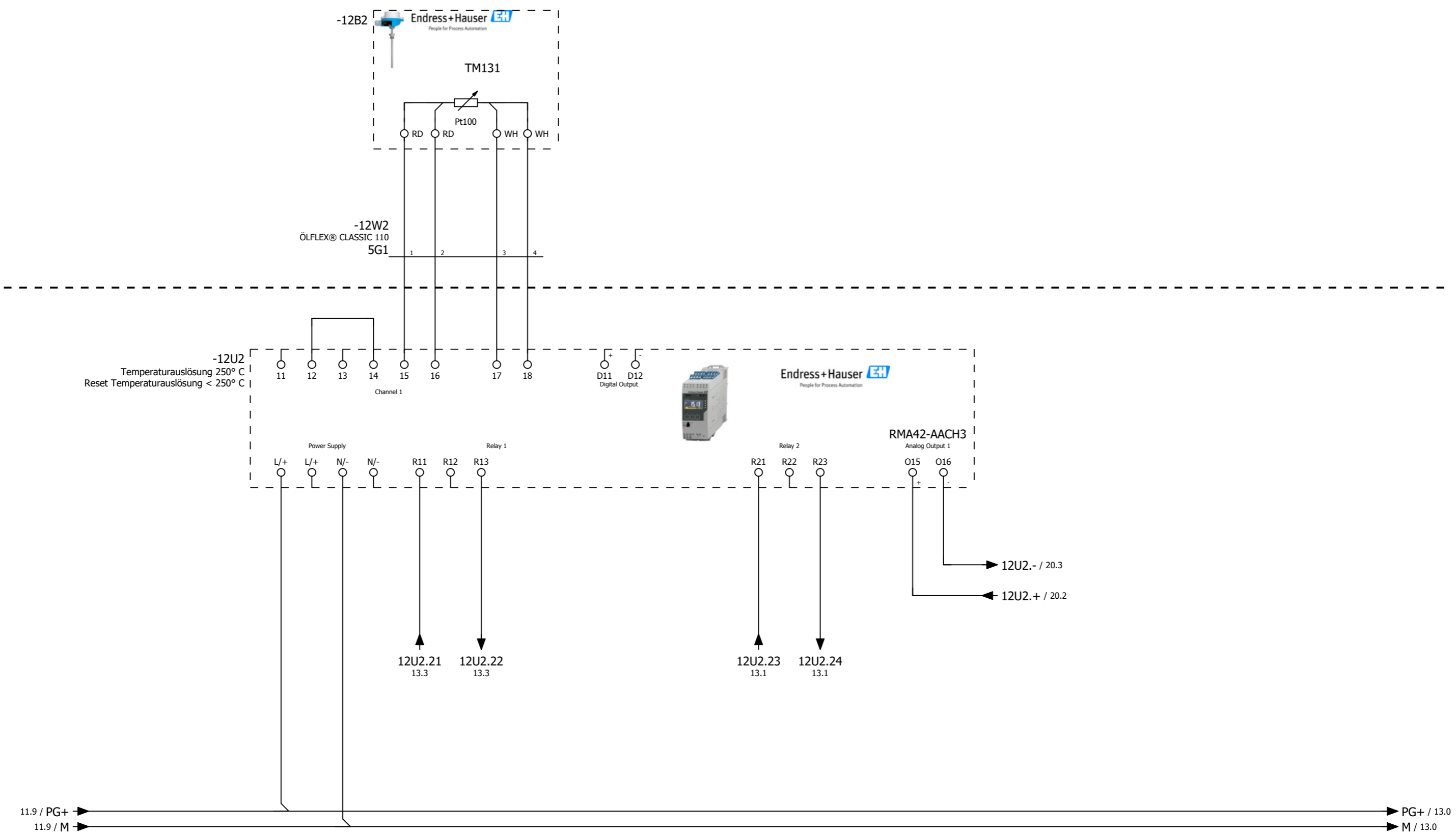
NO	NC
/13.6	/13.6
/16.4	/16.4

DRUCK CP003  
4...20mA SIGNAL

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



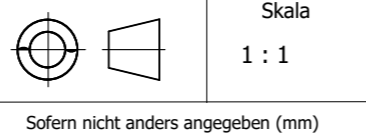
Druckmessleitung 3				= STD	REV NO
240213					
DRN	JaDa	4-11-2024	+		
CHD			Blatt 11		
APD					



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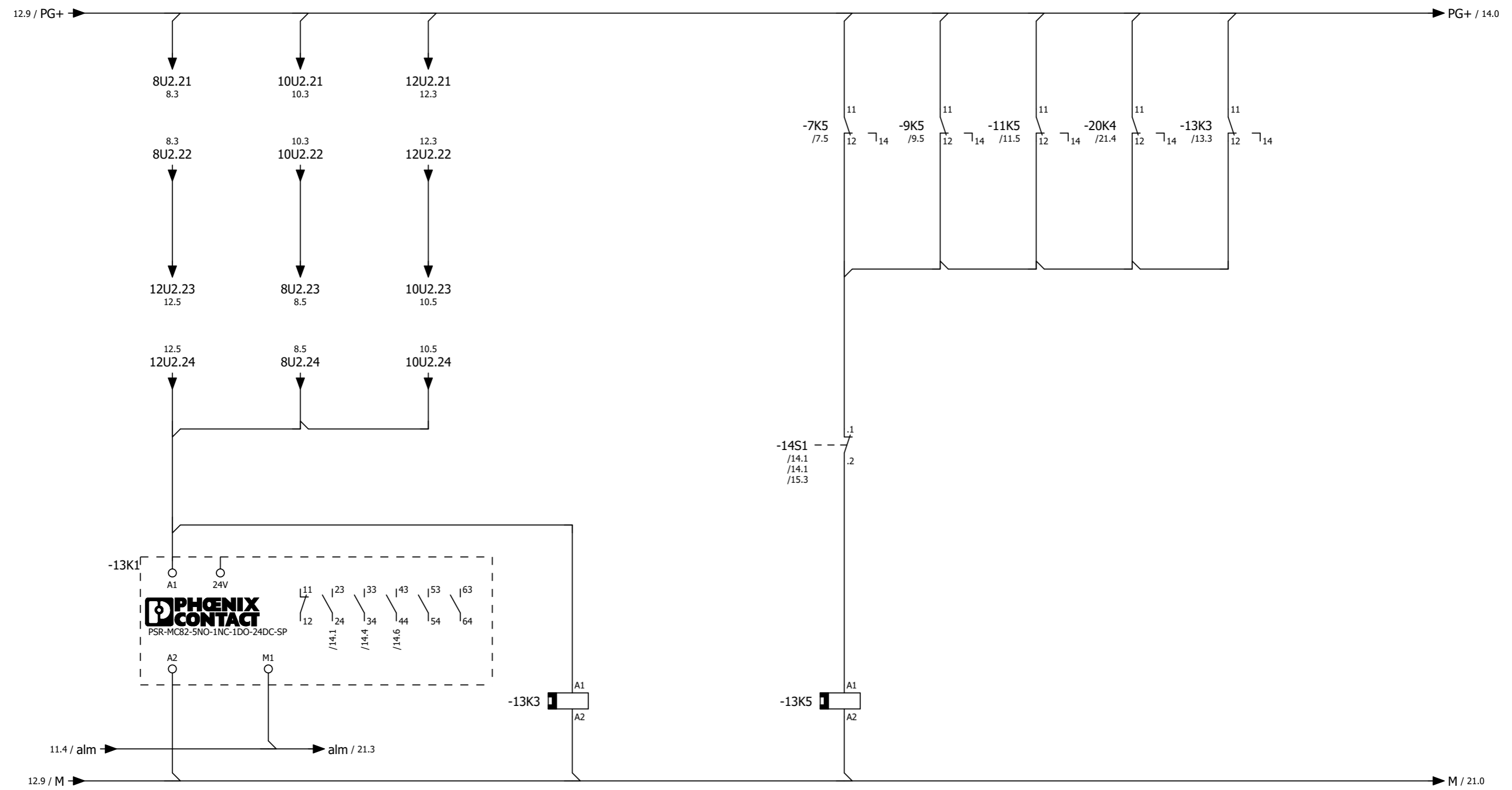
TEMPERATURLINIE 3 AUSGELÖST      CT003 2oo3 RELAIS KONTAKT      CT003 2oo3 RELAIS KONTAKT      TEMPERATUR CT003 4...20mA

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Temperaturmessleitung 3 240213				= STD	REV NO
DRN	JaDa	4-11-2024	+	Blatt 12	
CHD					
APD					

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DPS 2003  
TEMPERATUR AUSLÖSUNG

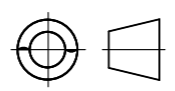
DPS 2003  
TEMPERATUR AUSLÖSUNG

DPS  
AUSGELÖST

NO	NC
/13.7	/13.7

NO	NC
/15.1	/15.1
/21.6	/21.6

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



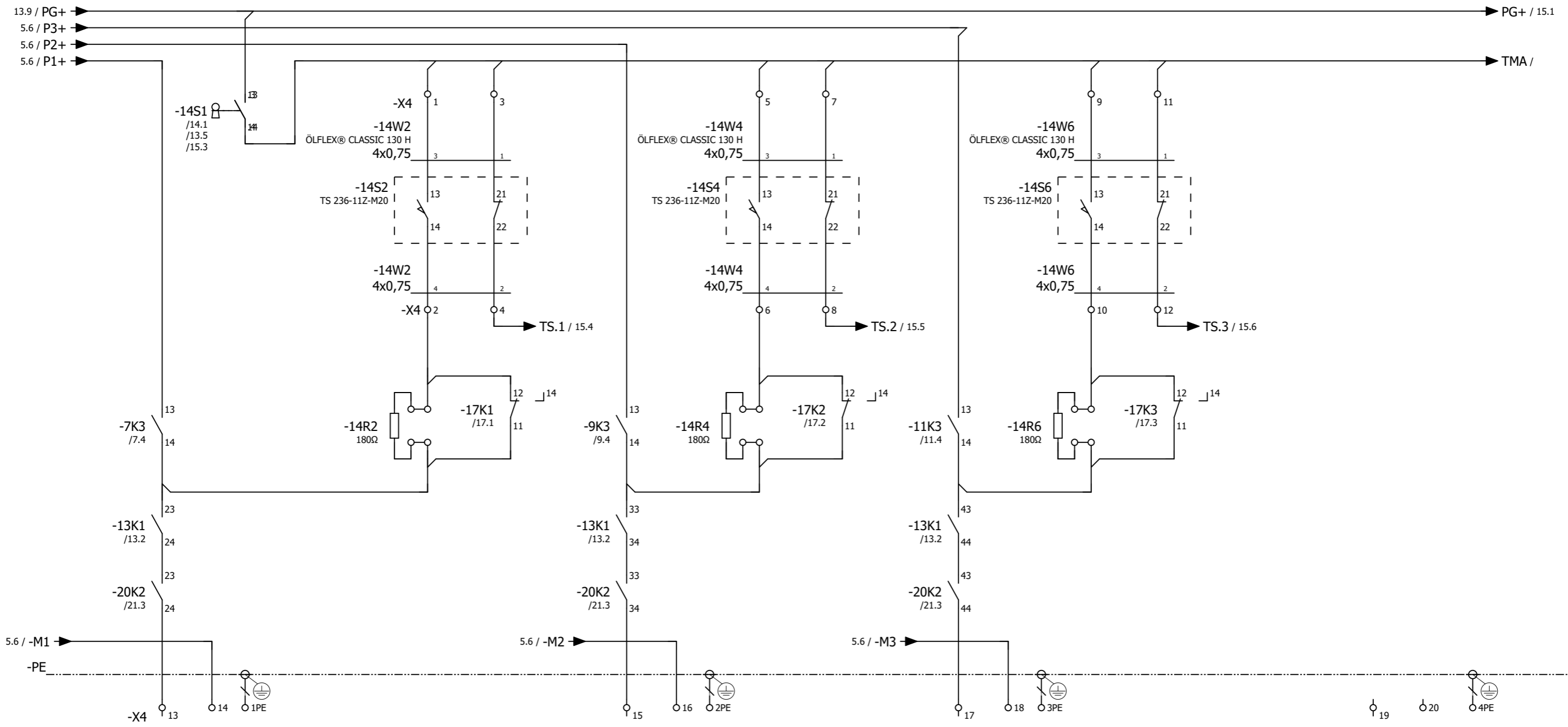
Skala  
1 : 1

Sofern nicht anders angegeben (mm)



Dampfprüfstock Auslösung				
240213				= STD
DRN	JaDa	22-10-2024	+	Blatt 13
CHD				
APD				
				REV NO

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AA001 TEST STRANG  
MV1A AKTIVIERT

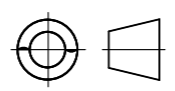
TEST STRANG 1  
AKTIV

AA001 TEST STRANG 2  
MV2A AKTIV

AA001 TEST STRANG 3  
MV3A AKTIV

- SPARE

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Skala  
1 : 1

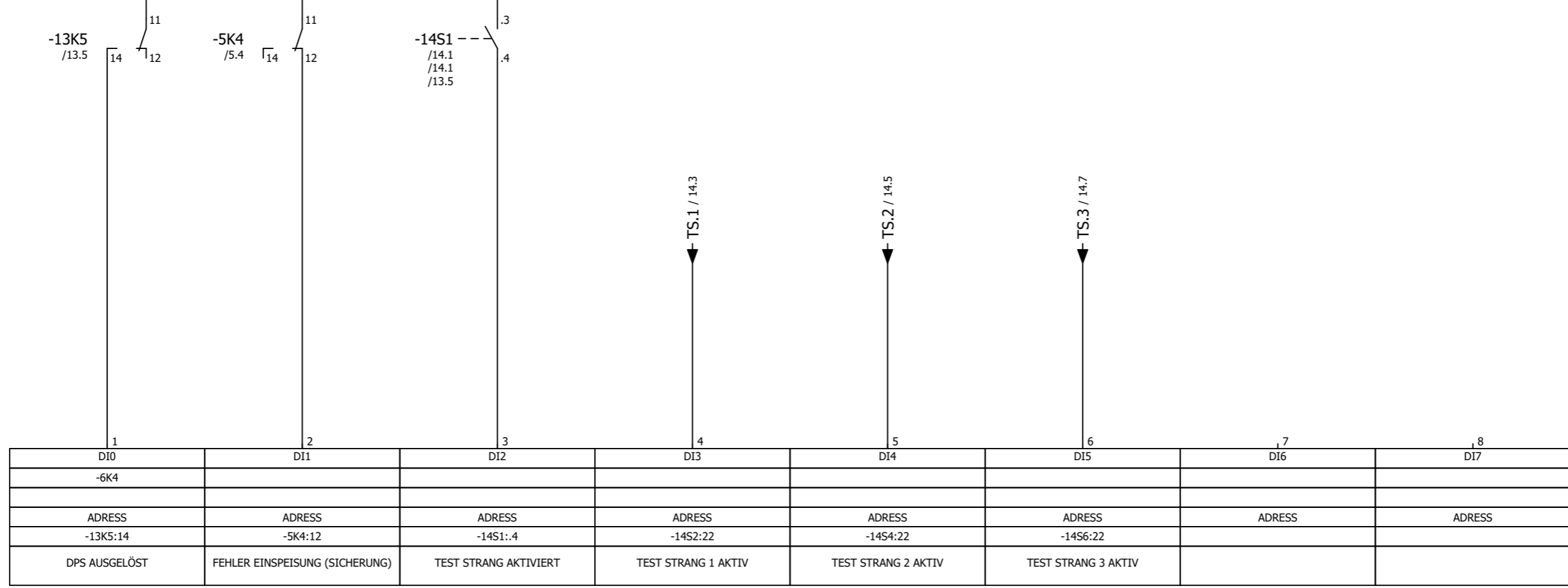
Sofern nicht anders angegeben (mm)



Sicherheitsventile 1003			
240213			= STD
DRN	JaDa	22-10-2024	+
CHD			Blatt 14
APD			REV NO

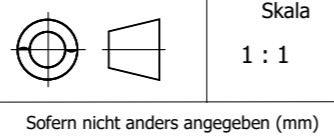
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14.9 / PG+ → PG+ / 16.1



DPS AUSGELÖST      FEHLER EINSPEISUNG (SICHERUNG)      TEST STRANG AKTIVIERT      TEST STRANG 1 AKTIV      TEST STRANG 2 AKTIV      TEST STRANG 3 AKTIV

4								
3								
2								
1								
1	BESCHREIBUNG	Rev. Von	CH	A P P	Datum			
REVISION								



ET200MP Eingänge 240213				= STD	REV NO
DRN	EPL0UA4950	8-7-2024	+	Blatt 15	
CHD					
APD					

15.8 / PG+ → PG+ / 21.0



9 DI8	10 DI9	11 DI10	12 DI11	13 DI12	14 DI13	15 DI14	16 DI15
-6K4							
ADRESS	ADRESS	ADRESS	ADRESS	ADRESS	ADRESS	ADRESS	ADRESS
-20K4:21	-7K5:21	-9K5:21	-11K5:21				
DPS FERN AUSLÖSUNG	DRUCKSCHALTER 1 AUSGELÖST	DRUCKSCHALTER 2 AUSGELÖST	DRUCKSCHALTER 3 AUSGELÖST				

DPS FERN  
AUSLÖSUNG

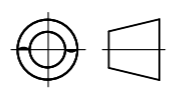
DRUCKSCHALTER 1  
AUSGELÖST

DRUCKSCHALTER 2  
AUSGELÖST

DRUCKSCHALTER 3  
AUSGELÖST

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4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Skala  
1 : 1

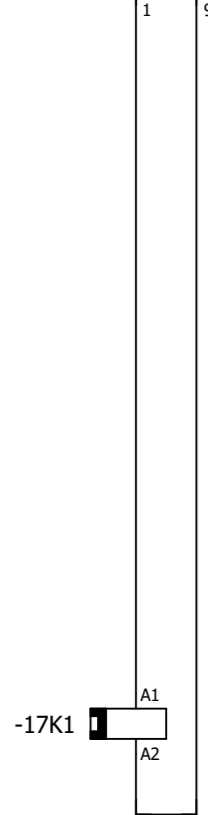
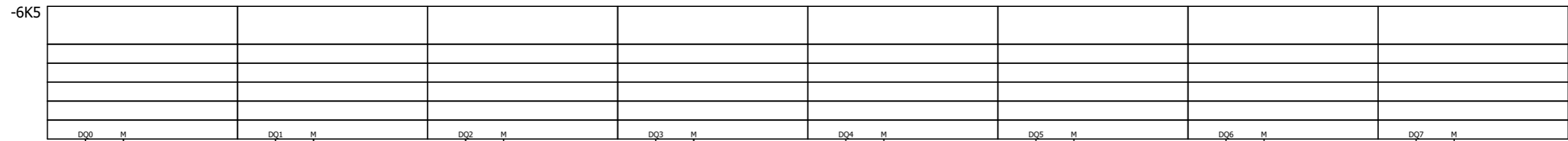
Sofern nicht anders angegeben (mm)



ET200MP Eingänge  
240213

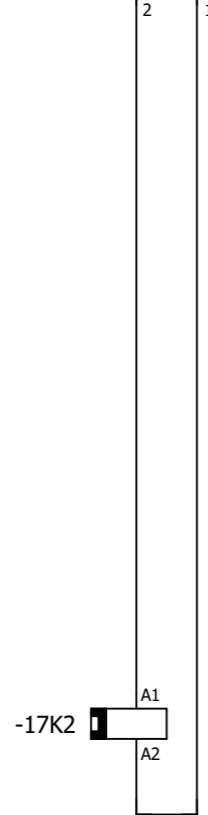
DRN	EPL0UA4950	8-7-2024	= STD	REV NO
CHD			+	
APD			Blatt 16	

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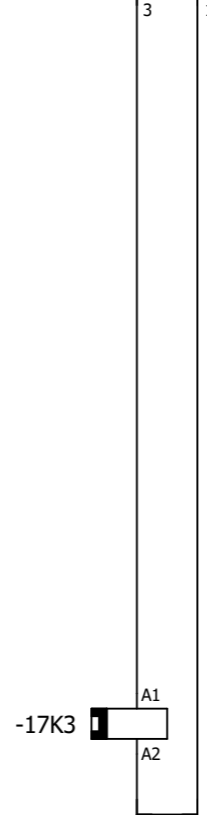
NO	NC
/14.3	/14.3

TESTHUB  
STRANG 1



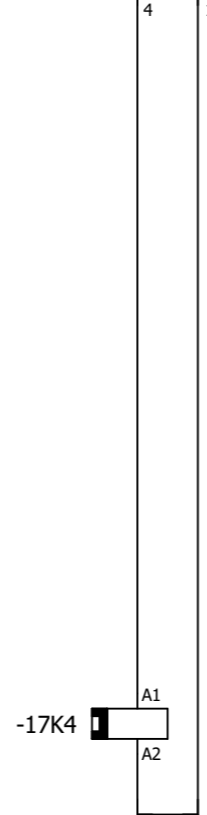
NO	NC
/14.5	/14.5

TESTHUB  
STRANG 2



NO	NC
/14.7	/14.7

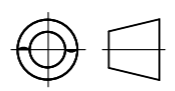
TESTHUB  
STRANG 3



NO	NC
/21.7	/21.7

TESTMODUS  
AKTIV

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



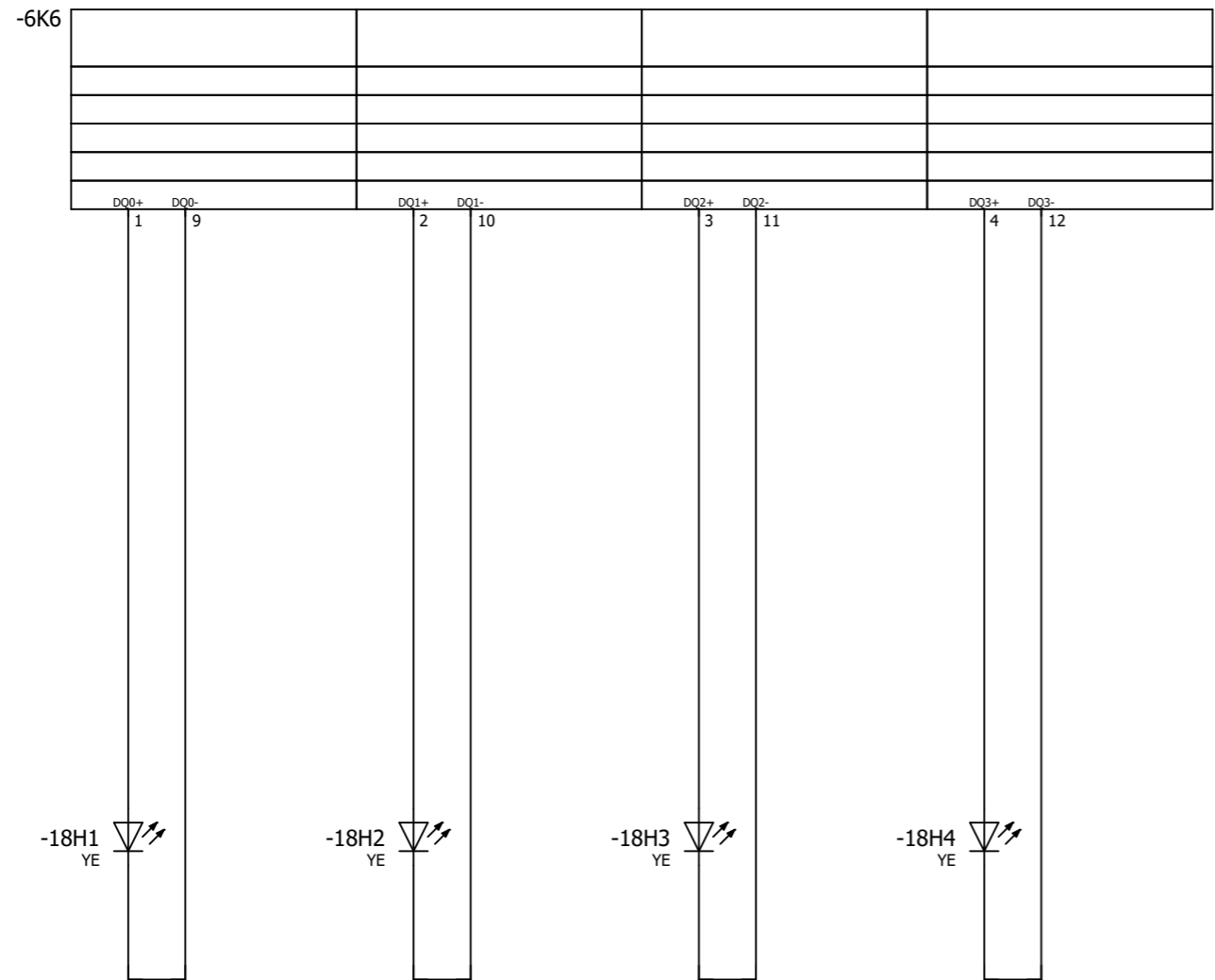
Skala  
1 : 1

Sofern nicht anders angegeben (mm)



ET200MP Ausgänge 240213			= STD	REV NO
DRN	EPL0UA4950	8-7-2024	+	
CHD			Blatt 17	
APD				

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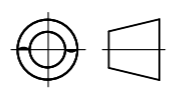
11LBT10CP350A  
AUSGELÖST

11LBT10CP350B  
AUSGELÖST

11LBT10CP350C  
AUSGELÖST

TEMPERATUR  
AUSGELÖST

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Skala  
1 : 1

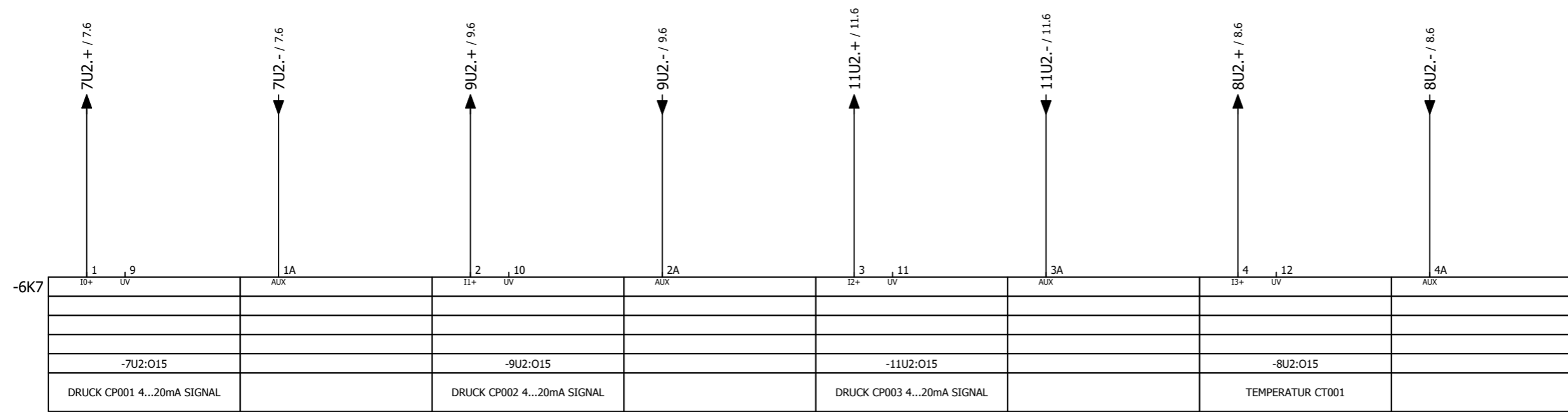
Sofern nicht anders angegeben (mm)



ET200MP Ausgänge  
240213

DRN	EPL0UA4950	8-7-2024	= STD	REV NO
CHD			+	
APD			Blatt 18	

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DRUCK CP001  
4...20mA SIGNAL

DRUCK CP002  
4...20mA SIGNAL

DRUCK CP003  
4...20mA SIGNAL

TEMPERATUR CT001  
4...20mA

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					

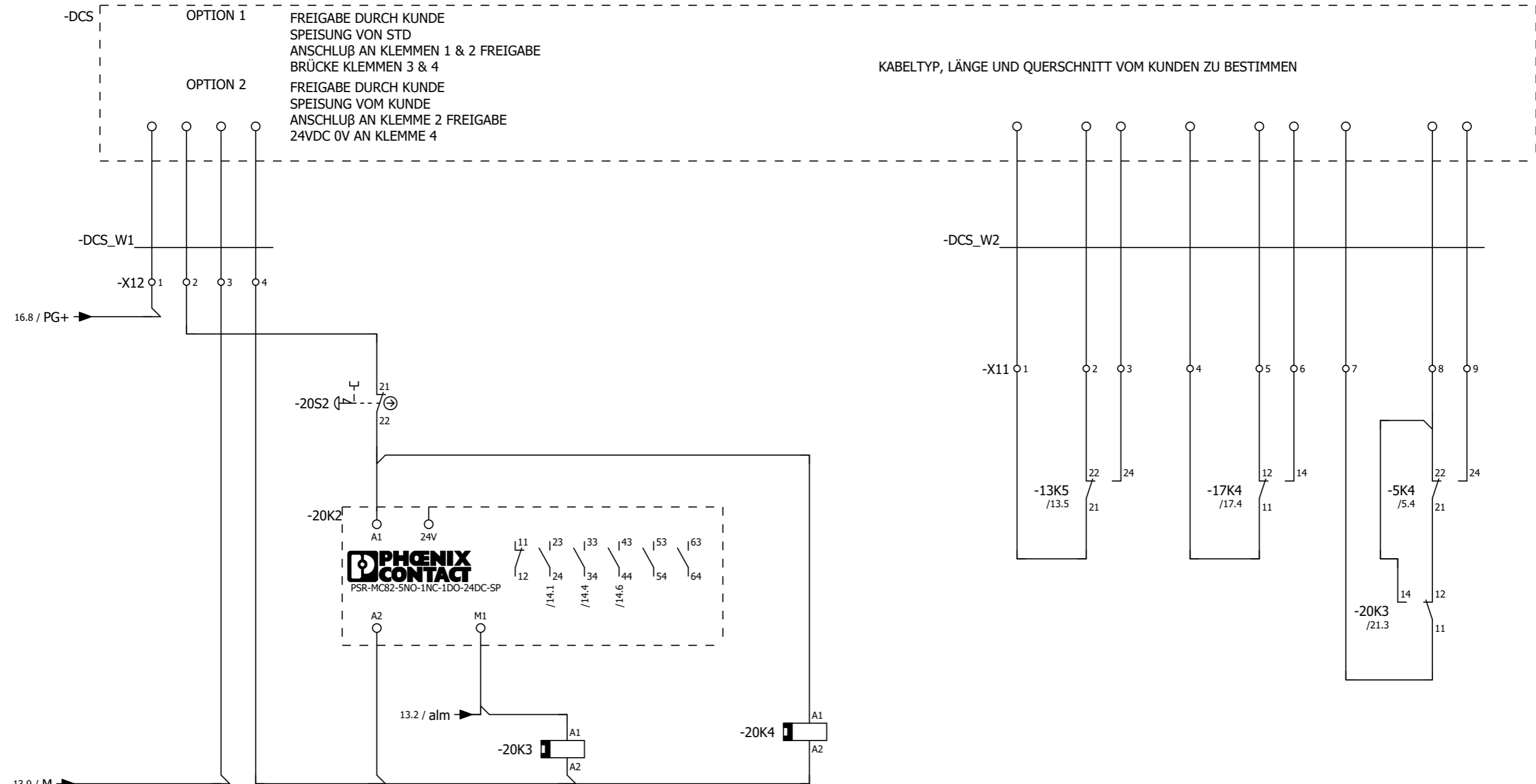
Skala  
1 : 1  
Sofern nicht anders angegeben (mm)



ET200MP Analoge Eingänge				= STD	REV NO
240213					
DRN	JaDa	4-11-2024	+	Blatt 19	
CHD					
APD					



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EXTERNE VERKABELUNG ORANGE 0,75 QMM

DPS EXTERN AUSGELÖST

DPS FERN AUSLÖSUNG

FEHLER SAFETY RELAIS

DPS KEINE AUSLÖSUNG

KEIN TEST MODUS AKTIV

STD KEIN FEHLER

NO	NC
/21.8	/21.8

NO	NC
/13.7	/13.7
/16.1	/16.1

4					
3					
2					
1					
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					

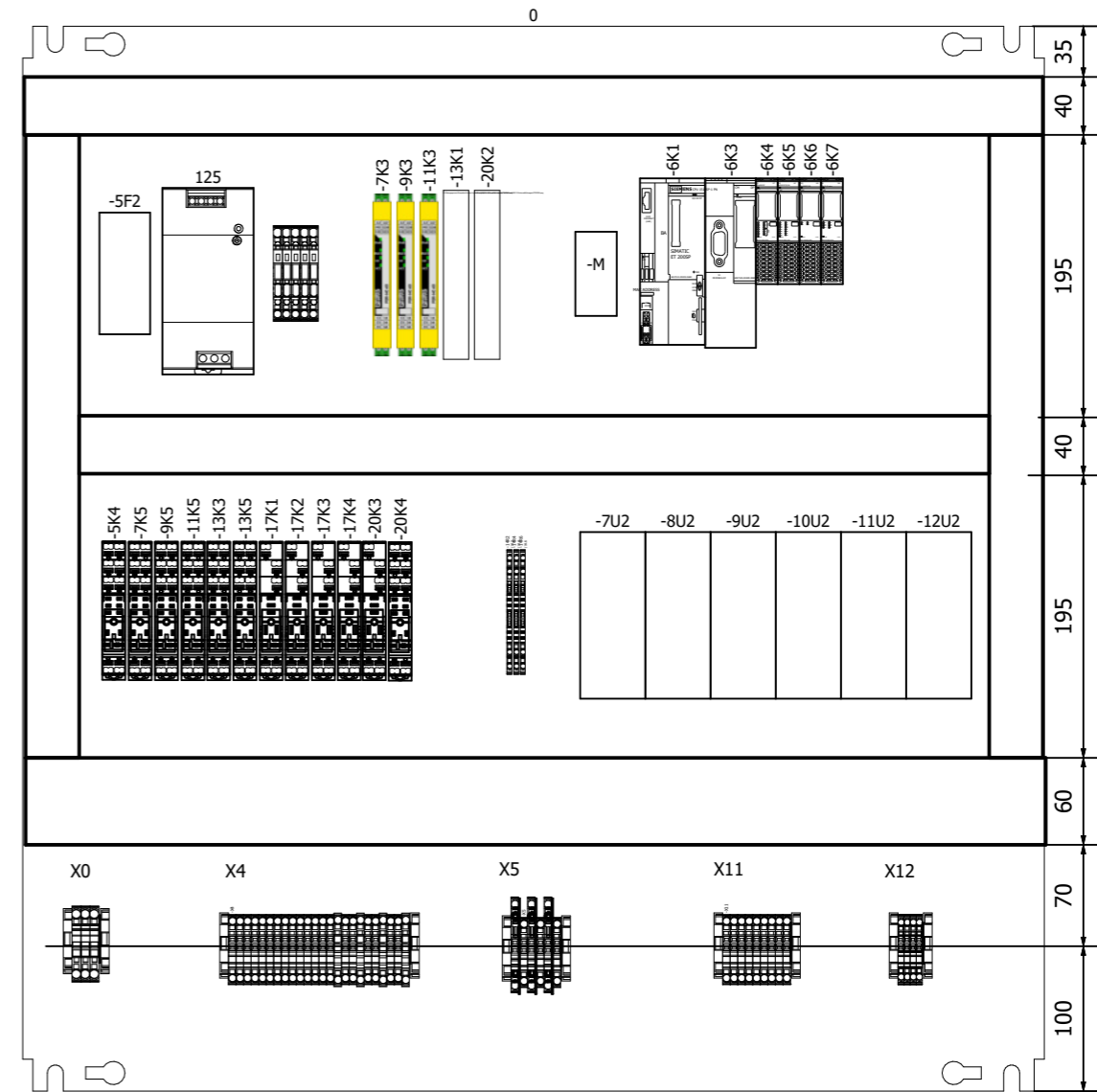
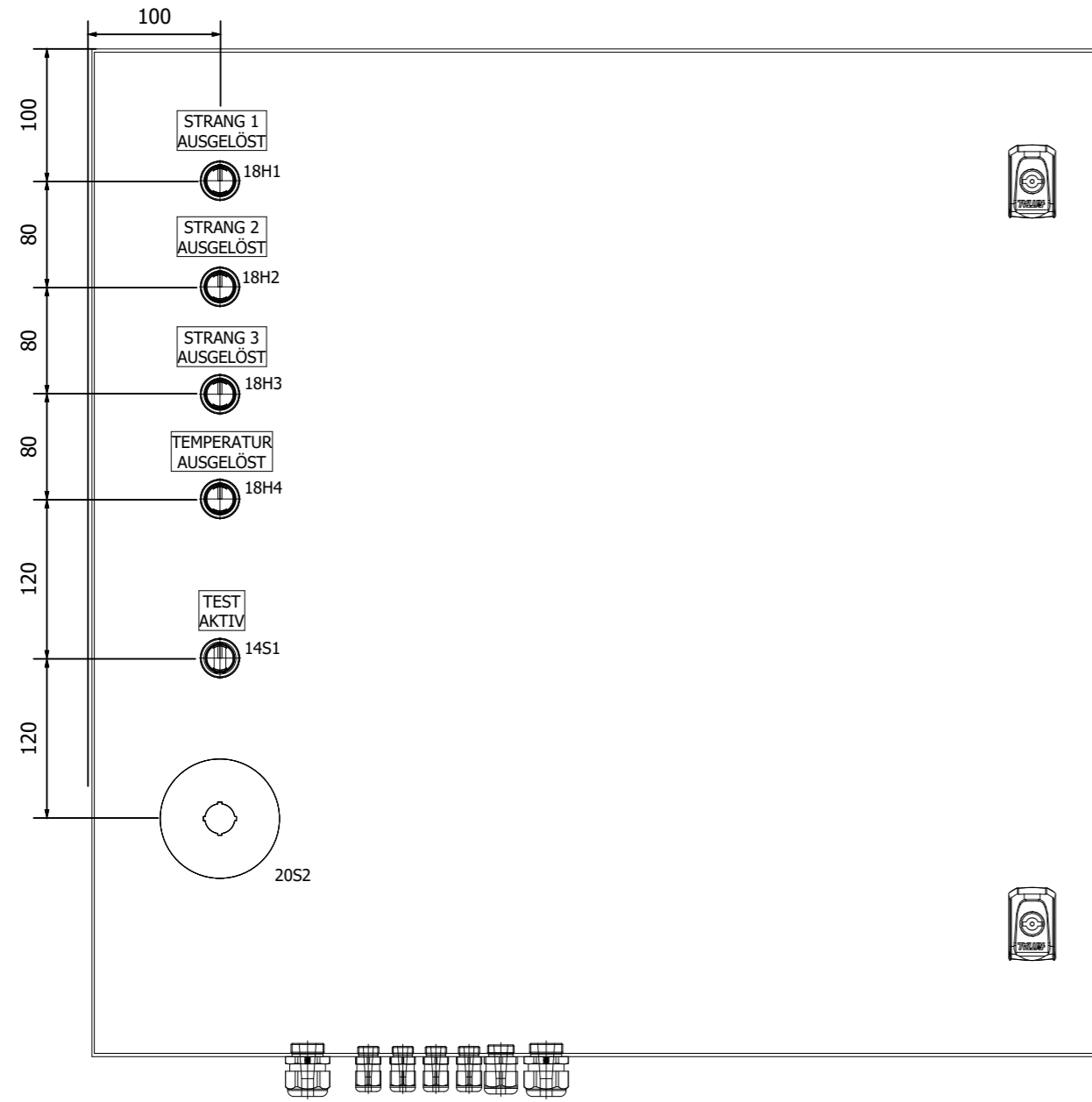
Skala  
1 : 1

Sofern nicht anders angegeben (mm)

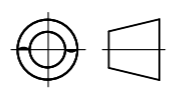


Verbindungen Kunde				= STD	REV NO
240213					
DRN	JaDa	22-10-2024	+		
CHD					
APD					
Blatt 21					

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REVISION	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
4					
3					
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Skala  
1 : 5

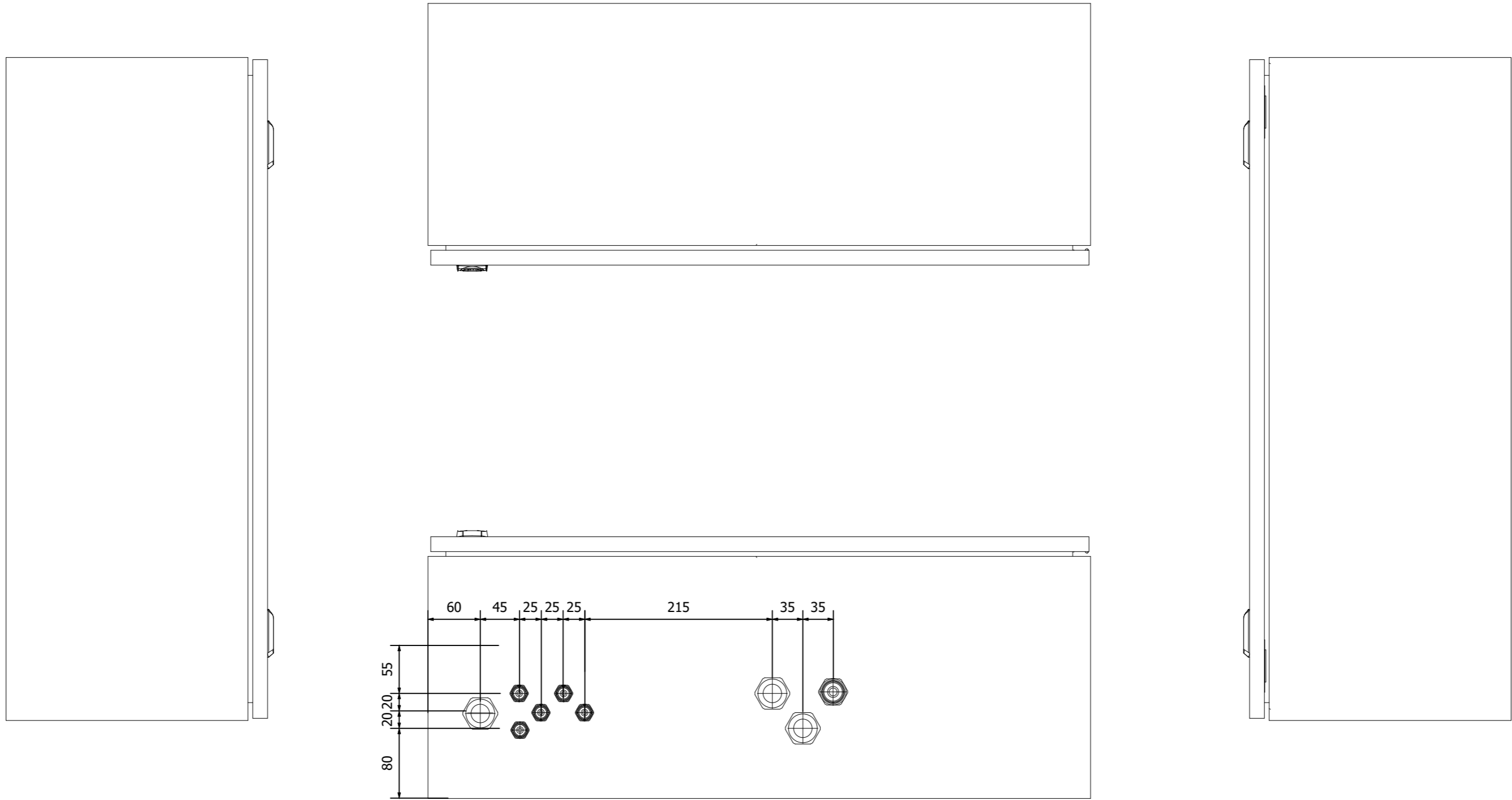
Sofern nicht anders angegeben (mm)



Schrank / montageplatte ansicht  
240213 = STD

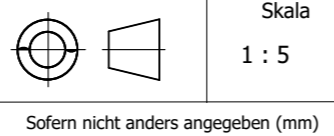
DRN	JaDa	4-11-2024	+	REV NO
CHD				
APD				

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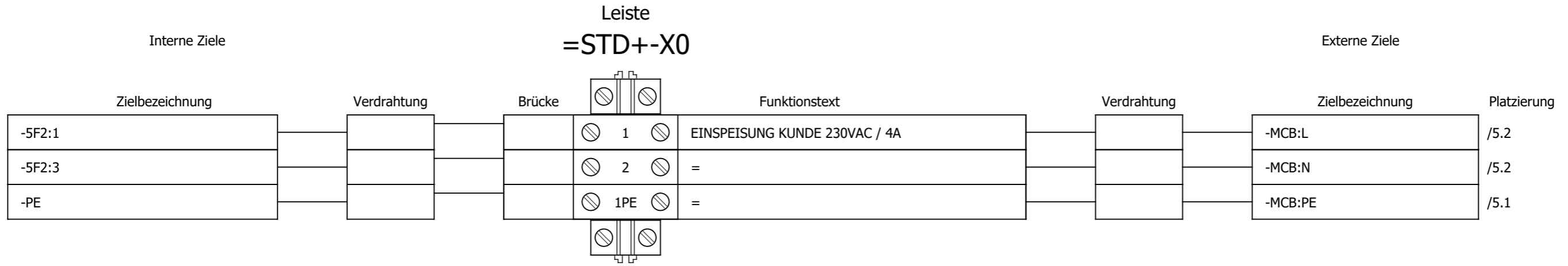
KABELVERSCHRAUBUNGEN  
 3 x M32  
 1 x M25  
 5 x M16

4					
3					
2					
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	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					



Schrank ansicht 240213				= STD
DRN	JaDa	22-10-2024	+	REV NO
CHD				
APD			Blatt 23	

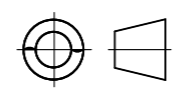
# Klemmenplan



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4	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
3					
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REVISION



Skala  
1 : 1

Sofern nicht anders angegeben (mm)



Klemmenplan 240213				= STD	REV NO
DRN	JaDa	22-10-2024	+		
CHD				Blatt 24	
APD					

# Klemmenplan

Leiste  
=STD+-X4

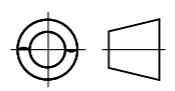
Interne Ziele

Externe Ziele

Zielbezeichnung	Verdrahtung	Brücke	Funktionstext	Verdrahtung	Zielbezeichnung	Platzierung
			TEST STRANG 1 AKTIV		-14S2:13	
-14R2			=		-14S2:14	/14.2
			=		-14S2:21	
-6K4:4			=		-14S2:22	/15.4
			TEST STRANG 2 AKTIV		-14S4:13	
-14R4			=		-14S4:14	/14.4
			=		-14S4:21	
-6K4:5			=		-14S4:22	/15.5
			TEST STRANG 3 AKTIV		-14S6:13	
-14R6			=		-14S6:14	/14.6
			=		-14S6:21	
-6K4:6			=		-14S6:22	/15.6
-20K2:24			AA001			/14.1
-M:1			MV1A			/5.6
-PE			TEST STRANG AKTIVIERT			/14.1
-20K2:34			AA001			/14.4
-M:1			MV2A			/5.6
-PE			=			/14.4
-20K2:44			AA001			/14.6
-M:1:1			MV3A			/5.6
-PE			=			/14.6
			- SPARE			
			=			

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REVISION					



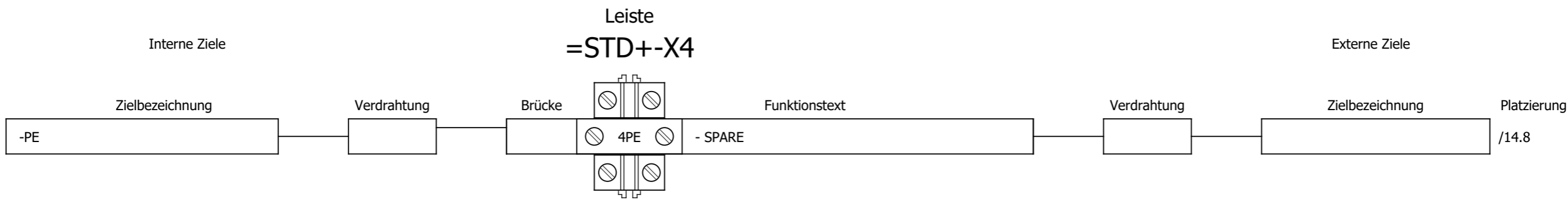
Skala  
1 : 1

Sofern nicht anders angegeben (mm)



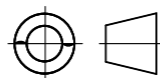
Klemmenplan 240213				= STD	Blatt 25	REV NO
DRN	JaDa	22-10-2024	+			
CHD						
APD						

# Klemmenplan



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REVISION	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
4					
3					
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1					



Skala  
1 : 1

Sofern nicht anders angegeben (mm)

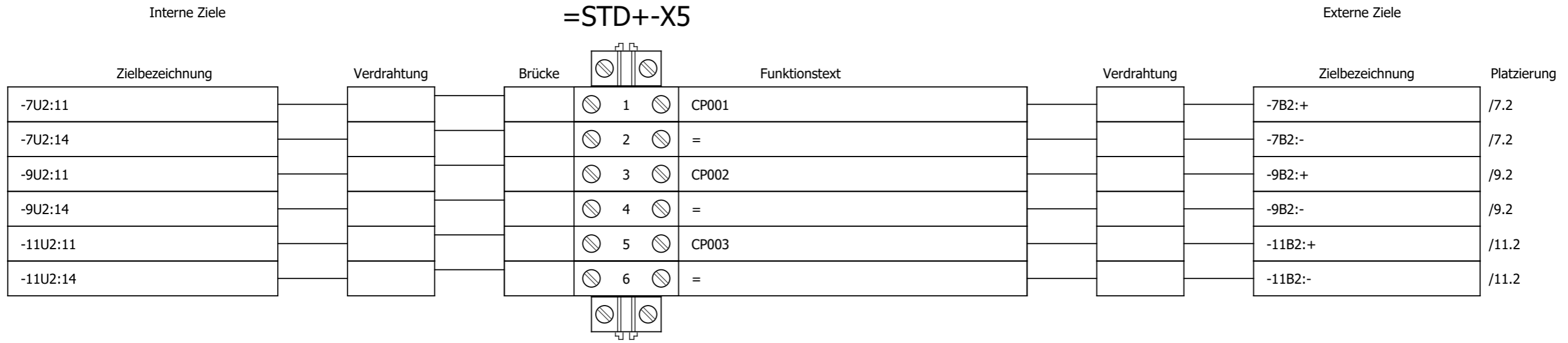


Klemmenplan  
240213

DRN	JaDa	22-10-2024	= STD	REV NO
CHD			+	
APD			Blatt 26	

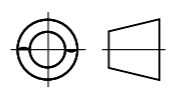
# Klemmenplan

Leiste  
=STD+-X5



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4					
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	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Skala  
1 : 1

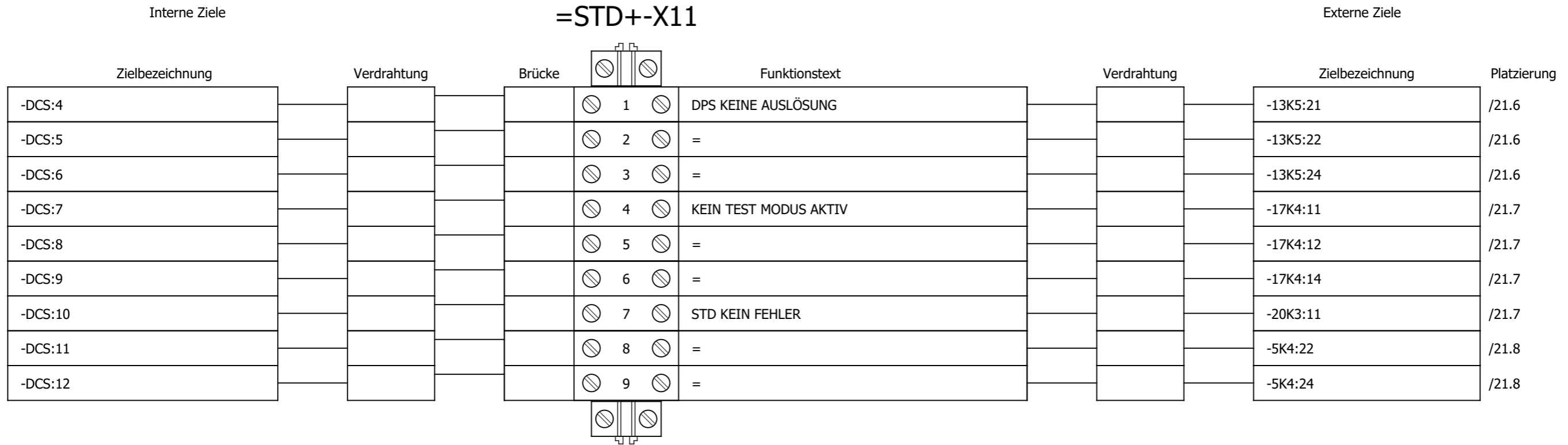
Sofern nicht anders angegeben (mm)



Klemmenplan 240213				= STD	REV NO
DRN	JaDa	22-10-2024	+	Blatt 27	
CHD					
APD					

# Klemmenplan

Leiste  
=STD+-X11



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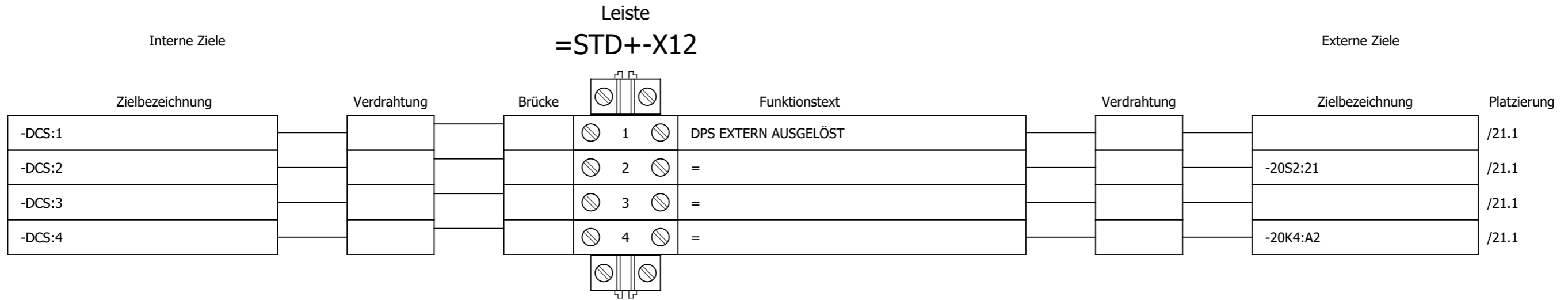
	BESCHREIBUNG	Rev. Von	CH	A P P	Datum
REVISION					

Skala  
 1 : 1  
  
 Sofern nicht anders angegeben (mm)



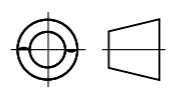
Klemmenplan 240213				= STD	Blatt 28	REV NO
DRN	JaDa	22-10-2024	+			
CHD						
APD						

# Klemmenplan



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1	BESCHREIBUNG	Rev. Von	C H	A P P	Datum
REVISION					



Skala  
1 : 1

Sofern nicht anders angegeben (mm)



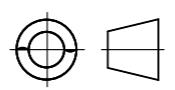
Klemmenplan 240213				= STD	REV NO
DRN	JaDa	22-10-2024	+		
CHD				Blatt 29	
APD					

# Artikelsummenstückliste.

Bestellnummer	Menge	Beschreibung Bezeichnung	Typnummer Artikelnummer	Hersteller Lieferant	
71086209	3 Stück	Drucksensor 0-40 Bar, Alu, M20, SIL	PMP51-AA22IB1PGBGCCB1+LA PMP51-AA22IB1PGBGCCB1+LA	E&H E&H	0 kg
TM131	3 Stück	Universelle modulare Thermometer mit RTD	TM131 TM131	E&H E&H	0 kg
AX 1014000	1 Stück	Kompakt-Schaltschrank AX	AX.1014000 RIT.1014000	RIT RIT	43 kg
10060771	5 Stück	Mutter Polyamid, M16x1,5 Ø 4,5-10 mm	10060771 10060771	WISKA WISKA	0 kg
10060773	1 Stück	Mutter Polyamid, M25x1,5 Ø 11-17 mm	10060773 10060773	WISKA WISKA	0 kg
10060774	3 Stück	Mutter Polyamid, M32x1,5 Ø 15-21 mm	10060774 10060774	WISKA WISKA	0 kg
10066411	5 Stück	ESKV Kabelverschraubung Polyamid, M16x1,5, Kabeldurchmesser 4,5-10 mm	10066411 10066411	WISKA WISKA	0 kg
10066413	1 Stück	ESKV Kabelverschraubung Polyamid, M25x1,5, Kabeldurchmesser 10-17mm	10066413 10066413	WISKA WISKA	1 kg
10066414	3 Stück	ESKV Kabelverschraubung Polyamid, M32x1,5, Kabeldurchmesser 17-25mm	10066414 10066414	WISKA WISKA	1 kg
L8532C04	2 Stück	Sicherungspatrone C4A 8x32mm	L8532C04 HAG.L8532C04	HAG HAG	0 kg
LSN402	1 Stück	gG 8.5x31.5 Sicherungslasttrennschalter, 2-polig	LSN402 HAG.LSN402	HAG HAG	0 kg
2002-1611	5 Stück	2-Leiter-Sicherungsklemme mit schwenkbarem Sicherungshalter 2,5 mm <sup>2</sup>	2002-1611 WAGO.2002-1611	WAGO WAGO	0 kg
216569	4 Stück	Leuchtelement, LED, weiß, Frontbefestigung, 12 - 30 V AC/DC, Federzuganschluss	M22-CLED-W ETN.M22-CLED-W	ETN ETN	0 kg
216374	6 Stück	Adapter für Kontaktelement	ETN M22-A ETN M22-A	ETN ETN	0 kg
216774	4 Stück	Leuchtmelder, flach, gelb	M22-L-Y ETN.M22-L-Y	ETN ETN	0 kg
46.52.9.024.0074	7 Stück	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074 FIN.46.52.9.024.0074	FINDER FINDER	0 kg
97.P2	7 Stück	Fassung mit push-in, für Relais 46.52	97.P2 FIN.97.P2	FINDER FINDER	0 kg

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REVISION					



Skala  
1 : 1

Sofern nicht anders angegeben (mm)



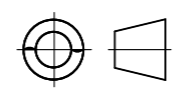
Artikelsummenstückliste			
240213		= STD	
DRN	JaDa	30-10-2024	+
CHD			Blatt 30
APD			
			REV NO

# Artikelsummenstückliste.

Bestellnummer	Menge	Beschreibung Bezeichnung	Typnummer Artikelnummer	Hersteller Lieferant	
6ES7510-1DK03-0AB0	1 Stück	CPU 1510SP-1 PN, 200KB Prog., 1MB Daten	6ES7510-1DK03-0AB0 SIE.6ES7510-1DK03-0AB0	SIE SIE	0 kg
6ES7545-5DA00-0AB0	1 Stück	CM DP	6ES7545-5DA00-0AB0 SIE.6ES7545-5DA00-0AB0	SIE SIE	0 kg
6ES7131-6BH01-0BA0	1 Stück	ET 200SP, DI 16x 24V DC ST, VPE 1	6ES7131-6BH01-0BA0 SIE.6ES7131-6BH01-0BA0	SIE SIE	0 kg
6ES7193-6BP00-0DA0	1 Stück	SIMATIC ET 200SP BU-Typ A0 BU15-P16+A0+2D	6ES7193-6BP00-0DA0 SIE.6ES7193-6BP00-0DA0	SIE SIE	0 kg
6ES7132-6BF00-0CA0	1 Stück	SIMATIC ET 200SP DQ 8x24 VDC/0,5 A HF	6ES7132-6BF00-0CA0 SIE.6ES7132-6BF00-0CA0	SIE SIE	0 kg
6ES7193-6BP00-0BA0	2 Stück	SIMATIC ET 200SP BU-Typ A0 BU15-P16+A0+2B	6ES7193-6BP00-0BA0 SIE.6ES7193-6BP00-0BA0	SIE SIE	0 kg
6ES7132-6BD20-0DA0	1 Stück	SIMATIC ET 200SP DQ 4x24 VDC/2 A HS	6ES7132-6BD20-0DA0 SIE.6ES7132-6BD20-0DA0	SIE SIE	0 kg
6ES7134-6GF00-0AA1	1 Stück	SIMATIC ET 200SP AI 8xI 2-/4-wire BA	6ES7134-6GF00-0AA1 SIE.6ES7134-6GF00-0AA1	SIE SIE	0 kg
6ES7193-6BP20-0BA0	1 Stück	BASEUNIT TYP A0, BU15-P16+A10+2B	6ES7193-6BP20-0BA0 SIE.6ES7193-6BP20-0BA0	SIEMENS SIEMENS	0 kg
2700569	3 Stück	Sicherheitsrelais PSR-MC40-3NO-1DO-24DC-SC	PSR-MC40-3NO-1DO-24DC-SC PXC.2700569	PXC PXC	0 kg
2702383	2 Stück	Erweiterungsmodul	PSR-MC82-5NO-1NC-1DO-24DC-SP PXC.2702383	PXC PXC	0 kg
46.61.9.024.0074	5 Stück	Relais mit Steckanschlüssen, 1 Wechsler 16 A, Spule 24 V DC, LED	46.61.9.024.0074 FIN.46.61.9.024.0074	FINDER FINDER	0 kg
97.P1	5 Stück	Fassung mit push-in, für Relais 46.61	97.P1 FIN.97.P1	FINDER FINDER	0 kg
3273066	1 Stück	Verteilerblock	PTFIX 6/6X2,5-NS35 GY 3273066	PXC PXC	0 kg
2000-2141	3 Stück	Doppeldurchgangsklemme; 1 mm <sup>2</sup> ; 13,5 A; grau	2000-2141 WAGO.2000-2141	WAGO WAGO	0 kg
216385	2 Stück	M22 Kontaktelement 1 Öffner, Frontbefestigung, Federzuganschluss	M22-CK01 216385	ETN ETN	0 kg
216887	1 PCE	Schlüsseltaste, 2 Stellungen, 0 I, rastend	M22-WRS ETN.M22-WRS	ETN ETN	0 kg

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REVISION					



Skala  
1 : 1

Sofern nicht anders angegeben (mm)



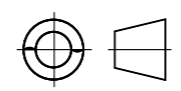
Artikelsummenstückliste				
240213				= STD
DRN	JaDa	4-11-2024	+	REV NO
CHD				
APD				
Blatt 31				

# Artikelsummenstückliste.

Bestellnummer	Menge	Beschreibung Bezeichnung	Typnummer Artikelnummer	Hersteller Lieferant	
216384	1 PCE	Kontaktelement 1 Schließer, Frontbefestigung, Federzuganschluss	M22-CK10 ETN.M22-CK10	ETN ETN	0 kg
216384	1 Stück	M22 Kontaktelement 1 Schließer, Frontbefestigung, Federzuganschluss	M22-CK10 216384	ETN ETN	0 kg
216876	1 Stück	NOT-HALT/AUS-Taste, d = 38 mm, zugentriegelt, unbeleuchtet	M22-PV 21687	ETN ETN	0 kg
216467	1 Stück	NOT-HALT-Schild, 90 mm, viersprachig	M22-XAK16 216467 M22-XAK16	ETN ETN	0 kg
231273	1 Stück	Schutzkragen, Not-Aus	M22-XGPV ETN.M22-XGPV	ETN ETN	0 kg
RMA42-AACH3	6 Stück	RMA42	RMA42-AACH3 EH-RMA42-AACH3	E&H E&H	0 kg
NDR-240-24	1 Stück	240W industrial rail power supply 230VAC / 10A	NDR-240-24 MWP.NDR-240-24	MWP MWP	1 kg
249-116	15 Stück	Schraubenlose Endklammer	249-116 WAGO.249-116	WAGO WAGO	0 kg
2004-1202	2 Stück	2-Leiter-Durchgangsklemme 4 mm <sup>2</sup>	2004-1202 WAGO.2004-1202	WAGO WAGO	0 kg
2004-1207	1 Stück	2-Leiter-Schutzleiterklemme 4 mm <sup>2</sup>	2004-1207 WAGO.2004-1207	WAGO WAGO	0 kg
2004-1291	1 Stück	Abschluss- und Zwischenplatte	2004-1291 WAGO.2004-1291	WAGO WAGO	0 kg
2002-1201	32 Stück	Durchgangs-Reihenklemme 2,5 mm <sup>2</sup>	2002-1201 WAGO.2002-1201	WAGO WAGO	0 kg
2002-1207	4 Stück	2-Leiter-Schutzleiterklemme 2,5 mm <sup>2</sup>	2002-1207 WAGO.2002-1207	WAGO WAGO	0 kg
2002-1291	4 Stück	Abschluss- und Zwischenplatte	2002-1291 WAGO.2002-1291	WAGO WAGO	0 kg
2002-1671	3 Stück	2-Leiter-Trennklemme 2,5 mm <sup>2</sup>	2002-1671 WAGO.2002-1671	WAGO WAGO	0 kg
2002-1691	3 Stück	Abschluss- und Zwischenplatte für 2002-1671	2002-1691 WAGO.2002-1691	WAGO WAGO	0 kg
2001-1201	4 Stück	2-Leiter-Durchgangsklemme 1,5 mm <sup>2</sup>	2001-1201 WAGO.2001-1201	WAGO WAGO	0 kg

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REVISION					



Skala  
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Sofern nicht anders angegeben (mm)



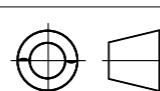
Artikelsummenstückliste			
240213		= STD	
DRN	JaDa	4-11-2024	REV NO
CHD			
APD			
Blatt 32			

# Artikelstückliste

Betriebsmittelkennzeichen	Menge	Bezeichnung	Typnummer	Lieferant	Artikel Nummer
-7B2	1	Drucksensor 0-40 Bar, Alu, M20, SIL	PMP51-AA22IB1PGBGCCB1+LA	E&H	PMP51-AA22IB1PGBGCCB1+LA
-8B2	1	Universelle modulare Thermometer mit RTD	TM131	E&H	TM131
-9B2	1	Drucksensor 0-40 Bar, Alu, M20, SIL	PMP51-AA22IB1PGBGCCB1+LA	E&H	PMP51-AA22IB1PGBGCCB1+LA
-10B2	1	Universelle modulare Thermometer mit RTD	TM131	E&H	TM131
-11B2	1	Drucksensor 0-40 Bar, Alu, M20, SIL	PMP51-AA22IB1PGBGCCB1+LA	E&H	PMP51-AA22IB1PGBGCCB1+LA
-12B2	1	Universelle modulare Thermometer mit RTD	TM131	E&H	TM131
-CAB	1	Kompakt-Schaltschrank AX	AX.1014000	RIT	RIT.1014000
-CAB	5	Mutter Polyamid, M16x1,5 Ø 4,5-10 mm	10060771	WISKA	10060771
-CAB	1	Mutter Polyamid, M25x1,5 Ø 11-17 mm	10060773	WISKA	10060773
-CAB	3	Mutter Polyamid, M32x1,5 Ø 15-21 mm	10060774	WISKA	10060774
-CAB	5	ESKV Kabelverschraubung Polyamid, M16x1,5, Kabeldurchmesser 4,5-10 mm	10066411	WISKA	10066411
-CAB	1	ESKV Kabelverschraubung Polyamid, M25x1,5, Kabeldurchmesser 10-17mm	10066413	WISKA	10066413
-CAB	3	ESKV Kabelverschraubung Polyamid, M32x1,5, Kabeldurchmesser 17-25mm	10066414	WISKA	10066414
-5F2	2	Sicherungspatrone C4A 8x32mm	L8532C04	HAG	HAG.L8532C04
-5F2	1	gG 8.5x31.5 Sicherungslasttrennschalter, 2-polig	LSN402	HAG	HAG.LSN402
-5F5	1	2-Leiter-Sicherungsklemme mit schwenkbarem Sicherungshalter 2,5 mm²	2002-1611	WAGO	WAGO.2002-1611
-5F6	1	2-Leiter-Sicherungsklemme mit schwenkbarem Sicherungshalter 2,5 mm²	2002-1611	WAGO	WAGO.2002-1611
-5F7	1	2-Leiter-Sicherungsklemme mit schwenkbarem Sicherungshalter 2,5 mm²	2002-1611	WAGO	WAGO.2002-1611
-5F8	1	2-Leiter-Sicherungsklemme mit schwenkbarem Sicherungshalter 2,5 mm²	2002-1611	WAGO	WAGO.2002-1611
-5F9	1	2-Leiter-Sicherungsklemme mit schwenkbarem Sicherungshalter 2,5 mm²	2002-1611	WAGO	WAGO.2002-1611
-18H1	1	Leuchtelement, LED, weiß, Frontbefestigung, 12 - 30 V AC/DC, Federzuganschluss	M22-CLED-W	ETN	ETN.M22-CLED-W
-18H1	1	Adapter für Kontaktelement	ETN M22-A	ETN	ETN M22-A
-18H1	1	Leuchtmelder, flach, gelb	M22-L-Y	ETN	ETN.M22-L-Y
-18H2	1	Leuchtelement, LED, weiß, Frontbefestigung, 12 - 30 V AC/DC, Federzuganschluss	M22-CLED-W	ETN	ETN.M22-CLED-W
-18H2	1	Adapter für Kontaktelement	ETN M22-A	ETN	ETN M22-A
-18H2	1	Leuchtmelder, flach, gelb	M22-L-Y	ETN	ETN.M22-L-Y
-18H3	1	Leuchtelement, LED, weiß, Frontbefestigung, 12 - 30 V AC/DC, Federzuganschluss	M22-CLED-W	ETN	ETN.M22-CLED-W
-18H3	1	Adapter für Kontaktelement	ETN M22-A	ETN	ETN M22-A
-18H3	1	Leuchtmelder, flach, gelb	M22-L-Y	ETN	ETN.M22-L-Y
-18H4	1	Leuchtelement, LED, weiß, Frontbefestigung, 12 - 30 V AC/DC, Federzuganschluss	M22-CLED-W	ETN	ETN.M22-CLED-W
-18H4	1	Adapter für Kontaktelement	ETN M22-A	ETN	ETN M22-A
-18H4	1	Leuchtmelder, flach, gelb	M22-L-Y	ETN	ETN.M22-L-Y
-5K4	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074
-5K4	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-6K1	1	CPU 1510SP-1 PN, 200KB Prog., 1MB Daten	6ES7510-1DK03-0AB0	SIE	SIE.6ES7510-1DK03-0AB0
-6K3	1	CM DP	6ES7545-5DA00-0AB0	SIE	SIE.6ES7545-5DA00-0AB0
-6K4	1	ET 200SP, DI 16x 24V DC ST, VPE 1	6ES7131-6BH01-0BA0	SIE	SIE.6ES7131-6BH01-0BA0
-6K4	1	SIMATIC ET 200SP BU-Typ A0 BU15-P16+A0+2D	6ES7193-6BP00-0DA0	SIE	SIE.6ES7193-6BP00-0DA0
-6K5	1	SIMATIC ET 200SP DQ 8x24 VDC/0,5 A HF	6ES7132-6BF00-0CA0	SIE	SIE.6ES7132-6BF00-0CA0
-6K5	1	SIMATIC ET 200SP BU-Typ A0 BU15-P16+A0+2B	6ES7193-6BP00-0BA0	SIE	SIE.6ES7193-6BP00-0BA0
-6K6	1	SIMATIC ET 200SP DQ 4x24 VDC/2 A HS	6ES7132-6BD20-0DA0	SIE	SIE.6ES7132-6BD20-0DA0
-6K6	1	SIMATIC ET 200SP BU-Typ A0 BU15-P16+A0+2B	6ES7193-6BP00-0BA0	SIE	SIE.6ES7193-6BP00-0BA0
-6K7	1	SIMATIC ET 200SP AI 8xI 2-/4-wire BA	6ES7134-6GF00-0AA1	SIE	SIE.6ES7134-6GF00-0AA1
-6K7	1	BASEUNIT TYP A0, BU15-P16+A10+2B	6ES7193-6BP20-0BA0	SIEMENS	SIE.6ES7193-6BP20-0BA0
-7K3	1	Sicherheitsrelais PSR-MC40-3NO-1DO-24DC-SC	PSR-MC40-3NO-1DO-24DC-SC	PXC	PXC.2700569
-7K5	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074
-7K5	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-9K3	1	Sicherheitsrelais PSR-MC40-3NO-1DO-24DC-SC	PSR-MC40-3NO-1DO-24DC-SC	PXC	PXC.2700569
-9K5	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074
-9K5	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-11K3	1	Sicherheitsrelais PSR-MC40-3NO-1DO-24DC-SC	PSR-MC40-3NO-1DO-24DC-SC	PXC	PXC.2700569
-11K5	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074

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Skala  
1 : 1

Sofern nicht anders angegeben (mm)



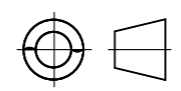
Artikelstückliste 240213				= STD
DRN	JaDa	4-11-2024	+	REV NO
CHD			Blatt 33	
APD				

# Artikelstückliste

Betriebsmittelkennzeichen	Menge	Bezeichnung	Typnummer	Lieferant	Artikel Nummer
-11K5	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-13K1	1	Erweiterungsmodul	PSR-MC82-5NO-1NC-1DO-24DC-SP	PXC	PXC.2702383
-13K3	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074
-13K3	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-13K5	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074
-13K5	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-17K1	1	Relais mit Steckanschlüssen, 1 Wechsler 16 A, Spule 24 V DC, LED	46.61.9.024.0074	FINDER	FIN.46.61.9.024.0074
-17K1	1	Fassung mit push-in, für Relais 46.61	97.P1	FINDER	FIN.97.P1
-17K2	1	Relais mit Steckanschlüssen, 1 Wechsler 16 A, Spule 24 V DC, LED	46.61.9.024.0074	FINDER	FIN.46.61.9.024.0074
-17K2	1	Fassung mit push-in, für Relais 46.61	97.P1	FINDER	FIN.97.P1
-17K3	1	Relais mit Steckanschlüssen, 1 Wechsler 16 A, Spule 24 V DC, LED	46.61.9.024.0074	FINDER	FIN.46.61.9.024.0074
-17K3	1	Fassung mit push-in, für Relais 46.61	97.P1	FINDER	FIN.97.P1
-17K4	1	Relais mit Steckanschlüssen, 1 Wechsler 16 A, Spule 24 V DC, LED	46.61.9.024.0074	FINDER	FIN.46.61.9.024.0074
-17K4	1	Fassung mit push-in, für Relais 46.61	97.P1	FINDER	FIN.97.P1
-20K2	1	Erweiterungsmodul	PSR-MC82-5NO-1NC-1DO-24DC-SP	PXC	PXC.2702383
-20K3	1	Relais mit Steckanschlüssen, 1 Wechsler 16 A, Spule 24 V DC, LED	46.61.9.024.0074	FINDER	FIN.46.61.9.024.0074
-20K3	1	Fassung mit push-in, für Relais 46.61	97.P1	FINDER	FIN.97.P1
-20K4	1	Relais mit Steckanschlüssen, 2 Wechsler 8 A, Spule 24 V DC, LED	46.52.9.024.0074	FINDER	FIN.46.52.9.024.0074
-20K4	1	Fassung mit push-in, für Relais 46.52	97.P2	FINDER	FIN.97.P2
-M	1	Verteilerblock	PTFIX 6/6X2,5-NS35 GY	PXC	3273066
-14R2	1	Doppeldurchgangsklemme; 1 mm <sup>2</sup> ; 13,5 A; grau	2000-2141	WAGO	WAGO.2000-2141
-14R4	1	Doppeldurchgangsklemme; 1 mm <sup>2</sup> ; 13,5 A; grau	2000-2141	WAGO	WAGO.2000-2141
-14R6	1	Doppeldurchgangsklemme; 1 mm <sup>2</sup> ; 13,5 A; grau	2000-2141	WAGO	WAGO.2000-2141
-14S1	1	M22 Kontaktelement 1 Öffner, Frontbefestigung, Federzuganschluss	M22-CK01	ETN	216385
-14S1	1	Schlüsseltaste, 2 Stellungen, 0 I, rastend	M22-WRS	ETN	ETN.M22-WRS
-14S1	1	Adapter für Kontaktelement	ETN M22-A	ETN	ETN M22-A
-14S1	1	Kontaktelement 1 Schließer, Frontbefestigung, Federzuganschluss	M22-CK10	ETN	ETN.M22-CK10
-14S1	1	M22 Kontaktelement 1 Schließer, Frontbefestigung, Federzuganschluss	M22-CK10	ETN	216384
-20S2	1	NOT-HALT/AUS-Taste, d = 38 mm, zugentriegelt, unbeleuchtet	M22-PV	ETN	21687
-20S2	1	Adapter für Kontaktelement	ETN M22-A	ETN	ETN M22-A
-20S2	1	M22 Kontaktelement 1 Öffner, Frontbefestigung, Federzuganschluss	M22-CK01	ETN	216385
-20S2	1	NOT-HALT-Schild, 90 mm, viersprachig	M22-XAK16	ETN	216467 M22-XAK16
-20S2	1	Schutzkragen, Not-Aus	M22-XGPV	ETN	ETN.M22-XGPV
-7U2	1	RMA42	RMA42-AAACH3	E&H	EH-RMA42-AAACH3
-8U2	1	RMA42	RMA42-AAACH3	E&H	EH-RMA42-AAACH3
-9U2	1	RMA42	RMA42-AAACH3	E&H	EH-RMA42-AAACH3
-10U2	1	RMA42	RMA42-AAACH3	E&H	EH-RMA42-AAACH3
-11U2	1	RMA42	RMA42-AAACH3	E&H	EH-RMA42-AAACH3
-12U2	1	RMA42	RMA42-AAACH3	E&H	EH-RMA42-AAACH3
-5V2	1	240W industrial rail power supply 230VAC / 10A	NDR-240-24	MWP	MWP.NDR-240-24
-X0	3	Schraubenlose Endklammer	249-116	WAGO	WAGO.249-116
-X0	2	2-Leiter-Durchgangsklemme 4 mm <sup>2</sup>	2004-1202	WAGO	WAGO.2004-1202
-X0	1	2-Leiter-Schutzleiterklemme 4 mm <sup>2</sup>	2004-1207	WAGO	WAGO.2004-1207
-X0	1	Abschluss- und Zwischenplatte	2004-1291	WAGO	WAGO.2004-1291
-X4	3	Schraubenlose Endklammer	249-116	WAGO	WAGO.249-116
-X4	20	Durchgangs-Reihenklammer 2,5 mm <sup>2</sup>	2002-1201	WAGO	WAGO.2002-1201
-X4	4	2-Leiter-Schutzleiterklemme 2,5 mm <sup>2</sup>	2002-1207	WAGO	WAGO.2002-1207
-X4	1	Abschluss- und Zwischenplatte	2002-1291	WAGO	WAGO.2002-1291
-X5	3	Schraubenlose Endklammer	249-116	WAGO	WAGO.249-116
-X5	3	2-Leiter-Trennklemme 2,5 mm <sup>2</sup>	2002-1671	WAGO	WAGO.2002-1671
-X5	3	Abschluss- und Zwischenplatte für 2002-1671	2002-1691	WAGO	WAGO.2002-1691
-X5	3	Durchgangs-Reihenklammer 2,5 mm <sup>2</sup>	2002-1201	WAGO	WAGO.2002-1201

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Skala  
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## Artikelstückliste

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DRN	JaDa	4-11-2024	Blatt 34	REV NO
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Figure similar

SIMATIC DP, CPU 1510SP-1 PN for ET 200SP, central processing unit with work memory 200 KB for program and 1 MB for data, 1st interface: PROFINET IRT with 3-port switch, 25 ns bit performance, SIMATIC Memory Card required, BusAdapter required for port 1 and 2 \* \*\*\* approvals and certificates according to entry 109817615 at support.industry.siemens.com to be observed! \*\*\*\*

General information	
Product type designation	CPU 1510SP-1 PN
HW functional status	FS01
Firmware version	V3.0
Product function	
<ul style="list-style-type: none"> <li>I&amp;M data</li> </ul>	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> <li>Module swapping during operation (hot swapping)</li> </ul>	Yes; Multi-hot swapping
<ul style="list-style-type: none"> <li>Isochronous mode</li> </ul>	Yes; only with PROFINET; with minimum OB 6x cycle of 500 µs
Engineering with	
<ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated from version</li> </ul>	V18 (FW V3.0); with older TIA Portal versions configurable as 6ES7510-1DJ01-0AB0
Configuration control	
via dataset	Yes
Control elements	
Mode selector switch	1
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
<ul style="list-style-type: none"> <li>Mains/voltage failure stored energy time</li> </ul>	10 ms
Input current	
Current consumption (rated value)	0.51 A
Current consumption, max.	0.7 A
Inrush current, max.	1.34 A; Rated value
$I^2t$	0.3 A <sup>2</sup> ·s
Power	
Infeed power to the backplane bus	8.05 W
Power loss	
Power loss, typ.	3.5 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
<ul style="list-style-type: none"> <li>integrated (for program)</li> </ul>	200 kbyte
<ul style="list-style-type: none"> <li>integrated (for data)</li> </ul>	1 Mbyte
Load memory	
<ul style="list-style-type: none"> <li>Plug-in (SIMATIC Memory Card), max.</li> </ul>	32 Gbyte

<b>Backup</b>	
• maintenance-free	Yes
<b>CPU processing times</b>	
for bit operations, typ.	25 ns
for word operations, typ.	32 ns
for fixed point arithmetic, typ.	42 ns
for floating point arithmetic, typ.	170 ns
<b>CPU-blocks</b>	
Number of elements (total)	4 000; Blocks (OB, FB, FC, DB) and UDTs
<b>DB</b>	
• Number range	1 ... 60 999; subdivided into: number range that can be used by the user: 1 ... 59 999, and number range of DBs created via SFC 86: 60 000 ... 60 999
• Size, max.	1 Mbyte; For DBs with absolute addressing, the max. size is 64 KB
<b>FB</b>	
• Number range	0 ... 65 535
• Size, max.	200 kbyte
<b>FC</b>	
• Number range	0 ... 65 535
• Size, max.	200 kbyte
<b>OB</b>	
• Size, max.	200 kbyte
• Number of free cycle OBs	100
• Number of time alarm OBs	20
• Number of delay alarm OBs	20
• Number of cyclic interrupt OBs	20; With minimum OB 3x cycle of 250 µs
• Number of process alarm OBs	50
• Number of DPV1 alarm OBs	3
• Number of isochronous mode OBs	1
• Number of technology synchronous alarm OBs	2
• Number of startup OBs	100
• Number of asynchronous error OBs	4
• Number of synchronous error OBs	2
• Number of diagnostic alarm OBs	1
<b>Nesting depth</b>	
• per priority class	24
<b>Counters, timers and their retentivity</b>	
<b>S7 counter</b>	
• Number	2 048
Retentivity	
— adjustable	Yes
<b>IEC counter</b>	
• Number	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
<b>S7 times</b>	
• Number	2 048
Retentivity	
— adjustable	Yes
<b>IEC timer</b>	
• Number	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
<b>Data areas and their retentivity</b>	
Retentive data area (incl. timers, counters, flags), max.	256 kbyte; in total; available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 216 KB
<b>Flag</b>	
• Size, max.	16 kbyte
• Number of clock memories	8; 8 clock memory bit, grouped into one clock memory byte
<b>Data blocks</b>	
• Retentivity adjustable	Yes
• Retentivity preset	No

<b>Local data</b>	
• per priority class, max.	64 kbyte; max. 16 KB per block
<b>Address area</b>	
Number of IO modules	2 048; max. number of modules / submodules
<b>I/O address area</b>	
• Inputs	32 kbyte; All inputs are in the process image
• Outputs	32 kbyte; All outputs are in the process image
<b>per integrated IO subsystem</b>	
— Inputs (volume)	8 kbyte
— Outputs (volume)	8 kbyte
<b>per CM/CP</b>	
— Inputs (volume)	8 kbyte
— Outputs (volume)	8 kbyte
<b>Subprocess images</b>	
• Number of subprocess images, max.	32
<b>Address space per module</b>	
• Address space per module, max.	288 byte; For input and output data respectively
<b>Address space per station</b>	
• Address space per station, max.	2 560 byte; for central inputs and outputs; depending on configuration; 2 048 bytes for ET 200SP modules + 512 bytes for ET 200AL modules
<b>Hardware configuration</b>	
Number of distributed IO systems	32; A distributed I/O system is characterized not only by the integration of distributed I/O via PROFINET or PROFIBUS communication modules, but also by the connection of I/O via AS-i master modules or links (e.g. IE/PB-Link)
<b>Number of DP masters</b>	
• Via CM	1
<b>Number of IO Controllers</b>	
• integrated	1
• Via CM	0
<b>Rack</b>	
• Modules per rack, max.	82; CPU + 64 modules + server module (mounting width max. 1 m) + 16 ET 200AL modules
• Quantity of operable ET 200SP modules, max.	64
• Quantity of operable ET 200AL modules, max.	16
• Number of lines, max.	1
<b>PtP CM</b>	
• Number of PtP CMs	the number of connectable PtP CMs is only limited by the number of available slots
<b>Time of day</b>	
<b>Clock</b>	
• Type	Hardware clock
• Backup time	6 wk; At 40 °C ambient temperature, typically
• Deviation per day, max.	10 s; Typ.: 2 s
<b>Operating hours counter</b>	
• Number	16
<b>Clock synchronization</b>	
• supported	Yes
• to DP, master	Yes; Via CM DP module
• to DP, slave	Yes; Via CM DP module
• in AS, master	Yes
• in AS, slave	Yes
• on Ethernet via NTP	Yes
<b>Interfaces</b>	
Number of PROFINET interfaces	1
Number of PROFIBUS interfaces	1; Via CM DP module
Optical interface	No
<b>1. Interface</b>	
<b>Interface types</b>	
• RJ 45 (Ethernet)	Yes; X1 P3; opt. X1 P1 and X1 P2 via BusAdapter BA 2x RJ45
• Number of ports	3; 1. integr. + 2. via BusAdapter
• integrated switch	Yes
• BusAdapter (PROFINET)	Yes; compatible BusAdapters: BA 2x RJ45, BA 2x FC, BA 2x M12

Protocols	
• IP protocol	Yes; IPv4
• PROFINET IO Controller	Yes
• PROFINET IO Device	Yes
• SIMATIC communication	Yes
• Open IE communication	Yes; Optionally also encrypted
• Web server	Yes
• Media redundancy	Yes

### PROFINET IO Controller

Services	
— PG/OP communication	Yes
— Isochronous mode	Yes
— Direct data exchange	Yes; Requirement: IRT and isochronous mode (MRPD optional)
— IRT	Yes
— PROFINergy	Yes; per user program
— Prioritized startup	Yes; Max. 32 PROFINET devices
— Number of connectable IO Devices, max.	128; In total, up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
— Of which IO devices with IRT, max.	64
— Number of connectable IO Devices for RT, max.	128
— of which in line, max.	128
— Number of IO Devices that can be simultaneously activated/deactivated, max.	8; in total across all interfaces
— Number of IO Devices per tool, max.	8
— Updating times	The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data

Update time for IRT	
— for send cycle of 250 µs	250 µs to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 500 µs of the isochronous OB is decisive
— for send cycle of 500 µs	500 µs to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive
— for send cycle of 1 ms	1 ms to 16 ms
— for send cycle of 2 ms	2 ms to 32 ms
— for send cycle of 4 ms	4 ms to 64 ms
— With IRT and parameterization of "odd" send cycles	Update time = set "odd" send clock (any multiple of 125 µs: 375 µs, 625 µs ... 3 875 µs)

Update time for RT	
— for send cycle of 250 µs	250 µs to 128 ms
— for send cycle of 500 µs	500 µs to 256 ms
— for send cycle of 1 ms	1 ms to 512 ms
— for send cycle of 2 ms	2 ms to 512 ms
— for send cycle of 4 ms	4 ms to 512 ms

### PROFINET IO Device

Services	
— PG/OP communication	Yes
— Isochronous mode	No
— IRT	Yes
— PROFINergy	Yes; per user program
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— activation/deactivation of I-devices	Yes; per user program
— Asset management record	Yes; per user program

## 2. Interface

Interface types	
• RS 485	Yes; Via CM DP module
• Number of ports	1

Protocols	
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	Yes
• SIMATIC communication	Yes

PROFIBUS DP master	
• Number of connections, max.	48; Of which 4 each reserved for ES and HMI

• Number of DP slaves, max.	125; In total, up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
<b>Services</b>	
— PG/OP communication	Yes
— Equidistance	No
— Isochronous mode	No
— Activation/deactivation of DP slaves	Yes
<b>Interface types</b>	
<b>RJ 45 (Ethernet)</b>	
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes
• Industrial Ethernet status LED	Yes
<b>RS 485</b>	
• Transmission rate, max.	12 Mbit/s
<b>Protocols</b>	
PROFIsafe	No
<b>Number of connections</b>	
• Number of connections, max.	128; via integrated interfaces of the CPU and connected CPs / CMs
• Number of connections reserved for ES/HMI/web	10
• Number of connections via integrated interfaces	88
• Number of connections per CP/CM	32
• Number of S7 routing paths	16
<b>Redundancy mode</b>	
• H-Sync forwarding	Yes
<b>Media redundancy</b>	
— Media redundancy	Yes; only via BusAdapter
— MRP	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0, MRP Manager; MRP Client
— MRP interconnection, supported	Yes; as MRP ring node according to IEC 62439-2 Edition 3.0
— MRPD	Yes; Requirement: IRT
— Switchover time on line break, typ.	200 ms; For MRP, bumpless for MRPD
— Number of stations in the ring, max.	50
<b>SIMATIC communication</b>	
• PG/OP communication	Yes; encryption with TLS V1.3 pre-selected
• S7 routing	Yes
• Data record routing	Yes
• S7 communication, as server	Yes
• S7 communication, as client	Yes
• User data per job, max.	See online help (S7 communication, user data size)
<b>Open IE communication</b>	
• TCP/IP	Yes
— Data length, max.	64 kbyte
— several passive connections per port, supported	Yes
• ISO-on-TCP (RFC1006)	Yes
— Data length, max.	64 kbyte
• UDP	Yes
— Data length, max.	2 kbyte; 1 472 bytes for UDP broadcast
— UDP multicast	Yes; max. 78 multicast circuits
• DHCP	Yes
• DNS	Yes
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
• Encryption	Yes; Optional
<b>Web server</b>	
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
<b>OPC UA</b>	
• Runtime license required	Yes; "Small" license required
• OPC UA Client	Yes; Data Access (registered Read/Write), Method Call

— Application authentication	Yes
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	"anonymous" or by user name & password
— Number of connections, max.	4
— Number of nodes of the client interfaces, recommended max.	1 000
— Number of elements for one call of OPC-UA_NodeGetHandleList/OPC-UA_ReadList/OPC-UA_WriteList, max.	300
— Number of elements for one call of OPC-UA_NameSpaceGetIndexList, max.	20
— Number of elements for one call of OPC-UA_MethodGetHandleList, max.	100
— Number of simultaneous calls of the client instructions for session management, per connection, max.	1
— Number of simultaneous calls of the client instructions for data access, per connection, max.	5
— Number of registerable nodes, max.	5 000
— Number of registerable method calls of OPC-UA_MethodCall, max.	100
— Number of inputs/outputs when calling OPC-UA_MethodCall, max.	20
● OPC UA Server	Yes; Data Access (Read, Write, Subscribe), Method Call, Alarms & Condition (A&C), Custom Address Space
— Application authentication	Yes
— Security policies	available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256, Aes128Sha256RsaOaep, Aes256Sha256RsaPss
— User authentication	"anonymous" or by user name & password
— GDS support (certificate management)	Yes
— Number of sessions, max.	32
— Number of accessible variables, max.	50 000
— Number of registerable nodes, max.	10 000
— Number of subscriptions per session, max.	50
— Sampling interval, min.	100 ms
— Publishing interval, min.	200 ms
— Number of server methods, max.	20
— Number of inputs/outputs per server method, max.	20
— Number of monitored items, recommended max.	4 000; for 1 s sampling interval and 1 s send interval
— Number of server interfaces, max.	10 of each "Server interfaces" / "Companion specification" type and 20 of the type "Reference namespace"
— Number of nodes for user-defined server interfaces, max.	15 000
● Alarms and Conditions	Yes
— Number of program alarms	100
— Number of alarms for system diagnostics	50
<b>Further protocols</b>	
● MODBUS	Yes; MODBUS TCP
<b>S7 message functions</b>	
Number of login stations for message functions, max.	32
Program alarms	Yes
Number of configurable program messages, max.	5 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH
Number of loadable program messages in RUN, max.	2 500
<b>Test commissioning functions</b>	
Joint commission (Team Engineering)	Yes; Parallel online access possible for up to 5 engineering systems
Status block	Yes; Up to 8 simultaneously (in total across all ES clients)
Single step	No
Number of breakpoints	8
<b>Status/control</b>	
● Status/control variable	Yes
● Variables	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
● Number of variables, max.	
— of which status variables, max.	200; per job

— of which control variables, max.	200; per job
<b>Forcing</b>	
• Forcing	Yes
• Forcing, variables	Peripheral inputs/outputs
• Number of variables, max.	200
<b>Diagnostic buffer</b>	
• present	Yes
• Number of entries, max.	1 000
— of which powerfail-proof	500
<b>Traces</b>	
• Number of configurable Traces	4; Up to 512 KB of data per trace are possible
<b>Interrupts/diagnostics/status information</b>	
<b>Diagnostics indication LED</b>	
• RUN/STOP LED	Yes
• ERROR LED	Yes
• MAINT LED	Yes
• Monitoring of the supply voltage (PWR-LED)	Yes
• Connection display LINK TX/RX	Yes
<b>Supported technology objects</b>	
Motion Control	Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool
• Number of available Motion Control resources for technology objects	1 120
• Required Motion Control resources	
— per speed-controlled axis	40
— per positioning axis	80
— per synchronous axis	160
— per external encoder	80
— per output cam	20
— per cam track	160
— per probe	40
• Positioning axis	
— Number of positioning axes at motion control cycle of 4 ms (typical value)	11
— Number of positioning axes at motion control cycle of 8 ms (typical value)	14
<b>Controller</b>	
• PID_Compact	Yes; Universal PID controller with integrated optimization
• PID_3Step	Yes; PID controller with integrated optimization for valves
• PID-Temp	Yes; PID controller with integrated optimization for temperature
<b>Counting and measuring</b>	
• High-speed counter	Yes
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
• horizontal installation, min.	-30 °C; No condensation
• horizontal installation, max.	60 °C
• vertical installation, min.	-30 °C; No condensation
• vertical installation, max.	50 °C
<b>Altitude during operation relating to sea level</b>	
• Installation altitude above sea level, max.	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual
<b>configuration / header</b>	
<b>configuration / programming / header</b>	
<b>Programming language</b>	
— LAD	Yes
— FBD	Yes
— STL	Yes
— SCL	Yes
— GRAPH	Yes
<b>Know-how protection</b>	
• User program protection/password protection	Yes
• Copy protection	Yes
• Block protection	Yes

Access protection	
• protection of confidential configuration data	Yes
• Protection level: Write protection	Yes
• Protection level: Read/write protection	Yes
• Protection level: Complete protection	Yes
programming / cycle time monitoring / header	
• lower limit	adjustable minimum cycle time
• upper limit	adjustable maximum cycle time
Dimensions	
Width	100 mm
Height	117 mm
Depth	75 mm
Weights	
Weight, approx.	265 g

**last modified:** 10/6/2023 



# BKH - Block Kugelhähne

## Ball valves block-type



Standard BKH  
Standard BKH

### Größen: DN04 bis DN25

Gehäuse: FSt-PI, Automatenstahl, S355J2G3  
Kugel + Schaltwelle: Automatenstahl, Edelstahl (1.4571/316Ti)  
Dichtungen: Kunststoff, Metall

### Anschlüsse:

Zölliges Gewinde, NPT Gewinde, Schneidringverschraubung leichte und schwere Reihe, UNC/UNF-Einschraubgewinde, Schottverschraubung, Schweißenden und -kegel, Steckmuffen und -nippel

### Druckstufen:

bis PN500 (Maßtabelle beachten)

### Einsatzbereiche:

Baumaschinenhydraulik, Landmaschinenhydraulik, Mobilhydraulik, Bergbau, Gasindustrie  
(Dichtungs- und Gehäusewerkstoffe zum Teil angepasst an den Anwendungsfall!)

### Betriebstemperatur:

Standard: -20°C bis +60°C

### Oberflächen:

Brüniert, chrom-6-frei, lackiert

### Sonderausführungen auf Anfrage!

- Abschließvorrichtung
- Antriebe
- Bodenplatten
- Befestigungsbohrungen
- Endschalter
- Kombinationen
- Rasterungen
- Sonderwerkstoffe

### Dimensions: DN04 to DN25

body: FSt-PI, free cutting steel, S355J2G3  
ball + stem: free cutting steel, stainless steel (1.4571/316Ti)  
sealing: plastics, metal

### Adapter:

BSP thread, NPT thread, compression fitting light and heavy series, UNC/UNF female thread, bulkhead connection, welding end and welding taper, plug-in socket and plug nipple

### Pressure range:

up to PN500 (note table of dimensions)

### Field of application:

hydraulics, particularly in construction industry and agricultural machinery, mining industry and gas industry  
(Material of seals and body adapted to application!)

### Temperature range:

standard: -20°C to +60°C (-4 to +140°F)

### Surface:

black oxide finishing, chrome-VI-free, varnished

### Special equipment on request!

- locking device
- actuators
- base plate
- mounting holes
- position switches
- combinations
- detent kits
- special materials



BKH mit Antrieb  
BKH with actuator



BKH Kombination  
BKH combination



BKH mit Bodenplatte  
BKH with base plate



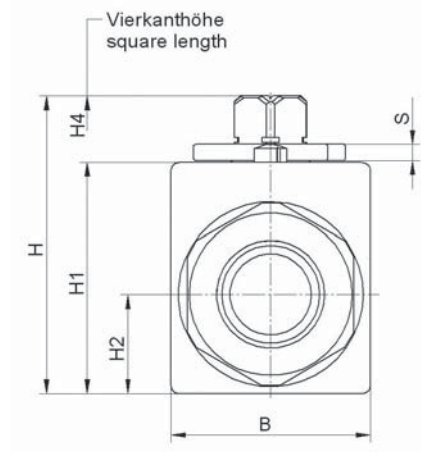
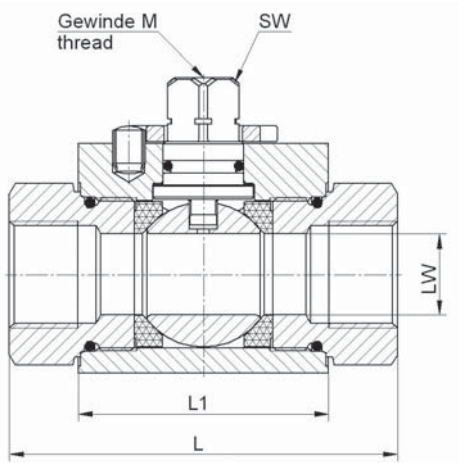
BKH mit Abschließvorrichtung  
und Endschalter  
BKH with locking device and  
position switch



BKH mit Befestigungsbohrungen  
BKH with mounting holes



BBKH MD-N  
BBKH MD-N



DN mm	LW mm	PN <sup>1)</sup> bar	L1 mm	B mm	H mm	H1 mm	H2 mm	H4 mm	SW mm	M	S mm
4	Ø 5	500	36,2	26	43,4	32	12,8	11	9	M5	3
6	Ø 6	500	36,2	26	43,4	32	12,8	11	9	M5	3
8	Ø 8	500	36,2	26	43,4	32	12,8	11	9	M5	3
10	Ø 10	500	43,2	32	49,2	38	16,25	10,9	9	M5	3
13	Ø 13	500	48,2	35	51,2	40	17,25	10,9	9	M5	3
16	Ø 15	500	48,2	38	61,9	46	18,7	15,5	12	M6	3,5
20	Ø 20	400	62,2	49	73,4	57	24,5	16	14	M6	4
25	Ø 24	400	66,2	54	76,6	60	26,5	16	14	M6	4

<sup>1)</sup> • Max. zul. PN und Anzugsdrehmoment sind den Angaben der Rohrverschraubungshersteller zu entnehmen. • Abmessungen gelten für Werkstoff FSt-PI und Automatenstahl, Gehäuse aus S355J2G3 haben abweichende Maße. • Druckabschläge entspr. Einsatzbereich/Werkstoffen sind zu beachten. • Maßänderungen vorbehalten.

<sup>1)</sup> • For PN max. and tightening torque see data of the compression fitting manufacturer. • Dimensions apply for FSt-PI and free cutting steel, dimensions of S355J2G3 bodies are different. • Reduced press. rating must be taken into consideration acc. to application and materials. • Dimensions subject to change without notice

### Bestellschlüssel

#### Order code

Serie 040	Anschluss <sup>3)</sup>	Nennweite	Werkstoff <sup>4)</sup>	Zubehör / Sonder <sup>4)</sup> siehe Rubrik Zubehör
Series 040	Connection <sup>3)</sup>	Nominal size	Material <sup>4)</sup>	Equipment / specials <sup>4)</sup> see category equipment
BKH	16S	13	1123 1	BoDg

<sup>3)</sup> Anschlüsse der linken und rechten Seite beliebig kombinierbar  
left and right side connectors can be used in any combination

<sup>4)</sup> Gerne helfen wir ihnen bei der Auswahl der geeigneten Werkstoffe und Sonderausstattungen weiter.  
We would be glad helping you to choose proper material and equipment.

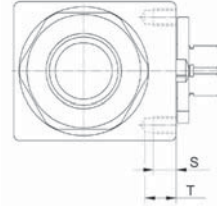
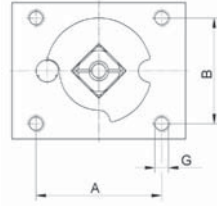
Bitte richten sie ihre Anfrage an: <verkauf@pister-gmbh.com>, oder rufen sie uns an: (+49) 72 22 / 50 02-0  
Bitte geben sie uns Auskunft über Druck, Temperatur und Medium ihrer Anwendung!

Please send your request to: <verkauf@pister-gmbh.com>, or give us a call: (+49) 72 22 / 50 02-0  
Please tell us pressure, temperature and medium of your application!

# Befestigungsbohrungen für BKH-Gehäuse

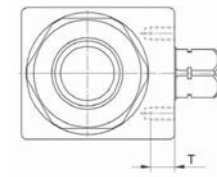
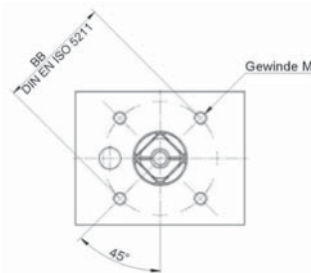
## Mounting holes for BKH

DN mm	A mm	B mm	G	S mm	T mm
4-8	26	18	M5	6	8,5
10	34	24	M6	8	11
13	34	24	M6	8	11
16	34	24	M6	8	11
20	45	38	M6	8	11
25	45	38	M6	8	11



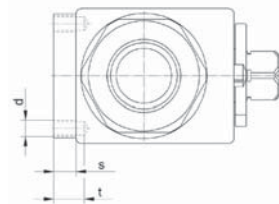
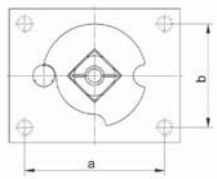
**BoSt:**  
Schalttafeleinbau  
panel mounting

DN mm	BB mm	ISO	M	T mm
10	Ø 36	F03	M5	7,5
13	Ø 36	F03	M5	7,5
16	Ø 36	F03	M5	7,5
20	Ø 42	F04	M5	9
25	Ø 50	F05	M6	9



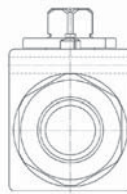
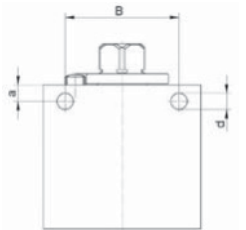
**BofA:**  
Gewindebohrung  
ISO 5211  
tapped holes  
ISO 5211

DN mm	a mm	b mm	d	t mm	s mm
4-8	24	20	M6	—	6
10	34	24	M5	7,5	6,5
13	38	27	M6	7	6,5
16	38	27	M6	7	7
20	51	39	M6	11	8
25	52	44	M6	8	6



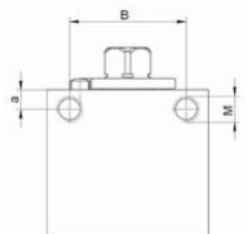
**Bo4Bo:**  
Gewindebohrung im  
Boden mit zusätzlicher  
Bodenplatte  
tapped holes at bottom  
with additional plate

DN mm	B mm	a mm	d mm
4-8	26	5	Ø 4,5
10	32	5	Ø 6,5
13	37,5	4,8	Ø 6,5
16	37,5	5	Ø 6,5
20	45	6,5	Ø 6,5
25	55	6	Ø 6,7



**BoDg:**  
Seitliche  
Durchgangsbohrungen  
through-bore holes  
on the side

DN mm	B mm	a mm	M	s mm	t mm
4-8	24	6	M6	6,5	9
10	32	5,5	M6	7	10
13	36	6	M6	8,5	11
16	32	8	M6	7	10,5
20	45	7,5	M10	12	15
25	45	7,5	M10	12	15



**BoGb:**  
Seitliche  
Gewindebohrungen  
tapped holes  
on the side

Kombinationen und Kugelhähne mit Bodenplatten finden sie im Kapitel Sonderausführungen

Stimmen sie sich bitte mit unserem Verkauf ab! Wir helfen ihnen gerne bei Auswahl und Größe des Bohrbildes weiter!  
Schicken sie eine E-mail an: <verkauf@pister-gmbh.com> oder rufen sie uns an: (+49) 72 22 / 50 02-0.

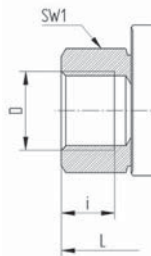
Ball valves with mounting plate or as combination, see chapter special types.

Please discuss your demand with us! We are happy to help you finding the correct hole pattern and size for your application!  
You can reach us by e-mail: <verkauf@pister-gmbh.com>, or phone: (+49) 72 22 / 50 02-0.

# Schraubstutzen für BKH

## Srew sockets for BKH

### Anschlußart Connection

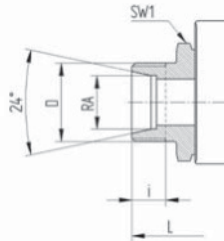


**Rohrgewinde**  
DIN/ISO 228  
**BSP**  
**female thread**  
DIN/ISO 228

DN	LW	Gewindegröße • Bestellschlüssel Screw size • Order code	Gewindegröße bei DIN2353 Screw size for DIN2353	L	i	SW1	Gewicht Weight
mm	mm		mm	mm	mm	mm	kg
4	Ø 5	G 1/8	—	69	8	22	0,35
6	Ø 6	G 1/4	—	69	12	22	0,35
10	Ø 8	G 3/8	—	69	12	22	0,35
10	Ø 10	G 3/8	—	73	12	27	0,5
13	Ø 13	G 1/2	—	85	14	30	0,65
16	Ø 15	G 1/2	—	84	14	32	0,75
20	Ø 20	G 3/4	—	96	16	41	1,5
25	Ø 24	G 1	—	113	18	46	2
32	Ø 24	G 5/4	—	121	20	50	2,1
40	Ø 24	G 3/2	—	124	22	55	2,1

**Rohrverschraubung,**  
**leichte Reihe**  
DIN 2353 L

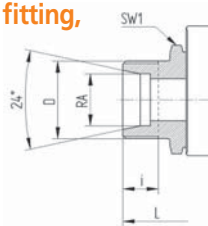
**For compression fitting,**  
**light series**  
DIN 2353 L



4	Ø 5	6L	M 12x1,5	67	7,5	22	0,3
6	Ø 6	8L	M 14x1,5	67	7,5	22	0,3
8	Ø 8	10L	M 16x1,5	71	8,5	22	0,3
10	Ø 8	12L	M 18x1,5	71	8,5	22	0,3
10	Ø 10	12L	M 18x1,5	75	8,5	27	0,5
13	Ø 10	15L	M 22x1,5	77	9,5	27	0,5
13	Ø 13	15L	M 22x1,5	84	9,5	30	0,6
16	Ø 13	18L	M 26x1,5	84	9,5	30	0,6
16	Ø 13	15L	M 22x1,5	83	9,5	32	0,75
16	Ø 15	18L	M 26x1,5	83	9,5	32	0,75
20	Ø 20	22L	M 30x2	102	12	41	1,5
25	Ø 24	28L	M 36x2	108	12	46	2
32	Ø 24	35L	M 45x2	114	13,5	50	2,1
40	Ø 24	42L	M 52x2	114	13,5	55	2,2

**Rohrverschraubung,**  
**schwere Reihe**  
DIN 2353 S

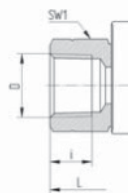
**For compression fitting,**  
**heavy series**  
DIN 2353 S



4	Ø 5	6S	M 14x1,5	71,5	9,5	22	0,35
4	Ø 5	8S	M 16x1,5	73	9,5	22	0,35
6	Ø 6	10S	M 18x1,5	73	9,5	22	0,35
8	Ø 8	12S	M 20x1,5	77	9,5	22	0,35
10	Ø 10	14S	M 22x1,5	84	11,5	27	0,5
13	Ø 13	16S	M 24x1,5	87	11,5	30	0,6
16	Ø 13	20S	M 30x2	91	13,5	30	0,65
16	Ø 13	16S	M 24x1,5	87	11,5	32	0,75
16	Ø 15	20S	M 30x2	90	13,5	32	0,75
20	Ø 20	25S	M 36x2	110	15	41	1,5
25	Ø 24	30S	M 42x2	120	17	46	2,1
32	Ø 24	38S	M 52x2	125	19	55	2,3

**NPT-Innengewinde**  
ANSI B 1.20.1

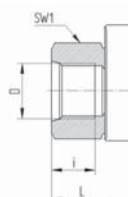
**NPT female thread**  
ANSI B 1.20.1



4	Ø 5	1/8 NPT	—	69	8	22	0,35
6	Ø 6	1/4 NPT	—	69	11,5	22	0,35
10	Ø 10	3/8 NPT	—	73	12	27	0,5
13	Ø 13	1/2 NPT	—	92	15,5	30	0,65
20	Ø 20	3/4 NPT	—	97	16	41	1,5
25	Ø 24	1 NPT	—	113	19	46	2
32	Ø 24	5/4 NPT	—	131	19,5	50	2,1
40	Ø 24	3/2 NPT	—	139	19,5	55	2,3

**UN/UNF-Einschraub-  
gewinde**  
SAE J514

**UN/UNF female  
thread**  
SAE J514

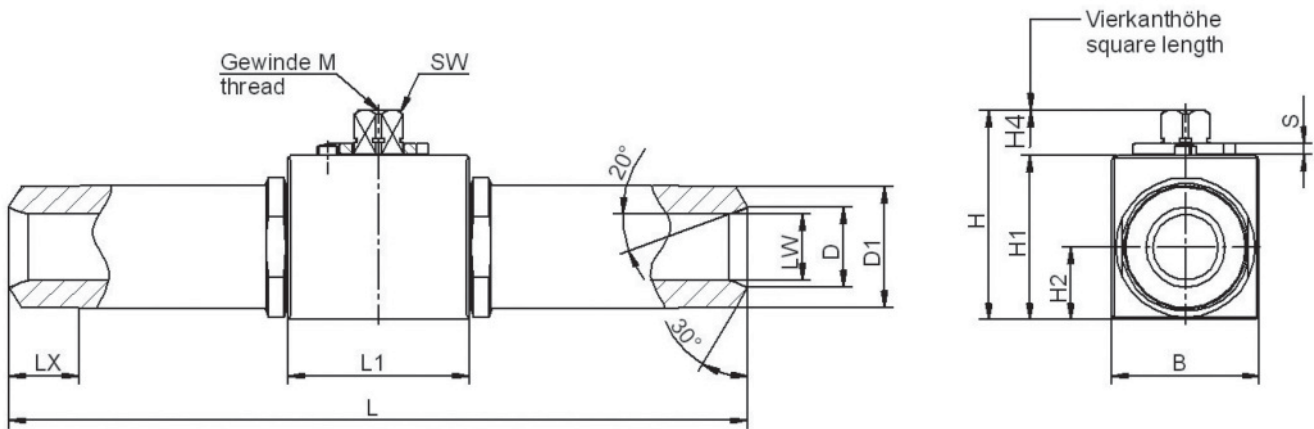


6	Ø 6	7/16-20 UNF-2B	—	69	11,5	22	0,35
10	Ø 10	9/16-18 UNF-2B	—	75	12,7	27	0,5
13	Ø 13	3/4-16 UNF-2B	—	85	14,3	30	0,65
16	Ø 15	7/8-14 UNF-2B	—	84	16,7	32	0,75
20	Ø 20	1 1/16-12 UN-2B	—	96	19	41	1,5
25	Ø 24	1 5/16-12 UN-2B	—	114	19	46	2
32	Ø 24	1 3/4-12 UN-2B	—	122	19	50	2,2
40	Ø 24	1 7/8-12 UN-2B	—	128	19	60	2,4

Sonderstutzen mit zölligem Außengewinde, metrischem Innen- oder Außengewinde sowie Schottverschraubungen auf Anfrage!  
Special connections with imperial male thread, metric female or male threads, as well as bulkhead connections on request!

# Anschweißenden für ABKH

## Butt welding ends for ABKH



### DIN 3239 Teil 1 Form 2

DN mm	LW mm	PN bar	D mm	D1 mm	LX mm	L mm	L1 mm	B mm	H mm	H1 mm	H2 mm	H4 mm	SW mm	M	S mm
10	Ø 10	16-100 / 160	Ø 13	Ø 18	>15	270	43,2	32	49,2	38	16,25	10,9	9	M5	3
10	Ø 10	250	Ø 12	Ø 18	>15	270	43,2	32	49,2	38	16,25	10,9	9	M5	3
10	Ø 10	320	Ø 12	Ø 18	>15	270	43,2	32	49,2	38	16,25	10,9	9	M5	3
10	Ø 10	400	Ø 10	Ø 18	>15	270	43,2	32	49,2	38	16,25	10,9	9	M5	3
16	Ø 15	16-100 / 160	Ø 17	Ø 22	>15	270	48,2	38	61,9	46	18,7	15,5	12	M6	3,5
16	Ø 15	250	Ø 16	Ø 22	>15	270	48,2	38	61,9	46	18,7	15,5	12	M6	3,5
16	Ø 15	320	Ø 15	Ø 22	>15	270	48,2	38	61,9	46	18,7	15,5	12	M6	3,5
16	Ø 15	400	Ø 17	Ø 28	>15	270	48,2	38	61,9	46	18,7	15,5	12	M6	3,5
20	Ø 20	16-100	Ø 22	Ø 28	>15	270	62,2	49	73,4	57	24,5	16	14	M6	4
25	Ø 24	16-100	Ø 28,5	Ø 34	>15	270	66,2	54	76,6	60	26,5	16	14	M6	4
25	Ø 24	160	Ø 27	Ø 34	>15	270	66,2	54	76,6	60	26,5	16	14	M6	4
25	Ø 24	250	Ø 26,5	Ø 35	>15	270	66,2	54	76,6	60	26,5	16	14	M6	4
25	Ø 24	320	Ø 24	Ø 35	>15	270	66,2	54	76,6	60	26,5	16	14	M6	4
25	Ø 24	400	Ø 29	Ø 44	>15	270	66,2	54	76,6	60	26,5	16	14	M6	4

- Abmessungen gelten für Werkstoff FSt-PI und Automatenstahl, Gehäuse aus S355J2G3 haben abweichende Maße. • Andere Baulängen auf Anfrage
- Druckabschläge entsprechend Einsatzbereich/Werkstoffen sind zu beachten. • Maßänderungen vorbehalten.
- Dimensions apply for FSt-PI and free cutting steel, dimensions of S355J2G3 bodies are different. • Other face to face dimensions on request
- Reduced pressure ratings must be taken into consideration according to applications and materials. • Dimensions subject to change without notice.



**Rohrabmessungen angeben! • Andere Anschweißenden auf Anfrage.**



**Specify the tube dimensions! • Other welding ends on request.**

### Bestellschlüssel

#### Order code

Serie 810	Nennweite	Druckstufe	Werkstoff <sup>2)</sup>	Ausführung	Zubehör / Sonder <sup>2)</sup> siehe Rubrik Zubehör
Series 810	Nominal size	Pressure rating	Material <sup>2)</sup>	Connection type	Equipment / specials <sup>2)</sup> see category equipment
ABKH	16	PN250	1123 1	BW	BoDg

<sup>2)</sup> Gerne helfen wir ihnen bei der Auswahl der geeigneten Werkstoffe und Sonderausstattungen weiter.

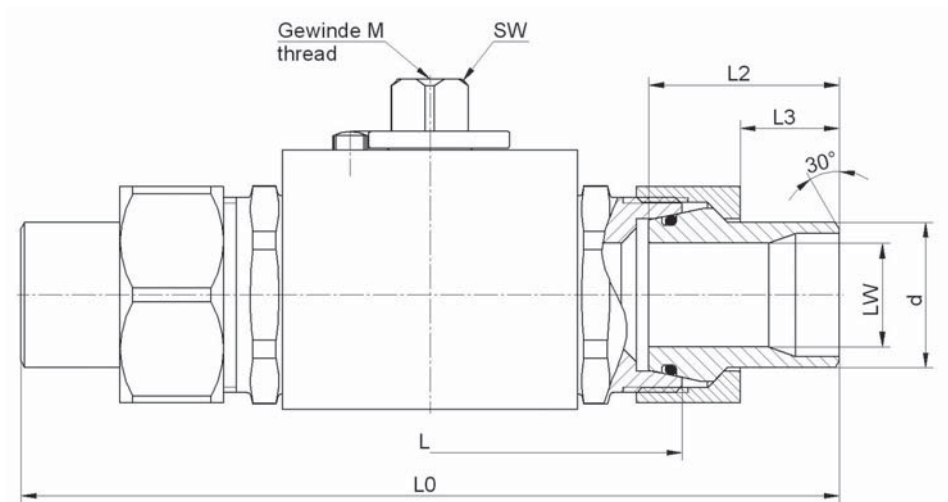
<sup>2)</sup> We would be glad helping you to choose proper material and equipment.

Bitte richten sie ihre Anfrage an: <verkauf@pister-gmbh.com>, oder rufen sie uns an: (+49) 72 22 / 50 02-0  
Bitte geben sie uns Auskunft über Druck, Temperatur und Medium ihrer Anwendung!

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Please tell us pressure, temperature and medium of your application!

# Anschweißkegel für ABKH

## Welding for ABKH



### Rohrverschraubung, leichte Reihe

DIN 2353 L

For compression fitting ,  
light series  
DIN 2353 L

DN mm	LW mm	Gewindegröße / Bestellbezeichnung Thread size / order code	L0 ±2 mm	L ±2 mm	L2 mm	L3 mm	d mm	Rohr Pipe mm
6	Ø 4	8L + SK	126	76	30,5	17	Ø 8	8x1
8	Ø 6	10L + SK	128	76	32	17	Ø 10	10x1
10	Ø 7,5	12L + SK	132	80	32	17	Ø 12	12x1,5
13	Ø 10	15L + SK	152	96	34	17,5	Ø 15	15x1,5
16	Ø 13	18L + SK	149	90	35,5	18	Ø 18	18x1,5
20	Ø 17	22L + SK	174	110	38	19	Ø 22	22x2
25	Ø 23	28L + SK	190	120	41	20,5	Ø 28	28x2
32	Ø 24	35L + SK	208	130	47	24,5	Ø 35	35x2
40	Ø 24	42L + SK	208	130	47	24,5	Ø 42	42x3

### Rohrverschraubung, schwere Reihe

DIN 2353 S

For compression fitting,  
heavy series  
DIN 2353 S

6	Ø 6	10S + SK	128	76	32	15,5	Ø 10	10x1,5
8	Ø 7,5	12S + SK	128	76	32	15,5	Ø 12	12x2
10	Ø 8	14S + SK	144	80	38	18,5	Ø 14	14x2
13	Ø 10	16S + SK	160	96	38	19	Ø 16	16x2
16	Ø 13	20S + SK	163	90	44	22	Ø 20	20x2,5
20	Ø 16	25S + SK	193	110	49	24,5	Ø 25	25x3
25	Ø 24	30S + SK	208	120	52	26,5	Ø 30	30x3
32	Ø 24	38S + SK	227	130	56,5	28	Ø 38	38x4



Rohrabbmessungen angeben! • Andere Anschweißenden auf Anfrage.  
Specify the tube dimensions! • Other welding ends on request.



### Bestellschlüssel

Order code

Serie 810	Anschluss	Anschluss	Anschluss	Zubehör / Sonder <sup>1)</sup> siehe Rubrik Zubehör
Series 810	Connection	Nominal size	Material <sup>1)</sup>	Equipment / specials <sup>1)</sup> see category equipment
ABKH	16S + SK	13	1123 1	BoDg

<sup>2)</sup> Gerne helfen wir ihnen bei der Auswahl der geeigneten Werkstoffe und Sonderausstattungen weiter.

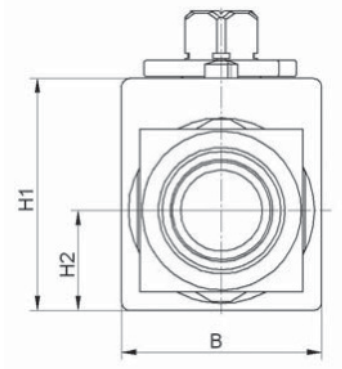
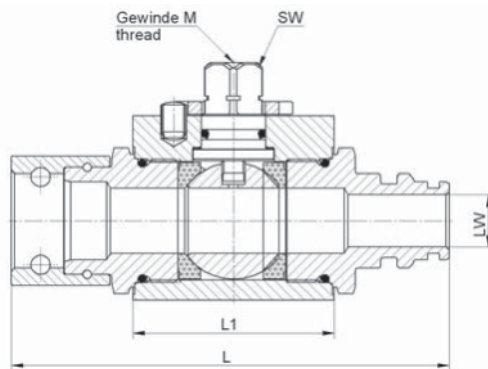
<sup>2)</sup> We would be glad helping you to choose proper material and equipment.

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Bitte geben sie uns Auskunft über Druck, Temperatur und Medium ihrer Anwendung!

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Please tell us pressure, temperature and medium of your application!

# BKH als Bergbauversion -> BBKH, DIN 20043

## BKH for mining industry -> BBKH, DIN 20043



### BBKH : Bergbau Kugelhähne

#### Ball valves for mining industry

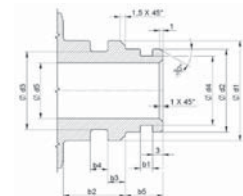
DN Schlauch • Hose mm	DN Kugelh. • Ball valve mm	LW mm	PN <sup>1)</sup> bar	L Steckmuffe-Steckmuffe • Female-Female (MD-MD) mm	L Steckmuffe-Stecknippel • Female-Male (MD-N) mm	B mm	H1 mm	H2 mm	SW mm	M
10	10	Ø 9	500	120	116	30	40	15	10	M6
12	13	Ø 10	500	119	116	30	40	15	10	M6
19	20	Ø 16	350	140	136	40	50	21	10	M6
25	25	Ø 24	350	151	151	60	60	26,5	14	M6

<sup>1)</sup> Max. zul. PN und Anzugsdrehmoment sind den Angaben der Rohrverschraubungshersteller zu entnehmen.  
• Druckabschläge entspr. Einsatzbereich/Werkstoffen sind zu beachten. • Maßänderungen vorbehalten.

<sup>1)</sup> For PN max. and tightening torque see data of the compression fitting manufacturer. • Reduced press. rating must be taken into consideration acc. to application and materials. • Dimensions subject to change without notice.

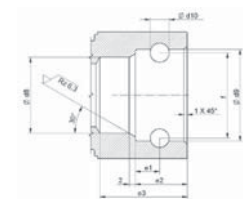
### N : Stecknippel • Male connector

DN Schlauch Hose mm	DN Kugelh. Ball valve mm	b1 mm	b2 mm	b3 mm	b4 mm	b5 mm	d1 mm	d2 mm	d3 mm	d4 mm	d5 mm
10	10	3,1	18	5	5,1	11	Ø 20	Ø 14	Ø 13,5	Ø 10,8	Ø 7
12	13	3,6	18	5	5,1	11	Ø 24	Ø 18	Ø 17,5	Ø 14	Ø 10
19	20	3,6	18	5	5,1	11	Ø 29	Ø 24	Ø 22,5	Ø 20	Ø 16
25	25	3,6	24	6	7,1	11	Ø 39	Ø 31	Ø 29	Ø 27	Ø 20



### MD : Steckmuffe • Female connector

DN Schlauch Hose mm	DN Kugelh. Ball valve mm	d8 mm	d9 mm	d10 mm	e1 mm	e2 mm	e3 mm	f mm
10	10	Ø 14	Ø 20	Ø 6	7	15	27	18
12	13	Ø 18	Ø 24	Ø 6	7	15	27	22
19	20	Ø 24	Ø 29	Ø 6	7	15	27	27
25	25	Ø 31	Ø 39	Ø 8,5	9	20	33	36



Bergbauhähne werden standardmäßig mit Flügelgriffen ausgestattet.

Ball valves for mining industry are standardly equipped with wing handles.

Bestellschlüssel

Order code

Serie 040	Anschluss <sup>2)</sup>	Nennweite	Werkstoff <sup>3)</sup>
Series 040	Connection <sup>2)</sup>	Nominal size	Material <sup>3)</sup>
BBKH	MD-N	20	11231

<sup>2)</sup> Anschlüsse der linken und rechten Seite beliebig kombinierbar • left and right side connectors can be used in any combination

<sup>3)</sup> Gerne helfen wir ihnen bei der Auswahl der geeigneten Werkstoffe und Sonderausstattungen weiter. • We would be glad helping you to choose proper material and equipment.

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Bitte geben sie uns Auskunft über Druck, Temperatur und Medium ihrer Anwendung!

Please send your request to: <verkauf@pister-gmbh.com>, or give us a call: (+49) 72 22 / 50 02-0

Please tell us pressure, temperature and medium of your application!

SIMATIC DP, CM PROFIBUS DP for ET 200SP CPU module with PROFIBUS DP interface (9-pole D-sub socket) DP master for 125 DP slaves



General information	
Product type designation	CM PROFIBUS DP
HW functional status	FS04
Engineering with	
<ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated from version</li> </ul>	V13 Update 3
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
1. Interface	
Interface types	
<ul style="list-style-type: none"> <li>RS 485</li> </ul>	Yes
Protocols	
<ul style="list-style-type: none"> <li>PROFIBUS DP master</li> <li>PROFIBUS DP slave</li> <li>SIMATIC communication</li> </ul>	Yes Yes Yes

PROFIBUS DP master	
• Number of DP slaves, max.	125
Services	
— PG/OP communication	Yes
— Equidistance	No
— Isochronous mode	No
— Activation/deactivation of DP slaves	Yes
PROFIBUS DP slave	
• Transmission rate, max.	12 Mbit/s
• automatic baud rate search	Yes
• Address area, max.	120
• User data per address area, max.	128 byte
Services	
— PG/OP communication	Yes; Only with active interface
— Routing	Yes; Only with active interface
— S7 communication	Yes; Only with active interface
— Direct data exchange (slave-to-slave communication)	Yes; No subscriber possible - only passive publisher
— DPV1	Yes
Transfer memory	
— Inputs	244 byte
— Outputs	244 byte
Interface types	
RS 485	
• Transmission rate, max.	12 Mbit/s
• Cable length, max.	100 m
Protocols	
SIMATIC communication	
• S7 routing	Yes
• Data record routing	Yes
Interrupts/diagnostics/status information	
Diagnostics function	Yes
Diagnostics indication LED	
• for module diagnostics	Yes; green/red DIAG LED
Potential separation	
between backplane bus and interface	Yes
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-25 °C; No condensation
• horizontal installation, max.	60 °C

- vertical installation, min. -25 °C; No condensation
- vertical installation, max. 50 °C

#### Altitude during operation relating to sea level


- Installation altitude above sea level, max. 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual

#### Dimensions

Width	35 mm
Height	117 mm
Depth	75 mm

#### Weights

Weight, approx.	80 g
-----------------	------

**last modified:** 12/09/2020 



### Main Features

- Ranges: from 1 to 1000 bar
- Nominal Output Signal:  
4...20mA (2 wires)  
0...10Vdc / 0.1...5.1Vdc / 0.1...10.1Vdc / 0...5Vdc /  
1...5Vdc / 1...6Vdc / 1...10Vdc / 0.2...10.2Vdc (3 wires)  
0.5...4.5Vdc (3 wires - ratiometric)
- Compact size
- Wetted parts: Stainless steel
- SIL 2 certified according to IEC/EN 62061:2005

KS transmitters are based on film sensing element deposited on stainless steel diaphragm.

Thanks to the latest state of the art SMD electronics and compact all stainless steel construction, these products are extremely robust and reliable, with SIL2 certification supplied as standard.

KS transmitters are suitable for all industrial applications, specially on hydraulics (presses, pumps, power pack, fluid power, etc.) with severe conditions usually with high level of shock, vibration, and pressure and temperature peaks.



This symbol present on the product label stands for further indications on product manual. For correct and safe installation, follow the instructions and observe the warnings contained in this manual. No hazards shall arise by any reasonably foreseeable misuse in a way not intended, and not described in this manual. The complete manual is available for download from the website [www.gefran.com](http://www.gefran.com).  
UL file number E216851

### TECHNICAL DATA

	VOLTAGE		RATIOMETRIC	CURRENT
Output signal				
Non Linearity (BFSL)			± 0.15% FS (typ) ± 0.25% FS (max)	
Hysteresis			+ 0.1% FS (typ) + 0.15% FS (max)	
Repeatability			± 0.025% FS (typ) ± 0.05% FS (max)	
Zero offset tolerance			± 0.15% FS (typ) ± 0.25% FS (max)	
Span offset tolerance			± 0.15% FS (typ) ± 0.25% FS (max)	
Accuracy at room temperature (1)			< ± 0.5% FS	
Pressure ranges (2)			From 1 bar to 1000 bar (See table)	
Resolution			Infinite	
Overpressure (without degrading performance)			See table	
Pressure containment (burst test)			See table	
Pressure Media			Fluids compatible with Stainless Steel AISI 430F and 17-4 PH	
Housing			Stainless Steel AISI 304	
Power supply (4)	B/M/P R N/C/T/Q	10...30Vdc 11...30Vdc 15...30Vdc	5Vdc ± 0,25V	10...30Vdc
Max current absorption			15mA	35mA
Dielectric strenght			250 Vdc	
Zero output signal	B/M/P/R/N/C/T/Q		0.5Vdc (X)	4 mA (E)
Full scale output signal	B/M/P/R/N/C/T/Q		4.5Vdc (X)	20 mA (E)
Allowed load			≥ 5KΩ	see load diagram
Long term stability			< 0.2% FS/per year	
Operating temperature range (process)			-40...+125°C (-40...+257°F)	
Operating temperature range (ambient) (5)			-40...+105°C (-40...+221°F)	
Compensated temperature range			-20...+85°C (-4...+185°F)	
Storage temperature range			-40...+125°C (-40...+257°F)	
Temperature effects over compensated range (zero)			± 0.01% FS/°C typ. (± 0.02% FS/°C max.)	
Temperature effects over compensated range (span)			± 0.01% FS/°C typ. (± 0.02% FS/°C max.)	
Response time (10...90%FSO)			< 1 msec.	
Warm-up time (3)			< 30 sec.	
Mounting position effects			Negligible	
Humidity			Up to 100%RH non-condensing	
Weight			80-120 gr. nominal	
Mechanical shock			100g/11msec according to IEC 60068-2-27	
Vibrations			20g max at 10...2000 Hz according to IEC 60068-2-6	
Ingress protection			IP65/IP67	
Output short circuit and reverse polarity protection			YES	
EC Conformity			According to Directive 2014/30/EU	

FS = Full scale

1 Incl. Non-Linearity, Hysteresis, Repeatability, Zero-offset and Span-offset (acc. to IEC 61298-2)

2 The operating pressure range is intended from 0.5% to 100% FS

3 Time within which the rated performance is achieved

4 The devices must be supplied with a Class 2 Power Supply (as for NEC) or LPS Power Supply (as for EN 60950). If devices are permanently connected to the machine it's requested an external switch or circuit breaker and external overcurrent protection.

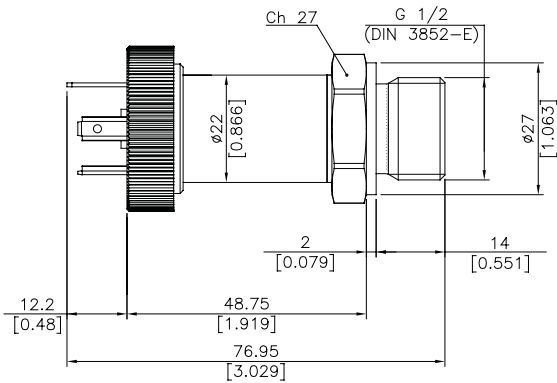
5 See possible restrictions in the paragraphs "Electrical connections" and "Accessories on request".

## PRESSURE RANGES

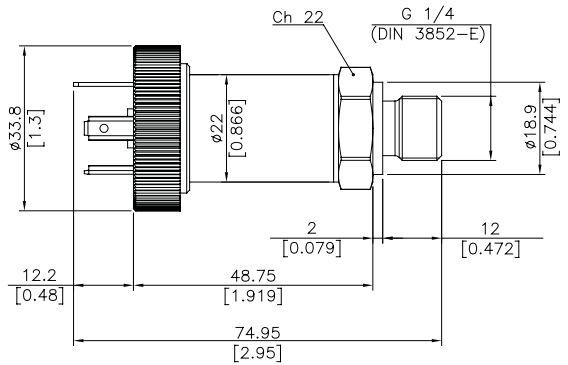
RANGE (Bar)	1	1.6	2	2.5	4	6	10	16	20	25	40	60	100	160	200	250	400	600	1000
Overpressure (Bar)	6	6	6	10	8	12	20	32	40	50	80	120	200	320	400	500	800	1200	1200
Burst pressure (Bar)	9	9	9	15	16	24	40	64	80	100	160	240	400	640	800	1000	1500	1500	1500

## INSTALLATION DRAWINGS

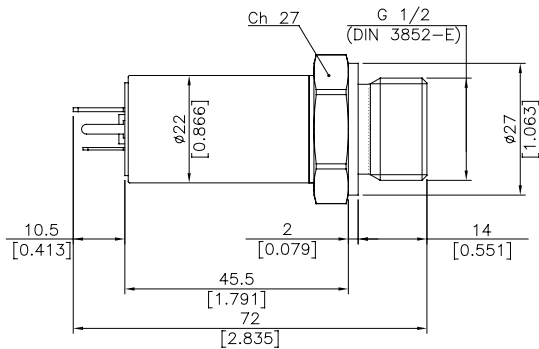
**Connector EN 175301-803 Form A**



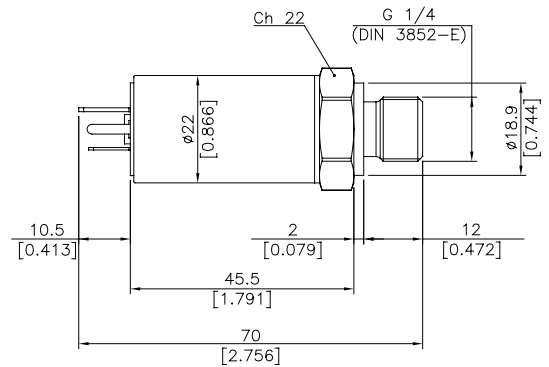
**Connector EN 175301-803 Form A**



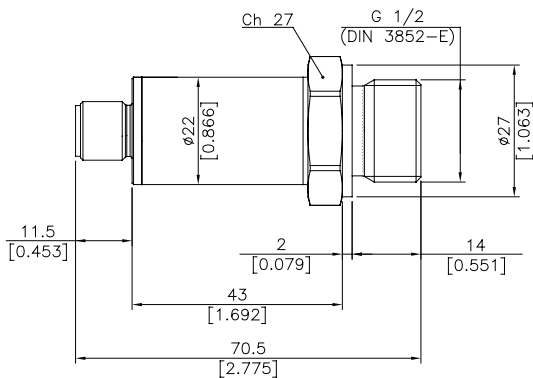
**Connector EN 175301-803 Form C**



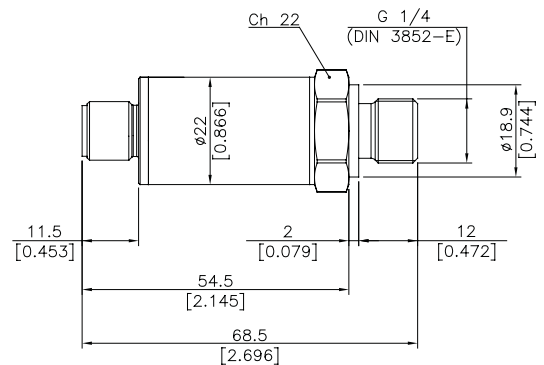
**Connector EN 175301-803 Form C**



**Connector M12x1**

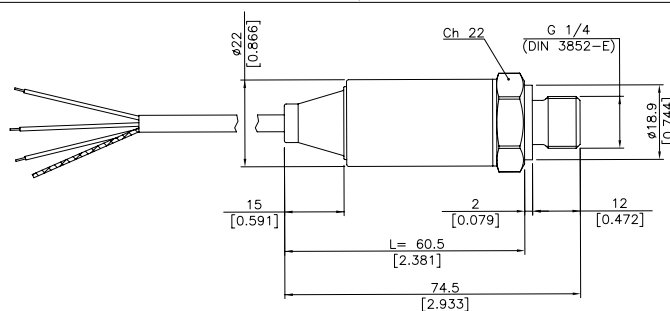


**Connector M12x1**



**Cable output**

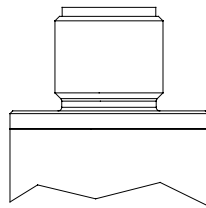
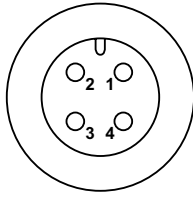
**3 Pole cable**



Dimensions in mm. [inches]

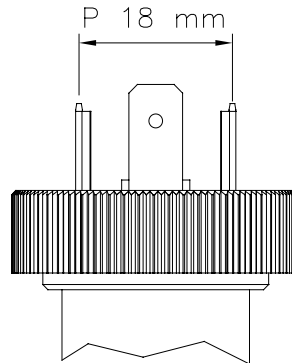
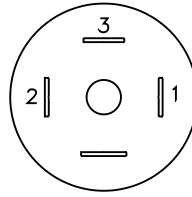
## ELECTRICAL CONNECTION - Connectors

### Z – 4 pin male connector M12 x 1



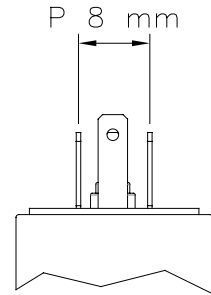
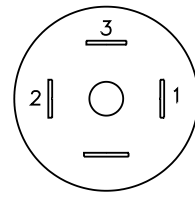
4 pin male connector  
Protection IP67

### E - EN 175301-803



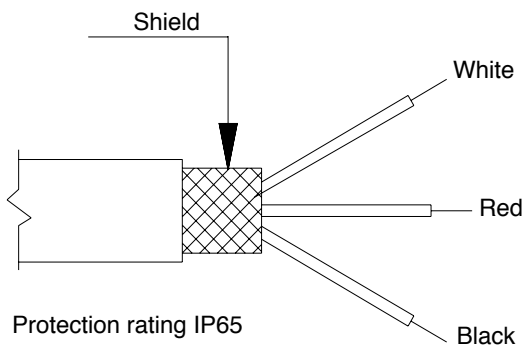
4 pin DIN  
Form A  
Protection IP65

### C – EN 175301-803



4 pin MicroDIN  
Form C  
Protection IP65

### F – 3 pole cable Shielded cable 3x26 AWG - Length 1 m



### ELECTRICAL CONNECTION – RATINGS

ELECTRICAL CONNECTION	IP RATING	cULus CERTIFIED	TEMPERATURE RATINGS **
F – 2/3 pole cable *	IP65		-10+105°C
Z - 4 pole male connector M12 x 1	IP67	X	-40+105 °C
E - 4 pole solenoid connector EN 175301-803-A	IP65	X	-40+105 °C
C - 4 pole microsolenoid connector EN 175301-803-C	IP65	X	-40+105 °C

\*UL certified version not available.

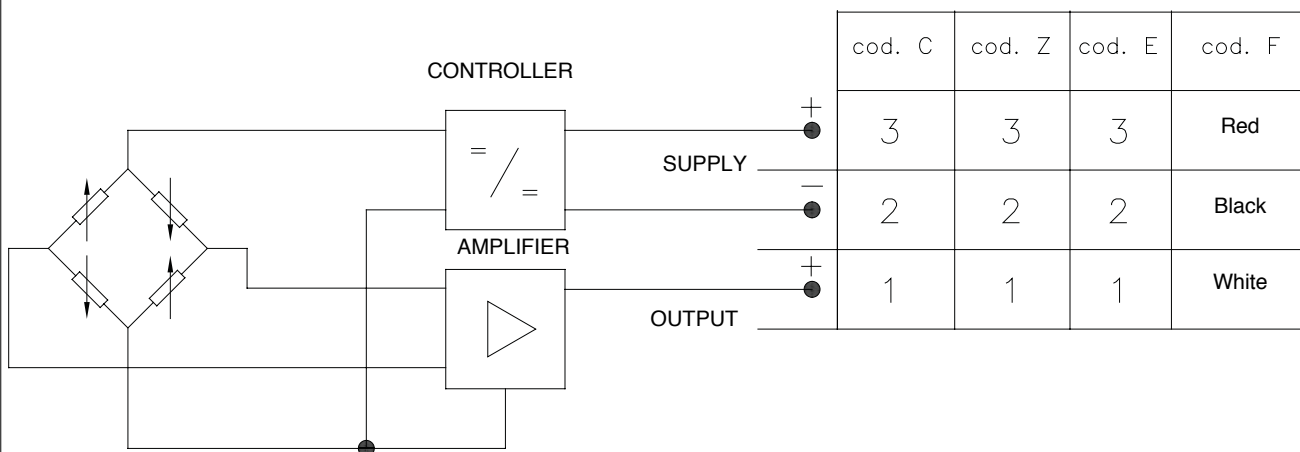
\*\* The operating temperature ranges, except where expressly indicated, are also applicable in the UL scope.

#### Notes:

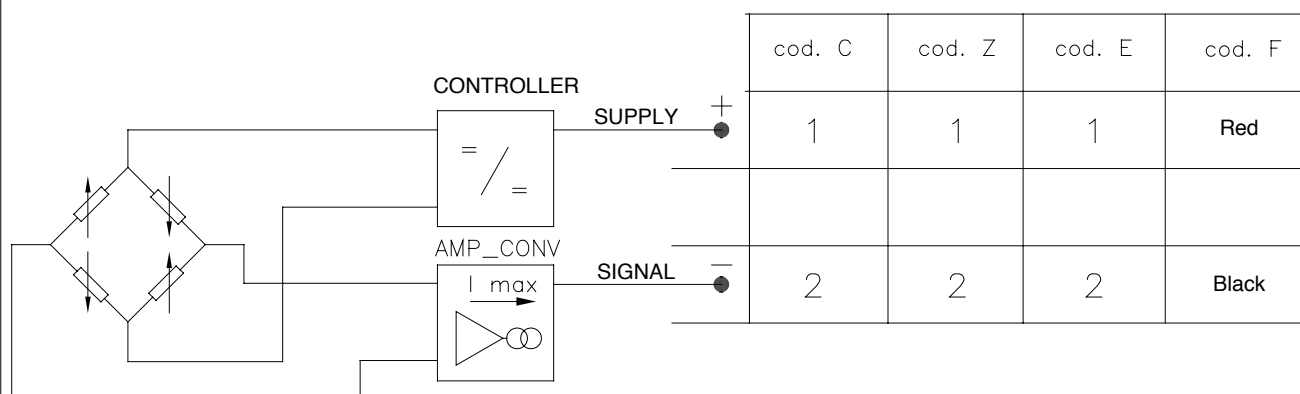
1. The IP rating specified in this document normally applies with the suitable female connector plugged-in and properly wired.
2. The pressure transducers with measuring range of 60 bar and below require vented cable and/or mating connector, to allow the compensation of the atmospheric pressure reference.

## ELECTRICAL CONNECTION - Connection diagrams

### VOLTAGE AMPLIFIED OUTPUT

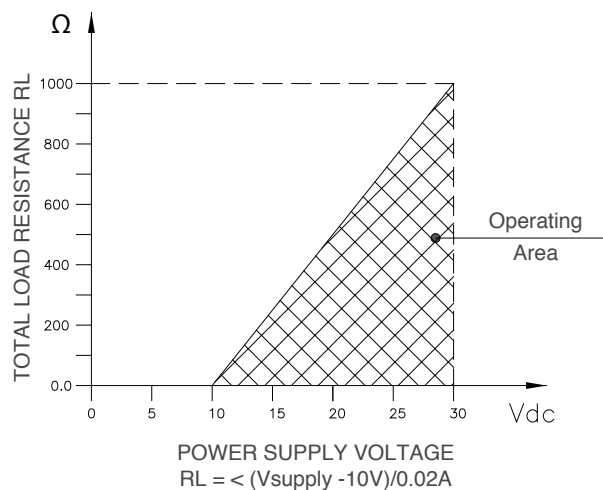


### CURRENT AMPLIFIED OUTPUT - mod. E



## LOAD DIAGRAM

### Current output



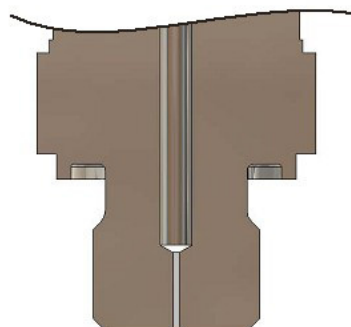
## PRESSURE PEAKS PROTECTION

Many industrial applications, especially in hydraulics, could present dangerous phenomena like cavitation, liquid hammer or pressure peaks, due for example to pumps start and stop or fast closing of a valve.

These phenomena can be harmful to the transducer.

The KS series, upon request, is available with an integrated pressure snubber which, thanks to a 0.5 mm diameter through hole, eliminates these harmful peaks, to protect the transducer.

Contact Gefran to request the version with pressure snubber.



## SIL CERTIFICATION (Safety Integrity Level) – FUNCTIONAL SAFETY

Safety is a critical requirement especially for machine builders. The new European Directive 2006/42/EC defines all the essential requirements in this regard.

In the context of functional safety, the European directive is received by the technical standard **IEC / EN 62061** "Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems"(SRECS)

KS pressure transmitters are certified SIL CL 2 by the Certification Body TÜV Rheinland with Test Report No.FS 28712235, in accordance with that rule, for use in applications "High Demand Mode" and then may be used in SRECS systems of machinery, where the safety variable to control will be the pressure of a fluid.

- NOTES:**
- 1) The SIL certification is supplied standard, and is available for pressure ranges from 0 ... 4 bar and above
  - 2) For models with voltage amplified output, SIL certification is only available for versions with output at atmospheric pressure greater than zero volts (ie: 0.1 ... 10.1 V)
  - 3) Full specifications and installation and user manual of KS certified SIL 2 can be downloaded directly from the website [www.gefran.com](http://www.gefran.com)

## ACCESSORIES ON REQUEST

### MATING CONNECTORS

DESCRIPTION	IP RATING	CODE	cULus CERTIFIED	TEMPERATURE RATINGS **
Connection E EN 175301-803 4 pin DIN Form A (P 18) - H=32	IP65	CON064	X	-40+125 °C -40+65°C (cULus)
		CON113	X	-40+90°C
Connection E 3 pole connector + ground EN 175301-803-A H28	IP65	CON045	X	-40+125 °C -40+65°C (cULus)
		CON114	X	-40+90°C
Connection C EN 175301-803 4 pin MicroDIN Form C (P 8)	IP65	CON047		-40+125 °C
		CON116	X	-40+90°C
Connection Z 4 pole female cable connector M12x1	IP67	CON293		-25+85°C
		CON087	X	-25+90°C
Connection Z 4 pole female cable connector, 90° M12x1	IP67	CON050		-25+85°C
		CON088	X	-25+90°C

### EXTENSION CABLES\*

DESCRIPTION	IP RATING	CODE	cULus CERTIFIED	TEMPERATURE RATINGS **	CABLE COLOR CODE	
					Pin	Wire
Connection Z female connector M12x1 + 2/3/5/10m of cable	IP67	CAV220	X	-30+80°C	1	Brown
		CAV221			2	White
		CAV222			3	Blue
		CAV223			4	Black

\* Other lengths on request

\*\* The nominal temperature ranges, except where expressly indicated, are also applicable in the UL scope.

For cULus applications extension cables, a 3 pole 26AWG Style 2464 cable is advised

### SEALING CODE ACCORDING TO PROCESS CONNECTION

PROCESS CONNECTION	STEEL + NBR	NBR	FKM
G 1/4 gas male DIN E			GUA036
G 1/2 gas male DIN E		GUA380	
M12x1,5			GUA166
G 1/4 gas male DIN A	RON300		
M14x1,5			GUA036
M10x1			GUA385
G3/8			GUA190
G1/8			GUA385
7/16-20 UNF		GUA175	

# ACCESSORIES DRAWINGS

DESCRIPTION	CODE	DRAWING
<b>Connection E</b> EN 175301-803 4 pin DIN Form A (P 18) H=32	CON064	
	CON113	
<b>Connection E</b> 3 pole connector + ground EN 175301-803-A H=28	CON045	
	CON114	
<b>Connection C</b> EN 175301-803 4 pin MicroDIN Form C (P 8)	CON047	

DESCRIPTION	CODE	DRAWING
<b>Connection C</b> EN 175301-803 4 pin MicroDIN Form C (P 8)	CON116	
<b>Connection Z</b> 4 pole female cable connector M12x1	CON293	
	CON087	
<b>Connection Z</b> 4 pole female cable connector, 90° M12x1	CON050	
	CON088	
<b>Connection Z</b> female connector M12x1 + 2/3/5/10m of cable	CAV220	
	CAV221	
	CAV222	
	CAV223	





**EN** Operating instructions..... pages 1 to 6  
Translation of the original operating instructions

**FR** Vous trouverez la version actuelle du mode d'emploi dans votre langue nationale officielle sur l'Internet, [www.schmersal.net](http://www.schmersal.net).

**ES** Encontrará el manual de instrucciones actual en su idioma oficial de la UE en nuestra página de Internet [www.schmersal.net](http://www.schmersal.net).

**NL** U vindt de huidige versie van de gebruikshandleiding in uw officiële landstaal op het Internet, [www.schmersal.net](http://www.schmersal.net).

**IT** Il manuale d'istruzioni aggiornato nella vostra lingua (lingua ufficiale UE) è scaricabile in Internet all'indirizzo [www.schmersal.net](http://www.schmersal.net).

**JP** EU公用語で書かれた最新の取扱説明書は、インターネット ([www.schmersal.net](http://www.schmersal.net)) からダウンロードできます。

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## 1 About this document

### 1.1 Function

This operating instructions manual provides all the information you need for mounting, set-up, commissioning, the safe operation and disassembly of the safety switchgear. The operating instructions must be available in a legible condition and complete version in the vicinity of the device.

### 1.2 Target group: authorised qualified personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel, authorised by the plant operator.

Please make sure that you have read and understood these operating instructions and that you know all applicable prescriptions regarding occupational safety and accident prevention prior to installing and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

### 1.3 Explanation of the symbols used



#### Information, hint, note:

This symbol is used for identifying useful additional information.



**Caution:** Failure to comply with this warning notice could lead to failures or malfunctions.

**Warning:** Failure to comply with this warning notice could lead to physical injury and/or damages to the machine.

### 1.4 Appropriate use

The products described in these operating instructions are developed to execute safety-related functions as a part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the proper functioning of the entire machinery or plant.

The safety switchgear must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of application can be found in the chapter "Product description".

### 1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.



Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: [www.schmersal.net](http://www.schmersal.net).

The information contained in this operating instructions manual is provided without liability. Subject to technical modifications.

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

### 1.6 Warning about misuse



In case of inadequate or improper use or manipulations of the safety switchgear, personal hazards or damages to machinery or plant components cannot be excluded. The relevant requirements of the standard EN 1088 must be observed.

### 1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden; the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

## 2 Product description

### 2.1 Ordering code

This operating instructions manual applies to the following types:

No.	Option	Description
①	Z	Snap action ⊖
	T	Slow action ⊖
②	Actuator selection	refer to the catalogue
③	3	slim design
	5	large design
④	5	Metal enclosure
	6	Thermoplastic enclosure
⑤	02	2 NC contacts
	11	1 NO contact / 1 NC contact
	20	2 NO contacts (not suitable for safety applications)
⑥	H	Slow action with staggered contacts
	UE	Slow action with overlapping contacts
⑦	Cable entry M20	
	ID	Cut-clamp technology
	NPT	Cable entry NPT 1/2"
	ST	M12 connector (A coding)
	2310	M12 connector (B coding)
⑧	1297	Enclosure with transverse slotted holes
⑨	2138	Roller lever 7H for safety applications
⑩	1637	Gold-plated contacts



In accordance with the Machinery Directive, the type plate of safety components is marked with an A.

Only if the conversions described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive is maintained.

### 2.2 Special versions

For special versions, which are not listed in the order code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.

### 2.3 Destination and use

The position switches with safety function are suitable for sliding and hinged guards, which need to be closed in order to ensure the required operational safety.



The user must evaluate and design the safety chain in accordance with the relevant standards and the required safety level.

### 2.4 Technical data

Standards:	IEC/EN 60947-5-1, EN ISO 13849-1, BG-GS-ET-15
Design:	DIN EN 50047
Enclosure:	236, 256: glass-fibre reinforced thermoplastic, self-extinguishing 235: zinc die-cast, enamel finish 255: aluminium die-cast, enamel finish
Protection class:	IP 67
Contact material:	Silver
Contact types:	change-over contact with double break, type Zb or 1 NC or 2 NC contacts, with galvanically separated contact bridges
Switching system:	⊖ IEC/EN 60947-5-1; slow action or snap action, positive break NC contact
Termination:	Screw connection
Cable section:	min. 0.75 mm <sup>2</sup> ; max. 2.5 mm <sup>2</sup> ; solid and stranded wire with conductor ferrules
Cable entry:	235, 236: 1 x M20 x 1.5; 255: 3 x M20 x 1.5; 256: 2 x M20 x 1.5
Ambient temperature:	- 30 °C ... + 80 °C
Mechanical life:	20 million operations
Switching frequency	max. 5000/h
max. actuating speed	1 m/s
Bounce duration	Snap action: < 3 ms; Slow action: in accordance with actuating speed
Switchover time:	Slow action: in accordance with actuating speed
Electrical data:	
Utilisation category:	AC-15; DC-13
I <sub>e</sub> /U <sub>e</sub> :	4 A / 230 VAC; 1 A / 24 VDC
U <sub>imp</sub> :	6 kV; connector: 0.8 kV
U <sub>i</sub> :	500 V; connector: 50 V
I <sub>the</sub> :	10 A
Max. fuse rating:	6 A gG D-fuse

### 2.5 Safety classification

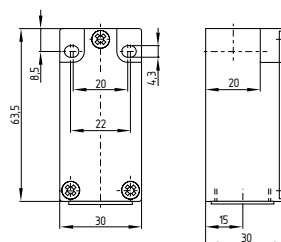
Standards:	EN ISO 13849-1
B <sub>10d</sub> (NC contact):	20,000,000
B <sub>10d</sub> (NO contact) at 10% ohmic contact load:	1,000,000

## 3 Mounting

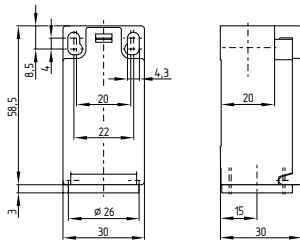
### 3.1 Dimensions

All measurements in mm.

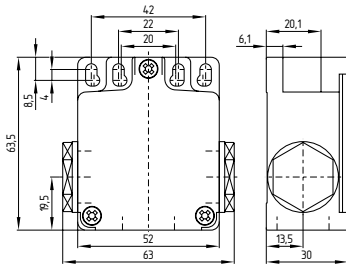
#### Dimensions Z/T 235



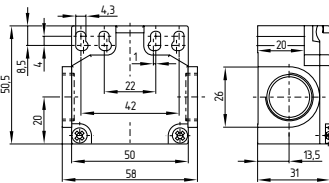
Dimensions Z/T 236



Dimensions Z/T 255



Dimensions Z/T 256



3.2 Mounting of the position switches

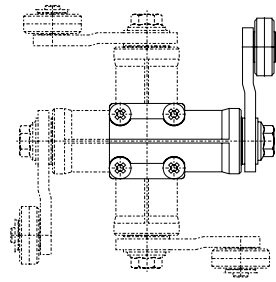
The mounting dimensions are mentioned at the rear of the enclosure. The fixing screws of the component must be protected against unauthorised unscrewing. The switch enclosure must not be used as end stop. Any mounting position. To ensure a proper functioning, the switch must be installed so that the required switch travel is obtained. For safety functions, at least the positive break travel indicated in the switch travel diagram (refer to catalogue) must be obtained. All components have sufficient after-travel to compensate for inaccuracies in the guidance of the actuating system. The actuation of the switch beyond its end stop however must be avoided.



Please observe the remarks of the standards EN ISO 12100, EN 953 and EN 1088.

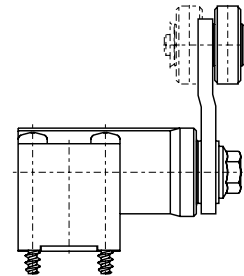
3.3 Mounting of the actuating heads

Repositioning the actuating heads (R, 1R, 4R, K, 3K, 4K, V.H)



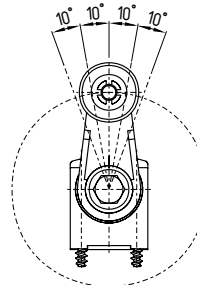
The actuating head can be repositioned by  $4 \times 90^\circ$ . Unscrew the four screws of the actuating head, reposition the actuating head in the desired position and retighten the four screws.

Repositioning the roller lever (H)



The (offset) roller arm may be reversed, so that the roller faces the inside of the arm.

Positioning the lever (.H)



The roller lever can be repositioned over  $360^\circ$  on the toothed shaft in  $10^\circ$  steps. Unscrew the hexagonal screw for approx. 4 mm, position the lever in the desired position and retighten the screw.

Length-adjustable lever (7H, 10H)

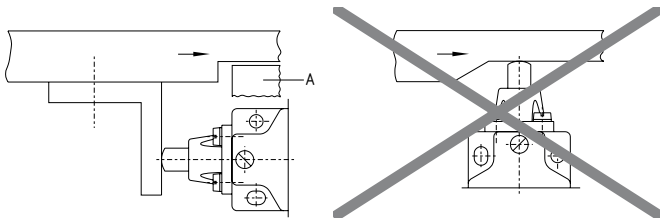
To adjust the length of the lever, unscrew the fixing screw of the lever. Firmly retighten the screw after the length adjustment.



Position switches with 7 H or 10 H actuator are not suitable for safety functions. Ordering suffix for actuator 7H with positive break: -2138.

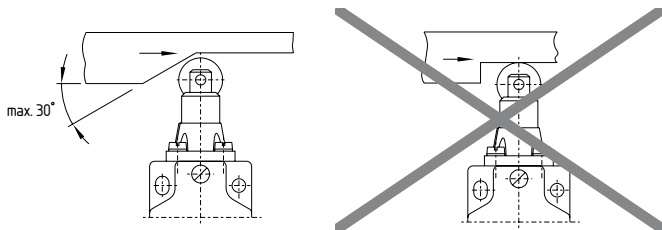
### 3.4 Actuation of the position switches

#### Top plunger

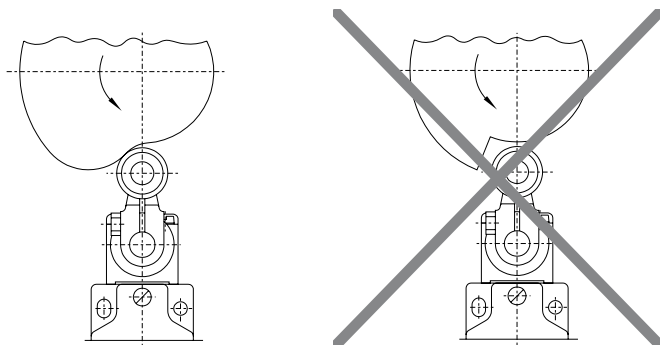


A Stop

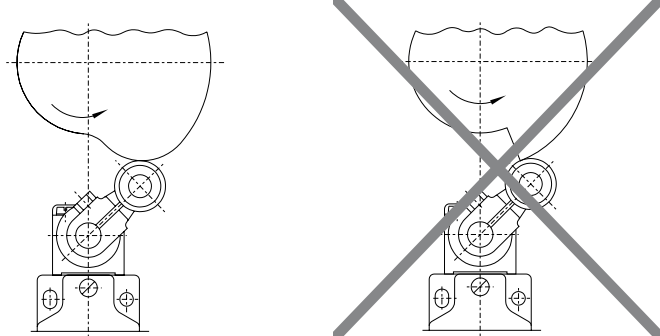
#### Roller plunger



#### Cam disc



Front side



Rear side

### 4 Electrical connection

#### 4.1 General information for the electrical connection



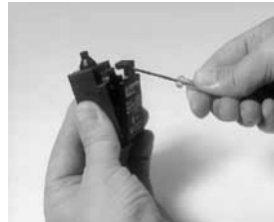
The electrical connection may only be carried out by authorised personnel in de-energised condition.

The contact labelling can be found in the wiring compartment of the switch. For the cable entry, suitable cable glands with an appropriate degree of protection must be used. After wiring, dust and soiling must be removed from the wiring compartment. The safety switches with thermoplastic enclosure of the 236/256 series are double-insulated. The use of a protective ground connector therefore is not authorised.



According to EN 60204-1, the versions with connector must only be used in PELV circuits.

#### Z/T 236: opening the cover



#### 4.2 Contact variants

The contacts are shown in non-actuated condition.

13 → 14 21 → 22	11 → 12 21 → 22	13 → 14 23 → 24
Z/T 235-11z	Z/T 235-02z	T 235-20z
Z/T 236-11z	Z/T 236-02z	T 236-20z
Z/T 236-11z	Z/T 255-02z	T 255-20z
Z/T 256-11z	Z/T 256-02z	T 256-20z



Position switches with two NO contacts (-20) are not suitable for safety functions.

### 5 Set-up and maintenance

#### 5.1 Functional testing

The safety function of the safety components must be tested. The following conditions must be previously checked and met:

1. Check the switch enclosure for damages
2. Check the free movement of the actuating element
3. Check the integrity of the cable entry and connections

#### 5.2 Maintenance

A regular visual inspection and functional test, including the following steps, is recommended:

1. Check the free movement of the actuating element
2. Remove particles of dust and soiling
3. Check cable entry and connections

Damaged or defective components must be replaced.

### 6 Disassembly and disposal


#### 6.1 Disassembly

The safety sensor must be disassembled in de-energised condition only.

#### 6.2 Disposal

The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

7.1 EC Declaration of conformity

	
<h2>EC Declaration of conformity</h2>	
Translation of the original declaration of conformity valid as of December 29, 2009	K.A. Schmersal GmbH Industrielle Sicherheitsschaltssysteme Mödinghofe 30, D - 42279 Wuppertal Germany Internet: www.schmersal.com
We hereby certify that the hereafter described safety components both in its basic design and construction conforms to the applicable European Directives.	
<b>Name of the component:</b>	Z/T 235; Z/T 236; Z/T 255; Z/T 256
<b>Description of the component:</b>	Positive break position switch for safety functions or position switch without safety function
<b>Harmonised EC-Directives:</b>	2006/42/EC EC-Machinery Directive <sup>1)</sup> 2006/95/EC EC Low Voltage Directive <sup>2)</sup>
<b>Affixing of the CE conformity mark:</b>	<sup>1)</sup> for safety components, whose type plate is labelled "safety component"  <sup>2)</sup> for position switches without safety function
<b>Person authorized for the compilation of the technical documentation:</b>	Ulrich Loss Mödinghofe 30 42279 Wuppertal
<b>Place and date of issue:</b>	Wuppertal, July 21, 2009
Index B+EN	
	Authorised signature Heinz Schmersal Managing Director



**Note**

The currently valid declaration of conformity can be downloaded from the internet at [www.schmersal.net](http://www.schmersal.net).



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E-Mail: [info@schmersal.com](mailto:info@schmersal.com)  
Internet: <http://www.schmersal.com>

## PRESSURE GAUGE VALVES

According to: DIN 16270, DIN 16271, DIN 16272

**Application**

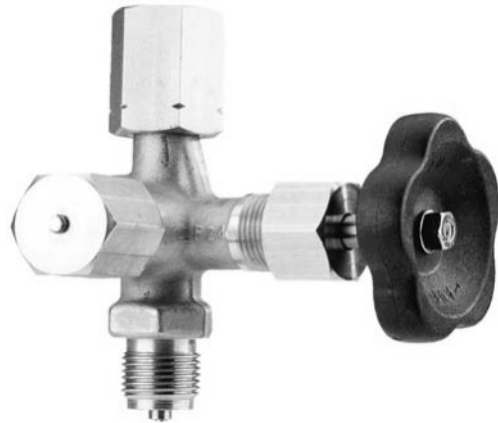
Pressure gauge valves are intended to isolate the pressure gauge from the pressure medium in order to enable inspection or replacement of the gauge.

**Features**

Pressure gauge valves are suitable up to PN250 to PN400 bar

Pressure rating and temperature span from -20...+200°C

For liquids, gaseous media and vapours.



Design	Connection	Material	PN in bar	Temperature range	Form	Article no.
	According to DIN 16 270, without test connector Form A with swivelling nut to DIN 16283 Form B union with tall nipple per DIN 16284 and shaft to fit surface mounting bracket					
	G 1/2 or M 20 x 1,5	Brass	250	-10...+120°C	A	MV 101
					B	MV 111
		Steel	400	-10...+120°C	A	MV 102
					B	MV 112
		CrNi steel	400	-20...+200°C	A	MV 103
				B	MV 113	
	According to DIN 16 271, with test connection M 20 x 1,5 Form A with swivelling nut to DIN 16283 Form B union with tall nipple per DIN 16284 and shaft to fit surface mounting bracket					
	G 1/2 or M 20 x 1,5	Brass	250	-10...+120°C	A	MV 201
					B	MV 211
		Steel	400	-10...+120°C	A	MV 202
					B	MV 212
		CrNi steel	400	-20...+200°C	A	MV 203
				B	MV 213	
	According to DIN 16 272, with separate shut off test connection M 20 x 1,5 Form A with swivelling nut to DIN 16 283 Form B union with tall nipple per DIN 16284 and shaft to fit surface mounting bracket					
	G 1/2 or M 20 x 1,5	Brass	250	-10...+120°C	A	MV 301
					B	MV 311
		Steel	400	-10...+120°C	A	MV 302
					B	MV 312
		CrNi steel	400	-20...+200°C	A	MV 303
				B	MV 313	



SIMATIC ET 200SP, digital output module, DQ 4x 24 V DC/2A High Speed, Pack quantity: 1 unit suitable for BU type A0, Color code CC00, 3 alternative operating modes: DQ, Oversampling, PWM  
Module diagnostics



General information	
Product type designation	DQ 4x24 V DC/2 A HS
Firmware version	V1.0.1
<ul style="list-style-type: none"> <li>FW update possible</li> </ul>	Yes
usable BaseUnits	BU type A0
Color code for module-specific color identification plate	CC00
Product function	
<ul style="list-style-type: none"> <li>I&amp;M data</li> </ul>	Yes; I&M0 to I&M3
Engineering with	
<ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated as of version</li> </ul>	V13 SP1
<ul style="list-style-type: none"> <li>STEP 7 configurable/integrated as of version</li> </ul>	V5.5 SP3 / -
<ul style="list-style-type: none"> <li>PROFIBUS as of GSD version/GSD revision</li> </ul>	GSD Revision 5
<ul style="list-style-type: none"> <li>PROFINET as of GSD version/GSD revision</li> </ul>	GSDML V2.3
Operating mode	
<ul style="list-style-type: none"> <li>DQ</li> </ul>	Yes
<ul style="list-style-type: none"> <li>DQ with energy-saving function</li> </ul>	Yes; Valve control
<ul style="list-style-type: none"> <li>PWM</li> </ul>	Yes

- Oversampling
- MSO

Yes  
No

### Supply voltage

Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes

### Input current

Current consumption, max.	50 mA; without load
---------------------------	---------------------

### Output voltage

Rated value (DC)	24 V
------------------	------

### Power loss

Power loss, typ.	2.5 W; at 24 V, 25 °C, DQ mode, 2 A per channel
------------------	---

### Address area

Address space per module	
• Address space per module, max.	1 byte; + 1 byte for QI information
• Inputs	1 byte; With QI
• Outputs	16 byte; Max. in Oversampling mode

### Digital outputs

Type of digital output	Source output (PNP, current-sourcing)
Number of digital outputs	4
Current-sinking	No
Current-sourcing	Yes; Push-pull output
Short-circuit protection	Yes
• Response threshold, typ.	6 A
Limitation of inductive shutdown voltage to	M (-1 V)
Controlling a digital input	No


### Digital output functions, parameterizable

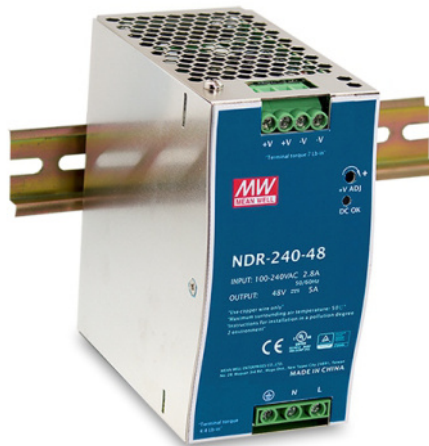
• PWM output	Yes
— Number, max.	4
— Cycle duration, parameterizable	Yes; 0 ms, 0.2 ms, 0.4 ms, 0.93 ms, 1.33 ms, 4.27 ms, 10.67 ms, 21.33 ms, 34.13 ms, 59.73 ms
— Resolution of the duty cycle	0.1 %
• Digital output with oversampling	Yes
— Number, max.	4
— Values per cycle, max.	32
— Resolution, min.	100 µs

### Switching capacity of the outputs

• with resistive load, max.	2 A
• on lamp load, max.	10 W

<b>Load resistance range</b>	
• lower limit	12 Ω
• upper limit	3 400 Ω
<b>Output current</b>	
• for signal "1" rated value	2 A
• for signal "0" residual current, max.	0.1 mA
<b>Output delay with resistive load</b>	
• "0" to "1", max.	1 μs
• "1" to "0", max.	1 μs
<b>Parallel switching of two outputs</b>	
• for uprating	No
<b>Switching frequency</b>	
• with resistive load, max.	5 kHz
• with inductive load, max.	5 kHz
• on lamp load, max.	5 kHz
<b>Total current of the outputs</b>	
• Current per channel, max.	2 A
• Current per module, max.	8 A
<b>Total current of the outputs (per module)</b>	
horizontal installation	
— up to 30 °C, max.	8 A; DQ mode
— up to 40 °C, max.	6.9 A; DQ mode
— up to 50 °C, max.	4.7 A; DQ mode
— up to 60 °C, max.	2.5 A; DQ mode
vertical installation	
— up to 30 °C, max.	7.2 A; DQ mode
— up to 40 °C, max.	5.6 A; DQ mode
— up to 50 °C, max.	4 A; DQ mode
— up to 60 °C, max.	4 A; DQ mode
<b>Cable length</b>	
• shielded, max.	50 m
• unshielded, max.	50 m
<b>Isochronous mode</b>	
Isochronous operation (application synchronized up to terminal)	Yes; Operating modes DQ and OVS only
Bus cycle time (TDP), min.	125 μs
Jitter, max.	1 μs
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	Yes
Substitute values connectable	Yes
<b>Alarms</b>	

• Diagnostic alarm	Yes
<b>Diagnostic messages</b>	
• Monitoring the supply voltage	Yes
• Wire-break	No
• Short-circuit	Yes; Module-wise
• Group error	Yes
<b>Diagnostics indication LED</b>	
• Monitoring of the supply voltage (PWR-LED)	Yes; green PWR LED
• Channel status display	Yes; Green LED
• for channel diagnostics	No
• for module diagnostics	Yes; green/red DIAG LED
<b>Potential separation</b>	
<b>Potential separation channels</b>	
• between the channels	No
• between the channels and backplane bus	Yes
<b>Isolation</b>	
Isolation tested with	707 V DC (type test)
<b>Dimensions</b>	
Width	15 mm
Height	73 mm
Depth	58 mm
<b>Weights</b>	
Weight, approx.	31 g
<b>last modified:</b>	01/29/2018 



### ■ Features

- Universal AC input / Full range
- Built-in active PFC function
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- UL 508 (industrial control equipment) approved
- EN61000-6-2(EN50082-2) industrial immunity level
- 100% full load burn-in test
- 3 years warranty

### ■ Applications

- Industrial control system
- Semi-conductor fabrication equipment
- Factory automation
- Electro-mechanical

### ■ Description

NDR-240 is one economical slim 240W Din rail power supply series, adapt to be installed on TS-35/7.5 or TS-35/15 mounting rails. The body is designed 63mm in width, which allows space saving inside the cabinets. The entire series adopts the full range AC input from 90VAC to 264VAC and conforms to EN61000-3-2, the norm the European Union regulates for harmonic current.

NDR-240 is designed with metal housing that enhances the unit's power dissipation. With working efficiency up to 90%, the entire series can operate at the ambient temperature between -20°C and 70°C under air convection. It is equipped with constant current mode for over-load protection, fitting various inductive or capacitive applications. The complete protection functions and relevant certificates for industrial control apparatus (UL508, TUV EN60950-1, and etc.) make NDR-240 a very competitive power supply solution for industrial applications.

### ■ Model Encoding

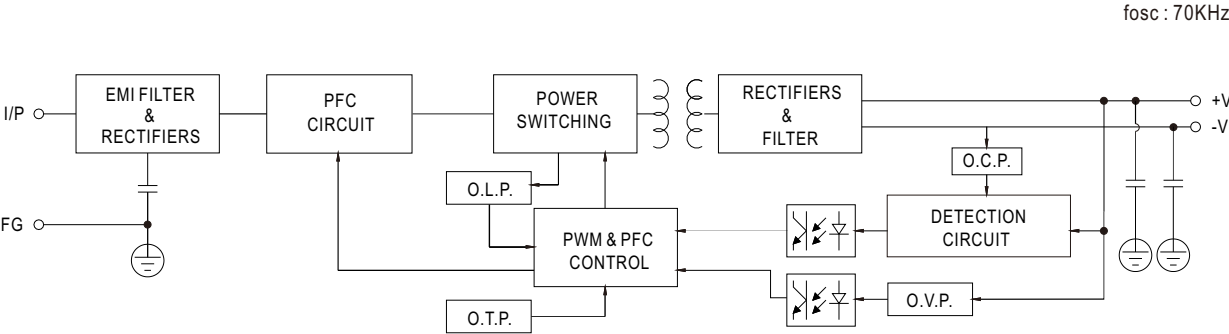
**NDR - 240 - 48**

- Output voltage
- Output wattage
- Series name

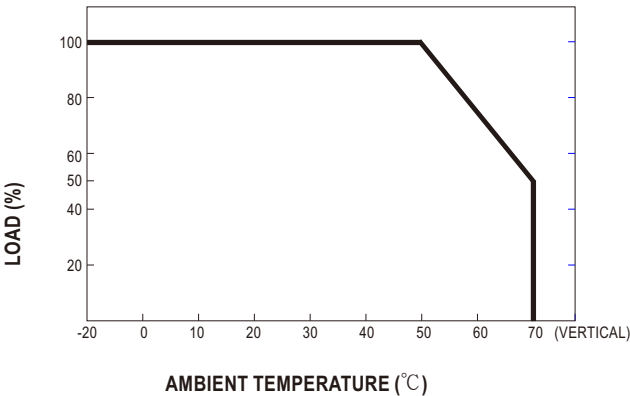
**SPECIFICATION**

MODEL		NDR-240-24	NDR-240-48
OUTPUT	DC VOLTAGE	24V	48V
	RATED CURRENT	10A	5A
	CURRENT RANGE	0 ~ 10A	0 ~ 5A
	RATED POWER	240W	240W
	RIPPLE & NOISE (max.) Note.2	150mVp-p	150mVp-p
	VOLTAGE ADJ. RANGE	24 ~ 28V	48 ~ 55V
	VOLTAGE TOLERANCE Note.3	± 1.0%	± 1.0%
	LINE REGULATION	± 0.5%	± 0.5%
	LOAD REGULATION	± 1.0%	± 1.0%
	SETUP, RISE TIME	1500ms, 100ms/230VAC	3000ms, 100ms/115VAC at full load
HOLD UP TIME (Typ.)	28ms/230VAC	22ms/115VAC at full load	
INPUT	VOLTAGE RANGE Note.4	90 ~ 264VAC	127 ~ 370VDC
	FREQUENCY RANGE	47 ~ 63Hz	
	POWER FACTOR (Typ.)	PF>0.98/115VAC, PF>0.95/230VAC at full load	
	EFFICIENCY (Typ.)	88.5%	90%
	AC CURRENT (Typ.)	2.5A/115VAC	1.3A/230VAC
	INRUSH CURRENT (Typ.)	20A/115VAC	35A/230VAC
	LEAKAGE CURRENT	<1mA / 240VAC	
PROTECTION	OVERLOAD	105 ~ 130% rated output power Protection type : Constant current limiting, recovers automatically after fault condition is removed	
	OVER VOLTAGE	29 ~ 33V	56 ~ 65V
	OVER TEMPERATURE	Shut down o/p voltage, recovers automatically after temperature goes down	
ENVIRONMENT	WORKING TEMP.	-20 ~ +70°C (Refer to "Derating Curve")	
	WORKING HUMIDITY	20 ~ 95% RH non-condensing	
	STORAGE TEMP., HUMIDITY	-40 ~ +85°C, 10 ~ 95% RH	
	TEMP. COEFFICIENT	± 0.03%/°C (0 ~ 50°C)	
VIBRATION	Component:10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes; Mounting: Compliance to IEC60068-2-6		
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UI508, TUV EN60950-1 approved ;(meet EN60204-1)	
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:2KVAC O/P-FG:0.5KVAC	
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:>100M Ohms / 500VDC / 25°C / 70% RH	
	EMC EMISSION	Compliance to EN55032 (CISPR32), EN61204-3 Class B, EN61000-3-2,-3	
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11, EN55024, EN61000-6-2 (EN50082-2), EN61204-3, heavy industry level, criteria A	
OTHERS	MTBF	230.2K hrs min. MIL-HDBK-217F (25°C)	
	DIMENSION	63*125.2*113.5mm (W*H*D)	
	PACKING	1Kg; 12pcs/13Kg/1.1CUFT	
NOTE	<p>1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.</p> <p>2. Ripple &amp; noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf &amp; 47uf parallel capacitor.</p> <p>3. Tolerance : includes set up tolerance, line regulation and load regulation.</p> <p>4. Derating may be needed under low input voltage. Please check the derating curve for more details.</p> <p>5. Installation clearances : 40mm on top, 20mm on the bottom, 5mm on the left and right side are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance is recommended.</p> <p>6. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies." (as available on <a href="http://www.meanwell.com">http://www.meanwell.com</a>)</p>		

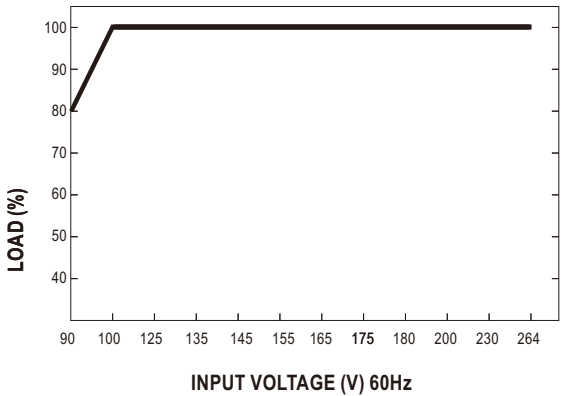
**Block Diagram**



**Derating Curve**

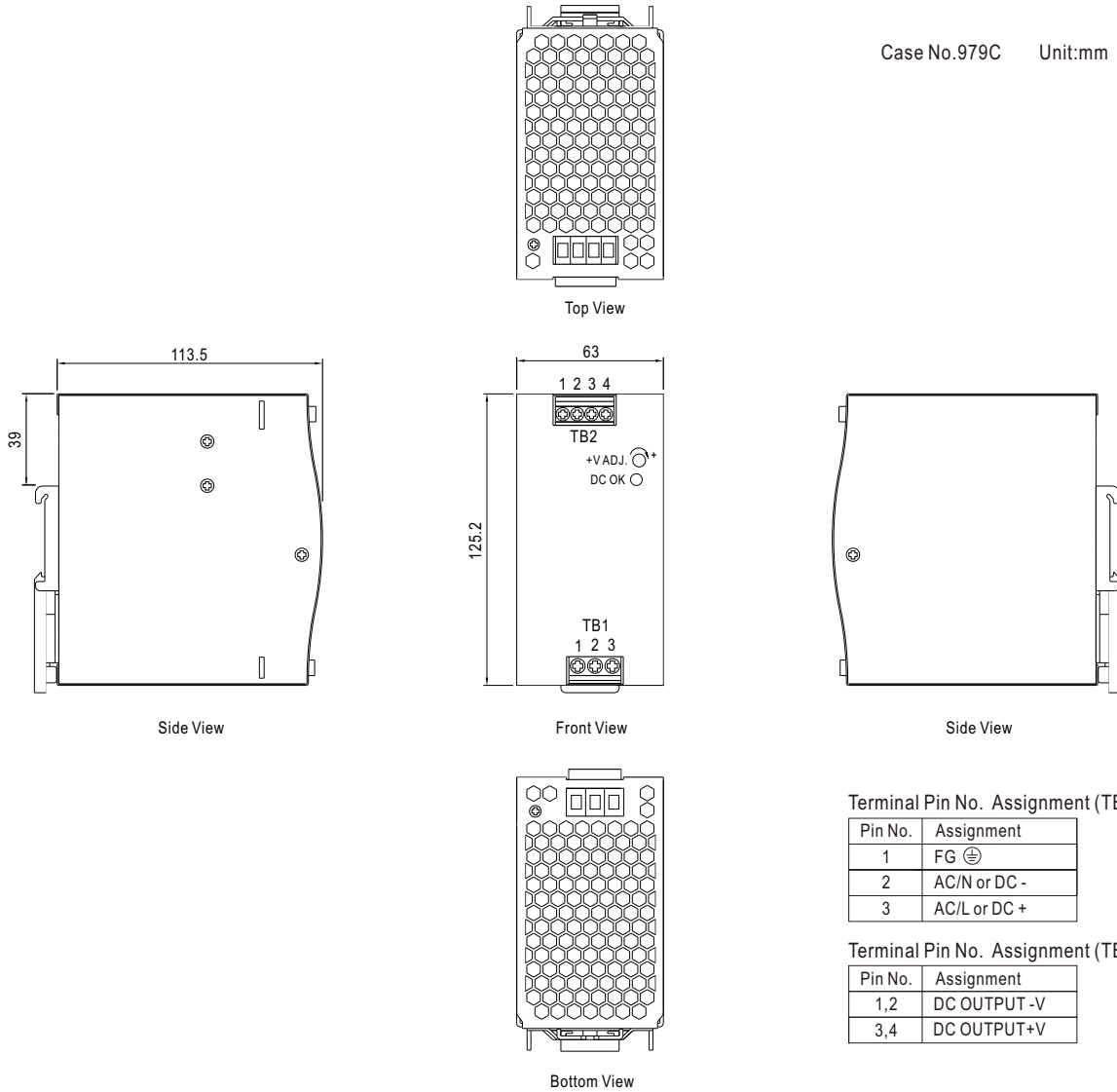


**Output derating VS input voltage**

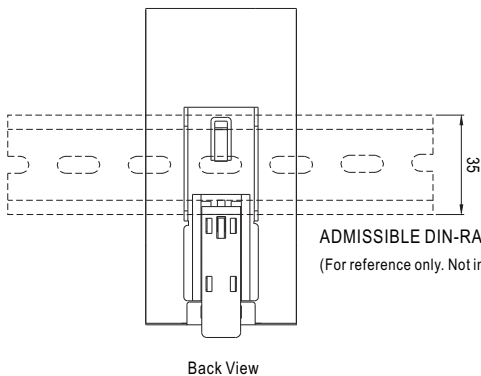


■ **Mechanical Specification**

Case No.979C Unit:mm



■ **Installation Instruction**



This series fits DIN rail TS35/7.5 or TS35/15.  
For installation details, please refer to the Instruction manual.

■ **Installation Manual**

Please refer to : <http://www.meanwell.com/manual.html>

## Extension module - PSR-MC82-5NO-1NC-1DO-24DC-SP - 2702383

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Contact extension up to SILCL 3, Cat. 4, PL e in conjunction with suitable evaluation device, 5 enabling current paths,  $U_s = 24\text{ V DC}$ , plug-in spring-cage terminal block


The figure shows a version with a screw connection

### Your advantages

- ✓ Up to Cat. 4/PL e according to ISO 13849-1, SILCL 3 according to IEC 62061 in conjunction with suitable evaluation device
- ✓ Low housing width of just 17.5 mm
- ✓ One or two-channel activation
- ✓ 5 enabling current paths, 1 confirmation current path, 1 digital signal output
- ✓ Automatic activation



### Key Commercial Data

Packing unit	1 pc
GTIN	 4 055626 145488
GTIN	4055626145488
Weight per Piece (excluding packing)	210.300 g
Custom tariff number	85371098
Country of origin	Germany

### Technical data

#### Note

Utilization restriction	EMC: class A product, see manufacturer's declaration in the download area
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#### Dimensions

Width	17.5 mm
Height	116.6 mm
Depth	114.5 mm

## Extension module - PSR-MC82-5NO-1NC-1DO-24DC-SP - 2702383

### Technical data

#### Ambient conditions

Ambient temperature (operation)	-20 °C ... 60 °C (observe derating)
Ambient temperature (storage/transport)	-40 °C ... 80 °C
Max. permissible relative humidity (operation)	75 % (on average, 85% infrequently, non-condensing)
Max. permissible humidity (storage/transport)	75 % (on average, 85% infrequently, non-condensing)
Maximum altitude	max. 2000 m (Above sea level)

#### Power supply

Rated control circuit supply voltage $U_s$	24 V DC -20 % / +25 %
	19.2 V DC ... 30 V DC
Rated control supply current $I_s$	typ. 80 mA
Power consumption at $U_s$	typ. 1.92 W
Inrush current	30 mA ( $\Delta t = 7$ ms at $U_s$ )
Filter time	4 ms (at A1 in the event of voltage dips at $U_s$ )
	max. 1 ms (at A1/A2, test pulse width, blanking pulses/dark test)
	5 ms (at A1/A2, test pulse rate, blanking pulses/dark test)
	Where test pulse width < 1 ms: test pulse rate = 5 x test pulse width
	max. 1 ms (at A1/A2, test pulse width, switch-on pulses/light test)
	10 ms (at A1/A2; test pulse rate; switch-on pulses/light test)
	Deactivate switch-on pulses/light tests for safety applications.
Protective circuit	Surge protection Suppressor diode
	Reverse polarity protection Universal diode

#### Relay outputs: enabling current path

Output name	Enabling current path
Output description	safety-related N/O contacts
Number of outputs	5 (undelayed)
Contact type	5 enabling current paths
Contact material	AgSnO <sub>2</sub>
Switching voltage	min. 5 V AC/DC
	max. 24 V DC (Enabling current path 23/24)
	max. 250 V AC/DC (all other enabling current paths, observe load curve)
Limiting continuous current	6 A (observe derating)
Inrush current	min. 10 mA
	max. 6 A
Sq. Total current	64 A <sup>2</sup> (observe derating)
Switching capacity	min. 50 mW
Switching frequency	0.5 Hz
Mechanical service life	10x 10 <sup>6</sup> cycles
Output fuse	10 A gL/gG
	6 A gL/gG (for low-demand applications)

#### Relay outputs: return current/signaling current path

## Extension module - PSR-MC82-5NO-1NC-1DO-24DC-SP - 2702383

### Technical data

#### Relay outputs: return current/signaling current path

Output name	Confirmation current path
Output description	Safety-related N/C contacts
Number of outputs	1 (undelayed)
Contact type	1 confirmation current path
Contact material	AgSnO
Switching voltage	min. 5 V AC/DC
	max. 24 V DC
Limiting continuous current	100 mA
Inrush current	max. 100 mA
	min. 10 mA
Switching capacity	min. 50 mW
Switching frequency	max. 0.5 Hz
Mechanical service life	10x 10 <sup>6</sup> cycles

#### Alarm outputs

Output description	non-safety-related
Number of outputs	1 (digital, PNP)
Voltage	typ. 23 V DC (U <sub>s</sub> - 1 V)
Current	max. 100 mA
Maximum inrush current	500 mA (Δt = 1 ms at U <sub>s</sub> )
Short-circuit protection	Yes

#### Times

Typical pickup time at US	< 50 ms (when controlled via A1/A2)
Typical response time at US	< 50 ms
Typical release time at US	< 25 ms (when controlled via A1/A2)
Recovery time	< 100 ms

#### General

Relay type	Electromechanical relay with forcibly guided contacts in accordance with EN 50205
Nominal operating mode	100% operating factor
Net weight	210.3 g
Mounting position	vertical or horizontal
Mounting type	DIN rail mounting
Assembly instructions	See derating curve
Degree of protection	IP20
Min. degree of protection of inst. location	IP54
Housing color	yellow
Status display	2 x green LEDs

#### Connection data

Connection method	Spring-cage connection
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# Extension module - PSR-MC82-5NO-1NC-1DO-24DC-SP - 2702383

## Technical data

### Connection data

pluggable	Yes
Conductor cross section solid min.	0.2 mm <sup>2</sup>
Conductor cross section solid max.	1.5 mm <sup>2</sup>
Conductor cross section flexible min.	0.2 mm <sup>2</sup>
Conductor cross section flexible max.	1.5 mm <sup>2</sup>
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Stripping length	8 mm

### Safety-related characteristic data

Stop category	0
Designation	IEC 61508 - High demand
Safety Integrity Level (SIL)	3 (In conjunction with suitable evaluating device)
Designation	IEC 61508 - Low demand
Safety Integrity Level (SIL)	3 (In conjunction with suitable evaluating device)
Designation	EN ISO 13849
Performance level (PL)	e (In conjunction with suitable evaluating device)
Category	4 (In conjunction with suitable evaluating device)
Designation	EN 62061
Safety Integrity Level Claim Limit (SIL CL)	3 (In conjunction with suitable evaluating device)

### Standards and Regulations

Designation	Air clearances and creepage distances between the power circuits
Standards/regulations	DIN EN 50178
Rated insulation voltage	250 V AC
	250 V AC
Rated surge voltage/insulation	Basic insulation 4 kV between all current paths
	Basic insulation 4 kV between all current paths and housing
	Safe isolation, reinforced insulation 6 kV between input circuits and enabling current paths 33/34, 43/44, and 63/64
Degree of pollution	2
Overvoltage category	III
Shock	15g (In the event of stress caused by shock, contact reactions are possible for up to 6 ms.)
Vibration (operation)	10 Hz ...150 Hz, 2g (In the event of stress caused by vibration, contact reactions are possible for up to 1 ms.)
Conformance	CE-compliant

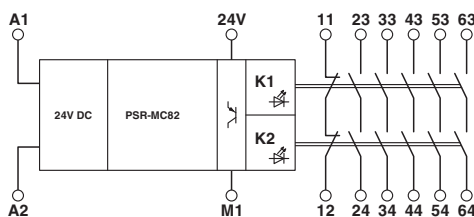
### Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

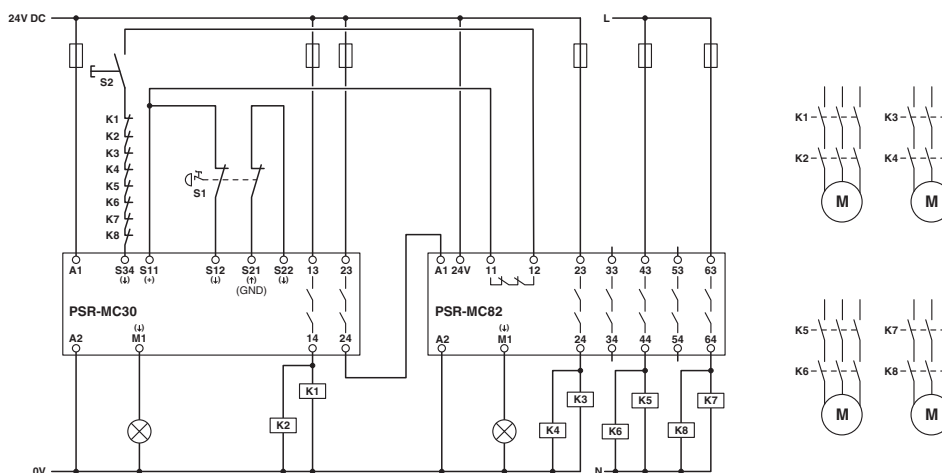
## Drawings

# Extension module - PSR-MC82-5NO-1NC-1DO-24DC-SP - 2702383

Block diagram



Circuit diagram



## Classifications

### eCl@ss

eCl@ss 5.1	27371900
eCl@ss 6.0	27371800
eCl@ss 7.0	27371819
eCl@ss 8.0	27371819
eCl@ss 9.0	27371819

### ETIM

ETIM 3.0	EC001449
ETIM 4.0	EC001449
ETIM 5.0	EC001449
ETIM 6.0	EC001449

### UNSPSC

UNSPSC 13.2	39121501
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## Approvals

### Approvals

# Extension module - PSR-MC82-5NO-1NC-1DO-24DC-SP - 2702383

## Approvals

### Approvals





UL Listed / cUL Listed / Functional Safety / cULus Listed

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### Ex Approvals

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### Approval details

UL Listed		<a href="http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm">http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm</a>	FILE E 140324
cUL Listed		<a href="http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm">http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm</a>	FILE E 140324
Functional Safety			44-205-15124303
cULus Listed			

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SIMATIC ET 200SP, Digital input module, DI 16x 24V DC Standard, type 3 (IEC 61131), sink input, (PNP, P-reading), Packing unit: 1 Piece, fits to BU-type A0, Colour Code CC00, input delay time 0,05..20ms, diagnostics wire break, diagnostics supply voltage

General information	
Product type designation	DI 16x24VDC ST
HW functional status	From FS02
Firmware version	V0.0
• FW update possible	No
usable BaseUnits	BU type A0
Color code for module-specific color identification plate	CC00
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	No
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V14
• STEP 7 configurable/integrated from version	V5.5 SP3
• PCS 7 configurable/integrated from version	V8.1 SP1
• PROFIBUS from GSD version/GSD revision	One GSD file each, Revision 3 and 5 and higher
• PROFINET from GSD version/GSD revision	GSDML V2.3
Operating mode	
• DI	Yes
• Counter	No
• Oversampling	No
• MSI	No
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	90 mA
Encoder supply	
24 V encoder supply	
• 24 V	No
Power loss	
Power loss, typ.	1.7 W
Address area	
Address space per module	
• Inputs	2 byte; + 2 bytes for QI information
Hardware configuration	
Automatic encoding	Yes
• Mechanical coding element	Yes
• Type of mechanical coding element	Type A

<b>Selection of BaseUnit for connection variants</b>	
<ul style="list-style-type: none"> <li>• 1-wire connection</li> <li>• 2-wire connection</li> <li>• 3-wire connection</li> <li>• 4-wire connection</li> </ul>	BU type A0 BU type A0 + Potential distributor module BU type A0 + Potential distributor module BU type A0 + Potential distributor module
<b>Digital inputs</b>	
Number of digital inputs	16
Digital inputs, parameterizable	Yes
Source/sink input	P-reading
Input characteristic curve in accordance with IEC 61131, type 3	Yes
<b>Input voltage</b>	
<ul style="list-style-type: none"> <li>• Rated value (DC)</li> <li>• for signal "0"</li> <li>• for signal "1"</li> </ul>	24 V -30 to +5 V +11 to +30V
<b>Input current</b>	
<ul style="list-style-type: none"> <li>• for signal "1", typ.</li> </ul>	2.5 mA
<b>Input delay (for rated value of input voltage)</b>	
for standard inputs	
— parameterizable	Yes; 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms (in each case + delay of 30 to 500 µs, depending on line length)
— at "0" to "1", min.	0.05 ms
— at "0" to "1", max.	20 ms
— at "1" to "0", min.	0.05 ms
— at "1" to "0", max.	20 ms
<b>Cable length</b>	
<ul style="list-style-type: none"> <li>• shielded, max.</li> <li>• unshielded, max.</li> </ul>	1 000 m 600 m
<b>Encoder</b>	
Connectable encoders	
<ul style="list-style-type: none"> <li>• 2-wire sensor</li> <li>— permissible quiescent current (2-wire sensor), max.</li> </ul>	Yes 1.5 mA
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	Yes
<b>Alarms</b>	
<ul style="list-style-type: none"> <li>• Diagnostic alarm</li> </ul>	Yes
<b>Diagnoses</b>	
<ul style="list-style-type: none"> <li>• Diagnostic information readable</li> <li>• Monitoring the supply voltage</li> <li>— parameterizable</li> <li>• Monitoring of encoder power supply</li> <li>• Wire-break</li> <li>• Short-circuit</li> <li>• Group error</li> </ul>	Yes Yes Yes No Yes; Module-by-module, optional protective circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm No Yes
<b>Diagnostics indication LED</b>	
<ul style="list-style-type: none"> <li>• Monitoring of the supply voltage (PWR-LED)</li> <li>• Channel status display</li> <li>• for channel diagnostics</li> <li>• for module diagnostics</li> </ul>	Yes; green PWR LED Yes; green LED No Yes; green/red DIAG LED
<b>Potential separation</b>	
Potential separation channels	
<ul style="list-style-type: none"> <li>• between the channels</li> <li>• between the channels and backplane bus</li> <li>• between the channels and the power supply of the electronics</li> </ul>	No Yes No
<b>Isolation</b>	
Isolation tested with	707 V DC (type test)
<b>Standards, approvals, certificates</b>	
Suitable for safety functions	No
<b>Ambient conditions</b>	
Ambient temperature during operation	

- horizontal installation, min. -30 °C; < 0 °C as of FS02
- horizontal installation, max. 60 °C
- vertical installation, min. -30 °C; < 0 °C as of FS02
- vertical installation, max. 50 °C

#### Altitude during operation relating to sea level


- Installation altitude above sea level, max. 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual

#### Dimensions

Width	15 mm
Height	73 mm
Depth	58 mm

#### Weights

Weight, approx.	28 g
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**last modified:** 8/23/2023 



SIMATIC ET 200SP, Analog input module, AI 8xI 2-/4-wire Basic, suitable for BU type A0, A1, Color code CC01, Module diagnostics, 16 bit

General information	
Product type designation	AI 8xI 2-/4-wire BA
HW functional status	from FS04
Firmware version	
• FW update possible	Yes
usable BaseUnits	BU type A0, A1
Color code for module-specific color identification plate	CC01
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	No
• Measuring range scalable	No
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V13 SP1
• STEP 7 configurable/integrated from version	V5.5 SP3 / -
• PROFIBUS from GSD version/GSD revision	One GSD file each, Revision 3 and 5 and higher
• PROFINET from GSD version/GSD revision	GSDML V2.3
Operating mode	
• Oversampling	No
• MSI	No
CiR - Configuration in RUN	
Reparameterization possible in RUN	Yes
Calibration possible in RUN	No
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	25 mA; without sensor supply
Encoder supply	
24 V encoder supply	
• 24 V	Yes
• Short-circuit protection	Yes
• Output current, max.	0.7 A; total current of all encoders/channels
Power loss	
Power loss, typ.	0.7 W; Without encoder supply voltage
Address area	
Address space per module	
• Address space per module, max.	16 byte
Hardware configuration	

Automatic encoding	Yes
• Mechanical coding element	Yes
• Type of mechanical coding element	Type A
<b>Selection of BaseUnit for connection variants</b>	
• 1-wire connection	BU type A0, A1
• 2-wire connection	BU type A0, A1
• 4-wire connection	BU type A0, A1 + potential distributor module
<b>Analog inputs</b>	
Number of analog inputs	8; Single-ended
• For current measurement	8
permissible input current for current input (destruction limit), max.	50 mA
Cycle time (all channels), min.	1 ms; per channel
<b>Input ranges (rated values), currents</b>	
• 0 to 20 mA	Yes
— Input resistance (0 to 20 mA)	100 Ω; 15 bit
• -20 mA to +20 mA	Yes
— Input resistance (-20 mA to +20 mA)	100 Ω; 16 bit incl. sign
• 4 mA to 20 mA	Yes
— Input resistance (4 mA to 20 mA)	100 Ω; 15 bit
<b>Cable length</b>	
• shielded, max.	200 m
<b>Analog value generation for the inputs</b>	
<b>Integration and conversion time/resolution per channel</b>	
• Resolution with overrange (bit including sign), max.	16 bit
• Integration time, parameterizable	Yes
• Interference voltage suppression for interference frequency $f_1$ in Hz	16.67 / 50 / 60 / 4 800 (16.67 / 50 / 60)
• Conversion time (per channel)	180 / 60 / 50 / 0.625 (67.5 / 22.5 / 18.75) ms
<b>Smoothing of measured values</b>	
• Number of smoothing levels	4; None; 4/8/16 times
• parameterizable	Yes
<b>Encoder</b>	
<b>Connection of signal encoders</b>	
• for voltage measurement	No
• for current measurement as 2-wire transducer	Yes
— Burden of 2-wire transmitter, max.	650 Ω
• for current measurement as 4-wire transducer	Yes
<b>Errors/accuracies</b>	
Linearity error (relative to input range), (+/-)	0.01 %
Temperature error (relative to input range), (+/-)	0.005 %/K
Crosstalk between the inputs, min.	50 dB
Repeat accuracy in steady state at 25 °C (relative to input range), (+/-)	0.05 %
<b>Operational error limit in overall temperature range</b>	
• Current, relative to input range, (+/-)	0.5 %
<b>Basic error limit (operational limit at 25 °C)</b>	
• Current, relative to input range, (+/-)	0.3 %
<b>Interference voltage suppression for <math>f = n \times (f_1 \pm 1 \%)</math>, <math>f_1 =</math> interference frequency</b>	
• Series mode interference (peak value of interference < rated value of input range), min.	70 dB; With conversion time 67.5 / 22.5 / 18.75 ms: 40 dB
<b>Interrupts/diagnostics/status information</b>	
Diagnostics function	Yes
<b>Alarms</b>	
• Diagnostic alarm	Yes
• Limit value alarm	No
<b>Diagnoses</b>	
• Monitoring the supply voltage	Yes
• Wire-break	Yes; at 4 to 20 mA
• Short-circuit	Yes; Sensor supply to M; module by module
• Group error	Yes
• Overflow/underflow	Yes

<b>Diagnostics indication LED</b>	
<ul style="list-style-type: none"> <li>• Monitoring of the supply voltage (PWR-LED)</li> </ul>	Yes; green LED
<ul style="list-style-type: none"> <li>• Channel status display</li> </ul>	Yes; green LED
<ul style="list-style-type: none"> <li>• for channel diagnostics</li> </ul>	No
<ul style="list-style-type: none"> <li>• for module diagnostics</li> </ul>	Yes; green/red DIAG LED
<b>Potential separation</b>	
<b>Potential separation channels</b>	
<ul style="list-style-type: none"> <li>• between the channels</li> </ul>	No
<ul style="list-style-type: none"> <li>• between the channels and backplane bus</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• between the channels and the power supply of the electronics</li> </ul>	No
<b>Isolation</b>	
Isolation tested with	707 V DC (type test)
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
<ul style="list-style-type: none"> <li>• horizontal installation, min.</li> </ul>	-30 °C; < 0 °C as of FS04
<ul style="list-style-type: none"> <li>• horizontal installation, max.</li> </ul>	60 °C
<ul style="list-style-type: none"> <li>• vertical installation, min.</li> </ul>	-30 °C; < 0 °C as of FS04
<ul style="list-style-type: none"> <li>• vertical installation, max.</li> </ul>	50 °C
<b>Altitude during operation relating to sea level</b>	
<ul style="list-style-type: none"> <li>• Installation altitude above sea level, max.</li> </ul>	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual
<b>Dimensions</b>	
Width	15 mm
Height	73 mm
Depth	58 mm
<b>Weights</b>	
Weight, approx.	31 g

**last modified:**

9/7/2023 

# PSR-MC40

## Safety relay for emergency stop, safety door and light grid monitoring



Data sheet  
106175\_en\_04

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## 1 Description

### Intended Use

The safety relay is used to monitor single or two-channel signal generators and to control actuators.

When the sensor circuit is interrupted, the safety relay initiates the safe state.

The safety relay interrupts circuits in a safety-related way.

### Possible signal generators

- Emergency stop button
- Door locking mechanisms
- Light grids

### Contact type

- 3 undelayed enabling current paths
- 1 digital signal output

The enabling current paths drop out without delay according to stop category 0 (EN 60204-1).

When the enabling current paths are open, the signal output is active.

The signal output transmits non-safety-related status information.

### Control

- Single or two channel
- Automatic or manual, monitored start

### Achievable safety integrity

- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061)

### Additional features

- Optional pluggable screw or Push-in terminal blocks
- 12.5 mm housing width

### Approvals



### WARNING: Risk of electric shock

Observe the safety regulations and installation notes in the corresponding section.



Make sure you always use the latest documentation.

It can be downloaded from the product at [phoenixcontact.net/products](https://phoenixcontact.net/products).



This document is valid for the products listed in the "Ordering data".

This document meets the same requirements as the original operating instructions with respect to the contents.

---

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### 3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Safety relay for emergency stop, safety doors, and light grids up to SIL 3, Cat. 4, PL e, 1 or 2-channel operation, automatic or manual, monitored start, 3 enabling current paths, $U_S = 24 \text{ V DC}$ , plug-in screw terminal block	PSR-MC40-3NO-1DO-24DC-SC	2700569	1
Safety relay for emergency stop, safety doors and light grids up to SIL 3, Cat. 4, PL e, 1 or 2-channel operation, automatic or manual, monitored start, 3 enabling current paths, $U_S = 24 \text{ V DC}$ , pluggable Push-in terminal block	PSR-MC40-3NO-1DO-24DC-SP	2700570	1
Accessories	Type	Item no.	Pcs./Pkt.
Coding profile, is inserted into the slot on the plug or inverted header, red insulating material	CP-MSTB	1734634	100
Coding section, inserted into the recess in the header or the inverted plug, red insulating material	CR-MSTB	1734401	100
Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, $0.25 \text{ mm}^2 \dots 6.0 \text{ mm}^2$ , lateral entry, trapezoidal crimp	CRIMPFOX 6	1212034	1

## 4 Technical data

### Hardware/firmware version

HW/FW  $\geq 06/--$

The technical data and safety characteristics are valid as of the specified HW/FW version.

### Supply: A1/A2

Rated control circuit supply voltage $U_S$	24 V DC -15 % / +10 %
Rated control circuit supply voltage $U_S$	20.4 V DC ... 26.4 V DC
Rated control supply current $I_S$	typ. 80 mA
Power consumption at $U_S$	typ. 1.92 W
Inrush current	5 A ( $\Delta t = 200 \mu s$ at $U_S$ )
Filter time	1 ms (at A1 in the event of voltage dips at $U_S$ )
Protective circuit	Surge protection Suppressor diode Protection against polarity reversal for rated control circuit supply voltage

### Digital inputs: Sensor circuit S12, S22

Number of inputs	2
Description of the input	safety-related sensor inputs
Input voltage range "0" signal	0 V DC ... 5 V DC (for safe Off; at S12 and S22)
Input current range "0" signal	0 mA ... 2 mA (for safe Off; at S12 and S22)
Inrush current	< 20 mA (with $U_S/I_x$ to S12) < 5 mA (with $U_S/I_x$ to S22)
Current consumption	< 5 mA (with $U_S/I_x$ to S12) < 5 mA (with $U_S/I_x$ to S22)
Filter time	max. 1.5 ms (at S12, S22; test pulse width) min. 7.5 ms (at S12, S22; test pulse rate) Test pulse rate = 5 x Test pulse width
Max. permissible overall conductor resistance	150 $\Omega$
Concurrence	$\infty$
Protective circuit	Suppressor diode

### Digital inputs: Start circuit S34

Number of inputs	1
Description of the input	non-safety-related
Input voltage range "1" signal	20.4 V DC ... 26.4 V DC
Inrush current	typ. 200 mA
Current consumption	< 10 mA (at S34/24 V) > -5 mA (at S34/0 V)
Max. permissible overall conductor resistance	150 $\Omega$
Protective circuit	Suppressor diode

**Relay outputs: Enabling current paths 13/14, 23/24, 33/34**

Number of outputs	3 (undelayed)
Output description	safety-related N/O contacts
Contact material	AgSnO <sub>2</sub>
Switching voltage	min. 12 V AC/DC max. 250 V AC/DC (Observe the load curve)
Limiting continuous current	6 A (observe derating)
Inrush current	min. 3 mA max. 6 A
Sq. Total current $I_{TH}^2 = I_1^2 + I_2^2 + \dots + I_N^2$	48 A <sup>2</sup> (observe derating)
Switching capacity	min. 60 mW
Switching frequency	0.5 Hz
Mechanical service life	10x 10 <sup>6</sup> cycles
Switching capacity according to IEC 60947-5-1	5 A (AC15) 4 A (DC13)
Output fuse	6 A gL/gG (N/O contact) 4 A gL/gG (for low-demand applications)

**Alarm outputs: M1**

Number of outputs	1 (digital, PNP)
Output description	non-safety-related
Voltage	22 V DC (U <sub>s</sub> - 2 V)
Current	max. 100 mA
Maximum inrush current	500 mA (Δt = 1 ms at U <sub>s</sub> )
Short-circuit protection	no

**Times**

Typical starting time with U <sub>s</sub>	< 250 ms (when controlled via A1)
Typical response time at U <sub>s</sub>	< 175 ms (automatic start) < 175 ms (manual, monitored start)
Typical release time with U <sub>s</sub>	< 20 ms (when controlled via A1 or S12 and S22.)
Recovery time	< 500 ms

<b>General data</b>		
Relay type	Electromechanical relay with force-guided contacts in accordance with IEC/EN 61810-3	
Nominal operating mode	100% operating factor	
Degree of protection	IP20	
Min. degree of protection of inst. location	IP54	
Mounting type	DIN rail mounting	
Mounting position	vertical or horizontal	
Assembly instructions	See derating curve	
Type of housing	Polyamide yellow	
Operating voltage display	1 x green LED	
Status display	3 x green LED	
Air clearances and creepage distances between the power circuits	according to DIN EN 60947-5-1	
Rated insulation voltage	250 V AC	
Rated surge voltage/insulation See "Insulation coordination"	Safe isolation, reinforced insulation 6 kV between input circuit and enabling current path (13/14) and enabling current path (23/24) and enabling current path (33/34) Basic insulation 4 kV between all current paths and housing	
Degree of pollution	2	
Overvoltage category	III	
<b>Dimensions</b>	<b>Screw connection</b>	<b>Push-in connection</b>
W x H x D	12.5 x 112.2 x 114.5 mm	12.5 x 116.6 x 114.5 mm
<b>Connection data</b>	<b>Screw connection</b>	<b>Push-in connection</b>
Conductor cross section solid	0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Conductor cross section flexible	0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Conductor cross-section AWG	24 ... 12	24 ... 16
Conductor cross section flexible, with ferrule without plastic sleeve		0.25 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> (only together with CRIMPFOX 6)
Conductor cross section flexible, with ferrule with plastic sleeve		0.25 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> (only together with CRIMPFOX 6)
Stripping length	7 mm	8 mm
Screw thread	M3	

**Ambient conditions**

Ambient temperature (operation)	-40 °C ... 55 °C (observe derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	75 % (on average, 85% infrequently, non-condensing)
Max. permissible humidity (storage/transport)	75 % (on average, 85% infrequently, non-condensing)
Maximum altitude	≤ 2000 m (Above sea level)
Information on operating height	See the "Using PSR devices at altitudes greater than 2000 m above sea level" section
Shock	15g
Vibration (operation)	10 Hz ... 150 Hz, 2g

**Conformance/Approvals**

CE	CE-compliant
Approvals	

**Safety data**

Stop category according to IEC 60204	0
--------------------------------------	---

**Safety parameters for IEC 61508 - High demand**

IEC 61508 - High demand	
SIL	3
PFH <sub>D</sub>	1.5 x 10 <sup>-9</sup> (4 A DC13; 5 A AC15; 8760 switching cycles/year)
Demand rate	< 12 Months
Proof test interval	240 Months
Duration of use	240 Months

**Safety parameters for IEC 61508 - Low demand**

IEC 61508 - Low demand	
SIL	3
PFD <sub>avg</sub>	1.46 x 10 <sup>-4</sup>
Proof test interval	60 Months
Duration of use	240 Months

**Safety characteristic data according to EN ISO 13849-1**

Category	4
Performance level	e (4 A DC13; 5 A AC15; 8760 switching cycles/year)
Duration of use	240 Months

For applications in PL e, the required demand rate for the safety function is once per month.

**Safety parameters for EN 62061**

SIL	3
-----	---

For applications in SIL 3 the required demand rate for the safety function is once per month.

## 5 Notes regarding documentation

### 5.1 Identification of warning notes



This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

**DANGER** Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

**WARNING** Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

**CAUTION** Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.



This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.



Here you will find additional information or detailed sources of information.

### 5.2 Validity

This data sheet is valid for the described product(s) from the hardware/firmware version specified in the technical data.

### 5.3 Target group

This data sheet is therefore aimed at:

- Qualified personnel who plan and design safety equipment for machines and systems and are familiar with regulations governing occupational safety and accident prevention.
- Qualified personnel who install and operate safety equipment in machines and systems.

### Qualified personnel:

Qualified personnel are people who, because of their education, experience, and instruction and their knowledge of relevant standards, regulations, accident prevention, and service conditions, have been authorized by those responsible for the safety of the system to carry out any required operations and who are able to recognize and avoid any possible dangers.

### Requirements:

Knowledge of the following topics is required:

- Handling safety components
- Valid EMC regulations
- Valid regulations governing occupational safety and accident prevention

## 6 Safety regulations and installation notes



### **WARNING: Death, serious personal injury or damage to equipment**

Depending on the application, incorrect handling of the device may pose serious risks for the user or cause damage to equipment.

- Observe all the safety notes and warning instructions provided in this chapter and elsewhere in this document.

### **Direct/indirect contact**

- Protection against direct and indirect contact according to VDE 0100 Part 410 must be ensured for all components connected to the system.

In the event of an error, parasitic voltages must not occur (single-fault tolerance).

### **Power supply units for 24 V supply**

- Only use power supply units with safe isolation and SELV/PELV.
- Protect the 24 V area with a suitable external fuse.
- Make sure that the power supply unit is able to supply **four times** the nominal current of the external fuse, to ensure that it trips in the event of an error.

### **Startup, mounting, and modifications**

Startup, mounting, modifications, and upgrades may only be carried out by qualified personnel.

- Before working on the device, disconnect the power.
- Carry out wiring according to the application. Refer to the “Application examples” section for this.

Reliable operation is only ensured if the device is installed in housing protected from dust and humidity.

- Install the device in housing protected from dust and humidity (min. IP54).

### **Mismatching and polarity reversal of connections**

- Take measures to prevent mismatching, polarity reversal, and manipulation of connections.

### **In operation**

During operation, parts of electrical switching devices carry hazardous voltages.

- Protective covers must not be removed when operating electrical switching devices.

For emergency stop applications, automatic startup of the machine can pose serious risks for the user.

- The machine must be prevented from restarting automatically by a higher-level controller.

With the manual, monitored reset device, a machine start may not be triggered in accordance with EN ISO 13849-1.

Inductive loads can lead to welded relay contacts.

- Connect a suitable and effective protective circuit to inductive loads.
- Implement the protective circuit parallel to the load and not parallel to the switch contact.

Magnetic fields can influence the device. The magnetic field strength of the environment must not exceed 30 A/m.

- Do not use the device in the vicinity of strong magnetic fields (e.g., caused by transformers or magnetic iron).

Noise emission may occur when operating relay modules. Wireless reception may be disrupted in residential areas.

The device is a Class A product.

- Observe the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4).
- Implement appropriate precautions against noise emission.

### **Faulty devices**

The devices may be damaged following an error. Correct operation can no longer be ensured.

- Replace any defective devices.

Only the manufacturer or their authorized representative may perform the following activities. Otherwise the warranty is invalidated.

- Repairs to the device
- Opening the housing

## 6.1 Safety of machines or systems

### Draw up and implement a safety concept

The machine or system manufacturer and the operator are responsible for the safety of the machine or system and the application in which the machine or system is used. In order to use the device described in this document, you must have drawn up an appropriate safety concept for your machine or system. This includes a risk assessment in accordance with the directives and standards specified in the EC Declaration of Conformity, as well as other standards.

### Risk assessment, validation and function test

- Before using the device, perform a risk assessment on the machine or system.
- Validate your entire safety system.
- Carry out a new validation every time you make a safety-related modification.
- Perform a function test on a regular basis.

### Achievable safety integrity

The functional safety is ensured for the device as a single component. However, this does not guarantee functional safety for the entire machine or system. In order to be able to achieve the desired safety level for the entire machine or system, define the safety requirements for the machine or system as well as how to implement them from both a technological and an organizational perspective.

## 7 Transport, storage, and unpacking

### 7.1 Transport

The device is delivered in cardboard packaging.

- Observe the instructions on how to handle the package indicated on the packaging.

### Suitable transport packaging

- Only transport the device in its original packaging or in packaging suitable for transport.

### Technical data and environmental conditions

- For transport, observe the specifications regarding the temperature range, humidity, and air pressure.

 See "Technical data" section.

### 7.2 Storage

#### Suitable storage location

The storage location must meet the following requirements:

- Dry
- Protected against unauthorized access
- Protected against harmful environmental influences such as UV light

### Technical data and environmental conditions

- For storage, observe the specifications regarding the temperature range, humidity, and air pressure.

 See "Technical data" section.

### 7.3 Unpacking

The device is delivered in packaging together with a packing slip that provides installation instructions.

#### Observing the packing slip

- Read the entire packing slip carefully.
- Retain the packing slip.

#### Checking the delivery

- Check the delivery for damage and completeness.
- Submit any claims for transport damage immediately.

#### Scope of supply

Refer to the ordering data for the standard scope of supply for the product.

 See "Ordering data" section.

## 8 Function description


### 8.1 Single-channel sensor circuit

The sensor circuit is not designed with redundancy.  
The safety relay does not detect short and cross-circuits in the sensor circuit.

### 8.2 Two-channel sensor circuit

The sensor circuit is designed with redundancy.  
The safety relay does not detect short and cross-circuits in the sensor circuit.

External cross-circuit detection can be implemented by using a suitable signal generator.

 See "Signal generator connection versions" section.


### 8.3 Automatic start

The device starts automatically after the sensor circuit has been closed.

### 8.4 Manual, monitored start

When the sensor circuit is closed, the device starts once the start circuit has been closed and opened again by pressing and releasing the reset button.

A connected reset button is monitored.

 See "Start and feedback circuit connection versions" section.

 See section "Function and time diagrams".



#### **WARNING: Risk of automatic machine restart**

If the manual reset function with monitored start is used, a cross-circuit between A2 (0 V) and the cable from the reset button to S34 can result in automatic machine startup.

This applies in particular for safety functions with increased risk potential.

- Prevent a cross-circuit between A2 (0 V) and the cable from the reset button to S34 by means of design measures (see error prevention in accordance with EN ISO 13849-2).

### 8.5 Safe shutdown

When the sensor circuit opens, the enabling current paths open without delay.

When the enabling current paths are open, the device is in the safe state.

Signal output M1 is active.

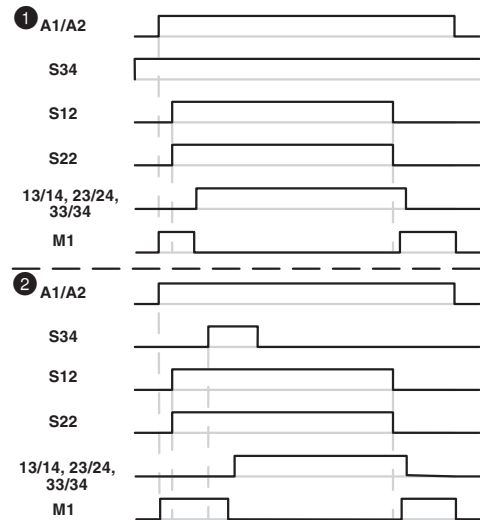


Signal output M1 transmits non-safety-related status information. Feedback of signal output M1 to external basic devices for reasons of functional safety is therefore not required.

## 9 Function and time diagrams

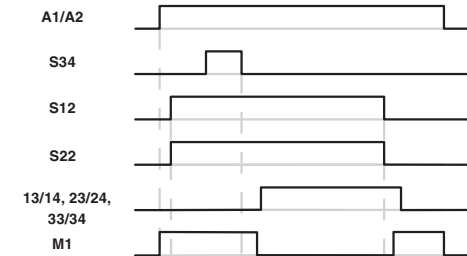
### 9.1 Time diagram for automatic start

Figure 1 Time diagram for automatic start



### 9.2 Time diagram for manual, monitored start

Figure 2 Time diagram for manual, monitored start

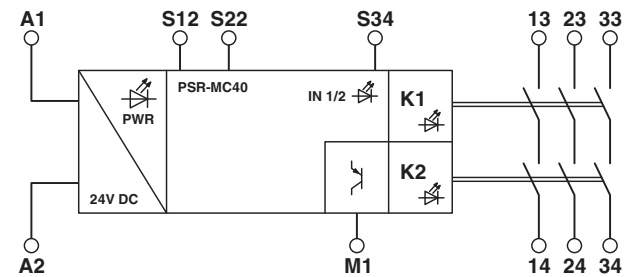


Key:

- ① Automatic start
- ② Start via external signal at S34 which is not monitored
- A1/A2** Power supply
- S34** Start circuit
- S12** Input sensor circuit (channel 1)
- S22** Input sensor circuit (channel 2)
- 13/14, 23/24, 33/34** Undelayed enabling current paths
- M1** Signal output (PNP), not safety-related

## 10 Block diagram

Figure 3 Block diagram



Key:

- A1** 24 V DC power supply
- A2** 0 V power supply
- M1** Signal output (PNP), not safety-related
- S12** Input sensor circuit (channel 1)
- S22** Input sensor circuit (channel 2)
- S34** Start circuit
- 13/14** Undelayed enabling current paths
- 23/24**
- 33/34**

### 10.1 Insulation coordination

	A1/A2, logic	13/14	23/24	33/34
A1/A2, logic	-	6 kV ST	6 kV ST	6 kV ST
13/14	-	-	6 kV ST	6 kV ST
23/24	-	-	-	6 kV ST
33/34	-	-	-	-

Key:

- ST** Safe isolation
- Logic** Sensor and start circuits, signal output



#### Safe isolation/reinforced insulation

(rated surge voltage of 6 kV)

Reinforced insulation (e.g., thanks to greater air clearances and creepage distances between conductive paths) is designed for one overvoltage category higher than basic insulation. This means that SELV circuits of  $U \leq 25$  V AC or  $U \leq 60$  V DC and circuits with higher voltages can be mixed.

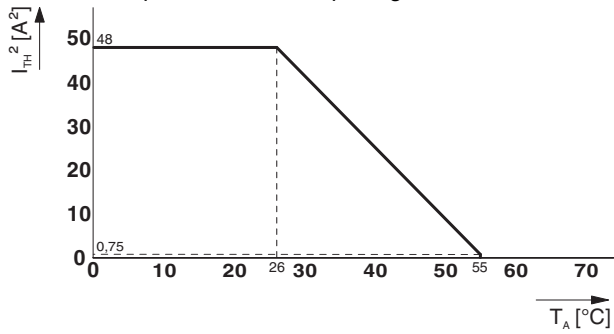
## 11 Derating

### 11.1 Vertical or horizontal mounting position

The derating curve applies for the following conditions:

- Mounting on a vertical or horizontal DIN rail
- Devices mounted next to each other without spacing

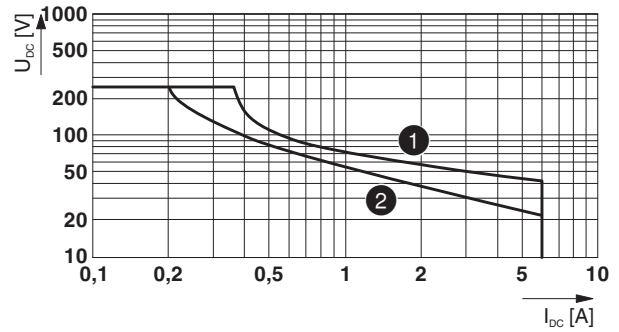
Figure 4 Derating curve - vertical or horizontal mounting position, without spacing



## 12 Load limit curve

### 12.1 Ohmic and inductive load

Figure 5 Load limit curve - ohmic and inductive load



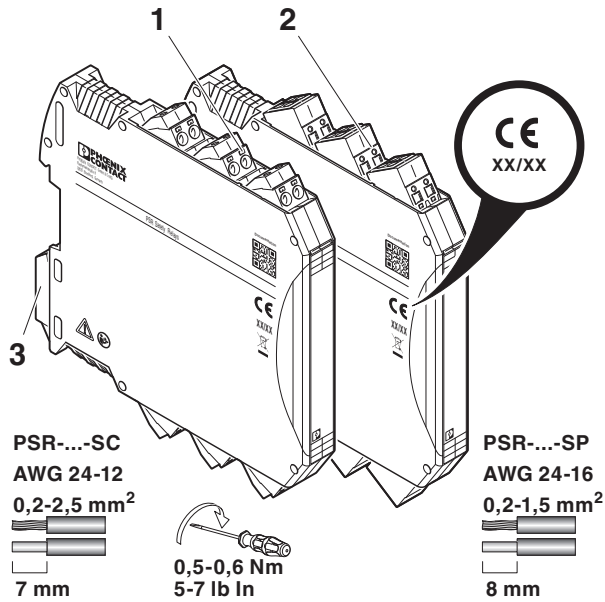
Key:

- ① Ohmic load                      L/R = 0 ms
- ② Inductive load                  L/R = 40 ms

### 13 Operating and indication elements

#### 13.1 Connection versions

Figure 6 Connection versions



- 1 COMBICON plug-in screw terminal block
- 2 Pluggable COMBICON Push-in terminal block
- 3 Metal lock for fixing to DIN rail

See section "Optional terminal coding".



The year the device was constructed can be found underneath the CE designation on the housing.  
XX/XX = Calendar week / year

#### 13.2 Connection assignment



- A1** 24 V DC power supply
- A2** 0 V power supply
- M1** Signal output (PNP), not safety-related
- S34** Start circuit
- S12** Input sensor circuit (channel 1)
- S22** Input sensor circuit (channel 2)
- PWR** Power LED (green)
- IN1/2** Status indicator sensor circuit; LED (green)
- K1** Status indicator safety circuit; LED (green)
- K2** Status indicator safety circuit; LED (green)

- 13/14**
- 23/24** Undelayed enabling current paths
- 33/34**

### 13.3 Optional terminal coding



The device connection terminal blocks are **not** coded as standard.

The optional coding accessories can provide you with increased safety against connection mismatching and reverse polarity. See section "Ordering data".

**If you do not use the coding accessories, ensure that alternative validation measures are taken.**

#### Coding system

The terminal blocks can be coded by using coding sections and coding profiles.

Coding sections are plugged onto the terminal block header in the device housing.

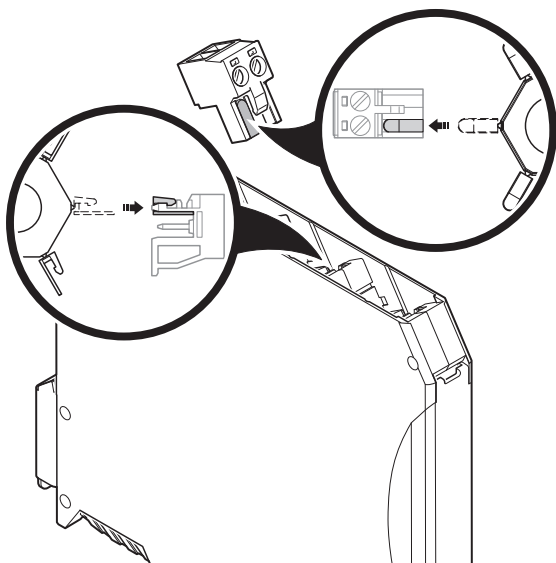
Coding profiles are plugged into the groove of the pluggable terminal block.

Various combinations can be used to create a coding system for the device terminal blocks.

#### Attaching coding elements

1. Push a coding section onto the terminal block header in the device housing.  
Remove the coding section from the coding star.
2. Push a coding profile into the groove of the terminal block.  
Remove the coding profile from the coding star.

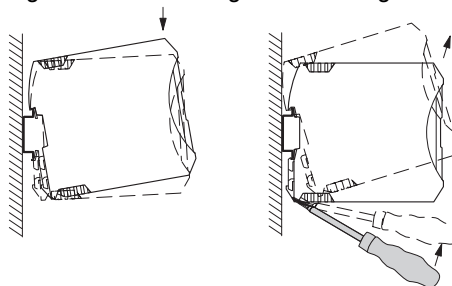
Figure 7 Attach coding elements



## 14 Mounting and removing

- Mount the device on a 35 mm DIN rail according to EN 60715.
- To remove the device, use a screwdriver to release the snap-on foot.

Figure 8 Mounting and removing



## 15 Wiring

- Connect the cables to the connection terminal blocks using a screwdriver.

Figure 9 Connecting the cables for PSR-...-SC (screw terminal block)

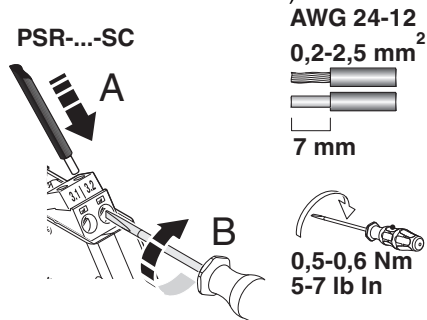
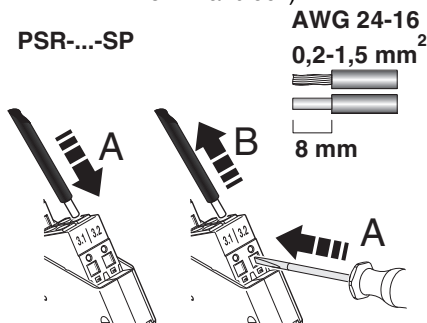


Figure 10 Connecting the cables for PSR-...-SP (Push-in terminal block)



It is recommended that ferrules are used to connect stranded cables.

Use the CRIMPFOX 6 crimping tool from PHOENIX CONTACT.

The tool enables the reliable processing of ferrules and easy removal of conductors with ferrules from the connection terminal blocks.



For compliance with UL approval, use copper wire that is approved up to 60°C/75°C.



### WARNING: Risk of automatic machine restart

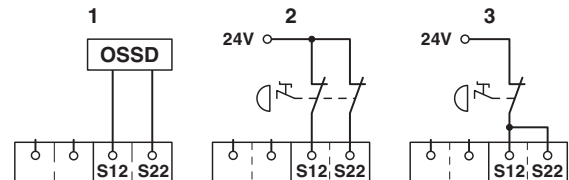
If the manual reset function with monitored start is used, a cross-circuit between A2 (0 V) and the cable from the reset button to S34 can result in automatic machine startup.

- Prevent a cross-circuit between A2 (0 V) and the cable from the reset button to S34 by means of design measures (see error prevention in accordance with EN ISO 13849-2).

### 15.1 Signal generator connection versions

- Connect suitable signal generators to S12/S22.

Figure 11 Signal generator connection versions



- Two-channel connection with **external** cross-circuit detection by the signal generator
- Two-channel connection without cross-circuit monitoring
- Single-channel connection

### 15.2 Start and feedback circuit connection variants

#### Automatic start

- Connect contact S34 to 0 V.

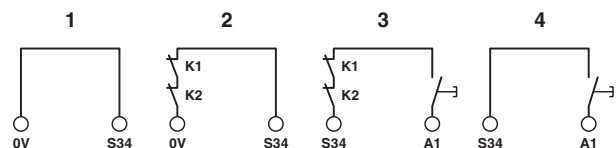
#### Manual, monitored start

- Connect a reset button to contacts A1/S34. A connected reset button is monitored.

#### Start and feedback circuit

- Place the relevant N/C contact in path 0 V/S34 or A1/S34 to monitor external contactors or extension devices with force-guided contacts.

Figure 12 Start and feedback circuit connection variants



- Automatic start
- Automatic start with monitored contact extension
- Manual, monitored start with monitored contact extension
- Manual, monitored start


## 16 Startup

- Apply the rated control circuit supply voltage (24 V DC) at terminal blocks A1/A2.

The Power LED lights up.

- Close the sensor circuit at 24 V/S12 and 24 V/S22 as per the wiring.

The IN1/2 LED lights up.

 See "Signal generator connection versions" section.

### Automatic start

The enabling current paths 13/14, 23/24 and 33/34 close.

The K1 and K2 LEDs light up.

Signal output M1 is not active.

### Manual, monitored start

- Press the reset button.
- Release the reset button.

The enabling current paths 13/14, 23/24 and 33/34 close.

The K1 and K2 LEDs light up.

Signal output M1 is not active.

## 17 Calculating the power dissipation



The total power dissipation of the safety relay is based on the input power dissipation and the contact power dissipation for the same and for different load currents.

### Input power dissipation

$$P_{\text{Input}} = U_B^2 / (U_S / I_S)$$

### Contact power dissipation

$$P_{\text{Contact}} = (I_{L1}^2 + I_{L2}^2 + \dots + I_{Ln}^2) \cdot 50 \text{ m}\Omega$$

### Total power dissipation

$$P_{\text{Total}} = P_{\text{Input}} + P_{\text{Contact}}$$

$$P_{\text{Total}} = U_B^2 / (U_S / I_S) + (I_{L1}^2 + I_{L2}^2 + \dots + I_{Ln}^2) \cdot 50 \text{ m}\Omega$$

### Key:

- P** Power dissipation in mW
- U<sub>B</sub>** Applied operating voltage
- U<sub>S</sub>** Rated control circuit supply voltage
- I<sub>S</sub>** Rated control supply current
- I<sub>L</sub>** Contact load current

## 18 Function test/proof test

To verify the device function, proceed as follows:

- Demand the safety function by actuating the corresponding safety equipment.
- Check whether the safety function was executed correctly by switching the device on again.

If the device does not switch on again, the proof test failed.



**WARNING: Loss of functional safety due to malfunction.**

If the proof test contains errors, the device no longer functions correctly.

- Replace the device.

## 19 Diagnostics



Plausibility errors are deleted when the supply voltage is switched off (power down reset).



In the event of an error or fault that is not listed, please contact Phoenix Contact.

### Signal output M1 - not safety-related



Signal output M1 transmits non-safety-related status information. Feedback of signal output M1 to external basic devices for reasons of functional safety is therefore not required.

#### 19.1 General states

##### Key:

- LED OFF
- LED ON

LED				State	Notes
PWR	IN1/2	K1	K2		
●	○	○	○	No relays are activated. The sensor circuit is inactive.	Possible error see error messages
●	●	○	○	The sensor circuit is active. Relays K1 and K2 are ready to start and await reset/start command (S34).	
●	●	●	●	The sensor circuit is active. All relays are picked up.	

## 19.2 Error messages

## Key:

- LED OFF
- LED ON

LED				State	Possible cause	Corrective
PWR	IN1/2	K1	K2			
●	○	○	○	The sensor circuit is actively controlled, but no input LEDs are lit up.	Interrupt in the sensor circuit or faulty signal generator.	Check the sensor circuit/signal generator. Then perform a function test.
●	●	○	○	The sensor circuit is active. The reset/start circuit (S34) is/was activated. The safety circuit (K1 and K2) is not picking up.	External error: the read-back contact (external actuator) is open in the reset circuit. Internal error: 1. The diagnostic contact is not working correctly. 2. An N/O contact is welded.	External error: check the actuator. Internal error: perform a power down reset with subsequent function test. <b>If the error occurs again after the function test, replace the device.</b>
●	●	○	○	The sensor circuit is active. The reset/start circuit (S34) is/was activated. The safety circuit (K1 and K2) is not picking up.	Error during manual reset S34 (stuck-at at the input).	Remove the error in the reset/start circuit. Then perform a function test.
●	●	○	●	The sensor circuit is active. The reset/start circuit (S34) is/was activated. The safety circuit (K1) is not picking up.	External error: sensor circuit channel 1 was opened and reactivated. Internal error: diagnostics active.	External error: check the sensor circuit. Internal error: perform a power down reset with subsequent function test. <b>If the error occurs again after the function test, replace the device.</b>
●	●	●	○	The sensor circuit is active. The reset/start circuit (S34) is/was activated. The safety circuit (K2) is not picking up.	External error: sensor circuit channel 2 was opened and reactivated. Internal error: diagnostics active.	External error: check the sensor circuit. Internal error: perform a power down reset with subsequent function test. <b>If the error occurs again after the function test, replace the device.</b>
○	○	○	○	The sensor circuit is active.	1. No supply voltage at A1/A 2. Over- or undervoltage at A1	Check the supply voltage.

## 20 Application examples

### 20.1 Emergency stop monitoring/automatic start

**Application description:**

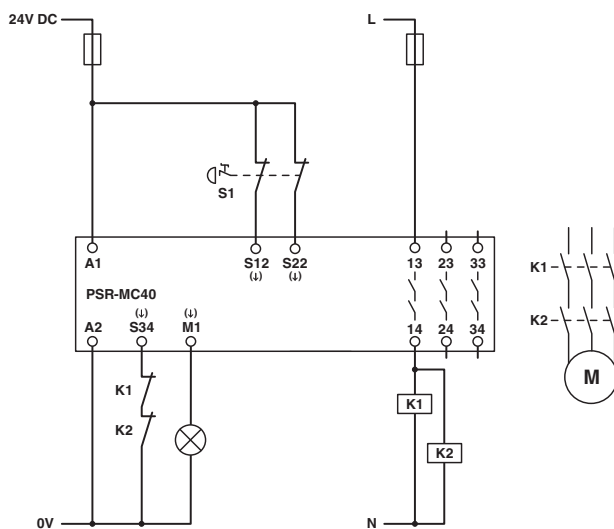
- Two-channel emergency stop monitoring
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator and the sensor circuit can be ruled out



Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.

For sensor circuits in the field, prevent cross-circuits by using a cable installation that is protected mechanically.

Figure 13 Emergency stop monitoring/automatic start



**Key:**

- S1** Emergency stop button
- K1/K2** Force-guided contactors

### 20.2 Emergency stop monitoring/manual, monitored start

**Application description:**

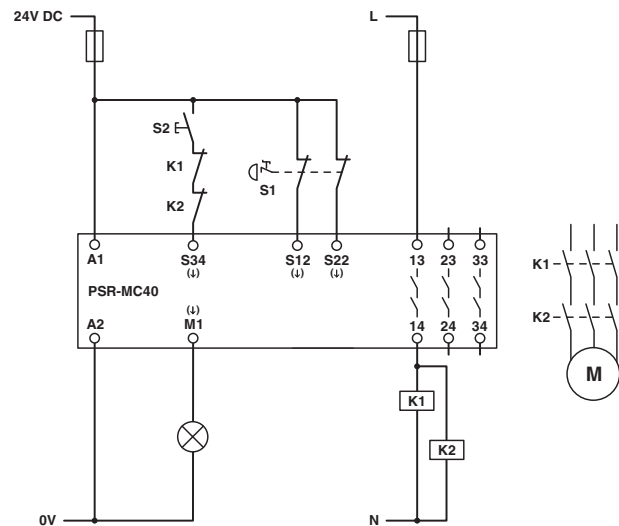
- Two-channel emergency stop monitoring
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator and the sensor circuit can be ruled out



Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.

For sensor circuits in the field, prevent cross-circuits by using a cable installation that is protected mechanically.

Figure 14 Emergency stop monitoring/manual, monitored start



**Key:**

- S1** Emergency stop button
- S2** Manual reset device
- K1/K2** Force-guided contactors

### 20.3 Safety door monitoring/automatic start

#### Application description:

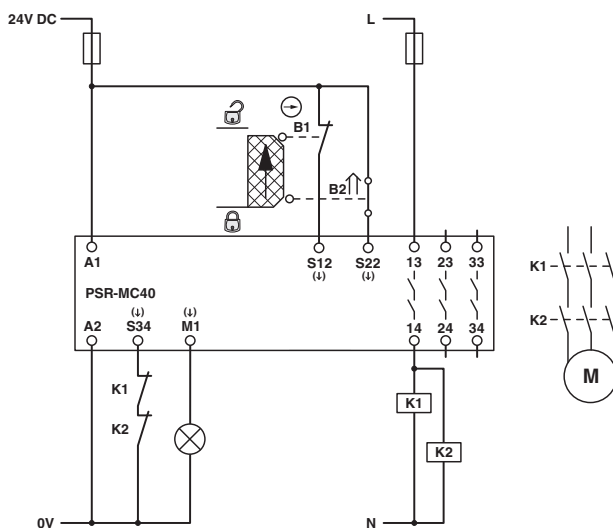
- Two-channel safety door monitoring
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator and the sensor circuit can be ruled out



Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.

For sensor circuits in the field, prevent cross-circuits by using a cable installation that is protected mechanically.

Figure 15 Safety door monitoring/automatic start



#### Key:

- B1/B2** Mechanical safety door switches
- K1/K2** Force-guided contactors

### 20.4 Safety door monitoring/manual, monitored start

#### Application description:

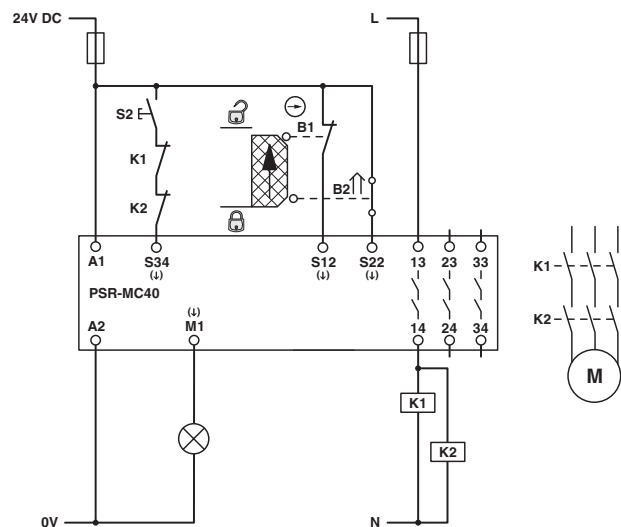
- Two-channel safety door monitoring
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator and the sensor circuit can be ruled out



Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.

For sensor circuits in the field, prevent cross-circuits by using a cable installation that is protected mechanically.

Figure 16 Safety door monitoring/manual, monitored start



#### Key:

- S2** Manual reset device
- B1/B2** Mechanical safety door switches
- K1/K2** Force-guided contactors

**20.5 Single-channel safety door monitoring/automatic start**

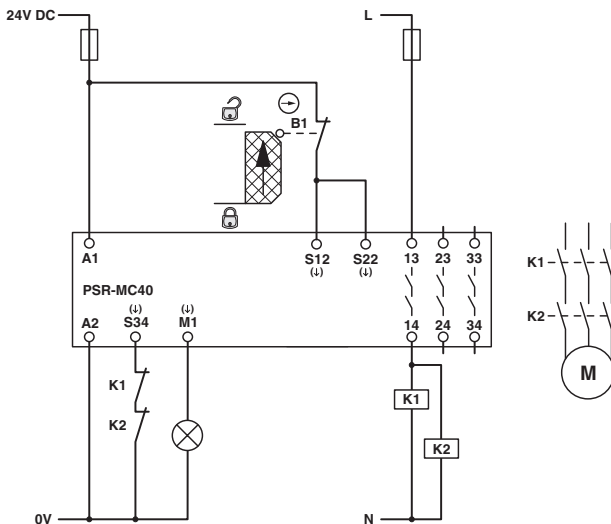
**Application description:**

- Single-channel safety door monitoring
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 1, PL c (EN ISO 13849-1), SIL 1 (EN 62061)



Contactor K2 is not essential in order to achieve category 1.

Figure 17 Single-channel safety door monitoring/automatic start



**Key:**

- S2** Manual reset device
- B1/B2** Mechanical safety door switches
- K1/K2** Force-guided contactors

**20.6 Single-channel safety door monitoring/manual, monitored start**

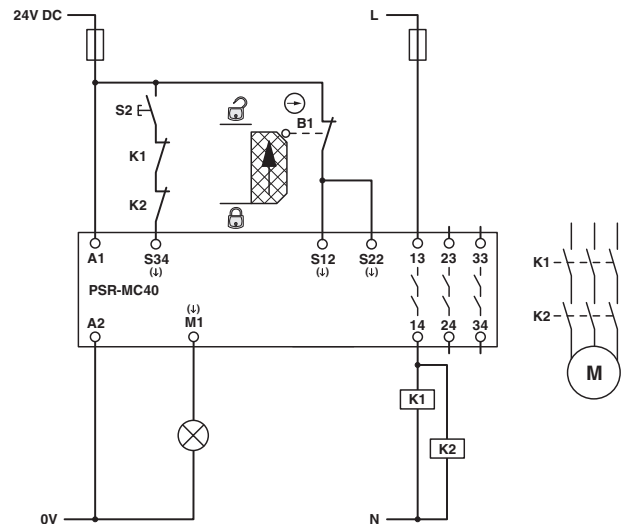
**Application description:**

- Single-channel safety door monitoring
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 1, PL c (EN ISO 13849-1), SIL 1 (EN 62061)



Contactor K2 is not essential in order to achieve category 1.

Figure 18 Single-channel safety door monitoring/manual, monitored start



**Key:**

- B1** Mechanical safety door switch
- K1/K2** Force-guided contactors

**20.7 Connection to failsafe controller/automatic start**

**Application description:**

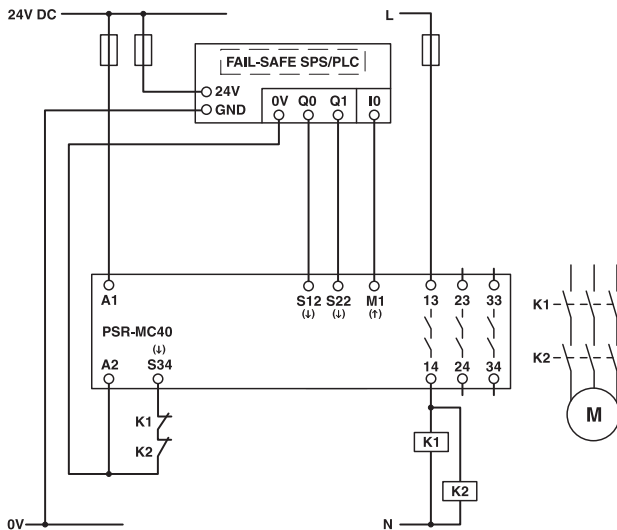
- Two-channel connection to the failsafe PLC
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if the failsafe controller meets PL e, SIL 3

**WARNING: Loss of functional safety**  
 Make sure that the signal generator and the safety relay have the same ground potential.

**WARNING: Loss of functional safety**  
 The switch-on pulses sent by the controller (light test) can lead to brief, unwanted activation of the safety relay.

- Deactivate the light pulses/light tests, unless they are safety-related.

Figure 19 Connection to error-free PLC/automatic start



**Key:**

- Q0, Q1** Digital outputs
- I0** Digital input
- K1/K2** Force-guided contactors

**20.8 Connection to failsafe controller/manual, monitored start**

**Application description:**

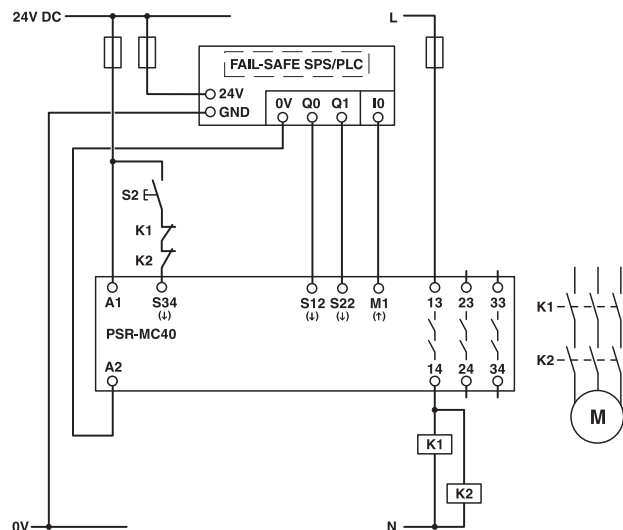
- Two-channel connection to the failsafe PLC
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if the failsafe controller meets PL e, SIL 3

**WARNING: Loss of functional safety**  
 Make sure that the signal generator and the safety relay have the same ground potential.

**WARNING: Loss of functional safety**  
 The switch-on pulses sent by the controller (light test) can lead to brief, unwanted activation of the safety relay.

- Deactivate the light pulses/light tests, unless they are safety-related.

Figure 20 Connection to error-free PLC/manual, monitored start




**Key:**


- S2** Manual reset device
- Q0, Q1** Digital outputs
- I0** Digital input
- K1/K2** Force-guided contactors


### 20.9 Single-channel connection to failsafe controller/automatic start

**Application description:**

- Single-channel connection to the failsafe PLC
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if the failsafe controller meets PL e, SIL 3 and cross-circuits can be ruled out

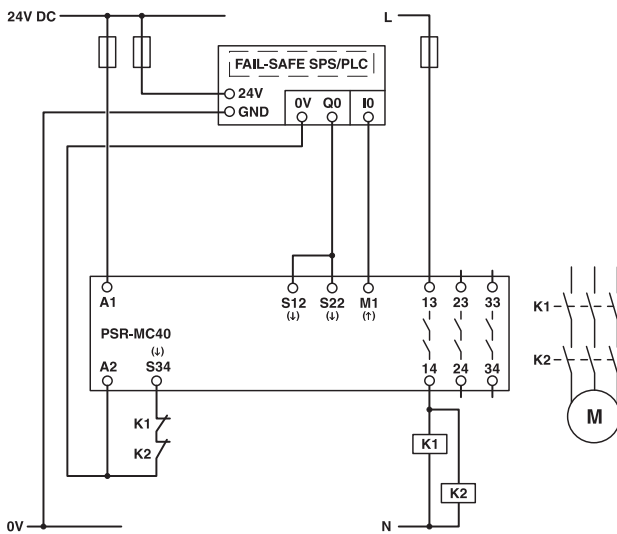
 Cross-circuits in the cable installation can be excluded if the failsafe PLC, safety relay, and external contactors K1 and K2 are located in the same electrical installation space.

 **WARNING: Loss of functional safety**  
Make sure that the signal generator and the safety relay have the same ground potential.

 **WARNING: Loss of functional safety**  
The switch-on pulses sent by the controller (light test) can lead to brief, unwanted activation of the safety relay.

- Deactivate the light pulses/light tests, unless they are safety-related.

Figure 21 Single-channel connection to failsafe PLC/automatic start




**Key:**


- Q0** Digital output
- I0** Digital input
- K1/K2** Force-guided contactors


### 20.10 Single-channel connection to failsafe controller/manual, monitored start

**Application description:**

- Single-channel connection to the failsafe PLC
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if the failsafe controller meets PL e, SIL 3 and cross-circuits can be ruled out

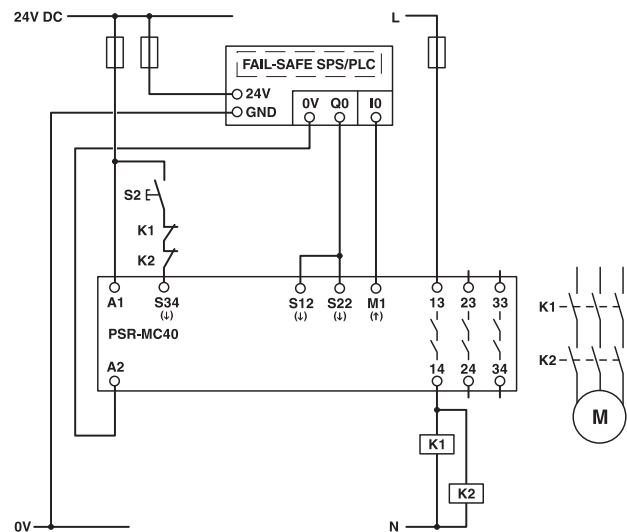
 Cross-circuits in the cable installation can be excluded if the failsafe PLC, safety relay, and external contactors K1 and K2 are located in the same electrical installation space.

 **WARNING: Loss of functional safety**  
Make sure that the signal generator and the safety relay have the same ground potential.

 **WARNING: Loss of functional safety**  
The switch-on pulses sent by the controller (light test) can lead to brief, unwanted activation of the safety relay.

- Deactivate the light pulses/light tests, unless they are safety-related.

Figure 22 Single-channel connection to failsafe PLC/manual, monitored start




**Key:**

- S2** Manual reset device
- Q0** Digital output
- I0** Digital input
- K1/K2** Force-guided contactors

### 20.11 Light grid monitoring/automatic start

**Application description:**

- Two-channel light grid monitoring
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator can be ruled out

 Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.


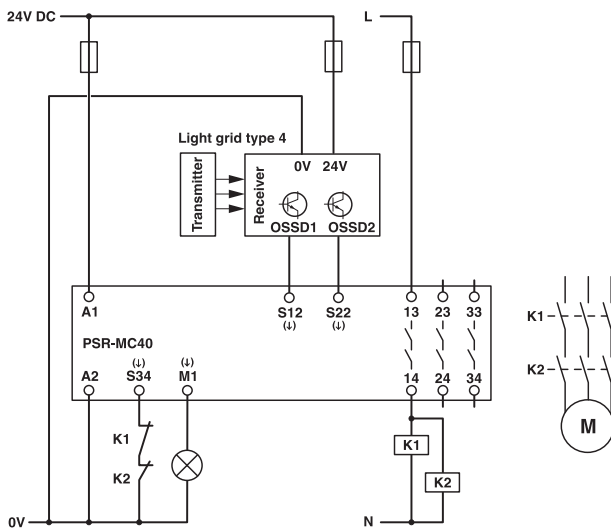
 **WARNING: Loss of functional safety**  
Make sure that the signal generator and the safety relay have the same ground potential.

Figure 23 Light grid monitoring/automatic start




**Key:**

**K1/K2** Force-guided contactors

### 20.12 Light grid monitoring/manual, monitored start

**Application description:**

- Two-channel light grid monitoring
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator can be ruled out

 Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.


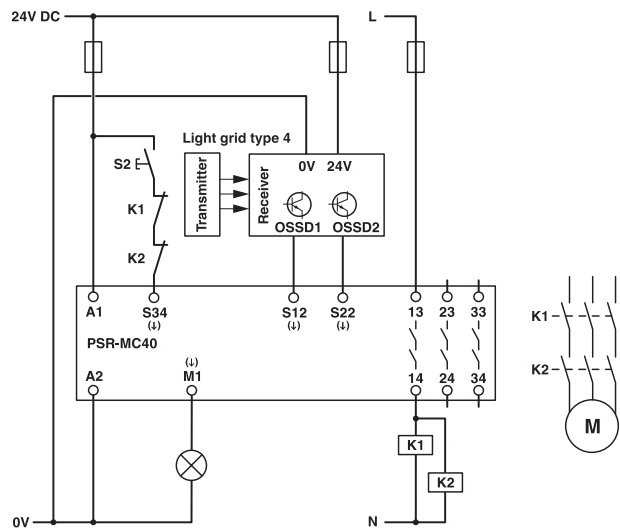
 **WARNING: Loss of functional safety**  
Make sure that the signal generator and the safety relay have the same ground potential.

Figure 24 Light grid monitoring/manual, monitored start




**Key:**

**S2** Manual reset device  
**K1/K2** Force-guided contactors

20.13 Transponder monitoring/automatic start

Application description:

- Two-channel transponder monitoring
- Automatic start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator can be ruled out

 Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.


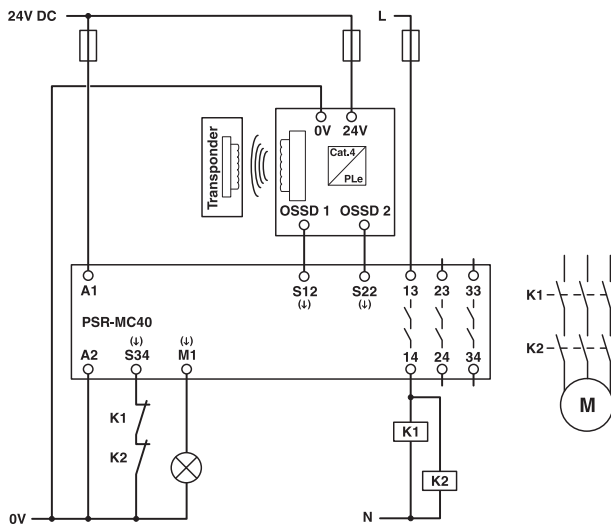
 **WARNING: Loss of functional safety**  
Make sure that the signal generator and the safety relay have the same ground potential.

Figure 25 Transponder monitoring/automatic start




Key:

**K1/K2** Force-guided contactors

20.14 Transponder monitoring/manual, monitored start

Application description:

- Two-channel transponder monitoring
- Manual, monitored start
- Monitoring of external, force-guided contactors
- No cross-circuit detection in the sensor circuit
- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN 62061), if cross-circuits in the control to the actuator can be ruled out

 Cross-circuits in the cable installation can be excluded if the safety relay and external contactors K1 and K2 are located in the same electrical installation space.


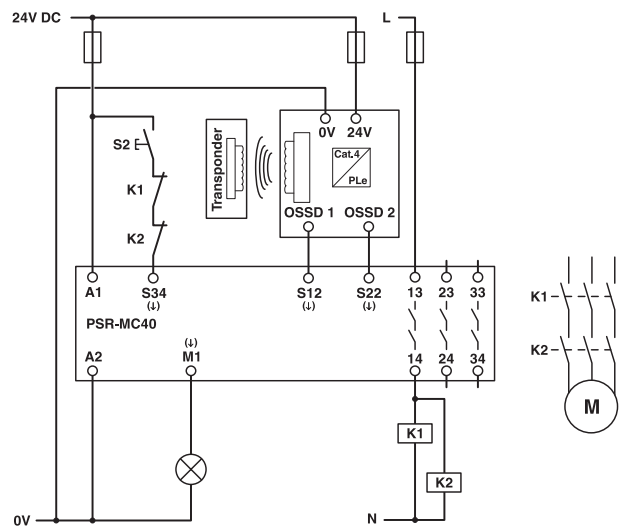
 **WARNING: Loss of functional safety**  
Make sure that the signal generator and the safety relay have the same ground potential.

Figure 26 Transponder monitoring/manual, monitored start



Key:

**S2** Manual reset device  
**K1/K2** Force-guided contactors

## 21 Device replacement, device defect, and repair

### 21.1 Device replacement

The device can be replaced, if necessary.

If you need to replace the device, proceed as described in the following section:

- Mounting and removal
- Wiring

#### Observe the device type and version

The new device must meet the following requirements:

- Same device type
- Same or later version

### 21.2 Device defect and repair

#### Do not open the housing

Repairs may only be carried out by Phoenix Contact. Do not open the housing. If the housing is opened, the function of the device can no longer be ensured.

#### Faulty devices

- Please contact Phoenix Contact.

## 22 Maintenance, decommissioning, and disposal

### 22.1 Servicing

The device requires no maintenance during the permissible duration of use. Refer to the technical data for the duration of use of the device.

If necessary, carry out proof tests within the specified proof test interval.

 See “Technical data” section.

Depending on the application and connected I/O devices, you should test the function of the I/O devices and the safety chain regularly.



Observe the relevant manufacturer specifications for carrying out maintenance on connected I/O devices.

### 22.2 Decommissioning and disposal

Carry out decommissioning according to the requirements of the machine or system manufacturer.

When decommissioning the system or parts of the system, ensure the following for the devices used.

#### The device continues to be used only as intended:

- Observe the storage and transport requirements.

 See “Transport, storage, and unpacking” section.

#### The device is not used any more:



The device contains valuable recyclable materials, which should be utilized.

#### Device disposal

- Do not dispose of the device with household waste; it should instead be disposed of in accordance with the currently applicable national regulations.

#### Packaging disposal

- Dispose of packaging materials that are no longer needed (cardboard packaging, paper, bubble wrap sheets, pillow bags, etc.) with household waste in accordance with the currently applicable national regulations.

## 23 Attachment

### 23.1 Using PSR devices at altitudes greater than 2000 m above sea level



The following section describes the special conditions for using PSR devices at altitudes greater than 2000 m above sea level. Observe the relevant device-specific data (technical data, derating, etc.) according to the product documentation for the individual device.

Using the device at altitudes **greater than 2000 m above sea level up to max. 4500 m above sea level** is possible under the following conditions:

1. Limit the rated control circuit supply voltage ( $U_S$ ) in accordance with the table below. Observe the technical data for the device.

$U_S$ according to the technical data for the device	$U_S$ when used at altitudes greater than 2000 m above sea level
< 150 V AC/DC	$U_S$ according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

2. Limit the maximum switching voltage in accordance with the table below. Observe the technical data for the device.

Max. switching voltage according to the technical data for the device	Max. switching voltage when used at altitudes greater than 2000 m above sea level
< 150 V AC/DC	Max. switching voltage according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

3. Reduce the maximum ambient temperature for operation by the corresponding factor in accordance with the table below.
4. If derating is specified, offset all the points of the derating curve by the corresponding factor in accordance with the table below.

Altitude above sea level	Temperature derating factor
2000 m	1
2500 m	0.953
3000 m	0.906
3500 m	0.859
4000 m	0.813
4500 m	0.766

#### Example calculation for 3000 m

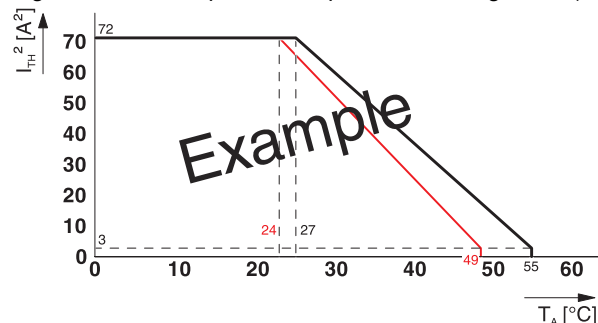


The following calculation and the illustrated derating curve are provided as examples. Perform the actual calculation and offset the derating curve for the device used according to the technical data and the “Derating” section.

$$27\text{ °C} \cdot 0.906 \approx 24\text{ °C}$$

$$55\text{ °C} \cdot 0.906 \approx 49\text{ °C}$$

Figure 27 Example of a suspended derating curve (red)



## 23.2 Revision history

Version	Date	Contents
00	2014-12-03	First publication
01	2015-03-05	Reverse polarity protection extended; relay type extended; dimensions updated; load curve extended
02	2015-03-05	Input voltage range "0" signal supplemented; relay type changed; application examples and notes on examples revised
03	2016-09-30	New edition of the data sheet: layout and structure revised; input current for "0" signal extended; output data (min. switching voltage) adjusted; note added regarding the protection of the 24 V area; inductive load curve extended; connection reset in Figure 11 adjusted; notes in application examples section extended; section on use at altitudes greater than 2000 m above sea level extended; information added regarding M1 = not safety-related
04	2021-11-19	New product photo; Section Technical data restructured; Section Safety regulations and installation notes revised; figures in Section Operating and display elements changed; note in Section Wiring extended; note in Section Connection versions start and return circuit extended; Section Calculating power dissipation revised; Section Function test / Proof test added as a stand-alone section (previously in Section Diagnostics); Section Diagnostics revised; note removed from Section Application examples (now in Section Connection versions start and return circuit); new sections: Documentation notes; Machinery or system safety; Transporting, storing, and unpacking; Optional terminal coding; Device replacement, Device defects and repairs; Maintenance, decommissioning, and disposal

# Functional Safety Manual RMA42

## Process transmitter



### Application

1- to 2-channel transmitter power supply with intrinsically safe current inputs, temperature inputs, limit value monitoring with two changeover contacts, mathematics functions and 1 to 2 analog outputs designed to satisfy particular safety systems requirements as per IEC 61508:2010.

The measuring system meets the requirements for

- functional safety as per IEC 61508:2010
- explosion protection (depending on version)
- electromagnetic compatibility as per EN 61326 and NAMUR recommendation NE 21
- electrical safety as per IEC/EN 61010-1

### Your benefits

- Suitable for use in a safety function up to SIL 2 in a safety-related system, independently assessed by Exida in accordance with IEC 61508:2010.

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# SIL Declaration of Conformity

SIL\_00154\_02.17

**Endress+Hauser**   
People for Process Automation

## SIL-Konformitätserklärung

Funktionale Sicherheit nach IEC 61508:2010 Beiblatt 1

## SIL Declaration of Conformity

Functional Safety according to IEC 61508:2010 Supplement 1

**Endress+Hauser Wetzlar GmbH+Co. KG, Obere Wank 1, 87484 Nesselwang**

erklärt als Hersteller, dass das Gerät

declares as manufacturer, that the device

### RMA42

für den Einsatz in sicherheitsrelevanten Anwendungen bis SIL2 nach IEC61508:2010 geeignet ist. In sicherheitsrelevanten Anwendungen sind die Angaben des Handbuchs zur Funktionalen Sicherheit zu beachten.

is suitable for the use in safety-instrumented systems up to SIL2 according to IEC61508:2010.

In safety instrumented systems the instructions of the Safety Manual have to be followed.

Allgemein / General			
Sicherheitsbezogenes Ausgangssignal Safety related output signal	Strom / Current 4...20mA	Spannung / Voltage 2...10V	Relais / Relay <sup>6)</sup>
Fehlersignal fault signal	3,5mA oder / or 22mA	0V oder / or 11V	Relais stromlos / Relay de-energized
Bewertetes Eingangssignal / Funktion Input signal / function	Strom, Spannung, Temperatur, Widerstand current, voltage, temperature, resistance		
Gerätetyp gem. IEC 61508-2 Device type acc. to IEC 61508-2	<input type="checkbox"/> Typ A	<input checked="" type="checkbox"/> Typ B	
Betriebsart Operating mode	<input checked="" type="checkbox"/> Low Demand Mode	<input type="checkbox"/> High Demand	<input type="checkbox"/> Continuous Mode
Gültige Hardware-Version valid hardware version	01.00.zz oder höher/ or higher		
Gültige Firmware-Version valid firmware version	01.03.03 oder höher / or higher		
Handbuch zur Funktionalen Sicherheit/ Functional safety manual	SD00025R/09		
Art der Bewertung Type of evaluation	<input type="checkbox"/>	Vollständige entwicklungsbegleitende HW/SW Bewertung inkl. FMEDA und Änderungsprozess nach IEC 61508-2, 3 Complete HW/SW evaluation parallel to development incl. FMEDA and change request acc. to IEC 61508-2, 3	
	<input checked="" type="checkbox"/>	Bewertung über Nachweis der Betriebsbewährung HW/SW inkl. FMEDA und Änderungsprozess nach IEC 61508-2, 3 Evaluation of "Proven-in-use" performance for HW/SW incl. FMEDA and change request acc. to IEC 61508-2, 3	
	<input checked="" type="checkbox"/>	Auswertung von Felddaten HW/SW zum Nachweis "Frühere Verwendung" gem. DIN EN 61511-1 2005 Evaluation of HW/SW field data to verify „prior use" acc. to DIN EN 61511-1 2005	
	<input checked="" type="checkbox"/>	Bewertung durch: Endress+Hauser SE+Co. KG / Report Nr. ASSESS_SIL-ZertVerl-RMA42 Evaluation through: Endress+Hauser SE+Co. KG / report no. ASSESS_SIL-ZertVerl-RMA42	
Prüfungsunterlagen Test documents	Entwicklungsdokumente, Testberichte, Datenblätter development documents, test reports, data sheets		

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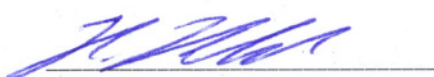
Endress+Hauser 

People for Process Automation

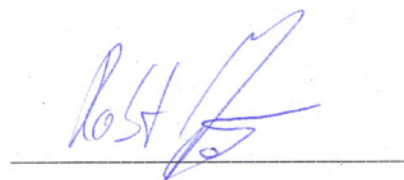
SIL – Integrität / SIL Integrity						
Hardware Sicherheitsintegrität Hardware safety integrity	Einkanaliger Einsatz / Single channel use		<input checked="" type="checkbox"/> SIL 2 fähig / capable		<input type="checkbox"/> SIL 3 fähig / capable	
FMEDA						
Empfohlenes Intervall für Wiederholungsprüfungen / recommended proof test interval	T <sub>1</sub> = 1 Jahr / year					
Sicherheitsbezogenes Ausgangssignal Safety related output signal	Strom / Current 4...20mA		Spannung / Voltage 2...10V		Relais / Relay	
Anzahl Eingänge / number of inputs	1	2	1	2	1	2
MTBF <sub>tot</sub> <sup>3)</sup> / Jahre / years	95	58	89	60	73	56
SFF	84,4 %	84,9 %	84,6 %	82,4 %	83,3 %	82,7 %
λ <sub>SD</sub> <sup>2)4)</sup>	0 FIT	0 FIT	0 FIT	0 FIT	0 FIT	0 FIT
λ <sub>SU</sub> <sup>2)4)</sup>	0 FIT	0 FIT	0 FIT	0 FIT	445 FIT	521 FIT
λ <sub>DD</sub> <sup>2)4)</sup>	559 FIT	841 FIT	584 FIT	751 FIT	234 FIT	266 FIT
λ <sub>DU</sub> <sup>2)4)</sup>	103 FIT	149 FIT	106 FIT	160 FIT	158 FIT	167 FIT
PFDA <sub>avg</sub> <sup>1)4)</sup> T <sub>1</sub> = 1 Jahr / year	4,51 x10 <sup>-4</sup>	6,53 x10 <sup>-4</sup>	4,64 x10 <sup>-4</sup>	7,01 x 10 <sup>-4</sup>	6,92 x10 <sup>-4</sup>	7,31 x10 <sup>-4</sup>
Fehlerreaktionszeit Fault reaction time <sup>5)</sup>	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec

- 1) Die Werte entsprechen SIL 2 nach ISA S84.01. PFD-Werte für andere T1-Werte siehe Handbuch zur Funktionalen Sicherheit. /  
The values comply with SIL 2 according to ISA S84.01. PFD values for other T1-values see Functional Safety Manual.
- 2) Gemäß Exida Bericht Nr. E+H 08/02-49. / According to Exida report no. E+H 08/02-49.
- 3) Gemäß Siemens SN29500, einschließlich Fehlern, die außerhalb der Sicherheitsfunktion liegen. /  
According to Siemens SN29500, including faults outside the safety function.
- 4) Gültig für gemittelte Umgebungstemperaturen bis zu +40 °C (+104 °F) Bei einer durchschnittlichen Dauereinsatztemperatur nahe +50 °C sollte ein Faktor von 1,3 berücksichtigt werden. /  
Valid for average ambient temperature up to +40 °C (+104 °F) For continuous operation at ambient temperature close to +50 °C (+122 °F), a factor of 1,3 should be applied.
- 5) Zeit zwischen Fehlererkennung und Fehlerreaktion. Die Zeit beträgt maximal 0,4 Sekunden. Bei Verwendung von RTD oder Thermoelement als Eingangssignal beträgt die Zeit zur Erkennung eines Leitungsbruches maximal 5 Sekunden. /  
Maximum time between error recognition and error response. The maximum time is 0,4 sec. If a RTD or a thermocouple input signal is used the fault reaction time is up to 5 sec for cable open recognition.

Nesselwang, 04.07.2019  
Endress+Hauser Wetzlar GmbH+Co. KG



Harald Hertweck  
Managing Director



i.V. Robert Zeller  
Head of department FEC

## General information

General information on functional safety (SIL) is available at: [www.de.endress.com/SIL](http://www.de.endress.com/SIL) (German) or [www.endress.com/SIL](http://www.endress.com/SIL) (English) and in the Competence Brochure CP01008Z11EN "Functional safety - SIL safety instrumented systems in the process industry".

## Structure of the measuring system

### System components

The measuring system's devices are shown in the following diagram (example).



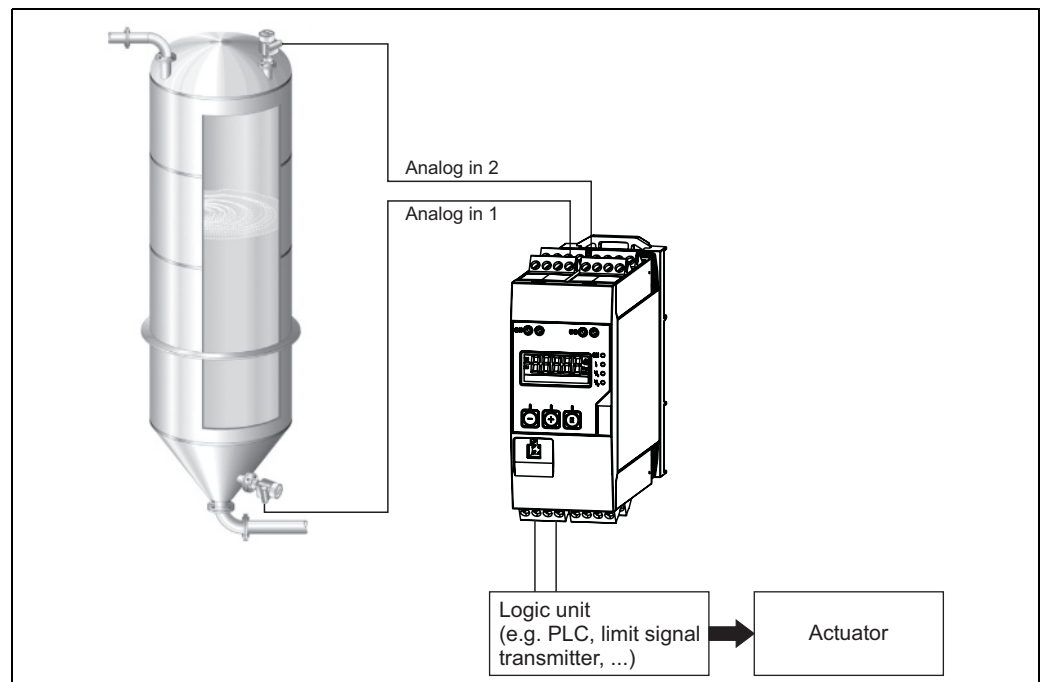
*Proportion of "average probability of a dangerous failure on demand of a safety function" (PFD<sub>AVG</sub>) accounted for by process transmitter*



In this documentation the RMA42 is regarded as part of a safety function.

The sensor, process transmitter, logic unit and actuator together form a safety-related system that performs a safety function. The "average probability of a dangerous failure on demand of a safety-related system" (PFD<sub>avg</sub>) is spread across the sensor, process transmitter, logic unit and actuator subsystems.

### Description of application as a safety instrumented system



Example of a "differential pressure" application

Powered by the RMA42 process transmitter, the sensors generate an analog output signal that is proportional to the measured value (4 to 20 mA or 2 to 10 V). Mathematics functions are used to create a new process variable. The process transmitter sends the analog signals that are proportional to the new process variable to a logic unit located downstream, a PLC for example. Limit value monitoring can also be performed directly with the RMA42 via two changeover contacts.

### Permitted devices types

The information on functional safety contained in this manual relates to the device versions listed below and are valid as of the specified software and hardware version.

Valid hardware version (electronics): from 01.00.xx

Valid firmware/software version: from 01.03.03 or higher

If changes are made to the device, a modification process compliant with IEC 61508 is applied. Unless otherwise indicated, all subsequent versions can also be used for safety instrumented systems.

Valid device versions for safety-related use:

Feature	Designation	Version
010	Approval	All
020	Input; output	All
590	Additional approval	at least H3 - others are optional

The table indicates the required versions. All other versions can be selected as desired.

#### Supplementary device documentation

Documentation	Contents	Comment
Technical Information TI00150R/09 (Process transmitter RMA42)	<ul style="list-style-type: none"> <li>▪ Technical data</li> <li>▪ Information on accessories</li> </ul>	
Operating Instructions BA00287R/09 (Process transmitter RMA42)	<ul style="list-style-type: none"> <li>▪ Identification</li> <li>▪ Installation</li> <li>▪ Wiring</li> <li>▪ Operation</li> <li>▪ Commissioning</li> <li>▪ Maintenance</li> <li>▪ Accessories</li> <li>▪ Troubleshooting</li> <li>▪ Technical data</li> <li>▪ Appendix: menu diagrams</li> </ul>	
Safety information depending on the "certificate" version chosen	<ul style="list-style-type: none"> <li>▪ Safety, installation and operating instructions for devices that are suitable for use in hazardous areas or for overfill prevention (WHG, German Water Resources Act).</li> </ul>	Additional safety instructions (XA, XB, XC, ZE, ZD) are supplied with certified device versions. Please refer to the nameplate for the relevant safety instructions.

## Description of safety requirements and boundary conditions

#### Safety function

An analog output or limit relay can be used if deployed as part of a safety function. One device can be used to implement several independent safety functions. All inputs and outputs that do not form part of a safety function may still be used. The use of non-safety-related inputs and outputs does not have a modifying effect on the safety function. The following table shows which settings are permitted or prohibited when the RMA42 is used in a safety-related application:

## Configuring the input signal:

Setup menu Analog in 1* Analog in 2*	Possible settings	Setting for safety function
Signal type*	4 to 20 mA	permitted
	0 to 20 mA	not permitted
	0 to 10 V	not permitted
	2 to 10 V	permitted
	0 to 5 V	not permitted
	1 to 5 V	not permitted
	± 1 V	not permitted
	± 10 V	not permitted
	± 30 V	not permitted
	± 100 mV	not permitted
	30 to 3000 Ohm	not permitted
	RTD/resistor 2-wire/3-wire/4-wire	permitted
Thermocouple	permitted	
<b>Expert menu</b> Input** Analog in 1** Analog in 2**		
<b>Failure mode**</b>	Fixed value	not permitted
	Invalid	permitted
<b>Namur NE43**</b>	On	permitted
	Off	not permitted

## Configuring the current or voltage output:

Setup menu Analog Out 1* Analog Out 2*	Possible settings	Setting for safety function
<b>Assignment*</b>	Analog Input 1	permitted
	Analog Input 2	permitted
	Calc Value 1	permitted
	Calc Value 2	permitted
<b>Signal type*</b>	4 to 20 mA	permitted
	2 to 10 V	permitted
	0 to 20 mA	not permitted
	0 to 10 V	not permitted
	0 to 5 V	not permitted
	1 to 5 V	not permitted
<b>Expert menu</b> Input** Analog Out 1** Analog Out 2**		
<b>Failure mode**</b>	Fixed value	not permitted
	Min	permitted
	Max	permitted

Configuring the relays for limit value monitoring:

Setup menu	Possible settings	Setting for safety function
Relay 1*		
Relay 2*		
Assignment*	Analog input 1*	permitted
	Analog input 2*	permitted
	Calc value 1*	permitted
	Calc value 2*	permitted
Function*	Off	not permitted
	Min	permitted
	Max	permitted
	Gradient	permitted
	OutBand	permitted
	InBand	permitted
<b>Expert menu</b>		
Output**		
Relay 1**		
Relay 2**		
Operation mode**	norm closed	permitted
	norm opened	not permitted
Failure mode**	norm closed	permitted
	norm opened	not permitted

\*) Displayed in Setup menu of device software

\*\*\*) Displayed in Expert menu of device software

For further information, refer to the supplementary device documentation.

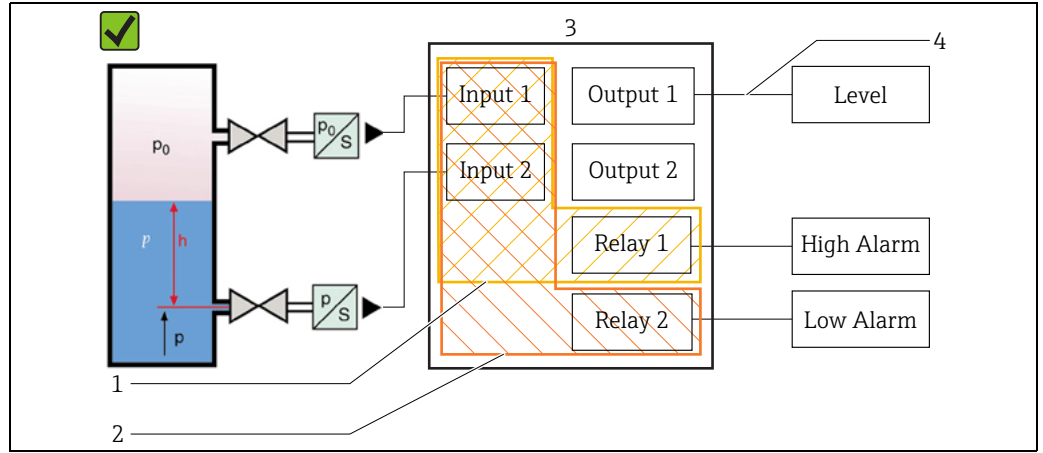
In addition, only certain settings are permitted for some parameters. If the setting of one of these parameters is not a permitted setting, safe operation of the device is no longer guaranteed.

Function group (menu path)	Setting
Expert → Application → Calc value 1/2 → Failure mode	Invalid
Expert → Diagnostics → Simulation → Simulation AO1/2	Off
Expert → Diagnostics → Simulation → Simu relay 1/2	Off

**Safety function**

**Example 1: Level monitoring with differential pressure measurement**

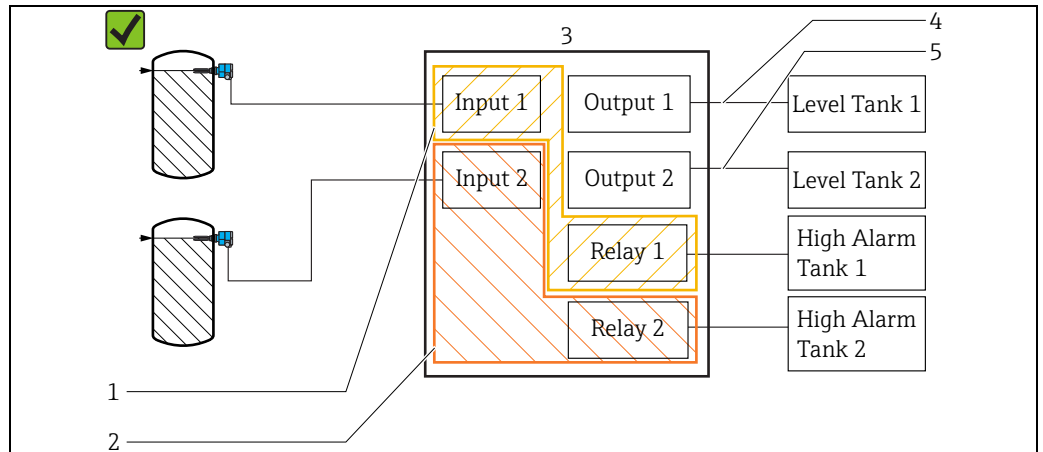
Safety function 1                      Calc value (Input 1, Input 2) -> Relay 1 max. level (overflow prevention)  
 Safety function 2                      Calc value (Input 1, Input 2) -> Relay 2 min. level (dry running protection)  
 Process value:                          Calc value (Input 1, Input 2) -> Output 1 (level)  
 (no safety function)



- 1: Safety function 1
- 2: Safety function 2
- 3: Process transmitter
- 4: Output 1 - Process value, not part of the safety function. Output 2 is not used

**Example 2: Level monitoring of two tanks**

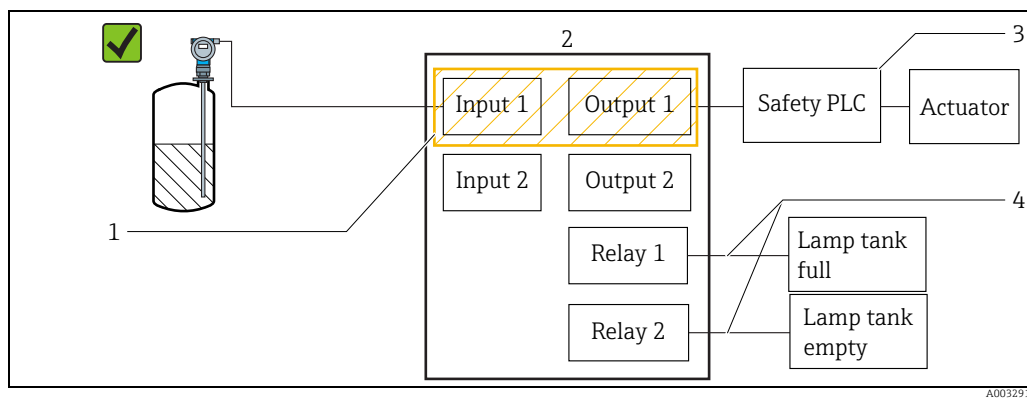
Safety function 1                      Input 1 -> Relay 1 max. level tank 1  
 Safety function 2                      Input 2 -> Relay 2 max. level tank 2  
 Process value:                          Input 1 -> Output 1 (level tank 1),  
 (no safety function)                      Input 2 -> Output 2 (level tank 2)



- 1: Safety function 1
- 2: Safety function 2
- 3: Process transmitter
- 4: Output 1 - Process value, not part of the safety function.
- 5: Output 2 - Process value, not part of the safety function.

**Example 3: continuous level monitoring of a tank**

Safety function 1                      Input 1 -> Output 1 continuous level value tank 1 to safety PLC with actuator  
 Process value:                          Input 1 -> Relay 1 (lamp for full tank),  
 (no safety function)                      Input 1 -> Relay 2 (lamp for empty tank)

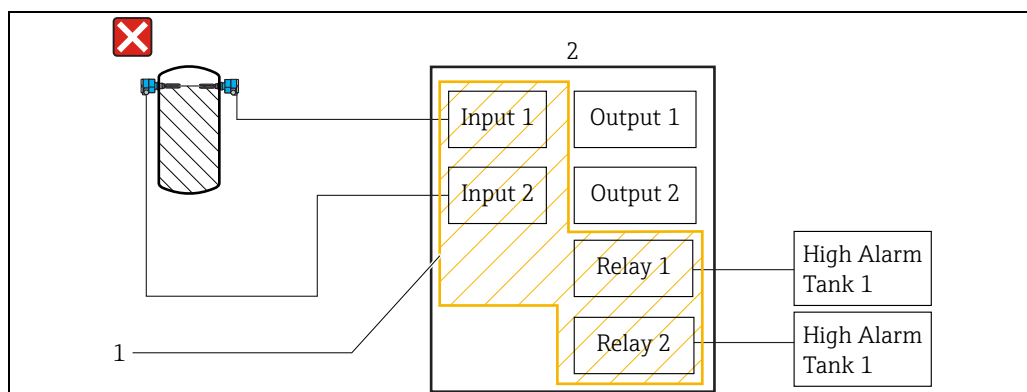


A0032918

- 1: Safety function 1
- 2: Process transmitter
- 3: Input 1 -> Output 1 continuous level value tank 1 to safety PLC with actuator
- 4: Relay 1 (lamp for full tank), Relay 2 (lamp for empty tank)

#### Example 4: Level monitoring of a tank with 2 channels (NOT PERMITTED!)

Safety function 1 (2 channels for Input 1 -> Relay 1 max. level tank 1  
homogeneous redundancy): Input 2 -> Relay 2 max. level tank 1



A0032918

- 1: Safety function 1
- 2: Process transmitter

#### Safety-related signal

The safety-related signal is the analog output signal 4 to 20 mA or 2 to 10V or the limit relay. All safety measures refer exclusively to the output signal.

The safety-related output signal or limit relay is supplied to a logic unit located downstream, e.g. a programmable logic controller or a limit signal transmitter, where it is monitored for the following events:

- a predefined point level is exceeded
- the occurrence of a fault, e.g. error current as per NE 43 ( $\leq 3.6 \text{ mA}$ ,  $\geq 21 \text{ mA}$ , interruption or short-circuit in signal line)

#### Restrictions for use in safety-related applications

- The measuring system must be used in accordance with the application, and attention must be paid to the ambient conditions.
- Follow the instructions for critical process situations and installation conditions in the Operating Instructions ("Installation conditions" section in BA00287R/09).
- The application-specific limits must be observed.
- The specifications in the Operating Instructions must not be exceeded. The accuracy of the safety-related output signal 4 to 20 mA or 2 to 10 V is  $\pm 1\%$  of the measuring range.
- Device start-up time: After the device start-up, the safety functions are available following an initialization period of 20 seconds.
- The device must be locked after parameter configuration.
- A complete function test of the safety-related functions must be carried out during commissioning.
- Only vertical orientation is permitted.

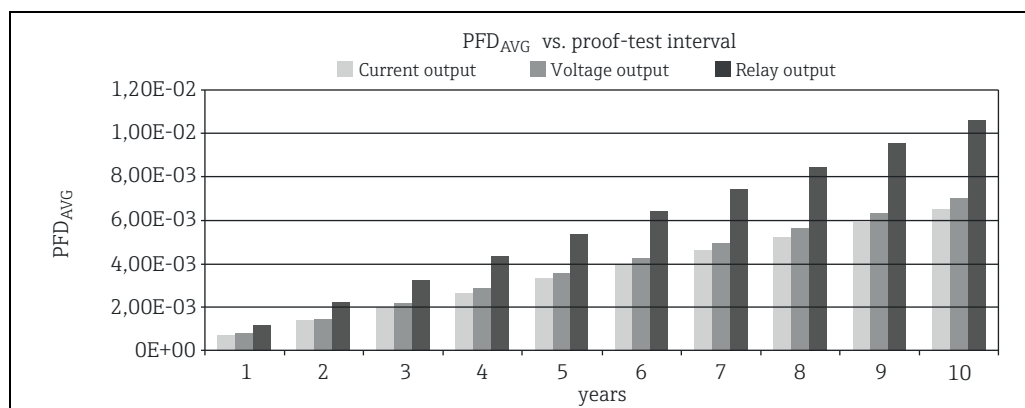
**Functional safety parameters** The table shows the specific functional safety parameters:

Parameter as per IEC 61508	Value, version 1	Value, version 2	Value, version 3
Safety function	Current output 1 input	Current output 2 inputs	Voltage output 1 input
SIL	2	2	2
HFT	0	0	0
Device type	B	B	B
Operating mode	Low demand mode	Low demand mode	Low demand mode
MTTR	24 hours	24 hours	24 hours
Recommended proof-test interval $T_1$	1 year	1 year	1 year
SFF	84.4 %	84.9 %	84.6 %
$\lambda_{SD}$	0 FIT	0 FIT	0 FIT
$\lambda_{SU}$	0 FIT	0 FIT	0 FIT
$\lambda_{DD}$	559 FIT	841 FIT	584 FIT
$\lambda_{DU}$	103 FIT	149 FIT	106 FIT
$\lambda_{Total}^{*1}$	662 FIT	990 FIT	690 FIT
PFD <sub>avg</sub> (for $T_1 = 1$ year) <sup>*2</sup>	$4.51 \times 10^{-4}$	$6.53 \times 10^{-4}$	$4.64 \times 10^{-4}$
MTBF <sup>*1</sup>	95 years	58 years	89 years
Fault reaction time <sup>*3</sup>	0.4 s / 5 s	0.4 s / 5 s	0.4 s / 5 s

Parameter as per IEC 61508	Value, version 4	Value, version 5	Value, version 6
Safety function	Voltage output 2 inputs	Limit relay 1 input	Limit relay 2 inputs
SIL	2	2	2
HFT	0	0	0
Device type	B	B	B
Operating mode	Low demand mode	Low demand mode	Low demand mode
MTTR	24 hours	24 hours	24 hours
Recommended proof-test interval $T_1$	1 year	1 year	1 year
SFF	82.4 %	83.3 %	82.7 %
$\lambda_{SD}$	0 FIT	0 FIT	0 FIT
$\lambda_{SU}$	0 FIT	445 FIT	521 FIT
$\lambda_{DD}$	751 FIT	234 FIT	266 FIT
$\lambda_{DU}$	160 FIT	158 FIT	167 FIT
$\lambda_{Total}^{*1}$	911 FIT	756 FIT	971 FIT
PFD <sub>avg</sub> (for $T_1 = 1$ year) <sup>*2</sup>	$7.01 \times 10^{-4}$	$6.9 \times 10^{-4}$	$7.3 \times 10^{-4}$
MTBF <sup>*1</sup>	60 years	78 years	56 years
Fault reaction time <sup>*3</sup>	0.4 s / 5 s	0.4 s / 5 s	0.4 s / 5 s

*1	* This value takes into account all failure types. Failure rates of electronic components in accordance with Siemens SN29500. (see "Management Summary - optional")
*2	Where the average temperature when in continuous use is in the region of 50°C, a factor of 1.3 should be taken into account. For further information, see "Management Summary - optional".
*3	Time between fault detection and fault reaction. The time is max. 0.4 seconds. When an RTD or thermocouple is used as the input signal, the time needed to detect a cable open circuit is max. 5 seconds.

## Proof-test interval



Proof-test interval as a function of  $PFD_{avg}$

### Dangerous undetected failures in this scenario

An incorrect output signal that deviates from the actual measured value by more than 1% but is still in the range of 4 to 20 mA or 2 to 10 V is considered a dangerous, undetected failure.

### Operating life of electrical components

The underlying failure rates of electrical components apply within the useful operating life as per IEC 61508-2:2010, section 7.4.9.5. Note 3.

The operating life of the device is determined mainly by the electrolyte capacitors and the ambient temperature. Due to the use of high-quality capacitors, the operating life of the device is 20 years; this assumes an average ambient temperature of 40°C. At higher ambient temperatures, the operating life is shorter.

### Behavior of device when in operation and in the event of a fault

The device monitors its inputs as well as its own internal functionalities by means of comprehensive monitoring mechanisms in the device software.

In the event that the device's self-diagnosis function detects a fault, the device reacts as follows:

- Status output (open collector) opens
- Red LED lights up
- Limit relay de-energizes (if activated)
- Analog output issues fault signal (e.g. <3.6mA in failure mode: minimum)
- Display switches to failsafe mode → color of channel affected changes to red and an error is displayed
- Display switches automatically between the active channels and the error display

### Installation

All relay outputs used as a safety function must be protected with a 2 A fuse. Alternatively, it is also possible to use a thermomagnetic device circuit breaker or electronic limiter or a miniature circuit breaker with tripping characteristic "Z".

### Orientation

The permitted orientations of the device are described in the supplementary device documentation.

### Operation

#### Device behavior when switched on

After it is switched on, the device runs through a diagnostic phase of maximum 20 seconds. During this time, the current output is set to error current  $\leq 3.6$  mA, the voltage output to 0 V, and the limit relays are de-energized.

Communication via the CDI interface is not possible during the diagnostic phase.

The output signal can only be regarded as safe on successful completion of the diagnostic function.

## Behavior of device in the event of alarms and warnings

### Analog output:

An fault exists at the output when the assigned input or mathematics channel delivers an error status. The failsafe mode of the output can be configured. The following options can be configured:

Setting	Current output	Voltage output
Min	< 3.6 mA (3.5 mA) <sup>1)</sup>	0 V
Max	> 21 mA (22 mA) <sup>1)</sup>	11 V

1) actual output value

### Limit relay:

An fault exists when the assigned input or mathematics channel delivers an error status. The limit relays are de-energized in the event of a fault.

### Alarm and warning messages:

The alarm and warning messages output in the form of error codes provide additional information and are not part of the safety function.

The following table shows the correlation between the error code and the input current/voltage:

Error code*	Meaning	Input current	Input voltage
F041	Sensor/cable open circuit	≤ 2 mA	n/a
F045	Sensor error	2 < x ≤ 3.6 mA ≥ 21 mA	n/a
F101	Below range	≥ 2 mA > 3.6 mA ≤ 3.8 mA (as per Namur)	< 1 V
F102	Above range	> 20.5 mA < 21 mA (as per Namur) ≥ 21 mA (as per Namur)	> 11 V

\*) The error codes are listed in the "Diagnosis list" section of Operating Instructions BA00287R/09.

## Device configuration

When using the devices in PCS safety instrumented systems, the device configuration must meet the following two requirements:

- Confirmation concept:  
Proven, independent verification of the safety-related parameters entered
- Locking concept:  
Device locking once configuration is complete (as required by DIN EN 61511-1 §11.6.4 and NE 79 §3)

### Device configuration procedure

Device configuration is described in Operating Instructions BA00287R/09. The restrictions detailed in the Safety function section also apply.

### Inspection

#### NOTICE

**An inspection of the entire safety function is necessary.**

- ▶ Once all of the parameters have been entered, the safety function must be checked before performing the locking sequence!
- ▶ When the device is used as part of a safety function, the complete safety function must be checked after each modification to the device, e.g. a change in the parameter settings.

### Locking

#### **⚠ CAUTION**

##### **The operation of the device must be locked.**

- ▶ Once all of the parameters have been entered and the safety function has been checked, the operation of the device must be locked. This is because a change in the measuring system or in the parameters could compromise the safety function. (→ "Access protection" section of Operating Instructions BA00287R/09).

The configuration software must be locked as follows:

- The device must be locked against access by unauthorized persons;
  - A user code protects the configured parameters: enter 4-digit code: select digit with '+' or '-' and press "E" to confirm the individual digit; once the digit has been confirmed, the cursor moves to the next position, or skips back to the 'System' menu item once the fourth digit has been entered.
  - The lock symbol appears on the display.
- Setup → System → Overfill protect: Select German WHG.



The device status must be changed if the device is configured using the FieldCare PC software, i.e. WHG must be disabled so that parameters can be changed.

### Maintenance

No special maintenance work is required on the device.

## Proof tests

Safety functions must be tested at appropriate intervals to ensure that they are functioning correctly and are safe.

The time intervals must be specified by the operator.

The "Proof-test interval as a function of PFDavg" diagram (Seite 12) can be used for this purpose.

Proof testing of the device can be performed as follows:

### Proof-test procedure

1. Bypass the logic unit or take other appropriate measures to prevent an undesirable reaction in the process.
2. Simulate several defined limit values across the entire input range and verify that the output or limit relay assume a safe state.
  - A safe state means, for example, that  $< 3.6\text{mA}$  is present at the current output for at least 4 sec., or that the limit relay is de-energized (see also failsafe mode).
3. Restore the complete operational capability of the loop.
4. Disable the logic unit bypass or restore normal operation in some other way. This test detects approx. 99% of all possible " $\lambda_{DU}$ " (dangerous undetected) failures of the RMA42 process transmitter.



If one of the test criteria from the test sequences described above is not satisfied, the device may no longer be used as part of a safety instrumented system.

The purpose of a proof test is to detect random device failures. This test does not cover the impact of systematic faults on the safety function, which must be assessed separately. Systematic faults can be caused by operating conditions or corrosion, for example.

## Repair

### Repair

All repairs to the device must be carried out by Endress+Hauser only.  
Please refer to the "Return" section of the associated Operating Instructions .



In the event of failure of a SIL-labeled E+H device operated in a safety function, the "Declaration of Hazardous Material and Decontamination" must be returned with the defective device and include the note "Used as SIL device in safety instrumented system".  
The "Declaration of Hazardous Material and Decontamination" can be found in the appendix at the end of this Functional Safety Manual.

## Appendix

### Commissioning or proof-test protocol

System-specific data	
Company	
Measuring points / TAG no.	
System	
Device type / order code	
Serial number of device	
Name	
Date	
Password (if device-specific)	
Signature	

Device-specific commissioning parameters		
Empty value		
Full value		
Proof-test protocol		
Test stage	Analog output / limit relay	
	Set point	Actual value
Jumper current input	Current: <3.6 mA or > 21 mA Voltage: 0.0 V or 11.0 V Relay: de-energized	
Connect multimeter (accuracy class 1) to current/voltage output		
Imprint a current value of x mA on current output		
Read the current/voltage value at the output and record it (set point e.g. x mA +/- 0.1 mA)		

[www.addresses.endress.com](http://www.addresses.endress.com)

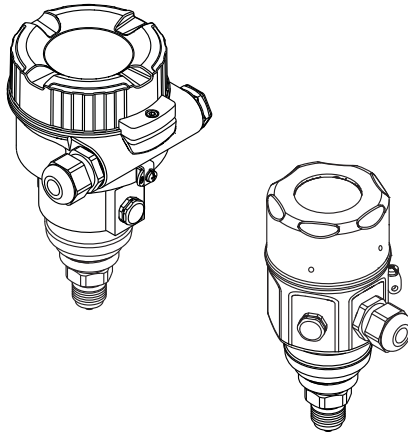
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# Brief Operating Instructions

## Cerabar M

### PMC51, PMP51, PMP55

Process pressure measurement

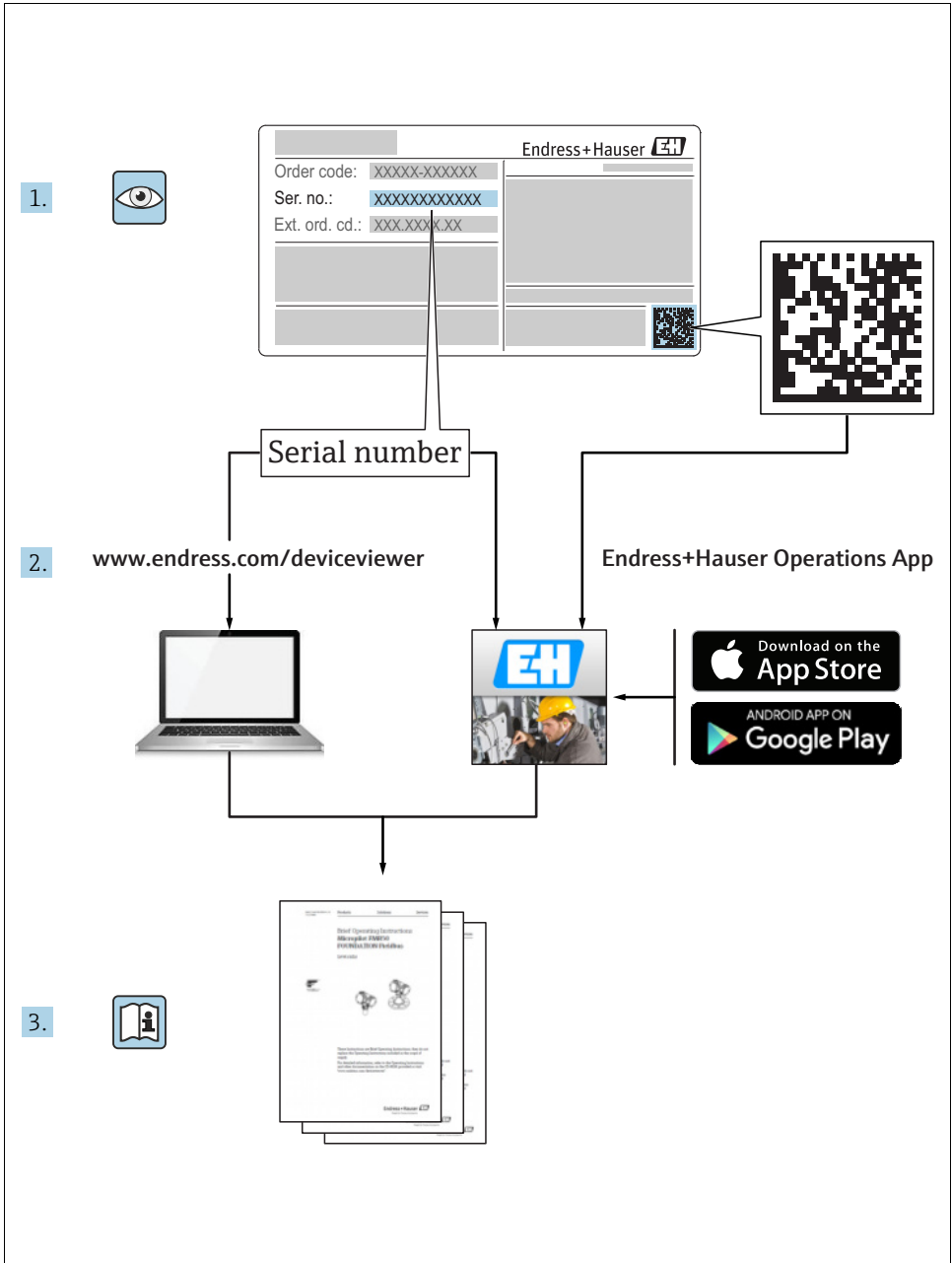


These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:

Available for all device versions via:

- Internet: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)
- Smart phone/tablet: *Endress+Hauser Operations App*



A0023555

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# 1 Document information

## 1.1 Document function







These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

## 1.2 Symbols used



### 1.2.1 Safety symbols

Symbol	Meaning
 <small>A0011189-DE</small>	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 <small>A0011190-DE</small>	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 <small>A0011191-DE</small>	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 <small>A0011192-DE</small>	<b>NOTICE!</b> This symbol contains information on procedures and other facts which do not result in personal injury.









### 1.2.2 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	Direct current and alternating current		<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	<b>Protective ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.		<b>Equipotential connection</b> A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

### 1.2.3 Tool symbols

Symbol	Meaning
 A0011221	Allen key
 A0011222	Hexagon wrench


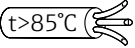
### 1.2.4 Symbols for certain types of information

Symbol	Meaning
 A0011182	<b>Permitted</b> Indicates procedures, processes or actions that are permitted.
 A0011184	<b>Forbidden</b> Indicates procedures, processes or actions that are forbidden.
 A0011193	<b>Tip</b> Indicates additional information.
 A0015482	Reference to documentation
 A0015484	Reference to page
 A0015487	Reference to graphic
1., 2., ...	Series of steps
 A0018343	Result of a sequence of actions
 A0015502	Visual inspection

### 1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3, 4, ...	Item numbers
1., 2., ...	Series of steps
A, B, C, D, ...	Views

### 1.2.6 Symbols at the device

Symbol	Meaning
	<p><b>Safety instructions</b> Observe the safety instructions contained in the associated Operating Instructions.</p>
	<p><b>Connecting cable immunity to temperature change</b> Indicates that the connecting cables have to withstand a temperature of 85°C at least.</p>

### 1.2.7 Registered trademarks

KALREZ<sup>®</sup>, VITON<sup>®</sup>, TEFLON<sup>®</sup>

Registered label of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP<sup>®</sup>

Registered label of Ladish & Co., Inc., Kenosha, USA

HART<sup>®</sup>

Registered trademark of the FieldComm Group, Austin, USA

GORE-TEX<sup>®</sup>

Registered label of W.L. Gore & Associates, Inc., USA

## 2 Basic safety instructions

### 2.1 Requirements concerning the staff

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- Trained, qualified specialists: must have a relevant qualification for this specific function and task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations

- Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- Following the instructions in these Operating Instructions

## 2.2 Designated use

The **Cerabar M** is a pressure transmitter for measuring level and pressure.

### 2.2.1 Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use.

Verification for borderline cases:

For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

## 2.3 Workplace safety

For work on and with the device:

- Wear the required personal protective equipment according to federal/national regulations.
- Switch off the supply voltage before connecting the device.

## 2.4 Operational safety

Risk of injury!

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.
- ▶ Only disassemble the device in pressurless condition!

### Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:

- ▶ If, despite this, modifications are required, consult with Endress+Hauser.

### Repair

To ensure continued operational safety and reliability,

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to repair of an electrical device.
- ▶ Use original spare parts and accessories from Endress+Hauser only.

## 2.5 Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

## 2.6 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which they are safe to operate. It fulfills general safety requirements and legal requirements. It also conforms to the EC directives listed in the device-specific EC declaration of conformity. Endress+Hauser confirms this fact by applying the CE mark.

## 2.7 Functional Safety SIL (optional)

If using devices for applications with safety integrity, the Functional Safety Manual (SD00347P/00/EN) must be observed thoroughly.

# 3 Identification

## 3.1 Product identification

The following options are available for identification of the measuring device:

- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in W@M Device Viewer ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): All information about the measuring device is displayed.

For an overview of the technical documentation provided, enter the serial number from the nameplates in the W@M Device Viewer ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)).

## 3.2 Scope of delivery

The scope of delivery comprises:

- Device
- Optional accessories

Documentation supplied:

- Operating Instruction BA00382P is available on the Internet.  
→ See: [www.endress.com](http://www.endress.com) → Download

- Brief Operating Instruction: KA01030P Cerabar M
- Final inspection report
- Additional Safety Instructions for ATEX, IECEx and NEPSI devices
- Optional: factory calibration form, test certificates

### 3.3 CE mark, Declaration of Conformity

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations as listed in the EC Declaration of Conformity and thus comply with the statutory requirements of the EC Directives. Endress+Hauser confirms the conformity of the device by affixing to it the CE mark.

## 4 Installation

### 4.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

### 4.2 Storage and transport

#### 4.2.1 Storage

The device must be stored in a dry, clean area and protected against damage from impact (EN 837-2).

Storage temperature range:

See Technical Information for Cerabar M TI00436P.

#### 4.2.2 Transport

##### **WARNING**

##### **Incorrect transportation**

Housing, diaphragm and capillaries may become damaged, and there is a risk of injury!

- ▶ Transport the measuring device to the measuring point in its original packaging or by the process connection.
- ▶ Follow the safety instructions and transport conditions for devices weighing more than 18 kg (39.6 lbs).
- ▶ Do not use capillaries as a carrying aid for the diaphragm seals.

## 4.3 Installation conditions

### 4.3.1 Dimensions

→ For dimensions, please refer to the Technical Information for Cerabar M TI00436P, "Mechanical construction" section.

## 4.4 General installation instructions

- Devices with a G 1 1/2 thread:  
When screwing the device into the tank, the flat seal has to be positioned on the sealing surface of the process connection. To avoid additional strain on the process isolating diaphragm, the thread should never be sealed with hemp or similar materials.
- Devices with NPT threads:
  - Wrap Teflon tape around the thread to seal it.
  - Tighten the device at the hexagonal bolt only. Do not turn at the housing.
  - Do not overtighten the thread when screwing. Max. torque: 20 to 30 Nm (14.75 to 22.13 lbf ft)

### 4.4.1 Mounting sensor modules with PVDF thread

#### **⚠ WARNING**

#### **Risk of damage to process connection!**

Risk of injury!

- ▶ Sensor modules with PVDF process connections with threaded connection must be installed with the mounting bracket provided!





#### **⚠ WARNING**

#### **Material fatigue from pressure and temperature!**

Risk of injury if parts burst! The thread can become loose if exposed to high pressure and temperatures.

- ▶ The integrity of the thread must be checked regularly and the thread may need to be re-tightened with the maximum tightening torque of 7 Nm (5.16 lbf ft). Teflon tape is recommended for sealing the 1/2" NPT thread.

## 4.5 Installing

- Due to the orientation of the Cerabar M, there may be a shift in the zero point, i.e. when the container is empty or partially full, the measured value does not display zero. You can correct this zero point shift →  24, Section "Function of the operating elements" or →  36, Section 8.4 "Position zero adjustment".
- For PMP55, please refer to Section 4.5.2 "Installation instructions for devices with diaphragm seals – PMP55", →  12.
- Endress+Hauser offers a mounting bracket for installing on pipes or walls.  
→  13, Section 4.5.5 "Wall and pipe mounting (optional)".

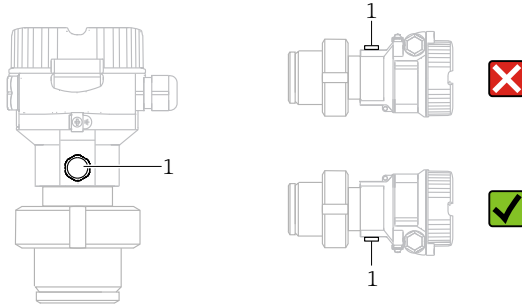
#### 4.5.1 Installation instructions for devices without diaphragm seals – PMP51, PMC51

##### NOTICE

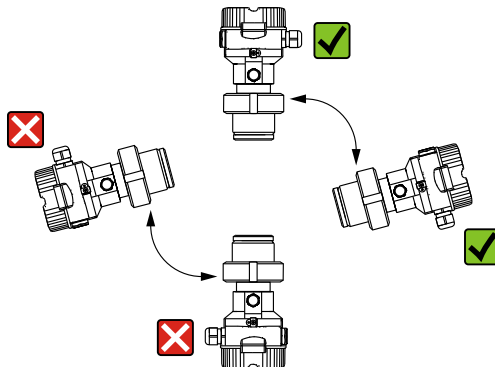
##### Damage to the device!

If a heated Cerabar M is cooled during the cleaning process (e.g. by cold water), a vacuum develops for a short time, whereby moisture can penetrate the sensor through the pressure compensation (1).

- If this is the case, mount the Cerabar M with the pressure compensation (1) pointing downwards.



- Keep the pressure compensation and GORE-TEX® filter (1) free from contamination.
- Cerabar M transmitters without diaphragm seals are mounted as per the norms for a manometer (DIN EN 837-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.
- Do not clean or touch process isolating diaphragms with hard or pointed objects.
- The device must be installed as follows in order to comply with the cleanability requirements of the ASME-BPE (Part SD Cleanability):



### Pressure measurement in gases

Mount the Cerabar M with the shutoff device above the tapping point so that any condensate can flow into the process.

### Pressure measurement in steams

- Mount Cerabar M with siphon above the tapping point.
- Fill the siphon with liquid before commissioning.  
The siphon reduces the temperature to almost the ambient temperature.

### Pressure measurement in liquids

- Mount Cerabar M with shutoff device below or at the same level as the tapping point.

### Level measurement

- Always install the Cerabar M below the lowest measuring point.
- Do not mount the device in the filling curtain or at a point in the tank which could be affected by pressure pulses from an agitator.
- Do not mount the device in the suction area of a pump.
- The calibration and functional test can be carried out more easily if you mount the device downstream of a shutoff device.

#### 4.5.2 Installation instructions for devices with diaphragm seals – PMP55

- Cerabar M devices with diaphragm seals are screwed in, flanged or clamped, depending on the type of diaphragm seal.
- Please note that the hydrostatic pressure of the liquid columns in the capillaries can cause zero point shift. The zero point shift can be corrected.
- Do not clean or touch the process isolating diaphragm of the diaphragm seal with hard or pointed objects.
- Do not remove process isolating diaphragm protection until shortly before installation.

#### NOTICE

##### Improper handling!

Damage to the device!

- ▶ A diaphragm seal and the pressure transmitter together form a closed, oil-filled calibrated system. The fill fluid hole is sealed and may not be opened.
- ▶ When using a mounting bracket, sufficient strain relief must be ensured for the capillaries in order to prevent the capillary bending down (bending radius  $\geq 100$  (3.94 in)).
- ▶ Please observe the application limits of the diaphragm seal filling oil as detailed in the Technical Information for Cerabar M TI00436P, "Planning instructions for diaphragm seal systems" section.

**NOTICE**

In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:

- ▶ Vibration-free (in order to avoid additional pressure fluctuations)
- ▶ Not in the vicinity of heating or cooling lines
- ▶ Insulate if the ambient temperature is below or above the reference temperature
- ▶ With a bending radius of  $\geq 100$  mm (3.94 in).
- ▶ Do not use the capillaries as a carrying aid for the diaphragm seals!

**Vacuum application**

See operating instructions.

**Mounting with temperature isolator**

See operating instructions.

**4.5.3 Seal for flange mounting****NOTICE**

**Corrupted measurement results.**

The seal is not allowed to press against the process isolating diaphragm as this could affect the measurement result.

- ▶ Ensure that the seal is not touching the process isolating diaphragm.

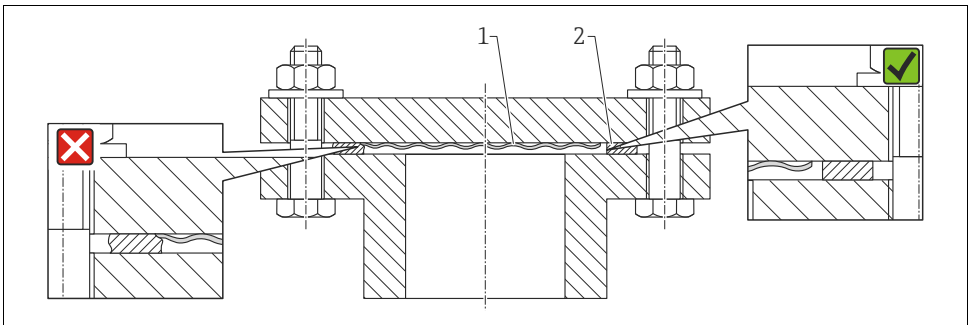


Fig. 1:

- 1 Process isolating diaphragm
- 2 Seal

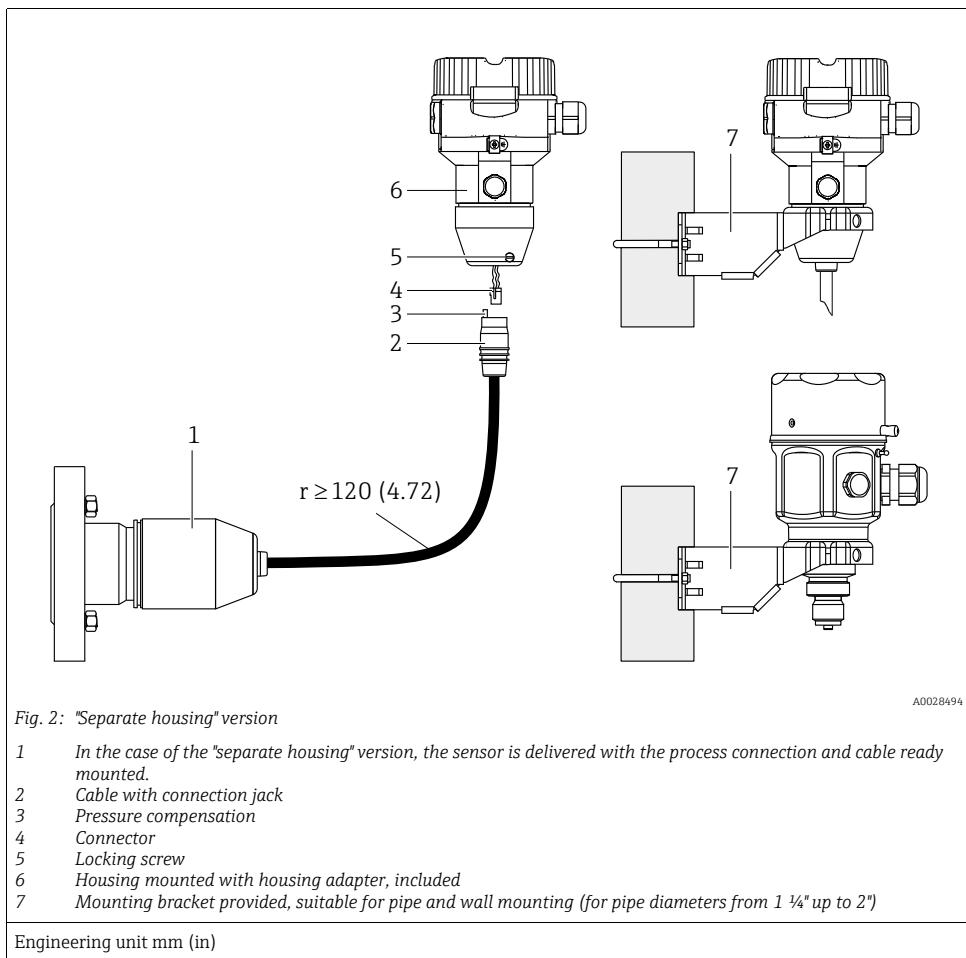
**4.5.4 Thermal insulation – PMP55**

See operating instructions.

**4.5.5 Wall and pipe mounting (optional)**

See operating instructions.

#### 4.5.6 Assembling and mounting the "separate housing" version



#### Assembly and mounting

1. Insert the connector (item 4) into the corresponding connection jack of the cable (item 2).
2. Plug the cable into the housing adapter (item 6).
3. Tighten the locking screw (item 5).
4. Mount the housing on a wall or pipe using the mounting bracket (item 7).  
 When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbs ft).  
 Mount the cable with a bending radius ( $r$ )  $\geq 120$  mm (4.72 in).

## Routing the cable (e.g. through a pipe)

You require the cable shortening kit.

Order number: 71093286

For details on mounting, see SD00553P/00/A6.

### 4.5.7 PMP51, version prepared for diaphragm seal mount – welding recommendation

See operating instructions.

## 4.6 Mounting of the profile seal for universal process mounting adapter

For details on mounting, see KA00096F/00/A3.

## 4.7 Closing the housing cover

### NOTICE

#### Devices with EPDM cover seal - transmitter leakiness!

Mineral-based, animal-based or vegetable-based lubricants cause the EPDM cover seal to swell and the transmitter to become leaky.

- ▶ The thread is coated at the factory and therefore does not require any lubrication.

### NOTICE

#### The housing cover can no longer be closed.

Damaged thread!

- ▶ When closing the housing cover, please ensure that the thread of the cover and housing are free from dirt, e.g. sand. If you feel any resistance when closing the cover, check the thread on both again to ensure that they are free from dirt.

### 4.7.1 Closing the cover on the stainless steel housing

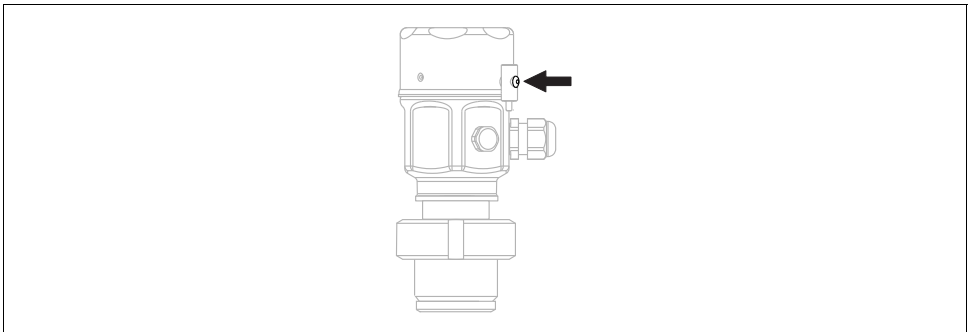


Fig. 3: Closing the cover

A0028497

The cover for the electronics compartment is tightened by hand at the housing until the stop. The screw serves as DustEx protection (only available for devices with DustEx approval).

## 4.8 Post-installation check

0	Is the device undamaged (visual inspection)?
0	Does the device comply with the measuring point specifications? For example: <ul style="list-style-type: none"> <li>▪ Process temperature</li> <li>▪ Process pressure</li> <li>▪ Ambient temperature range</li> <li>▪ Measuring range</li> </ul>
0	Are the measuring point identification and labeling correct (visual inspection)?
0	Is the device adequately protected against precipitation and direct sunlight?
0	Are the securing screw and securing clamp tightened securely?

# 5 Electrical connection

## 5.1 Connecting the device

### **⚠ WARNING**

#### **Supply voltage might be connected!**

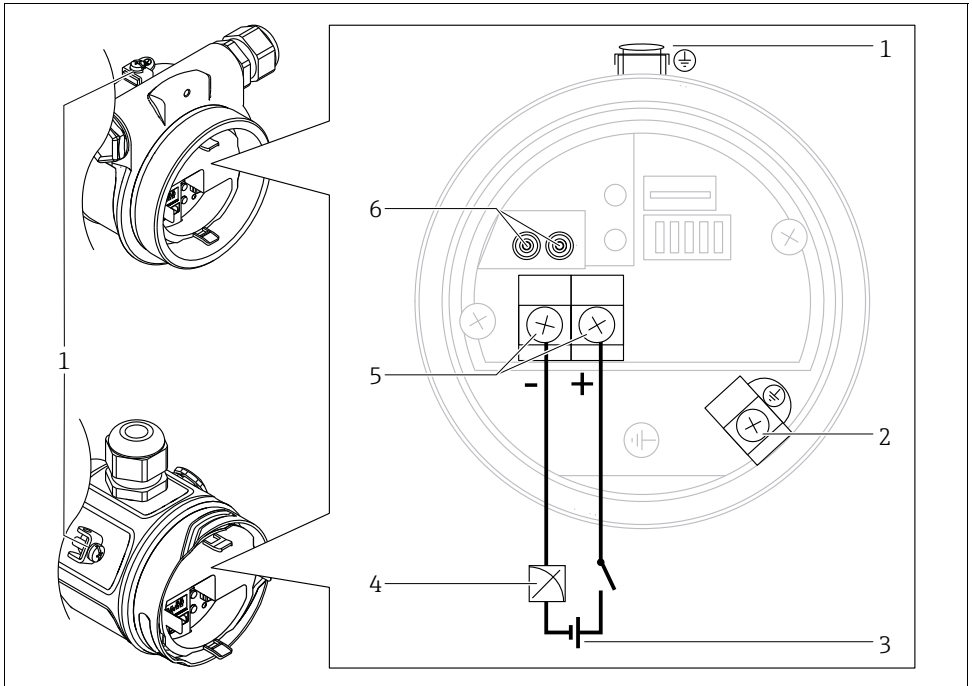
Risk of electric shock and/or explosion!

- ▶ Ensure that no uncontrolled processes are activated in the system.
- ▶ Switch off the supply voltage before connecting the device.
- ▶ When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- ▶ A suitable circuit breaker must be provided for the device in accordance with IEC/EN61010.
- ▶ Devices with integrated overvoltage protection must be grounded.
- ▶ Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.

Connect the device in the following order:

1. Check that the supply voltage corresponds to the supply voltage indicated on the nameplate.
2. Switch off the supply voltage before connecting the device.
3. Remove housing cover.
4. Guide the cable through the gland. Preferably use a twisted, shielded two-wire cable.

5. Connect the device in accordance with the following diagram.
6. Screw down the housing cover.
7. Switch on the supply voltage.



Electrical connection 4...20 mA HART

A0028498

- 1 External ground terminal
- 2 Grounding terminal
- 3 Supply voltage: 11,5 ... 45 VDC (versions with plug connectors: 35 V DC)
- 4 4 to 20 mA
- 5 Terminals for supply voltage and signal
- 6 Test terminals

### 5.1.1 Connecting devices with a Harting connector Han7D

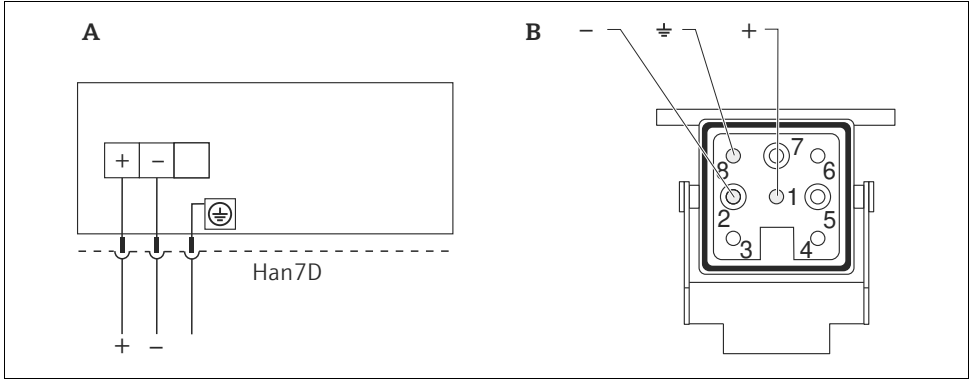


Fig. 4:

- A Electrical connection for devices with Harting plug Han7D
- B View of the connection on the device

Material: CuZn, gold-plated contacts of plug-in jack and connector

### 5.1.2 Connecting devices with an M12 connector

#### PIN assignment for M12 connector

PIN assignment for M12 connector	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal -
	4	Earth

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### 5.1.3 Devices with valve connector

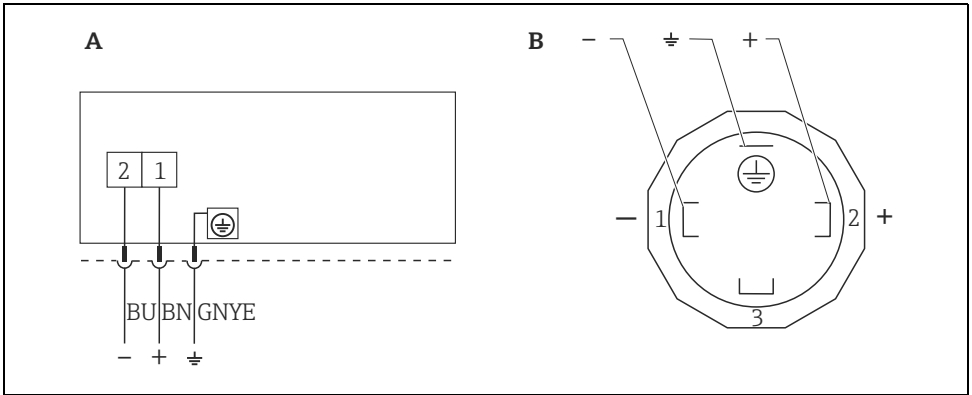


Fig. 5: BN = brown, BU = blue, GNYE = green/yellow

- A Electrical connection for devices with valve connector
- B View of the connection on the device

Material: PA 6.6

## 5.2 Connecting the measuring unit

### 5.2.1 Supply voltage

Electronic version	
4 to 20 mA HART, for non-hazardous areas	11.5 to 45 V DC (versions with plug-in connector 35 V DC)

### Taking 4 to 20 mA test signal

A 4 to 20 mA test signal may be measured via the test terminals without interrupting the measurement. To keep the corresponding measured error below 0.1%, the current measuring device should exhibit an internal resistance of < 0.7 Ω.

### 5.2.2 Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm<sup>2</sup> (20 to 12 AWG)

### 5.2.3 Cable specification

- Endress+Hauser recommends using twisted, shielded two-wire cables.

- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in) depends on the used cable gland (see technical information)

### 5.2.4 Load

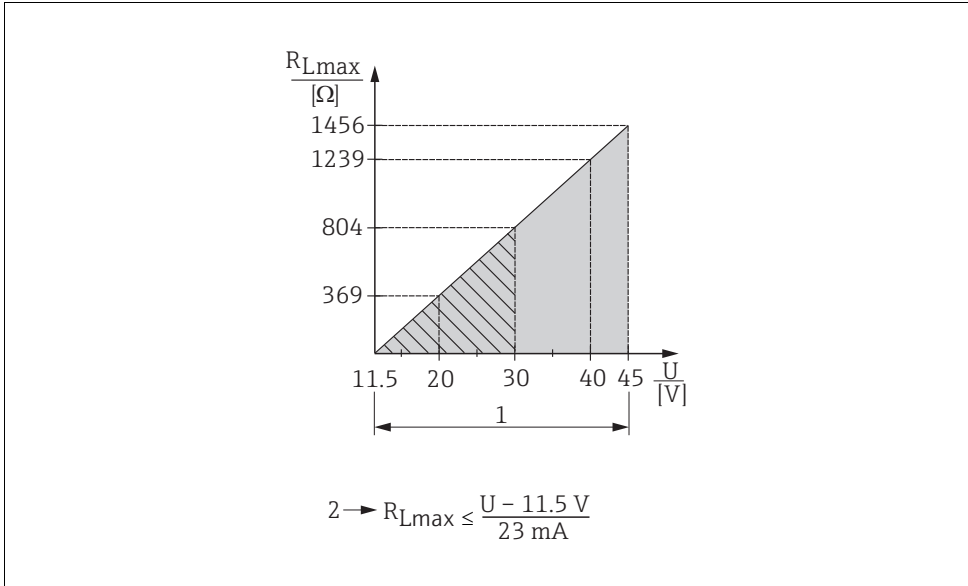


Fig. 6: Load diagram

- 1 Supply voltage 11.5 to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified device versions
- 2  $R_{Lmax}$  Maximum load resistance
- U Supply voltage



When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250  $\Omega$  must be taken into account.

### 5.2.5 Shielding/potential equalization

- A normal device cable suffices if only the analog signal is used. A shielded cable is recommended if using the HART protocol. Observe grounding concept of the plant.
- When using in hazardous areas, you must observe the applicable regulations. Separate Ex documentation with additional technical data and instructions is included with all Ex systems as standard. Connect all devices to the local potential equalization.

### 5.2.6 Connecting Field Xpert SFX100

See operating instructions.

### 5.2.7 Connecting Commubox FXA195

See operating instructions.

## 5.3 Overvoltage protection (optional)

See operating instructions.

## 5.4 Post-connection check

Perform the following checks after completing electrical installation of the device:

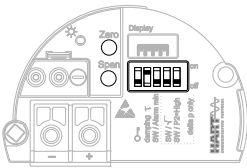
- Does the supply voltage match the specifications on the nameplate?
- Is the device properly connected?
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

As soon as voltage is applied to the device, the green LED on the electronic insert lights up for a few seconds or the connected local display lights up.


# 6 Operation

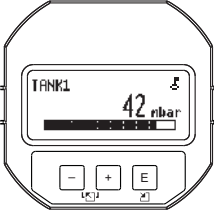

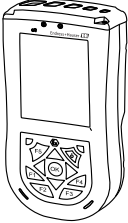

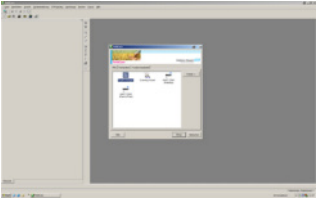

## 6.1 Operating options

### 6.1.1 Operation without operating menu

Operating options	Explanation	Graphic illustration	Description
Local operation without device display	The device is operated using the operating keys and DIP switches on the electronic insert.		→ 23

### 6.1.2 Operation with operating menu

Operation with an operating menu is based on an operation concept with "user roles" →  25.

Operating options	Explanation	Graphic illustration	Description
Local operation with device display	The device is operated using the operating keys on the device display.		→  27
Remote operation via HART handheld terminal	The device is operated using the HART handheld terminal (e.g. SFX100).		→  31
Remote operation via FieldCare	The device is operated using the FieldCare operating tool.		→  31

## 6.2 Operation without operating menu

### 6.2.1 Position of operating elements

The operating keys and DIP switches are located on the electronic insert in the device.

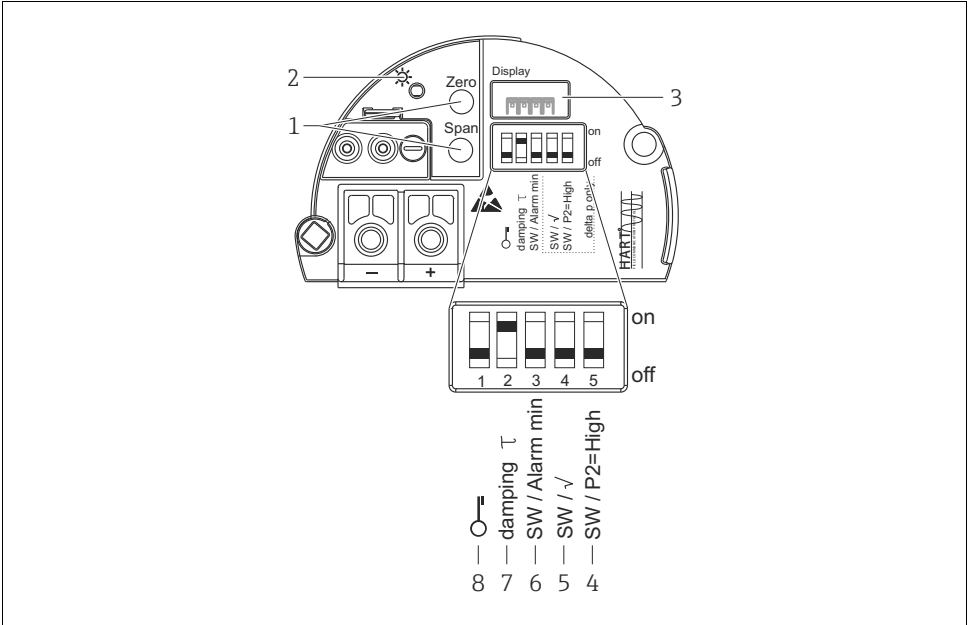


Fig. 7: HART electronic insert

A0023125

- 1 Operating keys for lower range value (zero) and upper range value (span)
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4+5 DIP switch only for Deltabar M
- 6 DIP switch for alarm current SW / Alarm Min (3.6 mA)
- 7 DIP switch for switching damping on/off
- 8 DIP switch for locking/unlocking parameters relevant to the measured value



### Function of the DIP switches

Switches	Symbol/ labeling	Switch position	
		"off"	"on"
1		The device is unlocked. Parameters relevant to the measured value can be modified.	The device is locked. Parameters relevant to the measured value cannot be modified.

Switches	Symbol/ labeling	Switch position	
		"off"	"on"
2	damping $\tau$	Damping is switched off. The output signal follows measured value changes without any delay.	Damping is switched on. The output signal follows measured value changes with the delay time $\tau$ . <sup>1)</sup>
3	SW/Alarm min	The alarm current is defined by the setting in the operating menu. ("Setup" -> "Extended setup" -> "Curr. output" -> "Output fail mode")	The alarm current is 3.6 mA regardless of the setting in the operating menu.
The following switches only for Deltabar M:			
4			
5			

- 1) The value for the delay time can be configured via the operating menu ("Setup" -> "Damping").  
Factory setting:  $\tau = 2$  s or as per order specifications.

### Function of the operating elements

Operating key(s)	Meaning
"Zero" pressed for at least 3 seconds	<p><b>Get LRV</b></p> <ul style="list-style-type: none"> <li>▪ <b>"Pressure" measuring mode</b> The pressure present is accepted as the lower range value (LRV).</li> <li>▪ <b>"Level" measuring mode, "In pressure" level selection, "Wet" calibration mode</b> The pressure present is assigned to the lower level value ("Empty calibration").</li> </ul>  <p>No function is assigned to the key if level selection = "In height" and/or calibration mode = "Dry"</p>
"Span" pressed for at least 3 seconds	<p><b>Get URV</b></p> <ul style="list-style-type: none"> <li>▪ <b>"Pressure" measuring mode</b> The pressure present is accepted as the upper range value (URV).</li> <li>▪ <b>"Level" measuring mode, "In pressure" level selection, "Wet" calibration mode</b> The pressure present is assigned to the upper level value ("Full calibration").</li> </ul>  <p>No function is assigned to the key if level selection = "In height" and/or calibration mode = "Dry"</p>
"Zero" and "Span" pressed simultaneously for at least 3 seconds	<p><b>Position adjustment</b></p> <p>The sensor characteristic curve is shifted such that the pressure present becomes the zero value.</p>
"Zero" and "Span" pressed simultaneously for at least 12 seconds	<p><b>Reset</b></p> <p>All parameters are reset to the order configuration.</p>

## 6.2.2 Locking/unlocking operation

Once you have entered all the parameters, you can lock your entries against unauthorized and undesired access.



If operation is locked by means of the DIP switch, you can only unlock operation again by means of the DIP switch. If operation is locked by means of the operating menu, you can only unlock operation again using the operating menu.

### Locking/unlocking via DIP switches

DIP switch 1 on the electronic insert is used to lock/unlock operation.

→ 23, "Function of the DIP switches".

## 6.3 Operation with an operating menu

### 6.3.1 Operation concept

The operation concept makes a distinction between the following user roles:

User role	Meaning
Operator	Operators are responsible for the devices during normal "operation". This is usually limited to reading process values either directly at the device or in a control room. If the work with the devices extends beyond value read-off tasks, the tasks involve simple, application-specific functions that are used in operation. Should an error occur, these users simply forward the information on the errors but do not intervene themselves.
Service engineer/technician	Service engineers usually work with the devices in the phases following device commissioning. They are primarily involved in maintenance and troubleshooting activities for which simple settings have to be made at the device. Technicians work with the devices over the entire life cycle of the product. Thus, commissioning and advanced settings and configurations are some of the tasks they have to carry out.
Expert	Experts work with the devices over the entire product life cycle, but their device requirements are often extremely high. Individual parameters/functions from the overall functionality of the devices are required for this purpose time and again. In addition to technical, process-oriented tasks, experts can also perform administrative tasks (e.g. user administration). "Experts" can avail of the entire parameter set.

### 6.3.2 Structure of the operating menu

User role	Submenu	Meaning/use
Operator	Language	Only consists of the "Language" parameter (000) where the operating language for the device is specified. The language can always be changed even if the device is locked.

User role	Submenu	Meaning/use
Operator	Display/operat.	Contains parameters that are needed to configure the measured value display (selecting the values displayed, display format, display contrast, etc.). With this submenu, users can change the measured value display without affecting the actual measurement.
Service engineer/technician	Setup	Contains all the parameters that are needed to commission measuring operations. This submenu has the following structure: <ul style="list-style-type: none"> <li>▪ <b>Standard setup parameters</b> A wide range of parameters, which can be used to configure a typical application, is available at the start. The measuring mode selected determines which parameters are available. After making settings for all these parameters, the measuring operation should be completely configured in the majority of cases.</li> <li>▪ <b>"Extended setup" submenu</b> The "Setup" submenu contains additional parameters for more in-depth configuration of the measurement operation to convert the measured value and to scale the output signal. This menu is split into additional submenus depending on the measuring mode selected.</li> </ul>
Service engineer/technician	Diagnosis	Contains all the parameters that are needed to detect and analyze operating errors. This submenu has the following structure: <ul style="list-style-type: none"> <li>▪ <b>Diagnostic list</b> Contains up to 10 error messages currently pending.</li> <li>▪ <b>Event logbook</b> Contains the last 10 error messages (no longer pending).</li> <li>▪ <b>Instrument info</b> Contains information on the device identification.</li> <li>▪ <b>Measured values</b> Contains all the current measured values</li> <li>▪ <b>Simulation</b> Is used to simulate pressure, level, current and alarm/warning.</li> <li>▪ <b>Reset</b></li> </ul>
Expert	Expert	Contains all the parameters of the device (including those in one of the submenus). The "Expert" submenu is structured by the function blocks of the device. It thus contains the following submenus: <ul style="list-style-type: none"> <li>▪ <b>System</b> Contains all the device parameters that neither affect measurement nor integration into a distributed control system.</li> <li>▪ <b>Measurement</b> Contains all the parameters for configuring the measurement.</li> <li>▪ <b>Output</b> Contains all the parameters for configuring the current output.</li> <li>▪ <b>Communication</b> Contains all the parameters for configuring the HART interface.</li> <li>▪ <b>Application</b> Contains all the parameters for configuring the functions that go beyond the actual measurement (e.g. totalizer).</li> <li>▪ <b>Diagnosis</b> Contains all the parameters that are needed to detect and analyze operating errors.</li> </ul>



For an overview of the entire operating menu: see operating instructions.

### Direct access to parameters

The parameters can only be accessed directly via the "Expert" user role.

Parameter name	Description
<b>Direct access (119)</b> Entry  Menu path: Expert → Direct access	Enter the direct access code to go directly to a parameter.  <b>Options:</b> <ul style="list-style-type: none"> <li>▪ Enter the desired parameter code.</li> </ul> <b>Factory setting:</b> 0  <b>Note:</b> For direct access, it is not necessary to enter leading zeros.

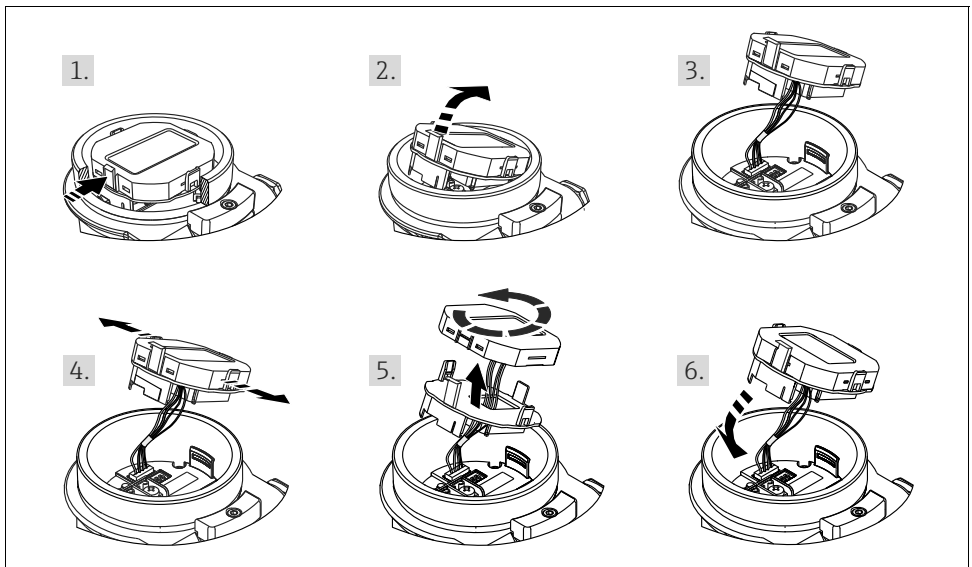
### 6.3.3 Operation with a device display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog texts, fault messages and notice messages.

For easy operation the display can be taken out of the housing (see figure steps 1 to 3). It is connected to the device through a 90 mm (3.54 in) cable.

The display of the device can be turned in 90° stages (see figure steps 4 to 6).

Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.



A0028500

Functions:

- 8-digit measured value display including sign and decimal point, bargraph for 4 to 20 mA HART as current display
- Three keys for operation
- Simple and complete menu guidance as parameters are split into several levels and groups
- Each parameter is given a 3-digit parameter code for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature etc.
- Comprehensive diagnostic functions (fault and warning message etc.)

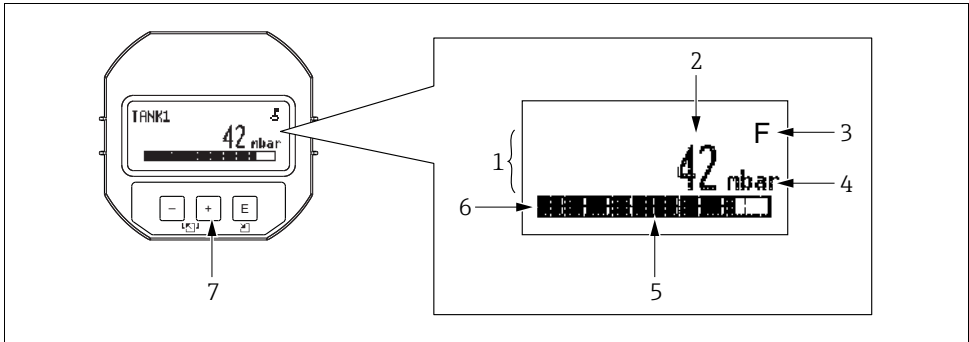


Fig. 8: Display

A0030013

- 1 Main line
- 2 Value
- 3 Symbol
- 4 Unit
- 5 Bar graph
- 6 Information line
- 7 Operating keys

The following table illustrates the symbols that can appear on the local display. Four symbols can occur at one time.

Symbol	Meaning
	<b>Lock symbol</b> The operation of the device is locked. To unlock the device, → 31, Locking/unlocking operation.
	<b>Communication symbol</b> Data transfer via communication

Symbol	Meaning
<b>S</b>	<b>Error message "Out of specification"</b> The device is being operated outside its technical specifications (e.g. during warmup or cleaning processes).
<b>C</b>	<b>Error message "Service mode"</b> The device is in the service mode (during a simulation, for example).
<b>M</b>	<b>Error message "Maintenance required"</b> Maintenance is required. The measured value remains valid.
<b>F</b>	<b>Error message "Failure detected"</b> An operating error has occurred. The measured value is no longer valid.

### Operating keys on the display and operating module

Operating key(s)	Meaning
+	<ul style="list-style-type: none"> <li>- Navigate downwards in the picklist</li> <li>- Edit the numerical values and characters within a function</li> </ul>
-	<ul style="list-style-type: none"> <li>- Navigate upwards in the picklist</li> <li>- Edit the numerical values and characters within a function</li> </ul>
E	<ul style="list-style-type: none"> <li>- Confirm entry</li> <li>- Jump to the next item</li> <li>- Selection of a menu item and activation of the editing mode</li> </ul>
+ and E	Contrast setting of local display: darker
- and E	Contrast setting of local display: brighter
+ and -	ESC functions: <ul style="list-style-type: none"> <li>- Exit the edit mode for a parameter without saving the changed value.</li> <li>- You are in a menu at a selection level. Each time you press the keys simultaneously, you go up a level in the menu.</li> </ul>


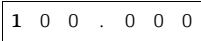
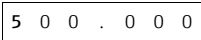
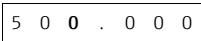
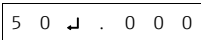
### Operating example: Parameters with a picklist

Example: selecting "Deutsch" as the language of the menu.

	Language	000	Operation
1	✓ English  Deutsch		"English" is set as the menu language (default value). A ✓ in front of the menu text indicates the active option.
2	Deutsch  ✓ English		Select "Deutsch" with $\leftarrow$ or $\rightarrow$ .
3	✓ Deutsch  English		1. Confirm your choice with $\leftarrow$ . A ✓ in front of the menu text indicates the active option ("Deutsch" is now selected as the menu language). 2. Exit the edit mode for the parameter with $\leftarrow$ .

**Operating example: User-definable parameters**

Example: setting "Set URV" parameter from 100 mbar (1.5 psi) to 50 mbar (0.75 psi).

	Set URV	014	Operation
1		mbar	The local display shows the parameter to be changed. The value highlighted in black can be changed. The "mbar" unit is specified in another parameter and cannot be modified here.
2		mbar	1. Press $\leftarrow$ or $\rightarrow$ to get to the editing mode. 2. The first digit is highlighted in black.
3		mbar	1. Use $\leftarrow$ to change "1" to "5". 2. Confirm "5" with $\leftarrow$ . The cursor jumps to the next position (highlighted in black). 3. Confirm "0" with $\leftarrow$ (second position).
4		mbar	The third position is highlighted in black and can now be edited.
5		mbar	1. Switch to the "." symbol with the $\leftarrow$ key. 2. Use $\leftarrow$ to save the new value and exit the editing mode. → See next graphic.

	Set URV	014	Operation
6	<input type="text" value="5 0 . 0 0 0"/>	mbar	<p>The new value for the upper range value is 50.0 mbar (0.75 psi).</p> <ul style="list-style-type: none"> <li>- You exit the edit mode for the parameter with <input type="button" value="E"/>.</li> <li>- You can get back to the editing mode with <input type="button" value="F"/> or <input type="button" value="B"/>.</li> </ul>

### Operating example: Accepting the pressure present

Example: setting position adjustment

	Pos. zero adjust	007	Operation
1	<input checked="" type="checkbox"/> Abort  Confirm		The pressure for position adjustment is present at the device.
2	Confirm  <input checked="" type="checkbox"/> Abort		Use <input type="button" value="F"/> or <input type="button" value="B"/> to switch to the "Confirm" option. The active option is highlighted in black.
3	Compensation accepted!		Accept the pressure present as position adjustment with the <input type="button" value="E"/> key. The device confirms the adjustment and goes back to the "Pos. zero adjust" parameter.
4	<input checked="" type="checkbox"/> Abort  Confirm		Exit the edit mode for the parameter with <input type="button" value="E"/> .

#### 6.3.4 Operation via SFX100

See operating instructions.

#### 6.3.5 Operation via FieldCare

See operating instructions.

#### 6.3.6 Locking/unlocking operation

See operating instructions.

#### 6.3.7 Resetting to factory settings (reset)

See operating instructions.

## 7 Integrating transmitter using HART® protocol

See operating instructions.

## 8 Commissioning

The device is configured at the factory for the Pressure measuring mode. The measuring range and the unit in which the measured value is transmitted correspond to the specifications on the nameplate.

### **⚠ WARNING**

#### **Exceeding the maximum allowable working pressure!**

Risk of injury due to bursting of parts! Warning messages are generated if pressure is too high.

- ▶ If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior" (050) parameter):

"S140 Working range P" or "F140 Working range P"

"S841 Sensor range" or "F841 Sensor range"

"S971 Adjustment"

Use the device only within the sensor range limits.

### **NOTICE**

#### **Shortfall of the allowable working pressure!**

Output of messages if pressure is too low.

- ▶ If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior" (050) parameter):

"S140 Working range P" or "F140 Working range P"

"S841 Sensor range" or "F841 Sensor range"

"S971 Adjustment"

Use the device only within the sensor range limits.

### 8.1 Function check


Carry out a post-installation and a post-connection check as per the checklist before commissioning the device.

- "Post-installation check" checklist → Chap. 4.8
- "Post-connection check" checklist → Chap. 5.4



## 8.2 Commissioning without an operating menu

### 8.2.1 Pressure measuring mode

If no local display is connected, the following functions are possible by means of the keys on the electronic insert:

- Position adjustment (zero point correction)
- Setting lower range value and upper range value
- Device reset →  24



- Operation must be unlocked. →  31, "Locking/unlocking operation"
- The device is configured for the "Pressure" measuring mode as standard. You can switch measuring modes by means of the "Measuring mode" parameter. →  36, "Measuring mode selection"
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.


#### **WARNING**

#### Changing the measuring mode affects the span (URV)!

This situation can result in product overflow.


- ▶ If the measuring mode is changed, the span setting (URV) must be verified and, if necessary, reconfigured!

Carrying out position adjustment. <sup>1)</sup>		Setting lower range value.		Setting upper range value.	
Pressure is present at device.		Desired pressure for lower range value is present at device.		Desired pressure for upper range value is present at device.	
↓		↓		↓	
Press the "Zero" and "Span" keys simultaneously for at least 3 s.		Press the "Zero" key for at least 3 s.		Press the "Span" key for at least 3 s.	
↓		↓		↓	
Does the LED on the electronic insert light up briefly?		Does the LED on the electronic insert light up briefly?		Does the LED on the electronic insert light up briefly?	
Yes	No	Yes	No	Yes	No
↓	↓	↓	↓	↓	↓
Applied pressure for position adjustment has been accepted.	Applied pressure for position adjustment has not been accepted. Observe the input limits.	Applied pressure for lower range value has been accepted.	Applied pressure for lower range value has not been accepted. Observe the input limits.	Applied pressure for upper range value has been accepted.	Applied pressure for upper range value has not been accepted. Observe the input limits.

1) Observe warning on commissioning (→  32)

## 8.2.2 Level measuring mode

The following functions are possible by means of the keys on the electronic insert:


- Position adjustment (zero point correction)
- Setting the lower and upper pressure value and assigning to the lower and upper level value
- Device reset →  24




- The "Zero" and "Span" keys only have a function with the following setting:

- "Level selection" = "In pressure", "Calibration mode" = "Wet"

The keys have no function in other settings.

- The device is configured for the "Pressure" measuring mode as standard. You can switch measuring modes by means of the "Measuring mode" parameter. →  36, "Measuring mode selection"

The following parameters are set to the following values at the factory:

- "Level selection" = "In pressure"
- "Calibration mode": wet
- "Unit before lin": %
- "Empty calib.": 0.0
- "Full calib.": 100.0
- "Set LRV": 0.0 (corresponds to 4 mA value)
- "Set URV": 100.0 (corresponds to 20 mA value)
- Operation must be unlocked. →  31, "Locking/unlocking operation".
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

### WARNING


#### Changing the measuring mode affects the span (URV)!

This situation can result in product overflow.

- ▶ If the measuring mode is changed, the span setting (URV) must be verified and, if necessary, reconfigured!






Carrying out position adjustment. <sup>1)</sup>	Setting lower pressure value.	Setting upper pressure value.
Pressure is present at device.	Desired pressure for lower pressure value ("empty pressure") is present at device.	Desired pressure for upper pressure value ("full pressure") is present at device.
↓	↓	↓
Press the "Zero" and "Span" keys simultaneously for at least 3 s.	Press the "Zero" key for at least 3 s.	Press the "Span" key for at least 3 s.
↓	↓	↓
Does the LED on the electronic insert light up briefly?	Does the LED on the electronic insert light up briefly?	Does the LED on the electronic insert light up briefly?

Carrying out position adjustment. <sup>1)</sup>		Setting lower pressure value.		Setting upper pressure value.	
Yes	No	Yes	No	Yes	No
↓	↓	↓	↓	↓	↓
Applied pressure for position adjustment has been accepted.	Applied pressure for position adjustment has not been accepted. Observe the input limits.	The pressure present was saved as the lower pressure value ("empty pressure") and assigned to the lower level value ("empty calibration").	The pressure present was not saved as the lower pressure value. Observe the input limits.	The pressure present was saved as the upper pressure value ("full pressure") and assigned to the upper level value ("full calibration").	The pressure present was not saved as the upper pressure value. Observe the input limits.

1) Observe warning on commissioning (→  32)

## 8.3 Commissioning with an operating menu

Commissioning comprises the following steps:

1. Function check (→  32)
2. Selecting the language, measuring mode and pressure unit (→  35)
3. Position adjustment (→  36)
4. Configuring measurement:
  - Pressure measurement (→  49 ff)
  - Level measurement (→  37 ff)

### 8.3.1 Selecting the language, measuring mode and pressure unit

#### Language selection

Parameter name	Description
<b>Language (000)</b> Selection  Menu path: Main menu → Language	Select the menu language for the local display.  <b>Options:</b> <ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Another language (as selected when ordering the device)</li> <li>▪ Possibly a third language (language of the manufacturing plant)</li> </ul> <b>Factory setting:</b> English

## Measuring mode selection


Parameter name	Description
<b>Measuring mode (005)</b> Selection  Menu path: Setup → Measuring mode	Select the measuring mode. The operating menu is structured differently depending on the measuring mode selected.  <div style="background-color: #ffcc00; padding: 2px; display: inline-block;"><b>⚠ WARNING</b></div> <b>Changing the measuring mode affects the span (URV)!</b> This situation can result in product overflow. ► If the measuring mode is changed, the span setting (URV) must be verified and, if necessary, reconfigured!  <b>Options:</b> <ul style="list-style-type: none"> <li>▪ Pressure</li> <li>▪ Level</li> </ul> <b>Factory setting:</b> Pressure

## Pressure unit selection

Parameter name	Description
<b>Press. eng. unit (125)</b> Selection  Menu path: Setup → Press. eng. unit	Select the pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit.  <b>Options:</b> <ul style="list-style-type: none"> <li>▪ mbar, bar</li> <li>▪ mmH2O, mH2O, inH2O</li> <li>▪ ftH2O</li> <li>▪ Pa, kPa, MPa</li> <li>▪ psi</li> <li>▪ mmHg, inHg</li> <li>▪ kgf/cm<sup>2</sup></li> </ul> <b>Factory setting:</b> mbar or bar depending on the sensor nominal measuring range, or as per order specifications

## 8.4 Position zero adjustment

The pressure resulting from the orientation of the device can be corrected here.

Parameter name	Description
<b>Corrected press. (172)</b> Display  Menu path: Setup → Corrected press.	<div style="text-align: center;"></div> Displays the measured pressure after sensor trim and position adjustment.  If this value is not equal to "0", it can be corrected to "0" by the position adjustment.

Parameter name	Description
<b>Pos. zero adjust (007) (Gauge pressure sensor)</b> Selection  Menu path: Setup → Pos. zero adjust	Position zero adjustment – the pressure difference between zero (set point) and the measured pressure need not be known.  <b>Example:</b> <ul style="list-style-type: none"> <li>- Measured value = 2.2 mbar (0.033 psi)</li> <li>- You correct the measured value via the "Pos. zero adjust" parameter with the "Confirm" option. This means that you assign the value 0.0 to the pressure present.</li> <li>- Measured value (after pos. zero adjust) = 0.0 mbar</li> <li>- The current value is also corrected.</li> </ul> <b>Options</b> <ul style="list-style-type: none"> <li>■ Confirm</li> <li>■ Abort</li> </ul> <b>Factory setting:</b> Abort
<b>Calib. offset (192) / (008) (absolute pressure sensor)</b> Entry	Position adjustment – the pressure difference between set point and the measured pressure must be known.  <b>Example:</b> <ul style="list-style-type: none"> <li>- Measured value = 982.2 mbar (14.73 psi)</li> <li>- You correct the measured value with the value entered (e.g. 2.2 mbar (0.033 psi)) via the "Calib. offset" parameter. This means that you are assigning the value 980.0 (14.7 psi) to the pressure present.</li> <li>- Measured value (after calib. offset) = 980.0 mbar (14.7 psi)</li> <li>- The current value is also corrected.</li> </ul> <b>Factory setting:</b> 0.0

## 8.5 Level measurement

### 8.5.1 Information on level measurement

- The limit values are not checked, i.e. the values entered must be appropriate for the sensor and the measuring task for the device to be able to measure correctly.
- Customer-specific units are not possible.
- There is no unit conversion.
- The values entered for "Empty calib./Full calib.", "Empty pressure/Full pressure", "Empty height/Full height" and "Set LRV/Set URV" must be at least 1% apart. The value will be rejected, and a warning message displayed, if the values are too close together.

You have a choice of two methods for calculating the level: "In pressure" and "In height". The table in the "Overview of level measurement" section that follows provides you with an overview of these two measuring tasks.

## 8.5.2 Overview of level measurement

Measuring task	Level selection	Measured variable selection	Description	Measured value display
Calibration is performed by entering two pressure-level value pairs.	"In pressure"	Via the "Unit before lin" parameter: %, level, volume or mass units.	<ul style="list-style-type: none"> <li>– Calibration with reference pressure (wet calibration), see → <a href="#">38</a></li> <li>– Calibration without reference pressure (dry calibration), see → <a href="#">40</a></li> </ul>	The measured value display and the "Level before lin" parameter display the measured value.
Calibration is performed by entering the density and two height-level value pairs.	"In height"		<ul style="list-style-type: none"> <li>– Calibration with reference pressure (wet calibration), see → <a href="#">42</a></li> <li>– Calibration without reference pressure (dry calibration), see → <a href="#">45</a></li> </ul>	

### 8.5.3 "In pressure" level selection Calibration with reference pressure (wet calibration)

#### Example:

In this example, the level in a tank should be measured in "m". The maximum level is 3 m (9.8 ft). The pressure range is set to 0 to 300 mbar (4.5 psi).

#### Prerequisite:

- The measured variable is in direct proportion to the pressure.
- The tank can be filled and emptied.



The values entered for "Empty calib./Full calib." and "Set LRV/Set URV" and the pressures present at the device must be at least 1% apart. The value will be rejected, and a warning message displayed, if the values are too close together. Further limit values are not checked, i.e. the values entered must be appropriate for the sensor and the measuring task for the measuring device to be able to measure correctly.

	Description
1	Perform "position adjustment". → <a href="#">36</a>
2	Select the "Level" measuring mode via the "Measuring mode (005)" parameter. Menu path: Setup → Measuring mode
3	Select the "In pressure" level mode via the "Level selection" parameter. Menu path: Setup → Extended setup → Level → Level selection.

Description	
4	Select a pressure unit via the "Press eng. unit" parameter, here "mbar" for example. Menu path: Setup → Press. eng. unit
5	Select a level unit via the "Unit before lin" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → Unit before lin
6	Select the "Wet" option via the "Calibration mode" parameter. Menu path: Setup → Extended setup → Level → Calibration mode
7	If calibration is performed with a medium other than the process medium, enter the density of the calibration medium in the "Adjust density" parameter. Menu path: Setup → Extended setup → Level → Adjust density
8	The pressure for the lower calibration point is present at the device, here 0 mbar for example.
	Select the "Empty calib." parameter. Menu path: Setup → Extended setup → Level → Empty calib.
	Enter the level value, here 0 m for example. The pressure value present is assigned to the lower level value by confirming the value.
9	The pressure for the upper calibration point is present at the device, here 300 mbar (4.5 psi) for example.
	Select the "Full calib." parameter. Menu path: Setup → Extended setup → Level → Full calib.
	Enter the level value, here 3 m (9.8 ft) for example. The pressure value present is assigned to the upper level value by confirming the value.
10	Set the level value for the lower current value (4 mA) by means of "Set LRV". Menu path: Setup → Extended setup → Current output → Set LRV
11	Set the level value for the upper current value (20 mA) by means of "Set URV". Menu path: Setup → Extended setup → Current output → Set URV
12	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "Process density" parameter.  Menu path: Setup → Extended setup → Level → Process density

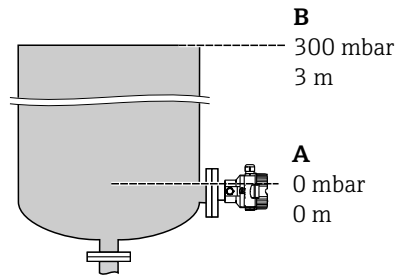
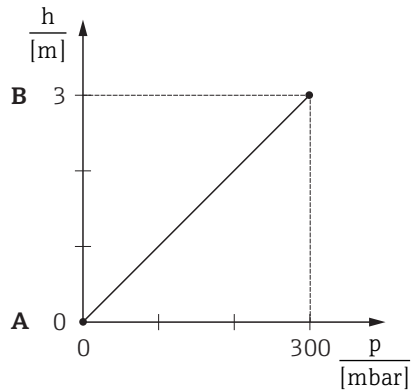


Fig. 9: Calibration with reference pressure - wet calibration

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A See Table, Step 8.  
B See Table, Step 9.



A0017658

Description	
13	<p>Result: The measuring range is set for 0 to 3 m (9.8 ft).</p> <div style="text-align: right;"> <p>The graph shows a linear relationship between current <math>I</math> in mA and height <math>h</math> in m. The y-axis is labeled <math>I</math> [mA] and has a tick mark at 20 labeled 'D'. The x-axis is labeled <math>h</math> [m] and has a tick mark at 3 labeled 'C'. A solid line starts at the origin (0,0) and passes through the point (3, 20). Dashed lines connect the point (3, 20) to the axes.</p> </div> <p><i>Fig. 10: Calibration with reference pressure – wet calibration</i></p> <p>A See Table, Step 8.            B See Table, Step 9.            C See Table, Step 10.            D See Table, Step 11.</p>



The measured variables %, level, volume and mass are available for this level mode. See operating instructions "Unit before lin (025)".

**8.5.4 "In pressure" level selection**  
**Calibration without reference pressure (dry calibration)**

**Example:**

In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 US gal) corresponds to a pressure of 450 mbar (6.75 psi). The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.75 psi) since the device is mounted below the start of the level measuring range.

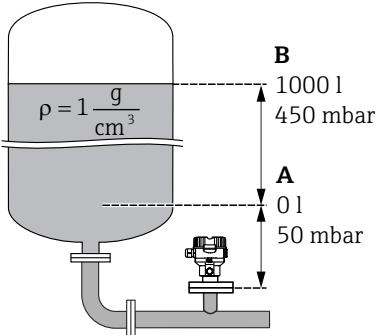
**Prerequisite:**

- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the pressure and volume values for the lower and upper calibration point must be known.



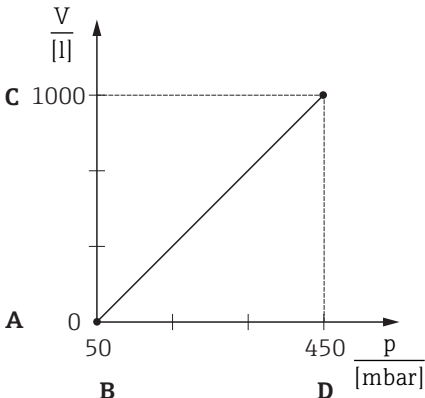
- The values entered for "Empty calib./Full calib.", "Empty pressure/Full pressure" and "Set LRV/Set URV" must be at least 1% apart. The value will be rejected, and a warning message displayed, if the values are too close together. Further limit values are not checked, i.e. the values entered must be appropriate for the sensor and the measuring task for the measuring device to be able to measure correctly.
- Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. when the container is empty or partly filled, the measured value is not zero. For information on how to perform position adjustment, see → 36, "Position zero adjustment".

Description	
1	Select the "Level" measuring mode via the "Measuring mode" parameter. Menu path: Setup → Measuring mode
2	Select the "In pressure" level mode via the "Level selection" parameter. Menu path: Setup → Extended setup → Level → Level selection
3	Select a pressure unit via the "Press eng. unit" parameter, here "mbar" for example. Menu path: Setup → Press. eng. unit
4	Select a level unit via the "Unit before lin" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → Unit before lin
5	Select the "Dry" option via the "Calibration mode" parameter. Menu path: Setup → Extended setup → Level → Calibration mode
6	Enter the volume value for the lower calibration point via the "Empty calib." parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → Empty calib.
7	Enter the pressure value for the lower calibration point via the "Empty pressure" parameter, here 50 mbar (0.75 psi) for example. Menu path: Setup → Extended setup → Level → Empty pressure
8	Enter the volume value for the upper calibration point via the "Full calib." parameter, here 1000 liters (264 US gal) for example. Menu path: Setup → Extended setup → Level → Full calib.
9	Enter the pressure value for the upper calibration point via the "Full pressure" parameter, here 450 mbar (6.75 psi) for example. Menu path: Setup → Extended setup → Level → Full pressure



**Fig. 11: Calibration without reference pressure - dry calibration**

A See Table, Steps 6 and 7.  
B See Table, Steps 8 and 9.



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	Description
10	"Adjust density" contains the factory setting 1.0 but this value can be changed if required. The value pairs subsequently entered must correspond to this density. Menu path: Setup → Extended setup → Level → Adjust density
11	Set the volume value for the lower current value (4 mA) via the "Set LRV" parameter. Menu path: Setup → Extended setup → Current output → Set LRV
12	Set the volume value for the upper current value (20 mA) via the "Set URV" parameter. Menu path: Setup → Extended setup → Current output → Set URV
13	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "Process density" parameter. Menu path: Setup → Extended setup → Level → Process density
14	Result: The measuring range is set for 0 to 1000 l (264 US gal).

The graph shows a linear relationship between current  $I$  in mA and volume  $V$  in liters. The y-axis is labeled  $I$  [mA] and has a tick mark at 4 (labeled E) and 20 (labeled F). The x-axis is labeled  $V$  [l] and has a tick mark at 1000. A solid line starts at the point (0, 4) and passes through the point (1000, 20). Dashed lines indicate the coordinates of the point (1000, 20).

Fig. 12: Calibration with reference pressure – wet calibration

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A See Table, Step 6.  
 B See Table, Step 7.  
 C See Table, Step 8.  
 D See Table, Step 9.  
 E See Table, Step 11.  
 F See Table, Step 12.



The measured variables %, level, volume and mass are available for this level mode. See see operating instructions "Unit before lin (025)".

### 8.5.5 "In height" level selection Calibration with reference pressure (wet calibration)

**Example:**

In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 US gal) corresponds to a level of 4.5 m (15 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring range.

The density of the medium is 1 g/cm<sup>3</sup> (1 SGU).

**Prerequisite:**

- The measured variable is in direct proportion to the pressure.
- The tank can be filled and emptied.



The values entered for "Empty calib./Full calib.," "Set LRV/Set URV" and the pressures present at the device must be at least 1% apart. The value will be rejected, and a warning message displayed, if the values are too close together. Other limit values are not checked, i.e. the values entered must be appropriate for the sensor and the measuring task for the device to be able to measure correctly.

Description	
1	Perform position adjustment. See → 36.
2	Select the "Level" measuring mode via the "Measuring mode" parameter. Menu path: Setup → Measuring mode
3	Select the "In height" level mode via the "Level selection" parameter. Menu path: Setup → Extended setup → Level → Level selection
4	Select a pressure unit via the "Press eng. unit" parameter, here mbar for example. Menu path: Setup → Press. eng. unit
5	Select a level unit via the "Unit before lin" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → Unit before lin
6	Select a level unit via the "Height unit" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → Height unit
7	Select the "Wet" option via the "Calibration mode" parameter. Menu path: Setup → Extended setup → Level → Calibration mode
8	The pressure for the lower calibration point is present at the device, here "50 mbar" (0.75 psi) for example.
	Enter the volume value for the lower calibration point via the "Empty calib." parameter, here 0 liters for example. (The pressure currently measured is displayed as the height, here 0.5 m (1.6 ft) for example.) Menu path: Setup → Extended setup → Level → Empty calib.

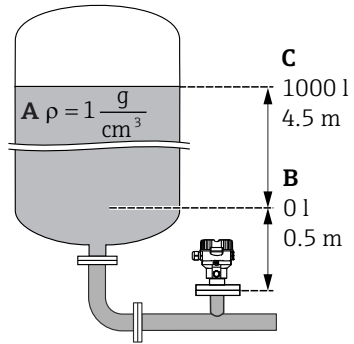
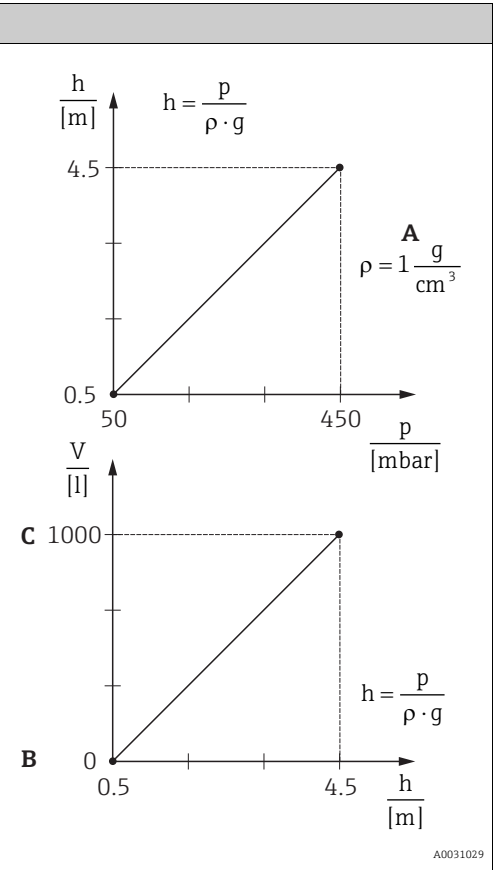


Fig. 13: Calibration with reference pressure – wet calibration

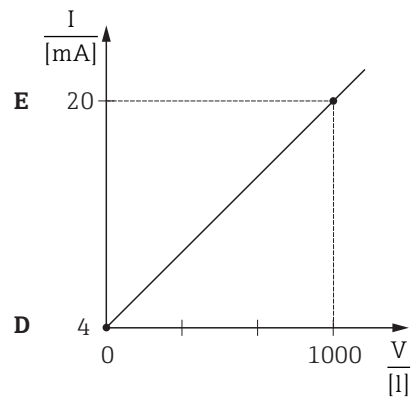
- A See Table, Step 10.
- B See Table, Step 8.
- C See Table, Step 9.

A0031027

Description	
9	<p>The pressure for the upper calibration point is present at the device, here "450 mbar" (6.75 psi) for example.</p> <p>Enter the volume value for the upper calibration point via the "Full calib." parameter, here "1000 liters" (264 US gal) for example. The pressure currently measured is displayed as the height, here "4.5 m" (15 ft) for example.</p> <p>Menu path: Setup → Extended setup → Level → Full calib.</p>
8	<p>If calibration is performed with a medium other than the process medium, enter the density of the calibration medium in the "Adjust density" parameter, here "1 g/cm<sup>3</sup>" (1 SGU) for example.</p> <p>Menu path: Setup → Extended setup → Level → Adjust density</p>
11	<p>Set the volume value for the lower current value (4 mA) via the "Set LRV" parameter.</p> <p>Menu path: Setup → Extended setup → Current output → Set LRV</p>
12	<p>Set the volume value for the upper current value (20 mA) via the "Set URV" parameter.</p> <p>Menu path: Setup → Extended setup → Current output → Set URV</p>
13	<p>If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "Process density" parameter.</p> <p>Menu path: Setup → Extended setup → Level → Process density</p>



A0031029

Description	
14	<p>Result: The measuring range is set for 0 to 1000 l (264 US gal).</p> <div style="text-align: right;">  </div> <p><i>Fig. 14: Calibration with reference pressure – wet calibration</i></p> <p><i>E See Table, Step 10.</i>  <i>F See Table, Step 8.</i>  <i>G See Table, Step 9.</i>  <i>H See Table, Step 11</i>  <i>I See Table, Step 12.</i></p>



The measured variables %, level, volume and mass are available for this level mode see operating instructions "Unit before lin (025)".

### 8.5.6 "In height" level selection Calibration without reference pressure (dry calibration)

**Example:**

In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 US gal) corresponds to a level of 4.5 m (15 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring range.

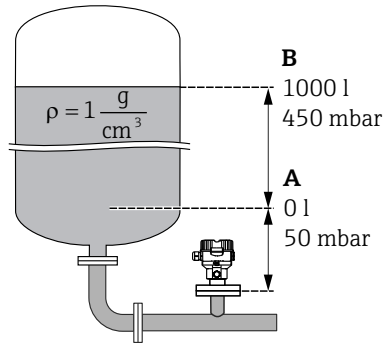
**Prerequisite:**

- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the height and volume values for the lower and upper calibration point must be known.



- The values for "Empty calib./Full calib.", "Empty height/Full height" and "Set LRV/Set URV" must be at least 1% apart. The value will be rejected, and a warning message displayed, if the values are too close together. Further limit values are not checked, i.e. the values entered must be appropriate for the sensor and the measuring task for the measuring device to be able to measure correctly.
- Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. when the container is empty or partly filled, the measured value is not zero. For information on how to perform position adjustment, see → 36, "Position zero adjustment".

Description	
1	Select the "Level" measuring mode via the "Measuring mode" parameter. Menu path: Setup → Measuring mode
2	Select a pressure unit via the "Press eng. unit" parameter, here "mbar" for example. Menu path: Setup → Press. eng. unit
3	Select the "In height" level mode via the "Level selection" parameter. Menu path: Setup → Extended setup → Level → Level selection
4	Select a level unit via the "Unit before lin" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → Unit before lin
5	Select a level unit via the "Height unit" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → Height unit
6	Select the "Dry" option via the "Calibration mode" parameter. Menu path: Setup → Extended setup → Level → Calibration mode
7	Enter the volume value for the lower calibration point via the "Empty calib." parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → Empty calib.



A0030030

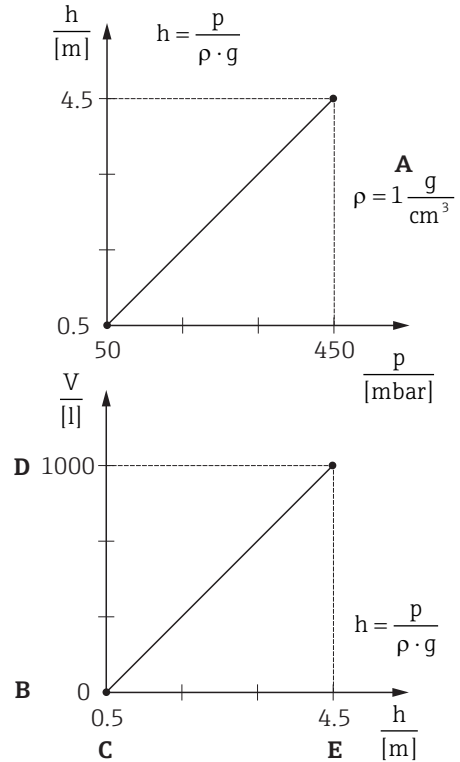
Fig. 15: Calibration without reference pressure – dry calibration

A See Table, Step 11.

B See Table, Steps 7 and 8.

D See Table, Steps 9 and 10.

Description	
8	Enter the height value for the lower calibration point via the "Empty height" parameter, here 0.5 m (1.6 ft) for example. Menu path: Setup → Extended setup → Level → Empty height
9	Enter the volume value for the upper calibration point via the "Full calib." parameter, here 1000 liters (264 US gal) for example. Menu path: Setup → Extended setup → Level → Full calib.
10	Enter the height value for the upper calibration point via the "Full height" parameter, here 4.5 m (15 ft) for example. Menu path: Setup → Extended setup → Level → Full height
11	Enter the density of the medium via the "Adjust density" parameter, here "1 g/cm <sup>3</sup> " (1 SGU) for example. Menu path: Setup → Extended setup → Level → Adjust density
12	Set the volume value for the lower current value (4 mA) via the "Set LRV" parameter. Menu path: Setup → Extended setup → Current output → Set LRV
13	Set the volume value for the upper current value (20 mA) via the "Set URV" parameter. Menu path: Setup → Extended setup → Current output → Set URV
14	If the process uses a medium other than that on which the calibration was based, the new density has to be specified in the "Process density" parameter. Menu path: Setup → Extended setup → Level → Process density



A0031066

Description	
15	<p>Result: The measuring range is set for 0 to 1000 l (264 US gal).</p>

A0031067

*Fig. 16: Calibration with reference pressure – wet calibration*

A See Table, Step 11.  
 B See Table, Step 7.  
 C See Table, Step 8.  
 D See Table, Step 9.  
 E See Table, Step 10.  
 F See Table, Step 12.  
 G See Table, Step 13.



The measured variables %, level, volume and mass are available for this level mode see operating instructions "Unit before lin (025)".

### 8.5.7 Calibration with partially-filled tank (wet calibration)

#### Example:

In this example a wet calibration is shown when it is not possible to empty the vessel and then fill it up to 100%. Here a 20% filling is used as "Empty" and a "25%" filling is used as "Full" calibration point. The calibration is then extended to 0% ... 100% and LRV / URV are adjusted accordingly.

#### Prerequisite:

The default value in the level mode for calibration mode is "Wet".

However, it can be changed via: Setup → Extended Setup → Level → Calibration mode

Description	
1	Select the "Level" measuring mode via the "Measuring mode (005)" parameter.  Menu path: Setup → Measuring mode (005)
2	Set value for "Empty calib." with acting pressure for Level e.g. 20%.  Menu path: Setup → Extended Setup → Level → Empty calibration
3	Set value for "Full calib." with acting pressure for Level e.g. 25%.  Menu path: Setup → Extended Setup → Level → Full calibration
4	The values for full and empty pressure are measured automatically at adjustment. As the transmitter automatically sets the pressure values that suit to empty and full calibration to min and max pressure that cause the output current, it is necessary to set the right upper range value (URV) and lower range value (LRV).

*Abb. 17: Calibration with partially-filled tank*

A    See Table, Step 2  
B    See Table, Step 3

A0030031



It is also possible to use different liquids (e.g. water) for the adjustment. In this case you have to enter the different densities at following menu path:

- Setup → Ext. Setup → Level → Adjust density (034) (e.g. 1.0 kg/l for water)
- Setup → Ext. Setup → Level → Process density (035) (e.g. 0.8 kg/l for oil)

## 8.6 Linearization

See operating instructions.

## 8.7 Pressure measurement

### 8.7.1 Calibration without reference pressure (dry calibration)

**Example:**

In this example, a device with a 400 mbar (6 psi) sensor is configured for the 0 to +300 mbar (4.5 psi) measuring range, i.e. 0 mbar is assigned to the 4 mA value and 300 mbar (4.5 psi) to the 20 mA value.

**Prerequisite:**

This is a theoretical calibration, i.e. the pressure values for the lower and upper range are known.



Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. the measured value is not zero in a pressureless condition. For information on how to perform position adjustment, see → 36.

Description	
1	Select the "Pressure" measuring mode via the "Measuring mode" parameter. Menu path: Setup → Measuring mode
2	Select a pressure unit via the "Press eng. unit" parameter, here "mbar" for example. Menu path: Setup → Press. eng. unit
3	Select the "Set LRV" parameter. Menu path: Setup → Set LRV
	Enter the value for the "Set LRV" parameter (here 0 mbar) and confirm. This pressure value is assigned to the lower current value (4 mA).
4	Select the "Set URV" parameter. Menu path: Setup → Set URV
	Enter the value for the "Set URV" parameter (here 300 mbar (4.5 psi)) and confirm. This pressure value is assigned to the upper current value (20 mA).
5	Result: The measuring range is configured for 0 to +300 mbar (4.5 psi).

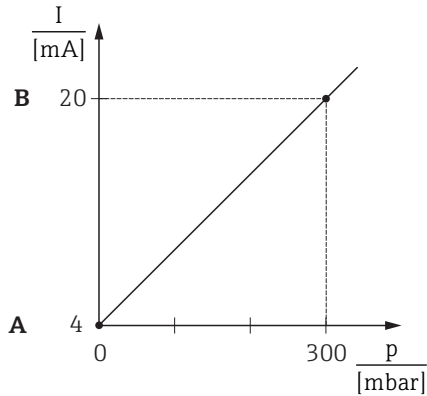


Fig. 18: Calibration without reference pressure

A0031032

A See Table, Step 3.  
B See Table, Step 4.

**8.7.2 Calibration with reference pressure (wet calibration)**

**Example:**

In this example, a device with a 400 mbar (6 psi) sensor is configured for the 0 to +300 mbar (4.5 psi) measuring range, i.e. 0 mbar is assigned to the 4 mA value and 300 mbar (4.5 psi) to the 20 mA value.

**Prerequisite:**

The pressure values 0 mbar and 300 mbar (4.5 psi) can be specified. The device is already mounted, for example.



For a description of the parameters mentioned, see operating instructions "Description of parameters".

Description	
1	Perform position adjustment → 36.
2	Select the "Pressure" measuring mode via the "Measuring mode" parameter. Menu path: Setup → Measuring mode
3	Select a pressure unit via the "Press eng. unit" parameter, here "mbar" for example. Menu path: Setup → Press. eng. unit
4	The pressure for the lower-range value (4 mA value) is present at the device, here 0 mbar for example.
	Select the "Get LRV" parameter. Menu path: Setup → Extended setup → Current output → Get LRV.
	Confirm the value present by selecting "Confirm". The pressure value present is assigned to the lower current value (4 mA).
5	The pressure for the upper-range value (20 mA value) is present at the device, here 300 mbar (4.5 psi) for example.
	Select the "Get URV" parameter. Menu path: Setup → Extended setup → Current output → Get URV.
	Confirm the value present by selecting "Confirm". The pressure value present is assigned to the upper current value (20 mA).
6	Result: The measuring range is configured for 0 to +300 mbar (4.5 psi).

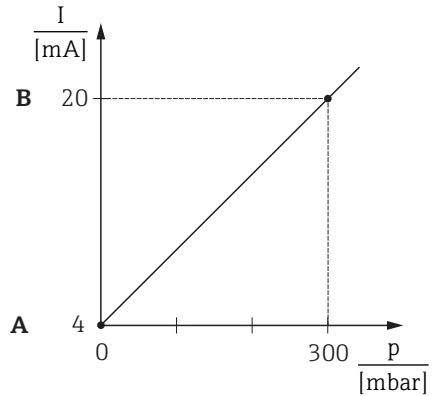


Fig. 19: Calibration with reference pressure

A0031032

- A See Table, Step 4.
- B See Table, Step 5.

## 8.8 Electrical differential pressure measurement with gauge pressure sensors

See operating instructions.



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**Weert, Netherlands**

## Inspection report

TÜV®

In case of questions please refer to:

Equipment number:  
Order number:  
Customer number:  
Reference number:

**Postal address: TÜV NORD InfraChem GmbH & Co. KG**  
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## Report of the safety circuits of the electro-hydraulic-control and the steam-measurement-device – STD100126

Place of performance:  
Uniteq Hydraulics  
Oude Graaf 18, 6002 NL  
Weert, Netherlands

Benefit recipient:  
Uniteq Hydraulics  
Oude Graaf 18, 6002 NL  
Weert, Netherlands

### Technical basic concepts and regulations:

EN 50156     EN 12952     EN 12953     EN 746     DIN EN 4126  
On basis of:     TRD 421

### Type of inspection:

before placing into operation     after modification     partial test  
 periodic     check of technical documentation     functional test on site  
 control of safety program

### Test object:

Kind of plant:    Steam test device  
Plant:  
Manufacturer:    Artes Valve & Service GmbH  
DPS Type:    STD100126  
Serial number:    20240183 (240213)  
Year of manufacture:    10-2024  
Firing:    --  
Mode of operation:    --

### Inspection result:

no deficiency     marginal deficiency  
 significant deficiency     hazardous deficiency

According to the PCS safety equipment:

time allowed for repair of deficiencies until     repair of deficiencies shall be confirmed in written form  
 continuation / revision of inspection necessary     reinspection on site necessary

Place: Weert, Netherlands

Date: 31.10.2024

**TÜVNORD**

Digital  
unterscrieben  
von Lafos André  
Datum: 2024.10.31  
14:40:04 +01'00'

Expert for functional safety: \_\_\_\_\_  
(Dipl. Ing. Dipl. Ing. Lafos)

### Further applicable documents:

Annex 1 Scope of inspection, description of plant

## Annex 01 – scope of inspection, description of plant

### Scope of inspection:

In the present test report, it was assessed whether the safety-related equipment described below was integrated into the control system in accordance with the standards/regulations of the test basis on the assessment basis of the circuit documents.

### Documents submitted for review:

- [U1]: “240213 KVA Vera II Rev01a”; 38 pages; Edit date 22.10.2024  
[U2]: “Checklist STD100126”

### Existing safety-related equipment:

- 1 pressure limiter; E+H Cerbar M PMP51 SN: W905B101129 (-7B2)  
acts on an evaluation unit; E+H RMA42-AACH3 (-7U2)  
which switches the safety relay; Phoenix Contact PSR-MC40-3NO-1DO (-7K3)
- 1 pressure limiter; E+H Cerbar M PMP51 SN: W905B001129 (-9B2)  
acts on an evaluation unit; E+H RMA42-AACH3 (-9U2)  
which switches the safety relay; Phoenix Contact PSR-MC40-3NO-1DO (-9K3)
- 1 pressure limiter; E+H Cerbar M PMP51 SN: W905AF01129 (-11B2)  
acts on an evaluation unit; E+H RMA42-AACH3 (-11U2)  
which switches the safety relay; Phoenix Contact PSR-MC40-3NO-1DO (-11K3)

in a 1oo3 voting on the safety valves.

Trip: 11 bara [10 barg]  
Hys: 1 bar

- 1 temperature limiter; PT100 (TM131) (-8B2)  
acts on an evaluation unit; E+H RMA42- AACH3 (-8U2)
- 1 temperature limiter; PT100 (TM131) (-10B2)  
acts on an evaluation unit; E+H RMA42- AACH3 (-10U2)
- 1 temperature limiter; PT100 (-12B2)  
acts on an evaluation unit; E+H RMA42- AACH3 (-12U2)

In a 2oo3 voting on the safety relay; Phoenix Contact PSR-MC82-5NO (-13K1)

Trip 250 °C  
Hys 10 °C

- Safety Switch 20S2

Order number:

## **Notes:**

- The test period determined by the operator for recurring functional tests of the safety devices is 12 months. The test is described in the associated test sheets.
- Within the scope of this audit, no consideration was given to IT security issues in relation to the security-relevant parts of the system. This still has to be done.
- The operator has defined and implemented basic IT security measures for the security-relevant parts of the plant. A holistic view of the plant has not yet been taken. Binding specifications, e.g., within the framework of an information security management system, do not yet exist.
- The safety Valves are not Part of this Inspection report.