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SPV-Proportional Pressure reducing valve

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Overview AMP Connector

Nimco Ident-Nr.12V

pA [bar]	Part No.
20	12547-4K
25	12631-4K

Nimco Ident-Nr.24V

pA [bar]	Part No.
20	12548-4K
25	13761-4K

Overview DEUTSCH Connector

Nimco Ident-No. 12V

pA [bar]	Part No.
20	13596-4K
25	13762-4K

Nimco Ident-No. 24V

pA [bar]	Part No.
20	13580-4K
25	13763-4K

This document contains the specification of the proportional cartridge valve Model SPV 12V/24V. Additional data is available on Nimco specification drawings, upon request.

GENERAL DATA	
Valve and Cavity Dimensions	See Nimco drawing number
Installation position	Any
Weight	175g/0,38lbs
Protection class	DIN 40050-9: IP6k 6/IPX9K
Electrical connections	Deutsch Connector DT04-2P or AMP Junior Power Timer
Min. supply voltage	12V / 24V
Supply pressure	pP,max = 50 bar, psi=725
Standards cited	ISO: 4406 DIN EN 60068 DIN: EN 51524 DIN 40050-9 DIN 50021-SS
Field damage of valves	For the applications we refer to Nimcos Sales and Warranty Conditions
Field damage of connector	For the applications we refer to Nimcos Sales Warranty Conditions
Filtration element	All values given here refer to all clean internal filtration screen. If the internal filtration screen in this cartridge element is contaminated more than 50%, the screen might break and a malfunction of the SPV valve can occur.

ELECTRICAL DATA

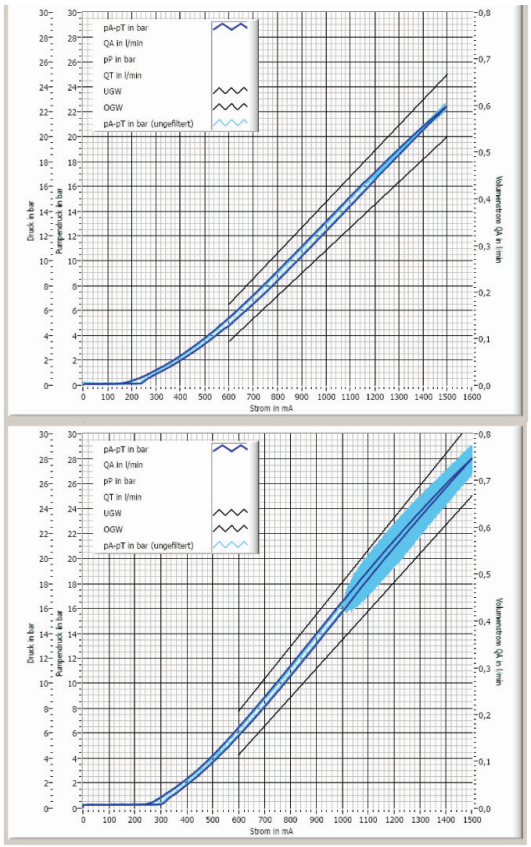
Voltage	12V	24V
R20 [Ohm]	4,72 ± 5%	20,8 ± 5%
I_1 [mA]	600 ± 10	300 ±10
I_{max} [mA]	1500 ± 10	750 ±10

Table 2: Coil resistance, current I1 and maximal current Imax according to voltage.

It is recommended that electrical power should be supplied to the valve via a current controlled,

Pulse-Width Modulated amplifier board, limiting the current to Imax.

P-L-CHARACTERISTIC CURVE



20 bar

25 bar

Figure 1: P-I limiting window

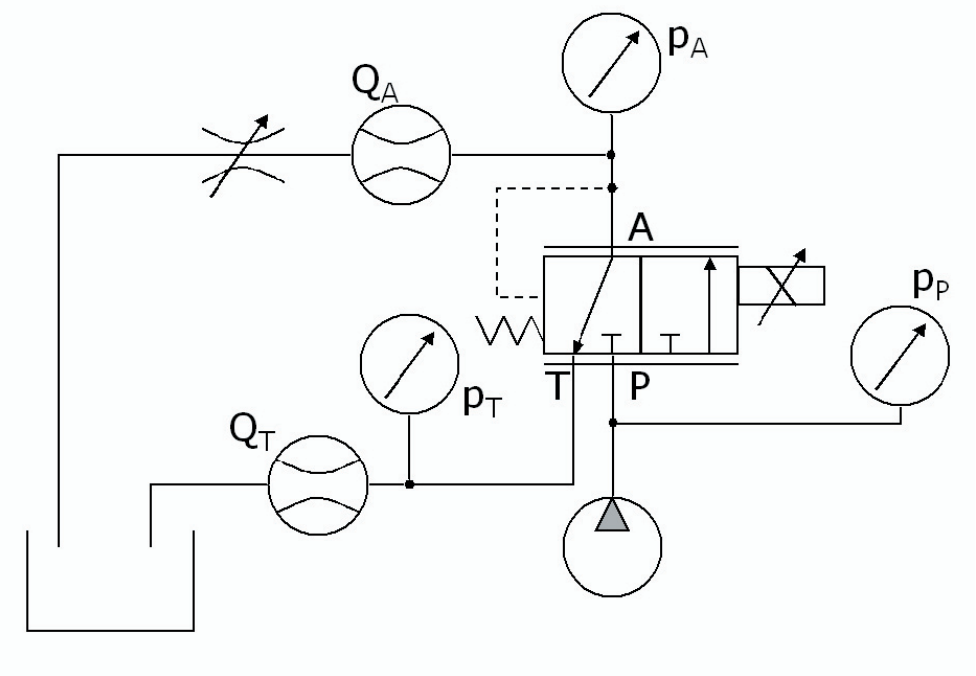
Boundary conditions	
Control	High speed PWM with 20kHz,overlaid with rectangular dithersignal from 100Hz, amplitude 200mA peak to peak
Current variation	140 mA/s (12V), 100mA/s (24V)
Mounting position	Valve body vertically downward
Fluid temperature	50 ±3 °C, 123 ± 38 °F
Ambient temperature	23 ±7 °C, 73 ± 47 °F
Fluid	DIN 51524 HLPD46
Limiting window	See graph above

p_A [bar]	$p_A(I_1)$ [bar]	$p_A(I_{max})$ [bar]	P_P [bar]/psi	Hysteresis max [bar]
20	$3.50 < p(I_1) < 6.50$	$20 < p(I_{max}) < 25$	35 ±2 / 508±70	5% from nominal pressure
25	$4.25 < p(I_1) < 7.75$	$25 < p(I_{max}) < 31$	35 ±2 / 508±30	5% from nominal pressure

Table: 3, p_A, p_A,min, p_A,max an hysteresis

Warning
Depending on the application and system where the SPV cartridge is used , note that the system tank pressure will be added to the working pressure. At measure point P_A in the below schematic tank pressure should be deducted to get the correct reading of messure point P_A

Figure 2: hydraulic test set-up for the p-I curve and flow measurement from P to A



PRESSURE DROP

Flow measurement from P to A			
p_A [bar]	Q_A [l/min]	$\Delta p=(p_P-p_A)$ [bar]	p_P [bar]/psi
20	4	≤9,5	35 ± 2 / 506 ±30
25	4	≤ 12	35 ± 2 / 508 ±30

I=Imax; with filter screen

Fluid temperature: 50°C

Hydraulic test procedure for the Pressure Drop Testing

from P to A; see figure 2

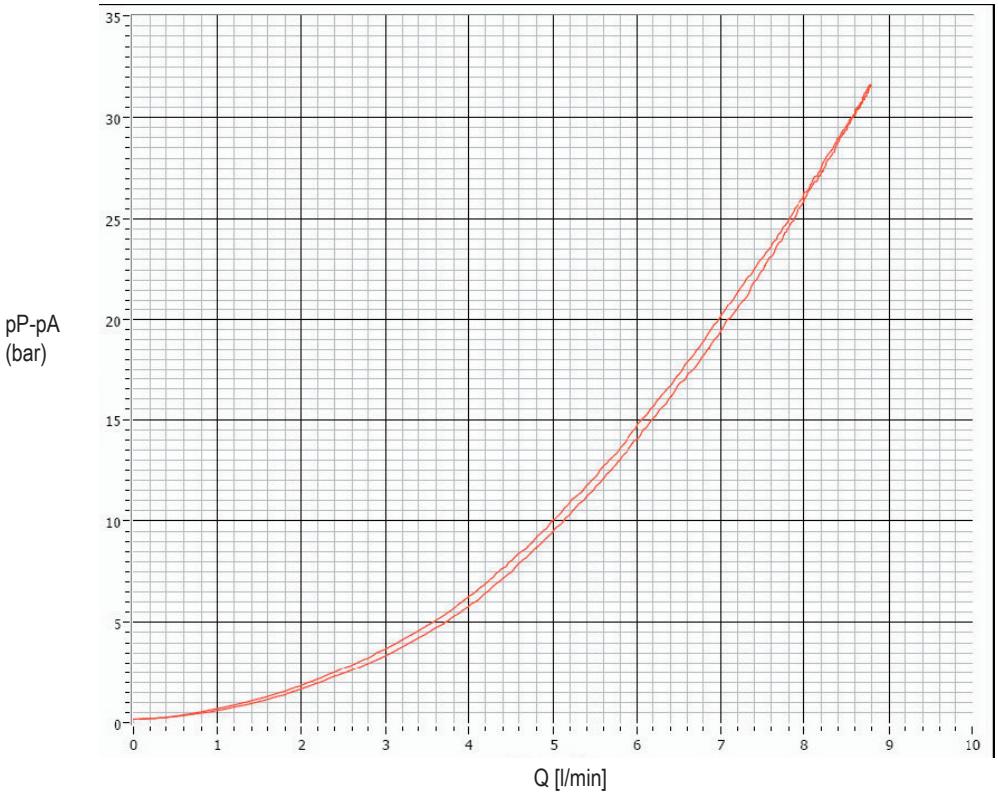


Figure 3:
Pressure drop
P --> A

Flow Measurement from A to T			
p_A [bar]	Q_A [l/min]	$\Delta p=(p_A-p_T)$ [bar]	p_P [bar] / psi
20	4	≤6	35 ± 2 / 508 ±30
25	4	≤ 9,5	35 ± 2 / 508 ±30

I=Imax;
Fluid temperature: 50°C
Hydraulic test procedure for the Pressure Drop Testing from A to T; see schematic

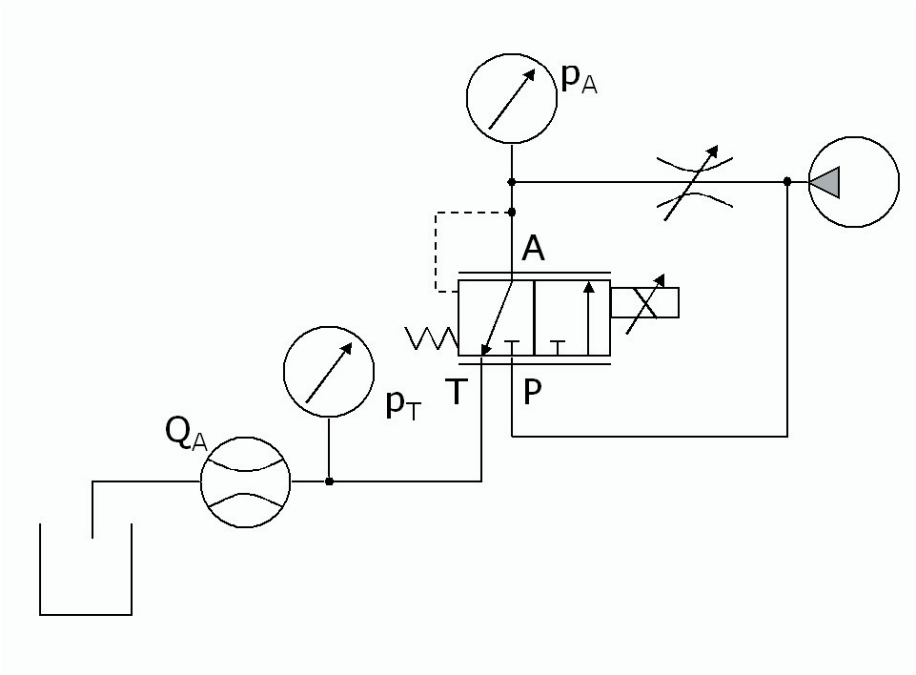
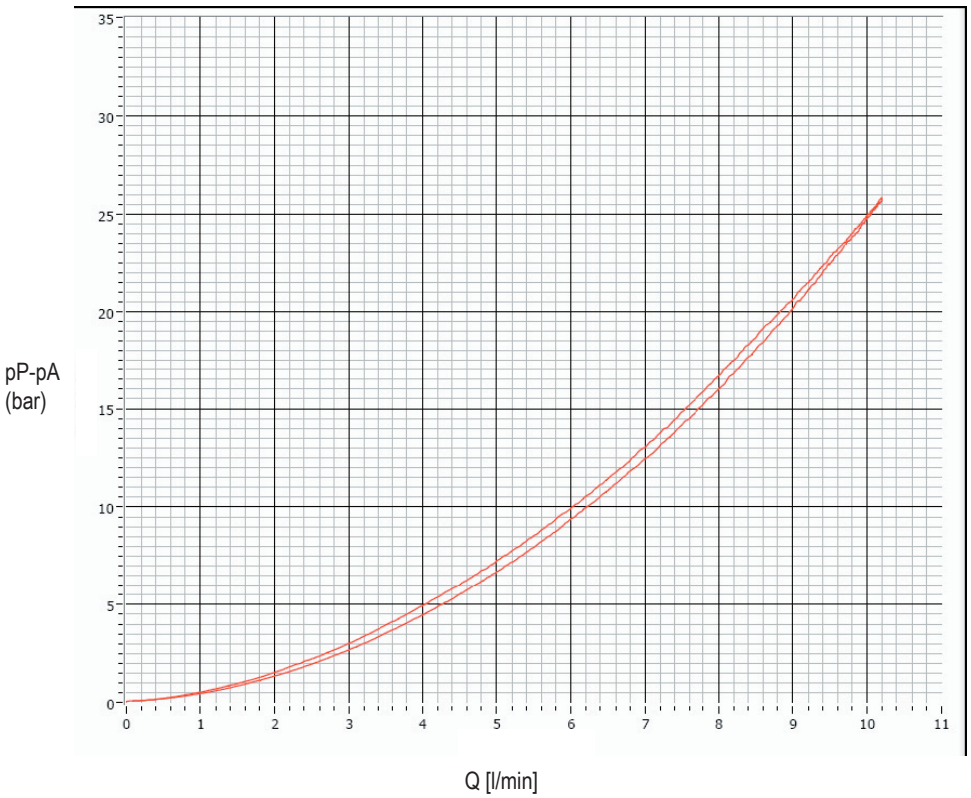


Figure 4: hydraulic test procedure for the Pressure Drop testing from A to T



INTERNAL LEAKAGE

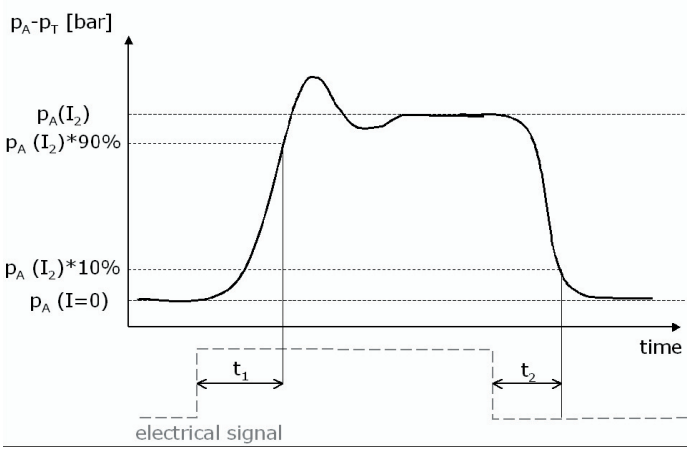
Internal Leakage Energized	A -->T	
max flow rate	Q [ml/min] / gpm	≤ 150 / ≤0,039
current	I [mA]	I_{max}
Fluid temperature		50°C / 122°F
pump pressure	p_P [bar] / psi	35 ± 2 / 508 ±30psi

Internal Leakage De-Energized	P -->T	
max flow rate	Q [ml/min] / gpm	≤ 30 / ≤11
current	I [mA]	I=0
Fluid temperature		50°C / 122°F
pump pressure	p_P [bar] / psi	35 ± 2 / 508 ±30

STEP RESPONS

Boundary conditions step respons	
Pump pressure	50 ± 2 bar , 725 ±30psi
Setup	with pressure accumulator at P-port
Fluid	DIN 51524 HLPD46

Figure 6: dynamic step response



Response time,	I=0mA --> Imax
on and off @	t_1 (pA=90% pA(Imax)) < 50 ms
50°Cv	Overshoot = max. 50% of p_S, after 100ms max. 20% of p_S
	oil-temp +50 °C, 122° F
	ambient temp+20°C, 68° F
	I_2=Imax I=0mA
	t_2 (pA=10%*pA(Imax)) < 50 ms
	oil-temp +50°C, 122° F
	ambient temp +20°C, 68° F
Response time	I=0mA --> I_{max}
On and off	t_1 (pA=90% p_A(Imax)) < 400 ms
@ -10°C	oil-temp max -10 °C, 14° F
	ambient temp max -10 °C, 14° F
	I2=Imax I=0mA
	t2 (pA=10%*pA(Imax)) < 300 ms
	oil-temp.: max -10 °C, 14° F
	ambient temp.: max -10 °C, 14° F

Oil temp max. –30°C, (-22 °F) ambient temp.max. –30°C, (-22 °F) function is – dependent on the pourpoint - warranted

Mounting position: Valve sleeve vertically downward

SMALL SIGNAL TEST

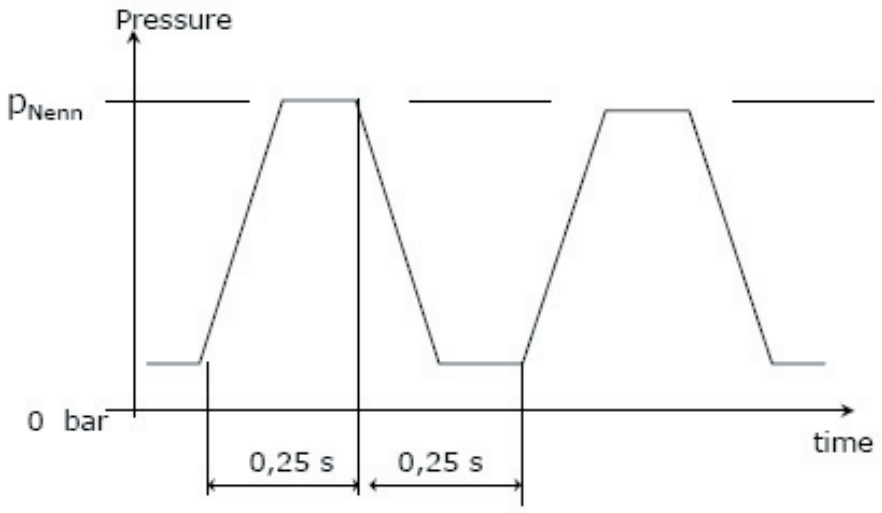
	ΔI [mA]	Δpmin [bar]	
20	ΔI = 12.5 mA	Δpmin = 0.300 bar/10psi	during 1s for 24 V
	ΔI = 25.0 mA	Δpmin = 0.300 bar/10psi	during 1s for 12 V
25	ΔI = 12.5 mA	Δpmin = 0.400 bar/10psi	during 1s for 24 V
	ΔI = 25.0 mA	Δpmin = 0.400 bar/10psi	during 1s for 12 V

Output measured pressure step as an average value over 0.5 s, valid for decreasing steps.

CURRENT CYKLE TEST

Boundary conditions current cycle test	
Number of cycles	5*106
Frequency	2 Hz
Current variation	I=0 to I_{max}
Control	See figure 1
Pressure variation	0 to pNenn
pP	35 ± 2bar, 508 ±30 psi
pT	0 bar, assumed open to atmosphere
Mounting position	Horizontal, assuming the mean valve axis
A-port connection	Pressure accumulator

Figure 7: test cycle - current cycle test



PRESSURE RESISTANCE

Pressure Resistance of the solenoid tube

Purpose: The endurance of the valve is tested against static and dynamic load of the return pressures.

Boundary conditions for static test	
p_{Tmax}	50 bar, 725 psi
I	0 mA
Pressure rise	pressure generated by hand pump until
Oil temperature	20 °C, 68°F
Remark	Pressure above the dynamic stability may cause permanent damage and a reduction of the valve lifetime.

Boundary conditions for dynamic test	
p_{Tmax}	30 bar / 435 psi
number of cycles	$5*10^6$
frequency	2 Hz
pressure variation	0 - 30 bar, 0-435psi
rate of pressure rise	750 bar/s, 10877psi/s
I	0 mA

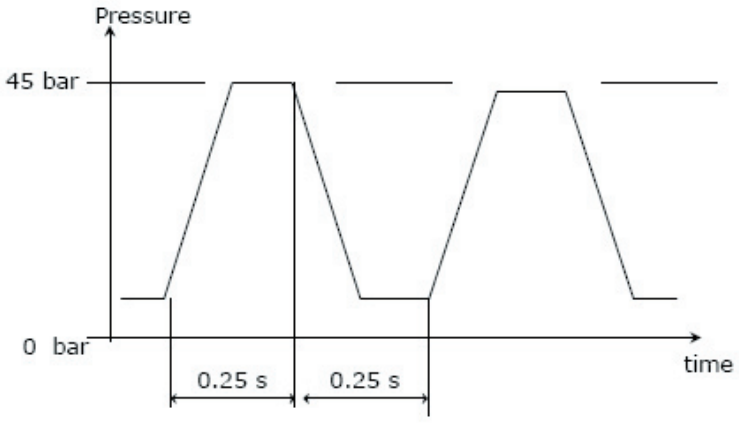
Figure 8: test cycle – pressure resistance of the solenoid tube

MOUNTING FLANGE ENDURANCE TEST

Purpose: The resistance of the flange is tested against dynamic pressure in the cavity. The pressure variation of the ports is geared to maximum allowed pressures and the associated surfaces.

Boundary conditions for dynamic test	
number of cycles	2*106
frequency	2 Hz
pressure variation	over the entire sealing surface of the tank (based on standard test)
rate of pressure rise	750 bar/s , 10877psi/s
I	0 mA

Figure 9: Test Cycle – Mounting Flange Endurance Test



TEMPERATUR OPERATING RANGE

Operation range	
Ambient temperature:	-30°C to +80°C ,-22 to +170°F
Fluid temperature:	-30°C to +105°C, -22 to +221°F
Block temperature	max. 80°C (176°F)at the mounting surface at 100% duty cycle with I_{max}

THERMAL STRESS ON THE SOLENOID

Boundary conditions heat gradient	
Block temperature:	105°C, 121 °F
Ambient temperature	80°C, 170 °F

Voltage[V]	Current	Duty cycle[% ED]	Rwarm	Coil-temperature[°C]	Cycleduration[min]	tmax[min]
12	Iconst=Imax	100%	1)	1)	1)	1)
24	Iconst=Imax	80°C, 176 °F	1)	1)	1)	1)

Table 6: Thermal stress-Coil temperature

PRESSURE MEDIUM

Specification Pressure medium	
Mineral oils:	HL and HLP according to DIN 51524
Biodegradable hydraulic oil:	The corrosion resistance of the valve must be checked before using biodegradable hydraulic oil. The solenoid parts should be affected as little as possible by biodegradable hydraulic oils. If Nimco or the customer finds out that the solenoid is affected by specific biodegradable oil either company should be notified by the other party about the oil effect and also which effect it is causing the performance of the SPV
viscosity range:	kinematic viscosity 10 cSt - 400 cSt for ISO VG 46
Contamination class:	according to ISO 4406

MECHANICAL STRESS ON THE SOLENOID

Shock test Conditions	
Standard	IEC68-2-27 Ea
Setup	valve in block
acceleration	50 g
time to complete the shock in one direction	11 ms, 0,11 lbs
- X+,X-,Y+,Y-,Z+,Z-:	3 times in each direction

VIBRATION TEST

Boundary conditions vibration test	
Standard	DIN EN 60068-2-64 Fh
10 to 250 Hz:	0.1 g^2/Hz, 0,0022 ibs^2/Hz
250 to 500 Hz:	-9dB/octave
Axis	X,Y,Z at 90-minute intervals

SALT SPRAY TEST

Boundary conditions salt spray test	
Standard	DIN 50021-SS,
Duration	DIN EN 12329: 192 hours
Function after the test:	According to drawing
Axis	Hydraulic function according to the boundary conditions in at page 7 have to be fulfilled before spray test
	Corrosion of the protective coating on the housing surface may occur (points with white corrosionproducts)
	Corrosion products from the base material may occur in the stamping area
	There should be no traces of salt or corrosion inside the solenoid
	The valve and the connector must be covered with an fully isolated plastic cap during the test. Other materials should not be in contact with the valve

SCREEN

The valve is fittet with a screen at the p-port.side.

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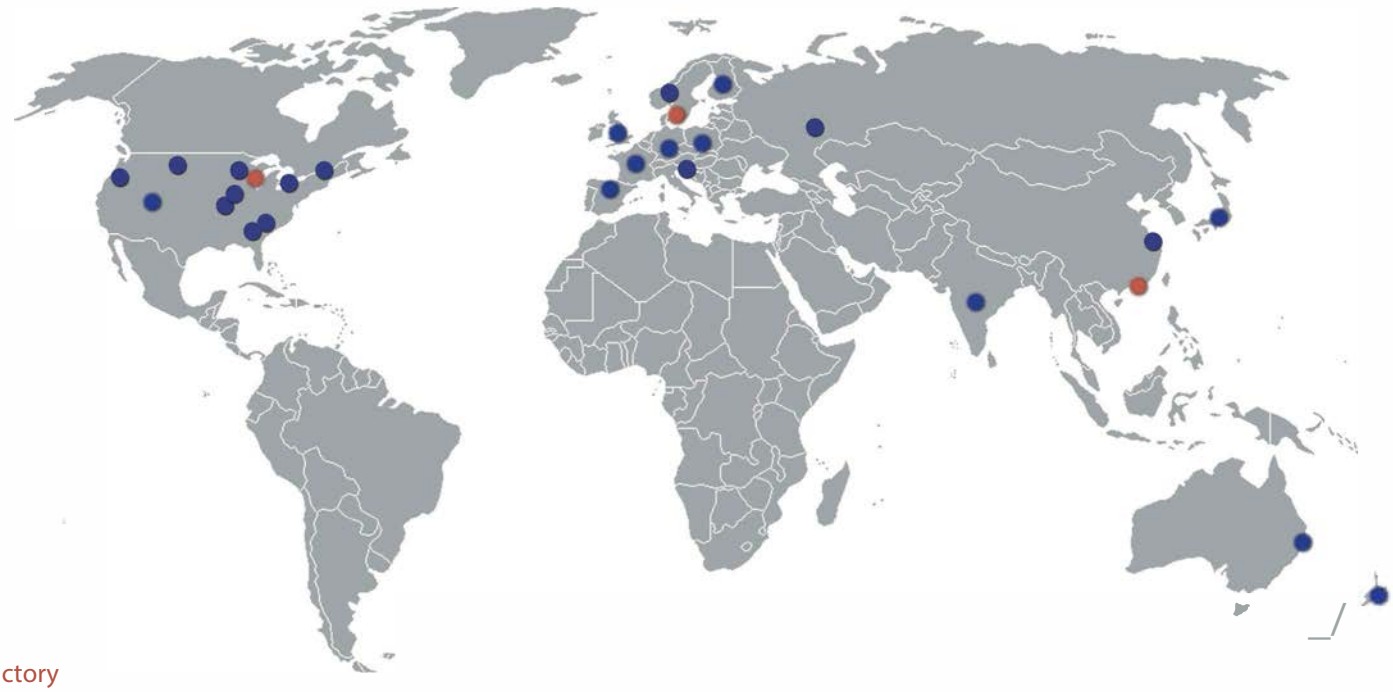

- Factory
- Distributor