![Continental Hydraulics logo, a member of DAIKIN group]

VED03 J Series

Proportional Directional
Control Valves with Feedback and
Integrated Digital Electronics

VED03JL

► DESCRIPTION:

VED03 J series Proportional valves are Direct Operated with Integrated Digital Electronics and use LVDT spool position feedback.

VED03JL style uses a compact box and M12- 5 Pin connection and also offers Analog, IO-Link and CANopen input interfaces.
See pages 3 - 5 for more details.

VED03MJ style uses the industry standard common 7 Pin connection and Analog inputs.
See pages 6 - 9 for more details.

VED03JH style provides for a variety of Fieldbus communication types.
See pages 10 - 14 for more details.

For all other performance data and accessories.
See pages 15 - 18

VED03MJ

► PERFORMANCE: (Mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

|		
Max operating pressure: P - A - B ports T port	PSI (bar)	5000 (350) 3000 (210)
Nominal flow with Δp 10 bar P-T	l/min	1 - 4 - 12 - 18 - 30
Response times		see page 17
Hysteresis	% of Q max	< 0.2%
Repeatability	% of Q max	< 0.2%
Threshold		< 0.1%
Valve reproducibility		≤ 5%
Electrical characteristics		see data under each style
Ambient temperature range	°F (°C)	-4 / 140 (-20 / +60)
Fluid temperature range	°F (°C)	-4 / 176 (-20 / +80)
Fluid viscosity range	cSt	10 - 400
Fluid contamination degree		according to ISO 4406:1999 class 18/16/13
Recommended viscosity	cSt	25
Mass: Single solenoid valve Double solenoid valve	lbs (kg)	4.85 (2.2) 5.95 (2.7)
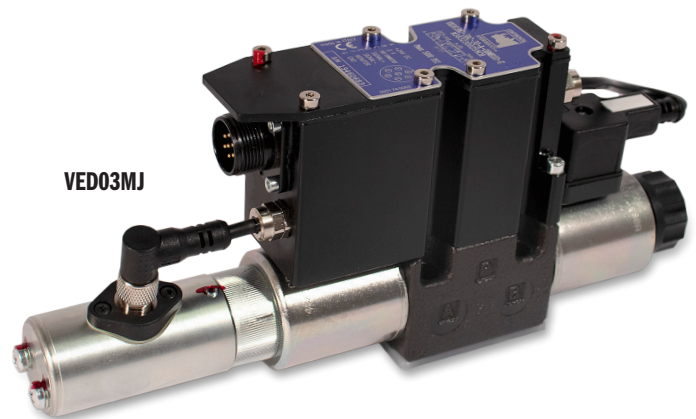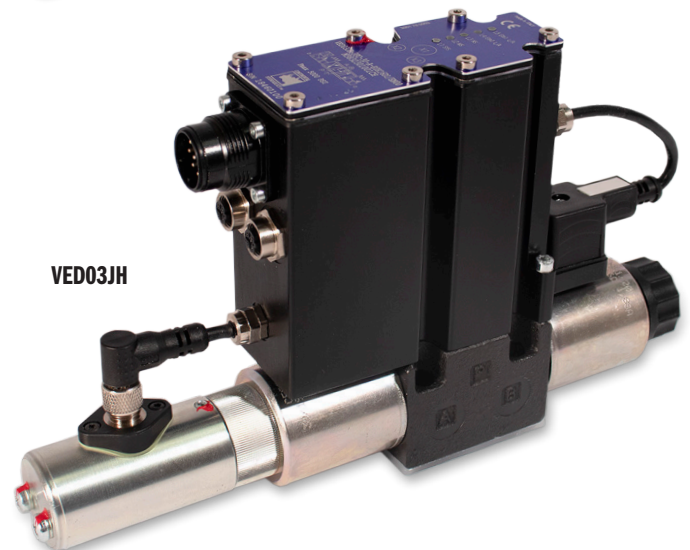
VED03JH

**SUBPLATE MOUNTING NFPA D03
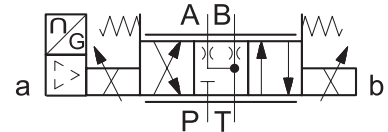ISO 4401-03**
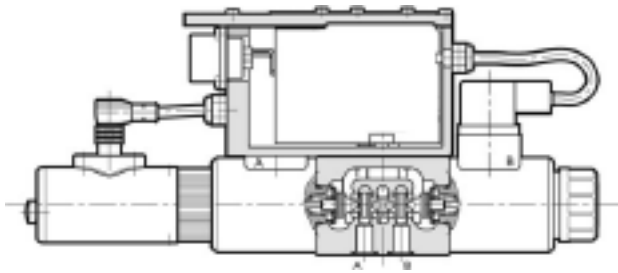
► OPERATING PRINCIPLE:

- The VED03 J valves are proportional directional valves, direct operated, with closed loop position control. The mounting interface is in compliance with ISO 4401 standards.

- The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal. Transducer and digital card allow a fine control of the spool position, reducing both hysteresis and response times and optimizing the valve performance.

- The valves are available with different types of electronics, with analogue or fieldbus interfaces.

- The fail safe function is available for spools type Z.

- Valves are easy to install. The driver manages digital settings directly.
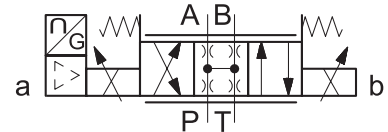
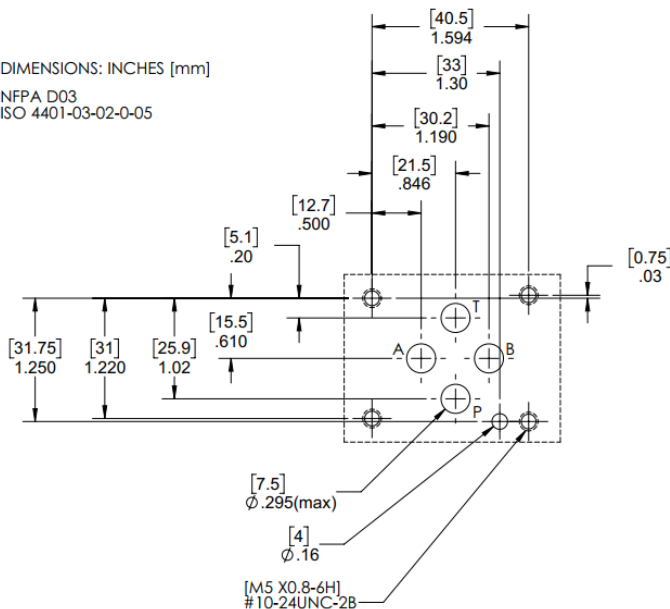### HYDRAULIC SYMBOLS (typical)

VED03*-3AC
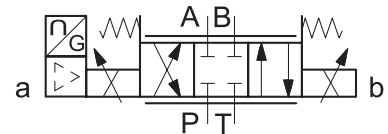
VED03*-3FC

VED03*-3ZC

MOUNTING INTERFACE

DIMENSIONS: INCHES [mm]
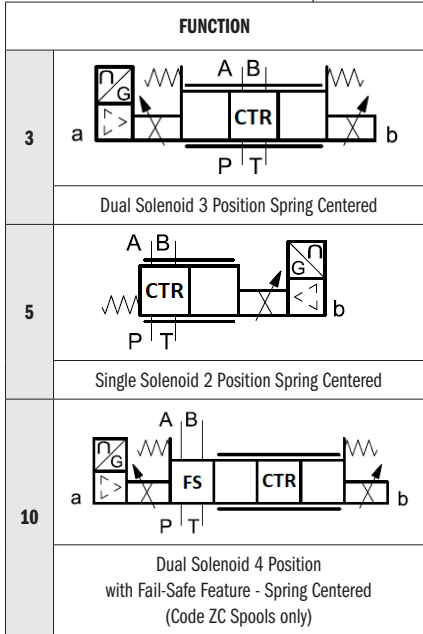
NFPA D03
ISO 4401-03-02-0-05

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▶ **IDENTIFICATION CODE:** Compact Electronics

VED03JL - ☐☐ - ☐ - ☐ - ☐**K12** - ☐ ————— DESIGN LETTER

Proportional D03 Direct Operated Directional Control with Digital On-Board and Compact Box

Low Profile Connection Box with M12 A 5 Pin (Male)

FUNCTION

3		Dual Solenoid 3 Position Spring Centered
5		Single Solenoid 2 Position Spring Centered
10		Dual Solenoid 4 Position with Fail-Safe Feature - Spring Centered (Code ZC Spools only)

SEALS

CODE	DESCRIPTION
A	BUNA (STD)
G	VITON

NOMINAL CONTROLLED FLOW with ΔP 10 Bar P-T

CODE	FLOW RATE
01	1 l/min
04	4 l/min
12	12 l/min
18	18 l/min (AC spool only)
30	30 l/min
30/15	30 (P-A) / 15 (P-B) l/min

CONTROL INTERFACE

CODE	DESCRIPTION
E0	Analog Voltage (±10V)
E1	Analog Current (4-20mA)
IOL	IO-Link Interface
CA	CANopen Interface

SPOOLS

NAME	SYMBOLS	DESCRIPTION	APPLICATION	FUNCTION MATCHING
AC		METER IN / METER OUT	MOTION CONTROL	3, 5
FC		METER IN / METER OUT	MOTION CONTROL	3, 5
ZC		METER IN / METER OUT	MOTION CONTROL	3
ZCF		METER IN / METER OUT WITH FAIL SAFE	MOTION CONTROL	10

Note: Function Code 5 valve only available with solenoid supplied on B port end. (P-A / B-T)

TYPICAL ORDERING CODE:
**VSD03JL-3ZC-30-A-IOLK12-***

► ELECTRONICS: Compact

In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to 100 V to avoid earth loops.
In IO-Link networks, the length of the connecting cable is limited to 20 meters.

VED03JL Electrical Characteristics

|		
Command signal: voltage (E0)	V DC	±10 (Impedance Ri = 11 kOhm)
current (E1)	mA	4 - 20 (Impedance Ri = 58 Ohm)
Monitor signal: voltage (E0)	V DC	0 - 5 (Impedance Ro > 1 kOhm)
current (E1)	mA	4 - 20 (Impedance Ro = 500 Ohm)
IO-Link communication (IOL): Data rate	kBaud	IO-Link Port Class B 230.4
Can Open communication (CA): Data rate	kbit	10 - 1000
Data register (IOL and CA versions only)		Solenoid voltage supply, solenoid faults (short circuit, bad config, internal), box temperature, switch-on time, vibrations
Connection		5-pin M12 code A (IEC 61076-2-101)

Pin tables

'E0' connection
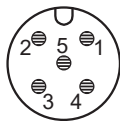
Pin	Values	Function
2	24V DC	Supply voltage (solenoid and logic)
5	0V	
1	± 10V	Command
3	0V	Command reference
4	0 - 5V	Monitor (0V reference: pin 5)

'E1' connection
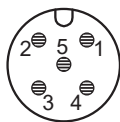
Pin	Values	Function
2	24V DC	Supply voltage (solenoid and logic)
5	0V	
1	4 - 20 mA	Command
3	0V	Command reference
4	4 - 20 mA	Monitor (0V reference: pin 5)

'IOL' connection
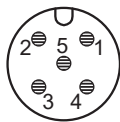
Pin	Values		Function
2	2L+	24V DC	Solenoid Supply Voltage
5	2L-	0V (GND)	
1	1L+	+24V DC	Logic and IO-Link Supply Voltage
3	1L-	0V (GND)	
4	C/Q		IO-Link Communication

Note: Pin 3 and pin 5 are linked with each other in the valves electronics. The reference potentials 1L- and 2L- of the two supply voltages must also be linked with each other on the customer side.

'CA' connection
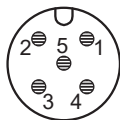
Pin	Values	Function
1	CAN_SH	Shield
2	24V DC	Supply voltage
3	0V (GND)	
4	CAN H	Bus line (high)
5	CAN_L	Bus line (low)

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▶ **INSTALLATION DATA:**

Dimensions inch (mm)

VED03JL   **VED03JL-3** K12**
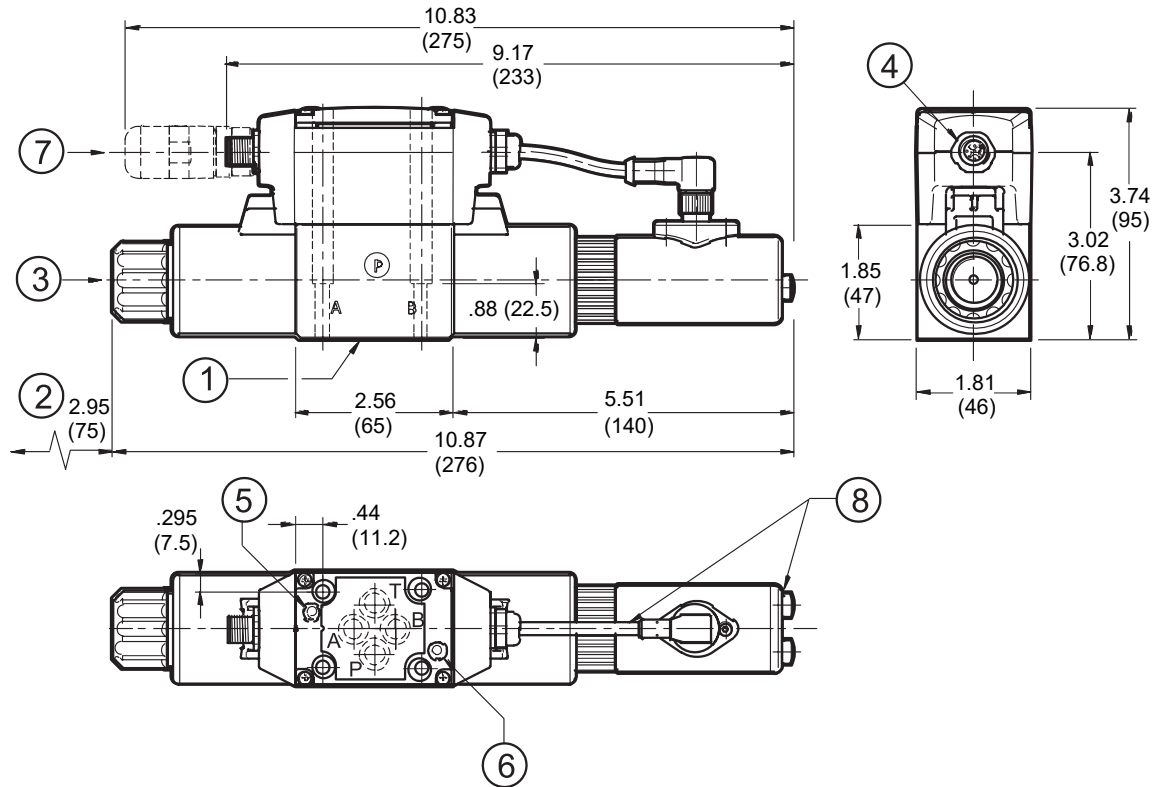
VED03JL-5 K12**
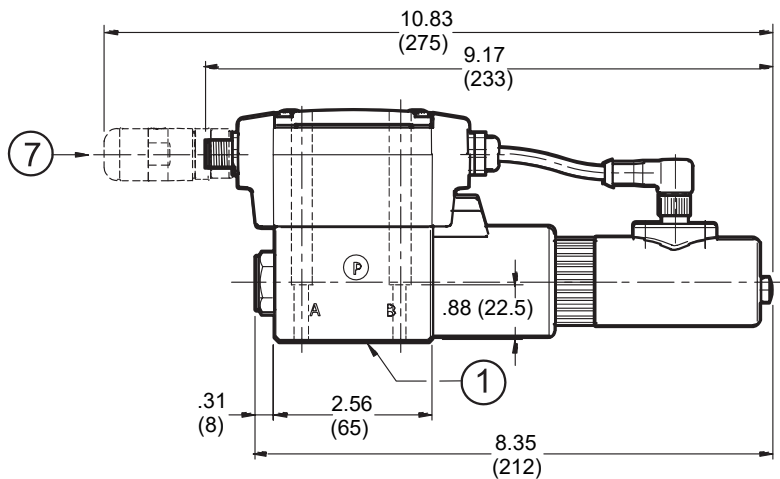
	Valve Bolts: 4 SHC screws 10-24 NC x 1.25" ASTM A574
	Torque: 4-6 lb.-ft. (5.4 - 8 Nm)
	Threads of mounting holes: 10-24 NC

1	Mounting surface with sealing rings: QTY 4 O-Ring size AS568-012 / 90 Shore
2	Coil removal space
3	Manual override by pin integrated in the solenoid tube
4	Connection M12 A 5 pin
5	L1 LED
6	L2 LED
7	Mating connector M12 5 poles - code A, female. To be ordered separately.
8	Adjustment sealing performed at factory. Do not disassemble the transducer.

▶ IDENTIFICATION CODE: Standard (7 Pin) Electronics

VED03MJ - ☐☐ - ☐ - ☐ - ☐☐**D** - ☐ ——— DESIGN LETTER

Proportional D03 Direct Operated with Digital On-Board Controls Standard 7 PIN Connection

FUNCTION

3		Dual Solenoid 3 Position Spring Centered
5		Single Solenoid 2 Position Spring Centered
10		Dual Solenoid 4 Position with Fail-Safe Feature - Spring Centered (Code ZC Spools only)
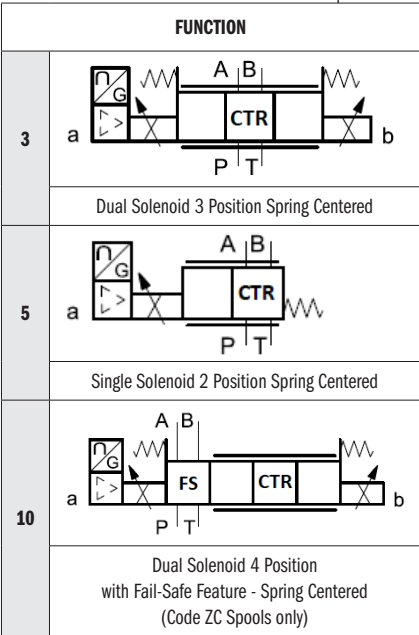
SEALS

CODE	DESCRIPTION
A	BUNA (STD)
G	VITON

REFERENCE SIGNAL

CODE	DESCRIPTION
E0	Voltage ± 10 V (STD)
E1	Current 4-20 mA

NOMINAL CONTROLLED FLOW with ΔP 10 Bar P-T

CODE	FLOW RATE
01	1 l/min
04	4 l/min
12	12 l/min
18	18 l/min (AC spool only)
30	30 l/min
30/15	30 (P-A) / 15 (P-B) l/min

CONNECTION

CODE	DESCRIPTION
OBW	On board electronics - Internal Enable monitor signal PIN F to PIN B
OBC	On board electronics - PIN C Enable monitor signal PIN F to PIN B
OBM	On board electronics - Internal Enable monitor signal PIN F to PIN C

SPOOLS

NAME	SYMBOLS	DESCRIPTION	APPLICATION	FUNCTION MATCHING
AC				3, 5
FC		METER IN / METER OUT	MOTION CONTROL	
ZC				3
ZCF		METER IN / METER OUT WITH FAIL SAFE		10

Note: Function Code 5 valve only available with solenoid supplied on A port end. (P-B / A-T)

TYPICAL ORDERING CODE:
VSD03MJ-3AC-30-A-OBWEOD-*

► ELECTRONICS: VED03MJ COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external	A	3
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2		According to 2014/30/EU standards

VED03MJ - STANDARD ELECTRONICS

3.1 - Electrical characteristics

Command signal: voltage (E0)	V DC	±10 (Impedance Ri = 11 kOhm)
current (E1)	mA	4 - 20 (Impedance Ri = 58 Ohm)
Monitor signal: voltage (E0)	V DC	0 - 5 (Impedance Ro > 1 kOhm)
current (E1)	mA	4 - 20 (Impedance Ro = 500 Ohm)
Connection		6-pin + PE (MIL-C-5015-G-DIN EN 175201-804)

On-board electonics diagrams

VERSION OBC - External Enable
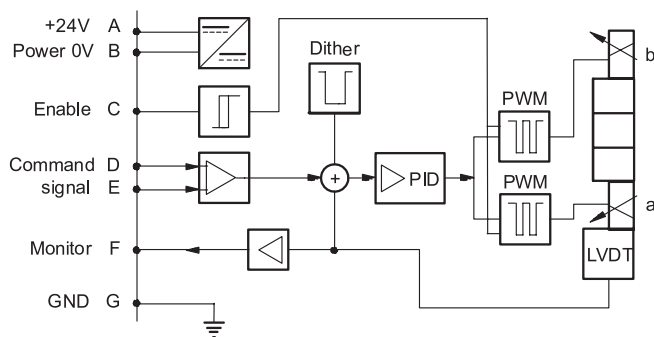
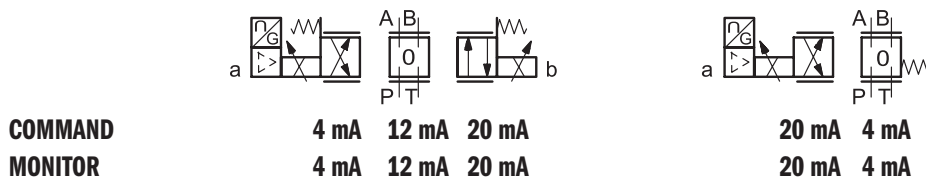**VERSION OBW** - Internal Enable
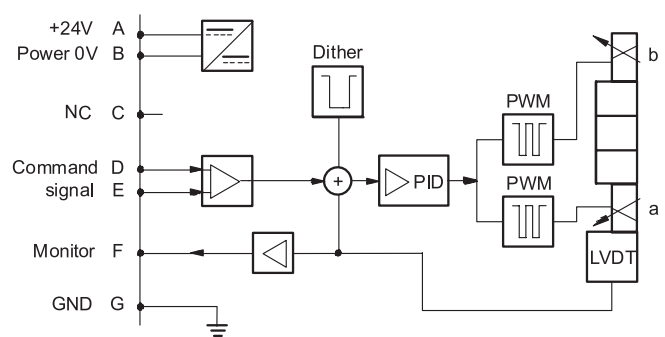
VERSION OBM - 0V Monitor
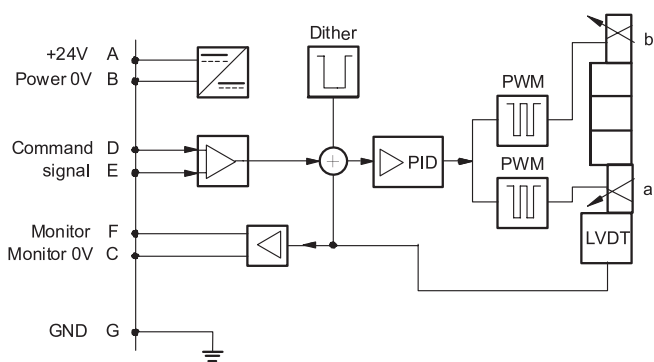
► ELECTRONICS:

VED03MJ Versions with voltage command (E0)

The reference signal is between -10V and +10V on double solenoid valve, and 0 - 10V on single solenoid valve.
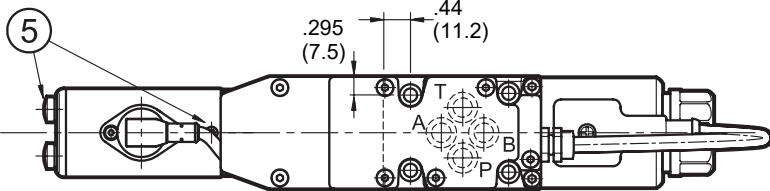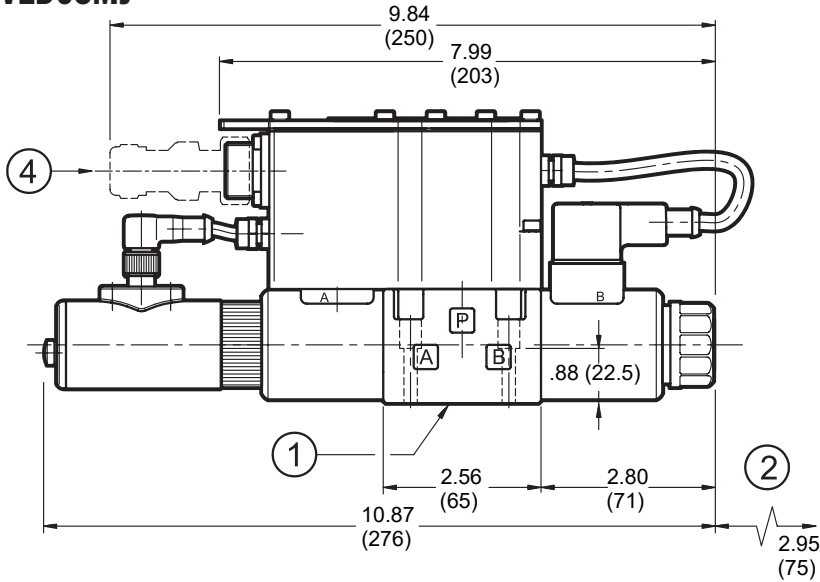The monitor feature of versions OBW and OBM becomes available with a delay of 0.5 sec from the power-on of the card.
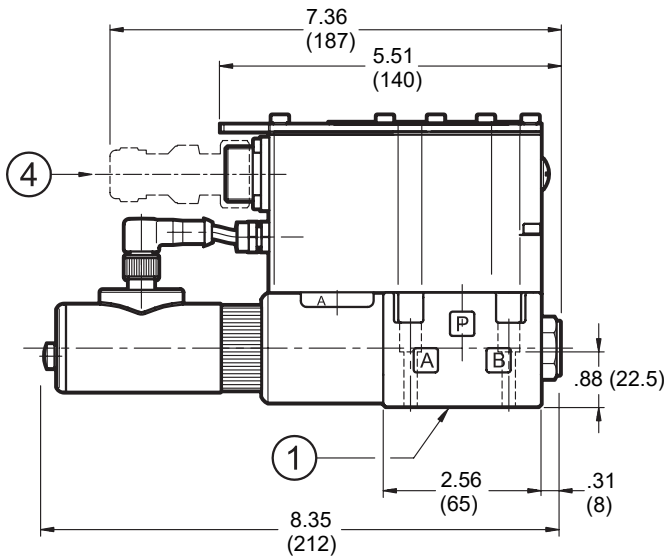

| | COMMAND | -10V | 0V | +10v | | +10V | 0V |
| | MONITOR | -10V | 0V | +10v | | +10V | 0V |

Pin	Values	version OBC	version OBW	version OBM
A	24V DC	Supply voltage		
B	0V			
C		Enable 24V DC	do not connect -	PIN F reference 0 V
D	± 10V	Command		
E	0 V	Command reference		
F	± 10V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		
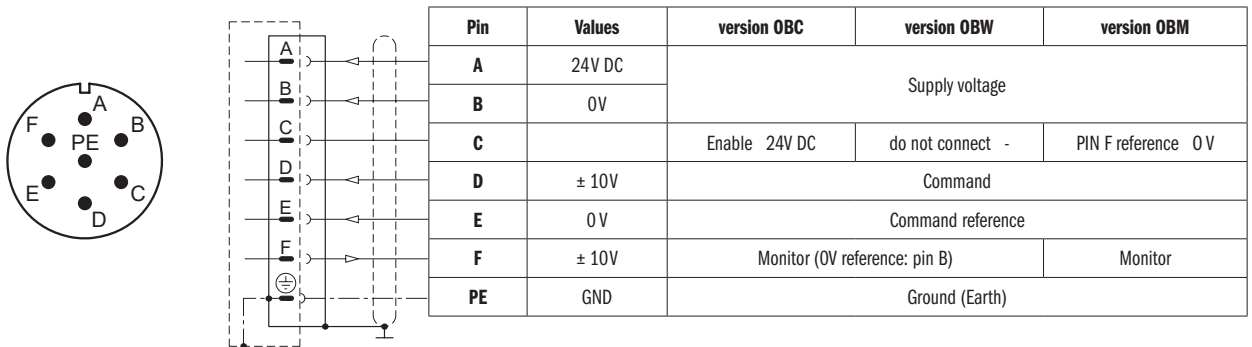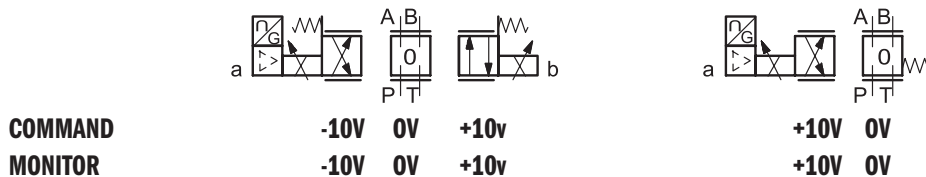
VDD03MJ Versions with current command (E1)

The reference signal is supplied in current 4 - 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions OBW and OBM becomes available with a delay of 0.5 sec from the power-on of the card.

| | COMMAND | 4 mA | 12 mA | 20 mA | | 20 mA | 4 mA |
| | MONITOR | 4 mA | 12 mA | 20 mA | | 20 mA | 4 mA |

Pin	Values	version OBC	version OBW	version OBM
A	24V DC	Supply voltage		
B	0V			
C		Enable 24V DC	do not connect -	PIN F reference 0 V
D	4 - 20 mA	Command		
E	0 V	Command reference		
F	4 - 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		
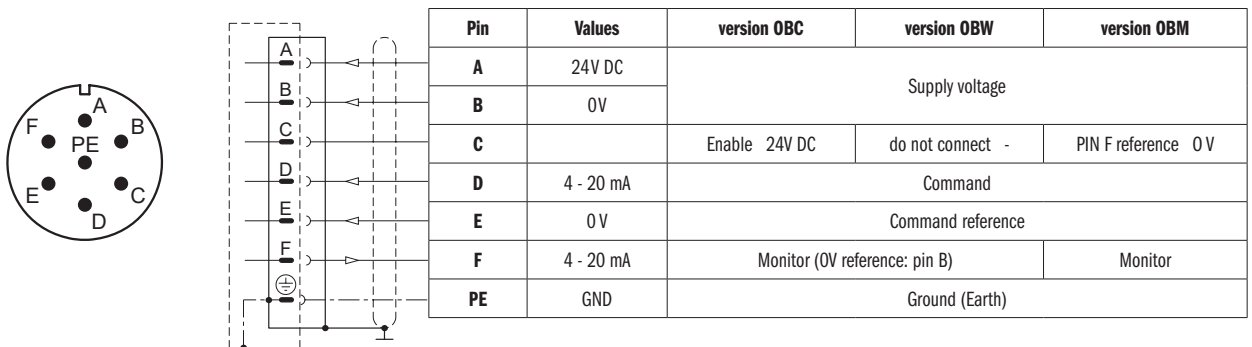
▶ INSTALLATION DATA:

Dimensions inch (mm)

VED03MJ

VED03MJ-3**

VED03MJ-5**

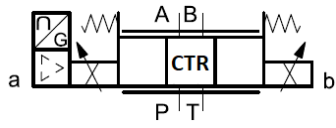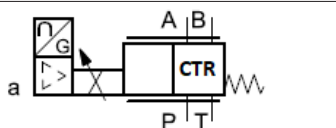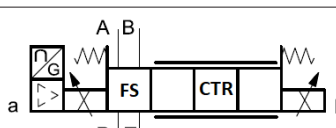| Valve Bolts: 4 SHC screws 10-24 NC x 1.25" ASTM A574 |
| --- |
| Torque: 4-6 lb.-ft. (5.4 - 8 Nm) |
| Threads of mounting holes: 10-24 NC |

1	Mounting surface with sealing rings: QTY 4 O-Ring Size AS568-012 / 90 Shore
2	Coil removal space (solenoid B only)
3	Main connection 6 pin + PE
4	Mating connector 6 poles + PE, female type MIL-5015-G To be ordered separately.
5	Adjustment sealing performed at factory. Do not disassemble the transducer.

▶ **IDENTIFICATION CODE:** Fieldbus Electronics

VED03JH - ☐☐ - ☐ - ☐ - ☐ K16 ☐ - ☐ ——— DESIGN LETTER
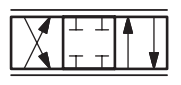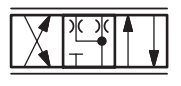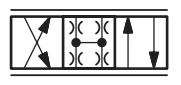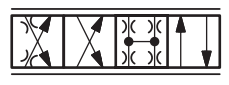
Proportional D03 Direct Operated Control with Digital On-Board and Fieldbus Controls

FUNCTION

3	
	Dual Solenoid 3 Position Spring Centered
5	
	Single Solenoid 2 Position Spring Centered
10	
	Dual Solenoid 4 Position with Fail-Safe Feature - Spring Centered (Code ZC Spools only)

SEALS

CODE	DESCRIPTION
A	BUNA (STD)
G	VITON

NOMINAL CONTROLLED FLOW with ΔP 10 Bar P-T

CODE	FLOW RATE
01	1 l/min
04	4 l/min
12	12 l/min
18	18 l/min (AC spool only)
30	30 l/min
30/15	30 (P-A) / 15 (P-B) l/min

CONNECTIONS (Select one for each X connection)

	CODE	DESCRIPTION
X1 Main Connector Configuration (Select One)	D1	One Command
	D0	Full Digital (on request - available for reference signal FD type Only)
X2, X3 Fieldbus type (Select One)	EC	EtherCAT
	EN	Ethernet / IP
	PN	Profinet
X7 Digital Transducer (Select One)	0	None
	1	SSI Type
	2	Encoder Type
X4 Analog transducer (Select One)	0	None
	1	Single / Double Transducer

SPOOLS

NAME	SYMBOLS	DESCRIPTION	APPLICATION	FUNCTION MATCHING
AC		METER IN / METER OUT	MOTION CONTROL	3, 5
FC				
ZC				3
ZCF		METER IN / METER OUT WITH FAIL SAFE		10

CONTROL INTERFACE

CODE	DESCRIPTION
E0	Analog Voltage (±10V)
E1	Analog current (4-20MA)
FD	Full Digital Version (on Request)

Note: Function Code 5 valve only available with solenoid supplied on A port end. (P-B / A-T)

TYPICAL ORDERING CODE:
**VSD03JH-3AC-30-A-E0K16DIEN00**

► ELECTRONICS:

VED03JH - FIELDBUS ELECTRONICS

The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

VED03JH Electrical characteristics

Command signal: voltage (E0) current (E1) digital (FD)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm) via fieldbus
Monitor signal: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Communication / diagnostic		via Bus register
Communication interface standards		IEC 61158
Communication physical layer		fast ethernet, insulated 100 Base TX
Power connection		11 pin + PE (DIN 43651)
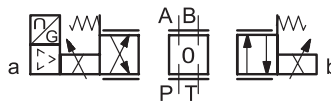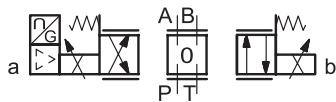
COMMAND	-10V	0V	+10v			4 mA	12 mA	20 mA
MONITOR	-10V	0V	+10v			4 mA	12 mA	20 mA

X1 Main connection pin table
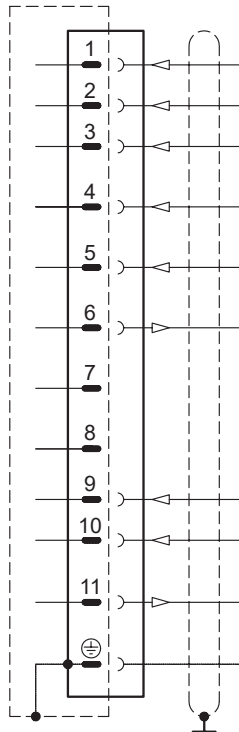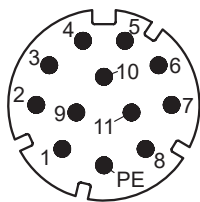
D1: one command

Pin	Values	Function
1	24V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	± 10V (E0) 4 - 20 (E1)	Command
5	0V	Command reference signal
6	± 10V (E0) 4 - 20 (E1)	Monitor (0V reference pin 10)
7	NC	do not connect
8	NC	do not connect
9	24V DC	Logic and control supply
10	0 V	
11	24V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

D0: full digital

Pin	Values	Function
1	24V DC	Main supply voltage
2	0 V	
3	24V DC	Enable
4	NC	do not connect
5	NC	do not connect
6	NC	do not connect
7	NC	do not connect
8	NC	do not connect
9	24V DC	Logic and control supply
10	0 V	
11	24V DC	Fault (0V DC) or normal working (24V DC) (0V reference pin 2)
12	GND	Ground (Earth)

▶ ELECTRONICS:

VED03JH FIELDBUS connections
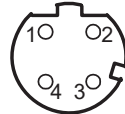Please wire following guidelines provided by the relative standards communication protocol.

Communication connections: EC (EtherCat), EN (Ethernet/IP), PN (PROFINET)

X2 (IN) connection M12 D 4 pin female
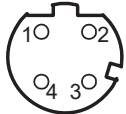
Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

Note: Shield connection on connector
housing is recommended.

X3 (OUT) connection: M12 D 4 pin female

Pin	Values	Function
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
HOUSING	shield	

Analogue transducer connection X4 connection: M12 A 4 pin female

VERSION 1: single / double transducer (single or double is a software-selectable option)
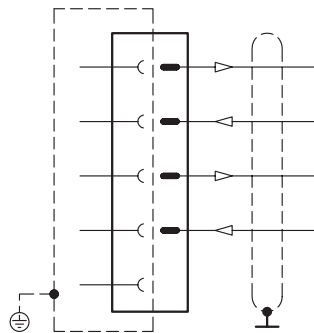
Pin	Values	Notes
1	+24V	Remote transducer power supply (out) 100 mA
2	±10 V 4 ÷20 mA	Input signal of transducer 1 (range software selectable)
3	0V	Common reference signal for transducer power and signals
4	±10 V 4 ÷20 mA	Input signal of transducer 2 (range software selectable)
5	-	

► ELECTRONICS:

Digital transducer connection

X7 connection: M12 A 8 pin female)

VERSION 1: SSI type

Pin	SSI Values	Function	Notes
1	CLK+	Serial synchronous clock (+)	Input - digital signal
2	CLK-	Serial synchronous clock (-)	
3	MISO+	Serial position data (+)	
4	MISO-	Serial position data (-)	
5	NC	-	do not connect
6	NC	-	
7	+24 V	transducer power supply	Output power supply
8	0 V	-	Common GND

VERSION 2: ENCODER type

Pin	SSI Values	Function	Notes
1	ENC_Z+	input channel Z+	Input - digital signal
2	ENC_Z-	input channel Z-	
3	ENC_A+	input channel A+	
4	ENC_A-	input channel A-	
5	ENC_B+	input channel B+	
6	ENC_B-	input channel B-	
7	+5 V	transducer power supply	Output power supply
8	0 V	-	Common GND

▶ **INSTALLATION DATA:**

Dimensions inch (mm)

VED03JH

VED03JH-3**

Note: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to page 10-12 for connection descriptions and pinout.
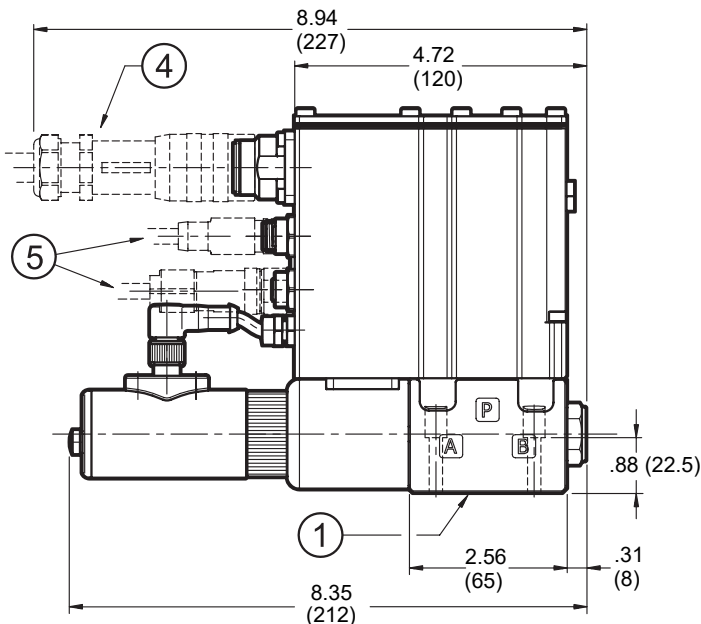
Valve Bolts: 4 SHC screws 10-24 NC x 1.25" ASTM A574
Torque: 4-6 lb.-ft. (5.4 - 8 Nm)
Threads of mounting holes: 10-24 NC

X1	Main connection 11 pin + PE
X2	Fieldbus communication (IN)
X3	Fieldbus communication (OUT)
X4	X4 connection for analogue transducer
X7	X7 connection for digital transducer

1	Mounting surface with sealing rings: QTY 4 O-Ring AS568-012 / 90 Shore
2	Coil removal space (solenoid B only)
3	Manual override by pin integrated in the solenoid tube
4	Mating connector 11 poles + PE To be ordered separately.
5	Mating connectors for fieldbus communication and signals To be ordered separately.

VED03JH-5**

▶ PERFORMANCE DATA:

VED03 J Series - CHARACTERISTIC CURVES

(Obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Typical flow rate curves related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

ZC-01

ZC-04

ZC-12

ZC-30
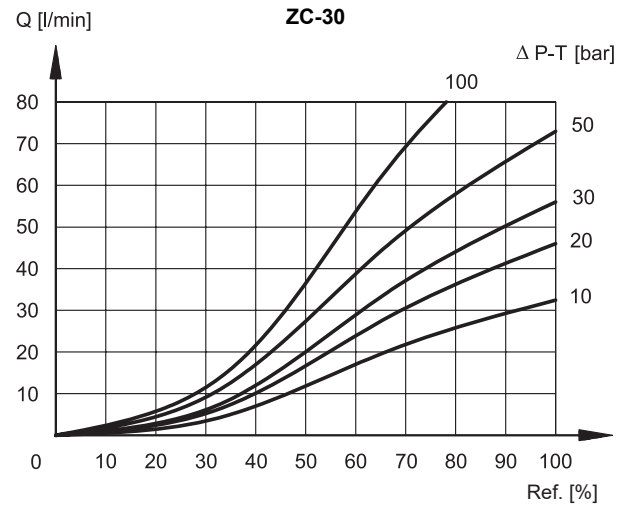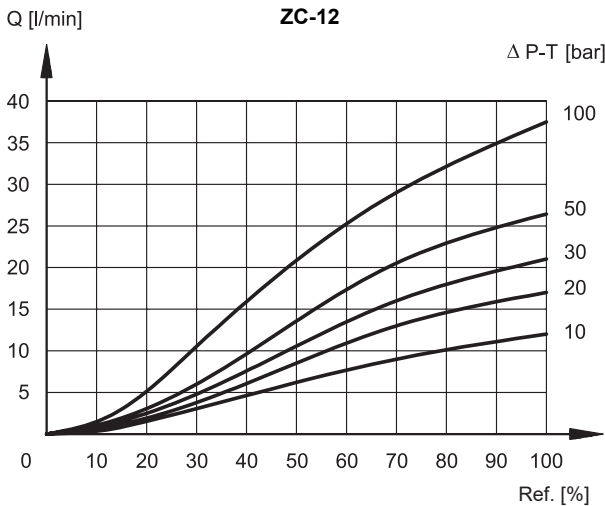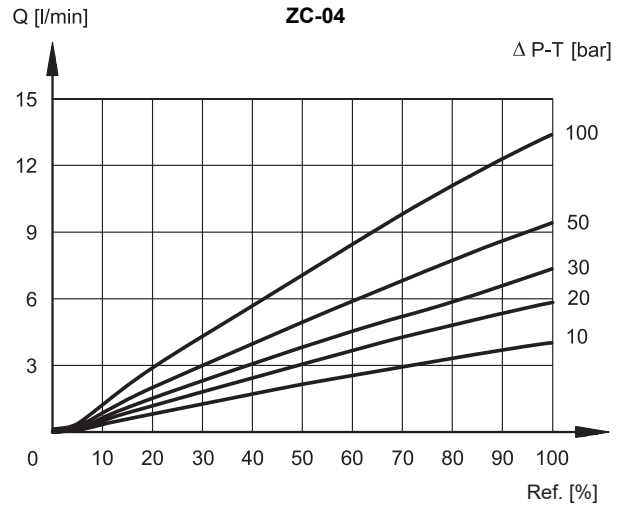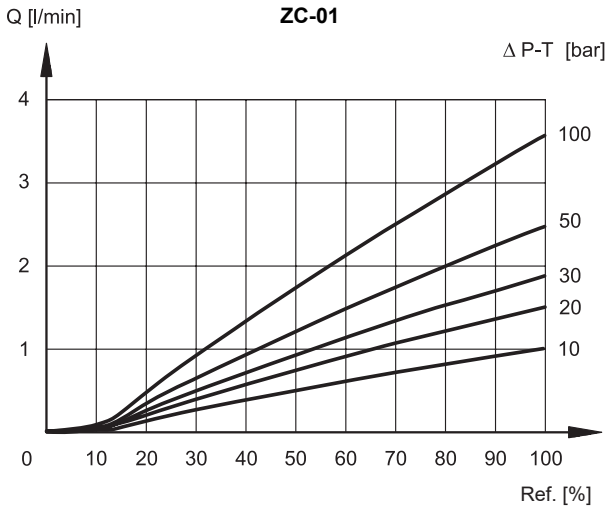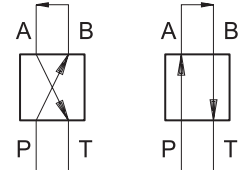
Common Conversions Formulas:

LPM to GPM (LPM x .2642 = GPM)
GPM to LPM (GPM x 3.785 = LPM)

Bar to PSI (Bar x 14.5 = PSI)
PSI to Bar (PSI x .06895 = Bar)

► ## PERFORMANCE DATA:

Q [l/min]   **AC-01 / FC-01**

Q [l/min]   **AC-04 / FC-04**

Q [l/min]   **AC-12 / FC-12**

Q [l/min]   **AC-18**

Q [l/min]   **AC-30 / FC-30**

► PERFORMANCE DATA:

10ZCF SPOOLS - FAIL SAFE FEATURE
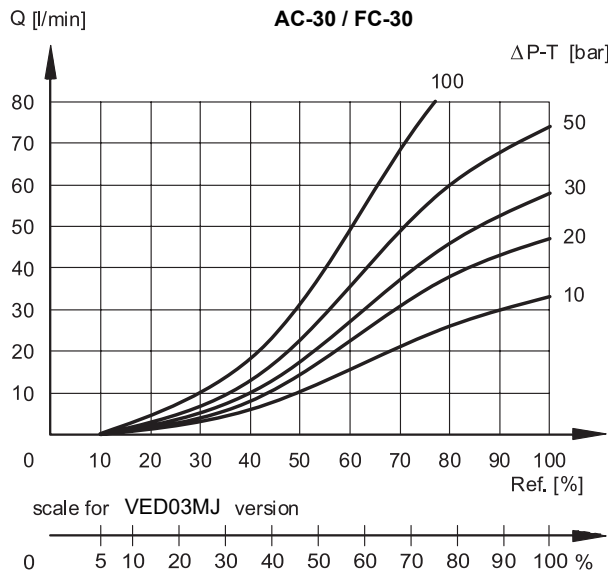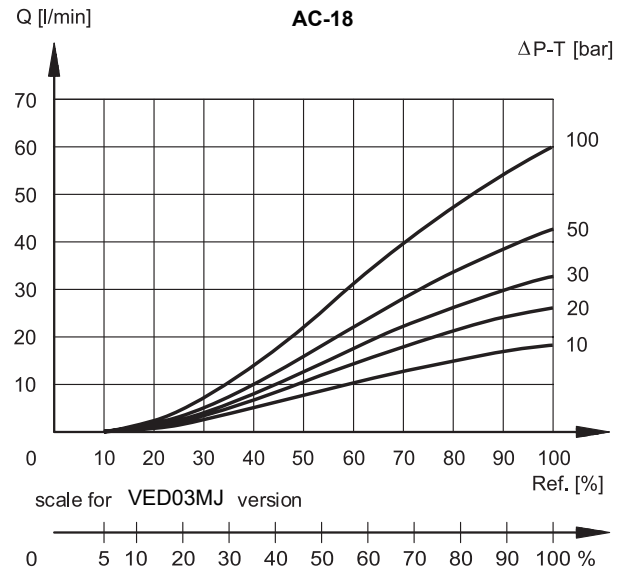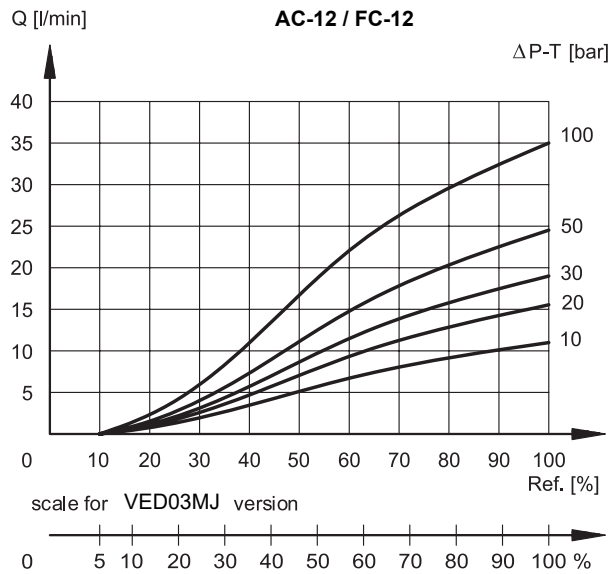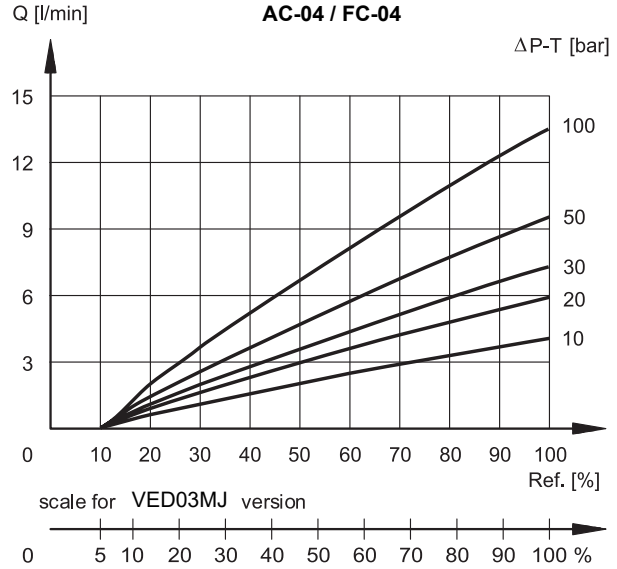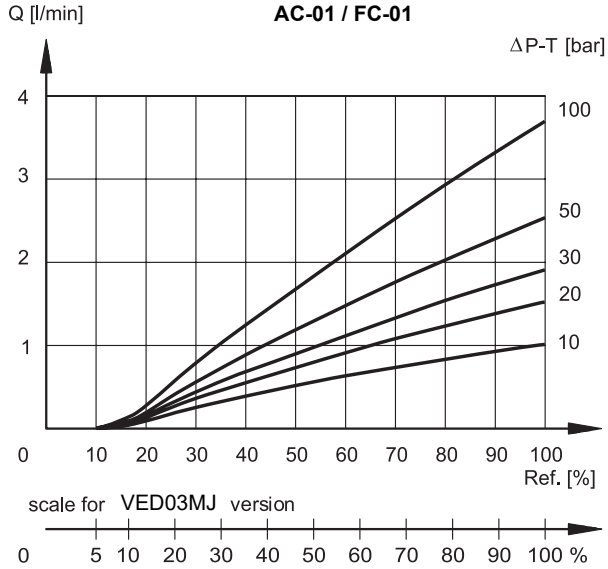
Flow P→B / A→T with valve in fail safe position, depending on the inlet pressure.

When a power failure (enabling OFF) occurs, the valve moves in 'fail safe' position, maintaining a minimum flow that allows the actuator to return slowly to a safe position.

During the black-out the centering springs retain the spool in fail safe-position.

RESPONSE TIMES
(Obtained with mineral oil with viscosity of 36 cSt at 50°C and 140 bar Δp P→T)

FREQUENCY RESPONSE (ZC SPOOLS)

RESPONSE TIME

Z SPOOLS - PRESSURE GAIN
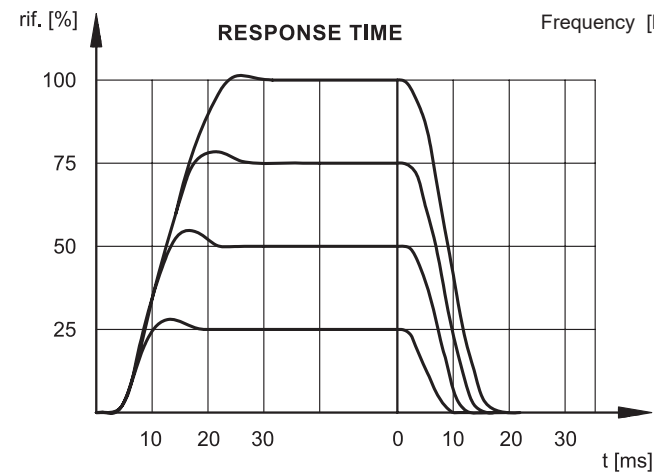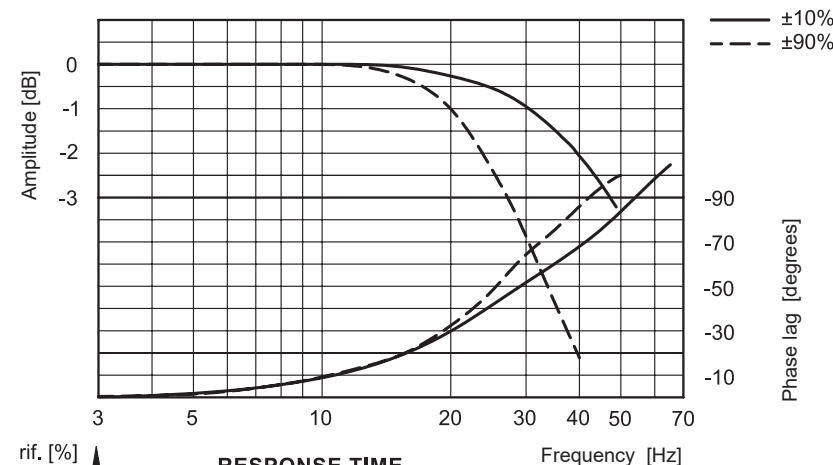
The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

▶ ACCESSORIES CATALOGS:

Connectors and Cables Sets
Form #1027453

Programming and Test Devices
Form #1027454

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