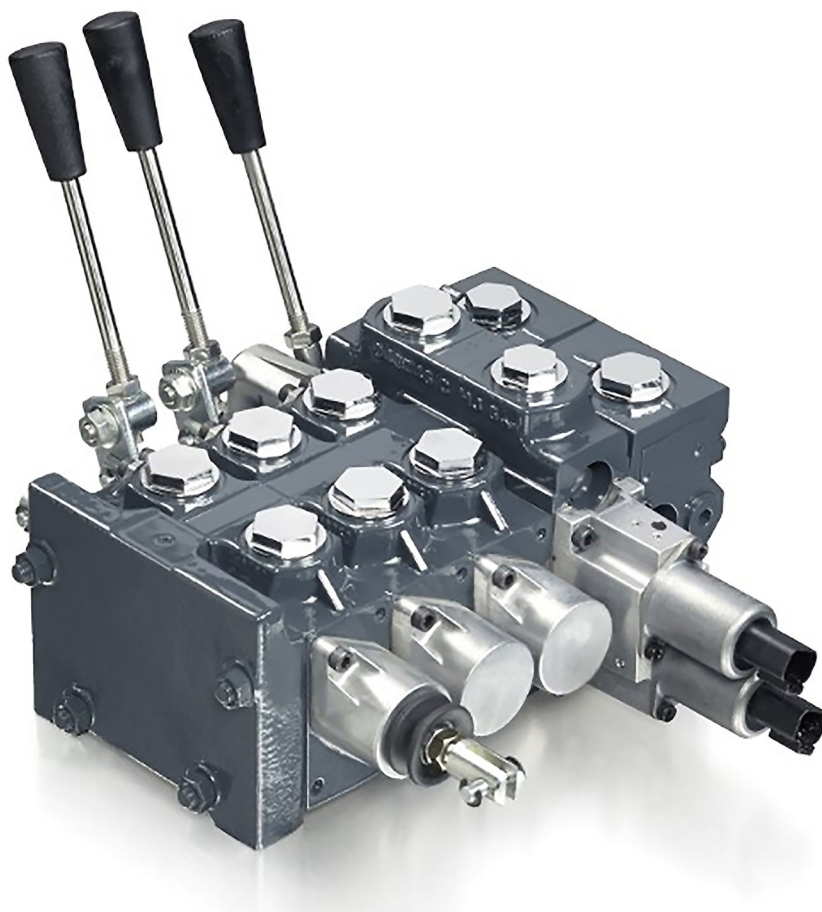


Technical Information

# Directional Control Valve

## ECO 80



**Revision history**

*Table of revisions*

Date	Changed	Rev
October 2016	First edition	0101

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## General Information

### ECO 80 general description

The ECO 80 LS is a hydraulic load sensing proportional valve group designed to give maximum flexibility in design and build concept. The ECO 80 LS is designed as a load sensing directional control valve which will lead to increased machine performance, higher efficiency, reduced cooling requirements and fuel saving compared to conventional directional control valves.

### ECO 80 LS general features

- Load sensing directional control:
  - Proportional control of oil flow to a work function
- Modular build concept:
  - Up to 12 basic modules per ECO 80 LS valve group
  - Different, interchangeable spool variants
  - System pressure up to 280 bar
  - Work port pressure up to 320 bar
  - Compact design and installation

### ECO modules

#### EVP, pump side modules

- Built-in pressure relief valve
- Pressure gauge connection
- Versions:
  - Open center version for systems with fixed displacement pumps
  - Closed center version for systems with variable displacement pumps
  - Integrated 25 bar pilot oil supply for hydraulic and electrohydraulic actuation
  - Versions prepared for electrical LS unloading valve

#### EVB, basic modules

- Interchangeable spools
- Load holding check valve in channel P
- Option for shock and suction valves for port A and B

#### Actuation modules

The basic module can be fitted with three main different actuation modules:

- Mechanical
- Electrical
- Hydraulic

## Technical description

### **ECO 80 LS with open center EVP (fixed displacement pump)**

When the pump is started and the main spools in the individual basic modules (2) are in the neutral position, oil flows from the pump, through connection P, across the pressure adjustment spool (8) to tank. The spring in the pressure adjustment spool determines the pump pressure (stand-by pressure) in neutral.

When one or more of the main spools are actuated, the highest load pressure is fed through the shuttle valve circuit to the spring chamber behind the pressure adjustment spool (8), and completely or partially closes the connection to tank. Pump pressure is applied to the left-hand side of the pressure adjustment spool (8). The pressure relief valve (7) will open should the load pressure exceed the set value, diverting pump flow back to tank.

With a non pressure-compensated basic module incorporating a load drop check valve (3) in channel P, the check valve prevents return oil flow. Please see [ECO 80 LS sectional view](#) on page 7 for better understanding of this example.

### **ECO 80 LS with closed center EVP (variable displacement pump)**

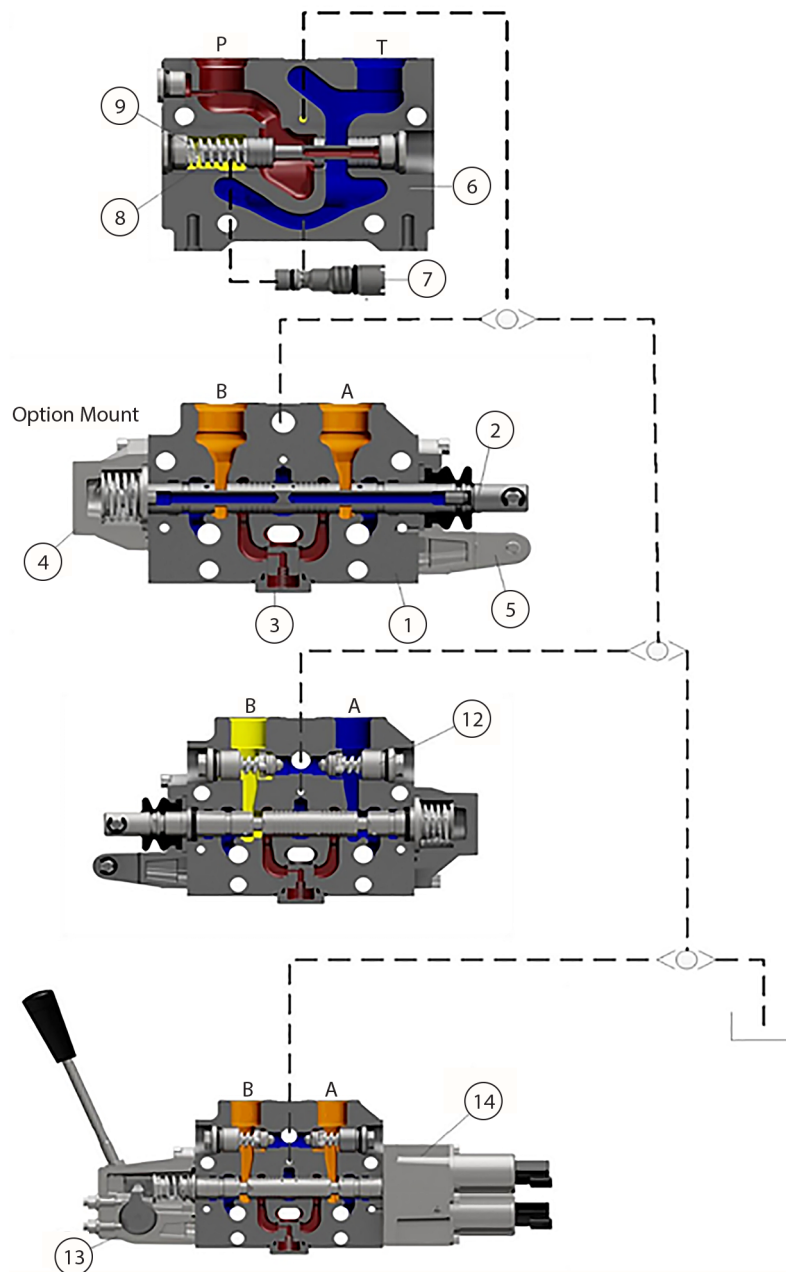
In the closed center version the pressure adjustment spool (8) will only open to tank when the pressure in channel P exceeds the set value of the pressure relief valve (7).

In load sensing systems the load pressure is led to the pump regulator via the LS connection. In the neutral position the pump control sets the displacement so that leakage in the system is compensated for, to maintain the set stand-by pressure.

When a main spool is actuated the pump regulator will adjust the displacement so that the set differential pressure between P and LS is maintained. The pressure relief valve (7) in EVP should be set at a pressure of approx. 30 bar above maximum system pressure (set on the pump or external pressure relief valve).

## Technical description

### ECO 80 LS sectional view



<b>1</b>	Workstation EVB	<b>8</b>	Unloader spool
<b>2</b>	Spool EVBS	<b>9</b>	Unloader spool spring
<b>3</b>	Check valve	<b>10</b>	LS Shuttle
<b>4</b>	Spring center EVME	<b>11</b>	Load sensing
<b>5</b>	Actuator EVOS	<b>12</b>	Shock valve
<b>6</b>	Pump Inlet EVP	<b>13</b>	Spring center (EH) EVM
<b>7</b>	Load sense relief	<b>14</b>	Electric Actuator

## Technical description

### ECO 80 LS technical data

The characteristics in this catalog are typical measured values. During measurement, a mineral-based hydraulic oil with a viscosity of 32 mm<sup>2</sup>/s at a temperature of 55 °C was used.

#### *ECO 80 LS technical data*

Maximum pressure	Port P, A/B continuous	280 bar
	Port A/B intermittent	320 bar
	Port T, static / dynamic	25 / 40 bar
Oil flow rated	Port P	80 l/min
	Port A/B	80 l/min
Spool travel, standard		± 5 mm
Dead band, flow control spools		± 1.5 mm
Maximum internal leakage at 70 bar and 32 mm <sup>2</sup> /s	A/B → T without shock valve	15 cm <sup>3</sup> /min
	A/B → T with shock valve	20 cm <sup>3</sup> /min
Oil temperature (inlet temperature)	Recommended temperature	30 → 60 °C
	Minimum temperature	-30 °C
	Maximum temperature	+90 °C
Ambient temperature		-30 → 60 °C
Oil viscosity	Operating range	12 - 75 mm <sup>2</sup> /s
	Minimum viscosity	4 mm <sup>2</sup> /s
	Maximum viscosity	460 mm <sup>2</sup> /s
Filtration / maximum contamination according to ISO 4406		23/19/16



## Safety

### Safety in application

All makes and all types of control valves (including proportional valves) can fail, thus the necessary protection against the serious consequences of function failure should always be built into the system. For each application an assessment should be made for the consequences of pressure failure and uncontrolled or blocked movements. To determine the degree of protection that is required to be built into the application, system tools such as FMEA (Failure Mode and Effect Analysis) and Hazard and Risk Analysis can be used.

### FMEA – IEC EN 61508

FMEA (Failure Mode and Effect Analysis) is a tool used for analyzing potential risks. This analytical technique is utilized to define, identify, and prioritize the elimination or reduction of known and/or potential failures from a given system before it is released for production. Please refer to IEC FMEA Standard 61508.

### Hazard and risk analysis ISO 12100-1/14121

This analysis is a tool used in new applications as it will indicate whether there are special safety considerations to be met according to the machine directives EN 13849.

Dependent on the determined levels conformity this analysis will determine if any extra requirements for the product design, development process, production process or maintenance, i.e. the complete product life cycle.

#### **Warning**

All makes/brands and types of directional control valves – inclusive proportional valves – can fail and cause serious damage. It is therefore important to analyze all aspects of the application.

Because the proportional valves are used in many different operation conditions and applications, the manufacturer of the application is alone responsible for making the final selection of the products – and assuring that all performance, safety and warning requirements of the application are met.

The process of choosing the control system – and safety levels – is governed by the machine directives EN 13849 (Safety related requirements for control systems).

## Function

### EVBS, main spools for flow control

When using standard flow control spools, the pump pressure is determined by the highest load pressure. This is done either via the pressure adjustment spool in open center PVP (fixed displacement pumps) or via the pump control (variable displacement pumps).

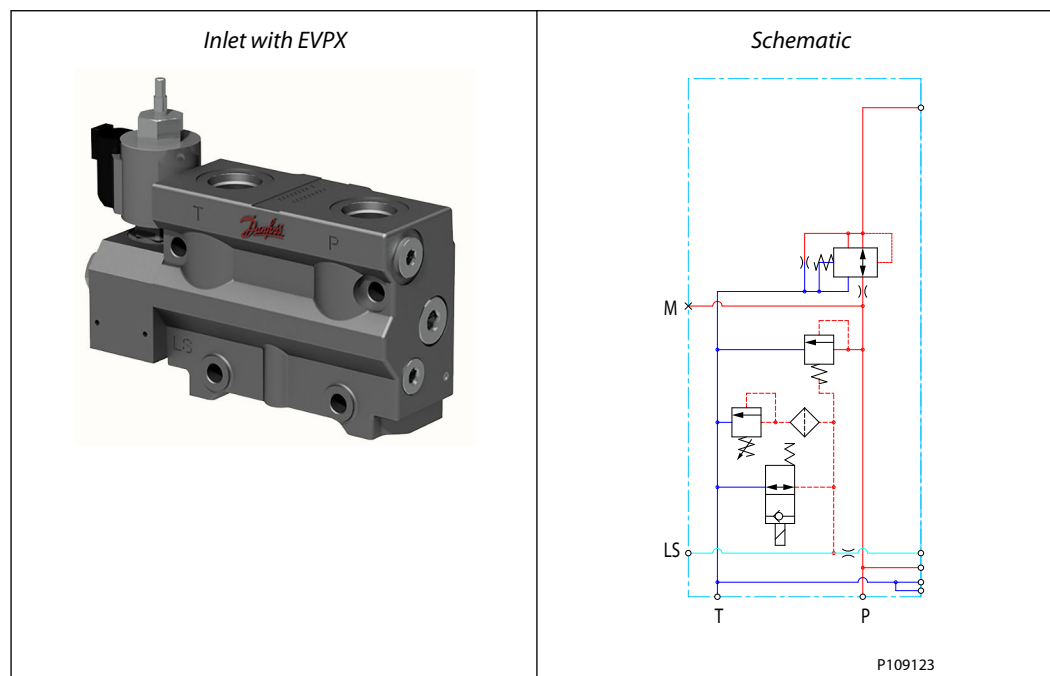
In this way the pump pressure will always correspond to the load pressure plus the stand-by pressure of the pressure adjustment spool or the pump control. This will normally give optimum and stable adjustment of the oil flow.

### EV PX, electrical LS unloading valve

EV PX is a solenoid LS unloading valve. EV PX is fitted into the pump side module enabling a connection to be made between the LS and the tank lines. Thus the LS signal can be relieved to tank by means of an electric signal.

For an EVP pump side module in open center version the relief to tank of the LS signal means that the pressure in the system is reduced to the sum of the tank port pressure plus the neutral flow pressure for the pump side module.

For a EVP pump side module in closed center version the relief to tank of the LS signal means that the pressure is reduced to the sum of the tank port pressure for the pump side module plus the stand-by pressure of the pump.

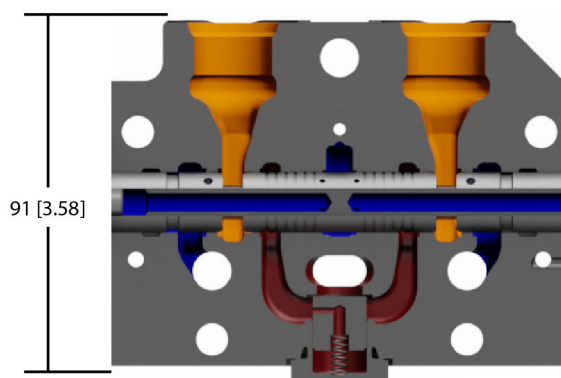


## Function

### EVB, Work Section

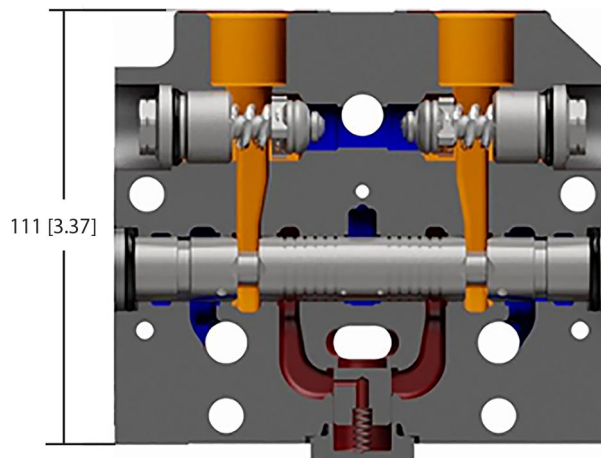
Worksections are available in 2 variants (for mechanical actuation & for hydraulic or electro-hydraulic actuation) and offer 2 option each: A 'low' body including p-channel check valves as well as a 'medium' body including p-channel check valve and shock & anti-cavitation valves. For both worksections all spool options are available.

#### *Low body*



F101 938

#### *Medium body*



The position of the tie-rods, location of P, T and LS lines are the same in both configurations. This enables that worksections can be built into the same valve stack and can be arranged freely in the valve to enable freedom in machine design.

The work sections does not facilitate possibility for options mounting.

**Function**

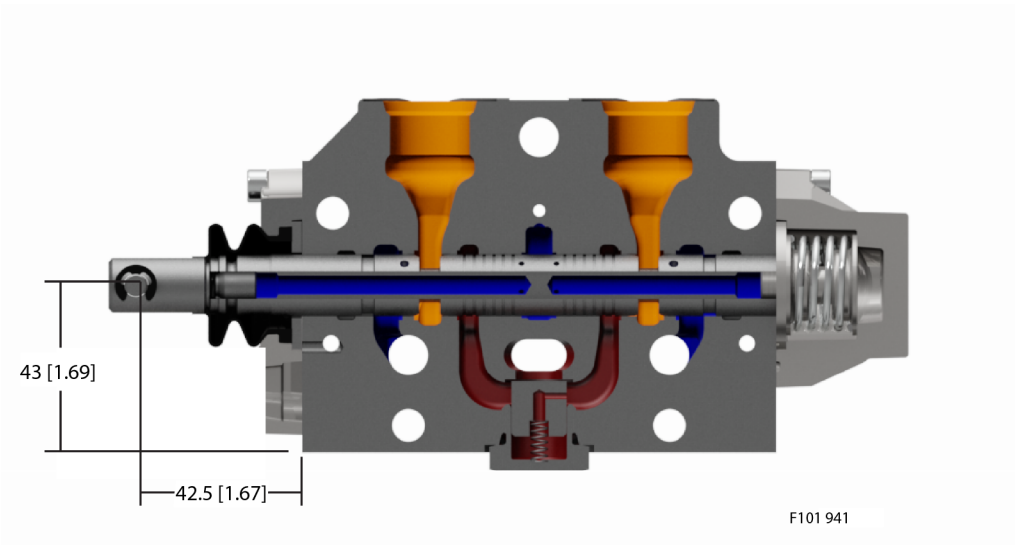
**EVOS, open spool mechanical actuation**

The EVOS mechanical actuation consists of an aluminum base with a lever and a rubber boot to protect the spool, mounted on the end of the valve slice. When actuating the lever the operator is directly pulling or pushing on the main spool inside the valve hence controlling the flow.


The lever has a travel of 14° in either direction from neutral. Actuating the lever fully will move the spool all 5 mm and give full flow. The lever can be mounted / removed without having to remove the EVOS base.

The EVOS should be used with open spool mechanical actuation and can be combined with any EVME, spring center, detent, through action and micro switch.

mm [in]



*Operating torque for EVOS*

	Spool displacement	Operating torque N•m
		EVOS + EVME (spring center, Micro Switch)
	From neutral position	18 ±1
	Maximum spool travel	29 ±1
	No control lever position	2 x 6 (see pg. 38 EVOS, Lever Position)
	Control lever range	±14°

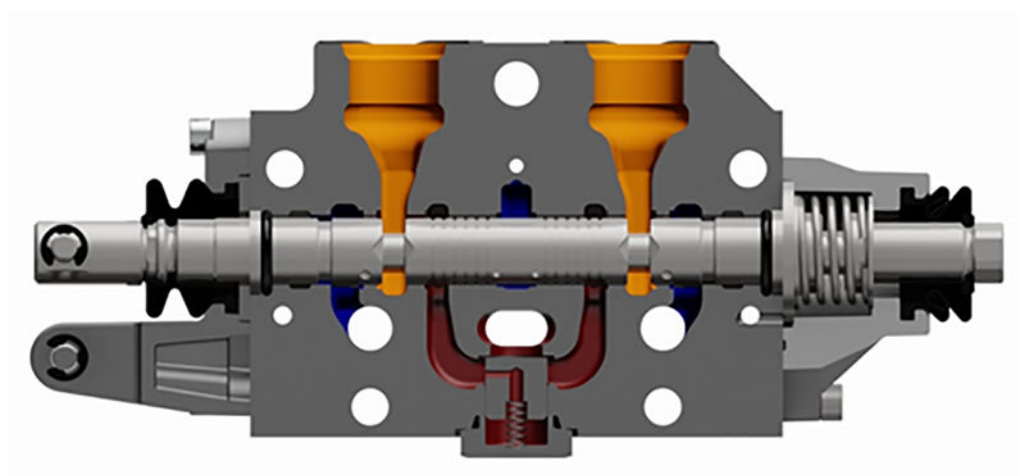
## Function

### EVOS, open spool through action


The EVOS open spool through action consists of an aluminum base with a rubber boot to protect the spool, mounted on the end of the valve slice, the connection with application is an female extension assembled on the main spool.

The valve is actuated by directly pulling or pushing the main spool inside the valve hence controlling the flow. Actuating the spool fully will move all 5 mm and give full flow. The EVOS should be used with open spool mechanical actuation and can be combined with any EVME, spring center, detent, through action and micro switch.

mm [in]



### Operation linear force through acting

 <p>F302 526</p>	Spool displacement	Operating linear force
	from neutral position	EVOS + EVME (Through Acting)
	maximum spool travel	135 ±5 [N] 218 ±5 [N]

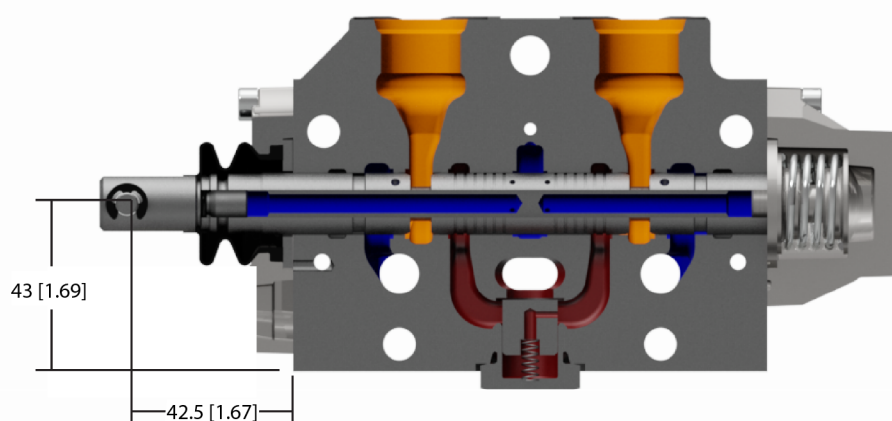
### Partnumbers EVOS

Description	Partnumber
EVOS80LS-ACTUATOR-MECH	047768
EVOS80LS-ACTUATOR-MECH-LEVER	11175314
ACCESSORIES-BASE MECH-HANDLE	11170923
EVOS80LS-ACTUATOR-THRU	11172533

## EVME, Open spool centering

### EVME spring centering

The EVME spring centering consists of an aluminum cover mounted on the end of the valve slice which ensures the position of the spool in neutral positions and spool in/out. The EVME spring centering should be used with spool option: Mechanical flow control spools, Female Extension. And can be combined with any EVOS, Open spool actuators.



F101 941

### EVME, detent 03 position

The EVME detent 03 positions consists of an aluminum cover mounted on the end of the valve slice which keep the position of the spool in neutral positions and spool in/out.

The EVME detent 03 positions should be used with spool option: Mechanical flow control spools, Female Extension and Detent 03 position. And can be combined with any EVOS, Open spool actuators.

### EVME, detent 02 position spool to A or B

The EVME detent 02 positions consists of an aluminum cover mounted on the end of the valve slice which keep the position of the spool in neutral positions and spool out, position spool in is blocked.

The EVME detent 02 positions should be used with spool option: Mechanical flow control spools, Female Extension and Detent 03 position with accessory part number 11173406. And can be combined with any EVOS, Open spool actuators.

## **EVME, Open spool centering**

### **EVME, through action**

The EVME through action consists of an aluminum cover with a rubber boot to protect the spool, mounted on the end of the valve slice which ensures the position of the spool in neutral positions and spool in/out.

The connection with application is a female thread M8 x 1,25 and is it possible to assemble an female extension as accessory part number 050548 on the thread.

The valve is actuated by directly pulling or pushing the main spool inside the valve hence controlling the flow. Actuating the spool fully will move all 5 mm and give full flow. The EVME through action should be used with spool option: Mechanical flow control spools, Female Extension and through acting. Can be combined with any EVOS, Open spool actuators.

#### *Partnumbers EVME*

<b>Description</b>	<b>Partnumber</b>
EVME80LS-COVER	11169579
EVME80LS-COVER-THRU	11169580
ACCESSORY-EXTENSION	050548
ACCESSORY-DETENT 02 POSITION	11173406

## EVME, Open spool centering

### EVME, micro switch NO

The EVME Micro Switch consists of an aluminum cover mounted on the end of the valve slice, which enables by two micro switches know which side the spool is being stroked, in or out.

The micro switches can have contacts in the configuration normally open "NO". The EVME Micro Switch should be used with spool option: Mechanical flow control spools, Female Extension and Micro Switch. And can be combined with any EVOS, Open spool actuators.

#### Technical data for EVME Micro Switch

EVME	Parameter	Voltage	
		12 V	24 V
	Max. current	10 A	
	Resistance	0.010 $\Omega \pm 15\%$	

#### Enclosure

Connector type	Protection class
DEUTSCH DT04-2P	IP 67

#### Partnumbers EVME-DIRECTIONAL INDICATOR

Description	Partnumber
EVOS80LS-COVER-THRU-DI-NO-DT	11170841



## EVOS x EVME, Combinations: Work Port A & Work Port B

### EVOS x EVME, Combinations

			Work Port B					
			EVOS, Open spool mechanical actuation			EVME, Open spool centering		
			047768 ACTUATOR- MECH	11175314 ACTUATOR- MECH-LEVER	11172533 ACTUATOR- THRU	11169579 COVER (Spring center, detent 02 and 03 positions)	11169580 COVER-THRU	11170841 Micro Switch COVER-THRU- DI-NO-DT
Work Port A	EVME, Open spool centering	11169579 COVER (Spring center, detent 02 and 03 positions)	X	X	X			
		11169580 COVER-THRU	X	X	X			
		11170841 Micro Switch COVER-THRU- DI-NO-DT	X	X	X			
	EVOS, Open spool mechanical actuation	047768 ACTUATOR- MECH				X	X	X
		11175314 ACTUATOR- MECH-LEVER				X	X	X
		11172533 ACTUATOR- THRU				X	X	X

## Actuation

### EVM, Mechanical Actuation

The EVM consists of an aluminum base with a lever mounted on the end of the valve slice on side B. When actuating the lever the operator is directly pulling or pushing on the main spool inside the valve hence controlling the flow.

The lever has a travel of 13.8° in either direction from neutral. Actuating the lever fully will move the spool all 5 mm and give full flow. The lever can be mounted / removed without having to remove the EVM base. The EVM should be used with Electrical flow control spools and can be combined with any EVHC or EVH.

#### Versions available:

##### *EVM without adjustment screws*

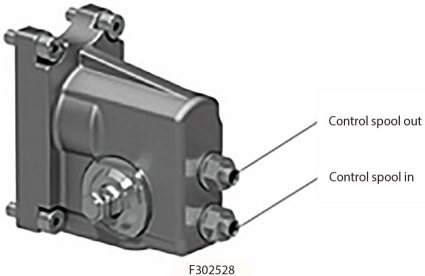
The standard EVM without adjustment screws will allow a spool travel of 5 mm in either direction. Full lever movement to one side will give full flow to the work ports. When the spool is moved 5mm it will stop due to a mechanical limitation build into the EVM base.

##### *EVM with adjustment screws*

The spool travel in either direction can be limited by the adjustment screws. This will limit the flow out of the work ports thereby reducing the speed of an application.

The spool travel is adjusted by first loosening the nut then adjusting the pin screw. After adjustment the nut must be tightened again applying  $8 \pm 1$  [N·m] of torque.

#### Operating torque for EVM

EMV	Spool displacement	Operating torque
		EVM + EVHC & EVM + EVH
	from neutral position maximum spool travel	19 ±1 [N·m] 55 ±1 [N·m]
	No control lever position	2 x 6
	Control lever range	±13.8°
No control lever position	2 x 6	
Control lever range	±13.8°	

#### Partnumbers EVM

Description	Part number
EVM-ACTUATOR	11119157
EVM-ACTUATOR-LEVER	11167001
EVM-ACTUATOR-ADJ SCREW	11145204
EVM-ACTUATOR-ADJ SCREW-LEVER	11167002

## Actuation

### EVC, cover for mechanical actuation

The EVC is an aluminum plate mounted on the end of the valve slice on side A for purely mechanically operated valve with EVM style.

The EVC is to be combined with an EVM.



#### Ordering information


Description	Part number
EVC-COVER	11171318

### EVH, hydraulic actuation

The EVH is an aluminum plate with two threaded connections mounted on the end of the valve slice on side A. When applying pressure through one of the ports, one side of the spool is pushed to one direction hence flow is coming from the work ports.

The EVH is to be combined with an EVM.

#### Technical data for EVH

	Control range pressure	5 – 18 bar
	Maximum pilot pressure	35 bar
	Maximum pressure on port T (the hydraulic remote control lever should be connected directly to tank.)	10 bar

#### Partnumbers EVH

Description	Partnumber
EVH-ACTUATOR-SAE	11169487
EVH-ACTUATOR-BSP	11169486

## Actuation

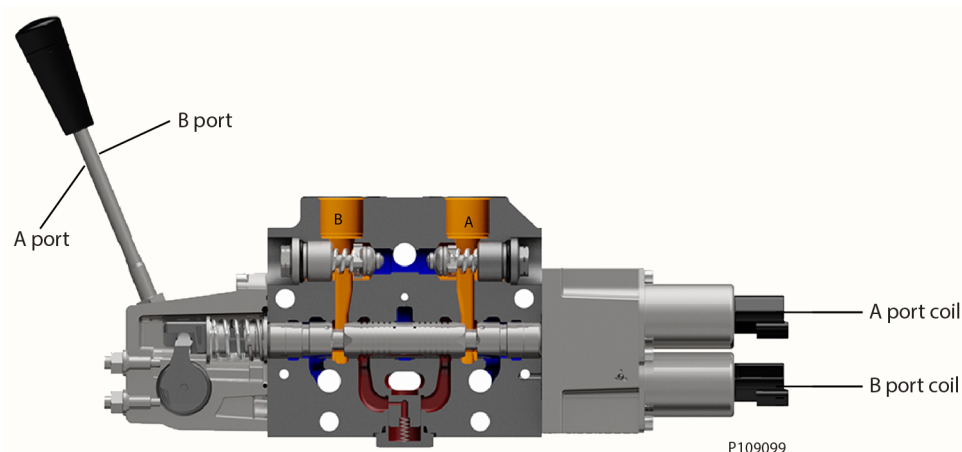
### Electrical actuation

#### EVHC, Electrical control of ECO

The EVHC consists of an aluminum base with two solenoids pressure reducing valves mounted on the end of the valve slice. When actuating with electrical proportional actuation, the main spool position is adjusted so that its position corresponds to an electrical control signal.

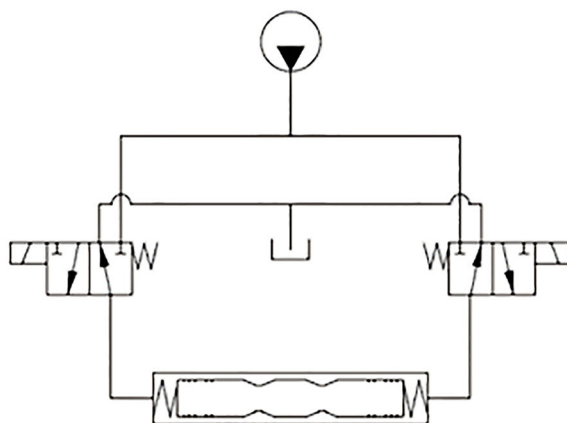
The control signal is converted into a hydraulic pressure signal that moves the main spool in the EVB. This is done by means of two proportional pressure-reducing valves. The electrical actuator can be controlled either by a current amplifier card, or directly from a programmable microcontroller.

*EVHC actuation module*



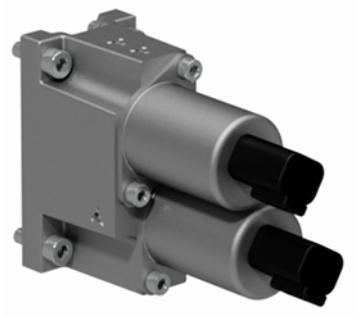
The actuator controls the spool by building up pilot oil pressure on the end of the spool. For the EVHC is necessary a pilot oil pressure between 25 and 30 bar.

The EVHC should be used with Electrical FLOW CONTROL spools and can be combined with any EVM.



## Actuation

### Technical data for EVHC

EVHC	Parameter	Control range	
		12 V	24 V
	Controller output current range	0 -1500 mA	0 - 750 mA
	Pressure control range	8 to 23 bar	
	Resistance	4.75 $\Omega \pm 5\%$	20.8 $\Omega \pm 5\%$
	Frequency	100 - 400 Hz	

### Enclosure

Connector type	Protection class
DEUTSCH DT04-2P	IP 67

### EVHC characteristic - Spool stroke vs current



EVHC current response and hysteresis @ 25 bar Pp, 32 cT5, 55 °C. The ideal curve (red line) is determined by the main spool neutral spring. The EVHC hysteresis is around  $\pm 7,5\%$  (grey region).

The hysteresis is affected by viscosity, friction, flow forces, dither frequency and modulation frequency. The spool position will shift when conditions are changed e.g. temperature change.

### Partnumbers EVHC

Description	Partnumber
EVHC-ACTUATOR-DT-12V	11162297
EVHC-ACTUATOR-DT-24V	11162298

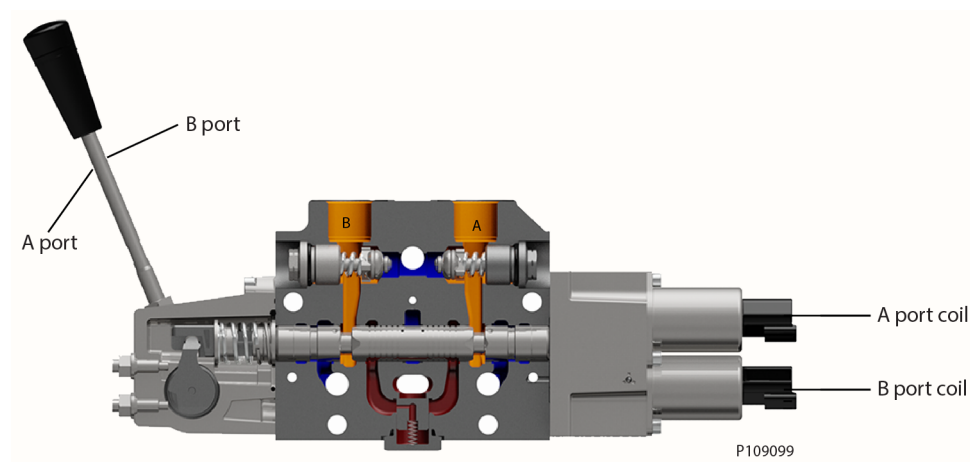
## Actuation

### EVHCO, On/Off Electrical Control of ECO

The EVHCO consists of an aluminum base with two solenoid valves mounted on the end of the valve slice. When active with electrical signal the main spool goes straight to end of stroke, A or B side.

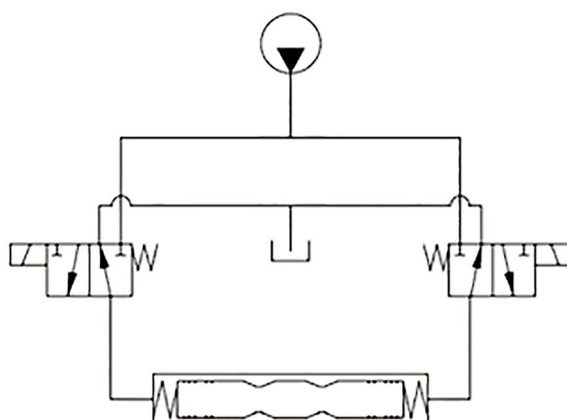
The electrical signal is converted into a hydraulic pressure signal that moves the main spool in the EVB. This is done by means of two on/off solenoid valves.

*EVHCO actuation module*



The actuator controls the spool by building up pilot oil pressure on the end of the spool. For the EVHCO is necessary a pilot oil pressure between 25 and 30 bar.

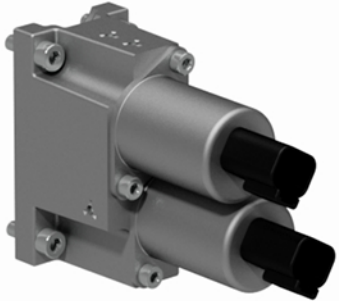
The EVHCO should be used with Electrical FLOW CONTROL spools and can be combined with any EVM.



Technical Information  
**ECO 80 Directional Control Valve**

## Actuation

### Technical data for EVHCO

EVHCO	Parameter	Control range	
		12 V	24 V
 F302 530	Pressure control range	25 to 30 bar	
	Resistance at 20 °C	8.15 $\Omega \pm 5\%$	32.5 $\Omega \pm 5\%$
	Duty Cycle	100%	
	Reaction time from neutral position to max. spool travel	-	Max. 0.300 s

### Enclosure

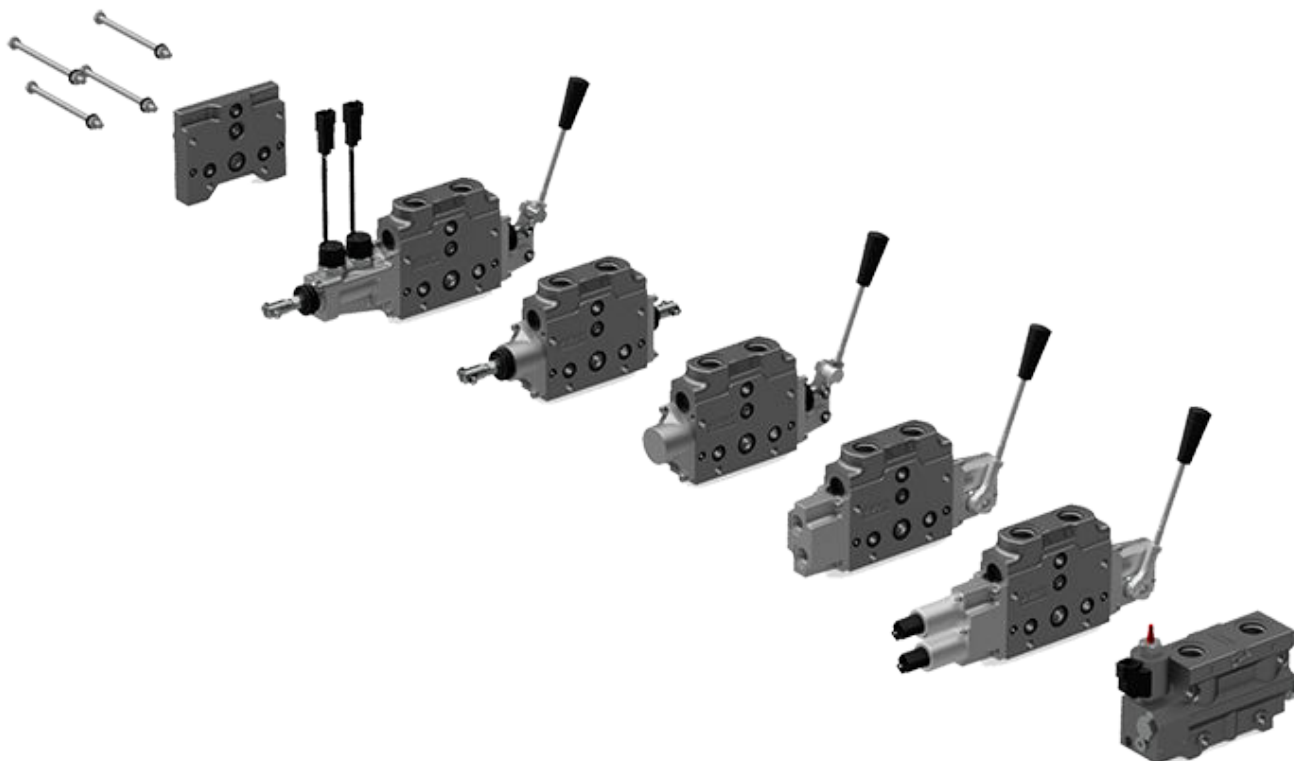
Connector type	Protection class
DEUTSCH DT04-2P	IP 67

### Ordering information EVHCO

Description	Part number
EVHCO-ACTUATOR-DT-12V	11179573
EVHCO-ACTUATOR-DT-24V	11179572

### ECO 80 Combinations

In ECO 80 it is possible for the same valve group to have the combination of all actuations type. It is necessary to have the same group combination of EVM and EVOS to keep the sequence: EVM + EVOS, this sequence is from the inlet.





## Technical characteristics

### General

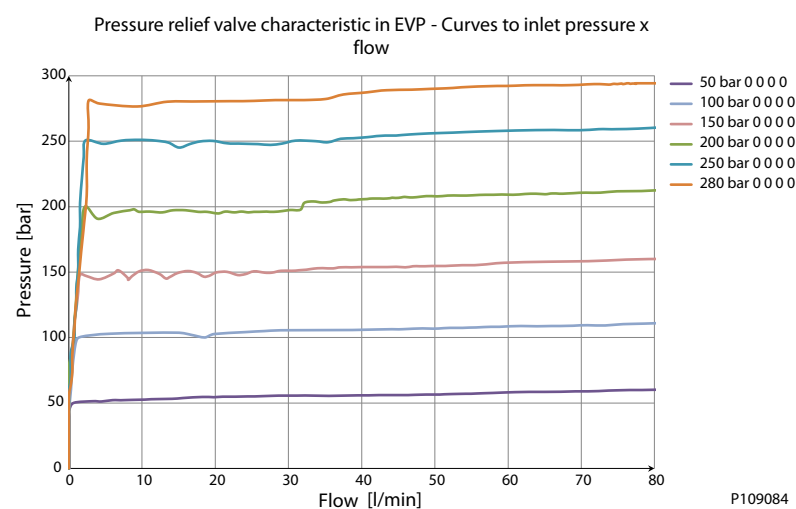
The characteristics in this catalog are typical measured values. During measuring, a mineral based hydraulic oil with a viscosity of 32 mm<sup>2</sup>/s at a temperature of 50°C was used.

### EVP, pump side module

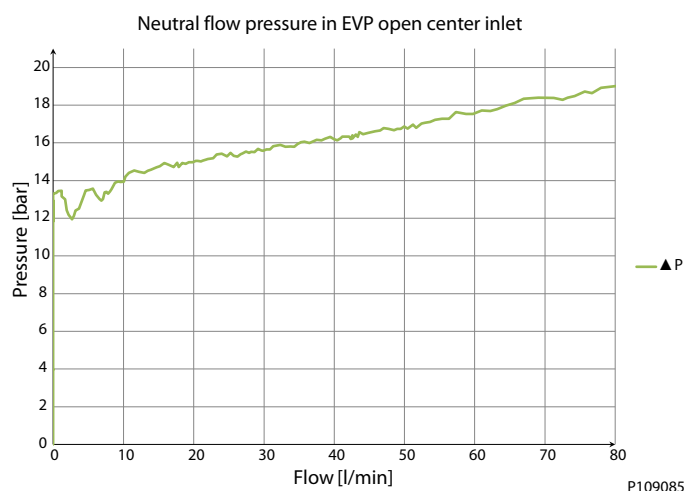
#### Pressure relief valve characteristic in EVP

The pressure relief valve is set at an oil flow of 5 l/min. Setting range: 50 to 280 bar

*Pressure relief valve Characteristic*



#### Neutral by-pass pressure drop characteristic (open center)



## Technical characteristics

### EVB, basic modules oil flow characteristics

- The oil flow for the individual spool depends on:
- Type of pump (fixed or variable displacement).

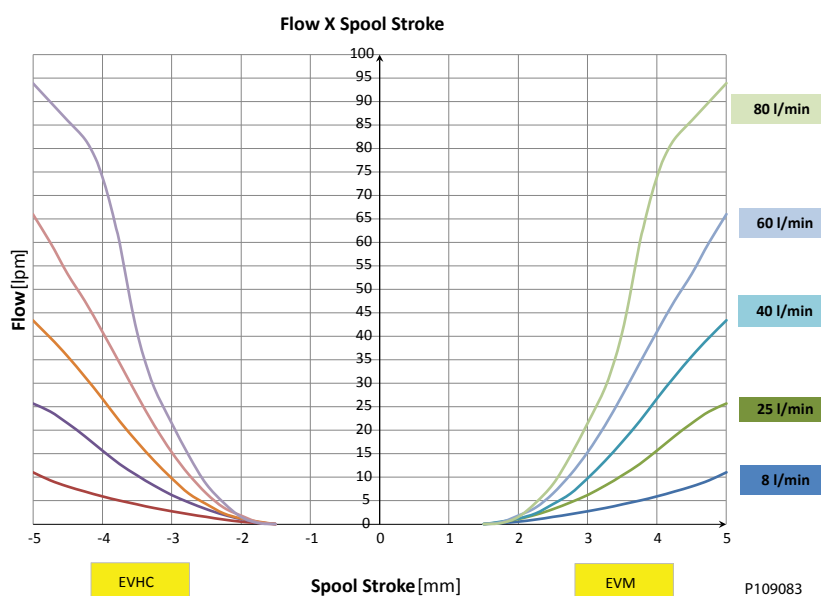
### EVB basic modules, open center EVP

The spool flow is dependent on the supplied oil flow, QP.

The characteristics apply to supply oil flow of 80 l/min with the actuation of one basic module and the supply flow level.

If several basic modules are activated at the same time, the characteristic depends on the load pressure of the actuated basic modules.

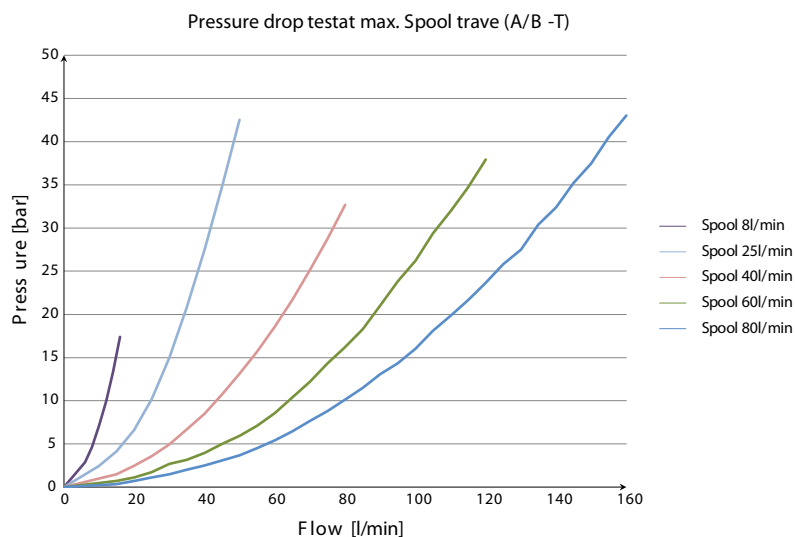
*Oil flow as a function of spool travel characteristic (all spools sizes)*



## Technical characteristics

### Oil flow characteristics for EVB

Pressure drop test at maximum spool travel (A/B-T)



P109082

### PVLP, shock and PVLA, suction valves

For more information, see *PVG 32 Technical Information*, [520L0344](#) for detailed information on PVLP, shock and PVLA, suction valves

## Oil

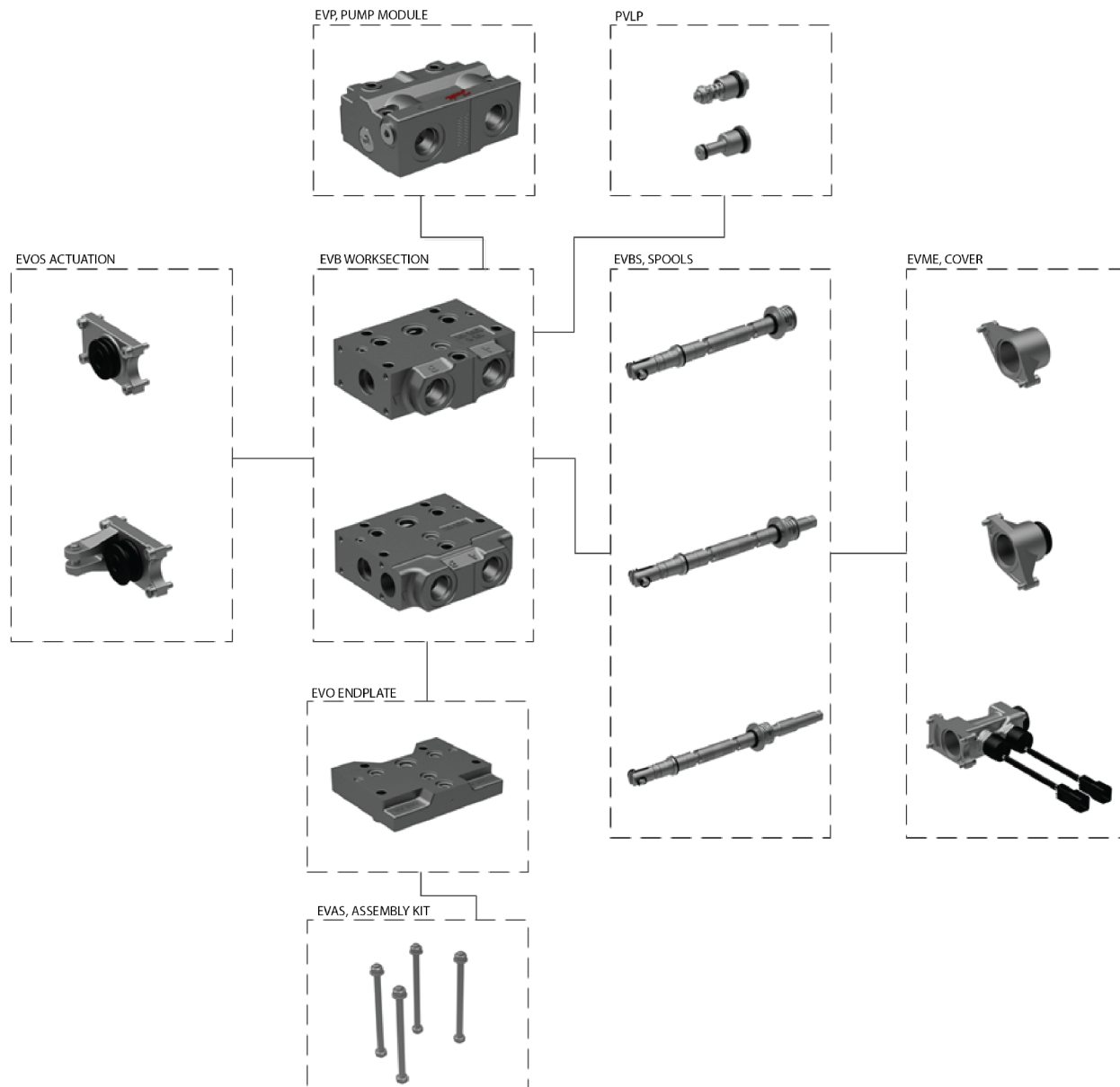
The main duty of the oil in a hydraulic system is to transfer energy; but it must also lubricate the moving parts in hydraulic components, protect them against corrosion, and transport dirt particles and heat out of the system. It is therefore important to choose the correct oil with the correct additives. This gives normal operation and long working life.

### Mineral oil

For systems with ECO 80 LS valves Danfoss recommends the use of mineral-based hydraulic oil containing additives: Type HLP (DIN 51524) or HM (ISO 6743/4).

## Module selection chart

### Mechanical Module selection chart, symbols, description and code numbers



F101 942

## Module selection chart

### EVP, pump side modules, mechanical acting

Symbol	Description	Code number
<p>P109139</p>	Open center pump side module for pumps with fixed displacement. For mechanical actuated valve groups.	P = G1/2, T = G 1/2 11173005
		P = SAE#10, T = SAE#10 11172981
<p>P109138</p>	Closed center pump side module for pumps with variable displacement. For mechanical actuated valve groups.	P = G1/2, T = G 1/2 11173006
		P = SAE#10, T = SAE#10 11173002

#### Connections:

P,T = G 1/2 - 14 in / LS, M = G 1/4 - 19 in

P,T = 7/8 - 14 unf; / LS, M = 9/16 - 18 unf

### EVB, basic modules, mechanical acting

Symbol	Description	Code number
<p>P109108</p>	Low Body with Load drop check valve. For mechanical actuated valve groups.	G1/2 11168505
		SAE#10 11168504
<p>P109109</p>	Medium Body with Load drop check valve and Facilities for shock valves A/B. For mechanical actuated valve groups.	G1/2 11168503
		SAE#10 11168502

#### Connections:

A/B = G 1/2 - 14 in, 14 mm deep

A/B = 7/8 - 14 unf, 1/2 in deep

## Module selection chart

### PVLA, suction valve (fitted in EVB), Mechanical and Electrical acting

Symbol	Description	Code number
	Suction valve for port A and/or B.	157B2001
	*Cavity Plug valve for port A and/or B.	11177714

\* Block connection between port and tank when is not necessary auxiliary valves

### PVLP, shock and suction valve (fitted in EVB), Mechanical and Electrical acting

Code no. 157B....		2032	2050	2063	2080	2100	2125	2140	2150	2160	2175
Settings	bar	32	50	63	80	100	125	140	150	160	175
	[psi]	[460]	[725]	[914]	[1160]	[1450]	[1813]	[2031]	[2175]	[2320]	[2538]

Code no. 157B....		2190	2210	2230	2240	2250	2265	2280	2300	2320
Settings	bar	190	210	230	240	250	265	280	300	320
	[psi]	[2755]	[3045]	[3335]	[3480]	[3625]	[3845]	[4061]	[4351]	[4641]

### PVLP, shock and suction valve, Mechanical and Electrical acting

Symbol	Description
	Shock and suction valve for port A and/or B. (Not adjustable). Lifetime 200.000 actuations.

### PVLP, shock and suction valve adjustable (fitted in EVB), Mechanical acting

Setting range	Code number
121-250 bar	11006594
251-285 bar	11006595

Symbol	Description
	Shock and suction valve for port A and/or B just for mechanical acting open spool style. (adjustable). Lifetime 200.000 actuations.

## Module selection chart


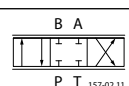
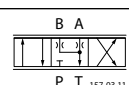
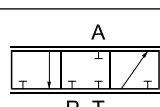
### EVOS, open spool mechanical actuation, Mechanical acting

Description	Code number
EVOS, Mechanical Standard, spring centered. Without actuation lever and base.	047768
EVOS, Mechanical Standard, spring centered. With actuation lever and base.	11175314
EVOS, Through acting, spring centered.	11172533


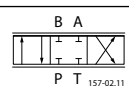
### EVOS, accessory, Mechanical acting

Description	Code number
Accessories - Base handle black	11170923

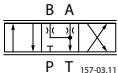
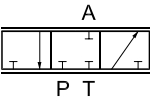
### EVBS, Mechanical flow control spools, Female Extension

Symbol	Code number					
	Spool size, flow range l/min					
	A	B	C	D	E	F
	8	25	40	60	80	100
 4-way, 3-position Closed neutral position	11169728	11169733	11169737	11169741	11169745	11182571
 4-way, 3-position Throttled, open neutral position	11169725	11169730	11169735	11169739	11169743	11182572
 3-way, 3-position Closed neutral position	11169729	11169734	11169738	11169742	11169746	Not available

### EVBS, Mechanical flow control spools, Female Extension and through acting


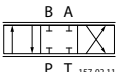
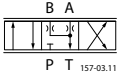
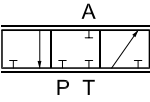
Symbol	Code number					
	Spool size, flow range l/min					
	A	B	C	D	E	F
	8	25	40	60	80	100
 4-way, 3-position Closed neutral position	11170744	11170747	11170750	11170753	11170756	11187072

## Module selection chart

Symbol	Code number					
	Spool size, flow range l/min					
 <p>157-03.11</p> <p>4-way, 3-position Throttled, open neutral position</p>	11170743	11170746	11170749	11170752	11170755	11187061
 <p>157-04.10</p> <p>3-way, 3-position Closed neutral position</p>	11170745	11170748	11170751	11170754	11170757	Not available

## EVBS, Mechanical flow control spools

### EVBS, Mechanical flow control spools, Female Extension and Detent 03 position and 02 position spool out\*


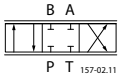
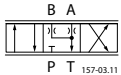
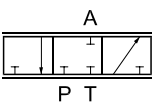
Symbol	Code number					
	Spool size, flow range l/min					
 <p>F302.534</p>	A	B	C	D	E	F
	8	25	40	60	80	100
 <p>157-02.11</p> <p>4-way, 3-position Closed neutral position</p>	11170627	11170634	11170638	11170642	11170646	11182609
 <p>157-03.11</p> <p>4-way, 3-position Throttled, open neutral position</p>	11170625	11170632	11170636	11170640	11170644	11182610
 <p>157-04.10</p> <p>3-way, 3-position Closed neutral position</p>	11170631	11170635	11170639	11170643	11170647	Not available

\* For 02 position detent spool out is necessary to use an accessory part number 11173406, see [EVME, detent 02 position spool to A or B](#) on page 14.



## Module selection chart

### EVBS, Mechanical flow control spools, Female Extension and Micro Switch

Symbol	Code number					
	Spool size, flow range l/min					
	A	B	C	D	E	F
	8	25	40	60	80	100
 157-02.11 4-way, 3-position Closed neutral position	11170264	11170268	11170272	11170276	11170280	11187073
 157-03.11 4-way, 3-position Throttled, open neutral position	11170262	11170266	11170270	11170274	11170278	11187074
 157-04.10 3-way, 3-position Closed neutral position	11170265	11170269	11170273	11170277	11170281	Not available


### EVME, OPEN SPOOL CENTERING, Mechanical acting

Description	Code number
EVME, spring centering, detent 03	11169579
EVME, spring centering, 02 positions	11169579 + accessory 11173406
EVME, Through acting	11169580


### EVME, Micro Switch, Mechanical acting

Description	Code number
EVME, Micro Switch NO	11170841

### EVO, end plate, Mechanical and Electrical acting

Symbol	Description	Code number
 P109140	EVO without active elements. No connections.	11172381

### EVO, end plate with Lx, Mechanical and Electrical acting

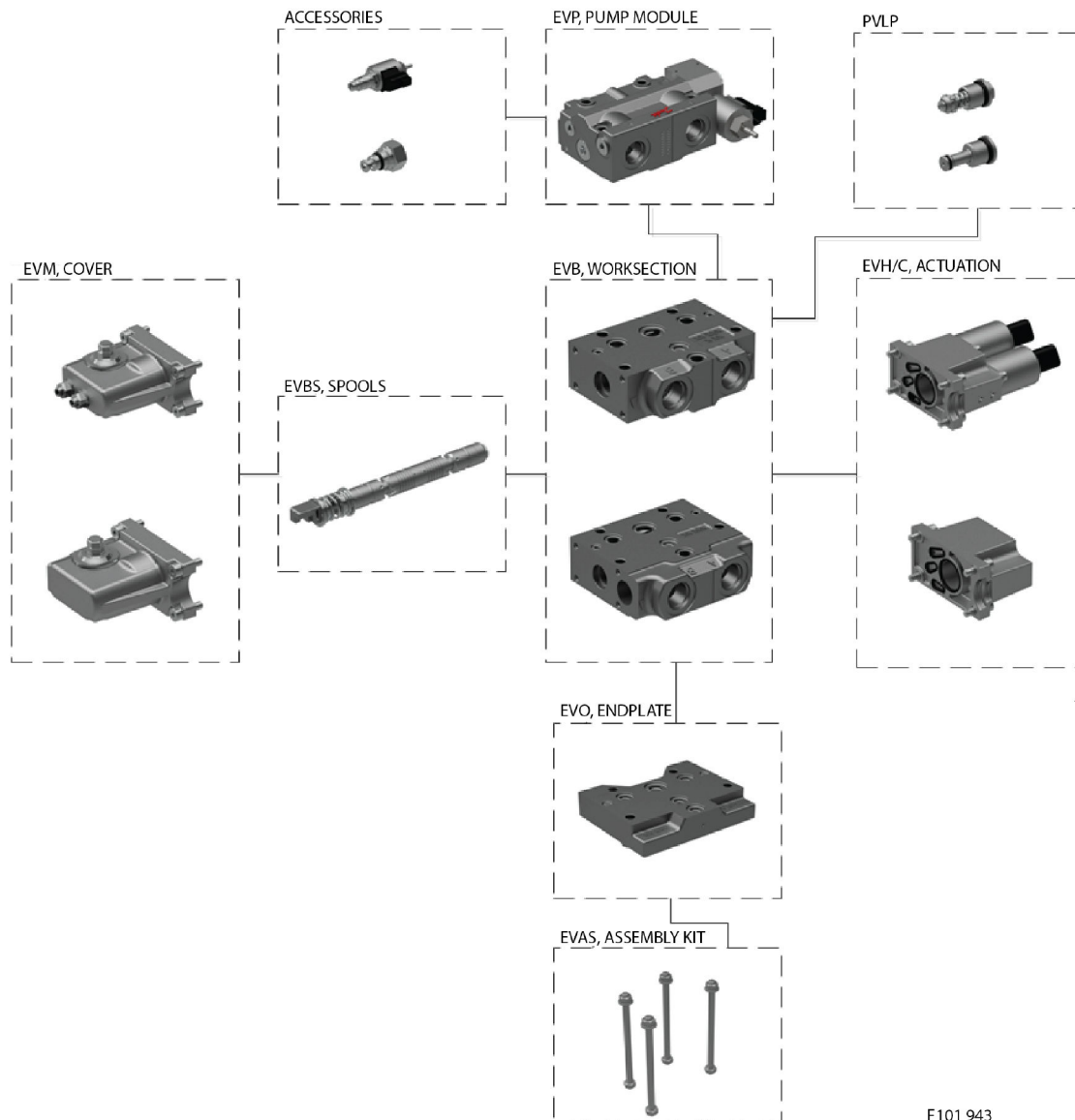
Symbol	Description	Threads	Code number
		G ¼ - 19 in	11172379
 P109141	EVO without active elements. Lx connections	9/16 - 18 unf	11172380

## Module selection chart

### EVT, assembly kit, Mechanical and Electrical acting

PVB's	1	2	3	4	5	6	7	8	9	10	11	12
Code n	11173102	11173103	11173104	11173105	11173106	11173107	11173108	11173109	11173110	11173111	11173112	11173113

## Electrical Module selection chart



F101 943

## Module selection chart

### Electrical Module selection chart, symbols, description and code numbers

#### *EVP, pump side modules, Electrical acting*

Symbol	Description		Code number
<p>P109112</p>	Open center pump side module for pumps with fixed displacement. With pilot oil supply for electrically actuated Valves.	P = G1/2, T = G 1/2	11172996
		P = SAE#10, T = SAE#10	11173010
<p>P109112</p>	Closed center pump side module for pumps with variable displacement. With pilot oil supply for electrically actuated Valves.	P = G1/2, T = G 1/2	11172997
		P = SAE#10, T = SAE#10	11173011
<p>P109113</p>	Open center pump side module for pumps with fixed displacement. With pilot oil supply for electrically actuated Valves. Connection for electrical LS unloading valve, PVPX (not incl.)	P = G1/2, T = G 1/2	11173023
		P = SAE#10, T = SAE#10	11173000

#### Connections:

P, T = G 1/2 - 14 in / LS, M = G 1/4 - 19 in

P, T = 7/8 - 14 unf; / LS, M = 9/16 - 18 unf

#### *EVPX, electrical LS unloading valve*

Description		Code number
PVPX, Normally open: LS pressure relieved with no signal to PVPX	12V	11172430
	24V	11172429

#### *ECO 80, plug for external pilot oil supply*

Description	Threads	Code number
Plug for external pilot oil supply	G 1/4 - 19 in	11177014
	9/16 - 18 unf	11177013

## Module selection chart

### ***EVb, basic modules, Electrical acting***

Symbol	Description		Code number
<p>P109114</p>	Low Body with Load drop check valve. For electrical actuated valve groups	G1/2	11168506
		SAE#10	11168507
<p>P109115</p>	Medium Body with Load drop check valve and Facilities for shock valves A/B. For electrical actuated valve groups	G1/2	11168509
		SAE#10	11168508

### **Connections:**

A/B = G ½ - 14 in, 14 mm deep

A/B = 7/8 - 14 unf, ½ in deep

## Module selection chart

### *EVM, mechanical actuation*

Description	Code number
EVM, Standard, spring centered. Without actuation lever and base.	11119157
EVM, Standard, spring centered. With actuation lever and base.	11167001
EVM, spring centered, Individual oil flow adjustment to ports A and B. Without actuation lever and base.	11145204
EVM, spring centered, Individual oil flow adjustment to ports A and B. With actuation lever and base.	11167002

### *EVM, accessory*

Description	Code number
Accessories - Base handle black	11107587

### *EVC, cover for mechanical actuation, assembled on side "A"*

Description	Code number
EVC, Cover for purely mechanically operated valve with EVM style	11171318

### *EVHC, electrical actuation, assembled on side "A"*

Description	Code number
EVHC, DEUTSCH Connector. 12 V	11162297
EVHC, DEUTSCH Connector. 24 V	11162298

### *EVHCO, On/Off electrical actuation, assembled on side "A"*

Description	Code number
EVHCO, DEUTSCH Connector 12 V	11179573
EVHCO, DEUTSCH Connector 24 V	11179572

### *EVH, hydraulic actuation, assembled on side "A"*

Symbol	Description	Code number
	EVH, Cover for Hydraulic actuation. EVH 9/16-18 UNF	11169487
	EVH, Cover for Hydraulic actuation. EVH G1/4	11169486

### *EVBS, Electrical flow control spools*

Symbol	Code number					
	Spool size, flow range l/min					
	A	B	C	D	E	F*
	8	25	40	60	80	100

## Module selection chart

Symbol	Code number					
	Spool size, flow range l/min					
<p>4-way, 3-position Closed neutral position</p>	11170445	11170449	11170453	11170457	11170461	11182178
<p>4-way, 3-position Throttled, open neutral position</p>	11170443	11170447	11170451	11170455	11170459	11182177
<p>3-way, 3-position Closed neutral position, P -&gt; A</p>	1117044	11170450	11170454	11170458	11170462	Not available

\* Only to be used as on/off spool.

### ***EVO, end plate, Mechanical and Electrical acting***

See [EVO, end plate, Mechanical and Electrical acting](#) on page 33

### ***EVO, end plate with Lx, Mechanical and Electrical acting***

See [EVO, end plate with Lx, Mechanical and Electrical acting](#) on page 33

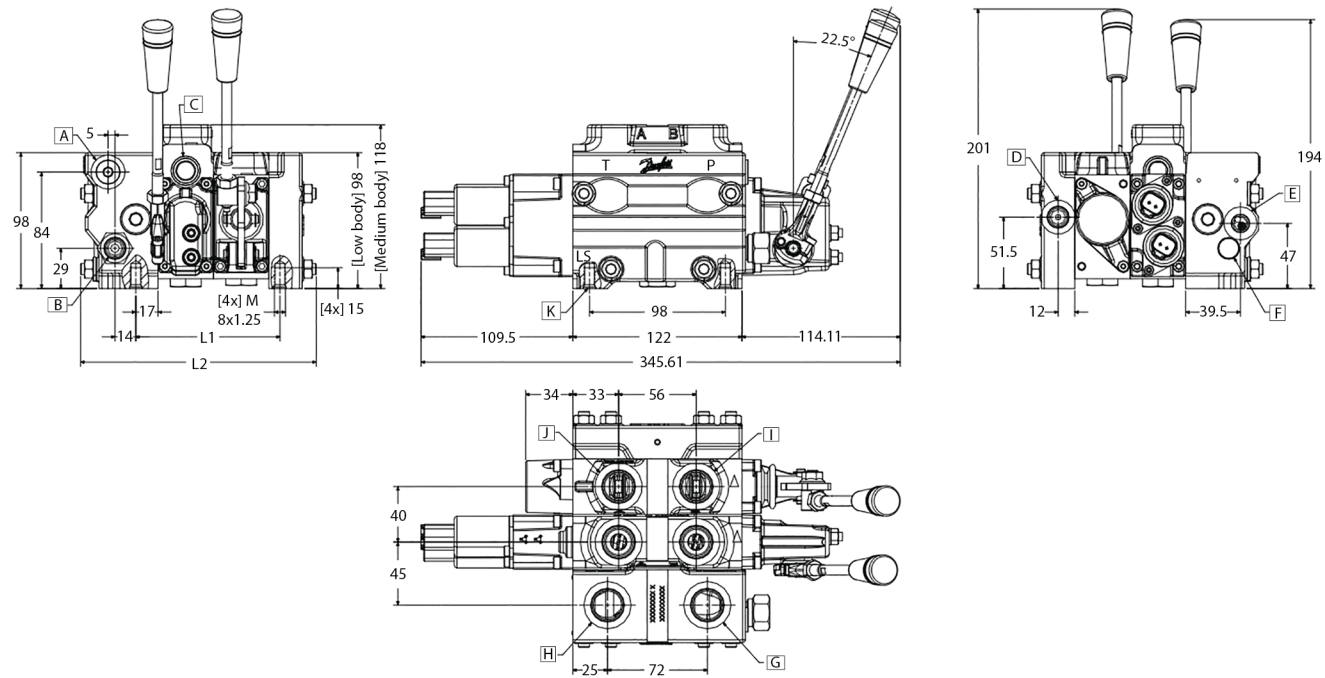
### ***EVT, assembly kit, Mechanical and Electrical acting***

See [EVT, assembly kit, Mechanical and Electrical acting](#) on page 34

Technical Information  
**ECO 80 Directional Control Valve**

**Dimensions**

**ECO 80**

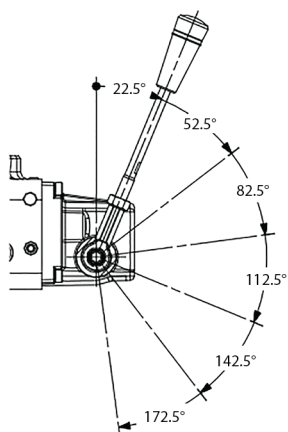


- A:** Pressure gauge connection
- B:** Pilot pressure connection
- C:** Shock and suction valve, PVLP and PVLA
- D:** Lx connection
- E:** LS connection
- F:** LS pressure relief valve
- G:** Pump connection
- H:** Tank connection
- I:** Work port B
- J:** Work port A
- K:** Fixing holes

EVb		1	2	3	4	5	6	7	8	9	10
L <sub>1</sub>	mm	65	105	145	185	225	265	305	345	385	425
L <sub>2</sub>	mm	130	170	210	250	290	330	370	410	450	490

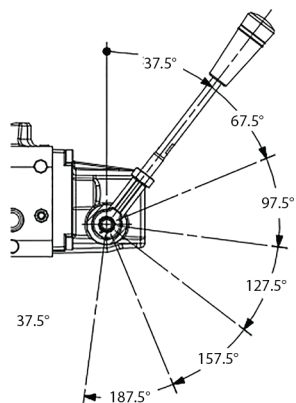
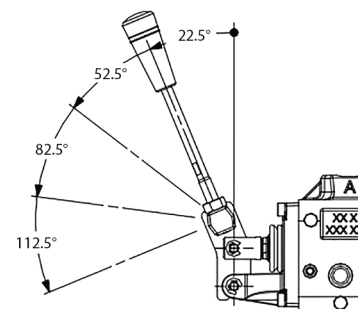
## Dimensions

### EVM and EVOS Lever positions



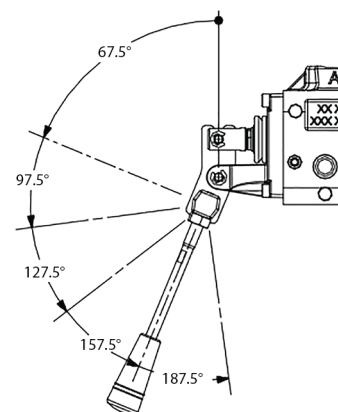
Base with an angle of 22.5°

Base with an angle of 22.5°



Base with an angle of 37.5°

Base with an angle of 157.5°





## Other operating conditions

### Particle content, degree of contamination

#### Biodegradable oils

ECO 80 valves can be used in systems with rapeseed oil. The use of rapeseed oil is conditioned by:

- complying with the demands on viscosity, water content, temperature and filtering etc. (see chapters below and technical data).
- adapting the operating conditions to the directions of the oil supplier.

Before using other biodegradable fluids, please consult the Danfoss organization. Oil filtration must prevent particle content from exceeding an acceptable level, i.e., an acceptable degree of contamination.

Maximum contamination for ECO 80 is 23/19/16 (see ISO 4406. Calibration in accordance with the ACFTD method). In our experience, a degree of contamination of 23/19/16 can be maintained by using a filter fineness as described in the next section. For more information, please see the Danfoss literature:

- *Design Guidelines for Hydraulic Fluid Cleanliness Technical Information*, **520L0467**.
- *Hydraulic Fluids and Lubricants Technical Information*, **521L0463**.
- *Experience with Biodegradable Hydraulic Fluids Technical Information*, **521L0465**.

## Filtration

Effective filtration is the most important precondition in ensuring that a hydraulic system performs reliably and has a long working life. Filter manufacturers issue instructions and recommendations. It is advisable to follow them.

#### System filters

Where demands on safety and reliability are very high a pressure filter with bypass and indicator is recommended. Experience shows that a 10 µm nominal filter (or finer), or a 20 µm absolute filter (or finer) is suitable. It is our experience that a return filter is adequate in a purely mechanically operated valve system.

The fineness of a pressure filter must be selected as described by the filter manufacturer so that a particle level of 23/19/16 is not exceeded.

The filter must be fitted with pressure gauge or dirt indicator to make it possible to check the condition of the filter.

In systems with differential cylinders or accumulators the return filter must be sized to suit the max. return oil flow. Pressure filters must be fitted to suit max. pump oil flow.





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