QUICK SELECTION GUIDE

PROPORTIONAL PRESSURE CONTROLS
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PROPORTIONAL FLOW CONTROLS
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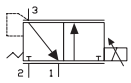
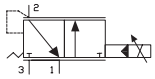
Proportional Pressure Controls - Chapter 1

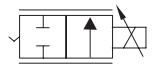
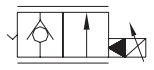
Direct Acting Pressure Reducing Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	1	700	3.8	50	IP-DAR-43C-L	4
	1	5000	3.8	350	IP-DAR-43C-H	4

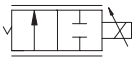
Normally Closed Relief Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	12	3000	45	207	EE-PRB	12

Pilot Operated Pressure Reducing Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	7.9	700	30	50	IP-PRZ-59-AM12	6
	7.9	700	30	50	EG-TRZ-42	8

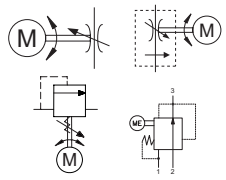
Normally Open Relief Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	12	3000	45	207	EE-PRD	14

Proportional Flow Controls - Chapter 2

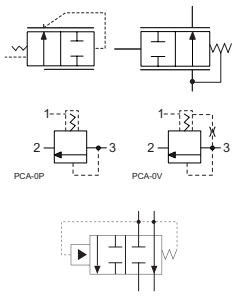
2 Way Normally Closed Flow Regulator Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	5.8	3500	22	245	EE-P2G-A	4
	13.2	3500	50	245	EE-P2G-B	4
	13.2	3500	50	245	EE-P2G-C	4
	6.5	3500	25	245	EB-P2A	6
	4	3500	15	245	EE-P2A-A	8
	8	3500	30	245	EE-P2A-B	8
	12	3500	45	245	EE-P2A-C	8
	17.2	3500	65	245	ET-P2A-A	10
	22.5	3500	85	245	ET-P2A-B	10
	29	3500	110	245	ET-P2A-C	10

2 Way, Normally Open Flow Regulator Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	8	3500	30	245	EE-P2H	14

Motorized Flow Regulators - Chapter 3

Motorized Flow Regulator and Relief Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	12	3500	45	245	AE-NVA	4
	40	3500	150	245	AJ-NVA	6
	24	3500	90	245	AJ-FCA	8
	24	3500	90	245	AK-FCQ	10
	37	3500	140	245	AJ-RVR	12
	10	4000	38	276	AF-PRP	14
	Electrical Connections					16

Pressure Compensators - Chapter 4

Pressure Compensated Regulator Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	8	3500	30	245	DF-CP2	4
	19	3500	70	245	QC-CP2	6
	10	3500	38	245	DF-TCS	10
	10	3500	38	245	DF-PCR	14
	40	3500	151	245	TR-PCA	16
	40	3500	151	245	SL-PCA	18
	33	3500	120	245	QC-CP3	20
	10	3500	38	245	DG-TCB	24

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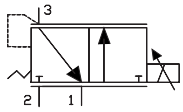
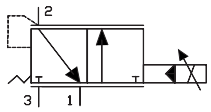
Index chapter 1

Section / Description page

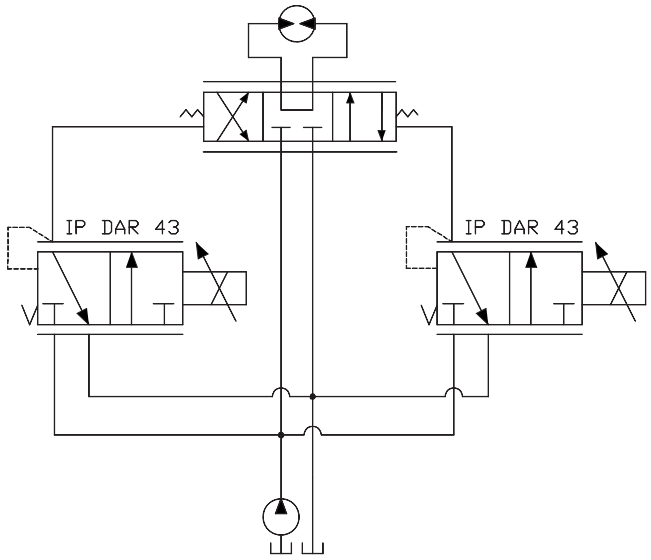
Proportional Pressure Reducing / Relieving Valves

Direct Acting	GPM	PSI	LPM	BAR	MODEL	PAGE
	1	700	3.8	50	IP-DAR-43C-L	4
	1	5000	3.8	350	IP-DAR-43C-H	4

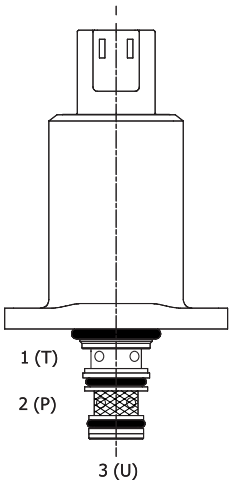
Pilot Operated	GPM	PSI	LPM	BAR	MODEL	PAGE
	7.9	700	30	50	IP-PRZ-59-AM12	6
	7.9	700	30	50	EG-TRZ-42	8

TYPICAL SCHEMATIC

Typical application for the IP-DAR-43 is the control of a metering spool on a directional valve.



IP-DAR-43C *Direct Acting Proportional, Pressure Reducing/Relieving, Slip-in Type*



DESCRIPTION

Special cavity, slip-in style flange retained, direct acting proportional, pressure reducing/relieving valve.

OPERATION

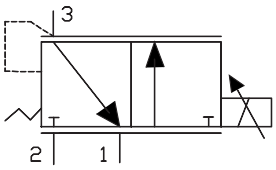
The IP-DAR-43C-AJ12 generates a variable pressure in response to a PWM (Pulse Width Modulated) current signal. With no current applied to the proportional solenoid, the inlet port 2 (P) is blocked and the regulated port 3 (U) is vented to port 1 (T). As current is increased, fluid pressure is proportionally controlled at the regulated port 3 (U). On attainment of proportionally determined pressure at 3 (U), the cartridge shifts to block flow at 2 (P), thereby regulating pressure at 3 (U). In this mode, the valve also will relieve 3 (U) to 1 (T) at a variable value over the set reducing pressure.

FEATURES

- Slip-in style.
- Efficient wet-armature construction.
- Integral waterproof coil.
- Continuous duty rated solenoid.

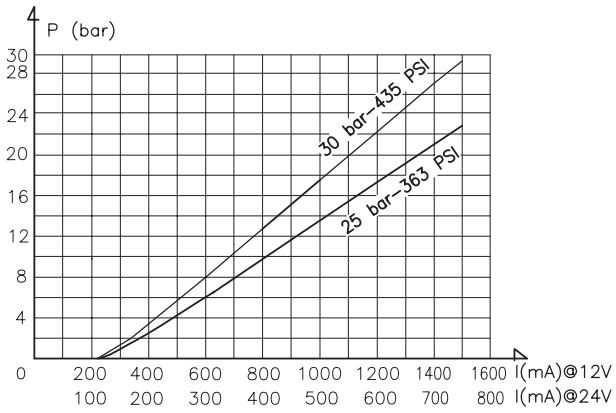
Flanged retained product. The coil is an integral part of the valve and is not serviceable. Eventual tank pressure exceeding 0 bar, has to be added to reduced pressure value.

HYDRAULIC SYMBOL



PERFORMANCE

Reduced pressure (bar) vs. Current (mA)
(12 V and 24 V coil)



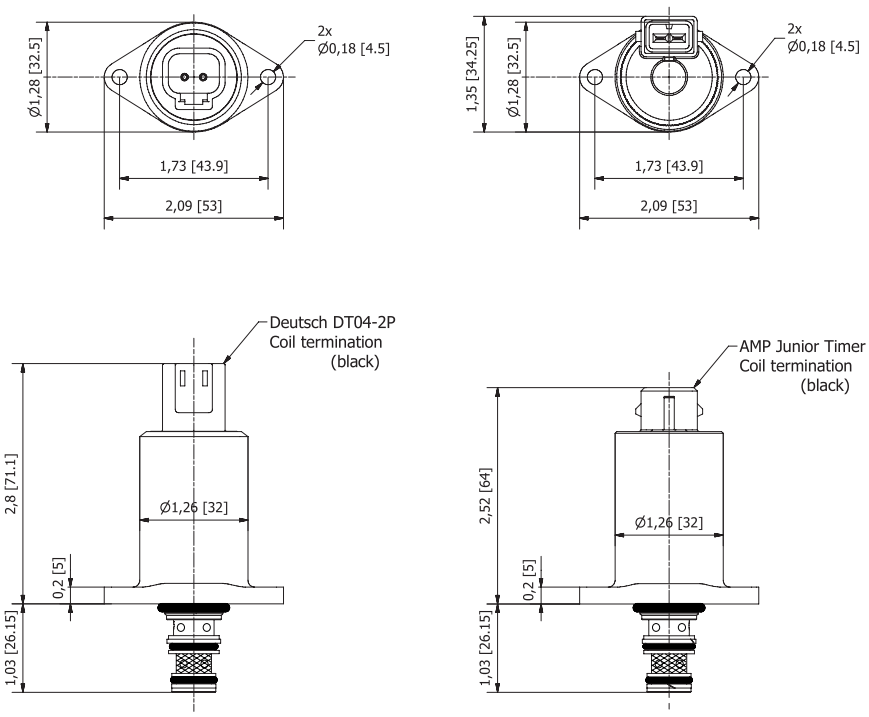
VALVE SPECIFICATIONS

Nominal Flow	1 GPM (3.8 LPM) @ 8 bar Delta P
Max Inlet Pressure “H” version	5000 PSI (350 bar)
Max Inlet Pressure “L” version	700 PSI (50 bar)
Controlled Pressure Range	0 ÷ 25 bar / 0 ÷ 30 bar (see graph)
Reduced Pressure Tolerance	±5%
Max Back-Pressure at T port	20 bar
Internal Leakage	15 ml/min @ 500 PSI (35 bar) inlet 35 ml/min @ 5000 PSI (350 bar) inlet
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/15/13
Media Operating Temp. Range	-25°C / +90°C
Weight	.54 lbs (.25 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cavity	T043
Cavity Tool Kit	K-T043
Flange Mounting Screws	M4x10 / torque 3ft-lbs (4 Nm)

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	200 ÷ 1500 (12 V coil) 100 ÷ 750 (24 V coil)
PWM or Super-Imposed Dither Frequency	100 - 200 Hz
Coil Resistance (12 VDC)	5.4 Ohm ±5% at 68°F (20°C)
Coil Resistance (24 VDC)	22 Ohm ±5% at 68°F (20°C)
Max Power Consumption	12 Watt (20°C)
Protection Degree	IP 67 according to IEC 529
Coil Termination	Deutsch-Integral DT04-2P AMP Junior Timer 84-9419
Color Connectors	Black

DIMENSIONS



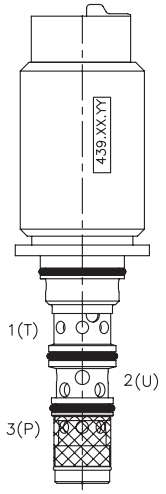
ORDERING INFORMATION

IP-DAR-43C – ____ – ____ – ____ – ____ – ____

COIL TERMINATION	VOLTAGE	INLET PRESSURE	MAX REGULATED PRESSURE	OPTIONS	BODIES
AJ - AMP Jr. Timer	**12** VDC	**L** - up to 700 PSI (50 bar)	**25** bar	**00** - HNBR Standard	**Blank** - Without body
DT - Deutsch DT04	**24** VDC	**H** - up to 5000 PSI (350 bar)	**30** bar	**A0** - With filter	**N** - 1/4" BSP Ports
					S - #6 SAE Ports

NOTE: screen (on inlet port): mesh 50 (300 µm)

IP-PRZ-59-AM12 *Pilot Operated Proportional, Pressure Reducing/Relieving, Slip-in Type*



DESCRIPTION

Special cavity, flange retained, slip-in proportional pressure reducing/relieving valve.

OPERATION

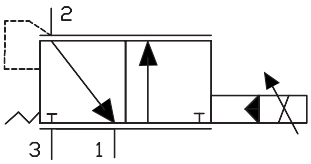
The IP-PRZ-59-AM12 generates a variable pressure in response to a PWM (Pulse Width Modulated) current signal. With no current applied to the proportional solenoid, the inlet port 3 (P) is blocked and the regulated port 2 (U) is vented to port 1 (T). As current is increased, fluid pressure is proportionally controlled at the regulated port 3 (U). On attainment of proportionally determined pressure at 2 (U), the cartridge shifts to block flow at 3 (P), thereby regulating pressure at 2 (U). In this mode, the valve also will relieve 2 (U) to 1 (T) at a variable value over the set reducing pressure.

FEATURES

- Economical slip-in style.
- Integral waterproof coil.
- Efficient wet-armature construction.
- Hardened parts for long life.

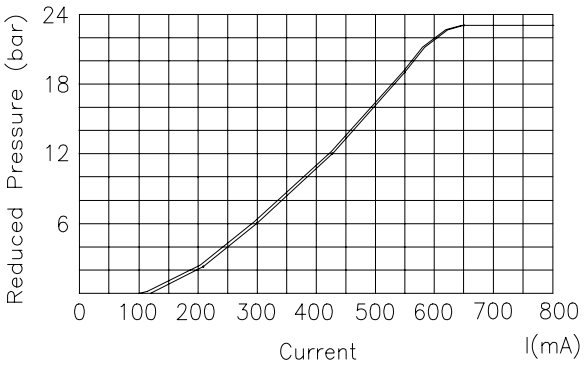
Flanged Retained Product. The coil (12 vdc) is an integral part of the valve and is not serviceable. Inlet pressure up to 50 bar. Max regulated pressure can be increased up to 35 bar (factory preset).

HYDRAULIC SYMBOL



PERFORMANCE

Reduced pressure (bar) vs. Current (mA)
(12 V coil, 24 bar inlet pressure)



Curve is attained with SAE 40
Grade oil @ 50° C

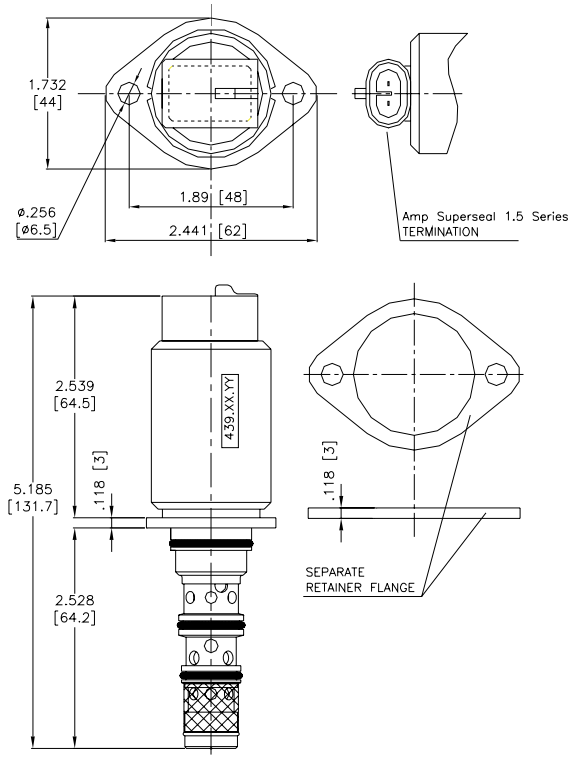
VALVE SPECIFICATIONS

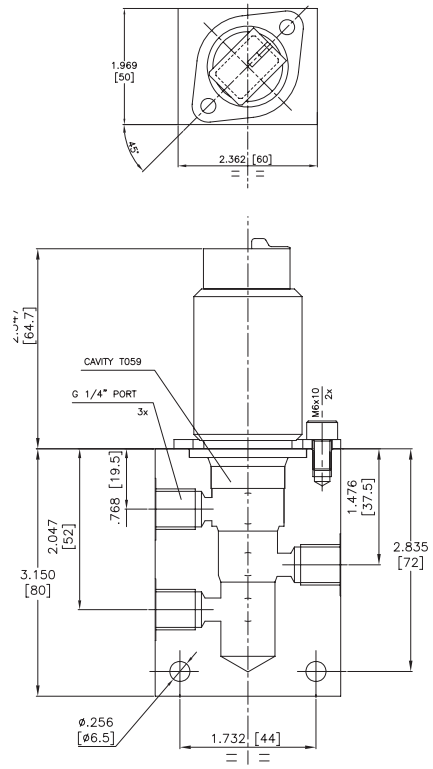
Nominal Flow	7.9 GPM (30 LPM) @ 3 bar Delta P
Max Inlet Pressure	700 PSI (50 bar)
Controlled Pressure Range	(see graph)
Max Internal Leakage	<500 cc/min @ 35 bar
Viscosity Range	5 to 5000 cSt
Filtration	ISO 18/15/13
Media Operating Temp. Range	-25°C / +85°C
Weight	.63 lbs (.29 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cavity	T059
Cavity Tools Kit (form tool, reamer, tap)	K-T059
Flange Mounting Screws and Torque	M6x10 / 4 ft-lbs (6 Nm)

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	100 - 900 mA
PWM or Super-Imposed Dither Frequency	100 - 150 Hz
Coil Resistance (12 VDC)	10 Ohm ±5% at 68°F (20°C)
Max Power Consumption	14 Watt
Protection Degree	IP 67 according to IEC 529
Coil Termination	AMP Superseal 1.5 Series 282080-1 Type
Color Connectors	Green

DIMENSIONS





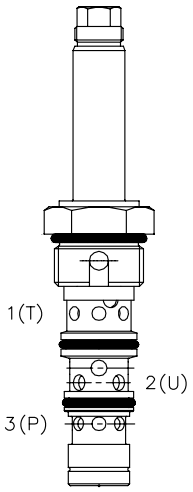
ORDERING INFORMATION

IP-PRZ-59-AM12 – _____ – _____

OPTIONS		BODIES	
Buna Standard	**00**	**Blank**	Without Body
Buna, Screen	**A0**	**N**	1/4" BSP Ports
		S	#6 SAE Ports

NOTE: screen (on inlet port): mesh 47 (280 µm)

EG-TRZ-42 *Pilot Operated Proportional, Pressure Reducing/Relieving*



DESCRIPTION

Special cavity, 7/8-14 thread, pilot operated proportional pressure reducing/relieving valve.

OPERATION

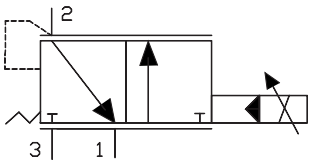
The EG-TRZ-42 generates a variable pressure in response to a PWM (Pulse Width Modulated) current signal. With no current applied to the proportional solenoid, the inlet port 3 (P) is blocked and the regulated port 2 (U) is vented to port 1 (T). As current is increased, fluid pressure is proportionally controlled at the regulated port 2 (U). On attainment of proportionally determined pressure at 2 (U), the cartridge shifts to block flow at 3 (P), thereby regulating pressure at 2 (U). In this mode, the valve also will relieve 2 (U) to 1 (T) at a variable value over the set reducing pressure.

FEATURES

- Hardened parts for long life.
- Efficient wet-armature construction.
- Unitized valve/coil.
- Continuous duty rated solenoid.

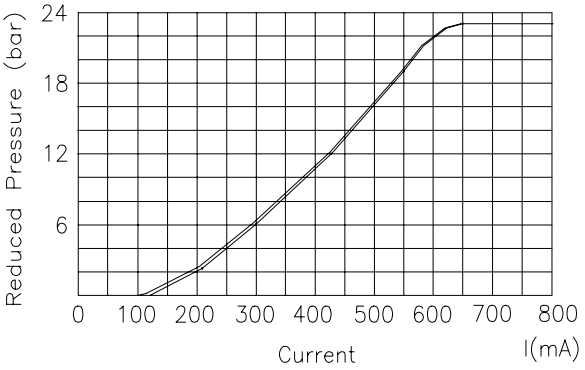
Inlet pressure up to 50 bar.
Max regulated pressure can be increased up to 35 bar (factory preset only).

HYDRAULIC SYMBOL



PERFORMANCE

Reduced pressure (bar) vs. current (mA)
(12 V coil, 24 bar inlet pressure)



Curve is attained with SAE 40 Grade oil @ 50° C

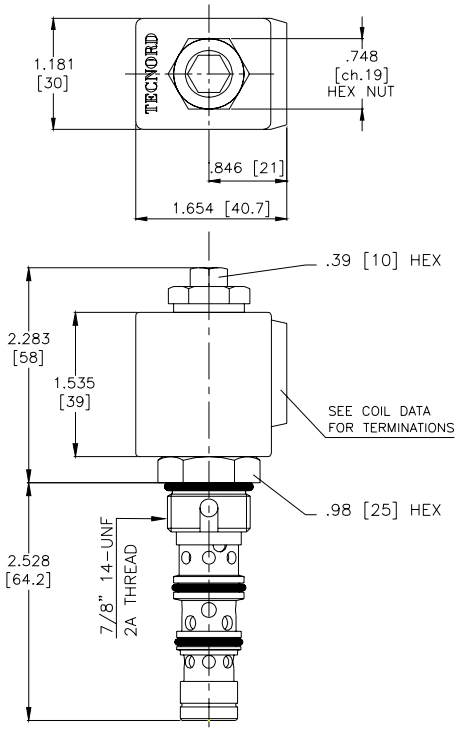
VALVE SPECIFICATIONS

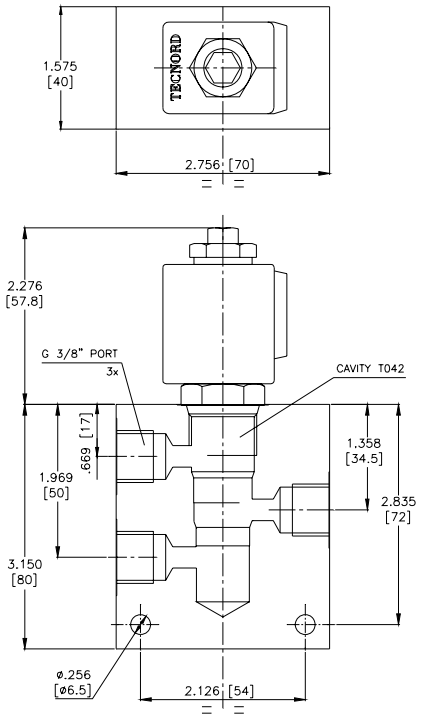
Nominal Flow	7.9 GPM (30 LPM) @ 3 bar Delta P
Max Inlet Pressure	700 PSI (50 bar)
Controlled Pressure Range	(see graph)
Max Internal Leakage	<500 cc/min
Max Back-Pressure at T Port	20 bar
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/15/13
Media Operating Temp. Range	-25°C / +85°C
Weight	.63 lbs (.29 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	16 ft-lbs (30 Nm)
Coil Nut Torque Requirements	1 - 2 ft-lbs (2-3 Nm)
Cavity	T042
Cavity Tools Kit (form tool, reamer, tap)	K-T042

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	100 - 900 mA
PWM or Super-Imposed Dither Frequency	100 - 150 Hz
Coil Resistance (12 VDC)	10 Ohm ±5% at 68°F (20°C)
Max Power Consumption	14 Watt

DIMENSIONS





ORDERING INFORMATION

EG-TRZ-42 – _____ – _____ – _____ – _____

OPTIONS

Buna Standard	**00**
Buna, Screen	**A0**

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#8 SAE Ports

VOLTAGE

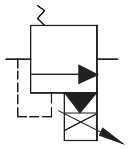
12	12 VDC
24	24 VDC

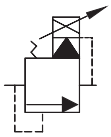
"A" COIL TERMINATION

DL	Double Lead
HC	DIN 43650 (Hirschmann)
JT	AMP Jr. Timer
MP	Metri-Pack - Integral

Approximate Coil Weight: .42 lbs (.19 kg)

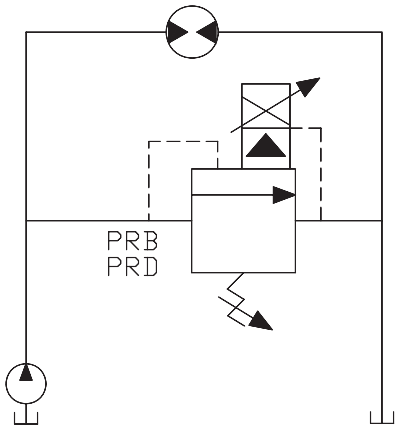
Proportional Pressure Relief Valves

Normally Closed	GPM	PSI	LPM	BAR	MODEL	PAGE
	12	3000	45	207	EE-PRB	12

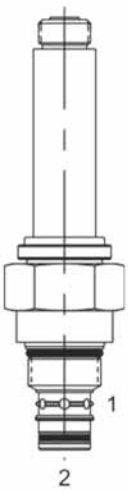
Normally Open	GPM	PSI	LPM	BAR	MODEL	PAGE
	12	3000	45	207	EE-PRD	14

TYPICAL SCHEMATIC

Typical application for the PRL and PRB is for fan or motor speed control.



EE-PRB *2 Way Normally Closed, Proportional Relief Valve*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, solenoid operated, 2 way normally closed, pilot operated spool type relief valve.

OPERATION

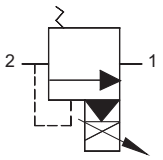
The EE-PRB blocks flow from (2) to (1) until sufficient pressure is present at (2) to offset a spring induced force. As solenoid current is increased, it offsets a portion of this force, resulting in a lower relief pressure. Can be infinitely adjusted across a prescribed range in response to a PWM (Pulse Width Modulated) current. Pressure output is inversely proportional to the current input. With full current applied to the solenoid, the valve will free flow from (2) to (1), at approximately 50 psi (3.5 bar).
Note: backpressure on port (1) becomes additive to the pressure setting at a 1:1 ratio.

FEATURES

- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

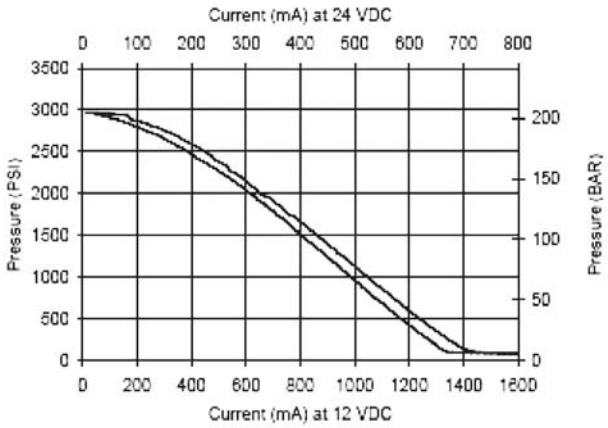
Great for fan drive motor control.
For best performance valve must be purged of air. Locate below reservoir or add check valve to return.

HYDRAULIC SYMBOL



PERFORMANCE

Actual Test Data (Cartridge Only)



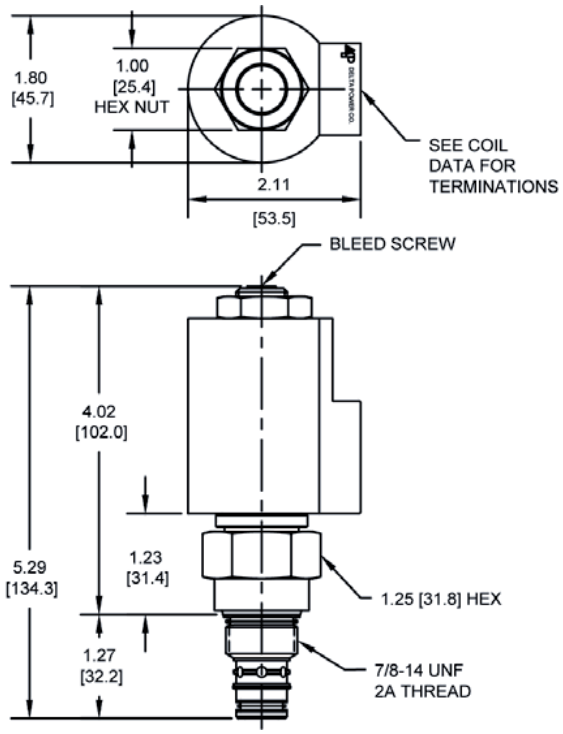
VALVE SPECIFICATIONS

Nominal Flow	0 - 12 GPM (0 - 45 LPM)
Operating Range	50 - 3000 PSI (3.4 - 207 bar)
Typical Hysteresis	10% Max
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.78 lbs (.35 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	30 ft-lbs (40.6 Nm)
Coil Nut Torque Requirements	5 - 7 ft-lbs (6.8 - 9.5 Nm)
Cavity	Delta 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191202

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	200 - 1600 mA
PWM or Super-Imposed Dither Frequency	500 Hz
Coil Resistance (12 VDC)	5.1 Ohm ±5% at 68°F (20°C)

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

EE-PRB – ____ – ____ – ____ – ____ – ____

OPTIONS

Buna Standard	**00**
Viton, Screen	**V0**

PRESSURE RANGE

50 - 1500 PSI	**15**
50 - 3000 PSI	**30**

"T" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DL	Double Lead

VOLTAGE

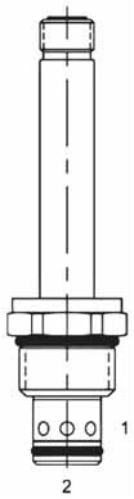
12	12 VDC
24	24 VDC

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#8 SAE Ports

Approximate Coil Weight: .89 lbs (.41 kg)

EE-PRD *2 Way Normally Open, Proportional Relief Valve*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, solenoid operated, 2 way normally open, pilot operated spool type relief valve.

OPERATION

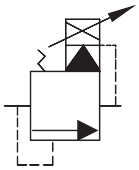
The EE-PRD blocks flow from (2) to (1) until sufficient pressure is present at (2) to offset the electrically induced solenoid force. Can be infinitely adjusted across a prescribed range in response to a PWM (Pulse Width Modulated) current. Pressure output is proportional to the current input.
With no current applied to the solenoid, the valve will free flow from (2) to (1) at approximately 50 psi.
Note: backpressure on port (1) becomes additive to the pressure setting at a 1:1 ratio.

FEATURES

- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

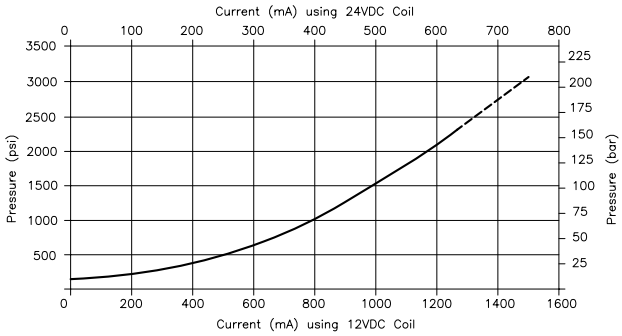
For best performance valve must be purged of air. Locate below reservoir or add check valve to return.

HYDRAULIC SYMBOL



PERFORMANCE

Actual Test Data (Cartridge Only)



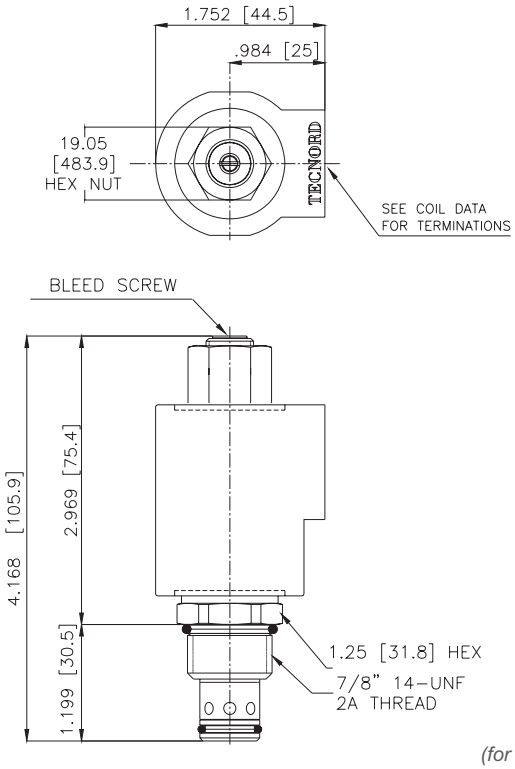
VALVE SPECIFICATIONS

Nominal Flow	0 - 12 GPM (0 - 45 LPM)
Operating Range	50 - 3000 PSI (3 - 207 bar)
Typical Hysteresis	5%
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.30 lbs (.13 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	30 ft-lbs (40.6 Nm)
Coil Nut Torque Requirements	4 - 6 ft-lbs (5.4 - 8.1 Nm)
Cavity	Delta 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191202

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	200 - 1500 mA
PWM or Super-Imposed Dither Frequency	500 Hz
Coil Resistance (12 VDC)	5.9 Ohm ±5% at 68°F (20°C)

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

EE-PRD – ____ – ____ – ____ – ____

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

"V" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DI	Deutsch - Integral DT04-2P
DL	Double Lead
JT	AMP Jr. Timer - Integral

VOLTAGE

12	12 VDC
24	24 VDC

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#8 SAE Ports

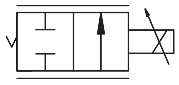
Approximate Coil Weight: .42 lbs (.19 kg)

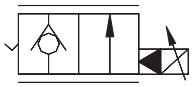
Index chapter 2

Via Malavolti, 36 - 41122 Modena - Italy - Phone +39 059/254895 - Fax +39 059/253512 - www.tecnord.com - mail: tecnord@tecnord.com

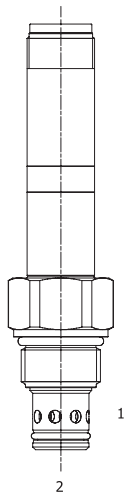
TECNORD
a Delta Power Company

2 Way Normally Closed Proportional Flow Regulator Valves

Spool Type	GPM	PSI	LPM	BAR	MODEL	PAGE
	5.8	3500	22	245	EE-P2G-A	4
	13.2	3500	50	245	EE-P2G-B	4
	13.2	3500	50	245	EE-P2G-C	4

Poppet Type	GPM	PSI	LPM	BAR	MODEL	PAGE
	6.5	3500	25	245	EB-P2A	6
	4	3500	15	245	EE-P2A-A	8
	8	3500	30	245	EE-P2A-B	8
	12	3500	45	245	EE-P2A-C	8
	17.2	3500	65	245	ET-P2A-A	10
	22.5	3500	85	245	ET-P2A-B	10
	29	3500	110	245	ET-P2A-C	10

EE-P2G *2 Way Normally Closed, Proportional Flow Control Valve*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, solenoid operated, 2 way normally closed, proportional flow control valve.

OPERATION

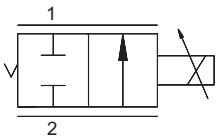
When de-energized the EE-P2G blocks flow at ports (1) and (2). When energized, the valve allows flow from (2) to (1). Flow is proportional to the current applied to the coil. A compensator must be used to create a pressure compensated flow control function.

OPERATION OF MANUAL OVERRIDE OPTION: to override, turn the manual override screw clockwise. To release turn the manual override screw counter-clockwise.

FEATURES

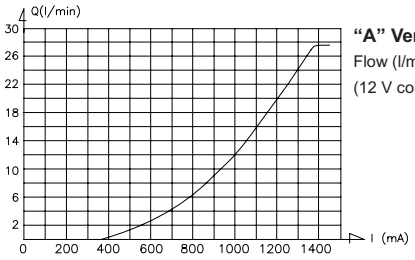
- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

HYDRAULIC SYMBOL

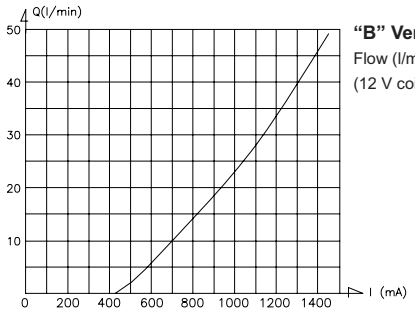


Curves are attained with Tecnord QC CP3 compensator.

PERFORMANCE



“A” Version
Flow (l/min) vs. Current (mA)
(12 V coil; Delta P = 14 bar; Toil = 40°C)



“B” Version
Flow (l/min) vs. Current (mA)
(12 V coil; Delta P = 14 bar; Toil = 40°C)

VALVE SPECIFICATIONS

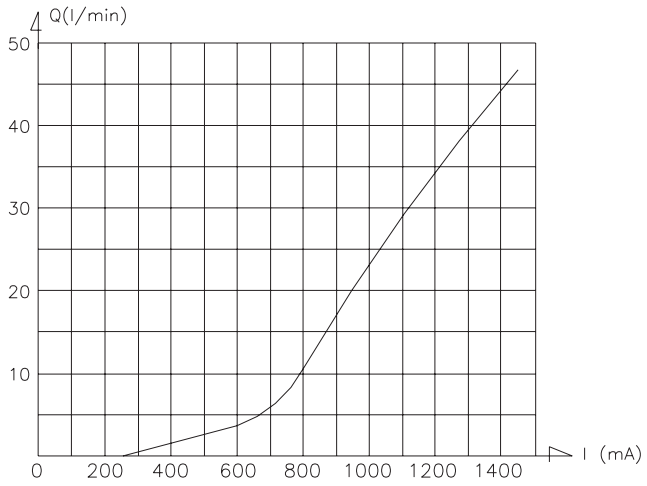
Flow Range	See curves for various versions
Max System Pressure	3500 PSI (245 bar)
Leakage	Max 50 cc/min at 245 bar
Hysteresis	±3%
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.58 lbs (.26 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	26 ft-lbs (35 Nm)
Coil Nut Torque Requirements	2 - 3 ft-lbs (3 - 4 Nm)
Cavity	Delta 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191200

COIL SPECIFICATIONS

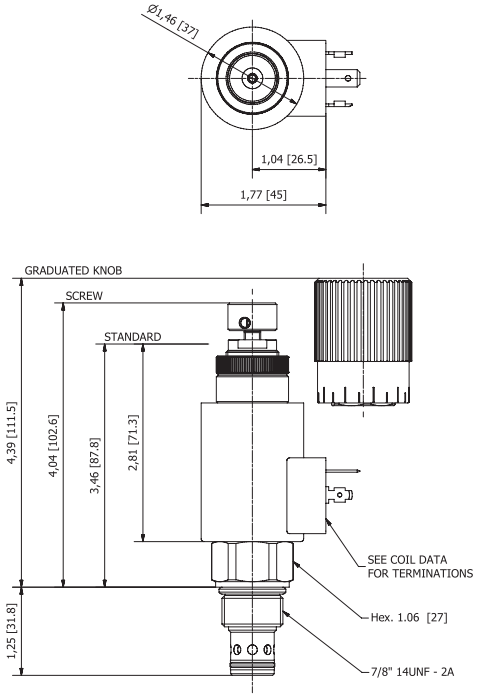
Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	200 - 1450 mA
PWM or Super-Imposed Dither Frequency	100 - 150 Hz
Coil Resistance (12 VDC)	7.2 Ohm ±5% at 68°F (20°C)

DIMENSIONS

"C" Version
Flow (l/min) vs. Current (mA)
(12 V coil; Delta P = 14 bar; Toil = 40°C)



NOTE: non linear characteristics



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

EE-P2G – ____ – ____ – ____ – ____

OPTIONS

Buna, Push Type Override Standard	**AP**	Up to 22 l/min
Buna, Screw Type Override (Knob)	**AS**	Up to 22 l/min
Buna, Screw Type Override (Grad. Knob)	**AK**	Up to 22 l/min
Buna, Push Type Override (Standard)	**BP**	Up to 50 l/min
Buna, Screw Type Override (Knob)	**BS**	Up to 50 l/min
Buna, Screw Type Override (Grad. Knob)	**BK**	Up to 50 l/min
Buna, Push Type Override (Standard)	**CP**	Up to 50 l/min
Buna, Screw Type Override (Knob)	**CS**	Up to 50 l/min
Buna, Screw Type Override (Grad. Knob)	**CK**	Up to 50 l/min

"F" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DI	Deutsch-Integral DT04-2P
JT	AMP Jr. Timer

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#8 SAE Ports

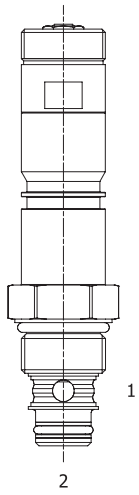
VOLTAGE

12	12 VDC
24	24 VDC

Approximate Coil Weight: .47 lbs (.21 kg)

NOTES: 1) Flows refer to a 14 bar Delta P.
2) For other seals, consult factory.

EB-P2A *2 Way Normally Closed, Proportional Flow Control Valve*



DESCRIPTION

8 size, 3/4-16 thread, solenoid operated, 2 way normally closed poppet style, proportional flow control valve.

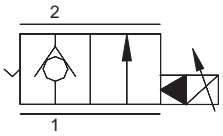
OPERATION

When de-energized the EB-P2A blocks flow from (1) to (2) and allows reverse flow from (2) to (1). When energized, the valve allows flow from (1) to (2). Flow is proportional to current applied to the coil. A compensator must be used to create a pressure compensated flow control function.

FEATURES

- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

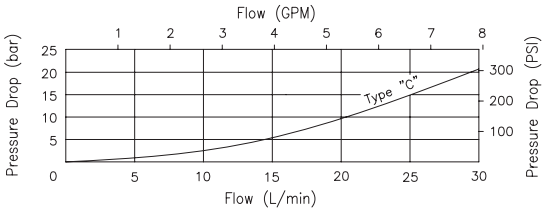
HYDRAULIC SYMBOL



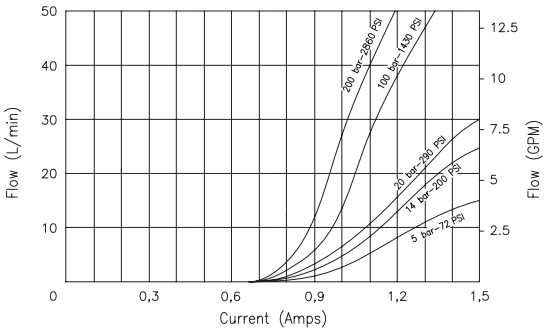
Curves are attained without pressure compensator. The valve can work with a pressure drop up to 200 bar.

PERFORMANCE

Pressure Drop 1 to 2 with valve completely open



Flow vs. Current at different Pressure Drop



Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)

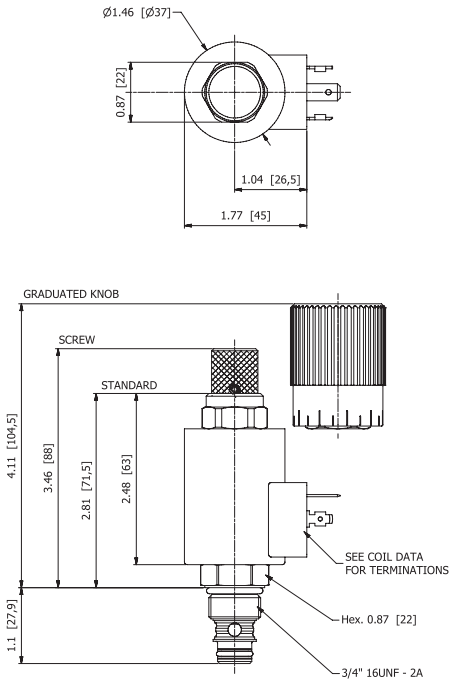
VALVE SPECIFICATIONS

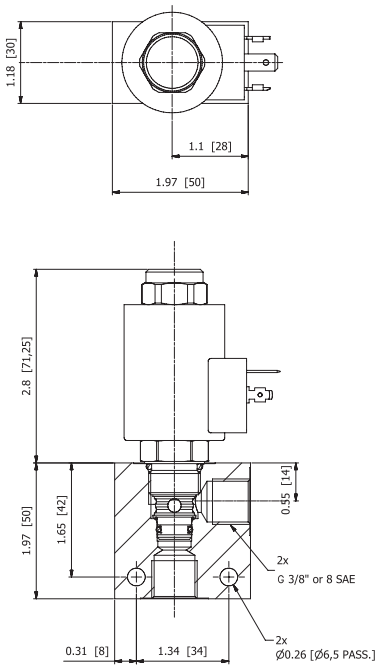
Flow Range	See curves
Max System Pressure	3500 PSI (245 bar)
Leakage	0 - 10 drops / min @ 245 bar
Hysteresis	±3%
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.72 lbs (.32 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	19 ft-lbs (25 Nm)
Coil Nut Torque Requirements	2 - 3 ft-lbs (3 - 4 Nm)
Cavity	Power 2W
Cavity Tools Kit (form tool, reamer, tap)	40500005
Seal Kit	21191102

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	500 - 1450 mA
PWM or Super-Imposed Dither Frequency	100 Hz
Coil Resistance (12 VDC)	7.2 Ohm ±5% at 68°F (20°C)

DIMENSIONS





(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

EB-P2A – ____ – ____ – ____ – ____

OPTIONS

Buna Standard	**C0** Up to 25 l/min
Buna, Screw Type Override (Knob)	**CS** Up to 25 l/min
Buna, Screw Type Override (Grad. Knob)	**CK** Up to 25 l/min

"F" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DI	Deutsch-Integral DT04-2P
JT	AMP Jr. Timer

VOLTAGE

12	12 VDC
24	24 VDC

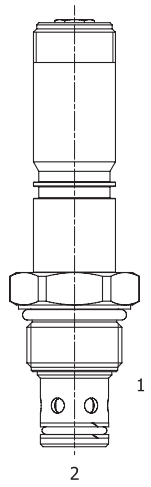
BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#8 SAE Ports

Approximate Coil Weight: .47 lbs (.21 kg)

NOTES: 1) Flows refer to a 14 bar Delta P.
2) For other seals, consult factory.

EE-P2A *2 Way Normally Closed, Proportional Flow Control Valve*



DESCRIPTION

10 size, 7/8-14 thread, solenoid operated, 2 way normally closed poppet style, proportional flow control valve.

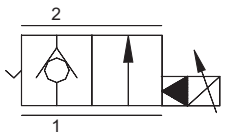
OPERATION

When de-energized the EE-P2A blocks flow from (1) to (2) and allows reverse flow from (2) to (1). When energized, the valve allows flow from (1) to (2). Flow is proportional to current applied to the coil. A compensator must be used to create a pressure compensated flow control function.

FEATURES

- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

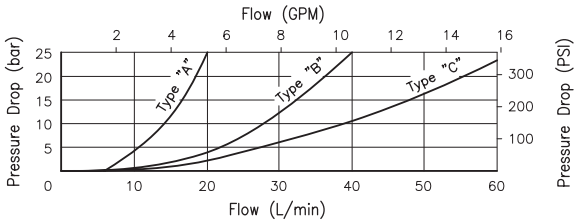
HYDRAULIC SYMBOL



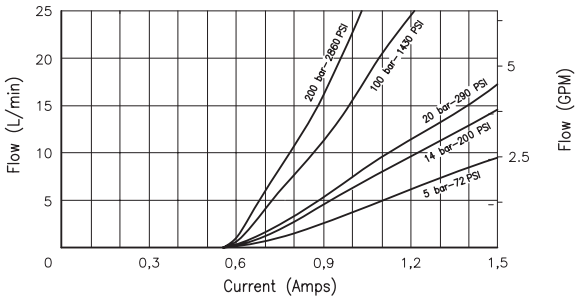
Curves are attained without pressure compensator. The valve can work with a pressure drop up to 200 bar.

PERFORMANCE

Pressure Drop 1 to 2 with valve completely open



Flow vs. Current at different Pressure Drop



Poppet type A - Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)

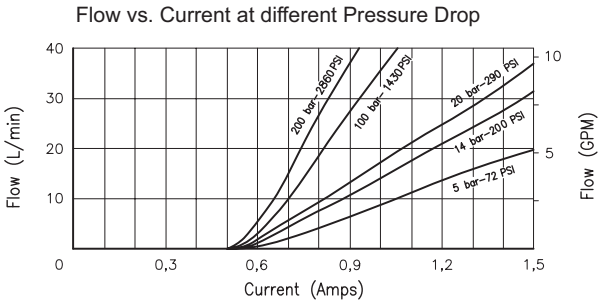
VALVE SPECIFICATIONS

Flow Range	See curves for various versions
Max System Pressure	3500 PSI (245 bar)
Leakage	0 - 10 drops / min @ 245 bar
Hysteresis	±3%
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.72 lbs (.32 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	26-35 ft-lbs (50 Nm)
Coil Nut Torque Requirements	2 - 3 ft-lbs (3 - 4 Nm)
Cavity	Delta 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191200

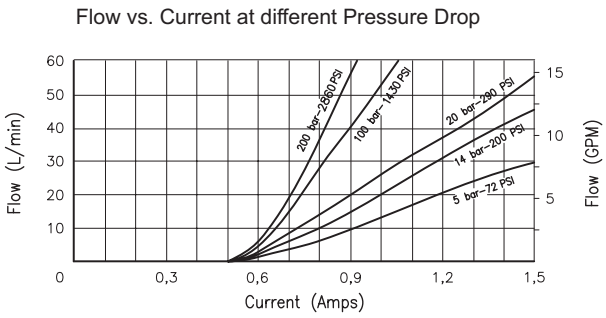
COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	500 - 1450 mA
PWM or Super-Imposed Dither Frequency	100 Hz
Coil Resistance (12 VDC)	7.2 Ohm ±5% at 68°F (20°C)

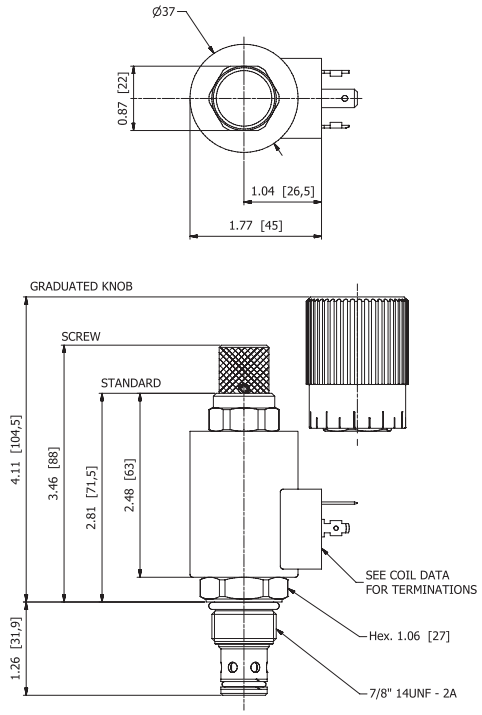
DIMENSIONS



Poppet type B - Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)



Poppet type C - Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

EE-P2A – ____ – ____ – ____ – ____

OPTIONS

Buna Standard	**A0** Up to 15 l/min
Buna, Screw Type Override (Knob)	**AS** Up to 15 l/min
Buna, Screw Type Override (Grad. Knob)	**AK** Up to 15 l/min
Buna Standard	**B0** Up to 30 l/min
Buna, Screw Type Override (Knob)	**BS** Up to 30 l/min
Buna, Screw Type Override (Grad. Knob)	**BK** Up to 30 l/min
Buna Standard	**C0** Up to 45 l/min
Buna, Screw Type Override (Knob)	**CS** Up to 45 l/min
Buna, Screw Type Override (Grad. Knob)	**CK** Up to 45 l/min

"F" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DI	Deutsch-Integral DT04-2P
JT	AMP Jr. Timer

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#8 SAE Ports

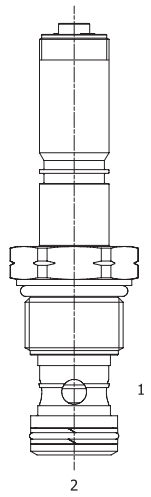
VOLTAGE

12	12 VDC
24	24 VDC

Approximate Coil Weight: .47 lbs (.21 kg)

NOTES: 1) Flows refer to a 14 bar Delta P.
2) For other seals, consult factory.

ET-P2A *2 Way Normally Closed, Proportional Flow Control Valve*



DESCRIPTION

12 size, 1 1/16-12 thread, solenoid operated, 2 way normally closed poppet style, proportional flow control valve.

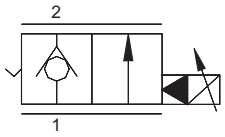
OPERATION

When de-energized the ET-P2A blocks flow from (1) to (2) and allows reverse flow from (2) to (1). When energized, the valve allows flow from (1) to (2). Flow is proportional to current applied to the coil. A compensator must be used to create a pressure compensated flow control function.

FEATURES

- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

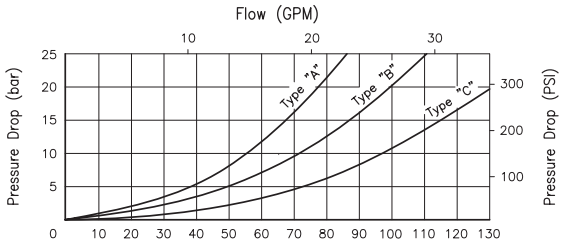
HYDRAULIC SYMBOL



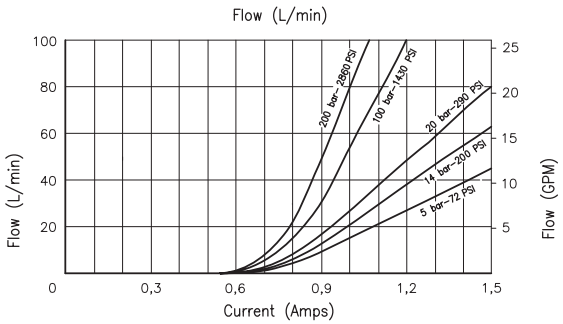
Curves are attained without pressure compensator. The valve can work with a pressure drop up to 200 bar.

PERFORMANCE

Pressure Drop 1 to 2 with valve completely open



Flow vs. Current at different Pressure Drop



Poppet type A - Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)

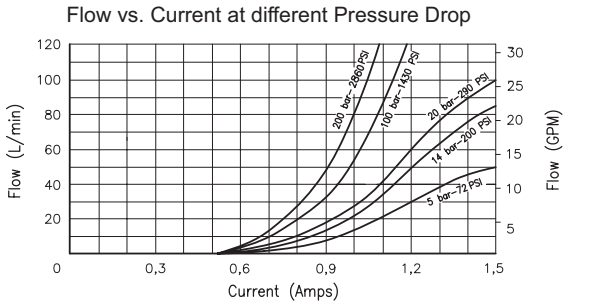
VALVE SPECIFICATIONS

Flow Range	See curves for various versions
Max System Pressure	3500 PSI (245 bar)
Leakage	0 - 10 drops / min @ 245 bar
Hysteresis	±3%
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.72 lbs (.32 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	37 ft-lbs (50 Nm)
Coil Nut Torque Requirements	2 - 3 ft-lbs (3 - 4 Nm)
Cavity	Tecnord 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191200

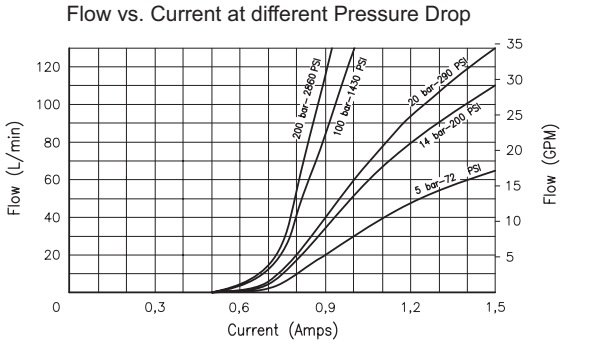
COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	500 - 1450 mA
PWM or Super-Imposed Dither Frequency	100 Hz
Coil Resistance (12 VDC)	7.2 Ohm ±5% at 68°F (20°C)

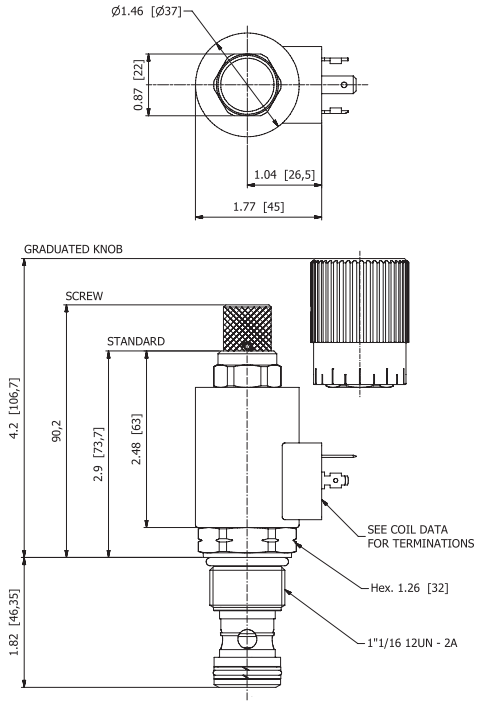
DIMENSIONS



Poppet type B - Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)



Poppet type C - Coil 12 vdc - hyd. oil 26 cSt (121 SSU) @ 40°C (104°F)



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

ET-P2A – ____ – ____ – ____ – ____

OPTIONS

Buna Standard	**A0**	Up to 65 l/min
Buna, Screw Type Override (Knob)	**AS**	Up to 65 l/min
Buna, Screw Type Override (Grad. Knob)	**AK**	Up to 65 l/min
Buna Standard	**B0**	Up to 85 l/min
Buna, Screw Type Override (Knob)	**BS**	Up to 85 l/min
Buna, Screw Type Override (Grad. Knob)	**BK**	Up to 85 l/min
Buna Standard	**C0**	Up to 110 l/min
Buna, Screw Type Override (Knob)	**CS**	Up to 110 l/min
Buna, Screw Type Override (Grad. Knob)	**CK**	Up to 110 l/min

"F" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DI	Deutsch-Integral DT04-2P
JT	AMP Jr. Timer

VOLTAGE

12	12 VDC
24	24 VDC

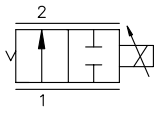
BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#8 SAE Ports

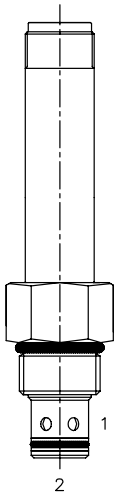
Approximate Coil Weight: .47 lbs (.21 kg)

NOTES: 1) Flows refer to a 14 bar Delta P.
2) For other seals, consult factory.

2 Way Normally Open Proportional Flow Regulator Valves

Spool Type	GPM	PSI	LPM	BAR	MODEL	PAGE
	8	3500	30	245	EE-P2H	14

EE-P2H *2 Way Normally Open, Proportional Flow Control Valve*



DESCRIPTION

10 size, 7/8-14 thread, solenoid operated, 2 way normally open, proportional flow control valve.

OPERATION

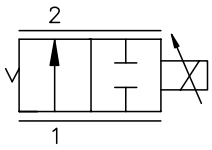
When de-energized the EE-P2H allows flow from (1) to (2). When fully energized, the valve blocks flow at port (1) and (2). Flow is proportional to current applied to the coil. A compensator must be used to create a pressure compensated flow control function.

OPERATION OF MANUAL OVERRIDE OPTION: to override, turn the manual override screw clockwise. To release turn the manual override screw counter-clockwise.

FEATURES

- Efficient wet-armature construction.
- Cartridges are voltage interchangeable.
- Industry common cavity.
- Unitized, molded coil design.
- Continuous duty rated solenoid.
- Optional coil voltages and terminations.

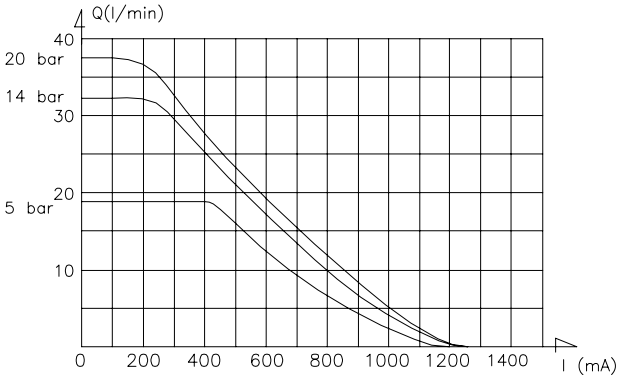
HYDRAULIC SYMBOL



Curve is attained with Tecnord QC CP3 compensator at with various settings.

PERFORMANCE

Flow (l/min) vs. Current (mA)
(12 V Coil; Delta P = 5, 14, 20 bar; Toil = 40°C)



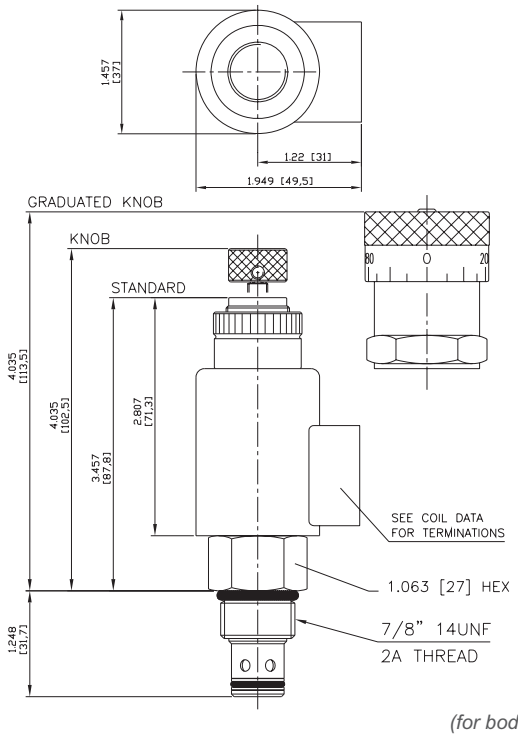
VALVE SPECIFICATIONS

Flow Range	See curve
Max System Pressure	3500 PSI (245 bar)
Leakage	Max 100 cc/min at 245 bar
Hysteresis	±4%
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.58 lbs (.26 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	26 ft-lbs (35 Nm)
Coil Nut Torque Requirements	2 - 3 ft-lbs (3 - 4 Nm)
Cavity	Delta 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191200

COIL SPECIFICATIONS

Current Supply Characteristics	PWM (Pulse Width Modulation)
Rated Current Range	0 - 1450 mA
PWM or Super-Imposed Dither Frequency	100 - 150 Hz
Coil Resistance (12 VDC)	7.2 Ohm ±5% at 68°F (20°C)

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

EE-P2H – ____ – ____ – ____ – ____

OPTIONS

Buna, Push Type Override Standard	**0P**
Buna, Screw Type Override (Knob)	**0S**
Buna, Screw Type Override (Grad. Knob)	**0K**

"F" COIL TERMINATION

HC	DIN 43650 (Hirschmann)
DI	Deutsch - Integral DT04-2P
JT	AMP Jr. Timer

VOLTAGE

12	12 VDC
24	24 VDC

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#8 SAE Ports

NOTES: for other seals, consult factory.

Approximate Coil Weight: .47 lbs (.21 kg)

Index chapter 3

Section / Description page

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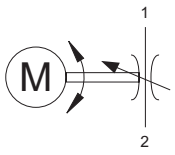
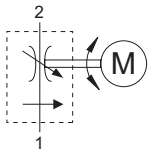
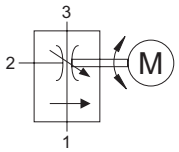
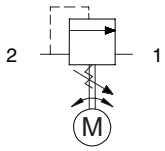
TECNORD
a Delta Power Company

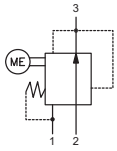
Motorized Flow Regulator and Relief Valves

Flow Restrictors (Needle Valves)	GPM	PSI	LPM	BAR	MODEL	PAGE
	12	3500	45	245	AE-NVA	4
	40	3500	150	245	AJ-NVA	6

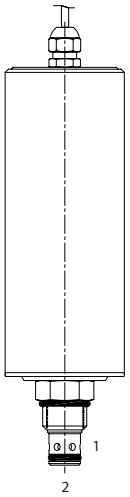
2 Way Pressure Compensated Flow Regulators	GPM	PSI	LPM	BAR	MODEL	PAGE
	24	3500	90	245	AJ-FCA	8

3 Way Pressure Compensated Flow Regulators	GPM	PSI	LPM	BAR	MODEL	PAGE
	24	3500	90	245	AK-FCQ	10

Relief Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	37	3500	140	245	AJ-RVR	12

Pressure Reducing Valves	GPM	PSI	LPM	BAR	MODEL	PAGE
	10	3000	38	207	AF-PRP	14

AE-NVA *Motorized Needle Flow Control Valve*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, motorized needle flow control valve.

OPERATION

The AE-NVA can be adjusted to any position between fully open and fully closed applying electrical power to the motor.

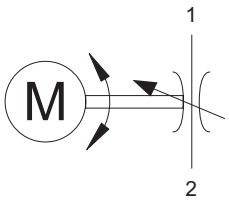
The amount of valve opening does not change unless the electric motor is activated. When adjusted open, the valve allows flow from (1) to (2) and (2) to (1). When fully closed the valve blocks flow from (1) to (2) and (2) to (1).

FEATURES

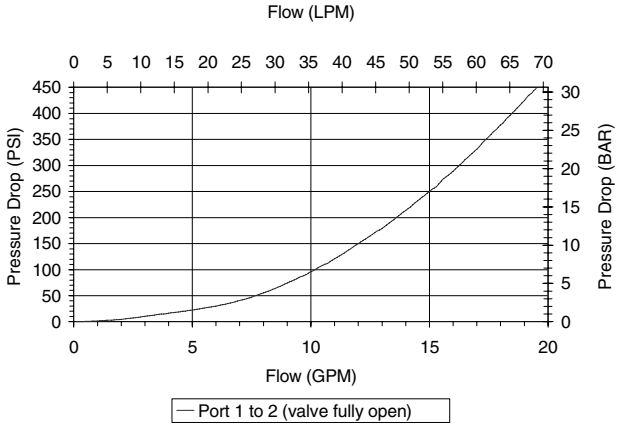
- Hardened parts for long life.
- Industry common cavity.

Adjustable via 12/24 vdc signal, no electronic driver required. A built-in position transducer with an analog output is available on request.

HYDRAULIC SYMBOL



PERFORMANCE

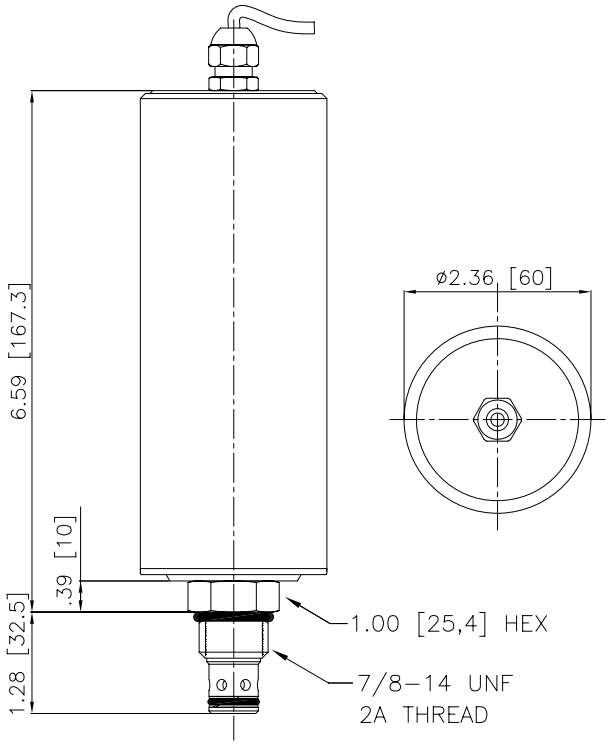


VALVE SPECIFICATIONS

Max Controlled Flow	12 GPM (45 LPM) @ 13 bar Delta P
Rated Operating Pressure	3500 PSI (245 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	1.68 lbs (.76 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	30 ft-lbs (40.6 Nm)
Current Draw	300 mA (12 VDC) / 150 mA (24 VDC)
Electrical Connection	Double lead wire - Length: 60-70 cm
Cavity	Delta 2W
Cavity Tools Kit (form tool, reamer, tap)	40500000
Seal Kit	21191200

Gear ratio	Response time (full closed to full open)
100	7 sec.
250	14 sec.
500	28 sec.

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

AE-NVA – ____ – ____ – ____ – ____

OPTIONS

Buna Standard **00**

GEAR RATIO

R500
R250
R100

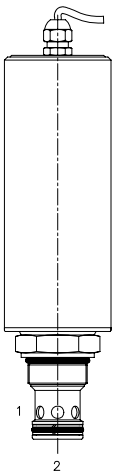
VOLTAGE

24 24 VDC
12 12 VDC

BODIES

Blank Without Body
N 3/8" BSP Ports
S #6 SAE Ports

AJ-NVA *Motorized Needle Flow Control Valve*



DESCRIPTION

16 size, 1 5/16-12 thread, “Super” series, motorized needle flow control valve.

OPERATION

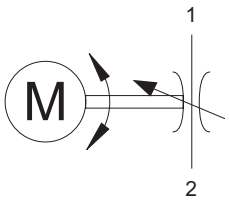
The AJ-NVA can be adjusted to any position between fully open and fully closed by applying electrical power to the motor.
The amount of valve opening does not change unless the electric motor is activated. When adjusted open, the valve allows flow from (1) to (2) and (2) to (1). When fully closed the valve blocks flow from (1) to (2) and (2) to (1).

FEATURES

- Hardened parts for long life.
- Industry common cavity.

Adjustable via 12/24 vdc signal, no electronic driver required. A built-in position transducer with an analog output is available on request.

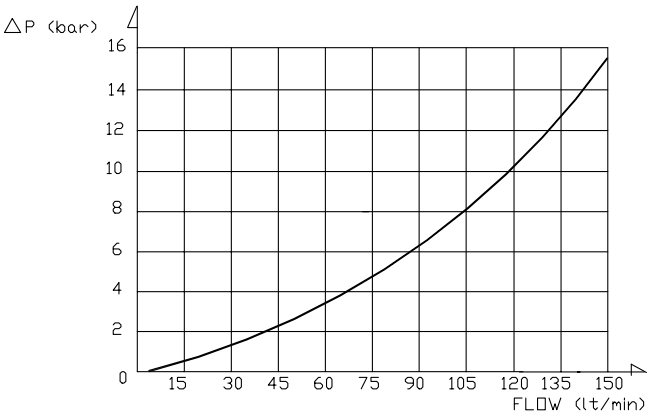
HYDRAULIC SYMBOL



VALVE SPECIFICATIONS

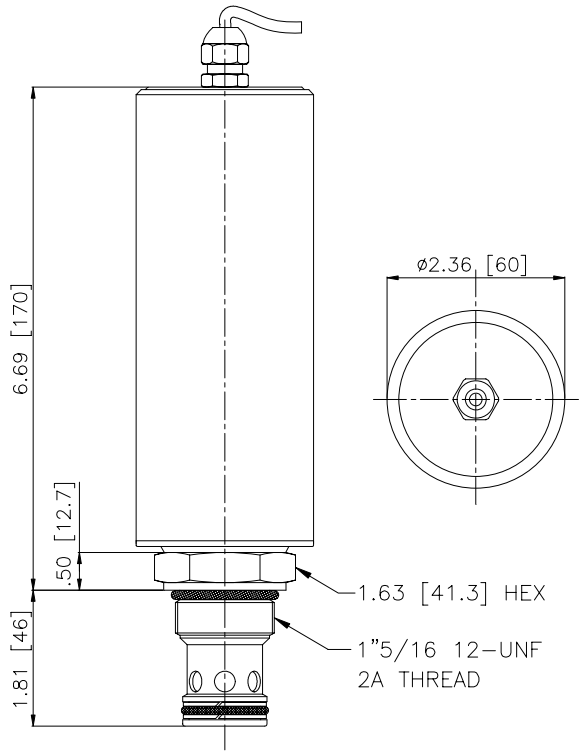
Max Controlled Flow	40 GPM (150 LPM) @ 15 bar Delta P
Max Operating Pressure	3500 PSI (245 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	2.24 lbs (1.02 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	90 ft-lbs (122 Nm)
Current Draw	300 mA (12 VDC) / 150 mA (24 VDC)
Electrical Connection	Double lead wire - Length: 50-60 cm
Cavity	Super 2W
Cavity Tools Kit (form tool, reamer, tap)	40500017
Seal Kit	21191401

PERFORMANCE



Gear ratio	Response time (full closed to full open)
100	12 sec.
250	28 sec.
500	55 sec.

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

AJ-NVA – ___ – ___ – ___ – ___

OPTIONS

Buna Standard	**00**

GEAR RATIO

R500	
R250	
R100	

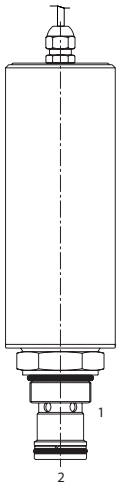
VOLTAGE

24	24 VDC
12	12 VDC

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#12 SAE Ports

AJ-FCA *Motorized Adjustable Pressure Compensated Flow Control Valve*



DESCRIPTION

16 size, 1 5/16-12 thread, “Super” series, motorized adjustable pressure compensated flow control valve.

OPERATION

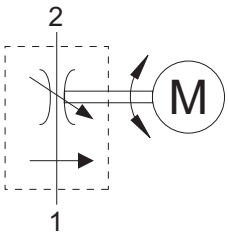
The AJ-FCA maintains a constant flow rate out of (1) regardless of load pressure changes in the circuit downstream of (1). The valve begins to respond to load changes when the flow through the valve creates a pressure differential across the control orifice greater than 100 psi (6.9 bar), with accurate flow maintenance from 100 to 3500 psi (6.9 to 240 bar).
Reverse flow (1) to (2) returns through the control orifice and is non-compensated.

FEATURES

- Hardened parts for long life.
- Industry common cavity.
- Fine low-torque adjustment.

Adjustable via 12/24 vdc signal, no electronic driver required. A built-in position transducer with an analog output is available on request.

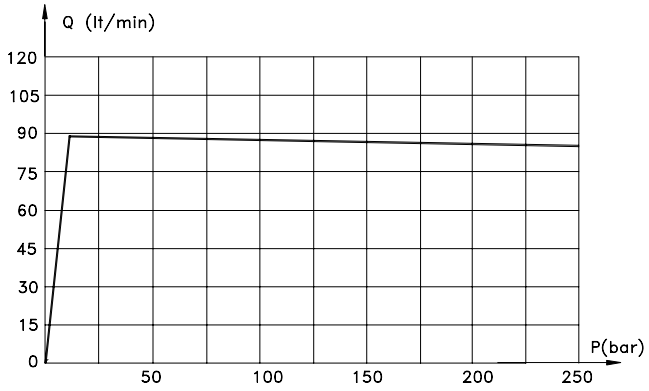
HYDRAULIC SYMBOL



VALVE SPECIFICATIONS

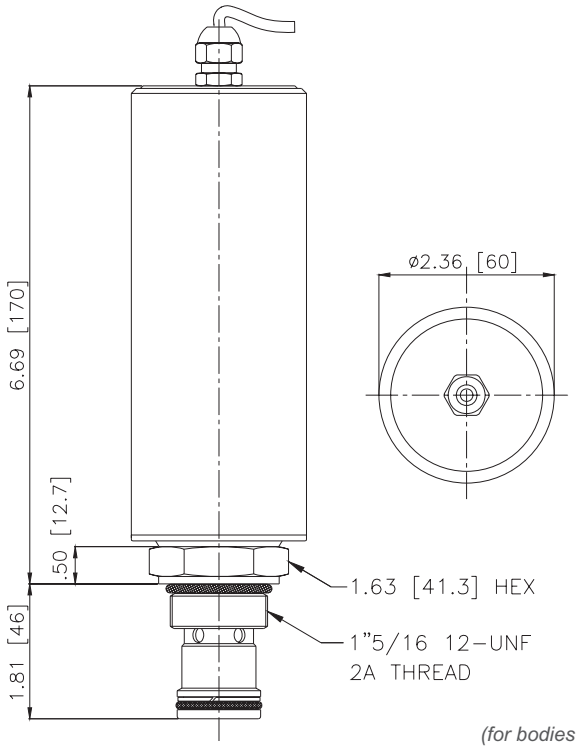
Max Controlled Flow	24 GPM (90 LPM)
Max Operating Pressure	3500 PSI (245 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	2.24 lbs (1.02 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	90 ft-lbs (122 Nm)
Current Draw	300 mA (12 VDC) / 150 mA (24 VDC)
Electrical Connection	Double lead wire - Length: 50-60 cm
Cavity	Super 2W
Cavity Tools Kit (form tool, reamer, tap)	40500017
Seal Kit	21191400

PERFORMANCE



Gear ratio options (see ordering code)	Response time (full closed to full open)
100	9 sec.
250	22 sec.
500	45 sec.

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

AJ-FCA – ___ – ___ – ___ – ___

OPTIONS

Buna Standard	**00**

GEAR RATIO

R500	
R250	
R100	

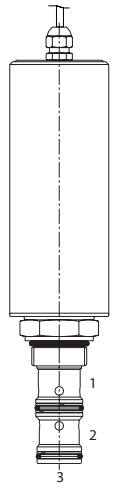
VOLTAGE

24	24 VDC
12	12 VDC

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#12 SAE Ports

AK-FCQ *Motorized Adjustable Priority Flow Control Valve*



DESCRIPTION

16 size, 1 5/16-12 thread, “Super” series, motorized adjustable priority flow control valve.

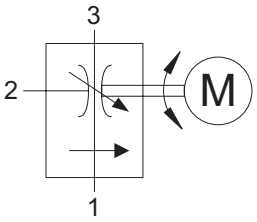
OPERATION

The AK-FCQ allows pressure compensated flow from (3) to (1) regulated the pressure present at (3). Excess flow passes out (2). The spring chamber is constantly vented at (1).

FEATURES

- Hardened parts for long life.
- Industry common cavity.

HYDRAULIC SYMBOL



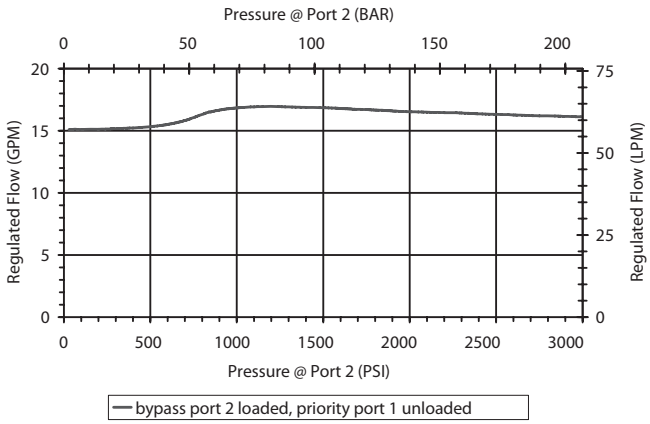
Adjustable via 12/24 vdc signal, no electronic driver required. A built-in position transducer with an analog output is available on request.

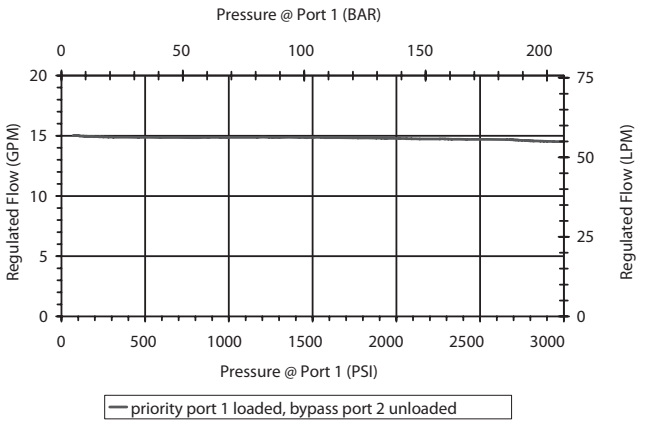
VALVE SPECIFICATIONS

Max Regulated Flow	24 GPM (90 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	2.34 lbs (1.06 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	90 ft-lbs (122 Nm)
Current Draw	300 mA (12 VDC) / 150 mA (24 VDC)
Electrical Connection	Double lead wire - Length: 50-60 cm
Cavity	Super 3W
Cavity Tools Kit (form tool, reamer, tap)	40500018
Seal Kit	21191404

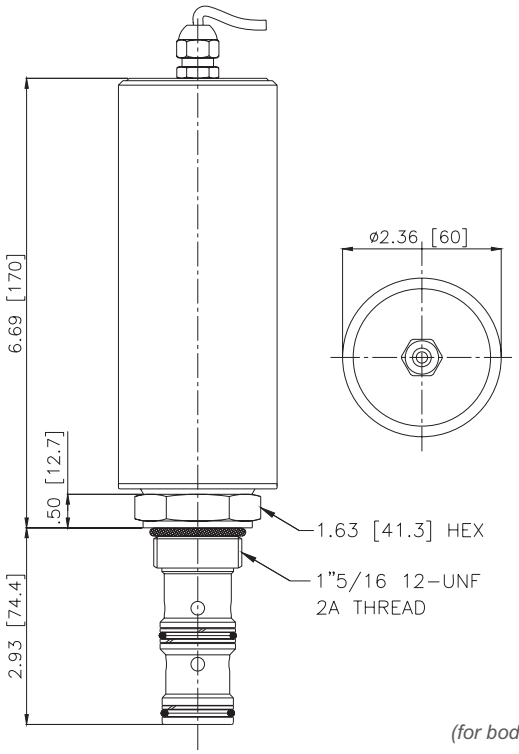
Gear ratio options (see ordering code)	Response time (full closed to full open)
100	9 sec.
250	22 sec.
500	45 sec.

PERFORMANCE





DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

AK-FCQ – ___ – ___ – ___ – ___

OPTIONS

Buna Standard	**00**

GEAR RATIO

R500	
R250	
R100	

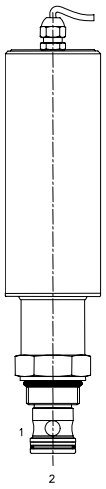
VOLTAGE

24	24 VDC
12	12 VDC

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#12 SAE Ports

AJ-RVR *Motorized Pilot Operated Relief Valve*



DESCRIPTION

16 size, 1 5/16-12 thread, “Super” series, motorized adjustable pilot-operated pressure relief valve.

OPERATION

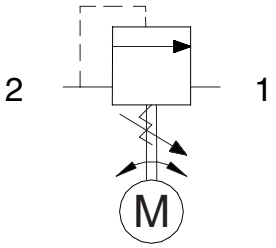
The AJ-RVR blocks flow from (2) to (1) until sufficient pressure is present at (2). The setting of the AJ-RVR can be adjusted to any value between 14 and 245 bar (200-3500 psi) applying electrical power to the motor. The setting does not change unless the electrical motor is activated. Reverse flow (1) to (2) occurs when the pressure at (1) is at least 2.1 bar (30 psi) higher then at port (2).

FEATURES

- Hardened parts for long life.
- Industry common cavity.
- Fine low-torque adjustment.

Adjustable via 12/24 vdc signal, no electronic driver required. A built-in position transducer with an analog output is available on request.

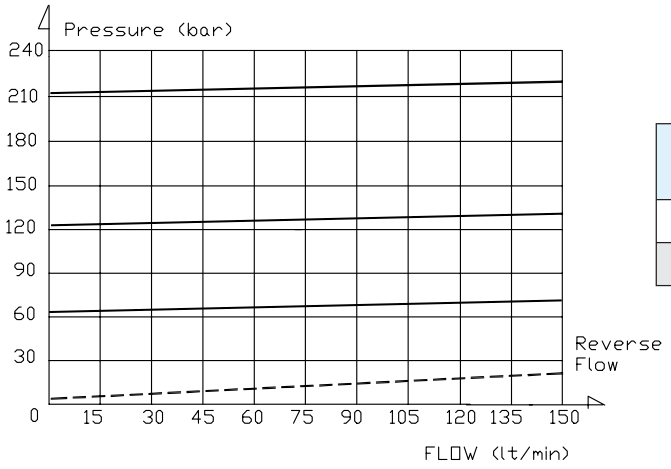
HYDRAULIC SYMBOL



VALVE SPECIFICATIONS

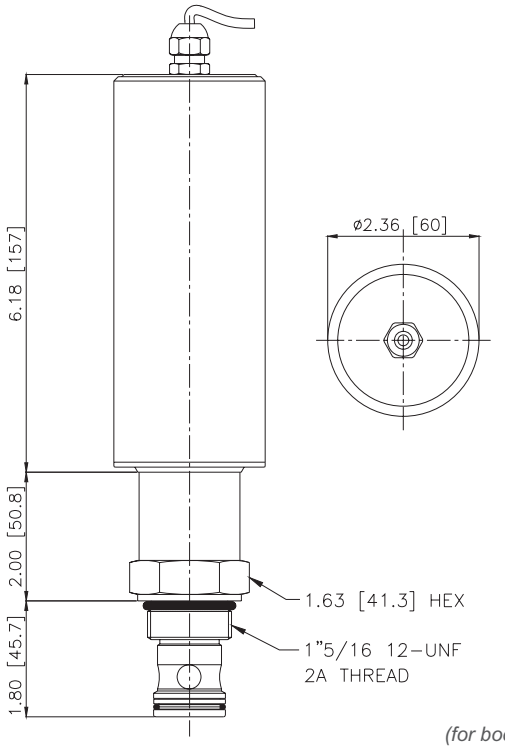
Max Controlled Flow	37 GPM (140 LPM)
Max Operating Pressure	3500 PSI (245 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	2.24 lbs (1.02 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	90 ft-lbs (122 Nm)
Current Draw	300 mA (12 VDC) / 150 mA (24 VDC)
Electrical Connection	Double lead wire - Length: 50-60 cm
Cavity	Super 2W
Cavity Tools Kit (form tool, reamer, tap)	40500017
Seal Kit	21191400

PERFORMANCE



Gear ratio options (see ordering code)	Response time (full closed to full open)
250	12 sec.
500	27 sec.

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

AJ-RVR – ___ – ___ – ___ – ___

OPTIONS

Buna Standard	**00**

GEAR RATIO

R250	
R100	

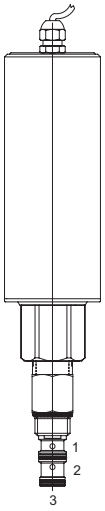
VOLTAGE

24	24 VDC
12	12 VDC

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#12 SAE Ports

AF-PRP *Motorized Pressure Reducing, Relieving Valve*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, motorized adjustable pressure reducing, relieving valve, pilot opearated.

OPERATION

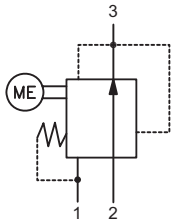
The AF-PRP can be adjusted to any position between fully open and fully closed applying electrical power to the motor.

When a pre-determined pressure is reached at (3), the spool shifts to restrict input flow at (2), thereby reducing (restricting) flow. If valve and pressure at port (3) exceeds setting, spool shift to open passage at port (1), thereby regulating pressure at port (3) by relieving excess flow.

FEATURES

- Hardened parts for long life.
- Industry common cavity.

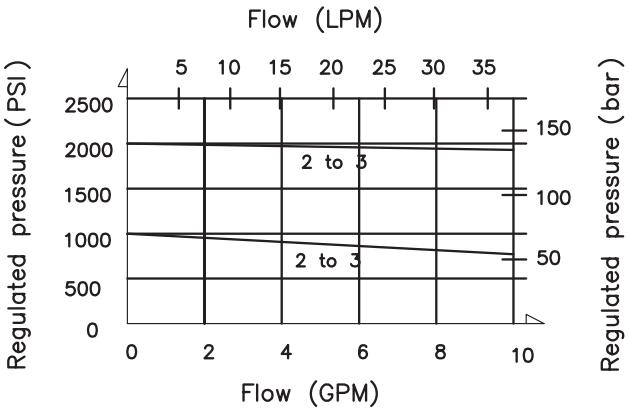
HYDRAULIC SYMBOL

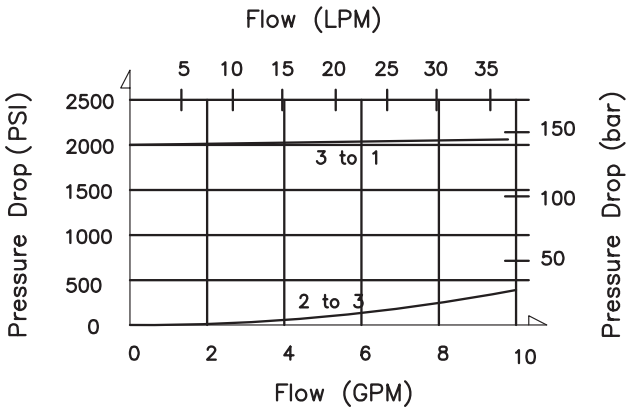


VALVE SPECIFICATIONS

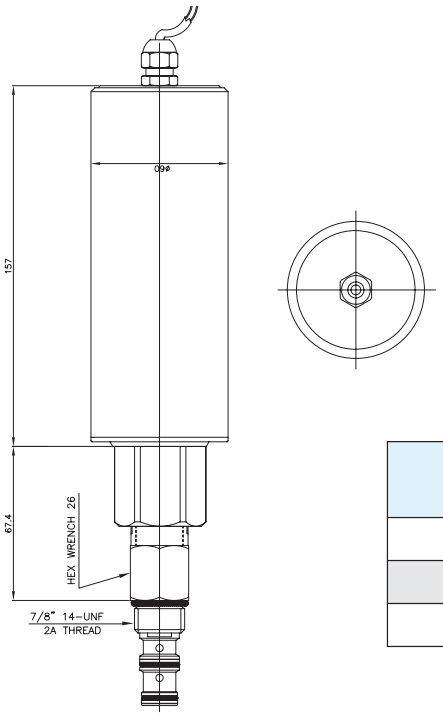
Nominal Flow	10 GPM (38 LPM)
Rated Operating Pressure	4000 PSI (276 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.59 lbs (.27 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	30 ft-lbs (40.6 Nm)
Cavity	Delta 3W
Cavity Tools Kit (form tool, reamer, tap)	40500001
Seal Kit	21191206

PERFORMANCE





DIMENSIONS



Gear ratio	Response time (full closed to full open)
100	7 sec.
250	14 sec.
500	28 sec.

(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

AF-PRP – ____ – ____ – ____ – ____

OPTIONS

Buna Standard **00**

GEAR RATIO

R500
R250
R100

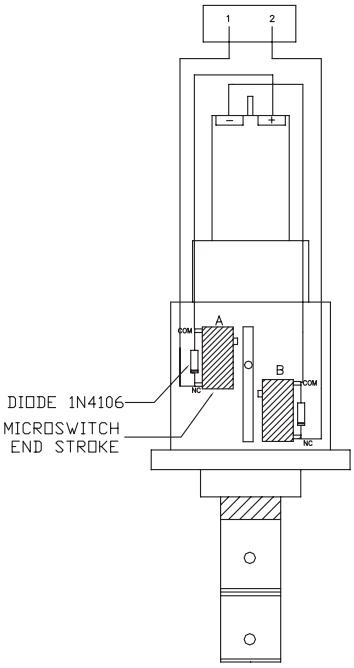
VOLTAGE

24 24 VDC
12 12 VDC

BODIES

Blank Without Body
N 3/8" BSP Ports
S #6 SAE Ports

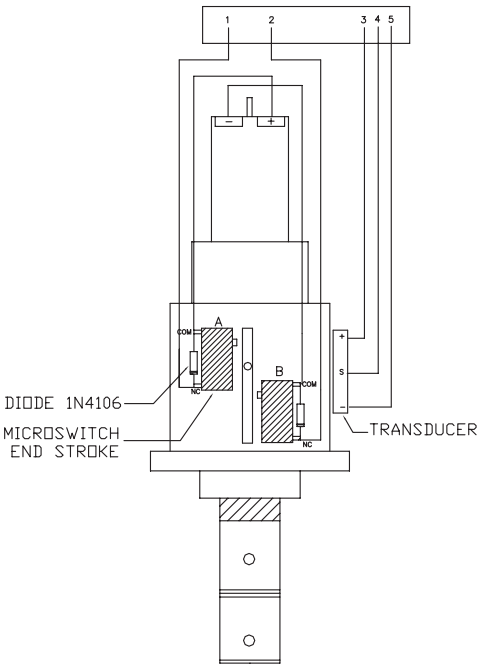
Electrical Connections



Version without position transducer

1 + Supply (BLUE)
2 - Supply (BROWN)

ROTATION
Anticlockwise Connect 1 at +12 V and 2 at Gnd (valve opening till end of stroke A)
Clockwise (valve closing) Connect 2 at +12 V and 1 at Gnd (valve opening till end of stroke B)



Version with position transducer

1 + Supply (RED)
2 - Supply (BLACK)
3 + Transducer supply (BLU)
4 Transducer output signal (YELLOW/GREEN)
5 Transducer supply (BROWN)

ROTATION
Anticlockwise Connect 1 at +12 V and 2 at Gnd (valve opening till end of stroke A)
Clockwise (valve closing) Connect 2 at +12 V and 1 at Gnd (valve opening till end of stroke B)

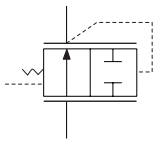
Note: an electronic card with a led to monitor the valve position is available (ordering code: 24.1003.005)

Index chapter 4

Via Malavolti, 36 - 41122 Modena - Italy - Phone +39 059/254895 - Fax +39 059/253512 - www.tecnord.com - mail: tecnord@tecnord.com

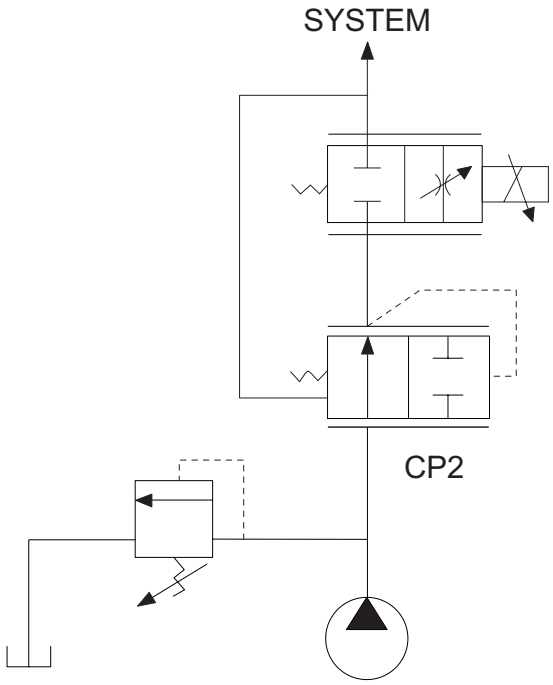
TECNORD
a Delta Power Company

2 Way Compensating/Reducing Valves

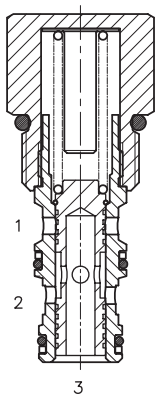
	GPM	PSI	LPM	BAR	MODEL	CAVITY	PAGE
	8	3500	30	245	DF-CP2	7/8” - 14 UNF	4
	19	3500	70	245	QC-CP2	Special	6

TYPICAL SCHEMATIC

Typical application for the CP2 is in a proportional circuit to achieve pressure compensated flow control.
The pressure compensator is located upstream of the orifice and is spring biased to an open position.



DF-CP2 *Pressure Compensating/Reducing Valve*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, 2 ways pressure compensating/reducing valve.

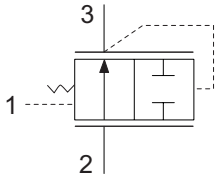
OPERATION

The DF-CP2 allows pressure compensated flow from (2) to (3) regulated by the pressure present at (1). Pressure differential between (3) and (1) is fixed at 8/14/18 bar (according to the pressure settings). These are minimum values, increasing with the flow because of the pressure drop through the valve (seegraph). When used with (1) connected to a drain line, it works as pressure reducing valve.

FEATURES

- Hardened parts for long life.
- Industry common cavity.
- Spring range 8 to 18 bar.

HYDRAULIC SYMBOL



Pressure compensator for 2 way flow control, typically used with an external orifice inline with port (3). Port (1) should sense upstream pressure of orifice.

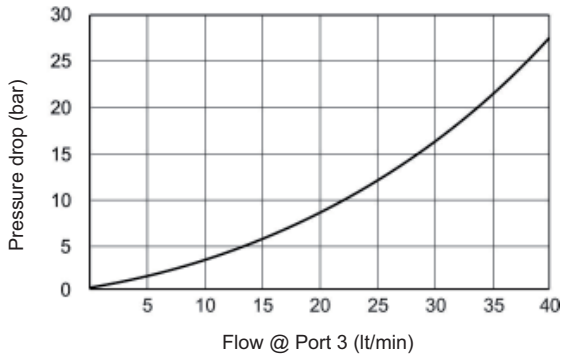
VALVE SPECIFICATIONS

Nominal Flow	8 GPM (30 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Typical Internal Leakage (150 SSU)	35 ml/min @ 250 bar
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-25° to +95°C
Weight	.35 lbs (.16 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	33 ft-lbs (45 Nm)
Cavity	Delta 3W
Cavity Tools Kit (form tool, reamer, tap)	40500001
Seal Kit	210902025

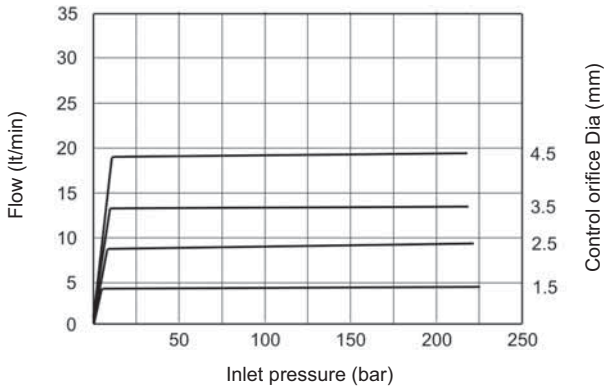
PERFORMANCE

Actual Test Data (Cartridge Only)

PRESSURE DROP (bar) vs. FLOW (lt/min)
For various pressure compensator settings (bar)



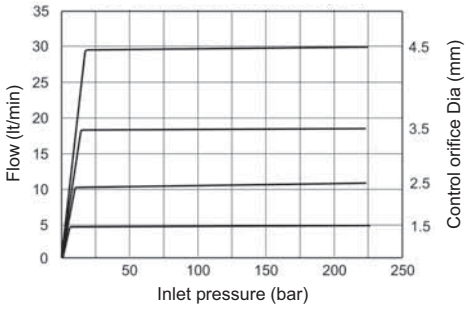
DF-CP2 008
FLOW (lt/min) vs. INLET PRESSURE (bar)
For various orifice diameters (mm)



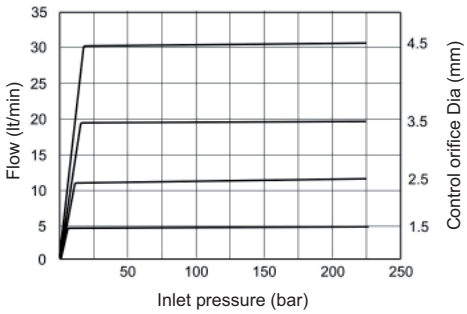
WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

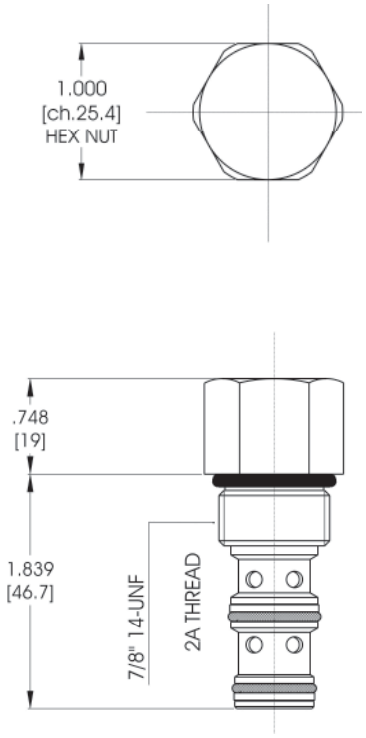
DIMENSIONS

DF-CP2 014
FLOW (lt/min) vs. INLET PRESSURE (bar)
For various orifice diameters (mm)



DF-CP2 018
FLOW (lt/min) vs. INLET PRESSURE (bar)
For various orifice diameters (mm)





(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

DF-CP2 – ____ – ____ – ____

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

PRESSURE SETTINGS

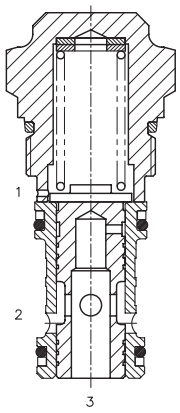
008	8 bar (115 PSI)
014	14 bar (200 PSI)
018	18 bar (260 PSI)

Differential Pressure Across
External Controlling Orifice

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#6 SAE Ports

QC-CP2 *Pressure Compensating/Reducing Valve*



DESCRIPTION

Special cavity, 2 ways pressure compensating/reducing valve.

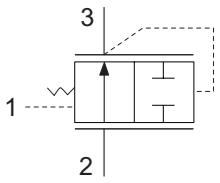
OPERATION

The QC-CP2 allows pressure compensated flow from (2) to (3) regulated by the pressure present at (1). Pressure differential between (3) and (1) is fixed at 8/14/18/24 bar (according to the pressure settings). These are minimum values, increasing with the flow because of the pressure drop through the valve (see graph). When used with (1) connected to a drain line, it works as a fix setting pressure reducing valve.

FEATURES

- Hardened parts for long life.
- Spring range 8 to 24 bar.

HYDRAULIC SYMBOL



Pressure compensator for 2 way flow control, typically used with an external orifice inline with port (3). Port (1) should sense upstream pressure of orifice.

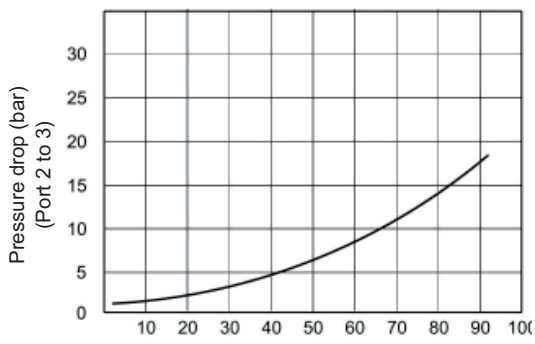
VALVE SPECIFICATIONS

Nominal Flow	19 GPM (70 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Typical Internal Leakage (150 SSU)	35 ml/min @ 250 bar
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.35 lbs (.16 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	52 ft-lbs (70 Nm)
Cavity	T031
Cavity Tools Kit (form tool, reamer, tap)	K-T031
Seal Kit	210902012

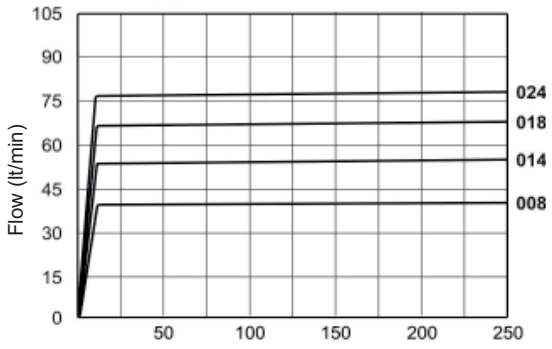
PERFORMANCE

Actual Test Data (Cartridge Only)

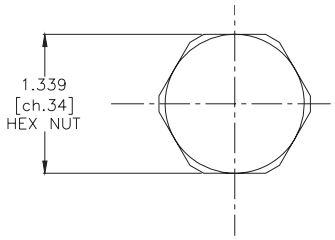
PRESSURE DROP (bar) vs. FLOW (lt/min)

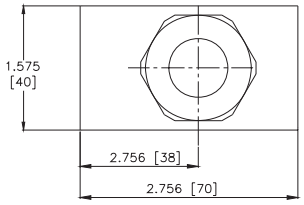


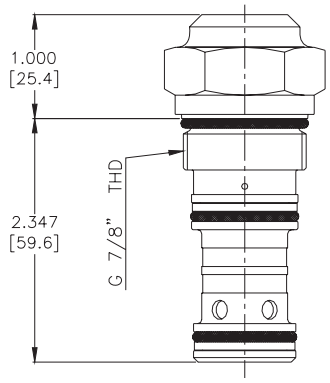
FLOW (lt/min) vs. INLET PRESSURE (bar)
For various press. compensator valve settings
Re: control orifice diameter: 5.5 mm

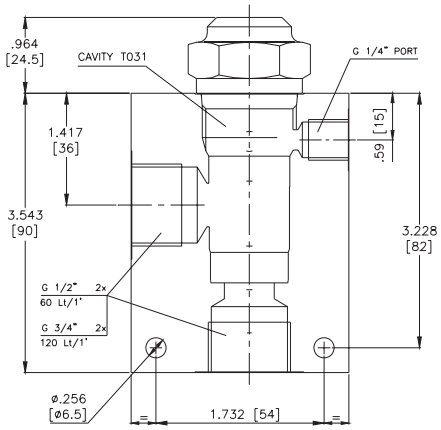


DIMENSIONS









ORDERING INFORMATION

QC-CP2 – ___ – ___ – ___

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

BODIES

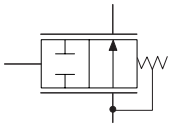
Blank	Without Body
N	1/2" BSP Ports
S	#8 SAE Ports

PRESSURE SETTINGS

008	8 bar (115 PSI)
014	14 bar (200 PSI)
018	18 bar (260 PSI)
024	24 bar (340 PSI)

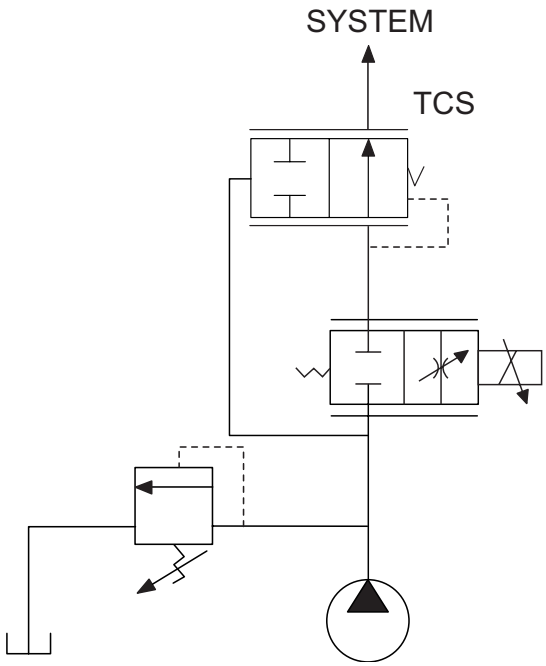
Differential Pressure Across
External Controlling Orifice

2 Way Restrictive Type Compensators

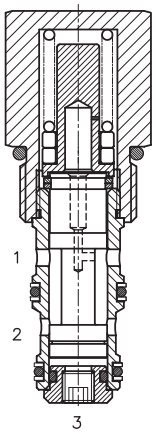
	GPM	PSI	LPM	BAR	MODEL	CAVITY	PAGE
	10	3500	38	245	DF-TCS	7/8” - 14 UNF	10

TYPICAL SCHEMATIC

Typical application for the TCS is in a proportional circuit to achieve pressure compensated flow control.
The pressure compensator is located downstream of the proportional valve and is spring biased to an open position.



DF-TCS *Pressure Compensating Valve, Restrictive Type*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, pressure compensating valve, restrictive type.

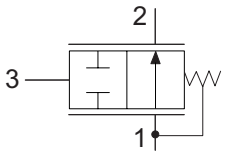
OPERATION

The DF-TCS allows pressure compensated flow from (1) to (2) regulated the pressure present at (3). Pressure differential between (1) and (3) is fixed at 8/24 bar (according to the pressure settings). These are minimum values increasing with the flow because of the pressure drop through the valve (see graph).

FEATURES

- Hardened parts for long life.
- Industry common cavity.

HYDRAULIC SYMBOL



Pressure compensator for 2 way flow control, typically used with an external orifice inline with port (1). Port (3) should sense downstream pressure of orifice.

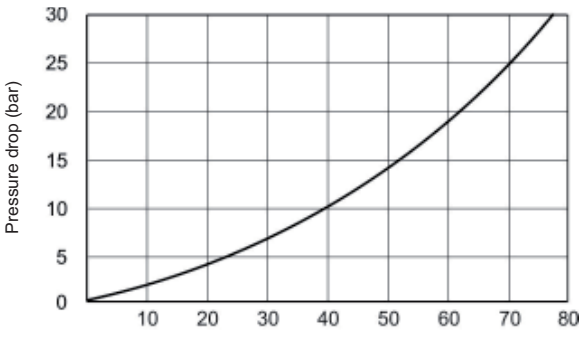
VALVE SPECIFICATIONS

Nominal Flow	10 GPM (38 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Typical Internal Leakage (150 SSU)	35 ml/min @ 250 bar
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.35 lbs (.16 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	33 ft-lbs (45 Nm)
Cavity	Delta 3W
Cavity Tools Kit (form tool, reamer, tap)	40500001
Seal Kit	210902026

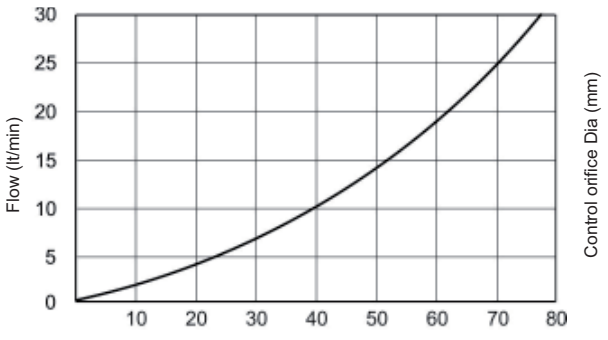
PERFORMANCE

Actual Test Data (Cartridge Only)

PRESSURE DROP (bar) vs. FLOW (lt/min)
For various pressure compensator settings (bar)

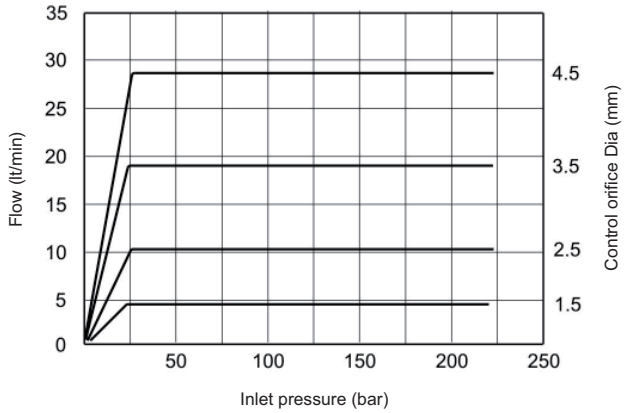


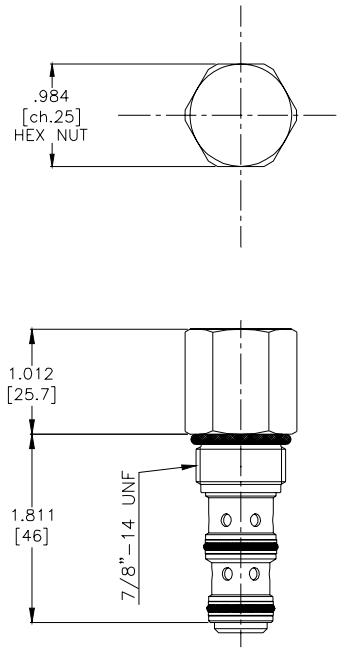
DF-TCS 008
FLOW (lt/min) vs. INLET PRESSURE (bar)
For various orifice diameters (mm)



DIMENSIONS

DF-TCS 024
FLOW (lt/min) vs. INLET PRESSURE (bar)
For various orifice diameters (mm)





(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

DF-TCS – ____ – ____ – ____

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

PRESSURE SETTINGS

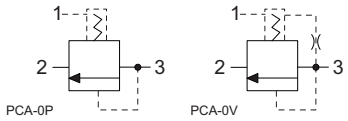
008	8 bar (115 PSI)
024	24 bar (340 PSI)

Differential Pressure Across
External Controlling Orifice

BODIES

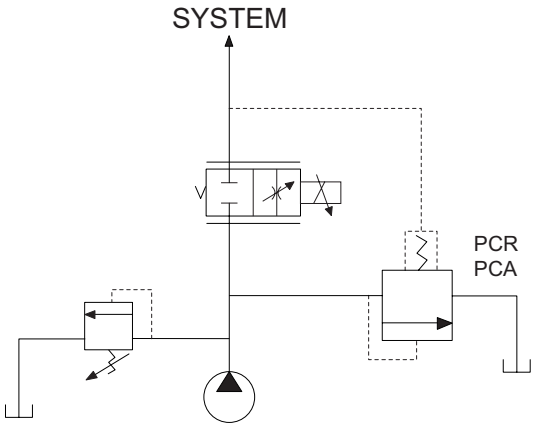
Blank	Without Body
N	3/8" BSP Ports
S	#6 SAE Ports

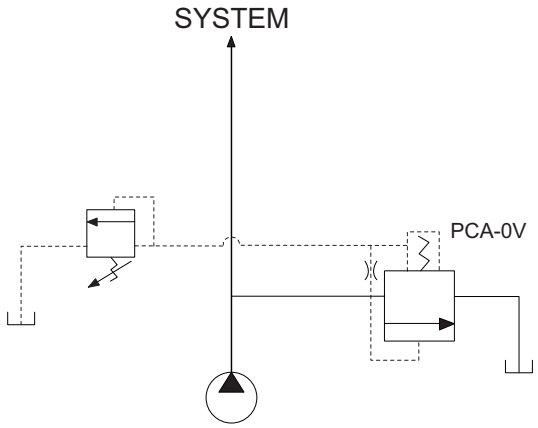
2 Way By-Pass Type for 3 Way Flow Control

	GPM	PSI	LPM	BAR	MODEL	CAVITY	PAGE
	10	3500	38	245	DF-PCR	7/8” – 14 UNF	14
	40	3500	151	245	TR-PCA	1 1/16” – 12 UNF	16
	40	3500	151	245	SL-PCA	1 5/16” – 12 UNF	18
	33	3500	120	245	QC-CP3	Special	20

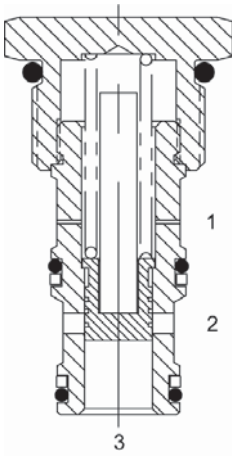
TYPICAL SCHEMATIC

Typical application for the PCR, PCA and CP3 is in a proportional circuit to achieve pressure compensated flow control or as main stage of a ventable relief valve. The pressure compensator is by-pass located and is spring biased to a closed position. The PCA-0V version is commonly used as main stage of a ventable relief valve.





DF-PCR *Pressure Compensating Valve, By-Pass Type for 3 Way Flow Control*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, pressure compensating regulator valve.

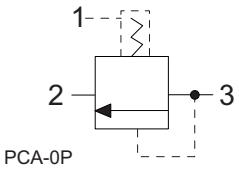
OPERATION

The DF-PCR-0P with an orifice between ports (3) and (1) maintains a constant flow rate from (3) regardless of load pressure changes in the system upstream of (3), or in the by-pass leg at (2) as long as pressure at (2) is less than (1).
The valve’s spool maintains a constant differential pressure across an external orifice, thereby regulating the hydraulic flow rate from (3) to (2). (See options table for pressure ranges).
When used with an orifice as described above, as a priority type regulator, delivering pump flow first to (3), then bypassing excess to (2). All ports may be fully pressurized.

FEATURES

- Hardened parts for long life.
- Industry common cavity.
- Spring range from 3 to 21 bar.

HYDRAULIC SYMBOL

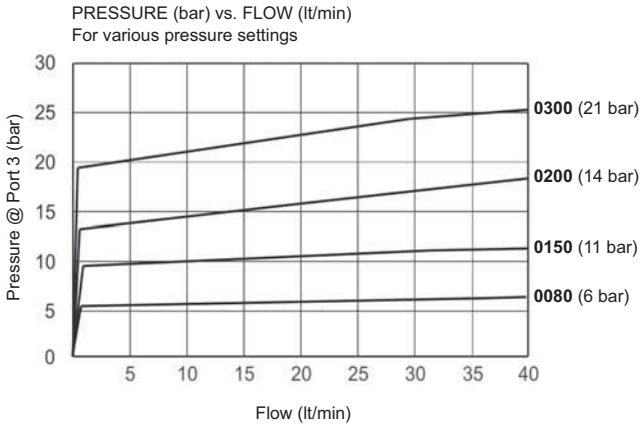


PCA-0P

Pressure compensator for 3 way flow control, typically used with an external orifice between ports (3) and (1). Port (1) should sense upstream pressure of orifice. Can be used as a logic element.

PERFORMANCE

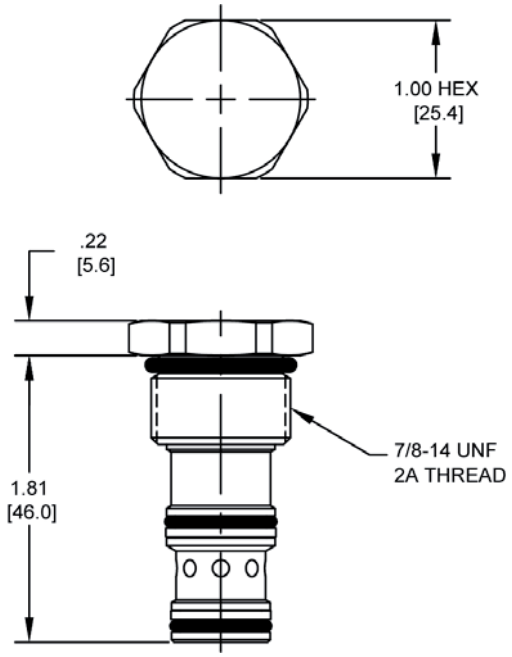
Actual Test Data (Cartridge Only)



VALVE SPECIFICATIONS

Nominal Flow	10 GPM (38 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Typical Internal Leakage (150 SSU)	35 ml/min @ 250 bar
Seat Ratio	Area of Pilot is equal to the area at Port (3)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.19 lbs (.08 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	45 ft-lbs (33 Nm)
Cavity	Delta 3W
Cavity Tools Kit (form tool, reamer, tap)	40500001
Seal Kit	21191206

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

DF-PCR – ____ – ____ – ____

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

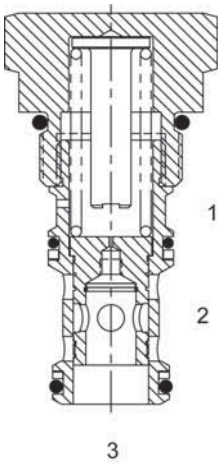
PRESSURE SETTINGS

0040	3 bar (40 PSI)
0080	6 bar (80 PSI)
0150	11 bar (155 PSI)
0200	14 bar (200 PSI)
0300	21 bar (300 PSI)

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#6 SAE Ports

TR-PCA *Pressure Compensating Valve, By-Pass Type for 3 Way Flow Control*



DESCRIPTION

12 size, 1 1/16-12 thread, “Tecnord” series, pressure compensating regulator valve.

OPERATION

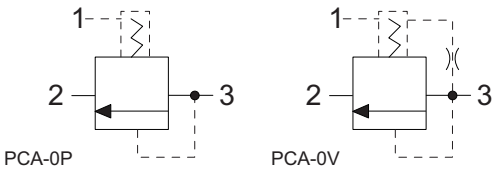
The TR-PCA-0P with an orifice between ports (3) and (1) maintains a constant flow rate from (3) regardless of load pressure changes in the system upstream of (3), or in the by-pass leg at (2) as long as pressure at (2) is less than (1).

The valve’s spool maintains a constant differential pressure across an external orifice, thereby regulating the hydraulic flow rate across this external orifice. (See options table for pressure ranges). When used with an orifice as described above, it functions as a priority type regulator, delivering pump flow first to the external orifice, then bypassing excess to (2). All ports may be fully pressurized. The TR-PCA-0V with a dump valve and a pilot relief valve at (1) acts as main stage of a ventable relief valve.

FEATURES

- Hardened parts for long life.
- Industry common cavity.
- Spring range from 20 to 230 psi.

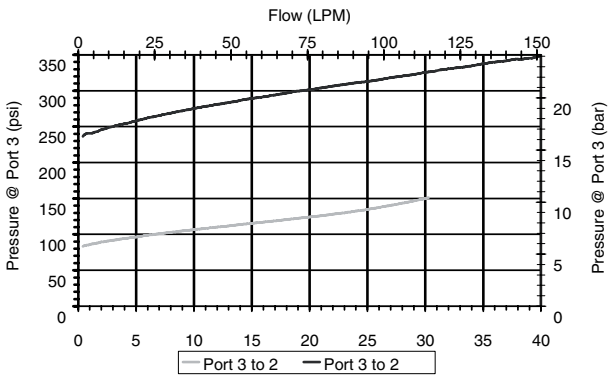
HYDRAULIC SYMBOL



Can be used as a logic element.
***TR-PCA-0P** is commonly used as a by-pass flow regulator (90 and 150 psi recommended).*
***TR-PCA-0V** is commonly used as the main stage of a ventable relief valve (50 and 90 psi recommended).*

PERFORMANCE

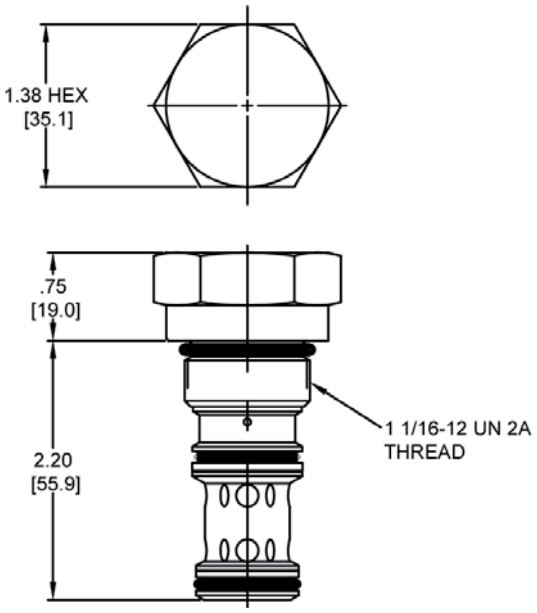
Actual Test Data (Cartridge Only)



VALVE SPECIFICATIONS

Nominal Flow	40 GPM (151 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Seat Ratio	Area of Pilot is equal to the area at Port (3)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.54 lbs (.24 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	70 ft-lbs (95 Nm)
Cavity	Tecnord 3W
Cavity Tools Kit (form tool, reamer, tap)	40500034
Seal Kit	21191306

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

TR-PCA – ____ – ____ – ____

OPTIONS

Buna, Pilot to Close	**0P**
Viton, Pilot to Close	**VP**
Buna, Vent to Open	**0V**
Viton, Vent to Open	**VV**

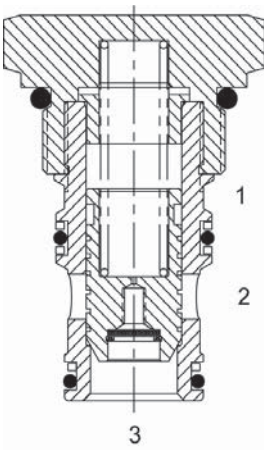
BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#12 SAE Ports

ΔP SETTINGS @ 1 GPM with Pilot Vented

0020	1.4 bar (20 PSI)
0050	3.5 bar (50 PSI)
0090	6.3 bar (90 PSI)
0150	10.5 bar (150 PSI)
0230	16.1 bar (230 PSI)
	±10%

SL-PCA *Pressure Compensating Valve, By-Pass Type for 3 Way Flow Control*



DESCRIPTION

12 size, 1 5/16-12 thread, “Super” series, pressure compensating regulator valve.

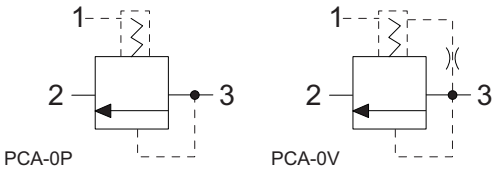
OPERATION

The SL-PCA-0P with an external orifice between ports (3) and (1) maintains a constant flow rate across the external orifice, regardless of load pressure changes in the system upstream of (3), or in the by-pass leg at (2) as long as pressure at (2) is less than (1).
The valve’s spool maintains a constant differential pressure across the external orifice, thereby regulating the hydraulic flow rate across the external orifice. (See options table for pressure ranges).
When used with an orifice as described above, it functions as a priority type regulator, delivering pump flow first to the external orifice, then bypassing excess to (2). All ports may be fully pressurized. The SL-PCA-0V with a dump valve and a pilot relief valve at (1) acts as main stage of a ventable relief valve.

FEATURES

- Hardened parts for long life.
- Industry common cavity.

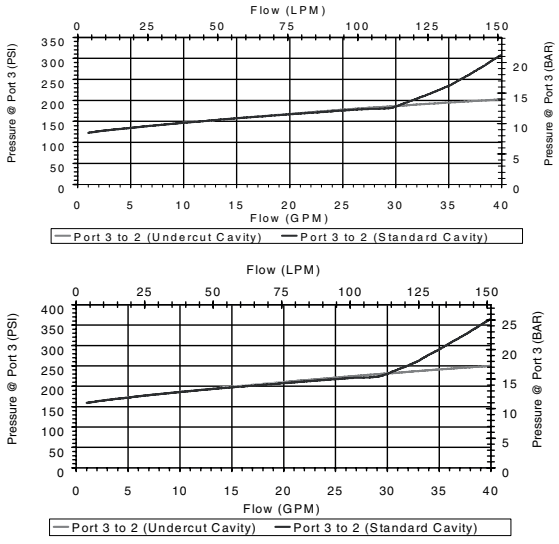
HYDRAULIC SYMBOL



Can be used as a logic element.
SL-PCA-0P *is commonly used as a by-pass flow regulator (100 psi recommended).*
SL-PCA-0V *is commonly used as the main stage of a ventable relief valve (50 and 100 psi recommended).*

PERFORMANCE

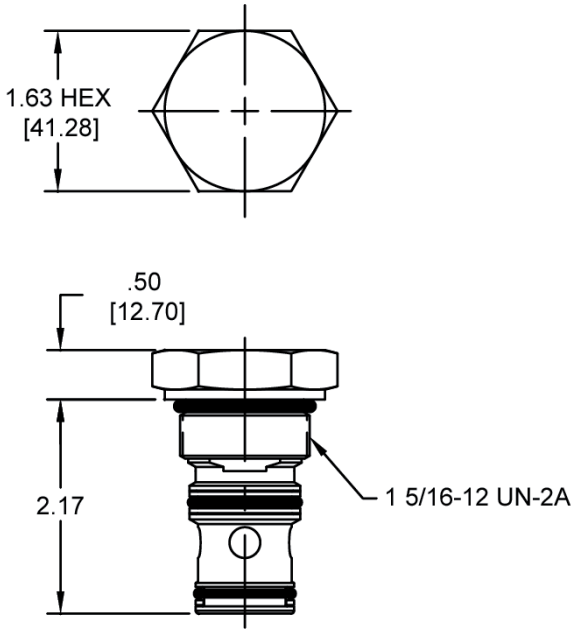
Actual Test Data (Cartridge Only)



VALVE SPECIFICATIONS

Nominal Flow	40 GPM (151 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Seat Ratio	Initially area of Pilot is 1.2 times the area at Port (3), then 1:1
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.70 lbs (.32 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	90 ft-lbs (122 Nm)
Cavity	Super 3W Short
Cavity Tools Kit (form tool, reamer, tap)	40500021
Seal Kit	21191406

DIMENSIONS



(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

SL-PCA – ____ – ____ – ____

OPTIONS

Buna, Pilot to Close	**0P**
Viton, Pilot to Close	**VP**
Buna, Vent to Open	**0V**
Viton, Vent to Open	**VV**
Buna, Pilot to Close with Seals	**0B**
Viton, Pilot to Close with Seals	**VB**
Buna, Vent to Open with Seals	**0C**
Viton, Vent to Open with Seals	**VC**

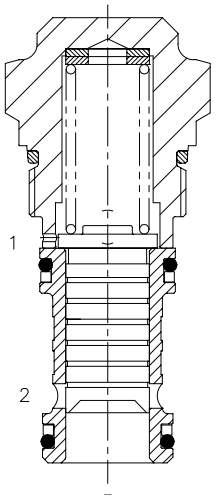
ΔP SETTINGS @ 1 GPM with Pilot Vented

0020	1.4 bar (20 PSI)
0050	3.5 bar (50 PSI)
0100	7 bar (100 PSI)
0150	10.5 bar (150 PSI)
	±20%

BODIES

Blank	Without Body
N	3/4" BSP Ports
S	#12 SAE Ports

QC-CP3 *Pressure Compensating Valve, By-Pass Type for 3 Way Flow Control*



DESCRIPTION

Special cavity, pressure compensating valve, by-pass type, for 3 way flow control, normally closed.

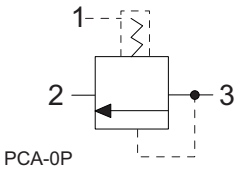
OPERATION

The QC-CP3 with an orifice between ports (3) and (1) maintains a constant flow rate from (3) regardless of load pressure changes in the system upstream of (3), or in the bypass leg at (2) as long as pressure at (2) is less than (1).
The valve's spool maintains a constant differential pressure across an external orifice, thereby regulating the hydraulic flow rate from (3) to (2). (See options table for pressure ranges).
When used with an orifice as described above, as a priority type regulator, delivering pump flow first to (3), then bypassing excess to (2). All ports may be fully pressurized.

FEATURES

- Hardened parts for long life.
- Spring range from 8 to 24 bar.

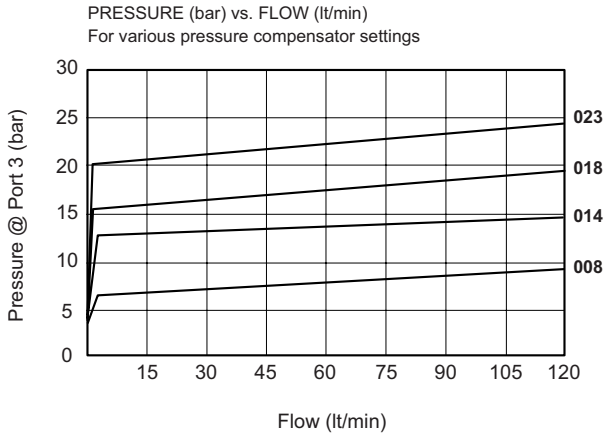
HYDRAULIC SYMBOL



Pressure compensator for 3 way flow control, typically used with an external orifice between ports (3) and (1).
Port (1) should sense upstream pressure of orifice.

PERFORMANCE

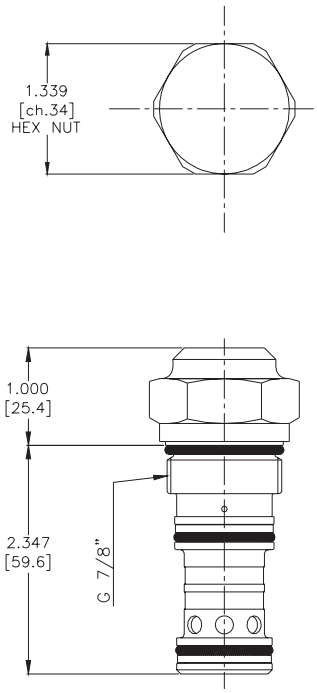
Actual Test Data (Cartridge Only)

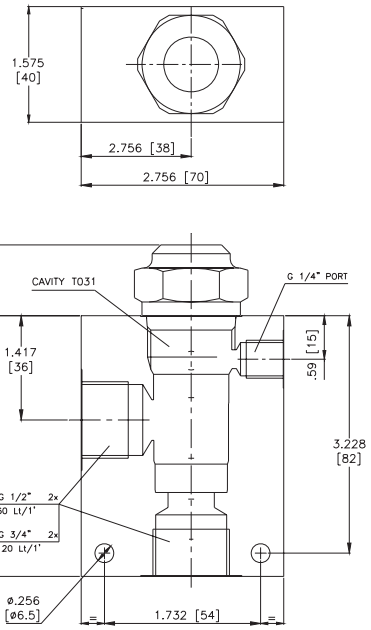


VALVE SPECIFICATIONS

Nominal Flow	33 GPM (120 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Typical Internal Leakage (150 SSU)	35 ml/min @ 250 bar
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.35 lbs (.16 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	52 ft-lbs (70 Nm)
Cavity	T031
Cavity Tools Kit (form tool, reamer, tap)	K-T031
Seal Kit	210902321

DIMENSIONS





ORDERING INFORMATION

QC-CP3 – – –

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

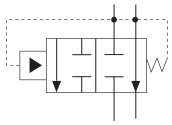
BODIES

Blank	Without Body
N	1/2" BSP Ports
S	#8 SAE

PRESSURE SETTING

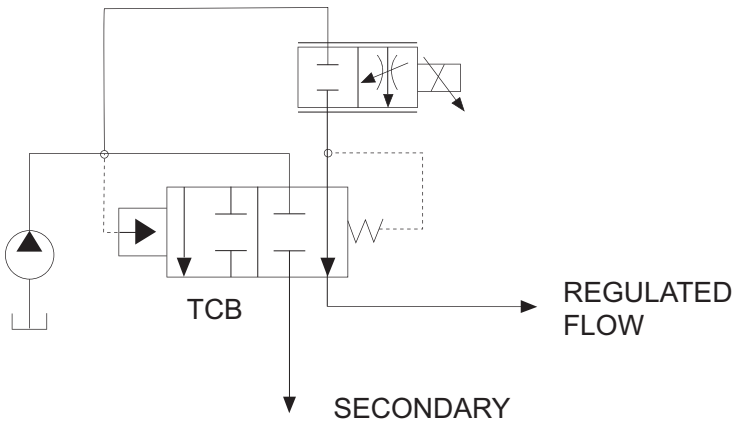
008	8 bar (115 PSI) @ 60 l/min
014	14 bar (200 PSI) @ 60 l/min
018	18 bar (260 PSI) @ 60 l/min
023	23 bar (330 PSI) @ 60 l/min

4 Way Priority Type Compensator with By-Pass Line

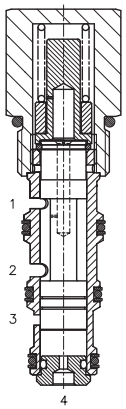
	GPM	PSI	LPM	BAR	MODEL	CAVITY	PAGE
	10	3500	38	245	DG-TCB	7/8” – 14 UNF	24

TYPICAL SCHEMATIC

Typical application for the TCB is in a proportional circuit to achieve pressure compensated flow control. The pressure compensator is located downstream of the proportional valve to achieve a pressure compensated flow control on the priority line, opening a secondary by-pass line, when the differential pressure becomes too high, for all flow in excess of that demanded the control orifice.



DG-TCB *Pressure Compensating Valve, Restrictive Type with By-Pass*



DESCRIPTION

10 size, 7/8-14 thread, “Delta” series, pressure compensating valve, restrictive type with by-pass.

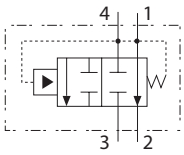
OPERATION

The DG-TCB allows pressure compensated or proportional flow from (1) to (2) regulated by the pressure differential across (1) and (4) with a by-pass of (4) to (3).
The spring chamber is constantly connected at (1).

FEATURES

- Hardened parts for longer life.
- Industry common cavity.

HYDRAULIC SYMBOL

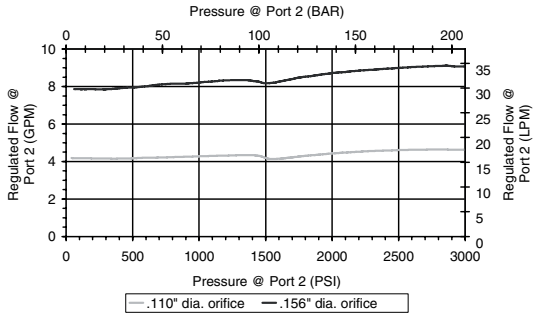


By-pass line (3) can be pressurized.

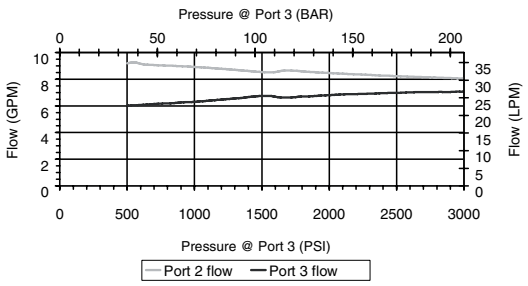
PERFORMANCE

Actual Test Data (Cartridge Only with 150 psi spring)

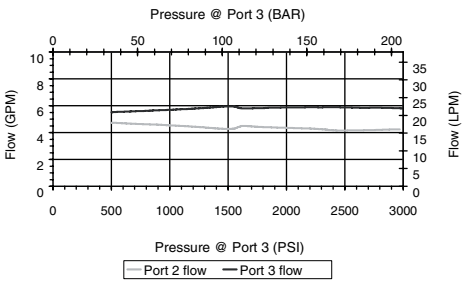
10 gpm supply flow, .110" orifice, 150 psi spring - 15 gpm supply flow, .156" orifice, 150 psi spring -1500 psi load on port 3



priority port 2 load: 1500 - 1700 psi, .156" dia orifice, 15 gpm supply
not intended for differential pressure > 1500 psi port 4 to port 3



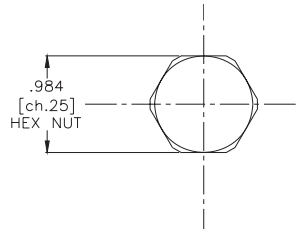
priority port 2 load: 1500 - 1700 psi, .110" dia orifice, 10 gpm supply
not intended for differential pressure > 1500 psi port 4 to port 3

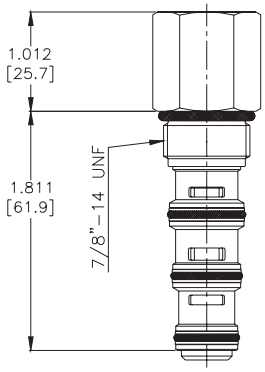


VALVE SPECIFICATIONS

Nominal Flow	10 GPM (38 LPM)
Rated Operating Pressure	3500 PSI (245 bar)
Typical Internal Leakage (150 SSU)	5 cu in/min (82 ml/min) per path
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temp. Range	-40° to 250°F (-40° to 120°C)
Weight	.38 lbs (.17 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	30 ft-lbs (40.6 Nm)
Cavity	Delta 4W
Cavity Tools Kit (form tool, reamer, tap)	40500002
Seal Kit	21191214

DIMENSIONS





(for bodies style and sizes see section "Accessories")

ORDERING INFORMATION

DG-TCB – ____ – ____ – ____

OPTIONS

Buna Standard	**00**
Viton Standard	**V0**

PRESSURE SETTINGS

014	10.5 bar (150 PSI)
020	20 bar (285 PSI)
032	32 bar (460 PSI)

Differential Pressure Across
External Controlling Orifice

BODIES

Blank	Without Body
N	3/8" BSP Ports
S	#6 SAE Ports

Index chapter 5

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TECNORD
a Delta Power Company

REFERENCE TABLE

Description		Tecnord P/N	Power Supply Range	Digital Inputs	Optoisolated Digital Inputs	Analog Inputs	Total Number of Inputs	Signal Digital Outputs	Low Side Power Outputs	High Side Power Outputs	Analog Outputs	PWM Outputs	Total Number of Outputs	RS232 (interface needed)	RS485	CANbus Interface	Connection for Display	Setting by Switches	Setting by Console	Setting by PC	Setting by Trimmers
PWM DRIVERS																					
PWM card 1 coil, 1 channel		EC-PWM-A1-MPC1-*	8.5-30 V			1	**1**					1	**1**					☺			
PWM card 2 coils, 1 channel		EC-PWM-A2-MPC1-*	8-32 V			1	**1**			1 (max 3.5 A)		2 (NOT simultaneous)	**3**								☺
PWM card 4 coils, 2 channels		EC-PWM-P4-MPC2-H	9-30 V			8	**8**			1 (max 5 A)		4 (max 2 simultaneous)	**5**	☺	☺					☺	
PWM card 8 coils, 4 channels (factory preset)		EC-PWM-08-MPC4-H	9-30 V	2		6	**8**					8 (max 4 simultaneous)	**8**								
PWM card 8 coils, 4 channels (programmable)		EC-PWM-P8-MPC4-H	9-30 V		2 (PNP, optional)	8	**8-10**			4 (optional, max 5 A)		8 (max 4 simultaneous)	**8-12**	☺	☺					☺	
MACHINE MANAGEMENT SYSTEMS																					
MMS 10 inputs, 12 outputs		EC-MMS-1012-H	9-30 V	2		8	**10**			11 (max 3.5 A)		1	**12**	☺	☺					☺	
MMS 5 inputs, 16 outputs		EC-MMS-0516-H	8.5-30 V	4 (2 if 16 output are used)		1	**3-5**			16 (max 3.5 A) (13 if 4 dig. inputs and 1 PWM are used)		1	**16**		☺		☺	☺			
MMS 20 inputs, 20 outputs		EC-MMS-2020-H	8.5-30 V	10 (12 if RS485 not used)		8	**18-20**			14 (max 3.5 A)	6 (0-5 V)		**20**	☺	☺				☺	☺	
MMS 48 inputs, 20 outputs (coding card)		EC-MMS-4820-H	8.5-40 V	32		16	**48**	16 (max 700 mA)		4 (max 3.5 A) (3 if PWM is used)		1 (1.5 A max)	**20**		☺	☺				☺	
MMS 62 inputs, 52 outputs (main unit)		EC-MMS-6252-H	8.5-40 V	40		16 (0-5 V) 6 (0-20 mA)	**62**	10 (max 700 mA)		8 (max 5 A) (4 if PWM is used) 28 (max 3.5 A)	6 (0-5 V)	4 (2 A max)	**52**	☺	☺	☺				☺	
MMS 15 inputs, 21 outputs (main unit)		EC-MMS-1521-H	8-32 V	4 (8 if 4 pow. outs not used)		11	**15-19**		2	18 (max 3.5 A) (6 if PWM is used)	1 (0-5 V)	12 (3 A max)	**21**			☺				☺	

WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

PWM Driver

EC-PWM-A1-MPC1-P *PWM Driver*

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a single proportional solenoid valve.

OPERATION

The EC-PWM-A1-MPC1-P proportional valve driver receives a command signal from a potentiometer, PLC or other control systems, and supplies a solenoid with a PWM *(Pulse Width Modulated)* current proportional to the input signal. An auxiliary power supply (+5 V) is provided as a reference for the command signal.

Adjustments of “Imin/Imax”, “Ramp time”, “Deadband” and “Dither” can be carried out directly from a key-pad integrated on the front panel.

Mounting option: panel-mounting style with INPUT/OUTPUT multi-core sheated cable.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Power supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and power supply.
- Output is protected against short circuits, over-current and over-temperature.
- The EC-PWM-A1-MPC1 is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

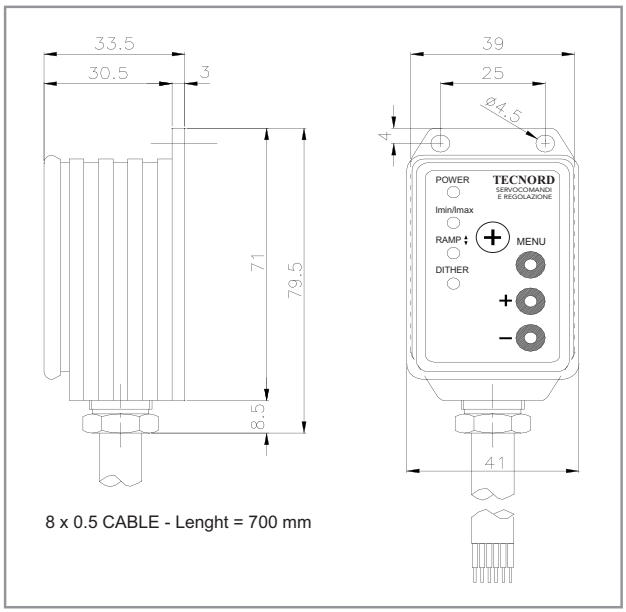
SPECIFICATIONS

• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	50 kΩ
• Analog input signals available:	0 ÷ 5 V 0 ÷ 10 V 0 ÷ 20 mA
• Typical ctrl pot resistance:	2 ÷ 47 kΩ
• Current output range (PWM):	100 ÷ 3000 mA
• PWM dither frequency:	55 ÷ 200 Hz (adjustable)
• Ramp time:	0.05 ÷ 5 s (adjustable)
• Max. current from auxiliary +5 V:	15 mA

APPLICATIONS

- Primary applications are the control of proportional pressure reducing valves and proportional flow regulators to attain smooth acceleration/deceleration and fine-metering control of electro-hydraulic functions.

DIMENSIONS



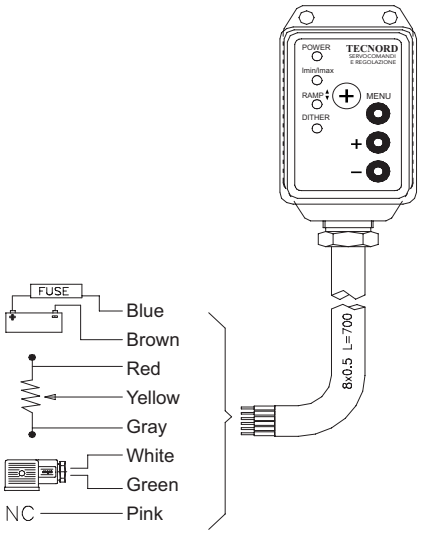
EC-PWM-A1-MPC1-P *PWM Driver*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Wiring Colours

Blue	+Battery
Brown	-Battery (GND)
Red	Command signal supply (+5 V)
Yellow	Command signal in
Gray	Command signal GND
White	Proportional coil output
Green	Proportional coil current feedback line
Pink	Spare / Not used

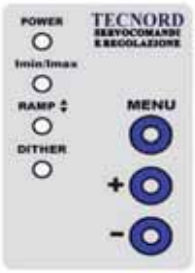
Note
A 5A fuse must be inserted on the BLUE wire connecting the PWM driver to the power source.



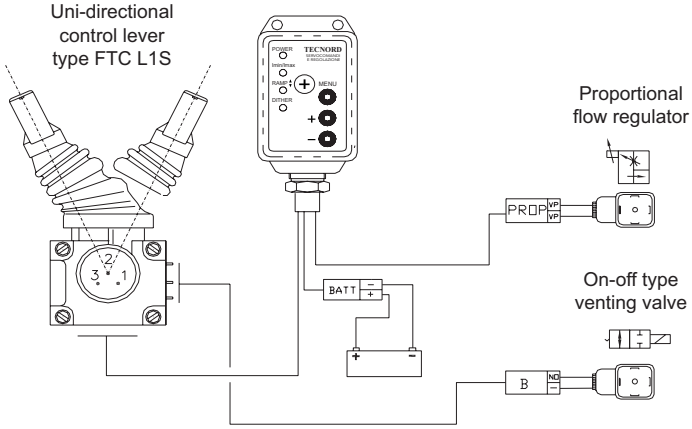
ADJUSTMENTS

The following adjustments can be made directly from the front key-pad by selecting the 3-pushpins in various combinations:

- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**



APPLICATION EXAMPLE



Remote operation of a proportional flow control valve from single axis/unidirectional control lever incorporating a rotary potentiometer and a center/power-off switch for the energization of an auxiliary solenoid-operated dump valve.

ORDERING INFORMATION

*EC-PWM-**A1**-MPC1-**P***

A = Adjustable

P = Panel mounting

Part numbers	*Version*
23.0409.045	0-5 V
23.0409.087	0-10 V
23.0409.136	0-20 mA

EC-PWM-A1-MPC1-D *PWM Driver*

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a single proportional solenoid valve.

OPERATION

The EC-PWM-A1-MPC1-D proportional valve driver receives a command signal from a potentiometer, PLC or other control systems, and supplies a solenoid with a PWM *(Pulse Width Modulated)* current proportional to the input signal.
An auxiliary power supply (+5 V) is provided as a reference for the command signal.
Adjustments of “Imin/Imax”, “Ramp time”, “Deadband” and “Dither” can be carried out directly from a key-pad integrated on the front panel.

Mounting option: female DIN 43650 socket on valve’s side and sheated exit cable to connect to power source and remote control devices.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Power supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and power supply.
- Output is protected against short circuits, over-current and over-temperature.
- The EC-PWM-A1-MPC1 is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

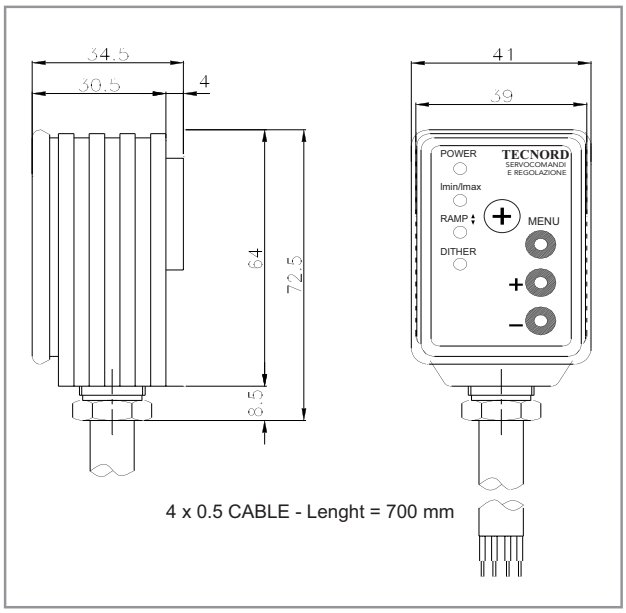
SPECIFICATIONS

• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	50 kΩ
• Analog input signals available:	0 ÷ 5 V 0 ÷ 10 V 0 ÷ 20 mA
• Typical ctrl pot resistance:	2 ÷ 47 kΩ
• Current output range (PWM):	100 ÷ 3000 mA
• PWM dither frequency:	55 ÷ 200 Hz (adjustable)
• Ramp time:	0.05 ÷ 5 s (adjustable)
• Max. current from auxiliary +5 V:	15 mA

APPLICATIONS

- Primary applications are the control of proportional pressure reducing valves and proportional flow regulators to attain smooth acceleration/deceleration and fine-metering control of electro-hydraulic functions.

DIMENSIONS



EC-PWM-A1-MPC1-D *PWM Driver*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Power supply wiring colours

Blue (+) Positive from power source
Yellow/Green (-) Negative from (GND)

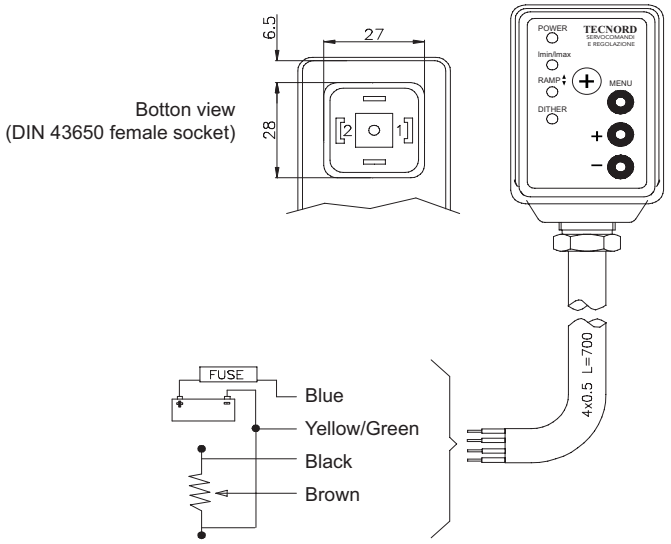
Remote potentiometer wiring colours

Black Command signal supply (+5 V)
Brown Command signal in

Proportional valve connector pins

1 Proportional coil output
2 Proportional coil current feedback line

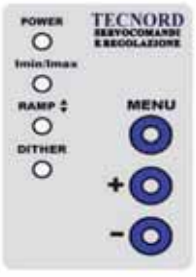
Note
A 5A fuse must be inserted on the BLUE wire connecting the PWM driver to the power source.



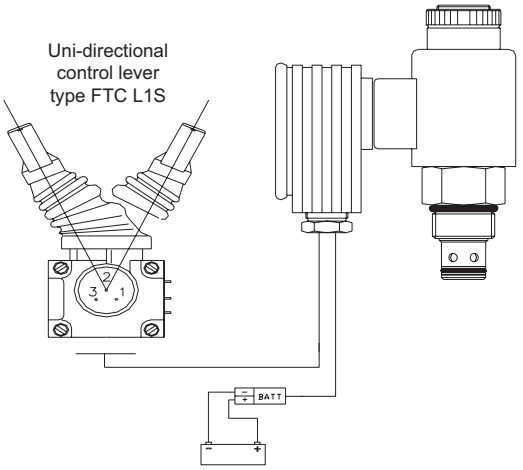
ADJUSTMENTS

The following adjustments can be made directly from the front key-pad by selecting the 3-pushpins in various combinations:

- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**



APPLICATION EXAMPLE



Remote operation of a proportional flow control valve from single axis/unidirectional control lever incorporating a rotary potentiometer and a center/power-off switch.

ORDERING INFORMATION

*EC-PWM-**A1**-MPC1-**D***

A = Adjustable
P = DIN 43650 socket connector

Part numbers	*Version*
23.0409.046	0-5 V
23.0409.065	0-10 V
23.0409.077	0-20 mA

EC-PWM-A1-MPC1-E *PWM Driver*

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a single proportional solenoid valve.

OPERATION

The EC-PWM-A1-MPC1-E proportional valve driver receives a command signal from a potentiometer, PLC or other control systems, and supplies a solenoid with a PWM *(Pulse Width Modulated)* current proportional to the input signal. An auxiliary power supply (+5 V) is provided as a reference for the command signal.
Adjustments of “Imin/Imax”, “Ramp time”, “Deadband” and “Dither” can be carried out directly from a key-pad integrated on the front panel.

Mounting option: female DIN 43650 socket on valve’s side and male DIN 43650 plug to connect to power source and remote control devices.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Power supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and power supply.
- Output is protected against short circuits, over-current and over-temperature.
- The EC-PWM-A1-MPC1 is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

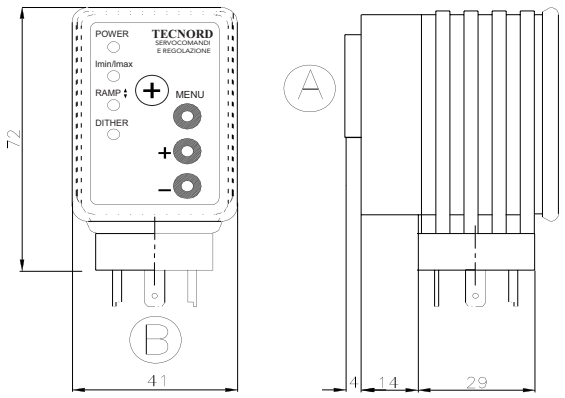
SPECIFICATIONS

• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	50 kΩ
• Analog input signals available:	0 ÷ 5 V 0 ÷ 10 V 0 ÷ 20 mA
• Typical ctrl pot resistance:	2 ÷ 47 kΩ
• Current output range (PWM):	100 ÷ 3000 mA
• PWM dither frequency:	55 ÷ 200 Hz (adjustable)
• Ramp time:	0.05 ÷ 5 s (adjustable)
• Max. current from auxiliary +5 V:	15 mA

APPLICATIONS

- Primary applications are the control of proportional pressure reducing valves and proportional flow regulators to attain smooth acceleration/deceleration and fine-metering control of electro-hydraulic functions.

DIMENSIONS

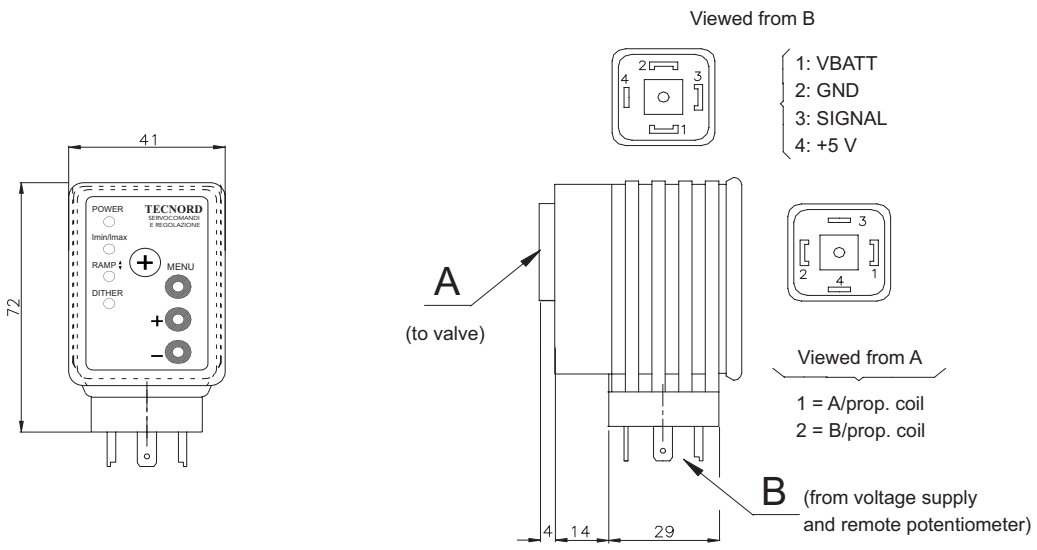


A socket connector type DIN 43650 (to proportional valve)

B plug connector type DIN 43650
(from voltage supply and remote potentiometer)

EC-PWM-A1-MPC1-E *PWM Driver*

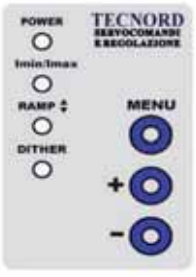
CIRCUIT BOARD PINOUT - WIRING DIAGRAM



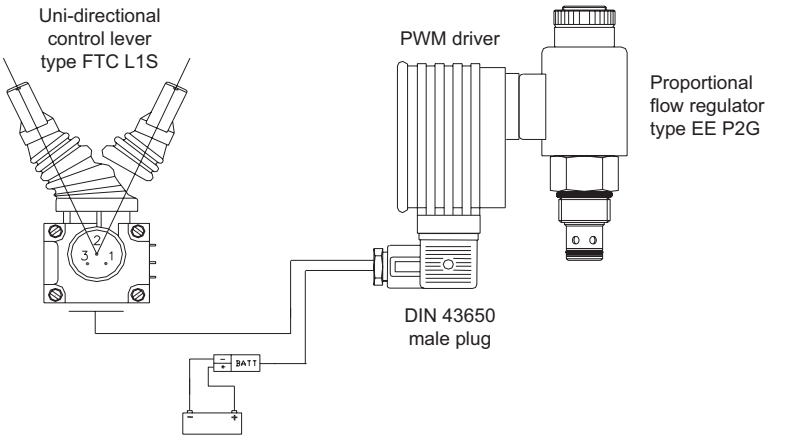
ADJUSTMENTS

The following adjustments can be made directly from the front key-pad by selecting the 3-pushpins in various combinations:

- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**



APPLICATION EXAMPLE



Remote operation of a proportional flow control valve from single axis/unidirectional control lever incorporating a rotary potentiometer.

ORDERING INFORMATION

*EC-PWM-**A1**-MPC1-**E***

A = Adjustable

E = DIN 43650 plug connector

Part numbers	*Version*
23.0409.089	0-5 V
23.0409.047	0-10 V
23.0409.137	0-20 mA

*EC-PWM-A2-MPC1-** *PWM Driver*

DESCRIPTION

Microprocessor-based PWM electronic driver for remote control of a dual-coil proportional solenoid valve.

OPERATION

The EC-PWM-A2-MPC1 proportional valve driver supplies a double solenoid with a PWM *(Pulse Width Modulated)* current proportional to the input signal from a potentiometer, PLC or other control systems.
Proportional valve A is controlled with an input command signal varying from 2.5 to 4.5 Volt.
Proportional valve B is controlled with an input command signal varying from 2.5 to 0.5 Volt. An auxiliary on-off type solenoid can be energised anytime the input signal goes out of the 2.25-2.75 V range.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity.
- Input is protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-A2 circuit is potted inside a plastic enclosure suitable for panel mounting by means of 2 set screws.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

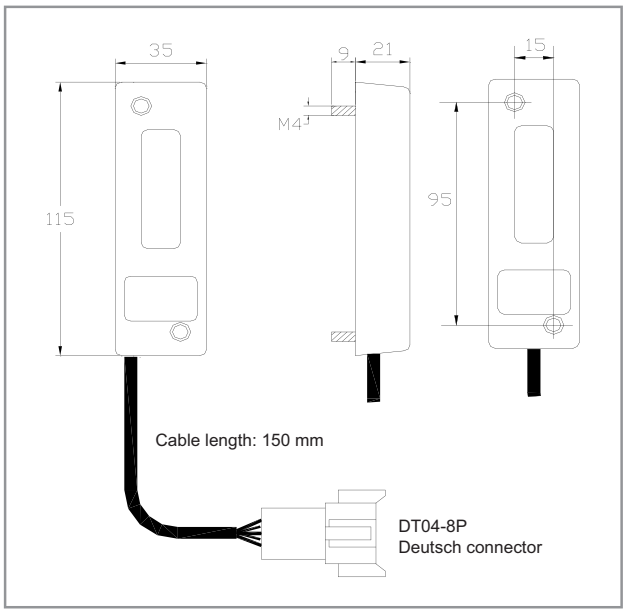
SPECIFICATIONS

• Operating voltage:	8 ÷ 32 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 68
• Input impedance:	40 kΩ
• Analog input signals:	0.5 - 2.5 - 4.5 vdc
• Typical ctrl pot resistance:	2 ÷ 10 kΩ
• Current output range (PWM):	100 ÷ 1500 mA
• Current on-off output:	max 1800 mA
• PWM dither frequency:	100 Hz
• Resolution:	10 bits
• DT04-8P Deutsch connector (male contacts)	

APPLICATIONS

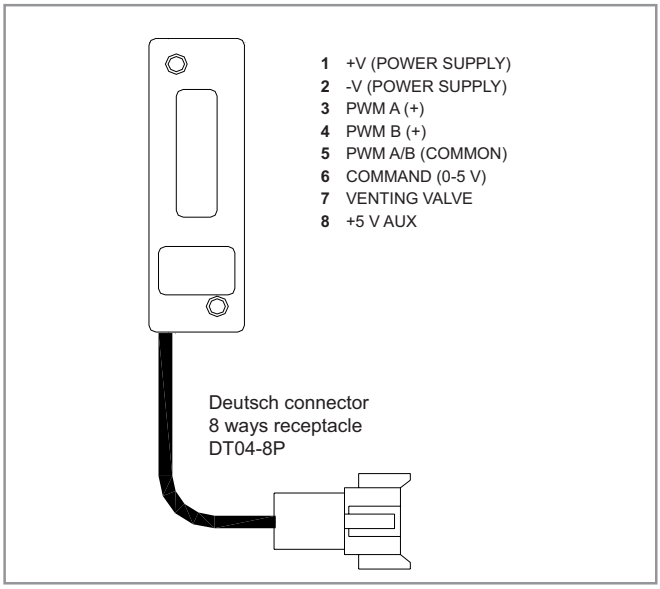
- 12 vdc and 24 vdc systems.
- Remote control of proportional valves.
- Field-adjustable applications.
- Control of a proportional bi-directional valve with a venting valve.

DIMENSIONS

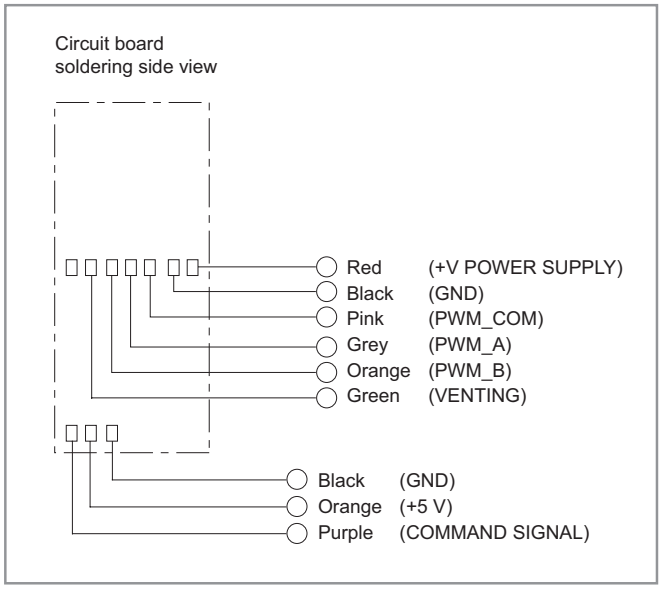


*EC-PWM-A2-MPC1-** *PWM Driver*

H VERSION - PINOUT



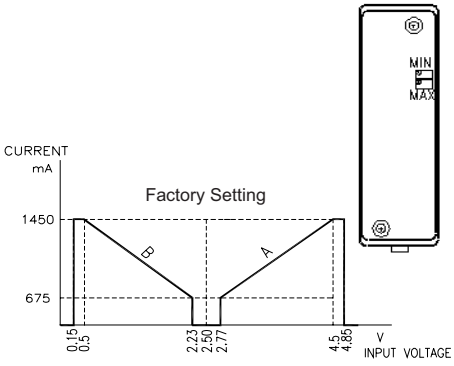
C VERSION - WIRING DIAGRAM



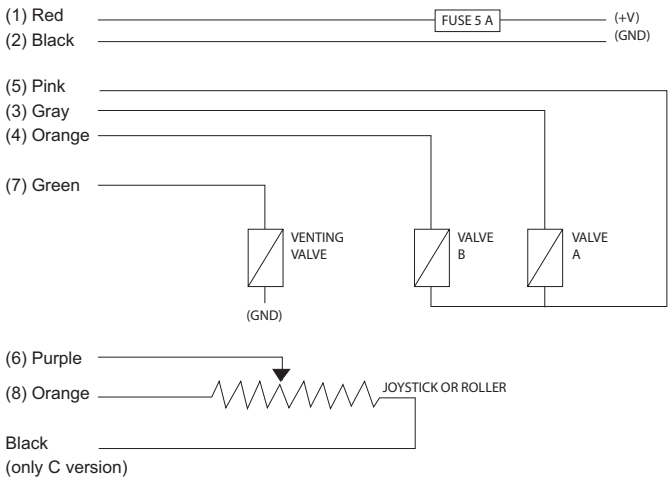
ADJUSTMENTS

Two rotary trimmers are located on the rear potted surface to provide the following field adjustments:

- **Imin (minimum output current)**
- **Imax (maximum output current)**



APPLICATION EXAMPLE



Proportional control of a dual coil valve from a bi-directional lever, joystick or roller.

ORDERING INFORMATION

*EC-PWM-**A2**-MPC1-**

A = trimmer Adjustable version

H = potted plastic Housing

C = Circuit board only

Part numbers	*Version*
23.0409.138	H
23.0409.109	C

WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-PWM-P4-MPC2-H *PWM Driver*

DESCRIPTION

Microprocessor-based PWM driver for remote control of 2 dual-coil proportional solenoid valves.

OPERATION

The EC-PWM-P4-MPC2-H proportional valve driver supplies up to two dual-coil proportional valves with PWM *(Pulse Width Modulated)* current proportional to input signals coming from potentiometers, PLC or other control systems.
The control characteristics (Imin/Imax, ramps, deadbands, dither) are configurable via PC connected with a RS232 serial line to a configuration kit and PC interface of Tecnord supply.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-P4-MPC2-H is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

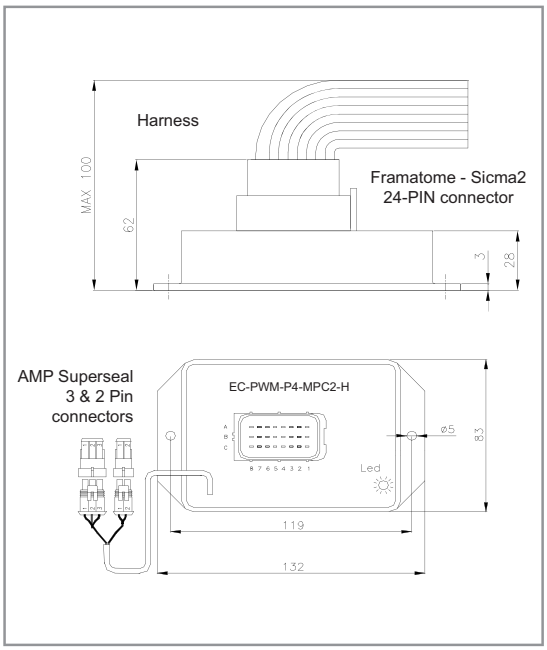
SPECIFICATIONS

• Operating voltage:	9 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	100 kΩ
• Analog inputs:	4 x 0-5 V
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	analog inputs can be used as digital
• Resolution:	10 bit
• PWM outputs channels:	2 x dual-coil proportional valves
• Current output range (PWM):	100 ÷ 1500 mA (3 A version available)
• PWM dither frequency:	75 ÷ 250 Hz (adjustable)
• On-off digital output:	1 (1500 mA)

APPLICATIONS

- Specifically designed for applications requiring accurate adjustments and calibrations.
- 12 vdc and 24 vdc systems.
- Remote control of non-feedback proportional valves.
- Control of a proportional bi-directional valve with a venting valve.

DIMENSIONS

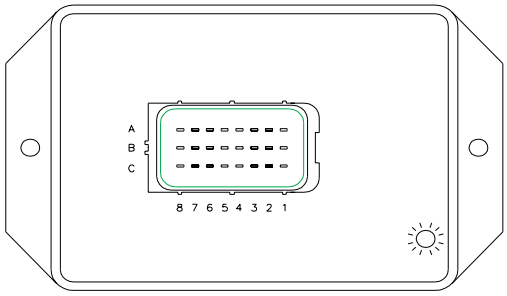


WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

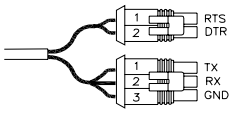
EC-PWM-P4-MPC2-H *PWM Driver*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2



Connector type: AMP-Seal



For software download
1 RTS
2 DTR

For calibration and adjustments
1 TX
2 RX
3 GND

A

1	ON-OFF OUTPUT
2	NOT CONNECTED
3	NOT CONNECTED
4	NOT CONNECTED
5	NOT CONNECTED
6	NOT CONNECTED
7	ANALOG INPUT FOR FUNCTION 1 (TO DRIVE EV1A/B)
8	FEEDBACK FOR EV1A/B

B

1	+V (POWER SUPPLY)
2	NOT CONNECTED
3	NOT CONNECTED
4	ANALOG INPUT FOR FUNCTION 2 (TO DRIVE EV2A/B)
5	NOT CONNECTED
6	FEEDBACK FOR EV2A/B
7	NOT CONNECTED
8	NOT CONNECTED

C

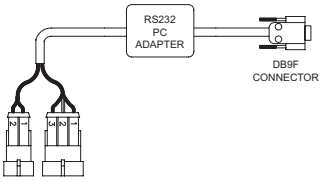
1	-V (POWER SUPPLY - GND)
2	+5 VDC EXTERNAL SUPPLY VOLTAGE
3	ANALOG INPUT - SPARE
4	ANALOG INPUT - SPARE
5	EV1A PROP. COIL OUTPUT (+)
6	EV1B PROP. COIL OUTPUT (+)
7	EV2A PROP. COIL OUTPUT (+)
8	EV2B PROP. COIL OUTPUT (+)

ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

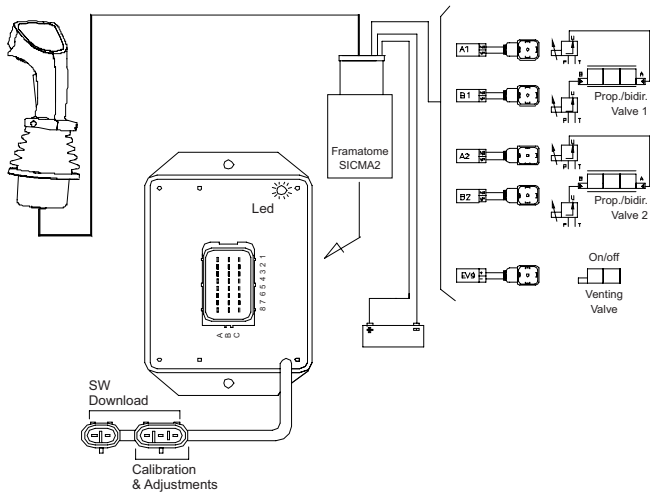
- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**

Ordering information for the configuration kit:
20.1001.026 RS232 interface card including PC configuration software tool on CD.



USB / RS232 interface available on request.

APPLICATION EXAMPLE



Proportional regulation of 2 dual-coil valves with 1 bi-directional joystick.

ORDERING INFORMATION

*EC-PWM-**P4**-MPC2-**H***

P = Programmable

H = potted plastic Housing

Part numbers	*Version*
23.0409.237	1.5 A
23.0409.238	3 A

EC-PWM-08-MPC4-H *PWM Driver*

DESCRIPTION

Microprocessor-based PWM driver for remote control of 4 dual-coil proportional solenoid valves.

OPERATION

The EC-PWM-08-MPC4 proportional valve driver supplies up to four dual-coil proportional solenoid valves with PWM *(Pulse Width Modulated)* current proportional to the input signals coming from potentiometers, PLC or other control systems.
PWM currents are factory pre-set and cannot be adjusted.

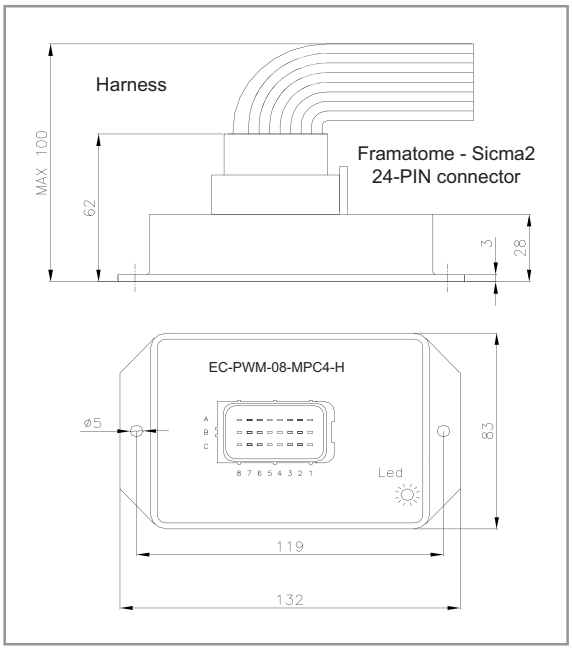
FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-08-MPC4-H is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

SPECIFICATIONS

• Operating voltage:	9 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-40°C / +100°C
• Degree of protection:	IP 67
• Input impedance:	100 kΩ
• Analog inputs:	6 x 0-5 V
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	2 x PNP (Active High)
• Resolution:	10 bit
• PWM outputs channels:	4 x dual-coil proportional valves
• Current output range (PWM):	100 ÷ 1500 mA
• PWM dither frequency:	75 ÷ 250 Hz (factory pre-set, standard 100 Hz)

DIMENSIONS



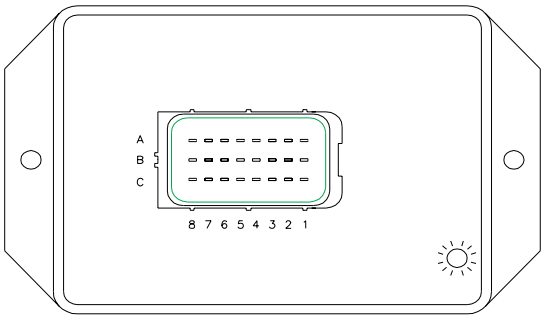
APPLICATIONS

- Specifically designed for applications with factory-set working parameters and requiring no field-adjustments.
- 12 vdc and 24 vdc systems.
- Remote control of proportional valves.
- Control of a 4 functions proportional bi-directional system.

EC-PWM-08-MPC4-H *PWM Driver*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2



A		B		C	
1	EV4A PROP. COIL OUTPUT FEEDBACK (-)	**1**	+V (POWER SUPPLY)	**1**	-V (POWER SUPPLY - GND)
2	EV4B PROP. COIL OUTPUT FEEDBACK (-)	**2**	ANALOG INPUT - SPARE	**2**	+5 VDC EXTERNAL SUPPLY VOLTAGE
3	EV3A PROP. COIL OUTPUT FEEDBACK (-)	**3**	ANALOG INPUT - SPARE	**3**	DIGITAL INPUT - SPARE
4	EV3B PROP. COIL OUTPUT FEEDBACK (-)	**4**	ANALOG INPUT FOR FUNCTION 2 (TO DRIVE EV2A/B)	**4**	DIGITAL INPUT - SPARE
5	ANALOG INPUT FOR FUNCTION 4 (TO DRIVE EV4A/B)	**5**	ANALOG INPUT - SPARE	**5**	EV1A PROP. COIL OUTPUT FEEDBACK (-)
6	ANALOG INPUT FOR FUNCTION 3 (TO DRIVE EV3A/B)	**6**	COMMON COMMAND FOR FOR EV2A/B (+)	**6**	EV1B PROP. COIL OUTPUT FEEDBACK (-)
7	ANALOG INPUT FOR FUNCTION 1 (TO DRIVE EV1A/B)	**7**	COMMON COMMAND FOR EV4A/B (+)	**7**	EV2A PROP. COIL OUTPUT FEEDBACK (-)
8	COMMON COMMAND FOR EV1A/B (+)	**8**	COMMON COMMAND FOR EV3A/B (+)	**8**	EV2B PROP. COIL OUTPUT FEEDBACK (-)

ADJUSTMENTS

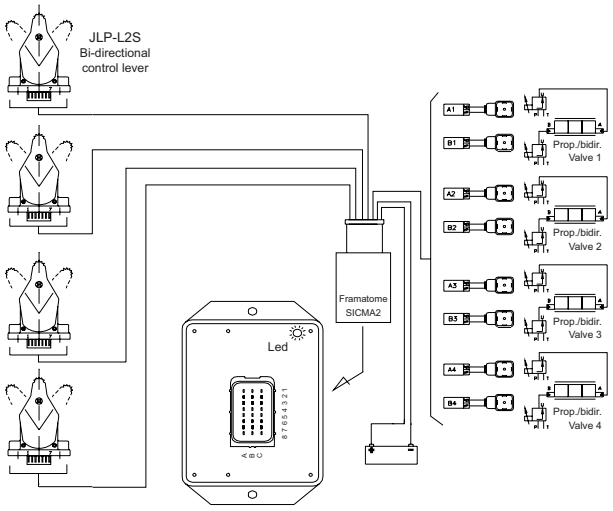
Factory pre-set for:

- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**

Factory pre-set values for the standard version p/n 23.0409.170:

- **Imin = 100 mA**
- **Imax = 1500 mA**
- **Ramp-up/-down time = 0 sec**
- **Dither frequency = 100 Hz**

APPLICATION EXAMPLE



Proportional regulation of 4 dual-coil valves with 4 bi-directional control levers.

ORDERING INFORMATION

*EC-PWM-**08**-MPC4-**H***

0 = factory pre-set

H = potted plastic Housing

Part numbers	*Version*
23.0409.170	1.5 A

EC-PWM-P8-MPC4-H *PWM Driver*

DESCRIPTION

Microprocessor-based PWM driver for remote control of 4 dual-coil proportional solenoid valves.

OPERATION

The EC-PWM-P8-MPC4 proportional valve driver supplies up to four dual-coil proportional solenoid valves with PWM (*Pulse Width Modulated)* current proportional to the input signals coming from potentiometers, PLC or other control systems. The control characteristics (Imin/Imax, ramps, deadbands, dither) are configurable via PC connected with a RS232 serial line to a configuration kit and PC interface of Tecnord supply.

FEATURES

- The current in the solenoid is independent from any change in the coil resistance or in the supply voltage.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- The EC-PWM-P8-MPC4-H is completely potted.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

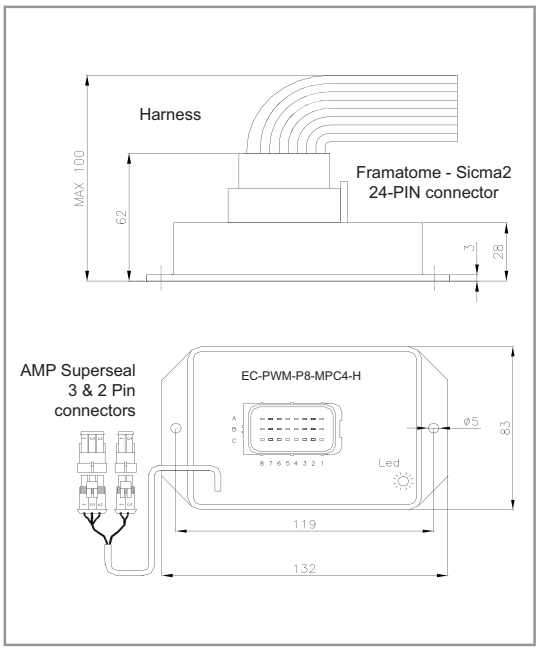
SPECIFICATIONS

• Operating voltage:	9 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	100 kΩ
• Analog inputs:	8 x 0-5 V
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	analog inputs can be used as digital
• Resolution:	10 bit
• PWM outputs channels:	4 x dual-coil proportional valves
• Current output range (PWM):	100 ÷ 1500 mA (3 A version available)
• PWM dither frequency:	75 ÷ 250 Hz (adjustable)

APPLICATIONS

- Specifically designed for applications requiring accurate adjustments and calibrations.
- 12 vdc and 24 vdc systems.
- Remote control of non-feedback proportional valves.
- Control of a proportional bi-directional valve with a venting valve.

DIMENSIONS

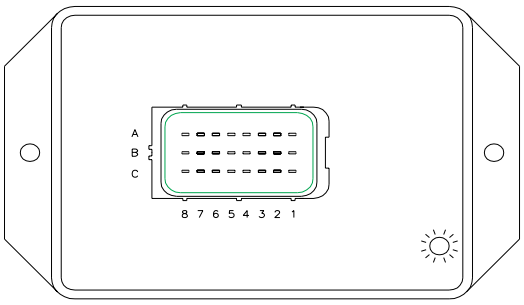


WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

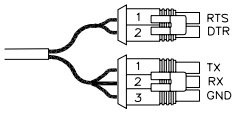
EC-PWM-P8-MPC4-H *PWM Driver*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2



Connector type: AMP-Seal



For software download
1 RTS
2 DTR

For calibration and adjustments
1 TX
2 RX
3 GND

A
1 EV4A PROP. COIL OUTPUT (+)
2 EV4B PROP. COIL OUTPUT (+)
3 EV3A PROP. COIL OUTPUT (+)
4 EV3B PROP. COIL OUTPUT (+)
5 ANALOG INPUT FOR FUNCTION 4 (TO DRIVE EV4A/B)
6 ANALOG INPUT FOR FUNCTION 3 (TO DRIVE EV3A/B)
7 ANALOG INPUT FOR FUNCTION 1 (TO DRIVE EV1A/B)
8 FEEDBACK FOR EV1A/B

B
1 +V (POWER SUPPLY)
2 NOT CONNECTED
3 ANALOG INPUT - SPARE
4 ANALOG INPUT FOR FUNCTION 2 (TO DRIVE EV2A/B)
5 ANALOG INPUT - SPARE
6 FEEDBACK FOR EV2A/B
7 FEEDBACK FOR EV4A/B
8 FEEDBACK FOR EV3A/B

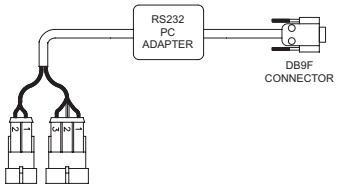
C
1 -V (POWER SUPPLY - GND)
2 +5 VDC EXTERNAL SUPPLY VOLTAGE
3 ANALOG INPUT - SPARE
4 ANALOG INPUT - SPARE
5 EV1A PROP. COIL OUTPUT (+)
6 EV1B PROP. COIL OUTPUT (+)
7 EV2A PROP. COIL OUTPUT (+)
8 EV2B PROP. COIL OUTPUT (+)

ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

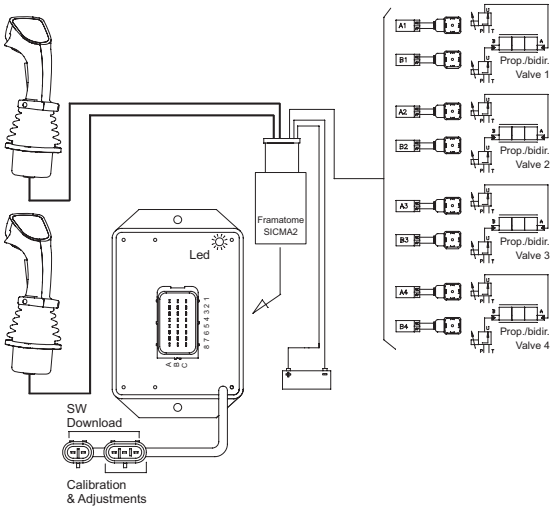
- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**

Ordering information for the configuration kit:
20.1001.026 RS232 interface card including PC configuration software tool on CD.



USB / RS232 interface available on request.

APPLICATION EXAMPLE



Proportional regulation of 4 dual-coil valves with 2 bi-directional joysticks.

ORDERING INFORMATION

*EC-PWM-**P8**-MPC4-**H***

P = Programmable

H = potted plastic Housing

Part numbers	*Version*
23.0409.081	1.5 A
23.0409.071	3 A

Machine Management Systems

EC-MMS-1012-H *Machine Management System*

DESCRIPTION

Digital MMS *(Machine Management System)* with built-in advanced safety and fault detection features for integrated control of mobile equipment functions.

OPERATION

10 inputs and 12 outputs are managed by this small-size unit. PWM current outputs are field-adjustable and their setting is stored in a EEPROM memory. Parameters can be loaded via software from a standard PC connected with a RS232 serial line.

It can be used as a stand-alone controller for both meter-in systems (up to 5 functions) and bi-directional proportional systems (up to 4 functions). Additional output for a safety venting valve is available.

FEATURES

- Supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and power supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- 3-wires RS232 serial interface.
- Auxiliary +5 V supply for control devices (e.g. potentiometers).
- Performance level c capability according to ISO 13849, due to high reliability of components and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

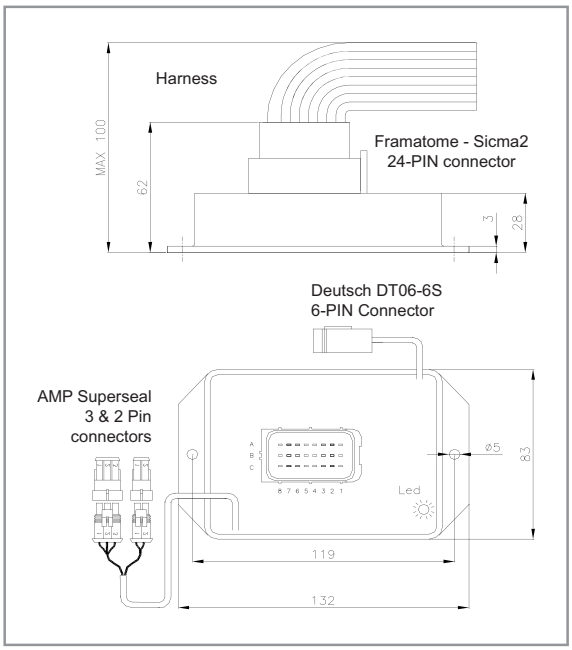
SPECIFICATIONS

• Operating voltage:	9 ÷ 30 vdc
• Max current consumption:	100 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	100 kΩ
• Analog inputs (10 bits):	8 (0-5 V)
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	2
• High side power outputs:	12 (3.5 A max)
• Inputs for current feedback:	4
• Current output range (PWM):	100 ÷ 1500 mA
• PWM dither frequency:	60 ÷ 200 Hz

APPLICATIONS

- 12 vdc and 24 vdc systems.
- Remote control of non-feedback proportional and on-off valves.
- Specifically designed for applications requiring accurate adjustments and calibrations.
- Control of up to 4 proportional bi-directional valves plus a venting valve and additional 3 auxiliary outputs.
- Control of up to 5 functions in meter-in configuration (10 on-off valves plus 1 proportional valve and 1 venting valve).

DIMENSIONS

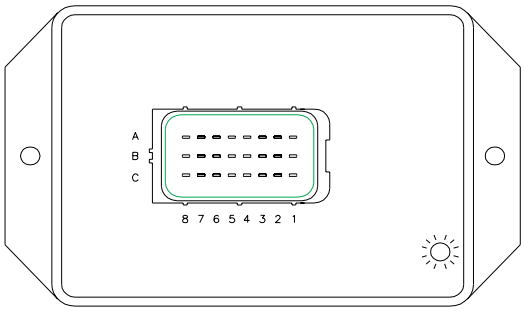


WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-MMS-1012-H *Machine Management System*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM (reference: meter-in layout)

Connector type: framatome SICMA2

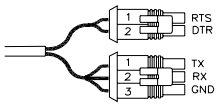


A
1 EV4A (HIGH SIDE)
2 EV4B (HIGH SIDE)
3 EV3A (HIGH SIDE)
4 EV3B (HIGH SIDE)
5 ANALOG IN 4
6 ANALOG IN 3
7 ANALOG IN 1
8 PROP. CURRENT FEEDBACK

B
1 +V (POWER SUPPLY)
2 EV9 (VENTING - HIGH SIDE)
3 ANALOG IN - SPARE
4 ANALOG IN 2
5 ANALOG IN 5
6 PROP. CURRENT FEEDBACK - SPARE
7 PROP. CURRENT FEEDBACK - SPARE
8 PROP. CURRENT FEEDBACK - SPARE

C
1 -V (POWER SUPPLY - GND)
2 5V EXT
3 ANALOG IN - SPARE
4 ANALOG IN - SPARE
5 EVP (HIGH SIDE)
6 EV5A (HIGH SIDE)
7 EV2A (HIGH SIDE)
8 EV2B (HIGH SIDE)

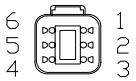
Connector type: AMP-Seal



For software download
1 RTS
2 DTR

For calibration and adjustments
1 TX
2 RX
3 GND

Connector type: Deutsch DT06-6S



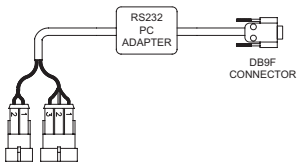
1 DIGITAL IN - SPARE
2 DIGITAL IN - DEAD MAN
3 NOT CONNECTED
4 EV1A (HIGH SIDE)
5 EV1B (HIGH SIDE)
6 EV5B (HIGH SIDE)

ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

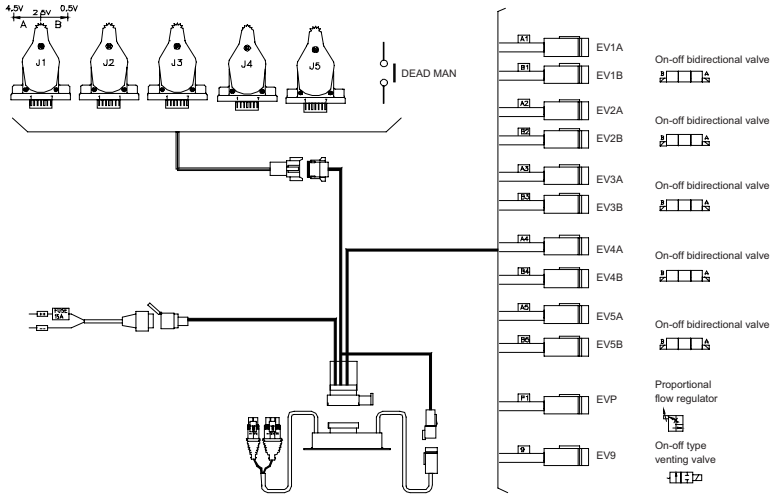
- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**
- **Dither frequency**

Ordering information for the configuration kit:
20.1001.026 RS232 interface card including PC configuration software tool on CD.



USB / RS232 interface available on request.

APPLICATION EXAMPLE



ORDERING INFORMATION

*EC-MMS-**1012-H***

1012 = 10 inputs - 12 outputs

H = potted plastic Housing for panel mounting

EC-MMS-2020-H *Machine Management System*

DESCRIPTION

Digital MMS *(Machine Management System)* with built-in advanced safety and fault detection features for integrated control of mobile equipment functions.

OPERATION

20 inputs and 20 outputs are managed by this small-size unit.
Analog outputs are field-adjustable and their setting is stored in an EEPROM memory and can be loaded via software from a standard PC connected through an RS232 serial line.

It can be used as a stand-alone controller or in conjunction with other MMS electronic units like Tecnord's Mod. MMS-4820.

FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- 3-wires RS232 serial interface and 2-wires RS485 serial interface.
- Especially designed to drive up to 6 electro-hydraulic proportional actuators Tecnord type MLT-FD4/5.
- Auxiliary +5 V supply for control devices (e.g. potentiometers).
- Performance level c capability according to ISO 13849, due to high reliability of components and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

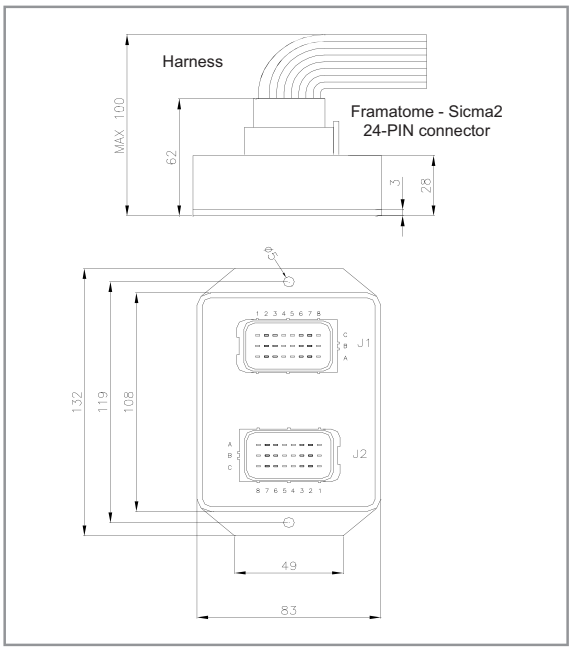
SPECIFICATIONS

• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	0.5 A (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	100 kΩ
• Analog inputs (10 bits):	8 (0-5 V)
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	12
• High side power outputs:	14 (3.5 A max)
• Max current load on all outputs:	10 A
• Analog outputs:	6 (0-5 V)

APPLICATIONS

- 12 vdc and 24 vdc systems.
- Closed loop systems with electro-hydraulic proportional actuators.
- General purpose applications requiring field-adjustments.
- Two or more MMS boards can be interconnected by means of 2-wires RS485 serial lines where rotating joints or cable are installed.

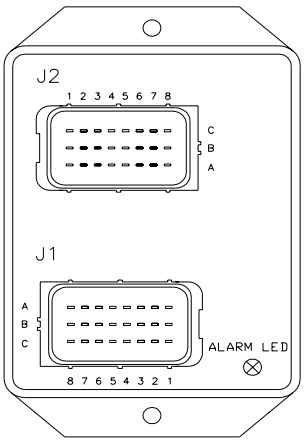
DIMENSIONS



EC-MMS-2020-H *Machine Management System*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2



J1

A		B		C	
1	ANALOG IN 2	1	ANALOG IN 1	1	ANALOG IN 0
2	ANALOG IN 5	2	ANALOG IN 4	2	ANALOG IN 3
3	DIGITAL IN 0	3	ANALOG IN 7	3	ANALOG IN 6
4	DIGITAL IN 2	4	DIGITAL IN 1	4	5V EXT
5	DIGITAL IN 4	5	DIGITAL IN 3	5	RS232 GND
6	DIGITAL IN 7	6	DIGITAL IN 6	6	DIGITAL IN 5
7	DIGITAL IN 9	7	DIGITAL IN 8	7	DIGITAL IN 10
8	RS232 TX	8	RS232 RX	8	DIGITAL IN 11

J2

A		B		C	
1	OUT 0	1	OUT 7	1	OUT 6
2	OUT 1	2	RS485 BUS-	2	OUT 9
3	OUT 2	3	ANALOG OUT 0	3	OUT 8
4	OUT 3	4	RS485 BUS+	4	OUT 11
5	OUT 4	5	ANALOG OUT 2	5	OUT 10
6	OUT 5	6	ANALOG OUT 1	6	OUT 13
7	ANALOG OUT 4	7	ANALOG OUT 5	7	OUT 12
8	-V (POWER SUPPLY - GND)	8	+V (POWER SUPPLY)	8	ANALOG OUT 3

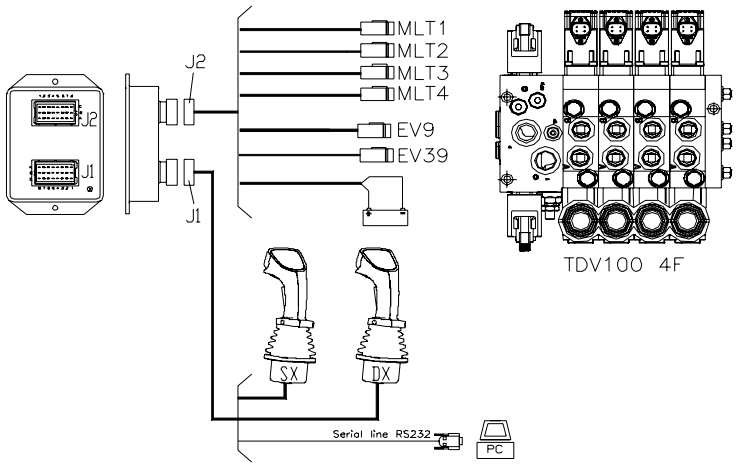
ADJUSTMENTS

Adjustments can be effected via RS232 serial line to modify the following work parameters:

- **Vmin (minimum output voltage)**
- **Vmax (maximum output voltage)**
- **Ramp-up time**
- **Ramp-down time**

Ask for: PC configuration electronic units calibration tool (see page 42).

APPLICATION EXAMPLE



Electro-hydraulic multi-function system requiring individual calibration of each semi-function to meet specific working or safety-related conditions.

ORDERING INFORMATION

*EC-MMS-**2020-H***

2020 = 20 inputs - 20 outputs

H = potted plastic Housing for panel mounting

EC-MMS-1521-H *Machine Management System Controller*

new

DESCRIPTION

MMS *(Machine Management System)* controller in rugged aluminum enclosure dual microprocessor, CANbus, built-in safety and fault-detection features for integrated control of complex functions in mobile equipment applications.

OPERATION

It is normally used as the main control unit in a complete management system. Two microprocessors and advanced diagnostics for safety applications.
The EC-MMS-1521 comes with an aluminium casing, a silicon rubber gasket and connectors, designed to ensure power dissipation, robustness and tightness required in severe environment conditions. Software download available.

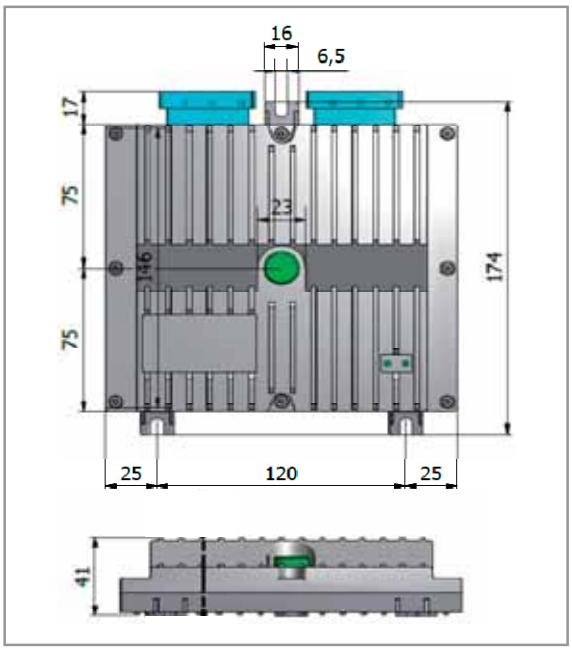
FEATURES

- Robust aluminum enclosure.
- Power supply is protected against reversed polarity (external fuse required) and overvoltage.
- Inputs are protected against short circuits to GND and power supply.
- Outputs protected against short circuits, over-current and over-temperature.
- 2 CANbus connections.
- PWM drivers with current feedback.
- +5 V auxiliary power supply for external control devices.
- Performance level d capability according to ISO 13849, thanks to redundant microcontroller and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
- Reserved power supply pins for safety power outputs.
- Optional add-on inclinometer.
- Optional real time clock for data logging.

SPECIFICATIONS

• Operating voltage:	8 ÷ 32 vdc
• Max. current consumption:	< 400 mA (no load applied)
• Operating temperature:	-40°C / +105°C
• Degree of protection:	IP 69
• Analog inputs (16 bits):	3 (0-5 V)
• Analog inputs (10 bits):	8 (0-5 V)
• Digital (frequency) inputs:	4
• High side power outputs:	18 (6 if PWM outputs are used)
• Low side power outputs (LS):	2
• PWM outputs with current feedback (3A):	12
• Analog voltage outputs (0-5 V):	1
• Pins selectable as power OUT or digital IN:	6
• Inputs with SW selectable pull-up:	4
• CANbus lines:	2 (ISO 11898, CAN 2.0A/B)
• Available bus speed:	up to 1 Mbit/s

DIMENSIONS



APPLICATIONS

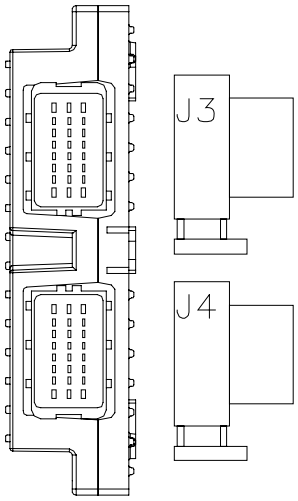
- Main ECU for aerial platforms, cranes, telehandlers, agriculture vehicles.
- 12 vdc and 24 vdc systems.
- Two or more MMS boards can be interconnected through the CANbus line.

EC-MMS-1521-H *Machine Management System Controller*

new

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: framatome SICMA2



J3 (GREY)

A		B		C	
1	VHS4	1	LS1	1	LS0
2	OUT_PWM7	2	OUT_PWM6	2	5V EXT
3	OUT_PWM2	3	ANALOG IN 8	3	ANALOG IN 9
4	OUT_PWM3	4	ANALOG IN 10	4	CAN L 1
5	DIG INT 1	5	DIG INT 3	5	CAN H 1
6	DIG INT 0	6	DIG INT 2	6	CAN L 2
7	OUT_PWM4	7	OUT_PWM5	7	CAN H 2
8	VHS3	8	VHS2	8	VHS1

J4 (BLACK)

A		B		C	
1	OUT 4	1	OUT 2	1	OUT_PWM0
2	OUT 5	2	OUT 3	2	OUT_PWM1
3	OUT 0	3	ANALOG IN 1	3	ANALOG IN 0
4	OUT 1	4	ANALOG IN 3	4	ANALOG IN 2
5	OUT_PWM8	5	ANALOG IN 5	5	ANALOG IN 4
6	OUT_PWM9	6	ANALOG IN 7	6	ANALOG IN 6
7	OUT_PWM10	7	OUT_PWM11	7	OUT AN 0
8	+V (POWER SUPPLY)	8	-V (POWER SUPPLY - GND)	8	-V (POWER SUPPLY - GND)

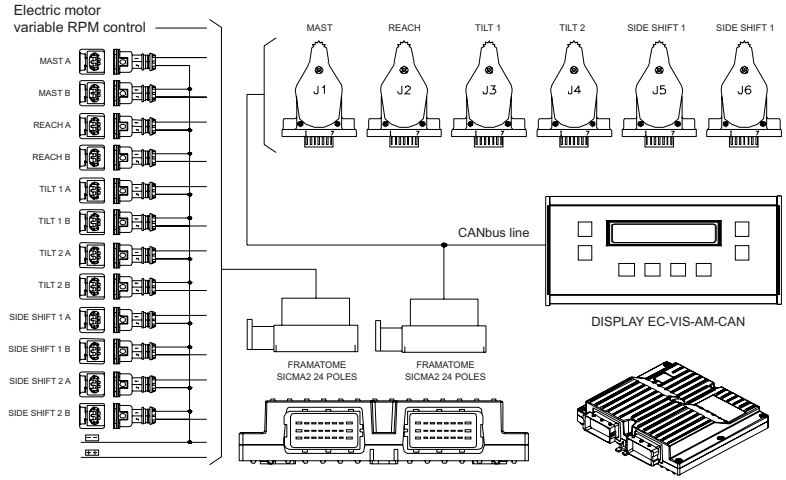
ADJUSTMENTS

Adjustments can be effected via CANbus interface to modify the following work parameters:

- **Imin (minimum output current)**
- **Imax (maximum output current)**
- **Ramp-up time**
- **Ramp-down time**

Ask for: PC configuration electronic units calibration tool (see page 42).

APPLICATION EXAMPLE



Forklift control system.

ORDERING INFORMATION

*EC-MMS-**1521-H***

1521 = 15 inputs - 21 outputs

H = aluminium Housing

WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-MMS-4820-H *Machine Management System*

DESCRIPTION

MMS *(Machine Management System)* coding card with CANbus and RS485 interface and built-in advanced safety and fault-detection features for integrated control of mobile equipment functions.

OPERATION

The MMS-4820 can be lodged inside any remote control box or panel to make command signals compatible with CANbus networks or RS485 serial lines.

It can be used as a stand-alone controller for Tecnord's Multidrom MLT/FD5 CANbus-configured electro-hydraulic proportional actuators.
It can be used as a remote coding card for RS485 serial line connection to other MMS electronic units like Tecnord's Mod. MMS-2020.

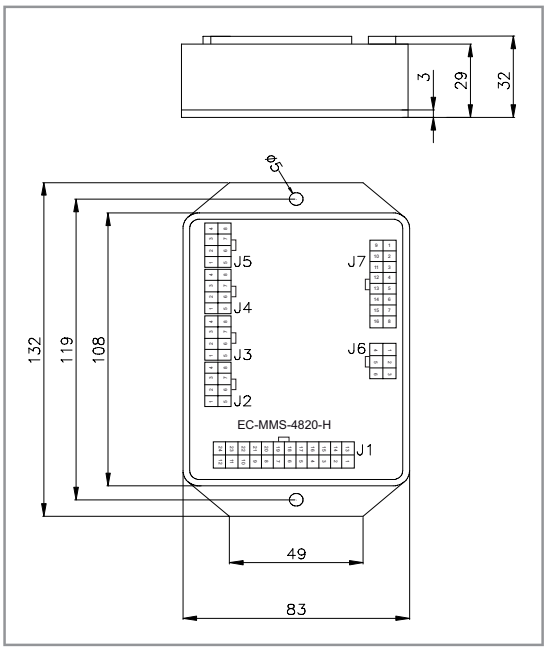
FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- 2-wires CANbus or RS485 serial interface.
- Performance level d capability according to ISO 13849, thanks to microprocessor redundancy.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).
- Auxiliary +5 V supply for control devices (e.g. potentiometers).

SPECIFICATIONS

• Operating voltage:	8.5 ÷ 40 vdc
• Max current consumption:	0.5 A (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 54
• Input impedance:	100 kΩ
• Analog inputs (10 bits):	16 (0-5 V)
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	32
• High side power outputs:	4 (3.5 A max)
• Max current load on all outputs:	5 A
• High side signal outputs:	16 (0.7 A max)
• Inputs for current feedback:	1
• Current output range (PWM):	100 ÷ 1500 mA
• PWM dither frequency:	60 ÷ 200 Hz (adjustable)

DIMENSIONS



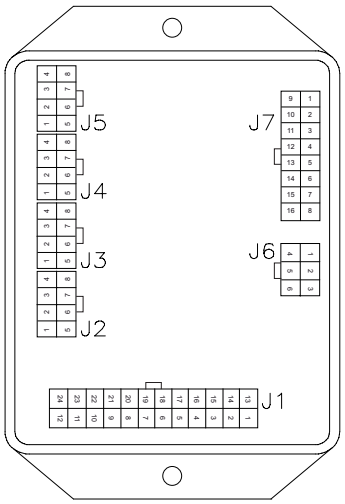
APPLICATIONS

- 12 vdc and 24 vdc systems.
- Control panel management.
- Field-adjustable applications.
- Closed loop systems with electro-hydraulic digital actuators.
- Two or more MMS boards can be interconnected by means of 2-wires RS485 serial lines or CANbus where rotating joints or cable reels are installed.

EC-MMS-4820-H *Machine Management System*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: Molex MINIfit



J1	
1	+V (POWER SUPPLY)
2	5V EXT
3	CANH / RS485+
4	CANL / RS485-
5÷12	ANALOG IN [1÷8]
13	-V (POWER SUPPLY - GND)
14	PROG1 (#1 MICROCONTROLLER)
15	PROG2 (#2 MICROCONTROLLER)
16	RESET
17÷24	ANALOG IN [9÷16]

J6	
1	POWER OUT 1
2	GND
3	PWM CURRENT FEEDBACK
4	POWER OUT 2
5	POWER OUT 3
6	POWER OUT 4

J2 ÷ J5	
1÷8	DIGITAL IN [1÷32]

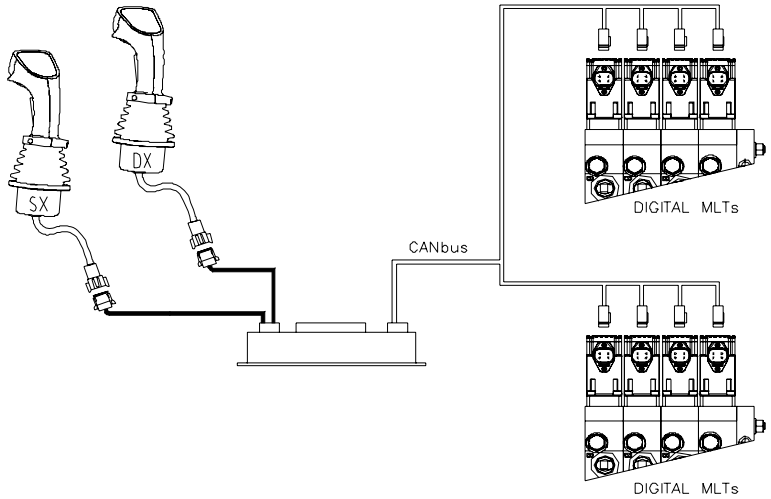
J7	
1÷16	SIGNAL OUT [1÷16]

ADJUSTMENTS

Adjustments through RS485 serial line and CANbus interface.

Ask for: PC configuration electronic units calibration tool (see page 42).

APPLICATION EXAMPLE



Electro-hydraulic system with MLT digital actuators controlled via 2-wires CANbus line.

ORDERING INFORMATION

*EC-MMS-**4820-H***

4820 = 48 inputs - 20 outputs

H = potted plastic Housing for panel mounting

EC-MMS-0516-H *Machine Management System*

DESCRIPTION

MMS *(Machine Management System)* controller with built-in advanced safety and fault-detection features to be used as a remote de-coding card for RS485 serial line connection to other MMS electronic units. Tecnord's main use is as radio receiver for combined on-off and proportional control.

OPERATION

The MMS-0516 is provided with display and push-buttons to configure the control characteristics (Imin/Imax, ramps, deadbands, dither) of its PWM output channel. It can be used as a stand-alone controller for meter-in applications where a single PWM channel and various on-off outputs are required or in conjunction with other MMS electronic units like Tecnord's Mod. MMS-4820.
Auxiliary safety microprocessor as option.

FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- 2-wires RS485 serial interface.
- The current in the solenoid is independent of change in the coil resistance and in supply voltage variations.
- Performance level c capability according to ISO 13849, due to high reliability of components and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

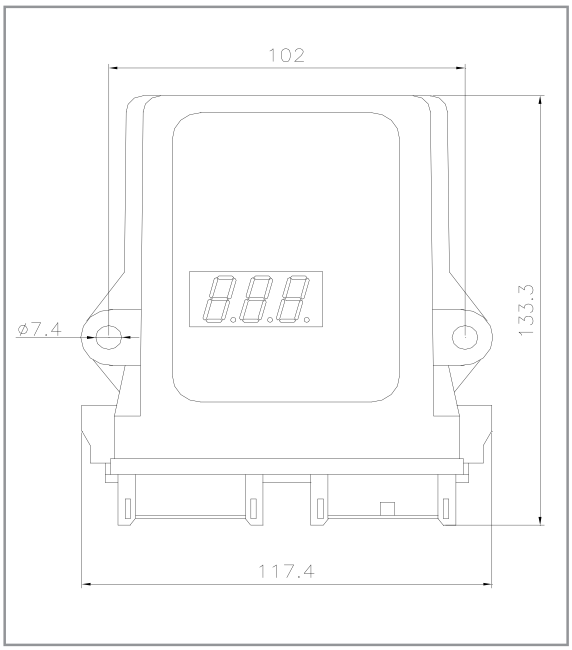
SPECIFICATIONS

• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	0.2 A (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 65 (with housing)
• Input impedance:	100 kΩ
• Analog inputs (10 bits):	1 (0-5 V)
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• Digital inputs:	4 (2 if 16 outputs are used)
• High side power outputs:	16 (3.5 A max)
• Max current load on all outputs:	10 A
• Inputs for current feedback:	1
• Current output range (PWM):	100 ÷ 1500 mA
• PWM dither frequency:	60 ÷ 200 Hz

APPLICATIONS

- 12 vdc and 24 vdc systems.
- For hand held terminal cable/radio applications.
- Field-adjustable applications.
- Two or more MMS boards can be interconnected by means of 2-wires RS485 serial lines where rotating joints or cable reels are installed.

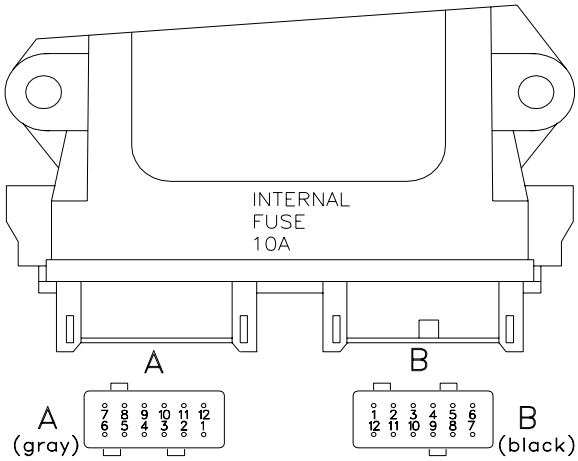
DIMENSIONS



EC-MMS-0516-H *Machine Management System*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: Deutsch - EEC-325-4B



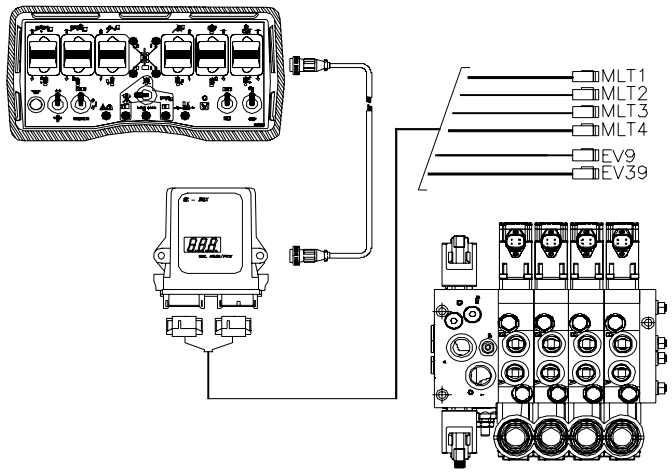
A (GREY)	
1	ANALOG IN
2	PROP. CURRENT FEEDBACK
3	-V (POWER SUPPLY-GND)
4	OUT 13 (HIGH SIDE)
5	OUT 14 (HIGH SIDE)
6	+V (POWER SUPPLY)
7	OUT 12 (HIGH SIDE)
8	OUT 11 (HIGH SIDE)
9	OUT 10 (HIGH SIDE)
10	OUT 9 (HIGH SIDE)
11	OUT 8 (HIGH SIDE)
12	OUT 7 (HIGH SIDE)

B (BLACK)	
1	OUT 6 (HIGH SIDE)
2	OUT 5 (HIGH SIDE)
3	OUT 4 (HIGH SIDE)
4	OUT 3 (HIGH SIDE)
5	OUT 2 (HIGH SIDE)
6	OUT 1 (HIGH SIDE)
7	RS485 BUS+
8	RS485 BUS-
9	DIGITAL IN 4 / OUT 15
10	DIGITAL IN 3 / OUT 16
11	DIGITAL IN 2
12	DIGITAL IN 1

ADJUSTMENTS

Adjustments through integrated display and pushbuttons possible after removing the electronic board from inside the enclosure.

APPLICATION EXAMPLE



MMS-0516 connected to a portable control unit through a RS485 line Radio connection as option.

ORDERING INFORMATION

*EC-MMS-**0516-H***

0516 = 5 inputs - 16 outputs

H = potted plastic Housing for panel mounting

WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-MMS-6252-H *Machine Management System Controller*

DESCRIPTION

MMS *(Machine Management System)* controller with built-in advanced safety and fault-detection features for integrated control of a high number of functions in mobile equipment applications.

OPERATION

It is normally used as the main control unit in a complete machine management system. Two microprocessors and advanced diagnostics for safety applications. CANbus communication. Serial connection for software download.

FEATURES

- Robust metal enclosure and complete potting.
- Power supply line is protected against reversed polarity and overvoltage.
- Inputs are protected against short circuits to GND and supply.
- Outputs are protected against short circuits, reversed polarity, over-current and over-temperature.
- Dual microprocessor for advanced diagnostics capability.
- Serial communication ports: CANbus, RS485, RS232.
- Optional add-on inclinometer.
- +5 V auxiliary power supply for external control devices.
- Performance level d capability according to ISO 13849, thanks to redundant microcontroller and embedded diagnostics.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity), EN 61000-6-3 (Emissions).

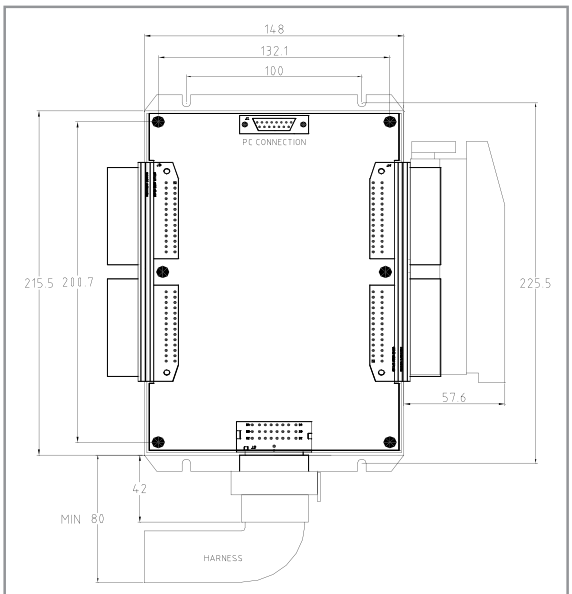
SPECIFICATIONS

• Operating voltage:	8.5 ÷ 32 vdc
• Max current consumption:	400 mA (no load applied)
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Input impedance:	100 kΩ
• Analog inputs (10 bits):	16 (0-5 V) 6 (0-20 mA)
• Typical ctrl pot resistance:	1 ÷ 10 kΩ
• High side power outputs:	8 (5 A max) 28 (3.5 A max)
• High side signal outputs:	10 (0.7 A max)
• Digital inputs:	40
• Max current load on all outputs:	16 A
• Inputs for current feedback:	4
• Current output range (PWM):	100 ÷ 1600 mA
• Analog voltage outputs:	6 (0-5 V)

APPLICATIONS

- 12 vdc and 24 vdc systems.
- Main ECU for aerial platforms, cranes, telehandlers, agric. machines.
- Field-adjustable applications.
- Two or more MMS boards can be interconnected by means of 2-wires RS485 serial lines or CANbus.

DIMENSIONS



Stainless steel enclosure completely potted.

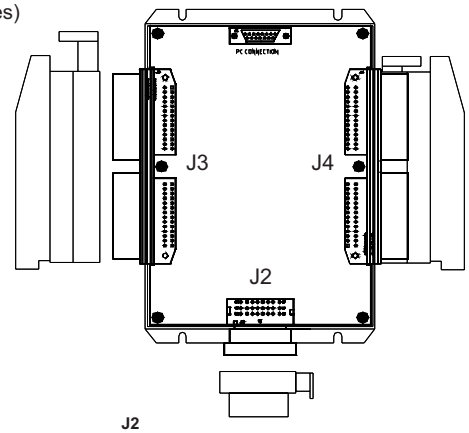
WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-MMS-6252-H *Machine Management System Controller*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Main Connectors type: SICMA2/DCS1 (56 poles)
Auxiliary connector type: SICMA2 (24 poles)
PC connector type: DB15 female

J3
1 CAN BUS
4 ANALOG INPUTS (0÷20 MA)
8 ANALOG INPUTS (0÷5 V)
24 ANALOG INPUTS
10 DIGITAL OUTPUTS (0.7 A)
1 RS485
2 +5 V AUX
2 +VBATT
2 GND



J4
2 CAN BUS
2 ANALOG INPUTS (0÷20 MA)
2 ANALOG INPUTS (0÷5 V)
16 DIGITAL INPUTS
18 DIGITAL OUTPUTS (3.5 A)
8 DIGITAL OUTPUTS (5 A)
4 CURRENT FEEDBACKS
2 GND

J2
6 ANALOG INPUTS (0÷5 V)
10 DIGITAL OUTPUTS (3.5 A)
6 ANALOG OUTPUTS (0÷5 V)
2 GND

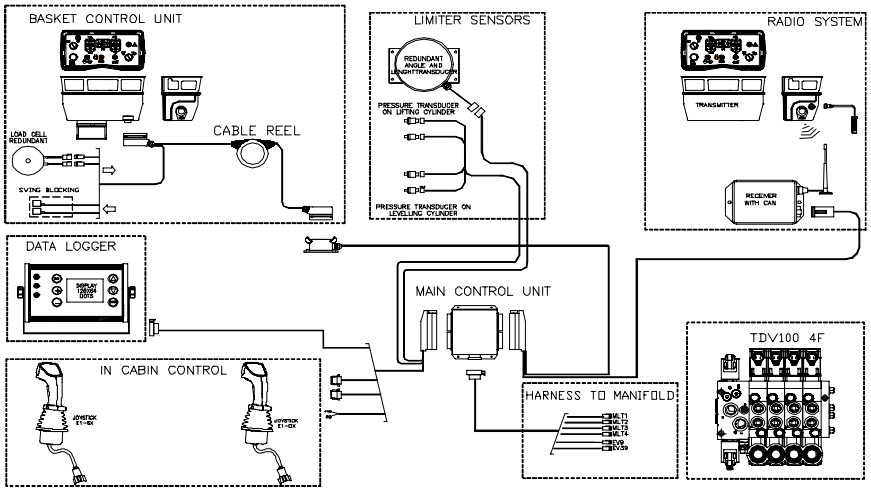
For wiring schematics consult factory.

ADJUSTMENTS

Adjustment of working parameters can be effected: via RS232 serial line or via CAN bus interface.

Ask for: PC configuration electronic units calibration tool (see page 42).

APPLICATION EXAMPLE



ORDERING INFORMATION

*EC-MMS-**6252-H***

6252 = 62 inputs - 52 output

H = stainless steel Housing

Two configuration available:
Standard (2 main connectors)
Full (all connectors)

WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

Graphic Display Units

EC-VIS-G-D128x64-M-C *Graphic Display Unit*

DESCRIPTION

Graphic display unit to be used as operator's interface in complex Machine Management Systems.

FEATURES

- RS-232 serial interface.
- 1 CANbus connection.
- Graphic display 128 x 64 dots backlighted.
- Real time clock with calendar.
- Wide data storage memory.

MECHANICAL / ENVIRONMENTAL SPECIFICATIONS

• Dimensions:	174 x 108 x 31 mm
• Housing:	Metal body Polycarbonate cover
• Operating temperature:	-25°C / 85°C
• Degree of protection:	IP 67
• Connector:	SICMA2, 24 pin

ELECTRICAL SPECIFICATIONS

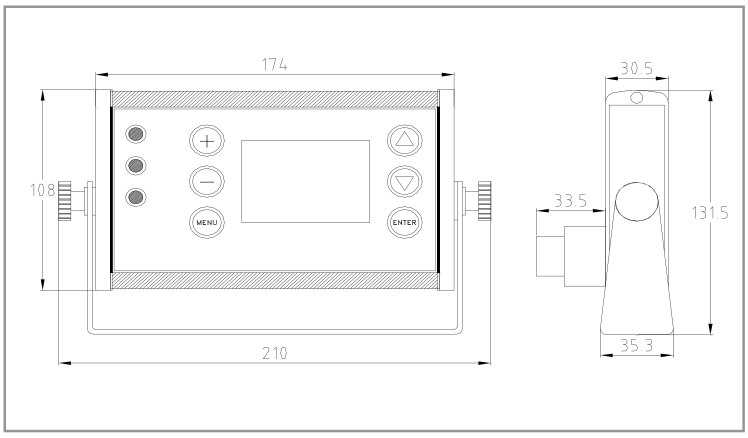
Display

• Type and size:	graphic
• Resolution:	128 x 64 dot-matrix
• Viewing area:	62 x 44 mm
• Brightness:	8 cd/m²
• Contrast:	8:1
• Viewing angle range:	40°

ELECTRONIC CONTROL UNIT

• Operating voltage:	8.5 ÷ 30 vdc
• Communication interfaces:	CANbus ISO11898 RS 232
• Analog inputs (10 bits):	8 (0-5 V)
• Digital inputs:	1
• High side power outputs:	4 (3.5 A max each)
• Inputs for current feedback:	2
• PWM output current range:	100-1500 mA
• Non volatile memory:	192 kB
• Backlighted pushbuttons:	standard 6 (max 9)
• High efficiency leds:	standard 3 (max 4)

DIMENSIONS



APPLICATIONS

- 12 vdc and 24 vdc systems.
- Load limiter and/or area control systems.
- In-cab terminal.
- Data logger.

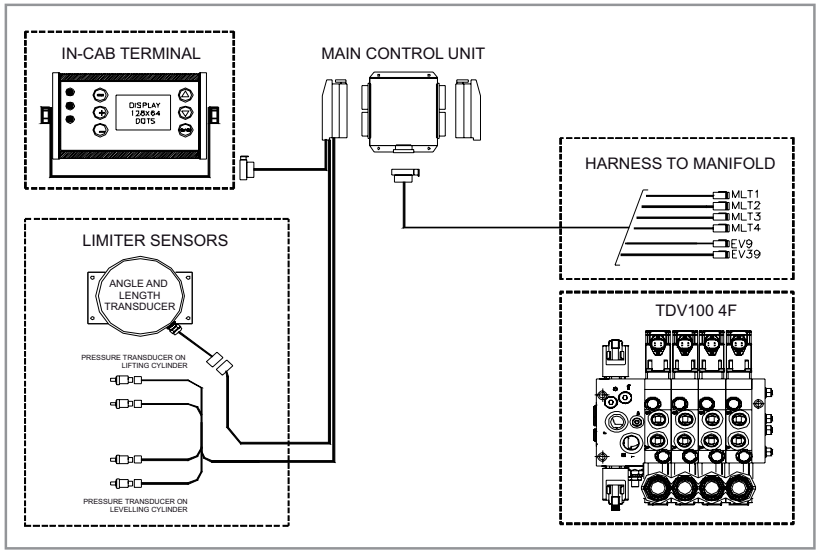
C-VIS-G-D128x64-M-C *Graphic Display Unit*

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: SICMA2 (24 poles)

A		B		C	
1	-V (POWER - GND)	**1**	+5V EXT	**1**	+V (POWER)
2	ANALOG IN 0	**2**	ANALOG IN 0	**2**	CAN-L
3	ANALOG IN 2	**3**	ANALOG IN 3	**3**	CAN-H
4	DIGITAL IN	**4**	HEATER IN	**4**	CURRENT FEEDBACK 1
5	ANALOG IN 5	**5**	ANALOG IN 4	**5**	CURRENT FEEDBACK 2
6	ANALOG IN 6	**6**	ANALOG IN 7	**6**	RS232 TX
7	OUT 1	**7**	-V (POWER - GND)	**7**	RS232 RX
8	OUT 0	**8**	OUT 3	**8**	OUT 2

ADJUSTMENTS



ORDERING INFORMATION

*EC-VIS-**G-D128x64-M-C***

- **C** = Cabin mount
- **M** = Metal enclosure
- **D** = 128 x 64 Dots
- **G** = Graphic display

EC-VIS-GC-P480x272-S *Graphic Display Unit*

new

DESCRIPTION

Color graphic display unit.

FEATURES

- Dual-molding plastic-silicon enclosure.
- 4.3” TFT backlighted color display.
- Standalone or dashboard mount.
- 6 pushbuttons (backlighted), 6 LEDs.
- CANbus interface.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)
- Auxiliary +5 V supply for external devices (e.g. sensors)

MECHANICAL / ENVIRONMENTAL SPECIFICATIONS

• Dimensions:	182 x 117 x 49 mm
• Housing:	polycarbonate body soft silicon rubber cover
• Operating temperature:	-25°C / 85°C
• Degree of protection:	IP 65
• Connector:	AMP superseal, 26 pin

ELECTRICAL SPECIFICATIONS

Display

• Type and size:	TFT, 4.3”, 16:9
• Resolution:	480 x 272 pixels
• Viewing area:	95.04 x 53.856 mm
• Brightness:	280 cd/m^2
• Contrast:	450:1
• Viewing angle range:	± 70° H, +70/-50° V

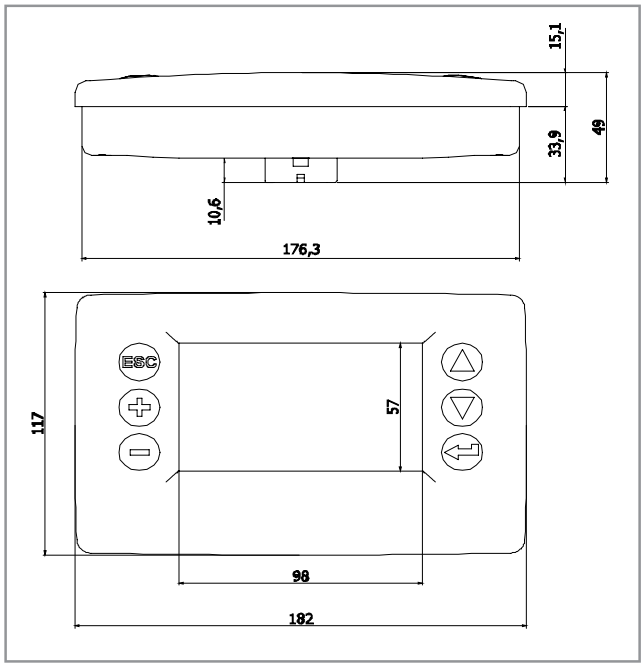
ELECTRONIC CONTROL UNIT

• Operating voltage:	8 ÷ 32 vdc
• Communication interfaces:	CANbus ISO11898 RS 232 USB
• Analog inputs (10 bits):	8 (0-5 V)
• Additional features:	real time clock 4 analog inputs
• Input impedance:	100 kΩ
• Max. current from +5 V auxiliary out:	25 mA

APPLICATIONS

- System diagnostic for heavy duty vehicles.
- Diagnostic/configuration unit for telehandlers.
- Service/maintenance tool.
- Data logger.

DIMENSIONS

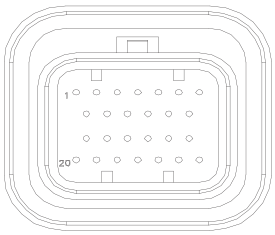


EC-VIS-GC-P480x272-S *Graphic Display Unit*

new

CIRCUIT BOARD PINOUT - WIRING DIAGRAM

Connector type: AMP Superseal 1.00 mm, 26 pin



1	ANALOG IN 0	**10**	ANALOG IN 5	**19**	+5 V EXT
2	ANALOG IN 1	**11**	NOT USED	**20**	CAN H
3	ANALOG IN 2	**12**	-V (POWER - GND)	**21**	CAN L
4	NOT USED	**13**	-V (POWER - GND)	**22**	-V (POWER - GND)
5	+5 V EXT	**14**	RX232	**23**	NOT USED
6	+V (POWER)	**15**	TX232	**24**	USB ID
7	+V (POWER)	**16**	NOT USED	**25**	USB D+
8	ANALOG IN 3	**17**	NOT USED	**26**	USB D-
9	ANALOG IN 4	**18**	NOT USED		

MOUNTING OPTIONS

Dashboard Mount

Panel cutout of 177 x 112 mm

Cabin Mount

N. 4 Fixing holes for M4 screws at 75 x 50 mm

ORDERING INFORMATION

*EC-VIS-**GC-P480x272-S**- ******

- **D** = Dashboard mount
- **C** = Cabin mount
- **S** = polycarbonate with Silicon cover
- **P** = 480 x 272 Pixels
- **GC** = Graphic Color display

Accessories

	Description	Page
Control unit connection	Connector kits	**40**
Control unit calibration tool	Software calibration too linking cables	**42**

Electronic Control Unit Connection *Accessories*

26 POLES AMP SUPERSEAL

Kit includes: male connector, female contacts.
Available for electronic control unit: EC-VIS-GC-P480x272-S

ORDERING CODE: 13.0310.635

6 POLES DEUTSCH DT06-6S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for electronic control unit: EC-MMS-1012-H

ORDERING CODE: 13.0310.467

8 POLES DEUTSCH DT06-8S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for electronic control unit: EC-PWM-A2-MPC1-H

ORDERING CODE: 13.0310.432

12 POLES "DEUTSCH DTM06-12SA & DTM06-12SB"

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for electronic control unit: EC-MMS-0516-H

ORDERING CODE: 13.0310.253

Electronic Control Unit Connection *Accessories*

24 POLES SICMA BLACK COLOR

Kit includes: male connector, female contacts, locking cum, fillers.
Available for electronic control unit: EC-PWM-P4-MPC2-H; EC-PWM-P8-MPC4-H; EC-PWM-08-MPC4-H; EC-MMS-1012-H; EC-MMS-2020-H; EC-MMS-1521-H

ORDERING CODE: 13.0310.150

24 POLES SICMA GREY COLOR

Kit includes: male connector, female contacts, locking cum, fillers.
Available for electronic control unit: EC-MMS-1521-H

ORDERING CODE: 13.0310.634

24 POLES SICMA BLACK COLOR WITH WIRES 0.8 M LENGTH

Kit includes: male connector, female contacts, locking cum and wires 0,8 m length.
Available for electronic control unit: EC-PWM-P4-MPC2-H; EC-PWM-P8-MPC4-H; EC-PWM-08-MPC4-H, EC-MMS-1012-H; EC-MMS-2020-H; EC-MMS-1521-H

ORDERING CODE: 13.0310.236

56 POLES SICMA

Kit includes: male connector, female contacts, locking cum, cover and fillers.
Available for electronic control unit: EC-MMS-6252-H

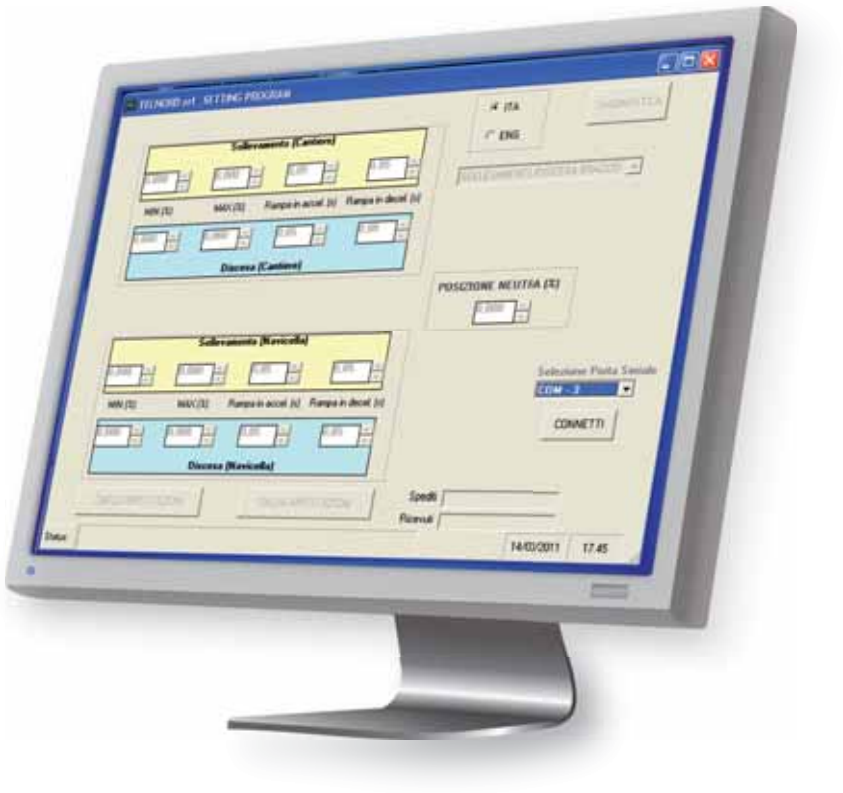
ORDERING CODE: 13.0310.324

Electronic Control Unit Calibration Tool *Accessories*

TECNORD SOFTWARE ELECTRONIC UNITS CALIBRATION TOOL

Tecnord electronic control units are supplied with operation parameters standard programming, which satisfies most applications.
For special application SCT calibration software allows some of the parameters for proportional solenoid valve control to be modified via computer; for example the minimum and maximum current or ramp up and ramp down parameters may be defined.
The linking cable shown in the following page (optional, to be ordered separately) is necessary for the computer connection.

SOFTWARE
INSTALLATION



MINIMUM SYSTEM REQUIREMENTS

- Windows XP® operating system or higher.
- Intel® Pentium processor.
- 32 Mb RAM.
- CD player unit.
- Connecting through a standard RS232 serial port, DB9 connection; alternatively, a USB-RS232 converter can be used.

PROGRAM INSTALLATION

To install the SCT software onto a personal computer, simply execute the file *setup.exe*.

Electronic Control Unit Linking Cables *Accessories*

AMPSEAL-DB9 CABLE ADAPTER

Available for electronic control unit: EC-PWM-P8-MPC4; EC-MMS-1012-H

ORDERING CODE: 20.1001.026

DEUTSCH-DB9 LINKING CABLE

Available for electronic control unit: EC-MMS-2020-H

ORDERING CODE: 21.0801.031

DB15-DB9 LINKING CABLE

Available for electronic control unit: EC-MMS-6252-H

ORDERING CODE: 20.0801.053

RS232 - USB CONVERTER

It allows Tecnord electronic control units to personal computer connection when the latter is unprovided of serial port; for installation follow the instruction enclosed with the converter.

ORDERING CODE: 50.2205.227

Index chapter 6

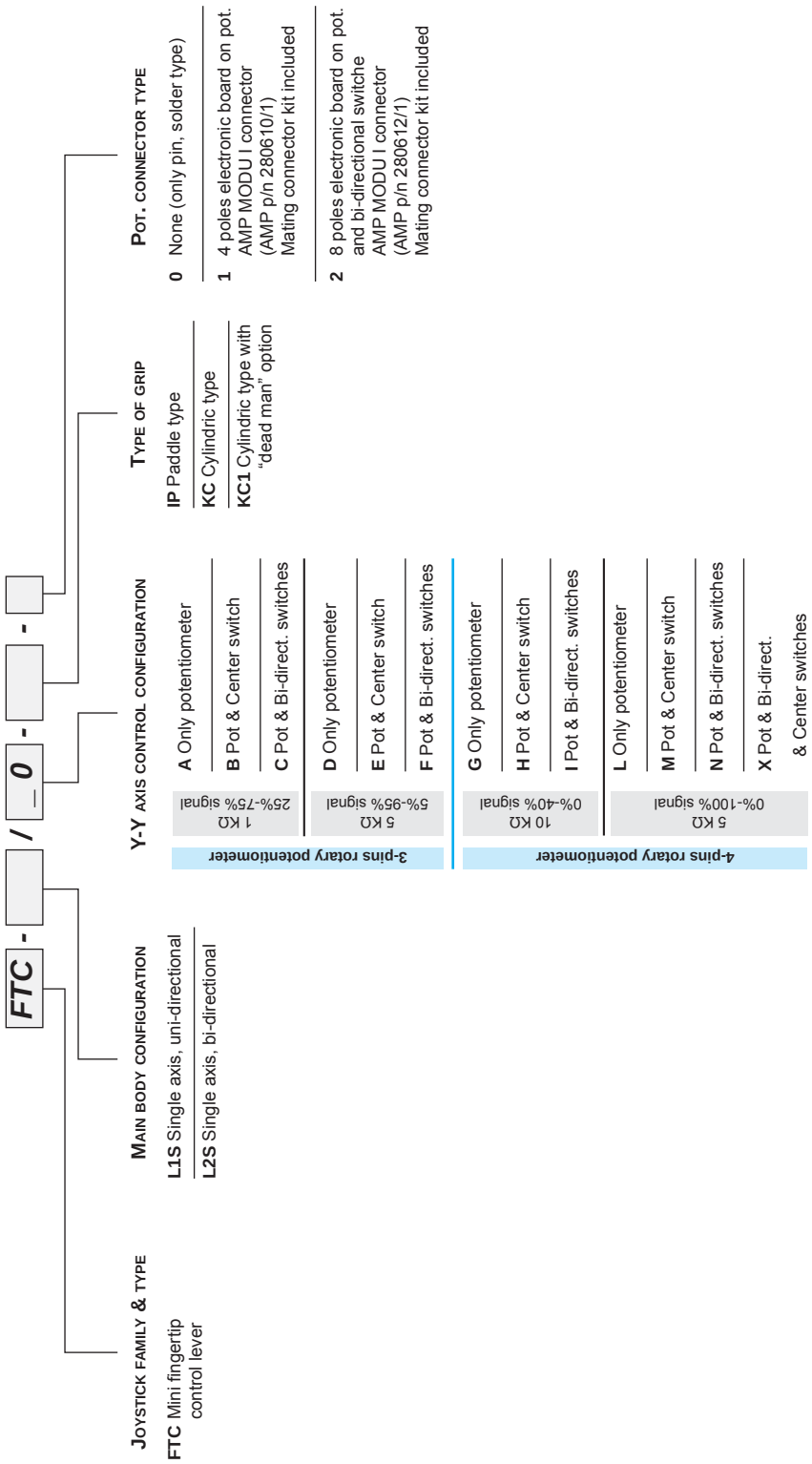
Section / Description page

Via Malavolti, 36 - 41122 Modena - Italy - Phone +39 059/254895 - Fax +39 059/253512 - www.tecnord.com - mail: tecnord@tecnord.com

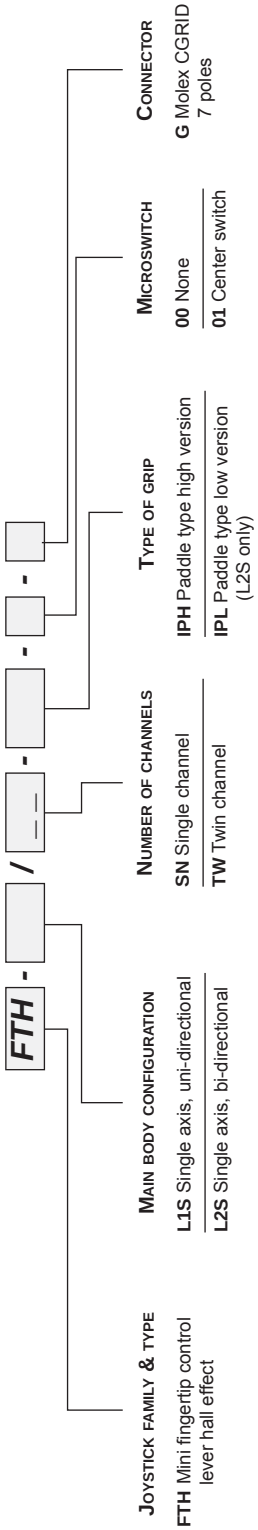
Fingertip Proportional Control Levers and Switches

Description	Ordering information page	Technical information page
FTC proportional control lever	4	9
FTH contactless proportional control lever	5	12
JLP proportional control lever	6	14
FPR proportional roller switch	7	16
PRS proportional rocker switch	7	18

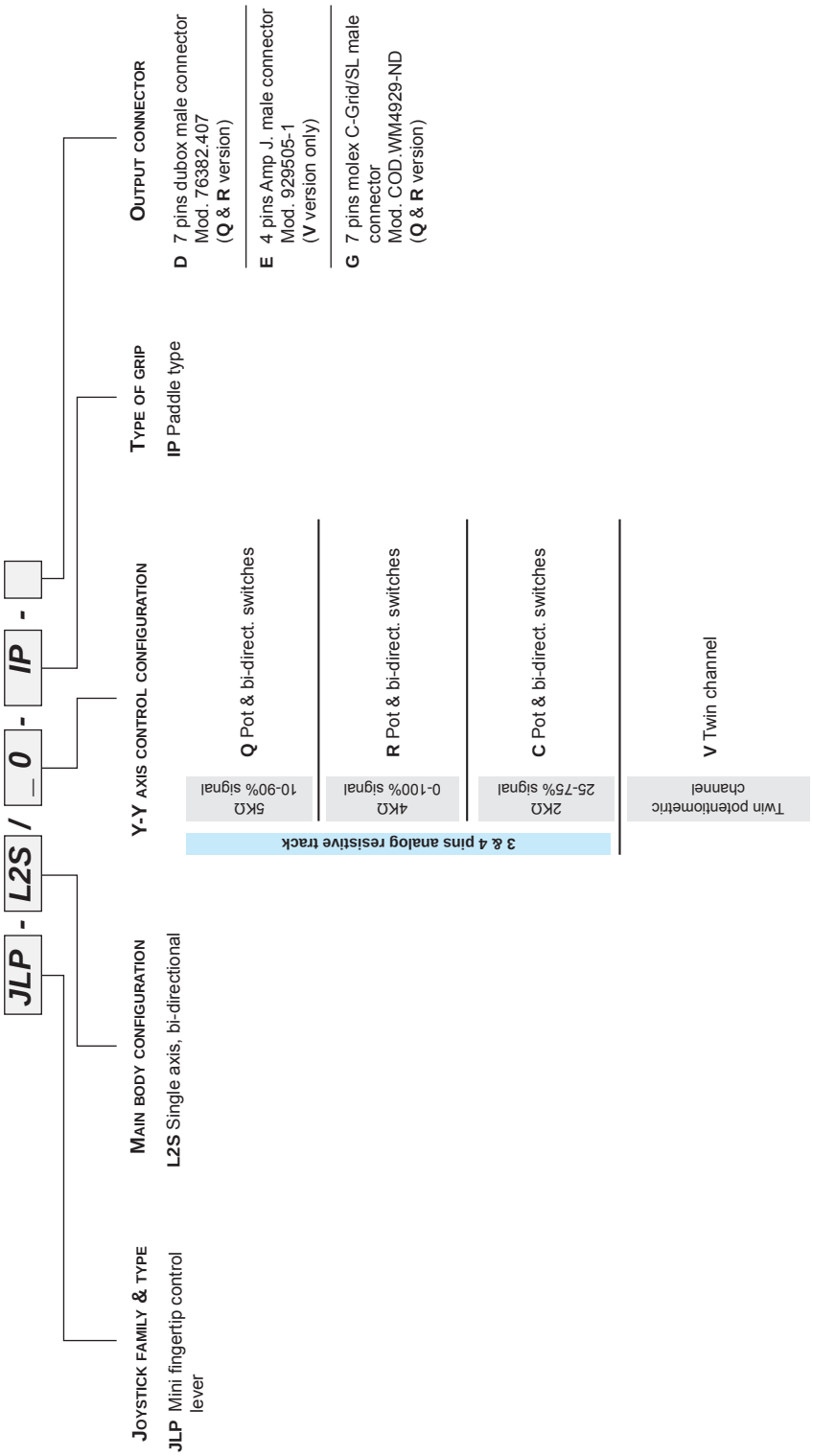
FTC Proportional Control Lever *Ordering Information*



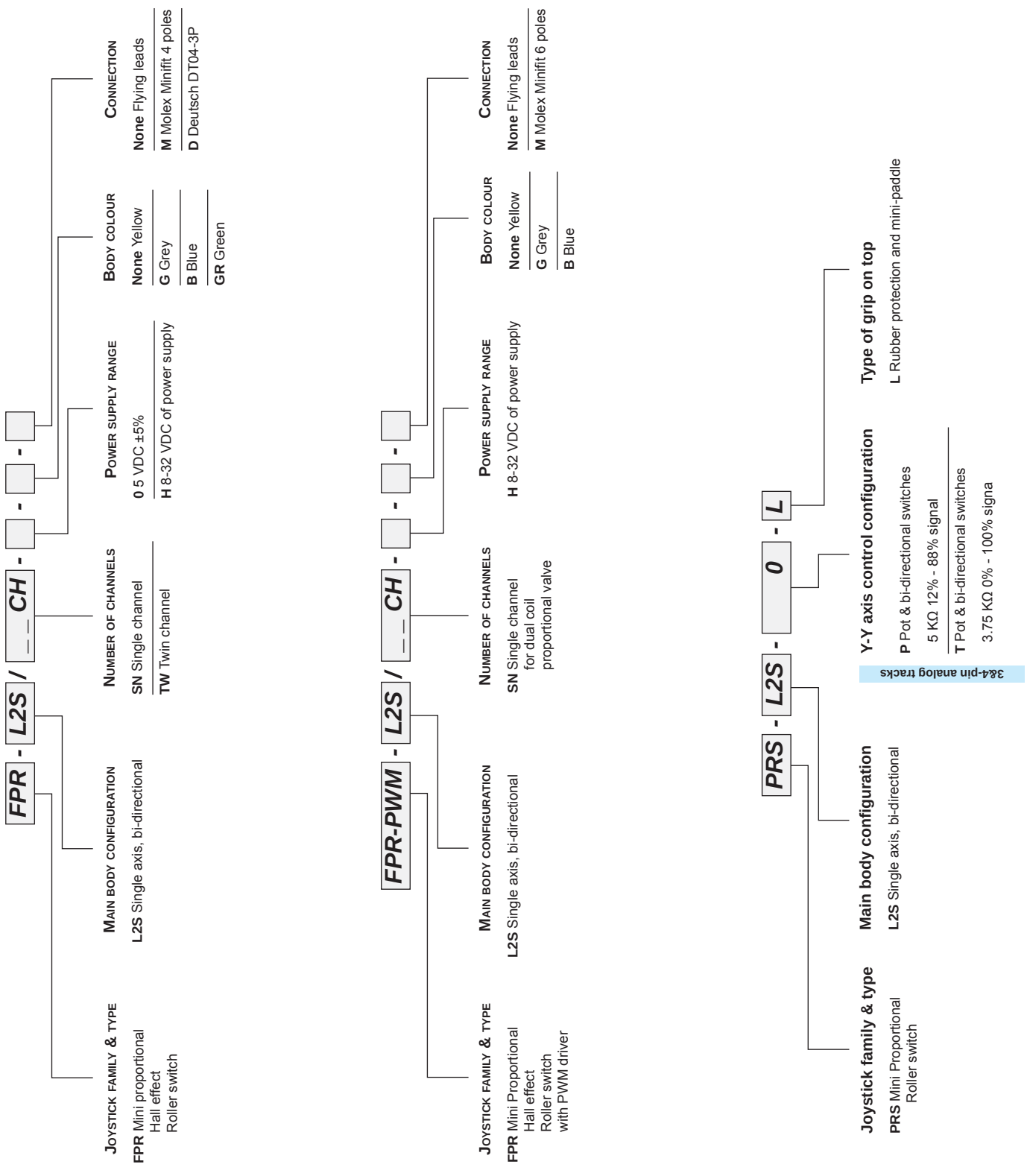
FTH Contactless Proportional Control Lever *Ordering Information*



JLP Proportional Control Lever *Ordering Information*



FPR/PRS Fingertip Proportional Switches *Ordering Information*



WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

FTC-L1S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / uni-directiional.
- 3-pins rotary potentiometer.
- Optional enable switch.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	50° ±1°
• Electrical angle:	50° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class:	IP 65 (above panel)
• Life:	3 million cycles

ELECTRICAL SPECIFICATIONS

3-pins rotary potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Ohmic resistance: / A = 50% of Vin	1 kΩ ±20%
• / D = 90% of Vin	5 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 2 (signal):	50 kΩ
• Max. operating current on pin 2:	1 mA
• Output voltage:	see graph
• Linearity (resistive track):	2% or better
• Connection type:	0 = solder type (no connector) 1 = AMP Modu I/ 4 poles connector (mating connector kit included)

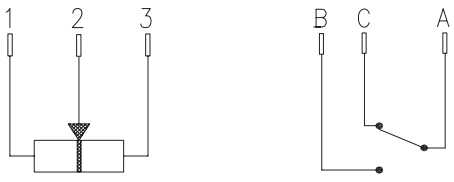
Neutral position switch (electromechanical type)

• Contact:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1.5 A / inductive
• Neutral position switch threashold angle:	+4°
• Protection class:	IP 55 (IP 67 available on request)

POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 50% Vin	S = 90% Vin
3-pin pot	A (Std)	D
3-pin pot & enable switch	B	E

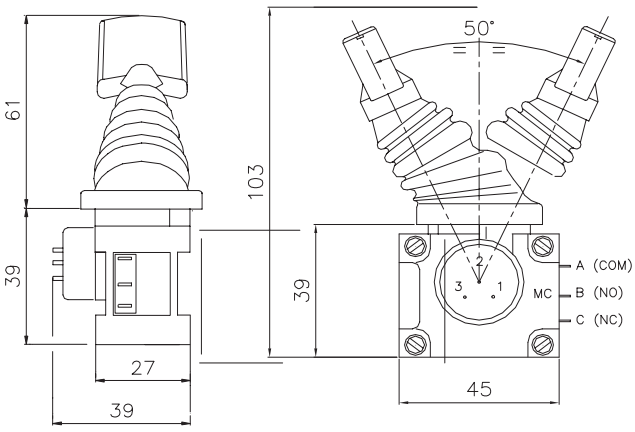
ELECTRICAL CONNECTIONS



Potentiometer

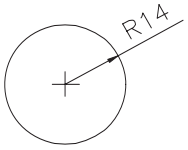
Neutral position switch MC

OVERALL DIMENSIONS

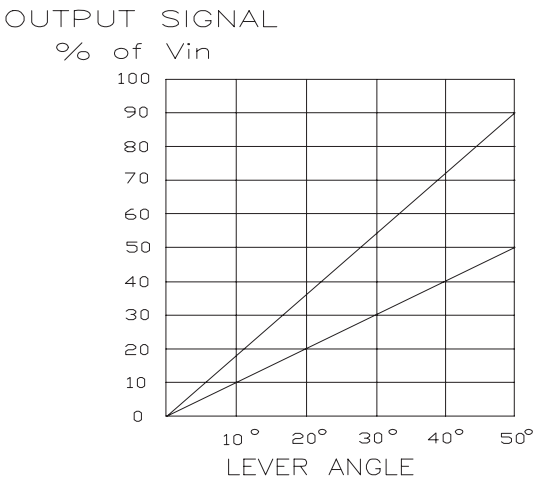


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

PANEL CUTOUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



*>> **ORDERING INFORMATION:** see page 4*

FTC-L2S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional.
- 3-pins rotary potentiometers.
- Optional center / power-off or bi-directional switches.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±25° ±1°
• Electrical angle:	±25° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class:	IP 65 (above panel)
• Life:	3 million cycles

ELECTRICAL SPECIFICATIONS

3-pins rotary potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Ohmic resistance: / A = 50% of Vin	1 kΩ ±20%
/ D = 90% of Vin	5 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 2 (signal):	50 kΩ
• Max. operating current on pin 2:	1 mA
• Output voltage:	see graph
• Linearity (resistive track):	2% or better
• Connection type:	0 = solder type (no connector)
	1 = AMP Modu I/ 4 poles connector
	(mating connector kit included)

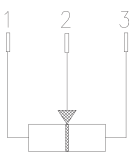
Center / bi-directional switches (electromechanical type)

• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1.5 A/inductive
• Neutral position switch threashold angle:	+4°
• Protection class:	IP 55

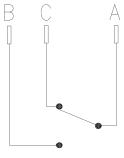
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 50% Vin	S = 90% Vin
3-pin potentiometer	A	D
3-pin pot & center switch	B	E (Std)
3-pin pot & bi-directional switch	C	F

ELECTRICAL CONNECTIONS

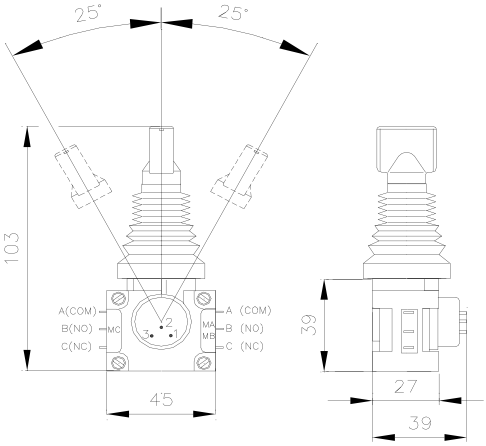


Potentiometer



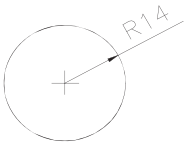
Same schematic for MA, MB (bi-directional switches) or MC (center switch)

OVERALL DIMENSIONS

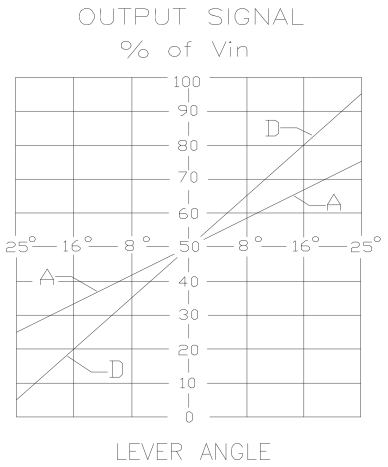


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



3-pins potentiometer configuration

*>> **ORDERING INFORMATION:** see page 4*

FTC-L2S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional.
- 4-pins rotary potentiometer.
- Optional center / power-off or bi-directional switches.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	± 25° ±1°
• Electrical angle:	± 25° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class:	IP 65 (above panel)
• Life:	3 million cycles

ELECTRICAL SPECIFICATIONS

3-pins rotary potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Ohmic resistance: / G = 40% of Vin	1 kΩ ± 20%
/ L = 100% of Vin	5 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 2 (signal):	50 kΩ
• Max. operating current on pin 2:	1 mA
• Output voltage:	see graph
• Linearity (resistive track):	2% or better
• Connection type:	0 = solder type (no connector) 1 = AMP Modu I/ 4 poles connector (mating connector kit included)

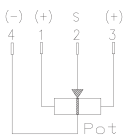
Center / bi-directional switches (electromechanical type)

• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1.5 A/inductive
• Neutral position switch threashold angle:	+4°
• Protection class:	IP 55 (IP 67 available on request)

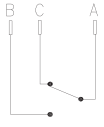
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 40% Vin	S = 100% Vin
4-pin potentiometer	G	L
4-pin pot & center switch	H	M
4-pin pot & bi-directional switchs	I	N (Std)
4-pin pot & bi-dir. switchs & center switch	None	X

ELECTRICAL CONNECTIONS

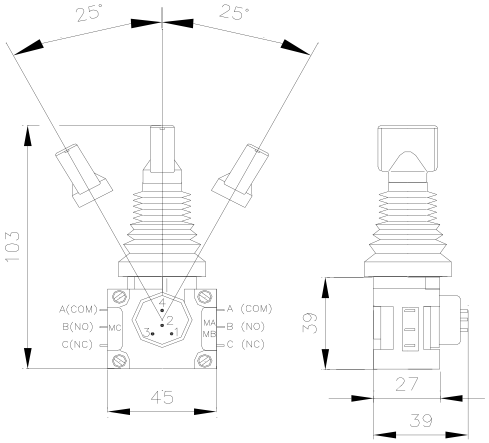


Potentiometer



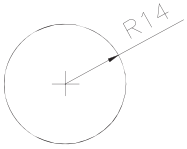
Same schematic for MA, MB (bi-directional switches) or MC (center switch)

OVERALL DIMENSIONS

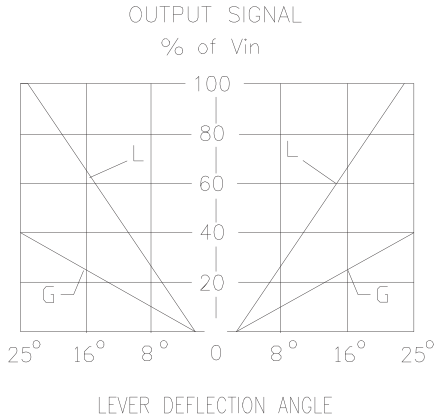


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



4-pins potentiometer configuration

>> ***ORDERING INFORMATION:*** *see page 4*

FTH-L1S *Contactless Fingertip Proportional Control Lever*

FEATURES

- Single axis / uni-directiional.
- Contactless, hall effect sensor.
- Optional “out of neutral” switch.
- Optional dual sensor (redundant).

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	50° ±1°
• Electrical angle:	50° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class:	IP 67
• Life:	> 3 million cycles (without switch)
• Connector:	molex CGRID/SL, 7 male pins

ELECTRICAL SPECIFICATIONS

Linear, hall-effect sensor

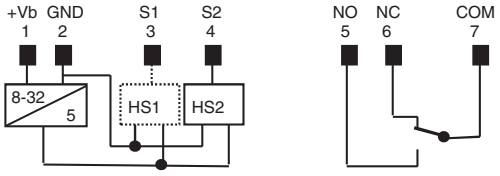
• Power supply voltage:	8 ÷ 32 vdc
• Current consumption:	< 15 mA (30 mA with 2 sensors)
• Output signal in neutral:	< 0.1 V
• Output signal range:	0.5 V ÷ 4.5 V
• Tolerance on output signal:	±0.1 V
• Linearity:	< 2%
• Max. output current:	1 mA
• Directional switch operating voltage:	< 48 vdc
• Directional switch max. current:	1 A

Neutral position switch (electromechanical type)

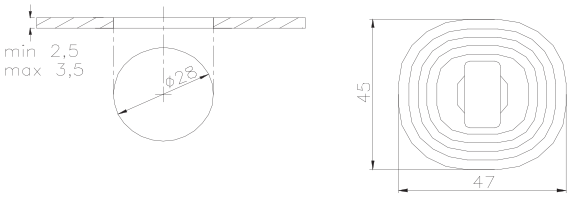
• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1 A
• Neutral position switch threashold angle:	7°
• Protection class:	IP 67

ELECTRICAL CONNECTIONS

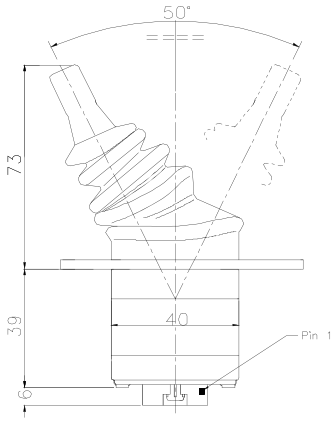
(HS1: optional)



PANEL CUT-OUT AND MOUNTING

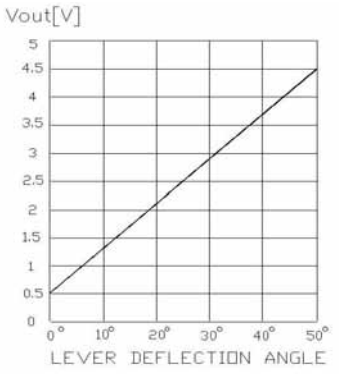


OVERALL DIMENSIONS

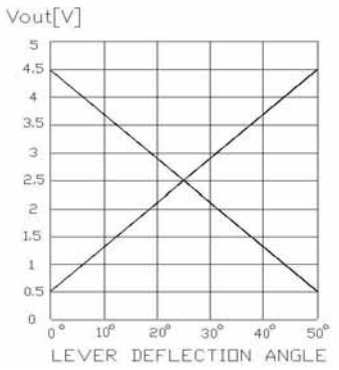


OUTPUT SIGNAL CONTROL CHARACTERISTIC

FTH-L1S / SN (single channel)



FTH-L1S / TW (dual channel)



*>> **ORDERING INFORMATION:** see page 5*

FTH-L2S *Contactless Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional.
- Contactless, hall effect sensor.
- Optional “out of neutral” switch.
- Optional dual sensor (redundant).

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±25° ±1°
• Electrical angle:	±25° ±1°
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 67
• Life:	> 3 million cycles (without switch)
• Connector:	molex CGRID/SL, 7 male pins

ELECTRICAL SPECIFICATIONS

Linear, hall-effect sensor

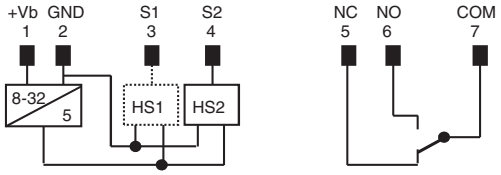
• Power supply voltage:	8 ÷ 32 vdc
• Current consumption:	< 15 mA (30 mA with 2 sensors)
• Output signal in neutral:	2.50 V ±0.1 V
• Output signal range:	0.5 V ÷ 4.5 V
• Tolerance on output signal:	±0.1 V
• Linearity:	< 2%
• Max. output current:	1 mA
• Directional switch operating voltage:	< 48 vdc
• Directional switch max. current:	1 A

Neutral position switch (electromechanical type)

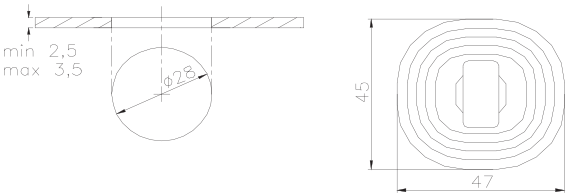
• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1 A
• Neutral position switch threashold angle:	7°
• Protection class:	IP 67

ELECTRICAL CONNECTIONS

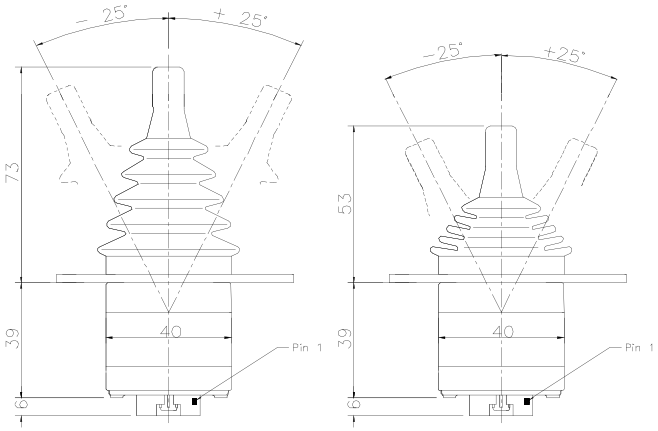
(HS1: optional)



PANEL CUT-OUT AND MOUNTING



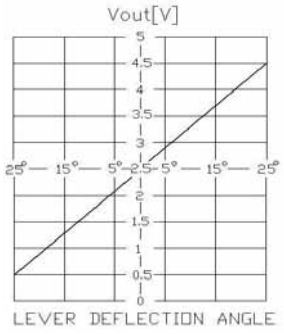
OVERALL DIMENSIONS



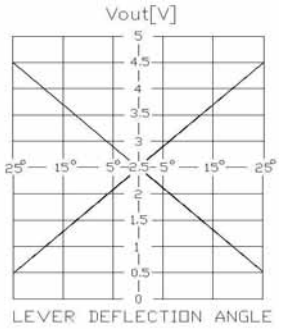
Paddle type high ***Paddle type low***

OUTPUT SIGNAL CONTROL CHARACTERISTIC

FTH-L2S / SN (single channel)



FTH-L2S / TW (dual channel)



*>> **ORDERING INFORMATION:** see page 5*

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JLP-L2S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional, panel mounting style.
- 3 & 4-pins potentiometer configuration.
- Bi-directional switches.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±32° ±1°
• Electrical angle:	±30° ±1°
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 (above panel)
• Life:	3 million cycles
• Fixing screws included:	2 - M4x16

ELECTRICAL SPECIFICATIONS

Potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Ohmic resistance: / A = 50% of Vin	8 kΩ ±20%
/ Q = 80% of Vin	5 kΩ ±20%
/ R = 100% of Vin	4 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 5 (signal):	50 kΩ
• Max. operating current on pin 5:	1 mA
• Output voltage:	see graph
• Linearity (resistive track):	2% or better

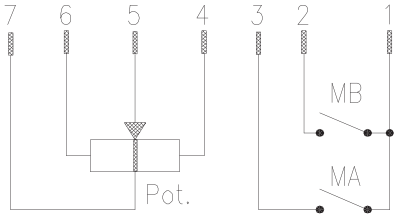
Directional switches

• Typical track resistance:	150 Ohm
• Max. operating input voltage:	48 V or ±24 V
• Min. load impedance on pins 2&3:	50 kΩ
• Max. operating current on pins 2&3:	1 mA
• Directional switches threashold angle:	±4°
• Connector type: Mod. D Dubox	P.N. 76382.407 wiring
Mod. G Molex	C-Grid P.N. 50-57-9407

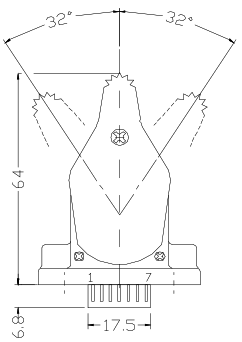
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes		
Output signal	S = 80% Vin	S = 100% Vin	S = 50% Vin
3-4 pins pot & bi-dir. switch	Q	R	C

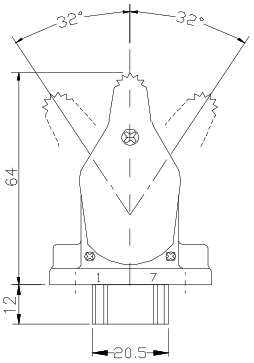
ELECTRICAL CONNECTIONS



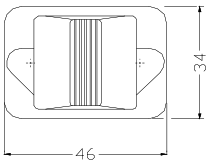
OVERALL DIMENSIONS



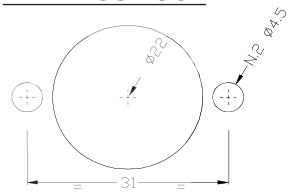
Mod. D Dubox



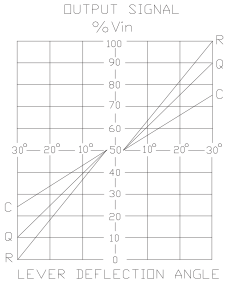
Mod. G Molex



PANEL CUT-OUT

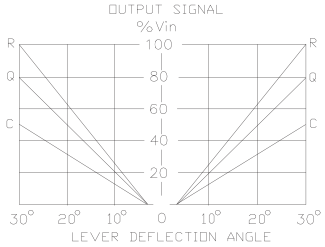


OUTPUT SIGNAL CONTROL CHARACTERISTIC



4	(+)
5	Signal
6	(-)
7	NC

3-pins configuration wiring



4	(+)
5	Signal
6	(+)
7	(-)

4-pins configuration wiring

*>> **ORDERING INFORMATION:** see page 6*

JLP-L2S Twin Channel *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional, panel mounting style.
- Twin channel potentiometer joystick.
- Redundancy on the 100% of the stroke.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±32° ±1°
• Electrical angle:	±30° ±1°
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 (above panel)
• Life:	3 million cycles
• Fixing screws included:	2 - M4x16

ELECTRICAL SPECIFICATIONS

Potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Total resistance between pin 1 and 3:	2 kΩ ±20%
• Nominal voltage supply (Vin):	10 V
• Tolerance between track 1 and 2:	± 4% of Vcc
• Output voltage:	see graph
• Load resistance:	100 kΩ - nominal 50 kΩ - minimum
• Linearity (resistive track):	2% or better

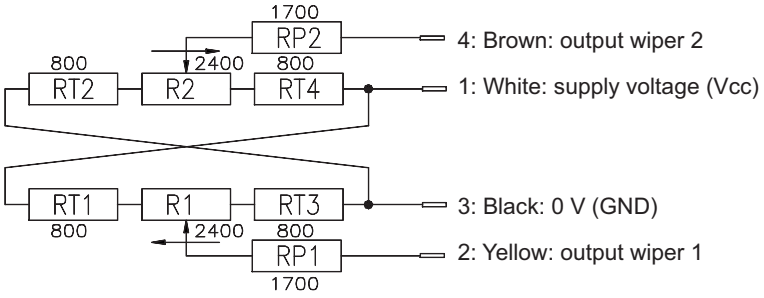
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 60% Vin	
3 pins potentiometer	V	

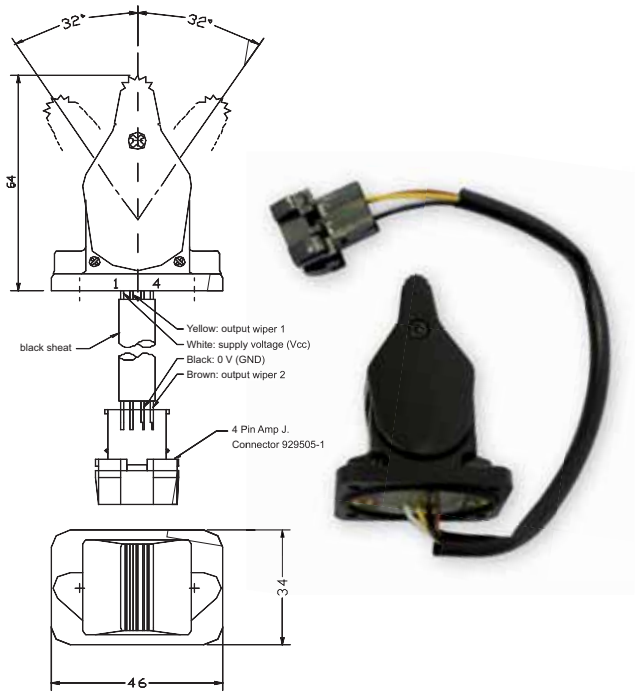
• Connector type:	AMP JPT P.N. 929505-1

ELECTRICAL CONNECTIONS

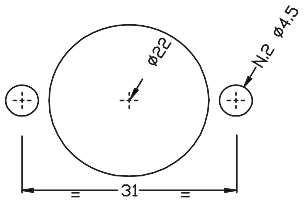
(pinout)



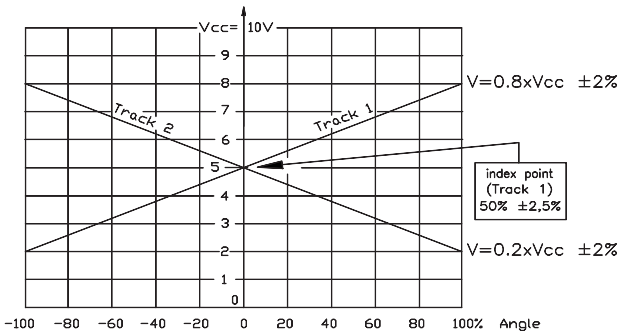
OVERALL DIMENSIONS



PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



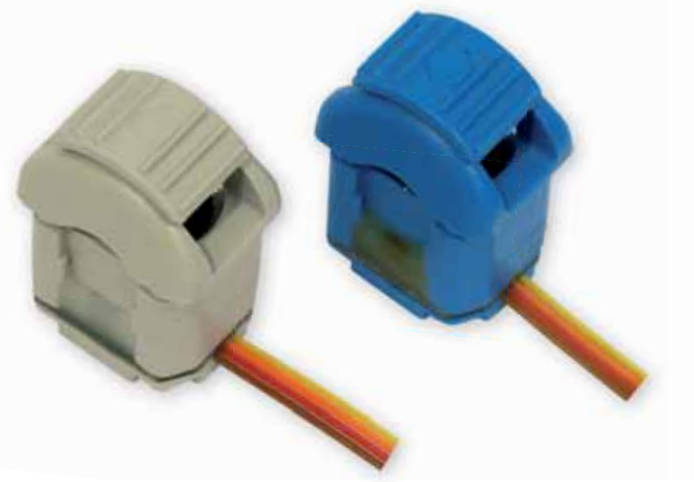
*>> **ORDERING INFORMATION:** see page 6*

Via Malavolti, 36 - 41122 Modena - Italy - Phone +39 059/254895 - Fax +39 059/253512 - www.tecnord.com - mail: tecnord@tecnord.com

FPR *Proportional Roller Switch with Hall Effect Sensor*

FEATURES

- Mini proportional roller switch with optimum ergonomic design for panel-mounting.
- High performance hall effect sensor circuitry.
- Twin channel configuration for redundancy.



MECHANICAL SPECIFICATIONS

• Rotation angle:	±30°
• Body material:	acetal resin / teflon compound
• Colours available:	yellow, grey, blue, green
• Rubber gaiter material:	EPDM / 35-45 shore - A
• Operating temperature range:	-25°C / +85°C
• Environmental protection:	IP 68 (above panel)
• Life:	> 5.000.000 cycles

ELECTRICAL SPECIFICATIONS

• Signal output @ rest:	2.5 vdc ±0.1 V	
• Supply voltage:	H - Version = 8 ÷ 32 vdc	
	0 - Version = 5 vdc ±5%	
• Full output signal range:	0.5 - 4.5 V, ±0.2 V	
• Current consumption at rest:	SNCH (S1 only)	15 mA
	TWCH (S1/S2)	25 mA
• Rated output current:	1 mA	
• Connection type: flying leads:	coloured flat cable 100 mm	
connector:	molex Minifit 4 poles P.N. 5559-4P	
connector:	Deutsch 3 poles P.N. DTO4-3P	

ELECTRICAL CONNECTIONS

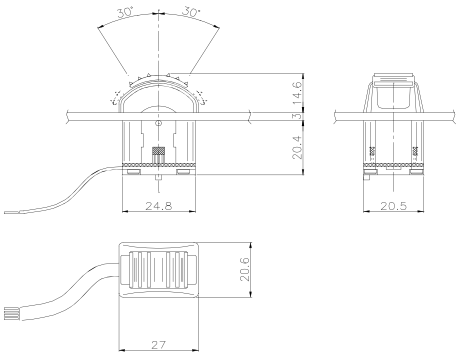
FPR - L2S - SNCH (single chan.)

(1) Yellow:	+5 vdc
(2) Orange:	(-) ground
(3) Red:	output 1 (S1)
(4) Brown:	not used

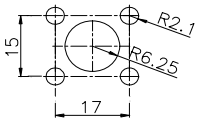
FPR - L2S - TWCH (twin chan.)

(1) Yellow:	+ 5 vdc
(2) Orange:	(-) ground
(3) Red:	output 1 (S1)
(4) Brown:	output 1 (S2)

OVERALL DIMENSIONS

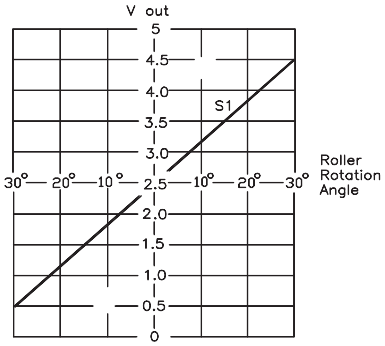


PANEL CUT-OUT

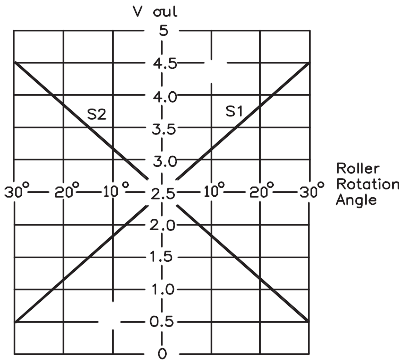


OUTPUT SIGNAL CONTROL CHARACTERISTIC

FPR - L2S - SNCH (single channel)



FPR - L2S - TWCH (twin channel)



*>> **ORDERING INFORMATION:** see page 7*

FPR-PWM *Proportional Roller Switch with PWM Driver*

FEATURES

- Mini proportional roller switch with optimum ergonomic design for panel-mounting.
- High performance hall effect sensor circuitry.
- PWM electronic driver integrated into the roller for remote control of a dual-coil proportional solenoid valve.

MECHANICAL SPECIFICATIONS

• Rotation angle:	±30°
• Main body material:	acetal resin / teflon compound
• Colours available:	yellow, grey, blue
• Rubber gaiter material:	EPDM / 35-45 shore - A
• Operating temperature range:	-25°C / +85°C
• Environmental protection:	IP 68 (above panel)
• Life:	> 5.000.000 cycles

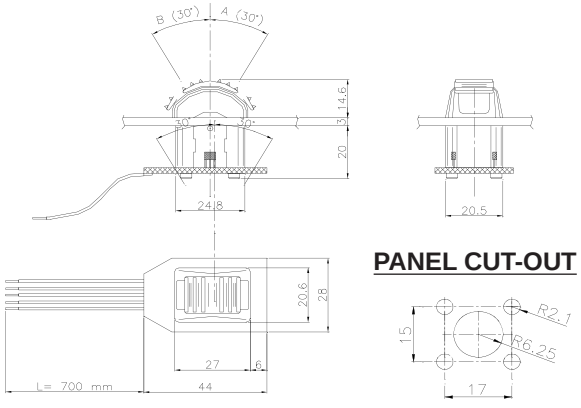
ELECTRICAL SPECIFICATIONS

• Supply voltage:		8 ÷ 32 vdc
• Current consumption with no load:		100 mA
• PWM dither frequency:		100 Hz
• Connection type:	flying leads:	GLX 0.5 sqmm
	connector:	molex minifit 6 poles P.N. 5559-6P
• Wire lenght:		700 mm
• Current output range (PWM):		100 ÷ 1500 mA @ 12 vdc

ELECTRICAL CONNECTIONS

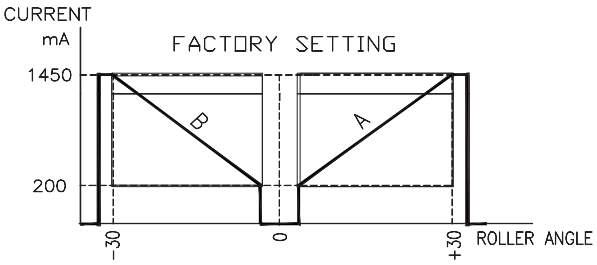
(1) Red:	+Battery
(2) Black:	-Battery (GND)
(3) Orange:	PWM Valve A+
(4) Gray:	PWM Valve B+
(5) White:	PWM A- / B- (common)
(6)	not used

OVERALL DIMENSIONS



PANEL CUT-OUT

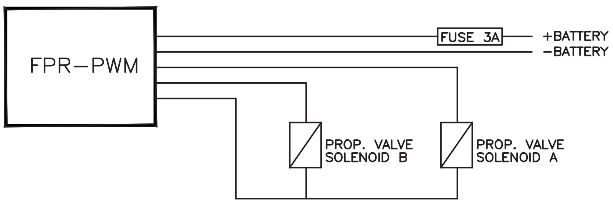
PWM OUTPUT CHARACTERISTIC EXAMPLE



The following values are factory set:

- Imin (minimum output current)
- Imax (maximum output current)
- Dither

APPLICATION EXAMPLE



Ordering code: 23.0409.160

(Imin = 200mA, Imax = 1500mA, PWM = 100Hz)

*>> **ORDERING INFORMATION:** see page 7*

PRS *Proportional Rocker Switch*

FEATURES

- Optimum ergonomic design for panel-mounting.
- 3 & 4 pins potentiometer configuration.
- Bi-directional switches.
- High performance resistive track.

MECHANICAL SPECIFICATIONS

• Rotation angle:	±20°
• Main body material:	acetal resin / teflon compound
• Rubber gaiter material (black colour):	EPDM / 35-45 shore - A
• Operating temperature range:	-25°C / +85°C
• Environmental protection:	IP 66 (above panel)
• Life:	> 1.000.000 cycles

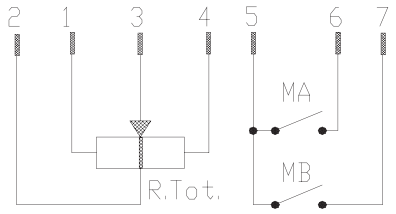
ELECTRICAL SPECIFICATIONS

• Potentiometer configuration:	3 & 4 pins w/bi-dir. switches
• Electrical power rating:	0.5 W @ 25°C
• Ohmic resistance:	5 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 5 (signal):	50 kΩ
• Rated output current:	1 mA
• Min resistive load on bi-dir. switched outputs:	50 kΩ
• Output voltage:	see graph
• Linearity (resistive track):	2% or better
• Prewired exit cable:	250 mm

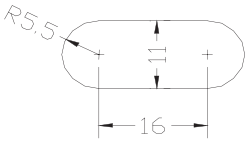
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 75% Vin	S = 100% Vin
3-4-pins pot & bi-directional switchs	P	T

ELECTRICAL CONNECTIONS

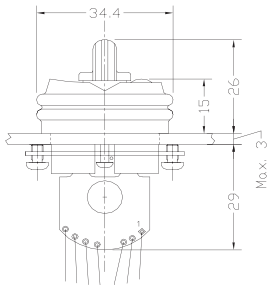


P & T version
3 & 4 pins configuration

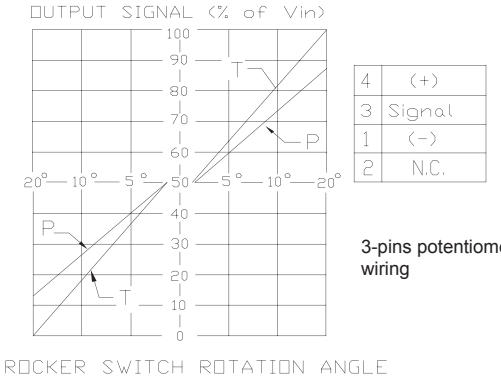


PANEL CUT-OUT

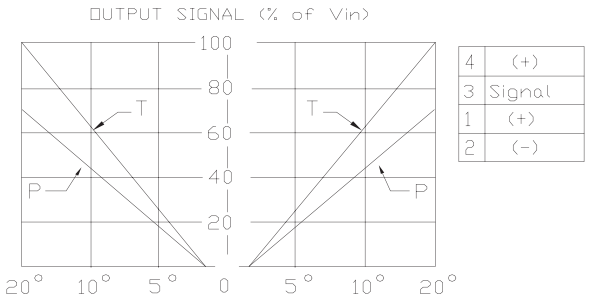
OVERALL DIMENSIONS



OUTPUT SIGNAL CONTROL CHARACTERISTIC



3-pins potentiometer wiring



4 pins configuration wiring

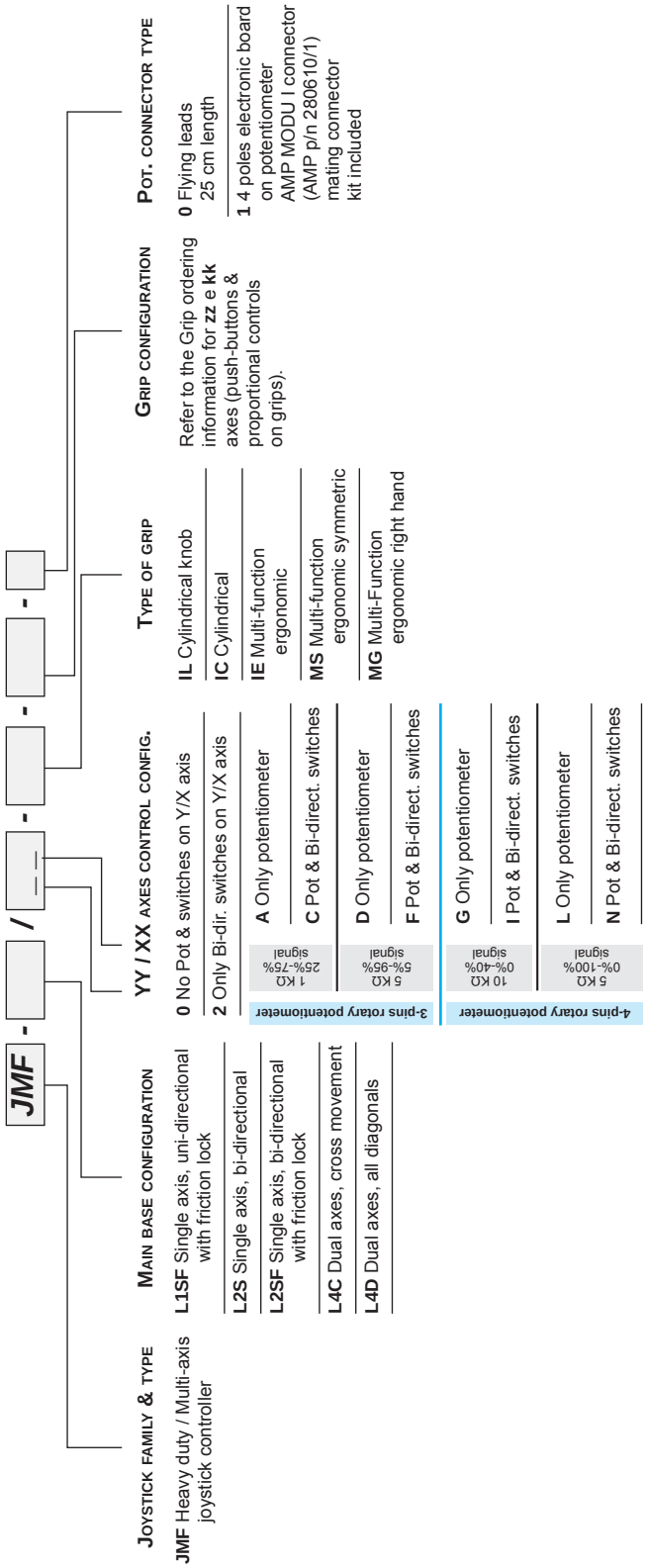
*>> **ORDERING INFORMATION:** see page 7*

Heavy Duty Multi-Axis Joysticks

Description	Ordering information page	Technical information page
JMF Type (potentiometric joystick body)	**20**	**22**
JHM Type (hall effect joystick body)	**21**	**26**

Note: 1) The joystick base does not include the grip.
2) The joystick base includes the rubber gaither.

JMF Heavy Duty Multi-Axis Joystick *Ordering Information*



JHM Heavy Duty Multi-Axis Joystick *Ordering nformation*

JHM - ____ / ____ - ____ / ____ - ____

Joystick family & type	Main base configuration	YY / XX axes control config.	Type of grip	Grip Configuration	Pot. connector type
JHM Heavy duty / Multi-axis hall effect type joystick controller	**L2S** Single axis, bi-directional	**ANL** Analog signal 0.5>2.5>4.5 VDC power supply range = 5 VDC ±5%	**IL** Cylindrical knob	Refer to the grip ordering information for **zz e kk** axes (push-buttons & proportional controls on grips).	**3** Flying leads 25 cm length
	L4C Dual axes, cross movement	**ANH** Analog signal 0.5>2.5>4.5 VDC power supply range = 8-32 VDC	**IC** Cylindrical		**4** Male connector, 12 poles, Deutsch DT04-12P, 15 cm cable length
	L4D Dual axes, all diagonals	**AVS** Center tap output signal with digital directional signals	**IE** Multi-function ergonomic		**5** Male connector, 4 poles, Deutsch DT04 4P, 15 cm cable length (for CANbus version only)
		TCN 1 PWM ouput in combination with up to 4 on-off channels	**MS** Multi-function ergonomic symmetric		
		PWM Pulse with modulation current output factory preset or set via PC	**MG** Multi-function ergonomic right hand		
		MLT adjustable output signal for closed loop prop. actuators			
		CAN CANbus version for connection to CANbus line J1939 protocol			

JMF *Heavy Duty Multi-Axis Potentiometric Joystick (joystick base only)*

FEATURES

The JMF potentiometeric joystick controller has been designed for use in mobile and industrial field application. The potentiometer in use, available with 3 or 4-pins configuration, grants precision and a long working life. When coupled with an **M** range of ergonomic multi-function handles, up to 5 proportional axes and 9 on-off push buttons can be integrated in the same joystick. Power directional switches are available.

MECHANICAL SPECIFICATIONS

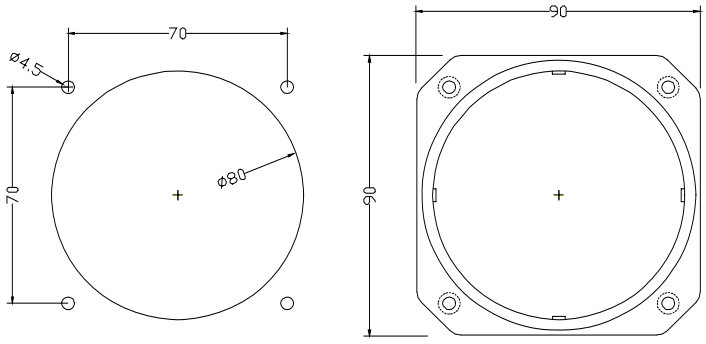
• Lever deflection angle:	±25° ±1°
• Electrical angle:	±25° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class (above panel):	up to IP 67, depending on grip
• Life:	3 million cycles

POTENTIOMETER & SWITCHES OPTIONS (Y-Y and X-X Axis)

	Reference codes	
Output signal	S = 50% Vin	S = 90% Vin
3-pins pot	A	D
3-pins pot & bi-directional switchs	C	F (Std)

	Reference codes	
Output signal	S = 40% Vin	S = 100% Vin
4-pins pot	G	L
4-pins pot & bi-directional switchs	I	N (Std)

PANEL CUT-OUT AND MOUNTING



AVAILABLE JOYSTICK MOVEMENTS

***Option L1S**	Single axis control / Uni-directional
***Option L2S**	Single axis control / Bi-directional
Option L4C	Cross axis control / Bi-directional
Option L4D	Multi axis control / Bi-directional

** friction lock option available for L1S and L2S*

Shown with IC grip

JMF *Heavy Duty Multi-Axis Potentiometric Joystick (joystick base only)*

ELECTRICAL SPECIFICATIONS

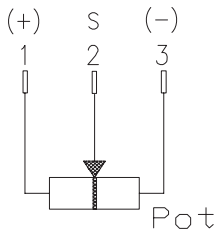
Directional switches (electromechanical type)

• Contacts:	silver plated
• Max. operating input voltage:	125/250 Vac
• Max. operating current:	16 A (5 A on request)*
• Pot. connector type:	0 = None (solder type) 1 = AMP Modu I/4 poles
• Neutral position switch threashold angle:	±10° (±5° on request)*
• Protection class:	IP 55 (specials available on request)

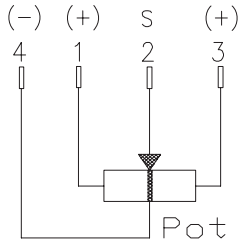
Rotary potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Ohmic resistance: / A = 50% of Vin (3-pins version) / D = 90% of Vin	1 kΩ ±20% 5 kΩ ±20%
• Ohmic resistance: / G = 40% of Vin (4-pins version) / L = 100% of Vin	10 kΩ ±20% 5 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 2 (signal):	50 kΩ
• Max. operating current on pin 2:	1 mA
• Output voltage:	see graphs
• Linearity (resistive track):	2% or better
• Protection class:	IP 67

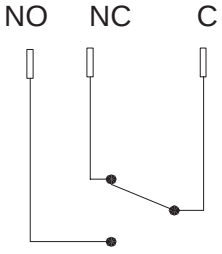
ELECTRICAL CONNECTIONS (for solder type connector)



3-pins potentiometer

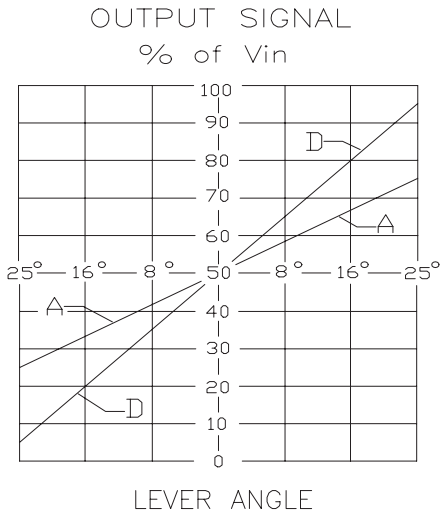


4-pins potentiometer

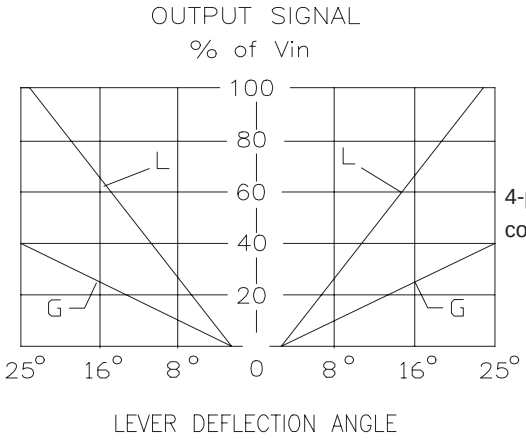


Directional switches
(see pinout on switch)

OUTPUT SIGNAL CONTROL CHARACTERISTICS



3-pins pot. configuration



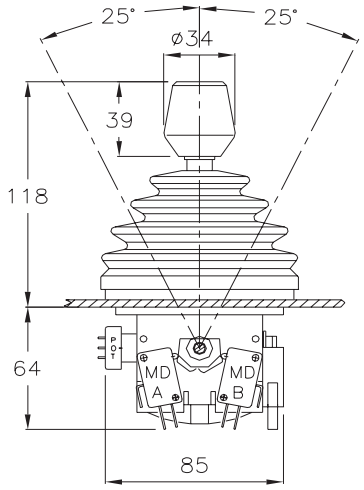
4-pins pot. configuration

>> ***AVAILABLE GRIPS:*** *see page 38*

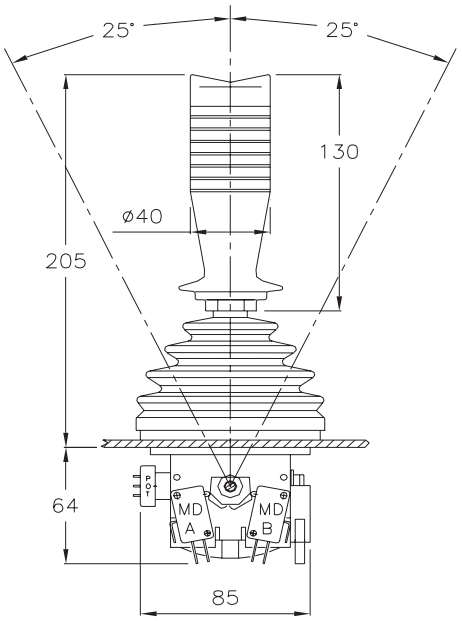
>> ***ORDERING INFORMATION:*** *see page 20*

JMF *Heavy Duty Multi-Axis Potentiometric Joystick*

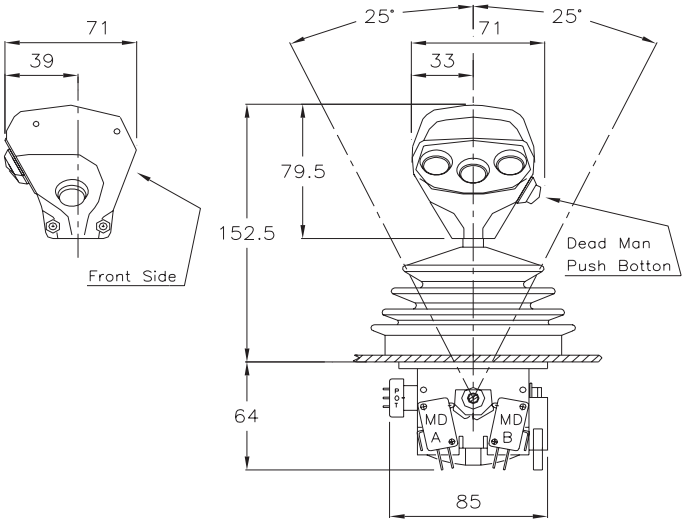
JMF joystick with grips - configuration examples with overall dimensions



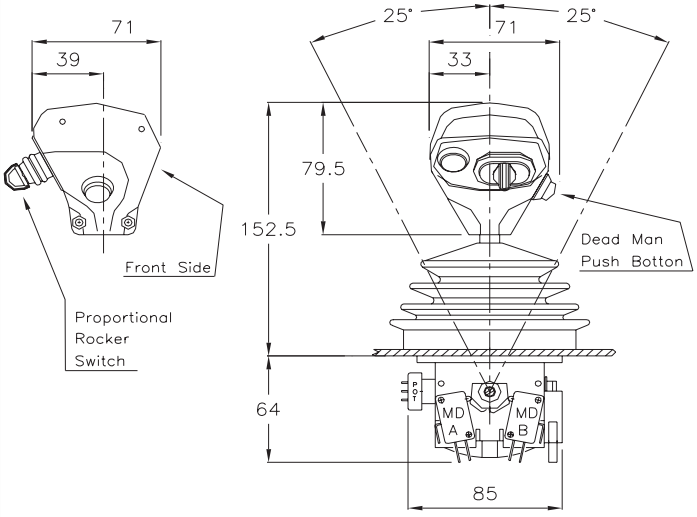
JMF base with IL handle
Complete code: **JMF-L4C/NN-IL 0000**



JMF base with IC handle
Complete code: **JMF-L4C/NN-IC 0200**



JMF base with IE type handle
Complete code: **JMF-L4C/NN-IE A3P9 0000**



JMF base with IE type handle
Complete code: **JMF-L4C/NN-IE A1P9 1PRS**

JMF *Heavy Duty Multi-Axis Potentiometric Joystick*

JMF joystick with grips - configuration examples with overall dimensions

JMF base with MS type handle
Complete code: **JMF-L4C/NN-MS A6P9 R3P9**

JMF base with MS type handle
Complete code: **JMF-L4C/NN-MS A2P9 2FPR R1P9**

JMF base with MG type handle
Complete code: **JMF-L4C/NN-MG A4P9 R1P9**

JMF base with MG type handle
Complete code: **JMF-L4C/NN-MG A2P9 1FPR R1P9**

JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

FEATURES

The JHM joystick controller has been designed for use in mobile and industrial Field applications. The use of the hall effect sensor, which eliminates any contact beetween moving electrical parts, improves overall resolution, precision and life. A complete line of built-in electronic drivers, generating on-off, proportional and CANbus control signals, guarantees the highest controllability of any type of electro-hydraulic system.
When coupled with an ergonomic multi-function handle of the **M** range, up to 5 proportional axes and 9 on-off push buttons can be integrated in the same joystick. As further option, the JHM is also available with a magnetic position detent on the Y - or X - axis.

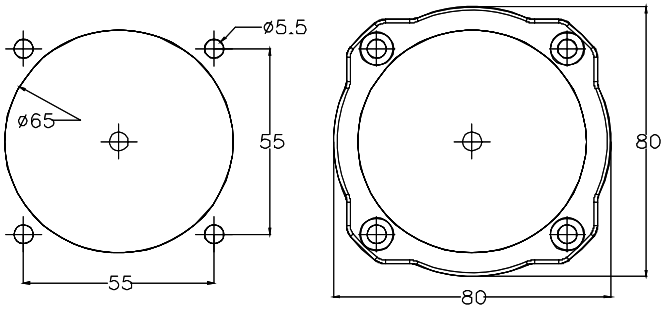
MECHANICAL SPECIFICATIONS

• Main body material:	aluminium
• Boot material:	NBR / Shore 50 - UV proof
• Lever deflection angle:	±22° ±1°
• Electrical angle:	±22° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class (above panel):	up to IP 67, depending on grip
• Life:	> 5 million cycles

ELECTRICAL SPECIFICATIONS

• Sensor:	hall effect contactless technology
• Supply voltage:	ANL version = 5 vdc ±5% other versions = 8 ÷ 32 vdc
• Current consumption @ rest:	25 mA (sensor only)
• Connector type:	Deutsch DT04-12P other types available on request
• Output signal configuration:	see next pages for all versions

PANEL CUT-OUT AND MOUNTING



AVAILABLE JOYSTICK MOVEMENTS

Option L2S	Single axis control / Bi-directional
Option L4C	Cross axis control / Bi-directional
Option L4D	Multi axis control / Bi-directional

Shown with MS grip

*>> **AVAILABLE GRIPS:** see page 38*

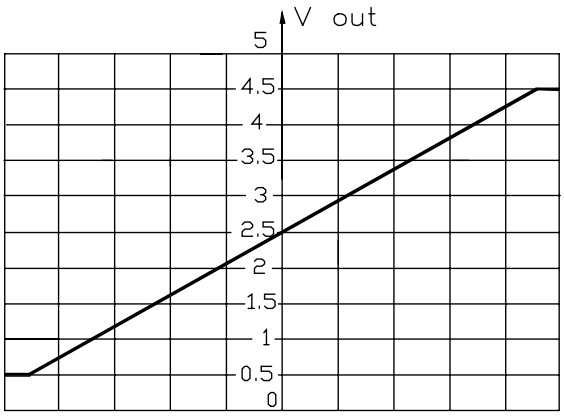
*>> **ORDERING INFORMATION:** see page 21*

JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

ANL & ANH VERSIONS
(basic version)

• Current consumption @ rest:	< 25 mA (sensor only)
• Supply voltage:	ANL - version = 5 vdc ±5% ANH - version = 8 ÷ 32 vdc
• Signal output @ rest:	2.5 vdc ±0.2 V
• Output signal range:	0.5 ÷ 4.5 V ±0.2 V (see graph)
• Rated output current:	1 mA
• Protections (ANH version):	overvoltage and reversed polarity

Output signal control characteristics



Lever deflection angle

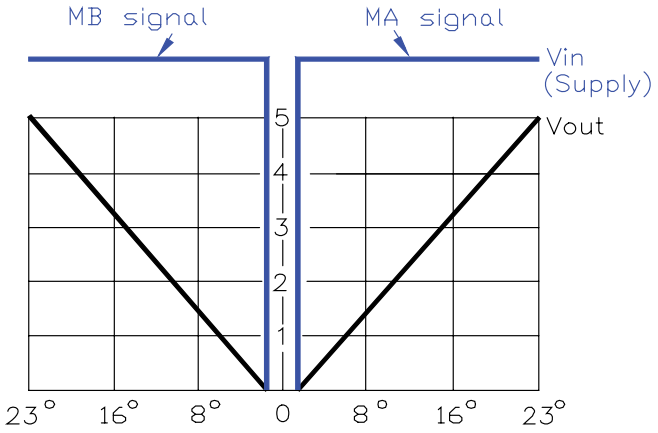
AVS VERSION
(center tap output signal with digital directional signals)

• Current consumption @ rest:	< 150 mA (without external load)
• Supply voltage (Vin):	8 ÷ 32 vdc
• Signal output @ rest:	0 V
• Output signal range:	0 ÷ 5 V ±0.2 V (see graph)
• Rated output current:	1 mA

(MA and MB signals on graph)

• Digital directional outputs on both axes:	0 / Vin (0.7 A max)
• Digital directional outputs switching angle:	between 2° and 5°

Output signal control characteristics



Lever deflection angle

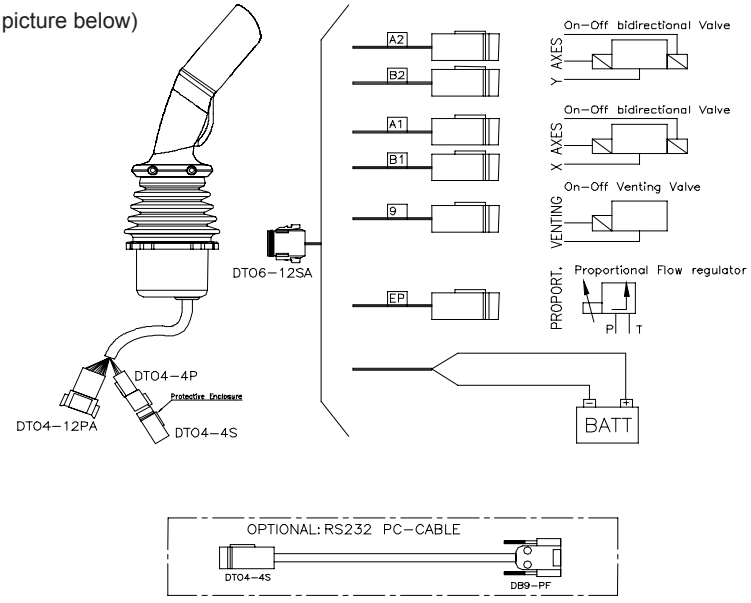
JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

TCN VERSION (1 PWM output in combination with up to 5 on-off outputs)

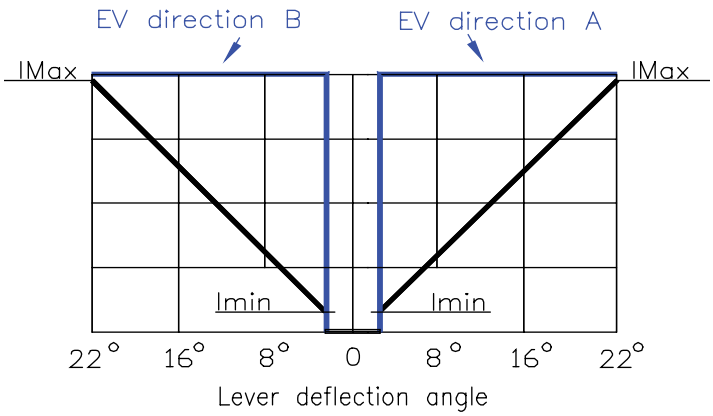
• Supply voltage:	8 ÷ 32 vdc
• Current consumption @ rest:	< 250 mA
• PWM output:	1 x single proportional solenoid valves
• Current output range (PWM):	100 to 1600 mA (3 A available on request)
• Dither frequency:	60 to 250 Hz (100 Hz factory preset)
• Adjustable ramp time:	0.05 to 5 s
• Power digital outputs:	5 (3.5 A)
• Adjustments:	via PC, RS232 serial line connection, using the Tecnord calibration and configuration tool (see picture below)

APPLICATION EXAMPLE

(shown with MS grip)



OUTPUT SIGNAL CONTROL CURVE



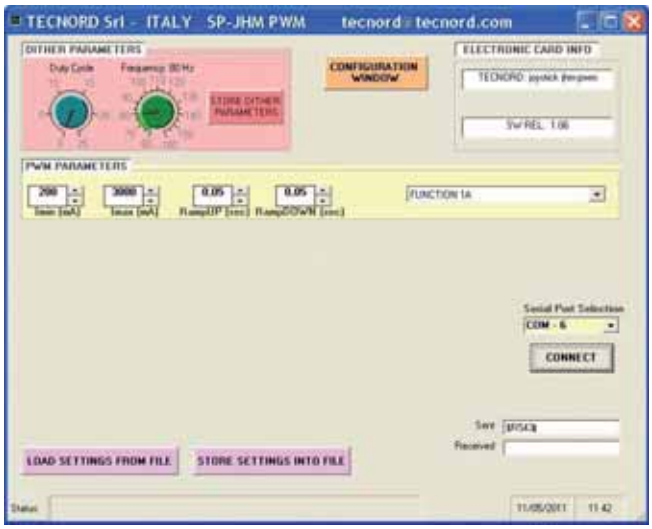
- Imin and digital outputs activation: between 2° and 5°

ADJUSTABLE PARAMETERS

The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool.

By use of the configuration window:
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:
- Operating parameters: Imin, Imax, Ramps.



WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

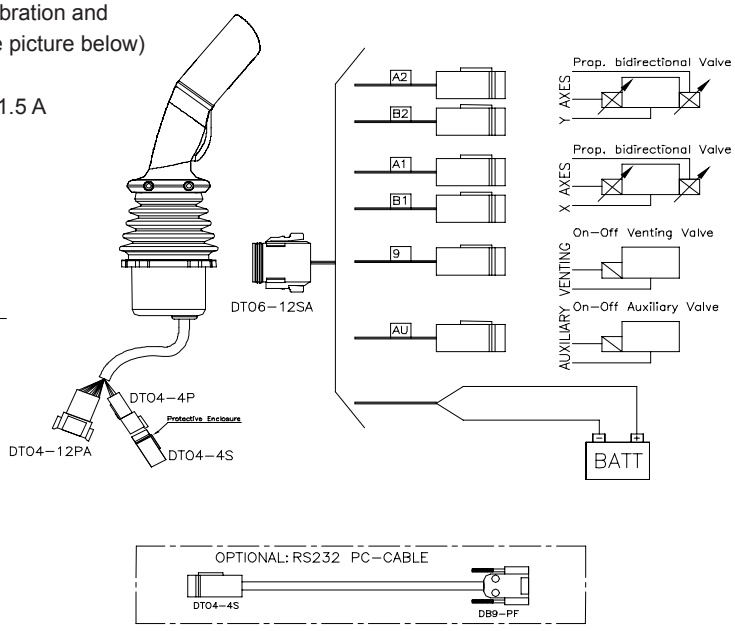
PWM VERSION (2 PWM output channels)

• Supply voltage:	8 ÷ 32 vdc
• Current consumption @ rest:	250 mA
• PWM output:	2 x dual proportional solenoid valves
• Current output range (PWM):	100 to 1600 mA (3 A available on request)
• Dither frequency:	60 to 250 Hz (100 Hz factory preset)
• Adjustable ramp time:	0.05 to 5 s
• Power digital outputs:	2 (3.5 A)
• Adjustments:	via PC, RS232 serial line connection, using the Tecnord calibration and configuration tool (see picture below)

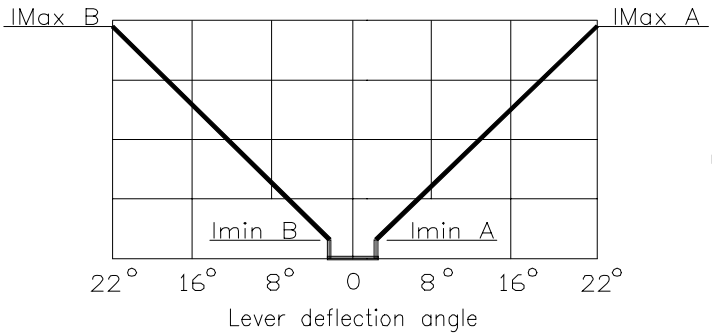
Notes: 1) 3rd axis available using FPR-PWM roller switch - Imax = 1.5 A
2) the base height is 60 mm instead of the standard 46 mm

APPLICATION EXAMPLE

(shown with MS grip)



OUTPUT SIGNAL CONTROL CURVE



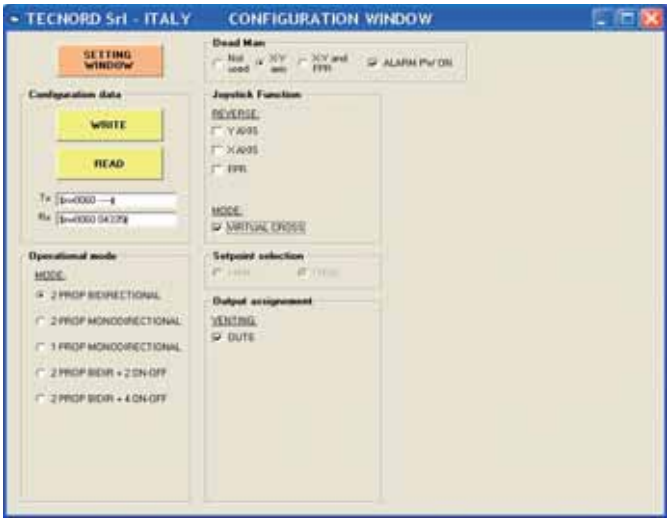
- Imin and venting valve activation: between 2° and 5°

ADJUSTABLE PARAMETERS

The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool.

By use of the configuration window:
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:
- Operating parameters: Imin, Imax, Ramps.

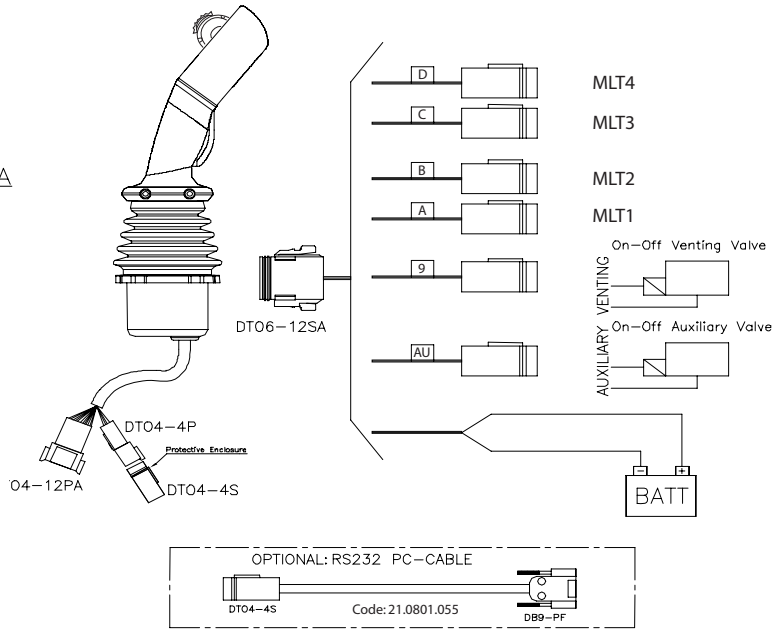


JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

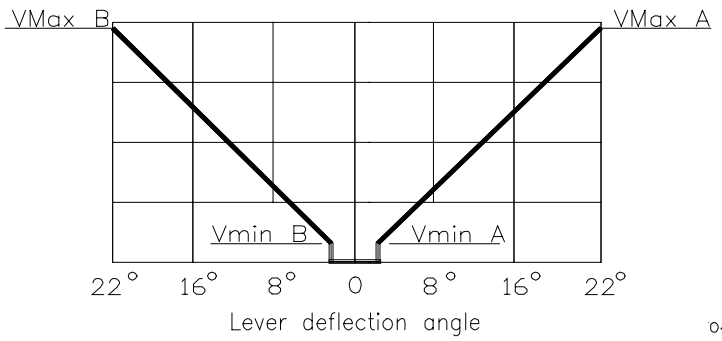
MLT VERSION (output adjustable signal for closed loop proportional actuators)

• Supply voltage:	8 ÷ 32 vdc
• Current consumption @ rest:	250 mA
• Analog outputs:	4
• Output signal range:	linear signal 0.9 ÷ 4.1 V 2 ÷ 6 V or ratiometric output available on request
• Rated output current:	15 mA
• Power digital outputs:	4 (0.7 A)
• Digital inputs available:	2
• Adjustments:	via RS232 serial line

APPLICATION EXAMPLE
(shown with MS grip)



OUTPUT SIGNAL CONTROL CURVE



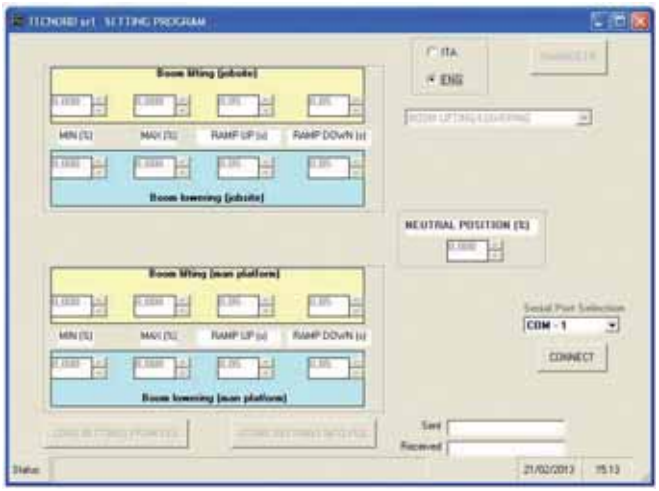
- Vmin and venting valve activation: between 2° and 5°

ADJUSTABLE PARAMETERS

The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool.

By use of the configuration window:
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:
- Operating parameters: Imin, Imax, Ramp up, Ramp down.



JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

CANBUS VERSION (with interface for CANbus line)

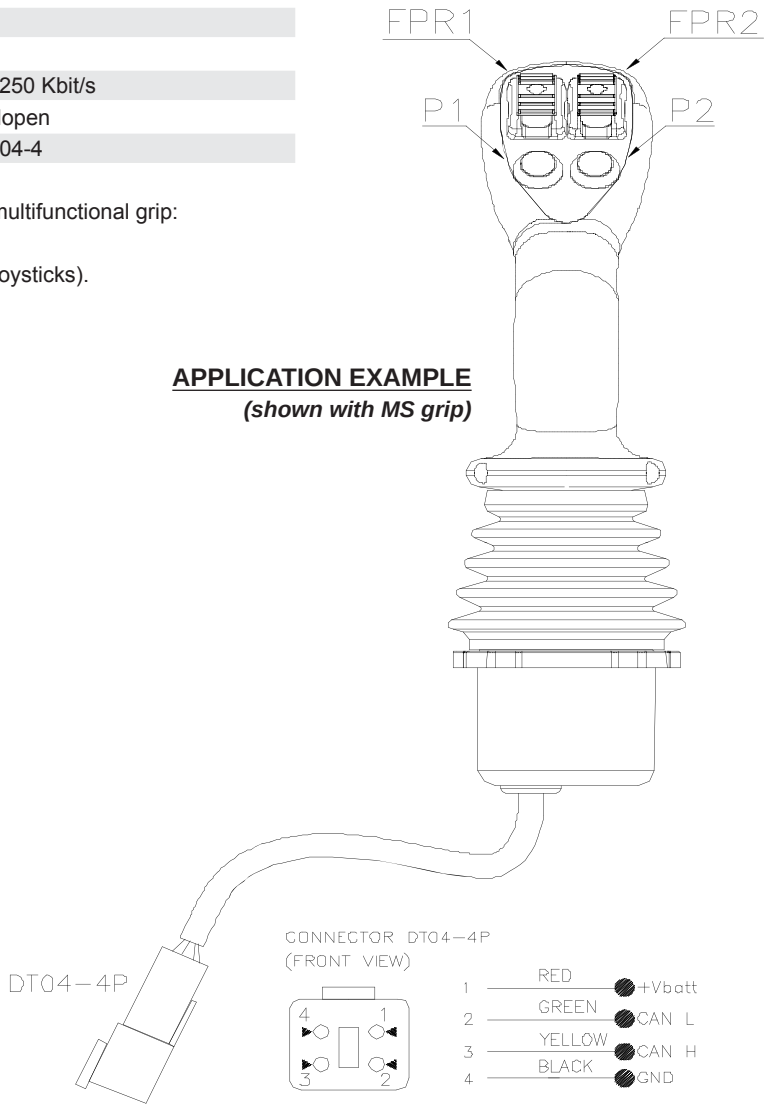
• Supply voltage:	8 ÷ 32 vdc
• Current consumption @ rest:	< 250 mA
• Physical layer:	ISO 11898, 250 Kbit/s
• Protocol:	J1939/ CANopen
• Connector type:	Deutsch DT04-4

With CANbus link, following signals can be managed on the multifunctional grip:

- 4 digital outputs 0.7A (LEDs, detent coils, buzzers, etc).
- 6 analog voltage input 0-5 V (proportional rollers and mini-joysticks).
- 6 digital inputs (push buttons, toggles, etc).

APPLICATION EXAMPLE

(shown with MS grip)



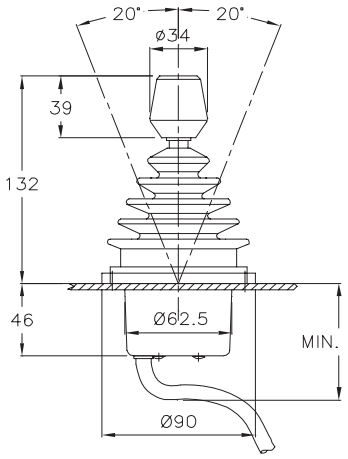
ADJUSTABLE PARAMETERS

The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool and an hardware interface device (see picture).
By use of the configuration window:

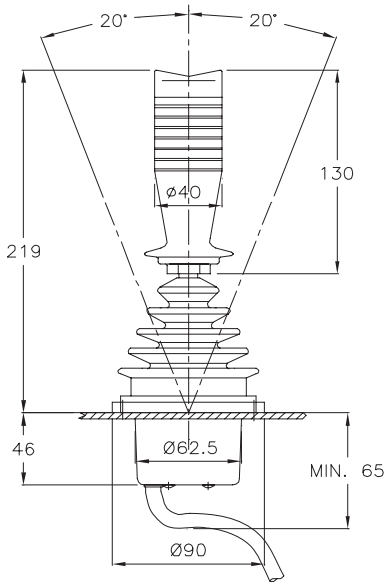
- Node ID

JHM Heavy Duty Multi-Axis Hall Effect Joystick

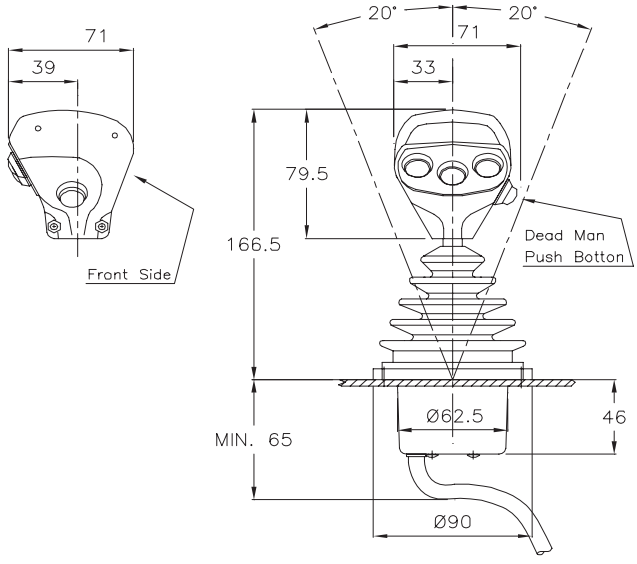
JHM joystick with grips - configuration examples with overall dimensions



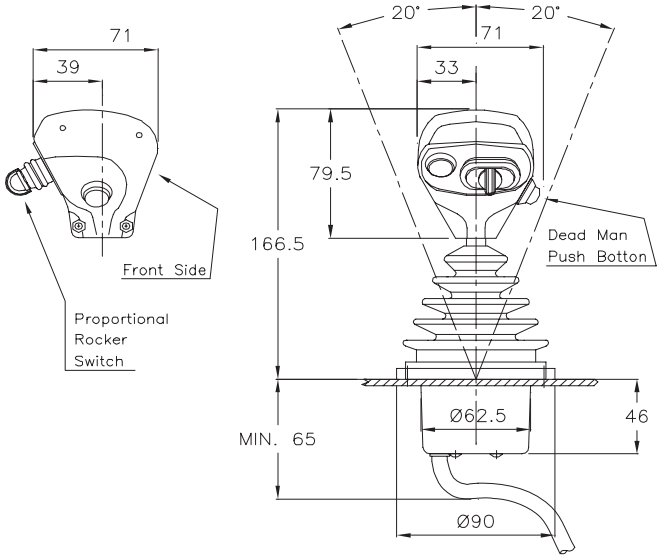
JHM base with IL handle
Complete code: **JHM-L4D/ANH-IL 0000**



JHM base with IC handle
Complete code: **JHM-L4D/ANH-IC 0200**



JHM base with IE type handle
Complete code: **JHM-L4D/ANH-IE A4P9 0000**



JMF base with IE type handle
Complete code: **JHM-L4D/ANH-IE A1P9 1PRS**

JHM *Heavy Duty Multi-Axis Hall Effect Joystick*

JHM joystick with grips - configuration examples with overall dimensions

JHM base with MS type handle
Complete code: **JHM L4D/ANH-MS A6P9 R3P9**

JHM base with MS type handle
Complete code: **JHM L4D/ANH-MS A2P9 2FPR R1P9**

JHM base with MG type handle
Complete code: **JHM L4D/ANH-MG A4P9 R1P9**

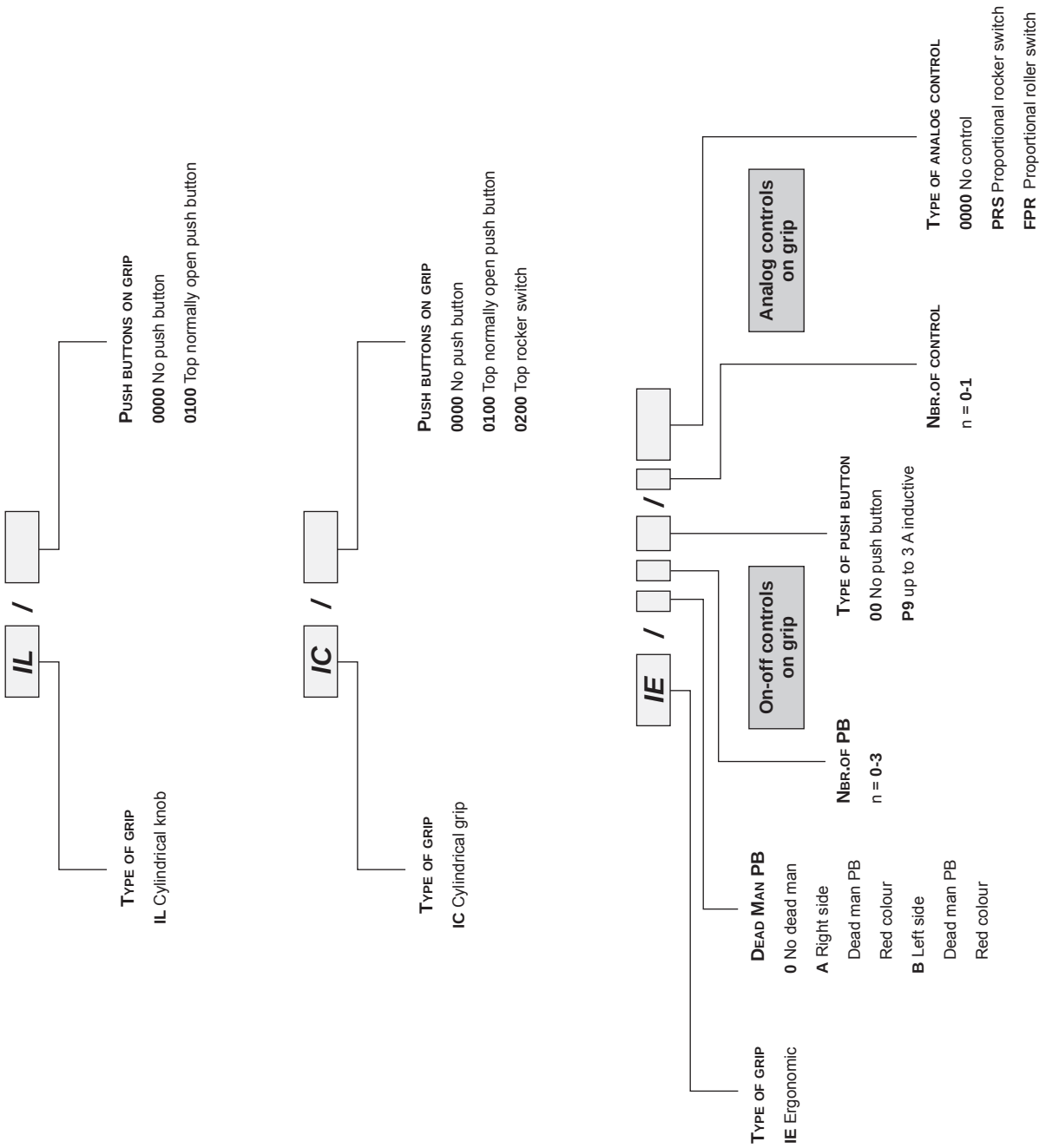
JHM base with MG type handle
Complete code: **JHM L4D/ANH-MG A2P9 1FPR 0000**

Ergonomic Grips

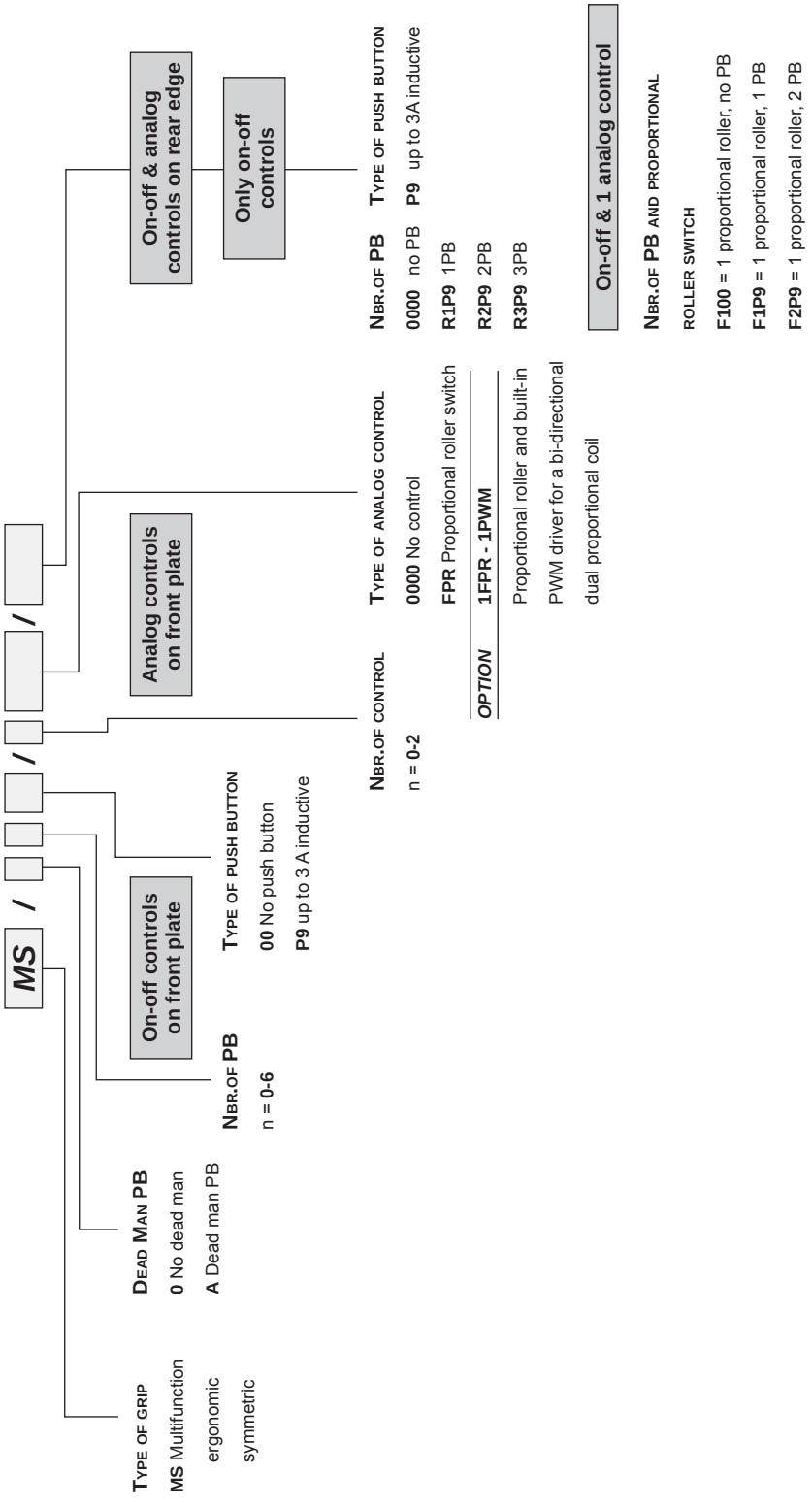
Description	Ordering information page	Technical information page
IL type (cylindrical knob)	**35**	**38**
IC type (cylindrical)	**35**	**38**
IE type (ergonomic, gear type, multi-functions)	**35**	**39**
MS type (ergonomic, symmetric, multi-functions)	**36**	**40**
MG type (ergonomic, right hand, multi-functions)	**37**	**43**

Note: 1) Ergonomic grips can be used as stand alone devices.
2) Grips do not include rubber gaiter and retainer ring, which must be ordered separately.

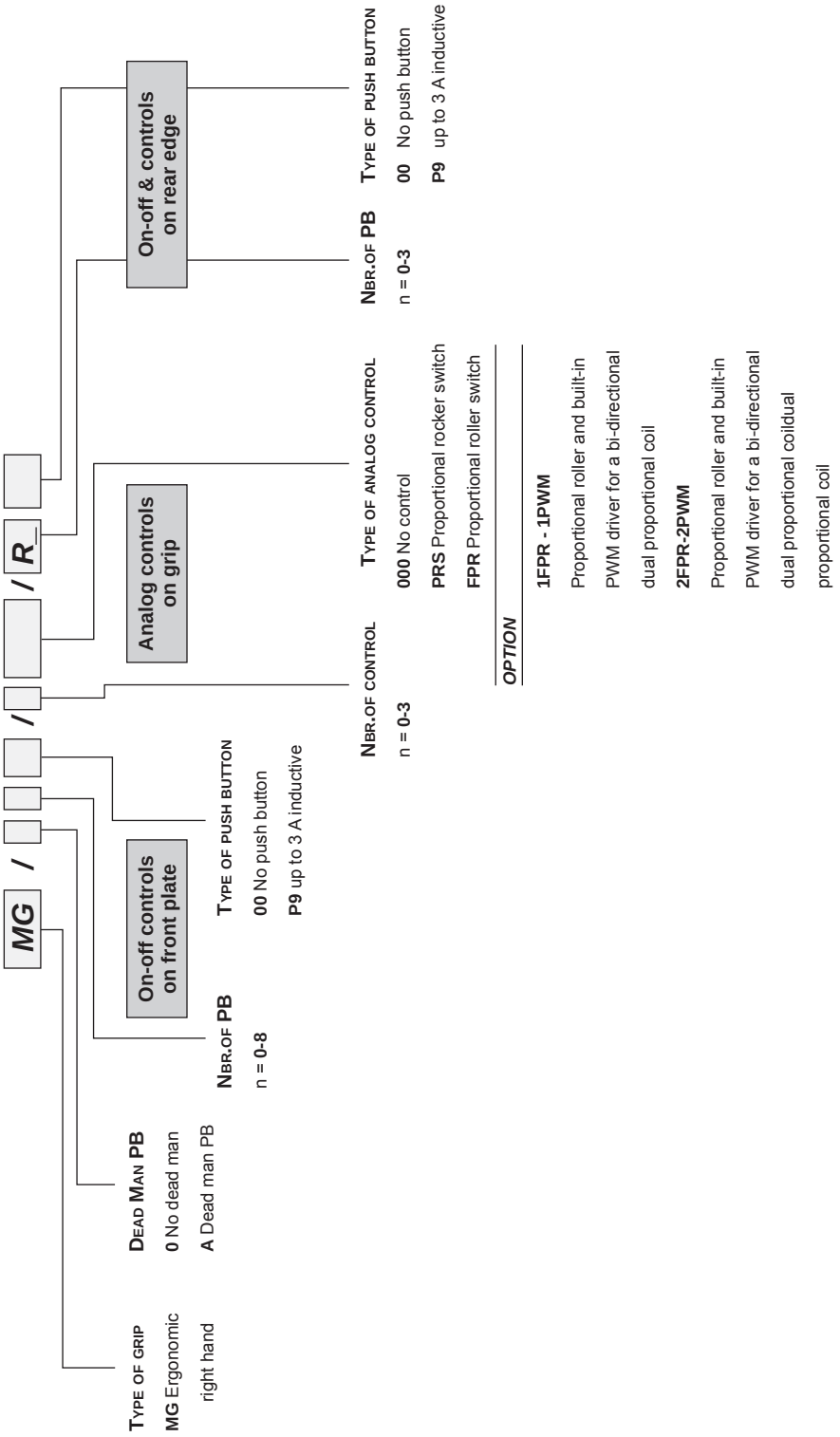
IL / IC / IE Grips *Ordering Information*



MS Ergonomic Symmetric Grip *Ordering Information*



MG Ergonomic Grip *Ordering Information*



IL - IC Grips

IL - CYLINDRICAL KNOB

MECHANICAL SPECIFICATIONS

• Body material:	bakelite
• Colour:	black
• Operating temperature range:	-20°C / +60°C
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
• Insulating cable material:	PVC

TOP PUSH BUTTON

• Rated amperage:	3 A inductive
• Life:	> 100.000 cycles
• Protection class:	IP 64

IC - CYLINDRICAL GRIP

MECHANICAL SPECIFICATIONS

• Body material:	nylon
• Bottom rubber material:	neoprene
• Colour:	black
• Operating temperature range:	-20°C / +60°C
• Connecting hub:	female thread / M14 x 1.5

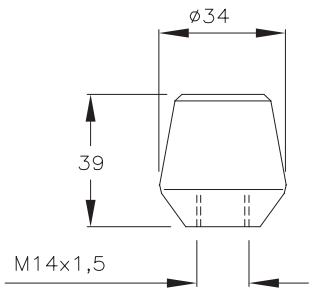
ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
• Insulating cable material:	PVC

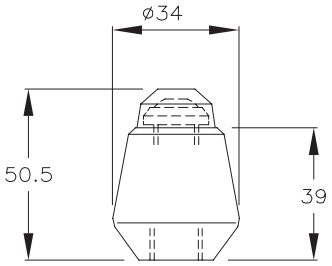
PUSH BUTTON AND ROCKER SWITCH

• Contacts:	silver plated
• Rated amperage:	16 A / 250 vac 3 A / 24 vdc
• Electrical life:	> 100.000 cycles
• Mechanical life:	> 3.000.000 cycles
• Protection class:	IP 54

OVERALL DIMENSIONS

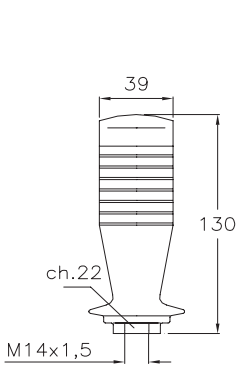


IL-0000
No push button

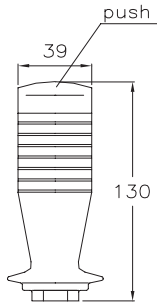


IL-0100
Top push button
(No circuit)

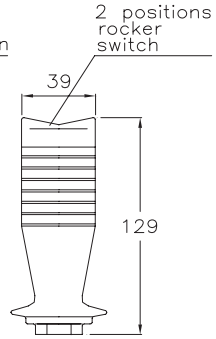
OVERALL DIMENSIONS



IC-0000
No push button



IC-0100
Top push button
(No circuit)



IC-0200
Top rocker switch

*>> **ORDERING INFORMATION:** see page 35*

IE Multi-Function Ergonomic Grip

MECHANICAL SPECIFICATIONS

• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Connecting hub:	female thread / M10 x 1.5
• Protection class:	IP 65 (plain grip)

ELECTRICAL SPECIFICATIONS

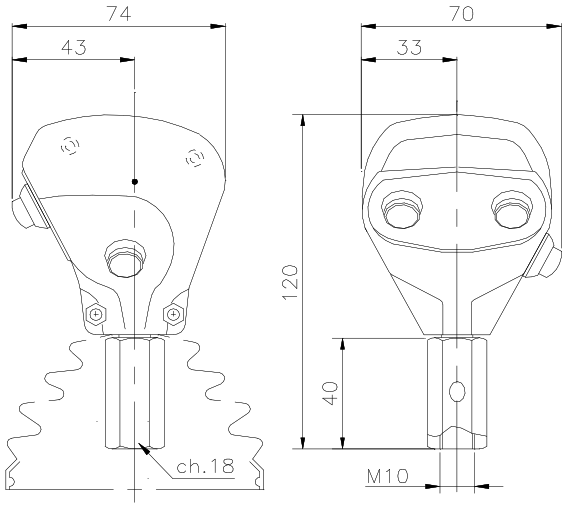
• Prewired exit cable:	250 mm

Available push buttons and switches

P9 - Push buttons

• No of push buttons on rear panel:	up to 3
• Rated amperage:	3 Amp inductive
• Life:	> 100.000 cycles
• Available colours:	red, blue, yellow, black, green, white
A - Side dead man push button	see above specifications for P9 push button
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor
PRS - Proportional rocker switch	see PRS data sheet
• Output signal:	3-pins resistive pot 4-pins with bidirectional switches

OVERALL DIMENSIONS



FEATURES

- Multi-functions ergonomic grip gear type with on-off and proportional switches.
- Easy adaptability to existing joystick control lever.

CONFIGURATION EXAMPLES

	D-man P/B	Rear P/B	Rear PRS
IE-0000-0000	0	0	0
IE-A000-0000	yes	0	0
IE-A1P9-0000	yes	1xP9	0
IE-A2P9-0000	yes	2xP9	0
IE-A3P9-0000	yes	3xP9	0
IE-0000-1PRS	0	0	1xPRS
IE-A1P9-1PRS	yes	1xP9	1xPRS
IE-0000-1FPR	0	0	1xFPR
IE-A1P9-1FPR	yes	1xP9	1xFPR

*>> **ORDERING INFORMATION:** see page 35*

MS *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

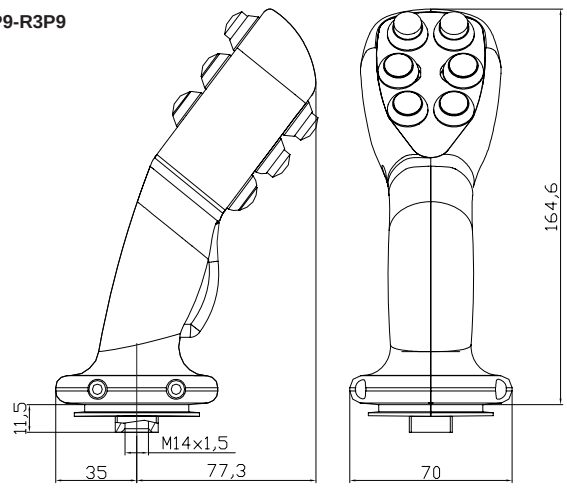
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	> 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy

OVERALL DIMENSIONS

Mod.
MS-A6P9-R3P9



CONFIGURATION EXAMPLES

	D-man P/B	Front P/B	Rear P/B
MS-0000-0000	0	0	
MS-A000-0000-0000	yes	0	
MS-A1P9-0000-0000	yes	1xP9	
MS-A2P9-0000-0000	yes	2xP9	
MS-A3P9-0000-0000	yes	3xP9	
MS-A4P9-0000-0000	yes	4xP9	
MS-A5P9-0000-0000	yes	5xP9	
MS-A6P9-0000-0000	yes	6xP9	
MS-A6P9-0000-R1P9	yes	6xP9	1xP9
MS-A6P9-0000-R2P9	yes	6xP9	2xP9
MS-A6P9-0000-R3P9	yes	6xP9	3xP9

*>> **ORDERING INFORMATION:** see page 36*

MS *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

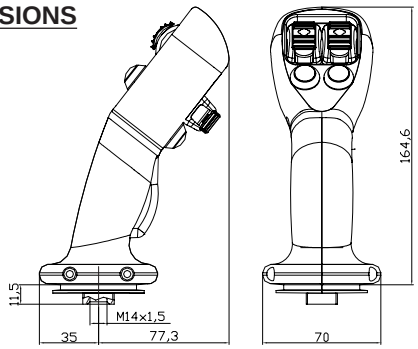
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	> 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor
PRS - Proportional rocker switch	see PRS data sheet
• Output signal:	3-pins resistive pot 4-pins center tap

OVERALL DIMENSIONS

Mod.
MS-A2P9-2FPR-F1P9



CONFIGURATION EXAMPLES

	D-man P/B	Front P/B	Front FPR	Rear P/B	Rear FPR
MS-01P9-1FPR-0000	0	1xP9	1xFPR		
MS-A2P9-1FPR-0000	yes	2xP9	1xFPR		
MS-A3P9-1FPR-R1P9	yes	3xP9	1xFPR	1xP9	
MS-A4P9-1FPR-R2P9	yes	4xP9	1xFPR	2xP9	
MS-A4P9-1FPR-F1P9	yes	4xP9	1xFPR	1xP9	1xFPR
MS-A4P9-1FPR-F2P9	yes	4xP9	1xFPR	2xP9	1xFPR
MS-A2P9-2FPR-0000	yes	2xP9	2xFPR	0	
MS-A2P9-2FPR-R1P9	yes	2xP9	2xFPR	1xP9	
MS-A2P9-2FPR-R2P9	yes	2xP9	2xFPR	2xP9	
MS-A2P9-2FPR-F1P9	yes	2xP9	2xFPR	1xP9	1xFPR
MS-A2P9-2FPR-F2P9	yes	2xP9	2xFPR	2xP9	1xFPR
MS-A000-3FPR-0000	yes	0	3xFPR	0	
MS-A000-3FPR-R1P9	yes	0	3xFPR	1xP9	
MS-A000-3FPR-R2P9	yes	0	3xFPR	2xP9	

*>> **ORDERING INFORMATION:** see page 36*

MS *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- Internal PWM driver.

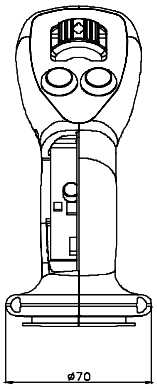
MECHANICAL SPECIFICATIONS

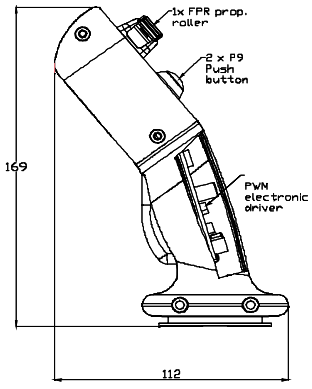
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	> 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor

OVERALL DIMENSIONS





Mod.
MS-A2P9-1FPR-1PWM

PWM - Pulse width modulated output current driver for a dual coil proportional valve

• Supply voltage:	8-32 Volt
• Max. current draw:	100 mA
• Current output range:	factory set btw 0 and 1500 mA
• PWM dither frequency:	100 Hz
• Operating temperature range:	-25°C / +85°C

CONFIGURATION EXAMPLES

	D-man P/B	Front P/B	Front FPR
MS-01P9-1FPR-1PWM	0	1xP9	1xFPR
MS-A2P9-1FPR-1PWM	yes	2xP9	1xFPR
MS-A3P9-1FPR-1PWM	yes	3xP9	1xFPR
MS-A4P9-1FPR-1PWM	yes	4xP9	1xFPR

*>> **ORDERING INFORMATION:** see page 36*

MG *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm

A - Dead man push button

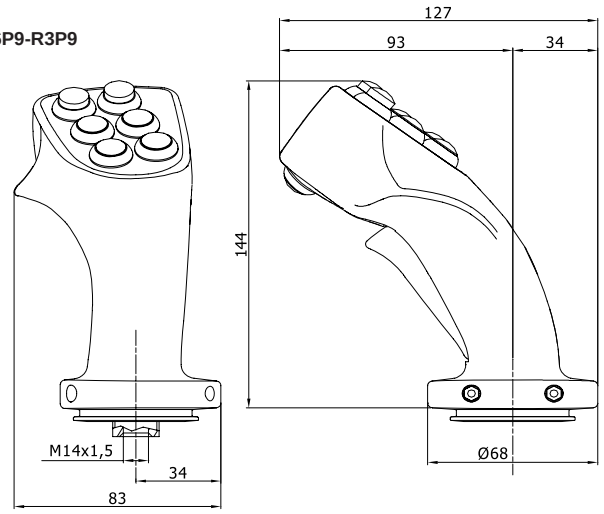
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67

P9 - Push buttons

• Operational life:	up to 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy

OVERALL DIMENSIONS

Mod.
MG-A6P9-R3P9



CONFIGURATION EXAMPLES

	D-man P/B	Front P/B	Rear P/B
MG-0000-0000	0	0	
MG-A000-0000-0000	yes	0	
MG-A1P9-0000-0000	yes	1xP9	
MG-A2P9-0000-0000	yes	2xP9	
MG-A3P9-0000-0000	yes	3xP9	
MG-A4P9-0000-0000	yes	4xP9	
MG-A5P9-0000-0000	yes	5xP9	
MG-A6P9-0000-0000	yes	6xP9	
MG-A6P9-0000-R1P9	yes	6xP9	1xP9
MG-A6P9-0000-R2P9	yes	6xP9	2xP9
MG-A6P9-0000-R3P9	yes	6xP9	3xP9

*>> **ORDERING INFORMATION:** see page 37*

MG *Multi-Function Ergonomic Right Hand Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

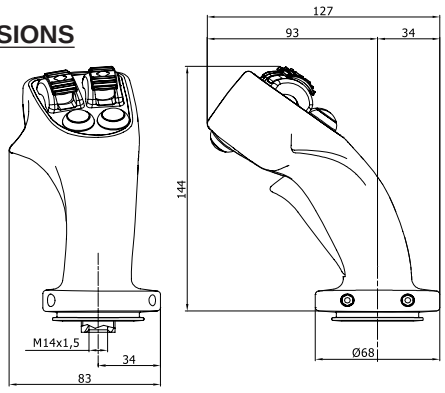
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	up to 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor
PRS - Proportional rocker switch	see PRS data sheet
• Output signal:	3-pins resistive pot 4-pins center tap

OVERALL DIMENSIONS

Mod.
MG-A000-3FPR



CONFIGURATION EXAMPLES

	D-man P/B	Front P/B	Front FPR	Rear P/B	Rear FPR
MG-01P9-1FPR-0000	0	1xP9	1xFPR		
MG-A2P9-1FPR-0000	yes	2xP9	1xFPR		
MG-A3P9-1FPR-R1P9	yes	3xP9	1xFPR	1xP9	
MG-A4P9-1FPR-R2P9	yes	4xP9	1xFPR	2xP9	
MG-A4P9-1FPR-F1P9	yes	4xP9	1xFPR	1xP9	1xFPR
MG-A4P9-1FPR-F2P9	yes	4xP9	1xFPR	2xP9	1xFPR
MG-A2P9-2FPR-0000	yes	2xP9	2xFPR	0	
MG-A2P9-2FPR-R1P9	yes	2xP9	2xFPR	1xP9	
MG-A2P9-2FPR-R2P9	yes	2xP9	2xFPR	2xP9	
MG-A2P9-2FPR-F1P9	yes	2xP9	2xFPR	1xP9	1xFPR
MG-A2P9-2FPR-F2P9	yes	2xP9	2xFPR	2xP9	1xFPR
MG-A000-3FPR-0000	yes	0	3xFPR	0	
MG-A000-3FPR-R1P9	yes	0	3xFPR	1xP9	
MG-A000-3FPR-R2P9	yes	0	3xFPR	2xP9	

*>> **ORDERING INFORMATION:** see page 37*

MG *Multi-Function Ergonomic Right Hand Grip*

FEATURES

- Optimum ergonomic design.
- Internal PWM driver.

MECHANICAL SPECIFICATIONS

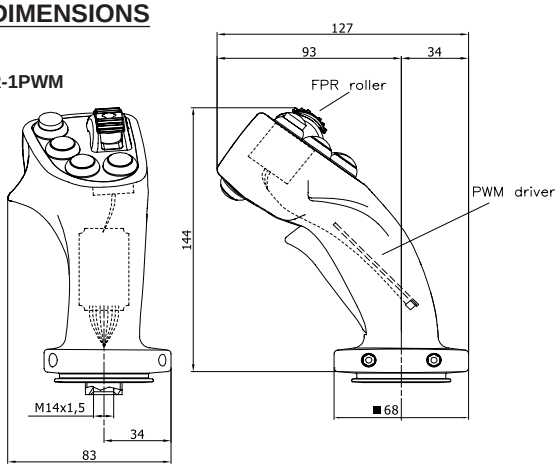
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	up to 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor

OVERALL DIMENSIONS

Mod.
MG-A4P9-1FPR-1PWM



PWM - Pulse width modulated output current driver for a dual coil proportional valve

• Supply voltage:	8-32 Volt
• Max. current draw:	100 mA
• Current output range:	factory set btw 0 and 1500 mA
• PWM dither frequency:	100 Hz
• Operating temperature range:	-25°C / +85°C

CONFIGURATION EXAMPLES

	D-man P/B	Front P/B	Front FPR	PWM	Rear P/B
MG-01P9-1FPR-1PWM	0	1xP9	1xFPR	1xPWM	
MG-A2P9-1FPR-1PWM	yes	2xP9	1xFPR	1xPWM	
MG-A3P9-1FPR-1PWM	yes	3xP9	1xFPR	1xPWM	
MG-A4P9-1FPR-1PWM	yes	4xP9	1xFPR	1xPWM	
MG-A4P9-1FPR-1PWM-R1P9	yes	4xP9	1xFPR	1xPWM	1xP9
MG-A4P9-1FPR-1PWM-R2P9	yes	4xP9	1xFPR	1xPWM	2xP9

*>> **ORDERING INFORMATION:** see page 37*

Accessories

	Description	Page
Joystick connections	Connector kits	**48**
Joystick calibration tool	Software calibration tool linking cables	**50**
Operators for grip assembling	Rocker switches, pushbuttons knob potentiometer	**52**

Joystick Connections *Accessories*

7 POLES C-GRID CONNECTOR

Kit includes: male connector, female contacts.
Available for joystick: JLP-L2S

ORDERING CODE: 13.0310.591

3 POLES DEUTSCH DT06-3S

Kit includes: male connector, female contacts, secondary lock.
Available for joystick: FPR

ORDERING CODE: 13.0310.394

4 POLES DEUTSCH DT06-4S

Kit includes: male connector, female contacts, secondary lock.
Available for joystick: JHM-CAN

ORDERING CODE: 13.0310.132

12 POLES DEUTSCH DT06-12S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for joystick: JHM

ORDERING CODE: 13.0310.441

Joystick Connections *Accessories*

7 POLES DUBOX CONNECTOR

Kit includes: male connector, female contacts.
Available for joystick: JLP-L2S

ORDERING CODE: 13.0310.046

7 POLES DUBOX CONNECTOR WITH 3 WIRES 0.6 M LENGTH

Kit includes: male connector, with inserted wires section 0.22 mm².
Available for joystick: JLP-L2S

ORDERING CODE: 13.0310.159

4 POLES MINIFIT CONNECTOR

Kit includes: male connector, female contacts.
Available for joystick: FPR

ORDERING CODE: 13.0310.640

6 POLES MINIFIT CONNECTOR

Kit includes: male connector, female contacts.
Available for joystick: FPR-PWM

ORDERING CODE: 13.0310.654

Joystick Calibration Tool *Accessories*

TECNORD SOFTWARE JOYSTICK CALIBRATION TOOL

Tecnord joysticks, with electronic control unit inside, are supplied with operation parameters standard programming, which satisfies most applications. For special application SCT calibration software allows some of the parameters for proportional solenoid valve control to be modified via computer; for example the minimum and maximum current or ramp up and ramp down parameters may be defined. The linking cable shown in the following page (optional, to be ordered separately) is necessary for the computer connection.

SOFTWARE
INSTALLATION

MINIMUM SYSTEM REQUIREMENTS

- Windows XP® operating system or higher.
- Intel® Pentium processor.
- 32 Mb RAM.
- CD player unit.
- Connecting through a standard RS232 serial port, DB9 connection; alternatively, a USB-RS232 converter can be used.

PROGRAM INSTALLATION

To install the SCT software onto a personal computer, simply execute the file *setup.exe*.

Joystick Calibration Linking Cables *Accessories*

DEUTSCH-DB9 LINKING CABLE

Available for joystiks: JHM-PWM, JHM-MLT

ORDERING CODE: 21.0801.055

RS232 - USB CONVERTER

It allows Tecnord joysticks to Personal Computer connection when the latter is unprovided of serial port; for installation follow the instruction enclosed with the converter.

ORDERING CODE: 50.2205.227

CAN - RS232 CONVERTER

It allows Tecnord CAN joysticks to Personal Computer connection with a serial port; for installation follow the instruction enclosed with the interface device.

ORDERING CODE: 50.2205.228

Operators for Grip Assembling *Accessories*

ROCKER SWITCH TYPE K1

Switch Operation:	ORDERING CODE:
On-Off-On	**50.1301.501**
On-Off	**50.1301.502**
Mom-Off-Mom	**50.1301.503**
Fwd-Neu-Rev	**50.1301.504**

ROCKER SWITCH TYPE 1838.3901

Switch Operation: On-Off-On

ORDERING CODE: 50.1301.500

PUSH BUTTONS WITH LED

Switch Operation: On-Off

CASE COLOR	LED COLOR	ORDERING CODE
GREEN	GREEN	**50.1301.324**
RED	RED	**50.1301.325**
ORANGE	AMBER	**50.1301.330**
YELLOW	WHITE	**50.1301.331**
BLUE	BLUE	**50.1301.332**

LATCHING PUSH BUTTONS

Switch Operation: On-Off Latching

CASE COLOR	LED COLOR	ORDERING CODE
RED	X	**50.1301.407**
RED	RED	**50.1301.414**
ORANGE	RED	**50.1301.415**

Operators for Grip Assembling *Accessories*

SEALING BOOTS

For raised dome.

ORDERING CODE: 50.1301.326

SEALING BOOTS

For flush dome.

ORDERING CODE: 50.1301.327

KNOB POTENTIOMETER TYPE P16

Ohmic value: 5kΩ 10%
Electrical travel: 270° ±10°

ORDERING CODE: 50.1501.025

Index chapter 7

Via Malavolti, 36 - 41122 Modena - Italy - Phone +39 059/254895 - Fax +39 059/253512 - www.tecnord.com - mail: tecnord@tecnord.com

TECNORD
a Delta Power Company

EC-SNR-ANG-S9090-H *Single Axis Inclinometer*

DESCRIPTION

Absolute single axis inclinometer sensor based on earth's gravity.

OPERATION

Signal output is linearly proportional to the tilt angle to the ground. With a measurement range of ±90° this device provides a 0.5 to 4.5 vdc output signal over its range with a nominal 2.5 vdc at 0 degree. It is normally used to control the inclination of a mechanical structure respect to the earth line.

FEATURES

- Supply line is protected against reversed polarity and load dump.
- Outputs are protected against short circuits to GND and supply.
- Vibration and shock resistant.
- Anti-debouncing software filter.
- CE certification.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)

SPECIFICATIONS

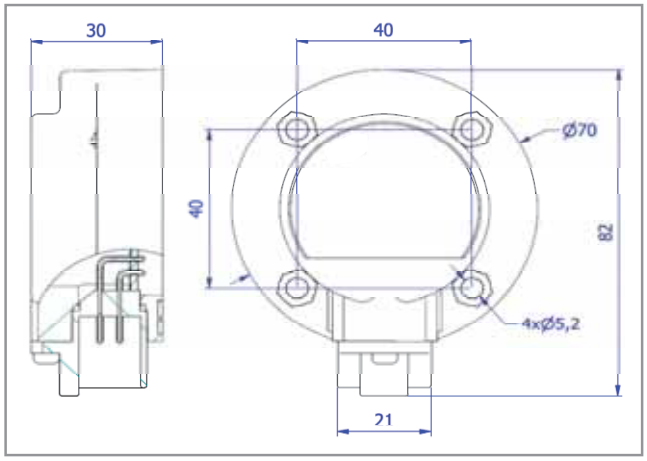
• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	20 mA
• Output signal:	0.5 ÷ 2.5 ÷ 4.5 vdc
• Max current output:	10 mA
• Max working angle:	±90°
• Resolution:	0.25°
• Operating temperature:	-40°C / +125°C
• Degree of protection:	IP 68
• Connector type:	Deutsch DT04-4P or M12
• Fixing screws included:	4 - M4x20

APPLICATIONS

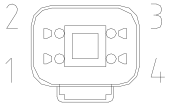
- 12 vdc and 24 vdc systems.
- Inclination sensor for articulated cranes and aerial platforms.

ORDERING CODE: **20.0401.016** (with Deutsch connector)
20.0401.018 (with M12 connector)

DIMENSIONS



CONNECTIONS



Deutsch DT04-4P

1 +V (POWER SUPPLY)
2 -V (POWER SUPPLY - GND)
3 OUTPUT SIGNAL
4 NOT USED

M12

EC-SNR-ANG-D3030-H *Dual Axis Inclinometer (tilt device)*

DESCRIPTION

Absolute dual axis inclinometer sensor based on earth's gravity.

OPERATION

Signal outputs are linearly proportional to the tilt angle to the ground. With a measurement range of ±30° this device provides a 0.5 to 4.5 vdc output signal over its range with a nominal 2.5 vdc at 0 degree. It is normally used to control the planarity of chassis or mechanical structure respect to the earth line.

FEATURES

- Supply line is protected against reversed polarity and load dump.
- Outputs are protected against short circuits to GND and supply.
- Microprocessor based.
- Vibration and shock resistant.
- Anti-debouncing software filter.
- CE certification.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)

SPECIFICATIONS

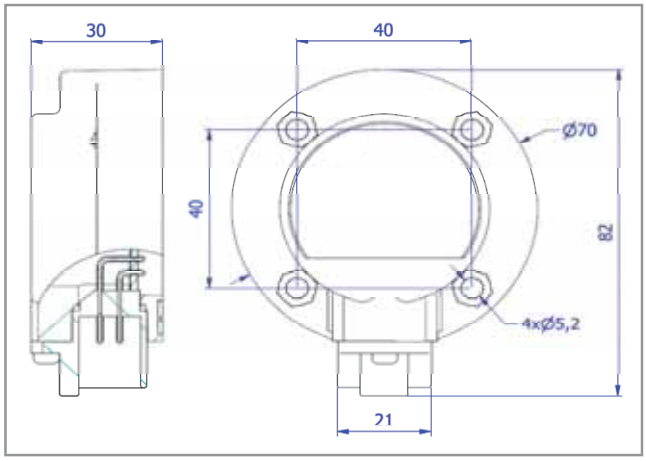
• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	20 mA
• Output signal:	0.5 ÷ 2.5 ÷ 4.5 vdc
• Max current output:	10 mA
• Max working angle for each axis:	±30°
• Resolution:	0.10°
• Operating temperature:	-40°C / +125°C
• Degree of protection:	IP 68
• Connector type:	Deutsch DT04-4P or M12
• Fixing screws included:	4 - M4x20

APPLICATIONS

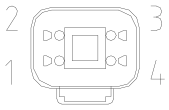
- 12 vdc and 24 vdc systems.
- Automatic self levelling system for trucks, agricoltural machines and lift equipment.
- Vehicle tilt monitoring.

ORDERING CODE: **20.0401.012/A** (with Deutsch connector)
20.0401.019/A (with M12 connector)

DIMENSIONS



CONNECTIONS



Deutsch DT04-4P

M12

1 +V (POWER SUPPLY)
2 -V (POWER SUPPLY - GND)
3 OUTPUT SIGNAL X AXIS
4 OUTPUT SIGNAL Y AXIS

EC-SNR-LA-1290-H *Lenght and Angle Sensor*

DESCRIPTION

Heavy duty, high protection length and angle sensor with redundant output signals.

OPERATION

It can be used for monitoring the position of a telescopic boom.
The “double sensors” system provides the highest safety features, as required for load limiter control systems.

It is normally used in conjunction with other MMS electronic units with the double microprocessor technology to implement safety functions according to ISO 13849.

FEATURES

- Supply line is protected against reversed polarity and load dump.
- Outputs are protected against short circuits to GND and supply.
- Cable entry on the left or on the right.
- CE certification.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)

SPECIFICATIONS

• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 65
• Connector type:	Deutsch DT04-8P

Angle sensor

• Operating voltage:	8.5 ÷ 30 vdc
• Max current consumption:	20 mA
• Output signal:	0.5 ÷ 2.5 ÷ 4.5 vdc
• Max working angle:	±90°
• Redundancy:	YES (dual angle sensor)

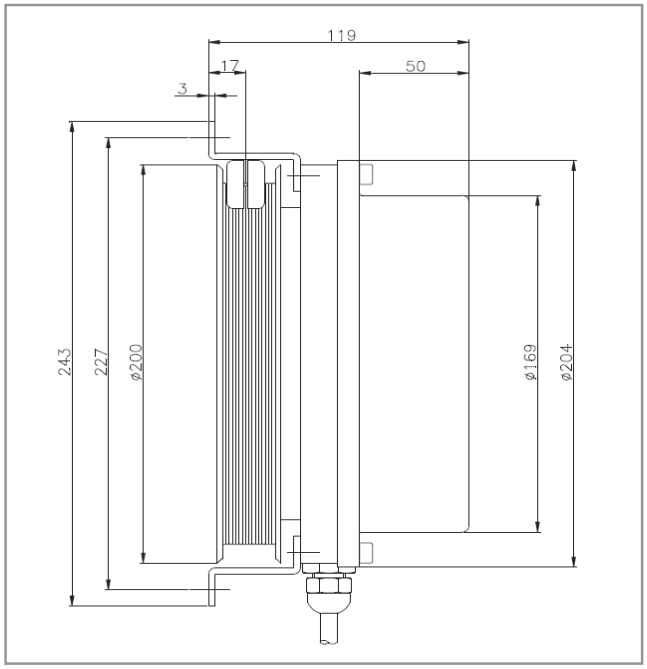
Length sensor

• Operating voltage:	5 vdc
• Output signal:	0 ÷ 5 V
• Max working lenght:	12 meters
• Potentiometer resistance:	5kΩ
• Redundancy:	YES (dual angle sensor)

APPLICATIONS

- 12 vdc and 24 vdc systems.
- Load limiter and/or area control systems for cranes and aerial platforms.

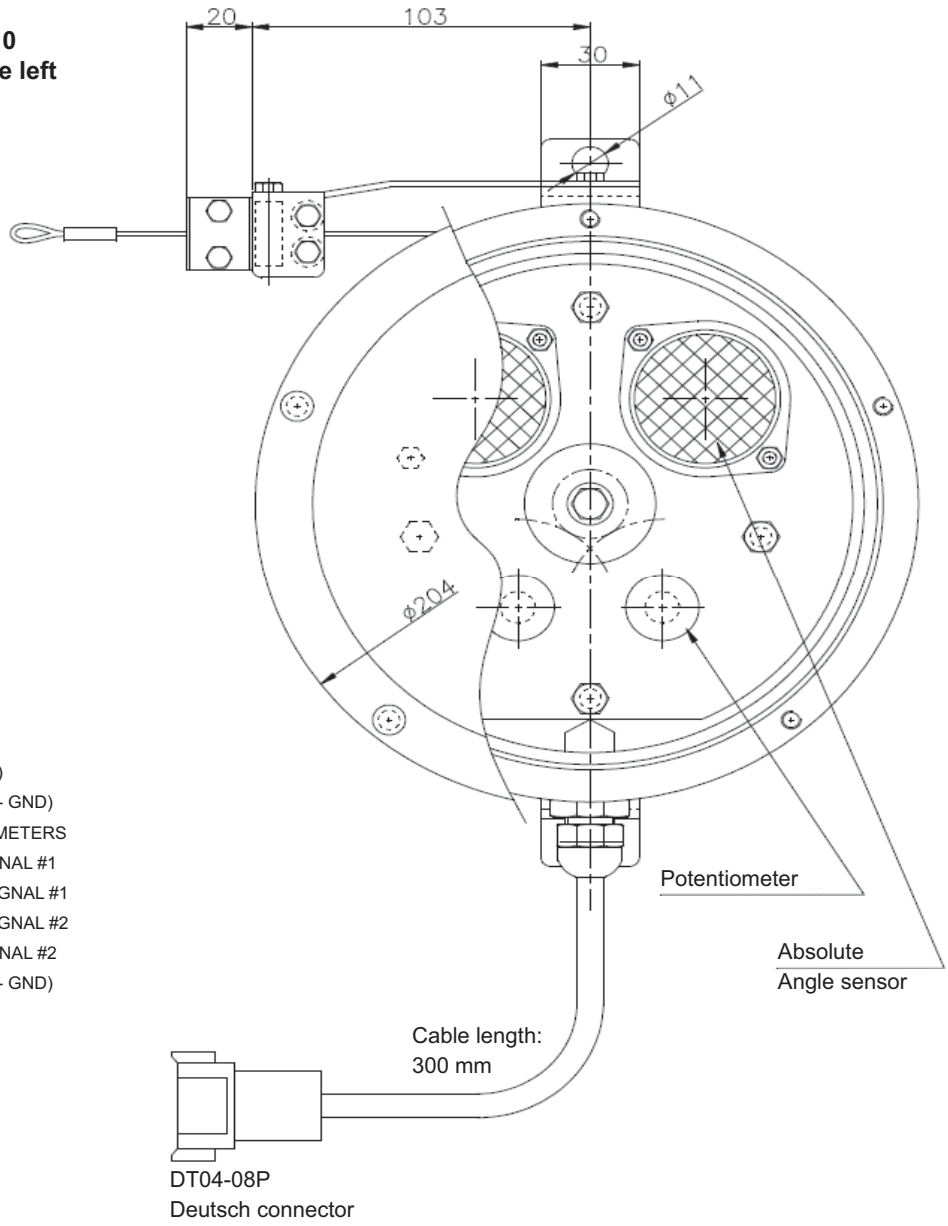
DIMENSIONS



EC-SNR-LA-1290-H *Lenght and Angle Sensor*

WIRING DIAGRAM

Model 21.0809.010
cable entry on the left



1 +V (POWER SUPPLY)
2 -V (POWER SUPPLY - GND)
3 +5V FOR POTENTIOMETERS
4 ANGLE SENSOR SIGNAL #1
5 LENGTH SENSOR SIGNAL #1
6 LENGTH SENSOR SIGNAL #2
7 ANGLE SENSOR SIGNAL #2
8 -V (POWER SUPPLY - GND)

ORDERING CODE: **21.0809.010** cable entry on the left
21.0809.014 cable entry on the right

EC-SNR-POS-75S-H *Slip-In Spool Position Transducer*

DESCRIPTION

Position transducer based on Hall effect sensor to detect a stroke of ± 7.5 mm. Slip-in assembly.

OPERATION

Signal output is linearly proportional to the stroke. With a measurement range of ±7.5 mm this device provides a 1 to 4 vdc output signal over its range with a nominal 2.5 vdc in the neutral position. It can be used as a safety device in conjunction with Tecnord's MMS electronic units (e.g. MMS 1521).

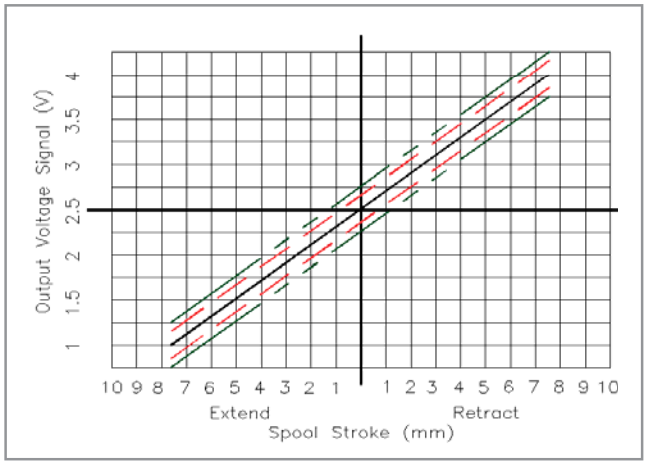
FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Output protected against short circuits to GND and supply.
- Redundant version (dual electronics) available.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)

SPECIFICATIONS

• Operating voltage:	6 ÷ 32 vdc
• Max current consumption:	<15mA
• Operating temperature:	-25°C / +105°C
• Degree of protection:	IP 67
• Maximum operating pressure:	35 bar
• Output signal:	1 ÷ 2.5 ÷ 4 vdc
• Tolerance on output signal:	±0.2 vdc
• Electrical stroke linearity range:	±7.5 mm
• Maximum mechanical stroke:	±8 mm
• Connector pins:	1 +V (POWER SUPPLY) 2 -V (POWER SUPPLY-GND) 3 Output signal 4 Not used
• Connector type:	Deutsch DT04-4P

OUTPUT SIGNAL

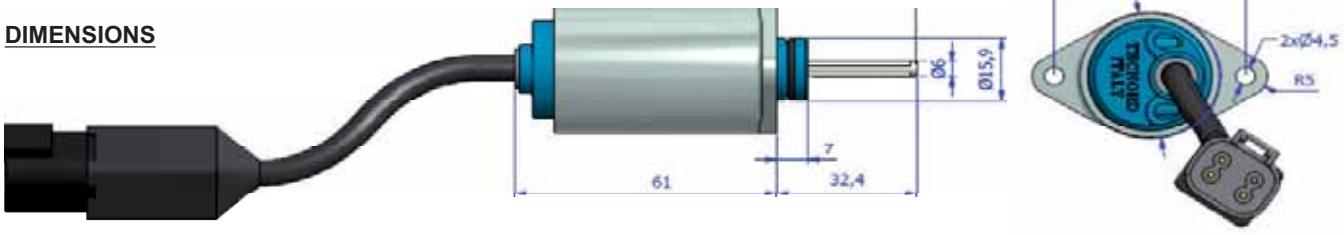


ORDERING CODE: 20.0204.007

APPLICATIONS

- 12 vdc and 24 vdc systems.
- Spool position detect for electrohydraulic manifolds.

DIMENSIONS



WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-SNR-POS-75O-H *Slip-In Spool Position Transducer*

DESCRIPTION

Position transducer based on Hall effect sensor to detect a movement from the neutral (zero) position. Slip-in assembly.

OPERATION

The sensor provides two directional signal outputs, each output becomes active when a movement is detected in its corresponding direction. Outputs are active low. Two low outputs means fault.
It can be used as a safety device in conjunction with Tecnord's MMS electronic units (e.g. MMS 1521).

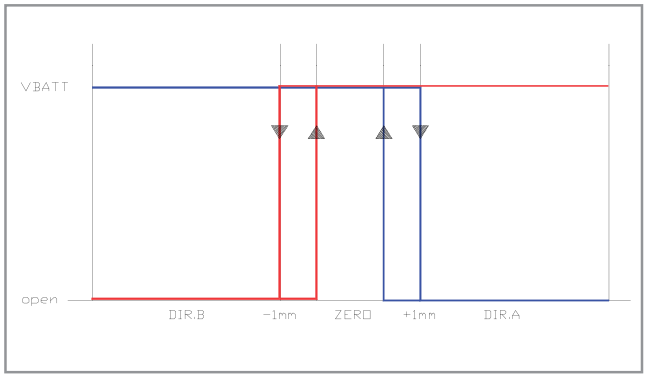
FEATURES

- Power supply line is protected against reversed polarity and overvoltage.
- Output protected against short circuits to GND and supply.
- Redundant version (dual electronics) available.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)

SPECIFICATIONS

• Operating voltage (VBATT):	6 ÷ 32 vdc
• Max current consumption:	<15mA
• Operating temperature:	-25°C / +105°C
• Degree of protection:	IP 67
• Maximum operating pressure:	35 bar
• Output signal (inactive):	open collector (pnp)
• Output signal (active):	VBATT
• Switching threshold:	1 mm
• Maximum mechanical stroke:	±8 mm
• Connector pins:	1 OUT A 1 +V (POWER SUPPLY) 2 -V (POWER SUPPLY-GND) 4 OUT B
• Connector type:	Deutsch DT04-4P

OUTPUT SIGNAL

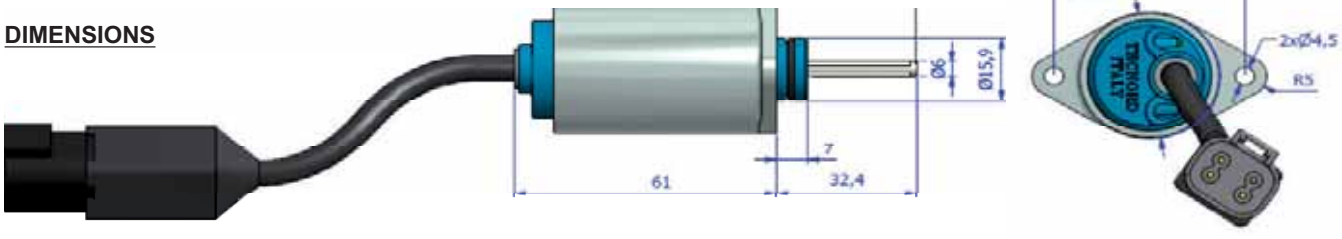


ORDERING CODE: 20.0204.006

APPLICATIONS

- 12 vdc and 24 vdc systems.
- Spool position detect for electrohydraulic manifolds.

DIMENSIONS



WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

EC-SNR-PRX-0102-H *Proximity Sensor*

DESCRIPTION

Heavy duty, high protection proximity sensor based on hall effect.

OPERATION

The sensor can be used to detect the presence of gear teeth and can be used to measure the speed of a rotating shaft.

FEATURES

- Supply line is protected against reversed polarity.

SPECIFICATIONS

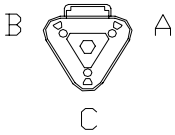
• Operating voltage:	4 ÷ 26 vdc
• Max current consumption:	11 mA
• Max current output:	20 mA
• Operating temperature:	-40°C / +150°C
• Degree of protection:	IP68
• Mechanical connection:	M18x1.5
• Detecting distance:	0.1 - 2 mm
• Max frequency for tooth detection:	8 kHz
• Output signal:	0 vdc - max V supply
• Output type:	NPN or PNP
• 3 wires cable, 0.75 mm² section, 200 mm length	

APPLICATIONS

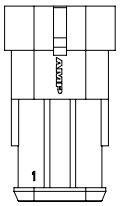
- 12 vdc and 24 vdc systems.
- Transmission speed measurement.
- Stop motion detector and tachometer.

ORDERING CODE: **20.0401.006** (Type: 68 mm - NPN - Deutsch)
20.0401.007 (Type: 130 mm - NPN - Deutsch)
20.0401.020/A (Type: 68 mm - PNP - Amp)

CONNECTIONS

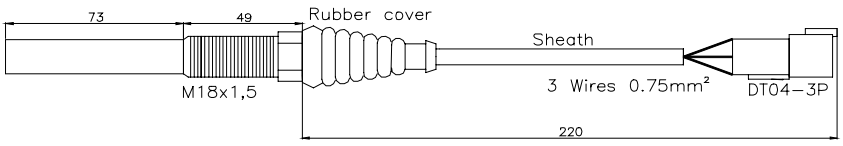


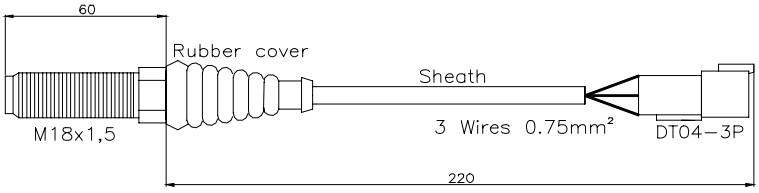
Deutsch DT04-3P
A +V (POWER SUPPLY)
B -V (POWER SUPPLY - GND)
C OUTPUT SIGNAL



Amp Superseal 3 poles
1 +V (POWER SUPPLY)
2 -V (POWER SUPPLY - GND)
3 OUTPUT SIGNAL

DIMENSIONS





EC-SNR-EOM-H *Material Sensor*

DESCRIPTION

End of material sensor based on a piezoelectric device designed for use in the extremely harsh environment associated with the rear of a mobile road salt spreader.

OPERATION

When the material from the “Spinner” hits the stainless steel probe, the sensor is activated and turn the output signal ON (+V).
When no material is detected hitting the probe, the sensor turns the output signal OFF (open). It can be used as an auxilary device in conjunction with the Tecnord **Ecomatic** salt spreader control unit.

FEATURES

- Supply line is protected against reversed polarity and overvoltage.
- Output protected against short circuits to GND and supply.
- No requirements for “screened” wires between the sensor and the control unit in cab.
- No extra electronics needed for the sensor to operate.
- High quality stainless steel probe for extended operational life.
- Electro Magnetic Compatibility (EMC): EN 61000-6-2 (Immunity)
  EN 61000-6-3 (Emissions)

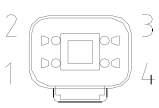
SPECIFICATIONS

• Operating voltage:	8 ÷ 32 vdc
• Max current consumption:	20mA
• Operating temperature:	-25°C / +85°C
• Degree of protection:	IP 67
• Digital output:	PNP type
• Max output current:	250mA
• Connector type:	Deutsch DT04-4P

APPLICATIONS

- 12 vdc and 24 vdc systems.
- End of material sensor for salt spreader systems.
- EOM sensor for agricultural spreader systems (e.g. fertilizers).

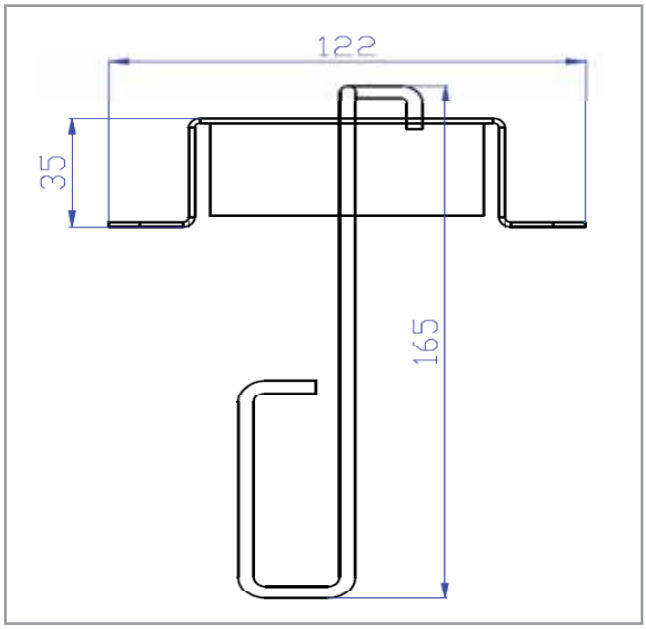
CONNECTIONS



Deutsch DT04-4P

1 +V (POWER SUPPLY)
2 -V (POWER SUPPLY - GND)
3 OUTPUT SIGNAL
4 NOT USED

DIMENSIONS



ORDERING CODE: 20.0401.037

WARNING: *the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.*

Sensors Connections *Accessories*

3 POLES AMP SUPERSEAL

Kit includes: male connector, female contacts, and fillers.
Available for sensor: EC-SNR-POS-55-H

ORDERING CODE: 13.0310.127

4 POLES AMP SUPERSEAL

Kit includes: male connector, female contacts, and fillers.
Available for sensor: EC-SNR-POS-75-H

ORDERING CODE: 13.0310.542

3 POLES DEUTSCH DT06-3S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for sensor: EC-SNR-PRX-0102-H

ORDERING CODE: 13.0310.394

4 POLES DEUTSCH DT06-4S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for sensor: EC-SNR-ANG-S9090-H, EC-SNR-ANG-D3030-H, EC-SNR-EOM-H

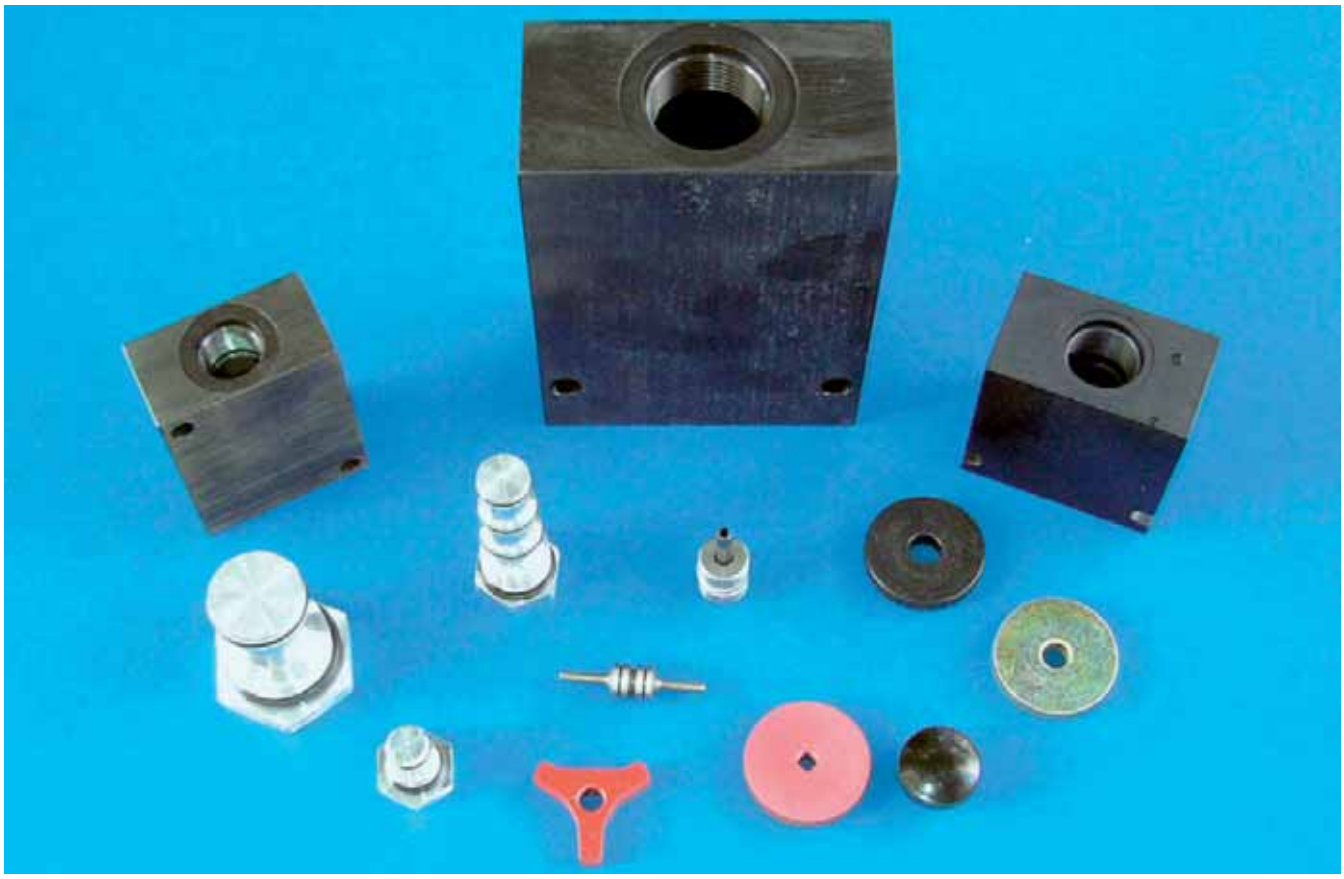
ORDERING CODE: 13.0310.132

Sensors Connections *Accessories*

8 POLES DEUTSCH DT06-8S

Kit includes: male connector, female contacts, secondary lock and fillers.
Available for sensor: EC-SNR-LA-1290-H

ORDERING CODE: 13.0310.432



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TECNORD
a Delta Power Company

Valve Bodies

Standard Bodies (aluminium)								
Port Size	**Ordering code**	**Style / Size**	**Dimensions**					
			A	**B**	**C**	**D**	**E**	**F**
1/4 BSP	13.1011.002	3W-5/8	30	50	60	25	52	34
#6SAE	13.1011.142	3W-5/8	30	50	60	25	52	34
1/4 BSP	13.1011.124	2W-3/4	30	50	50	23	42	34
3/8 BSP	13.1011.125	2W-3/4	30	50	50	23	42	34
#6 SAE	13.1011.144	2W-3/4	30	50	50	23	42	34
3/8 BSP	13.1011.116	2W-7/8	30	60	60	25	52	44
1/2 BSP	13.1011.115	2W-7/8	30	60	60	25	52	44
#8 SAE	13.1011.147	2W-7/8	30	60	60	25	52	44
3/8 BSP	13.1011.118	3W-7/8	30	60	70	30	62	44
#6 SAE	13.1011.148	3W-7/8	30	60	70	30	62	44
3/8 BSP	13.1011.121	4W-7/8	30	60	85	30	77	44
#6 SAE	13.1011.149	4W-7/8	30	60	85	30	77	44
3/4 BSP	13.1011.130	2W-1 1/16	50	80	80	40	70	60
#12 SAE	13.1011.138	2W-1 1/16	50	80	80	40	70	60
3/4 BSP	13.1011.131	3W-1 1/16	50	80	100	40	80	60
#12 SAE	13.1011.139	3W-1 1/16	50	80	100	40	80	60
3/4 BSP	13.1011.008	2W-1 5/16	50	80	80	34	60	60
#12 SAE	13.1011.137	2W-1 5/16	50	80	80	34	60	60
3/4 BSP	13.1011.153	3W-1 5/16	50	80	100	40	80	60
3/4 BSP	13.1011.155	3W-1 5/16 SHORT	50	90	85	45	65	70
#12 SAE	13.1011.154	3W-1 5/16	50	80	100	40	80	60

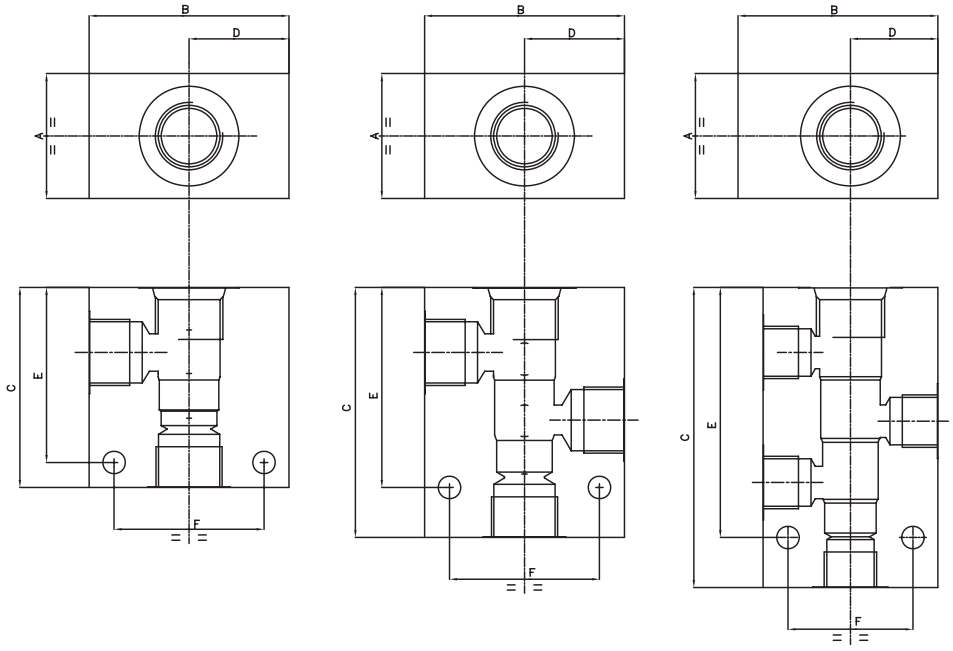
The following bodies are for the slip-in style cartridges. Contact factory for price and availability

Port Size	**Ordering code**	**Style / Size**	**Dimensions**					
			A	**B**	**C**	**D**	**E**	**F**
3/8 BSP	13.1011.042/A	3W-cavity 042	30	70	80	35	72	54
1/4 BSP	13.1011.086	3W-cavity 043	40	60	50	30	40	40
#8 SAE	13.1011.191	3W-cavity 059	50	90	80	45	73	76
1/4 BSP	13.1011.080	3W-cavity 059	50	90	80	30	73	76

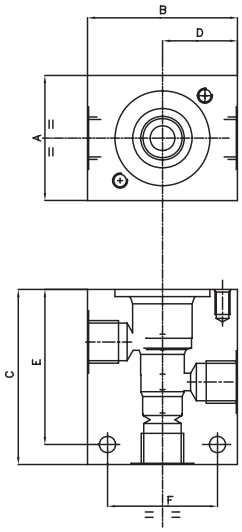
Valve Bodies

2 ways 3 ways 4 ways

Standard

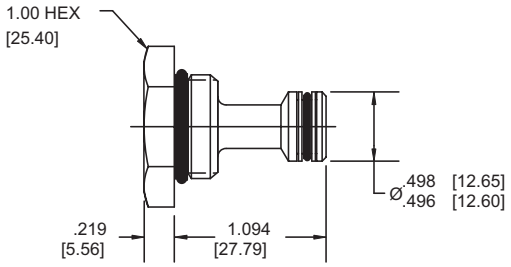


Special
(for slip–in style cartridges)

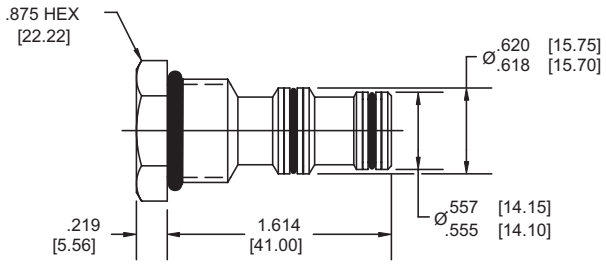


Power Series Cavity Plugs (Size 8)

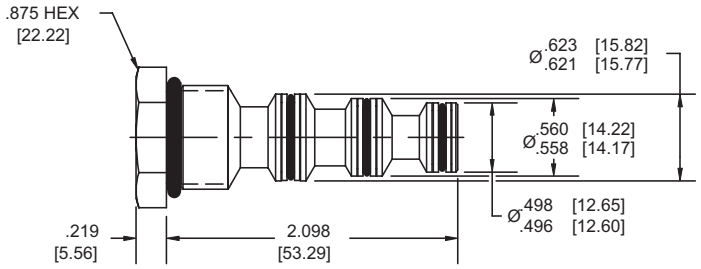
NOTE: dimensions in brackets are millimeters



2W 2P CAVITY PLUG
PB SERIES



3W 2P CAVITY PLUG
PP SERIES



4W 2P CAVITY PLUG
PQ SERIES

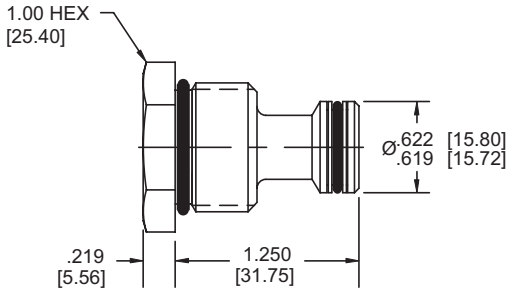
ORDERING INFORMATION

– –

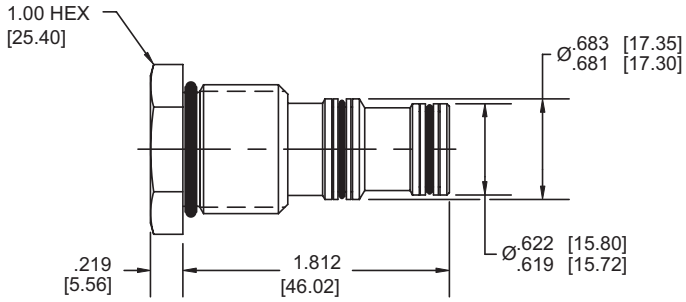
Standard Model Number			Options
2 Way	**PB**	**00**	Standard Buna
3 Way	**PP**	**V0**	Standard Viton
4 Way	**PQ**		

Delta Series Cavity Plugs (Size 10)

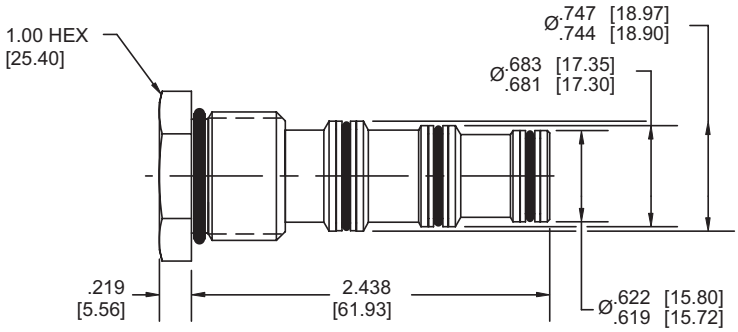
NOTE: dimensions in brackets are millimeters



2W 2P CAVITY PLUG
DE SERIES



3W 2P CAVITY PLUG
DF SERIES



4W 2P CAVITY PLUG
DG SERIES

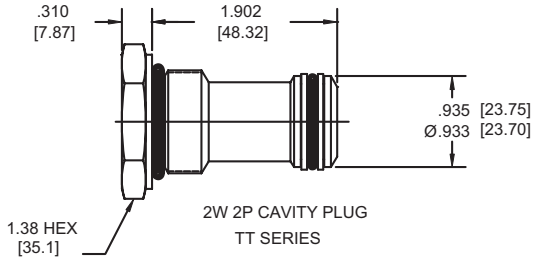
ORDERING INFORMATION

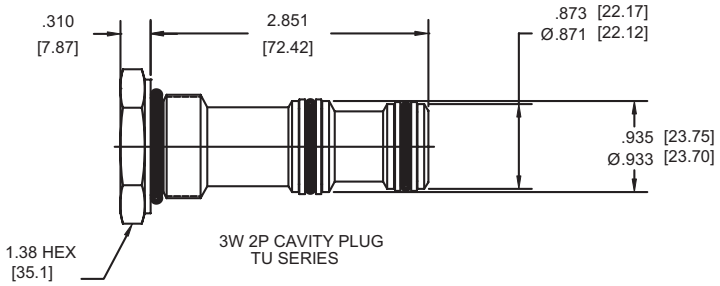
– –

Standard Model Number			Options
2 Way	**DE**	**00**	Standard Buna
3 Way	**DF**	**V0**	Standard Viton
4 Way	**DG**		

Tecnord Series Cavity Plugs (Size 12)

NOTE: dimensions in brackets are millimeters





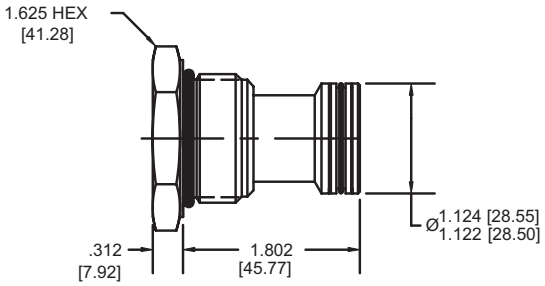
ORDERING INFORMATION

– –

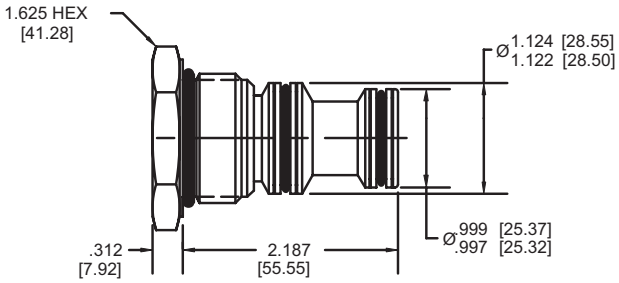
Standard Model Number			Options
2 Way	**TT**	**00**	Standard Buna
3 Way	**TU**	**V0**	Standard Viton

Super Series Cavity Plugs (Size 16)

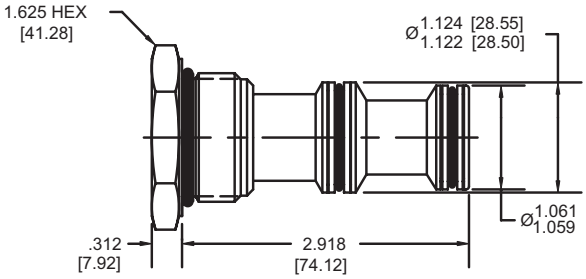
NOTE: dimensions in brackets are millimeters



2W 2P CAVITY PLUG
SJ SERIES



3W 2P SHORT CAVITY PLUG
SL SERIES



3W 2P CAVITY PLUG
SK SERIES

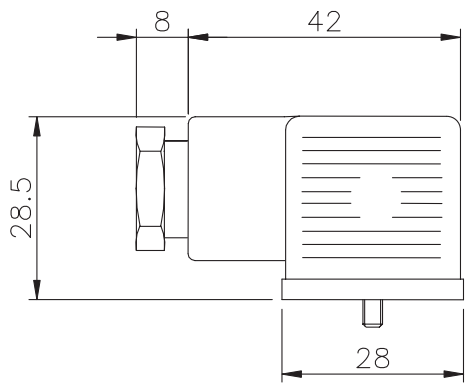
ORDERING INFORMATION

– –

Standard Model Number			Options
2 Way	**SJ**	**00**	Standard Buna
3 Way Short	**SL**	**V0**	Standard Viton
3 Way	**SK**		

Connectors for the DIN 43650 (Hirschmann) Termination

Standard connector dimensions and with internal VDR resistor against overvoltage peak



TECHNICAL DATA	
Number of poles	2 + Earth
Max operating current	10 A
Contact resistance	< 4 mOhm
Max. wire cross section	1.5 mm^2
Cable diameter	6 - 8 mm
Cable gland size	Pg 9
Protection class	IP 65

ORDERING INFORMATION	
DESCRIPTION	**CODE**
Standard	50.1004.002
With VDR resistor	50.1004.025

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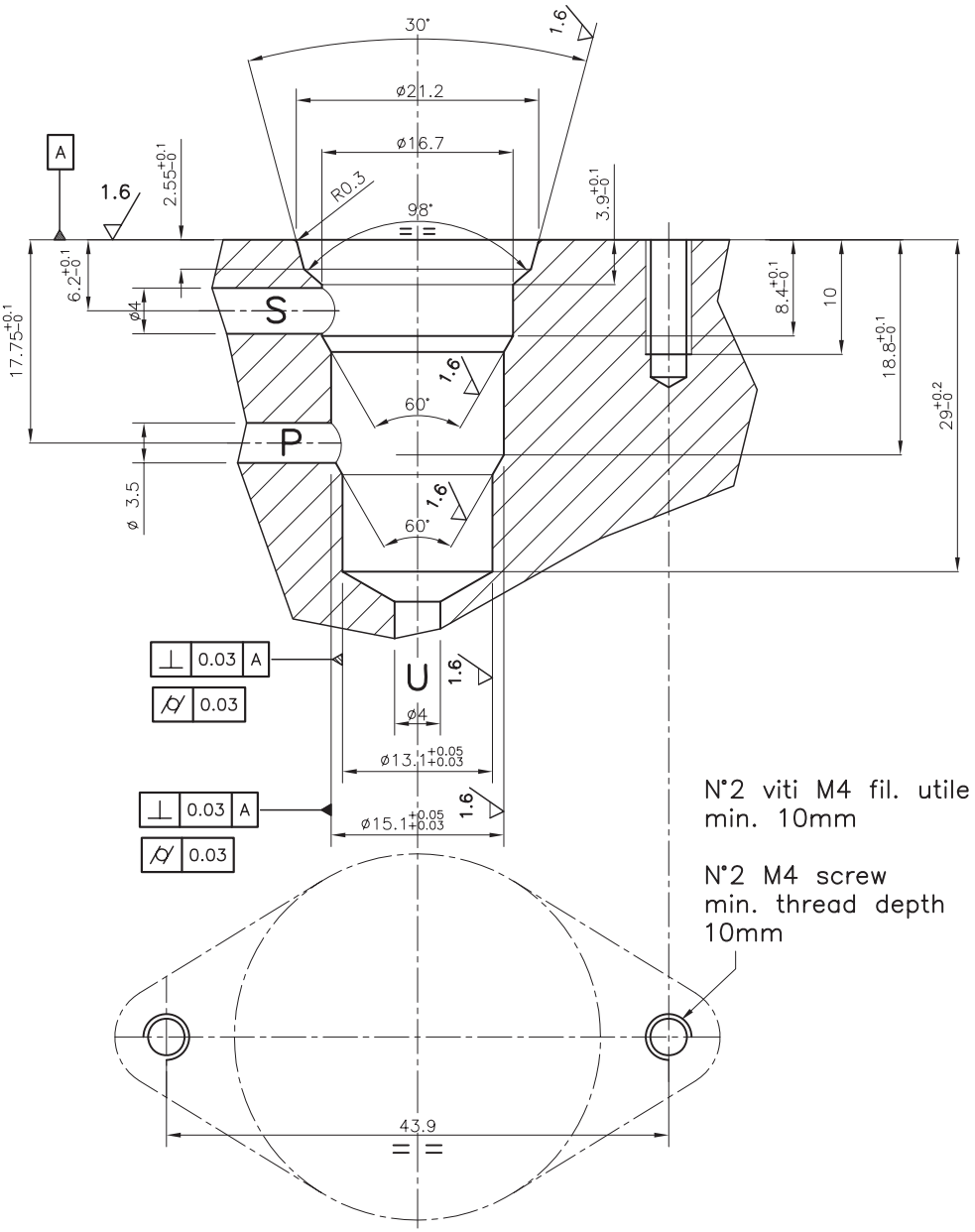
Cavity Data

SERIES	SIZE	THREAD SIZE	TOOLS KIT	PAGE
T043		SLIP-IN	K-T043	3
T059		SLIP-IN	K-T059	4
T042		7/8-14 UNF 2-B	K-T042	5
POWER 2 WAY	8	3/4-16 UNF 2-B	40500005	6
DELTA 2 WAY	10	7/8-14 UNF 2-B	40500000	7
DELTA 3 WAY	10	7/8-14 UNF 2-B	40500001	8
DELTA 4 WAY	10	7/8-14 UNF 2-B	40500002	9
TECNORD 2 WAY	12	1 1/16-12 UNF 2-B	40500032	10
TECNORD 3 WAY	12	1 1/16-12 UNF 2-B	40500034	11
SUPER 2 WAY	16	1 5/16-12 UNF 2-B	40500017	12
SUPER 3 WAY	16	1 5/16-12 UNF 2-B	40500018	13
SUPER 3 WAY SHORT	16	1 5/16-12 UNF 2-B	40500021	14

T043

DESCRIPTION

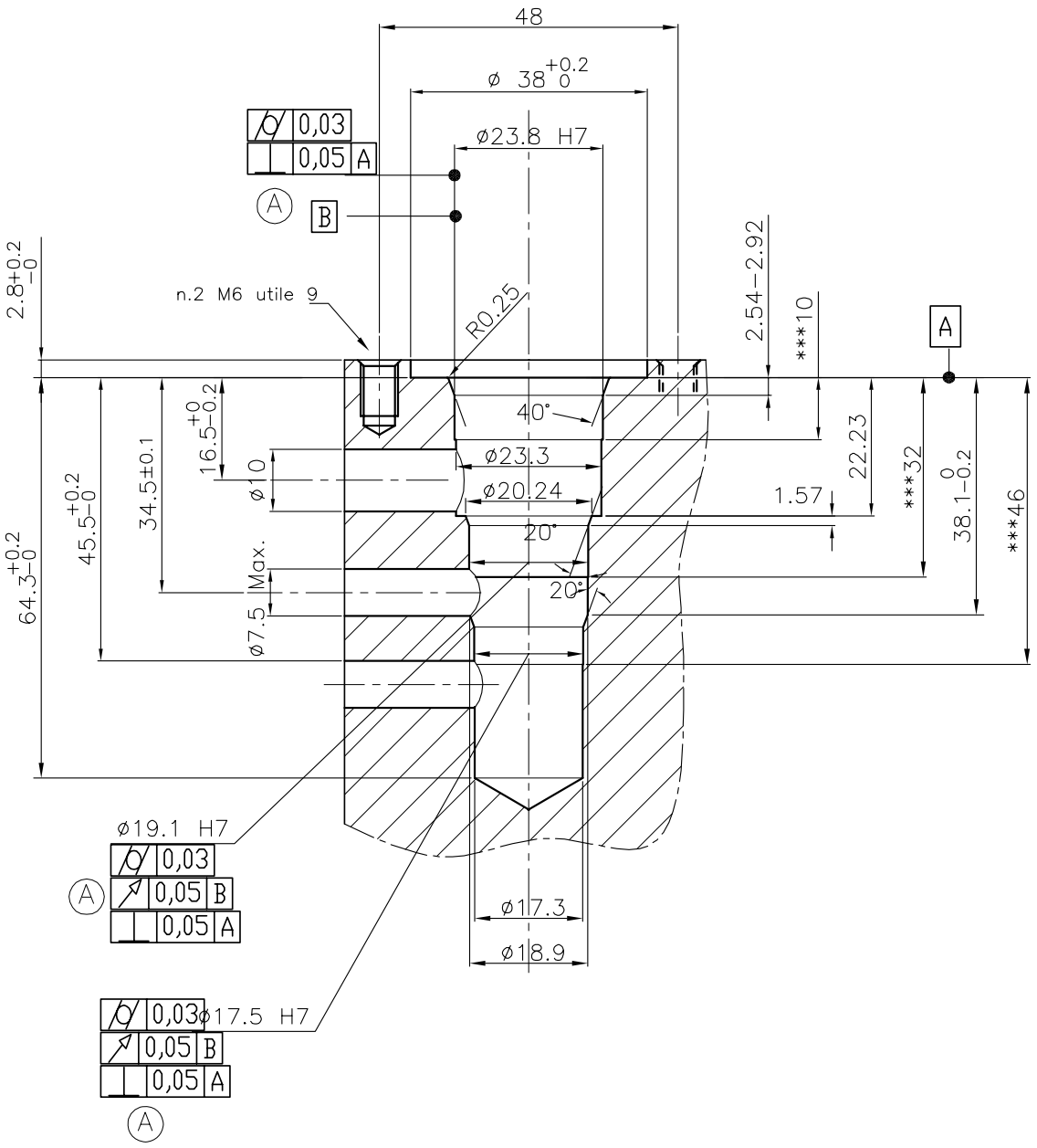
Slip-in cavity for IP-DAR-43 cartridge



T059

DESCRIPTION

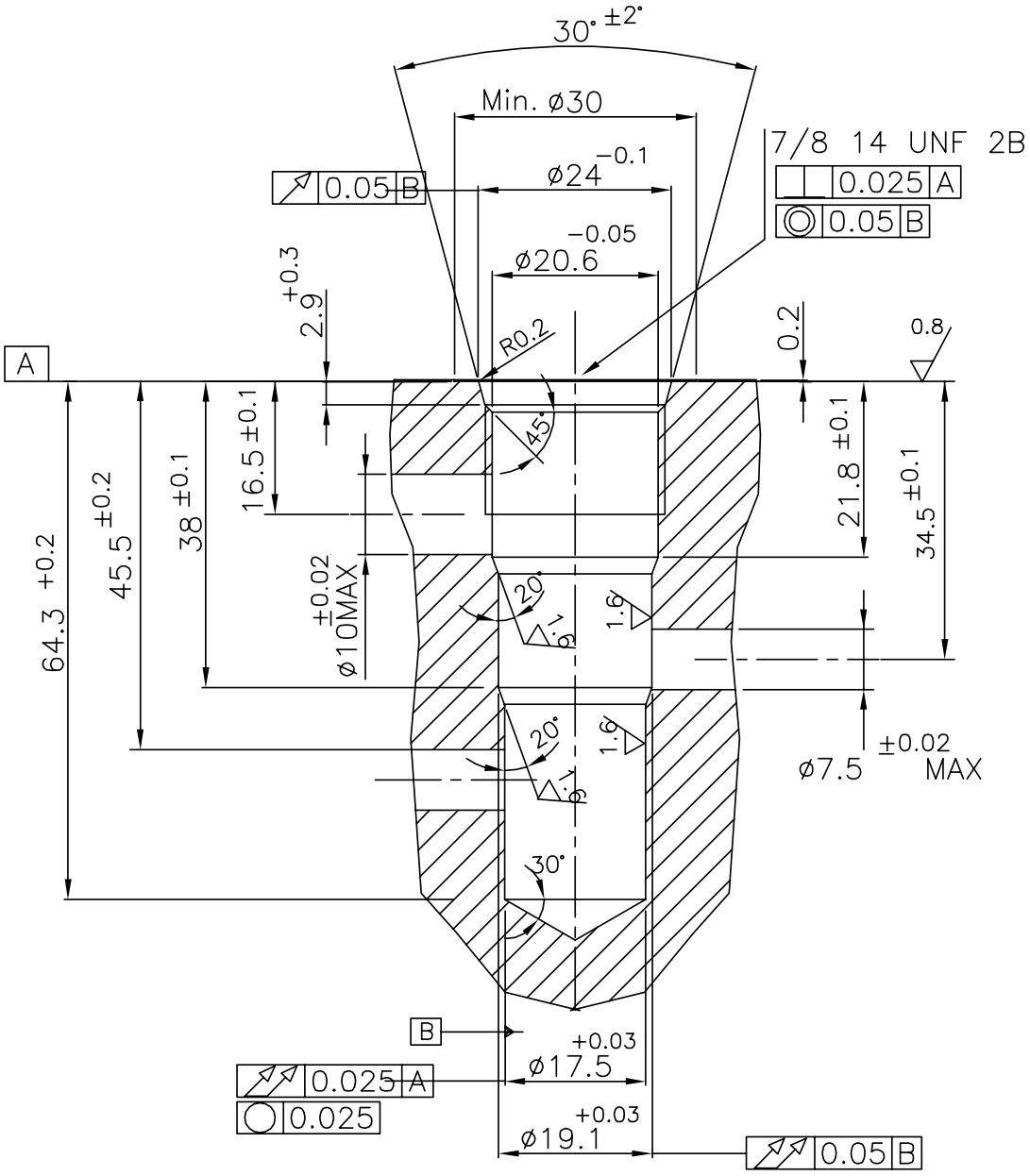
Slip-in cavity for IP-PRZ-59 cartridge



T042

DESCRIPTION

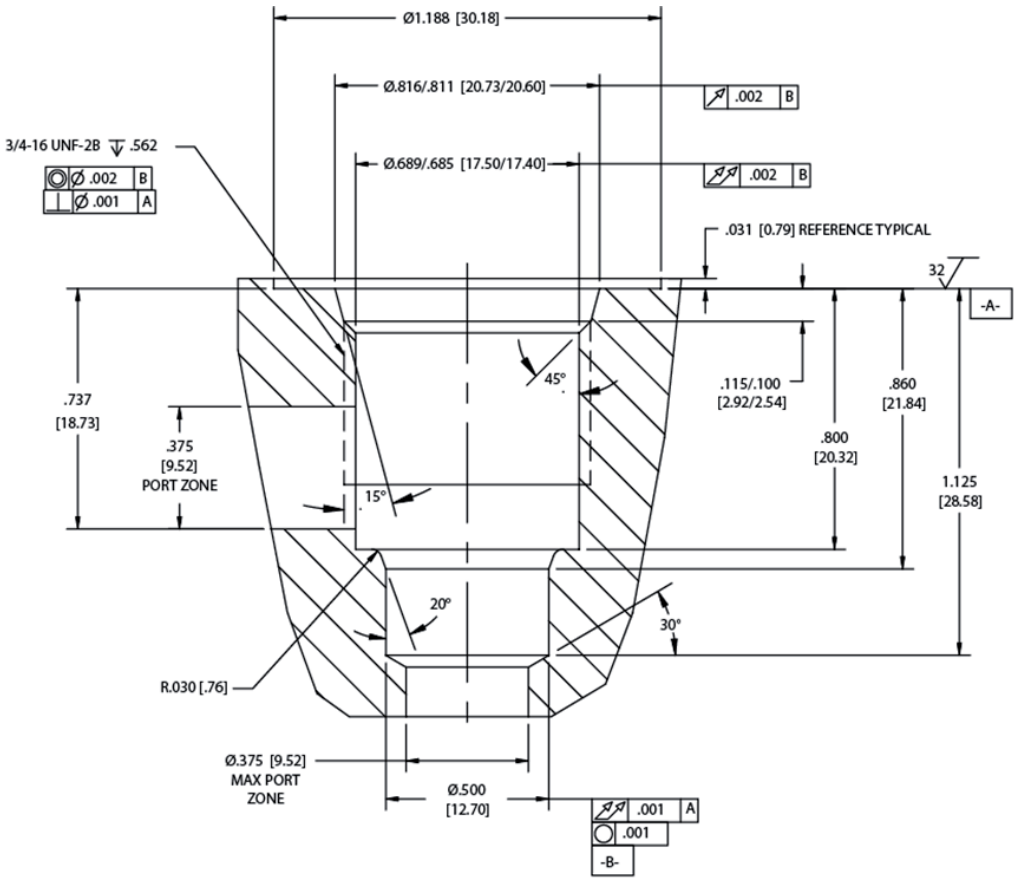
Cavity for EG-TRZ-42 cartridge, 7/8” - 14 thread



Power 2 Way

DESCRIPTION

8 Size, 3/4-16 thread “Power” series



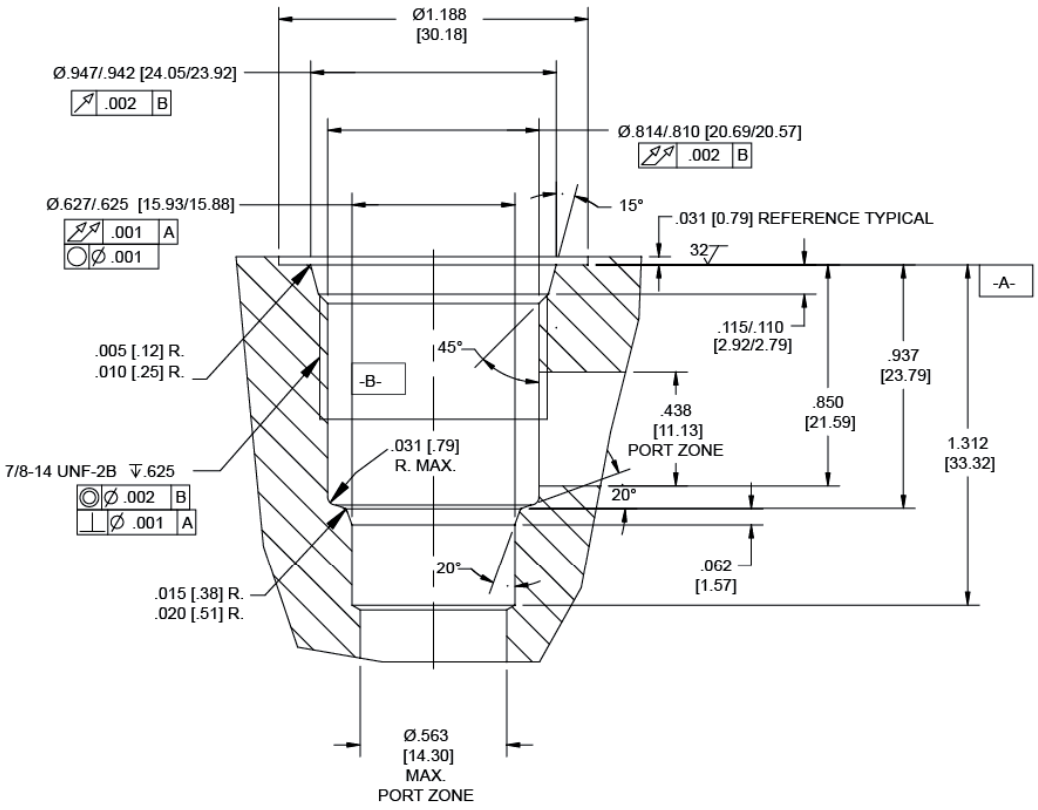
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500005.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Delta 2 Way

DESCRIPTION

10 Size, 7/8-14 thread “Delta” series



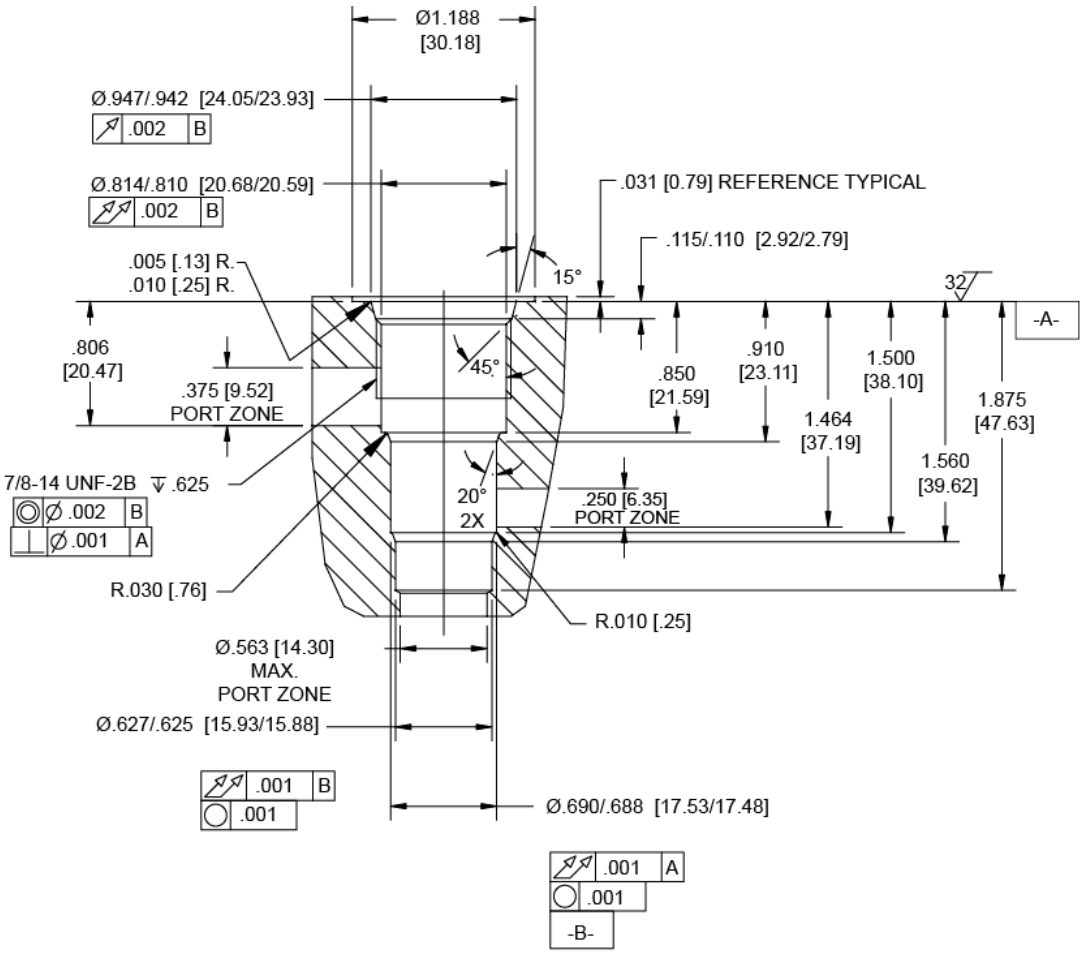
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500000.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Delta 3 Way

DESCRIPTION

10 Size, 7/8-14 thread “Delta” series



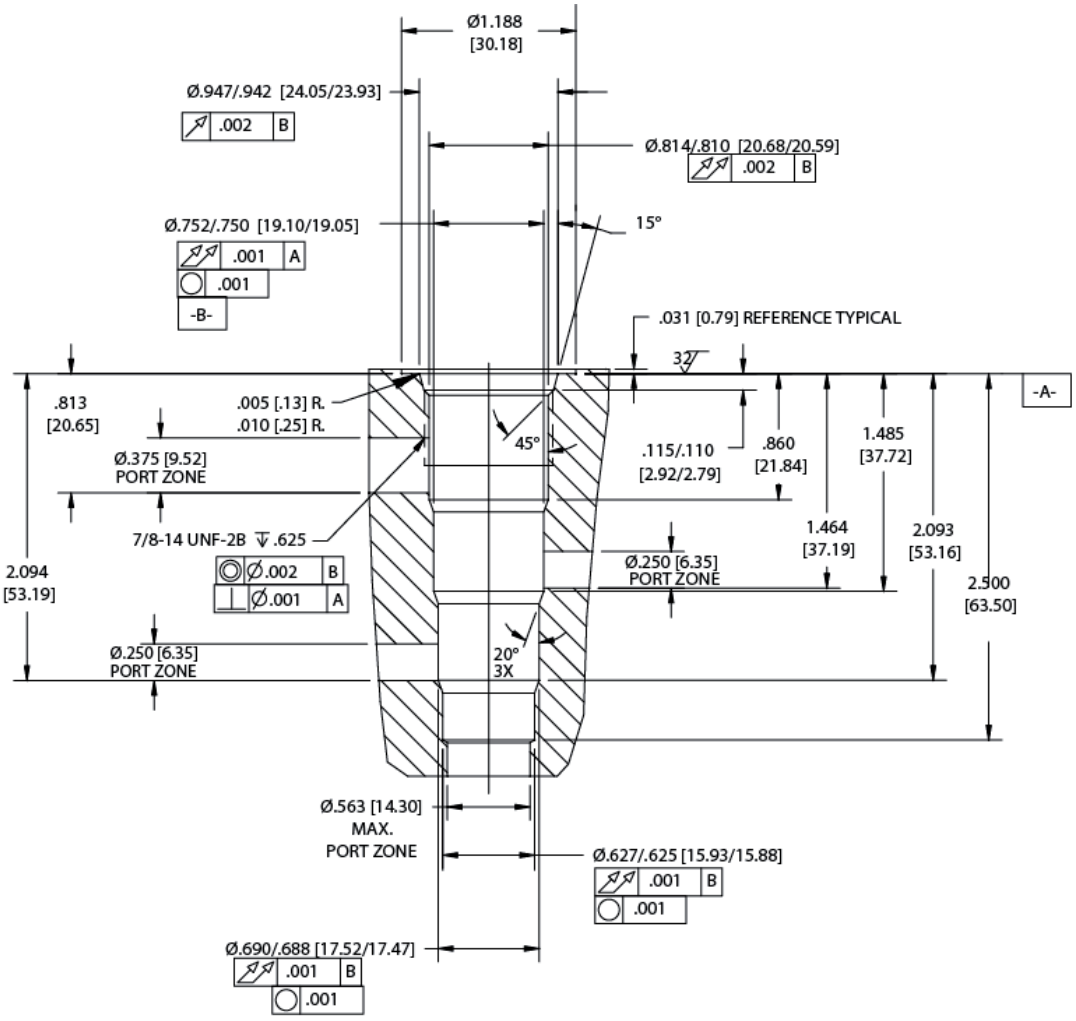
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500001.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Delta 4 Way

DESCRIPTION

10 Size, 7/8-14 thread “Delta” series



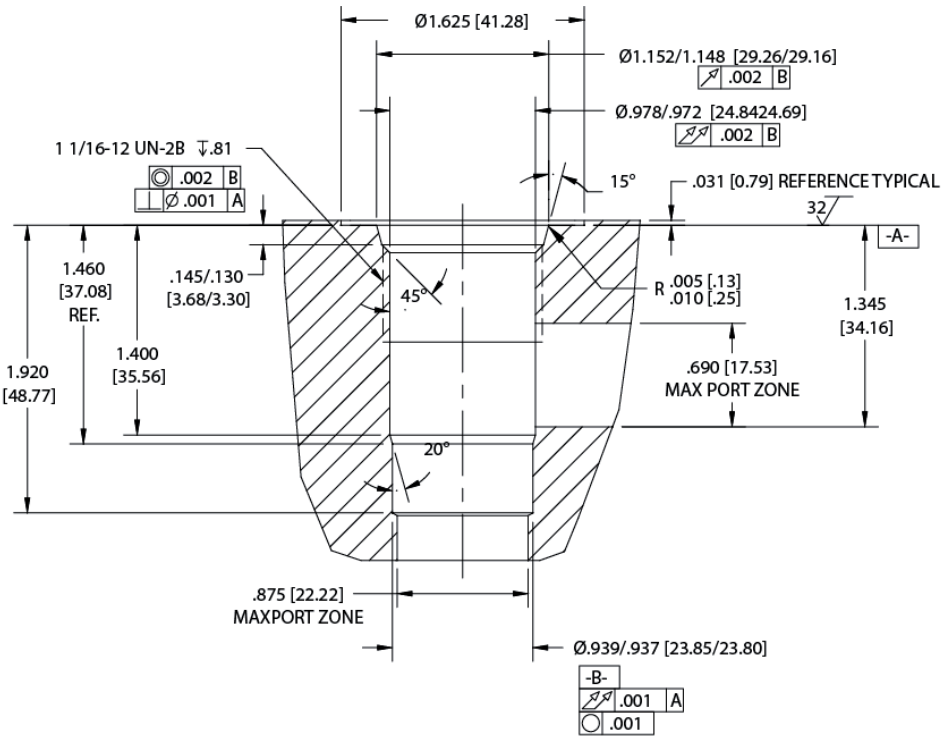
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500002.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Tecnord 2 Way

DESCRIPTION

12 Size, 1 1/16-12 thread “Tecnord” series



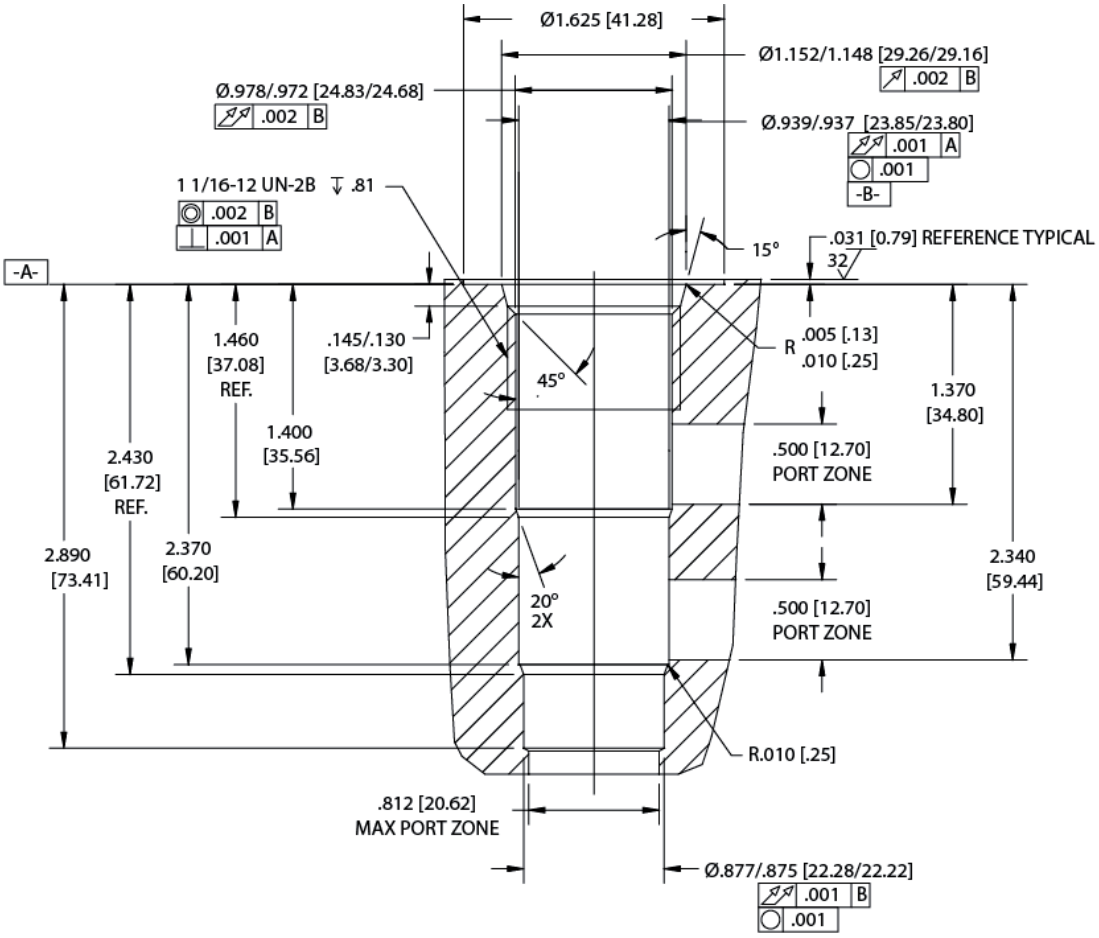
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500032.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Tecnord 3 Way

DESCRIPTION

12 Size, 1 1/16-12 thread “Tecnord” series



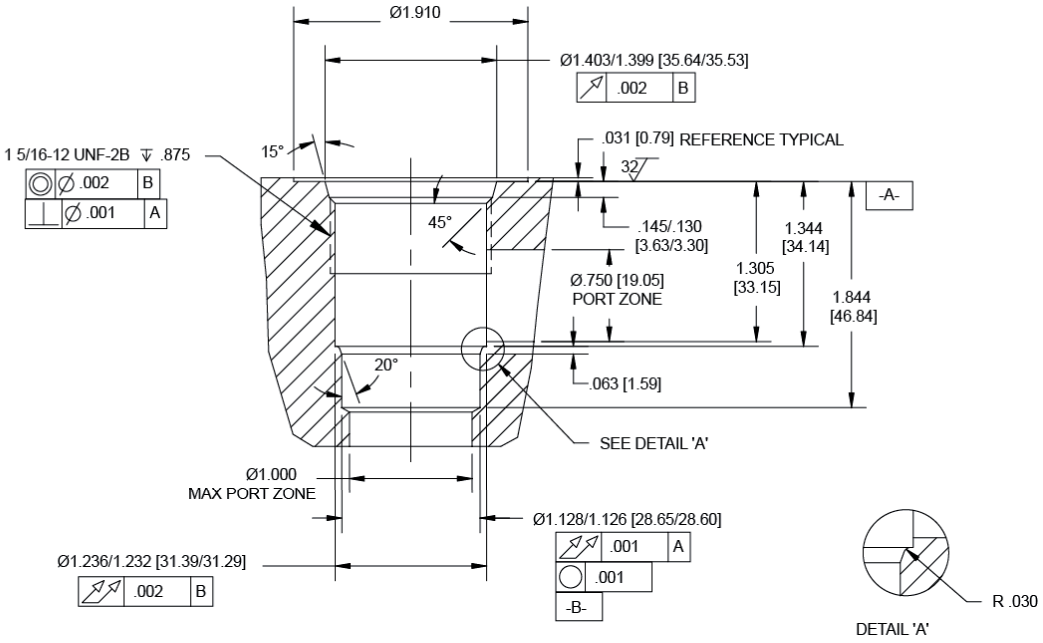
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500034.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Super 2 Way

DESCRIPTION

16 Size, 1 5/16-12 thread “Super” series



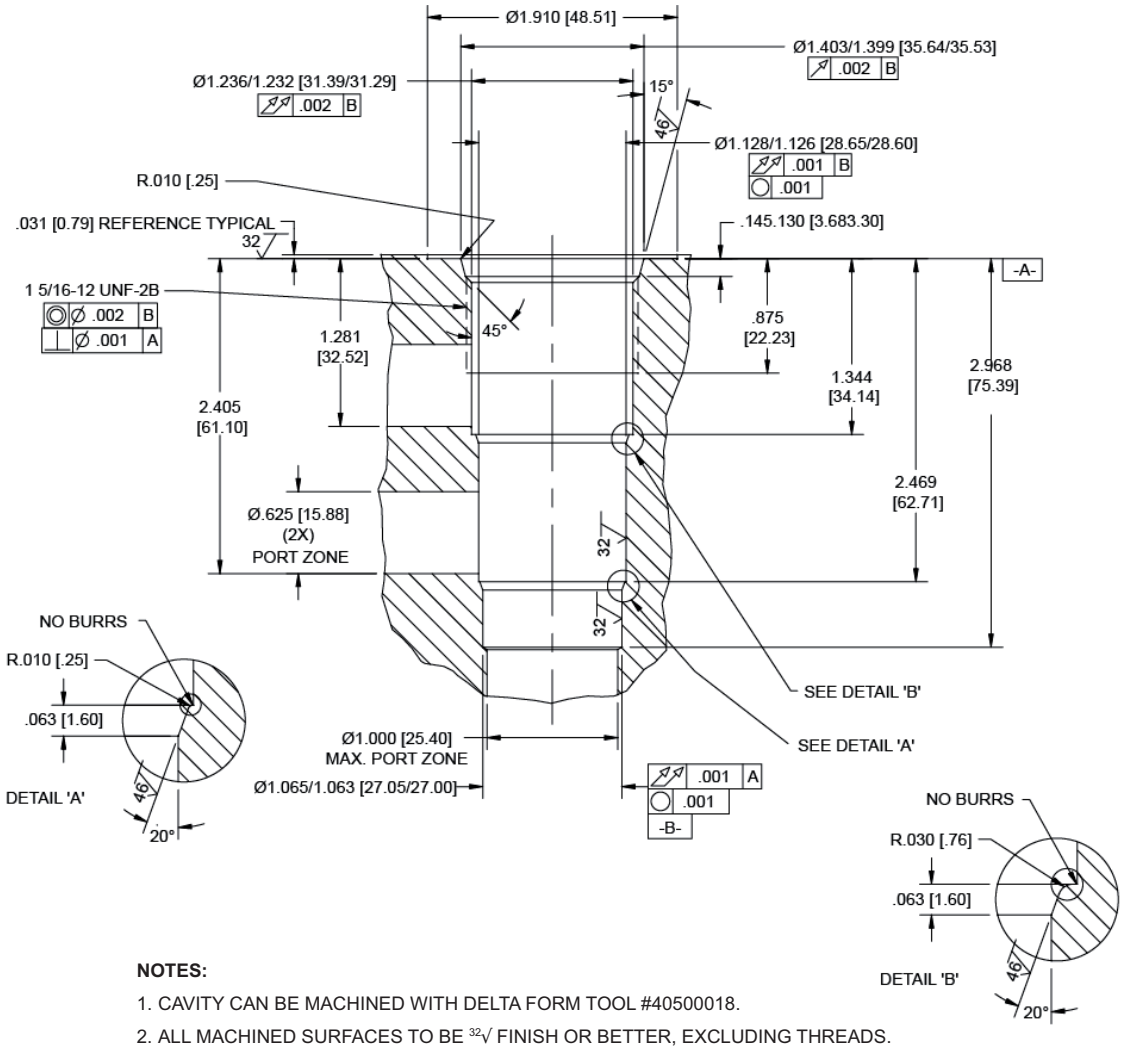
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500017.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Super 3 Way

DESCRIPTION

16 Size, 1 5/16-12 thread “Super” series



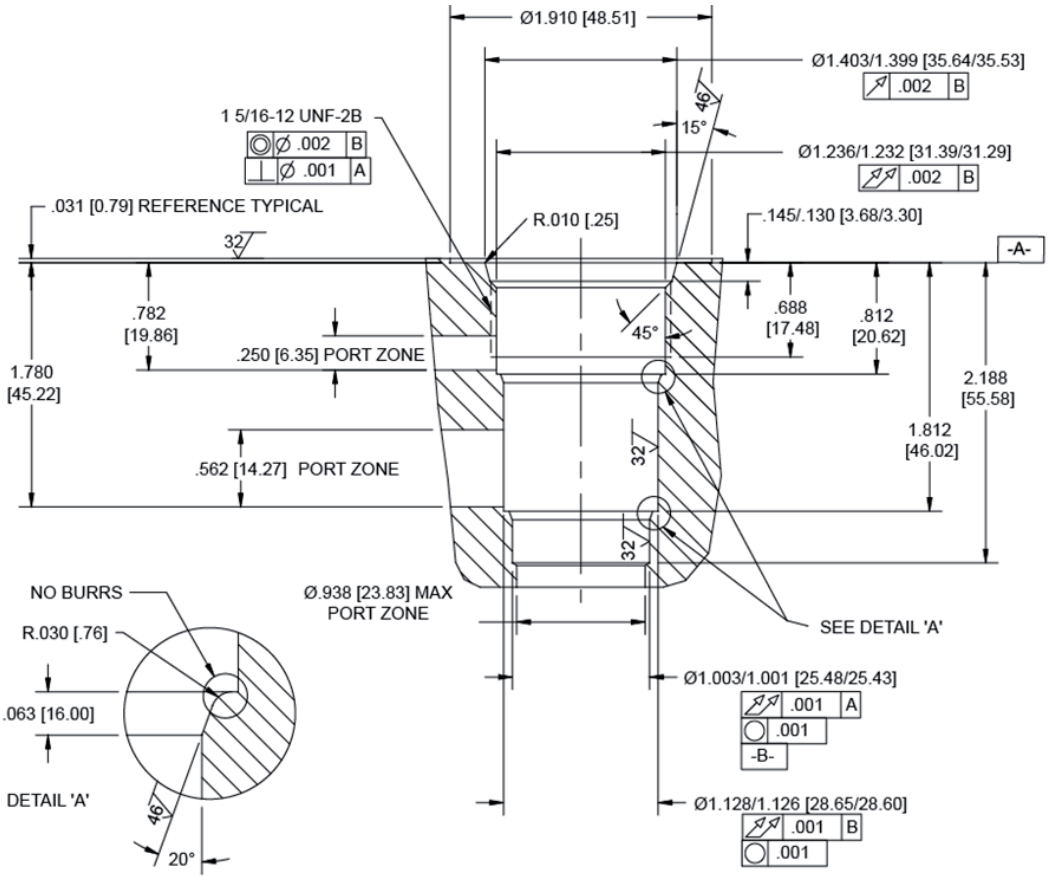
NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500018.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Super 3 Way Short

DESCRIPTION

16 Size, 1 5/16-12 thread “Super” series



NOTES:

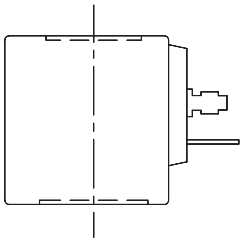
1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500021.
2. ALL MACHINED SURFACES TO BE $^{32}\surd$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

Coil Data

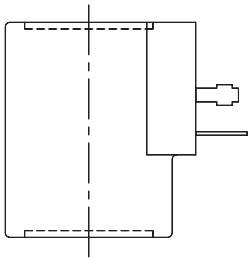
STANDARD COILS

TYPE	ID	WIDTH	HEIGHT	PAGE
A	13.3	30	39	16
V	13.2	37.5	50	18
F	19.1	37	50	20
T	19.1	46	56	22

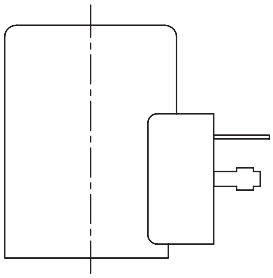
“A”



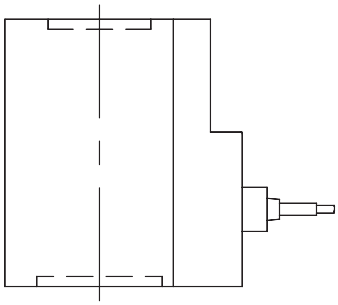
“V”



“F”



“T”



Standard "A" Type Coils

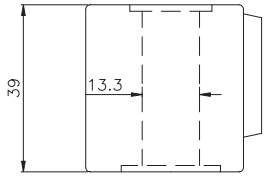
FEATURES

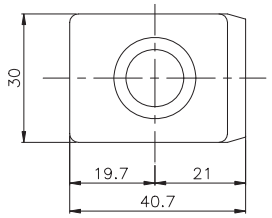
One piece water resistant encapsulated design.

Numerous terminals and voltages available.

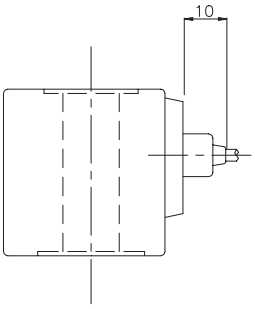
Internal arc suppression diodes available on request.

Color identification: black

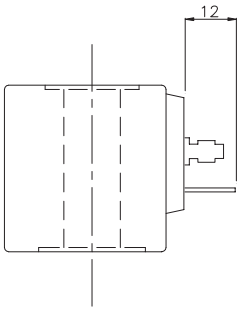




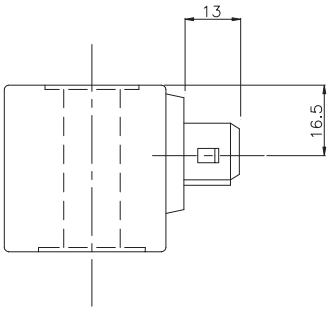
ADL



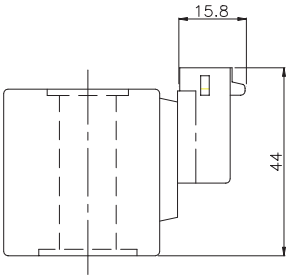
AHC



AJT



AMP



ORDERING INFORMATION

A	-	**	-	**
1		2		3

1 MODEL	2 TERMINATION	3 VOLTAGE
A (coil type)	**DL** Double Lead **HC** DIN 43650 (Hirschmann) **JT** AMP Junior Timer - Integral **MP** Metri-Pack - Integral	**12** 12 vdc **24** 24 vdc **22** 220 vac without internal rectifier (for HC termination only)

Standard "A" Type Coils

COIL MODEL NUMBERS

Termination	ADL	AHC	AJT	AMP
Description	***Double Lead***	***Hirschmann Connector***	***AMP Junior Timer***	***Metri-Pack***
Voltage / Amp	12 V / 1.5 A	12 V / 1.5 A	12 V / 1.5 A	12 V / 1.5 A
Voltage / Amp	24 V / 0.75 A	24 V / 0.75 A	24 V / 0.75 A	24 V / 0.75 A
Voltage / Amp		220 VAC rectified 0.06 A		

SPECIFICATIONS

Wattage: 18 Watts nominal

Duty rating: continuous duty ±10% rated voltage at 120°F (49°C) ambient

Minimum current for actuation: 80% of rated current at room temperature

Magnet wire insulation: class H (200°C)

Heat insulation: class H (180°C)

Ambient temperature range: -30°C / +60°C

Protection degree: IP 65 (with connector and suitable seals)

Lead wires: 600 Volt rating, with strain relief

Encapsulating material: glass filled polyester, resistant to moisture, caustic solutions, fungus and vibration

AC coils do not include the rectifier, supply voltage must be externally rectified

Approximate coil weight: .42 lbs (.19 kg)

Standard "V" Type Coils

FEATURES

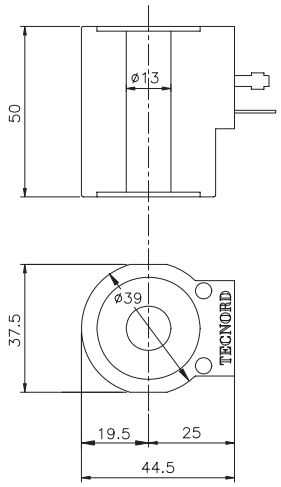
One piece water resistant encapsulated design.

Numerous terminals and voltages available.

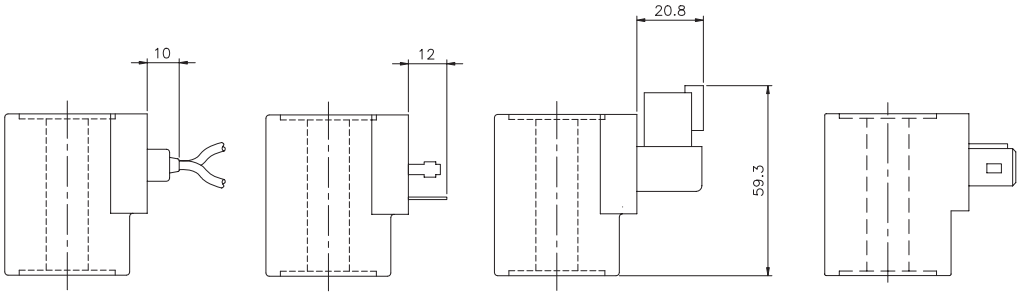
Internal arc suppression diodes available on request.

Color identification: black

Note: for coil selection in extreme conditions, please look at our immersion proof "I" coils.



VDL **VHC** **VDI** **VJT**



ORDERING INFORMATION

V	-	**	-	**
1		**2**		**3**

1 MODEL	2 TERMINATION	3 VOLTAGE
V (coil type)	**DL** Double Lead **HC** DIN 43650 (Hirschmann) **DI** Deutsch - Integral DT04-2P **JT** AMP Junior Timer - Integral	**12** 12 vdc **24** 24 vdc **22** 220 vac without internal rectifier (for HC termination only)

Standard "V" Type Coils

COIL MODEL NUMBERS

Termination	VDL	VHC	VDI	VJT
Description	***Double Lead***	***Hirschmann Connector***	***Deutsch Integral***	***AMP Junior Timer***
Voltage / Amp	12 V / 2.03 A	12 V / 2.03 A	12 V / 2.03 A	12 V / 2.03 A
Voltage / Amp	24 V / 1.01 A	24 V / 1.01 A	24 V / 1.01 A	24 V / 1.01 A
Voltage / Amp		220 VAC rectified 0.11 A		

SPECIFICATIONS

Wattage: 24 Watts nominal

Duty rating: continuous duty ±10% rated voltage at 120°F (49°C) ambient

Minimum current for actuation: 80% of rated current at room temperature

Magnet wire insulation: class H (200°C)

Heat insulation: class H (180°C)

Ambient temperature range: -30°C / +60°C

Protection degree: IP 65

Lead wires: 600 Volt rating, with strain relief

Encapsulating material: glass filled polyester, resistant to moisture, caustic solutions, fungus and vibration

AC coils do not include the rectifier, supply voltage must be externally rectified

Approximate coil weight: .56 lbs (.25 kg)

Standard "F" Type Coils

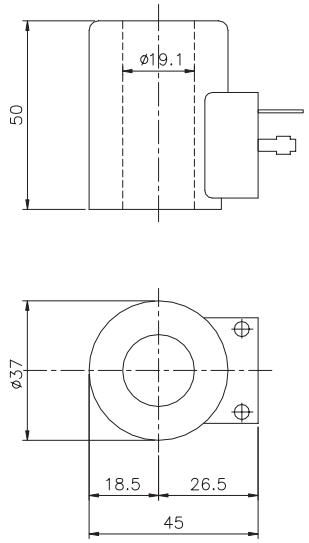
FEATURES

One piece water resistant encapsulated design.

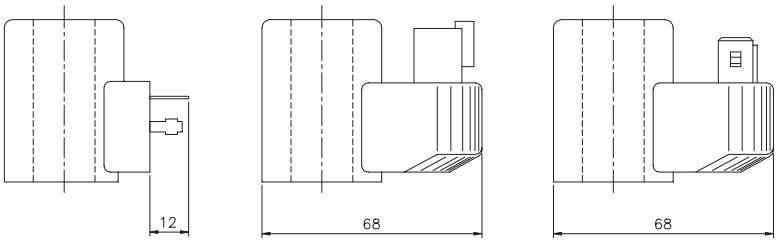
Numerous terminals and voltages available.

Internal arc suppression diodes available on request.

Color identification: yellow metallic envelope



FHC **FDI** **FJT**



ORDERING INFORMATION

F	-	**	-	**
1		2		3

1 MODEL	2 TERMINATION	3 VOLTAGE
F (proportional coil type)	**HC** DIN 43650 (Hirschmann) **DI** Deutsch - Integral DT04-2P **JT** AMP Junior Timer	**12** 12 vdc **24** 24 vdc

Standard "F" Proportional Type Coils

COIL MODEL NUMBERS

Termination	FHC	FDI	FJT
Description	***Hirschmann Connector***	***Deutsch Integral***	***AMP Junior Timer***
Voltage / Amp	12 V / 1.66 A	12 V / 1.66 A	12 V / 1.66 A
Voltage / Amp	24 V / 0.83 A	24 V / 0.83 A	24 V / 0.83 A

SPECIFICATIONS

Wattage: 20 Watts nominal

Duty rating: continuous duty ±10% rated voltage at 120°F (49°C) ambient

Minimum current for actuation: 80% of rated current at room temperature

Magnet wire insulation: class H (200°C)

Heat insulation: class H (180°C)

Ambient temperature range: - 30°C / +60°C

Protection degree: IP 65 (with connector and suitable seals)

Lead wires: 600 Volt rating, with strain relief

Encapsulating material: glass filled polyester, resistant to moisture, caustic solutions, fungus and vibration

Metallic parts protected against oxidation

Approximate coil weight: .49 lbs (.22 kg)

Standard "T" Type Coils

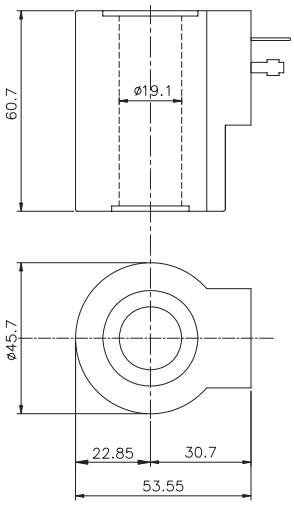
FEATURES

One piece water resistant encapsulated design.

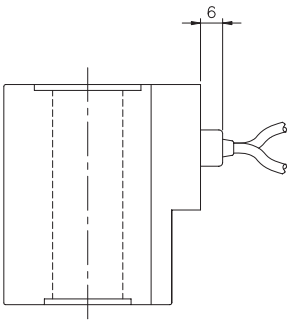
Numerous terminals and voltages available.

Internal arc suppression diodes available on request.

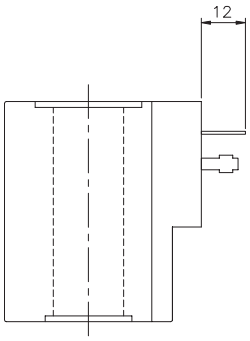
Color identification: black



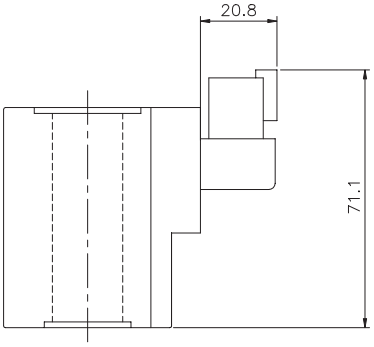
TDL



THC



TDI



ORDERING INFORMATION

T	-	**	-	**
1		**2**		**3**

1 MODEL	2 TERMINATION	3 VOLTAGE
T (coil type)	**DL** Double Lead **HC** DIN 43650 (Hirschmann) **DI** Deutsch - Integral DT04-2P	**12** 12 vdc **24** 24 vdc **22** 220 vac without internal rectifier (for HC termination only)

Standard "T" Type Coils

COIL MODEL NUMBERS

Termination	TDL	THC	TDI
Description	***Double Lead***	***Hirschmann Connector***	***Deutsch Integral***
Voltage / Amp	12 V / 2.5 A	12 V / 2.5 A	12 V / 2.5 A
Voltage / Amp	24 V / 1.25 A	24 V / 1.25 A	24 V / 1.25 A
Voltage / Amp		220 VAC rectified 0.18 A	

SPECIFICATIONS

Wattage: 30 Watts nominal

Duty rating: continuous duty ±10% rated voltage at 120°F (49°C) ambient

Minimum current for actuation: 80% of rated current at room temperature

Magnet wire insulation: class H (200°C)

Heat insulation: class H (180°C)

Ambient temperature range: -30°C / +60°C

Protection degree: IP 65 (with connector and suitable seals)

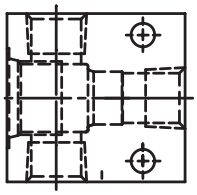
Lead wires: 600 Volt rating, with strain relief

Encapsulating material: glass filled polyester, resistant to moisture, caustic solutions, fungus and vibration

AC coils do not include the rectifier, supply voltage must be externally rectified

Approximate coil weight: .78 lbs (.35 kg)

General Installation Note



VALVE BODIES

Check the cartridge brochure to assure correct plumbing.

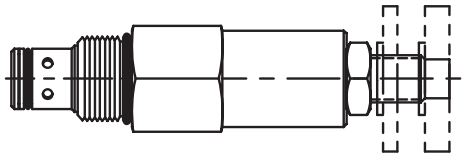
Inspect the cavity for burrs and any irregular machining which would damage 0-rings at assembly.

Shims may be required behind the block for panel mounting.

ASSEMBLY

Dip the cartridge in clean oil before installing.

Screw the cartridge in by hand until the top 0-ring is touching to the proper torque specification the manifold, then wrench tighten given below.



TORQUE SPECIFICATIONS

Final Cartridge Tightening:

Series	Torquet
5/8 MINI	10-15 ft-lbs
3/4 POWER	20-25 ft-lbs
7/8 DELTA	25-30 ft-lbs
1 1/16 TECNORD	60-70 ft-lbs
1 5/16 SUPER	80-90 ft-lbs

Adjusting Holding Parts:

Part	Torquet
Nut	3-5 ft-lbs
Knob	3-5 ft-lbs
Cap	2-3 ft-lbs