

Palletized fixture

Enerpac provides a variety of solutions for use in palletized fixtures:

- Manual and Automated Coupler Systems for connecting/disconnecting to the fixture
- Rotary couplers for use with continuous connection systems
- Pressure intensifiers to provide increased pressure for clamping when used with machine hydraulics
- Safe Link for remote wireless monitoring of fixture pressure or clamp position.







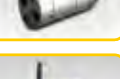
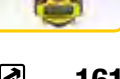


Technical support

- Safety instructions
- Basic hydraulic information
- Advanced hydraulic technology
- FMS (Flexible Machining Systems) technology
- Conversion charts and hydraulic symbols.

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components

	▼ series	▼ page	
Accumulators	AC WA	162 - 163	
Coupler Packages	AC, AP MHV	164 - 165	
Manual couplers	MCR, MCH	166 - 171	
Activator wand & boosters	B, RA	172 - 173	
Auto-coupler systems	MCA, MPA WCA, ACC	174 - 175	
Rotary couplers	AMP, CR, CRV	176 - 177	
Pressure intensifiers	PID	178 - 179	
SafeLink Wireless Communication	SLR, SLS SLE, SLD	180 - 185	

Shown: ACL-201A, WA-502, ACL-21A

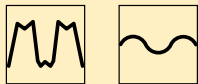


► Enerpac accumulators supply auxiliary pressure to dampen shock loads or to compensate pressure drop in applications where system pressure needs to be maintained.

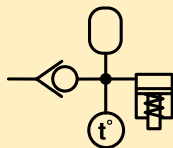
Accumulator applications:

- Energy storage
- Circuit pulsation dampening
- Thermal expansion compensation

Pulse dampening



Thermal expansion



■ ACBS-202 Accumulator package used to maintain pressure on a machine tool fixture.



Accumulators

...maintain circuit pressure

- Ideal for high frequency and rapid discharge applications
- ACL series are pre-charged to 100 bar
- Corrosion resistant bodies on ACL series
- Spring actuated accumulator for ACM-1
- High energy storage capacity in a compact package
- WA accumulators are piston type
- ACL accumulators are diaphragm type
- ACM accumulators use internal spring.

Product selection

Operating pressure bar	Model number	Max. rated oil volume cm ³	Gas volume cm ³	Pre-charged nitrogen pressure bar	Usable oil capacity cm ³ at 350 bar
▼ Pre-charged accumulators					
0-210	ACM-1	1,6	–	–	–
100-350	ACL-22A	14,7	20,0	100	8,7
100-350	ACL-202A	126,2	169,9	100	73,9
100-350	ACL-502A	337,6	450,0	100	196,6
▼ Uncharged accumulators					
0-350 ¹⁾	WA-502	41,0	41,0	–	41,0
0-350 ¹⁾	WA-5010	163,9	163,9	–	122,9

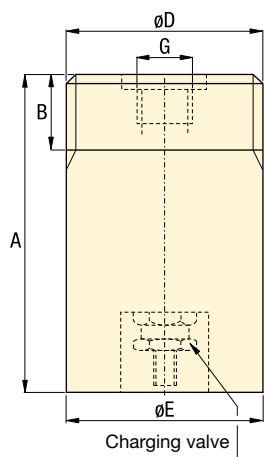
¹⁾ See pre-charge chart on page 163 for hydraulic operating pressures.

Recommended pre-charge

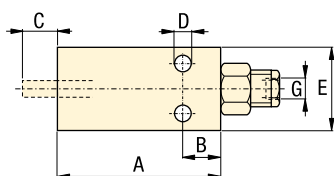
Operating pressure bar	Model number	Nitrogen pressure bar	Usable oil capacity ¹⁾ cm ³
0 - 70	WA-502	35	24,6
70 - 210	WA-502	70	32,8
210 - 350	WA-502	80	41,0
0 - 70	WA-5010	35	90,1
70 - 210	WA-5010	70	106,5
210 - 350	WA-5010	80	190,5

¹⁾ At maximum operating pressure.

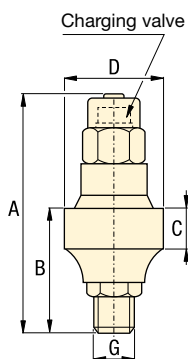
WA-502, WA-5010



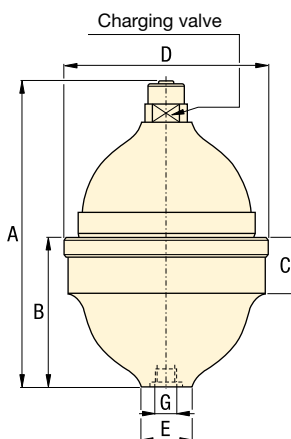
ACM-1



ACL-22A



ACL-202A, 502A



Product dimensions in mm []

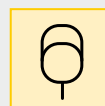
Model number	A	B	C	D	E	F	G	Recommended charging tool	kg
▼ Pre-charged accumulators									
ACM-1	133	19	13	6,7	45	-	1/4"-27 NPTF	-	1,0
ACL-22A	91	37	18	42,9	23	-	G1/4"	WAT-2	0,5
ACL-202A	137	69	29	84,5	29	-	G1/4"	WAT-2	1,2
ACL-502A	171	89	35	114,0	40	-	G3/8"	WAT-2	2,8
▼ Uncharged accumulators									
WA-502	119	30	-	2 3/4" -16 UN	70	-	SAE #8	WAT-1	3,2
WA-5010	181	30	-	2 3/4" -16 UN	70	-	SAE #8	WAT-1	5,2

Pressure: 0 - 350 bar

Oil volume: 1,6 - 337,6 cm³

Gas volume: 20 - 450 cm³

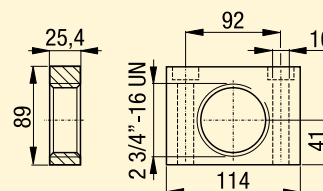
- E** Acumuladores
- F** Accumulateurs
- D** Druckspeicher



Options

AW-50 Mounting block

For WA-series accumulators.



Hydraulic oil

193 ▶



Fittings

194 ▶



Shown: AP-500, MHV-1, ACBS-22A



▶ Accumulator packages will help maintain system pressure to your fixture when separated from the hydraulic source. The gauge will display system pressure after the circuit is disconnected.

Coupler packages

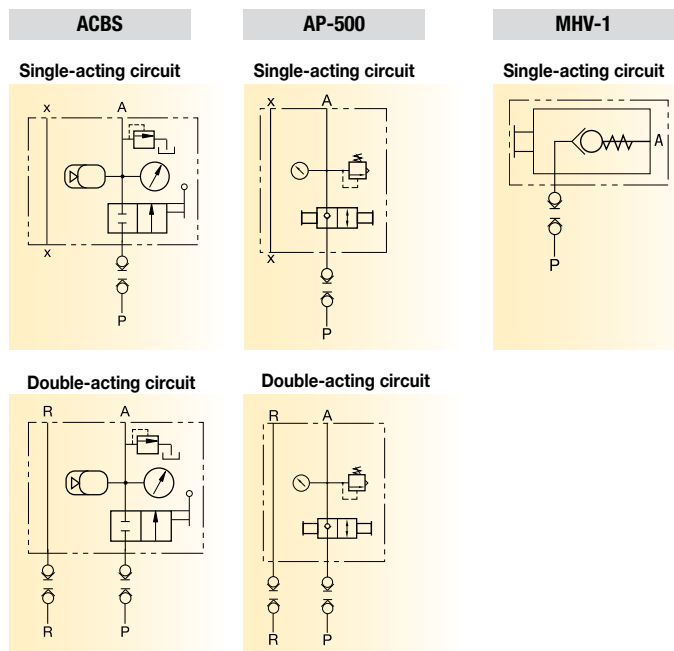
...compact design for easy use of accumulators

- Single design accommodates both single-acting or double-acting circuit
- Relief valve fitted and ball check shut-off
- Glycerin-filled gauge included
- Supplied standard with one male coupler (AH-652)
- Optional manifold mounting. O-ring seals located on bottom of block only for single-acting circuit.

MHV-1 Modular holding valve

- Allows separate operation of clamping fixtures with a single power source
- Ideal for applications when fluid feed lines are impractical. If system pressure is interrupted, the MHV-1 will hold the pressure beyond the valve
- Max. oil flow 5 l/min
- To release system pressure, rotate valve handle in either direction 90° to release and retract system pressure.

i Coupler package circuits



■ ACBS-202A Accumulator package used to maintain pressure on a machine tool fixture.



g Product selection

Operating pressure	Model number	Max. rated oil volume	Gas volume	Pre-charged nitrogen pressure	Usable oil capacity
bar		cm ³	cm ³	bar	cm ³ at 350 bar

▼ Accumulator coupler packages

100 - 350	ACBS-22A	16,4	20,0	100	8,7
100 - 350	ACBS-202A	163,9	169,9	100	73,9
0 - 350	AP-500	AP-500 uses WA-502 or WA-5010 ¹⁾			
0 - 207	MHV-1	-	-	-	-

¹⁾ See pre-charge chart on page 163 for hydraulic operating pressures.

Pressure: 0 - 350 bar

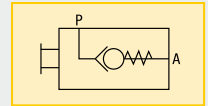
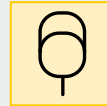
Oil volume: 16,4 - 163,9 cm³

Gas volume: 20 - 169,9 cm³

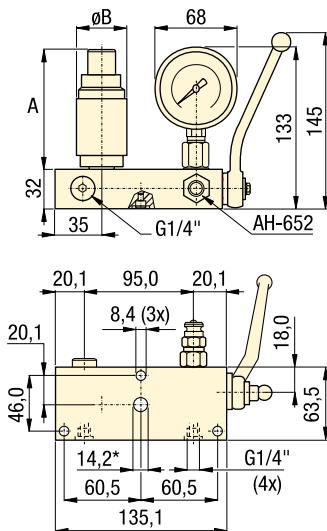
E Acopladores manuales

F Manuel coupleur

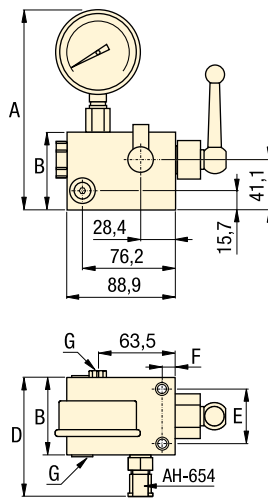
D Manuelle kupplung



ACBS

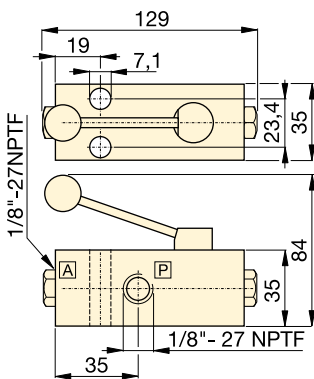


AP-500



¹⁾ Manifold hole should not exceed \varnothing 7,6 mm when port is utilized.

MHV-1



Product dimensions in mm []

Model number	A	B	C	D	E	F	G	Recommended charging tool	kg
▼ Pre-charged accumulator coupler packages									
ACBS-22A	68	42	-	-	-	-	G1/4"	WAT-2	4,6
ACBS-202A	106	85	-	-	-	-	G1/4"	WAT-2	5,4
AP-500	163,6	63,5	89,0	97,5	44,5	9,7	SAE #4	-	3,9
MHV-1	-	-	-	-	-	-	1/8" NPTF	-	-

Options

Couplers

192 ▶



High pressure filters

193 ▶



Hydraulic oil

193 ▶



Fittings

194 ▶



Important

Enerpac high pressure in-line filters are required for use with these control units to prevent damage that can be caused by contaminants that have penetrated your hydraulic fluid system.

Order an additional male coupler for use in double-acting hydraulic circuits.
ACBS-Series: AH-652
AP-500: AH-654

Shown: MCH-31, MCRA-11, MCRC-21, MCH-21, MCR-21

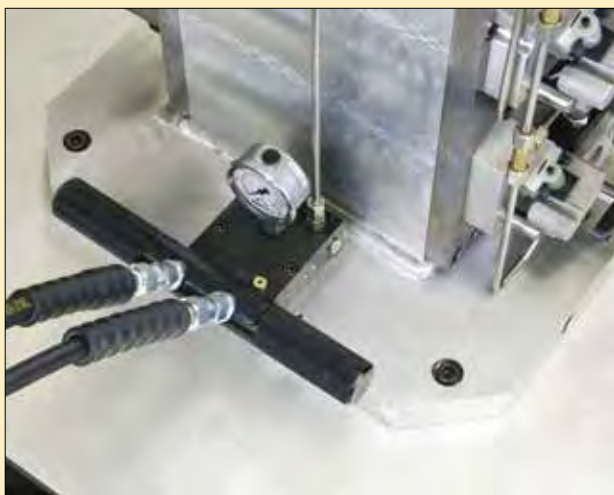


The Enerpac manual coupler is available as a dual connection model or dual connection with optional air circuit for part present sensing. The fixture side receiver is available with or without an internal pilot operated check valve. Filtration provides protection from contamination.

Manual coupler applications:

- **With P.O. check**
 - Use MCRC-21 for a complete, unitized coupler receiver solution.
- **Without P.O. check:**
 - Use MCR-21 when using a remote mounted Pilot Operated Check Valve.

■ *Enerpac manual couplers simplify the process of connecting and disconnecting to a palletized fixture.*

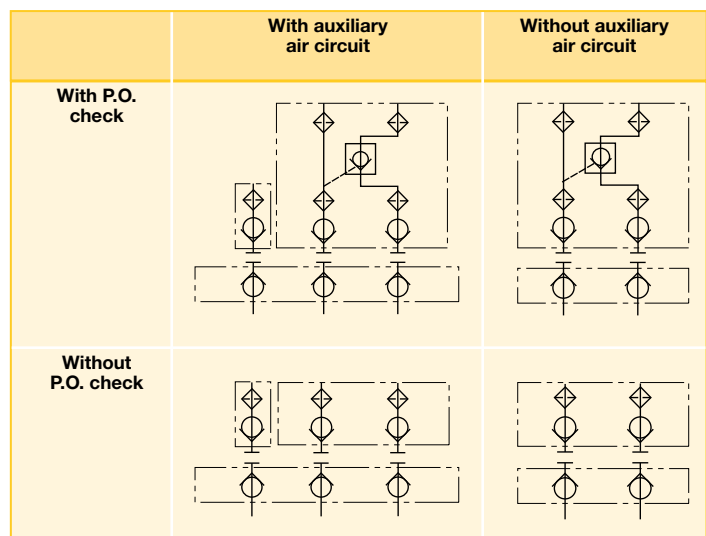


Manual Couplers

...convenient connection

- Use on palletized fixtures
- Available with or without an internal pilot operated (P.O.) check valve
- Optional coupler block available to add circuit for air part present sensing
- Manifold porting
- Porting for tubing connections
- Filtration to prevent contamination
- Removable front plate provides access to the front filters and check cartridge
- Top port accommodates an accumulator or gauge.

Manual Coupler Circuits



Product selection

Model number	Basic configurations	Circuits
MCRC-21	Pallet receiver with P.O. check	Two Hydraulic
MCR-21	Pallet receiver without P.O. check	Two Hydraulic
MCRA-11	Auxiliary air circuit receiver block	One Air
MCH-21	Operator handle	Two Hydraulic
MCH-31	Operator handle	Two Hydraulic, One Air
MCSB-21	Storage block	-
MCPS-21	Proximity switch kit	-

Select your components

MCRC-21 Pallet Receiver with P.O. Check

An internal pilot operated check valve and multiple ports to accommodate a gauge or accumulator make the MCRC-21 a great choice of coupler receiver for use in a palletized fixture. Internal filtration protects the check from contamination. Use with the MCH-21 operator handle.



MCR-21 Pallet Receiver

For applications where the pilot operated check valve is remote mounted in the fixture circuit, use the MCR-1. Internal filtration protects the circuit from outside contamination.



MCRA-11 Auxiliary air circuit receiver

The MCRA-11 is used to provide an additional connection for use with air part sensing circuits. Use with either the MCRC-21 or the MCR-21. Use with the MCH-31 operator handle.



MCSB-21 Operator Handle Storage Block

Proper storage of the MCH-21 or MCH-31 handle prevents contamination of the couplers, and makes sure that the handle is disconnected from the fixture. Use the MCPS-21 proximity switch to confirm proper storage as an input to the machine control.



MCH-21 Two Coupler Operator Handle

Use the MCH-21 with either the MCRC-21 or the MCR-21 pallet receiver.



MCH-31 Operator Handle

Use the MCH-31 when using the MCRA-11 with either the MCRC-21 or MCR-21 receivers.



Max. Flow: 15 l/min

Pressure: 0 - 350 bar

- E Acopladores manuales
- F Manuel coupleur
- D Manuelle kupplung

Options

FZ Series fittings

 194 ▶



Hoses

 192 ▶



Pilot operated check valves

 153 ▶



Accumulators

 162 ▶



Important

Do not couple or uncouple with the hydraulic nozzles under pressure. This can damage the couplers.

Do not exceed maximum flow and pressure.

Operating pressure bar	Replacement hydraulic nozzle	Replacement filter kit	Voltage VDC	Model number
7 - 350	AH-654	FL-2201K	-	MCRC-21
7 - 350	AH-654	FL-2201K	-	MCR-21
1 - 7 *	AH-654	FL-2201K	-	MCRA-11
7 - 350	AR-650	-	-	MCH-21
7 - 350	AR-650	-	-	MCH-31
-	AH-654	-	-	MCSB-21
-	-	-	24	MCPS-21

* Air pressure

Manual Couplers *Dimensions & options*

Shown: MCH-21, MCR-21



MCR and MCH-series

The Enerpac MCH-21 two passage operator handle conveniently connects and disconnects to the MCR-21 two passage receiver utilizing a simple push-on, pull-off action.

Collet-Lok® products

Swing clamps

Work Supports

Linear Cylinders

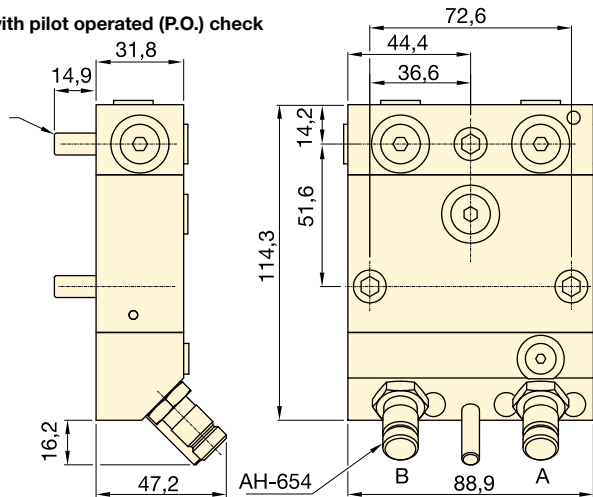
Power Sources

Valves

Pallet Components

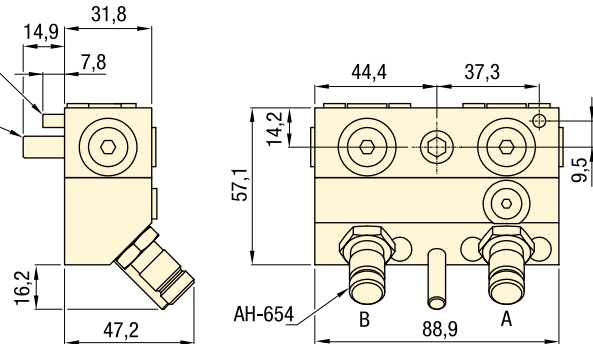
MCR-21 Receiver with pilot operated (P.O.) check

See page 170 for mounting pattern.



MCR-21 Receiver without pilot operated check

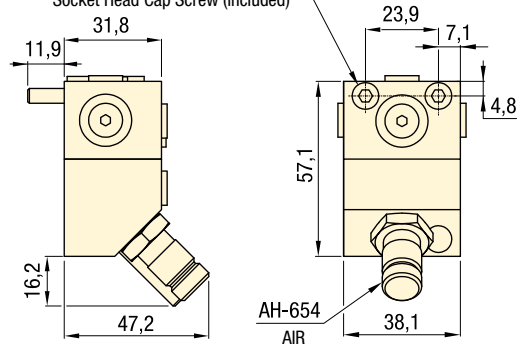
\varnothing 4,8 mm
 15,7 mm length
 spring roll pin (included)
 5/16"-18UN
 38 mm length
 Socket Head Cap Screw (included)



MCRA-11 Auxiliary air circuit receiver

See page 170 for mounting pattern.

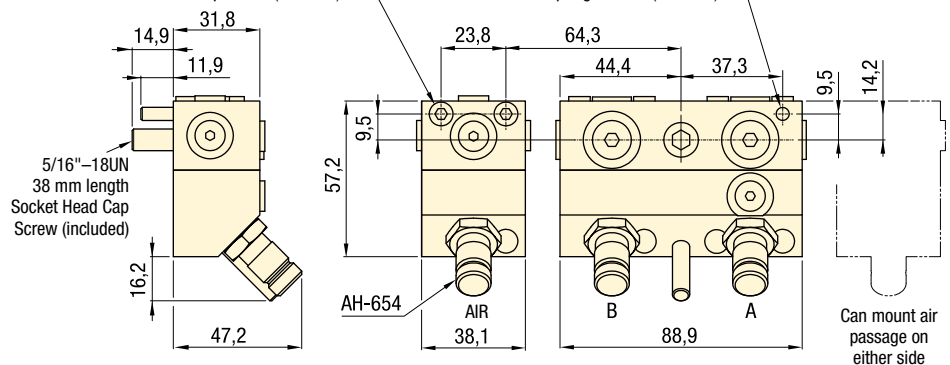
2x #10-24 UN 38 mm length
 Socket Head Cap Screw (included)



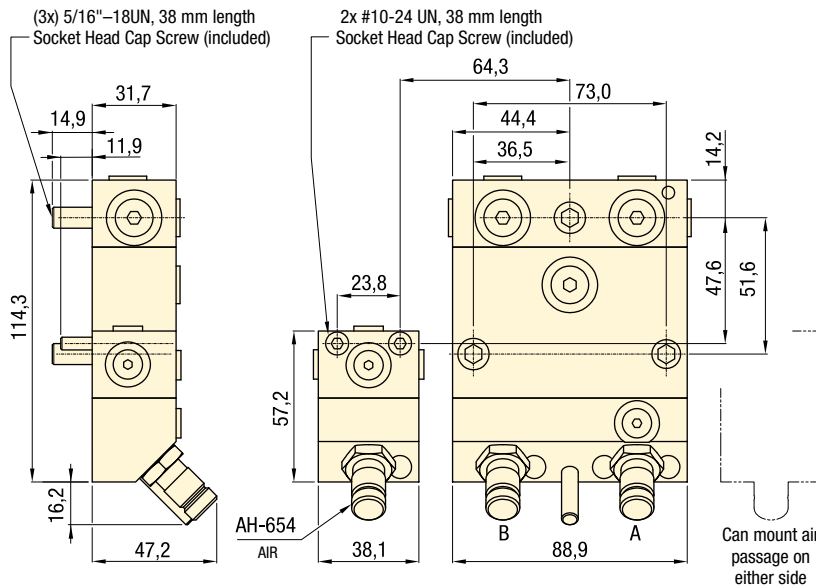
MCR-21 with MCRA-11 Receiver with air passage and without P.O. check

2x #10-24 UN 38 mm length
 Socket Head Cap Screw (included)
 5/16"-18UN
 38 mm length
 Socket Head Cap Screw (included)

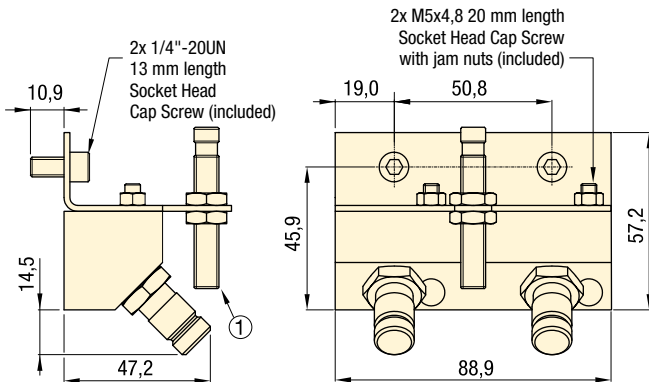
\varnothing 4,8 mm, 15,8 mm length
 Spring Roll Pin (included)



MCR-21 with MCRA-11 See page 170 for mounting pattern.



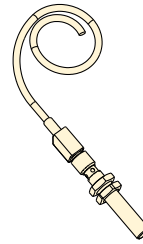
MCSB-21 Storage block. See page 171 for mounting pattern.



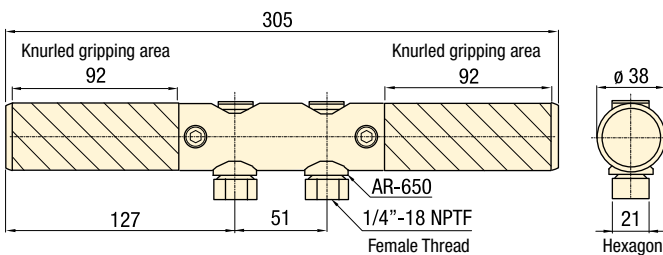
① Optional proximity switch is available. See MCPS-21

MCSB-21

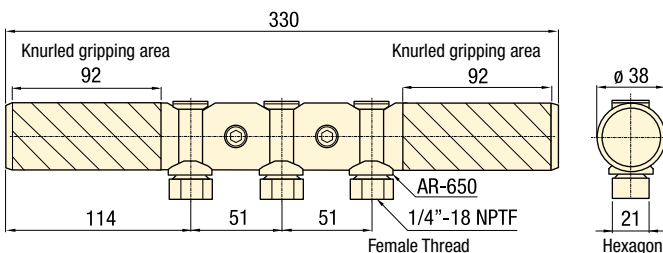
Optional proximity switch



MCH-21 Operator handle



MCH-31 Operator handle



Max. Flow: 15 l/min

Pressure: 0 - 350 bar

- E** Acopladores manuales
- F** Manuel coupleur
- D** Manuelle kupplung

Options

FZ Series fittings

☐ 194 ▶



Hoses and couplers

☐ 192 ▶



Pilot operated check valves

☐ 153 ▶



Accumulators

☐ 162 ▶



⚠ Important

Do not couple or uncouple with the hydraulic nozzles under pressure. This can damage the couplers.

Do not exceed maximum flow and pressure.

Manual Couplers *Mounting patterns*

Shown: MCR-21



MCR-series

The MCR-21 two passage receiver features multiple SAE #4 ports as well as manifold mount ports for easy plumbing to a fixture. Internal filtration in all receiver models protects the circuit from external contamination.

Collet-Lok® products

Swing clamps

Work Supports

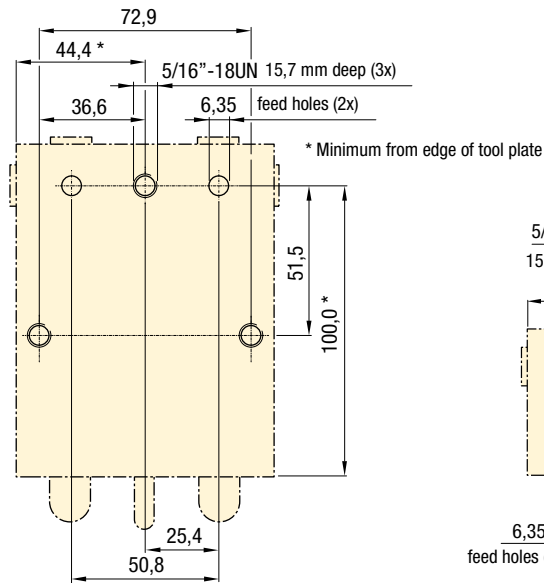
Linear Cylinders

Power Sources

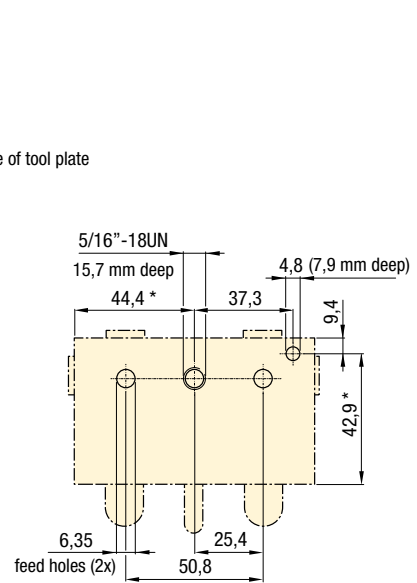
Valves

Pallet Components

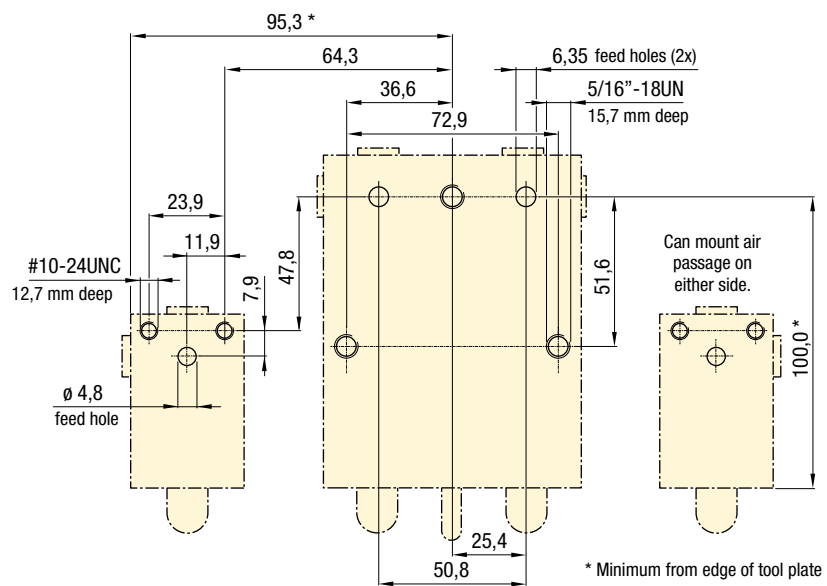
MCRC-21 Receiver with P.O. check – Mounting hole pattern



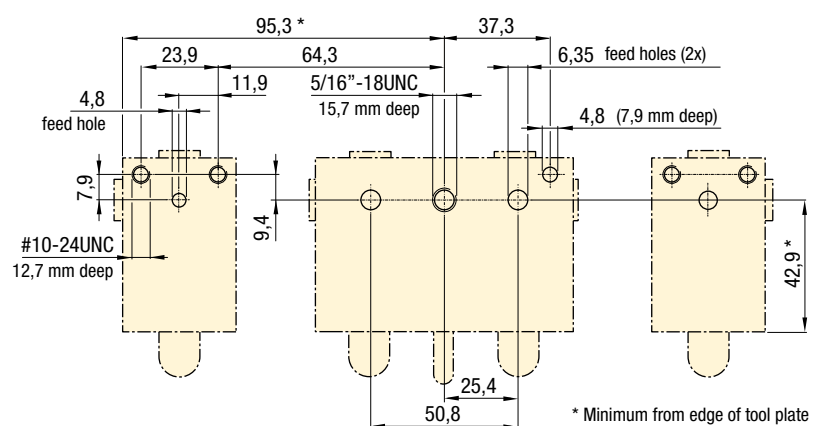
MCR-21 Receiver without P.O. check – Mounting hole pattern



MCRC-21 with MCRA-11 Receiver with air passage and with P.O. check – Mtg. hole pattern



MCR-21 with MCRA-11 Receiver with air passage and without P.O. check – Mtg. hole pattern



Activator wand and booster

Shown: RA-1061, B-81



B and RA-series

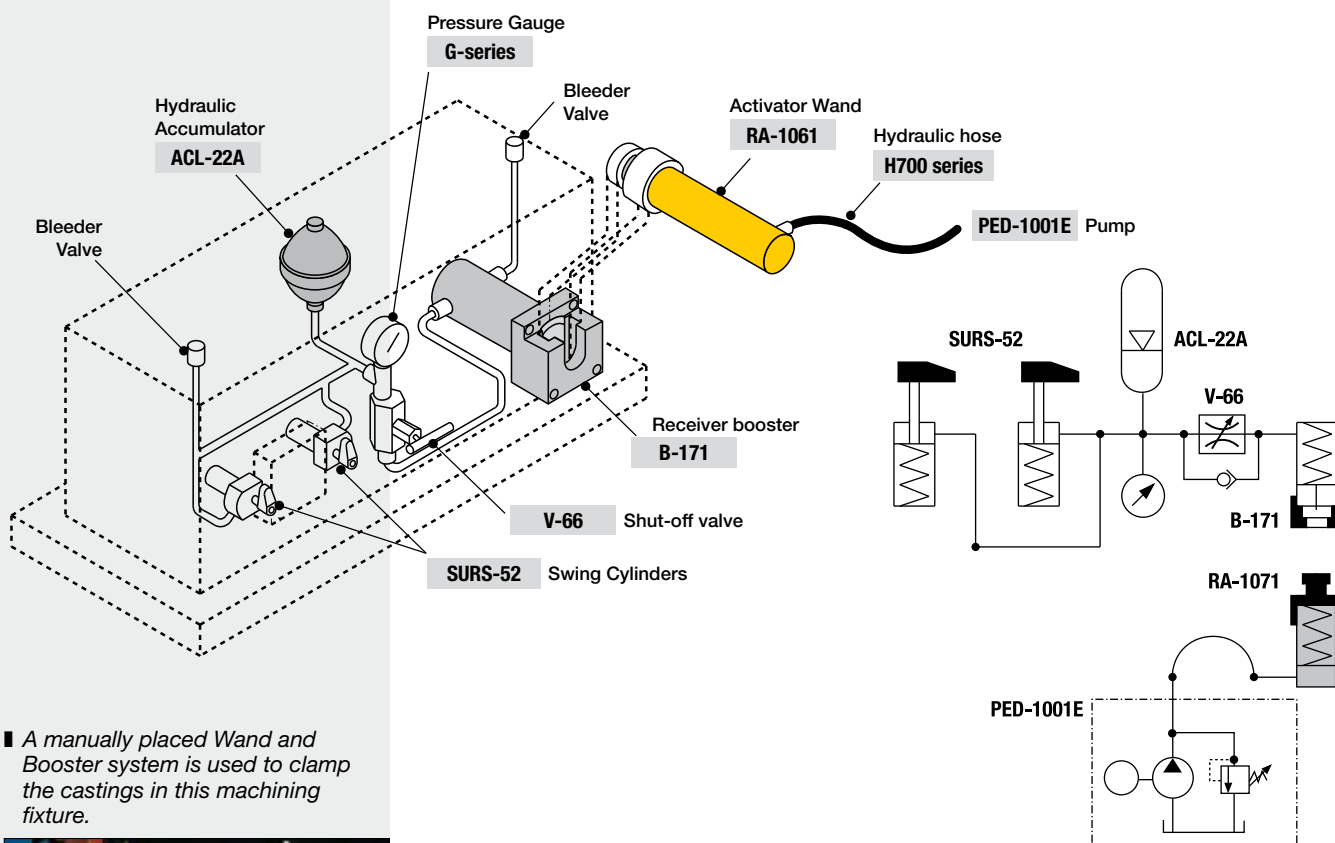
Mechanical energy transfer system uses external cylinder to operate receiver booster.

Contamination resistant closed hydraulic system

- No-leak palletized system, eliminates oil loss at connection point
- Closed design prevents machining chips and coolant from entering the hydraulic circuit
- Booster can be mounted in either horizontal or vertical position for flexible fixture design.

Hydraulic system schematics

The Activator Wand RA-1061 is placed into the receiver booster B-81 or B-171. The mechanical transfer of force from the activator wand plunger to the booster piston provides oil flow to the system.

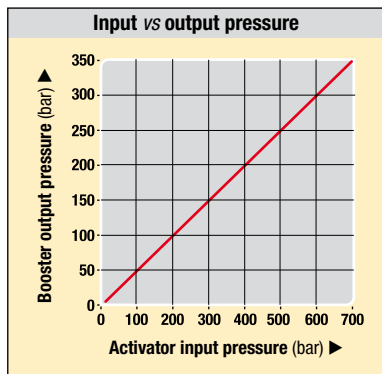


■ A manually placed Wand and Booster system is used to clamp the castings in this machining fixture.



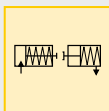
Product selection

Pressure ratio	Oil flow ratio	Oil volume per stroke cm ³	Stroke mm	Model number	Effective area cm ²	Operating pressure bar	kg
▼ Receiver booster							
2 : 1	1,75 : 1	132,7	51,8	B-81	25,7	30 - 350	5,7
2 : 1	1,75 : 1	280,2	109,2	B-171	25,7	30 - 350	7,1
▼ Activator wand							
-	-	162,2	112,7	RA-1061	14,4	60 - 700	5,1



- Ratio: 2 : 1
- Stroke: 51,8 - 112,7 mm
- Pressure: 30 - 350 bar

- E** Multiplicadores
- F** Multiplicateur
- D** Betätigungszyylinder und Druckverstärker



Options

Fittings

194 ▶

Hoses and couplers

192 ▶

For 700 bar pumps, refer to the Enerpac Industrial Tools Catalog E327e.

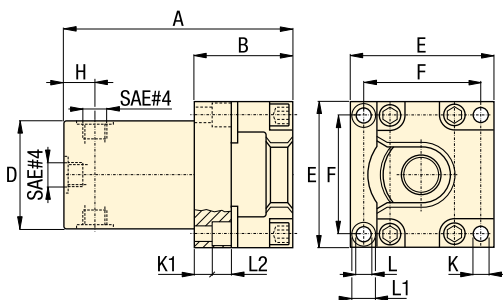
Existing fixtures with manual-connect single-acting circuits can be easily upgraded into the wand and booster.

Important

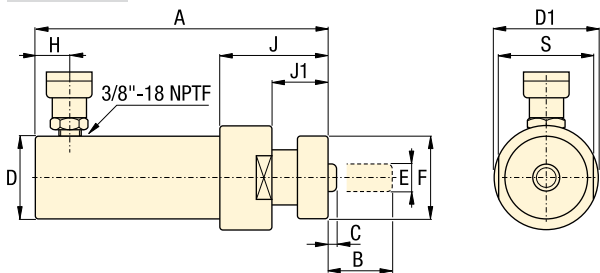
The activator wand has a 2 to 1 ratio of input pressure versus output force.

The booster output flow is 1,75 times the wand input flow.

B-81, -171



RA-1061



Product dimensions in mm []

Model number	A	B	C	D	D1	E	F	H	J	J1	K	K1	L	L1	L2	S
▼ Receiver booster																
B-81	174,2	69,6	44,2	76,2	-	101,6	82,6	28,4	-	-	10,4	57,4	10,4	15,7	10,7	-
B-171	231,6	69,6	44,2	76,2	-	101,6	82,6	28,4	-	-	10,4	57,4	10,4	15,7	10,7	-
▼ Activator wand																
RA-1061	295,1	117,6	4,8	57,2	76,2	19,1	58,9	19,1	76,7	38,9	-	-	-	-	-	69,9

Shown: MCA-62, MPA-62



The automatic coupler system allows connection and disconnection of palletized hydraulic circuits. This system eliminates the direct intervention of an operator, allowing hands free, safe functioning of the process. Typical systems include one base station located at the load/unload station operating one or more pallet receivers.

■ ACCB-2 Control shown with ZW4020HW-FHLT12U300 Pump.



■ A 4-way auto coupler is connected to the receiver, mounted on the side of a palletized fixture.



For automated coupling of hydraulic circuits on palletized systems

- Sensing feedback of coupler position allows for fully automated applications
- Horizontal or vertical mounting for flexible installation on machine tools
- Available as 2 or 4 port model to provide a solution to various hydraulic circuit needs
- Adjustment stroke allows clearance for pallet indexing
- Coupler elements supplied with air blow-off nozzles to prevent damage from contamination
- Automatic coupler control box provides pre-programmed safety features to insure proper sequencing of automatic coupler and fixture operations.



ACCB-2, Automatic coupler control box

175 ▶

- Provides automatic or manual control of your 2 or 4 port auto coupler station.
- Panel view informs when auto coupler is retracted or advanced and whether fixture is unclamped or clamped.
- Includes 2 pressure switches, 3 proximity switches.
- Pressure switches monitor clamping and unclamping system pressure.
- Proximity switches inform PLC when auto coupler is advanced or retracted and when pallet is in position for the auto coupling.
- Integrates with ZW4020HW-FHLT12U300 and ZW5020HW-FHLT12U300 pumps.

Product selection

Station position	Model number ¹⁾	Adjustable stroke		Oil capacity		Maximum oil flow ²⁾
		mm	advance	cm ³ retract	l/min	
▼ 2 port auto coupler						
Base	MCA-62	5 - 15		10,8	10,8	1,0
Base	WCA-82*	104 - 113		10,8	10,8	1,0
Pallet	MPA-62	-		-	-	-
▼ 4 port auto coupler						
Base	MCA-64*	5 - 15		10,8	10,8	1,0
Pallet	MPA-64*	-		-	-	-

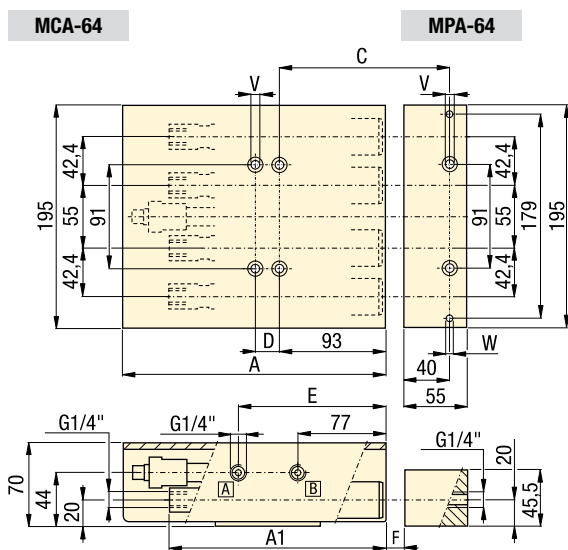
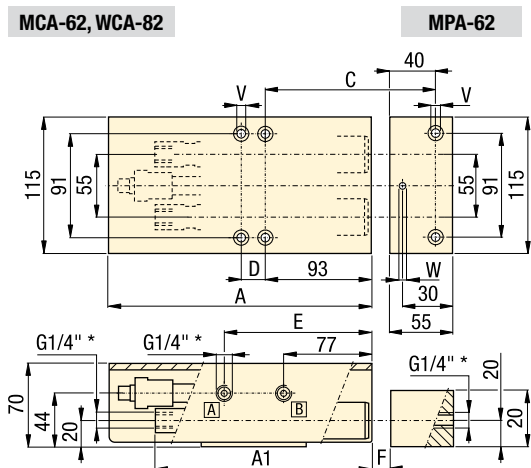
¹⁾ For additional pallet clearance, WCA-82 long stroke model are available.

²⁾ Maximum oil flow of coupler elements is 16 l/min.

* This product is made to order. Please contact Enerpac for delivery information before specifying in your design.

Product specifications

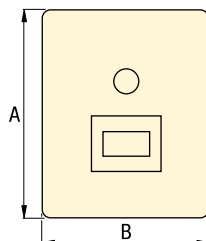
Model number	Required radial alignment accuracy mm	Operating pressure bar	Hydraulic nozzle model number (included)	Air blow-off fitting model No. (included)	Recommended alignment tool
▼ 2 port auto coupler					
MCA-62	± 0,5	40 - 350	CDF-6	FZ-2050	AT-1
WCA-82	± 0,5	40 - 350	CDF-6	FZ-2050	AT-2
MPA-62	± 0,5	40 - 350	CDM-6	FZ-2050	AT-1
▼ 4 port auto coupler					
MCA-64	± 0,5	40 - 350	CDF-6	FZ-2050	AT-1
MPA-64	± 0,5	40 - 350	CDM-6	FZ-2050	AT-1



Model number	Voltage / Current
▼ Automatic Coupler Control Box	
ACCB-2	115 VCA / 10 A

Note: Enclosure rating NEMA 12.

ACCB-2
Operator Station



Connection: 2 - 4 ports

Stroke: 5 - 113 mm

Pressure: 40 - 350 bar

- E** Acopladores automáticos
- F** Coupleurs automatiques
- D** Automatische Kupplungen

Options

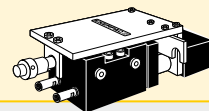
High pressure filters

193 ▶



AT series alignment tool

Use the AT series alignment tool to adjust the position of the pallet station in relation to the base station.



Hoses and couplers

192 ▶



Important

Use high pressure filters on pallet station outlet ports, to avoid contamination of pallet mounted valves and cylinders.

To guarantee leakage free connections, accurate positioning of the pallet and base stations is crucial. Carefully read the instruction manual included with the product.

Do not couple or uncouple with the hydraulic nozzles under pressure. This could damage the internal coupler seals.

Do not exceed maximum flow and pressure.

Product dimensions in mm []

Model number	A	A1	B	C	D	E	F max.	V ¹⁾ for mounting bolts thread x length	W ²⁾	kg
▼ 2 port auto couplers										
MCA-62	225	190	-	137,7	21	129,3	10,0-10,5	M8 x 90	-	7,6
WCA-82*	398	356	-	237,7	100	208,3	94	M8 x 90	-	13,1
MPA-62	-	-	-	-	-	-	-	M8 x 90	5,8	1,8
▼ 4 port auto couplers										
MCA-64*	225	190	-	137,7	21	129,3	10,0-10,5	M8 x 90	-	13,2
MPA-64*	-	-	-	-	-	-	-	M8 x 90	5,8	3,0
▼ Automatic coupler control box³⁾										
ACCB-2	325	-	300	-	-	-	-	-	-	13,6

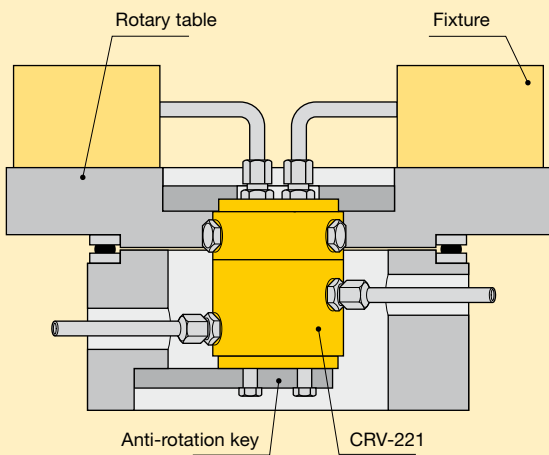
¹⁾ Mounting bolts are not included. ²⁾ Drill dowel pin holes after installing MPA. * This product is made to order. Please contact Enerpac for delivery information before specifying in your design.

Rotary couplers *Application & selection*

Shown: CRV-222, CR-112



Rotary couplers are specially designed unions to transfer pressurized fluid from a stationary supply line to a rotating device. Used for workholding or clamping device such as fixtures installed on rotating index tables.



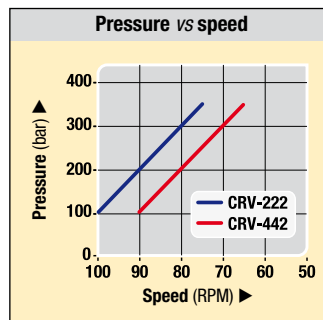
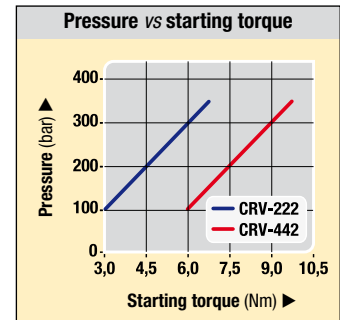
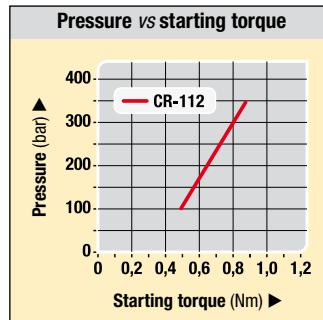
In this application eight CRV-222 rotary couplers are installed to power the individual presses of an eight station rotary press table.



Permanent hydraulic connection on indexing and rotating work stations

- High rotation per minute
- Low starting torque
- Internal oil bearings for increased lifetime
- Manifold mounting adaptors available to reduce fixture plumbing.

Starting torque and speed diagrams



NOTES:
Maximum oil flow: 9 l/min.
Oil loss CRV-222 = 30 cm³/hour.
Oil loss CRV-442 = 40 cm³/hour.

Product selection

No. of radial passages	Model number ¹⁾	Operating pressure range bar	Maximum speed RPM		Starting torque Nm	
			100 bar	350 bar	100 bar	350 bar
1	CR-112	100 - 350	30	30	0,5	0,9
2	CRV-222	100 - 350	100	75	3,0	7,0
4	CRV-442	100 - 350	90	65	6,0	10,0

¹⁾ Before selecting, note the starting torque and speed diagrams above.
Maximum oil flow: 9 l/min.

Manifold mounting adaptor



Mounting adaptor AMP-2, AMP-4

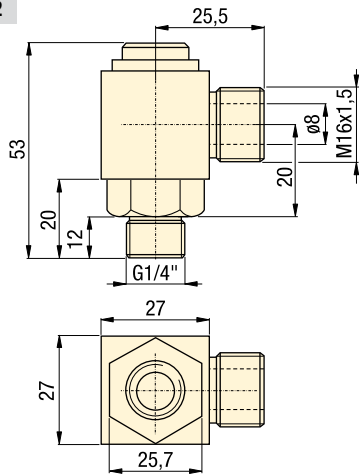
Mounts onto end of two and four passage rotary unions. Allows O-ring mounting directly to fixture.

Product selection

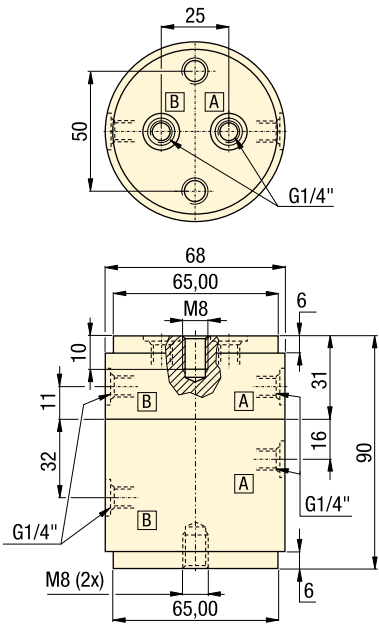
Number of radial passages	Model number	Operating pressure range bar	Used with
2	AMP-2	100 - 350	CRV-222
4	AMP-4	100 - 350	CRV-442

Product dimensions in mm []

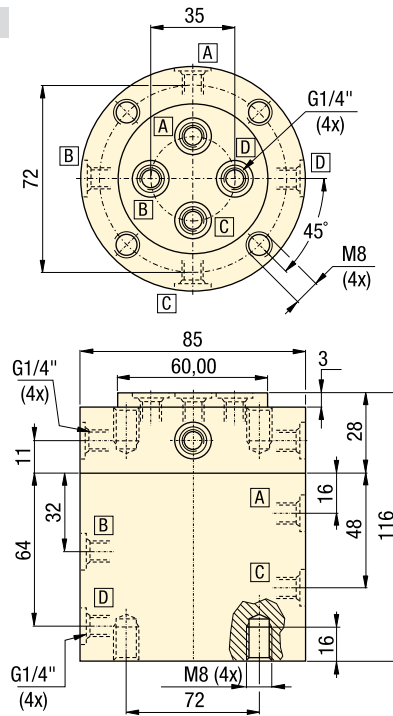
CR-112



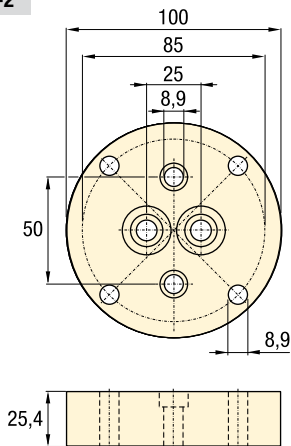
CRV-222



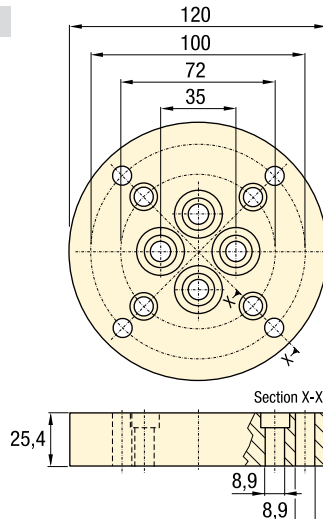
CRV-442



AMP-2



AMP-4



Passages: 1 - 4 lines

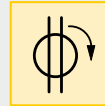
Speed: 30 - 100 RPM max.

Pressure: 100 - 350 bar

E Acoplamiento giratorios

F Joints tournants

D Drehdurchführungen



Options

Fittings

 194



Couplers

 192



Hoses and couplers

 192



Important

Before selecting, note the pressure versus starting torque diagrams.

Rotary couplers must be mounted in the center of rotation of the installation.

Anti-rotation keys should be utilized.

For proper application, clamp force, pressures and timing, consult Enerpac for support.

Oil/oil intensifiers

Shown: PID-402



PID-series

When hydraulic pressure from an existing power source is limited, Enerpac oil-to-oil intensifiers serve to increase output pressure to satisfy the required application.

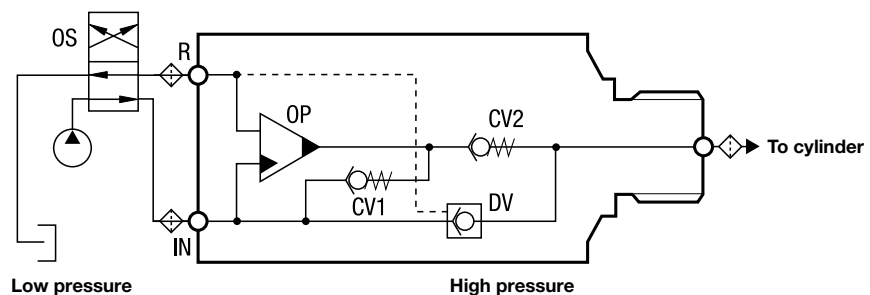
High flow units intensify low inlet oil pressure to high outlet pressure

- Internal bypass valving enables high output flow rates
- Wide range of intensification ratios allows for adapting to various operating pressure requirements
- Compact and self-contained design allows for ease of installation
- Includes dump valve eliminating the need for an external pilot check valve
- Select fit of all internal components provides long operating life.

Intensifier principle

- When oil is supplied to the inlet (IN) port it flows freely past the check valves (CV) and the dump valve to the cylinder and advances it.
- As the inlet pressure increases the oscillating pump (OP) automatically increases the outlet pressure by the chosen intensification.
- Once the maximum pressure is reached, the pump frequency lowers and balances at the maximum pressure.
- Free flow from the cylinder to tank occurs when the directional control valve is switched to supply the R-port.
- 10 micron filtration is required on all ports in the circuit to ensure trouble free operation. Filters and flow control included.

PID Series



■ PID-Series intensifier utilizes low pressure machine hydraulics to power clamping cylinders.



Product selection

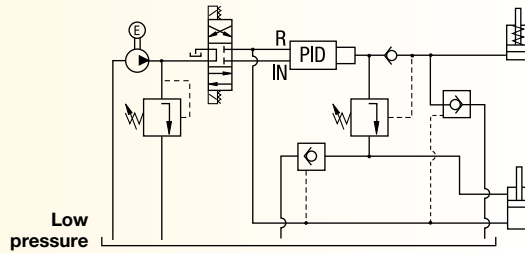
Maximum pressure	Pressure intensification ratio	Maximum input flow	Maximum output flow	Model number	Inlet pressure range	kg
bar		l/min	l/min	with dump valve	bar	
700	1 : 3,2	10,0	2,5	PID-322F	21 - 107	1,2
700	1 : 4,0	9,5	2,0	PID-402F	21 - 86	1,2
700	1 : 5,0	9,0	1,5	PID-502F	21 - 69	1,2
700	1 : 6,6	8,7	1,2	PID-662F	21 - 56	1,2

* Operating pressures above 350 bar require high pressure fittings or intensifier models with BSPP ports. Contact Enerpac for details.

i System set-up information:

With dump valve (PID models)

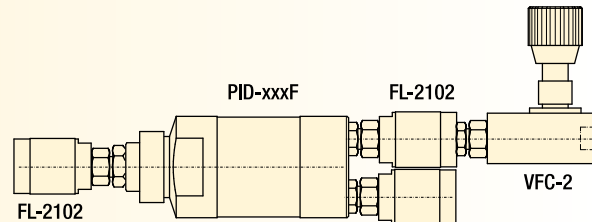
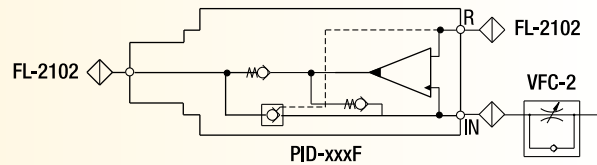
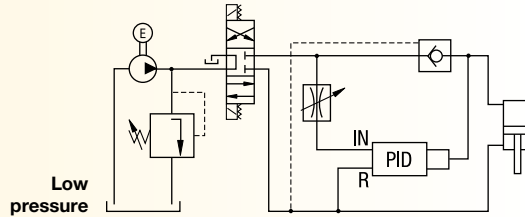
The intensifier with the dump valve is used to achieve high pressure on the advance side of a double-acting cylinder.



With external dump valve

In a system where the pump's oil flow is higher than the maximum inlet oil flow of the intensifier, an external check valve and flow control valve reduces the pump's oil flow.

This application can be set up when machines are equipped with low pressure hydraulics but the pressure to clamp the workpiece must be higher.



Ratio: 1 : 3,2 - 1 : 6,6

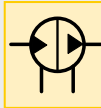
Flow: 1,2 - 2,5 l/min

Pressure: 65 - 700 bar

E Multiplicadores

F Multiplicateur

D Öl-Öl Druckübersetzer



i Options

FL-series, high-pressure filters

☐ 193 ▶



Directional valves

☐ 135 ▶



FZ-series fittings

☐ 194 ▶



! Important

Do not exceed maximum allowable inlet pressure.

10 micron filtration is included to ensure trouble-free operation.

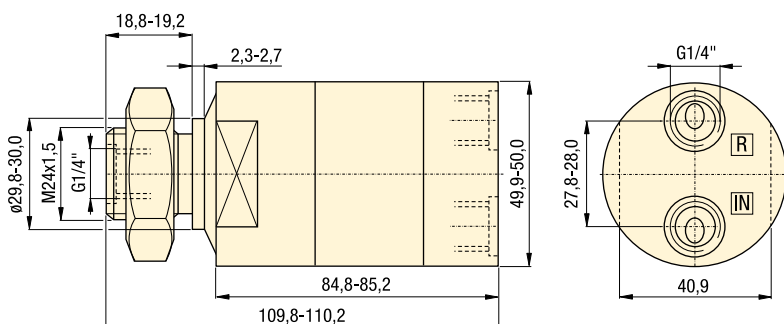
Applications above 350 bar require high pressure fittings or intensifier models with BSPP ports. Contact Enerpac for details.

PID models with dump valve provide an economical means of relieving pressure from the system.

Can be panel mounted into machine (M24x1,5 thread).

i Product dimensions in mm [\pm]

PID-series



Shown: SLS-2



▶ SafeLink provides wireless communication between the fixture mounted SEND unit and the machine control interfaced RECEIVE unit.

A pressure switch is used on the fixture to monitor the circuit pressure. If the pressure switch on the fixture goes open, the RECEIVE unit communicates the changed status to the machine control through either 24 VDC, Modbus RTU RS485 or Ethernet IP protocol or Modbus TCP/IP.

The machine control would interrupt the machining process. The SEND unit can also be used with limit switch based position sensing clamps to verify clamped or unclamped status for robotically loaded systems.

WIRELESS communication between a fixture circuit and the machine control

- Fixture mounted “SEND” unit uses radio communication to monitor pressure and/or clamp position
- 2.4 GHz Frequency Band for global acceptance
- “Frequency Hopping” used to for signal stability, even in busy production environments
- “SEND” units are easily reassigned to a different “RECEIVE” unit so fixtures can be moved between machines
- No limit to the number of systems used in a production area
- “SEND” units are internally powered by a replaceable 3,6 VDC Lithium battery – provides up to 3-year battery life
- “SEND” units are sealed to IP-67 for protection from contamination and coolant
- LED lights for visual status indication
- LCD Display window for set-up and status display.

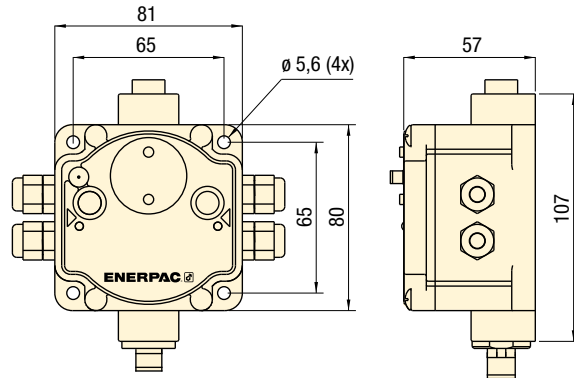
Product selection

Model Number	Description
SLS-1	“SEND” Unit with Internal Antenna
SLS-2	“SEND” Unit with External Antenna
SLS-3	“SEND” Unit with External Antenna, 3 Inputs
SLR-1	“RECEIVE” Unit with External Antenna
SLR-2	“RECEIVE” Unit with External Antenna, 3 Inputs
SLS-2AC	0,2 meter Antenna Cable
SLEM-1	Expansion Module for SLR
SLEB-1	Ethernet Bridge for SLR-1
SLSC-1	Power and Communication Splitter Cable for SLEB-1
SLDB-1	DIN Rail Mounting Bracket

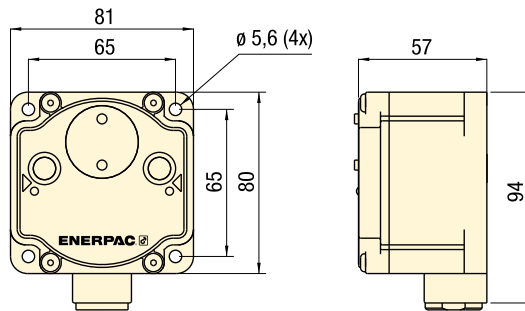
Product specifications

IP Rating	Radio Frequency	Transmit Power	Input Power for RECEIVE Unit	Output	FCC Rating	Receiver Communication Protocols	Additional Outputs available from Receiver
IP 67	2.4 GHz	21 dBm	+10 VDC	+24 VDC	FCC	Modbus	24 VDC
		conducted	to		Part 15,	RTU RS485	
			+30 VDC		Subpart C,	Ethernet IP	
					15.247		
Dust tight, immersion up to 1 meter	Global Standard		Supplied by machine control	NMOS Sinking		Ethernet TCP/IP	Max. from Receiver: 6

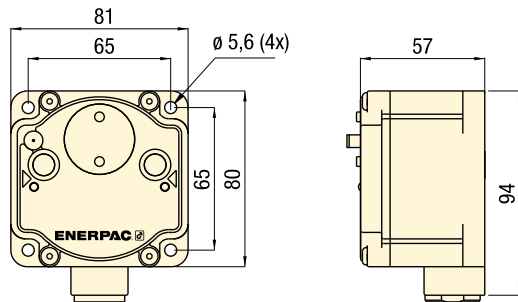
SLR-1, SLR-2 Receive Unit



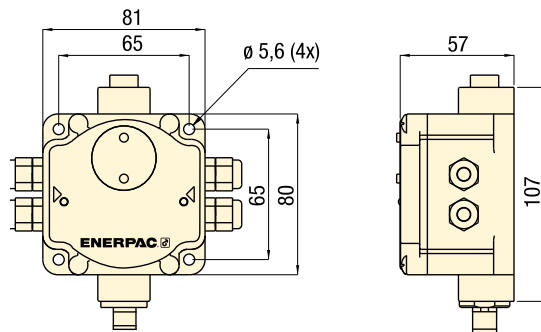
SLS-1 Send Unit



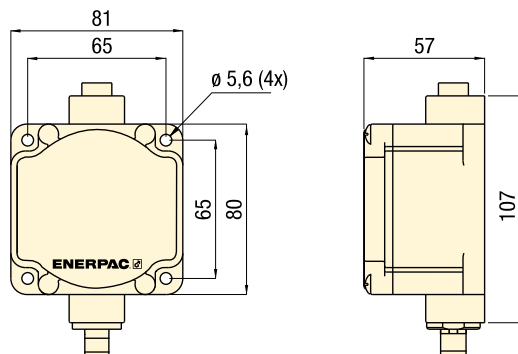
SLS-2, SLS-3 Send Unit



SLEM-1 Expansion Module



SLEB-1 Ethernet Bridge



Radio Frequency: 2,4 GHz

IP Rating: 67

Communication protocols:
Modbus RTU RS485
Ethernet TCP IP

- E** Monitoreo Inalámbrico
- F** Contrôle sans fil
- D** Drahtlose Überwachung

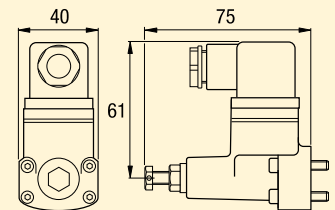
⚠ Important

A Pressure Switch is required to monitor the pressure in the fixture circuit. For a convenient manifold mount model, use the **PSCK-8** or **PSCK-9** from Enerpac.

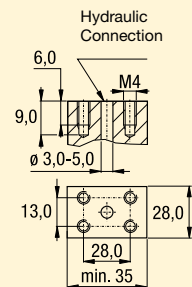


Manifold Mount Pressure Switch

IP Rating: 65 (Dust and Water Jet)
PSCK-8: Range 100 - 345 bar
PSCK-9: Range 20 - 210 bar



Mounting Dimensions



Shown: SLS-1



SafeLink

SafeLink can provide a discrete 24 VDC output signal for systems of up to 4 fixtures. Each SEND unit can provide up to three outputs to the RECEIVE unit. The RECEIVE unit has 6 terminal stations, which are assigned to SEND units in groups of 3. So each RECEIVE unit can be paired with 2 SEND units when using the 24VDC output. For extra capacity, an EXPANSION MODULE provides an additional terminal strip, adding 2 more sets of three terminal stations.

Collet-Lok® products

Swing clamps

Work Supports

Linear Cylinders

Power Sources

Valves

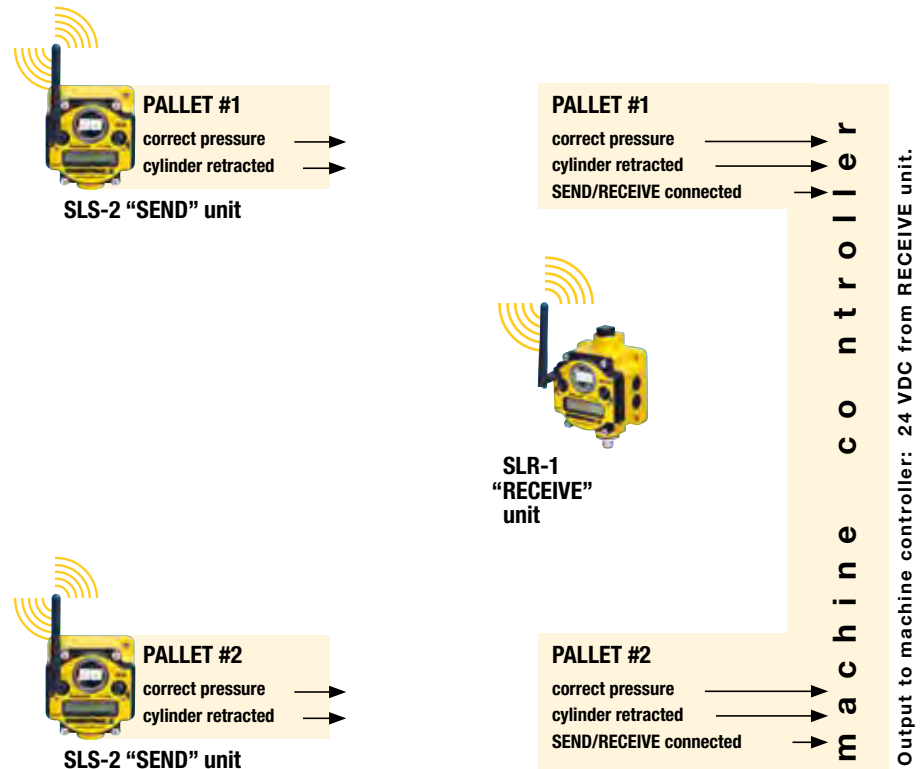
Pallet Components

SLCS-1 Splitter Cable

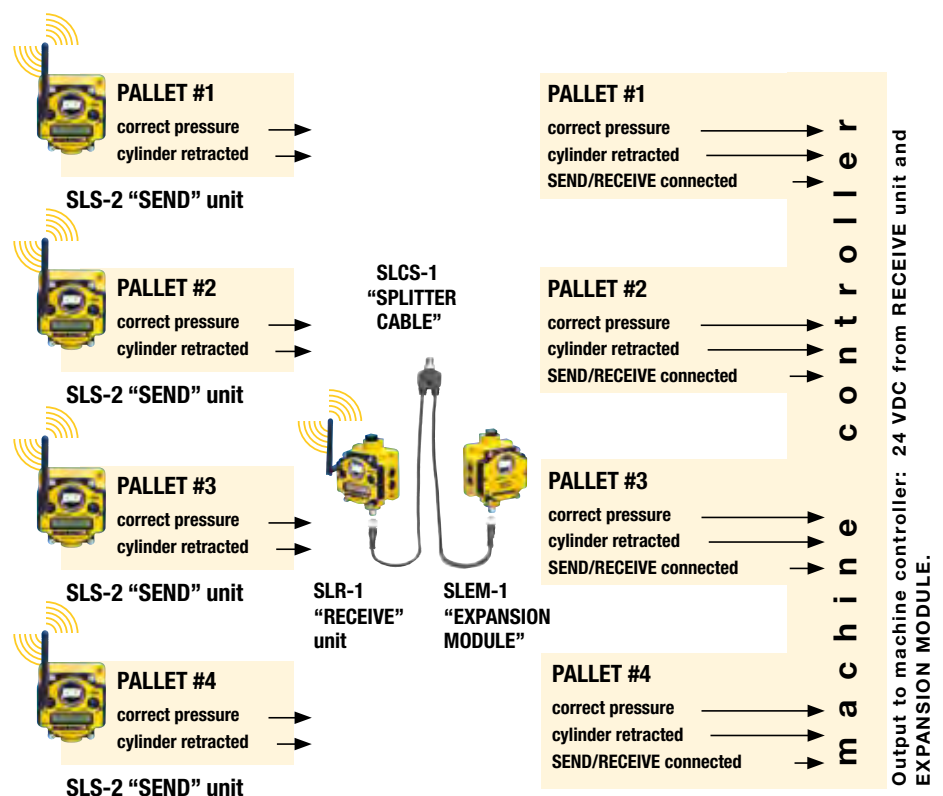


The **SLCS-1 Splitter Cable** is used with the **SLEM-1** Expansion Module and the **SLEB-1** Ethernet Bridge to connect to the **SLR-1** RECEIVE unit and the machine control circuit.

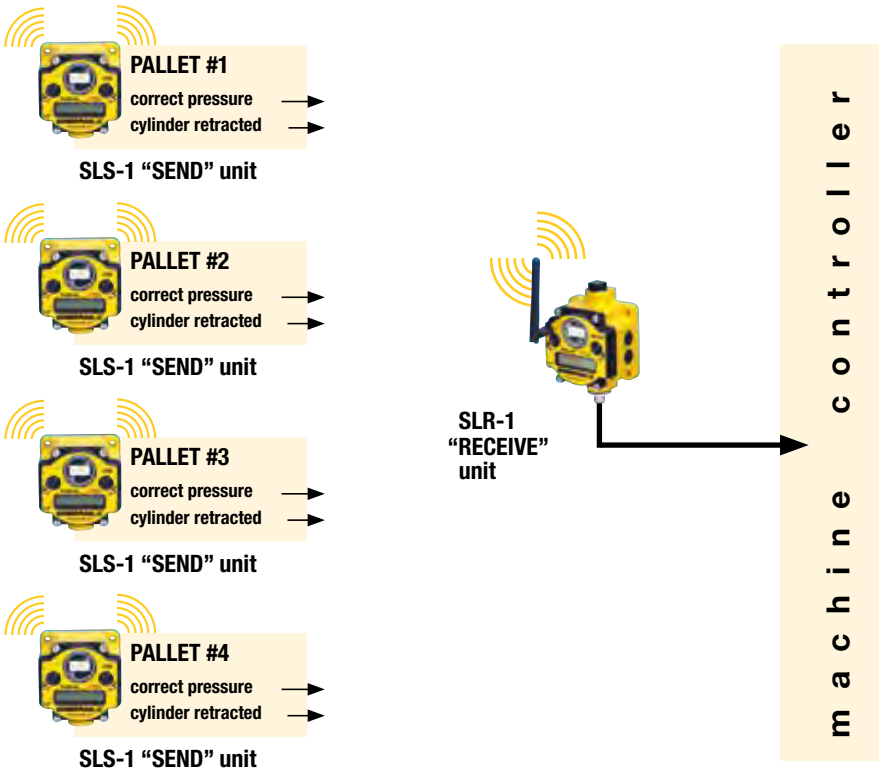
Basic System with I/O Machine Interface



Larger System with I/O Machine Interface



Larger System with Modbus RTU Machine Interface



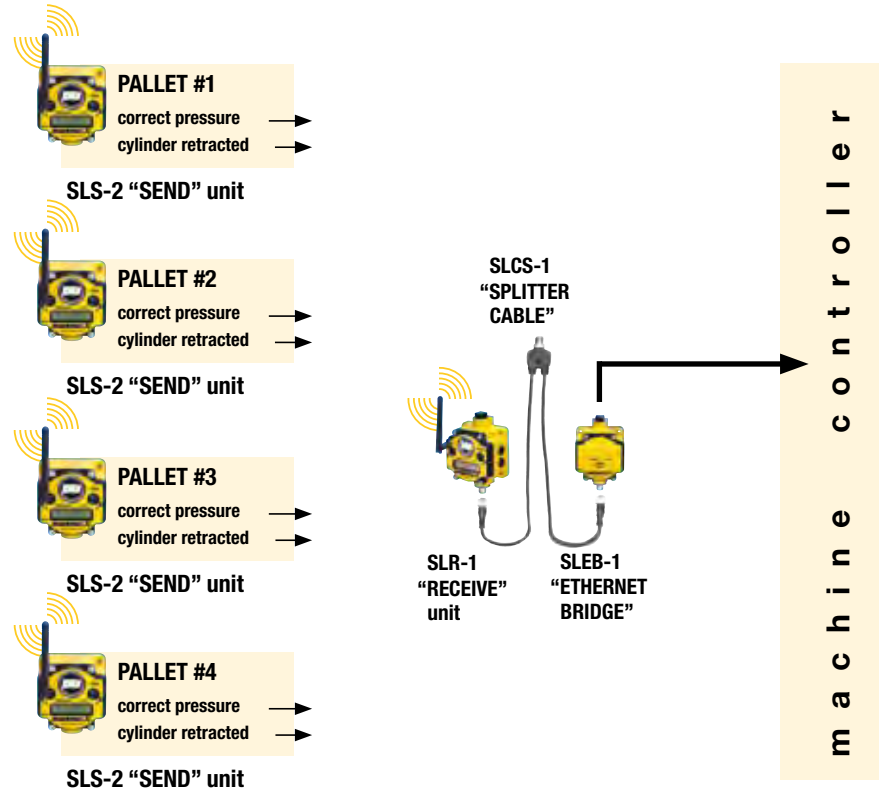
Output to machine controller: Modbus RTU RS-485.

Shown: SLR-1



SafeLink RECEIVE units can supply the outputs by using the standard Modbus RTU RS-485 protocol. This output uses the 5 pin connector on the RECEIVE unit. If Ethernet protocol is preferred, an ETHERNET BRIDGE is available to convert the Modbus RTU R-485 to ETHERNET IP or Modbus TCP/IP.

Larger System with Ethernet IP Machine Interface



Output to machine controller: Ethernet IP or Modbus TCP/IP.

Shown: SLEB-1



The SLEB-1 Ethernet Bridge is used with the SLR-1 Receiver when Ethernet connection is available in the machine control. Use of the SLEB-1 will allow the monitoring of more fixtures in a large pallet pool system.

Shown: SLR-1



SafeLink provides wireless communication between the fixture mounted SEND unit and the machine control interfaced RECEIVE unit. If the pressure switch on the fixture goes open, the RECEIVE unit communicates the changed status to the machine control through either 24 VDC Modbus RTU RS485 or Ethernet TCP IP protocol. The machine control would interrupt the machining process. The SEND unit can also be used with limit switch based position sensing clamps to verify clamped or unclamped status for robotically loaded systems.

▶ WHAT IS SAFE LINK?

SafeLink is a wireless way to communicate between a palletized fixture and a machine control.

▶ WHY USE SAFE LINK?

SafeLink can monitor the fixture pressure and clamp position in real time- even when parts are being machined. The system can also be used to verify that the operator has properly pressurized the fixture before it is sent in to be machined. If there is a pressure deficiency, the signal between the Send and Receive units is interrupted, and the machine control can respond before expensive damage occurs.

▶ HOW DOES SAFE LINK WORK?

SafeLink uses 2,4 GHz radios to allow the SEND unit on the fixture to communicate with the RECEIVE unit that is interfaced with the machine control. The RECEIVE unit provides both 24 VDC outputs and a standard Modbus RTU RS485 communication protocol. An optional Ethernet Bridge will convert this to an Ethernet TCP IP protocol. The machine control must be set up to respond to this protocol to initiate a Feed Hold command, turn on a warning light, or even activate a Machine Stop command.

A pressure switch for pressure monitoring or a limit switch for position sensing is used with the SEND unit. If the pressure or position is lost, the switch goes open and the signal to the RECEIVE unit is interrupted.

▶ WHAT POWERS THE SEND UNIT?

The SEND unit uses a 3,6 VDC size D Lithium battery that is supplied with the unit. Projected battery life is 3 years.

▶ WHAT POWERS THE RECEIVE UNIT?

The receive unit requires 24 VDC power, usually from the power supply in the machine control.

▶ WILL THE MACHINE FAULT IF THE PALLET IS IN THE LOADING STATION AND THE CLAMPS ARE UNCLAMPED?

The Receive unit is just an input source for the machine control. The machine control must be able to identify which fixture is in the machine being run and which one is in the loading station. When in the loading station, the machine control must be able to ignore the signal loss when the clamps are unclamped to remove the completed parts.

▶ HOW MANY FIXTURES CAN BE MONITORED BY ONE RECEIVE UNIT?

By using either Modbus RTU RS485 or Ethernet TCP IP, up to 56 SLS-1 or SLS-2 Send Units on fixtures can be monitored by a single SLR-1 Receive Unit.

▶ IS INSTALLATION AVAILABLE FROM ENERPAC?

Enerpac has partnered with a CNC control specialist that can quote custom installation services. Contact your Enerpac Territory Manager for details.

SafeLink Monitoring System Worksheet

SAFELINK PALLET MONITORING SYSTEM

FOR CUSTOMERS WHO REQUIRE CUSTOM INSTALLATION OF THE ENERPAC SAFELINK PALLET MONITORING SYSTEM, PLEASE PROVIDE THE FOLLOWING INFORMATION FOR EACH MACHINE TOOL TO BE EVALUATED:

COMPANY: _____ CITY, STATE, ZIP: _____
 CONTACT: _____ CONTACT PHONE (EXT): _____
 ADDRESS: _____ CONTACT EMAIL: _____

BUDGET

BUDGET FOR CUSTOM INSTALLATION OF SAFELINK SYSTEM ON THIS MACHINE TOOL:

200 EURO	1500 EURO	1000 EURO	2000+ EURO
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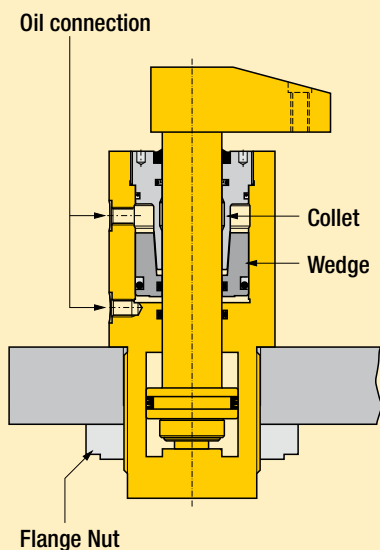
MACHINE INFORMATION

MACHINE MAKE	
MACHINE MODEL	
MACHINE SERIAL NUMBER	
MACHINE TYPE	
SINGLE BED HORIZONTAL MACHINING CENTER	
PALLET POOL CELL WITH HORIZONTAL MACHINING CENTERS	
NUMBER OF MACHINES IN CELL	
SINGLE BED VERTICAL MACHINING CENTER	
TWO PALLET VERTICAL MACHINING CENTER	
SLIDE BY	
VERTICAL TURRET LATHE (VTL)	
OTHER/DESCRIBE	
NUMBER OF FIXTURES ASSOCIATED WITH THIS MACHINE	
TOTAL NUMBER OF CIRCUITS IN FIXTURE GROUP	

MACHINE CONTROL INFORMATION

MACHINE CONTROL/MAKE									
MACHINE CONTROL/MODEL NUMBER									
MACHINE CONTROL/SERIAL NUMBER									
MACHINE CONTROL INTERFACE AVAILABLE	<table border="1"> <tr> <td>MODBUS</td> <td>ETHERNET</td> <td>DEVICENET</td> <td>RELAY</td> </tr> <tr> <td>SERIAL RS-232</td> <td colspan="3">OTHER/DESCRIBE</td> </tr> </table>	MODBUS	ETHERNET	DEVICENET	RELAY	SERIAL RS-232	OTHER/DESCRIBE		
MODBUS	ETHERNET	DEVICENET	RELAY						
SERIAL RS-232	OTHER/DESCRIBE								
MACHINE CONTROL IP ADDRESS									
ACTION IF FAULT IS DETECTED	<table border="1"> <tr> <td>FEEDHOLD</td> <td>ACTIVATE A LIGHT</td> </tr> <tr> <td>MACHINE STOP</td> <td>OTHER/DESCRIBE</td> </tr> </table>	FEEDHOLD	ACTIVATE A LIGHT	MACHINE STOP	OTHER/DESCRIBE				
FEEDHOLD	ACTIVATE A LIGHT								
MACHINE STOP	OTHER/DESCRIBE								

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One of the most important aspects of machining cycle times is the speed and precision of the workpiece positioning, clamping and release.

The speed of these actions is greatly improved through the use of hydraulic workholding components, leading to increased efficiencies and cost savings.

Use of palletized fixtures

Being able to load many parts onto palletized fixtures also greatly increases the productivity and efficiency of the machining cycle. The use of palletized fixtures poses several problems however. The clamping cylinders must be repeatedly connected and disconnected from the hydraulic power source to make use of the flexibility of the pallets.

With conventional hydraulic cylinders, this also requires the use of load holding valves and accumulators to maintain pressure. With proper maintenance, this system of hydraulic workholding is very effective. This type of clamping is also very susceptible to contamination, and additional care must be taken to maintain the filtration and preventive maintenance schedules required.

Enerpac's exclusive Collet-Lok® Technology

There is another solution to palletized clamping. Enerpac's exclusive Collet-Lok® technology eliminates the need for live hydraulics to be maintained on the pallet during the machining cycle. Once the part is hydraulically clamped in position for machining, the cylinders are mechanically locked in place. This mechanical lock replaces the accumulators, load holding valves and other requirements of live hydraulic palletized circuits. Once the machining cycle is complete, the mechanical lock is released, and the cylinders can be retracted to allow for the next piece to be loaded.

Enerpac offers swing cylinders, work supports and push cylinders with Collet-Lok® technology incorporated. Used in conjunction with an automatic coupler, pressure switches and proximity sensors, this technology can provide a totally automated and accurate clamping cycle.

On the next page is an example of how this technology works. The Collet-Lok® swing cylinder has four ports.

Port #1 is first pressurized to apply the appropriate clamping force. Once this pressure is reached, a sequence valve opens, sending pressure to **Port #2**, which mechanically locks a wedge into place. This wedge locks the plunger in place, preventing movement, and maintaining the clamping force on the workpiece. The pressure should now be removed and machining can be performed at any time. This lock can be maintained for minutes, hours, even days, without the need for hydraulic pressure.

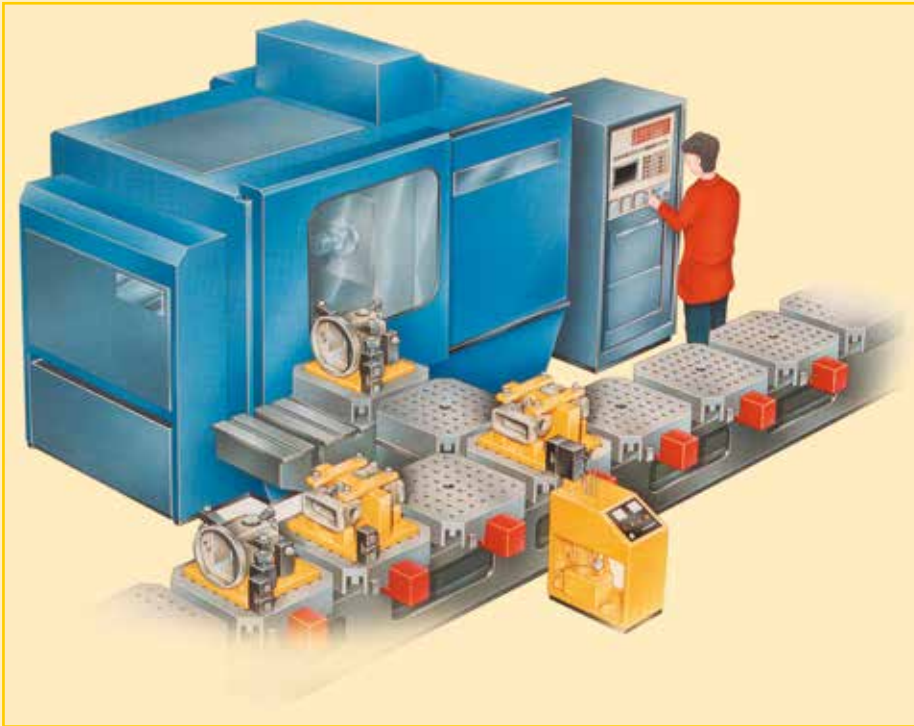
Once the machining cycle is complete, and the workpiece needs to be changed, the lock can be very easily removed. Pressure should be applied to **Port #3** to unlock the wedge system. Once the wedge is unlocked, and the plunger is free, pressure can be applied to **Port #4** to allow the plunger to retract. With this complete, the machined workpiece can be removed and a new piece can be loaded into the fixture to continue the process.

This system is the ultimate in system automation and positive control in clamping technology. For more information, be sure to consult Enerpac to receive additional literature and installation instructions.

■ Fixture for machining exhaust manifolds.

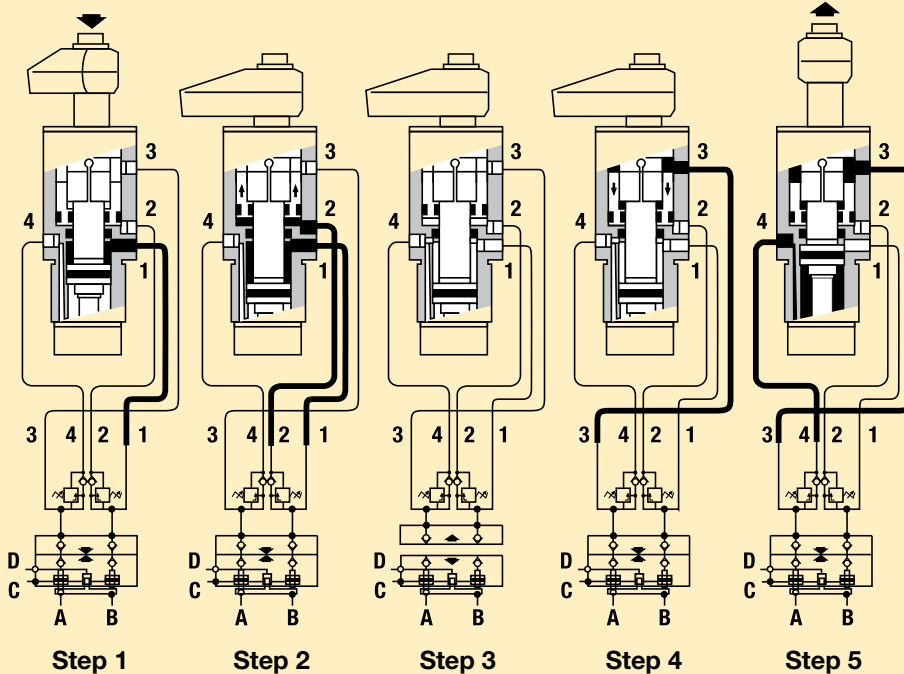


Palletized machining



■ MPTL-100 and MPTR-100 Collet-Lok® Swing Clamps are used to securely clamp these exhaust manifolds.

Hydraulic Clamping and Hydraulic Mechanical Locking



MPTR-100 Collet-Lok® swing cylinder

- 1 = 90° Rotation + Clamp
- 2 = Lock
- 3 = Unlock
- 4 = Unclamp + 90° Rotation.

MCA-62, MPA-62 Auto Coupler

- A = Pressure line from pump to swing cylinder
- B = Pressure line from pump to swing cylinder
- C = Auto coupler advance
- D = Auto coupler retract.

Step 1

2-way Auto coupler connects external power source with pallet part and the Collet-Lok® cylinder is activated for hydraulic clamping.

Step 2

After reaching maximum clamping pressure the sequence valve is opened and actuates the internal wedge hydraulically.

Step 3

The wedge system secures the plunger position mechanically and the hydraulic pressure is taken off, then the auto coupler retracts. The product on the pallet is now securely clamped, without being connected to a power source.

Step 4

After being in the center of the machine the pallet returns to the loading and unloading position and the auto coupler is connected again to release the wedge.

Step 5

The hydraulic plunger is now retracted and the pallet is free for unloading and loading.