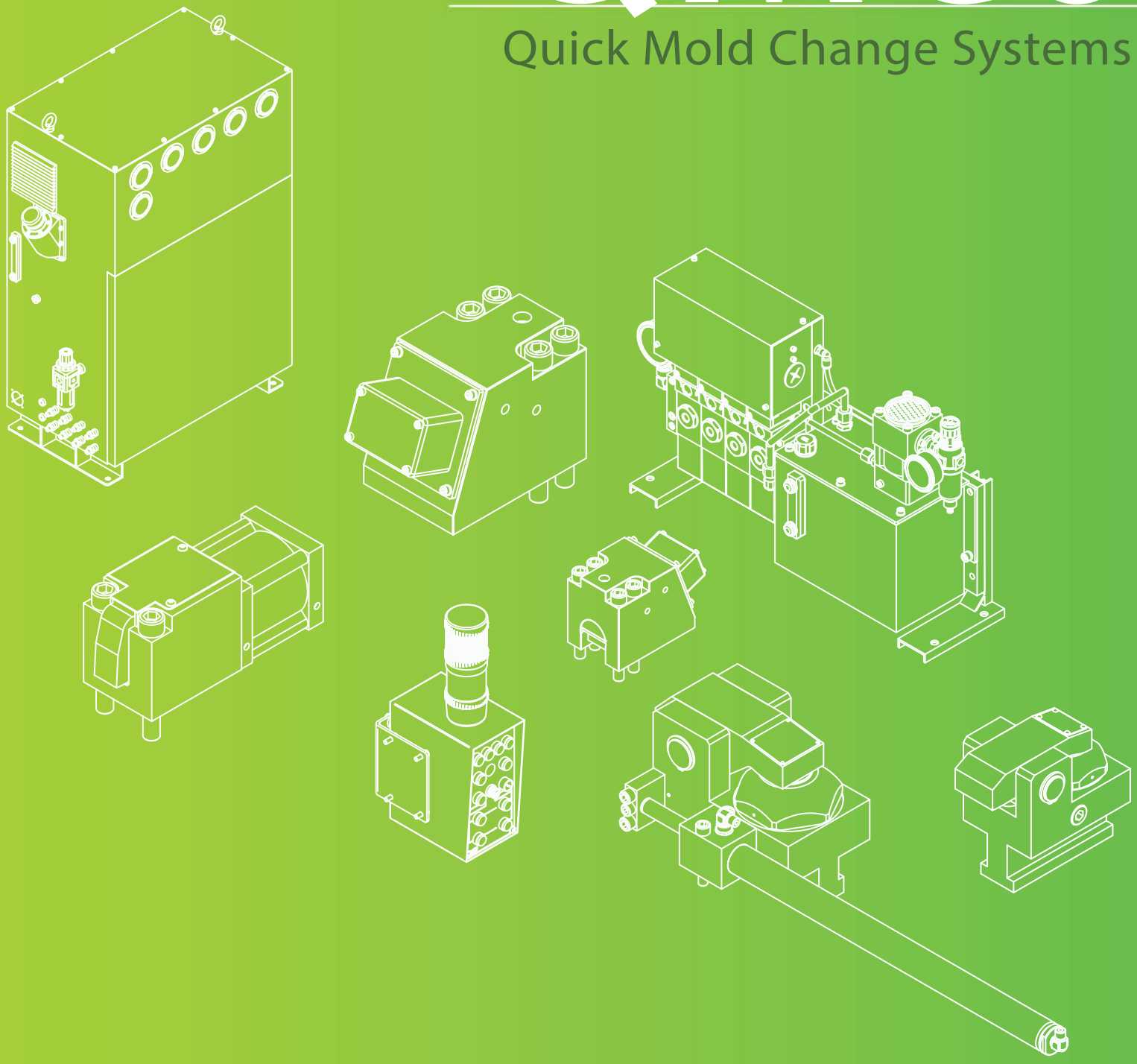
QMCS

Quick Mold Change Systems



Mold change technology for,
injection molding and die casting machine.

KAR
KING AIR

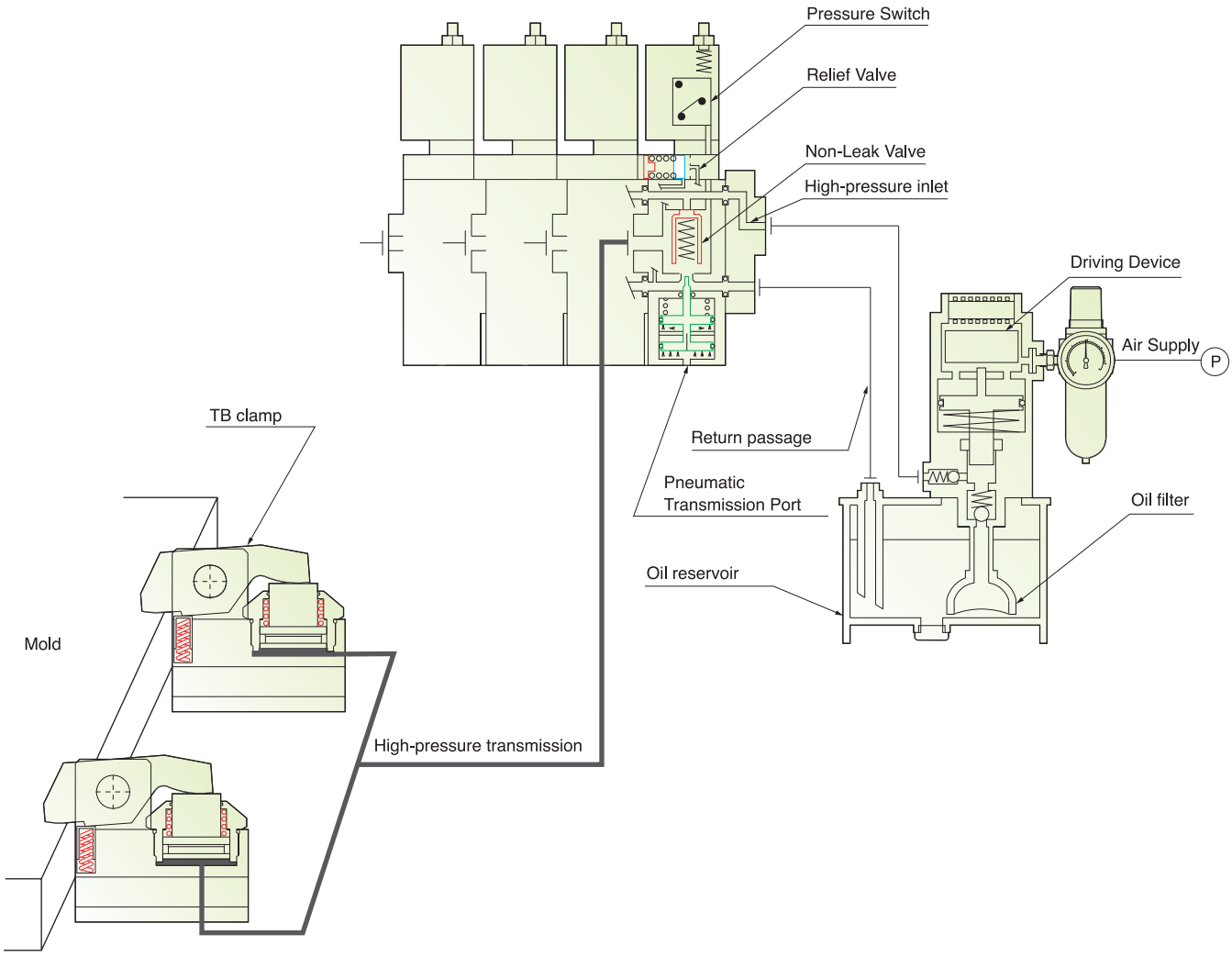
KAR
KING AIR

- Improve production efficiency
- Reduce product cost
- Reduce inventory levels and enable prompt delivery
- Safe working conditions can eliminate danger in mold setup
- Interlock system can eliminate misoperation and prevent injuries

KING AIR

Introduction to Hydraulic Power Clamping

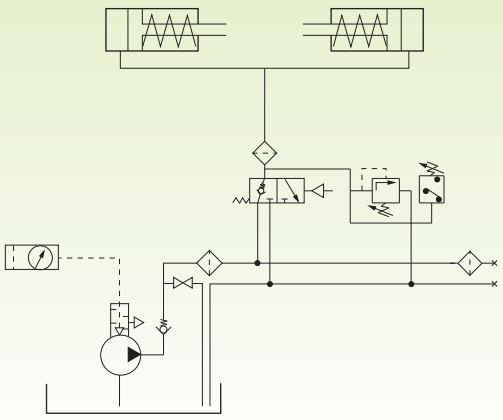
Principle Features of a Pneumatically Hydraulic Pump
with 4 Control Valves and 2 Hydreulic clamps.



Force Transmission Clamps

NoN-Leak Control Valve Unit

Power Source



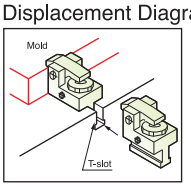
All control valves with pressure switch for I.M.M mold interlock.

KING AIR

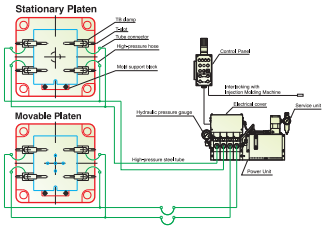
Elements and Systems for Quick Mold Change

TB Clamp
Data sheet P.3

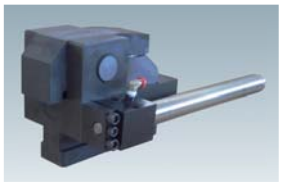
Displacement Diagram



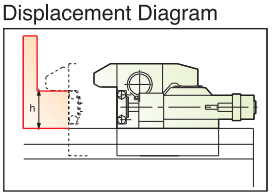
TB clamping systems
Data sheet P.4



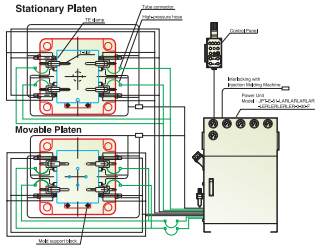
TE Clamp
Data sheet P.5



Displacement Diagram

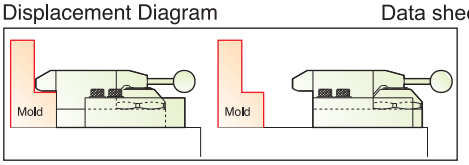


TE clamping systems
Data sheet P.6

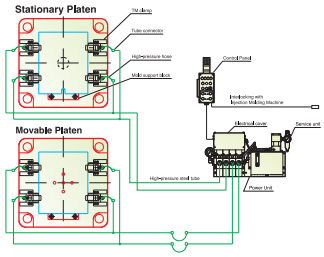


TM Clamp
Data sheet P.7

Displacement Diagram

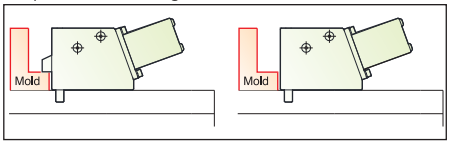


TM clamping systems
Data sheet P.8

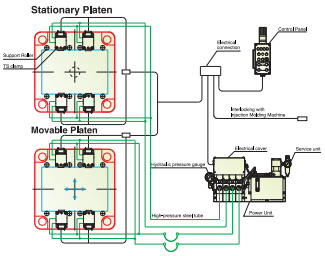


TS Clamp
Data sheet P.9

Displacement Diagram

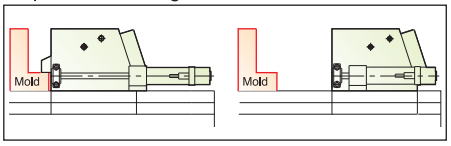


TS clamping systems
Data sheet P.10

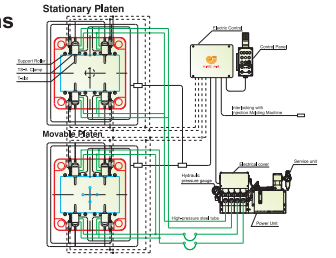


TS-A Clamp
Data sheet P.11

Displacement Diagram

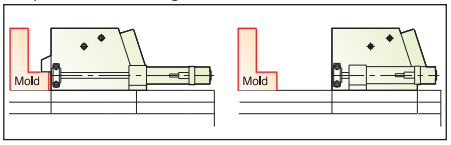


TS-A clamping systems
Data sheet P.12

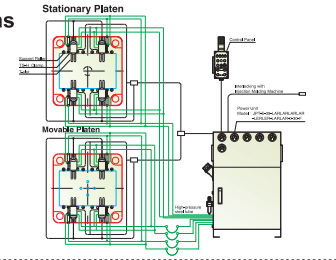


TS-H Clamp
Data sheet P.13

Displacement Diagram

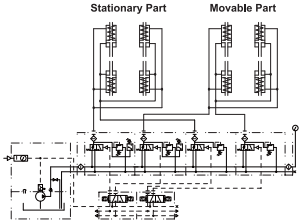


TS-H clamping systems
Data sheet P.14

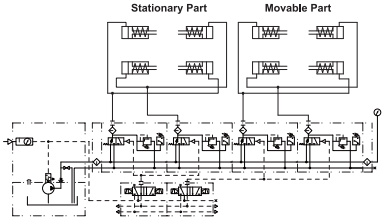


BP Series
Data sheet P.15

Model：BPT-49-LERLERLARLAR-0-5-F



Model：BPT-62-LERLERLERLER-0-5-F

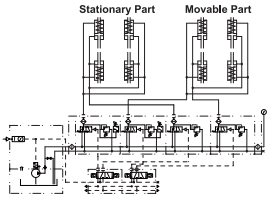


KING AIR

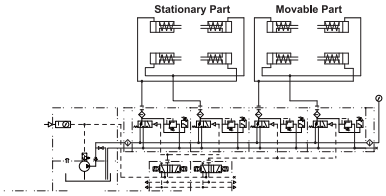
Power Units Electric Controllers

AP Series
Data sheet P.17

Model：APT-44-LERLER-LARLAR-0-5-F

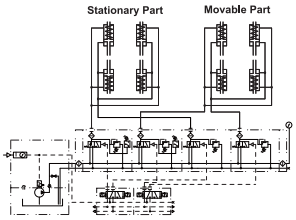


Model：APT-64-LERLERLERLER-0-5-F



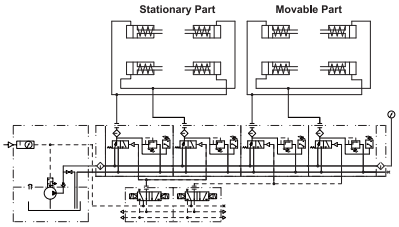
WP Series
Data sheet P.19

Model：WPT-39-LERLER-LARLAR-0-5-F



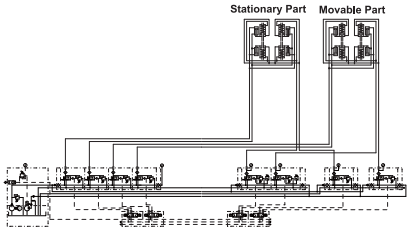
JP Series
Data sheet P.20

Model：JPT-51-LERLERLERLER-0-10-F



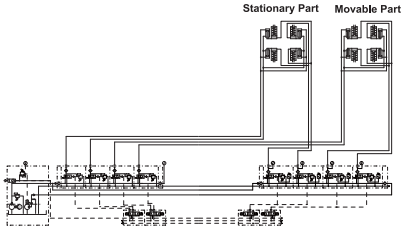
Power Unit
Data sheet P.21

Model：JPT-E-39-LARLARLARLAR-LERLERLARLAR-0-30-F

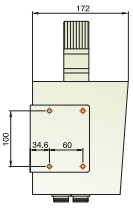


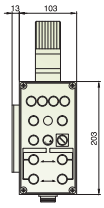
Power Unit
Data sheet P.23

Model：JPT-E-51-LARLARLARLAR-LERLERLERLER-0-30-F



Control Panel Model : EC-08A
Data sheet P.25





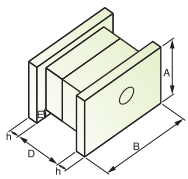
Data for Price Quotation
Data sheet P.26

A. I.M.M.

I.M.M.	Manufacturer	Model	Mold Clamping force (M. Ton)	Mold Opening force (M. Ton)	Q'ty	Remark
1						
2						
3						

B. Type of Mold Change

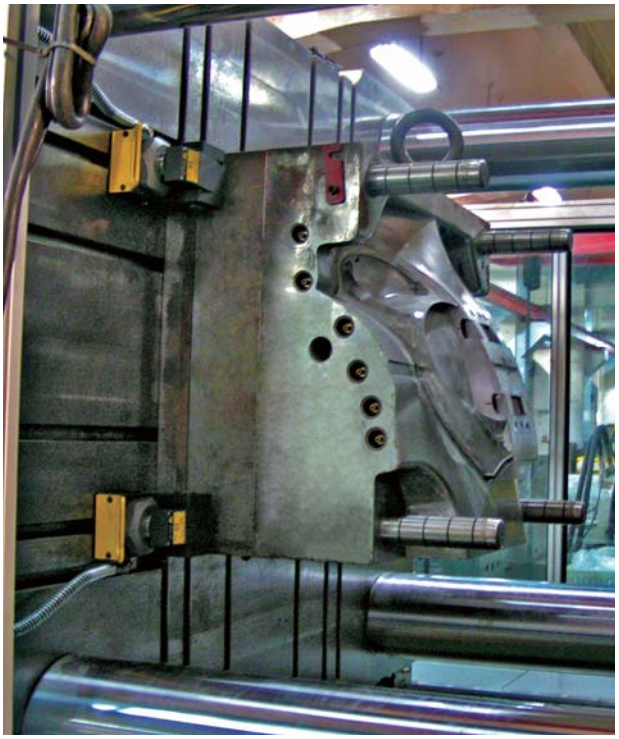
Type of loading	☐ Vertical Loading ☐ Horizontal Loading
Mold platen T-slot	☐ to be T-slot ☐ Not to be T-slot
Mold clamp	☐ stationary(TS) ☐ Manual Feeding(TB) or ☐ (TM) ☐ Pneumatic Cylinder Feeding(TE) or ☐ (TS-A) ☐ Hydraulic Cylider Feeding(TS-H)
Hydraulic pressure sources	☐ from I.M.M. ☐ Separate Hydraulic Unit



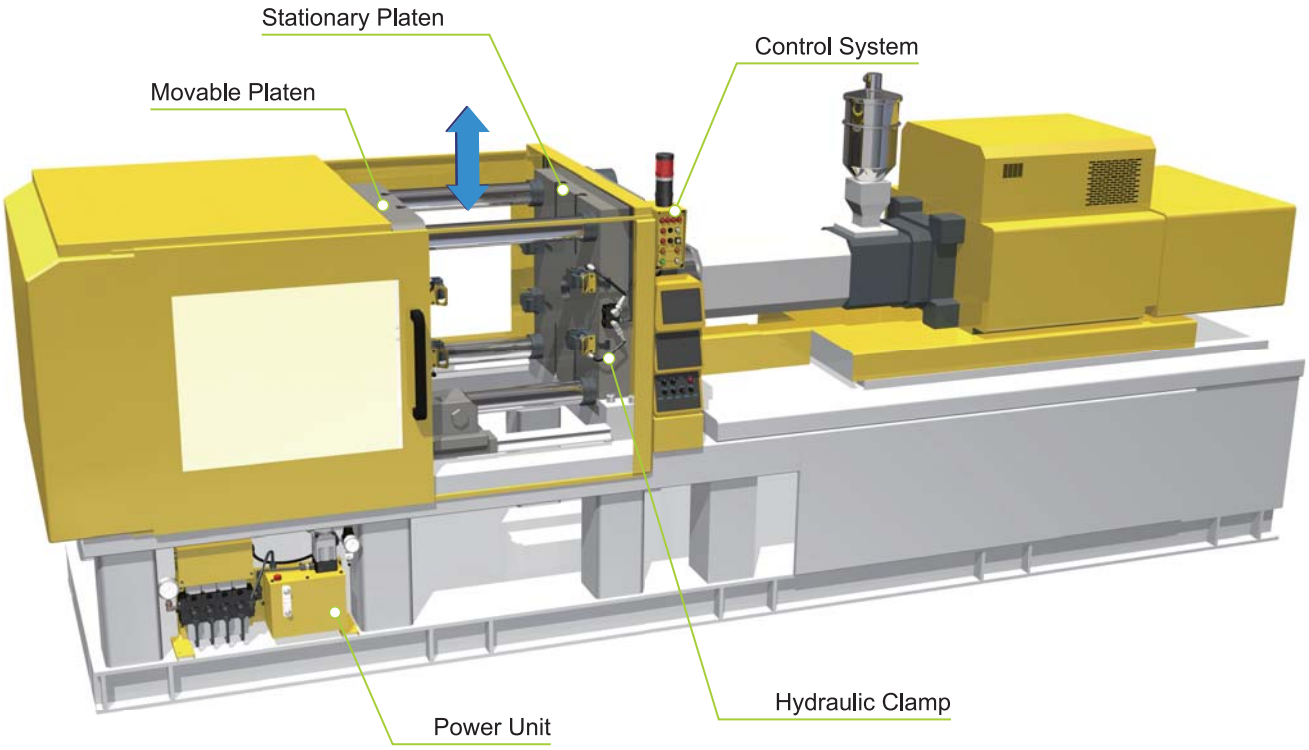
I.M.M.	A	B	D	E	h	Weight(kg)
1	MAX / MIN	MAX / MIN	MAX / MIN	MIN	Same	
2						
3						

Type of Mold Change : Vertical Loading

Application Example

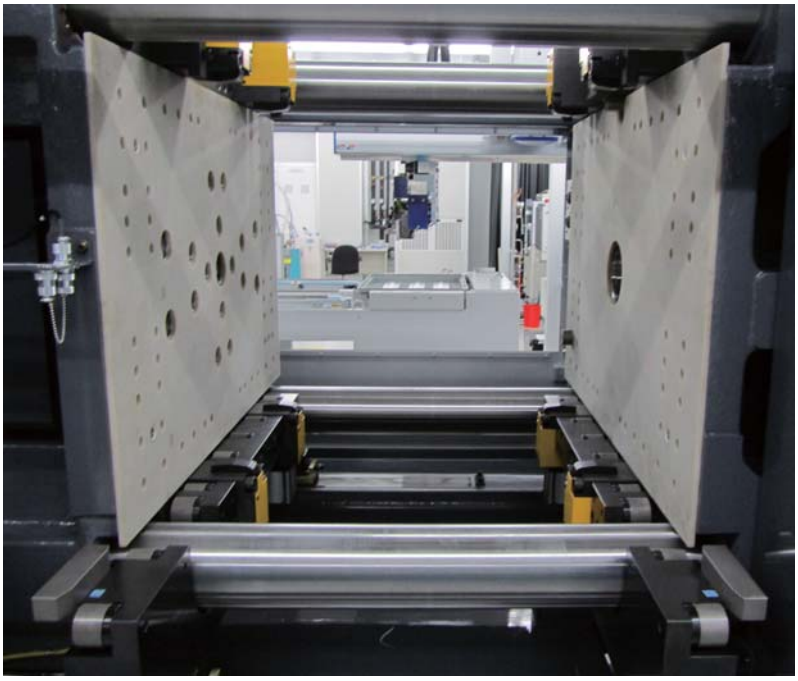


Application Features

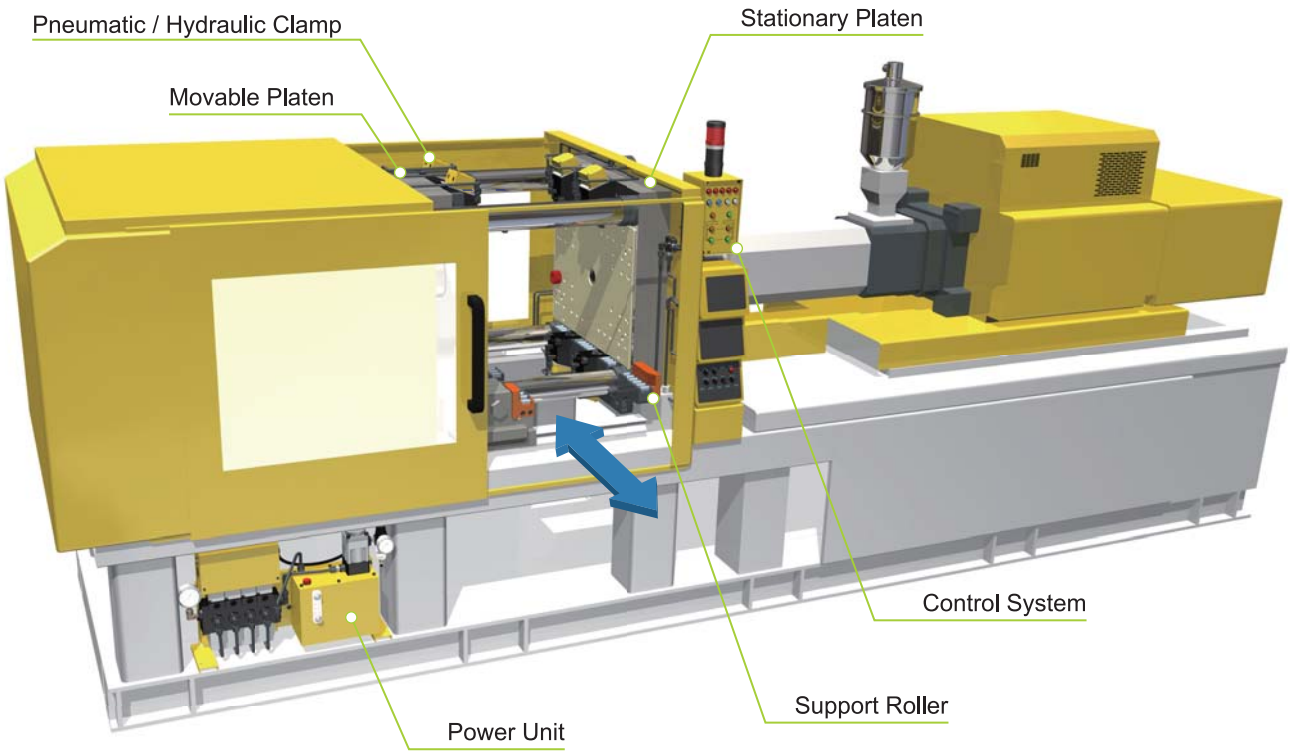


Type of Mold Change : Horizontal Loading

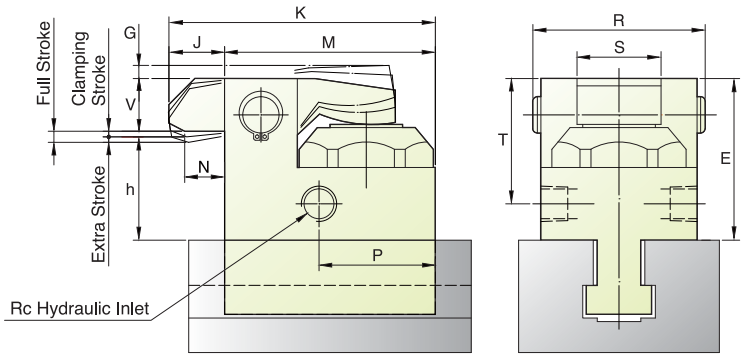
Application Example



Application Features



Standard Type



Outline Dimensions(mm)

Model No.	MIN.C	MIN.E	MAX.G	MAX.h	J	K	M	N	P	Rc	R	S	T
TB-01	7	44.5	6	50	15	75	60	10	32	1/8	43.8	20	39.5
TB-02	7	52	7	50	18	99	81	14	44.5		58.4	30	49
TB-03	9.5	60	7	50	20	105	85	14	44.5		63.9	32	51.5
TB-04	12	69	7	50	23	129	106	16	53		73	40	60
TB-06	14	82	8	60	30	161	131	20	64	1/4	93.3	50	70
TB-10	16	109	8	70	30	190	160	20	78		104	55	95
TB-16	19	131	9	80	30	230	200	20	95		125	60	117
TB-25	22	153	10	80	32	272	240	24	72		153.6	73	136

Specifications

Model No.		TB-01	TB-02	TB-03	TB-04	TB-06	TB-10	TB-16	TB-25
Clamping Force(at 250kg/cm²)	tf	1	1.5	2.4	4	6.3	10	16	25
Full Stroke	mm	6	10	7	7	8	8	8	9
Clamping Stroke	mm	3	5	4	4	4	4	4	5
Extra Stroke	mm	3	5	3	3	4	4	4	4
Cylinder Capacity at Full Stroke	cc	2.7	7.7	9.1	13	24	38.6	71.2	100.5
Minimum T-slot "a" Dimensions		12	14	16	20	22	24	28	36

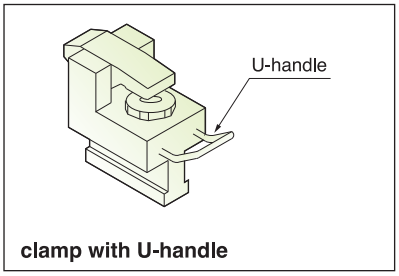
Order Example

TB - 06 – M
① ②

① Model No. : see specifications.

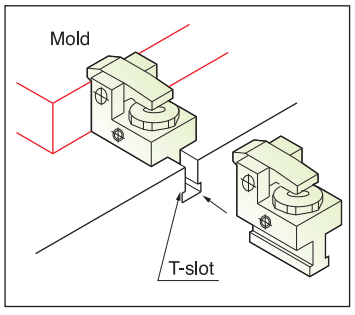
② M : Clamp with U-handle.
No Mark : Standard Type.

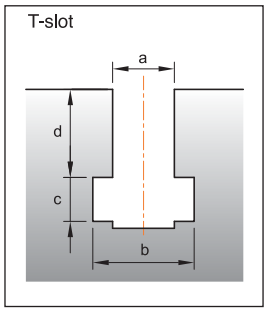
Note: Specify T -slot (a, b, c, d) and clamping height "h" dimensions when ordering.



clamp with U-handle

Displacement Diagram

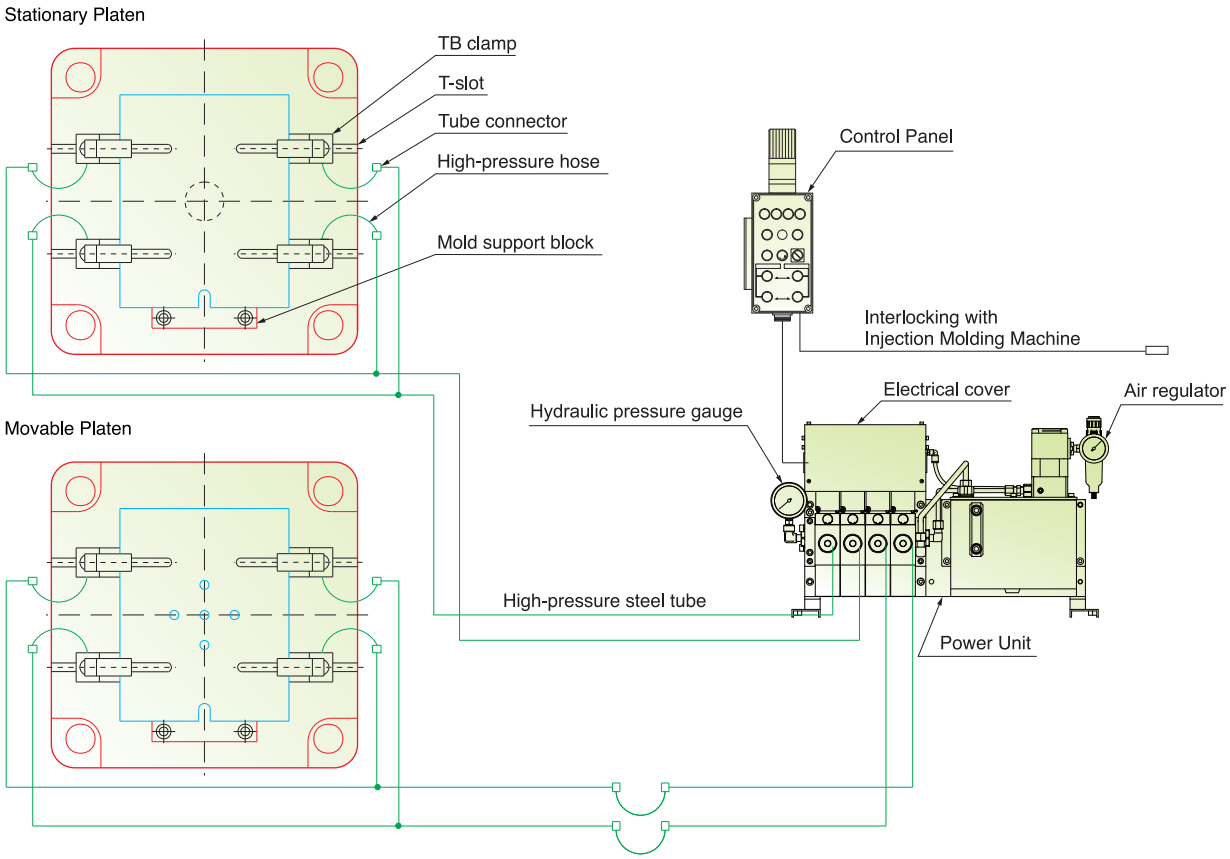




Recommended T-slot and clamping height "h" dimensions.(mm)

Model No.	a	b	c	d	h
TB-01	18 $^{+0.5}_{-0}$	30 $^{+1}_{-0}$	12 $^{+1}_{-0}$	15 $^{\pm 0.2}$	35
TB-02					
TB-03	22 $^{+0.5}_{-0}$	37 $^{+2}_{-0}$	16 $^{+2}_{-0}$	19 $^{\pm 0.2}$	40
TB-04					
TB-06					
TB-10	28 $^{+0.5}_{-0}$	46 $^{+2}_{-0}$	23 $^{+2}_{-0}$	23 $^{\pm 0.2}$	50
TB-16					
TB-25	36 $^{+0.5}_{-0}$	56 $^{+2}_{-0}$	25 $^{+2}_{-0}$	28 $^{\pm 0.2}$	

Principle Features



Description

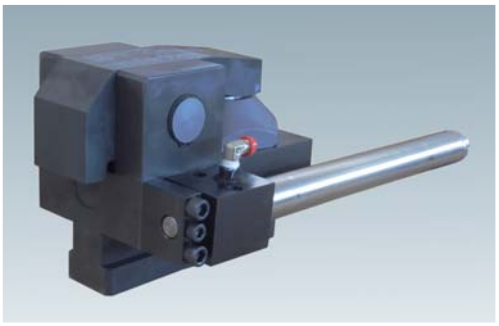
- Mold loading method : Vertical loading.
- Mold plate : If not standardized.
- Conditions : I.M.M. platen needs to be T-slot or fitted with a T-slot plate.
- Mold clamp : Manual feeding.

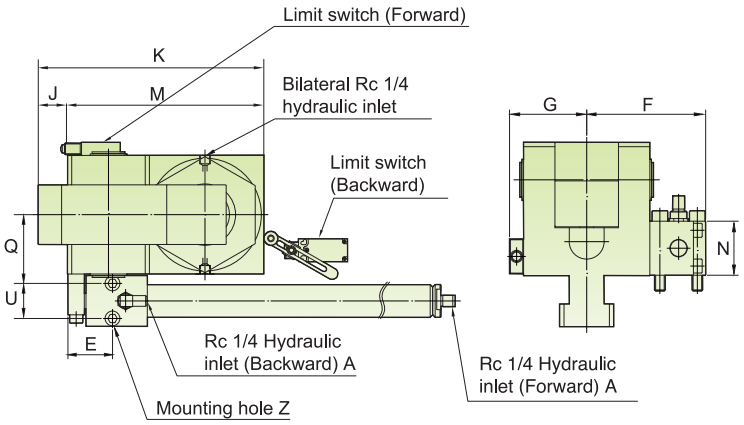
Important note

- All mold plates must have a standardized thickness.

Standard System Selection

Injection Molding Machine Capacity (M. Ton)	Clamp			Control Panel	Power Unit
	Model	Q'ty	Single-Side Force (M. Ton)		
~50	TB-01	8	4	EC-08A	BPT-62-LERLERLERLER-0-5-F
~75	TB-02		6		
~150	TB-03		9.6		
~250	TB-04		16		
~350	TB-06		25.2		APT-64-LERLERLERLER-0-5-F
~550	TB-10		40		
~850	TB-16		64		JPT-51-LERLERLERLER-0-10-F
~1300	TB-25		100		





Outline Dimensions(mm)

Model No.	A	E	F	G	J	K	M	N	Rc	Q	U	W	Z	
													Mounting bolt	Tapping
TE-10	Rc1/8	46	95	79	30	190	160	54	1/4	61	24	92.5	M8X55	M8XD16
TE-16	Rc1/4	54.5	121	75	30	230	200	62		70.5	43	113.5	M12X85	M12XD25
TE-25		54.5	136.5	88.5	32	270	240	62		84	43	127	M12X85	M12XD25

Specifications

Model No.		TE-10	TE-16	TE-25
Clamping Force (at 250kg/cm²)	tf	10	16	25
Driving Hydraulic Pressure	kg/cm²	80		
Slide Stroke	mm	50~300		
Minimum T-slot "a" size	mm	24	28	36
Voltage of Limit Switch		24 VDC		

Order Example

TE- 10 – 100 – L
① ② ③

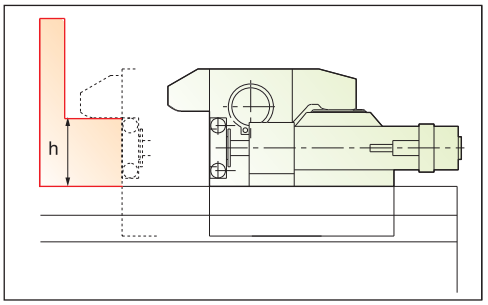
① Model No. : see specifications.

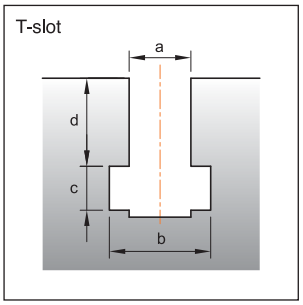
② Slide Stroke (mm)
Standard stroke : 50, 100, 150,
200, 250, 300

③ Cylinder Mounting Position
L : Left (As shown in diagram).
R: Right (To be mounted in reverse order to that shown in diagram).

Note: Specify T -slot (a, b, c, d) and clamping height "h" dimensions when ordering.

Displacement Diagram

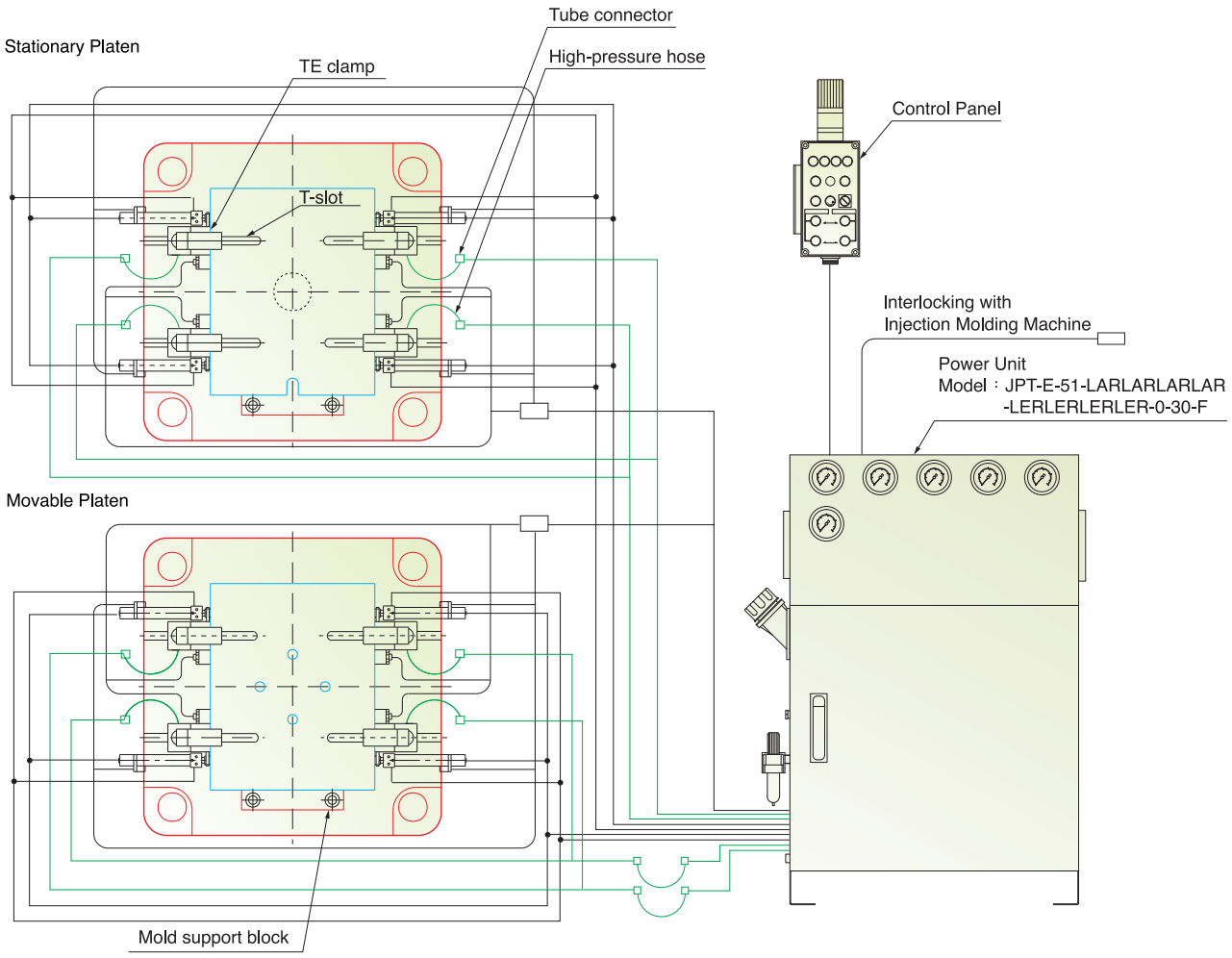




Recommended T-slot and clamping height "h" dimensions.(mm)

Model No.	a	b	c	d	h
TE-10	$28^{+0.5}_{-0}$	46^{+2}_{-0}	23^{+2}_{-0}	$23^{\pm 0.2}$	50
TE-16					
TE-25	$36^{+0.5}_{-0}$	56^{+2}_{-0}	25^{+2}_{-0}	$28^{\pm 0.2}$	

Principle Features



Description

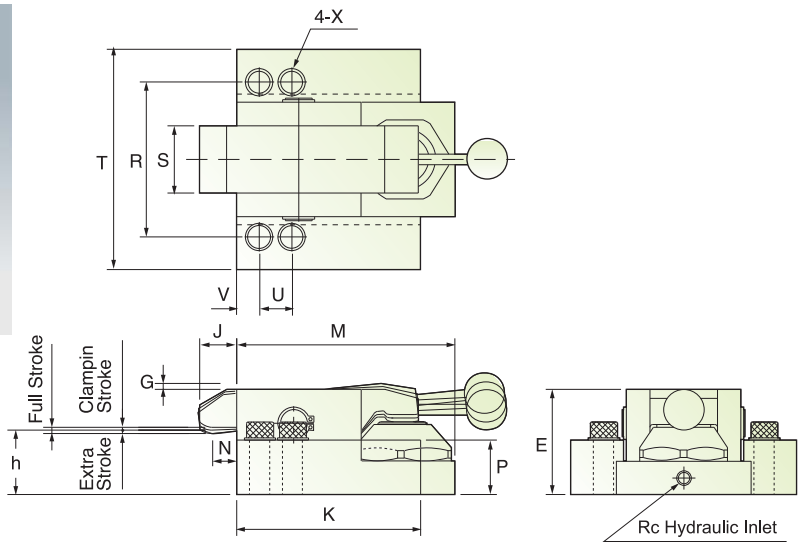
- Mold loading method : Vertical loading
- Mold plate : If not standardized
- Conditions : I.M.M.platen needs to be T-slot or fitted with a T-slot plate
- Mold clamp : Hydraulic cylinder feeding

Important note

- All mold plates must have a standardized thickness

Standard System Selection

Injection Molding Machine Capacity (M. Ton)	Clamp			Control Panel	Power Unit
	Model	Q'ty	Single-Side Force (M. Ton)		
~550	TE-10	8	40	EC-08A	JPT-E-51-LARLARLARLAR-LERLERLERLER-0-30-F
~850	TE-16		64		
~1300	TE-25		100		



Outline Dimensions(mm)

Model No.	MIN.E	MAX.G	MAX.h	J	MIN.K	M	N	P	Rc	R	S	T	U	V	X
TM-03	60	7	50	20	95	145	14	40	1/4	87	32	130	20	12	M12
TM-04	69	7	50	23	115	188	16	46		102	40	150	25	15	M16
TM-06	82	8	60	30	145	245	20	52		129	50	200	32	18	M20
TM-10	109	8	70	30	190	288	20	69		145	55	250	40	23	M24

Specifications

Model No.		TM-03	TM-04	TM-06	TM-10
Clamping Force (at 250kg/cm²)	tf	2.4	4	6.3	10
Full Stroke	mm	7	7	8	8
Clamping Stroke	mm	4	4	4	4
Extra Stroke	mm	3	3	4	4
Cylinder Capacity at Full Stroke	cc	7.5	12	22	36
Slide Effective Stroke	mm	50	75	100	100

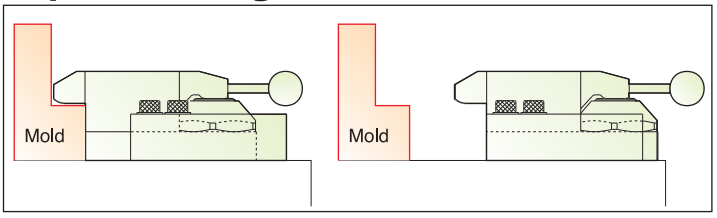
Order Example

TM-[06] – [40]
① ②

① Model No. : see specifications.

② Clamping height "h" (mm)

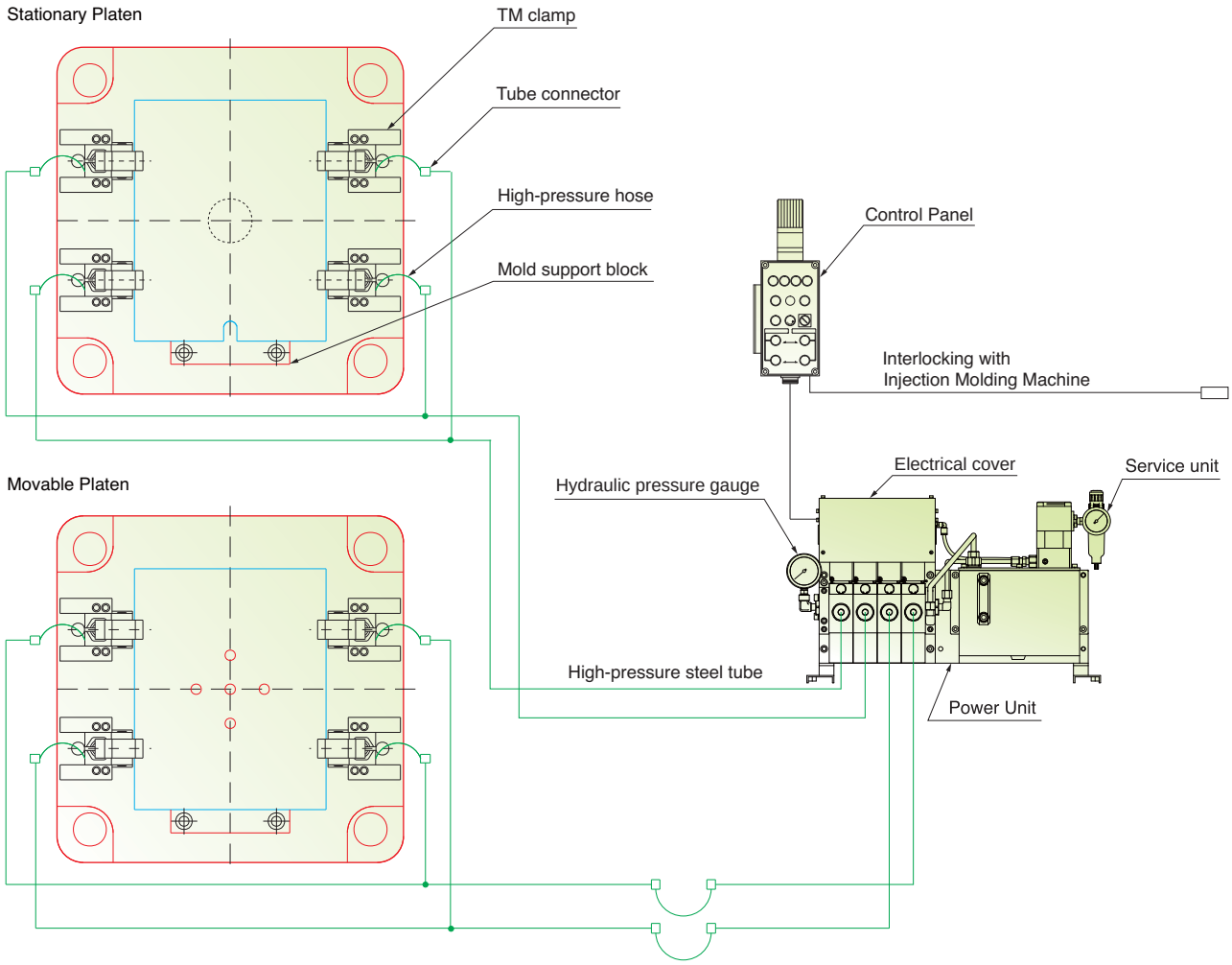
Displacement Diagram



Recommended T-slot and clamping height "h" dimensions.(mm)

Model No.	h
TM-03	40
TM-04	
TM-06	
TM-10	50

Principle Features



Description

- Mold loading method : Vertical loading.
- Mold plate : If not standardized.
- Conditions : Clamp sliding guide lock must be fixed in position on the platen.
- Mold clamp : Manual feeding.

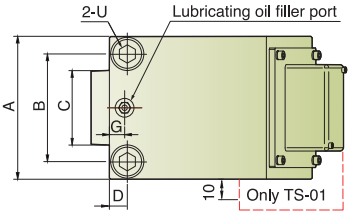
Important note

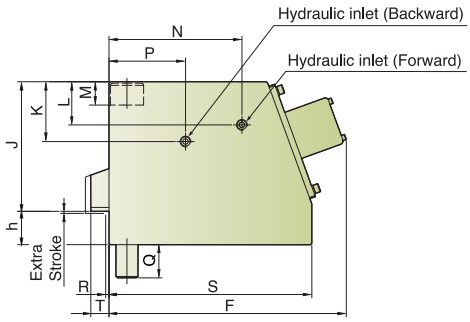
- All mold plates must have a standardized thickness.

Standard System Selection

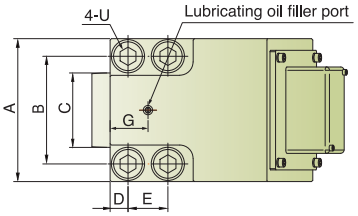
Injection Molding Machine Capacity (M. Ton)	Clamp			Control Panel	Power Unit
	Model	Q'ty	Single-Side Force (M. Ton)		
~150	**TM-03**	8	9.6	EC-08A	BPT-62-LERLERLERLER-0-5-F
~250	**TM-04**		16		
~350	**TM-06**		25.2		
~550	**TM-10**		40		

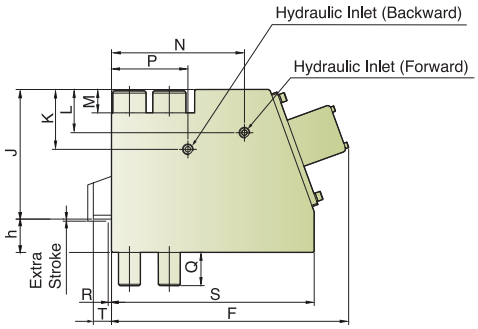
Model : TS-01 ~ TS-10





Model : TS-16 ~ TS-50





Outline Dimensions(mm)

Model No.	A	B	C	D	E	F	G	J	K	L	M	N	P	Q	R	S	T	U	Rc
TS-01	48	33	20	8	-	129	10	41	19.5	8	8	48.5	21.5	12	1.5	81	8	M8	1/8
TS-02	58	39	25	9.5	-	140	12	48	23	9.5	10	56.5	28	17	1.5	93	9	M10	1/8
TS-03	72	50	23	11	-	150	8	56	24	17	13	59	30.5	22	2	107	10	M12	1/8
TS-04	92	65	30	17.5	-	173	14	69	30	33	16.5	72	38	27	2	125	15	M16	1/4
TS-06	110	76	43	17	-	191	17	82	34	22	21.5	81	44	34	3	140	14	M20	1/4
TS-10	135	95	52	20	-	202	20	98	36	51	25.5	95	46	37	3	152	17	M24	1/4
TS-16	138	104	75	17	40	256	40	128	63	63	21	144	80	33	5	205	20	M20	1/4
TS-25	170	130	95	20	50	302	45	155	80	80	25	174	94	40	5	245	24	M24	1/4
TS-40	215	162	108	27	60	357	57	195	90	65	35	200	115	50	5	305	28	M30	3/8
TS-50	215	162	108	27	60	357	57	195	90	65	35	200	115	50	5	305	28	M33	3/8

Specifications

Model No.		TS-01	TS-02	TS-03	TS-04	TS-06	TS-10	TS-16	TS-25	TS-40	TS-50
Clamping Force(at 140kg/cm²)	tf	1	1.5	2.4	4	6.3	10	16	25	40	50
Holding Force (at 0 kg/cm²)	tf	0.4	0.6	1	1.5	2.5	4	6.4	10	16	16
Extra Stroke	mm	1.0						1.5			

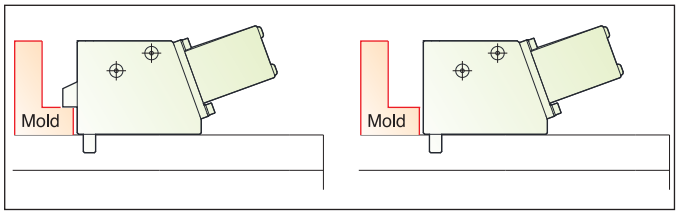
Order Example

TS-[06] – [35]
① ②

① Model No. : see specifications.

② Clamping height "h" (mm).

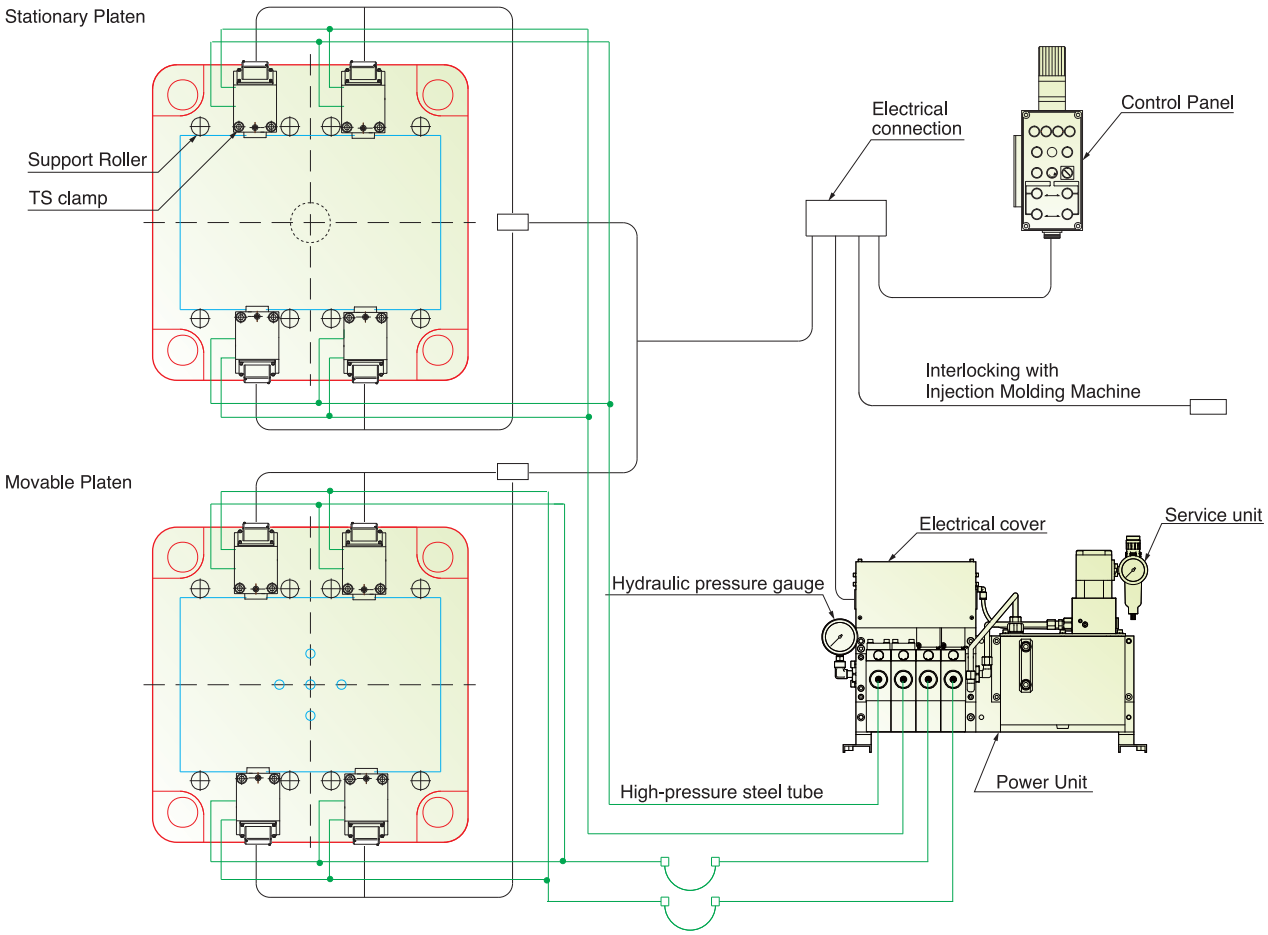
Displacement Diagram



Recommended clamping height "h" dimensions.(mm)

Model No.	TS-01	TS-02	TS-03	TS-04	TS-06	TS-10	TS-16	TS-25	TS-40	TS-50
h ± 0.5	20		30		35	40		50		

Principle Features



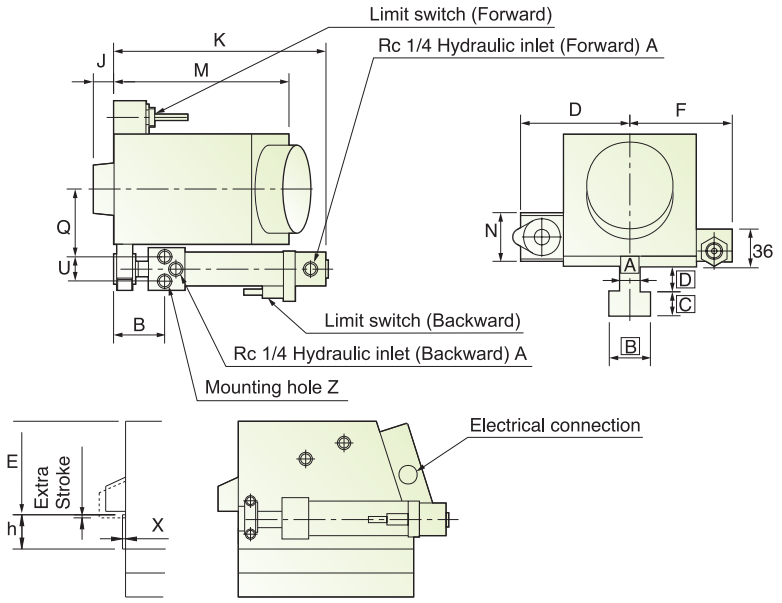
Description

- Mold loading method : Horizontal or Vertical loading is reguired.
- Mold plate : If standardized.
- Conditions : Clamp must be fixed in position on the platen.
- Mold clamp : Stationary.

Standard System Selection

Injection Molding Machine Capacity (M. Ton)	Clamp			Control Panel	Power Unit
	Model	Q'ty	Single-Side Force (M. Ton)		
~50	TS-01	8	4	EC-08A	BPT-49-LERLER-LARLAR-0-5-F
~75	TS-02		6		
~150	TS-03		9.6		
~250	TS-04		16		
~350	TS-06		25.2		APT-44-LERLER-LARLAR-0-5-F
~550	TS-10		40		
~850	TS-16		64		WPT-39-LERLER-LARLAR-0-5-F
~1300	TS-25		100		
~2000	TS-40		160		JPT-39-LERLER-LARLAR-0-18-F
~3000	TS-50		200		

TS-A Clamp



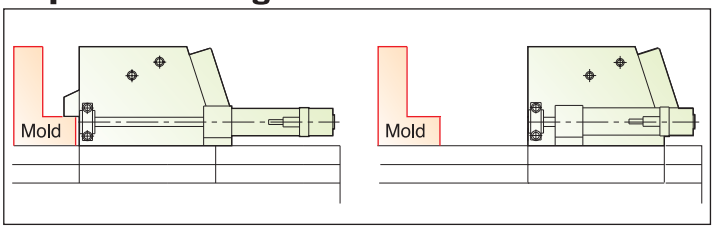
Outline Dimensions(mm)

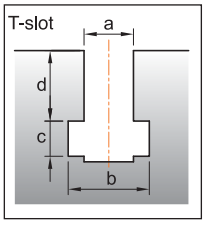
Model No.	A	B	D	E	F	J	K	M	N	Q	U	X	Z	
													Mounting bolt	Tapping
TS-03A	Rc1/8	40	71.5	56	67	10	159	112	37	47	18	2	M5X0.8X40	M5X0.8XD10
TS-04A		46	86.5	69	76	12	180	128	52	57	22		M6X50	M6XD12
TS-06A		46	92.5	82	76	14	202	145	58	59	24	3	M8X55	M8XD16
TS-10A		56	114.0	106	86	18	215	160	71	71.5	32		M10X70	M10XD20
TS-16A	Rc1/4	64	140.0	140	100	20	262	210	81	87	41	5	M12X85	M12XD24
TS-25A		66	167.5	170	116	24	308	250	87	106	46		M16X100	M16XD32

Specifications

Model No.		TS-03A	TS-04A	TS-06A	TS-10A	TS-16A	TS-25A
Clamping Force	tf	2.4	4	6.3	10	16	25
Holding Force (at 140kg/cm²)	tf	2.4	4	6.3	10	16	25
Holding Force (at 0kg/cm²)	tf	0.5	0.8	1.0	2	3	5
Driving Air Pressure	kg/cm²	5					
Slide Stroke	mm	50~150		50~300			
Extra Stroke	mm	1.0				1.5	
Minimum T-slot "a" size	mm	18	20	22	22	28	32
Voltage of Limit Switch		24 VDC					

Displacement Diagram





Order Example

TS-[06]A – [100] – [L]
① ② ③

①Model No. : see specifications.

②Slide Stroke (mm)
Standard stroke : 50, 100, 150, 200, 250, 300

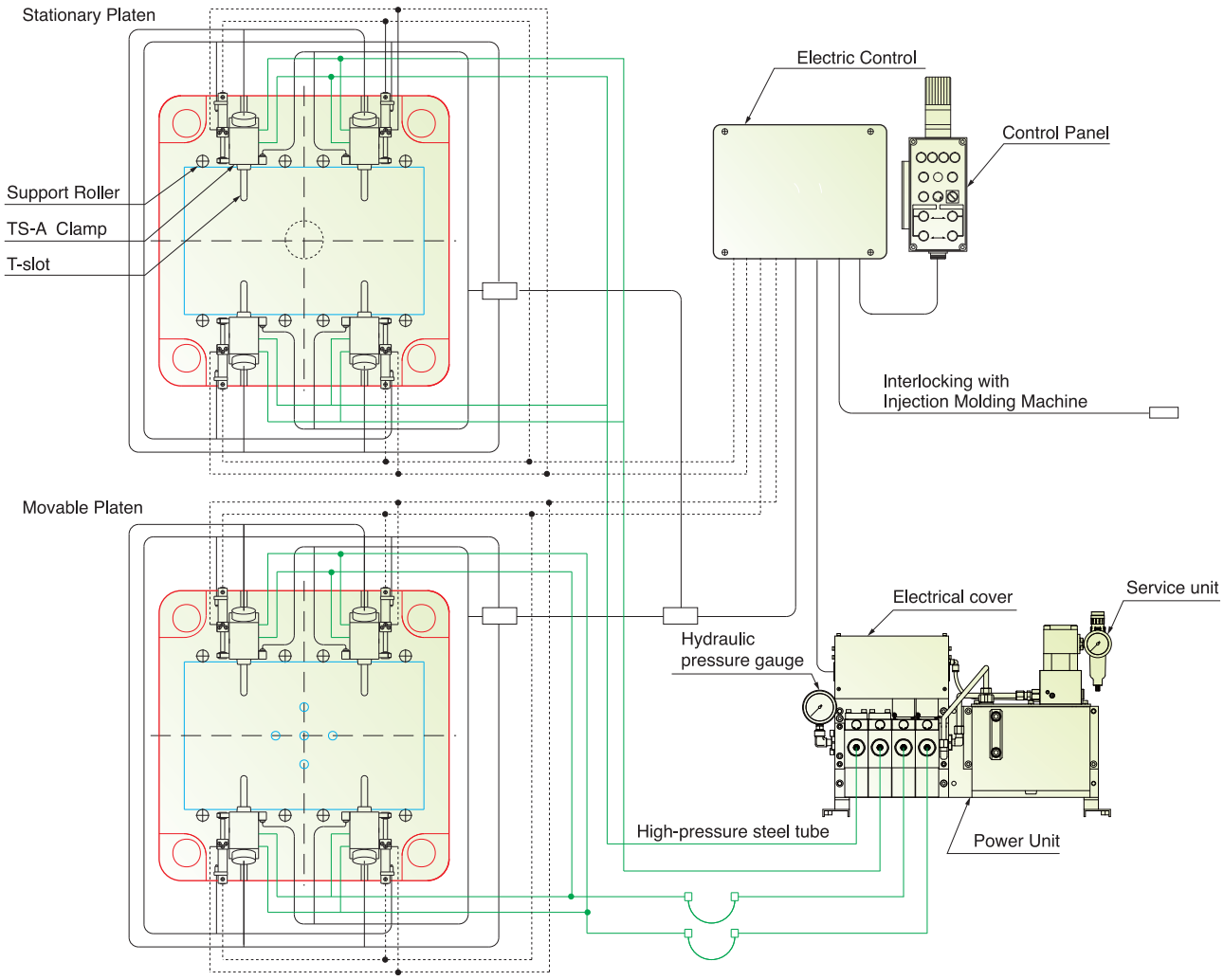
③Cylinder Mounting Position
L: Left (As shown in diagram).
R: Right (To be mounted in reverse order to that shown in diagram).

Note: Specify T -slot (a, b, c, d) and clamping height "h" dimensions when ordering.

Recommended T-slot and clamping height "h" dimensions.(mm)

Model No.	a	b	c	d	h±0.5
TS-03A	22 $^{+0.5}_{-0}$	37 $^{+2}_{-0}$	16 $^{+2}_{-0}$	19 $^{\pm 0.2}$	30
TS-04A					
TS-06A					35
TS-10A	28 $^{+0.5}_{-0}$	46 $^{+2}_{-0}$	23 $^{+2}_{-0}$	23 $^{\pm 0.2}$	40
TS-16A					
TS-25A	36 $^{+0.5}_{-0}$	56 $^{+2}_{-0}$	25 $^{+2}_{-0}$	28 $^{\pm 0.2}$	50

Principle Features



Description

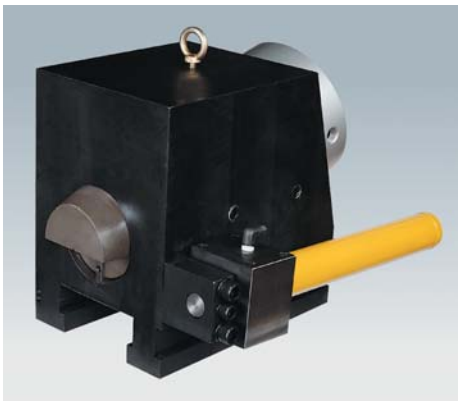
- Mold loading method : Horizontal or Vertical loading is reguired.
- Mold plate : If not standardized.
- Conditions : I.M.M platen needs to be T-slot or fitted with a T-slot plate.
- Mold clamp : Pneumatic cylinder feeding.

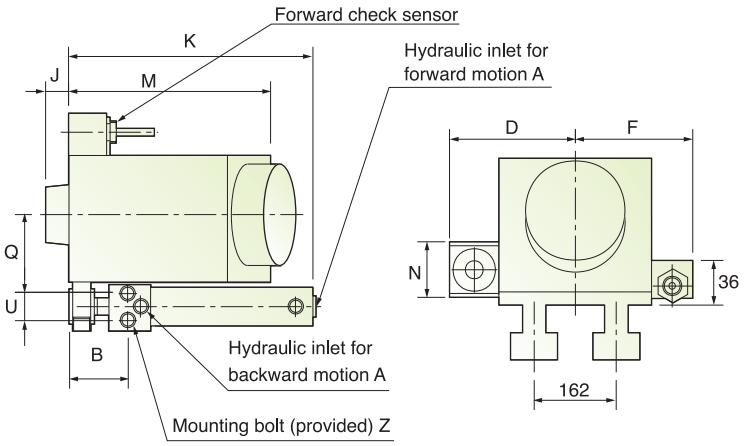
Important note

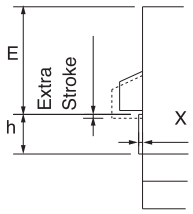
- All mold plates must have a standardized thickness.

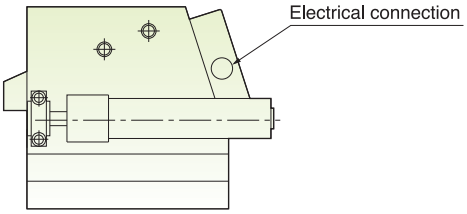
Standard System Selection

Injection Molding Machine Capacity (M. Ton)	Clamp			Control Panel	Electric Control	Power Unit
	Model	Q'ty	Single-Side Force (M. Ton)			
~150	TS-03A	8	9.6	EC-08A	EP-02	BPT-49-LERLER-LARLAR-0-5-F
~250	TS-04A		16			
~350	TS-06A		25.2			APT-44-LERLER-LARLAR-0-5-F
~550	TS-10A		40			
~850	TS-16A		64			JPT-39-LERLER-LARLAR-0-18-F
~1300	TS-25A		100			









Outline Dimensions(mm)

Model No.	A	B	D	E	F	J	K	M	N	Q	U	X	Z	
													Mounting bolt	Tapping
TS-40H	Rc¼	73	183.5	195	138.5	28	360	310	70	123.5	50	5	M12X95	M12XD25
TS-50H														

Specifications

Model No.		TS-40H	TS-50H
Clamping Force	tf	40	50
Holding Force (at 140kg/cm²)	tf	40	50
Holding Force (at 0kg/cm²)	tf	8.0	8.0
Hydraulic Cylinder Driving Pressure MAX.	kg/cm²	140	
Slide Stroke	mm	50~300	
Extra Stroke	mm	1.5	
Minimum T-slot "a" size	mm	42	
Sensor Load Voltage		24 VDC	

Order Example

TS- 50 H – 100 – L
① ② ③

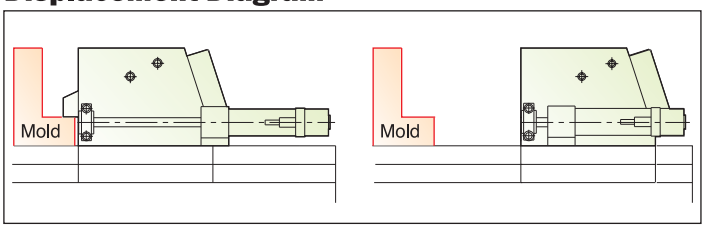
① Model No. : see specifications.

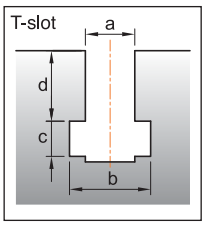
② Slide Stroke (mm)
Standard stroke : 50, 100, 150,
200, 250, 300

③ Cylinder Mounting Position
L: Left (As shown in diagram).
R: Right (To be mounted in reverse order to that shown in diagram).

Note: Specify T -slot (a, b, c, d) and clamping height "h" dimensions when ordering.

Displacement Diagram

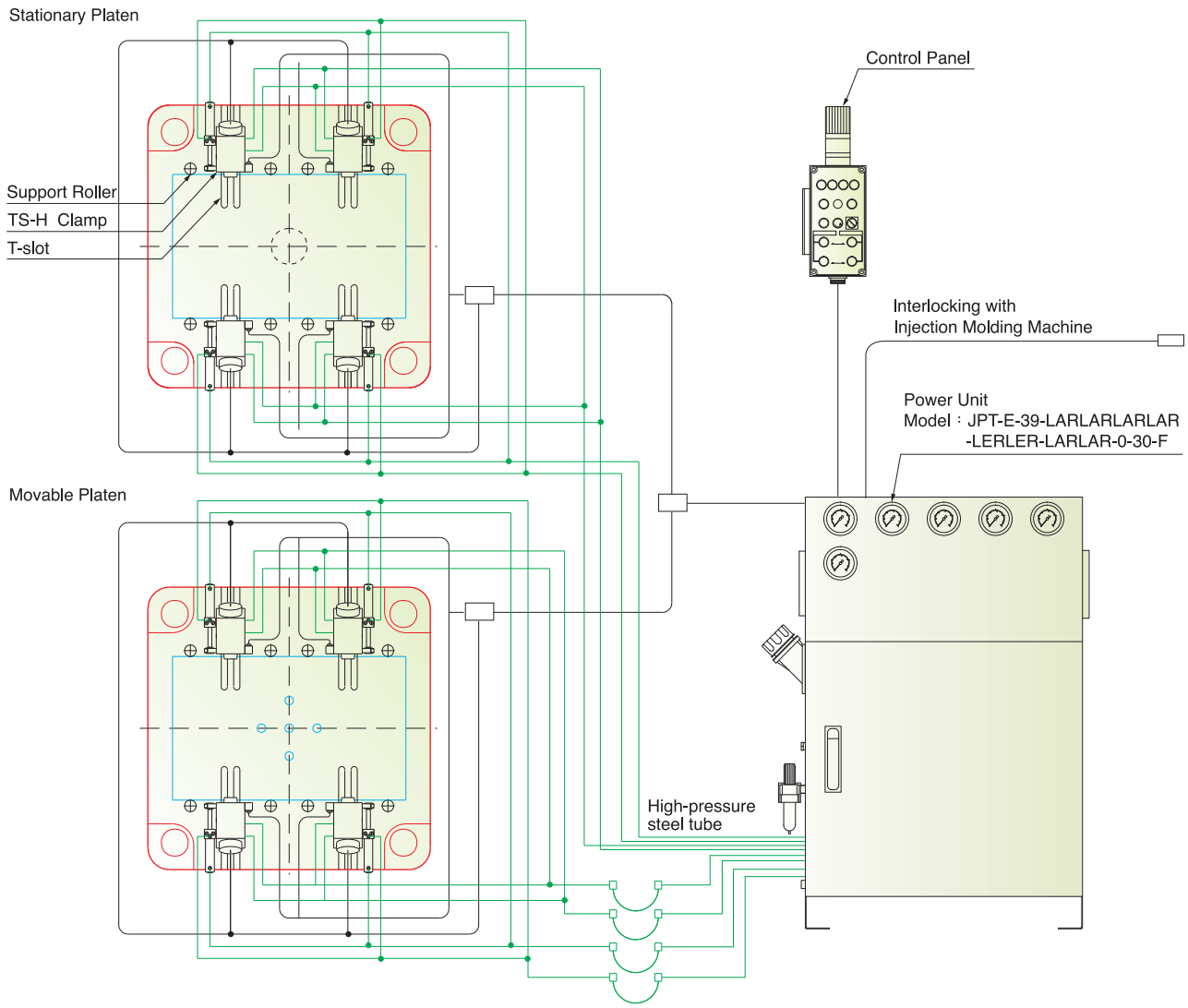




Recommended T-slot and clamping height "h" dimensions.(mm)

Model No.	a	b	c	d	h ±0.5
TS-40H	$42^{+0.5}_{-0}$	68^{+2}_{-0}	32^{+2}_{-0}	$42^{\pm 0.2}$	75
TS-50H					

Principle Features



Description

- Mold loading method : Horizontal or Vertical loading is reguired.
- Mold plate : If not standardized.
- Conditions : I.M.M platen needs to be T-slot or fitted with a T-slot plate.
- Mold clamp : Hydraulic cylinder feeding.

Important note

- All mold plates must have a standardized thickness.

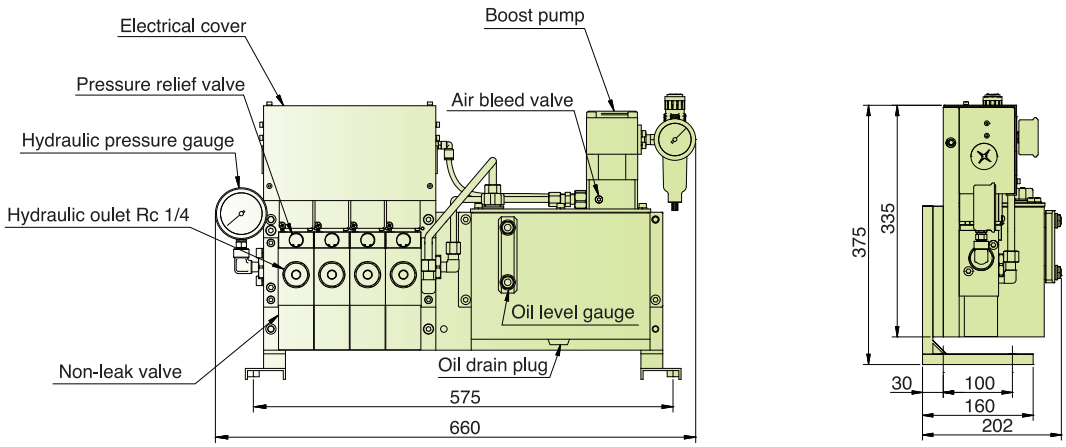
Standard System Selection

Injection Molding Machine Capacity (M. Ton)	Clamp			Control Panel	Power Unit
	Model	Q'ty	Single-Side Force (M. Ton)		
~2000	TS-40H	8	160	EC-08A	JPT-E-39-LARLARLARLAR-LERLER LARLAR-0-30-F
~3000	TS-50H		200		

Note : Consult us when you need to select a system for a I.M.M that exceeds 3000 ton capacity.

Four Circuits Power Unit

Outline Dimensions

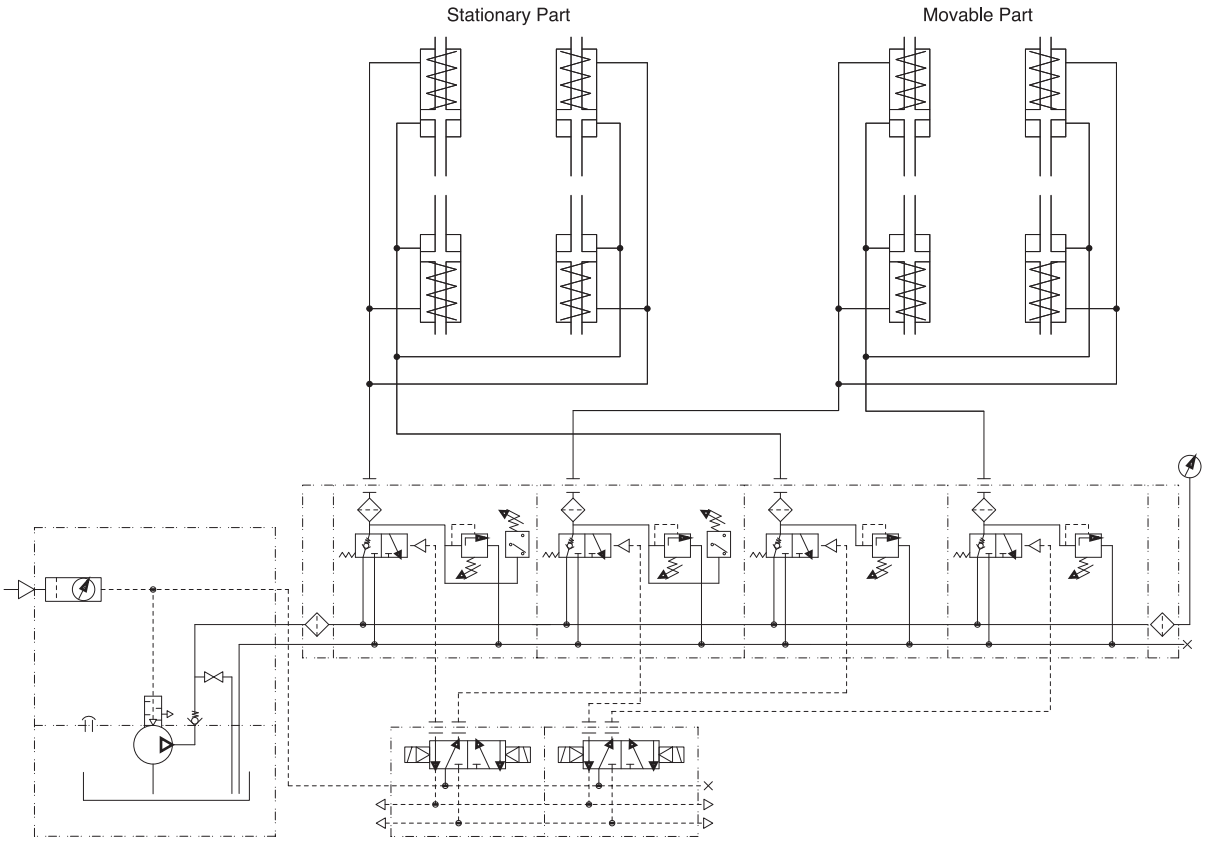


Technical Data

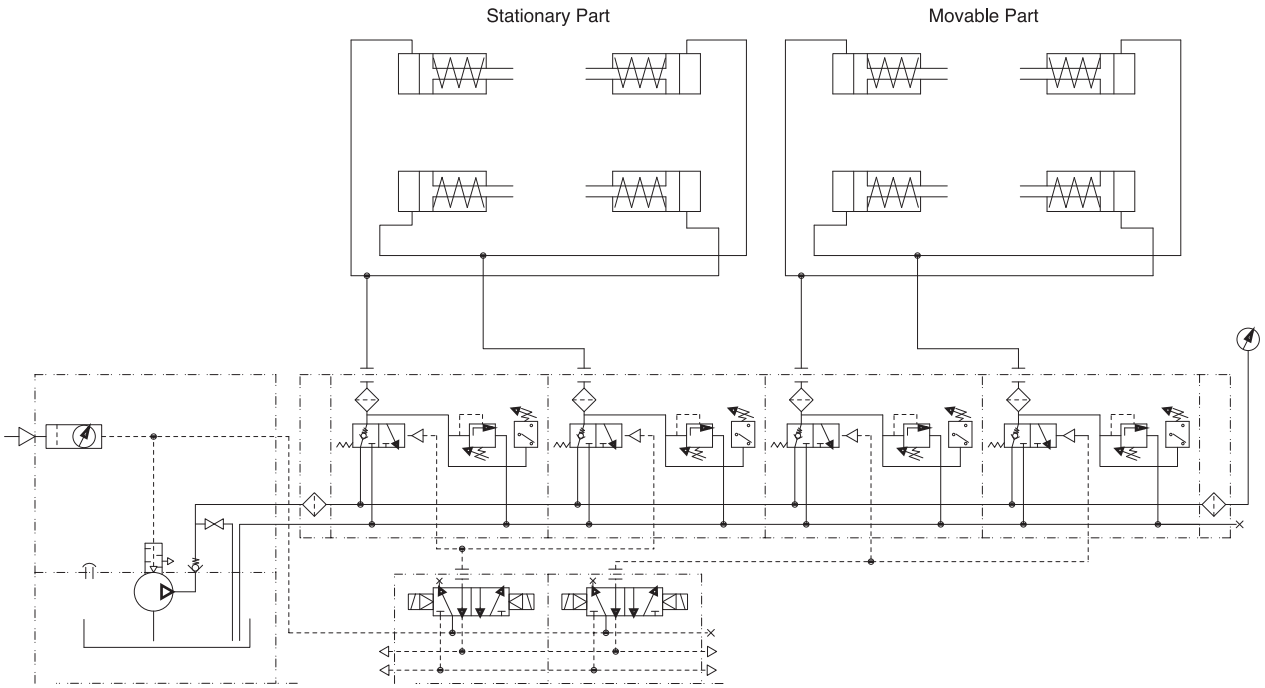
Model No.	BPT-49-LERLERLARLAR-0-5-F	BPT-62-LERLERLERLER-0-5-F
Operating pressure	140 kg/cm²	250 kg/cm²
Transmission ratio	1 : 49	1 : 62
Air pressure	3.1 bar	4.2 bar
Valve voltage	24 VDC	24 VDC
Hydraulic oil	ISO-VG-32	ISO-VG-32
Max. charge	5 L	5 L
Usable oil volume	4 L	4 L

Hydraulic Circuit Diagram

Model：BPT-49-LERLERLARLAR-0-5-F

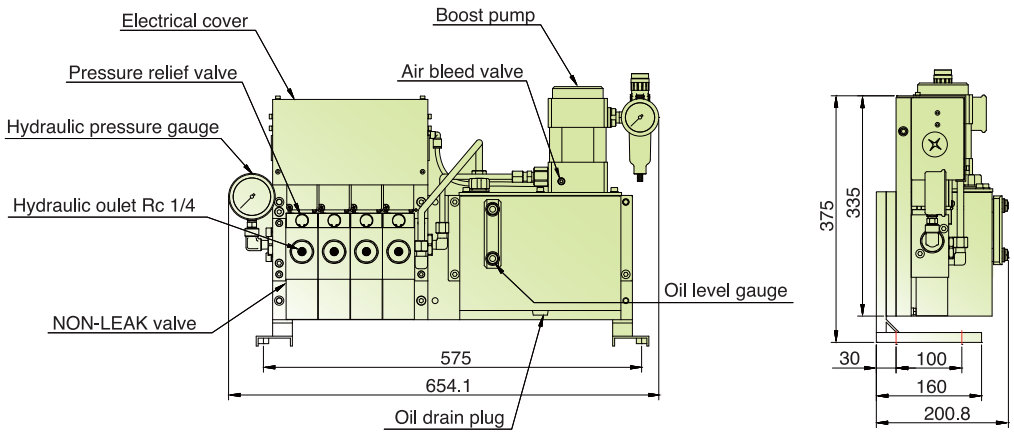


Model：BPT-62-LERLERLERLER-0-5-F



Four Circuits Power Unit

Outline Dimensions

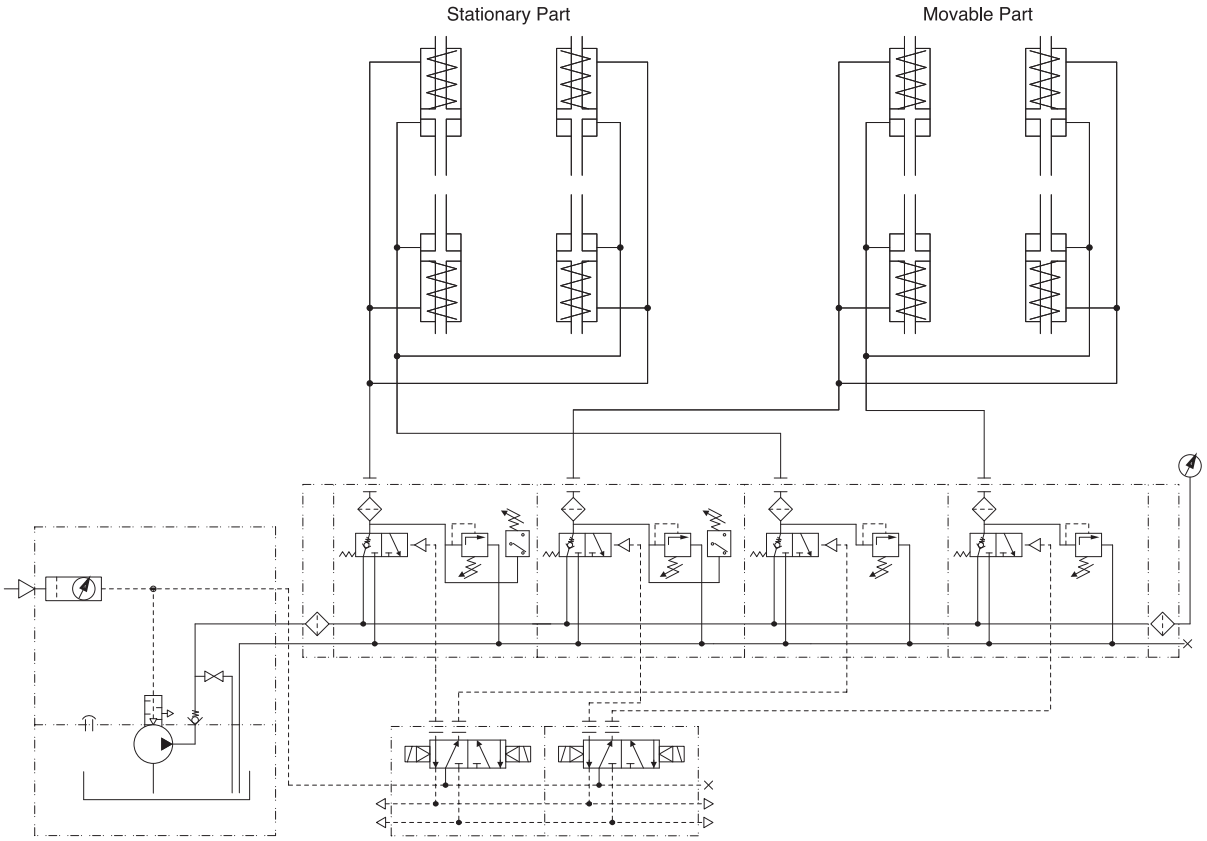


Technical Data

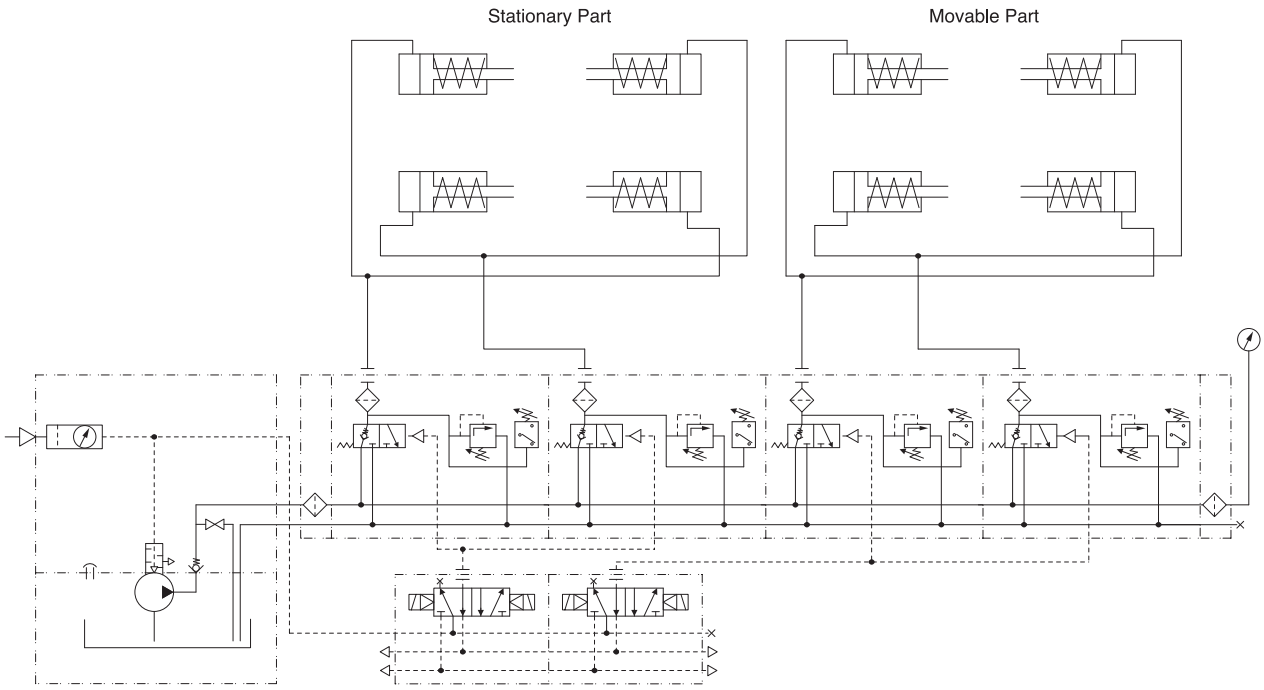
Model No.	APT-44-LERLER-LARLAR-0-5-F	APT-64-LERLERLERLER-0-5-F
Operating pressure	140 kg/cm²	250 kg/cm²
Transmission ratio	1 : 44	1 : 64
Air pressure	3.3 bar	4.2 bar
Valve voltage	24 VDC	24 VDC
Hydraulic oil	ISO-VG-32	ISO-VG-32
Max. charge	5 L	5 L
Usable oil volume	4 L	4 L

Hydraulic Circuit Diagram

Model：APT-44-LERLER-LARLAR-0-5-F



Model：APT-64-LERLERLERLER-0-5-F



KING AIR

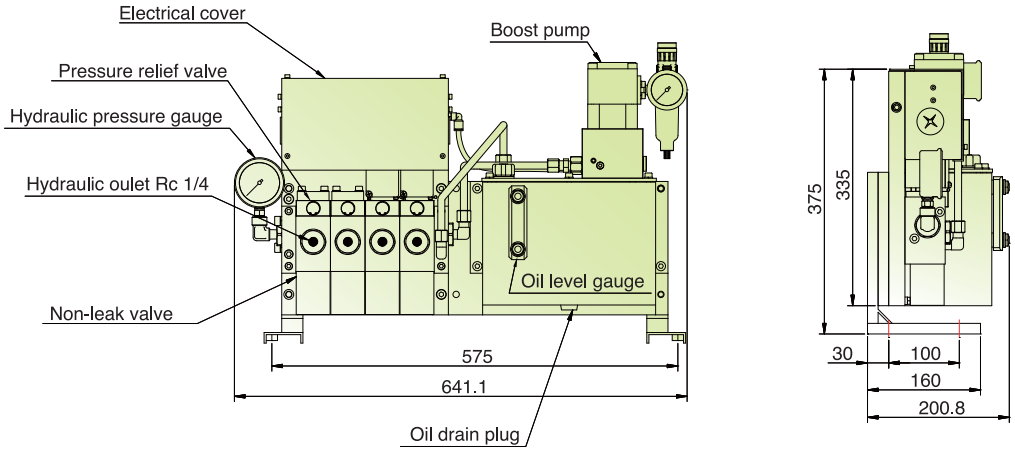
WP Series

Four Circuits Power Unit

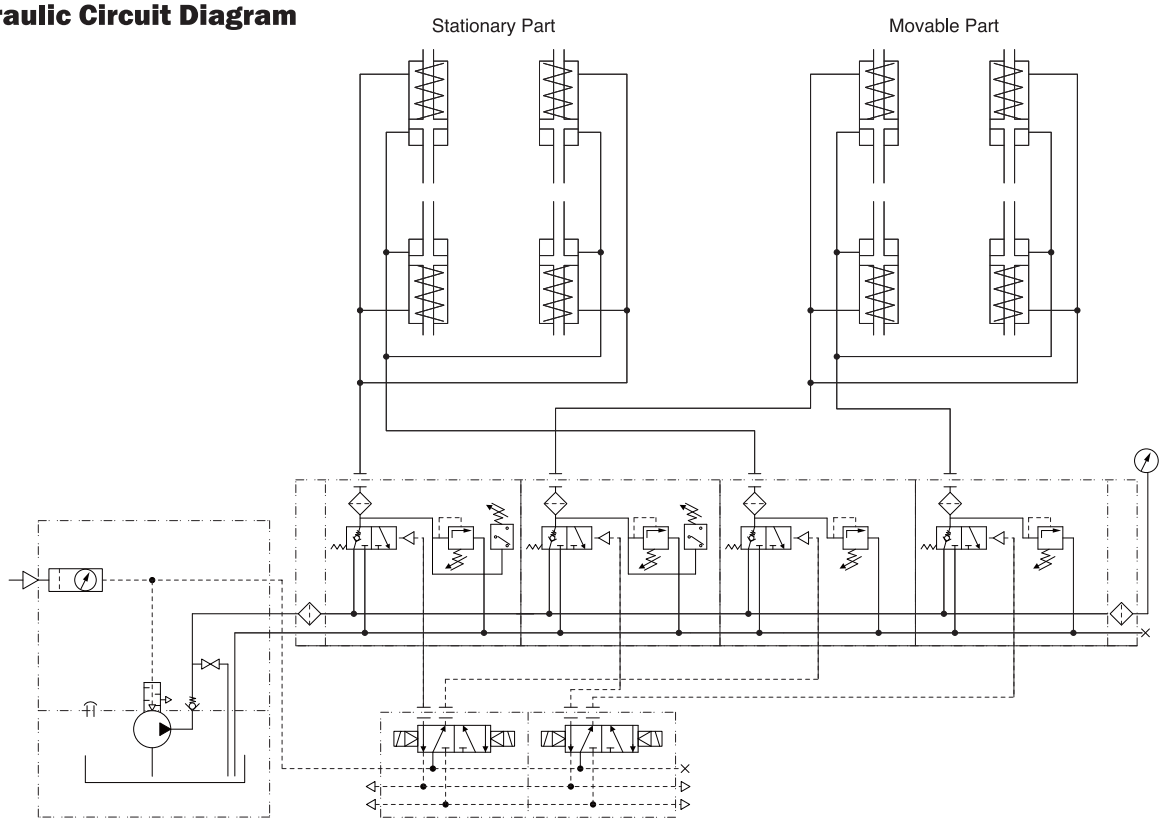
Technical Data

- Model：WPT-39-LERLER-LARLAR-0-5-F
- Operating pressure : 140 kg/cm²
- Transmission ratio : 1 : 39
- Air pressure : 3.7 bar
- Valve voltage : 24 VDC
- Hydraulic oil : ISO-VG-32
- Max. charge : 5 L
- Usable oil volume : 4 L

Outline Dimensions



Hydraulic Circuit Diagram



KING AIR

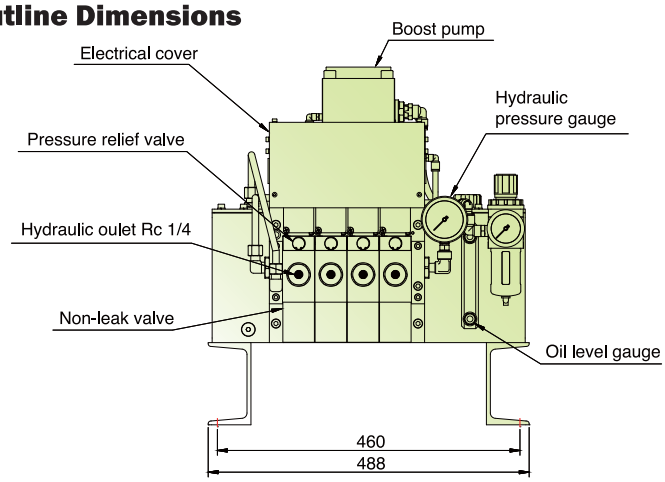
JP Series

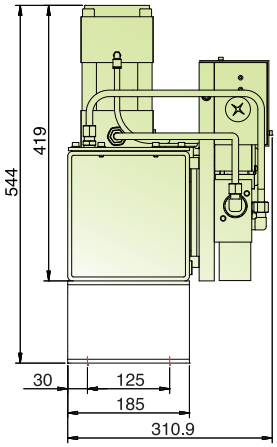
Four Circuits Power Unit

Technical Data

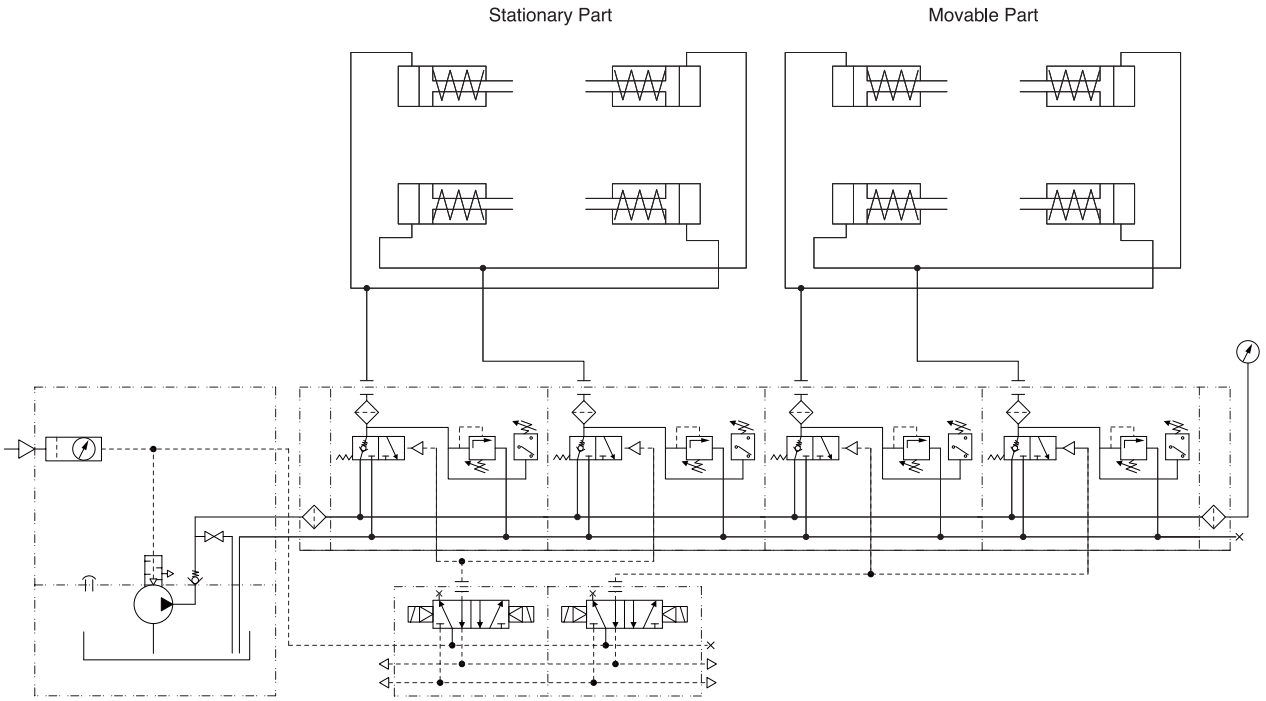
- Model：JPT-51-LERLERLERLER-0-10-F
- Operating pressure : 250 kg/cm²
- Transmission ratio : 1 : 51
- Air pressure : 5.1 bar
- Valve voltage : 24 VDC
- Hydraulic oil : ISO-VG-32
- Max. charge : 10 L
- Usable oil volume : 8 L

Outline Dimensions





Hydraulic Circuit Diagram

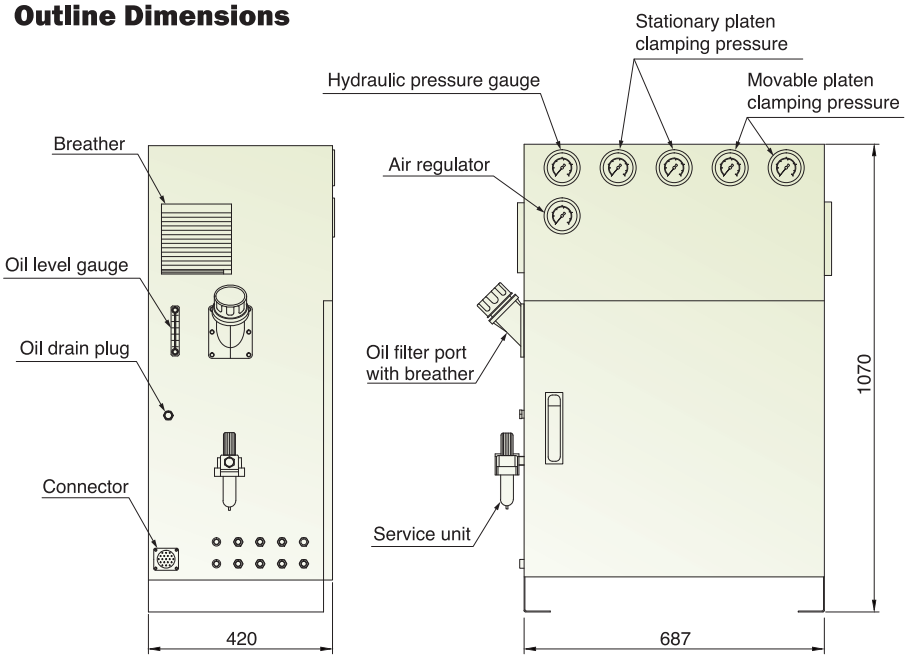


KING AIR

Power Unit

Model : JPT-E-51-LARLARLARLAR-LERLERLERLER-O-30F

Outline Dimensions



Technical Data

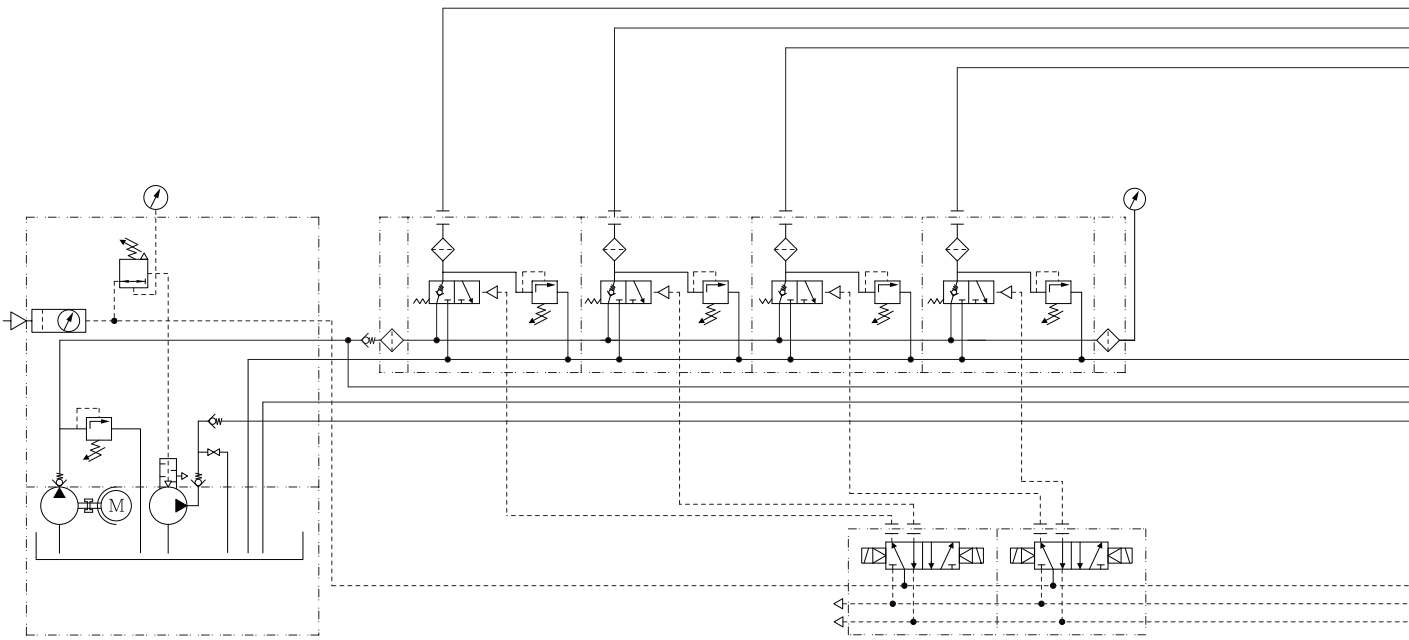
A. Boost pump
- Operating pressure : 140 kg/cm²
- Transmission ratio : 1 : 39
- Air pressure : 4.2 bar

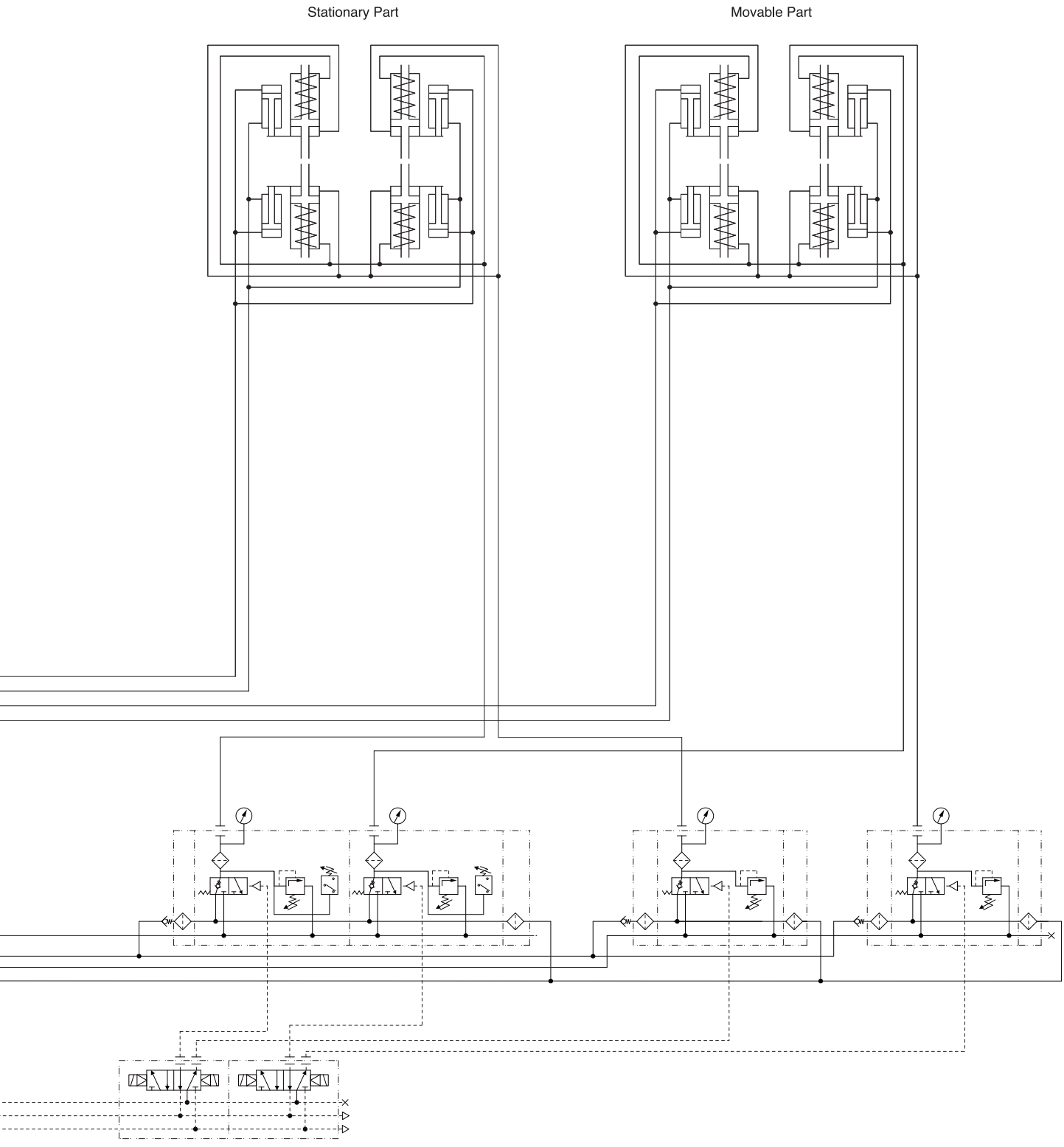
B. Control valve
- Voltage : 24 VDC

C. Motor
- Nominal rating : 1.5kw
- Voltage : 220/380 V
- Power system : 3-phase AC 60 Hz

D. Reservoir
- Hydraulic oil : ISO-VG-68
- Max. charge : 35 (L)
- Usable oil volume : 30 (L)

Hydraulic Circuit Diagram



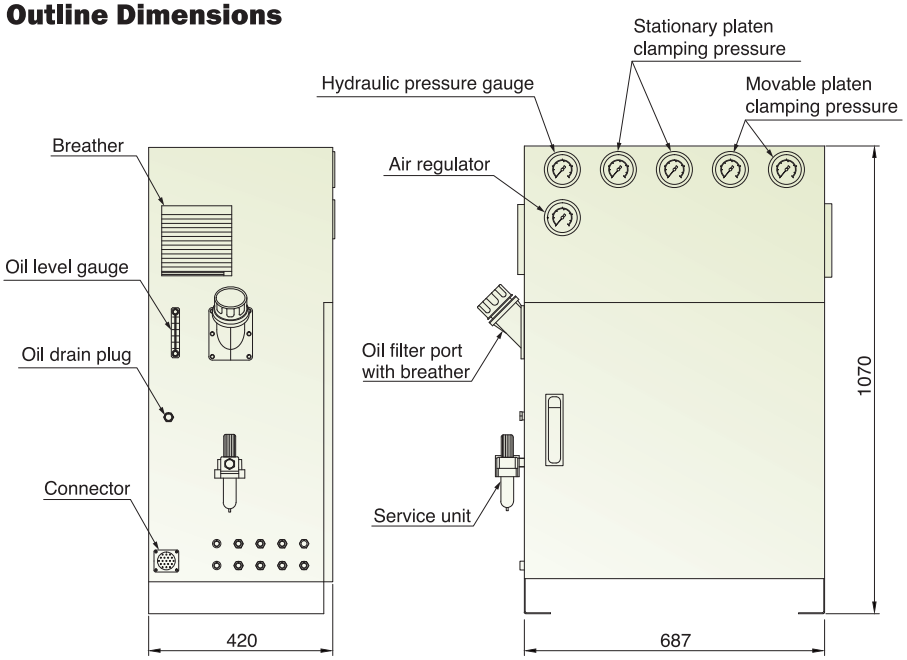

Stationary Part
Movable Part

KING AIR

Power Unit

Model : JPT-E-51-LARLARLARLAR-LERLERLERLER-O-30F

Outline Dimensions



Technical Data

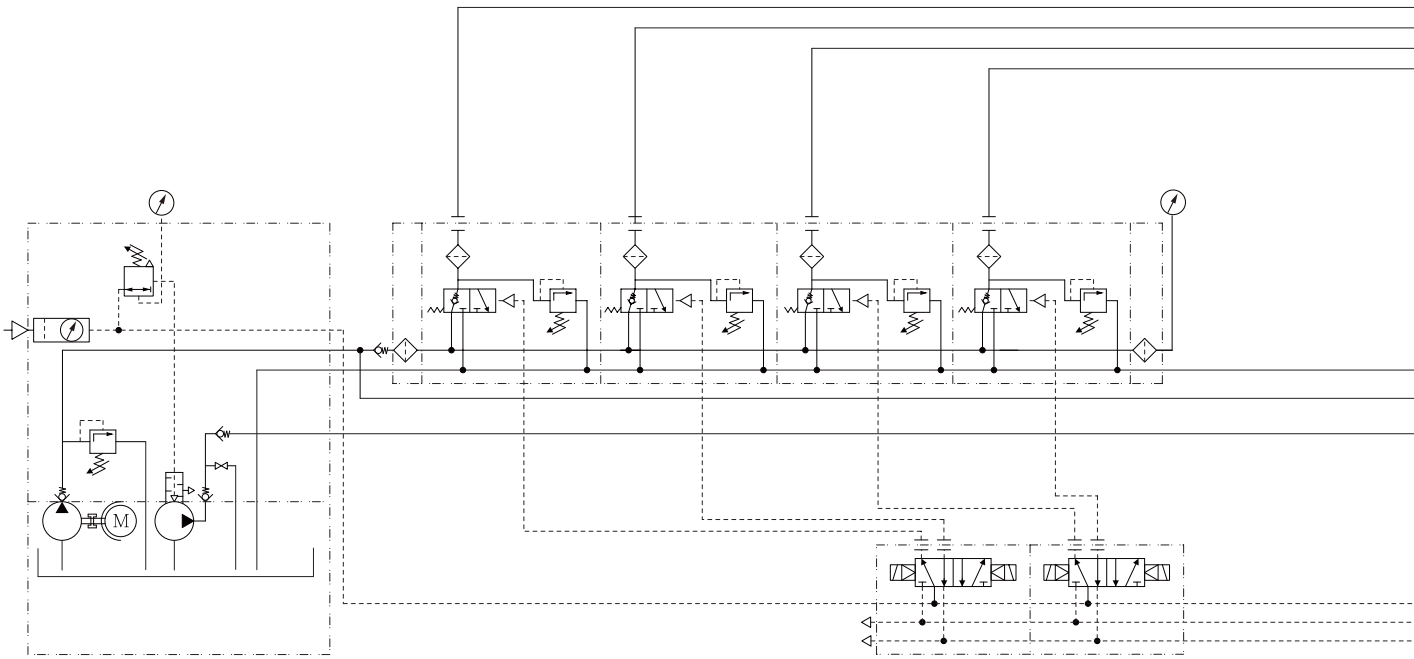
A. Boost pump
- Operating pressure : 250 kg/cm²
- Transmission ratio : 1 : 51
- Air pressure : 3.8 bar

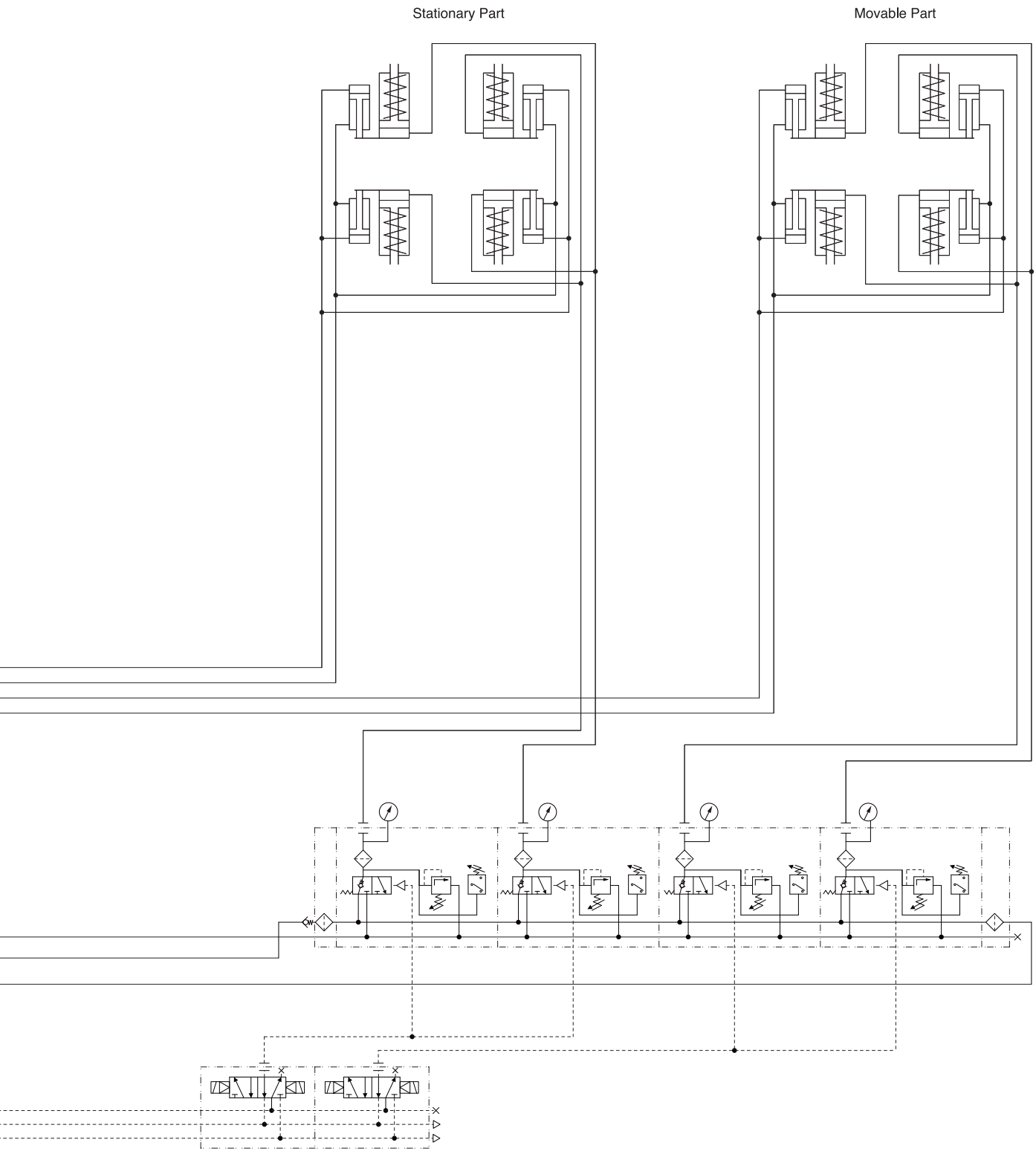
B. Control valve
- Voltage : 24 VDC

C. Motor
- Nominal rating : 1.5kw
- Voltage : 220/380 V
- Power system : 3-phase AC 60 Hz

D. Reservoir
- Hydraulic oil : ISO-VG-68
- Max. charge : 35 (L)
- Usable oil volume : 30 (L)

Hydraulic Circuit Diagram



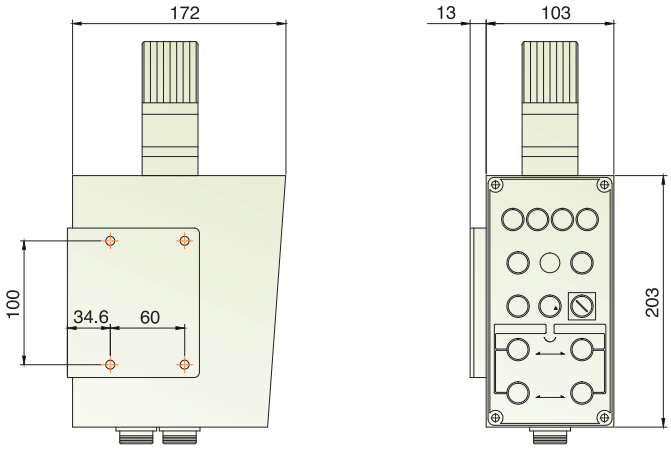

Stationary Part
Movable Part

KING AIR

Control Panel

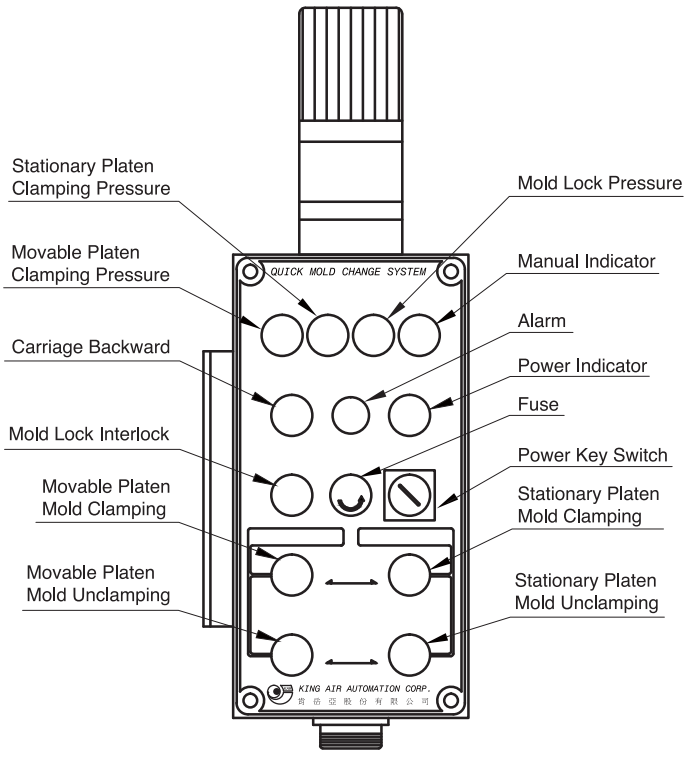
Model : EC-08A

Outline Dimensions



Description

The control panel is operated with safety and convenience to QMCS on press.It consists of the electric supply key switch to prevents accidents.The system pressure indicator shows the situation of the clamp.When the hydraulic pressure of power unit lower than the normal working pressure, it will command the injection molding machine to stop.



Specifications

Model No.	EC-08A
Supply Voltage	AC 100-240V 50/60 Hz
Power Switch	Start by Key ON - die change operation OFF - take the key away after the die is clamped

Supply us with following information for price quotation of your system:

A. I.M.M.

I.M.M.	Manufacturer	Model	Mold Clamping force (M. Ton)	Mold Opening force (M. Ton)	Q'ty	Remark
1						
2						
3						

B. Type of Mold Change

Type of loading	☐ Vertical Loading	☐ Horizontal Loading
Mold platen T-slot	☐ to be T-slot	☐ Not to be T-slot
Mold clamp	☐ stationary(TS)	☐ Manual Feeding(TB) or ☐ (TM)
	☐ Pneumatic Cylinder Feeding(TE) or ☐ (TS-A) ☐ Hydraulic Cylider Feeding(TS-H)	
Hydraulic pressure sources	☐ from I.M.M.	☐ Separate Hydraulic Unit

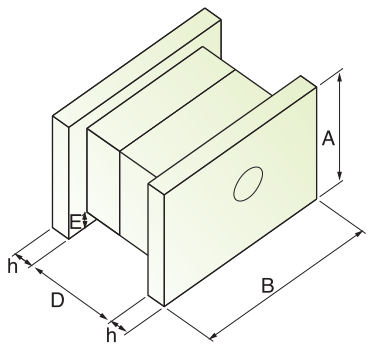
C. Power Supply Voltage

☐ other _____ v

☐ 220 VAC

D. Mold Dimensions

I.M.M.	A	B	D	E	h	Weight(kg)
1	MAX / MIN	MAX / MIN	MAX / MIN	MIN	Same	
2						
3						



肯岳亞股份有限公司
KING AIR AUTOMATION CORPORATION

40849 台中市南屯區文山北巷1-5號
40849 No. 1-5 Wenshan N. Lane Nantun District, Taichung, Taiwan
TEL: +886-4-2387-6060
FAX: +886-4-2387-6161
Email: sales@king-air.com.tw
http://www.king-air.com.tw

KING AIR

QMCS-0718-E-02 Printed in Taiwan