
Travail de fin d'études et stage[BR]- Travail de fin d'études : Développement et prototypage d'un système de tubage automatisé de séparateurs de faisceaux de tubes[BR]- Stage d'insertion professionnelle

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Annexe A

Code Arduino

```

1  #include <AccelStepper.h>
2
3  // Plus explicite que 0 ou 1
4  typedef enum{
5      RIGHT = 1,
6      LEFT  = 0
7  }side;
8
9  //Définition d'un nouveau type "plateType" pour décrire une plaque
10 typedef void (*plateType)();
11
12 /*
13  * Plaque d'interface courte
14  * Distance en mm
15  */
16 #define DIST_BTW_HOLE_X1 2
17 #define DIST_BTW_HOLE_Z1 2
18 #define LENGTH_X1 24
19 #define LENGTH_Z1 8
20
21 /*
22  * Plaque d'interface large
23  * Distance en mm
24  */
25 #define DIST_BTW_HOLE_X2 2.0
26 #define DIST_BTW_HOLE_Z2 2
27 #define LENGTH_X2 48
28 #define LENGTH_Z2 4
29
30 /*
31  * Mricrostepping du driver
32  */
33 #define MICROSTEP_X 8.0
34 #define MICROSTEP_Y 8.0
35 #define MICROSTEP_Z 4.0
36 #define MICROSTEP_WHEEL 4.0
37
38 /*
39  * Pas de la vis
40  * Distance en mm
41  */
42 #define LEAD_X 15.0
43 #define LEAD_Y 15.0
44 #define LEAD_Z 1.0
45 #define LEAD_WHEEL 87.0 //Diamètre de la roue * pi
46
47 /*
48  * Définition des entrées et sorties
49  * Adapté pour un arduino Mega
50  */
51 const byte ENAX = 35;
52 const byte DIRX = 37;
53 const byte PULX = 39;
54
55 const byte ENAY = 34;
56 const byte DIRY = 36;
57 const byte PULY = 38;
58
59 const byte ENAZ = 47;
60 const byte DIRZ = 49;
61 const byte PULZ = 51;
62
63 const byte ENAEXT = 41;
64 const byte DIREXT = 43;
65 const byte PULEXT = 45;
66
67 const byte button1 = 23;
68 const byte button2 = 24;
69 const byte button3 = 25;

```

```

70
71  const byte magnetRelay = 53;
72  const byte gripRelay = 32;
73  const byte pullRelay = 33;
74
75  const byte isTubeLeft = A3;
76  const byte isTubeRight = A7;
77  const byte wheelInterrupt = A11;
78
79  const byte switchX = 46;
80  const byte switchZ = 48;
81  const byte switchY = 44;
82
83  const byte led = 22;
84
85  //Définition des steppers du mécanisme
86  AccelStepper xAxis(1,PULX,DIRX);
87  AccelStepper yAxis(1,PULY,DIRY);
88  AccelStepper zAxis(1,PULZ,DIRZ);
89  AccelStepper extMotor(1,PULEXT,DIREXT);
90
91  //Définition des prochaines plaques à tuber
92  plateType nextHole1;
93  plateType nextHole2;
94
95  byte state = 0;
96
97  //Valeur du capteur photoélectrique dans le canal d'acheminement
98  short tubeRefLeft = 0;
99
100 //Valeur du capteur photoélectrique dans le canal de gauche
101 short tubeRefRight = 0;
102
103 //Valeur du capteur photoélectrique derrière la roue
104 short wheelRef = 0;
105
106 //Nombre de raté sur un seul trou et remis à 0 à chaque trou
107 byte nbrFail = 0;
108
109 /*
110  * Conversion des distances en mm vers une valeur en pas moteur
111  * 200 pas pour un tour complet dans les stepper utilisés
112  */
113 float mm2stepX = 200.0*MICROSTEP_X/LEAD_X;
114 float mm2stepY = 200.0*MICROSTEP_Y/LEAD_Y;
115 float mm2stepZ = 200.0*MICROSTEP_Z/LEAD_Z;
116 float mm2stepWheel = 200.0*MICROSTEP_WHEEL/LEAD_WHEEL;
117
118 //Nombre d'orifices dans les plaques
119 const unsigned short nbrHole1 = LENGTH_X1 * LENGTH_Z1;
120 const unsigned short nbrHole2 = LENGTH_X2 * LENGTH_Z2;
121
122 //Etat d'avancement du tubage
123 unsigned short tubeNbr = 0;
124
125 //Coordonnées du premier orifices de la plaque d'interface courte en nombre de pas et placée
  à gauche
126 const long coordx1Ref = -9244;//-9091;//-9305
127 const long coordy1Ref = -19340;//-19330;//-19320
128 const long coordz1Ref = 18142;//7092;//10253 11:45
129
130 //Coordonnées du premier orifices de la plaque d'interface large en nombre de pas et placée
  à gauche
131 const long coordx2Ref = -12026;//-10049;//-10102
132 const long coordy2Ref = -3180;//-3124;//-3157 3074
133 const long coordz2Ref = 18065;//15038;//18238;
134
135 //Coordonnées du premier orifices de la plaque d'interface à tube fin
136 const long coordx3Ref = 0;

```

```

137  const long coordy3Ref = 0;
138  const long coordz3Ref = 0;
139
140  //Coordonnées de La position intermédiaire et d'attente
141  const long coordxVia = -1600;
142  const long coordyVia = -10000;
143  const long coordzVia = 4800;
144
145  //Nombre de pas entre la position initiale du mécanisme et les capteurs
146  //Utile pour l'ajout d'une nouvelle plaque d'interface
147  long x = 0;
148  long y = 0;
149  long z = 0;
150
151  //Coordonnées absolues de la prochaine position en pas
152  long coordx = 0;
153  long coordy = 0;
154  long coordz = 0;
155
156  //Valeur à 1 lorsque le tube est serti
157  volatile bool crimpedFlag = false;
158
159  bool enter = true;
160  int p = 0;
161
162
163  // Renvoie les informations (0-9) reçues sur le moniteur série
164  byte communication();
165
166  // Affectation du type en fonction du numéro de plaque
167  plateType plateAssignment();
168
169  // Définition de la positions d'une nouvelle plaque relatif aux capteurs
170  void savePlate();
171
172  // Mise à zéro du mécanisme
173  void calibration();
174
175  // Extrusion du tube jusqu'à ce le capteur change d'état
176  void extrudeUntilTrigger(bool tubeExtremity);
177
178  // Extrusion du tube en fonction d'une distance à parcourir en mm
179  void extrudeDist(int dist);
180
181  // Définition de la plaque d'interface courte
182  void plate1();
183
184  // Définition de la plaque d'interface large
185  void plate2();
186
187  // Définition de la plaque d'interface tube fin
188  void plate3();
189
190  // Séquence pour la plaque de droite
191  bool tubagePlaque1();
192
193  // Séquence pour la plaque de gauche
194  void tubagePlaque2();
195
196  // Commande pneumatique de sertissage
197  bool sertissage();
198
199  // dégagement du tube en dehors de la tête d'extrusion
200  void degagement();
201
202  // Routine d'interruption pour la détection du sertissage
203  ISR(TIMER1_COMPA_vect);
204
205  // Dégagement du tube lorsqu'il y a un problème de tubage

```

```

206 void ejection(side plaque);
207
208
209 void setup(){
210
211     cli(); //ALL interruption disable
212
213     TCCR1A = 0; //Set entire TCCR1A register to 0
214     TCCR1B = 0; //Same for TCCR1B
215     TCNT1 = 0; //Initialize counter value to 0
216
217     OCR1A = 6249; // set compare match register :(16*10^6) / (10*256) - 1
218
219     TCCR1B |= (1 << WGM12); // turn on CTC mode;
220     TCCR1B |= (1 << CS12) | (0 << CS11) | (0 << CS10); //Prescaler 256x
221     //TIMSK1 |= (1 << OCIE1A);//Enable timer compare interrupt
222
223     sei(); //ALL interruption enable
224
225     xAxis.setMaxSpeed(3000);
226     xAxis.setAcceleration(2000);
227     xAxis.setMinPulseWidth(20);
228     xAxis.setPinsInverted(0,1,0);
229
230     yAxis.setMaxSpeed(3500);
231     yAxis.setAcceleration(2000);
232     yAxis.setMinPulseWidth(20);
233     yAxis.setPinsInverted(0,1,0);
234
235     zAxis.setMaxSpeed(3500);
236     zAxis.setAcceleration(2000);
237     zAxis.setMinPulseWidth(20);
238     zAxis.setPinsInverted(0,1,0);
239
240     extMotor.setMaxSpeed(3000);
241     extMotor.setAcceleration(2000);
242     extMotor.setMinPulseWidth(20);
243     extMotor.setPinsInverted(0,1,0);
244
245     pinMode(ENAEXT,OUTPUT);
246     digitalWrite(ENAEXT,HIGH);
247
248     pinMode(ENAX,OUTPUT);
249     digitalWrite(ENAX,HIGH);
250
251     pinMode(ENAY,OUTPUT);
252     digitalWrite(ENAY,HIGH);
253
254     pinMode(ENAZ,OUTPUT);
255     digitalWrite(ENAZ,HIGH);
256
257     pinMode(gripRelay,OUTPUT);
258     pinMode(pullRelay,OUTPUT);
259     pinMode(magnetRelay,OUTPUT);
260
261     pinMode(button1,INPUT_PULLUP);
262     pinMode(button2,INPUT_PULLUP);
263     pinMode(button3,INPUT_PULLUP);
264
265     pinMode(switchX,INPUT_PULLUP);
266     pinMode(switchY,INPUT_PULLUP);
267     pinMode(switchZ,INPUT_PULLUP);
268
269     pinMode(wheelInterrupt, INPUT);
270
271     pinMode(led,OUTPUT);
272
273     xAxis.setCurrentPosition(0);
274     yAxis.setCurrentPosition(0);

```

```

275     zAxis.setCurrentPosition(0);
276
277     Serial.begin(9600);
278     state = communication();
279     if(state == 2){
280         state = 6;
281     }
282     delay(2000);
283 }
284
285 void loop(){
286
287     while(1){
288         tubeRefLeft = analogRead(isTubeLeft);
289         tubeRefRight = analogRead(isTubeRight);
290
291         extMotor.setSpeed(1500);
292
293         while(abs(analogRead(isTubeLeft) - tubeRefLeft) < 50){
294             delay(250);
295         }
296         extrudeUntilTrigger(1);
297         delay(100);
298
299         extrudeDist(80);
300         delay(2000);
301         yAxis.move(-2133);
302         yAxis.runToPosition();
303         delay(500);
304
305         extrudeUntilTrigger(0);
306         delay(5000);
307
308     }
309
310     switch(state){
311
312         case 1:
313
314             nextHole1 = plateAssignement();
315             delay(1000);
316
317             nextHole2 = plateAssignement();
318             delay(1000);
319
320             state = 2;
321
322         break;
323
324         case 2:
325
326             calibration();
327
328             yAxis.runToNewPosition(coordyVia);
329             delay(100);
330
331             state = 3;
332
333         break;
334
335         case 3:
336
337             while((tubeNbr >= 43 && tubeNbr <= 47) || (tubeNbr >= 90 && tubeNbr <= 95) || (tubeNbr
338                 >= 139 && tubeNbr <= 143) || (tubeNbr >= 186 && tubeNbr <= 191)){
339                 nextHole1();
340                 nextHole2();
341                 tubeNbr++;
342             }

```

```

343
344     if(tubeNbr == 192){
345         state = 5;
346
347     }else{
348         tubeRefLeft = analogRead(isTubeLeft);
349         tubeRefRight = analogRead(isTubeRight);
350
351         nextHole1();
352
353         nbrFail = 0;
354         while(!tubagePlaque1()){
355             nbrFail++;
356             if(nbrFail == 2){
357                 digitalWrite(pullRelay, !digitalRead(pullRelay));
358                 delay(1500);
359
360                 break;
361             }
362         }
363         state = 4;
364     }
365
366     break;
367
368     case 4:
369
370         tubagePlaque2();
371
372         tubeNbr++;
373         state = 3;
374
375     break;
376
377     case 5:
378         yAxis.runToNewPosition(coordyVia);
379         delay(100);
380
381         state = 0;
382
383     break;
384
385     case 6:
386
387         savePlate();
388         state = 0;
389
390     break;
391 }
392 }
393
394 byte communication(){
395     while(1){
396         delay(500);
397         if(!digitalRead(button1)){
398             return 1;
399         }
400         if(!digitalRead(button2)){
401             return 2;
402         }
403         if(!digitalRead(button3)){
404             return 7;
405         }
406     }
407 }
408
409 plateType plateAssignement(){
410     byte plate = 0;
411

```



```

412     plate = communication();
413     switch(plate){
414
415         case 1:
416             return &plate1;
417             break;
418
419         case 2:
420             return &plate2;
421             break;
422
423     }
424 }
425
426
427 void savePlate(){
428     byte plaque = communication();
429
430     if(plaque == 1){ //right
431         yAxis.move(-1600);
432         yAxis.runToPosition();
433     }else if(plaque == 2){ //left
434         yAxis.move(1600);
435         yAxis.runToPosition();
436     }
437
438     calibration();
439
440     Serial.print("Distance X du couvercle en pas : ");
441     Serial.println(x);
442
443     Serial.print("Distance Y du couvercle en pas : ");
444     Serial.println(y);
445
446     Serial.print("Distance Z du couvercle en pas : ");
447     Serial.println(z);
448
449 }
450
451 void calibration(){
452
453     unsigned i = 1;
454
455     xAxis.setSpeed(1000); //vers l'arriere
456     yAxis.setSpeed(1000); //vers la droite
457     zAxis.setSpeed(-2000); //vers le haut
458
459     while(i>=0){
460         xAxis.runSpeed();
461         if(!(i%100)){
462             if(!digitalRead(switchX)){
463                 xAxis.stop();
464                 break;
465             }
466         }
467         i++;
468     }
469     i=1;
470     xAxis.setSpeed(-100);
471     delay(500);
472     while(i>=0){
473         xAxis.runSpeed();
474         if(digitalRead(switchX)){
475             x = xAxis.currentPosition();
476             xAxis.setCurrentPosition(0);
477             //Serial.println("X axis set");
478             xAxis.stop();
479             break;
480         }

```

```

481 }
482
483 delay(1000);
484
485 while(i>=0){
486     zAxis.runSpeed();
487     if(!(i%100)){
488         if(!digitalRead(switchZ)){
489             zAxis.stop();
490             break;
491         }
492     }
493     i++;
494 }
495 i=1;
496 zAxis.setSpeed(200);
497 delay(500);
498 while(i>=0){
499     zAxis.runSpeed();
500     if(digitalRead(switchZ)){
501         z = zAxis.currentPosition();
502         zAxis.setCurrentPosition(0);
503         //Serial.println("Z axis set");
504         zAxis.stop();
505         break;
506     }
507 }
508
509 delay(1000);
510
511 while(i>=0){
512     yAxis.runSpeed();
513     if(!(i%100)){
514         if(!digitalRead(switchY)){
515             yAxis.stop();
516             break;
517         }
518     }
519     i++;
520 }
521 i=1;
522 yAxis.setSpeed(-100);
523 delay(500);
524 while(i>=0){
525     yAxis.runSpeed();
526     if(digitalRead(switchY)){
527         y = yAxis.currentPosition();
528         yAxis.setCurrentPosition(0);
529         //Serial.println("Y Axis set");
530         yAxis.stop();
531         break;
532     }
533 }
534
535 delay(1000);
536
537 }
538 void extrudeUntilTrigger(bool tubeExtremity){
539
540     short wheelSpeed = 1500; //sens anti-horaire
541
542     digitalWrite(ENAEXT, HIGH);
543     extMotor.setSpeed(wheelSpeed);
544
545     if(tubeExtremity){
546         while(abs(analogRead(isTubeRight) - tubeRefRight) < 150){
547             extMotor.runSpeed();
548         }
549

```

```

550     }else{
551         while(abs(analogRead(isTubeLeft) - tubeRefLeft) > 50){
552             extMotor.runSpeed();
553         }
554     }
555     extMotor.stop();
556
557     digitalWrite(ENAEXT, LOW);
558 }
559
560 void extrudeDist(int dist){
561
562     digitalWrite(ENAEXT, HIGH);
563
564     extMotor.move((long)(dist*mm2stepWheel));
565     extMotor.runToPosition();
566
567     digitalWrite(ENAEXT, LOW);
568 }
569
570 void plate1(){
571
572     static short x1 = 0;
573     static short y1 = 0;
574     static short z1 = 0;
575
576     //Si c'est le 1er tube dans la plaque
577     if(tubeNbr == 0){
578         x1 = 0;
579         z1 = 0;
580
581         //Si on est a la moitié de la plaque
582     }else if(tubeNbr == (nbrHole1)/2){
583         x1 -= DIST_BTW_HOLE_X1 * (LENGTH_X1-1);
584         z1 += DIST_BTW_HOLE_Z1*2;
585
586     }else{
587         if(tubeNbr % LENGTH_X1){
588             x1 += DIST_BTW_HOLE_X1;
589         }else{
590             z1 += DIST_BTW_HOLE_Z1;
591             // A changer si on commence par la partie du bas ou du haut
592             if(tubeNbr > nbrHole1/2){
593                 x1 -= DIST_BTW_HOLE_X1*(LENGTH_X1-1) - DIST_BTW_HOLE_X1/2;
594             }else{
595                 x1 -= DIST_BTW_HOLE_X1*(LENGTH_X1-1) + DIST_BTW_HOLE_X1/2;
596             }
597         }
598     }
599     coordx = coordx1Ref + (long)(x1*mm2stepX);
600     coordy = coordy1Ref + (long)(y1*mm2stepY);
601     coordz = coordz1Ref - (long)(z1*mm2stepZ);
602 }
603
604 void plate2(){
605
606     static float x2 = 0.0; //décalage de 0.5 mm à certaines rangées
607     static short y2 = 0;
608     static short z2 = 0;
609
610     if(tubeNbr == 0){
611         x2 = 0.0;
612         z2 = 0;
613     }else{
614         if(tubeNbr % LENGTH_X2){
615             x2 += DIST_BTW_HOLE_X2;
616         }else{
617             z2 += DIST_BTW_HOLE_Z2;
618             if(tubeNbr/LENGTH_X2 == 1 || tubeNbr/LENGTH_X2 == 3){

```

```

619         x2 -= DIST_BTW_HOLE_X2 * (LENGTH_X2-1) - DIST_BTW_HOLE_X2/2;
620     }else{
621         x2 -= DIST_BTW_HOLE_X2 * (LENGTH_X2-1) + 0.5;
622     }
623 }
624 }
625 Serial.println(x2);
626 coordx = coordx2Ref + (long)(x2*mm2stepX);
627 coordy = coordy2Ref + (long)(y2*mm2stepY);
628 coordz = coordz2Ref - (long)(z2*mm2stepZ);
629 }
630
631
632 bool tubagePlaque1(){
633
634     digitalWrite(pullRelay, !digitalRead(pullRelay));
635     delay(2000);
636
637     crimpedFlag = false;
638     //nextHole1();
639
640     xAxis.runToNewPosition(coordx + 1000);
641     delay(50);
642     zAxis.runToNewPosition(coordz);
643     delay(50);
644     xAxis.runToNewPosition(coordx);
645     delay(50);
646     yAxis.runToNewPosition(coordy);
647     delay(50);
648
649     while(abs(analogRead(isTubeLeft) - tubeRefLeft) < 50){
650         delay(250);
651     }
652     extrudeUntilTrigger(1);
653     delay(100);
654
655     extrudeDist(80);
656     //delay(100);
657
658     if(!sertissage()){
659         ejection(RIGHT);
660         return 0;
661     }
662
663     //Mouvement de l'extrudeur vers la gauche de 9 cm
664     yAxis.runToNewPosition(coordyVia);
665     delay(50);
666
667     extrudeUntilTrigger(0);
668     //delay(100);
669
670     //Avancement du chariot pour la découpe
671
672     coordx -= 960;
673     xAxis.runToNewPosition(coordx);
674     delay(50);
675
676     return 1;
677 }
678
679 void tubagePlaque2(){
680
681     digitalWrite(pullRelay, !digitalRead(pullRelay));
682     delay(2000);
683
684     crimpedFlag = false;
685
686     nextHole2();
687

```

```

688     xAxis.runToNewPosition(coordx + 1000);
689     delay(50);
690     zAxis.runToNewPosition(coordz);
691     delay(50);
692     xAxis.runToNewPosition(coordx);
693     delay(50);
694     yAxis.runToNewPosition(coordy);
695     delay(50);
696
697     extrudeDist(30);
698     delay(100);
699
700     extrudeDist(-100);
701     //delay(100);
702
703     if(!sertissage()){
704         ejection(LEFT);
705         return;
706     }
707
708     degagement();
709     delay(100);
710
711     yAxis.runToNewPosition(coordyVia);
712     delay(50);
713
714     //Avancement du chariot pour la découpe
715     coordx -= 4500;
716     xAxis.runToNewPosition(coordx);
717     delay(100);
718
719 }
720
721 bool sertissage(){
722     wheelRef = analogRead(wheelInterrupt);
723
724     TIMSK1 |= (1 << OCIE1A); //Enable interrupt depending on timer1
725
726     digitalWrite(gripRelay,HIGH);
727     delay(500);
728
729     digitalWrite(pullRelay, !digitalRead(pullRelay));
730     delay(2000);
731
732     digitalWrite(gripRelay,LOW);
733     delay(500);
734
735     digitalWrite(pullRelay, !digitalRead(pullRelay));
736     delay(2000);
737
738     TIMSK1 &= ~(1 << OCIE1A); //Disable interrupt depending on timer1
739
740     if(!crimpedFlag){
741         return 0;
742     }else{
743         return 1;
744     }
745 }
746
747 void degagement(){
748     //distance de recul en pas
749     long distRecul = 3000;
750
751     digitalWrite(magnetRelay,HIGH);
752
753     coordx += distRecul;
754     xAxis.runToNewPosition(coordx);
755     delay(500);
756

```

```

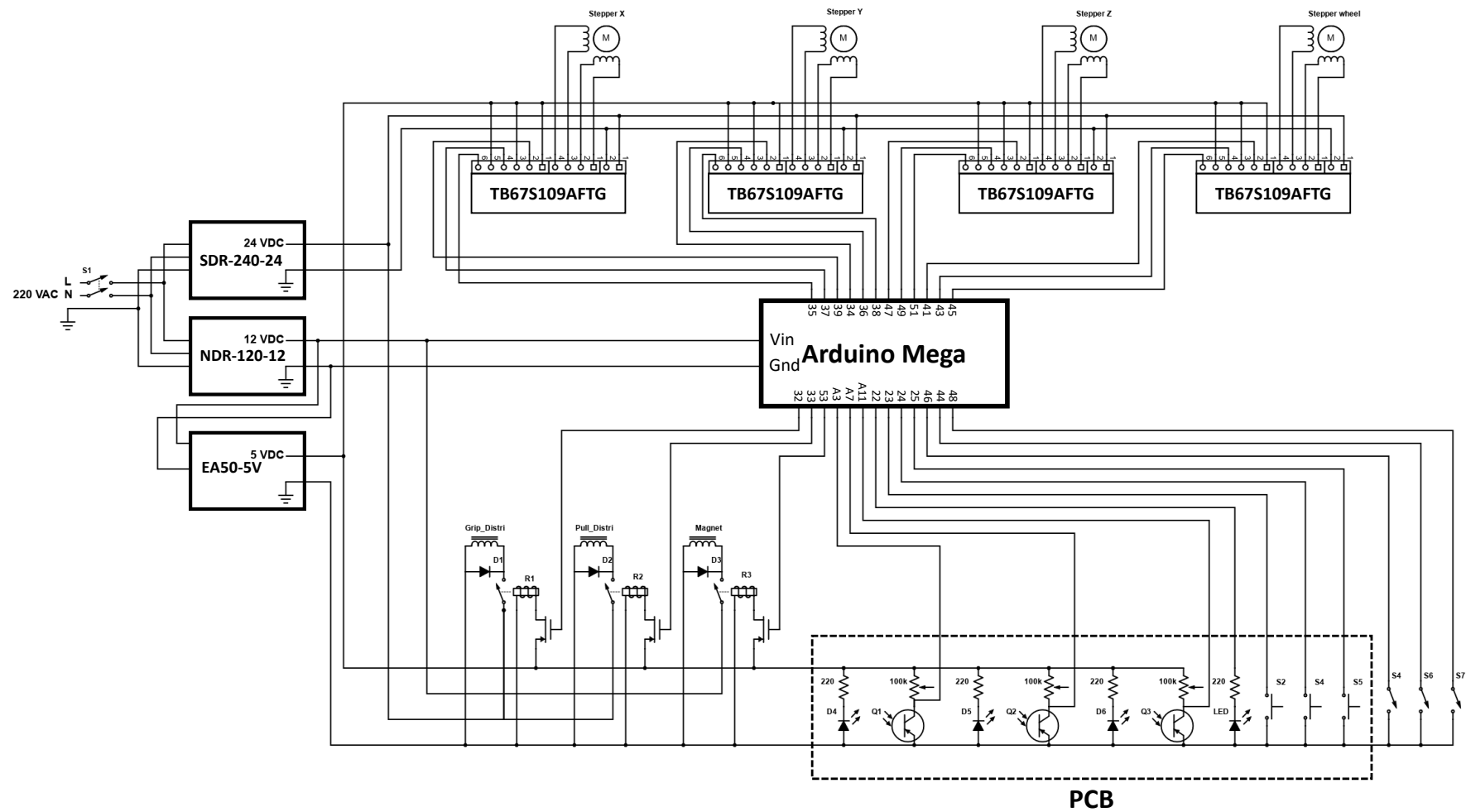
757     digitalWrite(magnetRelay, LOW);
758
759 }
760
761 ISR(TIMER1_COMPA_vect){
762     if(abs(analogRead(wheelInterrupt) - wheelRef) > 300){
763         crimpedFlag = true;
764     }
765 }
766
767 void ejection(side plaque){
768
769     digitalWrite(ENAEXT, HIGH);
770
771     if(plaque){
772
773         digitalWrite(pullRelay, !digitalRead(pullRelay));
774         delay(2000);
775
776         yAxis.runToNewPosition(coordyVia);
777         delay(500);
778         extMotor.setSpeed(1500);
779
780         while(abs(analogRead(isTubeRight) - tubeRefRight) > 30){
781             extMotor.runSpeed();
782         }
783
784         delay(500);
785
786         while(1){
787             digitalWrite(led, !digitalRead(led));
788             delay(1000);
789             if(!digitalRead(button1)){
790                 digitalWrite(ENAEXT, LOW);
791                 return;
792             }
793         }
794     }else{
795         extMotor.setSpeed(1500);
796         while(abs(analogRead(isTubeRight) - tubeRefRight) > 30){
797             extMotor.runSpeed();
798         }
799         delay(500);
800
801         yAxis.runToNewPosition(coordyVia);
802         delay(500);
803
804         while(1){
805             digitalWrite(led, !digitalRead(led));
806             delay(1000);
807             if(!digitalRead(button1)){
808                 digitalWrite(ENAEXT, LOW);
809                 return;
810             }
811         }
812     }
813 }
814
815 void plate3(){
816     static float x3 = 0.0;
817     static float y3 = 0.0;
818     static short z3 = 0;
819
820     if(tubeNbr == 0){
821         x3 = 0;
822         z3 = 0;
823     }else if(tubeNbr % 15){
824         x3 += 1.5;
825     }else{

```

```
826         z3 += 1.5;
827         x3 -= 22.5;
828     }
829     coordx = coordx3Ref + (long)(x3*mm2stepX);
830     coordy = coordy3Ref + (long)(y3*mm2stepY);
831     coordz = coordz3Ref - (long)(z3*mm2stepZ);
832 }
833
```

Annexe B

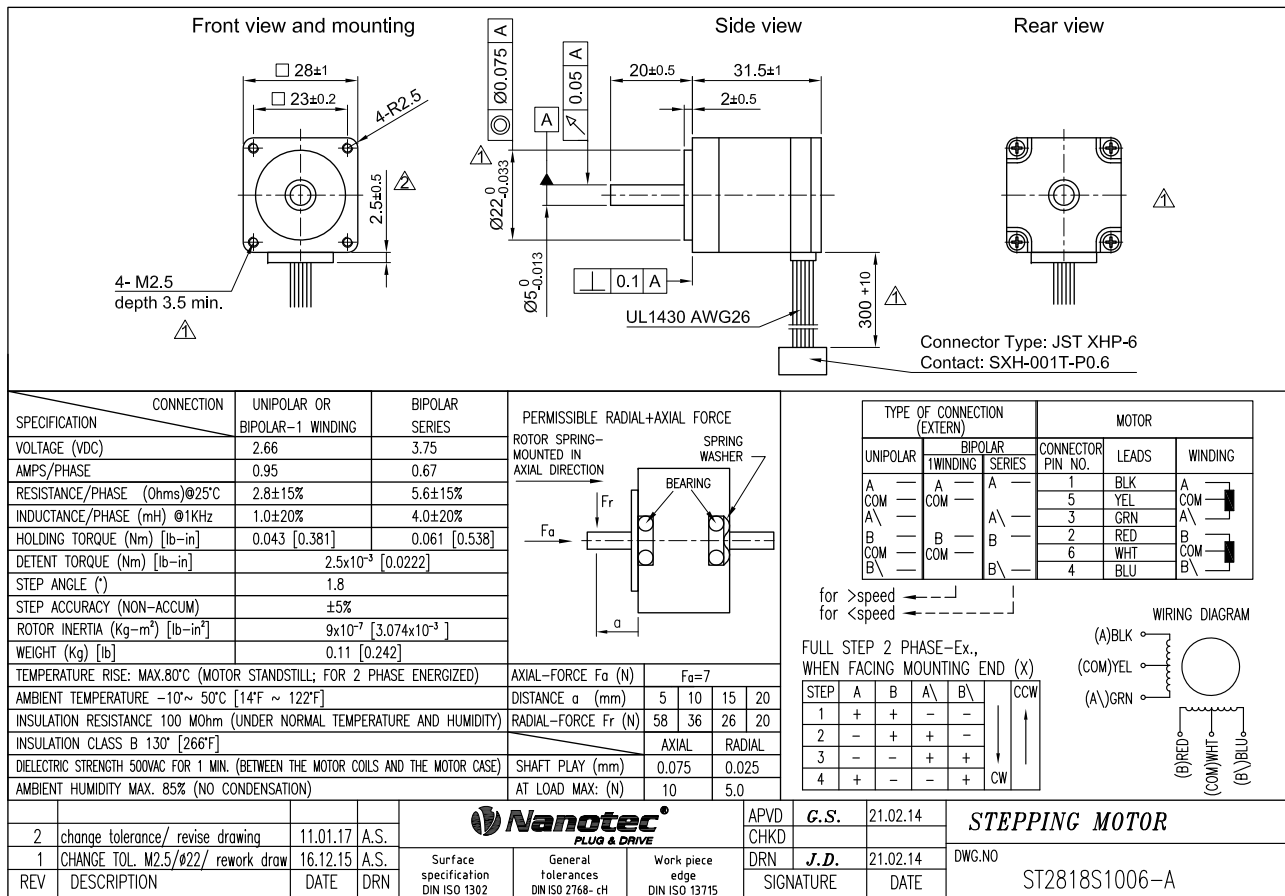
Schéma électrique



Annexe C

Fiches techniques

1 Stepper NEMA 11

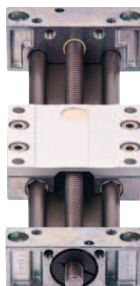


2 Rails IGUS

Tables
linéaires
drylin® SLW

drylin® SLW | Tables linéaires | Gamme de produits

La compacte



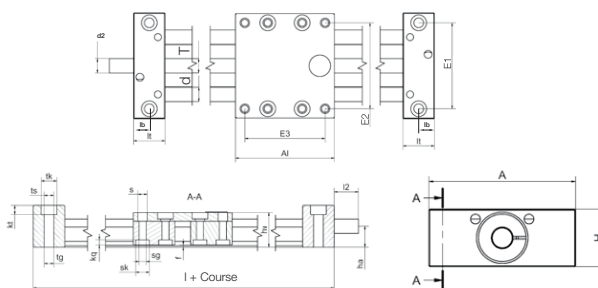
- Faible hauteur de montage
- Grande rigidité
- Entièrement supporté
- Rail drylin® W, aluminium anodisé dur
- Accessoires ► [page 1303](#)
- Ecrus pour vis filetés disponibles séparément ► [page 1148](#)
- Moteur ► [page 1261](#)



Constitution de la référence
en entier ► [page 1206](#)

SLW-1040

Cotes
Version compacte



Données techniques et cotes [mm]

Référence	Forme	Course maxi	Poids de			supplém.		Capacité de charge stat. maxi				Matériau bride		
		[mm]	l'arbre	[kg]	(par 100 mm)	axial	radial							
								[kg]	[N]	[N]				
SLW-0630		300	0,2	0,08		50	200	Polymères						
SLW-1040		750	0,7	0,10		700	2 800	Zamac						
SLW-1080		750	0,9	0,20		700	2 800	Aluminium						
SLW-10120		750	1,6	0,25		700	2 800	Aluminium						
SLW-1660		750	1,5	0,30		1 200	4 600	Aluminium						
SLW-2080		1 000	3,0	0,40		1 600	6 400	Aluminium						
SLW-25120		1 250	5,9	0,90		2 500	10 000	Aluminium						
Référence	A	Al ⁽⁹⁴⁾	H	E1	E2	E3	I	hw	f	lt	lb	tk	ts	tg
	-0,3	-0,3		±0,15	±0,15	±0,15								
SLW-0630	54	60	20	40	45	51	100	18	1,2	20	8	11	6,6	–
SLW-1040	74	69	29	60	60	56	113	24	1,5	22	11	11	6,8	M8
SLW-1080	108	100	29	94	94	87	144	24	1,5	22	11	11	6,8	M8
SLW-10120	154	100	29	140	140	87	144	24	1,5	22	11	11	6,8	M8
SLW-1660	104	100	37	84	86	82	150	35	1,5	25	12,5	15	9,0	M10
SLW-2080	134	150	46	116	116	132	206	44	1,5	28	14	15	8,6	M10
SLW-25120	200	150	60	173	173	128	220	55	2,5	35	17,5	20	13,5	M16
Référence	kt	s	sk	sg	kq	d	T	l2	d2	ha				
	±0,1								Standard					
SLW-0630	8,0	4,5	7,0	M4	2,0	6	M8	15	M8	9,5				
SLW-1040	6,4	6,6	9,5	M6	4,4	10	Tr10x2	17	Tr10x2 ⁽⁹²⁾	14,5				
SLW-1080	6,4	6,6	9,5	M6	4,4	10	Tr10x2	17	Tr10x2 ⁽⁹²⁾	14,5				
SLW-10120	M8	6,4	9,5	M6	4,4	10	Tr10x2	17	Tr10x2 ⁽⁹²⁾	14,50				
SLW-1660	8,6	9,0	11	M8	5,5	16	Tr14x4	20	Tr14x4 ⁽⁹²⁾	18,5				
SLW-2080	8,6	9,0	14	M8	5,5	20	Tr18x4	26	12h9	23,0				
SLW-25120	12,6	11,0	15	M10	5,0	25	Tr24x5	38	14h9	30,0				

⁹²⁾ Sortie de vis, ⁹⁴⁾ Chariots d'une longueur de 100, 150, 200 et 250 mm disponibles sur demande

1196 Outils en ligne et plus d'informations ► www.igus.fr/drylinSLW

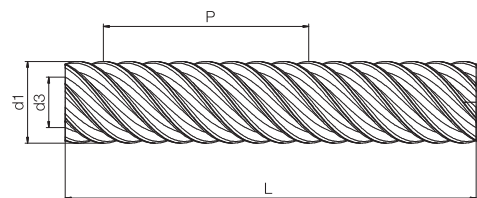




Stainless steel, rolled (1.4301)



Aluminium, rolled (EN AW 6082)



Technical data

Helix deviation	0.1 mm to 300 mm
Straightness (standard)	0.3 mm to 300 mm
Aligned	<0.1 mm to 300 mm

The tensile/compressive strength of the EN AW 6082 lead screw material is 160 MPa per mm² (elongation limit 0.2 mm).

Technical data

Thread	Hand of rotation		Material		Pitch P [mm]	Number of threads	Pitch angle α [°]	Weight	
	Right	Left	Stainless steel 1.4301	Aluminium EN AW 6082				Stainless steel [kg/m]	Aluminium [kg/m]
Ds6.35x2.54	●	–	●	●	2.54	2	7.26	0.25	0.09
Ds6.35x5.08	●	–	●	●	5.08	4	14.29	0.25	0.09
Ds6.35x12.7	●	–	●	●	12.7	4	32.48	0.25	0.09
Ds6.35x25.4	●	–	●	●	25.4	8	51.85	0.25	0.09
Ds8x10	●	●	●	●	10	4	21.70	0.40	0.14
Ds8x15	●	●	●	●	15	6	30.83	0.40	0.14
Ds10x12	●	●	●	●	12	4	21.54	0.62	0.21
Ds10x25	●	●	●	●	25	8	38.51	0.62	0.21
Ds10x50	●	●	●	●	50	10	57.86	0.62	0.21
Ds12x5	●	–	●	●	5	2	7.55	0.89	0.31
Ds12x25	●	–	●	●	25	8	33.55	0.89	0.31
Ds14x25	●	●	●	●	25	5	29.61	1.22	0.42
Ds14x30	●	–	●	●	30	6	34.30	1.22	0.42
Ds14x40.6	●	–	●	●	40.6	8	42.71	1.22	0.42
Ds16x35	●	–	●	●	35	7	34.85	1.59	0.54
Ds18x24	●	●	●	●	24	6	22.99	2.01	0.69
Ds18x40	●	●	●	●	40	8	35.55	2.01	0.69
Ds18x80	●	●	●	●	80	12	54.74	2.01	0.69
Ds18x100	●	●	●	●	100	12	60.51	2.01	0.69
Ds20x20	●	–	●	●	20	4	17.66	2.48	0.85
Ds20x60	●	●	●	●	60	8	43.68	2.48	0.85
Ds20x80	●	–	●	●	80	12	55.07	2.48	0.85
Dx20x90	●	●	●	●	90	12	55.08	2.48	0.85



Order key

Part number	Thread	Options
-------------	--------	---------

DST-LS-10X50-R-1000-ES

dryspin® technology	Lead screw	Diameter	Pitch	Hand of rotation	Length [mm]	Lead screw material
---------------------	------------	----------	-------	------------------	-------------	---------------------

Options:

Hand of rotation

R: Right

L: Left

Length in mm: freely selectable (see table)

Lead screw material

ES: Stainless steel, rolled

AL: Aluminium, rolled



Talk to us!

All drylin® leads screws can be custom machined. Please send us your drawing. We can then provide a quotation quickly.

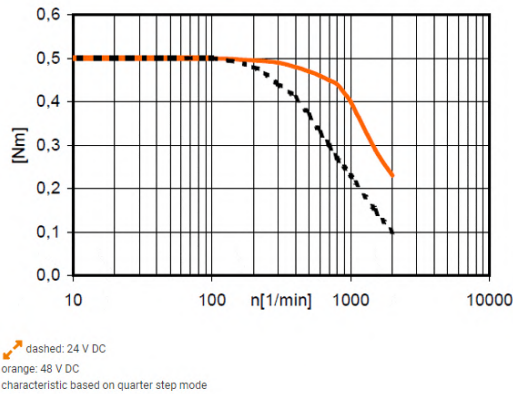
Dimensions [mm]

Outer Ø d1 -0.05	Core Ø d3 -0.05	Max. total length L		Part No.
		Stainless steel	Aluminium	
6.35 -0.1	4.35 -0.1	1,000	1,000	DST-LS-6.35X2.54-R-□-□-ES
6.35 -0.1	4.85 -0.1	1,000	1,000	DST-LS-6.35X5.08-R-□-□-ES
6.35 -0.1	4.35 -0.1	1,000	1,000	DST-LS-6.35X12.7-R-□-□-ES
6.35 -0.1	4.15 -0.1	1,000	1,000	DST-LS-6.35X25.4-R-□-□-ES
8.0	5.63	1,000	1,000	DST-LS-8X10-□-□-ES
8.0	5.63	1,000	1,000	DST-LS-8X15-□-□-ES
10.0	6.95	3,000	1,000	DST-LS-10X12-□-□-ES
10.0	7.10	3,000	1,000	DST-LS-10X25-□-□-ES
10.0	7.35	3,000	1,000	DST-LS-10X50-□-□-ES
12.0	9.60	3,000	1,500	DST-LS-12X5-R-□-□-ES
12.0	8.95	3,000	1,500	DST-LS-12X25-R-□-□-ES
14.0	9.60	3,000	1,500	DST-LS-14X25-□-□-ES
14.0	9.60	3,000	1,500	DST-LS-14X30-R-□-□-ES
14.0	9.65	3,000	1,500	DST-LS-14X40.6-R-□-□-ES
16.0	11.60	3,000	1,500	DST-LS-16X35-R-□-□-ES
18.0	14.40	3,000	1,500	DST-LS-18X24-□-□-ES
18.0	13.60	3,000	1,500	DST-LS-18X40-□-□-ES
18.0	14.00	3,000	1,500	DST-LS-18X80-□-□-ES
18.0	13.55	3,000	1,500	DST-LS-18X100-□-□-ES
20.0	15.60	3,000	1,500	DST-LS-20X20-R-□-□-ES
20.0	15.55	3,000	1,500	DST-LS-20X60-□-□-ES
20.0	15.98	3,000	1,500	DST-LS-20X80-R-□-□-ES
20.0	15.55	3,000	1,500	DST-LS-20X90-□-□-ES

drylin® step motor NEMA17

igus® stepper motors complement drylin® linear axes well. They distinguish themselves by their cost-efficiency, precision and simple control. They work reliably under varied environmental conditions (depending on the selected protection class IP). Due to the standardized power connection the igus® step motors can be connected to the most popular motor controls.

Characteristics



Technical data

Distance over hubs		42mm (NEMA17)
Motor		
Maximum voltage	[VDC]	60
Nominal voltage	[VDC]	24-48
Nominal current	[A]	1.8
Holding torque	[Nm]	0.5
Detent torque	[Nm]	0.022
Step angle	°	1.8
Resistance / phase	[Ω]	1.75±10%
Inductance / phase	[mH]	3.30±20%
Moment of inertia / rotor	[kgcm] ²	0.08
Max load axial	[N]	7
Max load radial	[N]	20

Encoder

Operating voltage	[VDC]	5
Impulse / turn	[1/min]	500
Zero impulse / index		Yes
Line-driver		RS422 protocol

brake

Operating voltage	[VDC]	24±10%
Wattage	[W]	8
Holding torque	[Nm]	0.4
Moment of inertia	[kgcm] ²	0.01

Weight

Product weight	[kg]	0.32
With encoder	[kg]	0.34
With encoder and brake	[kg]	0.58

Operating data

Ambient temperature	[°C]	-10...+50
Max temperature rise	[°C]	80
insulation class		B
humidity (not condensing)	%	85
protection class engine case		IP65 (shaft seal IP52)
CE		EMV guideline

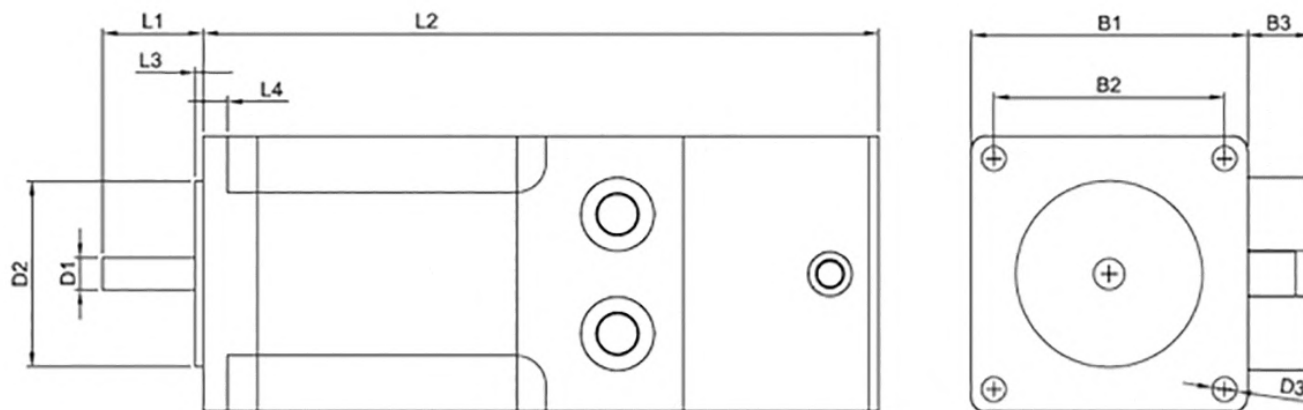
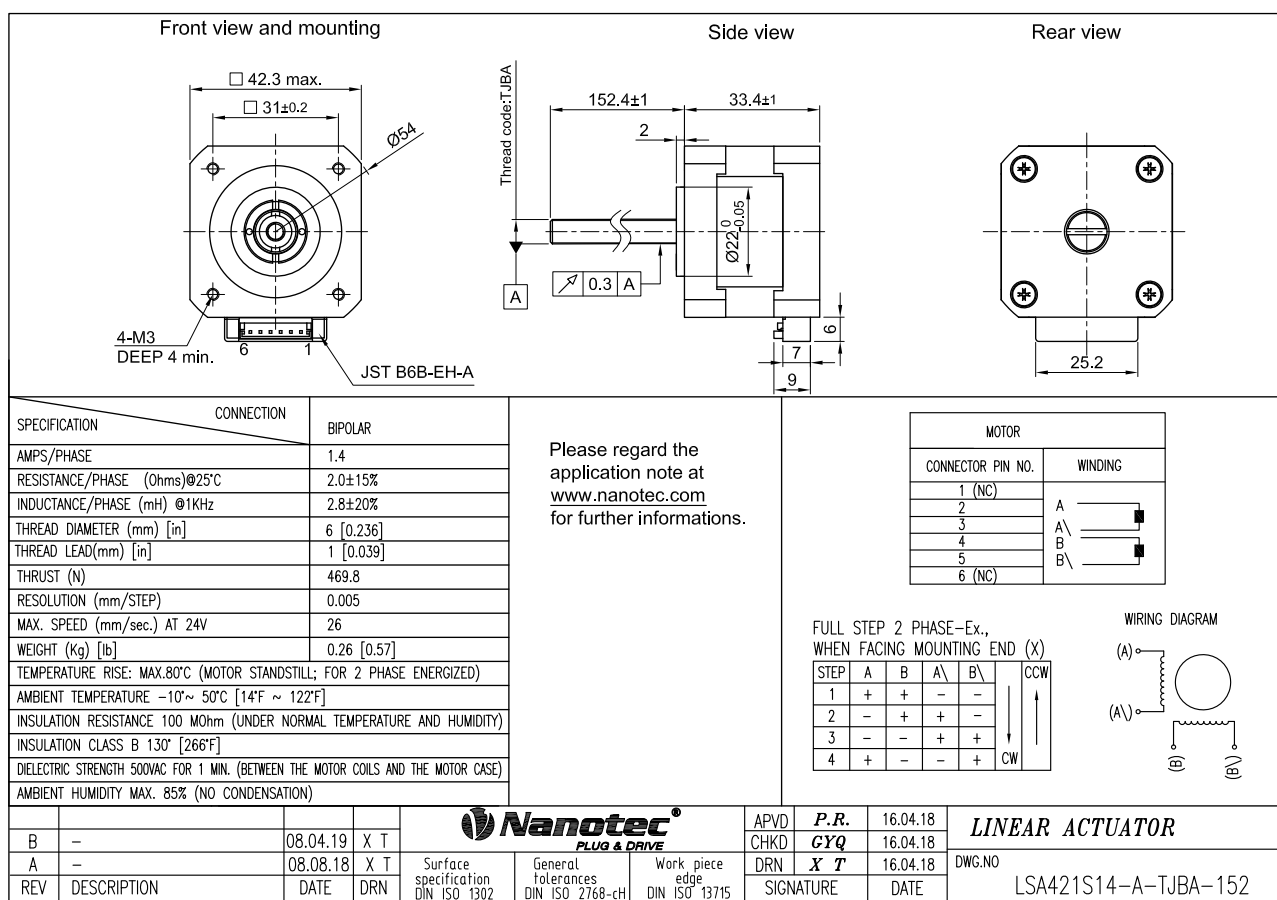


figure with encoder and brake

Dimensions

type	B1	B2	B3	ØD1	ØD2	ØD3	L1	L2	L3	L4	
	[mm]	[mm] ±0,2	[mm]	[mm] -0,013	[mm] ±0,025	[mm]	[mm] ±1,0	[mm] ±1,0	[mm]	[mm]	
MOT-AN-S-060-005-042-L-C-AAAC											
MOT-AN-S-060-005-042-L-A-AAAA	1.67	1.22	0	0.2	0.87	M3	0.94	1.93	0.08	0	

3 Actionneur axe Z



4 Rails de guidage



Guides linéaires miniatures

Blocs standard, précharge légère / jeu léger



Points de comparaison avec les produits similaires

Le type le plus classique de toutes les spécifications aux normes industrielles. Choisir parmi les types à précharge légère présentant une précision et une rigidité supérieures.

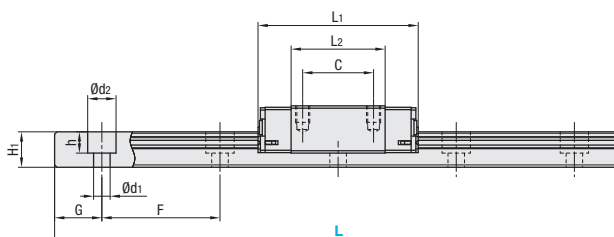
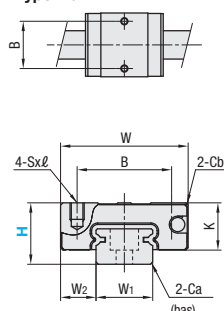
Norme industrielle



RoHS10

- De type à la même dimension de montage que les produits concurrents, et peut ainsi les remplacer.
- Les blocs et les glissières ne sont pas soudés séparément. Ce type présente des jeux radiaux et des précisions garantis pour les ensembles de blocs et de rails.

Type H6



Pour les modèles à dimension L configurable, les dimensions G diffèrent de celles indiquées dans le tableau ci-dessous. Pour plus de détails, voir P531.

Précautions d'utilisation

- Les blocs sont équipés de systèmes de retenue (fil) pour empêcher les billes de tomber. Pour savoir comment manipuler les blocs, voir P525.
- Les écartements radiaux et les précisions ne sont pas garantis si les blocs et les glissières sont interchangeables à partir des combinaisons d'ensembles d'origine.
- Les plans de référence sont équipés de rainures droites. Veiller à faire correspondre les lignes de référence lors de l'utilisation.
- Il est impossible de raccorder des rails bout à bout.
- La précision des guides linéaires est garantie après la fixation du rail (après avoir serré les vis sur le rail et poussé le rail sur le plan de référence). Une courbure mineure du rail s'ajustera après le montage et n'affectera pas les performances.

Accessoire

- Le modèle H6 est fourni avec des vis à tête ronde cruciformes de classe 1, numéro 0 (M2x6).
- Le modèle H8 est fourni avec des vis d'assemblage (M2x6).

Autres

- Modèles remplis de graisse au savon de lithium (Multemp PS2 de Kyodo Yushi Co., Ltd.).
- Pour calculer la durée de fonctionnement, voir P527.
- Pour calculer la durée de fonctionnement, utiliser notre logiciel de calcul gratuit disponible à la page : http://download.misumi.jp/mol/fa_soft.html.
- Le type MX est lubrifié avec une graisse au lithium complexe (TOUGHLIX GREASE MP2, fabriquée par JXTG Nippon Oil & Energy Corporation).

Référence pièce			L	Dimensions du bloc								Dimension de la glissière						
Type	MX	H		W	L1	B	C	Sxℓ	L2	K	Cb	W1	W2	H1	Ca	Trou contre-alésé d1xd2xh	F	C
SSEB SSE2B SSEBL SSE2BL SSEBV SSE2BV SSEBLV SSE2BLV SSEBZ SSE2BZ SSEBLZ SSE2BLZ	Obturation : aucune -MX : tournée	6	25-100 (70)	12	17.4	8	-	M2x1.5	9.7	4.5	0.3	5	3.5	4	0.3	2.4x3.5x1	15	5
		8	40-130 (70)	17	23.6	12	8	M2x2.5	13.6	6.5	0.3	7	5	4.7	0.3	2.4x4.2x2.3	15	5
		10	35-275 (75)	20	30	15	10	M3x3	19	7.8	0.3	9	5.5	5.5	0.3	3.5x6x3.5	20	7.5
		13	45-470 (95)	27	33.9	20	15	M3x3.5	19.9	10	0.5	12	7.5	7.5	0.5	3.5x6x4.5	25	10
		16	70-670 (110)	32	42.4	25	20	M3x4	27.4	12	0.5	15	8.5	9.5	0.5	3.5x6x4.5	40	15
		20	100-700 (160)	40	50	30	25	M4x6	34.6	15	0.5	20	10	11	0.5	6x9.5x5.5	60	20

⚠ Les dimensions indiquées entre () concernent le type à 2 blocs.

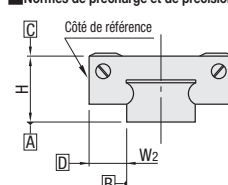
Les dimensions indiquées entre () concernent le type à 2 blocs.

kgf=Nx0.101972

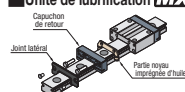
H	Capacité de charge de base C (dynamique) kN	Co (statique) kN	Ma N-m	Mb N-m	Mc N-m	Bloc (kg)	Rail de guidage kg/m
6	0.3	0.6	0.8	0.8	1.5	0.004	0.13
8	0.9	1.5	4.1	4.1	5.2	0.01	0.19
10	1.5	2.5	5.1	5.1	10.2	0.02	0.31
13	2.2	3.3	8.8	9.5	16.1	0.04	0.61
16	3.6	5.4	21.6	23.4	39.6	0.06	1.02
20	5.2	8.5	48.4	48.4	86.4	0.12	1.65



Normes de précharge et de précision



Unité de lubrification MX



Même taille de bloc que les produits existants !

La partie roue poreuse imprégnée d'huile est intégrée au produit.

- Avantages de l'unité de lubrification MX : Permet une utilisation prolongée sans entretien. Réduit les coûts d'entretien.

Spécifications	Précharge légère, qualité élevée	Précharge légère, qualité de précision	Jeu léger, qualité standard
Jeu radial	-3-0	±10	0-+15
Tolérance de hauteur H	±20	±10	±20
Écart de hauteur H des paires	15	7	40
Tolérance de largeur W2	±25	±15	±25
Écart de largeur des paires W2	20	10	40
Parallélisme de fonctionnement du plan C par rapport au plan A	Voir P525		
Parallélisme de fonctionnement du plan D par rapport au plan A			

- Le type à jeu léger présente un jeu (écart) entre les rails et les blocs. Si précision et rigidité sont requises, choisir le type à précharge légère.

Guides linéaires miniatures - Rails larges

Blocs larges et longs, précharge légère

■ **Caractéristiques :** Type à bloc large aux spécifications d'origine MISUMI. La taille de vis plus large offre une force de serrage plus importante par rapport aux produits standard.

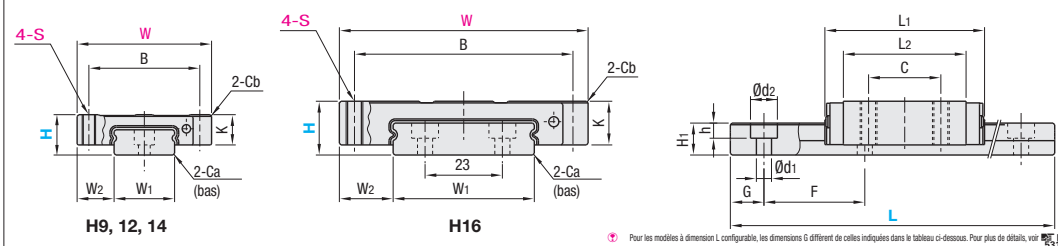
MISUMI d'origine



Matériau Dureté	Type	Dimension L	Nombre de blocs
	Précharge légère Niveau élevé		
Acier inoxydable 56HRC~	SSELBWM	Sélectionnable	1
	SSEL2BWM		2
	SSELBWML	Configurable	1
	SSEL2BWML		2

Résistance à la chaleur : -20 ~ 80°C

⚠ Les blocs et les glissières ne sont pas soudés séparément. Ce type présente des jeux radiaux et des précisions garantis pour les ensembles de blocs et de rails.



⚠ Pour les modèles à dimension L configurable, les dimensions G diffèrent de celles indiquées dans le tableau ci-dessous. Pour plus de détails, voir P525.

■ Précautions d'utilisation

- ⚠ Les blocs sont équipés de systèmes de retenue (fil) pour empêcher les billes de tomber. Pour savoir comment manipuler les blocs, voir P525.
- ⚠ Les écartements radiaux et les précisions ne sont pas garantis si les blocs et les glissières sont interchangés partir des combinaisons d'ensembles d'origine.
- ⚠ Les plans de référence sont équipés de rainures droites.
- ⚠ Veiller à faire correspondre les lignes de référence lors de l'utilisation.
- ⚠ Il est impossible de raccorder des rails bout à bout.
- ⚠ La précision des guides linéaires est garantie après la fixation du rail (après avoir serré les vis).

sur le rail et poussé le rail sur le plan de référence).

Une courbure mineure du rail s'ajustera après le montage et n'affectera pas les performances.

■ Autres

- Modèles remplis de graisse au savon de lithium (Multemp PS2 de Kyodo Yushi Co., Ltd.).
- Pour calculer la durée de fonctionnement, voir P527.
- Pour calculer la durée de fonctionnement, utiliser notre logiciel de calcul gratuit disponible à la page : http://download.misumi.jp/mol/fa_soft.html.

Référence pièce		L	Dimensions du bloc								Dimension de la glissière						
Type	H		W	L1	B	C	S	L2	K	Cb	W1	W2	H1	Ca	Trou contre-alésé d1xd2xh	F	G
SSELBWM SSEL2BWM SSELBWML SSEL2BWML	9	80~290 (110)	36	43.5	29	19	M4	32.5	7	0.3	14	11	5.2	0.5	3.5x6x3.2	30	10
	12	80~290 (110)	40	51.6	33	24	M4	40.6	9	0.3	18	11	7.5	0.5	3.5x6x4.5	30	10
	14	110~470 (150)	51	61.6	44	28	M4	47.4	11	0.5	24	13.5	8	0.5	4.5x8x4.5	40	15
	16	110~670 (190)	74	74.9	65	35	M5	59.9	13	0.5	42	16	9.5	0.5	4.5x8x4.5	40	15

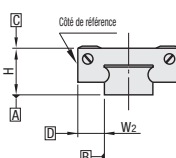
⚠ Les dimensions indiquées entre () concernant le type à 2 blocs.

kgf=Nx0.101972

H	Capacité de charge de base			Moment statique admissible			Masse	
	C (dynamique) kN	Co (statique) kN		MA N·m	MB N·m	MC N·m	Bloc (kg)	Rail de guidage kg/m
9	1.7	4.0	12.1	12.1	28.8	0.05	0.50	
12	2.6	5.3	20.2	20.2	49.5	0.09	0.96	
14	3.9	8.5	38.6	38.6	104.6	0.16	1.40	
16	7.2	14.3	86.0	86.0	305.2	0.3	2.95	

MA MB MC

■ Normes de précharge et de précision



Unité : µm

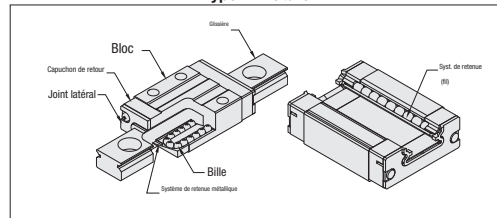
Spécifications	Précharge légère, qualité élevée
Jeu radial	-3~0
Tolérance de hauteur H	±20
Écart de hauteur H des paires	15
Tolérance de largeur W2	±25
Écart de largeur des paires W2	20
Parallélisme de fonctionnement du plan C par rapport au plan A	Voir P525
Parallélisme de fonctionnement du plan D par rapport au plan A	

Structure et précision des guides linéaires

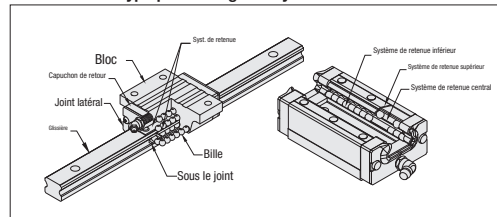
Précharge et charge admissible des guides linéaires

Guides linéaires - Structure et caractéristiques

Type miniature



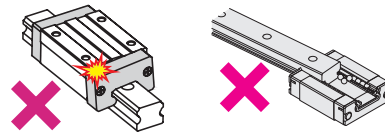
Type pour charges moyennes/lourdes



- Les guides linéaires utilisent des billes en acier qui roulent sur des rainures arrondies meulées avec précision et circulent à nouveau grâce aux capuchons de retour en plastique.
- Les joints d'extrémité empêchent l'intrusion de corps étrangers dans les blocs.
- Le type miniature comporte deux rangées de billes de contact en acier dans un contact en forme de rainure arrondie à 4 points.
- Les types pour charges moyennes/lourdes comportent quatre rangées de billes de contact en acier dans un contact en forme de rainure arrondie à 2 points.
- Les capacités de charge sont identiques dans les quatre sens (radial, radial inverse et sens latéraux). Elles sont utilisables dans n'importe quelle orientation.
- Précautions

Ne pas exercer de choc sur le capuchon de retour. Cela risquerait de nuire à la circulation des billes et d'entraîner des défauts de glissement.

Les billes ne tombent pas des guides linéaires MISUMI lors de leur retrait des rails car les blocs sont pourvus de systèmes de retenue des billes. Cependant, les billes peuvent chuter si les blocs sont retirés rapidement de la glissière ou si la glissière est insérée dans le bloc en position inclinée. Faire preuve de précautions pour retirer et mettre en place les blocs.



Précision

Précision des dimensions

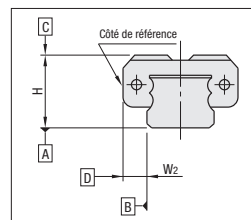
Type	Normes de précision	Produits existants			
		Taux de précision	Niveau élevé	Niveau standard	Produit économique
Miniature Type	Tolérance de hauteur H	±10	±20	±20	±40
	Écart de hauteur H des paires	7	15	40	30
	Tolérance de largeur W ₂	±15	±25	±25	±40
	Écart de largeur des paires W ₂	10	20	40	30
Charges moyennes/ lourdes Type	Normes de précision	Niveau élevé	Interchangeable	Niveau standard	Niveau standard
	Tolérance de hauteur H	±40	±20	±100	±120
	Écart de hauteur H des paires	15	15	20	40
	Tolérance de largeur W ₂	±20	±30	±100	±100
	Écart de largeur des paires W ₂	24, 28	15	25	20
		33, 42	15	25	30
		30, 36, 40, 42	-	25	-

[Ecart de hauteur H des paires]

Différence entre les valeurs min./max. de hauteur (dimension H) pour une combinaison de blocs sur un rail.

[Écart de largeur des paires W₂]

Différence entre les valeurs min./max. de largeur (dimension W) pour une combinaison de blocs sur un rail.



Parallélisme de fonctionnement

Unité : µm

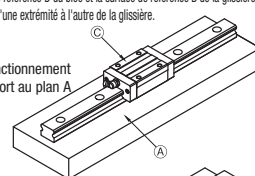
Longueur de la glissière (mm)	Miniature				Charges moyennes/lourdes			
	Produits existants	économe	Produits existants	économe	Produits existants	économe	Produits existants	économe
Sup.								
50	2	3	13	13	7	6	7	10
80	2	3	13	13	7	6	7	10
125	3	7	15	15	7	6.5	7	10
200	3	9	15	15	7	7	7	10
250	3.5	9	17	17	7	8	7	10
315	4	11	18	18	8	9	12	10
400	5	11	18	18	8	11	12	12
500	5	12	19	19	9	12	14	13
630	6	13.5	21	21	11	14	18	15
800	6	14	21.5	21.5	13	16	21	17
1000	-	-	-	-	14.5	18	23	19
1250	-	-	-	-	16	20	25	22
1600	-	-	-	-	-	23	27	23
1600	-	-	-	-	-	26	28.5	24

[Parallélisme de fonctionnement]

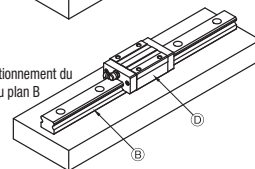
Mesure lorsque le rail est fermement boulonné à une base de surface de référence standard.

Un écart relatif de la surface supérieure C du bloc par rapport à la surface inférieure A de la glissière, et un écart relatif de la surface de référence D du bloc et la surface de référence B de la glissière sont mesurés lorsque le bloc se déplace d'une extrémité à l'autre de la glissière.

• Parallélisme de fonctionnement du plan C par rapport au plan A



• Parallélisme de fonctionnement du plan D par rapport au plan B



Sélection d'écartements radiaux (précharge)

Type	Précharge	Taille (dimension H)	Ecartement radial (µm)
Miniature	Produits existants	Précharge légère	-3~0
	Produit économique	Jeu léger	0~+15
Charges moyennes/ lourdes	Produits existants	Ecartement normal	-3~+7
		24	-4~+2
		28	-5~+2
		33	-6~+3
	Produit économique	Précharge légère, interchangeable	-4~0
		24, 28	-5~0
		30, 36, 40, 42	-7~0
		*42	-4~+4
	Produit économique	Ecartement normal	-5~+5
		24	-6~+6
		28, 30	-7~+7
		33, 36, 40	-7~+7
		45	-7~+7

Les dimensions marquées d'un * correspondent aux types pour charges très lourdes/ultra lourdes.

Force de friction (force de poussée requise)

La force de friction des guides linéaires (poussée requise) varie en fonction de la charge, de la vitesse et de la lubrification. La force de friction du type à précharge augmente, en particulier lorsqu'une charge de moment est appliquée.

Même si la résistance d'étanchéité varie en fonction de la tolérance d'ajustement forcé des lèvres des joints et de la lubrification, elle n'est pas proportionnelle à la charge et conserve une valeur constante. La force de friction est obtenue par la formule suivante.

$$F = \mu \cdot W + f$$

F : friction (N)

µ : coefficient de friction dynamique

W : charge appliquée

f : résistance d'étanchéité (2N~5N)

Charge admissible

• Capacité de charge dynamique de base (C)

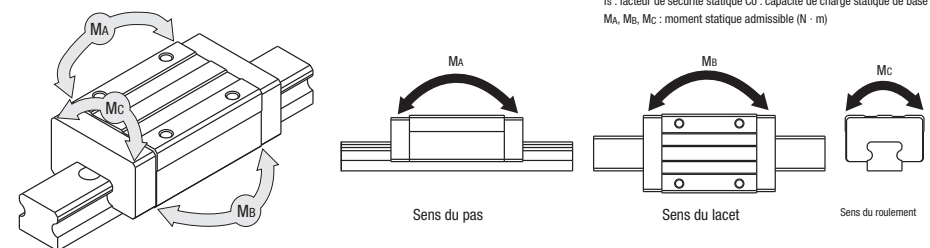
Définition : charge appliquée dans une direction constante et actionnée sous condition identique dans un groupe de spécimen de guides linéaires où 90% du spécimen atteint 50x10⁶m sans dommage causé par l'usure liée au roulement.

• Capacité de charge statique de base (Co)

Définition : charge appliquée à des guides linéaires immobiles où la somme de la quantité de déformation du plastique des éléments de roulement et de la quantité de déformation du plastique des surfaces de roulement est égale à 0.0001 fois celle du diamètre de l'élément de roulement (billes).

• Moment statique admissible (M_A, M_B, M_C)

Il s'agit d'une charge de moment statique critique définie par la valeur de déformation permanente identique au coefficient de capacité de charge statique de base.



• Facteur de sécurité statique (fs)

La capacité de charge statique de base Co, à l'état statique ou à basse vitesse, est divisée par le facteur de sécurité statique fs dans le Tableau 2 selon les conditions de fonctionnement.

- Le jeu et la précharge des guides linéaires MISUMI sont contrôlés par des réglages de la taille des billes.
- La rigidité accrue et la déformation élastique réduite sont obtenues au moyen de la précharge (jeu négatif).
- En général, la sélection de certaines précharges a un effet favorable sur la précision et la durée de vie des guides linéaires.
- Les blocs et rails fabriqués par MISUMI garantissent leurs propres jeux radiaux (précharge) et leurs propres précisions en tant qu'ensembles de blocs et de rails. Toujours utiliser les blocs et les rails en tant qu'ensembles.

Tableau 1. Coefficient de frottement dynamique

Type	Coefficient de friction dynamique (µ)
Guides linéaires miniatures	0.004~0.006
Guides linéaires pour charges moyennes et lourdes	0.002~0.003

Charge admissible (N) ≤ Co/fs

Moment admissible (N · m) ≤ (M_A, M_B, M_C)/fs

fs : facteur de sécurité statique Co : capacité de charge statique de base (N)

M_A, M_B, M_C : moment statique admissible (N · m)

Tableau 2. Facteur de sécurité statique (limite inférieure de fs)

Conditions d'utilisation	Limites inférieures de fs
Pour une utilisation normale	1~2
Pour des performances d'exécution régulières	2~4
En cas de vibrations et d'impacts	3~5

[Technical Data] Calculation of Life Span of Linear Systems 1

Allowable Load

Basic Dynamic Load Rating (C)

Basic dynamic load rating is a constant load applied in a constant direction that enables each linear system of the same series to travel $50 \times 10^3 \text{ m}$ under the same conditions, without 90% of the material suffering damage from rolling contact fatigue.

Basic Static Load Rating (Co)

Basic static load rating is the static load exerted on contacting parts under maximum stress, at which the sum of the permanent deformation in the rolling element and rolling contact surface equals 0.0001 times the diameter of the rolling element.

Allowable Static Moment (Mr, My, Mn)

Allowable static moment is a critical static moment load that acts upon a system at the loading moment. It is set in accordance with the permanent deformation as in basic static load rating Co.

Static Safety Factor (fs)

Static safety factors are given in Table-1. When a linear system is still or moving at low speed, basic static load rating Co must be divided by fs in accordance with the conditions of use.

Table-1 Static Safety Factor (Lower Limit of fs)

Condition of Use	Lower Limit of fs
Under Normal Operating Conditions	1~2
When Smooth Travel is Required	2~4
When Subjected to Vibrations, Impacts	3~5

Allowable Load (N) $\leq$ Co/fs

Allowable Moment (N-m) $\leq$ (Mr, My, Mn)/fs

fs: Static Safety Factor Co: Basic Static Load (N)

Mr, My, Mn: Static Allowable Moment (N-m)

Life Span

When a load is applied to a linear system, the system moves back and forth in a linear direction. In the process, repeated stress acts upon rolling elements and rolling contact surfaces, causing damage referred to as flaking from material fatigue. The life span of a linear system is measured in terms of the total travel distance covered by the system up until initial flaking occurs.

Rated Life Span (L)

Rated life span is the total travel distance that each linear system of the same series can endure under the same conditions, without the occurrence of flaking in 90% of the system.

Rated life span can be obtained as follows from the basic dynamic load rating and various loads exerted on the linear system.

$$\text{For Ball Bearings } L = \left(\frac{C}{P} \right)^3 \cdot 50$$

$$\text{For Roller Bearings } L = \left(\frac{C}{P} \right)^{10/3} \cdot 50$$

L: Rated Life Span (km)

C: Basic Dynamic Load Rating (N)

P: Acting Load (N)

When actually using a linear system, the first thing you must do is to calculate the load. It is necessary to consider load also in terms of vibration and impact that occur during operation, as well as its distribution across the entire linear system as it moves back and forth in a linear direction. Calculations are not simple. Operating temperature also significantly influences useful life. When these parameters are taken into consideration, the above formula is transformed as follows:

$$\text{For Ball Bearings } L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P} \right)^3 \cdot 50$$

$$\text{For Roller Bearings } L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P} \right)^{10/3} \cdot 50$$

L: Rated Life Span (km)

f_H: Hardness Coefficient (See Fig.1)

C: Basic Dynamic Load Rating (N)

f_T: Temperature Coefficient (See Fig.2)

P: Acting Load (N)

f_C: Contact Coefficient (See Table 3)

f_W: Load Coefficient (See Table 4)

The Life span can be computed as a number of hours by obtaining the travel distance for a unit of time.

It can be obtained by using the following formula, in which stroke length and stroke cycles are assumed to be constant.

$$L_h = \frac{L \cdot 10^3}{2 \cdot \ell_s \cdot n_1 \cdot 60}$$

L_h: Life Span Hours (hr)

ℓ_s: Stroke Length (m)

L: Rated Life Span (km)

n₁: Reciprocating Times per Minute (cpm)

Friction Resistance and Required Thrust

Using the following formula, the friction resistance (required thrust) can be obtained from the load and the seal resistance specified by the system.

$$F = \mu \cdot W + f$$

F: Friction Resistance (N)

μ: Dynamic Friction Coefficient

W: Weight Loaded

f: Seal Resistance (2N~5N)

Table-2 Dynamic Friction Coefficient

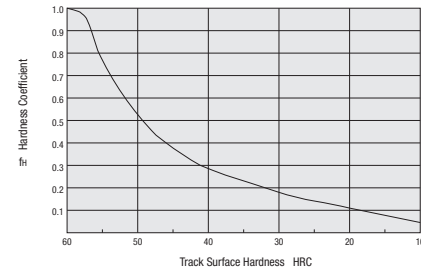
Type	Dynamic Friction Coefficient (μ)
Miniature Slide Guides	0.004~0.006
Medium Load Slide Guides	0.002~0.003
Slide Ways	0.001~0.003
Slide Tables	0.001~0.003
Linear Bushings	0.002~0.003
Linear Ball Bushings	0.0006~0.0012

Hardness Coefficient (f_H)

In a linear system, the shaft must be hard enough to withstand contact with the ball bearings. Unless sufficient hardness is provided, the allowable load can decrease, resulting in a short useful life.

Compensate the rated life span with the hardness coefficient.

Fig-1. Hardness Coefficient



Contact Coefficient (f_C)

In general, two or more linear systems are used with each shaft. Depending on the machining precision, the load exerted on each of the respective systems can vary. In this case, the load applied on each linear system changes depending on the machining precision, therefore it cannot be uniformly applied. As a result, allowable load per linear system changes depending on the number of linear systems on one axis.

Compensate the rated life span with the contact coefficient in Table-3.

Load Coefficient (f_W)

When calculating the load that acts on a linear system, it is necessary to work with precise figures for material weight, the force of inertia resulting from operating speed, load moment, various changes that occur over time, and so on. However, it is difficult to have accurate calculation for oscillating movement as beside the normal repetition of start and stop, other factors such as vibration and impact also need to be considered.

Therefore, the life span calculation needs to be simplified using the load coefficient in Table-3.

Linear Bushings

Rated life span can be obtained as follows from the basic dynamic load rating and the load to the linear bushing.

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P} \right)^3 \cdot 50$$

L: Rated Life Span (km)

f_H: Hardness Coefficient (See Fig.1)

C: Basic Dynamic Load Rating (N)

f_T: Temperature Coefficient (See Fig.2)

P: Working Load (N)

f_C: Contact Coefficient (See Table3)

f_W: Load Coefficient (See Table4)

The Life span can be computed as a number of hours by obtaining the travel distance for a unit of time. It can be obtained using the following formula, in which stroke length and stroke cycles are assumed to be constant.

$$L_h = \frac{L \cdot 10^3}{2 \cdot \ell_s \cdot n_1 \cdot 60}$$

L_h: Life Span Hours (hr) ℓ_s: Stroke Length (m) L: Rated Life Span (km)

n₁: Reciprocating Times per Minute (cpm)

Temperature Coefficient (f_T)

When temperature in a linear system exceeds 100°C, the hardness of the system and the shaft become degraded. This decreases the allowable load to a greater extent than when the system is used at ambient temperature, and can shorten the life span.

Compensate the rated life span with the temperature coefficient.

Fig-2 Temperature Coefficient

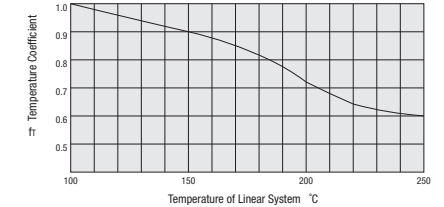


Table-3. Contact Coefficient

Number of Bearings per Shaft	Contact Coefficient f _C
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

Table-4. Load Coefficients

Condition of Use	f _W
Low speed with no external vibration or impact (Max. 15m/min)	1.0~1.5
Middle range speed with no external vibration or impact of considerable force (Max. 60m/min)	1.5~2.0
High speed with no external vibration or impact (Over 60m/min)	2.0~3.5

Linear Ball Bushings

Rated life span can be obtained as follows from the basic dynamic load rating and the load to the linear ball bushing.

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P} \right)^3 \cdot 50$$

L: Rated Life Span (km) f_H: Hardness Coefficient (See Fig.1)

C: Basic Dynamic Load Rating (N) f_T: Temperature Coefficient (See Fig.2)

P: Working Load (N) f_C: Contact Coefficient (See Table 3)

f_W: Load Coefficient (See Table 4)

Life Span Hours

For revolution and reciprocating motion

$$L_h = \frac{10^6 \cdot L}{60 \sqrt{(dm \cdot n)^2 + (10 \cdot S \cdot n_1)^2} / dm}$$

For reciprocating motion

$$L_h = \frac{10^6 \cdot L}{600 \cdot S \cdot n_1 / (\pi \cdot dm)}$$

L_h: Life Span Hours (hr) S: Stroke Length (mm) n: Revolutions per Minute (rpm)

n₁: Strokes Per Minute (cpm)

dm: Pitch Diameter of Ball (mm) = 1.15dr

Revolution and reciprocal motion allowable values

$$DN \geq dm \cdot n + 10 \cdot S \cdot n_1$$

[Technical Data] Calculation of Life Span of Linear Systems 2

•Load Calculations

Since a linear system bears the weight of the work while it performs a reciprocating linear motion, the load exerted on the system can vary depending on the work's center of gravity, thrust acting position change, and the speed changes by starting, stopping and acceleration, deceleration.

It is necessary to take these conditions into consideration when selecting a linear system.

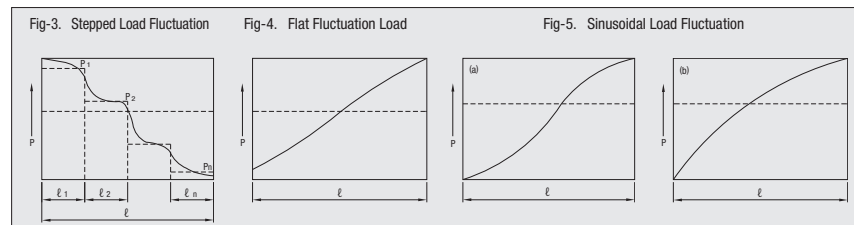
Table-5. Use Conditions and Load Calculation Formulas

Type	Condition of Use and Load	Type	Condition of Use and Load
1	Horizontal Axis $P_1 = \frac{1}{4}W + \frac{X_0}{2X}W + \frac{Y_0}{2Y}W$ $P_2 = \frac{1}{4}W - \frac{X_0}{2X}W + \frac{Y_0}{2Y}W$ $P_3 = \frac{1}{4}W + \frac{X_0}{2X}W - \frac{Y_0}{2Y}W$ $P_4 = \frac{1}{4}W - \frac{X_0}{2X}W - \frac{Y_0}{2Y}W$	3	Perpendicular to Horizontal Axis $P_1 = P_2 = P_3 = P_4 = \frac{\ell_1}{2X}W$ $P_{1S} = P_{3S} = \frac{1}{4}W + \frac{X_0}{2X}W$ $P_{2S} = P_{4S} = \frac{1}{4}W - \frac{X_0}{2X}W$
	Vertical Axis $P_1 = P_2 = P_3 = P_4 = \frac{\ell_1}{2X}W$ $P_{1S} = P_{2S} = P_{3S} = P_{4S} = \frac{Y_0}{2Y}W$		In Acceleration, Deceleration •Acceleration at Starting $P_1 = P_3 = \frac{1}{4}W \left(1 + \frac{2V_1 \cdot \ell_1}{g \cdot t_1 \cdot X} \right)$ $P_2 = P_4 = \frac{1}{4}W \left(1 - \frac{2V_1 \cdot \ell_1}{g \cdot t_1 \cdot X} \right)$ •Deceleration at Stopping $P_1 = P_3 = \frac{1}{4}W \left(1 - \frac{2V_1 \cdot \ell_1}{g \cdot t_3 \cdot X} \right)$ $P_2 = P_4 = \frac{1}{4}W \left(1 + \frac{2V_1 \cdot \ell_1}{g \cdot t_3 \cdot X} \right)$ •Constant Speed $P_1 = P_2 = P_3 = P_4 = \frac{1}{4}W$ g:Gravitational Acceleration=9.8×10³mm/sec²

W :Acting Load(N) P₁,P₂,P₃,P₄:Load applied to the Linear System(N)

X,Y: Linear System Span(mm) V:Moving Speed(mm/sec)

t₁:Acceleration Time(sec) t₃:Deceleration Time(sec)



•Mean Load Derived from Fluctuating Loads

In general, the load acting upon a linear system can change according to how the system is used. This happens for example when the reciprocating motion is started, stopped as compared to constant speed motion, and whether or not work is present during transfer, etc. Therefore, in order to correctly design the life span under various conditions and fluctuating loads, it is necessary to obtain a mean load and apply it to the life span calculations.

(1) When load changes in steps by a travel distance (Fig-3)

Travel distance ℓ_1 subjected to load P_1

Travel distance ℓ_2 subjected to load P_2

...

Travel distance ℓ_n subjected to load P_n

Mean load P_m can be obtained by using the following formula:

$$P_m = \sqrt[3]{\frac{1}{\ell} (P_1^3 \ell_1 + P_2^3 \ell_2 + \dots + P_n^3 \ell_n)}$$

P_m : Mean Load Derived from Fluctuating Loads(N) ℓ : Total Travel Distance(m)

(2) When load changes almost linearly (Fig-4)

Mean load P_m can be approximated by the following formula:

$$P_m \approx \frac{1}{3} (P_{min} + 2 \cdot P_{max})$$

P_{min} : Min. Fluctuating Load (N)

P_{max} : Max. Fluctuating Load(N)

(3) When the load change resembles a sinusoidal curve as shown in Fig-5

(a), (b), Mean Load P_m can be approximated by the following formula:

$$\text{Fig-5(a)} \quad P_m = 0.65 P_{max}$$

$$\text{Fig-5(b)} \quad P_m = 0.75 P_{max}$$

•Slide Guides

Rated life span is the total travel distance each linear guide of the same series can endure under the same conditions, without the occurrence of flaking in 90% of the system.

Rated life span can be obtained as follows from the basic dynamic load rating and the load to the slide guide.

$$L = \left(\frac{f_r \cdot C}{f_w \cdot P} \right)^3 \cdot 50 \quad (1)$$

L : Rated Life Span(km) C : Basic dynamic load rating(N)

f_r : Temperature Coefficient(See Fig-2) P : Acting Load(N)

f_w : Load Coefficient(See Fig-4)

The life span hours can be computed as a number of hours by obtaining the travel distance for a unit of time. It can be obtained by using the following formula, in which stroke length and stroke cycles are assumed to be constant.

$$L_h = \frac{L \cdot 10^3}{2 \cdot \ell_s \cdot n_1 \cdot 60} \quad (2)$$

L_h : Life Span Hours(hr) ℓ_s : Stroke Length(m)

L : Rated Life Span(km) n₁ : Reciprocating Times per Minute(cpm)

•Slide Ways

Rated load for slide ways is determined by the rolling elements(numbers of rollers). It can be calculated by using the following formulas:

One shaft is used

Load Direction

Dynamic Load Rating (N) $C = \left(\frac{Z}{2} \right)^{3/4} \cdot C_1$

Static Load Rating (N) $C_0 = \left(\frac{Z}{2} \right) \cdot C_{01}$

One shaft is used vertically

Load Direction

Dynamic Load Rating (N) $C = \left(\frac{Z}{2} \right)^{3/4} \cdot C_1 \cdot 2^{7/9}$

Static Load Rating (N) $C_0 = \left(\frac{Z}{2} \right) \cdot C_{01} \cdot 2$

Two shafts are used in parallel

Load Direction

Dynamic Load Rating (N) $C = \left(\frac{Z}{2} \right)^{3/4} \cdot C_1 \cdot 2^{7/9}$

Static Load Rating (N) $C_0 = \left(\frac{Z}{2} \right) \cdot C_{01} \cdot 2$

C₁ : Basic Dynamic Load Rating per Roller(N)

C₀₁ : Basic Static Load Rating per Roller(N)

Z : Number or Rolling Elements

The life span for slide ways is calculated by using the following formula.

$$L = \left(\frac{f_r \cdot C}{f_w \cdot P} \right)^{10/3} \cdot 50$$

L : Life Span Hours(km) C : Dynamic Load Rating(N)

f_r : Temperature Coefficient(See Fig-2) P : Acting Load(N)

f_w : Load Coefficient(See Fig-4)

Life Span Hours

$$L_h = \frac{L \cdot 10^3}{2 \cdot \ell_s \cdot n_1 \cdot 60}$$

L_h : Life Span Hours(hr) ℓ_s : Stroke Length(m)

L : Life Span Hours(km) n₁ : Reciprocating Times per Minute(cpm)

5 Capteur photoélectrique

Reflective Object Sensor

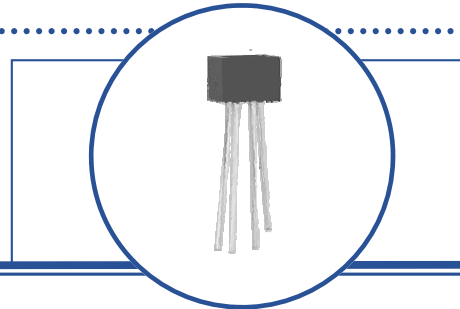
OPB706A, OPB706B, OPB706C

OPB707A, OPB707B, OPB707C



Features:

- Choice of Phototransistor (OPB706) or Photodarlington (OPB707) output
- Unfocused for sensing diffuse surface
- Low cost plastic housing
- Designed for use with PCBoards or connectors



Description:

The **OPB706** consists of an infrared Light Emitting Diode (LED) and an NPN silicon Phototransistor mounted "side-by-side" on parallel axes in a black plastic housing. The **OPB707** consists of an infrared LED and an NPN silicon Photodarlington mounted "side-by-side" on parallel axes in a black plastic housing.

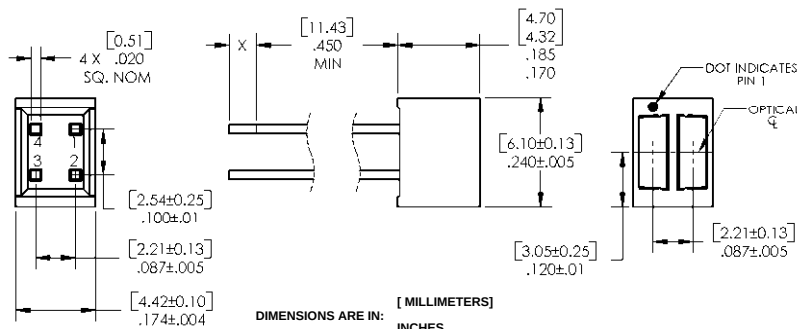
On both **OPB706** and **OPB707**, the LED and Phototransistor / Photodarlington are molded using dark infrared transmissive plastic to reduce ambient light noise. The Phototransistor / Photodarlington responds to light from the emitter when a reflective object passes within its field of view of the device.

Custom electrical, wire and cabling and connectors are available. Contact your local representative or OPTEK for more information.

Applications:

- Non-contact reflective object sensor
- Assembly line automation
- Machine automation
- Machine safety
- End of travel sensor
- Door sensor

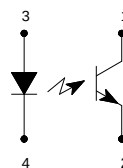
Part Number	LED Peak Wavelength	Sensor	Reflection Distance	Lead Length / Spacing
OPB706A	935 nm	Transistor	0.050" (1.27mm)	0.45" / 0.087", 0.100"
OPB706B				
OPB706C				
OPB707A		Darlington		
OPB707B				
OPB707C				



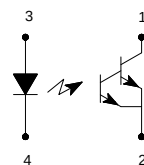
DIMENSIONS ARE IN: [MILLIMETERS]
INCHES

Pin #	LED	Pin #	Transistor
3	Anode	1	Collector
4	Cathode	2	Emitter

OPB706



OPB707



RoHS

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

Reflective Object Sensor
OPB706A, OPB706B, OPB706C
OPB707A, OPB707B, OPB707C



Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Storage and Operating Temperature Range	-40°C to $+85^{\circ}\text{C}$
Lead Soldering Temperature [1/16 inch (1.6mm) from the case for 5 sec. with soldering iron] ⁽¹⁾	260°C

Input Diode

Forward DC Current	50 mA
Peak Forward Current (1 μs pulse width, 300 pps)	3 A
Reverse DC Voltage	2 V
Power Dissipation ⁽²⁾	75 mW

Output Phototransistor (OPB706) | Output Photodarlington (OPB707)

Collector-Emitter Voltage OPB706 OPB707	24 V 15 V
Emitter-Collector Voltage	5 V
Collector DC Current OPB706 OPB707	25 mA 125 mA
Power Dissipation OPB706 ⁽²⁾ OPB707 ⁽³⁾	75 mW 100 mW

Notes:

- (1) RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
- (2) Derate linearly 1.25 mW/ $^{\circ}\text{C}$ above 25°C .
- (3) Derate linearly 1.67 mW/ $^{\circ}\text{C}$ above 25°C .

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

Reflective Object Sensor
OPB706A, OPB706B, OPB706C
OPB707A, OPB707B, OPB707C



Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
--------	-----------	-----	-----	-----	-------	-----------------

Input Diode (see OP165W for additional information)

V_F	Forward Voltage	-	-	1.7	V	$I_F = 20 \text{ mA}$
I_R	Reverse Current	-	-	100	μA	$V_R = 2 \text{ V}$

Output Phototransistor (see OP505W for additional information) | **Photodarlington** (see OP535 for additional information)

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage OPB706 OPB707	24 15	- -	- -	V	$I_C = 100 \mu\text{A}$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5	-	-	V	$I_E = 100 \mu\text{A}$
I_{CEO}	Collector Dark Current OPB706 OPB707	- -	- -	100 250	nA	$V_{CE} = 5 \text{ V}, I_F = 0, E_E \leq 0.1 \mu\text{W}/\text{cm}^2$

Combined

I_{CX}	Crosstalk OPB706 OPB707	- -	- -	200 10	nA μA	$I_F = 20 \text{ mA}, V_{CE} = 5 \text{ V}, \text{No reflecting surface}^{(1)}$
$I_{C(ON)}$	On-State Collector Current OPB706A OPB706B OPB706C OPB707A OPB707B OPB707C	500 350 250 25 17 10	- - - - - -	- - - - - -	μA mA	$I_F = 20 \text{ mA}, V_{CE} = 5 \text{ V}, d = 0.05" (1.27 \text{ mm})^{(2) (3)}$
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage OPB706 OPB707	0.4 1.1	- -	- -	V	$I_F = 20 \text{ mA}, d = 0.05" (1.27 \text{ mm})^{(2) (3)}$ $I_{C(ON)} = 100 \mu\text{A}$ $I_{C(ON)} = 2 \text{ mA}$

Notes:

- (1) Crosstalk (I_{CX}) is the collector current measured with the indicated current in the input diode and with no reflecting surface.
- (2) The distance from the assembly face to the reflective surface is "d".
- (3) Measured using Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface. Reference: Eastman Kodak, Catalog #E 152 7795.
- (4) Lower curve is a calculated worst case condition rather than the conventional -2 Ω limit.
- (5) All parameters tested using pulse techniques.

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

6 Vérin compact de la pince

Compact Cylinder: Standard Type Single Acting, Single Rod

CQS Series

ø12, ø16, ø20, ø25

How to Order

CQS B 20 - 10 S - **M9BWV**

With auto switch **CDQS B 20 - 10 S** - **M9BWV**

With auto switch
(Built-in magnet)

Mounting type

B	Through-hole/Both ends tapped common (Standard)
L	Foot type
LC	Compact foot type
F	Rod side flange type
G	Head side flange type
D	Double clevis type

Bore size

12	12 mm
16	16 mm
20	20 mm
25	25 mm

Cylinder stroke (mm)

Bore size (mm)	Standard stroke (mm)
12, 16, 20, 25	5, 10

For "Manufacture of Intermediate Strokes", refer to page 715.

Auto switch

Nil	Without auto switch
-----	---------------------

* Refer to the table below for the applicable auto switch model.

Body option

Nil	Standard (Rod end female thread)
M	Rod end male thread
F	Boss on head end

* Combination of body options is available. FM

Action

S	Single acting, Spring return
T	Single acting, Spring extend

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Made to Order
Refer to page 715 for details.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example) CDQSL25-10T

Applicable Auto Switches/Refer to pages 1575 to 1701 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load
					DC	AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)		
Solid state auto switch	Diagnostic indication (2-color indicator)	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	M9NV (M9N)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	IC circuit	Relay, PLC
				3-wire (PNP)		12 V	M9PV (M9P)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	
				2-wire		5 V, 12 V	M9BV (M9B)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	
				3-wire (NPN)		12 V	M9NWV (M9NW)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	
	Water resistant (2-color indicator)	Grommet	Yes	3-wire (PNP)	24 V	5 V, 12 V	M9PWV (M9PW)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	IC circuit	
				2-wire		12 V	M9BWV (M9BW)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	
				3-wire (NPN)		5 V, 12 V	M9NAV ^{*1} (M9NA) ^{*1}	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	IC circuit	
				3-wire (PNP)		12 V	M9PAV ^{*1} (M9PA) ^{*1}	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	24 V	5 V	A96V	A96	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	IC circuit	Relay, PLC
				2-wire		12 V	A93V ^{*2}	A93	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	
				2-wire		100 V or less	A90V	A90	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	—	

*1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance. Consult with SMC regarding water resistant types with the above model numbers.

*2 1 m type lead wire is only applicable to D-A93.

* Lead wire length symbols: 0.5 m..... Nil (Example) M9NWV
1 m..... M (Example) M9NWVM
3 m..... L (Example) M9NWVL
5 m..... Z (Example) M9NWVZ

* Solid state auto switches marked with "O" are produced upon receipt of order.

* Since there are other applicable auto switches than listed, refer to page 749 for details.

* For details about auto switches with pre-wired connector, refer to pages 1648 and 1649.

* Auto switches are shipped together (not assembled).

Note 1) There is the case D-A93V/M9□V/M9□V/M9□V/M9□V type auto switches cannot be mounted on the port surface, depending on the cylinder's stroke and the fitting size for piping. Consult with SMC for details.

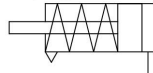
Note 2) The D-M9□□□ (in-line entry) type auto switch in () cannot be mounted due to the manufacturable stroke. When this auto switch satisfies the conditions stated in Note 3) on page 749, it can be ordered separately.

Compact Cylinder: Standard Type **CQS Series** Single Acting, Single Rod

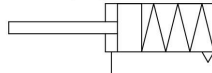


Symbol

Single acting,
Spring return



Single acting,
Spring extend



Made to Order:
Individual Specifications
(For details, refer to pages 750 and 752.)

Symbol	Specifications
-X271	Fluororubber seals
-X1876	With concave shape end boss on the cylinder tube head side

Made to Order Specifications

[Click here for details](#)

Symbol	Specifications
-XA□	Change of rod end shape
-XB10	Intermediate stroke (Using exclusive body), Extension type only
-XC6	Piston rod, retaining ring, rod end nut made of stainless steel
-XC36	With boss on rod side, ø12 and ø16 only
-XC85	Grease for food processing equipment

Body Option

Description	Application
Rod end male thread	Available for all standard models of single acting, single rod.

Mounting Bracket Part No.

Bore size (mm)	Foot (1)	Compact foot (1)	Flange	Double clevis
12	CQS-L012	CQS-LC012	CQS-F012	CQS-D012
16	CQS-L016	CQS-LC016	CQS-F016	CQS-D016
20	CQS-L020	CQS-LC020	CQS-F020	CQS-D020
25	CQS-L025	CQS-LC025	CQS-F025	CQS-D025

Note 1) When ordering foot and compact foot brackets, order 2 pieces per cylinder.

Note 2) Parts belonging to each bracket are as follows.
Foot, Compact foot, Flange type: Body mounting bolt
Double clevis type: Clevis pin, Type C retaining ring for axis, Body mounting bolt.

Moisture Control Tube IDK Series

When operating an actuator with a small diameter and a short stroke at a high frequency, the dew condensation (water droplet) may occur inside the piping depending on the conditions.
Simply connecting the moisture control tube to the actuator will prevent dew condensation from occurring. For details, refer to [the IDK series in the Best Pneumatics No. 6](#).



Standard Specifications

Bore size (mm)	12	16	20	25
Action	Single acting, Single rod			
Fluid	Air			
Lubrication	Not required (Non-lube)			
Proof pressure	1.5 MPa			
Maximum operating pressure	1.0 MPa			
Minimum operating pressure	0.25 MPa		0.18 MPa	
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing)			
	With auto switch: -10 to 60°C (No freezing)			
Cushion	None			
Rod end thread	Female thread			
Stroke length tolerance	+1.0 mm 0			
Piston speed	50 to 500 mm/s			
Allowable kinetic energy (J)	0.022	0.038	0.055	0.09

Theoretical Output

(N)

Action	Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm ²)	Operating pressure (MPa)			Retracted side	Extended side
Spring return	12	6	IN	—	0.3	0.5	0.7	14	4
			OUT	113	20	43	65	15	6
	16	8	IN	—	45	86	126	15	6
			OUT	201	78	141	204	15	6
	20	10	IN	—	126	224	323	21	11
			OUT	314	24	54	85	19	4
	25	12	IN	—	44	91	138	27	5
			OUT	491	84	160	235	29	10
Spring extend	12	6	IN	84.8	14	31	48	10	3
			OUT	—	24	54	85	19	4
	16	8	IN	151	44	91	138	27	5
			OUT	—	84	160	235	29	10
	20	10	IN	236	126	224	323	21	11
			OUT	—	24	54	85	19	4
	25	12	IN	378	44	91	138	27	5
			OUT	—	84	160	235	29	10

Manufacture of Intermediate Stroke (Single acting, Spring retract type is excluded.)

Description	Spacer is installed in the standard stroke body.
Part no.	Refer to "How to Order" for the standard model no. (page 714).
Description	Intermediate strokes in 1 mm increments are available by using spacers with standard stroke cylinders.
Stroke range	Bore size: 12 to 25 Stroke range: 1 to 9
Example	Part no.: CQSB20-3T CQSB20-5T with 2 mm width spacer inside. B dimension is 24.5 mm.

Refer to pages 747 to 749 for cylinders with auto switches.

- Minimum auto switch mounting stroke
- Proper auto switch mounting position (detection at stroke end) and mounting height
- Operating range

CUJ

CU

CQS

JCQ

CQ2

RQ

CQM

CQU

MU

D-□

-X□

Technical
Data

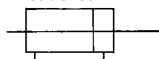
7 Vérin double effet central

Series CQ2W



JIS Symbol

Double acting,
Double rod



Made to Order

(For details, refer to pages 177 to 207.)

Symbol	Specifications
-XA□	Special rod end shape
-XB6	Heat resistant cylinder (-10 to 150°C) w/o auto switch only
-XB7	Heat resistant cylinder (-40 to 70°C) w/o auto switch only
-XB9	Low-speed cylinder (10 to 50 mm/s)
-XB10	Intermediate stroke (Exclusive body type)
-XB13	Low-speed cylinder (5 to 50 mm/s)
-XC4	With heavy-duty scraper, ø40 to ø100 only
-XC6	Piston rod/Retaining ring/Rod end nut material: Stainless steel
-XC35	With coil scraper, ø32 to ø100 only
-XC36	With boss on rod end
-X144	Special port location, with auto switch ø12 to ø25 only
-X235	Special rod end for double rod cylinder
-X271	Fluororubber seals
-X293	Full length dimension is the same as Series CQ1W.
-X633	Intermediate stroke of double rod cylinder

Refer to pages 169 to 175 for the specifications
of cylinders with auto switches.

- Auto switch proper mounting position
(detection at stroke end) and its mounting
height
- Minimum stroke for auto switch mounting
- Operating range
- Auto switch mounting brackets/Part no.

Specifications

Pneumatic type

Bore size (mm)		12	16	20	25	32	40	50	63	80	100
Action		Double acting, Double rod									
Fluid		Air									
Proof pressure		1.5 MPa									
Maximum operating pressure		1.0 MPa									
Minimum operating pressure		0.07 MPa		0.05 MPa							
Ambient and fluid temperature		Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)									
Lubrication		Not required (Non-lube)									
Piston speed		50 to 500 mm/s									
Allowable kinetic energy (J)	Standard	0.022	0.038	0.055	0.09	0.15	0.26	0.46	0.77	1.36	2.27
	With rubber bumper	0.043	0.075	0.11	0.18	0.29	0.52	0.91	1.54	2.71	4.54
Stroke length tolerance		+1.0 mm (Note)									

Note) Stroke length tolerance does not include the amount of bumper change.

Air-hydro type

Air-hydr type								
Bore size (mm)	20	25	32	40	50	63	80	100
Action	Double acting, Double rod							
Fluid	Turbine oil ^{Note)}							
Proof pressure	1.5 MPa							
Maximum operating pressure	1.0 MPa							
Minimum operating pressure	0.18 MPa			0.1 MPa				
Ambient and fluid temperature	5 to 60°C							
Piston speed	5 to 50 mm/s							
Cushion	None							
Stroke length tolerance	+1.0 mm							

Note) Refer to "Handling Precautions for SMC Products" (M-E03-3) for Actuator Precautions (5).

Standard Strokes

Pneumatic type (Non-lube) (mm)		Air-hydro type (mm)	
Bore size	Standard stroke	Bore size	Standard stroke
12, 16	5, 10, 15, 20, 25, 30	20, 25	5, 10, 15, 20, 25, 30 35, 40, 45, 50
20, 25	5, 10, 15, 20, 25, 30 35, 40, 45, 50	32, 40	5, 10, 15, 20, 25, 30 35, 40, 45, 50, 75, 100
32, 40	5, 10, 15, 20, 25, 30 35, 40, 45, 50, 75, 100	50, 63 80, 100	10, 15, 20, 25, 30 35, 40, 45, 50, 75, 100
50, 63 80, 100	10, 15, 20, 25, 30 35, 40, 45, 50, 75, 100		

Manufacture of Intermediate Strokes

Type	A spacer is installed in the standard stroke body. (5 mm intervals)	A spacer is installed in the standard stroke body. (1 mm intervals)	Exclusive body (-XB10)
Part no.	Refer to "How to Order" for the standard model number. (P. 22)	Suffix "-X633" (P. 205) to the end of standard model number. (P. 22)	Suffix "-XB10" to the end of standard model number. (P. 22)
Description	Strokes in 5 mm intervals are available by installing a spacer in the standard stroke cylinder.	Strokes in 1 mm intervals are available by installing a spacer in the standard stroke cylinder.	Strokes in 1 mm intervals are available by using an exclusive body with the specified stroke.
Stroke range	Bore size	Bore size	Bore size
	Stroke range	Stroke range	Stroke range
	12, 16	6 to 29	12, 16
	20, 25	6 to 49	20, 25
32 to 100	55 to 95	32, 40	32, 40
		50 to 100	50 to 100
		11 to 99	11 to 99
Example	Part no.: CQ2WB50-65DZ CQ2WB50-75DZ with 10 mm width spacer inside The B dimension is 125.5 mm.	Part no.: CQ2WB50-72DZ-X633 CQ2WB50-75DZ with 3 mm width spacer inside The B dimension is 125.5 mm.	Part no.: CQ2WB50-65DZ-XB10 Makes 65 mm stroke tube. The B dimension is 115.5 mm.

- Except air-hydro type
- In the case of spacer type, intermediate strokes with bumper for ø40 to ø100, "-X633" is not available.
- In the case of exclusive body type with ø32 to ø100 (-XB10) with the stroke length exceeding 50 mm, reference values of the longitudinal dimension will be changed.

Calculate length dimensions by deducting from those of 75 or 100 mm stroke models.



Series CQ2W

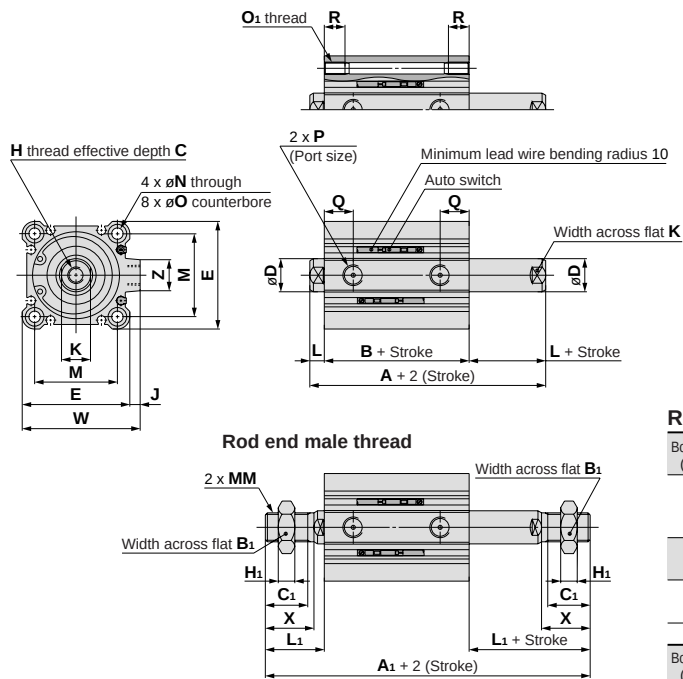
Dimensions

ø32 to ø50/With Auto Switch

(In the case of without auto switches, the A, B and P dimensions will be only changed. Refer to the dimension table.)

Standard (Through-hole): CQ2WB/CDQ2WB

Both ends tapped: CQ2WA/CDQ2WA



Both Ends

Tapped

Bore size (mm)	O ₁	R
32	M6 x 1.0	10
40	M6 x 1.0	10
50	M8 x 1.25	14

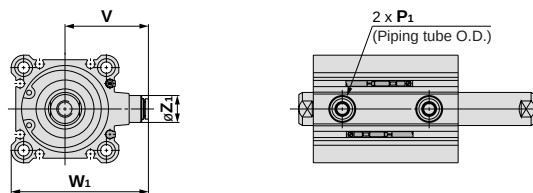
Note 1) The positions of left and right width across flats are not constant.

Rod End Male Thread

Bore size (mm)	Stroke range (mm)	Without auto switch	With auto switch
32	5	87.5	97.5
	10 to 50		
	75, 100	97.5	
40	5 to 50	97	107
	75, 100	107	
	10 to 50	107.5	117.5
50	75, 100	117.5	

Bore size (mm)	B ₁	C ₁	H ₁	L ₁	MM	X
32	22	20.5	8	28.5	M14 x 1.5	23.5
40	22	20.5	8	28.5	M14 x 1.5	23.5
50	27	26	11	33.5	M18 x 1.5	28.5

Built-in one-touch fittings: ø32 to ø50



Built-in One-touch Fittings

Bore size (mm)	Without auto switch	With auto switch	Z ₁	P ₁
32	V	W ₁	V	W ₁
32	38	60.5	36.5	59
40	42	68	40.5	66.5
50	50	82	50	82

Standard For auto switch proper mounting position and its mounting height, refer to pages 169 to 175. (mm)

Bore size (mm)	Stroke range (mm)	Without auto switch			With auto switch		
		A	B	P	A	B	P
32	5	44.5	30.5	M5	54.5	40.5	1/8
	10 to 50			1/8			
	75, 100	54.5	40.5	1/8			
40	5 to 50	54	40	1/8	64	50	1/8
	75, 100	64	50				
50	10 to 50	56.5	40.5	1/4	66.5	50.5	1/4
	75, 100	66.5	50.5				

Bore size (mm)	C	D	E	H	J	K	L	M	N	O	Q	W	Z
32	13	16	45	M8 x 1.25	4.5	14	7	34	5.5	9 depth 7	12.5	49.5	14
40	13	16	52	M8 x 1.25	5	14	7	40	5.5	9 depth 7	14	57	15
50	15	20	64	M10 x 1.5	7	17	8	50	6.6	11 depth 8	14	71	19

Note 2) The external dimensions with rubber bumper are same as those of the standard, as shown above.

* For details about the rod end nut and accessory brackets, refer to page 19.

8 Drivers des stepper

TOSHIBA

TB67S109AFTG/FNG

TOSHIBA BiCD Integrated Circuit Silicon Monolithic

TB67S109AFTG, TB67S109AFNG

CLOCK-in controlled Bipolar Stepping Motor Driver

The TB67S109A is a two-phase bipolar stepping motor driver using a PWM chopper. The clock in decoder is built in. Fabricated with the BiCD process, rating is 50 V/4.0 A.

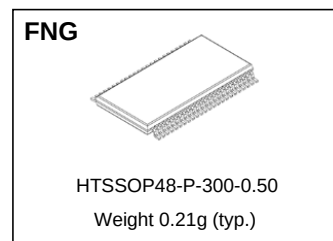
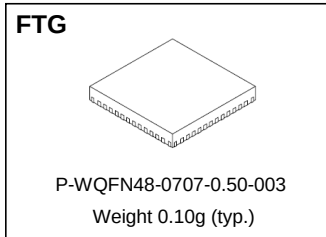
Features

- BiCD process integrated monolithic IC.
- Capable of controlling 1 bipolar stepping motor.
- PWM controlled constant-current drive.
- Allows full, half, quarter, 1/8, 1/16, 1/32 step operation.
- Low on-resistance (High + Low side=0.49Ω(typ.)) MOSFET output stage.
- High efficiency motor current control mechanism (Advanced Dynamic Mixed Decay)
- High voltage and current (For specification, please refer to absolute maximum ratings and operation ranges)
- Error detection (TSD/ISD) signal output function
- Built-in error detection circuits (Thermal shutdown (TSD), over-current shutdown (ISD), and power-on reset (POR))
- Built-in VCC regulator for internal circuit use.
- Chopping frequency of a motor can be customized by external resistance and capacitor.
- Multi package lineup

TB67S109AFTG: P-WQFN48-0707-0.50-003

TB67S109AFNG: HTSSOP48-P-300-0.50

Note) Please be careful about thermal conditions during use.



Function explanation (Stepping motor)

CLK Function

Each up-edge of the CLK signal will shift the motor's electrical angle per step.

CLK Input	Function
Up-edge	Shifts the electrical angle per step.
Down-edge	(State of the electrical angle does not change.)

ENABLE function

The ENABLE pin controls the ON and OFF of the corresponding output stage. This pin serves to select if the motor is stopped in OFF mode (High impedance) or activated. Please set the ENABLE pin to 'L' during VM power-on and power-off sequence.

ENABLE Input	Function
H	Output stage='ON' (Normal operation mode)
L	Output stage='OFF' (High impedance mode)

CW/CCW function and the output pin function (Output logic at the time of a charge start)

The CW/CCW pin controls the rotation direction of the motor. When set to 'Clockwise', the current of OUTA is output first, with a phase difference of 90°. When set to 'Counterclockwise', the current of OUTB is output first with a phase difference of 90°.

CW/CCW Input	OUT (+)	OUT (-)
H: Clockwise operation(CW)	H	L
L: Counterclockwise operation(CCW)	L	H

Step resolution select function

DMODE0	DMODE1	DMODE2	Function
L	L	L	Standby mode (the OSCM is disabled and the output stage is set to 'OFF' status)
L	L	H	Full step resolution
L	H	L	Half step resolution(Type A)
L	H	H	Quarter step resolution
H	L	L	Half step resolution(Type B)
H	L	H	1/8 step resolution
H	H	L	1/16 step resolution
H	H	H	1/32 step resolution

When switching the DMODE0,1,2; setting the RESET signal to Low (will set the electrical angle to the initial status), is recommended.

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit	Remarks
Motor power supply	VM	50	V	—
Motor output voltage	Vout	50	V	—
Motor output current	Iout	4.0	A	(Note 1)
Internal Logic power supply	VCC	6.0	V	When externally applied.
Logic input voltage	VIN(H)	6.0	V	—
	VIN(L)	-0.4	V	—
MO output voltage	VMO	6.0	V	—
LO output voltage	VLO	6.0	V	—
MO Inflow current	IMO	30	mA	—
LO Inflow current	ILO	30	mA	—
Power dissipation	WQFN48	PD	1.3	W (Note 2)
	HTSSOP48	PD	1.3	W (Note 2)
Operating temperature	TOPR	-20 to 85	°C	—
Storage temperature	TSTR	-55 to 150	°C	—
Junction temperature	Tj(max)	150	°C	—

Note 1: Usually, the maximum current value at the time should use 70% or less of the absolute maximum ratings for a standard on thermal rating. The maximum output current may be further limited in view of thermal considerations, depending on ambient temperature and board conditions.

Note 2: Device alone (Ta = 25°C)

Ta: Ambient temperature

Topr: Ambient temperature while the IC is active

Tj: Junction temperature while the IC is active. Tj(max) is limited by the thermal shutdown (TSD) circuitry. It is advisable to keep the maximum current below a certain level so that the maximum junction temperature, Tj (max), will not exceed 120°C.

Caution) Absolute maximum ratings

The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment. Do not exceed any of these ratings.

Exceeding the rating (s) may cause device breakdown, damage or deterioration, and may result in injury by explosion or combustion.

The value of even one parameter of the absolute maximum ratings should not be exceeded under any circumstances. The TB67S109A does not have overvoltage detection circuit. Therefore, the device is damaged if a voltage exceeding its rated maximum is applied.

All voltage ratings, including supply voltages, must always be followed. The other notes and considerations described later should also be referred to.

Operation Ranges (Ta=-20 to 85°C)

Characteristics	Symbol	Min	Typ.	Max	Unit	Remarks
Motor power supply	VM	10	24	47	V	—
Motor output current	Iout	—	1.5	3.0	A	(Note 1)
Logic input voltage	VIN(H)	2.0	—	5.5	V	Logic input High Level
	VIN(L)	0	—	0.8	V	Logic input Low Level
MO output pin voltage	VMO	—	3.3	5.0	V	—
LO output pin voltage	VLO	—	3.3	5.0	V	—
Clock input frequency	fCLK	—	—	100	kHz	—
Chopper frequency	fchop(range)	40	70	150	kHz	—
Vref input voltage	Vref	GND	2.0	3.6	V	—

Note 1: Maximum current for actual usage may be limited by the operating circumstances such as operating conditions (exciting mode, operating time, and so on), ambient temperature, and heat conditions (board condition and so on).

Electrical Specifications 1 (Ta = 25°C, VM = 24 V, unless otherwise specified)

Characteristics		Symbol	Test condition	Min	Typ.	Max	Unit
Logic input voltage	HIGH	VIN(H)	Logic input	2.0	—	5.5	V
	LOW	VIN(L)	Logic input	0	—	0.8	V
Logic input hysteresis voltage		VIN(HYS)	Logic input (Note 1)	100	—	300	mV
Logic input current	HIGH	IIN(H)	VIN(H)=3.3V	—	33	—	μA
	LOW	IIN(L)	VIN(L)=0V	—	—	1	μA
MO output pin voltage	LOW	VOL(MO)	IOL=24mA output=Low	—	0.2	0.5	V
LO output pin voltage	LOW	VOL(LO)	IOL=24mA output=Low	—	0.2	0.5	V
Current consumption		IM1	Output pins=open Standby mode	—	2	3.5	mA
		IM2	Output pins=open Standby release ENABLE=Low	—	3.5	5.5	mA
		IM3	Output pins=open Full step resolution	—	5.5	7	mA
Output leakage current	High-side	IOH	VRS=VM=50V,Vout=0V	—	—	1	μA
	Low-side	IOL	VRS=VM=Vout=50V	-1	—	—	μA
Motor current channel differential		ΔIout1	Current differential between Ch	-5	0	5	%
Motor current setting accuracy		ΔIout2	Iout=1.5A	-5	0	5	%
RS pin current		IRS	VRS=VM=24V	0	—	10	μA
Motor output ON-resistance (High-side+Low-side)		Ron(H+L)	Tj=25°C, Forward direction (High-side+Low-side)	—	0.49	0.6	Ω

Note 1: VIN (H) is defined as the VIN voltage that causes the outputs (OUTA,OUTB) to change when a pin under test is gradually raised from 0 V. VIN (L) is defined as the VIN voltage that causes the outputs (OUTA, OUTB) to change when the pin is then gradually lowered. The difference between VIN (H) and VIN (L) is defined as the VIN (HYS).

Note: When the logic signal is applied to the device whilst the VM power supply is not asserted; the device is designed not to function, but for safe usage, please apply the logic signal after the VM power supply is asserted and the VM voltage reaches the proper operating range.

9 Blocs d'alimentation



120W Single Output Industrial DIN RAIL

NDR-120 series



■ Features

- Universal AC input / Full range
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- UL 508 (industrial control equipment) approved
- BS EN/EN61000-6-2(BS EN/EN50082-2) industrial immunity level
- 100% full load burn-in test
- 3 years warranty

■ Applications

- Industrial control system
- Semiconductor fabrication equipment
- Factory automation
- Electro-mechanical apparatus

■ GTIN CODE

MW Search: <https://www.meanwell.com/serviceGTIN.aspx>

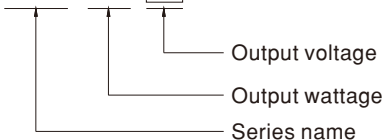
■ Description

NDR-120 is one economical slim 120W DIN rail power supply series, adapt to be installed on TS-35/7.5 or TS-35/15 mounting rails. The body is designed 40mm in width, which allows space saving inside the cabinets. The entire series adopts the full range AC input from 90VAC to 264VAC and conforms to BS EN/EN61000-3-2, the norm the European Union regulates for harmonic current.

NDR-120 is designed with metal housing that enhances the unit's power dissipation. With working efficiency up to 89%, the entire series can operate at the ambient temperature between -20°C and 70°C under air convection. It is equipped with constant current mode for over-load protection, fitting various inductive or capacitive applications. The complete protection functions and relevant certificates for industrial control apparatus (UL508, TUV BS EN/EN62368-1, and etc.) make NDR-120 a very competitive power supply solution for industrial applications.

■ Model Encoding

NDR - 120 - 12





120W Single Output Industrial DIN RAIL

NDR-120 series

SPECIFICATION

MODEL	NDR-120-12		NDR-120-24		NDR-120-48	
OUTPUT	DC VOLTAGE	12V		24V		48V
	RATED CURRENT	10A		5A		2.5A
	CURRENT RANGE	0 ~ 10A		0 ~ 5A		0 ~ 2.5A
	RATED POWER	120W		120W		120W
	RIPPLE & NOISE (max.) Note.2	100mVp-p		120mVp-p		150mVp-p
	VOLTAGE ADJ. RANGE	12 ~ 14V		24 ~ 28V		48 ~ 55V
	VOLTAGE TOLERANCE Note.3	±2.0%		±1.0%		±1.0%
	LINE REGULATION	±0.5%		±0.5%		±0.5%
	LOAD REGULATION	±1.0%		±1.0%		±1.0%
	SETUP, RISE TIME	1200ms, 60ms/230VAC 2500ms, 60ms/115VAC at full load				
HOLD UP TIME (Typ.)	16ms/230VAC 10ms/115VAC at full load					
INPUT	VOLTAGE RANGE Note.6	90 ~ 264VAC 127 ~ 370VDC [DC input operation possible by connecting AC/L(+), AC/N(-)]				
	FREQUENCY RANGE	47 ~ 63Hz				
	EFFICIENCY (Typ.)	85.5%		88%		89%
	AC CURRENT (Typ.)	2.25A/115VAC 1.3A/230VAC				
	INRUSH CURRENT (Typ.)	20A/115VAC 35A/230VAC				
	LEAKAGE CURRENT	<1mA / 240VAC				
PROTECTION	OVERLOAD	105 ~ 130% rated output power Protection type : Constant current limiting, recovers automatically after fault condition is removed				
	OVER VOLTAGE	14 ~ 17V		29 ~ 33V		56 ~ 65V
		Protection type : Shut down o/p voltage, re-power on to recover				
	OVER TEMPERATURE	Shut down o/p voltage, re-power on to recover				
ENVIRONMENT	WORKING TEMP.	-20 ~ +70℃ (Refer to "Derating Curve")				
	WORKING HUMIDITY	20 ~ 95% RH non-condensing				
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH				
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)				
	VIBRATION	Component:10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes; Mounting: Compliance to IEC60068-2-6				
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL508, TUV BS EN/EN62368-1, EAC TP TC 004 approved;(meet BS EN/EN60204-1)				
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:2KVAC O/P-FG:0.5KVAC				
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:>100M Ohms / 500VDC / 25℃ / 70% RH				
	EMC EMISSION	Compliance to BS EN/EN55032 (CISPR32), BS EN/EN61204-3 Class B, BS EN/EN61000-3-2,-3, EAC TP TC 020				
	EMC IMMUNITY	Compliance to BS EN/EN61000-4-2,3,4,5,6,8,11, BS EN/EN55024, BS EN/EN61000-6-2 (BS EN/EN50082-2), BS EN/EN61204-3, heavy industry level, EAC TP TC 020				
OTHERS	MTBF	2636.8K hrs min. Telcordia SR-332 (Bellcore) ; 453.3K hrs min. MIL-HDBK-217F (25℃)				
	DIMENSION	40*125.2*113.5mm (W*H*D)				
	PACKING	0.6Kg; 20pcs/13Kg/1.16CUFT				
NOTE	1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. 5. Installation clearances : 40mm on top, 20mm on the bottom, 5mm on the left and right side are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance is recommended. 6. Derating may be needed under low input voltage. Please check the derating curve for more details. 7. The ambient temperature derating of 3.5℃/1000m with fanless models and of 5℃/1000m with fan models for operating altitude higher than 2000m(6500ft). ※ Product Liability Disclaimer : For detailed information, please refer to https://www.meanwell.com/serviceDisclaimer.aspx					



240W Single Output Industrial DIN RAIL with PFC Function

SDR-240 series



■ Features :

- High efficiency 94% and low power dissipation
- 150% peak load capability
- Built-in active PFC function, PF>0.93
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- UL 508 (industrial control equipment) approved
- BS EN/EN61000-6-2(BS EN/EN50082-2) industrial immunity level
- Built-in DC OK relay contact
- 100% full load burn-in test
- 3 years warranty

User's Manual



■ GTIN CODE

MW Search: <https://www.meanwell.com/serviceGTIN.aspx>

SPECIFICATION



MODEL		SDR-240-24		SDR-240-48	
OUTPUT	DC VOLTAGE	24V		48V	
	RATED CURRENT	10A		5A	
	CURRENT RANGE	0 ~ 10A		0 ~ 5A	
	RATED POWER	240W		240W	
	PEAK CURRENT	15A		7.5A	
	PEAK POWER Note.6	360W (3sec.)			
	RIPPLE & NOISE (max.) Note.2	50mVp-p		50mVp-p	
	VOLTAGE ADJ. RANGE	24 ~ 28V		48 ~ 55V	
	VOLTAGE TOLERANCE Note.3	±1.0%		±1.0%	
	LINE REGULATION	±0.5%		±0.5%	
LOAD REGULATION	±1.0%		±1.0%		
SETUP, RISE TIME	650ms, 60ms/230VAC		1300ms, 60ms/115VAC at full load		
HOLD UP TIME (Typ.)	20ms/230VAC		20ms/115VAC at full load		
INPUT	VOLTAGE RANGE	88 ~ 264VAC		124 ~ 370VDC	
	FREQUENCY RANGE	47 ~ 63Hz			
	POWER FACTOR (Typ.)	0.94/230VAC		0.99/115VAC at full load	
	EFFICIENCY (Typ.) Note.8	94%			
	AC CURRENT (Typ.)	2.6A/115VAC		1.3A/230VAC	
	INRUSH CURRENT (Typ.)	33A/115VAC		55A/230VAC	
	LEAKAGE CURRENT	<1mA / 240VAC			
PROTECTION	OVERLOAD	Normally works within 110 ~ 150% rated output power for more than 3 seconds and then shut down o/p voltage with auto-recovery >150% rated power, constant current limiting with auto-recovery within 2 seconds and may cause to shut down if over 2 seconds			
	OVER VOLTAGE	29 ~ 33V		56 ~ 65V	
	OVER TEMPERATURE	Protection type : Shut down o/p voltage with auto-recovery 95°C ±5°C (TSW : detect on heatsink of power switch)			
		Protection type : Shut down o/p voltage, recovers automatically after temperature goes down			
FUNCTION	DC OK REALY CONTACT RATINGS (max.)	60Vdc/0.3A, 30Vdc/1A, 30Vdc/0.5A resistive load			
ENVIRONMENT	WORKING TEMP. Note.5	-25 ~ +70°C (Refer to "Derating Curve")			
	WORKING HUMIDITY	20 ~ 95% RH non-condensing			
	STORAGE TEMP., HUMIDITY	-40 ~ +85°C, 10 ~ 95% RH			
	TEMP. COEFFICIENT	±0.03%/°C (0 ~ 50°C)			
	VIBRATION	Component:10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes; Mounting: Compliance to IEC60068-2-6			
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL508, TUV BS EN/EN62368-1, AS/NZS 62368.1, EAC TP TC 004 approved;(meet BS EN/EN60204-1)			
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:2KVAC O/P-FG:0.5KVAC O/P-DC OK:0.5KVAC			
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:>100M Ohms / 500VDC / 25°C / 70% RH			
	EMC EMISSION	Compliance to BS EN/EN55032 (CISPR32), BS EN/EN61204-3 Class B, BS EN/EN61000-3-2,-3, EAC TP TC 020			
	EMC IMMUNITY	Compliance to BS EN/EN61000-4-2,3,4,5,6,8,11, BS EN/EN55024, BS EN/EN61000-6-2 (BS EN/EN50082-2), BS EN/EN61204-3, heavy industry level, EAC TP TC 020, SEMI F47 approved			
OTHERS	MTBF	1160.3K hrs min. Telcordia SR-332 (Bellcore) ; 169.3K hrs min. MIL-HDBK-217F (25°C)			
	DIMENSION	63*125.2*113.5mm (W*H*D)			
	PACKING	1.03Kg; 12pcs/13.4Kg/1.22CUFT			
NOTE	1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. 5. Installation clearances : 40mm on top, 20mm on the bottom, 5mm on the left and right side are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance is recommended. 6. 3 seconds max., please refer to peak loading curves. 7. Derating may be needed under low input voltage. Please check the derating curve for more details. 8. After 30 minutes of burn-in. 9. The ambient temperature derating of 3.5°C/1000m with fanless models and of 5°C/1000m with fan models for operating altitude higher than 2000m(6500ft). ※ Product Liability Disclaimer : For detailed information, please refer to https://www.meanwell.com/serviceDisclaimer.aspx				

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