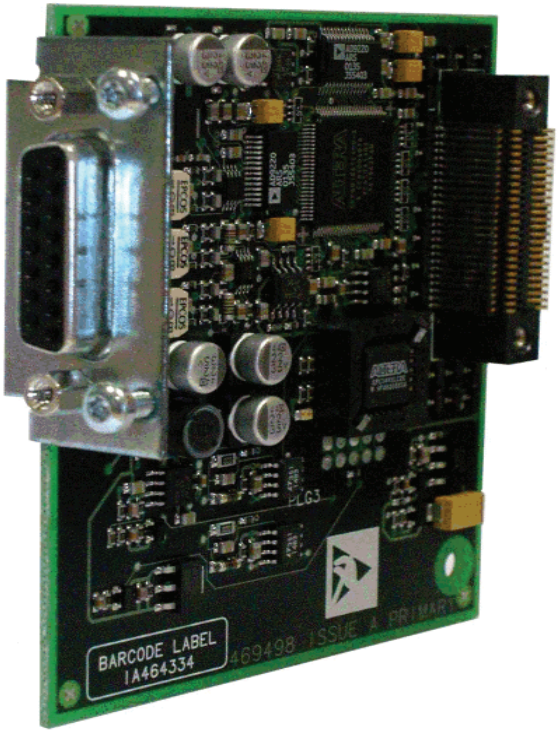

8902/E1

Sin/Cos Speed Feedback Option

HA469252U001 Issue 4
Technical Manual

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ENGINEERING YOUR SUCCESS.

8902/E1
Sin/Cos Speed Feedback Option

Technical Manual

HA469252U001 Issue 4

Compatible with Version 1.x Software

Safety Information

WARNING!
During commissioning, remove the fuses (or trip the circuit breaker) on your 3-phase supply.
Make sure the power is OFF, and that it cannot be switched on accidentally whilst you are working.

REFER TO YOUR MAIN PRODUCT MANUAL FOR SPECIFIC SAFETY INFORMATION ABOUT THE DEVICE YOU ARE CONTROLLING

IMPORTANT: Please read this information BEFORE installing the equipment.

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, EMC considerations, and to enable the user to obtain maximum benefit from the equipment.

Application Area

The equipment described is intended for industrial motor speed control.

Personnel

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

Safety

All control and signal terminals are SELV, i.e. protected by double insulation.

EMC

In a domestic environment this product may cause radio interference in which case the user may be required to take adequate counter-measures.

This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.

Cont.2

Safety Information

CAUTION!

At any time, there may be a loss of motor control and separate/independent application measures should be taken to ensure that such loss of motor control cannot present a safety hazard.

RISK ASSESSMENT

Under fault conditions, power loss or unintended operating conditions, the drive may not operate as intended. In particular:

- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the drive appears to be switched off
- The motor's direction of rotation might not be controlled
- The motor speed might not be controlled
- The motor might be energised

A drive is a component within a drive system that may influence its operation or effects under a fault condition. Consideration must be given to:

- Stored energy
- Supply disconnects
- Sequencing logic
- Unintended operation

Cont.3

Contents

SIN/COS SPEED FEEDBACK OPTION

Description

The Sin/Cos Speed Feedback Option allows 1V p-p (point-to-point) Sin/Cos encoders to be connected directly to the motor controller to provide highly accurate speed feedback measurement.

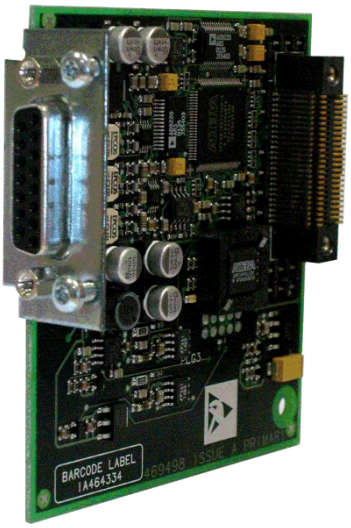


Figure 1 Sin/Cos Speed Feedback Option

Features

The Option has the following features:

- Interpolates each encoder line with 12-bit accuracy giving 4 million counts per revolution on a 1024 line encoder
- Decoding logic to interface the encoder to the microprocessor
- Supplies 5V or 10V to the encoder
- Will decode Heidenhain Endat 2.1 Abosolute Position Encoders

Part Number

The part number for the Sin/Cos Speed Feedback Option is :

8902/E1/00/00
8902/EI/00/FF (indicates a factory-fitted Option)

Used On

- This Option can be used on 890 drives with the following Product Codes:

890SD/..	890SD Standalone Drive
890CD/..	890CD Common Bus Drive

Refer to the 890 Engineering Reference Manual, Appendix E for Product Code details.

Specifications

Maximum Pulse Rate	250kHz
Receiver Impendance	120Ω
Input Format	Two differential 1V p-p signals in quadrature
Encoder Supply	Maximum load = 250mA Voltage adjustable: 5V/10V
Terminal Type	15-way, D-type socket

Recommended Spare Parts

We recommend that you keep one Option as a spare to reduce down-time.

Fitting the Option

If the Option is not factory-fitted, follow the procedure given below.

WARNING!
Disconnect all sources of power before attempting installation.

Caution
This Option contains ESD (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing and servicing this Option.

1. Undo the two screws securing Option A and Option B to the front of the drive. If Options are not fitted, completely remove the blank covers for the Option A and Option B slots.
2. Undo the screws (A) located in the top and bottom handles of the control board. Gently pull on the handles to withdraw the board from the drive, supporting any attached option boards. Note that the boards are sliding in top and bottom slots.
3. Remove any other Options that are fitted to the control board.
4. Offer up the Sin/Cos Option through the "OPTION F" cut-out as shown opposite.
5. Fit the two locating pegs of the large connector on the rear edge of the option board into the locating holes on the control board, as shown below.
6. Fit the two screws and crinkle washers (C) at the rear edge of the Option.
   DO NOT OVERTIGHTEN.
   Tightening torque : 0.2Nm (28 oz-in).
7. Secure with the two screws (B) to the front of the control board.

   The front panel screws (B) are self-tapping and can be quite hard to turn. This turning torque must not be transferred through the option board to the control board connector. To avoid this hold the option board with one hand, while tightening the font panel screws with the other. DO NOT hold the control board while tightening these screws.
8. Refit any other Options that were removed from the control board.
9. Replace the control board (with attached Options) into the drive.
10. Tighten the Option A and Option B screws; or importantly, fit the blank covers and secure with the screws.

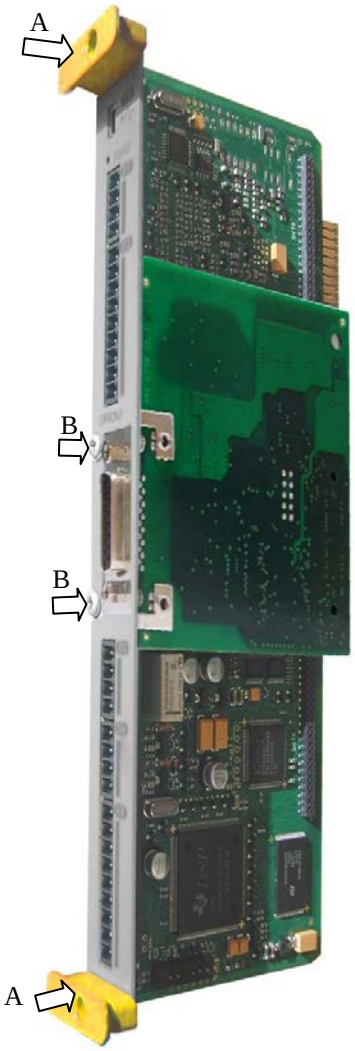


Figure 2 Control board showing Option correctly mounted

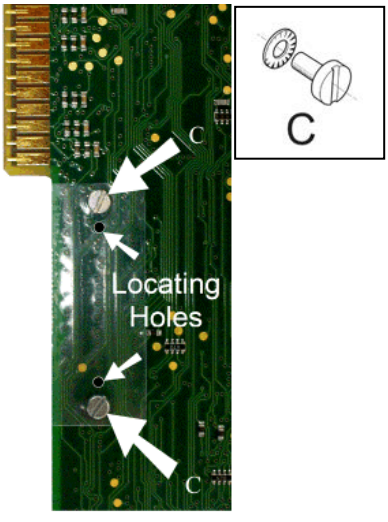


Figure 3 Rear of Control Board

Wiring the System

WARNING!
Disconnect all sources of power before attempting installation.

Caution
This Option contains ESD (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing and servicing this Option.

D-Type Connections

Take special care wiring the encoders to the Option due to the low level of the signals.

Use twisted-pair, screened cable with an overall screen and a screen over each individual pair. The signal pairs should have characteristic impedance of 120Ω. To ensure compliance with the EMC Directive the overall cable screen should be connected to the encoder body and to the cable clamp.

Use the encoder manufacturer's recommended cable.

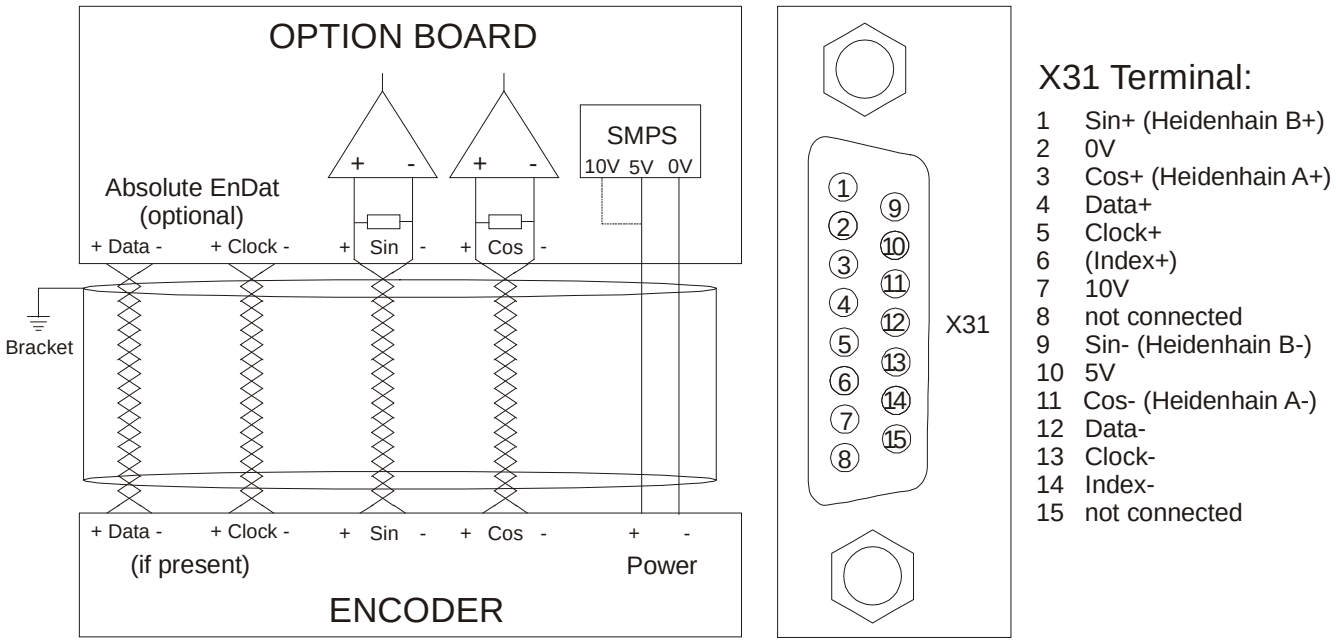


Figure 4 Wiring Diagram

Configuring the 890 Drive

Use the DSE 890 Configuration Tool to configure the ENCODER function block, as detailed below.

The DSE 890 Configuration Tool is Parker SSD Drives' Windows-based block programming software and is supplied with each drive.

ENCODER Function Block

SETUP::MOTOR CONTROL::ENCODER

This block allows Speed Feedback to be measured using a Sin/Cos encoder.

Parameter Descriptions

Ignore the setting for this parameter

PULSE ENC VOLTS *PREF: 71.01* *Default: 10.0 V* *Range: 5.0 to 20.0 V*

Set this approximately to the supply voltage required by the pulse encoder.

SINCOS ENC VOLTS *PREF: 71.22* *Default: 5.0 V* *Range: See below*

Set the supply volts required by the sin/cos encoder.

Enumerated Value : SinCos Encoder Volts

0 : 5V
1 : 10V

ENCODER LINES *PREF: 71.02* *Default: 2048* *Range: 250 to 262413*

Set the number of lines to match the type of encoder being used. Incorrect setting of this parameter will result in an erroneous speed measurement.

ENCODER INVERT *PREF: 71.03* *Default: FALSE* *Range: FALSE/TRUE*

Used to match the encoder direction to the motor direction. When TRUE, changes the sign of the measured speed and the direction of the position count. Setting the encoder direction should be done as part of the Autotune when running in Closed-loop Vector Mode.

ENCODER TYPE *PREF: 71.04* *Default: 0* *Range: See below*

This parameter defines the type of encoder being used.

Enumerated Value : Type

0 : QUADRATURE	single-ended pulse encoder
1 : CLOCK/DIR	single-ended pulse encoder
2 : CLOCK	single-ended pulse encoder
3 : QUADRATURE DIFF	differential pulse encoder
4 : CLOCK/DIR DIFF	differential pulse encoder
5 : CLOCK DIFF	differential pulse encoder
6 : SINCOS INC	sin/cos encoder
7 : ABS ENDAT ST	single turn endat absolute encoder
8 : ABS ENDAT MT	multi-turn endat absolute encoder

Note that if an absolute endat encoder is used, the encoder MUST be wired exactly as specified. If not, it will fail to calibrate the absolute position and an error will result when the drive is started. Its status can be viewed via the parameter CALIBRATN STATUS.

LOAD G'BOX RATIO *PREF: 71.05* *Default: 1* *Range: 1 to 64*

This parameter can be used to configure absolute position control applications. It must be an integer gear box ratio, e.g. 64:1. If there is a gearbox between the motor and the load, set the gearbox ratio via this parameter. "Load position" i.e. the position of the load on the other side of the gearbox, will then be calculated.

Parameter Descriptions

ENCODER MECH O/S *PREF: 71.06* *Default: 0.0000 deg* *Range: 0.0000 to 360.0000 deg*

(encoder mechanical offset) Use this parameter ro enter a mechanical offset of between 0 and 360 degrees to allow the output shaft position to be correctly zeroed. This value is subtracted from the LOAD POSITION which is reported by the encoder.
To zero the shaft position: turn the shaft to the zero position; note the value of the LOAD POSITION parameter, and enter this value into the ENCODER MECH O/S parameter. LOAD POSITION will now read zero.
Note that "load position" refers here to the shaft position on the other side of a gearbox which may be mounted on the motor output. It does not refer to the motor shaft position, unless the output gearbox ratio (LOAD G'BOX RATIO) is set to 1 (i.e. no gearbox fitted).

ENCODER FBK % *PREF: 71.08* *Default: —.xx %* *Range: —.xx %*

This parameter shows the mechanical speed of the motor shaft, calculated from the encoder feedback, as a percentage of the user maximum speed setting (MAX SPEED in the REFERENCE function block).

SHAFT POSITION *PREF: 71.09* *Default: —.xx deg* *Range: —.xx deg*

This diagnostic provides the motor shaft position (before the gear box).

LOAD POSITION *PREF: 71.10* *Default: —.xx deg* *Range: —.xx deg*

This is the position of a shaft on the other side of a gearbox attached to the motor. If a gearbox is not fitted, set LOAD G'BOX RATIO to 1. This variable is controlled by the position loop, i.e. the position loop will force the load position to equal the demanded position.

CALIBRATN STATUS *PREF: 71.13* *Default: 0* *Range: see below*

If a sincos absolute Endat encoder is fitted (single-turn or multi-turn), the software will attempt to match the slow absolute position (Endat) information to the fast analog feedback information, to obtain a fast absolute position feedback. This will normally be done on power-up. If the encoder is wired correctly and working correctly, these should match. The CALIBRATN STATUS diagnostic will then display COMPLETED. If the encoder is not an absolute type, the diagnostic will show NOT REQUIRED. If calibration fails, this diagnostic will indicate where the problem may lie. Refer to CAL FAIL RETRY.

Enumerated Value : Type

0 : NOT REQUIRED
1 : DRIVE NOT STOP'D
2 : MOTOR NOT STOP'D
3 : ENDAT FAULT
4 : CAL IN PROGRESS
5 : ID PSN IN PRGRSS
6 : COMPLETED
7 : CALIBRATION LOST
8 : CALIBRATN FAILED
9 : CAL WARNING

Note that if an absolute endat encoder is used, the encoder MUST be wired exactly as specified. If not, it will fail to calibrate the absolute position and an error will result when the drive is started. This could be CALIBRATION FAILED or CAL WARNING.

CAL FAIL RETRY *PREF: 71.24* *Default: FALSE* *Range: FALSE / TRUE*

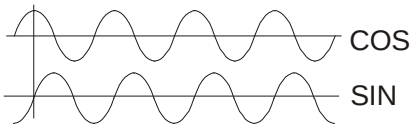
The software will make a number of attempts to calibrate the absolute position (see CALIBRATN STATUS above) and then go into the CALIBRATN FAILED state. If the problem has been corrected, it is necessary to get it to try again. This can be done either by switching the drive on and off, changing a related parameter, or by setting CAL FAIL RETRY = TRUE. When the calibration is done, it will automatically be reset to FALSE.

Save the Application

Remember to save your new configuration in DSE 890 and install it in the drive. In DSE 890, select "Command→Install At Selected" to install the currently opened configuration into a drive.

Functional Description

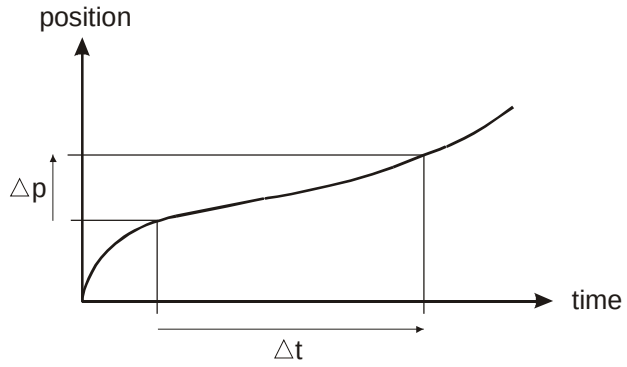
A Sin/Cos encoder uses 2 input signals, SIN and COS which by definition are offset by a quarter of a cycle (90°). Direction is obtained by looking to see if SIN is leading or lagging the COS signal.



A course position is obtained by incrementing or decrementing a counter when the polarity of the SIN signal changes with the COS signal high. This gives one count per encoder line.

The SIN and COS inputs are further sampled by a 12-bit ADC (analog-digital converter) so that encoder positon can be interpolated within one line count, eg. for a 1024 line encoder this gives:

$$1024 \times 2^{12} \text{ counts per revolution} = 4{,}194{,}304 \text{ counts per revolution}$$



High resolution speed can now be calculated from this high resolution position:

$$\text{speed} = \frac{\triangle \text{position}}{\triangle \text{time}}$$

Parker SSD Drives Approved Encoders

Parker SSD Drives recommend the use of the following encoders:

	1V p-p	EnDat 2.1	Single Turn ABS	Multi-turn ABS
Heidenhain:				
EQN425	✓	✓		✓
ECN413	✓	✓	✓	
ERN480	✓			
Stegmann:				
HG660 AKR(xxxx)S	✓			
HG660 DKR(xxxx)S	✓			
Hengstler:				
RIS58-H	✓			

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Parker Worldwide

AE – UAE, Dubai
Tel: +971 4 8127100
parker.me@parker.com

AR – Argentina, Buenos Aires
Tel: +54 3327 44 4129

AT – Austria, Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

AT – Eastern Europe,
Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

AU – Australia, Castle Hill
Tel: +61 (0)2-9634 7777

AZ – Azerbaijan, Baku
Tel: +994 50 2233 458
parker.azerbaijan@parker.com

BE/LU – Belgium, Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

BR – Brazil, Cachoeirinha RS
Tel: +55 51 3470 9144

BY – Belarus, Minsk
Tel: +375 17 209 9399
parker.belarus@parker.com

CA – Canada, Milton, Ontario
Tel: +1 905 693 3000

CH – Switzerland, Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

CL – Chile, Santiago
Tel: +56 2 623 1216

CN – China, Shanghai
Tel: +86 21 2899 5000

CZ – Czech Republic, Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

DE – Germany, Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

DK – Denmark, Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

ES – Spain, Madrid
Tel: +34 902 330 001
parker.spain@parker.com

FI – Finland, Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

FR – France, Contamine s/Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

GR – Greece, Athens
Tel: +30 210 933 6450
parker.greece@parker.com

HK – Hong Kong
Tel: +852 2428 8008

HU – Hungary, Budapest
Tel: +36 1 220 4155
parker.hungary@parker.com

IE – Ireland, Dublin
Tel: +353 (0)1 466 6370
parker.ireland@parker.com

IN – India, Mumbai
Tel: +91 22 6513 7081-85

IT – Italy, Corsico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

JP – Japan, Tokyo
Tel: +81 (0)3 6408 3901

KR – South Korea, Seoul
Tel: +82 2 559 0400

KZ – Kazakhstan, Almaty
Tel: +7 7272 505 800
parker.easteurope@parker.com

MX – Mexico, Apodaca
Tel: +52 81 8156 6000

MY – Malaysia, Shah Alam
Tel: +60 3 7849 0800

NL – The Netherlands,
Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

NO – Norway, Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

NZ – New Zealand, Mt Wellington
Tel: +64 9 574 1744

PL – Poland, Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

PT – Portugal, Leca da Palmeira
Tel: +351 22 999 7360
parker.portugal@parker.com

RO – Romania, Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

RU – Russia, Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

SE – Sweden, Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

SG – Singapore
Tel: +65 6887 6300

SK – Slovakia, Banská Bystrica
Tel: +421 484 162 252
parker.slovakia@parker.com

SL – Slovenia, Novo Mesto
Tel: +386 7 337 6650
parker.slovenia@parker.com

TH – Thailand, Bangkok
Tel: +662 717 8140

TR – Turkey, Istanbul
Tel: +90 216 4997081
parker.turkey@parker.com

TW – Taiwan, Taipei
Tel: +886 2 2298 8987

UA – Ukraine, Kiev
Tel +380 44 494 2731
parker.ukraine@parker.com

UK – United Kingdom,
Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

US – USA, Cleveland
Tel: +1 216 896 3000

VE – Venezuela, Caracas
Tel: +58 212 238 5422

ZA – South Africa,
Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

European Product Information Centre
Free phone: 00 800 27 27 5374
(from AT, BE, CH, CZ, DE, EE, ES, FI, FR, IE, IL, IS, IT, LU, MT, NL, NO, PT, SE, SK, UK)

Parker Hannifin Manufacturing Limited,
Automation Group, SSD Drives Europe,
New Courtwick Lane, Littlehampton,
West Sussex BN17 7RZ
United Kingdom
Tel: +44(0)1903 737000
Fax: +44(0)1903 737100
www.parker.com/ssd

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