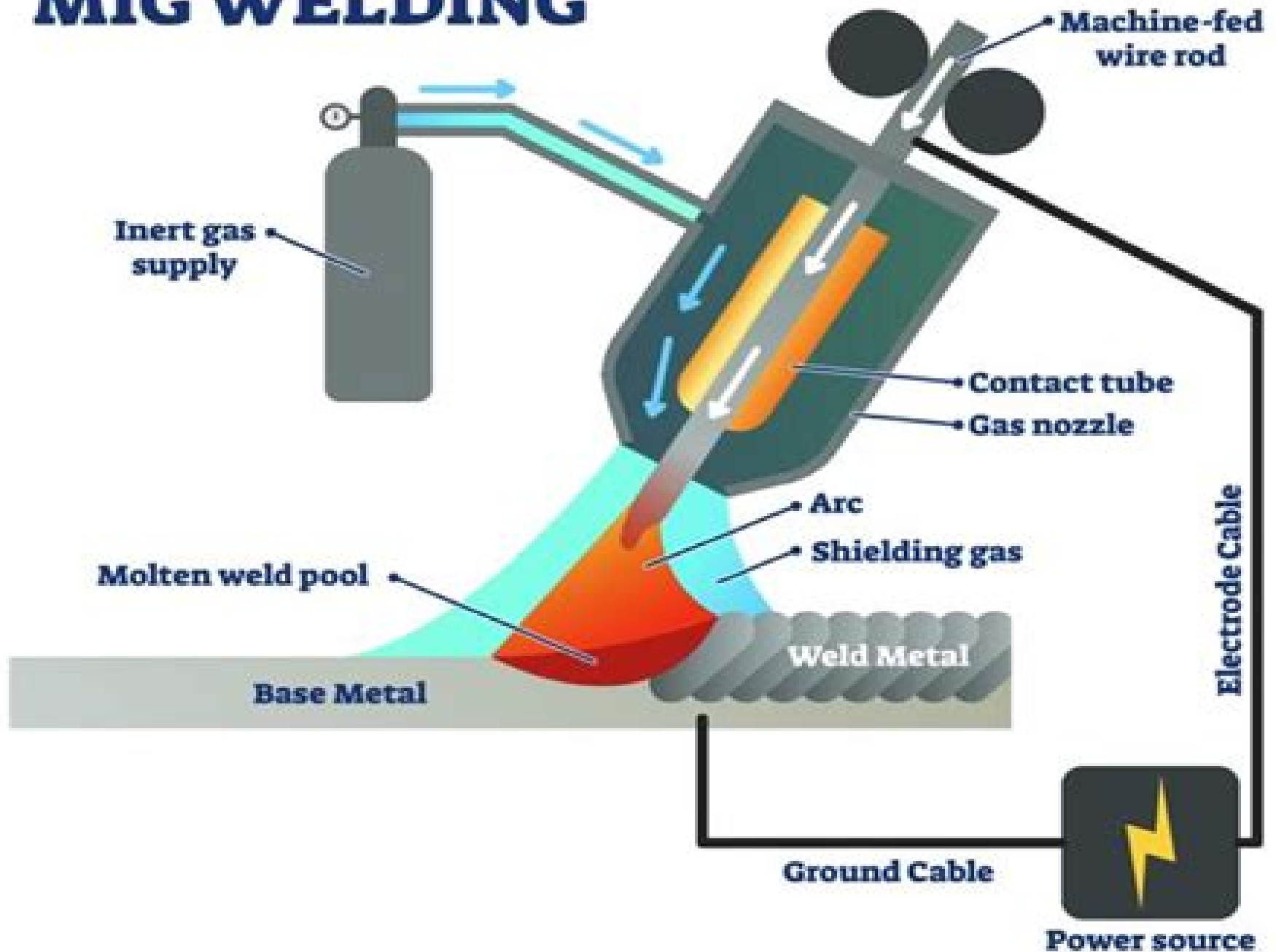


# MIG WELDING



# Mig Mag Welding Guide For Gas Metal Arc Welding

**AW Chickering**



## **Mig Mag Welding Guide For Gas Metal Arc Welding:**

Mig Welding Guide K Weman,G Lindén,2006-04-30 MIG metal inert gas welding also known as gas metal arc welding GMAW is a key joining technology in manufacturing MIG welding guide provides a comprehensive practical and accessible guide to this widely used process Part one discusses the range of technologies used in MIG welding including power sources shielding gases and consumables Fluxed cored arc welding pulsed MIG welding and MIG brazing are also explored Part two reviews quality and safety issues such as improving productivity in MIG MAG welding assessing weld quality health and safety and methods for reducing costs The final part of the book takes a practical look at the applications of MIG welding with chapters dedicated to the welding of steel and aluminium the use of robotics in MIG welding and the application of MIG welding in the automotive industry MIG welding guide is essential reading for welding and production engineers designers and all those involved in manufacturing Provides extensive coverage on gas metal arc welding a key process in industrial manufacturing User friendly in its language and layout Looks at the practical applications of MIG welding *MIG/MAG Welding Guide for Gas Metal Arc Welding (GMAW).* ,1995 MIG/Mag Welding Guide ,1997 *Advancements in Intelligent Gas Metal Arc Welding Systems* Paul Kah,2021-06-23 *Advancements in Intelligent Gas Metal Arc Welding Systems* Fundamentals and Applications presents the latest on gas metal arc welding which plays a significant role in modern manufacturing industries and accounts for about 70% of welding processes The importance of advancements in GMAW cannot be underestimated as they can lead to more efficient production strategies resource savings and quality improvements This book provides an overview of various aspects associated with GMAW starting from the theoretical basis and ending with characteristics of industrial applications and control methods Additional sections cover processes associated with welding and welding control such as fuzzy logic artificial neural networks and others Provides an up to date overview of recent GMAW developments Includes insights into intelligent welding automation Describes real world industrial cases of welding automation implementation **Gas Metal Arc Welding Handbook Instructor's Guide** ANONIMO,William H. Minnick,2007-11-05 Provides answers to questions in the text Gas Metal Arc Welding Handbook William H. Minnick,1996 *Gas Metal Arc Welding Handbook* provides comprehensive easy to understand coverage of this welding process This edition presents basic skills and advanced GMAW techniques with clearly written content and hundreds of illustrations **A Practical Guide to TIG (GTA) Welding** P W Muncaster,1991-10-31 Comprehensive advice on applications techniques and the best available equipment is given in clear straightforward language Gas Metal Arc Welding Ku Hyun Jung,2018-03-13 Filled with step by step instructions and detailed illustrations GMAW First Edition provides an easy to follow introduction to Gas Metal Arc Welding and basic metal properties You ll learn how to set up your workshop properly use welding equipment design projects work safely and get professional results even if you have no experience With coverage of the latest tools materials and techniques this fully updated hands on guide 9 practical works serves as an ideal beginner tutorial as well as

an on the job reference for experienced welders Ph D Ku Hyun Jung is Professor of Korea Polytechnic Colleges where he taught technical curriculums for more than 30 years

- 1 Introduction
- 2 Gas Metal Arc welding GMAW
- 3 Cutting and processing

Work 01 CO2 MAG MIG arc welding machine installation and control GMAW Work 02 Mild steel plate flat bead CO2 gas arc welding Work 03 Mild steel plate horizontal bead CO2 gas arc welding Work 04 Mild steel plate vertical up and down bead CO2 gas arc welding Work 05 Mild steel plate T shape fillet CO2 gas arc welding horizontal vertical down and overhead Work 06 Mild steel plate V shape butt CO2 gas arc welding horizontal and vertical up and down position Work 07 Aluminum plate T shape fillet MIG welding horizontal and vertical position Work 08 Stainless steel plate T shape fillet MIG welding horizontal vertical down and overhead position Work 09 Stainless steel plate V shape fillet MIG welding flat and vertical position

**Gas Metal Arc Welding** W. Minnick, 1995-01-01 *Welder's Handbook* Richard Finch, 2007-02-21 A newly updated state of the art guide to MIG and TIG arc welding technology Written by a noted authority in the field this revised edition of HP's bestselling automotive book for over 20 years is a detailed instructional manual on the theory technique equipment and proper procedures of metal inert gas MIG and tungsten inert gas TIG welding

**Manufacturing Engineer's Reference Book** D. KOSHAL, 2014-06-28 Never before have the wide range of disciplines comprising manufacturing engineering been covered in such detail in one volume Leading experts from all over the world have contributed sections The coverage represents the most up to date survey of the broad interests of the manufacturing engineer Extensive reference lists are provided making this an indispensable work for every engineer in industry Never before have the wide range of disciplines comprising manufacturing engineering been covered in such detail in one volume Leading experts from all over the world have contributed sections Materials and processes are described as well as management issues ergonomics maintenance and computers in industry CAD Computer Aided Design CAE Computer Aided Engineering CIM Computer Integrated Manufacturing and Quality are explored at length The coverage represents the most up to date survey of the broad interests of the manufacturing engineer Extensive reference lists are provided making this an indispensable work for every engineer in industry

Technical Guide for Gas Metal Arc Welding Martha A. Baker, 2012

*GMAW/FCAW Handbook* William H. Minnick, James Mosman, 2016-11-08 Resource added for the Welding program 314421

**Tool and Manufacturing Engineers Handbook Desk Edition** W. H. Cubberly, Ramon Bakerjian, 1989 The TMEH Desk Edition presents a unique collection of manufacturing information in one convenient source Contains selected information from TMEH Volumes 1-5 over 1 200 pages of manufacturing information A total of 50 chapters cover topics such as machining forming materials finishing coating quality control assembly and management Intended for daily use by engineers managers consultants and technicians novice engineers or students

**Handbook of Steel Connection Design and Details** Akbar R. Tamboli, 2010 Surveys the leading methods for connecting structural steel components covering state of the art techniques and materials and includes new information on welding and connections Hundreds of detailed examples

photographs and illustrations are found throughout this handbook from publisher description Advances in Manufacturing II Bartosz Gapiński, Marek Szostak, Vitalii Ivanov, 2019-05-02 This book covers a variety of topics related to machine manufacturing and concerning machine design product assembly technological aspects of production mechatronics and production maintenance Based on papers presented at the 6th International Scientific Technical Conference MANUFACTURING 2019 held in Poznan Poland on May 19 22 2019 the different chapters reports on cutting edge issues in constructing machine parts mechatronic solutions and modern drives They include new ideas and technologies for machine cutting and precise processing Chipless technologies such as founding plastic forming non metal construction materials and composites and additive techniques alike are also analyzed and thoroughly discussed All in all the book reports on significant scientific contributions in modern manufacturing offering a timely guide for researchers and professionals developing and or using mechanical engineering technologies that have become indispensable for modern manufacturing **The Repair of Vehicle Bodies** Andrew Livesey, Alan Robinson, 2006-08-11 The most comprehensive construction repair and finishing of vehicle bodies text Fully covers the underpinning knowledge needed for the Automotive Skills Council vehicle body and paint operations requirements City and Guilds 3980 Vehicle Body Repair Competence courses and the NVQ and the Progression Awards of both City and Guilds and the Institute of the Motor Industry at levels 2 and 3 Essential reading for all those involved in the trade and insurance assessment as well as for professional vehicle restorers and DIY enthusiasts working on the restoration or adaptation of classic and modern cars *MIG Welding for Beginners* Metalworks Publishing, 2025-08-05 With over 23 years of hands on welding experience I've seen firsthand how many beginners struggle due to bad advice outdated resources or poor instruction That's why I created this guide to make sure you start with the right foundation learn proper technique from day one and avoid the costly mistakes that hold most beginners back Whether you're aiming for a career in welding or just picking up the torch for your first DIY project my goal is to walk you through every step with clarity confidence and safety in mind Inside you'll learn how to Choose the right MIG welding machine wire and shielding gas Set up your welding station safely and correctly Understand machine settings like wire feed speed and voltage Master essential welding techniques and torch control Weld different types of joints and materials including steel and aluminum Troubleshoot common problems like porosity spatter and undercut Take on beginner friendly welding projects to sharpen your skills Maintain your equipment and stay safe while welding Designed specifically for beginners and self taught welders this guide is easy to follow jargon free and packed with valuable tips you won't find in a manual Whether you're learning MIG welding for home repairs creative projects or future career opportunities this book is your blueprint for success Start welding today safely confidently and with the right knowledge to grow Scroll up and grab your copy of *MIG Welding for Beginners* today *Computational Methods for Optimizing Manufacturing Technology: Models and Techniques* Davim, J. Paulo, 2012-02-29 This book contains the latest research developments in manufacturing technology and its optimization and demonstrates the

fundamentals of new computational approaches and the range of their potential application Provided by publisher A  
*Management and Engineer's Guide to MIG Welding Quality, Costs, and Training* Edward F. Craig, 1996 MIG and flux cored  
weld results achieved with the world's most utilized welding equipment are frequently influenced by weld sales advice This  
600 plus page book has been called the MIG bible by some readers It's the most comprehensive book ever written on  
managing the MIG process The book covers all aspects of controlling both the MIG and flux cored process A MANAGER OR  
ENGINEER DOES NOT REQUIRE THE ABILITY TO WELD HOWEVER THEY SHOULD HAVE THE FUNDAMENTAL  
PROCESS KNOWLEDGE OF WHAT MAKES A GOOD MIG OR FLUX CORED WELD WHEN A MANAGER OR ENGINEER  
UNDERSTANDS HOW SALES INFLUENCE AND HYPE EFFECTS THE WELD SHOP THEY ARE WELL ON THEIR WAY TO  
WELD PROCESS MANAGEMENT In the MIG Management book you will find Extensive data on MIG gas selection without  
sales input Over 100 pages on the problems with the pulsed process How to establish effective weld process controls for  
robot cells How to use special techniques to increase robot weld speeds How to optimize manual and robot weld deposition  
rates How to control sheet metal welds in automotive plants How to best utilize MIG and flux cored for pipe welds All this  
along with a unique simple method for controlling weld costs These are just a few of the important topics Without question  
this is the most practical and comprehensive book you will ever find on managing the MIG process

As recognized, adventure as well as experience practically lesson, amusement, as without difficulty as pact can be gotten by just checking out a ebook **Mig Mag Welding Guide For Gas Metal Arc Welding** as well as it is not directly done, you could say you will even more around this life, approximately the world.

We offer you this proper as skillfully as simple quirk to get those all. We present Mig Mag Welding Guide For Gas Metal Arc Welding and numerous ebook collections from fictions to scientific research in any way. in the course of them is this Mig Mag Welding Guide For Gas Metal Arc Welding that can be your partner.

[https://new.webyeshiva.org/book/browse/Download\\_PDFS/modern%20biology%20study%20guide%20answer%20key%209%201.pdf](https://new.webyeshiva.org/book/browse/Download_PDFS/modern%20biology%20study%20guide%20answer%20key%209%201.pdf)

## **Table of Contents Mig Mag Welding Guide For Gas Metal Arc Welding**

1. Understanding the eBook Mig Mag Welding Guide For Gas Metal Arc Welding
  - The Rise of Digital Reading Mig Mag Welding Guide For Gas Metal Arc Welding
  - Advantages of eBooks Over Traditional Books
2. Identifying Mig Mag Welding Guide For Gas Metal Arc Welding
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Mig Mag Welding Guide For Gas Metal Arc Welding
  - User-Friendly Interface
4. Exploring eBook Recommendations from Mig Mag Welding Guide For Gas Metal Arc Welding
  - Personalized Recommendations
  - Mig Mag Welding Guide For Gas Metal Arc Welding User Reviews and Ratings
  - Mig Mag Welding Guide For Gas Metal Arc Welding and Bestseller Lists

5. Accessing Mig Mag Welding Guide For Gas Metal Arc Welding Free and Paid eBooks
  - Mig Mag Welding Guide For Gas Metal Arc Welding Public Domain eBooks
  - Mig Mag Welding Guide For Gas Metal Arc Welding eBook Subscription Services
  - Mig Mag Welding Guide For Gas Metal Arc Welding Budget-Friendly Options
6. Navigating Mig Mag Welding Guide For Gas Metal Arc Welding eBook Formats
  - ePub, PDF, MOBI, and More
  - Mig Mag Welding Guide For Gas Metal Arc Welding Compatibility with Devices
  - Mig Mag Welding Guide For Gas Metal Arc Welding Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Mig Mag Welding Guide For Gas Metal Arc Welding
  - Highlighting and Note-Taking Mig Mag Welding Guide For Gas Metal Arc Welding
  - Interactive Elements Mig Mag Welding Guide For Gas Metal Arc Welding
8. Staying Engaged with Mig Mag Welding Guide For Gas Metal Arc Welding
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Mig Mag Welding Guide For Gas Metal Arc Welding
9. Balancing eBooks and Physical Books Mig Mag Welding Guide For Gas Metal Arc Welding
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Mig Mag Welding Guide For Gas Metal Arc Welding
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Mig Mag Welding Guide For Gas Metal Arc Welding
  - Setting Reading Goals Mig Mag Welding Guide For Gas Metal Arc Welding
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Mig Mag Welding Guide For Gas Metal Arc Welding
  - Fact-Checking eBook Content of Mig Mag Welding Guide For Gas Metal Arc Welding
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning



- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

### **14. Embracing eBook Trends**

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

## **Mig Mag Welding Guide For Gas Metal Arc Welding Introduction**

In the digital age, access to information has become easier than ever before. The ability to download Mig Mag Welding Guide For Gas Metal Arc Welding has revolutionized the way we consume written content. Whether you are a student looking for course material, an avid reader searching for your next favorite book, or a professional seeking research papers, the option to download Mig Mag Welding Guide For Gas Metal Arc Welding has opened up a world of possibilities. Downloading Mig Mag Welding Guide For Gas Metal Arc Welding provides numerous advantages over physical copies of books and documents. Firstly, it is incredibly convenient. Gone are the days of carrying around heavy textbooks or bulky folders filled with papers. With the click of a button, you can gain immediate access to valuable resources on any device. This convenience allows for efficient studying, researching, and reading on the go. Moreover, the cost-effective nature of downloading Mig Mag Welding Guide For Gas Metal Arc Welding has democratized knowledge. Traditional books and academic journals can be expensive, making it difficult for individuals with limited financial resources to access information. By offering free PDF downloads, publishers and authors are enabling a wider audience to benefit from their work. This inclusivity promotes equal opportunities for learning and personal growth. There are numerous websites and platforms where individuals can download Mig Mag Welding Guide For Gas Metal Arc Welding. These websites range from academic databases offering research papers and journals to online libraries with an expansive collection of books from various genres. Many authors and publishers also upload their work to specific websites, granting readers access to their content without any charge. These platforms not only provide access to existing literature but also serve as an excellent platform for undiscovered authors to share their work with the world. However, it is essential to be cautious while downloading Mig Mag Welding Guide For Gas Metal Arc Welding. Some websites may offer pirated or illegally obtained copies of copyrighted material. Engaging in such activities not only violates copyright laws but also undermines the efforts of authors, publishers, and researchers. To ensure ethical downloading, it is advisable to utilize reputable websites that prioritize the legal distribution of content. When downloading Mig Mag Welding Guide For Gas Metal Arc Welding, users should also consider the potential security risks associated with online platforms. Malicious actors may exploit vulnerabilities in unprotected websites to distribute malware or steal personal information. To protect themselves, individuals should ensure their devices have reliable antivirus software

installed and validate the legitimacy of the websites they are downloading from. In conclusion, the ability to download Mig Mag Welding Guide For Gas Metal Arc Welding has transformed the way we access information. With the convenience, cost-effectiveness, and accessibility it offers, free PDF downloads have become a popular choice for students, researchers, and book lovers worldwide. However, it is crucial to engage in ethical downloading practices and prioritize personal security when utilizing online platforms. By doing so, individuals can make the most of the vast array of free PDF resources available and embark on a journey of continuous learning and intellectual growth.

### **FAQs About Mig Mag Welding Guide For Gas Metal Arc Welding Books**

**What is a Mig Mag Welding Guide For Gas Metal Arc Welding PDF?** A PDF (Portable Document Format) is a file format developed by Adobe that preserves the layout and formatting of a document, regardless of the software, hardware, or operating system used to view or print it. **How do I create a Mig Mag Welding Guide For Gas Metal Arc Welding PDF?** There are several ways to create a PDF: Use software like Adobe Acrobat, Microsoft Word, or Google Docs, which often have built-in PDF creation tools. Print to PDF: Many applications and operating systems have a "Print to PDF" option that allows you to save a document as a PDF file instead of printing it on paper. Online converters: There are various online tools that can convert different file types to PDF. **How do I edit a Mig Mag Welding Guide For Gas Metal Arc Welding PDF?** Editing a PDF can be done with software like Adobe Acrobat, which allows direct editing of text, images, and other elements within the PDF. Some free tools, like PDFescape or Smallpdf, also offer basic editing capabilities. **How do I convert a Mig Mag Welding Guide For Gas Metal Arc Welding PDF to another file format?** There are multiple ways to convert a PDF to another format: Use online converters like Smallpdf, Zamzar, or Adobe Acrobats export feature to convert PDFs to formats like Word, Excel, JPEG, etc. Software like Adobe Acrobat, Microsoft Word, or other PDF editors may have options to export or save PDFs in different formats. **How do I password-protect a Mig Mag Welding Guide For Gas Metal Arc Welding PDF?** Most PDF editing software allows you to add password protection. In Adobe Acrobat, for instance, you can go to "File" -> "Properties" -> "Security" to set a password to restrict access or editing capabilities. Are there any free alternatives to Adobe Acrobat for working with PDFs? Yes, there are many free alternatives for working with PDFs, such as: LibreOffice: Offers PDF editing features. PDFsam: Allows splitting, merging, and editing PDFs. Foxit Reader: Provides basic PDF viewing and editing capabilities. **How do I compress a PDF file?** You can use online tools like Smallpdf, ILovePDF, or desktop software like Adobe Acrobat to compress PDF files without significant quality loss. Compression reduces the file size, making it easier to share and download. **Can I fill out forms in a PDF file?** Yes, most PDF viewers/editors like Adobe Acrobat, Preview (on Mac), or various online tools allow you to fill out forms in PDF files by selecting text fields and entering information. Are

there any restrictions when working with PDFs? Some PDFs might have restrictions set by their creator, such as password protection, editing restrictions, or print restrictions. Breaking these restrictions might require specific software or tools, which may or may not be legal depending on the circumstances and local laws.

### Find Mig Mag Welding Guide For Gas Metal Arc Welding :

[modern biology study guide answer key 9 1](#)

[honey and salt second portion](#)

**workshop manual for subaru forester**

[sociolinguistics goals approaches and problems](#)

[97 mustang gt fuse box](#)

**2000 ford super duty owners manual**

[accounting practice sales california](#)

[operating instructions microwave convection oven model](#)

[method and madness the making of a story](#)

[spanish language survival guide](#)

*blue pelican math pre calculous answers*

~~83 ford mustang gt owners manual~~

*manual repair corvette c3 from 1981*

~~les cowboys du sexas franek james~~

[dynamic probabilistic systems volume i markov models ronald a howard](#)

### Mig Mag Welding Guide For Gas Metal Arc Welding :

Wiring Diagrams Wiring Diagrams. S1/A/S2/A · Early H1 w/CDI · S1B/C/S3/A · Early H1 w/CDI (edited) ... H2/H1D Stator · Home. Service Manuals - Pinterest Sep 27, 2019 - Repair and Service Manuals including wiring diagrams and carburetor jetting specifications. 2015 bf 750 stator wire diagram. Oct 17, 2021 — I've put a 08 engine in the 2015 but wiring for the stator is different. I plugged in every wire that would but two of the stator wire plugs ... Wiring diagrams Aug 25, 2021 — Hey does anybody have or know where I can get a wiring diagram for my 07 500r. Want to put my tail light and signals on. Thanks! 2006 Vulcan 900 Stator schematic. Oct 2, 2016 — I am in need of a stator schematic. The previous owner ruined the wiring ... Looking closer at the diagrams, it appears that Kawasaki calls out ... [86-07] - wiring diagram | Kawasaki Ninja

250R ... Dec 13, 2015 — Here you go. Caution!!! The OEM ignition switch has a 100 ohm resistor, without it the bike won't start, it's an anti-thief feature. PM310, 23hp Kawasaki Wiring Diagram Gravely 990020 (001000 - ) PM310, 23hp Kawasaki Wiring Diagram Exploded View parts lookup by model. Complete exploded views of all the major manufacturers. Kawasaki Barako BC 175 Electrical Wiring Update Aug 11, 2017 — If there are no problems on the wirings and connectors; 2. Check the input to the VR, there are two wires coming from the charging coils. One is ... Buell 1125R Motorcycle Forum - Ignition Wire - BadWeB Oct 22, 2017 — Easiest way to gain access is to trace the short wiring bundle from the ignition to it's plug and unplug it. The plug is likely tangled up/ ... 2009 Buell 1125 Electrical Diagnostics Manual Key switch fuse. 900 W electric with one-way clutch. Cooling fan fuse. Auxiliary power. Fuel pump. Table 1-6. Fuel Pump Pressure Specifications. AMPERES. 30. 15. 2008 Buell 1125R Electrical Diagnostic Manual 99949-08Y 1. With the ignition on and the security disarmed, press and hold the TOGGLE and MODE switches until the SETUP MENU is displayed. · 2. Press and release the MODE ... Electrical Protection: Buell 1125R Models See Figure 1. The vehicle's electrical system is protected with fuses. The fuse block is located under the seat on the left side of the vehicle. Motorcycle Electrical & Ignition Switches for Buell 1125R Get the best deals on Motorcycle Electrical & Ignition Switches for Buell 1125R when you shop the largest online selection at eBay.com. Ignition/Headlamp Key Switch - Buell P3 Service Manual Buell P3 Manual Online: Ignition/Headlamp Key Switch. GENERAL 11 1 WARNING The automatic-on headlamp feature provides increased visibility of the rider to ... Un-do the "Harley fix" Mar 25, 2015 — I only had to figure out which connectors/wires the harley harness was tied into on the bikes main system, remove the harley harness and plug ... Buell 1125 R to CR Conversion Part 2 (Cable Routing, New ... Wiring Guru NEEDED Mar 13, 2012 — I've attaching the diagrams for the M-Lock, the wiring diagram and the connector I cut of the ignition. ... looking at the table for the ignition ... Concise Introduction to EU Private International Law: Fourth ... Concise Introduction to EU Private International Law: Fourth ... Concise Introduction to EU Private International Law It provides legal practitioners with an overview of this highly complex field of law and can serve as an introductory textbook in elective undergraduate courses ... Concise Introduction to EU Private International Law This book is an introduction to the rules of private international law belonging to the legal system of the European Union - more specifically to its core, ... Concise Introduction to EU Private International Law This book is an introduction to the rules of private international law belonging to the legal system of the European Union - more specifically to its core, ... Concise Introduction to EU Private International Law Concise Introduction to EU Private International Law : Third Edition (Paperback). By Michael Bogdan. \$67.85. Description; About the Author; Details; Reviews ... Concise Introduction to EU Private International Law This concise book is mainly intended to be used as an introduction to the rules of private international law belonging to the legal system of the European ... Concise introduction to EU private international law - Catalog This concise book is mainly intended to be used as an introduction to the rules of private international law belonging to the legal system of the European Union ... Concise

introduction to EU private international law The third edition of this concise book is mainly intended to be used as an introduction to the rules of private international law belonging to the legal ... Concise Introduction to EU Private International Law Michael Bogdan, Concise Introduction to EU Private International Law (Europa. Law Publishing, Groningen, 2006) ISBN 978-90-76871-70-7, 220 + x pages. Michael ... Concise Introduction to EU Private International Law ... It provides legal practitioners with an overview of this highly complex field of law and can serve as an introductory textbook in elective undergraduate courses ...