KH4205

High Performance Ratiometric Linear Hall Effect Sensor

General Description

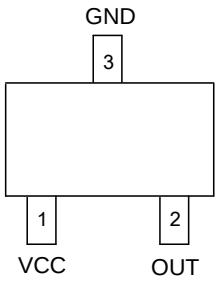
The KH4205 is a small, versatile linear Hall-effect device that is operated by the magnetic field from a permanent magnet or an electromagnet. The output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

For motion detectors, gear tooth sensors, and proximity detectors, they are magnetically driven mirrors of mechanical events. As sensitive monitors of electromagnets, they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.

The integrated circuitry provides low noise output, which makes it unnecessary to use external filtering components in most cases. It also includes precision resistors to provide increased temperature stability and accuracy. The operating temperature range of these linear Hall sensors is -40°C to +150°C, appropriate for commercial, consumer, and industrial environments.

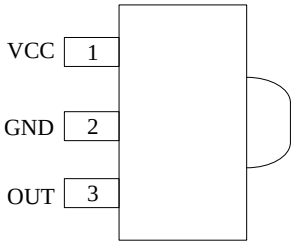
The KH4205 is available in standard TO-92S, SOT23-3 and SOT89-3 packages.

(Top View)



SOT23-3

(Top View)



SOT89-3

Features

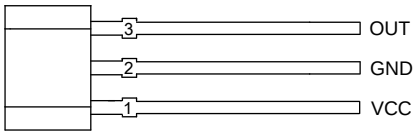
- 4.5V to 10.5V Wide Operating Voltage
- Sensitivity: 5mV/GS
- Ratiometric Rail to Rail Linear Output
- Precise sensitivity and temperature compensation
- Superior Temperature Stability: -40~+150 ℃
- A Stable and Accurate Output
- TO-92S(SIP-3L), SOT23-3 and SOT89-3 package

Applications

- Position Sensing
- Liquid Level Sensing
- Weight Sensing
- Ferrous Metal Detector
- Vibration Sensing
- Rotary Encoder
- Magnetic Code Reading
- Motor Control
- Current Sensing

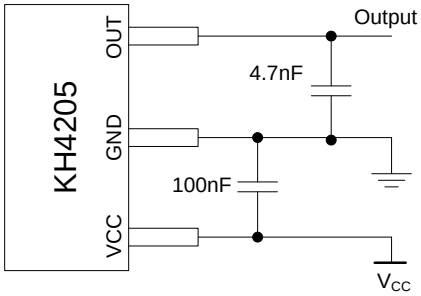
Pin Assignments

(Front View)



TO-92S

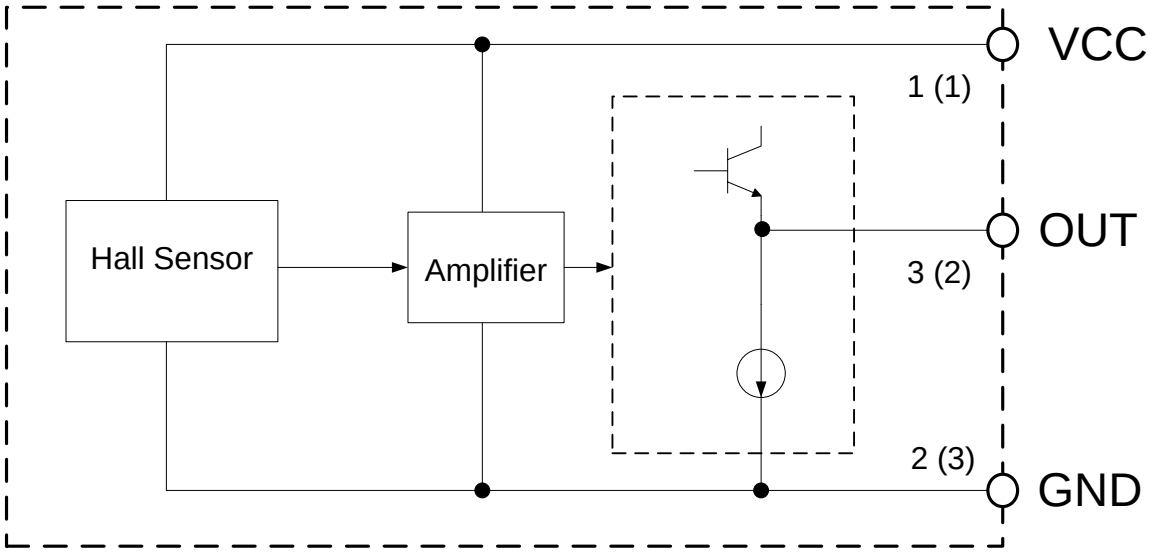
Typical Applications Circuit



Pin Descriptions

Pin Number			Pin Name	Function
TO-92S	SOT23-3	SOT89-3		
1	1	1	VCC	Supply voltage
2	3	2	GND	Ground pin
3	2	3	OUT	Output Pin

Functional Block Diagram



A(B)
A for TO-92S and SOT89-3
B for SOT23-3

Absolute Maximum Rates (@TA=+25ºC, Note 1&2)

Symbol	Parameter	Rating		Unit
V_{CC}	Supply Voltage	12		V
Vout	Output Voltage	12		V
Iout	Output Sink Current	5		mA
P_D	Power Dissipation	TO-92S	230	mW
		SOT23-3	301	
		SOT89-3	230	
T_A	Ambient Temperature	-40 to +150		°C
T_{STG}	Storage Temperature	-50 to +165		°C

Notes: 1. Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.
2. Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	4.5	10.5	V
T_{OP}	Operating Temperature	-40	+150	°C

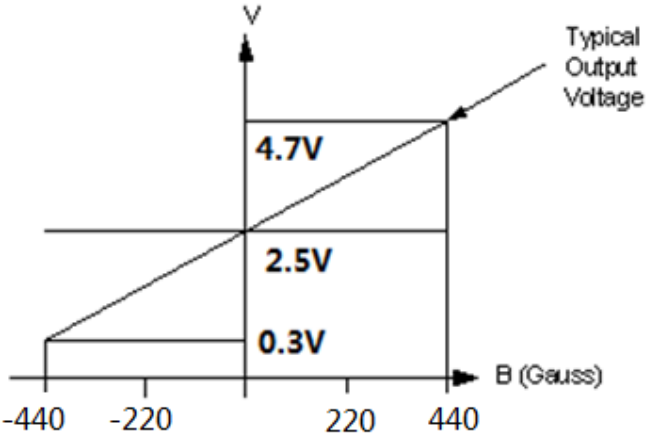
Electrical Characteristics (@TA=+25℃, VCC=5V, unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
Vcc	Supply Voltage		4.5	5	10.5	
I_{CC}	Supply Current		-	5	8.7	mA
Iout	Output Current		-	1.5	-	mA
V_{NULL}	Quiescent Output Voltage	B = 0 (Gauss)	2.425	2.5	2.575	V
V_{SEN}	Output Voltage Sensitivity	B = 0 to ±600 (Gauss)	4.9	5	5.1	mV/Gauss
V_{OUT_S}	Output Voltage Span		0.4 to (V_{CC} -0.4)	-	0.2 to (V_{CC} -0.2)	V
B	Linear Magnetic Range		±400	±440	±480	Gauss
	Linearity of Span		1	-	1.5	%

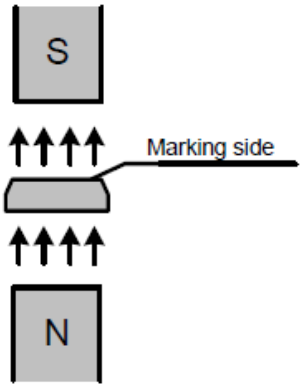
Transferring Characteristics (@T_A=+25°C, V_{CC}=5V)

When there is no external magnetic field (B=0Gauss), the quiescent output voltage is one-half the supply voltage in general.

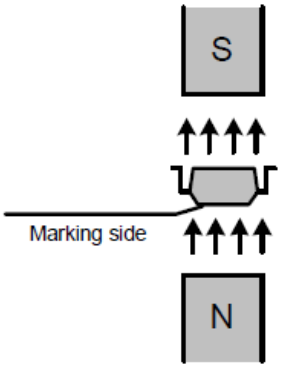
For TO-92S and SOT89-3 package, if a South magnetic pole approaches the part marking surface (the side with part marking ID) of the Hall effect sensor, the circuit will drive the output voltage higher. In contrary, a North magnetic pole will drive the output voltage lower. The variations of voltage level up or down from the quiescent output voltage (the null voltage) are symmetrical and is proportional to the magnetic flux density. In the SOT23-3 the die is placed underneath the lead frame and therefore when a magnet pole approaches the SOT23-3 part marking surface, the direction of the magnetic field in to the die is reversed compared to TO-92S. This results in a reverse response to the magnetic flux density in SOT23-3 package compared with TO-92S and SOT89-3 packages. (i.e. if the reverse magnetic pole approaches the part marking surface of SOT23-3, the output is the same as TO-92S package.) The largest magnetic sensitivity is obtained with a supply voltage of 10.5V, but at the cost of increased supply current and a slight loss of output symmetry. So, it is not recommended to work in such condition unless the output voltage magnitude is a main issue. The output signal can be capacitively coupled to a next-level amplifier for further amplifying if the changing frequency of the magnetic field is high.



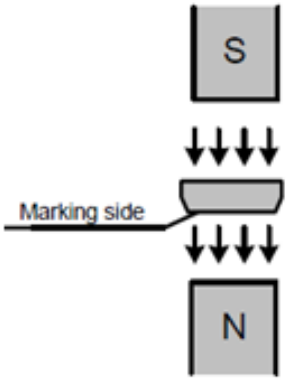
Transfer Characteristic



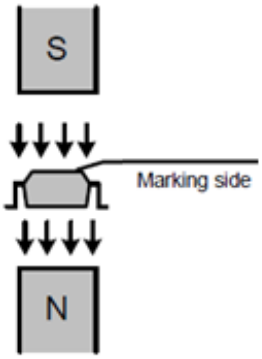
TO-92S&SOT89-3(OUT=2.5V~4.7V)



SOT23-3(OUT=2.5~4.7V)



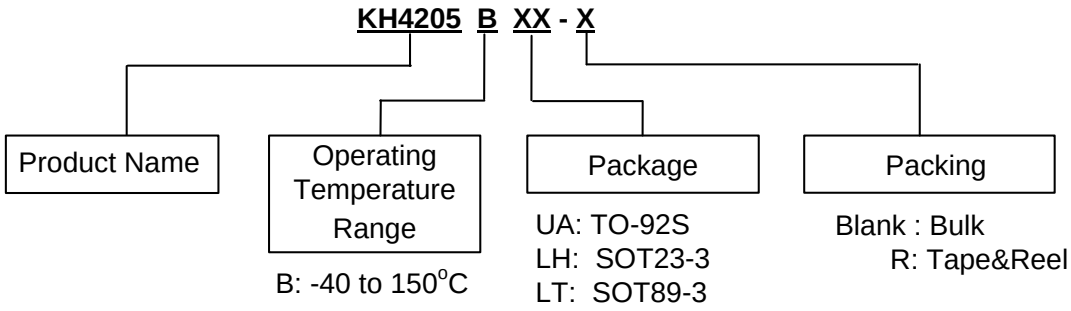
TO-92S&SOT89-3(OUT=0.3V~2.5V)



SOT23-3(OUT=0.3~2.5V)

Output Voltage vs. Magnetic Flux Density

Ordering Information



Package	Part Number	Marking ID	Packing Type
TO-92S	KH4205BUA	4205	1000/Bulk
SOT23-3	KH4205BLH	4205	3000/Tape&Reel
SOT89-3	KH4205BLT	4205	3000/Tape&Reel

Marking Informaiton

Package Type: TO-92S

First lines: Marking ID
Second line: Date Code
Y: Year 0 to 9
WW: Week 00 to 52 (Work week of molding)
X: Internal Code

Package Type: SOT23-3

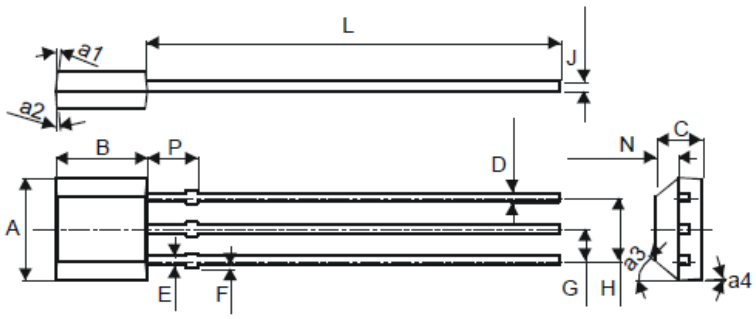
First lines: Marking ID

Package Type: SOT89-3

First lines: Marking ID
Second line: Date Code
Y: Year 0 to 9
WW: Week 00 to 52 (Work week of molding)
X: Internal Code

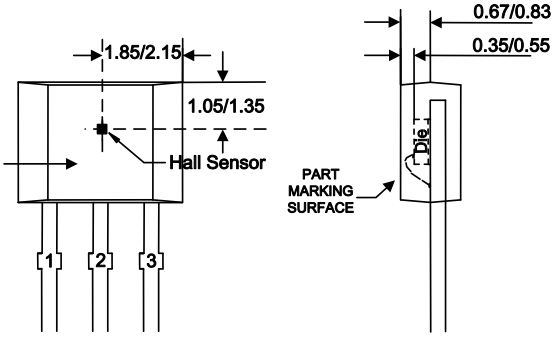
Package Outline Demension

Package Type: TO-92S



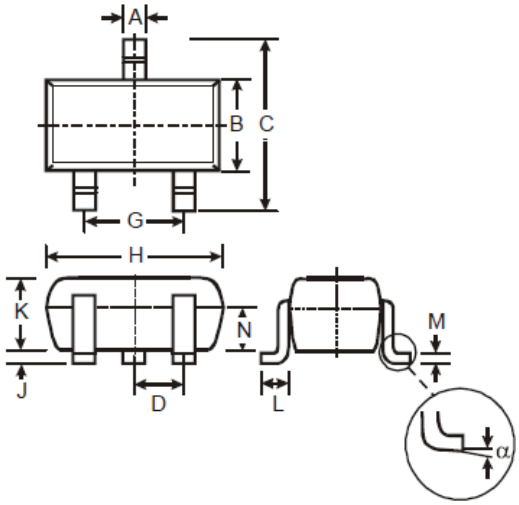
TO-92S		
Dim	Min	Max
A	4.0	4.2
a1	3° Typ	
a2	6° Typ	
a3	45° Typ	
a4	3° Typ	
B	3.08	3.28
C	1.48	1.68
D	0.36	0.56
E	0.44 Typ	
F	-0.05	0.20
G	1.27 Typ	
H	2.54 Typ	
J	0.38 Typ	
L	13.5	14.5
N	0.71	0.81
P	2.60	3.00
All Dimensions in mm		

Min/Max



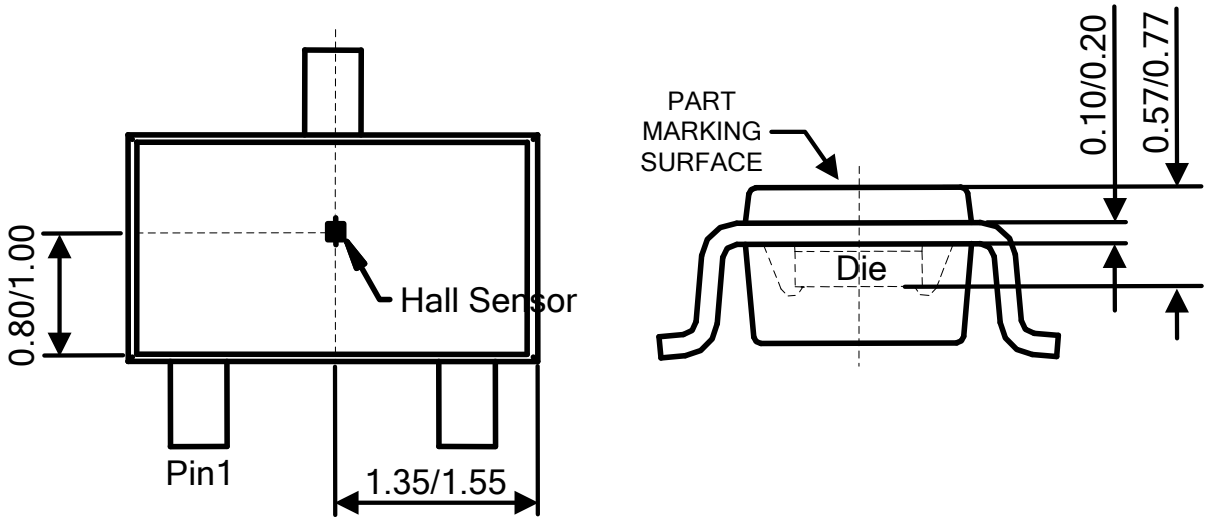
Sensor Location

Package Type: SOT23-3



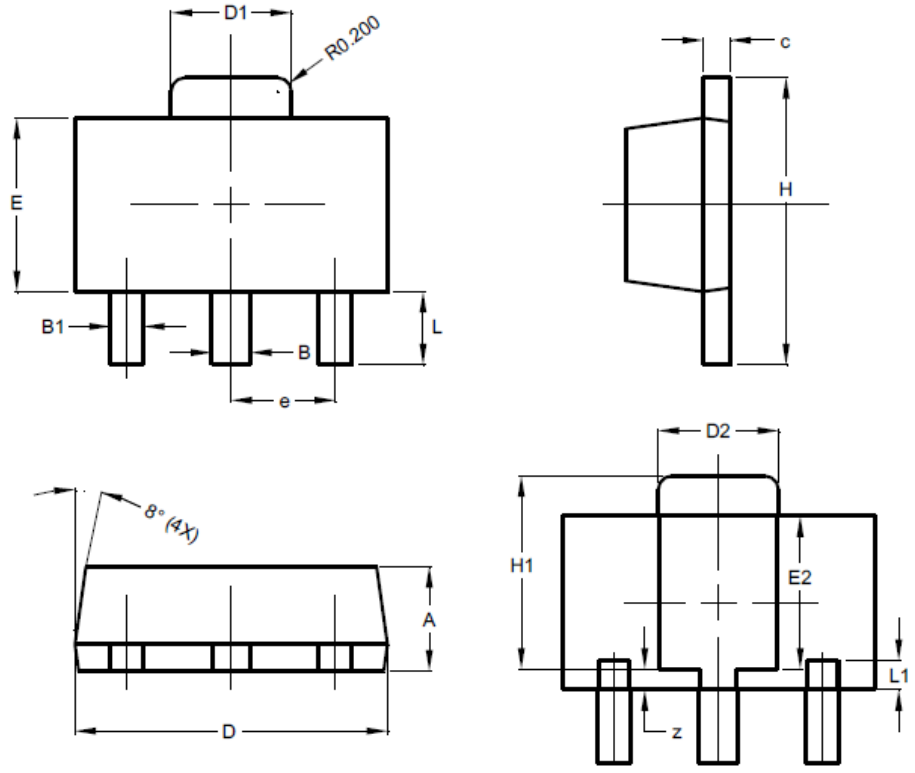
SOT23-3			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Min/Max

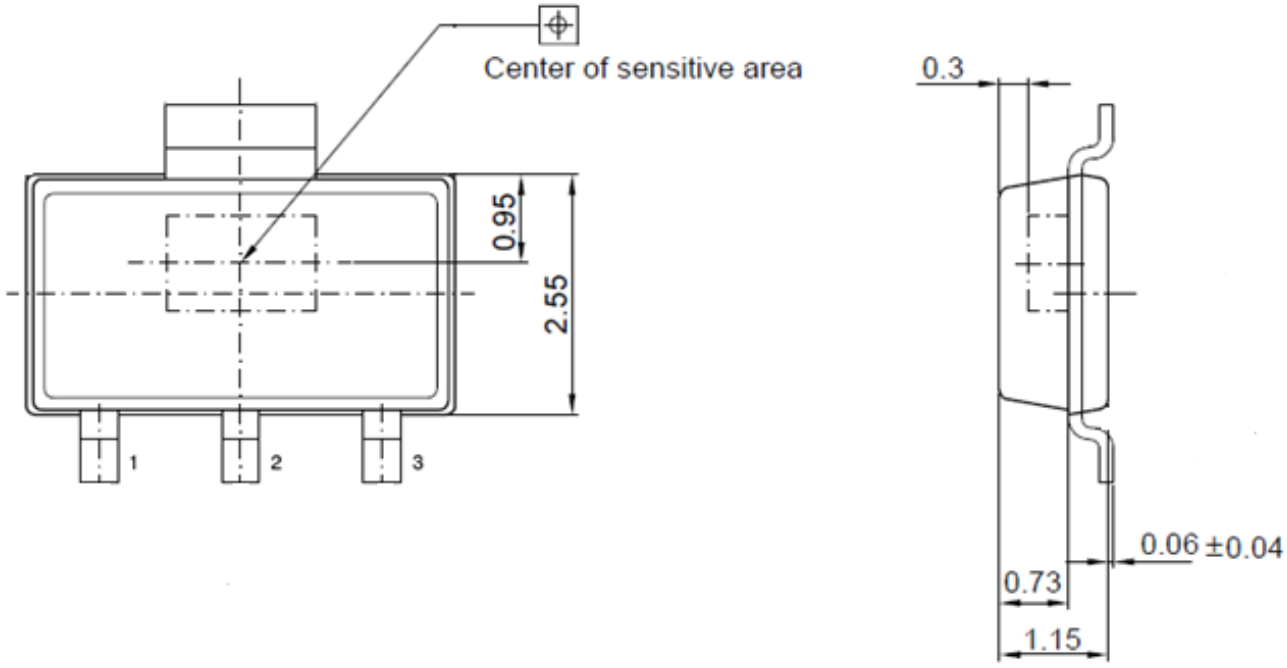


Sensor Location

Package Type: SOT89-3



SOT89-3			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in mm			



Sensor Location

IMPORTANT NOTICE

THE KOMPASS SYSTEM MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).THE INFORMATION AND DATA CONTAINED IN THIS DOCUMENT ARE BELIEVED TO BE ACCURATE AND RELIABLE. THE SOFTWARE AND PROPRIETARY INFORMATION CONTAINED HEREIN MAY BE PROTECTED BY COPYRIGHT, PATENT TRADEMARK AND/OR OTHER INTELLECTUAL PROPERTY RIGHTS OF KOMPASS SYSTEM. ALL RIGHTS NOT EXPRESSLY GRANTED REMAIN RESERVED BY KOPASS SYSTEM.

KOMPASS SYSTEM AND ITS SUBSIDIARIES RESERVE THE RIGHT TO REVIEW THIS DOCUMENT AND TO MAKE MODIFICATIONS, ENHANCEMENTS, IMPROVEMENTS, CORRECTIONS OR OTHER CHANGES AT ANY TIME WITHOUT OBLIGATION TO NOTIFY ANY PERSON OR ENTITY OF SUCH REVISION OR CHANGES DESCRIBED HEREIN. FOR FURTHER ADVICE PLEASE CONTACT US DIRECTLY.

KOMPASS SYSTEM DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF THIS DOCUMENT OR ANY PRODUCT DESCRIBED HEREIN; NEITHER DOES KOMPASS SYSTEM CONVEY ANY LICENSE UNDER ITS PATENT OR TRADEMARK RIGHTS, NOR THE RIGHTS OF OTHERS. ANY CUSTOMER OR USER OF THIS DOCUMENT OR PRODUCTS DESCRIBED HEREIN IN SUCH APPLICATIONS SHALL ASSUME ALL RISKS OF SUCH USE AND WILL AGREE TO HOLD KOMPASS SYSTEM AND ALL THE COMPANIES WHOSE PRODUCTS ARE REPRESENTED ON KOMPASS SYSTEM WEBSITE, HARMLESS AGAINST ALL DAMAGES.

ANY INFORMATION AND DATA WHICH MAY BE PROVIDED IN THE DOCUMENT CAN AND DO VARY IN DIFFERENT APPLICATIONS, AND ACTUAL PERFORMANCE MAY VARY OVER TIME. ALL OPERATING PARAMETERS MUST BE VALIDATED FOR EACH CUSTOMER APPLICATION BY CUTOMERS' TECHNICAL EXPERTS. ANY NEW ISSUE OF THIS DOCUMENT INVALIDATES PREVIOUS ISSUES.

KOMPASS SYSTEMS DOES NOT WARRANT OR ACCEPT ANY LIABILITY WHATSOEVER IN RESPECT OF ANY PRODUCTS PURCHASED THROUGH UNAUTHORIZED SALES CHANNEL.
SHOULD CUSTOMERS PURCHASE OR USE KOMPASS SYSTEM PRODUCTS FOR ANY UNINTENDED OR UNAUTHORIZED APPLICATION, CUSTOMERS SHALL INDEMNIFY AND HOLD KOMPASS SYSTEM AND ITS REPRESENTATIVES HARMLESS AGAINST ALL CLAIMS, DAMAGES, EXPENSES, AND ATTORNEY FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PERSONAL INJURY OR DEATH ASSOCIATED WITH SUCH UNINTENDED OR UNAUTHORIZED APPLICATION.

PRODUCTS DESCRIBED THEREIN MAY BE COVERED BY ONE OR MORE UNITED STATES, INTERNATIONAL OR FOREIGN PATENTS PENDING. PRODUCT NAMES AND MARKINGS NOTED THEREIN MAY ALSO BE COVERED BY ONE OR MORE UNITED STATES, INTERNATIONAL OR FOREIGN TRADEMARKS.

THIS DOCUMENT IS WRITTEN IN ENGLISH BUT MAY BE TRANSLATED INTO MULTIPLE LANGUAGES FOR REFERENCE. ONLY THE ENGLISH VERSION OF THIS DOCUMENT IS THE FINAL AND DETERMINATIVE FORMAT RELEASED BY KOMPASS SYSTEM.

LIFE SUPPORT

DO NOT USE OUR PRODUCTS IN LIFE-SUPPORTING SYSTEMS, MILITARY, AVIATION, OR AEROSPACE APPLICATIONS! UNLESS EXPLICITLY AGREED TO OTHERWISE IN WRITING BETWEEN THE PARTIES, KOMPASS SYSTEM'S PRODUCTS ARE NOT DESIGNED, INTENDED OR AUTHORIZED FOR USE AS COMPONENTS IN SYSTEMS INTENDED FOR SURGICAL IMPLANTS INTO THE BODY, OR OTHER APPLICATIONS INTENDED TO SUPPORT OR SUSTAIN LIFE, OR FOR ANY OTHER APPLICATION IN WHICH THE FAILURE OF THE PRODUCT COULD CREATE A SITUATION WHERE PERSONAL INJURY OR DEATH COULD OCCUR.

CUSTOMERS REPRESENT THAT THEY HAVE ALL NECESSARY EXPERTISE IN THE SAFETY AND REGULATORY RAMIFICATIONS OF THEIR LIFE SUPPORT DEVICES OR SYSTEMS, AND ACKNOWLEDGE AND AGREE THAT THEY ARE SOLELY RESPONSIBLE FOR ALL LEGAL, REGULATORY AND SAFETY-RELATED REQUIREMENTS CONCERNING THEIR PRODUCTS AND ANY USE OF KOMPASS SYSTEM PRODUCTS IN SUCH SAFETY-CRITICAL, LIFE SUPPORT DEVICES OR SYSTEMS, NOTWITHSTANDING ANY DEVICES- OR SYSTEMS-RELATED INFORMATION OR SUPPORT THAT MAY BE PROVIDED BY KOMPASS SYSTEM. FURTHER, CUSTOMERS MUST FULLY INDEMNIFY KOMPASS SYSTEM AND ITS REPRESENTATIVES AGAINST ANY DAMAGES ARISING OUT OF THE USE OF KOMPASS SYSTEM PRODUCTS IN SUCH SAFETY-CRITICAL, LIFE SUPPORT DEVICES OR SYSTEMS.

www.kompassys.com